Ensuring a safe and secure homeland for all North Dakotans

ENHANCED MITIGATION

Mission Area Operations Plan

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Adoption Documentation

The State of North Dakota adopted the 2019 State Enhanced Mitigation Mission Area Operations Plan (MAOP) through the executive powers of the governor. Copies of the letters signed by the State's Governors documenting the adoption of this plan in 2018, 2014, 2011, 2008, and 2005 are provided here. Through this adoption North Dakota State government, across all agencies, and in collaboration with its private partners, continues its commitment to hazard mitigation.

The adoption also provides assurances that that State of North Dakota will continue to comply with all applicable federal statutes and regulations in effect with respect to the periods for which the state receives grant funding, as stated in 44 CFR 13.11(c), and will amend this plan when necessary to reflect changes in state or federal laws or statutes as required in 44 CFR 13.11(d). The applicable text from the Code of Federal Regulations (CFR) follows.

TITLE 44--EMERGENCY MANAGEMENT AND ASSISTANCE

CHAPTER I--FEDERAL EMERGENCY MANAGEMENT AGENCY, DEPARTMENT OF HOMELAND SECURITY

PART 13_UNIFORM ADMINISTRATIVE REQUIREMENTS FOR GRANTS AND COOPERATIVE AGREEMENTS TO STATE AND LOCAL GOVERNMENTS

Subpart B_Pre-Award Requirements

Section 13.11 State plans.

- *A) Scope. The statutes for some programs require States to submit plans before receiving grants. Under regulations implementing Executive Order 12372, ``Intergovernmental Review of Federal Programs,'' States are allowed to simplify, consolidate and substitute plans. This section contains additional provisions for plans that are subject to regulations implementing the Executive Order.*
- *B) Requirements. A State need meet only Federal administrative or programmatic requirements for a plan that are in statutes or codified regulations.*
- *C) Assurances. In each plan the State will include an assurance that the State shall comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding. For this assurance and other assurances required in the plan, the State may:*
    1. *Cite by number the statutory or regulatory provisions requiring the assurances and affirm that it gives the assurances required by those provisions,*
    2. *Repeat the assurance language in the statutes or regulations, or*
    3. *Develop its own language to the extent permitted by law.*
- *D) Amendments. A State will amend a plan whenever necessary to reflect: (1) New or revised Federal statutes or regulations or (2) a material change in any State law, organization, policy, or State agency operation. The State will obtain approval for the amendment and its effective date but need submit for approval only the amended portions of the plan.*

U.S. Department of Homeland Security
Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267

FEMA

R8-MT

February 6, 2019

Cody Schulz, Director
Division of Homeland Security
North Dakota Department of Emergency Services
Fraine Barracks Lane, Building 35
Bismarck, North Dakota 58504

Dear Mr. Schulz:

FEMA Region VIII is pleased to announce the approval of the North Dakota Enhanced Mitigation Mission Area Operations Plan. FEMA found the plan to be in compliance with Title 44 of the Code of Federal Regulations (CFR) Section 201.5, Enhanced State Mitigation Plans. The plan is approved through February 5, 2024.

This approval confirms the continued eligibility of the State of North Dakota to receive non-emergency Stafford Act funding including Public Assistance (Categories C-G), Fire Management Assistance (FMAG), and Hazard Mitigation Assistance (HMA) grant programs. As a State with a FEMA-approved Enhanced State Mitigation Plan, North Dakota is also eligible at the time of a disaster declaration to receive increased funds under the Hazard Mitigation Grant Program (HMGP), based on twenty percent of the total estimated eligible Stafford Act disaster assistance. The North Dakota Enhanced State Hazard Mitigation Plan must be reviewed and revised as appropriate, and resubmitted to FEMA every five years to maintain eligibility to apply for funding through the programs referenced above.

We commend the State of North Dakota for its time and effort developing this plan and the State's continued commitment to reducing future disaster losses. Please contact Nicole Aimone, Senior Community Planner at (303) 235-4814 or Jeanine Petterson, Mitigation Division Director at (303) 235-4610 with any questions.

Sincerely,

Lee K. dePalo
Regional Administrator

www.fema.gov

State of
North Dakota
Office of the Governor

Doug Burgum
Governor

January 24, 2019

Lee dePalo, Regional Administrator
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267

Dear Mr. dePalo:

The North Dakota State Hazard Mitigation Team and I thank the Federal Emergency Management Agency (FEMA) for its encouragement and technical assistance during our recent effort to revise the State of North Dakota's *Enhanced Mitigation Mission Area Operations Plan* (Enhanced Mitigation MAOP). As a result of the support from FEMA and the collaboration of 84 public and private partners, we achieved our goal to develop an actionable plan designed to increase the resiliency of North Dakota for future disasters.

The Enhanced Mitigation MAOP meets and exceeds the requirements of the Disaster Mitigation Act of 2000 (DMA2K), Section 322, ensuring the State of North Dakota's eligibility to receive federal disaster mitigation funds. The DMA2K requires states to develop a mitigation plan that describes the processes for identifying hazards, risks and vulnerabilities; identifies and prioritizes mitigation actions; encourages the development of local and tribal mitigation; and provides technical support for these efforts. As determined by both your Region VIII staff and a National Review Panel, the Enhanced Mitigation MAOP meets requirements outlined in 44 Code of Federal Regulations (44CFR) 201.4 for Standard State Mitigation Plans and 201.5 for Enhanced State Mitigation Plans.

The State of North Dakota assures it will continue to comply with all applicable federal and state regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR, Part 13(c). The State will amend the plan whenever necessary to reflect changes in the state or federal laws and statutes as required in 44 CFR, Part 13.11(d). The adoption of this plan demonstrates the State of North Dakota's commitment to fulfilling the mitigation objectives outlined in the plan and authorizes the responsible agencies and organizations identified in the plan to execute their responsibilities.

With the submission of the 2018 Enhanced Mitigation MAOP, the plan is hereby adopted by the State of North Dakota under the executive powers of the Governor. We look forward to future collaboration as we move forward with enacting the mitigation strategy designed to improve the lives of North Dakotans.

Sincerely,

Doug Burgum

CC: MG Alan Dohrmann, Director, North Dakota Department of Emergency Services
Cody Schulz, Director, North Dakota Division of Homeland Security
Justin Messner, Disaster Recovery Chief, North Dakota Division of Homeland Security
Nicole Aimone, Senior Community Planner, Federal Emergency Management Agency

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State of
North Dakota
Office of the Governor

Jack Dalrymple
Governor

February 3, 2014

Tony Russell, Acting Regional Administrator
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
PO Box 25267
Denver, CO 80225-0267

Dear Mr. Russell:

The State of North Dakota's Multi-Hazard Mitigation Plan Update meets the requirements of the Disaster Mitigation Act of 2000 (DMA2K), Section 322. Section 322 of the Act requires that states, as a condition of receiving federal disaster mitigation funds, have a mitigation plan in place which describes the planning process for identifying hazards, risks and vulnerabilities; identifying and prioritizing mitigation actions; encouraging the development of local mitigation; and providing technical support for these efforts.

This Multi-Hazard Mitigation Plan Update with Enhancements is the result of an extensive planning effort that was coordinated by the North Dakota Department of Emergency Services (NDDES) and a multi-agency State Hazard Mitigation Team (SHMT) with professional planning assistance from AMEC Environment and Infrastructure. This update reflects broad-based involvement of local, state, federal agencies, private industry and non-profit organizations, as evidenced by the 82 participants who came to the kickoff meeting and the large number of participants at subsequent meetings.

The State of North Dakota assures it will continue to comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44CFR, Part 13.11(c). The State will amend the plan whenever necessary to reflect changes in the state or federal laws and statutes as required in 44CFR, Part 13.11(d). The adoption of this plan demonstrates the State of North Dakota's commitment to fulfilling the mitigation objectives outlined in the plan and authorizes the responsible agencies identified in the plan to execute their responsibilities.

With the submission of the 2014 North Dakota Multi-Hazard Mitigation Plan Update with Enhancements, the plan is hereby adopted by the State of North Dakota under the executive powers of the Governor.

Sincerely,

Jack Dalrymple

Jack Dalrymple
Governor

C: MG David Sprynczynatyk, North Dakota Adjutant General
Greg Wilz, Director, North Dakota Department of Homeland Security

37:68:56

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State of
North Dakota
Office of the Governor

Jack Dalrymple
Governor

March 1, 2011

Robin Finegan
Regional Administrator
Federal Management Agency, Region VIII
Denver Federal Center, Building 710
PO Box 25267
Denver, CO 80255-0267

Dear Administrator Finegan;

The State of North Dakota's Multi-Hazard Mitigation Plan meets the requirements of the Disaster Mitigation Act of 2000 (DMA2K), Section 322. Section 322 of the Act requires States, as a condition of receiving federal disaster mitigation funds, have a mitigation plan in place which describes the planning process for identifying hazards, risk and vulnerabilities, identifies and prioritizes mitigation actions, encourages the development of local mitigation and provides technical support for these efforts.

The State of North Dakota assures it will continue to comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44CFR, Part 13.11(c). The State will amend the plan whenever necessary to reflect changes in the state or federal laws and statutes as required in 44CFR, Part 13.11(d). The adoption of this plan demonstrates the State of North Dakota's commitment to fulfilling the mitigation objectives outlined in the Plan and authorize the responsible agencies identified in the Plan to execute their responsibilities.

With the submission of the 2011 North Dakota Multi-Hazard Mitigation Plan, the Plan is hereby adopted by the State of North Dakota under the executive powers of the Governor.

Sincerely,

Jack Dalrymple

Jack Dalrymple
Governor

37:68:56

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State of
North Dakota
Office of the Governor

John Hoeven
Governor

March 3, 2008

Douglas A. Gore, Acting Regional Administrator
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, Colorado 80225-0267

Dear Mr. Gore:

The State of North Dakota's Multi Hazard Plan meets the requirements of the Disaster Mitigation Act of 2000 (DMA2K), Section 322. Section 322 of the Act requires States, as a condition of receiving federal disaster mitigation funds, have a mitigation plan in place which describes the planning process for identifying hazards, risk and vulnerabilities, identifies and prioritizes mitigation actions, encourages the development of local mitigation and provides technical support for these efforts.

The State of North Dakota assures it will continue to comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR parts 13.11 (c). The State will amend the plan whenever necessary to reflect changes in state or federal laws and statutes as required in 44 CFR 13.11 (d). The adoption of this plan demonstrates the State of North Dakota's commitment to fulfilling the mitigation objectives outlines in the Plan and authorized the responsible agencies identified in the Plan to execute their responsibilities.

With the submission of the 2008 North Dakota Multi Hazard Mitigation Plan, the Plan is hereby adopted by the State of North Dakota under the executive powers of the Governor.

Sincerely,

John Hoeven
Governor

38:47:59

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— State of —
North Dakota
Office of the Governor

John Hoeven
Governor

March 9, 2005

Mr. David I. Maurstad, Regional Director
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, Colorado 80225-0267

Dear Mr. Maurstad:

The State of North Dakota's Multi Hazard Mitigation Plan meets the requirements of the Disaster Mitigation Act of 2000 (DMA2K), Section 322. Section 322 of the Act requires States, as a condition of receiving federal disaster mitigation funds, have a mitigation plan in place which describes the planning process for identifying hazards, risk and vulnerabilities, identifies and prioritizes mitigation actions, encourages the development of local mitigation and provides technical support for these efforts.

The State of North Dakota assures it will comply with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR part 13.11 (c). The State will amend the plan whenever necessary to reflect changes in state or federal laws and statutes as required in 44 CFR 13.11 (d). The adoption of this plan demonstrates the State of North Dakota's commitment to fulfilling the mitigation objectives outlines in the Plan and authorized the responsible agencies identified in the Plan to execute their responsibilities.

With the submission of the 2004 North Dakota Multi Hazard Mitigation Plan, the Plan is hereby adopted by the State of North Dakota under the executive powers of the Governor.

Regards!

Sincerely,

John Hoeven
Governor

38:28:35

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Executive Summary

A Whole Community Plan

Mandan resident Ken Blazer captured the essence of hazard mitigation when he urged implementation of permanent solutions to lessen the impacts of hazards and threats on North Dakota communities. "We should be saving money," he said. "Every once in a while, someone has an idea that works." The Enhanced Mitigation Mission Area Operations Plan (MAOP) reflects the insights and ideas of citizens like Mr. Blazer for building a disaster-resilient North Dakota.

Plan development required a robust Whole Community approach with 84 public and private organizations contributing unprecedented support for development. The 2018 State Hazard Mitigation Team (SHMT) represented 15 federal agencies; 41 state agencies and divisions; 8 local agencies; and 20 non-governmental organizations and private partners. While public universities and electric cooperatives were invited to participate on the SHMT for awareness and local perspective, these entities typically are covered under county plans for hazard mitigation purposes. A record number of individuals, 103 in total, participated in the first planning meeting. The commitment of this diverse, invested group continued throughout the planning process.

Community Coffee Comments

Justin Messner, NDDES Disaster Recovery Chief, discusses hazards and threats with a Mandan family.

Additionally, more than 100 citizens contributed to the plan, sharing their stories, experiences and concerns about the state's natural and technological hazards and adversarial threats. Community Coffees, an initiative of the North Dakota Department of Emergency Services (NDDES) and the SHMT, targeted specific sectors of communities, many of whose voices had never been heard in mitigation planning. They included senior citizens; homeless individuals; disaster volunteers; public and private health care workers; first responders; service providers; individuals with functional and access needs; federal, state, and local elected officials; and local and tribal government employees.

Participants shared harrowing stories of encounters with the State's hazards and threats that provided insights into understanding impacts on North Dakotans. They provided a wealth of data that contributed to understanding our State's risk and vulnerability, and they identified a number of viable options to keep North Dakota safer. NDDES is indebted to Community Coffee participants and the SHMT for their contributions.

A New Direction for the Plan

In preparation for revisions to the 2014 State of North Dakota Multi-Hazard Mitigation Plan, NDDES mitigation staff evaluated content as well as comments from its federal partner, the Federal Emergency Management Agency (FEMA), and local and tribal emergency managers regarding the utility of the plan. Staff determined the previous plan relied too heavily on background information and contained limited useful analyses. The team recommended reversing that equation by emphasizing more thoughtful analyses of data and capabilities, and leveraging conclusions for each section to summarize key points and to establish the groundwork for identification of viable mitigation strategies.

Mitigation staff presented the evaluation of the previous plan to the Technical Advisory Committee (TAC) of the SHMT, which establishes the direction of the plan and the State's mitigation strategy. The TAC agreed with the mitigation staff's assessment that extensive revisions would be required to enhance understanding of hazards and threats, and the capabilities required to mitigate their impacts. NDDES and the TAC agreed to rename the plan to the Enhanced Mitigation MAOP in keeping with the revised structure of the State

Emergency Operations Plan (SEOP). The SEOP structure follows the five mission areas identified in the National Preparedness Goal. The SEOP includes the Enhanced Mitigation, Response, and Recovery MAOPs; the mission areas of Prevention and Protection are combined into one MAOP.

Finally, the TAC approved the recommendation by NDDES to pursue Enhanced Plan status as a natural progression of the state's increased capability to manage the hazard mitigation program. Since the last update, North Dakota has been approved to use the Program Administration by State (PAS) Pilot Program for all delegated authorities therein, which has provided the state with more responsibilities and oversight for both mitigation grant management and local mitigation plan review.

Developing the Plan

Development of the Enhanced Mitigation MAOP began in February with NDDES reviewing its analysis of the previous plan with Hagerty Consulting. Participants discussed goals for the next plan as well as a content proposal. The TAC set the direction for the planning process during a March 9, 2018, meeting with NDDES and Hagerty Consulting approving the content proposal.

SHMT Members Attend Kickoff Meeting

Development of the plan occurred over a compressed timeframe with the SHMT; members were given an overview of the planning process and a Data Collection Guide during the kickoff meeting on April 5, 2018. The SHMT provided the information on hazards and threats, as well as capabilities, during April and May, and reviewed a draft risk assessment in June and July. The second SHMT meeting on July 25, 2018 provided the opportunity for 17 committees to meet and discuss content revisions and to identify potential mitigation actions. Two webinars followed, one on August 22, 2018 to discuss mitigation strategies goals and objectives and another on September 20, 2018 to review the draft version of the final plan.

In keeping with the structure of the SEOP, the plan was reorganized into key sections of content as follows:

Section Number	Section
None	Mitigation Partners
None	Executive Summary
1	Planning Process
2	Situation
3	Hazard Profiles and Risk Assessment
4	Capabilities Analysis
5	Execution
6	Plan Maintenance
7	Hazard- and Threat-Specific Appendices and Supporting Materials

North Dakota's Hazards and Threats

At its first meeting, the SHMT classified hazards as natural and technological and as adversarial threats. Natural hazards include: drought, fire, floods, geologic, infectious diseases, severe summer weather, severe winter weather, and space weather. Technological hazards are dam failure, hazardous material release, and transportation incident. Adversarial threats included criminal, terrorist, or nation-state attack, cyberattack, and civil disturbance.

The team eliminated wind storm as a natural hazard and decided to add space weather in place of shortage or outage of critical materials and infrastructure. Transportation accident was renamed transportation incident, and communicable disease changed to infectious diseases. The SHMT voted to combine wild fire and urban fire or structure collapse. The classification of adversarial threats represented a departure from the previous plan in that homeland security threats were expanded into three categories: criminal, terrorist, or nation-state attack, cyberattack, and civil disturbance.

The team subsequently ranked the hazards and threats as follows:

#	Hazard/Threat	#	Hazard Threat
1	Cyberattack	8	Hazardous Materials
2	Flood	9	Space Weather
3	Severe Winter Weather	10	Dam Failure
4	Severe Summer Weather	11	Criminal, Terrorist or Nation-State Attack
5	Fire	12	Geologic Hazards
6	Infectious Diseases & Pest Infestations	13	Civil Disturbance
7	Drought	14	Transportation Incident

Integration of the State's Threat and Hazard Identification and Risk Assessment process also became a priority for the SHMT. The team determined plan development required an analysis of core capabilities applicable to all five mission areas established by the National Preparedness Goal, Prevention, Protection, Mitigation, Response, and Recovery. These core capabilities include: Planning, Public Information and Warning, and Operational Coordination. Additionally, NDDES considers Intelligence and Information Sharing as a core capability with applicability to all mission areas. The TAC also directed analysis take into account the mitigation core capabilities of: Community Resilience, Long-Term Vulnerability Reduction, Risk and Disaster Resilience Assessment, and Threat and Hazard identification.

The State's Mitigation Strategy

To the greatest extent possible, this plan serves as a roadmap for the SHMT to enact North Dakota's mitigation strategy. The development of a mitigation strategy allows the State of North Dakota to coordinate with state, local, and tribal agencies to create a vision for preventing future disaster losses, establishing a purpose, agreeing on a common set of mitigation goals and objectives, prioritizing actions, and evaluating the success of such actions.

The purpose of the strategy is to minimize losses by reducing the vulnerability of the public, property, infrastructure, environment, and economy of North Dakota and its communities to the impacts of natural and technological hazards as well as adversarial threats. The strategy looks at the short term, enhancing local plans and regulations and expanding education and outreach, while focusing on the long term by expanding the state's capabilities to integrate planning efforts; applying studies and technologies; building more resiliently with a focus on structural, natural systems and environmental projects; and improving worker safety and protection of public health.

The strategy looks at the short term, enhancing local plans and regulations and expanding education and outreach, while focusing on the long term by expanding the state's capabilities to integrate planning efforts; applying studies and technologies; building more resiliently with a focus on structural, natural systems and environmental projects; and improving worker safety and protection of public health. Additionally, repetitive loss and severe repetitive loss remains a continuing and long-term strategy for the state. Within the context of the State's Mitigation Strategy, the SHMT considers short-term strategies, goals, objectives and associated actions as those that can be completed within 12 months. The team defines medium strategies, goals, objectives and actions as can be completed within 12 to 36 months and establishes long-term strategies, goals, objectives and actions as those that extend 36 months or longer.

SHMT established a series of goals and objectives for this plan that are based on the analysis of hazards and threats. Many of the objectives have been written to include a baseline to measure their progress of implementation starting in 2019. This does not mean that this work is not continuing, the baseline will be adjusted as the plan is updated. Goals and objectives are as follows, with the short-term goal listed first followed by three longer-term goals. Objectives are also listed by short to long term for each of the goals. The SHMT prioritized goals as follows from short to long-term; and, within those goals, objectives may be short, medium-term and long-term based on the definitions outlined in paragraph 3.

Goal 1: Develop and implement state, local, and tribal mitigation plans that reflect a sound understanding of hazards and threats.

Objective 1.1: Every five years, starting in 2019, state, local, and tribal governments update hazard mitigation plans in accordance with federal, state, and local requirements. Support the development, maintenance and implementation of one state, 53 county, two city, and four tribal hazard mitigation plans.

Objective 1.2: Every three years, starting in 2019, identify the frequency, magnitude, and impacts of hazards and threats that can occur in North Dakota using modeling and industry best practice.

Objective 1.3: Every five years, starting in 2019, provide technical assistance, emergency preparedness training, and risk management education programs to local emergency managers, private partners, and residents throughout the state.

Objective 1.4: Coordinate across state, local, and federal jurisdictions and integrate with partners from across the whole community in order to effectively invest mitigation funding (e.g. Pre-Disaster Mitigation [PDM], Hazard Mitigation Grant Program [HMGP]), within the program's period of performance.

Objective 1.5: Every five years, starting in 2019, conduct a review of vulnerabilities, resilience capabilities, and estimate impacts of hazards and threats across government, private, and community organizations.

Goal 2: Promote hazard and threat awareness and preparedness within the whole community, inclusive of individuals with access and functional needs and limited English proficiency.

Objective 2.1: Communicate risk to the public (including people with access and functional needs and individuals with limited English proficiency) annually, starting in 2019; conveying how their actions can reduce the impacts from the hazards and threats to their homes, workplaces, and communities.

Objective 2.2: Encourage and support community and individual/family preparedness efforts across the whole community annually starting in 2019 through information dissemination and public notification.

Goal 3: Promote resiliency of current and future buildings and infrastructure systems from the impacts of hazards and threats.

Objective 3.1: Within five years, starting in 2019, significantly reduce risk to buildings and infrastructure located in hazard- or threat-prone areas (including floodplains).

Objective 3.2: Within five years, starting in 2019, encourage adoption and enforcement of disaster resilient building codes and wise land use planning, appropriate to local and tribal risks.

Goal 4: Preserve/protect people, property, and natural and cultural resources from the impacts of hazards and threats. Ensure that communities are resilient to the impacts of hazards and threats.

Objective 4.1: Within five years, starting in 2019, reduce the vulnerability of people, property, and natural and cultural resources to hazards and threats.

During the past five years, SHMT members periodically revised mitigation actions associated with goals and objectives from the past plan to ensure they remained current. These course corrections are reflected in the 2014-2016 Progress Report: Hazard Mitigation in North Dakota. As a result of these efforts to make course corrections to ensure viability of actions, only one of the previous plan's actions, data digitization, has been completed. The remaining actions were revised to reflect course corrections. The SHMT restructured the mitigation actions by the following categories: local plans and regulations, plan integration, studies and application of technology, structural projects and resiliency, natural systems and environmental protection, education and outreach, and worker safety and public health protection.

Integration of Efforts

The SHMT decided to make integration a core tenant of the Enhanced Mitigation MAOP. The SHMT recognizes the importance of mitigation as a backbone for a variety of different state plans and activities that address mitigation. Th There are several “coordinating structures” that advance the principles of risk reduction, resilience, and mitigation in North Dakota outside of the five-year Enhanced Mitigation MAOP planning cycle. Section 4 describes how the SHMT has integrated mitigation into programs and partnerships to meet mitigation goals.

To help North Dakota meet their broader preparedness and resilience goals, the SHMT decided to integrate the THIRA update process with the 2018 Enhanced Mitigation MAOP update. Evidence of this integration can be seen throughout this plan. Data will also be used to help inform subsequent updates of the THIRA.

In 2018, North Dakota’s statewide emergency management system received national accreditation from the Emergency Management Accreditation Program (EMAP). The SHMT also decided to account for the mitigation-related EMAP standards within this plan to streamline the anticipated process of EMAP reaccreditation.

Ryan Melin of the North Dakota Forest Service discusses fire hazards.

This plan also emphasizes the high level of stakeholder involvement in mitigation-related projects. The SHMT supports initiatives to reduce the risk of flooding in river basins, participate in dam safety exercise, build resilient infrastructure, limit the spread of several human and animal infectious diseases, promote better understanding of hazards and threats, and advance understanding of impacts using technology. Appendix 7.8 illustrates how this plan’s stakeholders are involved in a variety of projects, meetings, and organizations that contribute to the execution of this plan’s mitigation strategy.

A Mitigation Strategy with Results

North Dakota’s disaster history speaks volumes as to why the state’s investment in mitigation is important. Presidents have issued 58 federal disaster declarations for North Dakota since 1957 with 35 of those declarations issued since 1993. The state’s most recent catastrophic event, the 2011 flood, carried a price tag of more than $1 billion, to include $250 million from the Public Assistance (PA) program and $150 million from the Individual Assistance programs. Even with these dollar amounts calculated, the emotional loss and mental impacts to survivors was immeasurable.

This mitigation plan offers a common-sense approach to reducing the impacts and losses of these disasters. Research by the National Institute of Building Sciences found every dollar spent on mitigation resulted in a six dollar savings. The cost of the 2017 spring flood underscores these findings. The flood caused an estimated $8.6 million in infrastructure damages, which could have been substantially worse if not for previous mitigation efforts under the PA 406 Mitigation Program to increase and armor culverts. The flood also had far less personal impacts than previous disasters, a direct result of efforts to relocate individuals and families from harm’s way. With the assistance of the Unified Hazard Mitigation Assistance Program, Community Development Block Grants, and the North Dakota State Water Commission cost-share programs, the State has created green space along rivers and lakes by acquiring more than 1,400 properties in flood-prone areas at an estimated cost benefit of $386,400,000 using the national pre-determined benefit amount of $276,000 per property. Many of these properties were located in north central and northeastern North Dakota where 2017 flooding occurred. Today, North Dakota has no severe repetitive loss properties as a result of the partnership to mitigate flood impacts.

Communities also have benefited by the investment in mitigation. Resiliency measures included lift station elevations/relocations, permanent flood protection, overhead line burials, sewer system improvements, installation of river gauges, early warning sirens, emergency generators for critical facilities, and the purchase and installation of pre-case concrete storm shelters.

The investment in mitigation is resulting in substantial savings for the State. For this plan revision, NDDES conducted a losses avoided analysis of projects recently funded under 2016 and 2017 PDM grant and DR-4323 (2017 Spring flood) HMGP. Based on the Benefit Cost Analyses for all Regular projects that were funded under the aforementioned programs, it is estimated that more losses of more than $14 million dollars have been avoided through the implementation and funding of only 15 projects over 2 separate calendar years. Approved projects included bank stabilizations, generators, water intake and lift station improvements, storm shelters, and electrical line burials.

This plan builds upon the state's proven mitigation strategy. A Community Coffee participant in Grand Forks summarized the benefit of mitigation planning, when she stated, "It saves not only money, but it saves lives and a lot of stress."

Mitigation Partners

As part of this Enhanced Mitigation Mission Area Operations Plan update, the following public and private partners were involved and engaged in the process. Specific involvement and role in the Plan update is detailed in Section 1.

Technical Advisory Committee

North Dakota Department of Emergency Services, Division of Homeland Security, Chair
National Oceanic and Atmospheric Administration, National Weather Service
North Dakota Department of Human Services
North Dakota Department of Transportation
North Dakota Emergency Management Association/Ward County Emergency Management
North Dakota State Water Commission

State Hazard Mitigation Team

State Partners

Job Service North Dakota
North Dakota Aeronautics Commission
North Dakota Attorney General's Office

- North Dakota Bureau of Criminal Investigation
- North Dakota Peace Officers Standards and Training Board
- North Dakota State Fire Marshal's Office

North Dakota Office of Management and Budget

- Facilities Management Division
- Risk Management Division

North Dakota Department of Agriculture

- North Dakota Division of Animal Health

North Dakota Department of Commerce
North Dakota Department of Mineral Resources

- North Dakota Geological Survey

North Dakota Department of Emergency Services

- State Radio Communications

North Dakota Department of Health
North Dakota Department of Public Instruction
North Dakota Forest Service
North Dakota Game and Fish Department
North Dakota Highway Patrol
North Dakota Housing Finance Agency
North Dakota Indian Affairs Commission
North Dakota Information Technology Department
North Dakota Insurance Department
North Dakota National Guard

- 81st Civil Support Team

North Dakota Office of the State Tax Commissioner
North Dakota Parks and Recreation Department
North Dakota Public Service Commission
North Dakota State Electrical Board
North Dakota State Local and Intelligence Center
North Dakota State University:

- Extension Service
- State Climatologist Office

North Dakota University System

North Dakota Workforce Safety and Insurance
State Historical Society of North Dakota

Federal Partners

Bureau of Indian Affairs

- Safety of Dams Program
- Standing Rock Agency, Branch of Wildland Fire Management

Federal Highway Administration
Minot Air Force Base
United States Animal Plant and Health Inspection Services
United States Army Corps of Engineers
United States Bureau of Reclamation
United States Department of Agriculture

- Natural Resources Conservation Service
- Rural Development

United States Department of Homeland Security
United States Forest Service
United States Geological Survey

Local Partners

Bismarck Emergency Management
Burleigh County Emergency Management
City of West Fargo Emergency Management
Dunn County Planning and Zoning
Foster County Emergency Management
LaMoure County Emergency Management
Logan County Emergency Management
Pembina County Emergency Management

Non-Governmental Organizations and Private Partners

American Red Cross
Dakota Valley Electric Cooperative
Lutheran Social Services Disaster Response
Missouri Valley Coalition of Homeless People
Mouse River Firefighters Association
North Dakota Association of Counties
North Dakota Association of Rural Electric Cooperatives
North Dakota Community Foundation
North Dakota Fire Chiefs Association
North Dakota Firefighters Association
North Dakota League of Cities
North Dakota Petroleum Council
North Dakota Safety Council
North Dakota Stockmen's Association
North Dakota Township Officers Association
Northern Plains Electric Cooperative
University of Mary
Western Dakota Energy Association

1 Planning Process

1.1 Mitigation Planning in North Dakota

1.1.1 Plan Mission, Purpose, and Scope

The Enhanced Mitigation Mission Area Operations Plan (MAOP), referred to as the Plan throughout the rest of the document, represents a coordinated effort and ongoing commitment to mitigate potential losses and damages caused by the various hazards and threats that occur in North Dakota. The plan was originally developed in 1989 and updated in 2000, 2002, 2004, 2007, 2010, 2013, and 2018. The State of North Dakota and its political subdivisions are confronted with the possibility of natural and technological hazards and adversarial threats that pose a risk to the health, welfare, and security of its citizens. State, local, and tribal governments are responsible for developing and maintaining a high level of preparedness for all hazards and threats, including response and recovery plans, training, development and management of resources; mitigation is the focus of this plan.

1.1.2 Planning Process

Revisions to the Enhanced Mitigation MAOP required a robust Whole Community approach with 84 public and private organizations contributing unprecedented support for development of the State of North Dakota's mitigation strategy. The 2018 State Hazard Mitigation Team (SHMT) represented 15 federal agencies; 41 state agencies and divisions; 8 local agencies; and 20 non-governmental organizations and private partners. Attendance at meetings reflected the high level of involvement with 103 partners attending the April 5, 2018 Kickoff Meeting. The commitment continued throughout the planning process with this diverse, invested group providing data and then working collectively through 17 committees to analyze information and develop viable mitigation actions.

The plan update process began in February of 2018, with the initial internal kick-off between North Dakota Department of Emergency Services (NDDES) and Hagerty Consulting, Inc. The planning process included public and stakeholder engagement through two meetings and two webinars, described in more detail in below. All meeting materials can be found in Appendix 7.2. The draft plan review was completed in September 2018. In October 2018, the Plan was finalized and submitted to the Federal Emergency Management Agency (FEMA) Region XIII for review. During this update, the Plan was updated and improved to meet Enhanced State Hazard Mitigation requirements and renamed the Enhanced Mitigation MAOP. State adoption was executed through a letter signed by the Governor, as shown in the Adoption Documentation section. This plan incorporates all changes associated with the implementation of federal and state hazard mitigation programs, including the applicable sections of the Disaster Mitigation Act of 2000. The Plan is updated at least every five years, or after each disaster declaration if needed, by members of the SHMT.

The SHMT Technical Advisory Committee (TAC) set the direction for the planning process during a March 9, 2018 meeting with NDDES and Hagerty Consulting. The TAC established priorities to obtain Enhanced Plan status from the FEMA. The TAC determined revisions to the plan would reflect a more in-depth analysis of natural and technological hazards and adversarial threats and long-term climate changes that may affect or influence long-term vulnerability to natural hazards.

NDDES and the TAC decided to follow the Six-Step Planning Process for revisions to the plan, as outlined in the FEMA's Developing and Maintaining Emergency Operations Plans: Comprehensive Preparedness Guide (101).

The TAC also determined the SHMT required more direction on responsibilities and requirements. Members approved the Guidance Memo contained in Appendix 7.2. This memo established the following objectives for the SHMT:

- Increase North Dakota's disaster resiliency by developing and maintaining an effective statewide hazard mitigation program that is supported by all levels of government, non-governmental organizations, and the private sector.

- Promote hazard mitigation efforts to reduce loss of life and property by lessening the impact of disasters.
- Ensure North Dakota's continued eligibility for federal disaster recovery dollars.
- Contribute expertise for development of the Enhanced Mitigation MAOP, which serves as the foundation for enactment of a statewide mitigation program.

Integration of the state's Threat and Hazard Identification and Risk Assessment (THIRA) process also became a priority for the TAC. The team determined plan development required an analysis of core capabilities applicable to all five mission areas established by the National Preparedness Goal (NPG), Prevention, Protection, Mitigation, Response, and Recovery. These core capabilities include: Planning, Public Information and Warning, and Operational Coordination. Additionally, NDDES considers Intelligence and Information Sharing as a core capability with applicability to all mission areas. The TAC also directed analysis take into account the mitigation core capabilities of: Community Resilience, Long-Term Vulnerability Reduction, Risk and Disaster Resilience Assessment, and Threat and Hazard identification.

The TAC evaluated comments from FEMA staff regarding the 2014 plan and enacted several changes, including a more robust public outreach. This initiative evolved into a series of Community Coffees held across the state to elicit public feedback. Nearly 100 individuals attended these meetings; they represented senior citizens, homeless individuals, first responders, volunteers, local and tribal government, and the public. Feedback from these Community Coffees helped contextualize the State's hazards and threats. Participants discussed how the hazards and threats impacted them personally and as a community; and shared their ideas for mitigating their impacts.

1.1.3 Schedule

Table 1-1: Enhanced Mitigation MAOP Development Schedule

Phase	Timeframe	Milestones
Form Planning Team and Scope of Plan	February 2018 – April 2018	• Draft and Final Project Management Plan • NDDES and TAC Kick-Off Meetings • Ongoing Project Management Activities (bi-weekly calls and monthly reports)
Understand the Situation and Perform Information Analysis	March 2018 – August 2018	• In-Person: Project Kick-Off and Risk Assessment Methodology Meeting • Document Review • In-Person: Risk Assessment Review and Mitigation Opportunities Meeting • Draft and Final Risk and Vulnerability Assessment • State and Local Capabilities Analyses • Public Outreach and Stakeholder Engagement Plan
Determine Goals and Objectives	May 2018 – September 2018	• Mitigation Strategies Recommendations Report • Community Coffee Meetings
Plan Development	June 2018 – September 2018	• Enhanced Plan Documentation • Webinar: Mitigation Strategy Meeting • Draft and Final Mitigation Strategy
Plan Preparation, Review, and Approval	August 2018 – December 2018	• Draft Enhanced Mitigation MAOP • Webinar: Final Planning Meeting • Public and Stakeholder Review • Final Draft Enhanced Mitigation MAOP for FEMA review • Final FEMA-Approved Enhanced Mitigation MAOP

Phase	Timeframe	Milestones
Plan Implementation and Maintenance	January 2019	• Document Transfer • Project Closeout Meeting • Project Closeout Memorandum

1.1.4 Planning Meetings

During the 2018 planning process, NDDES assumed the lead role in updating the Enhanced Mitigation MAOP. NDDES designated the Mitigation Planning Officer to be the "NDDES Mitigation Planning Lead" for the entirety of this plan update. NDDES contracted with Hagerty Consulting to support the state's development of the plan, as well as assist in stakeholder engagement. Eight meetings were held between February 2018 and September 2018. The first four meetings were held between February 2018 and March 2018 and only included NDDES or the TAC. The first of these meetings occurred on February 20, 2018 to outline expectations between the hired consultants, Hagerty, and NDDES for the development of the Plan. The second meeting occurred on March 2, 2018 to identify data needs and requirements for the THIRA. On March 9, 2018, a meeting was held to discuss strategies for the development of the Plan. The last preliminary meeting occurred on March 20, 2018, NDDES and Hagerty discussed opportunities and methods of local and tribal involvement and engagement. The remaining four meetings involved the entire SHMT. The first of these meetings was held on April 5, 2018, which presented an overview of the project, planning process, and risk assessment to the entire SHMT (including the TAC, Hazard- and Threat-Specific Committees, and Planning Committees). During this meeting, participants determined the hazards and threats the plan would assess. Stakeholders were presented with data collection requirements and asked to provide data to be used in the hazard profiles and risk assessment. A full listing of the data collected can be found in Appendix 7.2.

The second SHMT meeting was held on July 25, 2018 to discuss the results of the risk assessment. The meeting included breakout sessions where stakeholders were encouraged to provide feedback on the hazard profiles, as well as potential mitigation actions to be used as part of the mitigation strategy. Following the meeting, stakeholders continued to review and revise the risk assessment and provide electronic feedback to Hagerty. During the review of the Risk Assessment, NDDES Mitigation Planning Lead met and worked with each hazard- and threat-specific committee to review and revise the profiles. As part of these meetings, NDDES Mitigation staff also discussed mitigation actions and strategies with the hazard- and threat-specific committees to include in Section 6 Execution.

A webinar served as the third meeting on August 22, 2018, to discuss mitigation strategies, including goals and objectives. The last SHMT meeting occurred on September 20, 2018, as a webinar to serve as the Final Planning Meeting. During this meeting, stakeholders were provided a draft version of the final plan and guidance on how to focus their review of the contents.

Community Coffee Comments

Participants in Community Coffees shared their experiences with hazards and threats as well as ideas for keeping North Dakota safer.

As an example, homeless individuals provided insights into how, without adequate shelter, they are exposed to harshest of conditions during severe summer and winter weather.

However, of all the hazards, homeless individuals ranked infectious diseases and pest infestations as the greatest threat. While homeless shelters do their best to keep clients safe, diseases have the potential to spread rapidly if residents have limited access to disinfectants. Homeless individuals complained about bed bugs that could result in secondary infections if bites are not cleaned and disinfected. One woman discussed how she required antibiotics to treat a staphylococcal infection after scratching bed bug bites.

Community Coffee participants also noted they are exposed to colds, hepatitis and Lyme disease.

1.2 State Hazard Mitigation Team

1.2.1 Structure

The SHMT consists of the TAC, Hazard Specific Committees, and Planning Committees. Each of these stakeholder groups had different expectations and responsibilities throughout the 2018 planning process, the details of which are outlined below.

1.2.1.1 Technical Advisory Committee

The TAC was formed to set the overall priorities beyond the requirements from FEMA. This committee is comprised of leaders from each of the hazard specific committees. The TAC included representation from the NDDES, Division of Homeland Security; National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS); North Dakota Department of Human Services (NDHS); North Dakota Department of Transportation (NDDOT); North Dakota Emergency Management Association (NDEMA); and North Dakota State Water Commission (NDSWC).

1.2.1.2 Hazard- and Threat-Specific Committees

Hazard- and Threat-Specific Committees were formed to provide a more in-depth evaluation and analysis of the hazard information in the risk assessment and the associated mitigation initiatives. These committees allow for broader participation by agencies and organizations that have a focus or an interest in a particular hazard. There was a wide representation from agencies and organizations that participated in these committees, including state and federal environmental agencies, non-profit organizations, and local governments. Additionally, there was a strong military presence involved with this process, particularly from the North Dakota National Guard. Appendix 7.2 lists the agencies represented on the committees. Membership in a committee was open to all interested persons or organizations. If a logical agency was noticeably missing from the committee, an invitation to participate was extended to that organization. Invitations can also be found in Appendix 7.2. These committees discussed and reviewed information and initiatives specific to their hazard throughout the planning process.

1.2.1.3 Planning Committees

Unlike the Hazard- and Threat-Specific Committees, the Planning Committees focused on broader, overarching strategies, including critical facilities and infrastructure, oil and gas industry expansion, and climate change. These committees provided in-depth evaluation of the risk assessment and mitigation strategies. Appendix 7.2 lists the agencies represented on the committees.

1.2.2 Roles and Responsibilities

1.2.2.1 Participation in Plan Development

The NDDES Mitigation staff coordinated with all SHMT members throughout the 2018 planning process. NDDES undertook an extensive outreach and coordination effort to ensure broad-based participation in the planning process. Planning meetings were well attended, with 103 persons represented at the Kickoff Meeting. To help facilitate the update process, SHMT members were assigned to Hazard- and Threat-Specific or Planning Committees. Committee members assisted with the update process by providing data for hazard profiles, updating the mitigation strategy, and reviewing drafts of the plan update.

The SHMT was given an opportunity to comment on the draft Risk Assessment from July – August 2018 and the entire draft plan in September 2018. Table 7.2.1-2 in Appendix 7.2 summarizes the participation of all the SHMT agencies in the different planning process meetings.

1.2.2.2 Participation in Identifying Mitigation Goals and Objectives

The Mitigation Strategy was discussed during the July 25, 2018 meeting, and the August 22, 2018 webinar. The SHMT was asked to provide feedback regarding the proposed Mitigation Goals, Objectives, and Actions throughout the month of August 2018. SHMT members were sent a copy of the 2014 Mitigation Action Plan to report on the status of the previous plan's actions. A worksheet was also sent in August to the SHMT to collect details about any new proposed mitigation actions for the 2018 Mitigation Action Plan, the submitted worksheets are included in Appendix 7.6. Feedback received through a live poll during the August 22, 2018 webinar can be found in Appendix 7.2.

1.2.2.3 Providing Access to Data

As part of the first meeting held on April 5, 2018, committee members were asked to provide specific data and resources. This information would be used especially in the update of the risk assessment, in addition to the rest of the plan. Appendix 7.2 details the committees and the data requested from agencies and individuals.

1.3 Outreach Strategy

As part of the planning process, North Dakota continuously communicated the planning process to the SHMT as well as collected feedback from larger stakeholder groups and the general public and incorporate it into this plan. An Outreach Strategy was created at the start of this planning process to document the various mechanisms of outreach to be applied throughout the plan update process. The full strategy can be found in Appendix 7.2. Some of the activities identified in the Outreach Strategy are described in further detail below.

1.3.1 Monthly Newsletters

A monthly newsletter was developed and distributed to SHMT members that opted into the email distribution list. The newsletter communicated updates on the planning process and upcoming planning expectations to the team. Each month, a different hazard was "profiled" in the newsletter. All newsletters are archived in Appendix 7.2.

1.3.2 Community Coffees

NDDES facilitated a series of five "Community Coffees" with SHMT members and emergency managers throughout the state. The purpose of these meetings was to meet with local public and private stakeholder groups to understand how different hazards impact their lives and brainstorm mitigation opportunities. NDDES worked through identified stakeholder groups to facilitate these meetings. Specific feedback received from these Community Coffees has been summarized in call out boxes throughout the hazard profiles in the Risk Assessment section. Detailed notes from the Community Coffees can be found in Appendix 7.2. NDDES held meetings in Mandan, Bismarck, Jamestown, Rolla, and Grand Forks.

1.3.3 Online Survey

An online survey was released through the NDDES website along with the full draft plan, in an effort to collect feedback from public stakeholder groups outside of the SHMT. The survey was posted online from September 28, 2018 to October 11, 2018. This data was collected to ensure that the Enhanced Mitigation MAOP aligns with the needs and priorities of the public. The results of this survey are summarized in Appendix 7.2. Five people responded to the survey with a general sentiment of supporting the plan and believing that it will help the respondents' communities. Overall, North Dakota's planning process utilized plans and agencies that represented the interest of the general public, and local hazard mitigation plans (HMPs) were incorporated into the Plan as a means of integrating the local and state planning efforts.

1.4 Plan Structure

As part of the 2018 update, each section was updated with new or revised information. At the outset of the process, the plan was reviewed by NDDES and the planning consultant and it was determined that each section of the plan would need to be revisited. Changes made to the Enhanced Mitigation MAOP during the update process included:

- Reorganization of the plan for readability and format;
- Updates and improvements to all sections of the previous plan;
- Development of a comprehensive integrated process to connect state, local, and tribal mitigation planning;
- Incorporation of information and comments collected at stakeholder meetings and through other means;
- Description of the hazard identification process;
- Changes to and additional documentation of the hazard analysis and loss estimation methodologies;
- Update of the historical, facility, infrastructure, and development data;
- Additional Geographic Information System (GIS) mapping using new and updated data;
- Statements and reports highlighting the changes that have occurred since the previous version of the plan;

- Further documentation and evaluation of the state's pre- and post-disaster policies and programs;
- Further documentation of the local mitigation policies and programs and roll-up of information from new or updated local HMPs;
- Update and refinement of the mitigation strategy based on changes since the previous version of the plan was approved;
- Alignment of mitigation objectives with 2018 THIRA target language;
- Update of the list of possible mitigation funding sources and mitigation-related laws; and
- Additions and improvements to the plan to meet FEMA enhanced state plan criteria.

Table 1-2: lists the sections of the plan and highlights changes or improvements made during the 2018 update.

Table 1-2: Summary of Changes - 2018 Enhanced Mitigation MAOP

Section	Summary of Changes
Front Material	• Added Executive Summary place of introduction and revised language • Added 2018 State approval letter • Added Mitigation Partners Section
Section 1 Planning Process	• Summary of 2018 update meetings and public involvement process
Section 2 Situation	• Renamed Situation instead of Assets; added state demographics and culture, current and future land use, cost of disasters in the State of North Dakota, and other legal authorities and references • New data since 2014 added, including Homeland Security Infrastructure Program (HISP) data for critical infrastructure/key resources (CIKR) facilities • New list of state-owned facilities identified from State Fire and Tornado Fund data
Section 3 Risk Assessment	• Updated to include new data since 2014 • New GIS mapping and analysis incorporated • New, more thorough, methodologies for assessing risk and vulnerability at state and county level used where possible • Windstorm removed as individual hazard • Hazardous Materials Incident expanded to include impacts of oil and gas industry • Homeland Security Incidents split into two separate hazard profiles: Cyber Attack and Criminal, Terrorist, Nation Attack • Space Weather added to Risk Assessment • State Risk Assessment combined with Local Risk Assessment • Revised Risk Factor Assessment included with results
Section 4 Capability Analysis	• Updated 2018 state capabilities analysis and local capabilities analysis
Section 5 Execution	• Updated mitigation goals • Updated mitigation objectives and aligned with 2018 THIRA targets • Updated and refined mitigation actions and progress made on implementation • Renamed Execution instead of Mitigation Strategy • Combined with previous Chapter 7 to include mitigation implementation system (which also includes revisions to reflect current state and local hazard mitigation capabilities, as well as updated mitigation programs and funding sources)
Section 6 Plan Maintenance	• Revised and refined to reflect current processes and procedures
Section 7 Annexes	• Updated with information from 2018 planning process

1.5 Planning Process Conclusions

The planning process defined "Whole Community" with a broad-based public-private partnership and high level of involvement by each member of the committee. The team members provided a substantial amount of data to analyze and to incorporate into the plan. While a challenging task, NDDES believe the investment in time and energy to review the data resulted in a stronger plan. Each hazard and threat profile contained a conclusion of the data that provided the foundation for developing the state's mitigation strategy. As demonstrated with past updates to mitigation actions, the SHMT made adjustments to the actions to reflect changes in priorities.

Community Coffees provided an expanded viewpoint of hazards and threats from the public's perspective. NDDES determined past survey efforts were not effective and, as a result, worked with SHMT members and emergency managers to develop the Community Coffee public outreach strategy. During the process, emergency managers requested the meetings also be tailored to meet their needs for mitigation plan updates. As a result, NDDES provided a summary of the Community Coffees, attendance forms and copies of presentations to demonstrate compliance with public stakeholder engagement requirements. The emergency managers provided invaluable support by identifying target groups and reaching out to their stakeholders and the public.

Some improvements are recommended for the next plan update. They include revising the Guidance Memo to provide more specific direction for the SHMT. Unlike past plan updates, committee leads assumed more of a leadership role. Expectations were not always clear as to their responsibilities, which require revisions to the guidance memo.

Plan development occurred in a compressed time period. For the next update, NDDES recommends a longer time period to discuss the hazard and threat profiles, capabilities, and mitigation actions. During this update, the SHMT accommodated quick turnarounds in a clear demonstration of their level of commitment to mitigation in North Dakota. While Community Coffees were successful, time constraints did not allow for more meetings to be held. NDDES recommends these Community Coffees continue during the next five years as a public outreach effort beneficial to state, local, and tribal planning teams.

2 Situation

2.1 Legal Authorities and References

NDDES, in partnership with the SHMT, developed the State of North Dakota Enhanced Mitigation MAOP, pursuant to Section 322 of the Disaster Mitigation Act of 2000 (Public Law [P.L.] 106-390). The Disaster Mitigation Act of 2000 became law on October 30, 2000 and amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the "Stafford Act") (P.L. 93-288, as amended). Regulations for this activity can be found in 44 Code of Federal Regulations (CFR), Part 201 and require the state to develop mitigation plans that:

- Identify the hazards, risks, and vulnerabilities of areas in the state;
- Support development of local and tribal mitigation plans;
- Provide for technical assistance to local and tribal governments for mitigation planning; and
- Identify and prioritize mitigation actions that the state will support, as resources become available.

The North Dakota Century Code 37-17.1, as amended, requires NDDES to coordinate the development of a HMP. The Governor has the leadership role in the issuance of guidance to all state agencies to minimize the effects of natural and technological hazards and adversarial threats on the citizens of North Dakota. In State and Federal recovery agreements following a Presidentially Declared Disaster, the Governor, through NDDES, administers mitigation guidance and funding to state, local, and tribal applicants. The Disaster Mitigation Act of 2000 also requires local governments to develop and submit HMPs as a condition of receiving Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) project grants. The local HMPs are an integral part of this Plan and are considered appendices.

2.2 Situation Overview

2.2.1 Cost of Disasters in the State of North Dakota

The cost of disasters can be difficult to fully capture. Cascading impacts from an incident may reach far into the future, contributing to economic loss and additional impacts in communities. One way to measure the cost of disasters in the State of North Dakota is by reviewing the FEMA Public Assistance (PA) dollars obligated per disaster declaration. As an example, for the State's most recent catastrophic event, the 2011 Flood declaration, FEMA obligated $226,819,295.93 to North Dakota (FEMA, 2017). For a smaller event, the Severe Storms and Flooding declaration in 2014, FEMA obligated $2,396,873.15. Dollars obligated depends on FEMA's final review and approval of PA projects. Disaster costs not approved or covered by the PA program fall to the state and affected communities, factoring in to the overall cost of a disaster.

The SHMT actively pursues mitigation to lessen the impacts of disasters. As an example, the 2017 spring flood caused an estimated $8.6 million in infrastructure damages, which could have been substantially worse if not for previous mitigation efforts under the PA 406 Mitigation Program to increase and armor culverts. The 2017 flood also had, but had far less, personal impacts than previous disasters, a direct result of efforts to relocate individuals and families from harm's way. With the assistance of the Hazard Mitigation Assistance (HMA) Program and Community Development Block Grants (CDBG), the State has created green space along rivers and lakes by acquiring more than 1,400 properties in flood-prone areas at an estimated cost benefit of $386,400,000 using the national pre-determined benefit amount of $276,000 per property. Many of these properties were located in north central and northeastern North Dakota, where flooding primarily occurred.

2.2.1.1 Federal Declaration History

The State of North Dakota has had 58 federal disaster declarations since 1957. The majority of those declarations were due to flooding, severe storms, and winter weather. The table below outlines these declarations by year and type from 2000-2017. There were no federal disaster declarations for North Dakota in 2008, 2012, 2015, or 2016. A full list of disaster declarations in North Dakota can be found in Appendix 7.3.

Table 2-1 Federal Disaster Declarations by Year and Type

Year	Type	Declaration Number
2017	Flooding	DR-4323
2014	Severe Storms and Flooding	DR-4190
2013	Flooding (2)	EM-3364; DR-4118
	Severe Storms and Flooding	DR-4128
	Standing Rock Sioux Tribe Severe Storms and Flooding	DR-4123
	Severe Winter Storm	DR-4154
2011	Flooding (2)	EM-3318; DR-1981
	Severe Winter Storm	DR-1986
2010	Severe Winter Storm (2)	DR-1879; DR-1901
	Flooding (2)	EM-3309; DR-1907
2009	Severe Storms and Flooding	DR-1829
2007	Severe Storms and Flooding	DR-1713
	Severe Storms and Tornadoes (2)	DR-1726; DR-1725
2006	Severe Storms, Flooding, and Ground Saturation	DR-1645
2005	Severe Storms, Flooding, and Ground Saturation	DR-1597
	Severe Winter Storm	DR-1621
	Severe Winter Storm and Record and/or Near Record Snow	DR-1616
	Hurricane Katrina Evacuation	EM-3247
2004	Severe Storms, Flooding, and Ground Saturation	DR-1515
	Snow	EM-3196
2003	Severe Storms and High Winds	DR-1483
2002	Fire	FSA-2435
	Severe Storms, Tornadoes, and Flooding	DR-1431
2001	Flooding	DR-1376
2000	Severe Storms and Flooding	DR-1334
	Severe Winter Storm	DR-1353

2.2.1.2 Governor's Emergency and Disaster Declarations

Sometimes incidents occur that substantially impact a community, but the damage does not rise to the level of receiving a Federal Disaster Declaration. The Governor of North Dakota has the authority to issue a variety of executive orders; these orders may be used to issue evacuations, states of emergency, emergency and disaster declarations, and activation of emergency plans. The table below details Governor's Emergency and Disaster Declarations from 2010-2017 in North Dakota.

Table 2-2 Governor's Emergency and Disaster Declarations

Year	Type
2017	Mandatory Evacuation due to Flooding
	State of Emergency due to Flooding
	State of Emergency due to Flooding
	Flood Disaster Declaration
	Drought Emergency Declaration
	Statewide Fire and Drought Emergency Declaration
	Drought Disaster Declaration
	Activation of the State Emergency Operations Plan (SEOP)
2016	Emergency Declaration in Southwest and South-Central North Dakota
	Emergency Evacuation Ordered due to Harsh Winter Conditions
2015	Fire Emergency Declaration
2014	Emergency Declaration to Assist Counties Hard Hit by Overland and Riverine Flooding
	Severe Summer Storm and Flood Disaster Proclamation for Northwestern and Central North Dakota

Year	Type
2013	Flood Emergency Declaration
	Flood Disaster Declaration
	Flood Emergency Declaration
	Flood Disaster Proclamation
	Winter Storm Emergency Declaration for Southwest and South-Central North Dakota
	Winter Storm Disaster Proclamation
2012	Fire Emergency Declaration
	State Emergency Declaration in Devils Lake Basin
	Flood Emergency Declaration for Ward County
	Agricultural Drought Emergency Declaration
	Fire Emergency Declaration
2011	State Emergency Declaration to Provide Flood Protection to the Devils Lake Basin
	Statewide Flood Emergency Declaration
	Statewide Winter Storm Emergency Declaration
	Flood Emergency Proclamation
	State of Emergency Declaration to Provide Flood Protection to the Devils Lake Basin
	Winter Storm Emergency Declaration
	Statewide Flood Disaster Proclamation
	Winter Storm Disaster Proclamation
	Mandatory Evacuation Order Due to Flood Emergency – Ward County
	Mandatory Evacuation Along the Souris (Mouse) River Due to Flood Emergency
	Mandatory Evacuation Order due to Flood Emergency - Morton County
	Mandatory Evacuation Order – City of Sawyer
	Mandatory Evacuation Order - City of Velva and Areas in McHenry County
	Severe Summer Weather Emergency Declaration for Dickey and LaMoure Counties
2010	Statewide Winter Storm Emergency Proclamation

2.2.1.3 Non-Declared Disasters

North Dakota has experienced several disasters that have not risen to the level of receiving federal funding via federally declared disasters. Most recently, North Dakota's 2017 drought did not receive a federal disaster declaration, despite being classified as the worst drought in the state since 2006 (North Dakota State University [NDSU], 2017). Other relatively routine incidents like flooding, severe summer and winter weather, storms, and snow occur annually in North Dakota, most of which do not receive a disaster declaration.

2.2.2 State History, Demographics and Culture

2.2.2.1 History[1]

Prehistoric people populated the land that is now North Dakota. These people would have been hunter-gatherers, subsisting on local flora and fauna. The land became United States territory as part of the Louisiana Purchase of 1803.The region was originally part of the Minnesota and Nebraska territories, until, along with South Dakota, it was organized into the Dakota Territory in 1861. The State was very sparsely populated until the arrival of the railroads in the late 1800s and did not become a state until 1889.

Immigrants came to North Dakota from Norway, Sweden, Denmark and Finland. Most settled in east and north-central North Dakota, along the main line of the Great Northern Railroad, beginning in the 1870s. Today, 193,000 people of Norwegian heritage live in North Dakota. About 38% of the state's population is of Scandinavian descent, with about 33% of that being Norwegian.

Many people of German descent also immigrated to North Dakota from Russia in the 1880s and settled in south-central North Dakota. The land they settled on was semi-arid and similar to that of the steppe in

[1] *North Dakota Department of Commerce, Division of Tourism, https://www.ndtourism.com/articles/north-dakota-history.*

Russia. Today, North Dakotans from Germany, or Germans from Russia, comprise roughly 43% of the State population.

Agriculture has been important to the people of North Dakota since they arrived in this area thousands of years ago and remains North Dakota's largest industry today. The Mandan, Hidatsa and Arikara tribes were non-nomadic people who devoted much of their time to raising crops for food. A great settlement boom occurred within North Dakota from 1879 to 1886, bringing in 100,000 new settlers, mostly farmers whose farms thrived in the rich black soil of the Red River Valley.

Farms gradually moved away from a monoculture focused on wheat in the early part of the 20th century and diversified with crops like sugar beets, sunflowers and various row crops. Farms grew in size as they became more mechanized and in 1920, North Dakota was home to 77,690 farms, each averaging around 466 acres. Today, that number has dropped to less than 30,000, with the average farm size coming in at 1,280 acres.

Other industries aside from agriculture have also been prominent in the State's history. Fur trade in North Dakota led to the first interaction between American Indians and Europeans, and the first trading post in North Dakota was established in 1801 at Pembina by Alexander Henry. In western North Dakota, an 1880s cattle boom encouraged population influx and growth in the Badlands and surrounding Little Missouri River valley. President Theodore Roosevelt had two cattle ranches near Medora, North Dakota in the 1880s, the Maltese Cross Ranch and the Elkhorn Ranch. The thriving cattle industry suffered a crushing blow in the winter of 1886 – 1887 when blizzards killed off 75 percent of the region's cattle.

More recently, North Dakota has been a leader in coal, oil, gas, and wind energy. Beginning in the 1960s, North Dakota's Governor promoted the utilization of the vast lignite resources in the State for energy development. Coal-fueled electricity generating plants grew in number during the 1970s. The Bakken oil boom in western North Dakota vaulted the state to second in the nation in oil production. The shale has been in development since 1953 when oil was discovered in Antelope Field where significant drilling occurred during the 1950s and 1960s. In the late 1970s and early 1980s, activity picked up in the upper Bakken. In 1987, Meridian Oil drilled its first horizontal well in the Bakken's upper shale. Horizontal drilling occurred along the Bakken Fairway with mixed results, peaking in 1992 and ending in 2000 (Universal Royalty Company, 2013).

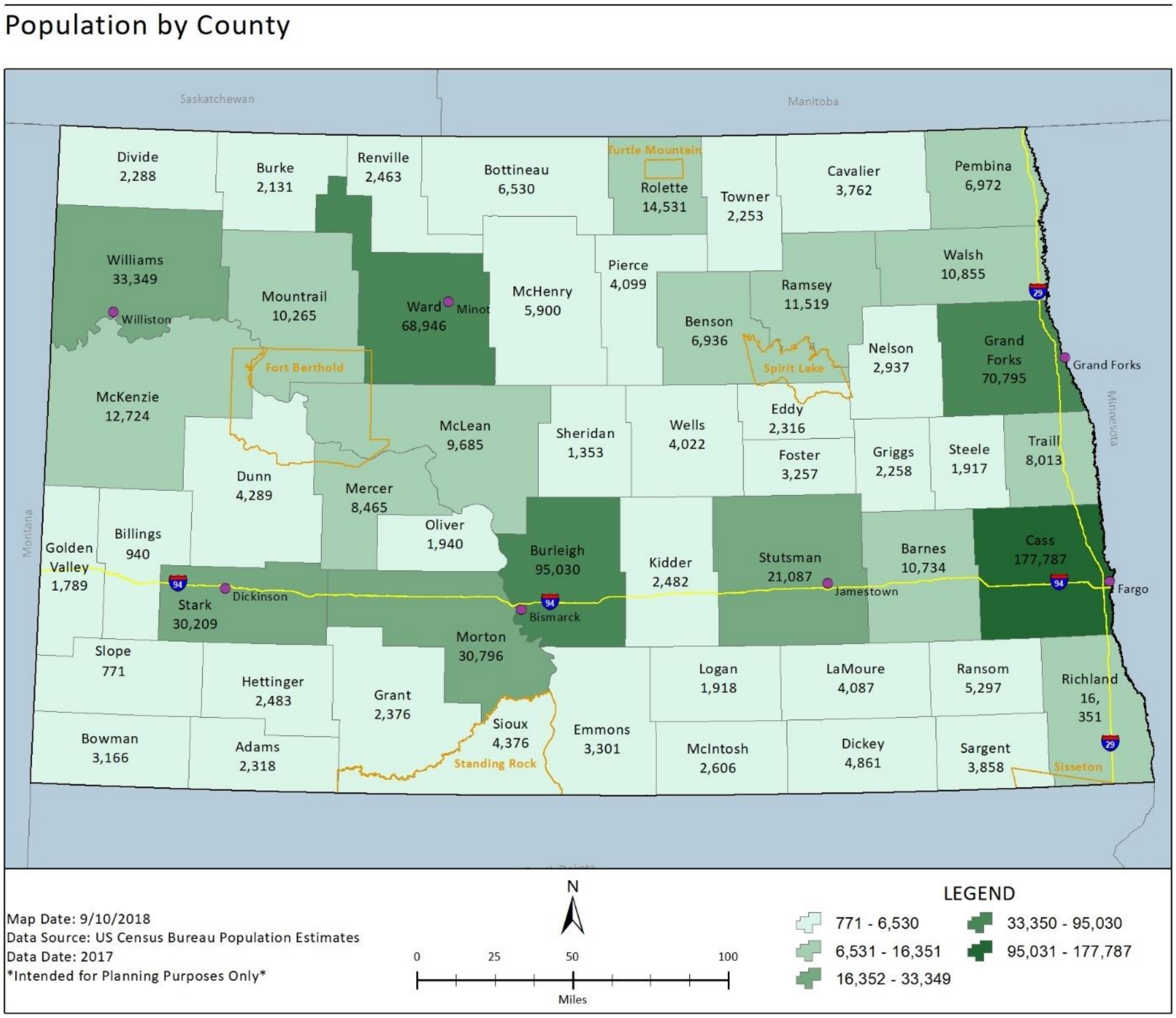
Today, North Dakota continues to explore development of renewable energy fuel sources, such as the production of E85, a mixture of 15% gasoline and 85% ethanol from corn, soybeans and canola, which is used to fuel automobiles. And with an average wind speed of 10.2 mph, North Dakota wind farms are on the rise.

2.2.2.2 State Demographics

North Dakota has an estimated 2017 population of 755,393 people across 53 counties and many incorporated cities and townships (United States Census Bureau, 2017), as summarized in Figure 2-1 below. The largest cities in the state include Fargo in Cass County (population of 122,359), Bismarck in Burleigh County (population of 72,865 people), Grand Forks in Grand Forks County (population of 57,056) and Minot in Ward County (population of 47,822) (Cubit Planning, Inc., 2017).

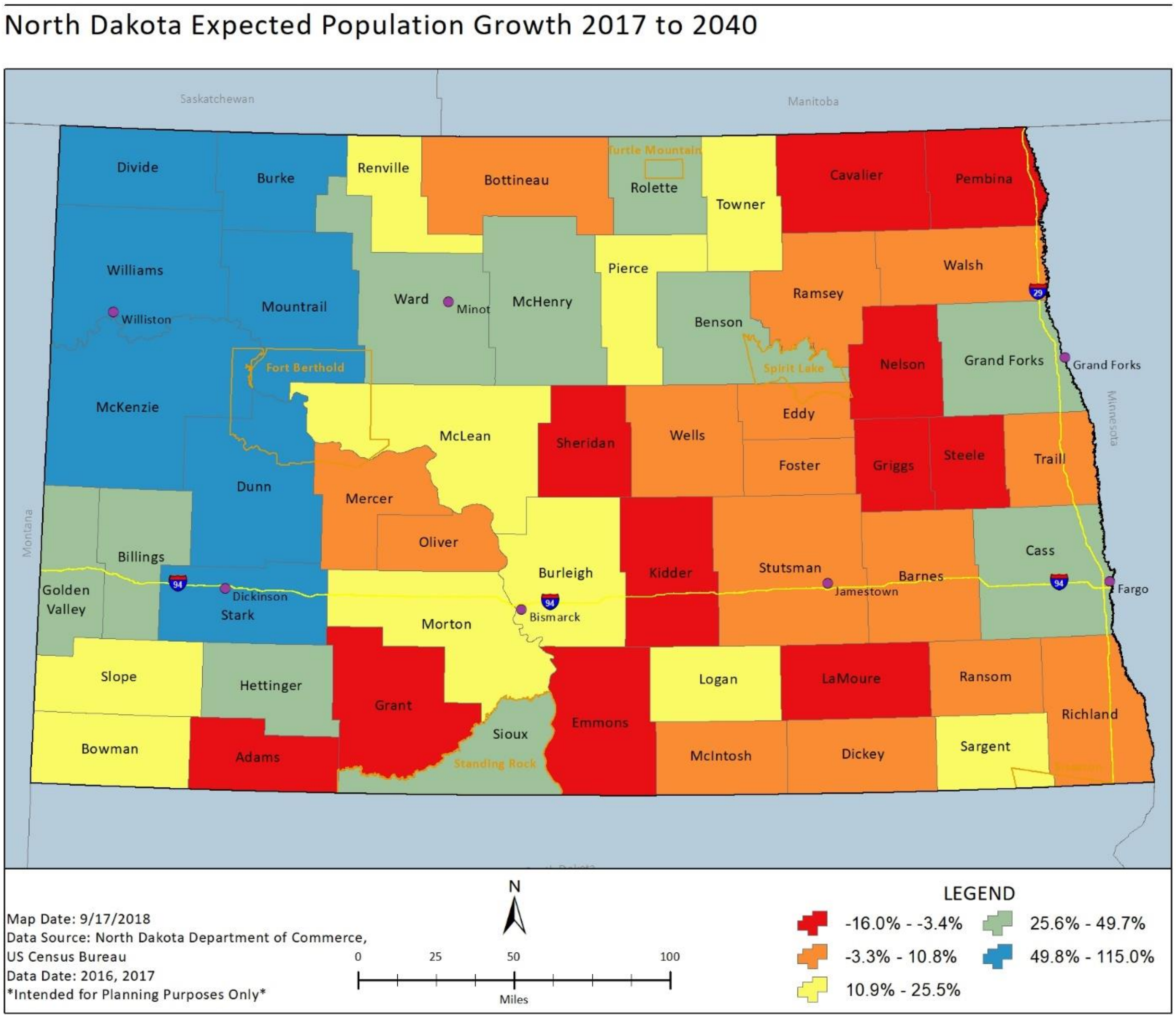
The state's population ratio is about 11 people per square mile. North Dakota has three Native American reservations within its borders and shares two with South Dakota. These tribes include the Mandan, Hidatsa, and Arikara Nation (Three Affiliated Tribes), the Spirit Lake Nation, the Standing Rock Sioux Tribe, the Turtle Mountain Band of Chippewa Indians, and the Sisseton-Wahpeton Oyate Nation. (Please note: The Sisseton-Wahpeton Oyate Nation coordinates with South Dakota Office of Emergency Management for mitigation planning support. Standing Rock Sioux Tribe, in turn, coordinates with NDDES.) In total, there are an estimated 31,329 American Indians living in North Dakota (North Dakota State Government, 2016). These numbers are included in the population map on the following page.

Figure 2-1 Population by County, 2017



Some areas of the state, particularly cities and counties in proximity to the oil industry, are expected to see continual population growth in the years ahead, while other areas will see very minor growth, and some will see population decline. Figure 2-2 on the following page displays expected population growth through 2040. The data behind this map is summarized in a table in Appendix 7.3.

Figure 2-2 Expected Population Growth 2017-2040



Language

Roughly 666,166 people, or 94.8% of the population in North Dakota speak only English. The remaining 36,889 people, or 5.2% of the population, speaks a language other than English. Additionally, five federally recognized tribes live, at least in part, in the state, all of whom speak their own language.

The Standing Rock Sioux speak a form of Lakota (a variety of the Siouan language); the Spirit Rock Sioux speak Dakhota (another variety of the Siouan language); the Turtle Mountain Band of Chippewa Indians speak Ojibwe (an Algonquian language) and Michif (a mixed language); the three affiliated tribes MHA (Mandan, Hidatsa, and Arikara) Nation speak three separate languages named after their respective tribes; and the Sisseton-Wahpeton Oyate Nation (a tribe primarily located in South Dakota with a small portion of the reservation in southeastern North Dakota) speaks Dakhota.

Further information about languages spoken in North Dakota is displayed in the table below.

Table 2-3 North Dakota Language Demographics

Subject	Population Numbers	Population Percentage
Speaks only English	666,166	94.8%
Speaks a language other than English	36,889	5.2%
Spanish	12,986	1.8%

Subject	Population Numbers	Population Percentage
Other Indo-European languages	14,390	2.0%
Asian and Pacific Island languages	4,254	0.6%
Other languages	435	0.1%

Source: U.S. Census, American Community Survey Data, 2016

Income

The 2016 average per capita income in North Dakota was $33,107 and the average household income was $59,114 (United States Census Bureau, 2016). Per capita income, household income, and poverty percentage rates by county are displayed in the table below.

Table 2-4 Per Capita Income, Household Income, and Poverty Rate (2016 dollars)

County	Per Capita Income	Median Household Income	Percentage of Population in Poverty
Adams	$32,594	$53,295	9.6
Barnes	$34,244	$55,778	10.9
Benson	$20,561	$41,530	29.4
Billings	$40,549	$67,969	8.9
Bottineau	$32,661	$55,958	11.1
Bowman	$34,388	$62,955	8.2
Burke	$35,857	$65,521	9.0
Burleigh	$36,093	$66,057	7.2
Cass	$32,485	$54,926	10.7
Cavalier	$39,779	$65,645	9.7
Dickey	$28,843	$55,882	10.9
Divide	$41,063	$62,470	10.0
Dunn	$40,102	$66,964	9.8
Eddy	$33,785	$55,489	10.1
Emmons	$29,467	$45,472	13.9
Foster	$30,310	$55,625	8.9
Golden Valley	$26,536	$37,014	9.8
Grand Forks	$29,376	$50,652	13.9
Grant	$32,200	$45,978	15.6
Griggs	$31,866	$50,250	9.6
Hettinger	$31,074	$55,230	10.5
Kidder	$36,779	$58,527	12.6
LaMoure	$36,493	$55,900	11.6
Logan	$33,272	$55,068	12.7
McHenry	$36,072	$60,741	10.9
McIntosh	$30,620	$43,650	12.1
McKenzie	$37,938	$78,179	7.9
McLean	$34,218	$59,976	9.2
Mercer	$34,194	$73,801	6.6
Morton	$34,715	$63,549	8.9
Mountrail	$39,285	$68,082	9.5
Nelson	$33,895	$51,280	11.6
Oliver	$35,524	$66,196	10.3
Pembina	$32,779	$56,813	9.1
Pierce	$27,926	$43,086	13.0

County	Per Capita Income	Median Household Income	Percentage of Population in Poverty
Ramsey	$30,372	$50,776	14.1
Ransom	$30,822	$57,088	8.1
Renville	$31,646	$65,927	8.2
Richland	$28,534	$58,125	10.2
Rolette	$17,744	$37,313	26.7
Sargent	$33,072	$57,472	7.7
Sheridan	$31,244	$48,375	16.9
Sioux	$15,338	$39,539	35.3
Slope	$36,168	$58,750	11.3
Stark	$37,681	$76,817	8.0
Steele	$36,802	$58,603	8.3
Stutsman	$30,623	$53,685	11.2
Towner	$33,785	$53,929	10.7
Traill	$31,188	$55,764	8.4
Walsh	$30,266	$51,181	11.0
Ward	$32,395	$63,037	8.8
Wells	$30,260	$50,685	10.5
Williams	$45,442	$90,080	6.8
North Dakota	**$33,107**	**$59,114**	**10.7**

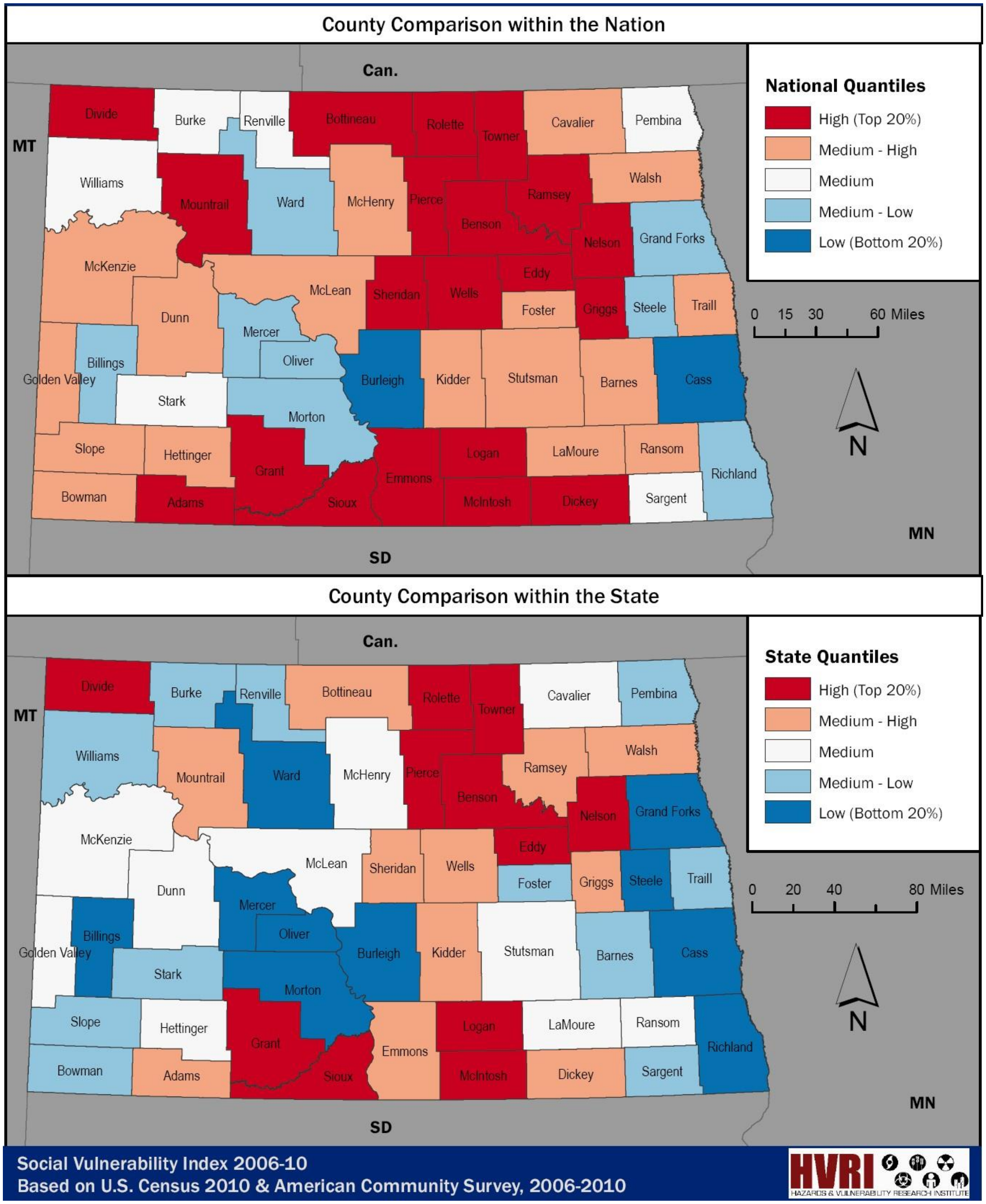
Source: United States Census Bureau, 2012-2016 Quick Facts.

A Social Vulnerability Index compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina measures the social vulnerability of United States counties to environmental hazards for the purpose of examining the differences in social vulnerability among counties.

Based on national data sources, primarily the 2010 Census, the index synthesizes 42 socioeconomic and built environment variables that research suggests contribute to reduction in the ability of a community to prepare for, respond to and recover from hazards (i.e., social vulnerability). Eleven composite factors were identified that differentiate counties according to their relative level of social vulnerability: personal wealth, age, density of the built environment, single-sector economic dependence, housing stock and tenancy, race (African American and Asian), ethnicity (Hispanic and Native American), occupation, and infrastructure dependence.

At the time of the 2018 revision, the Social Vulnerability Index 2006-2010 is the most recent data. The index can be used by the State to help determine where social vulnerability and exposure to hazards overlaps and how and where mitigation resources might best be used. See the figure on the following page for a map that illustrates North Dakota's geographic variation in social vulnerability with a county comparison within the nation and a county comparison within the State. This map shows where there is uneven capacity for preparedness and response and where resources might be used most effectively to reduce pre-existing vulnerability; more vulnerable counties are displayed in shades of orange and red.

Figure 2-3 Social Vulnerability to Environmental Hazards in North Dakota



2.2.2.3 Geography

North Dakota is located in the North Central part of the United States, in the region known as the Great Plains. The state shares the Red River of the North with Minnesota to the east and is bounded on the north by the Canadian provinces of Manitoba and Saskatchewan, on the south by South Dakota, and on the west by Montana. North Dakota is a land of prairies and cropland. Its area is roughly 70,700 square miles, approximately 211 miles from north to south and 340 miles from east to west. The surface geology is primarily made up of glacial deposits (drift) and former lake (lacustrine) plains formed by continental ice sheets. The state is drained through the Missouri River and the Hudson Bay drainage areas. The divide separating these two major drainage systems runs from the northwest through the central and southeastern portions of the state.

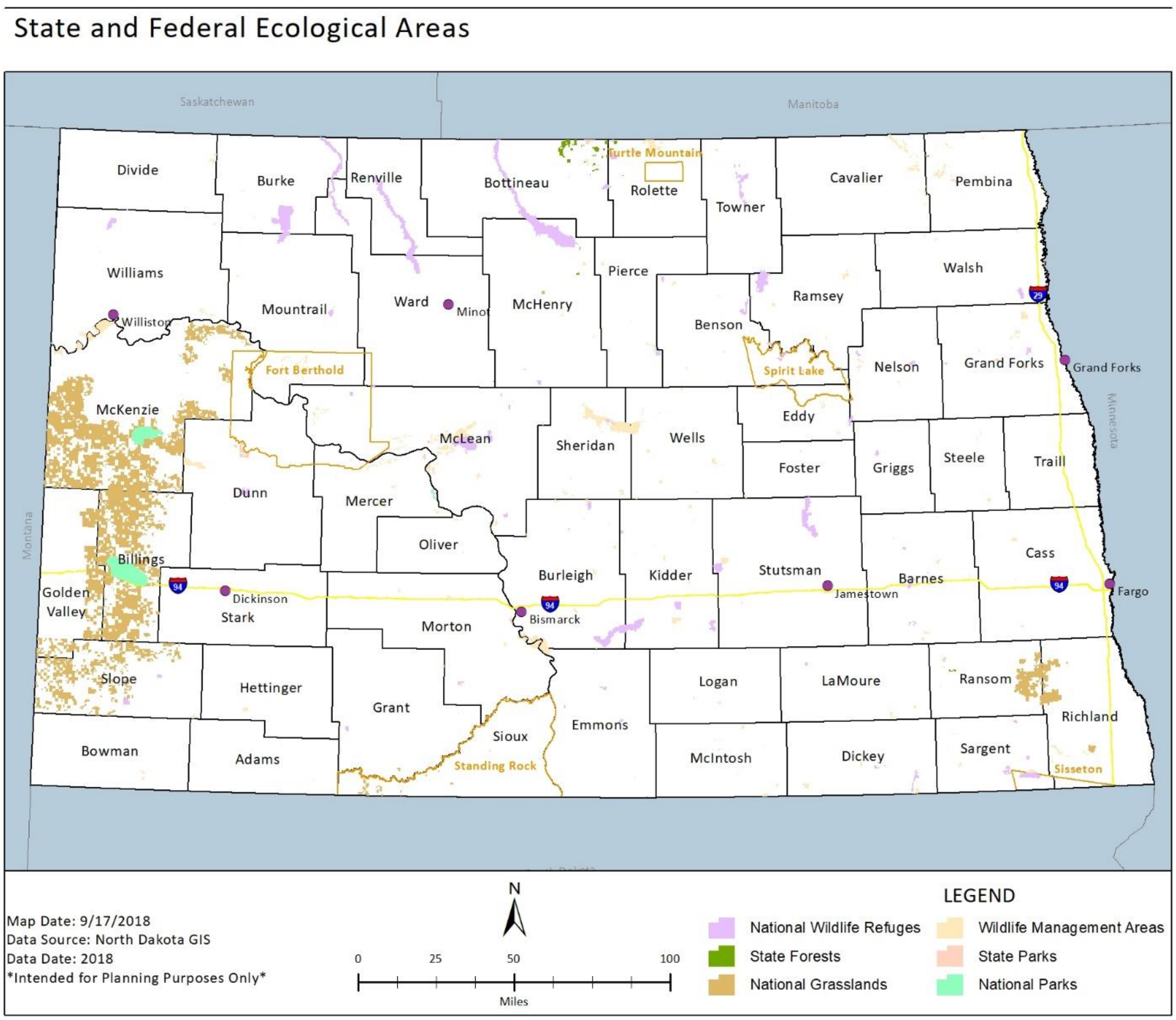
2.2.2.4 Ecology

Ecological values represent the relationship between organisms and their environment. For humans, these values include clean air, clean water, a sustainable way of life, and a healthy, natural environment including a diversity of species. Natural hazards, such as floods and wildfires, are usually part of a healthy ecosystem but often human-caused hazards damage ecological values. As of August 2018, the following Endangered Species have been identified in North Dakota (United States Fish and Wildlife Service[USFWS]):

- Northern Long-Eared Bat;
- Whooping Crane;
- Red Knot;
- Piping Plover;
- Dakota Skipper;
- Poweshiek Skipperling;
- Pallid Sturgeon;
- Least Tern; and the
- Gray Wolf.

North Dakota has also identified one endangered plant, the western prairie fringed Orchid. Areas of ecologic significance in the State include Theodore Roosevelt National Park, the Dakota Prairie National Grasslands, 64 National Wildlife Refuges, 11 National Wetland Management Districts, 1 National Game Preserve, 5 State Nature Preserves, and 5 State Forests. Figure 2-4 displays State and Federal ecological areas in North Dakota.

Figure 2-4 State and Federal Ecological Areas



2.2.2.5 Climate

North Dakota's geographic location results in a sub-humid continental climate characterized by marked fluctuations in temperatures and light to moderate precipitation. Average annual precipitation ranges from 13 inches in the northwest to more than 20 inches in the southeast. The precipitation tends to be irregular in occurrence, amount, and area of coverage. The inconsistency of the state's weather arises from the interaction of three major air masses that originate in distinct global regions: cold, dry air from the polar region, warm, moist air from the Gulf of Mexico, and cool, moist air from the northern Pacific.

The polar air mass tends to dominate the other two, but its influence is considerably lessened during the summer. Warm summers and cold winters typify the state's continental climate. July temperatures are the warmest with average temperatures ranging from 67°F in the northeast to 73°F in the south. January is the coldest month with average temperatures ranging from 2°F in the northeast to 17°F in the southwest.

Average monthly snowfall amounts during the winter period of December through March are five to eight inches. Annual average snowfall in North Dakota ranges from fewer than 26 inches in the west central part of the state to about 38 inches in a belt extending diagonally across the state from the northeast corner to the southwest corner. Weather records and tree ring studies indicate the state experiences cyclical periods of below and above average precipitation. Climatic, geomorphic, and pedologic factors may combine to reinforce periods of drought or flooding, either of which creates a potential catastrophe.

2.2.2.6 Buildings

In addition to critical facilities and state-owned buildings, other structures such as residences and businesses in North Dakota are also threatened by natural and human-caused hazards. North Dakota does not currently maintain a statewide database of building data, therefore FEMA's Hazards US Multi-Hazard Earthquakes, Hurricanes, and Floods (Hazus-MH) software was used to extract building values for the entire state. This data is summarized in the table below for residential, commercial, agricultural, and religious buildings and facilities.

Table 2-5 North Dakota Building Exposure, by County

County	Residential	Commercial	Agriculture	Religious
Adams	$351,303,000	$138,102,000	$19,926,000	$15,700,000
Benson	$2,283,214,000	$605,424,000	$138,848,000	$107,106,000
Billings	$154,080,000	$35,738,000	$7,208,000	$412,000
Bottineau	$1,107,926,000	$219,827,000	$71,746,000	$39,370,000
Bowman	$540,491,000	$144,804,000	$37,322,000	$16,342,000
Burke	$406,082,000	$70,910,000	$21,564,000	$15,564,000
Burleigh	$10,912,501,000	$3,402,073,000	$99,420,000	$443,476,000
Cass	$20,939,189,000	$6,293,516,000	$235,718,000	$380,164,000
Cavalier	$733,436,000	$212,626,000	$77,860,000	$30,118,000
Dickey	$737,762,000	$247,822,000	$65,020,000	$36,566,000
Divide	$382,519,000	$119,130,000	$15,770,000	$11,470,000
Dunn	$594,425,000	$64,209,000	$28,612,000	$14,586,000
Eddy	$321,560,000	$61,332,000	$28,764,000	$9,848,000
Emmons	$520,078,000	$134,804,000	$40,120,000	$24,230,000
Foster	$470,021,000	$165,343,000	$30,676,000	$24,006,000
Golden Valley	$215,780,000	$85,520,000	$12,748,000	$13,360,000
Grand Forks	$8,586,016,000	$2,702,966,000	$165,870,000	$224,702,000
Grant	$440,631,000	$97,538,000	$37,778,000	$17,180,000
Griggs	$349,057,000	$101,270,000	$33,548,000	$27,486,000
Hettinger	$368,835,000	$97,855,000	$39,612,000	$13,132,000
Kidder	$411,284,000	$63,154,000	$36,412,000	$13,184,000
La Moure	$633,439,000	$171,456,000	$68,402,000	$42,672,000
Logan	$273,586,000	$66,509,000	$40,688,000	$16,716,000
McHenry	$717,354,000	$131,081,000	$56,340,000	$34,050,000
McIntosh	$515,128,000	$136,926,000	$34,132,000	$24,248,000
McKenzie	$926,851,000	$141,806,000	$32,956,000	$21,488,000
McLean	$1,608,033,000	$295,472,000	$82,234,000	$58,220,000
Mercer	$1,382,051,000	$264,854,000	$24,264,000	$52,186,000
Morton	$3,493,638,000	$824,647,000	$95,830,000	$108,686,000
Mountrail	$1,185,696,000	$191,199,000	$45,260,000	$21,716,000
Nelson	$488,802,000	$135,170,000	$47,060,000	$28,144,000
Oliver	$297,192,000	$30,157,000	$23,200,000	$7,054,000
Pembina	$1,126,860,000	$315,828,000	$103,268,000	$46,678,000
Pierce	$549,664,000	$383,397,000	$45,942,000	$18,496,000
Ramsey	$1,580,946,000	$465,403,000	$52,064,000	$52,400,000
Ransom	$734,534,000	$174,459,000	$53,906,000	$42,798,000
Renville	$405,226,000	$95,734,000	$42,796,000	$17,422,000
Richland	$2,295,712,000	$600,478,000	$138,026,000	$149,086,000
Rolette	$1,118,754,000	$317,664,000	$18,480,000	$29,518,000
Sargent	$615,518,000	$155,289,000	$51,320,000	$24,516,000
Sheridan	$197,380,000	$44,548,000	$29,696,000	$11,134,000
Sioux	$296,318,000	$39,643,000	$6,854,000	$5,972,000
Slope	$132,321,000	$6,326,000	$4,392,000	$376,000

County	Residential	Commercial	Agriculture	Religious
Stark	$3,178,756,000	$1,039,966,000	$58,768,000	$99,528,000
Steele	$311,155,000	$52,910,000	$21,602,000	$14,766,000
Stutsman	$2,826,116,000	$815,127,000	$129,518,000	$139,340,000
Towner	$443,591,000	$102,597,000	$42,870,000	$13,544,000
Traill	$1,155,824,000	$450,234,000	$67,800,000	$34,846,000
Walsh	$1,611,786,000	$559,777,000	$148,062,000	$67,206,000
Ward	$7,636,429,000	$2,736,126,000	$139,568,000	$200,282,000
Wells	$609,144,000	$173,607,000	$65,222,000	$38,174,000
Williams	$3,232,713,000	$1,282,596,000	$49,374,000	$90,750,000
Total	**$92,406,707,000**	**$27,264,949,000**	**$3,064,436,000**	**$2,990,014,000**

The National Flood Insurance Program (NFIP) is an insurance program that requires communities to adopt and enforce floodplain management ordinances in order for property owners to purchase federally backed flood insurance. These ordinances provide some measure of protection for new construction and significant renovations in the floodplain. Unrestricted development may occur in areas prone to flooding but not mapped and in those communities that lack floodplain management ordinances.

As of August 2018, there were 330 communities in North Dakota participating in the NFIP (322 in the regular program and 8 in the emergency program). Table 2-6 summarizes the 26 sanctioned communities with identified flood hazards that do not participate in the NFIP.

Table 2-6 NFIP Sanctioned Communities as of August 2018

Community Name	County	Sanction Date
Adams, City of	Walsh	07/25/1976
Anamose, City of	McHenry	07/17/1989 (S)
Barnes, Township of	Cass	01/20/2015 (S)
Brinsmade, City of	Benson	12/20/2001
Fordville, City of	Walsh	06/04/1977
Gardar, Township of	Pembina	05/03/2012
Gladstone, City of	Stark	08/13/1977
Golden Valley, City of	Mercer	06/27/1976
Hegton, Township of	Grand Forks	12/17/2011
Hoople, City of	Walsh	08/13/1977
Kenmare, City of	Ward	02/23/1983
Lansford, Township of	Bottineau	09/03/2009 (S)
Logan Center, Township of	Grand Forks	12/17/2011
Loretta, Township of	Grand Forks	12/17/2011
McKenzie County	McKenzie	09/02/2016
Neche, Township of	Pembina	06/06/2010
New England, City of	Hettinger	07/16/1977
Oberon, City of	Benson	06/20/2002
Park, Township of	Pembina	04/27/1983
Portal, City of	Burke	09/06/1989 (S)
St. Thomas, City of	Pembina	02/21/1976
St. Thomas, Township of	Pembina	05/03/2012
Stafford, Township of	Renville	12/08/1987 (W)
Stanton, City of	Mercer	04/02/1977
Towner, City of	McHenry	01/31/1976
Wells County	Wells	06/06/2019

*(S) indicates Suspended Community; (W) indicates Withdrawn Community

Housing Units

Housing unit data is useful in assessing population and housing trends over time. The estimated total number of housing units in North Dakota rose from 317,498 in 2010 to 374,657 in 2017 – a positive change of 57,159, or roughly 18%. Another indicator of growth is the number of building permits issued for privately owned construction. The table below displays the number of new housing units authorized per year from 2010 to 2017.

Table 2-7 New Privately-Owned Housing Units Authorized per Year

2010	2011	2012	2013	2014	2015	2016	2017
3,833	6,201	10,340	10,532	12,646	6,256	3,981	3,411

Source: U.S. Census Bureau, 2017

Impact of the Oil and Gas Industry on Buildings and Housing

The increase in population has resulted in rising housing costs and a lack of housing availability. With local populations doubling in just a few years, housing markets have been unable to keep up with demand. In some areas, "$3,400 a month for a three-bedroom apartment is typical" (Aries Residence Suites, 2018). Oil and gas companies have constructed "Man Camps" near frontage roads to supply some housing for workers. There are also camper clusters which consist of Recreational Vehicles parked very close together. While efforts are underway to make year-round Recreational Vehicle (RV) parks operational for RV parking, these camper spots are also very expensive. Camper clusters are created as a result to try to minimize the cost of living, in which case the risk exposure greatly increases. New housing construction is occurring quickly. But because of inflated prices, not all residents can afford to purchase homes.

Locals who are on fixed incomes are having difficulty affording the inflated prices. The 2016 North Dakota Statewide Housing Needs Assessment: Housing Forecast provides additional details on the issues related to housing needs in North Dakota. This publication prepared by the Center for Social Research at North Dakota State University is available online.[2]

2.2.2.7 Economy

In 2017, the Gross Domestic Product (GDP) for North Dakota was $55.5 billion. The State's real GDP grew 1.0% in 2017 compared to the national change of 2.1% (Bureau of Economic Analysis, 2018). In part, this growth is attributed to the oil and gas boom that started in 2005, although the largest industry in North Dakota in 2017 was finance, insurance, real estate, rental, and leasing. Additional information on North Dakota industries and their contributions to the State economy are detailed in the table below.

Table 2-8 Industry Contributions to North Dakota's 2017 GDP

Industry	Percentage of State GDP
Finance, Insurance, Real Estate, Rental, and Leasing	16%
Mining, Quarrying, and Oil and Gas Extraction	12%
Government and Government Enterprises	11%
Wholesale Trade	9%
Educational Services, Health Care, and Social Assistance	8%
All others	45%

Source: Bureau of Economic Analysis, 2018.

As North Dakota's GDP has grown, the state has also seen business and industry expansion. Data related to business expansion and activity was primarily collected through reports generated by the North Dakota Department of Commerce. This data is compiled in the table below and displays business start-ups, relocations, and expansions in 2017 and 2018.

[2] http://www.ndhfa.org/Web_Images/NDSHNA_HousingForecast_Final.pdf

Table 2-9 Business Start-ups, Relocations, and Industry Expansions (2017-2018)

Industry/Business	Type	Location	Year
SkyScopes, Inc.	Expansion	Minot	2018
Pipeline Foods, Limited Liability Company (LLC)	Expansion	Bowbells	2018
Pipeline Foods, LLC	Expansion	Lignite	2018
Buffalo Coulee Wood Products	Start-up	Cummings	2018
Allete Renewable Resources	Expansion	Hettinger	2018
Allete Renewable Resources	Expansion	Glen Ullin	2018
LM Wind Power Blades ND Inc	Expansion	Grand Forks	2018
Arrow Field Services LLC	Expansion	Watford City	2017
Dakota Specialty Milling Inc	Expansion	Fargo	2017
Arrow Field Services LLC	Start-up	Watford City	2017
CoSchedule LLC	Expansion	Bismarck	2017
North Dakota Soybean Processors LLC	Expansion	Spiritwood	2017
Dakota Specialty Milling Inc	Expansion	Fargo	2017
Agri-Cover Inc (Schmeichel Brothers LLP)	Expansion	Jamestown	2017
Heimbuch Potatoes LLC	Expansion	Cogswell	2017
Mackow Industries International GP	Expansion	West Fargo	2017
Anchor Ingredients Co LLC	Expansion	Buffalo	2017
Korber Medipak Systems NA Inc	Expansion	Fargo	2017
Border States Industries Inc	Expansion	Fargo	2017
Protosthetics LLC	Expansion	Fargo	2017
curaNEXUS LLC	Recruitment	Fargo	2017
Project Phoenix LLC	Start-up	Fargo	2017
Elbit Systems of America	Recruitment	Hillsboro	2017
Oasis Midstream Services	Expansion	McKenzie County	2017
Midco Connections	Expansion	Fargo	2017
Plasticom Inc	Expansion	Pembina	2017
Northern Tier Seed Company	Expansion	Thompson	2017
Northrop Grumman	Expansion	Grand Forks AFB	2017
Golden Valley Ingredients LLC	Expansion	Beach	2017
Tharaldson Ethanol Plant I LLC	Expansion	Casselton	2017
Dakota Carrier Network	Expansion	Fargo	2017
eSmart Systems	Expansion	Hillsboro/Grand Forks	2017
MCP Networks Inc	Expansion	Fargo	2017
Firebird Artisan Mills	Expansion	Harvey	2017
Advanced Bone Technology Inc	Start-up	Fargo	2017

Source: North Dakota Department of Commerce, 2018.

2.2.2.8 Culture

The State of North Dakota has a long and rich cultural heritage. Before the arrival of the Europeans, the land was a major center of Native American settlement for centuries. French fur traders were the first Europeans to arrive, soon followed by Americans and, later, Scandinavian and German migrants in the early 1900's. The State's pioneer culture remains prominent today. A strong Native American culture is also present, with five federally recognized tribes living in the state. A table in Appendix 7.3 summarizes the number of historic places in North Dakota by county, including houses and districts on the federal register.

2.2.2.9 Social

Social values are often not fixed locations or quantified but are important aspects of quality of life and interpersonal relationships. Examples of social values may include gatherings to promote community building, personal achievement, freedom from tyranny, the ability to communicate with others, pride in making the world a better place, and friendships. The realm of social values is only limited by the human imagination and usually relates to how a person feels. Disasters, both natural and human-caused, can disrupt important social activities and sometimes have lasting effects on society.

2.2.3 State Assets and Critical Infrastructure

The State of North Dakota has a specific interest in protecting facilities and property owned by the State. Disasters can damage private and government property, placing a financial and operational burden on the state. Losses can extend from structures and contents to the interruption of services and the general economy. The North Dakota Insurance Department State Fire and Tornado Fund provides affordable building and business personal property insurance coverage to state entities and political subdivisions of the state. Through this coverage, the department maintains an inventory of state-owned buildings that is updated annually, including building property value, personal property value, outdoor property value, and trailer property value.

These values are either replacement values or actual cash values. In some cases, the state may lease a property, and therefore, personal property (contents) values may be listed but the building property (structure) value may not, since the structure is not owned by the state. The State Fire and Tornado Fund does not provide specific flood insurance, and therefore, does not have flood certificates available for state-owned buildings. Whenever practicable, buildings and contents are insured for their replacement cost. Because some buildings in North Dakota are old structures, they can no longer be insured for their replacement cost, so they are insured for the actual cash value of the building.

Whenever a building or contents are listed as being insured for the actual cash value only, it is understood that the repairs or replacement cost caused by damage from a hazard event could far exceed the insured value of the structure. This is a recognized limitation, but the State Fire and Tornado Fund offers the most complete and accurate account of the value of state-owned structures and their contents.

State assets include critical facilities and infrastructure, emergency medical and fire response systems, airports and other transportation facilities, and a variety of other agencies, community services, utilities, and academic institutions. The table below displays the state-owned assets insured through North Dakota's Fire and Tornado Fund. This data was used in the Risk Assessment to analyze the exposure of state-owned properties and facilities to various hazards. Of note, North Dakota educational facilities, including schools and universities, account for about half of the total insured value of state-owned building stock in North Dakota (approximately $6.8 billion).

Table 2-10 State-Owned Assets Insured through the State's Fire and Tornado Fund (as of 2018)

Category	Facility Count	Insured Value
Adjutant General	225	$201,283,476.00
Airport Authorities	336	$78,936,408.00
City	7613	$3,273,068,979.00
County	1919	$1,128,053,436.00
Fair Associations	243	$36,474,735.00
Fire District	226	$44,412,891.00
Historical Societies	257	$26,404,507.00
Housing Authorities	469	$137,001,982.00
Libraries	40	$59,756,080.00
Other	99	$75,633,995.00
Park District	2644	$537,285,976.00

Category	Facility Count	Insured Value
School District	3042	$3,360,967,464.00
Soil Conservation District	111	$6,883,390.00
State Agency	786	$1,085,285,555.00
Township	61	$4,132,135.00
University	1563	$3,522,407,597.00
Water Districts	404	$133,148,038.00
Grand Total	**20038**	**$13,711,136,644.00**

The table below displays North Dakota's critical facilities and infrastructure by class and type. Critical facilities and infrastructure are those assets essential to public safety and continuity of government operations. Damaged or destroyed facilities or infrastructure in any of the classes described below could have debilitating effects on safety, security, public health, or the economy.

Table 2-11 North Dakota Critical Facilities and Infrastructure

Facility Class	Facility Type	Total Facilities
Communications	Cell Towers	6706
	Communication Towers	45
Emergency Services	Law Responders	111
	Fire Responders	337
	Emergency Medical Services (EMS) Responders	132
	Public Safety Answering Points (PSAPs)	22
Water	Water Treatment Plants	227
	Drinking Water Facilities	1961
	Dikes	747
Energy	Natural Gas Compression Stations	18
	Ethanol Plants	5
	Oil Wells	35598
Public Health	Hospitals	55
	Long-term Care Facilities – Assisted Living	77
	Long-term Care Facilities – Skilled Nursing Home	80
	Long-term Care Facilities – Basic Care	63
	Pharmacies	266
Transportation	Airports	304
	Commercial Airports	7
Government	Schools	448
	Court Houses	53
	Jails	30
Financial Institutions	State Chartered Banks	209
	Credit Unions	111
Total:		**47612**

2.2.3.2 Food/Agriculture

Agriculture is one of North Dakota's primary industries. Agricultural production comprises about 90% of the total land area in the state. North Dakota leads the nation in the production of several crops such as barley, sunflower seeds, spring and durum wheat for processing, and farm-raised turkeys. This production is critical to the national food industry and economy in addition to North Dakota's. Recent events have demonstrated the extent to which agricultural losses can impact the economy.

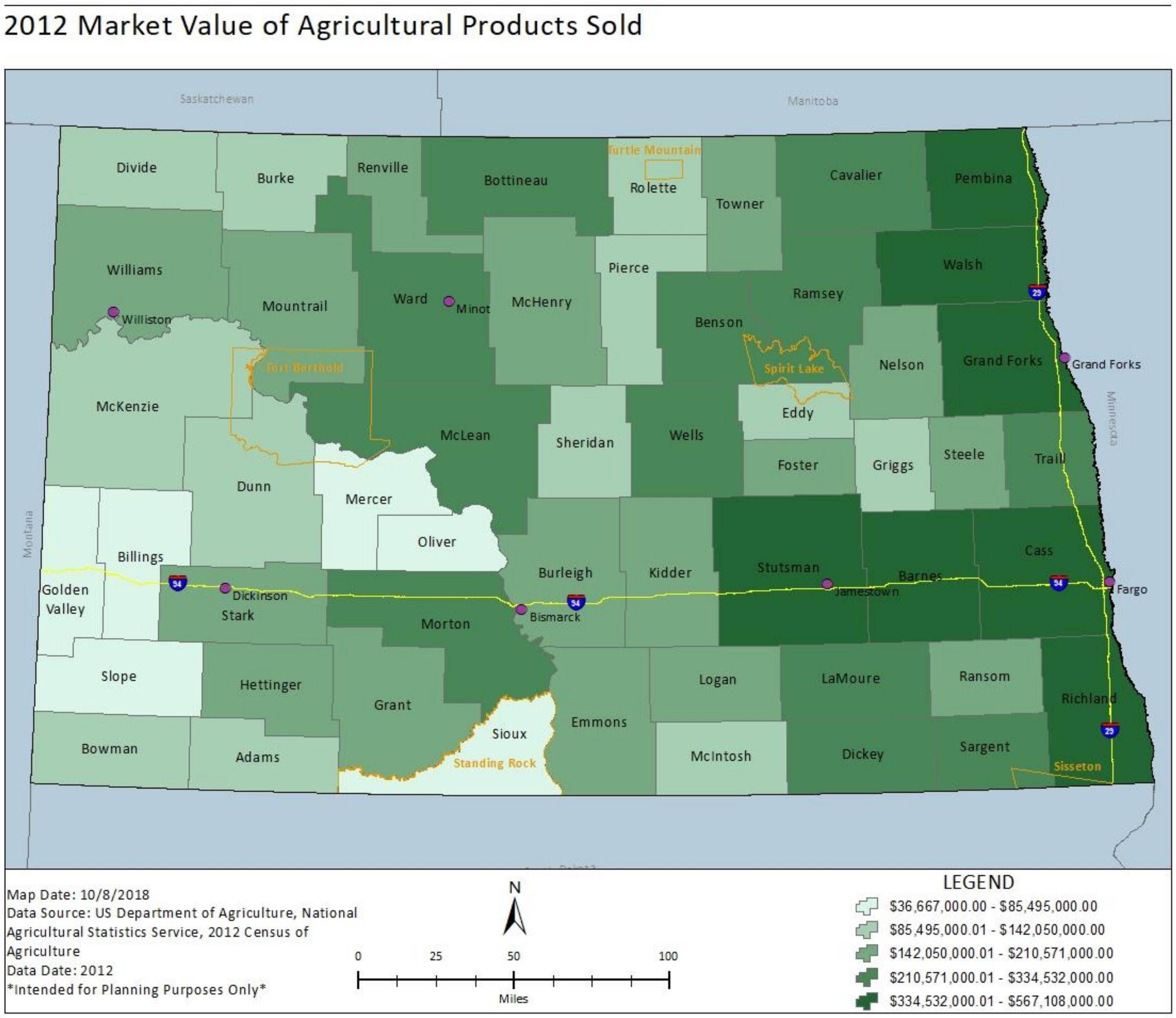
Drought conditions in 2017 contributed to agricultural losses, with the resulting overall economic impact of the drought totaling $2.5 billion. Further information on drought can be found in the drought hazard profile in Section 3.7.3. Table 2-12 and Figure 2-5 summarize the value of production of various agricultural products as detailed in the 2017 State Agricultural Overview. At the time this plan was being developed, the 2017 Census of Agriculture was underway.

Table 2-12 North Dakota Commodities and Value of Production

Commodity	Price per Unit	Value of Production
Soybeans	8.9 $ / Bushel (BU)	$2,133,330,000
Wheat	5.8 $ / BU	$1,384,140,000
Wheat (Spring, Excl, Durum)	5.75 $ / BU	$1,195,253,000
Wheat (Spring, Durum)	6.35 $ / BU	$183,642,000
Wheat (Winter)	4.05 $ / BU	$5,245,000
Corn	2.9 $ / BU	$1,302,013,000
Canola	17.5 $ / hundredweight (CWT)	$444,990,000
Hay and Haylage	99 $ / Ton	$326,045,000
Hay (Alfalfa)	105 $ / Ton	$198,450,000
Hay (Excl Alfalfa)	75.5 $ / Ton	$127,595,000
Beans	24.3 $ / CWT	$301,126,000
Potatoes	11.1 $ / CWT	$279,276,000
Sunflower	18.4 $ / CWT	$127,030,000
Barley	4.25 $ / BU	$105,761,000
Peas	12.7 $ / CWT	$93,726,000
Lentils	26.5 $ / CWT	$57,638,000
Flaxseed	9.25 $ / BU	$31,774,000
Oats	2.85 $ / BU	$13,224,000
Safflower	15.9 $ / CWT	$769,000

Source: 2017 State Agricultural Overview

Figure 2-5 2012 Market Value of Agricultural Products Sold



In 2017, of the total 23,099,127 acres of cropland in North Dakota, approximately 21,566,784 acres were covered by crop insurance through the United States Department of Agriculture (USDA) Risk Management Agency, covering 93 percent of insurable crops. In addition to agriculture, the two other main industries in North Dakota are the Oil and Gas Industry and Food Processing. Other sectors of the economy include mining, construction, manufacturing, healthcare, transportation, communications, utilities, wholesale trade, retail trade, professional and public services, finance, insurance, education, and real estate.

2.2.3.3 Energy

North Dakota produces and uses a considerable amount of energy-related commodities. According to the United States Energy Information Administration, North Dakota ranks fourth in the nation for per capita energy consumption, partly because of the high heating demand in the winter and an energy-intensive economy. Major energy features in the state are mapped by the Energy Information Administration.[3]

Industry accounts for over one-half of the total energy consumption in the state. Nearly all of the electricity generated in North Dakota is produced by coal-fired power plants. Much of this coal is extracted from large surface mines in central North Dakota. The state is also a substantial producer of wind energy and leads

[3] https://www.eia.gov/state/?sid=ND

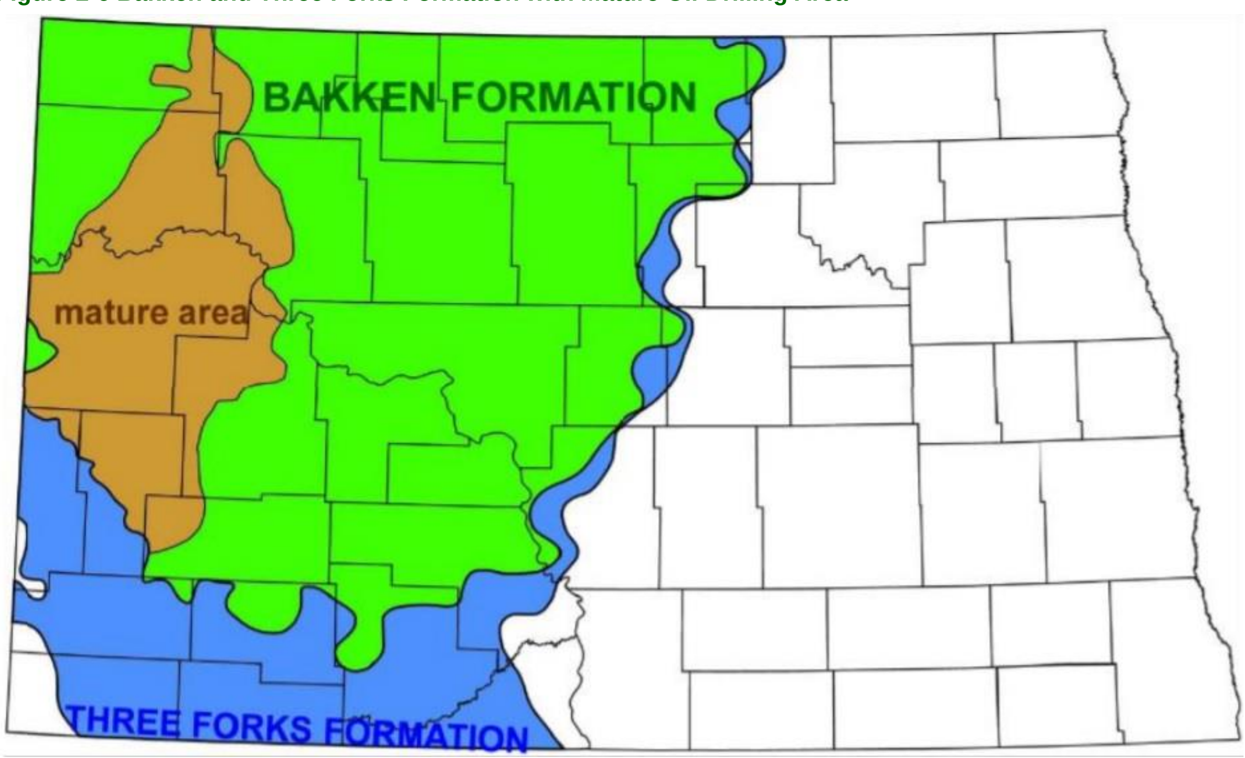
the United States in potential wind power capacity. North Dakota has the distinction of being one of only three states to produce synthetic natural gas and is home to the largest synthetic gas plant in the nation. North Dakota also has considerable ethanol production capacity but is one of only a few states that allow statewide use of conventional motor gasoline rather than specific gasoline blends.

In 2016, North Dakota oil production trailed only Texas, accounting for 12 percent of total United States crude oil production (United States Energy Information Administration, 2016). Crude oil production has increased significantly since early in 2007 because of the increased use of horizontal drilling and hydraulic fracturing in the Bakken Formation in the Williston Basin. Because over 80% of North Dakota's wells are located in only four counties—Dunn, McKenzie, Mountrail, and Williams—in the northwest area of the state, harsh weather in these areas can reduce the state's total crude oil production.

North Dakota currently has three operational refineries. Existing refineries include the Andeavor refineries in Mandan and Dickinson, with a capacity of 74,000 bbl/d (barrels per day) and 20,000 bbl/d, respectively, and the Davis refinery in Billings County, with a capacity of 49,500 bbl/d. Primary products of these refineries include diesel fuel, jet fuel, heavy fuel oils, and liquefied petroleum gas.

In North Dakota, as well as Montana, the Bakken and Three Forks Shale formations are rich in oil and natural gas which are located within the Williston Basin. The Bakken Formation in northwest North Dakota has been the focus of most oil drilling and extraction growth since 2005. In 2010, drilling into the Three Forks Sanish Formation, below the Bakken Formation, began and could continue the exponential growth of this industry in the state. Figure 2-6 shows the Bakken Formation and Three Forks Formation in North Dakota with the mature area of oil drilling.

Figure 2-6 Bakken and Three Forks Formation with Mature Oil Drilling Area



Source: North Dakota Geological Survey, Bakken and Three Forks Basics presentation

The continued development of new oil fields, particularly in the western part of the state, creates additional risk from both new fixed facilities and the associated increase in hazardous material transportation in the area. New and proposed pipelines associated with oil and gas development pose additional threats in parts of the State. The industry does not have enough pipelines to handle this capacity. Three-fourths of the State's crude oil is now trucked from wellheads and the natural gas is burned off, or flared, at one of every five wells because of the lack of pipeline infrastructure. Below are two figures that compare the oil and gas wells in North Dakota between 2013 and 2018. The number of oil and gas wells in Divide, Williams, and McKenzie counties have increased markedly in the last 5 years.

Figure 2-7 Oil and Natural Gas Wells, 2013

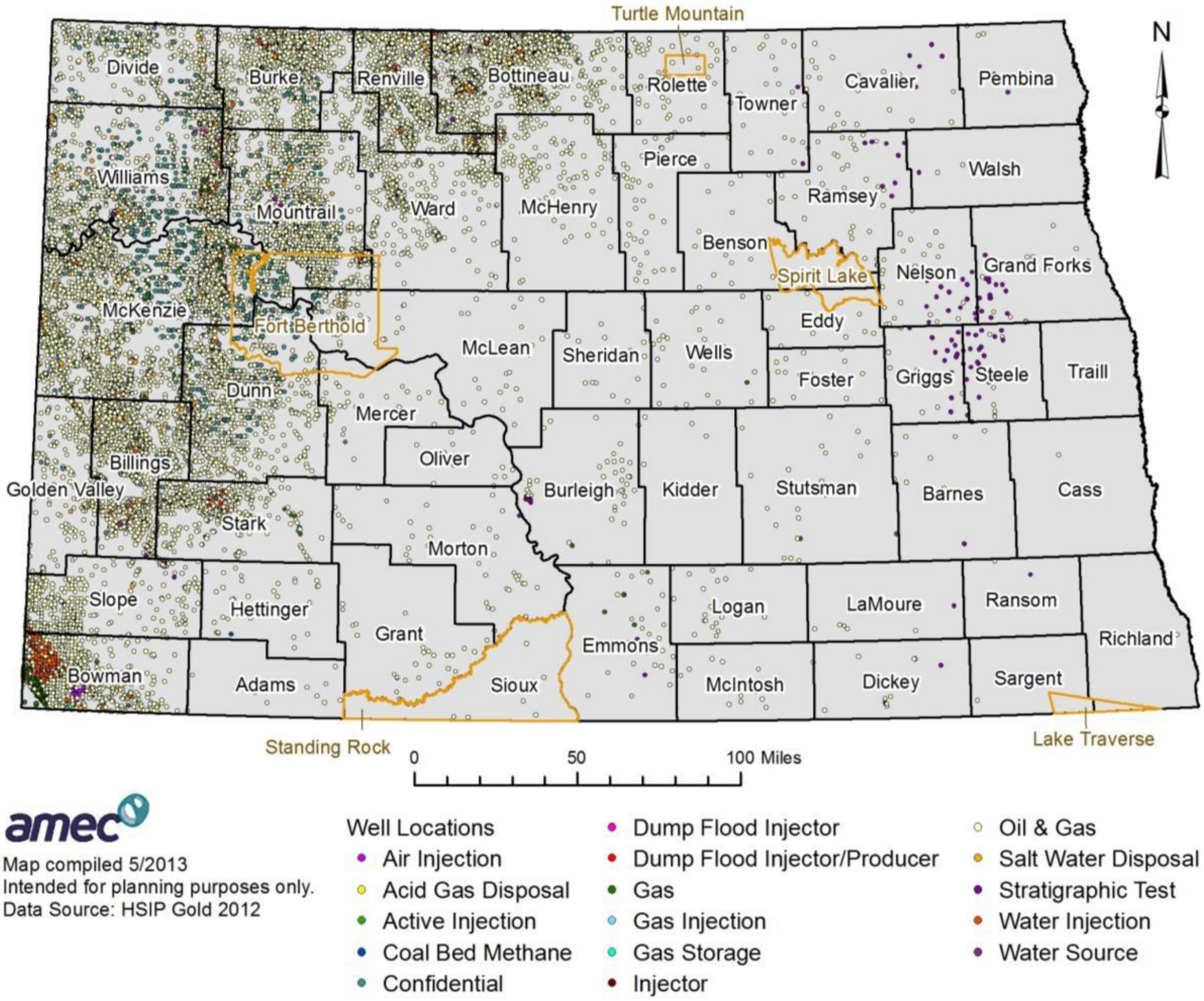
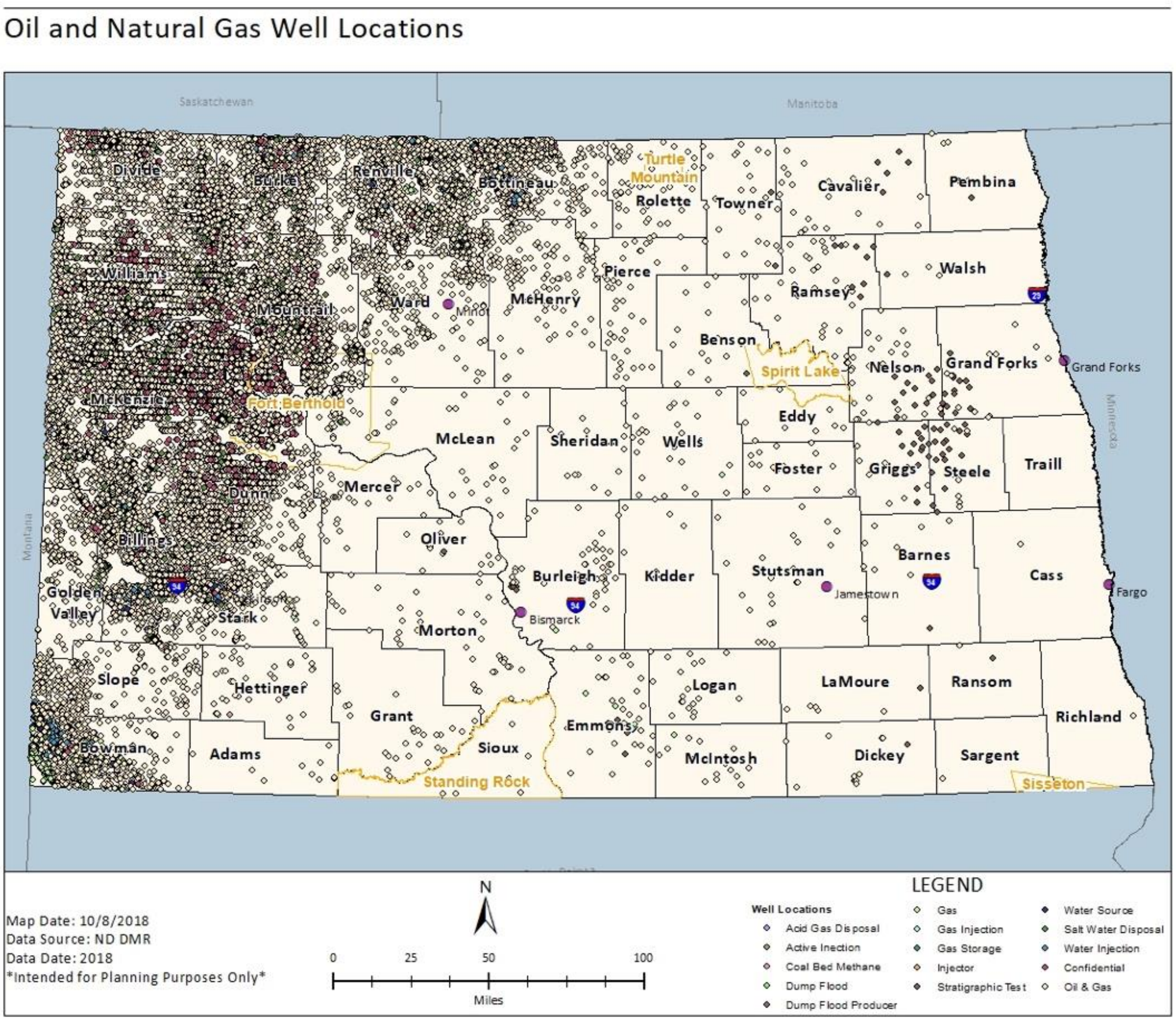


Figure 2-8 Oil and Natural Gas Wells, 2018



In recent months, the Dakota Access Pipeline project in North Dakota has increased pipeline infrastructure. In June 2017, 78% of Bakken crude oil produced was transported via pipeline and 7 percent was transported via rail (Holdman, 2017). This is a marked shift in the mode of oil transport; in 2013, 71 percent of North Dakota-produced oil was transported via rail, with only 20 percent transported via pipeline.

2.2.3.4 Public Health

The hospitals selected for inclusion in this section were based on their trauma designation as Level II, verified by the American College of Surgeons (ACS). The designation of trauma facilities is a geopolitical process by which empowered entities, government or otherwise, are authorized to designate such facilities. The ACS does not designate trauma centers; instead, it verifies the presence of the resources listed in Resources for Optimal Care of the Injured Patient. This is a voluntary process and only those trauma centers that have successfully completed a verification visit are listed below.

Table 2-13 Hospitals/Trauma Centers in North Dakota

Hospitals	County
Sanford Medical Center, Bismarck	Burleigh
Catholic Health Initiatives (CHI) St. Alexius Medical Center, Bismarck	Burleigh
Essentia Health, Fargo	Cass

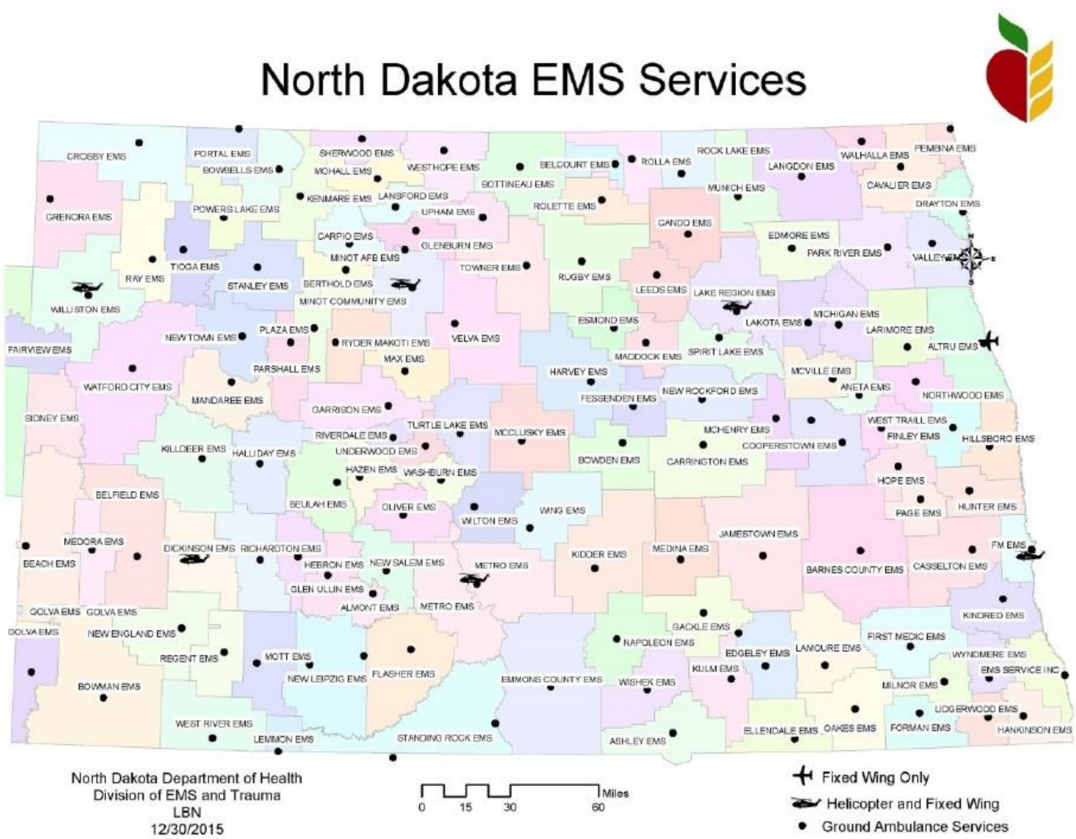
Hospitals	County
Sanford Medical Center, Fargo	Cass
Altru Health System, Grand Forks	Grand Forks
Trinity Hospital, Minot	Ward

Source: American College of Surgeons, http://www.facs.org/trauma/verified.html

2.2.3.5 Emergency Services

Emergency Medical Services in North Dakota are displayed on the map below. Additional information on medical care and public health can be found in the Infectious Disease and Pest Infestations and Hazardous Materials Release hazard profiles.

Figure 2-9 EMS in North Dakota



2.2.3.6 Communications

Statewide communication services ensure necessary resources are dispatched for emergency response. The North Dakota State Radio Communications System has over four thousand users representing 287 agencies of the local, state, and federal government. The Division of State Radio coordinates 911 services as well as emergency medical, fire, and law enforcement response. It provides all public safety communications services for 24 counties and is the designated back-up for the other 22 public service answering points throughout the state. State Radio is the primary dispatch center for the North Dakota Highway Patrol and also responds to calls for emergency assistance across the state.

A communications center that is open 24 hours a day provides direct assistance to more than 4,000 users representing 287 federal, state, local, and tribal agencies. Services include the following:

- America's Missing: Broadcast Emergency Response (AMBER) Alert Response
- Mobile Data Terminal Communication Systems
- National Crime Information Center (NCIC)
- National Law Enforcement Telecommunications System (NLETS)
- National Warning System (NAWAS)
- North Dakota Law Enforcement Telecommunications System
- State Radio Communications System
- State warning point for the NAWAS notification
- Statewide Paging System
- Statewide 9-1-1 and Emergency Telephone Systems
- Statewide Roadblock System
- Statewide Frequency Coordination System

2.2.3.7 Transportation

The expansion of the oil and gas industry has translated to more traffic volume on those roads in boom counties. This has resulted in additional maintenance requirements and traffic concerns. NDDOT has projects underway to expand capacity in oil boom jurisdictions; more information on these projects and other transportation-related data can be found in the Transportation hazard profile.

2.2.3.8 Water

NDSWC is responsible for several regulatory functions and responsibilities, including allocation of the state's waters, dam safety, sovereign land management, and drainage. The Commission has the authority to investigate, plan, construct, and develop water-related projects, and serves as a mechanism to financially support those efforts throughout North Dakota.

2.2.3.9 Other Critical Infrastructure, Facilities, and Key Resources

During or following a disaster, some facilities become exceedingly important in protecting the safety of the population, the continuity of government, or the continued delivery of essential community services; these facilities are termed critical facilities. Utilities such as electricity, heating fuel, telephone, water, sewer, communications, and transportation rely on established infrastructure to provide services. The providers of these services use a variety of systems to ensure consistent service throughout the state. Each of these services is important to daily life in North Dakota, and in some cases, is critical to the protection of life and property; therefore, this infrastructure is termed "critical infrastructure". As a public document, this plan is somewhat limited in the amount of detail provided related to critical facilities and infrastructure. For the most part, publicly available data sources have been used to describe and quantify the critical facilities and infrastructure in the state.

Since much of the nation's critical infrastructure is owned and managed by private entities, it is not comprehensively included in this plan due to the proprietary nature of the infrastructure. These sectors include energy production, transmission, and distribution, food production and distribution, telecommunications distribution, information technology development and distribution, and large public gathering places. Although detailed data regarding these sectors is not included, a summation by county was provided for some of these sectors by the North Dakota Critical Infrastructure Program.

2.2.4 Current and Future Land Use

Much of the land in North Dakota is devoted to agriculture. About 90% of the 70,655 square miles of land area is used for cropland, rangeland, or pastureland. The Red River Valley, with higher amounts of precipitation, consists of primarily croplands. The drier central and southwestern parts of the state have more livestock-based land uses. Natural resource extraction and energy production is another important land use, particularly in the western part of the state.

The State, with its agricultural economy, is primarily rural. However, several urban centers exist. The largest cities in North Dakota include Fargo, Bismarck, Grand Forks, and Minot. These cities make up the majority of the urban land area. The National Land Cover Database 2011 is the most recent national land cover product created by the Multi-Resolution Land Characteristics (MRLC) Consortium. The data was mapped for North Dakota and can be found in Figure 2-10 below. A vast majority of the mapped land use type is "82 – Cultivated Crops," which further supports how extensive the agricultural industry is in North Dakota.

Figure 2-10 North Dakota Land Cover

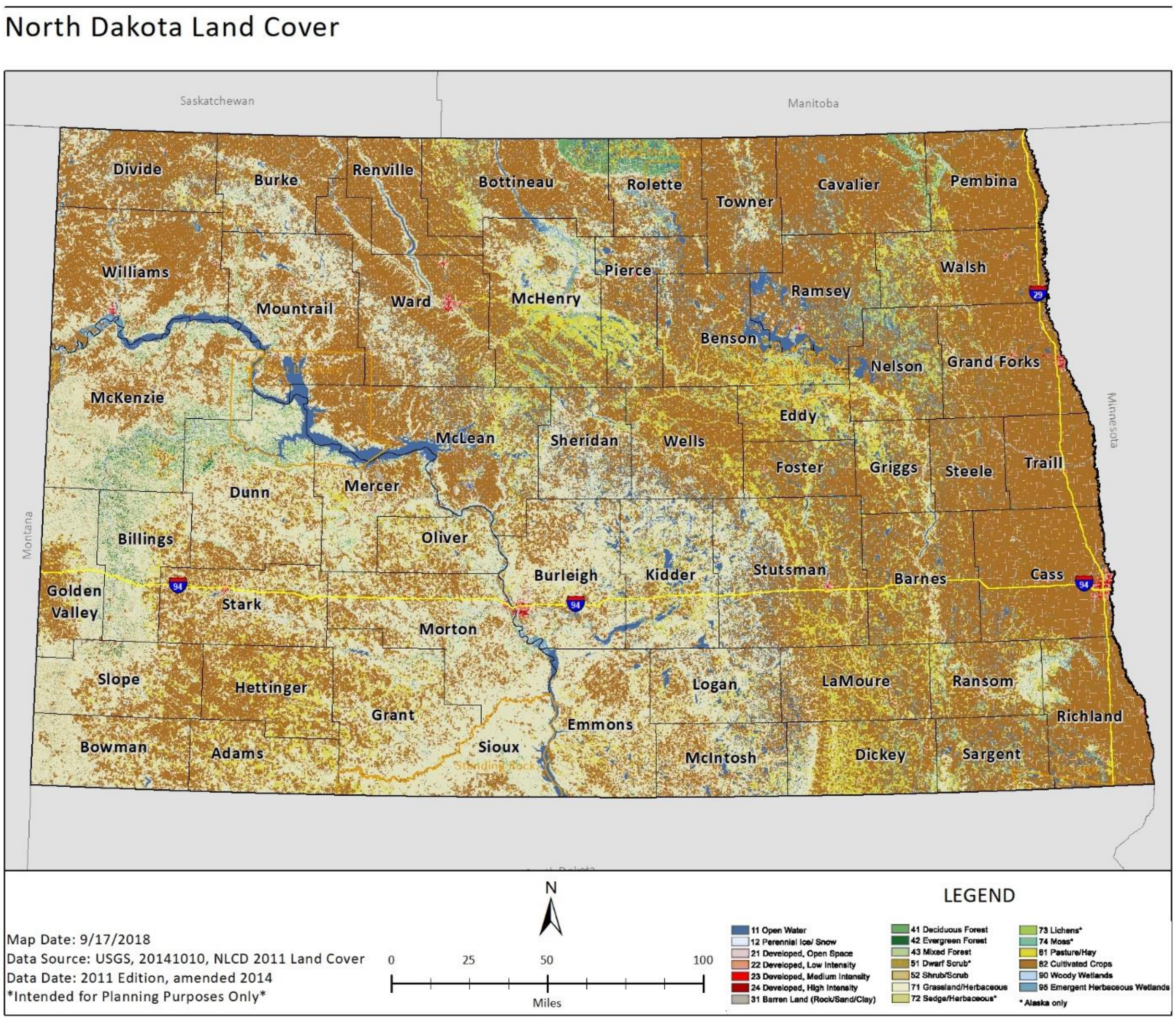
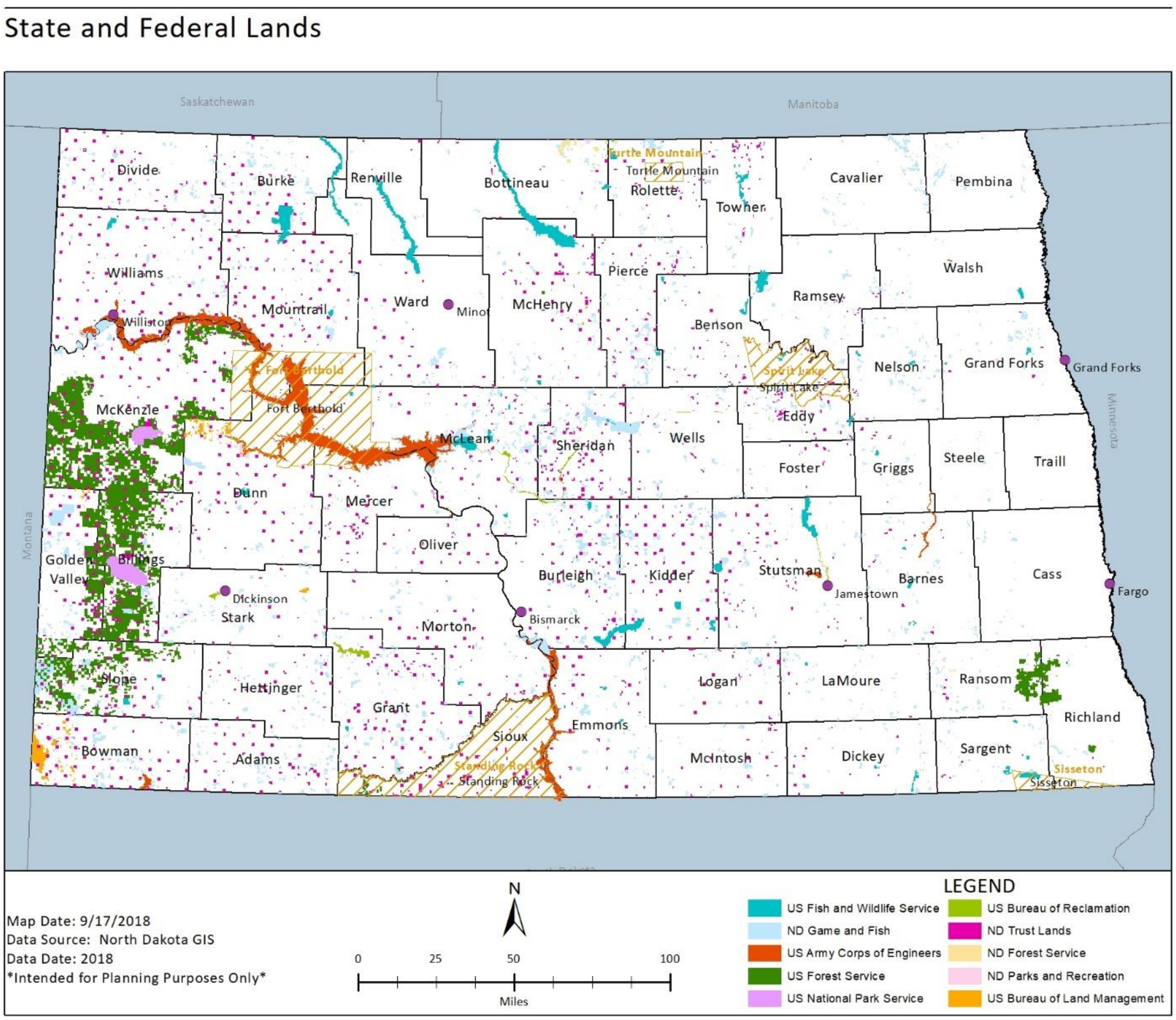


Figure 2-11 summarizes the different state and federal-owned lands in the state. North Dakota Trust Lands, especially those found throughout the western/southwestern part of the state, are lands leased for oil and gas drilling and other mineral exploration.

Figure 2-11 State and Federal Owned Lands in North Dakota



The way in which new development occurs is important to disaster mitigation. Often, smart development is an inexpensive and effective way to reduce the impact of disasters on the communities. In contrast, new development in hazardous areas without provisions for hazard mitigation adds to the vulnerability of a community and ultimately can lead to more costly disasters. Population trends in North Dakota have oscillated between decreasing and increasing since the 1940s. The early 2000s featured annual population net decreases across the state, but beginning in 2004, the trend shifted to slow population increases.

Rural areas in general are seeing population decreases but urban areas are increasing. Areas experiencing business and industrial growth are also reflecting the associated population increases. It is anticipated that the expansion of the oil and gas industry will continue to impact future development. Projections for future populations estimate that the overall trend will be population increases in the State through 2025.

Land use for agriculture has also seen changes over the years. One study found that 669,656 acres of grassland were converted to corn/soy production between 2006 and 2011 (Shafer et al, 2014). The eastern part of North Dakota has also seen increasing precipitation which has larger influenced higher corn production, given that corn is a water-thirsty crop (Arora and Hennessy, n.d.). To understand the motivation behind the changing land use for agriculture, 1,026 land operators in east river South Dakota and North Dakota were surveyed during spring 2015 to understand the motivators behind the land use choice from the producers' perspective. The top three motivating factors were changing crop prices, improved crop yields, and changing input prices (Wang, 2017).

2.3 Situation Conclusions

The State of North Dakota is an agricultural leader and thrives in the coal, oil, gas, and wind energy industries. The State's biggest industry is agriculture, but recent development is primarily due to oil and gas industry-driven population growth. Development and land use trends will continue to be affected by population shifts, industry expansion, and the impacts of climate change. As climate shifts affect temperatures and weather patterns, North Dakota can expect to see more extreme hot and cold weather systems. A changing climate will affect more than just temperatures. An increase in the frequency and severity of extreme heat events will adversely affect public health, water resources, and agriculture production, while an increase in the frequency and severity of extreme cold and winter weather will likewise negatively impact public health and water resources, as well as other essential services. A recent study (Badh et al., 2009) shows an overall increase in growing season length by 12 days per century in North Dakota. In addition to increasing growing season length, increases in average temperature provides opportunity for the row crops requiring higher heat units (Growing Degree Days) and more moisture (precipitation). Corn and soybean are two perfect examples of these new crops growing in North Dakota competitively. Climate change is the main reason why these new crops are successful in North Dakota.

Factors aside from climate and weather shifts affect and will influence North Dakota in the future. As identified during SHMT meeting, cybersecurity concerns continue to grow nationally and globally as the consequences of cyberattacks become more severe. Other forms of human-caused hazards pose threats as well, as do natural hazards the State has faced before, like flooding and drought. North Dakota must continue to mitigate and plan for natural disasters while also enacting safety and security measures to prevent human-caused harm.

3 Hazard and Threat Profiles and Risk Assessment

3.1 Hazard and Threat Identification

Many natural and technological hazards and adversarial threats have the potential to affect the State of North Dakota, from global events to isolated, localized incidents. To provide a framework for the risk assessment, the SHMT identified hazards and threats for this plan based on potential and past occurrence, history of state and federal disaster declarations, input and discussion by public and private stakeholders, and inclusion in previous versions of local, tribal, and state mitigation, recovery, and response plans. Closely related-hazards and threats were grouped together for simplicity. A summary of presidential disaster and emergency declarations for the State of North Dakota by type and by jurisdiction and a summary of Governor's Emergency and Disaster Declarations can be found in Section 2.

The 2018 hazard and threat identification process produced a list of 14 probable hazard and threat groups to be profiled. Table 3.1-1 shows the hazards and threats, and how and why they were identified. The level of detail for each hazard and threat correlates to the relative risk of each and is limited by the amount of data available. As new hazards and threats are identified, they can be added to the list, profiled, and mitigated. Table 3.1-2 lists the hazards and threats that were excluded from this plan and the reasons why. The process to identify new hazards and threats in future plan updates should include:

- Evaluation of the identified hazards and threats by stakeholders;
- Review of other state plans and programs for other hazards and threats identified and/or managed;
- Review of local and tribal mitigation plans for other hazards and threats identified; and
- Review of recent disaster history for new hazards and threats.

Table 3.1-1 North Dakota Major Hazards and Threats

Hazard and threat Profile	How Identified	Why Identified
Civil Disturbance	• 2015 THIRA • Protest Reports	• Added to 2018 update due to recent occurrences of civil disturbance in the State of North Dakota
Cyberattack	• North Dakota Information Technology (IT) Department • Cyber Security Task Force Report • 2015 THIRA • Incident Prevention/Response/Notification Standard • 2016 security assessment of the state's IT infrastructure by ManTech International Corporation	• Hazard added in 2018 update due to increasing potential for cyber-attack and terrorism • Recent history and occurrences of cyber-terrorist incidents

Hazard and threat Profile	How Identified	Why Identified
Criminal Terrorist Nation Attack	• North Dakota State and Local Intelligence Center (SLIC) • Federal Bureau of Investigation (FBI) • National Memorial for the Prevention of Terrorism • Terrorist Screening Center • U.S. Department of Homeland Security • U.S. Secretary of State • N.D. Bureau of Criminal Investigation • NDDES • North Dakota State Fire and Tornado Fund	• National indications and foreign threats of future terrorist attacks • Critical national infrastructure, including intercontinental ballistic missiles and bombers, and energy infrastructure exists within the state • Potential for school violence and other domestic attacks
Dam Failure	• NDSWC • United States Army Corps of Engineers (USACE)	• Numerous dams throughout the state, including 48 high hazard dams • Dam maintenance problems and extreme weather events could cause failures
Drought	• Drought studies • Farm Service Agency • High Plains Regional Climate Center • National Drought Mitigation Center • North Dakota State Climate Office • NDSWC • Risk Management Agency • USDA • NWS	• History of droughts • Importance of large water users and agriculture to the State's economy • Numerous USDA disaster declarations and state declared disasters and emergencies
Fire (including urban fire or structure collapse, and wildland fire)	• NDDES • North Dakota State Fire Marshal (NDSFM) • North Dakota Forest Service (NDFS) • National Fire Protection Association (NFPA) • NDSFM • North Dakota State Fire and Tornado Fund • United States Fire Administration • NWS	• Urban fire and structure collapse and wildland fire were combined into one hazard profile in 2017 • History of large and damaging wildland fires • Scattered government lands and natural fuels throughout the state • History of major downtown urban fires • History of structure collapses under heavy snow loads • Potential for structure collapses for a variety of reasons

Hazard and threat Profile	How Identified	Why Identified
Flood (including riverine, levee failure, closed basin, ice jam, and flash floods)	• FEMA • National Centers for Environmental Information (NCEI) • NDDES • NDSWC • USACE • USGS • North Dakota State Fire and Tornado Fund • NWS	• Extensive history of severe riverine floods and high losses • History of damaging ice jam and flash floods • Ongoing, persistent closed basin flooding • Numerous Presidential disaster declarations for flooding
Geologic Hazards (including landslide, earthquake, abandoned land mines, expansive/unstable soils, environmental minerals, meteorite falls, volcanic hazards)	• National Earthquake Hazards Reduction Program • North Dakota Geological Survey (NDGS) • United States Geological Survey (USGS) • North Dakota State Fire and Tornado Fund	• History of landslide losses • Increase in mining activity and related geologic hazards • Potential for minor earthquake losses • Impacts of environmental minerals on health
Hazardous Material Release	• Environmental Protection Agency (EPA) • National Transportation Safety Board • NDDES • United States Department of Transportation (USDOT) • N.D. Department of Health • N.D. Oil and Gas Division	• History of major hazardous material releases • Highways, railroads, airports, pipelines, and fixed facilities exist throughout the state • Regular truck and rail traffic transport hazardous materials through the state • Numerous fixed facilities house chemicals, gases, and explosives • Impact of the oil and gas industry
Infectious Diseases and Pest Infestations (including human, animal, and plant diseases)	• Centers for Disease Control and Prevention (CDC) • North Dakota Department of Health (NDDoH) • North Dakota Division of Animal Health Pandemic studies • Risk Management Agency • USDA • United States Census Bureau • World Health Organization (WHO)	• Global disease threat • History of pandemics • Dependence on agricultural economy
Severe Summer Weather (including downbursts, extreme heat, hail, lightning, high wind, and tornado)	• NCEI • National Severe Storms Laboratory • NWS • North Dakota Atmospheric Resources Board • NDDES • Risk Management Agency • Storm Prediction Center	• Extensive history of damaging tornadoes, hail, downbursts, lightning, and strong winds throughout the state • Numerous Presidential disaster declarations for severe storms

Hazard and threat Profile	How Identified	Why Identified
Severe Winter Weather (including blizzards, extreme cold/wind chill, heavy snow, ice storms, structure collapse)	• NCEI • NWS • NDDES • Risk Management Agency	• History of blizzards, severe winter storms, heavy snow, ice storms, and extreme wind chills • High probability of blizzards and other potentially damaging storms • Numerous Presidential disaster declarations for severe winter storms
Space Weather	• North Dakota State Emergency Operations Plan • NOAA Space Weather Prediction Center • NOAA A Profile of Space Weather • Space Weather Prediction Center	• Added to 2018 update to comprehensively address all risks to critical facilities and infrastructure
Transportation Incident (including vehicular, railway, and aircraft accidents)	• Federal Railroad Administration • National Transportation Safety Board • NDDOT	• Potential for serious accident involving multiple patients • History of highway closures • History of highway accidents • History of small plane crashes

Table 3.1-2 Hazards Excluded or Minimally Addressed in this Plan

Hazard	Why Excluded/Where Addressed
Avalanche	Avalanches generally require long stretches of slopes of 25-55 degrees; North Dakota has few areas that meet these criteria. North Dakota is not covered by a National Avalanche Center. North Dakota does not have a history of any declared state or federal avalanche disasters.
Coastal Erosion	North Dakota does not have an ocean coastline.
Coastal Storm	North Dakota does not have an ocean coastline.
Hurricane	North Dakota does not have an ocean coastline, nor is it located in a potential hurricane impact area.
Shortage or Outage of Critical Materials and/or Infrastructure	Included as part of each hazard.
Windstorm	Downbursts and wind damage were included as part of Severe Summer Weather.
Tsunami	North Dakota does not have an ocean coastline.
Volcano	Volcanic ashfall can occur over North Dakota, but the frequency is relatively rare, and the potential impacts are not expected to exceed local and tribal capabilities. North Dakota does not have a history of any declared state or federal volcano disasters.

3.2 Local and Tribal Plan Integration

Each hazard and threat profile in this Risk Assessment summarizes data extracted from each of the plans that local and tribal jurisdictions completed. At the time this plan update was developed, 1 city, all 53 counties, and 4 tribal nations had a federally-approved plan or had a plan that was under development. Most local and tribal plans in North Dakota use a uniform hazard ranking system of high, medium, and low. The factors used to create this ranking can vary by jurisdiction, though generally each hazard and threat ranking will include the criteria outlined in Table 3.2-3. The local plan Risk Assessments were reviewed to extract the hazard and threat rankings and loss estimate information. Table 3.2-4 summarizes the overall hazard and threat rankings from this review as well as the number of local and tribal plans that ranked each hazard high, medium, and low. Some local and tribal plans that were reviewed did not identify a particular hazard or threat or included the hazard or threat in the plan but did not classify it. The detailed hazard and threat ranking by jurisdiction can be found in the Jurisdictions at Risk sections of each profile.

Table 3.2-3 Risk Analysis Criteria

Frequency	
Highly Likely	Nearly 100% probability in the next year
Likely	10-100% probability in the next year, or at least 1 chance in the next 10 years
Possible	1-10% probability next year, or at least 1 chance in the next 100 years
Unlikely	Less than 1% probability in the next 100 years
Impact	
Catastrophic	More than 50% of jurisdiction affected
Critical	25-50% of jurisdiction affected
Limited	10-25% of jurisdiction affected
Negligible	Less than 10% of jurisdiction affected

Table 3.2-4 Local Plan Hazard Ranking Summary

Hazard or Threat	Rank	# High	# Medium	# Low	# NI	# NL	# NP
Severe Winter Weather	1	46	9	1	0	0	2
Severe Summer Weather	2	41	14	1	0	0	2
Flood	3	17	27	11	0	1	2
Drought	4	13	32	10	1	0	2
Fire	5	6	42	8	0	0	2
Hazard Material Release	6	13	31	9	1	2	2
Infectious Disease	7	6	26	20	3	1	2
Transportation Incident	8	7	22	13	12	2	2
Criminal, Terrorist, Nation-state Attack	9	1	24	23	7	1	2
Dam Failure	10	2	10	35	6	3	2
Geologic	11	0	2	14	38	2	2
Space Weather	12	0	0	0	56	0	2
Cyberattack	12	0	0	0	56	0	2
Civil Disturbance	12	0	0	0	56	0	2

NI = Not identified in local or tribal plan
NL = Included in local or tribal plan, but no classification listed
NP = No local or tribal plan

The primary limitation with this methodology is that each jurisdiction, each with its own perspectives and individuals conducting the assessments, determines its risk class for each hazard and threat. In addition, this assessment demonstrates the variation of hazards and threats within the jurisdiction, showing which have the higher disaster potential, rather than as a comparison to other counties or tribal nations. This information is very important for the integration of local and tribal perspectives and hazard and threat assessments, but it does not allow for a very consistent statewide picture.

Potential losses listed in the local plans were also incorporated into the Jurisdictions at Risk section of each hazard and threat profile. Local jurisdictions used a variety of methods to estimate losses, including statewide assessments of losses as well as local methodologies. Ultimately, local and tribal plan updates should include updated potential losses that reflect the changes in development for their jurisdiction.

3.3 Summary of Data Analysis

A key step in preventing and reducing disaster losses is the development of a comprehensive understanding of the hazards and threats that pose risks throughout North Dakota. A realistic all-hazard and threat risk assessment based on historical data that looks at probable losses allows for cross comparisons of hazards and geographic areas and the prioritization of mitigation activities. The following terms in Table 3.3-5 below can be found throughout this section.

Table 3.3-5 Risk Assessment Terms and Definitions

Term	Definition
Hazard	A source of danger
Public	State residents and visitors to North Dakota[1]
Risk	Possibility of loss or injury
Vulnerability	Open to attack or damage

Source: Federal Emergency Management Agency, 2001
1. "Public" has been defined by the State of North Dakota for the purposes of this plan.

This all-hazard and threat risk assessment serves as a statewide source of hazard information for North Dakota. Local and tribal mitigation plans are more specific documents regarding hazards and threats in a particular part of the state. Other plans and studies may be referenced and remain vital hazard and threat documents, but each hazard and threat has its own profile in this plan. As more data becomes available and disasters occur, the individual hazard and threat profiles can expand or new hazards and threats can be added. This summary of hazards and threats identifies and describes the major hazards and threats that threaten North Dakota. This statewide risk assessment and the local and tribal plans are the cornerstones of the mitigation strategy and provide the basis for many of the mitigation goals, objectives, and initiatives.

3.3.2 Threat and Hazard Profiles

The Risk Assessment consists of individual *profiles* that evaluate the risks from each hazard and threat to the state. A stand-alone hazard and threat profile allows for the comprehensive analysis from many different aspects. Each profile contains the *description* of the hazard or threat containing information from specific hazard or threat experts. The profiles also each contain a section on *previous occurrences*, compiled from a wide variety of databases and sources. *Location and extent* where spatial differences exist, allows for analyses by geographic location and magnitude of events. Some hazards and threats, such as riverine flooding, can have varying levels of risk based on location (i.e. proximity to a river) and severity of event. Other hazards and threats, such as winter storms or drought, cover larger geographic areas and the delineation of areas is not typically available or useful.

The *Consequence Analysis* researched and detailed the various impacts of each hazard and threat on individual community sectors, including the public, state operations, the environment, responders, economic condition, public confidence, facilities/infrastructure, and property.

3.3.3 State Risk Assessment

The *State Risk Assessment* for each hazard and threat includes four sections: 1) probability, 2) vulnerability assessment, 3) state assets and/or critical facilities at risk, and 4) loss estimates. A combination of historical data, risk data, and exposure data at the county level was used to assess the vulnerability for each county and reservation. The statewide inventory included in the Risk Assessment describes the values at risk, such as state-owned buildings and property, critical facilities and infrastructure, population, buildings, economic values, ecologic values, historic values, social values, land uses, new development, and future development. This inventory was collected from a variety of sources across the state. In many cases, assets at risk are also mapped by county.

Using the historical occurrence, or more specific documentation if available, a *probability* was determined for a specific type of event. In most cases, the number of years recorded was divided by the number of occurrences, resulting in a simple past-determined recurrence interval. If the hazard or threat lacked a definitive historical record, the probability was assessed qualitatively based on regional history or other contributing factors. If the past occurrence was not an accurate representation, general knowledge of the hazard was used to approximate the types of impacts that could be expected. The frequency and impact ranges show the differentiation between high frequency, low impact events and low frequency, high impact events.

The *Vulnerability* section assessed the susceptibility of people and property to each hazard or threat. One method to assess vulnerability is to qualitatively discuss the impacts a hazard or threat can have to people and property based on observations from past occurrences in the state or elsewhere in the country. Where previous occurrence or previous loss data was available, ArcGIS was used to create a frequency of past damages map to show areas of the state with greater vulnerability. Regions of the state with significantly changing populations were also highlighted as areas with increased vulnerability to certain hazards.

Another method used to analyze vulnerability includes identifying the property that is exposed to different hazard or hazard areas. To perform this analysis, hazard data must be available to show the spatial extent of a hazard's impact. The hazard data used for the exposure analysis in this plan update was obtained from a variety of Federal sources. Flood hazard data was collected from the FEMA's National Flood Hazard Layer (NFHL). The NFHL does not cover all of the state of North Dakota. The 2010 Wildland-Urban Interface (WUI) dataset was obtained from SILVIS labs which produces the national WUI dataset. General landslide susceptibility data was obtained from the USGS landslide susceptibility national dataset. Levee area data was collected from the USACE National Levee Database.

The *State Assets and/or Critical Facilities at Risk* section of the Flood, Wildfire, and Geologic profiles summarizes the results of the exposure analysis. Using ArcGIS software, state-owned assets and critical facilities were overlaid with the different hazard areas. The analysis determined which critical facilities lied within the boundaries of identified hazards, and thus would be exposed and vulnerable to the identified hazard. The full results of this analysis are summarized in Table 3.7-1 and Table 3.7-2 in Section 3.8.

Loss Estimates were determined using a variety of methods, depending on the hazard or threat. Losses were described qualitatively where no loss estimation data was available for certain hazards or threats. Other hazards had significant data about previous losses that could be used to estimate and predict future losses. Losses can also be estimated using FEMA's Hazus-MH software that combines the GIS-based, statistical, and scenario-based analyses to create one output that summarizes the potential losses to people, property, and economy from different hazard events. For this plan update, Hazus version 4.2 was used to run a Level 1 Earthquake scenario with magnitude 5. The methodology uses Hazus default data on seismic hazards along with state-wide building stock data (based on 2010 United States Census data) and the software's standard algorithms. The calculation algorithms quantify the potential losses associated with seismic hazards using information about shake probabilities, soil characteristics, and other parameters.

3.3.4 Conclusions and Risk Factor Assessment

At the end of the Risk Assessment, the *Summary / Conclusion* brings together data from each of the jurisdictional ratings were brought together to show the areas of the state that are most vulnerable to all hazards and threats. The prioritization of hazards and threats into high, moderate, and low categories is based on the classification by the individual jurisdictions which was then reviewed and adjusted by the state planning team. The summary also describes the final results of the risk factor assessment. A risk factor assessment was conducted to determine the overall risk of each hazard and threat, using the state risk assessment, previous occurrences, location and extent, and any additional resources documented in the hazard or threat profile. Table 3.3-6 shows the risk factor assessment approach, including the risk factor category, degree of risk, and weight value. Due to the inherent data limitations present in any risk assessment, the results of this risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

Table 3.3-6 Risk Factor Assessment Approach Summary

Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
Probability	**Unlikely**	Less than 1% annual probability	**1**	**30%**

Risk Assessment Category	Degree of Risk				Weight Value
	Level	**Criteria**		**Index**	
What is the likelihood of a hazard event occurring in a given year?	**Possible**	Between 1% & 49.9% annual probability		**2**	
	Likely	Between 50% & 90% annual probability		**3**	
	Highly likely	Greater than 90% annual probability		**4**	
Impact *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**Minor**	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.		**1**	**30%**
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.		**2**	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.		**3**	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.		**4**	
Spatial Extent *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**Negligible**	Less than 1% of area affected		**1**	**20%**
	Small	Between 1 & 10.9% of area affected		**2**	
	Moderate	Between 11 & 25% of area affected		**3**	
	Large	Greater than 25% of area affected		**4**	
Warning Time *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**More than 24 Hours**	Self-Defined	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	**1**	**10%**
	12 to 24 Hours	Self-Defined		**2**	
	6 to 12 Hours	Self-Defined		**3**	
	Less than 6 Hours	Self-Defined		**4**	
Duration *How long does the hazard event usually last?*	**Less than 6 Hours**	Self-Defined	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	**1**	**10%**
	Less than 24 Hours	Self-Defined		**2**	
	Less than 1 week	Self-Defined		**3**	
	More than 1 week	Self-Defined		**4**	

Probability was assessed differently for adversarial threats, including criminal, terrorist, nation-state attack, civil disturbance, and cyber-attack. Due to the nature of adversarial threats, it is difficult to assign a numerical probability, and thus, a more qualitative approach was created to comprehensively assess each threat's probability. The description of probability was changed but still aligned with the numerical probability listed in Table 3.3-6. Additionally, adversarial threats are at minimum a possible threat in the State of North

Dakota, so for the purposes of this revised probability, “unlikely” was eliminated from the probability category. Table 3.3-7 shows the revised probability for adversarial threat profiles.

Table 3.3-7 Revised Probability for Adversarial Threat Profiles

Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
Probability *What is the likelihood of a hazard event occurring in a given year?*	**Possible**	Generally means the information is scant, questionable, or very fragmented which makes it difficult to make solid analytic inferences.	**2**	**30%**
	Likely	Generally means there are various ways to interpret the information, we have alternative views, or the information is credible and plausible but not corroborated sufficiently.	**3**	
	Highly Likely	Generally indicates judgments based on high-quality information and/or the nature of the issue makes it possible to conclude a solid judgment.	**4**	

Table 3.3-8 details the results of the impact assessment of each hazard on individual community sectors. Table 3.3-9 details the final results of the Risk Factor Assessment. In-depth analyses of each risk factor can be found for each hazard in Section 3.7.

Table 3.3-8 Risk Factor Assessment Impact Results

Hazard	Impact Assessment Category								Impact
	People	State Ops	Environment	Responders	Economic Condition	Public Confidence	Facilities/ Infrastructure	Property	
Drought	2	1	4	1	4	2	2	3	2.65
Fire	3	2	3	3	2	1	3	3	2.6
Flood	3	2	2	3	3	3	3	4	3.05
Geologic Hazards	3	2	3	2	2	1	4	4	2.9
Infectious Diseases	3	2	3	3	3	3	3	1	2.65
Severe Summer Weather	4	4	3	4	4	3	4	4	3.9
Severe Winter Weather	3	3	2	3	3	1	3	2	2.7
Dam Failure	3	3	2	2	2	3	3	4	2.8
Hazardous Materials	4	2	4	3	3	2	3	3	3.15
Transportation Incident	3	2	1	3	1	1	2	1	1.75
Civil Disturbance	2	3	2	4	2	3	2	4	2.5
Criminal Terrorist Nation Attack	4	4	3	4	3	3	4	3	3.5
Cyberattack	4	4	1	4	2	3	4	4	3.3
Space Weather	3	4	1	3	3	2	4	2	2.95
Weight Factor	*0.2*	*0.05*	*0.05*	*0.05*	*0.25*	*0.05*	*0.2*	*0.15*	*1*

Table 3.3-9 Risk Factor Assessment Results Summary

Hazard	Risk Factor (RF)	Risk Assessment Category				
		Probability (1 – 4)	Impact (1 – 4)	Spatial Extent (1 – 4)	Warning Time (1 – 4)	Duration (1 – 4)
Cyberattack	3.49	3	3.3	4	4	4
Flood	3.32	4	3.05	3	3	3
Severe Winter Weather	3.21	4	2.7	4	1	3
Severe Summer Weather	3.17	4	3.9	2	3	1
Fire	2.98	4	2.6	2	4	2
Infectious Diseases	2.90	4	2.65	2	1	4
Drought	2.70	2	2.65	4	1	4
Hazardous Materials	2.45	2	3.15	1	4	3
Space Weather	2.39	1	2.95	4	1	3
Dam Failure	2.34	2	2.8	2	4	1
Criminal Terrorist Nation Attack	2.25	1	3.5	2	4	1
Geologic Hazards	2.17	2	2.9	1	4	1
Civil Disturbance	2.15	3	2.5	1	1	2
Transportation Incident	1.53	1	1.75	1	4	1
Weight Factor	*1*	*0.3*	*0.3*	*0.2*	*0.1*	*0.1*

3.4 Assessment of Future Conditions

The assessment on *development in identified hazard areas* is based on an analysis of development trends with consideration of those jurisdictions that had moderate-high and high vulnerability to the hazard or threat based on the State's risk assessment. Also considered are the mechanisms currently in place to limit or regulate development in hazardous areas. Some hazards or threats can be mitigated during development, others cannot. The impacts were assessed through a narrative on how new and future development could be impacted by the hazard or threat given population growth. Additionally, an analysis was conducted on climate change and its impacts on the frequency, duration, extent, and location of hazards.

3.5 Data Limitations

Many unknown variables limit the ability to quantitatively assess all aspects of a hazard with high accuracy. Therefore, *data limitations* provide a framework for identifying the missing or variable information. These limitations were determined by hazard and threat through the risk assessment process. In some cases, the limitations may be resolved through research or data collection. If a limitation can be reasonably resolved through a mitigation project, the resolution is included in the mitigation strategy initiatives. *Other key documents,* as well as other data resources and state agencies, are listed since many other plans and studies provide important pieces of information regarding a particular hazard or threat and often contain more data than is needed or useful in a multi-hazard plan.

3.6 Integration with the THIRA

During 2018, NDDES made efforts to align the Enhanced Mitigation MAOP update process with the 2018 THIRA update. The threats and hazards of both processes were aligned to allow for more seamless integration, with a long-term goal of allowing the THIRA process to inform mitigation planning at the strategic level. The THIRA's Capability Targets that include hazard mitigation were also integrated into the mitigation objectives described in Section 5 of the Enhanced Mitigation MAOP.

This update to the THIRA meets the requirements issued to States and Urban Areas Security Initiative (UASI) jurisdictions by:

- Identifying North Dakota's threats and hazards, and detailing those threats and hazards which are of concern;
- Providing outcome statements for all 32 Core Capabilities described in the NPG;
- Estimating impacts for the threats and hazards of concern in relation to all the 32 core capabilities, and determining desired outcomes for delivery of each core capability; and
- Providing capability targets for all 32 core capabilities, which define what successful delivery of the core capability looks like.

The THIRA was developed by generally following guidelines recommended in Comprehensive Preparedness Guide (CPG) 201. Where appropriate, terminology and information from the state's THIRA has informed and been integrated into this Risk Assessment. The state has identified three threat/hazard groups as 1) Natural, 2) Technological, and 3) Adversarial. The state's current THIRA does not provide a detailed hazard profile for all hazards; only those of concern.

3.7 Threat and Hazard Profiles

3.7.1 Civil Disturbance

3.7.1.1 Description

Civil disturbances[1] can occur when large groups, organizations, or distraught individuals act with potentially disastrous or disruptive results. Many issues can cause civil disturbance, but most are due to political grievances, economic disputes or social discord, terrorism, or foreign agitators. Additionally, civil disturbance can result following a disaster that creates panic in the community. Forms of civil disturbance can range from groups blocking sidewalks, roadways, and buildings to mobs rioting and looting to gang activity. Civil disturbance may be spontaneous, as when a mob erupts into violence, or they may be planned, as when a demonstration or protest intentionally interferes with another individual's or group's lawful business. These types of incidents typically do not escalate to the traditional definition of a disaster but can have significant impacts on the community and require additional resources to manage.

3.7.1.2 Previous Occurrences

In the past 50 years, there have been two civil disturbance events in North Dakota – one in 1969 and one in 2016. In 1969 the Zip to Zap riot was initially intended as a large-scale party but turned into a riot after tensions arose between students and authorities. College campuses currently were rife with dissatisfaction for the nation's involvement in the Vietnam War and nuclear proliferation.

In 2016, the Dakota Access Pipeline (DAPL) project resulted in multiple criminal activities including acts of vandalism, trespassing, riots, vehicles, hay bales and tires set on fire, and the arrest of 709 protesters. The protestors gathered to express concern about the installation of an 1134-mile long crude oil pipeline across North Dakota and other states.

The protest transitioned into an unlawful assembly and civil disorder on August 10, 2016, when individuals attempted to block access to construction activities associated with the pipeline. Originally an environmental-focused event, it quickly grew from a few hundred participants to numbers estimated near 10,000. It also expanded its scope to include real or perceived concerns surrounding Native American rights, as well as a myriad of other environmental concerns not necessarily associated with construction of the DAPL. Widespread criminal activity spawned from the protest, to include vandalism, terroristic threats, and intimidation tactics directed at local landowners as well as law enforcement and their families, doxing of law enforcement and other officials (doxing is the Internet-based practice of researching and broadcasting private or identifiable information), arson, poaching, and the theft and killing of livestock in the area.

Among the most notable impacts to the area was the closure of North Dakota Highway 1806 from the vicinity of Fort Rice to the Cannonball Bridge. This key and critical public roadway remained closed for most of the protest out of concerns for public safety. This closure contributed to hardships experienced by local landowners, the tribe, and others who depend on the road for commerce and access to the surrounding area.

3.7.1.3 Location and Extent

Civil disturbances can occur anywhere in the state. While it is not possible to predict the location of civil disturbance, large venue locations such as stadiums, government facilities, industrial facilities, and those locations with correctional facilities are somewhat more likely to be susceptible to such incidents. Correctional facilities and other facilities in which inmates are housed in North Dakota are listed below, not including county jails. North Dakota does not contract with private prisons.

- North Dakota State Penitentiary, Bismarck, ND – Burleigh County
- Dakota Women's Correctional and Rehabilitation Center, New England, ND – Hettinger County

[1] Civil Disturbances are criminal actions and are not protected by 1st Amendment Activities; "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press, or the right of the people peaceably to assemble, and to petition the government for redress of grievances"

- James River Correctional Center, Jamestown, ND – Stutsman County
- Missouri River Correctional Center, Bismarck, ND – Burleigh County
- North Dakota Youth Correctional Center, Mandan, ND – Morton County

Civil disturbances may escalate to an act of terrorism depending on the circumstances, and acts of terrorism can occur associated with civil disturbances. Additionally, the effects of a civil disturbance can spread beyond the immediate area where such activity is occurring. For example, when people unlawfully assemble on a public roadway, other people from outside the area or critical services may need to delay their trip or divert around the unlawful assembly. Table 3.7.1-1 displays the anticipated spatial extent of a civil disturbance in North Dakota.

Table 3.7.1-1 Spatial Extent of Civil Disturbance Incident

Resources	Extent of Impacts
People	Regional
Property	Local
Infrastructure	Local
Government Operations	Regional
Environment / Natural Resources	Local
Cultural Resources	Local

3.7.1.4 Consequence Analysis

A consequence analysis exercise was conducted by the state in 2017 to predict impacts from different hazard scenarios. Please note that the following analysis applies to homeland security incidents as well as civil disturbances. The consequence analysis scenario specifically for a civil disturbance event is as follows:

Table 3.7.1-2 Civil Disturbance Consequence Analysis

Civil Disturbance Impacts	
Public	Impact on the public due to a civil disturbance would be localized in the area of the disturbance; however; if the disturbance were directed at or occurring on or near a transportation route (i.e. I-94/ I-29), the impact may be felt on a regional level. Mass casualties and fatalities among the public are the most severe possibilities; other impacts may include the spread of misinformation via social media, mass panic, and loss of ability for responders to access the scene of the incident. Additionally, there can be a loss of productivity and economic loss due to interrupted and/or delayed lawful activities, as well as increased, un-forecasted public and private costs due to response and recovery requirements.
Responders	Depending on the location and number of individuals, a civil disturbance may occur quickly and for an extended amount of time. Increased demand for emergency services may leave other areas close to the incident scene vulnerable. First responders may be delayed or diverted from others that require assistance, especially as a civil disturbance may continue until an appropriate number of responders are on scene and can stop the unlawful actions. Casualties or fatalities among responders can occur.
COOP	A small localized civil disturbance will likely compromise Continuity of Operations in smaller jurisdictions. However, with a large civil disturbance, these areas would be strained not only at the local level but at the state level as well.
Delivery of Services	Disrupted service delivery due to closed/damaged/destroyed infrastructure. A small localized civil disturbance will likely compromise delivery of services in smaller jurisdictions. However, with a large civil disturbance, these areas would be strained not only at the local level but at the state level as well.

Civil Disturbance Impacts	
Property, Facilities, and Infrastructure	Property, facilities, and infrastructure are often targets and/or locations of civil disturbances and many times are damaged or destroyed during an incident. Effects could be catastrophic, including loss of power, loss of utility functions, limited access to transportation, and destruction of both public and private property. Other damages stemming from things like looting, plus the un-forecasted public and private costs due to response and recovery requirements, can have long-lasting effects on the local community.
Environment	Civil disturbances can take a toll on the environment due to pollution, contamination, waste and debris (human and garbage), destruction of landmarks (natural and manmade), and the consequences of any malfunctioning of facilities and critical infrastructure.
State Economy	A small localized civil disturbance will likely compromise this area in smaller jurisdictions. However; with a large civil disturbance this area would be strained not only at the local level but at the state level as well. Commerce may be disrupted due to closed, damaged, or destroyed infrastructure; loss of service delivery options may further compound economic losses. Decreased economic activity in general due to avoidance of civil disturbance areas will also exacerbate the impact on the state economy, as will un-forecasted public and private costs due to response and recovery requirements.
Public Confidence in the State's Governance	Social values and public confidence can be affected by any sort of civil disturbance, particularly one that occurs locally. Community members may not feel safe and may have lasting emotional impacts, especially if they or someone close to them is personally affected by the incident. Vigilante justice is possible as members of the public lose confidence in their government's ability to retain law and order.

3.7.1.5 State Risk Assessment

Probability

Civil disturbances are difficult to predict, because they may be motivated by any number of criminal or ideological goals, or as a result of the second and third order effects of an adversarial threat or natural or technological hazard event. However, it is likely that civil disturbances will continue to occur in North Dakota.

Vulnerability Assessment

As demonstrated in the DAPL unlawful assembly and civil disorder, a large civil disturbance can have a notable impact on both the local communities and the state. Additionally, as detailed above, the impact of a civil disturbance can spread far beyond the immediate area of the incident.

Authorities can maintain awareness of activities for threats concerning public safety. Every county is vulnerable to the impacts of a civil disturbance; however, government facilities and large gathering areas have a greater potential to be the target of a civil disturbance.

As evidenced by the DAPL protest, civil disturbance threatens public safety of nearby residents and responders who reported being intimidated and social media doxxing. Civil disturbance also places our natural resources in jeopardy. Without proper remediation that took place following the protest, debris, trash and untreated waste could have washed into the Cannonball River and Lake Oahe. Millions of pounds of trash, including human waste, had the potential to leach into the soil and potentially contaminate the Missouri River. Ultimately, 9.8 million pounds of trash was removed from the protest camps.

State Assets and/or Critical Facilities at Risk

Any government building or facility can be the target for large protests that have the potential to turn into civil disturbance. Additionally, industrial infrastructure such as oil and gas operations and large feedlots may also be targets for civil disturbance, as can be any utility.

State assets and critical infrastructure can be the targets of protests and may grow to become civil disturbances without warning. State assets may also be the target of intentional disturbances. Each of the identified state assets and critical infrastructure are considered vulnerable to the impacts of a civil disturbance, though areas that are more political or controversial to specific groups are more vulnerable.

Loss Estimates

The impact of a civil disturbance can include the cost of responding to the disturbance, property damage, and economic loss. The loss estimates are contingent on the location and scope of the disturbance, but the recent DAPL unlawful assembly and civil disorder provides an example of the potential loss and impact from a large disturbance.

The response to the DAPL unlawful assembly and civil disorder was one of the most expensive and lengthy in the history of the state and ranks among the most major long-term civil disturbances in the history of the nation. Public costs in dollars and time, as well as overall scope of operations and efforts, are detailed in Table 3.7.1-1.

Table 3.7.1-1 Public Costs and Scope of Operations

3.7.1.6 Future Conditions

The future vulnerability of North Dakota to civil disturbances is determined by both the current risk and an understanding of how this risk is expected to change in the future. As noted above, it is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future risk. Key factors influencing the future initiation of a civil disturbance include:

- Political grievance;
- Real or perceived economic and societal disparity;
- Safety and security fears resulting from another event;
- The joy or disappointment of a group due to the result of any high-profile event, such as a concert or the win or loss of a favorite sports team; and
- The widespread use and abuse of substances in a group setting, either independently or in conjunction with another cause for a civil disturbance.

Climate Change

Due to the human-caused nature of civil disturbance, climate change is not expected to impact this hazard. However, the growing public concern over climate change may influence protests that can turn into civil disturbance directed towards the prominent oil and gas industry in North Dakota.

Changes in Development

In general, development should have little to no impact on civil disturbances. However, a large influx of population in a short amount of time in areas that aren't accustomed to these population sizes can be a source of civil disturbance. As detailed in Section 2 of this plan, the state has experienced population growth since 2010 and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 census. McKenzie, Williams, and Mountrail counties are projected to over double in population from 2010 to 2030, with a 269% change, 165% change, and 103% change respectively. Although development is not the only indicator of risk to civil disturbance, these large influxes of population may make these counties more vulnerable.

Future occurrences of civil disturbances can occur for multiple reasons. Recently, civil disturbances have been more likely to begin because of political grievance (e.g. the results of an election, an unpopular court decision, or a controversial public or private action such as construction of a crude oil pipeline or law enforcement officer-involved shooting incident). These civil disturbances are the most likely to impact state assets and critical infrastructure. As exemplified in the DAPL protests, development of certain projects may raise controversy and can cause a civil disturbance.

3.7.1.7 Jurisdictions at Risk

In reviewing the local HMPs available at the time of this state plan update, there were no local plans found that profiled civil disturbance in the Risk Assessment. However, there is growing recognition that robust and comprehensive hazard mitigation planning should be inclusive of the potential for a civil disturbance.

3.7.1.8 Summary / Conclusion

Following this plan's risk assessment methodology, the civil disturbance risk factor score was 2.15, which is a low-ranking hazard on a scale of one to four, where four is the highest threat risk. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Civil disturbance is an example of a human-caused hazard that is intentional and often planned. It is important to note that there is a proud tradition of lawful protest in our nation which has brought about positive change and the recognition and protection of natural rights for all citizens. However, this can be used to justify unlawful civil disturbance actions. The DAPL unlawful assembly and civil disorder in 2016 was one of the largest civil disturbances in the nation's history, having a large impact on the local population and property, as well as state resources. North Dakota continues to be at risk to civil disturbances, especially in large gathering areas as well as areas with critical infrastructure and state assets which can be a target for protests.

Because civil disturbance is a hazard that is intentional and often planned, it is difficult to quantitatively express the probability of an incident. For this reason, civil disturbances have been understood in the context of the following definitions:

Future probability: If probability cannot be calculated numerically, probability is indicated as either highly likely, likely, or possible.

- *Highly likely* probability generally indicates judgments based on high-quality information and/or the nature of the issue makes it possible to conclude a solid judgment.
- *Likely probability* generally means there are various ways to interpret the information, we have alternative views, or the information is credible and plausible but not corroborated sufficiently.
- *Possible probability* generally means the information is scant, questionable, or very fragmented which makes it difficult to make solid analytic inferences.

There is a possible probability that civil disturbances will continue to occur in North Dakota. The impact of a civil disturbance is likely to be minor, with very few, if any, injuries, minor levels of property damage, and the temporary shutdown of critical facilities. The spatial impact of a disturbance, or to what extent the surrounding area may be affected, is likely to be small, with between 1-10.9% of the area affected. Warning time will be less than six hours, with a disturbance likely lasting for one week or less. These results as well as feedback received during the hazard mitigation planning process indicate that a civil disturbance incident ranks number thirteen out of fourteen hazards present in North Dakota.

3.7.1.9 Data Limitations / References

Data limitations in researching civil disturbances exist primarily in context with impacts in the United States. Several databases exist that compile information about civil disturbance incidents and impacts globally. An online database of historical civil disturbances and associated losses in the United States would prove beneficial in documenting the effects of disturbances and directing mitigation activities in North Dakota.

Key documents and plans that were used to create this hazard profile include the 2015 THIRA and research about the impact of the DAPL protests.

3.7.2 Criminal, Terrorist, or Nation/State Attack

3.7.2.1 Description

For the purposes of this profile, a criminal, terrorist, or nation/state attack includes chemical attacks, biological attacks, radiological attacks, nuclear attacks, explosive attacks, food/food production attacks, and armed assaults. These can broadly be defined as any intentional adversarial human-caused incident, domestic or international, that causes mass casualties, large economic losses, or widespread panic in the country. These incidents are examples of human-caused hazards that are intentional and often planned. An attack can result in a variety of hazards; for example, terrorists might compromise a dam leading to catastrophic dam failure. Other hazards that can be intentionally initiated by human actions given the appropriate materials and motivation include infectious disease, transportation incidents, hazardous material releases, utility or communications failures, and wildland fires.

Terrorism, both domestic and international, is a violent act performed with the intent of influencing the government or the population politically or socially. Terrorist acts present in many recognized forms and perpetrators increasingly utilize non-traditional methods. Some recognized forms of terrorism are chemical, explosive, biological, radiological, nuclear, food production, and armed assault, as described below.'

- **Chemical Attack:** A chemical attack is the use of chemical agents to poison, kill, or incapacitate the population or animals, destroy crops or natural resources, or deny access to certain areas. Chemical agents can be grouped into five different categories: nerve agents, vesicants, cyanide, pulmonary agents, and incapacitating agents. Known nerve agents include tabun, sarin, soman, cyclosarin (GF), and VX, and can cause a variety of conditions affecting the central nervous system either through vapor or liquid form. Vesicants cause blisters on the skin and can damage eyes, airways, and other tissues and organs. Vesicant agents include sulfur mustard, Lewisite, and phosgene oxime. Cyanides can be in solid salt or volatile liquid format, or when combined with acid, a vapor or gas. Their absorption can cause everything from nausea to death, depending on the amount absorbed. Pulmonary agents such as phosgene and perfluroroisobutylene cause pulmonary edema usually hours after exposure. Incapacitating agents can affect cognitive abilities, produce reversible disturbances within the central nervous system and include the agent BZ (Sidell, 1996).
- **Explosive Attack:** Terrorism using explosive and incendiary devices including bombs and any other technique that creates an explosive, destructive effect. Bombs can take many forms, from a vehicle-borne Improvised Explosive Device (IED) to a mail bomb. They can be remotely detonated using a variety of devices or directly detonated as in the case of a suicide bomb.
- **Biological Attack:** A biological attack, or bioterrorism, is the use of biological agents, such as Anthrax, Ricin, and Smallpox, to infect the population, plants, or animals with disease. The impacts of bioterrorism may be similar to those discussed in Section 3.7.10, with the primary exception being that the infection of the population was intentionally caused.
- **Radiological Attack:** The United States Department of Homeland Security (DHS) defines a radiological attack as the spreading of radioactive material with the intent to do harm. A radiological attack would likely be carried out using a "dirty bomb." A dirty bomb is a low-tech, easily assembled and transported device made up of simple explosives combined with a suitable radioactive agent. These types of explosives are also known as Radiological Dispersal Devices (ROD). Exposure to radiation can cause radiation sickness, long-term illness, and even death, in addition to contamination of the environment.
- **Nuclear Attack:** A nuclear attack can be defined as the use of nuclear weapons or nuclear facilities to attack the population. A nuclear explosion is caused by an uncontrolled chain reaction that splits atomic nuclei (fission) to produce an intense wave of heat, light, air pressure, and radiation, followed by the production and release of radioactive particles. Fallout from a nuclear attack can expose people at great distances to radiation (National Academies and DHS, 2005). North Dakota is also home to United States intercontinental ballistic missiles located in silos in north central North Dakota. These missiles contain nuclear material and could be hazardous if accidentally or intentionally damaged or tampered with; however, these systems contain a very high level of security and protection by the United States Air Force.

- **Food/Food Production Attack:** An attack on food or food production can be considered agroterrorism, or "the deliberate introduction of an animal or plant disease for the purpose of generating fear, causing economic losses, or undermining social stability." An agroterrorism attack might target agricultural facilities, impact food production and food supply, affect restaurants and grocery stores, and have detrimental effects on public health.
- **Armed Assault:** An armed assault is defined as a hostile non-state actor(s) using assault tactics to conduct strikes on vulnerable target(s) within the U.S. resulting in at least one fatality or injury (DHS, 2011).
- **Vehicle Attack**: A vehicle attack is characterized by the use of a vehicle to cause death, injury, and damage. Examples include the use of commercial airliners to attack the World Trade Center in New York City and the Pentagon in Arlington, Virginia on Sept 11, 2001, and the May 18, 2017 vehicle ramming attack in Times Square, also in New York City. The 9/11 attacks killed 2,977 people with several thousand injuries, while the 2017 attacks killed one and injured at least 22. Such attacks may be directed at large gatherings of people and/or buildings in areas of limited mobility due to the terrain or crowd mass.

The mission of the North Dakota State and Local Intelligence Center (SLIC) is to gather, evaluate, analyze and disseminate information and intelligence data (records) on crimes, both real and suspected, to the law enforcement community, government officials and private industry concerning dangerous drugs, fraud, organized crime, terrorism and other criminal activity for the purposes of decision making, public safety and proactive law enforcement while ensuring the rights and privacy of citizens.

Information and communication technology has played an essential role in discussing and disseminating radical ideologies as well as serving to help coordinate, facilitate, and provide support for would-be terrorists' plans. Social networking media and the Internet have replaced many of the physical networks that were previously integral to radicalization and plot development. The Dark Web, YouTube, Skype, email interfaces, blogs, message boards, and other social networking websites have become invaluable tools and resources to those seeking out information on joining or supporting terrorist groups or wishing to attack the United States. The Internet has made terrorist acts easier for individuals to plan and carry out without significant external support. Because it can be accessed from almost any location, it allows extremists to prepare for their attacks without making themselves significantly vulnerable to detection.

Many times, homeland security incidents, both domestic and international, are driven by a terrorist group or criminal organizations. Other times, incidents may be driven by a nation/state attack. Occasionally, individuals perform independent acts, also known as lone wolves/actors. In many cases, perpetrators have an underlying belief that drives the act. Definitions of different types of Terrorist and Criminal Organizations are listed below:

- **Eco-terrorism/ terrorists:** Use or threatened use of violence of a criminal nature against innocent victims or property by an environmentally-oriented, subnational group for environmental-political reasons, or aimed at an audience beyond the target, often of a symbolic nature.
- **State Sponsors of Terrorism:** Countries determined by the Secretary of State to have repeatedly provided support for acts of international terrorism are designated pursuant to three laws: section 6(j) of the Export Administration Act, section 40 of the Arms Export Control Act, and section 620A of the Foreign Assistance Act. Taken together, the four main categories of sanctions resulting from designation under these authorities include restrictions on U.S. foreign assistance; a ban on defense exports and sales; certain controls over exports of dual use items; and miscellaneous financial and other restrictions.
- **Gangs:** The United States Department of Justices (USDOJ) defines a gang as: (1) an association of three or more individuals; (2) whose members collectively identify themselves by adopting a group identity which they use to create an atmosphere of fear or intimidation frequently by employing one or more of the following: a common name, slogan, identifying sign, symbol, tattoo or other physical marking, style or color of clothing, hairstyle, hand sign or graffiti; (3) the association's purpose, in part, is to engage in criminal activity and the association uses violence or intimidation to further its criminal objectives; (4) its members engage in criminal activity, or acts of juvenile delinquency that if committed by an adult would be crimes; (5) with the intent to enhance

or preserve the association's power, reputation, or economic resources; (6) the association may also possess some of the following characteristics: (a) the members employ rules for joining and operating within the association; (b) the members meet on a recurring basis; (c) the association provides physical protection of its members from other criminals and gangs; (d) the association seeks to exercise control over a particular location or region, or it may simply defend its perceived interests against rivals; or (e) the association has an identifiable structure. (7) This definition is not intended to include traditional organized crime groups such as La Cosa Nostra, groups that fall within the Department's definition of "international organized crime," drug trafficking organizations or terrorist organizations. Examples of gangs include Outlaw Motorcycle Gangs (OMGs) and Criminal Street Gangs.

- **Foreign Terrorist Organizations:** Foreign Terrorist Organizations (FTOs) are foreign organizations that are designated by the Secretary of State in accordance with section 219 of the Immigration and Nationality Act (INA), as amended. FTO designations play a critical role in our fight against terrorism and are an effective means of curtailing support for terrorist activities and pressuring groups to get out of the terrorism business (United States State Department).
- **Organized Crime:** Transnational Organized Crime refers to those self-perpetuating associations of individuals who operate internationally for the purpose of obtaining power, influence, monetary and/or commercial gains, wholly or in part by illegal means, while protecting their activities through a pattern of corruption or violence. There is no single structure under which international organized crime groups operate; they vary from hierarchies to clans, networks and cells, and may evolve to other structures (USDOJ).
- **Homegrown Violent Extremism/Extremists (HVEs):** An HVE is a person of any citizenship who has mostly lived in the United States and who engages in a terrorist activity to advance an ideology (FBI).
- **Left Wing Extremists:** Left-wing terrorism (sometimes called Marxist–Leninist terrorism or revolutionary/left-wing terrorism) is terrorism meant to overthrow conservative or capitalist systems and replace them with Marxist–Leninist, socialist, or anarchist societies (USDOJ).
- **Right Wing Extremists:** Right-wing terrorism is terrorism motivated by a variety of ideologies and beliefs, including Islamophobia, anti-communism, neo-fascism and neo-Nazism, and a mindset against abortion. This type of terrorism has been sporadic, with little or no international cooperation (USDOJ).

3.7.2.2 Previous Occurrences

North Dakota is not immune to homeland security incidents. In many cases, information about past threats that have been thwarted is not publicly distributed. Since January of 2014, there have been forty-three Terrorist Screening Center (TSC) hits or encounters within North Dakota, in which the North Dakota SLIC provided support when requested. Also, since January of 2014, the North Dakota SLIC has received hundreds of suspicious activity reports (SARs), of which two hundred and sixty-six of have been deemed to have a "possible nexus to terrorism." These vetted SARs were passed onto the FBI for follow up and possible investigation.

The North Dakota SLIC and the State Historical Society of North Dakota (SHSND), as well as news and media reports, provided the following information on previous occurrences of Homeland Security Incidents that have occurred in North Dakota possibly relating to Terrorism and/or Organized Crime:

- **April 6, 2018**: A Walmart store in Jamestown, North Dakota received a bomb threat via telephone around 2330 hours. Law enforcement set up a perimeter, evacuated customers and employees, and searched the store and surrounding area.
- **March – April 2018**: Legacy High School in Bismarck, North Dakota received seven separate bomb threats by telephone between March and April. The school was evacuated and searched by law enforcement.
- **August 10, 2016 - March 23, 2017**: One of the longest unlawful assemblies and civil disorders in United States history occurred in response to the construction of the Dakota Access Pipeline, which connected the Bakken and Three Forks production areas in North Dakota to Patoka, Illinois. Individuals first lawfully protested this construction project, believing that a pipeline leak would contaminate the water supply on the nearby Standing Rock Reservation. The protest escalated

into an unlawful assembly and civil disorder on August 10, 2016. This occurred along North Dakota State Highway 1806, just north of Cannonball, North Dakota. More information on this is discussed in the Civil Disturbance profile in Section 3.7.1.

- **October 2016**: An activist from Seattle named Michael Foster cut through a chain link fence and turned a shut-off valve on the Keystone Pipeline as part of a four-state protest to draw attention to climate change and support demonstrations against the Dakota Access pipeline. This was a coordinated attack which occurred in North Dakota, Montana, Minnesota, and Washington State. Activists trespassed onto private property and turned shut-off valves at five pipelines (Nicholson, 2018). Foster was convicted in October 2017 of conspiracy, criminal mischief and trespass but acquitted of reckless endangerment. He was sentenced in Cavalier, North Dakota to serve one year in prison for targeting an oil pipeline in North Dakota.
- **August 2013:** Craig Cobb, a white supremacist who had lived in Canada, Estonia, and the United States while developing his racist ideology and founding his own white supremacist video-sharing site, relocated to Leith, North Dakota, a small town of 15 people (United States Census Bureau, 2017). Cobb's goal was to transform Leith into a white supremacy enclave, and he sought to achieve this goal by buying up cheap properties in the prairie town and inviting other white supremacists and neo-Nazis to move in. In 2013, he had given residential property lots to a former member of the Ku Klux Klan (KKK), and another to the founder of a white supremacist website. Nazi flags began flying in Leith, and Cobb plotted to take over the city council. As residents of the town and the surrounding area began to resist Cobb, his house was vandalized, and he and a fellow white supremacist were arrested after threatening residents on an "armed patrol through town" (Schmidt, 2018). Cobb was arrested and pleaded guilty to menacing and terrorizing the town.
- **July 2013:** The Country Boy Crips (CBC), a criminal street gang operating out of Bakersfield, California, moved 10 to 20 members to Dickinson, North Dakota, a southwestern city of 22,186 people (United States Census Bureau, 2017). Some members moved for legitimate jobs in the oil industry, some to supply drugs. Five CBC members were charged in connection to a July 2013 shooting that left one man severely injured (Lymn, 2015).
- **February 13, 1983:** Federal law enforcement officers went to Medina, North Dakota to arrest Gordon Kahl on a Texas warrant. Kahl farmed in Heaton, North Dakota, north of Medina. Kahl was a decorated war veteran and a tax protester who had served time for refusing to pay his taxes. The warrant accused him of violating his probation. On the morning of February 13, Gordon Kahl, his wife, Joan, his son Yorie Kahl, and two friends David Broer and Scott Faul, gathered at Dr. Clarence Martin's clinic in Medina to talk right-wing politics. After the meeting, Kahl's group headed north out of Medina, toward home. They met a roadblock. Gordon and Yorie Kahl, Faul, and Broer got out of their cars. There was a brief verbal confrontation and gunfire erupted. Marshal Kenneth Muir and Deputy Marshal Robert Cheshire died. Two additional law enforcement officers and Yorie Kahl were hurt. Gordon Kahl vanished. Authorities caught up with him in June of 1983 near Smithville, Arkansas, where he died in a shootout and fire. Yorie Kahl and Faul are serving life sentences in the murders.

3.7.2.2 Location and Extent

An attack on the United States that adversely affects the national economy, agricultural economy, or requires warfare and the drafting of soldiers is considered a high magnitude event. On a smaller but very significant scale would be an attack on a facility such as a school or business involving shooters, homemade bombs, or the taking of hostages. Schools and universities across the country have struggled with similar events, and therefore, such an incident is possible anywhere in North Dakota.

In general, jurisdictions with large, dense population areas are more vulnerable to attacks as well as special events with large populations gathered at a specific site. Cass County has the highest population density in the State by far, followed by Burleigh and Grand Forks Counties. Table 7.4.1-1 in Appendix 7.4.1 provides additional information on population density by county and is sorted in order of density.

North Dakota produces a bounty of commodities and ships these commodities locally, nationally and even internationally for processing or use. This makes the state a potential target for a variety of adversarial threats. The potential for negative impact at the production level is due to the variety of commodities produced in the state, often in rural areas with few producers who focus on certain products as a result of more efficient modern production practices. These adversarial impacts at the production level are most likely to occur from groups opposed to animal agriculture or those opposed to use of land for production agriculture.

Although these groups could have a profound impact on an individual operation, including introduction of a disease, obstruction of operation, or intentional damage to a commodity, the potential of a large-scale impact on the food supply is unlikely from these adversarial impacts. Testing at sale for commodities to processors or elevators is common as well as other quality review processes. Food and agriculture producers also manages this risk by issuing health certificates for animals leaving and entering the state and phytosanitary certificates for commodities leaving and entering the country. Public perception related to an impact at this level could have a more profound economic impact on the state than the reach of an actual event.

A concern regarding adversarial threat to food relates to potential for interruption within the production and distribution process for food. While the processing of commodities for food is highly regulated and inspected at the federal and state levels, there remains the potential for adulteration, obstruction of operation, or intentional damage to a facility or product. The likelihood is low and impact likely limited.

Adulteration or damage in the food distribution chain after processing exists as a possibility but impact would likely be limited in most scenarios, with few opportunities for adversarial impacts to progress.

The most likely scenario with the highest possibility for widespread impact results from an interruption of the transportation system, whether that is damage to infrastructure, to infrastructure control systems (electronic logging systems, or rail/traffic/vehicle automation) essential to moving raw or finished products These have less oversight and regulation than food production and distribution chains and could impact a substantial area. A summary of the possible spatial extent of impacts from a criminal, terrorist, or nation/state attack are summarized in Table 3.7.2-1.

Table 3.7.2-1 Spatial Extent of Criminal, Terrorist, or Nation/State Attack Impacts

Resources	Extent of Impacts
People	Statewide
Property	Statewide
Infrastructure	Statewide
Government Operations	Statewide
Environment / Natural Resources	Regional
Cultural Resources	Regional

3.7.2.3 Consequence Analysis

A consequence analysis exercise was conducted by the state in 2017 to predict impacts from different hazard scenarios; however, the consequence analysis did not include a scenario specifically for a criminal, terrorist, or nation/state attack event. The analysis below was based on data gathered from other incidents in the United States as well as globally.

Table 3.7.2-2 Criminal, Terrorist, or Nation/State Attack Consequence Analysis

Criminal, Terrorist, or Nation/State Attack Impacts	
Public	In the event of a criminal, terrorist, or nation/state attack, the impact to the public may be significant, especially to those in the directly targeted area(s). During attacks and times of unrest, the greatest risk is to human lives. Terrorists typically try to make a dramatic statement that will generate media interest. Attacking the population through a large loss of life is a common tactic. Depending on the type of attack, casualties could be light or encompass much of an urban population. Casualties or fatalities and loss of life among innocent bystanders,

Criminal, Terrorist, or Nation/State Attack Impacts	
	lawful protestors, and unlawful actors are possible, as is damage and destruction to homes and sources of livelihoods. Depending on the type, size, scale, and method(s) utilized, impact to the public could expand beyond North Dakota, regionally or even nationally. Information spreads quickly with today's information and communication technology, and social media functions as a news multiplier, quickly touching populations far outside the directly affected area. The spread of misinformation and rumors is also quickly accomplished through social media.
Responders	Casualties or fatalities among responders as well as the diversion or delay of first responders away from others requiring their assistance are potential impacts. Today, responders' training is robust and inclusive of multiple threats and hazards, which makes responders more capable and effective than ever before. However, criminal, terrorist, and nation/state attacks often occur with little or no notice, and responders themselves have been the targets of these events in the past. Successful attacks on responders effectively eliminate the ability of these responders to end an attack quickly; this allows an attack to continue unhampered, affecting more people and potentially causing additional deaths and injuries.
COOP	A localized event/attack will compromise Continuity of Operations in smaller jurisdictions. However; with a large event/attack these areas would be strained not only at the local level, but at the regional and state level as well. Continuity of operations may be affected by damaged or destroyed physical infrastructure, damage to technology and information systems, and/or the loss of employees affected by the incident or otherwise unable to perform their duties.
Delivery of Services	A localized event/attack will compromise the delivery of services in smaller jurisdictions. However; with a large event/attack these areas would be strained not only at the local level, but at the regional and state level as well. Delivery of services may be affected by damaged or destroyed physical infrastructure including transportation networks, damage to technology and information systems, and/or the loss of employees affected by the incident or otherwise unable to perform their duties.
Property, Facilities, and Infrastructure	Property, facilities, and infrastructure are often targets/locations of an event/attack and many times are damaged and/or destroyed during an incident. The impact of facilities and infrastructure being damaged and/or destroyed could be catastrophic; such damage may lead to the loss of power during winter, the shutting down of waste water and water production facilities, or a closing of public transportation facilities.
Environment	In the event of a criminal, terrorist, or nation/state attack, there is a potential toll on the environment, including destruction of landmarks (natural and manmade), pollution (air, water, or land), radiological and biological hazards, and contamination. Ecological values could be harmed if a damaging chemical, biological, or radioactive agent is used.
State Economy	Terrorist attacks generally have a damaging effect on the economy. A small event/attack will likely compromise in the economies of smaller jurisdictions. However, with a large event/attack, this area would be strained not only at the local level, but at the regional and state level as well. Any time the public's safety is compromised, more people stay home until they are more confident in their safety. Tourism and travel industries may be affected; attacks on the national information or financial infrastructure could lead to significant declines in the national economy. Specific to North Dakota, attacks on agriculture could lead to substantial direct losses in the state. Loss of productivity and economic loss due to interrupted and/or delayed lawful activities as well as increased, un-forecasted public and private costs due to response and recovery requirements may exacerbate any strain on the economy.

Criminal, Terrorist, or Nation/State Attack Impacts	
Public Confidence in the State's Governance	Social values can be affected with any sort of homeland security incident, particularly one that occurs locally. Community members may not feel safe and may have lasting emotional impacts. Regardless of the level of response, both negative and positive reactions from the public are likely. The focus of the government needs to be on public safety and ending the incident.

3.7.2.4 State Risk Assessment

Probability

The probability of an attack or armed assault event affecting North Dakota directly is difficult to determine. There are no specific terrorist targets that have been identified in the North Dakota; however, the storage of missiles, military presence, and energy facilities make parts of the state possible targets. As with any area, a shooting by a disgruntled employee or student is also possible. A large-scale attack cannot be ruled out, and therefore, a small probability exists. Of greater probability is a terrorist attack that has an indirect effect on the state through its economy. The September 11th terrorist attacks in New York, Washington, and Pennsylvania had a significant impact on the national economy and required the activation of many local and state resources. Another attack could have a similar effect. Such an attack in another part of the country has a greater probability than a direct attack within North Dakota, but even the probability of such an attack elsewhere is unknown and is the subject of much debate.

Vulnerability Assessment

The vulnerability of the state can be understood in a variety of ways; as the state's demographics and industries shift and expand, the vulnerability of the state to criminal, terrorist, or nation/state attacks also shifts. For example, one result of population influx into the western half of the state due to the oil-production industry was a rise in the state's human trafficking activity. This rise hit its peak in May 2015 and has since decreased, with the National Human Trafficking Hotline logging 66 phone calls, nine emails, and three online tips regarding human trafficking in North Dakota in 2016 and only 19 as of June 30, 2017 (North Dakota Bureau of Criminal Investigation, 2017).

State Assets and/or Critical Facilities at Risk

State-owned buildings and property, as well as critical facilities and infrastructure, are at risk to an attack or armed assault event. Often, terrorists target facilities that are highly important for government services and community stability. Government facilities can become targets if an individual or group disagrees with actions they associate with the facility. Certainly, some state-owned buildings and property may be more vulnerable to incidents than others due to the activities performed at the facility or the level of security at the building.

The North Dakota Homeland Security Advisor's Critical Infrastructure Sector priorities as of April 2018 align with the Presidential Policy Directive 21 and are as follows:

- Energy Sector
- Information Technology Sector
- Water and Wastewater Systems Sector
- Healthcare and Public Health Sector
- Food and Agriculture Sector
- Emergency Services Sector
- Financial Services Sector
- Chemical Sector
- Communications Sector
- Transportation Systems Sector
- Government Facilities Sector
- Commercial Facilities Sector

- Dams Sector
- Critical Manufacturing Sector
- Nuclear Reactors, Materials, and Waste Sector
- Defense Industrial Base Sector

All sectors are represented in North Dakota except Nuclear Reactors, Materials, and Waste. Facilities critical to homeland security can be considered essential facilities. For additional details on state-owned facilities and other critical facilities, see Section 2.

Loss Estimates

Potential losses from attacks or armed assault events include all infrastructure, critical facilities, crops, humans and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic and long-lasting damage to the environment. Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public in order to maintain national security and prevent future attacks.

It is difficult to quantify potential losses in terms of the jurisdictions most threatened by attacks due to the many variables and human element. Therefore, for the purposes of this plan, the loss estimates will consider several hypothetical scenarios. Please note that these hypothetical scenarios are included to provide a sample methodology for local jurisdictions to estimate potential losses. The hypothetical scenarios include: a chemical attack, a biological attack, an improvised explosive device (IED) attack, and a radiological attack. For comparative purposes, these hypothetical attack scenarios will all be staged at the same venue, a college football stadium in a university city in North Dakota during a home football game. The hypothetical stadium is situated on less than one square mile in an urban area and has a seating capacity of approximately 20,000 persons. Surface area and parking structures are located adjacent to the stadium.

Analysis of vulnerable populations is aided by a program developed by Johns Hopkins University in 2006 called Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) which utilizes hypothetical scenarios developed by the Department of Homeland Security. According to the scenarios of chemical, biological, explosive, and radiological attacks, the following are the highest potential losses from these attacks:

- Number of Impacted Persons: 10,113 persons
- Fatalities: 695 persons
- Cost in Property Loss: $2,150,000

The full results of the scenarios can be found in Appendix 7.4.1.

Climate Change

Due to the human-caused nature of an attack or armed assault, climate change is not expected to impact this hazard.

Changes in Development

Successful mitigation of an attack or armed assault event requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future risk.

In general, development should have little to no impact on a homeland security incident. However, an increase in population and population density and the associated increase in the potential for life and property losses could impact a jurisdiction in terms of vulnerability and magnitude should an event occur.

As detailed in Section 2 of the plan, the state has experienced population growth since 2010, and expects this growth to continue. Table 3.7.2-3 summarizes the population change from 2010 to 2018 for the entire State of North Dakota, which overall has experienced a 12% increase in population. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Counties in North Dakota with the highest populations in 2010 are projected to continue to grow through 2030. The four counties with the highest projected 2030 population include Cass with a projected population of 214,719 people, Burleigh with 110,932 people, Ward with 91,644 people, and Grand Forks with 89,081 people. These counties may be more vulnerable to an attack due to more people that could be impacted by an event.

Table 3.7.2-3 Population Changes at the State Level

Year	Population
2010	672,591
2018	755,393
Change	+82,802

Source: North Dakota Census Office, 2018

The population density of North Dakota's cities has also increased in recent years, as people move out of rural areas in favor of urban living. This trend increases the vulnerability of cities to future attacks, as more people live in higher density living situations. Additionally, the continued growth of the oil and gas industry in North Dakota will continue to increase the vulnerability of these areas to an attack, particularly in the state's four largest oil producing counties, Dunn, McKenzie, Mountrail, and Williams.

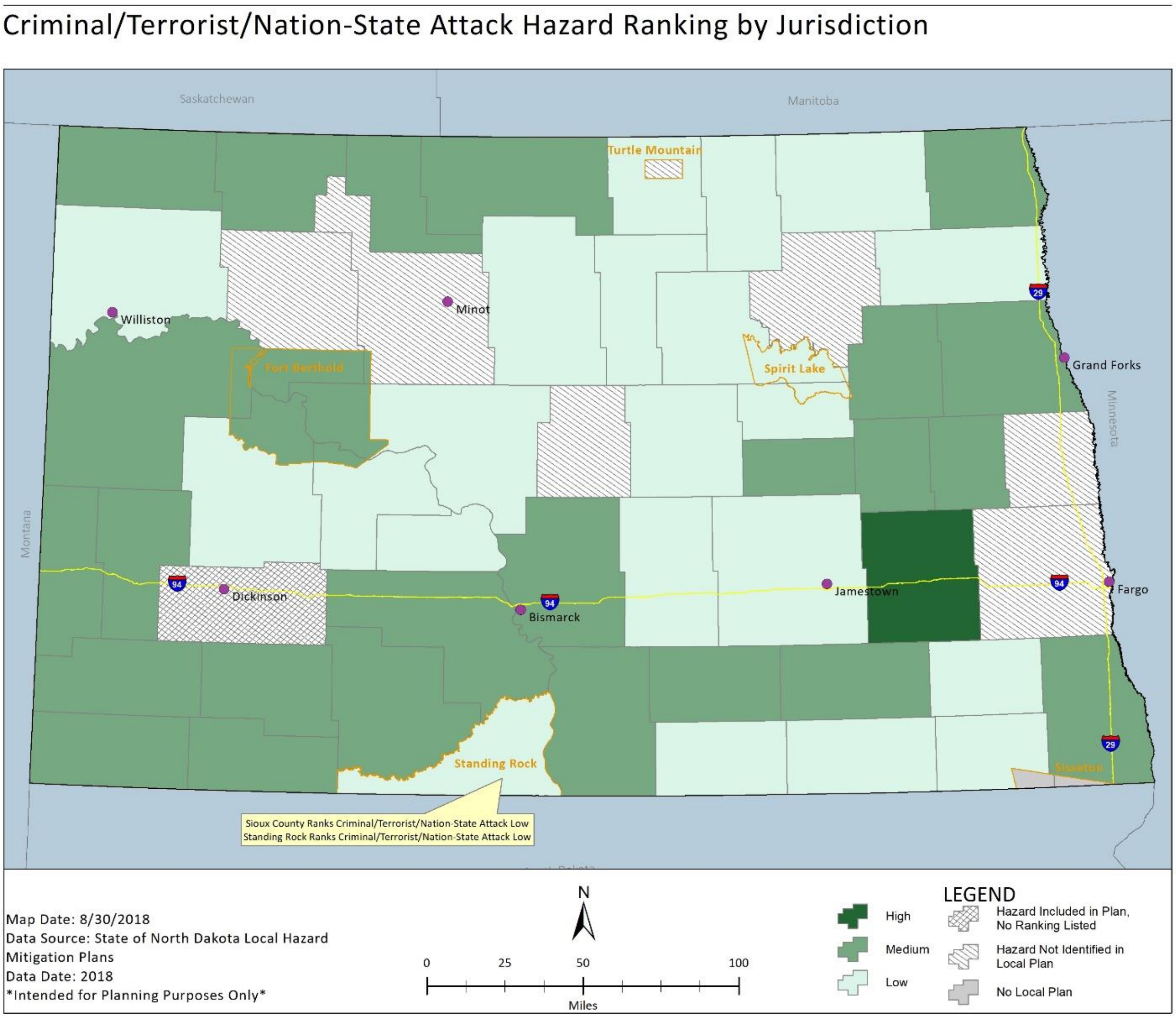
However, increased development is not always an indicator of risk to an attack, particularly since some of North Dakota's largest economic drivers that may be at risk to an attack, such as agricultural facilities, are not always located in urban areas or areas with high population density.

The risk to state-owned assets and critical facilities is not likely to change significantly in the future. Institutions such as government buildings, schools, and other critical infrastructure will likely always be at higher risk to terrorism or assault events.

3.7.2.5 Jurisdictions at Risk

Fifty of fifty-eight local HMPs profile an attack or armed assault. Figure 3.7.2-1 presents a summary of those plans and also identifies how they ranked the overall risk presented from attack or armed assault. One jurisdiction ranked attack or armed assault as a high hazard, twenty-six as medium, and twenty-three as low. Seven plans did not identify attack or armed assault as a hazard, and one plan profiled the hazard but did not classify it. This ranks attack or armed assault as number nine out of twelve hazards according to North Dakota local HMPs. Table 7.4.1-3 in Appendix 7.4.1 includes a compilation of available loss information, when available, as documented in these local HMPs.

Figure 3.7.2-1 Criminal, Terrorist, Nation/state Attack Hazard Ranking



3.7.2.6 Summary / Conclusion

Following this plan's risk assessment methodology, the criminal, terrorist, or nation/state attack risk factor score was 2.25, which is a moderately ranked hazard on a scale of one to four, where four is the highest threat risk. The full results of this assessment can be seen in Table 3.3-6 in Section 3.3.

Despite utilizing this risk factor methodology, it is difficult to quantitatively express the probability of human-caused hazards such as these. For this reason, criminal, terrorist, or nation/state threats have been understood in the context of the following definitions:

Future probability: If probability cannot be calculated numerically, probability is indicated as either highly likely, likely, or possible.

- *Highly likely* probability generally indicates judgments based on high-quality information and/or the nature of the issue makes it possible to conclude a solid judgment.
- *Likely probability* generally means there are various ways to interpret the information, we have alternative views, or the information is credible and plausible but not corroborated sufficiently.
- *Possible probability* generally means the information is scant, questionable, or very fragmented which makes it difficult to make solid analytic inferences.

The results of the risk factor methodology indicate that a criminal, terrorist, or nation state attack in North Dakota is rare but possible and could have catastrophic impacts. As indicated by the 2017 THIRA, an explosive attack could cause mass casualties and strain local hospitals. This highlights the importance of incorporating these events into planning documents to reduce the risk to an attack or armed assault event.

The impact of a criminal, terrorist, nation/state attack may range from limited to critical. Limited impact may include minor injuries, limited property damage (10% of the area or less), and the shutdown of critical facilities or infrastructure for more than one day; critical impacts may include multiple deaths and/or injuries, property damage or destruction in 25% or more of the affected area, and the complete shutdown of critical facilities and infrastructure for more than one week. The spatial impact of an attack, or to what extent the surrounding area may be affected, is likely to be large, affecting 25% or more of the area. These impacts may be exacerbated by the fact that criminal, terrorist, or nation/state attacks are human-driven and thus have very little warning time, typically six hours or less.

An attack may be over very quickly or may be prolonged, but in most cases, effects will last for a week or more. In incidents that cause death or injuries, and even those that don't, psychological trauma on a large scale may be seen; whole communities are affected not only physically but mentally by an actual or perceived loss of safety. The impact may be felt in the local economy as tourism slows and people stay home rather than go out to eat or shop; businesses damaged or destroyed by an incident may lose revenue for a number of days, weeks, or months. The September 11th attacks cost New York City 143,000 jobs a month and $2.8 billion in lost wages in the three months that followed (Polgreen, 2004). Damage to critical facilities, infrastructure, and the environment can cause cascading effects felt far outside the affected area, impacting the region, the state, and potentially the nation. Criminal, terrorist, and nation/state attacks are unique in that they tend to inspire questions of identity, belonging, and culture. Physical and psychological damage compound to make these attacks particularly poignant.

3.7.2.7 Data Limitations / References

Since homeland security incidents are such isolated events and little history exists on the effects to North Dakota, the probability and vulnerabilities are difficult to quantify. Therefore, generalities were used to estimate the potential losses. Given the uncertain nature of this hazard, facility managers and private individuals can only be encouraged to identify their security weaknesses and address them internally.

Other key documents related to the Homeland Security Incident hazard include:

- North Dakota State Emergency Operations Plan, Terrorism Annex
- North Dakota THIRA
- North Dakota State Preparedness Report (SPR)
- North Dakota Mitigation MAOP

3.7.3 Cyberattack

3.7.3.1 Description

A cyberattack is the attack or hijack of information technology infrastructure critical to the functions controlled by computer networks such as: operating, financial, communications, and trade systems. Any cyberattack that creates unrest, instability, or negatively impacts confidence of citizens/consumers can be considered cyber terrorism. Computer security incidents are an ongoing threat and require due diligence to address accordingly to mitigate any potential disruption to critical infrastructure. There are seven common types of cyberattacks that governments, businesses, and people are at risk to, as described below (Crime Statistics Online [CSO], 2017).

1. **Socially engineered malware:** A normally trusted site is compromised, and the attackers embed malware into the site. Users of the site are tricked into downloading malware onto their computers through a Trojan Horse.
2. **Password phishing attacks:** Emails are designed to look like they are from trusted vendors and users are prompted to enter their passwords to access the content from the email. The site the user is taken to saves the password the user provides; which attackers can use to access the real site and the user's information.
3. **Unpatched software:** Cyber attackers can access software on users' computers if the software patches are not up to date.
4. **Social media threats:** Friend or application install requests are designed to mask malware or phishing attempts. Users who accept these requests are tricked into providing their email, downloading malware, or otherwise giving cyber attackers access to their computer and data.
5. **Advanced persistent threats:** Cyber attackers gain access to an organization's data using phishing or Trojan Horse attacks. These attacks typically target multiple employees to trick at least one into providing their password or downloading the malware.
6. **Distributed Denial of Service:** An attack in which multiple compromised computer systems attack a target, such as a server, website or other network resource and cause a denial of service for users of the targeted resource.
7. **Doxing:** Discovering and releasing of personally identifiable information.

To ensure a quick and proper response to cyberattacks, systems vulnerable to cyber terrorism should have an incident response plan to minimize negative impacts.

3.7.3.2 Previous Occurrences

Three large cyberattacks occurred within the past five years that directly impacted North Dakota. In 2017, the University of North Dakota's (UND) website was hit with a cyberattack that shut down its website. This type of offense was a Distributed Denial of Service (DDoS) attack. This type of attack compromises several computer systems to target a network source and flood it with connection requests, malformed packet, or incoming messages to slow down or crash the system. As a result, the UND.edu website became unresponsive, and the attack denied service to legitimate users or systems.

In 2018, a North Dakota Company experienced a phishing attack, which is a form of fraud where an attacker masquerades as a reputable entity or person in email or other communication channel. The attacker used phishing emails to distribute malicious links or attachments that can perform a variety of functions, including the extraction of login credentials or account information from victims. The company received over 150 phishing emails, and over a dozen employees were successfully phished. Personnel records were accessed, which included personally identifiable information.

The third attack was during the DAPL criminal protests. Unknown individual(s) released personally identifying information of law enforcement officers who assisted in the protest response with the intent to have others harass and/or intimidate them or their families. This attack was accomplished through a Doxing email, which publicly identifies or publishes private information about someone especially as a form of punishment or revenge.

3.7.3.3 Location and Extent

A cyberattack could occur or impact any location in the state. The impacts from a cyberattack are not limited to the location of the targeted system and could have far-reaching impacts. Additionally, a cyberattack that occurs outside of North Dakota may still impact people, business, and institutions in the state, such as a breach at a nation-wide bank. Table 3.7.3-1 describes the spatial extent of impacts from a cyberattack in North Dakota.

Table 3.7.3-1 Spatial Extent of Cyberattack Impacts

Resources	Extent of Impacts
People	Local
Property	Local
Infrastructure	Local
Government Operations	Regional
Environment / Natural Resources	Regional
Cultural Resources	Local

3.7.3.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event stemming from a cyberattack incident. Effects on the environment and economic conditions would be the least impacted, although these sectors may still experience a moderate impact. The full results of the consequence analysis can be found in the table below.

Table 3.7.3-2 Cyberattack Consequence Analysis

Cyberattack Impacts	
Public	Often the public is unaware that an attack has occurred; many times, they are made aware only when it affects them personally (i.e. loss of personal identifying information [PII], financial issues due to exposure of personal financial information). Spread of misinformation related to the cyber incident may also affect the public.
Responders	In cyberattack incidents, responders span from law enforcement and the private sector. Law enforcement tends to focus on the forensics of the attack (i.e. tactics, techniques, and procedures [TTPs], where the threat originated, and who may be responsible for the attack. Law enforcement also pursues prosecution of cyber attackers when they are identified.
COOP	Continuity of operations could be greatly impacted by a cyberattack, which could lead to catastrophic consequences. Technological systems are relied upon in nearly all industries, including government, education, banking and financial institutions, utilities, health and medical organizations, public works and engineering, and a host of other sectors. Any incident that affects the functioning of these systems may negatively impact continuity of operations.
Delivery of Services	Delivery of services may be greatly impacted by a cyberattack due to the same factors that would negatively affect continuity of operations. In today’s world, the delivery of goods and services is heavily reliant on technology for the facilitation of transactions. A cyber incident could significantly disrupt the delivery of goods and services to the extent upon which businesses and entities rely on technology for the delivery of their materials.

Cyberattack Impacts	
Property, Facilities, and Infrastructure	Property, facilities, and infrastructure are often the target locations for cyber attackers, and many times are damaged and/ or destroyed during an incident. These damages and potential destruction may have far-reaching consequences, including loss of power and electricity during severe winter or summer weather, or the malfunctioning or shutting down of critical utilities and facilities that operate systems including traffic control, police and fire dispatch, and response systems.
Environment	Cyberattacks have little impact on the environment unless the attack is specifically targeted at facilities or infrastructure where physical controls are affected, and release of potentially harmful chemicals or other agents is successful. For example, a cyberattack targeting a pipeline may contribute to the release of harmful chemicals into the environment.
State Economy	Increased, un-forecasted public and private costs due to response and recovery requirements, especially if the cyberattack targets personal financial information; loss of productivity and economic loss due to interrupted and/or delayed lawful activities. Tourism and travel industries may be affected. Additionally, attacks on the national informational or financial infrastructure could lead to significant declines in the national economy. Specific to North Dakota, attacks on cyber systems related to agriculture could lead to substantial direct losses in the state. Given the complexity of many cyberattacks the full economic impacts may never be known. Entities affected by cyberattacks may experience varying levels of economic impact. These impacts may include loss of production and/or services, repair or replacement of equipment (i.e. servers, electrical grids, fiber lines), and loss of stakeholders.
Public Confidence in the State's Governance	Social values and public confidence can be affected by any sort of homeland security incident, particularly one that occurs locally. Community members may not feel safe and may have lasting emotional impacts, especially if personal information is released or obtained by an attacker. Regardless of the level of response, it is likely that the public will display both positive and negative confidence in their government leaders. The focus of the government should be on public safety and ending a cyber-incident as quickly as possible. Often if a private sector entity is affected the government is unaware of the attack and do not have a role in protecting, responding or assisting the entity.

3.7.3.5 State Risk Assessment

Probability

Cyber attackers are persistent in targeting their intended victims, but there are also countermeasures for each type of cyberattack. For the most common types of cyberattacks, educating personnel and the public about the dangers of providing secure information online, ensuring all software patches are up-to-date, installing anti-malware programs, and having enhanced authentication systems (i.e., smartcards, biometrics) can help to reduce the probability of cyberattacks (CSO, 2017).

However, employing countermeasures does not guarantee the protection against all cyberattacks. Impacts of cyberattacks range from theft of personal or business information to loss of functionality for communications and information systems to impacts on the physical world through cyberattack vectors causing damage to infrastructure, systems, or people. Due to the prevalence and ever-changing tactics of cyberattacks, the probability of attacks occurring in the future is high.

Vulnerability Assessment

All North Dakota state and local governments, businesses, and other organizations and institutions are vulnerable to the impacts of cyberattacks. Increased awareness of these threats, preventative education about avoiding attacks, and enhanced counter-measures can protect all organizations from cyberattacks, but if a cyber-attacker is able to gain access to an organization's data or systems, then the organization is at a great risk of loss of functionality or services, or an impact on infrastructure, systems, or people.

State Assets and/or Critical Facilities at Risk

The 2017 THIRA identified 16 critical infrastructure sectors within North Dakota. Ongoing work continues with sector partners to identify and prioritize critical facilities, assets, systems, and networks that need to be protected. Identifying critical facilities to ensure considerations are made to reduce risk pre- and post-disaster remains a capability gap. An attack on technology-dependent critical infrastructures could result hazardous materials releases that could jeopardize the environment by potential contamination of soil and portions of the state's 56,680 miles of rivers and streams.

Securing information technology resources, state assets, and critical facilities requires collaboration among stakeholders. In accordance with the Incident Prevention/Response/Notification Standard, each organization should designate an agency contact known as a security officer. Security officers become part of a proactive group that communicates and corrects security incidents and vulnerabilities.

Although state assets and critical facilities might not be directly impacted by a cyberattack, a cyberattack could result in loss of electronic communication, data transmission, and data storage to maintain function. Additionally, a data breach could impact critical functions as well as provide access to sensitive information. Facilities such as utilities, refineries, military systems, and water treatment plants now rely on digital systems to operate and control their operations. This improved efficiency increases the vulnerability of critical facilities and state assets to a cyberattack.

There are current limitations to sharing levels of threat information outside the government sector, between agencies and levels of government, and within the private sector to those outside their organizations. The current operating environment and regulatory limitations present obstacles to sharing optimal levels of information.

Loss Estimates

The loss of functionality of a system due to a cyberattack can impact a business's revenue, an organization's ability to provide services, or physical infrastructure. The loss resulting from each attack will depend on the organization attacked and the scope of the attack. Based on attacks in the last five years, North Dakota organizations are at risk for minor loss of services and functionality but should be prepared to withstand more impactful attacks in the future.

Loss estimates specific to North Dakota were not available at the time this plan was published; however, losses incurred in other cyberattacks nationally and worldwide can assist in demonstrating the potential economic impact of an attack. The 2017 WannaCry ransomware attack caused nearly $4 billion in financial and economic loss, while the 2017 NotPetya attack, originating in Ukraine, caused an estimated $300 million in economic losses for FedEx subsidiary TNT Express and another $300 million in losses for shipping company Maersk (TrendMicro 2018; North Dakota Trade Office 2018).

Other loss estimates have been developed based on specific scenarios related to cybersecurity. In 2017, Lloyd's of London, an insurance underwriter, developed a plausible scenario for an attack on the Eastern Interconnection—one of the two major electrical grids in the continental United States—which services roughly half the country. A large-scale attack on the power grid in the United States could have devastating consequences; the 2003 Northeast Blackout, a widespread power outage affecting much of the Northeast, the Midwest, and parts of Ontario, caused economic losses between $4 billion and $10 billion. The Lloyd's of London scenario estimates economic losses of $243 billion in an attack on the Eastern Interconnection (Knake, 2017).

Climate Change

Due to the human-caused nature of a cyberattack, climate change is not projected to impact this hazard.

3.7.3.6 Changes in Development

Successful mitigation of cyberattacks requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future risk to cyberattacks, as was experienced during the DAPL protests.

In general, development should have little to no impact on a cyberattack event. However, an increase in population could result in more people being impacted in the event of a cyberattack. As detailed in Section 2, the state has experienced population growth since 2010, and expects this growth to continue based on future population projection. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 U.S. Census. If essential services, such as utilities, are disrupted due to a cyberattack, the impacts would be more severe with a higher population.

As operations continue to rely on digital infrastructure to operate, they will become increasingly vulnerable to cyberattacks. To develop and maintain resilient cybersecurity capabilities, there must be cooperation between federal, state, local, tribal, non-governmental organizations, and private sector partners. Multi-sector discussions and outreach efforts increase emphasis on whole community participation in planning. Detecting highly structured malicious activity (via all threat vectors) directed against all critical infrastructure, key resources, and networks must be a priority. Law enforcement and intelligence assets should be leveraged to identify, investigate, and prosecute malicious actors.

The ability to return 100% of life safety-critical system to operation within 24 hours is an ongoing State-set priority. The target goal for restoration of all other critical systems is within one week. Planning documents with processes for achieving these targets are complete but require updates and testing through exercises or real-world events.

3.7.3.7 Jurisdictions at Risk

In reviewing the local HMPs, none were found to include a cyberattack hazard profile. However, there is growing recognition of the need to consider cybersecurity and the potential for cyberattacks at the State and local levels. Cyberattack profiles or similar analyses are currently under development in several jurisdictions in North Dakota and will be considered in future updates of the Enhanced Mitigation MAOP.

3.7.3.8 Summary / Conclusion

Following this plan’s risk assessment methodology, the cyberattack risk factor score was 3.49, which is a highly ranked hazard on a scale of one to four, where four is the highest threat risk. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Despite utilizing this risk factor methodology, it is difficult to quantitatively express the probability of human-caused hazards such as these. For this reason, adversarial hazards such as cyberattacks have been understood in the context of the following definitions:

Future probability: If probability cannot be calculated numerically, probability is indicated as either highly likely, likely, or possible.

- *Highly likely probability* generally indicates judgments based on high-quality information and/or the nature of the issue makes it possible to conclude a solid judgment.
- *Likely probability* generally means there are various ways to interpret the information, we have alternative views, or the information is credible and plausible but not corroborated sufficiently.
- *Possible probability* generally means the information is scant, questionable, or very fragmented which makes it difficult to make solid analytic inferences.

The probability of a cyberattack in any given year in North Dakota is therefore considered to be possible. The impact of a cyberattack may range from limited to critical. Limited impact may include minor injuries, limited property damage (10% of the area or less), and the shutdown of critical facilities or infrastructure for more than one day; critical impact may include multiple deaths and/or injuries, property damage or destruction in 25% or more of the affected area, and the complete shutdown of critical facilities and infrastructure for more than one week. The spatial impact of an attack, or to what extent the surrounding area may be affected, is likely to be large, affecting 25% or more of the area. These impacts may be exacerbated by the fact that cyberattacks are human-driven and thus have very little warning time, typically six hours or less.

In addition to the lack of warning time and potential catastrophic consequences to people, systems, and operations, a hazard incident stemming from a cyberattack is likely to last for a week or more. In part, this is because of the wide spread and long-lasting impacts on a multitude of individuals, families, businesses, public services, and government operations; in other cases, effects may not be fully understood for some time, effectively lengthening the presence of the threat.

An attack can impact business revenue, services offered by state or local governments and other organizations, and the functionality of infrastructure and other physical systems. North Dakota has put a higher priority on building prevention systems and countermeasures to mitigate the impacts of this hazard, but the prevalence and varied approaches of cyberattacks means that this remains a threat.

In summary, the entire State of North Dakota is vulnerable to the impacts of cyberattacks. The impact of a cyber incident on various sectors of society will likely vary in severity, with people and first responders, property, facilities, infrastructure, and state operations being most affected with consequences ranging from critical to catastrophic.

3.7.3.9 Data Limitations / References

North Dakota Information Technology Department (NDITD) has cybersecurity and cyberattack plans in place for state government systems, but no statewide- or jurisdictional-level plan exists currently. Some key documents exist to inform this profile including but not limited to the following:

- Cybersecurity Task Force Report
- Incident Prevention/Response/Notification Standard
- 2016 security assessment of the state’s IT infrastructure by ManTech International Corporation
- 2017 North Dakota THIRA

3.7.4 Dam Failure

3.7.4.1 Description

A dam is any artificial barrier, including appurtenant works, which impounds or diverts water. Dam failure is defined as a sudden, rapid, and uncontrolled release of impounded water that can create a potentially significant downstream hazard. The purpose of dams includes storage of water for irrigation, hydroelectric power generation, flood control, water supply, fire protection, recreation, and wildlife habitat. Should a dam fail, the consequences can be devastating or minimal depending on the dam's characteristics and regional attributes.

Pursuant to North Dakota Century Code, the North Dakota State Engineer and the North Dakota State Water Commission have the power, authority and general jurisdiction to regulate, control, and supervise the construction and operation of dams within the State of North Dakota. As such, North Dakota State Water Commission administers the Dam Safety Program.

Most dams are classified based on the potential hazard to life and property should the dam suddenly fail. Note the hazard rating is not an indicator of the condition of the dam or its probability of failure. The following hazard categories have been established for North Dakota according to North Dakota Administrative Code § 89-08-01-01:

- Low Hazard: These dams are located where there is little possibility of future development such as rural or agricultural areas. Failure of low hazard dams may result in damage to agricultural land, township and county roads, and non-residential farm buildings. No loss of life is expected if failure occurs.
- Medium (Significant) Hazard: These dams are in predominately rural or agricultural areas where failure may damage isolated homes, main highways, railroads, or cause interruption of minor public utilities. The potential for the loss of a few lives exists if the dam fails.
- High Hazard: These are dams located upstream of developed and urban areas where failure may cause serious damage to homes, industrial and commercial buildings, and major public utilities. There is a potential for the loss of more than a few lives if the dam fails.

There are many potential causes for dam failure including: overtopping caused by floods that exceed the capacity of the dam, deliberate acts of sabotage, structural failure of materials used in dam construction, movement and/or failure of the foundation supporting the dam, settlement and cracking of concrete or embankment dams, piping and internal erosion of soil and in embankment dams, and inadequate maintenance and upkeep (FEMA, 2018). Earthquakes can also contribute to dam failure, weakening the foundation and support, causing cracks in the foundation. The causes behind a dam failure can be interrelated and complex. The most common causes of failure of earthen embankment dams are overtopping and seepage related issues; except for a few small concrete low head dams, all dams in North Dakota are earthen embankment dams.

A dam can be overtopped during a flood event due to insufficient reservoir storage and insufficient spillway capacity. Dams are susceptible to failure when overtopped. Erosion of auxiliary spillways can also occur during flood events.

All dams have some seepage occurring through the embankment and foundation. Seepage, if uncontrolled, can cause piping and internal erosion where soil is eroded from inside the embankment or foundation of an earthen dam. These conditions can lead to complete failure of the dam.

3.7.4.2 Previous Occurrences

There have been no previous occurrences of high or medium hazard dam failure in the State of North Dakota. However, there have been many previous dam failures throughout the United States that have resulted in loss of life and significant property damage. In North Dakota, there have been a number of past non-failure dam incidents, as well as failures of low hazard dams. As a result, dam failure is a hazard in the state. Additional details related to some of the non-failure incidents from the past ten years are provided below.

- **April 2018:** Erosion was noticed around the low-level outlet of the west embankment of Daub Dam, a medium hazard dam, also known as West Arroda Dam, in Oliver County. West Arroda Lake has been lowered to mitigate this situation until repairs can be made.
- **March 2015:** Tolna Dam, a medium hazard dam, in Nelson County experienced erosion underneath its concrete spillway. This was caused by water flowing underneath the spillway.
- **May 2013:** Dams in the Tongue River watershed in the northeastern corner of North Dakota experienced significant rainfall on top of reservoirs that were already full of heavy late season snow and late season snowmelt runoff. Several dams in that watershed experienced record high, or near record high reservoir levels. At Renwick Dam, a high hazard dam, in Pembina County, record high reservoir levels, combined with concern due to a highly erosive earthen auxiliary spillway, and the fact that the dam was under construction to replace the auxiliary spillway, resulted in the evacuation of approximately 1,300 people in the town of Cavalier. Olson Dam, a high hazard dam in Pembina County, and Bourbanis Dam, a medium hazard dam in Cavalier County, both experienced erosion damage to their earthen auxiliary spillways resulting from flow through the spillways.
- **April 2011**: Burlington Dam No. 1, a low hazard dam in Ward County built in the 1930s, was threatening failure under stress from the flooding.
- **2011 Flooding**: During this flood event, the spillway gates at Garrison Dam were opened for the first time since the dam was built in the 1950s. While the dam was not in any danger of failure, the record water levels were an historic event. Garrison Dam is a high hazard dam on the Missouri River owned by the USACE.
- **Spring 2010:** The spring runoff caused flow through the emergency spillway at Cottonwood Creek Dam again in the spring of 2010. The emergency spillway again experienced some erosion damage, but to a lesser degree than in 2009. Absaraka Dam (Swan Buffalo Detention Dam No. 12), a medium hazard dam in Cass County, also experienced damage to the emergency spillway.
- **Spring 2009:** Both Clausen Springs Dam and Cottonwood Creek Dam experienced a significant amount of flow through their emergency spillways due to spring runoff. Clausen Springs Dam is a high hazard dam located in Barnes County. Cottonwood Creek Dam is a medium hazard dam located in LaMoure County. The emergency spillways at both dams experienced major erosion, but neither dam failed. Absaraka Dam (Swan Buffalo Detention Dam No. 12), a medium hazard dam in Cass County, also experienced damage to the emergency spillway.

3.7.4.3 Location and Extent

Dams are located throughout the entire State of North Dakota. There are currently 3,151 known dams in North Dakota's dam inventory (NDSWC, April 2018). Of these, 48 dams are currently classified as high hazard and 82 are currently classified as medium hazard, meaning that there is the potential for loss of life or significant property damage downstream if one of those dams were to fail. The remaining 3,021 are currently classified as low hazard or undetermined hazard. Figure 3.7.4-1 through Figure 3.7.4-5 show the location of all dams currently classified as high and medium hazard dams in North Dakota.

The risk of a dam failure is related to many factors including the design of the dam, hydrologic conditions that may occur, the age of the dam, and how well the dam has been maintained. Older dams may need to be rehabilitated to be brought into compliance with current dam safety standards. Throughout the life of a dam, proper maintenance is essential to keep the dam functioning as designed. As dams age, components of the dam can begin to deteriorate, increasing the relative risk of failure. Many of the dams in North Dakota are 50 years old or more, and proper maintenance and repair is critical to keep these structures safely functioning. Many of the larger dams in the state are reaching the end of their design life. More than 60% of dams in the state capable of storing more than 1,000 acre-feet of water are 50 years old or more and more than 80% are more than 40 years old. Dam owners are responsible for maintenance of their dams, so their commitment is essential to reducing the risk of dam failures.

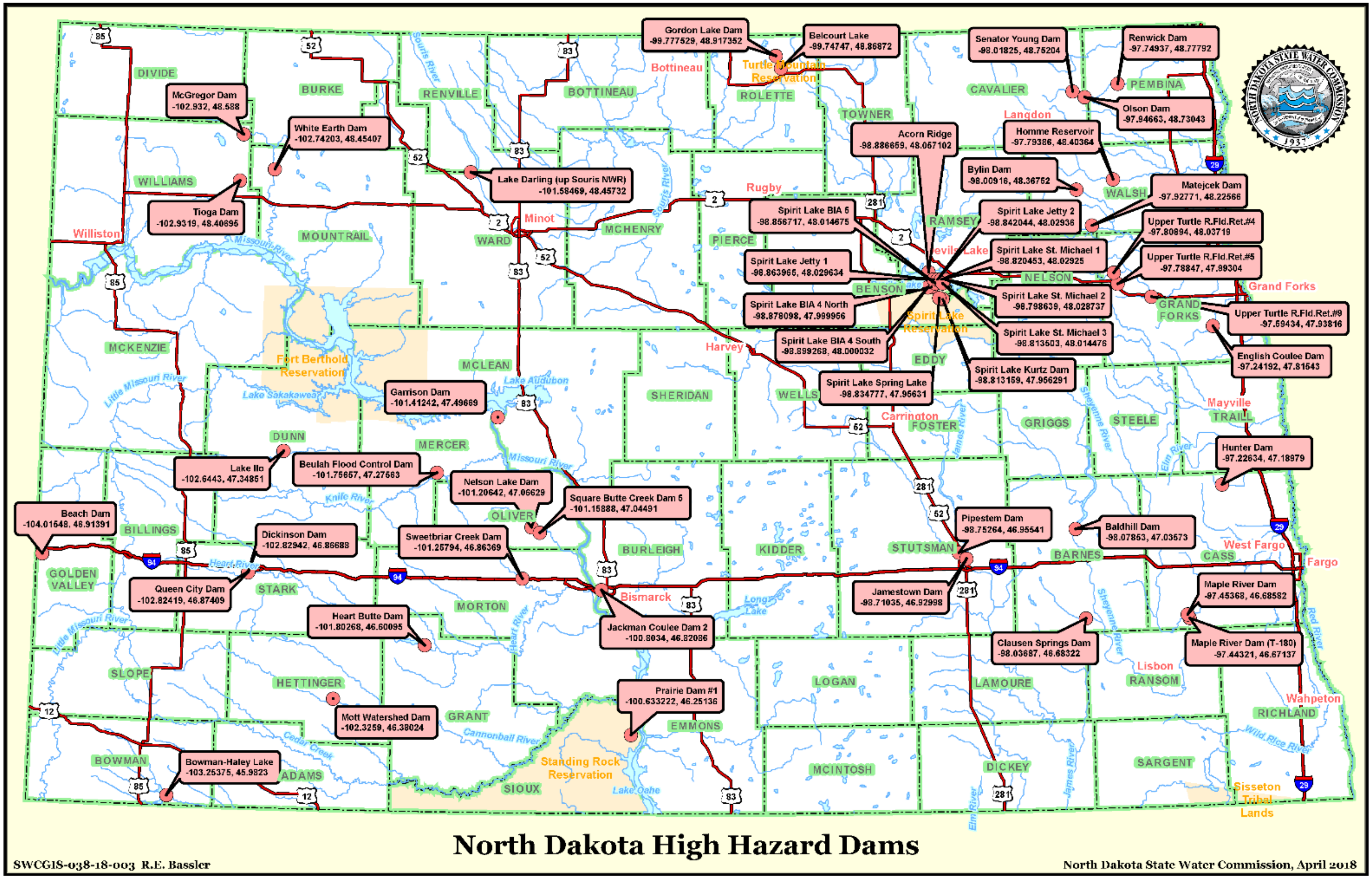
In recent years, Roads Acting as Dams (RAADs) have been a problem in the Devils Lake Basin. RAADs are roads that hold water back and act as a dam, but that were not designed as a dam. Previously, there were four RAADs in the Devils Lake area. 1) ND 20 at Spring Lake, 2) ND 20 at Geske's Curve, 3) ND 20 at Acorn Ridge, and 4) ND 57 south of the Casino. However, these have been resolved as follows:

- ND 20 at Spring Lake – ND 20 was raised to an elevation of approximately 1461 ft and it was also equalized so it no longer acts as a dam.
- ND 20 at Geske's Curve – The Spirit Lake Nation built a perimeter dam that now protects ND 20 to an elevation of around 1460. This section of ND 20 no longer acts as a dam as culverts were reestablished.
- ND 20 at Acorn Ridge – ND 20 was constructed as a dam as part of the City of Devils Lake levee protection. This is a High Hazard Dam in Ramsey County and is indicated as Acorn Ridge Dam.
- ND 57 south of the Casino – ND 57 was raised to its ultimate elevation of 1,465 ft and it was also equalized so it no longer acts as a dam.

The Spirit Lake Nation has several perimeter dams and roads that were constructed as dams throughout the reservation. These dams are not built to their design elevation. Additional money is needed to improve these dams to meet design elevation requirements.

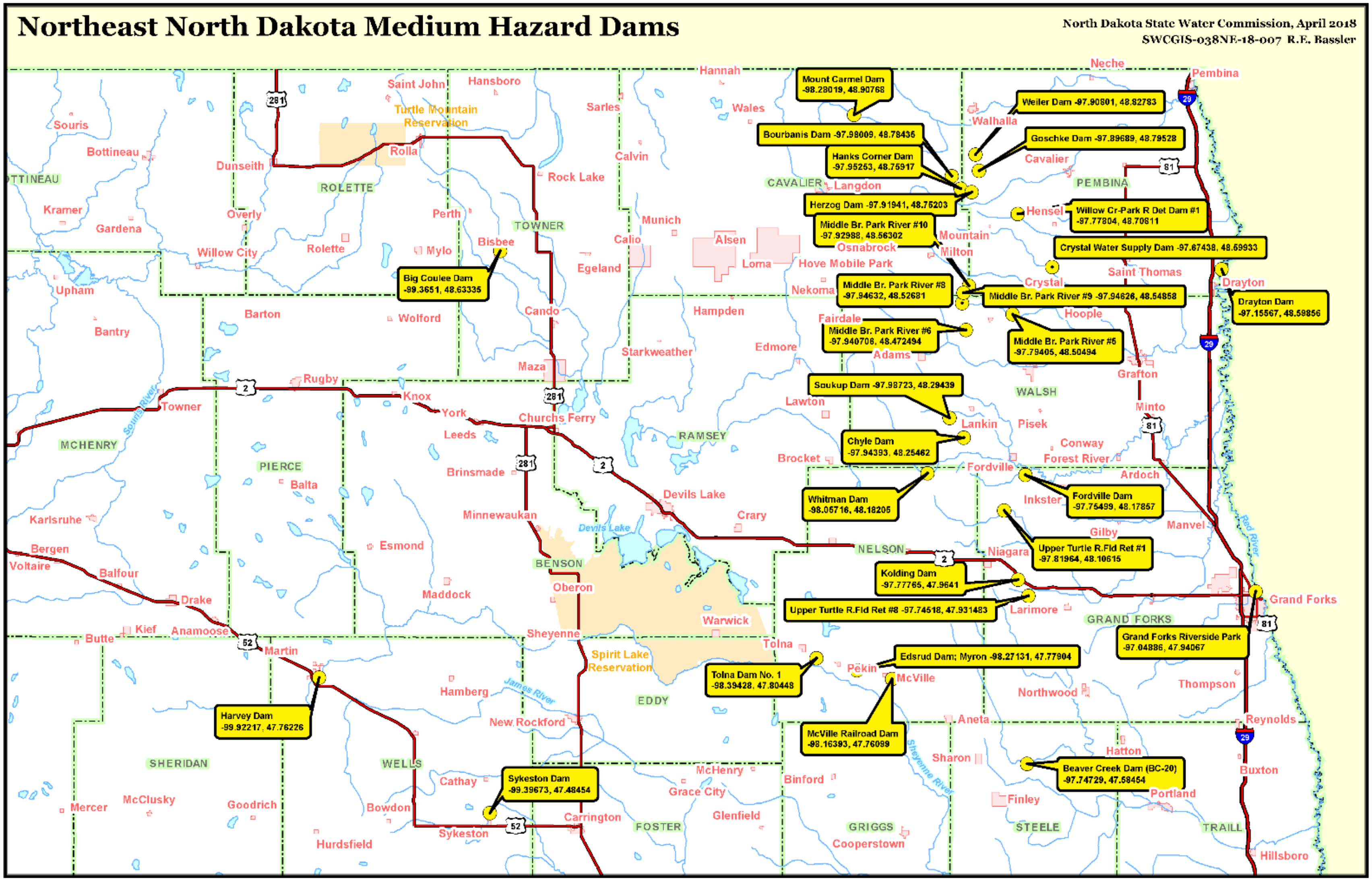
Although North Dakota has very low risk to seismic activity, the U.S. Army Corps of Engineers has strong motion sensors installed at the Garrison Dam site near Riverdale that measure intense ground movement. There are an additional three seismic monitoring stations throughout the State. One is located south of Bismarck near Huff, another in the Red River Valley just northwest of Fargo, and the third southeast of Devils Lake near Maddock.

Figure 3.7.4-1 North Dakota High Hazard Dams



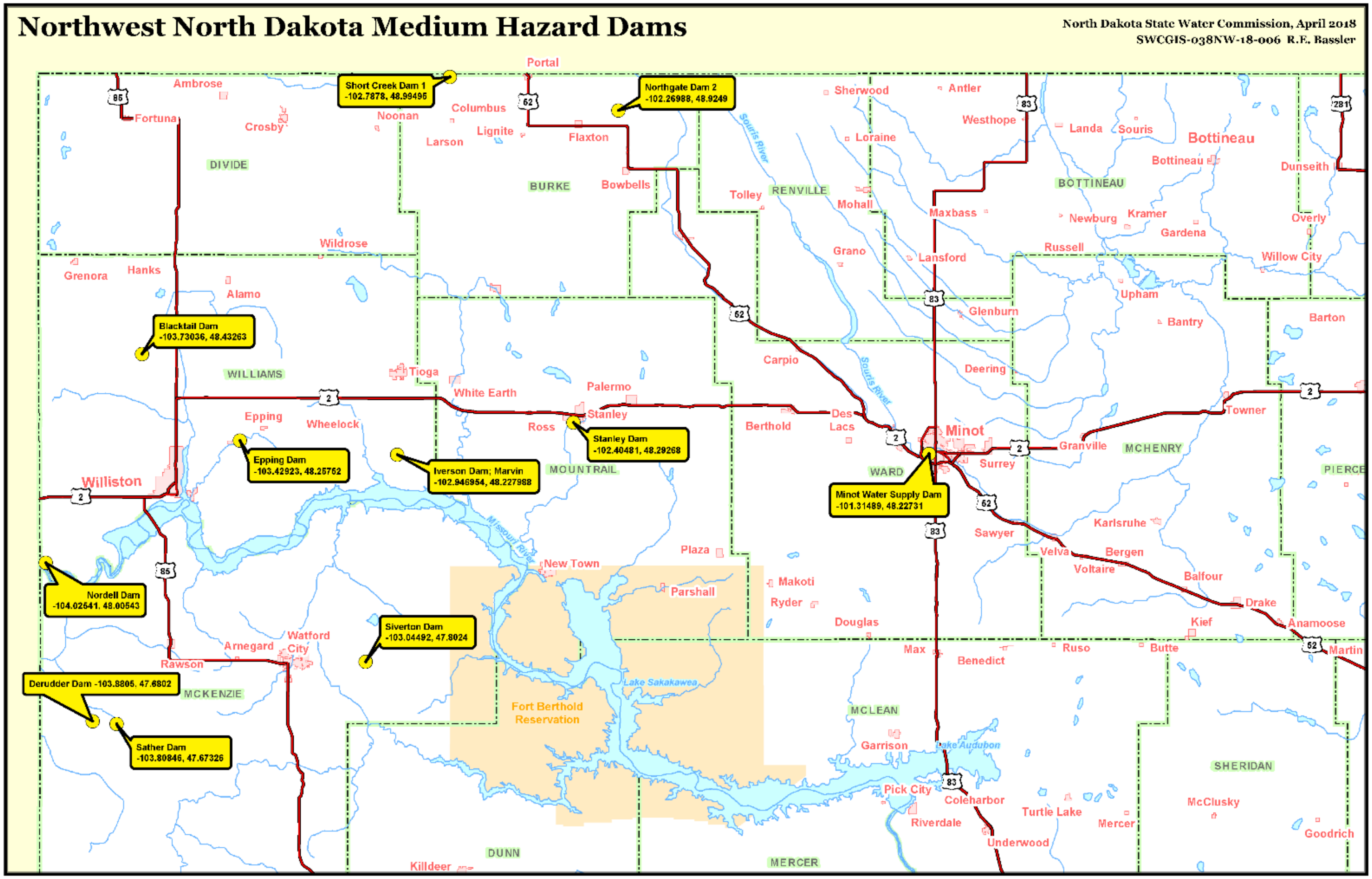
Source: North Dakota State Water Commission, 2018

Figure 3.7.4-2 Northeast North Dakota Medium Hazard Dams



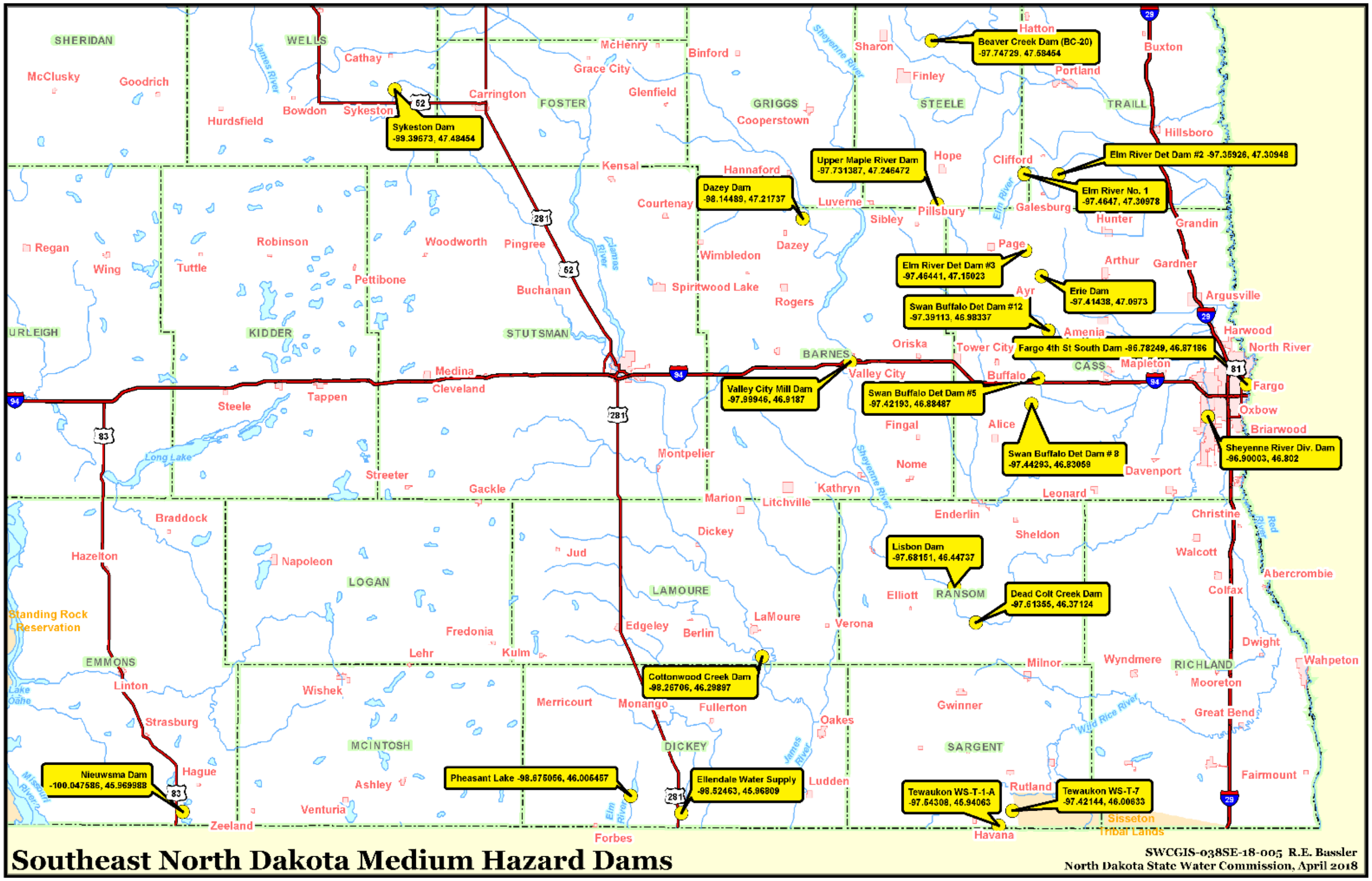
Source: North Dakota State Water Commission, 2018

Figure 3.7.4-3 Northwest North Dakota Medium Hazard Dams



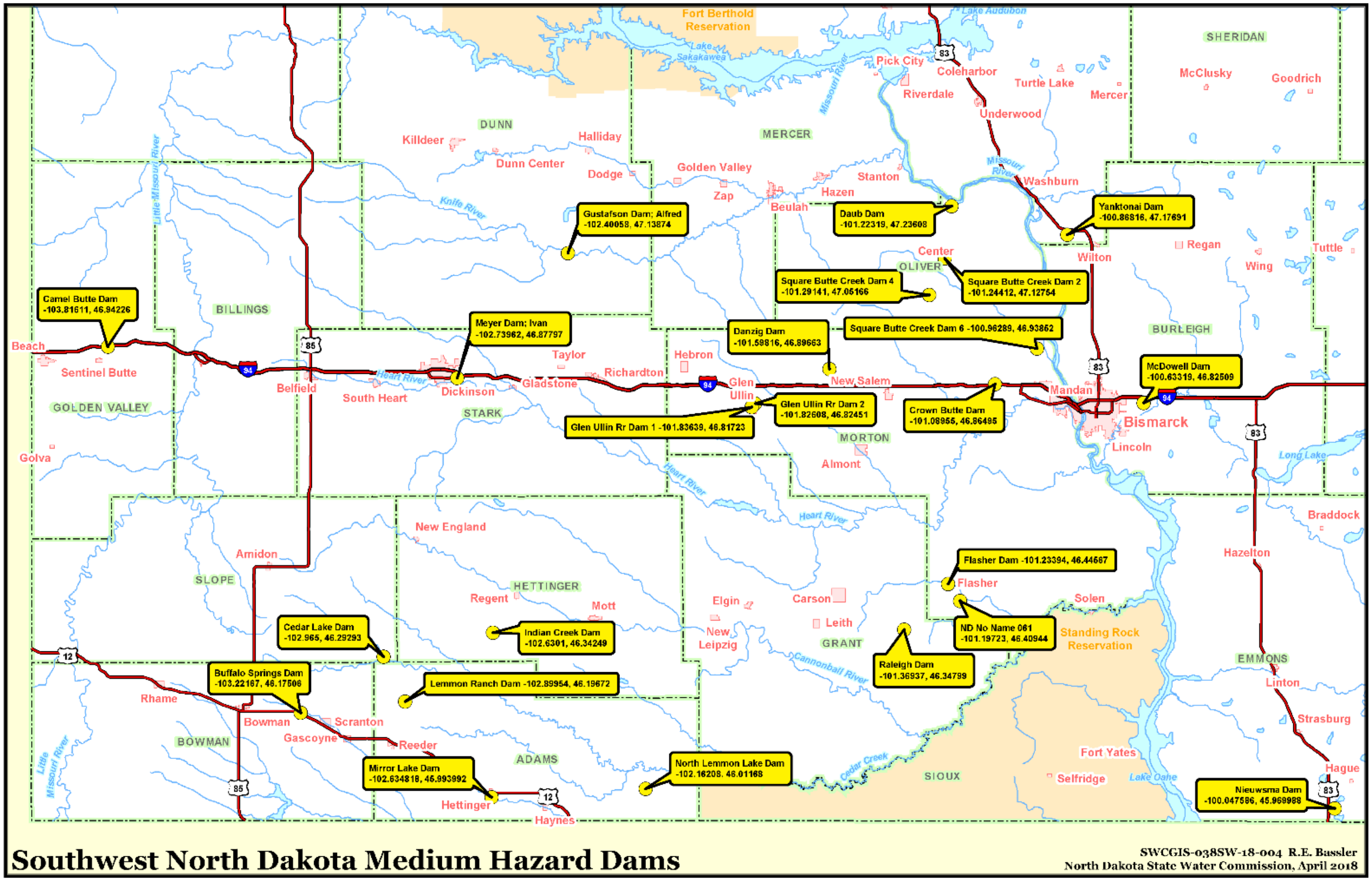
Source: North Dakota State Water Commission, 2018

Figure 3.7.4-4 Southeast North Dakota Medium Hazard Dams



Source: North Dakota State Water Commission, 2018

Figure 3.7.4-5 Southwest North Dakota Medium Hazard Dams



Source: North Dakota State Water Commission, 2018

Table 3.7.4-1 shows high and medium hazard dams by owner type. The federal government owns the highest hazard dams, while local government owns the most medium hazard dams. In total, local governments own the most high and medium hazard dams, with 87 total.

Table 3.7.4-1 Number of High and Medium (Significant) Hazard Dams by Owner Type

Owner Type	# High Hazard Dams	# Medium Hazard Dams	Total
Federal	23	1	24
Local	22	65	87
Private	0	6	6
Public Utility	1	0	1
State	2	10	12
Total	48	82	130

Source: North Dakota State Water Commission, 2018

Table 3.7.4-2 provides an overview of the spatial extent of impacts to various resources from dam failure.

Table 3.7.4-2 Spatial Extent of Dam Failure Impacts

Resources	Extent of Impact
People	Local
Property	Local
Infrastructure	Local
Government Operations	Regional
Environment / Natural Resources	Regional
Cultural Resources	Local

3.7.4.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. In the result of a dam failure, the impacts to the public, continuity of operations, property, facilities, and infrastructure, the environment, and public confidence in government the highest.

Table 3.7.4-3 Dam Failure Consequence Analysis

Dam Failure Impacts	
Public	Dam failure will cause major impacts to the public living in the inundation zone. Flooding due to dam failure can cause human death and/or injury.
Responders	Responders would be highly impacted by high floodwaters caused by dam failure because it would limit their ability to rescue those in the inundation zone. The rapidly moving water may also cause danger to the responders.
COOP	Depending on the location of the dam failure, transportation, water treatment and supply, energy supply, and emergency services could be highly impacted which may affect COOP.
Delivery of Services	Depending on the location of the dam failure, transportation, water treatment and supply, energy supply, and emergency services could be highly impacted. The impact on delivery of services would be extremely dependent on where the dam failure is located.
Property, Facilities, and Infrastructure	All property, facilities, and infrastructure located in the inundation zone may be damaged by flooding. Depending on the dam size and location, the extent of the impact varies.

Dam Failure Impacts	
Environment	Flooding can be an important part of the health of rivers, however because of the nature of inundation zones, areas that do not commonly experience riverine flooding may flood if a dam fails causing potential damage. Additionally, dam failure can highly impact animals and wildlife. They can drown or suffer from lack of food in the case of dam failure.
State Economy	Depending on the location of the dam failure, North Dakota industries could be highly impacted. Agricultural areas of North Dakota exist in the inundation zone of dam failures – if flooded, crops could be lost leading to reduced profits or the planting season could be delayed. Additionally, larger businesses that exist in inundation zones could have damage to facilities or products which results in loss of profits.
Public Confidence in the State's Governance	Failure of government infrastructure will directly impact the public's confidence in state governance. The public largely expects dams to work and not fail. Given this situation, particularly if dam failure results in a huge amount of property damage or loss of life, the public may lose confidence in state governance.

3.7.4.5 State Risk Assessment

Probability

The probability of dam failure probability is relatively low in North Dakota based on the minimal history of significant events and the regular inspection and upkeep of the high hazard dams. Should a high or significant/medium hazard dam fail, that event would be considered a high magnitude event. The probability of a dam failure is very site-specific and dependent on numerous factors, each with their own probability such as the probability of a flood event capable of overtopping a dam. The design and condition of the dam also factors into the probability of failure.

Vulnerability Assessment

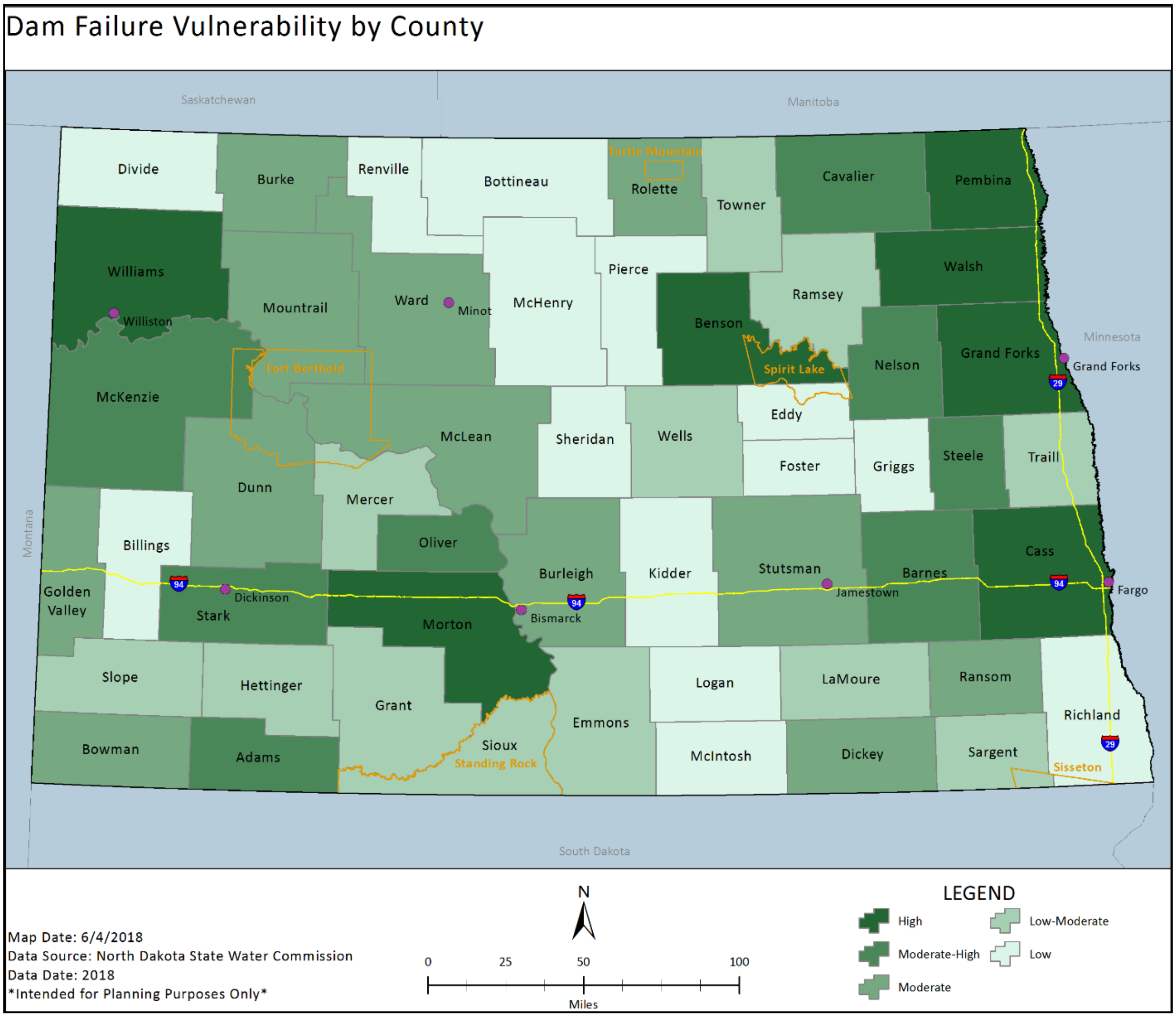
To complete an analysis of vulnerability to dam failure as well as attempt to describe vulnerability in terms of the jurisdictions most threatened by dam failure, points were assigned to each type of dam and aggregated for a total point score for each county. Points were assigned as follows for each dam:

- Medium Hazard Dams, two points,
- High Hazard Dams, three points,
- High and Medium Hazard Dams without an Emergency Action Plan (EAP), an additional two points

Figure 3.7.4-6 displays these results in a statewide thematic map. This analysis does not intend to demonstrate vulnerability in terms of dam structures that are likely to fail, but rather provides a general overview of the counties that have a high number of dams, with weighted consideration given to dams whose failure would result in greater damage. Additionally, it is recognized that failure of dams can impact adjacent downstream counties. This is a recognized data limitation. Actual inundation areas would be needed to fully resolve this limitation. Table 7.4.2-2 in Appendix 7.4.2 provides the full results of the dam failure vulnerability analysis.

According to this analysis, the counties with high exposure to dam failure are: Williams, Walsh, Grand Forks, Pembina, Morton, Cass, and Benson. The highest concentration of counties with high exposure are located along North Dakota's eastern border. Benson County is considered the most vulnerable, with 10 high hazard dams. It is recognized that this method of determining vulnerability has its limitations. For example, Stutsman County has two high hazard dams immediately upstream of Jamestown but did not have a high vulnerability score. A more accurate method would be to calculate potential losses based on inundation mapping. However, statewide data is not available in a GIS format to allow this type of analysis to be accomplished.

Figure 3.7.4-6 : Dam Failure Vulnerability by County



Upstream dams in adjacent states/provinces can also impact North Dakota in the event of failure depending on their proximity to North Dakota as well as the volume of water that they hold. Table 7.4.2-1 in Appendix 7.4.2 lists the high hazard dams with a minimum 1,000-acre foot of storage within 40 miles (as the crow flies) upstream of the North Dakota border. Due to the volume of the Fort Peck dam in Montana, it was also included in this analysis even though it is more than 100 miles away. It should be noted that this analysis provides only a broad overview of upstream dams with the potential to impact North Dakota in the event of failure. This analysis revealed several dams in Montana and the Canadian province of Saskatchewan that could impact downstream communities in North Dakota if a dam failure were to occur. This analysis is not based on specific inundation studies which would provide more accurate results.

State Assets and/or Critical Facilities at Risk

The high and medium hazard dams, by definition, have the potential to destroy property downstream, including State-owned property. Without specific inundation zone data in GIS format it is not possible to determine specific facilities that may be at increased risk to dam failure. Therefore, assessing the vulnerability of a specific structure can only be done on a case-by-case basis.

Like State-owned buildings, critical facilities and infrastructure may also be vulnerable to dam failure. More specifically, if in the inundation area, any building is susceptible to damage from flood waters.

Other State-owned infrastructure, particularly State highways and bridges could be vulnerable to damage in dam failure inundation zones.

Table 3.8-1 and Table 3.8-2 provide a summary by county of State-owned and operated facilities and critical facilities as well as other critical facilities. This summary table also indicates the Overall Vulnerability Rating for each hazard, where applicable. For additional details on State-owned facilities and other critical facilities in North Dakota, see Section 2.

Loss Estimates

GIS analysis of populations and development in dam inundation areas would provide the most accurate results in terms of estimates of potential loss in the unlikely event of failure. However, GIS-based inundation maps for State-regulated and federal dams are not readily available to determine loss estimates based on inundation areas. As inundation maps are developed for significant and high hazard dams, local HMPs should work to develop potential loss estimates for dam failure events. At this time, it is not anticipated that a statewide dam inundation layer will be developed. Therefore, the State will rely on potential loss estimates generated in local plans for this hazard.

In 2012, the National Science Foundation (NSF) provided funding through the Integrated Geospatial Education and Technology Training (iGETT) program to Williston State College in North Dakota. With these funds, the college chose to conduct a study of the damage and loss estimates to Williston, North Dakota as the result of a catastrophic dam failure of Ft. Peck Dam. Ft. Peck Dam, in Montana, is located upstream from North Dakota and would impact portions of the State in the event of failure. A summary of the results of this study are provided below:

- Estimated arrival of flood waters—33.6 hours after dam failure.
- Estimate of 3,337 of 5,868 parcels lost (nearly 57%).
- Estimated value of parcels lost $287,290,274.

3.7.4.6 Future Conditions

Successful mitigation of dam failure requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future dam failure risk. A dam failure could inundate cropland and adversely impact ecosystems.

Climate Change

An increase in high intensity precipitation events in North Dakota from climate change may put more dams at risk to conditions that exceed the original design criteria of aging dams. According to NOAA, since 1991, rainfall during heavy precipitation events has been significantly above average in the Great Plains. Over the next several decades, heavy downpours are likely to account for an increasing percentage of all precipitation events. These changes in precipitation patterns may not have been accounted for in the original construction of dams, and along with current dam safety concerns such as lack of maintenance, aging dams, and funding for repairs, may increase the risk of dam failure in North Dakota. Additionally, an increase in overall precipitation and an increase in high intensity precipitation events from climate change in North Dakota can add to the risk of dam failure, which may impact State-owned assets and critical facilities.

Changes in Development

As detailed in Section 2, according to future population projections, the State has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Increased development can put more people at risk to hazards across the State, so understanding future development trends is an important tool for hazard mitigation.

New and future development in North Dakota is generally at risk from dam failures. There are limited State, Tribal, or Local laws that prohibit or mitigate new development from taking place in dam inundation areas.

North Dakota Century Code Section 61-02-81, which became effective on August 1, 2017, prohibits state financial assistance for dam improvements necessitated by development in breach inundation zones. An additional exception are those areas that are also within the designated floodplain. In many cases, dam flood waters will flow along floodways encompassing the floodplain, but often, the waters can extend far beyond the mapped floodplain areas. Therefore, the very highest hazard areas for dam failures, in the floodplain, are regulated in most cases. Some dams are on streams that may not have mapped floodplains which presents challenge for understanding the full extent of risk. Future development outside the floodplain may also be at risk should a large dam fail.

Table 7.4.2-3 in Appendix 7.4.2 compares the projected population change from 2010 to 2030 and vulnerability to dam failure by county, based on the vulnerability assessment above. It should be noted that the vulnerability assessment is limited in scope and does not incorporate potential loss information that could alter the results of the analysis. McKenzie County is projected to experience the highest population growth, with an increase of 269%, and a moderate-high vulnerability to dam failure. Williams County is projected to experience the second-highest population growth, at 165%, and a high vulnerability to dam failure. Such large increases in people can create rapid development of housing and other infrastructure in areas downstream from dams, also known as hazard creep. Hazard creep downstream of existing dams was determined to be one of the top dam safety concerns according to the State Water Commission's dam safety program. The five counties with the highest population growth, McKenzie, Williams, Mountrail, Dunn, and Stark respectively, all have moderate, moderate-high, or high vulnerability to dam failure.

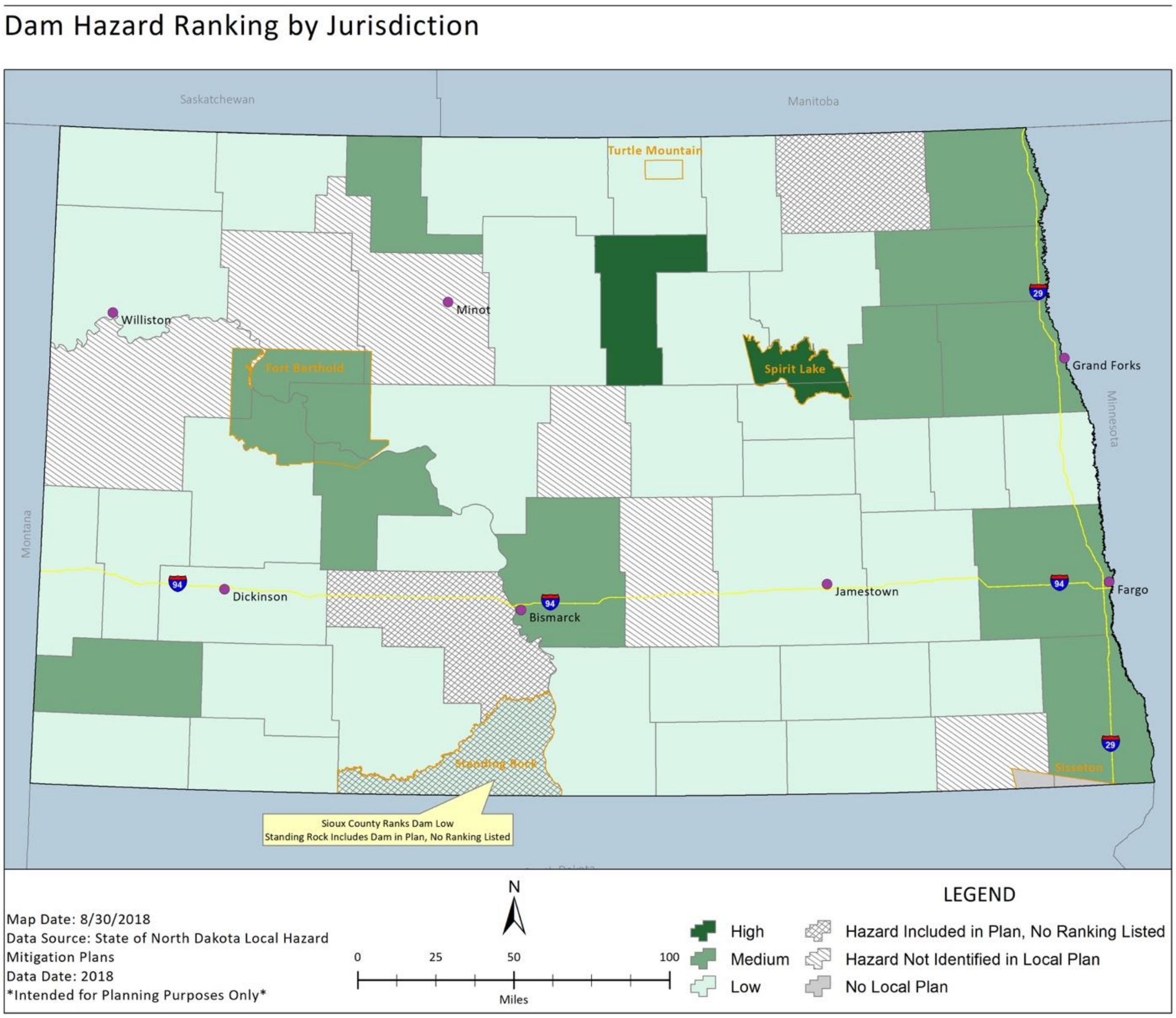
In the absence of maps of inundation areas, State assets will continue to be at risk to dam failure in the future. Additionally, an increase in overall precipitation and an increase in high intensity precipitation events from climate change in North Dakota can add to the risk of dam failure, which may impact State-owned assets and critical facilities.

3.7.4.7 Jurisdictions at Risk

51 of 58 local and tribal HMPs profile dam failure. Figure 3.7.4-7 presents a summary of those plans and identifies how they ranked the overall risk presented by dam failure. Two jurisdictions ranked dam failure as a high hazard, 10 as medium, 36 as low, and three plans identified dam failure as a hazard, but did not provide a ranking. The two jurisdictions that ranked dam failure are Pierce County and Spirit Lake reservation. Seven plans did not identify dam failure as a hazard. This ranks dam failure as the number 10 out of 14 hazards according to North Dakota local HMPs.

Table 7.4.2-4 in Appendix 7.4.2 includes a compilation of available hazard ranking and loss information, when available, for dam failure as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. Common losses mentioned by jurisdictions are structural, agricultural, and injuries/loss of life.

Figure 3.7.4-7 Dam Failure Ranking by Jurisdiction



3.7.4.8 Summary / Conclusion

Following this plan's risk assessment methodology, the dam failure risk factor score was 2.34, which is a moderately ranked hazard on a scale of one to four, where four is the highest risk threat. The full results of this assessment can be seen in Table 3.3-9 in Section 3.3.4.

In summary, although the overall occurrence of dam failure is low, an event could be catastrophic. Ongoing dam safety concerns such as lack of maintenance, aging dams, funding for repairs, and hazard creep downstream of existing dams, lead to an increase risk of a dam failure event. Additionally, changes in precipitation patterns from climate change may put more dams at risk to conditions that exceed the original design criteria of aging dams. These factors make it imperative to include dam failure in hazard mitigation planning to reduce the risk to North Dakota.

Committee members emphasized the importance of addressing issues related to dam failure preparedness. Importantly, this includes advancing inundation mapping in North Dakota. The committee discussed how there are some funding barriers to utilize technology to have widespread coordinated inundation mapping. However, members also discussed how there is also a barrier in sharing of GIS data between agencies to make data easy to access. The committee also discussed promoting EAPs. Currently for private high/medium hazard dams, there is little pressure for owners to create EAPs. The committee discussed finding methods of encouraging all high/medium hazard dams to have EAPs developed and updated.

Additionally, the committee discussed communities living in the inundation zones, and methods of limiting development and ensuring that the population knows that they are living in the inundation zone of a failed dam. The committee discussed the power of zoning, and the challenge of zoning being developed and enforced at the local level. Educating local officials on the importance on developing zoning codes with awareness of hazards should be a priority. Moreover, better enforcement of in place regulations will support hazard mitigation practices. Furthermore, educating the public on issues of dam failure will be critical for reducing risk to dam failure hazards. Utilizing methods such as sirens or text alerts to inform the public about failed dams will be useful. But the committee also discussed identifying members of the public living in the inundation zone to ensure that they are educated on the risks of dam failure.

Lastly, as discussed throughout this section, many of North Dakota's high and medium hazard dams are reaching the end of their life cycle. Funding needs to be allocated to keep North Dakota's dam infrastructure in good condition.

3.7.4.9 Data Limitations / References

Emergency action plans and digital data outlining the inundation areas of all high hazard dams in the state would allow for potential loss estimates. This analysis would provide detailed figures on the number of structures and residences in the hazard area. Combined with digital point data for state-owned buildings and critical facilities and infrastructure, a more accurate estimate of potential losses could be derived. A listing of deficient dams based on state or federal inspections would also allow for a current analysis of dam failure probabilities and establish a clearer prioritization scheme.

Other key documents related to the Dam Failure hazard include:

- Individual Dam Emergency Action Plans
- North Dakota Dam Design Handbook (currently under revision)
- North Dakota State Emergency Operations Plan, Dam Failure Annex

3.7.5 Drought

3.7.5.1 Description

Drought is a condition of climatic dryness severe enough to reduce soil moisture below the minimum necessary for sustaining plant, animal, and human life systems. Drought characteristics usually include precipitation levels well below normal and temperatures higher than normal.

Scientifically, drought can mean many things to many people, depending on the discipline and perspective of the individual. Operational definitions are used to help quantify the beginning, end, and degree of severity of a drought. The National Drought Mitigation Center defines the following different types of droughts:

- Meteorological drought is usually an expression of precipitation's departure from normal over some period. These definitions are usually region-specific, and presumably based on a thorough understanding of regional climatology.
- Agricultural drought occurs when there isn't enough soil moisture to meet the needs of a crop at a time. Agricultural drought happens after meteorological drought but before hydrological drought. Agriculture is usually the first economic sector to be affected by drought.
- Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as streamflow and as lake, reservoir, and groundwater levels. There is a time lag between lack of rain and less water in streams, rivers, lakes, and reservoirs, so hydrological measurements are not the earliest indicators of drought. When precipitation is reduced or deficient over an extended period, this shortage will be reflected in declining surface and subsurface water levels.
- Socioeconomic drought occurs when physical water shortage starts to affect people, individually and collectively. Or, in more abstract terms, most socioeconomic definitions of drought associate it with the supply and demand of an economic good.
- Likely probability generally means there are various ways to interpret the information, we have alternative views, or the information is credible and plausible but not corroborated sufficiently.

Under drought conditions, topsoil crumbles and is lost due to wind erosion. Streams, ponds, and wells often dry up and water levels in lakes and rivers drastically fall, creating severe strain on vegetation, wildlife, and livestock. Although the agricultural economy may be more negatively impacted, urban economies are also constrained when the amount of domestic and industrial water is in short supply. Economic sectors such as recreation, oil and gas development, and agricultural food processing also rely heavily on the water supply levels in the state. Prolonged droughts have caused severe economic hardships in North Dakota. Effects of drought accumulate slowly but tend to persist over long periods of time.

Several drought indices are used to measure a drought's severity and any combination of these indices and others may be used to trigger a wide variety of response activities by governments, individuals, and organizations. Table 3.7.5-1 lists the more common indices and their use. Note that various response plans may address how these indices are used in response to a drought.

Table 3.7.5-1 Drought Indices

Index	Use
Percent of Normal	The percent of normal is a simple calculation well suited to the needs of television weathercasters and general audiences.
Standardized Precipitation Index (SPI)	The SPI is an index based on the probability of precipitation for any time scale.
Palmer Drought Severity Index (PDSI)	The Palmer is a soil moisture algorithm calibrated for relatively homogeneous regions.
Crop Moisture Index (CMI)	A Palmer derivative, the CMI reflects moisture supply in the short term across major crop-producing regions and is not intended to assess long-term droughts.
Surface Water Supply Index (SWSI)	The SWSI was originally designed to complement the Palmer in the State of Colorado, where mountain snowpack is a key element of water supply. The SWSI is calculated by river basin, based on snowpack, streamflow,

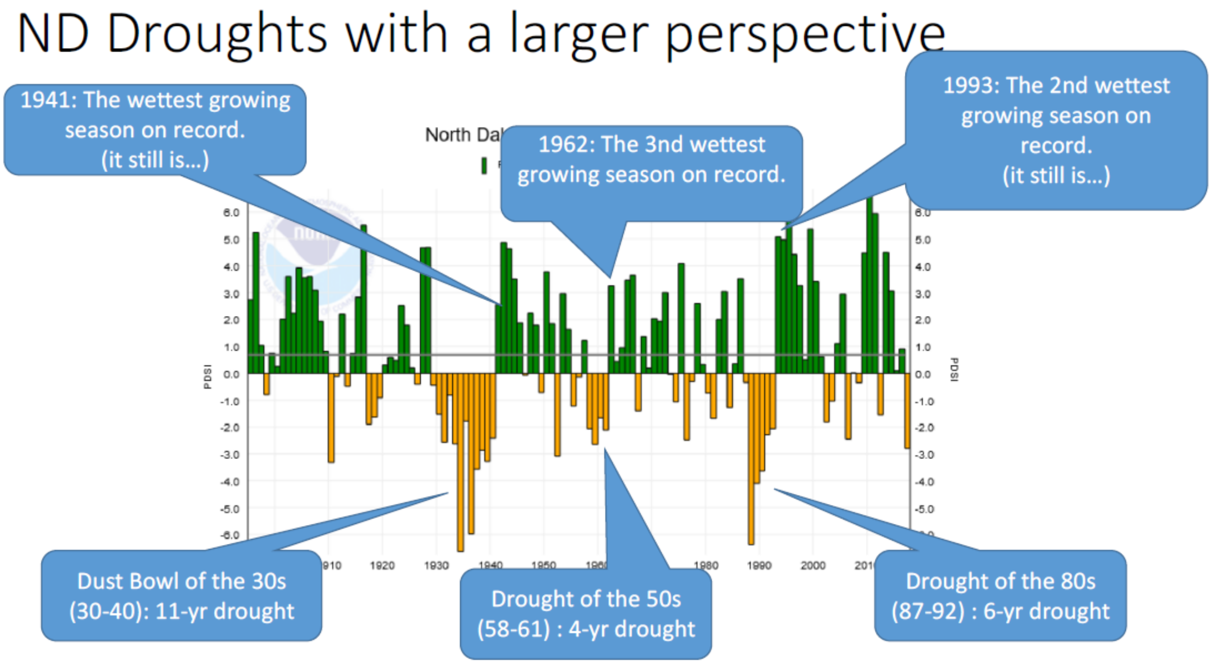
Index	Use
	precipitation, and reservoir storage. Other states have modified the SWSI for their areas.
Reclamation Drought Index (RDI)	Like the SWSI, the RDI is calculated at the river basin level, incorporating temperature as well as precipitation, snowpack, streamflow, and reservoir levels as input.
Deciles	Groups monthly precipitation occurrences into deciles so that, by definition, much lower than normal weather cannot occur more often than 20% of the time.
Drought Severity and Coverage Index (DSCI)	DSCI is useful tool to combine both drought coverage and drought severity for a given geographical area (county, climate division, state or the country). It allows the given drought a historical comparison among other years.
Accumulated Drought Severity and Coverage Index (ADSCI)	It is useful to assess the accumulated impact of the ongoing drought since the inception of the drought in terms of areal coverage and intensity combined. It captures the impact of multi-year droughts.
Evaporative Demand Drought Index (EDDI)	The EDDI maps use atmospheric evaporative demand anomalies across a timescale of interest relative to its climatology to indicate the spatial extent and severity of drought. Unlike the other indices, EDDI utilizes temperature data but not precipitation.
Quick Drought Response Index (QuickDRI)	QuickDRI represents a drought "alarm" indicator of emerging or rapidly changing drought conditions that can support drought severity assessment in combination with traditional, longer-term and/or application-specific drought indicators.

Several secondary hazards are generally associated with drought. Rural grassland fires increase due to dry vegetation. Reduction in vegetation will expose the soil to wind erosion. Reduced flow characteristics adversely affect water quality of lakes and rivers. Sediment transport regimes in streams and rivers are altered. Deterioration of water quality results in injury and death to plants and animals. Stagnant pools along rivers provide favorable habitat for insects, particularly mosquitoes. When normal rain patterns develop, the dry, unstable topsoil becomes vulnerable to gullies and flooding.

3.7.5.2 Previous Occurrences

Droughts cannot be defined with certainty as extremely dry periods often alternate with wetter than normal periods. Since 1930, North Dakota has suffered drought in the 1930s, 1950s, early 1960s, mid 1970s, early 1980s, 1988 through 1991, 2002 through 2004, 2006, 2008, 2012, and 2017. Figure 3.7.5-1 shows wet and dry periods on the PDSI scale in the State of North Dakota from 1895-2017.

Figure 3.7.5-1 Statewide Wet and Dry Periods 1895-2017

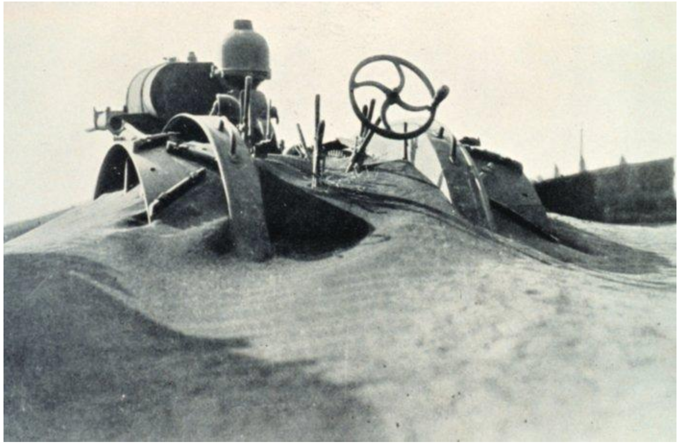


Source: North Dakota State Climate Office, 2018

The following describes significant drought events in North Dakota:

- <u>1930s Dust Bowl</u>: June 1929 was one of the driest on record in North Dakota, followed by continuing drought conditions throughout the 1930s. In 1936, North Dakota recorded its highest temperature of 121°F at Steele, North Dakota, on July 6, according to the State Historical Society of North Dakota. The Dust Bowl, as it is called, resulted in widespread drought conditions, soil erosion, and grasshopper infestations. This drought was exacerbated by poor farming practices, low market prices, and a depressed economy. Lessons learned during the 1930s drought stimulated the creation of governmental agencies to promote conservation, increased irrigation, and education stressing more flexible and diverse operations using improved management practices. The Federal Crop Insurance Program was established and institutions liberalized credit. The USDA, the North Dakota State Agricultural Experiment Station System, and agricultural colleges and universities began an intensified research effort. This resulted in technologies for control of soil erosion, soil moisture conservation, higher yielding grain varieties that could better withstand dry conditions, improved fertilizers, and better farm management techniques. Figure 3.7.5-2 shows a photo from 1935 when dust buried farm equipment in North Dakota.

Figure 3.7.5-2 Photo from 1935 during Dust Bowl in North Dakota



Source: National Weather Service, 1935.

- 1950s: The impact of drought in the early 1950s was less severe than the 1930s. The widespread financial distress, interstate migration, and regional disruption characteristic of the Dust Bowl era were largely absent. Strong emphasis was placed on water conservation and augmentation, weather modification research, weather prediction and control, groundwater recharge, irrigation and river basin development, evaporation control, desalination, phreatophyte control, and irrigation canal lining.
- 1970s and 1980s: 1976 was the driest year in North Dakota since the 1930s according to the State Historical Society of North Dakota. By 1988, the North Dakota Governor declared a statewide emergency because of the drought. Damage was not limited to agricultural losses. Public water systems and individual wells also began to dry up. Disaster damage in 1988 was estimated to be $3.5 billion, not including the cost of indirect impacts. In the 1970s and 1980s, response to drought by state and federal governments was characterized by provisions for livestock feed assistance, crop loss financial aid packages (deficiency and disaster payments), commodity stock adjustments, disaster credit and forbearance programs for agriculture producers and related small businesses, and some water-related assistance.
- 2000-2007: North Dakota soils were under some degree of drought for 78 consecutive months from December 2000 until mid-June 2007. The most severe drought occurred during July 2006 when 100% of the state experienced at least moderate drought status on the drought monitor scale. The conditions strained public water supplies and directly affected hydropower production. In 2007, drought cost the livestock industry more than $32 million. Grazing was reduced due to drought conditions, forcing producers to sell livestock as well as land, and many cattle did not survive. Also, approximately 45,000 acres of grassland burned, and 50% of counties were under burn bans throughout the summer. In Fargo, the clay beneath the city shrunk from lack of moisture leading to cracked sidewalks, driveways and streets. During this time, the United States Bureau of Reclamation (BOR) assisted several communities with low water levels. At Fort Yates, they assisted in relocating the water intake in 2004, and then installing an interim intake screen, intake pump, and an air burst system in 2005-2006, which is still in use. At Parshall, they paid for high service pumps, area pipelines and elevated water storage in 2005-2006. In Four Bears, White Shield and Twin Buttes, the BOR raised and exposed the existing backup intake

> ***Community Coffee Comments***
>
> The 2017 drought reminded retired farmers about past struggles with dry conditions during the 1980s and 2000s. Drought resulted in inadequate feed for livestock, dried wells and low dam levels. They worried about how greatly reduced yields would adversely impact their families' economic viability and the future of family farms. They experienced greatly diminished water quality and supply for livestock.

screens for their water treatment plants, as well as rip rap installation/repair at the intakes for both high and low water lake conditions in 2005-2006.

- 2012: Most locations across western and central North Dakota this year experienced it as one of the top ten warmest years on record, drier than normal conditions, and a snowfall deficit of over 10 inches. Several locations had their warmest March average temperature on record. The average temperatures in March were 12 to 14 degrees Fahrenheit above normal. The drought conditions deteriorated throughout the summer and fall, with below normal precipitation and abnormally dry conditions. In August and September, there were very high and extreme fire dangers in portions of southwest and south-central North Dakota. The west to northwest wind gusts were reported between 45 to 51 mph on several days. The drought conditions improved during November and December as the weather pattern transitioned into wetter than normal conditions.

Drought Impacts: Grant County Pasture

2016

2017

Source: NDSU Photo.

- 2017: Exceptional drought conditions returned to parts of North Dakota for the first time in more than a decade. The *U.S. Drought Monitor* placed the state at the epicenter of drought for the nation. Approximately six percent of North Dakota was in the exceptional drought category. A combination of prolonged hot temperatures and minimal precipitation contributed to the "flash drought" across the northern plains. Bismarck, North Dakota saw high temperatures of 90 degrees or hotter on 11 of the first 18 days in July. Cities including Dickinson and Minot saw the driest year-to-date precipitation values as of July 18, 2017. Impacts included a poor to very poor condition of spring wheat crop, livestock water holes drying up, and cattle losing weight due to lack of grazing land (Dolce, 2017). The economic impact totaled $2.5 billion. As of early 2018, it is likely that the 2017 drought conditions may continue in 2018.

Table 3.7.5-2 summarizes the billion-dollar droughts that have had significant impacts in North Dakota from 2002-2017.

Table 3.7.5-2 Billion-Dollar Drought Related Weather Disasters Involving North Dakota

Event	States Involved	CPI Adjusted Estimated Cost (in Billions)
2017 Drought	**ND**, SD, MT	$2.5
2012 Drought	AZ, CA, CO, IA, ID, IL, KS, MT MI MN, MO, **ND**, NE, NM, NV, OK, OR, SD, TX, UT, WA, WI, WY, AR, IN, and GA	$43.9
2008 Drought	AL, AR, CA, CO, GA, ID, IN, KS, KY, MD, MN, MS, MT, NC, **ND**, NJ, NM, OH, OK, OR, SC, TN, TX, UT, VA, WA, and WI.	$8.2
2006 Drought	**ND**, SD, NE, KS, OK, TX, MN, IA, MO, AR, LA, MS, AL, GA, FL, MT, WY, CO, NM	$7.4

Event	States Involved	CPI Adjusted Estimated Cost (in Billions)
2002 Drought	AZ, CO, AI, ID, IL, KS, MI, MN, MO, MT, **ND**, NE, NM, OR, SD, WA, and WI	$19.3

Source: NOAA, NCEI, 2018

According to the USDA Risk Management Agency, insured crop losses to farmers in the State of North Dakota from 2003 to 2017 because of drought conditions totaled $1,563,105,333. Table 3.7.5-3 shows crop insurance paid because of drought conditions by year for this time frame. The highest crop insurance payout was in 2008, followed by 2017 and 2013. This information is also reported and annualized by county in the State Risk Assessment Loss Estimate section for this hazard. Please note that this data only applies to insured crops. According to the *2011 North Dakota Crop Insurance Profile Report* issued by the USDA Risk Management Agency, 89% of North Dakota's row crops were insured in 2011. Some crops such as forage, millet, oats, rye, and safflower do not have high insurance coverage rates, and there are other crops that are not insurable, such as field hay, therefore additional non-quantifiable losses likely occurred.

Table 3.7.5-3 Insured Crop Insurance Paid by Year, 2003-2017

Year	Crop Insurance Paid
2017	$399,229,371
2016	$30,325,442
2015	$47,955,787
2014	$8,169,733
2013	$212,040,852
2012	$113,235,984
2011	$1,830,842
2010	$2,593,303
2009	$10,718,104
2008	$434,422,647
2007	$11,817,688
2006	$194,367,439
2005	$2,929,721
2004	$38,739,768
2003	$54,728,652
Total	**$1,563,105,333**

Source: USDA Risk Management Agency, 2018

FEMA's ability to utilize the President's Disaster Fund for drought relief to state and local interests is very limited in scope; however, the USDA declares Secretarial Disaster Declarations for agricultural disasters including drought. Secretarial Disasters are designated from a natural disaster and have a minimum of 30% production loss of at least one crop in the county. Table 7.4.3-1 in Appendix 7.4.3 lists all drought declared disasters and emergencies from 1976 through April 2018. Overall, North Dakota has experienced 74 drought disasters and emergencies, touching every county in the state.

3.7.5.3 Location and Extent

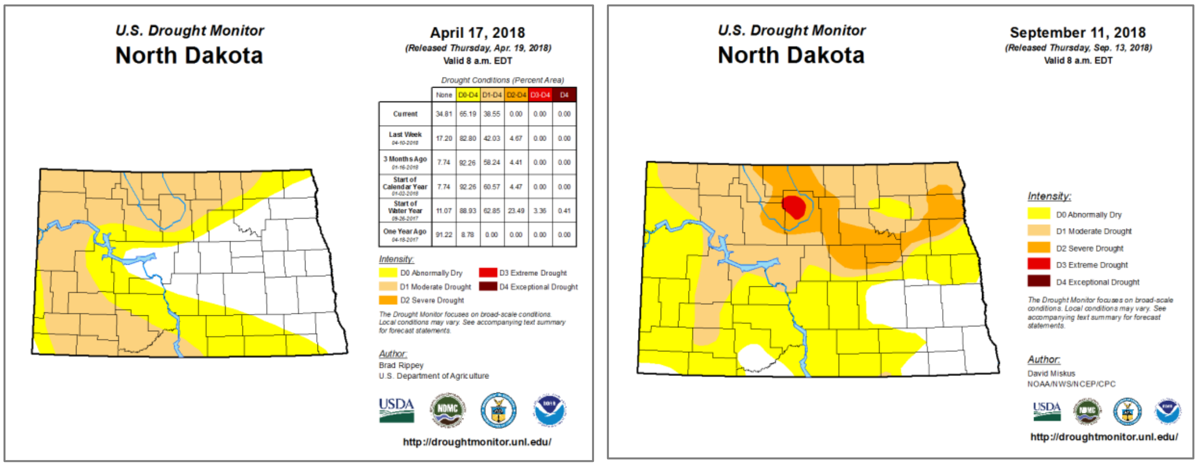
Drought is usually a regional hazard and any part of the state could be impacted in any given year. Table 3.7.5-4 reflects the fact that the spatial extent of impact due to drought on all major community sectors would be statewide.

Table 3.7.5-4 Spatial Extent of Drought Impacts

Resources	Extent of Impacts
People	Statewide
Property	Statewide
Infrastructure	n/a
Government Operations	Statewide
Environment / Natural Resources	Statewide
Cultural Resources	Statewide

Mapping of the current drought status is published by the U.S. Drought Monitor each Thursday (National Drought Mitigation Center, 2018a). As examples, Figure 3.7.5-3 shows drought conditions in North Dakota on April 17, 2018, compared to September 11, 2018. Much of the western portion of the state experienced abnormally dry or moderate conditions in April. However, by the end of summer, the most severe drought conditions can be found in the north central portion of the state. In general, every county in North Dakota is prone to experiencing drought conditions at different times of year, and from year to year.

Figure 3.7.5-3 Drought Conditions in North Dakota – April 17, 2018 to September 11, 2018



Source: The National Drought Mitigation Center, 2018a

Additionally, North Dakota has an extensive network of ground monitoring wells and surface water gauges. Ground water information, including hydrographs, recent water levels and chemistry conditions, are published by the North Dakota Southwest Water Authority (SWA) on its online map service tool (North Dakota State Water Commission, 2018). Daily streamflow conditions are maintained by the U.S. Geological Survey and can be found online (United States Geological Survey, 2018).

3.7.5.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. In-depth analysis of losses in hydrological, agricultural, and socioeconomic sectors can be found in Appendix 7.4.3, Table 7.4.3-3.

Table 3.7.5-5: Drought Consequence Analysis

Drought Impacts	
Public	Drought affects the public primarily with health and economic issues. Health issues include reductions in nutrition, increased respiratory ailments, and even loss of life due to heat stress, and suicides. Studies show that workers in farming, fishing, and forestry are already 3.4% more likely to commit suicide, which can be exacerbated by drought conditions adding additional stress (Knutson, 2018). People can also be impacted economically as well, experiencing losses from a reduction in the tourism industry, agricultural decline, and subsequent increases in food prices. Individuals with residential wells may also be impacted. Individual ground water users may have additional information regarding the vulnerabilities of their specific ground water systems. The levels at which specific areas begin to experience ground water impacts depend on the local ground soil and water conditions and the depth of the well.
Responders	An increase in wildfires or drought-related health issues could greatly impact first responders. Drought's statewide impact extent could put additional stress on resources, staffing, and responders. Reduced freshwater availability would also impact first responders' firefighting abilities.

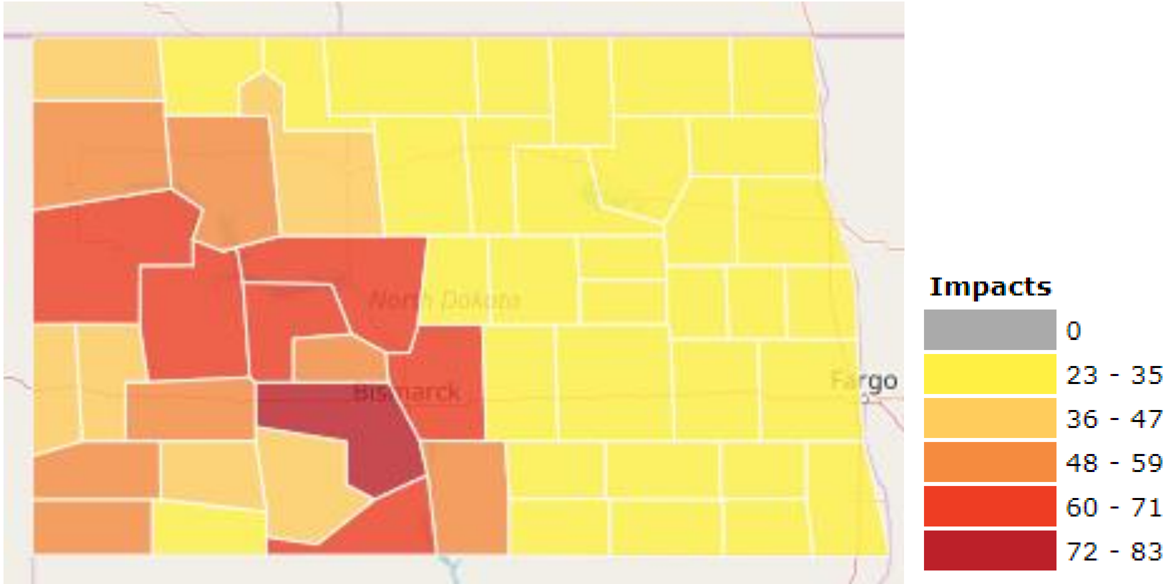
Drought Impacts	
COOP	Greater communication and time requirements would be expected of the Drought Unified Command Team during a time of drought. Continuity of Operations could be impacted if economic resources are depleted through reduced tax base or other economic impacts of drought. Energy-sector impacts could also have impacts on government operations. However, continuity of operations should experience limited impact from drought, unless power outages which prohibit operations and/or communication occur.
Delivery of Services	Government services could also be impacted through long-term drought events by the loss of revenue due to reduced tax base and economic impacts of drought. If public water supplies are lost, this would in turn negatively impact the function of state government services. Many surface water bodies in North Dakota have water supply intakes for municipal, industrial, and irrigation purposes. Low water levels can cause operations to cease and damage to systems can occur. Such problems can have serious consequences for municipal water supplies, electric power generation, and other critical industries such as agriculture. Irrigation is the top water user in the state followed by industrial users. Overall, delivery of services would have limited impact, unless extremes such as outages and reduction in goods and materials occur.
Property, Facilities, and Infrastructure	There is no anticipated impact extent for infrastructure and facilities. Limited impact to drought may be expected to property, facilities, and infrastructure. Energy-sector impacts could have secondary impacts on the facility operations. In addition to surface water supplies, ground water supplies can also be affected by drought, diminishing the water available from wells. Sixty percent of all North Dakotans rely on ground water for their primary source of drinking water, and that figure increases to 97% for rural populations. Should a public water or sewer system be affected, the losses could be into the millions of dollars if equipment is damaged and outside water is shipped in.
Environment	Reduced precipitation or low irrigation supplies may damage crops and reduce the amount of feed available for livestock. Non-irrigated croplands and rangelands are most susceptible to moisture shortages. Irrigated agricultural lands do not feel the effects as quickly, but their yields can also be greatly reduced, particularly if irrigation supplies are rationed. Drought can also lead to high mortality rates for animals, due to unavailability of feed or drinking water, disease, migration or concentration of animals, increased predation, as well as reduction or degradation to habitat. Drought also impacts the environment through decreased water levels, erosion, and water quality, causing land subsidence, groundwater depletion, reduced discharge, and even loss of wetlands. Erosion and lack of topsoil moisture can also disrupt biological processes for plants, which could subsequently impact wildlife and animals (Al-Kaisi, 2017). The lack of water can also lead to wildfire and range fires, creating further strain on vegetation, wildlife, and livestock.

Drought Impacts	
State Economy	Typically, the most profound impact of a drought on a community is to its economy. Important sectors of the North Dakota economy that can experience economic impacts from drought include agriculture, energy development/production, food processing, and tourism/recreation. Food processing similarly requires large amounts of water. With an agricultural market value of over $10 billion, drought can severely diminish profits for the roughly 30,000 farms and ranches in North Dakota. Over the past 10 years, insured crop losses in North Dakota due to drought have averaged $115 million annually. Drought conditions can drastically reduce production and have a trickle-down effect on other elements of the economy. Water-based recreation has a less direct effect on the economy but is an important factor when considering all impacts of drought. Those communities around the Missouri River reservoirs could see the greatest impacts. In the oil production sector, large amounts of water are needed to drill a well with the hydraulic fracturing or fracking, process. It takes an average 8.15 million gallons of water which is provided by a combination of pipelines and trucks. Oil and natural gas production in North Dakota is concentrated in western North Dakota in the Bakken and Three Forks formations, which are in the Williston Basin. These areas could be negatively impacted by drought's effect on water resources. Increased energy demand and reduced supply because of power curtailments, and costs associated with substituting more expensive fuels for hydroelectric power could greatly impact state economic resources.
Public Confidence in the State's Governance	A drought event has the possibility of becoming long-term, or lasting several months or longer, which can impact the public's confidence in the state's governance, particularly whether the government is taking appropriate actions to combat the drought event. This is significant if government communications are not clear and publicly distributed on a regular basis.

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. The Drought Impact Reporter maps the effects of drought, based on reports from media, observers, and other sources. Impacts are an observable loss or change at a specific place and time due to drought. The Drought Impact Reporter is not a comprehensive set of data, but is useful in tracking drought, if submissions are adequate, to aid in better understanding and responding to droughts.

The Drought Impact Reporter contains information on 371 impacts from droughts that affected North Dakota between January 2003 and May 2018 (Figure 3.7.5-4). Most of the impacts, 163, were classified as agricultural. Other impacts include: fire (30), relief, response, and restrictions (53), tourism and recreation (4), business and industry (8), plants and wildlife (32), society and public health (26), and water supply and quality (55). These categories are described on the National Drought Mitigation Center, Drought Impact Reporter website (National Drought Mitigation Center, 2018b). As shown in the figure below, the county of Morton has the highest reported impacts. Looking at the entire state, the western and west central counties have historically had the most drought-related impacts in North Dakota. This tool is particularly valuable for future drought planning.

Figure 3.7.5-4 Drought Impacts Recorded from January 2003 – May 2018



Source: The National Drought Mitigation Center, 2018b

3.7.5.5 State Risk Assessment

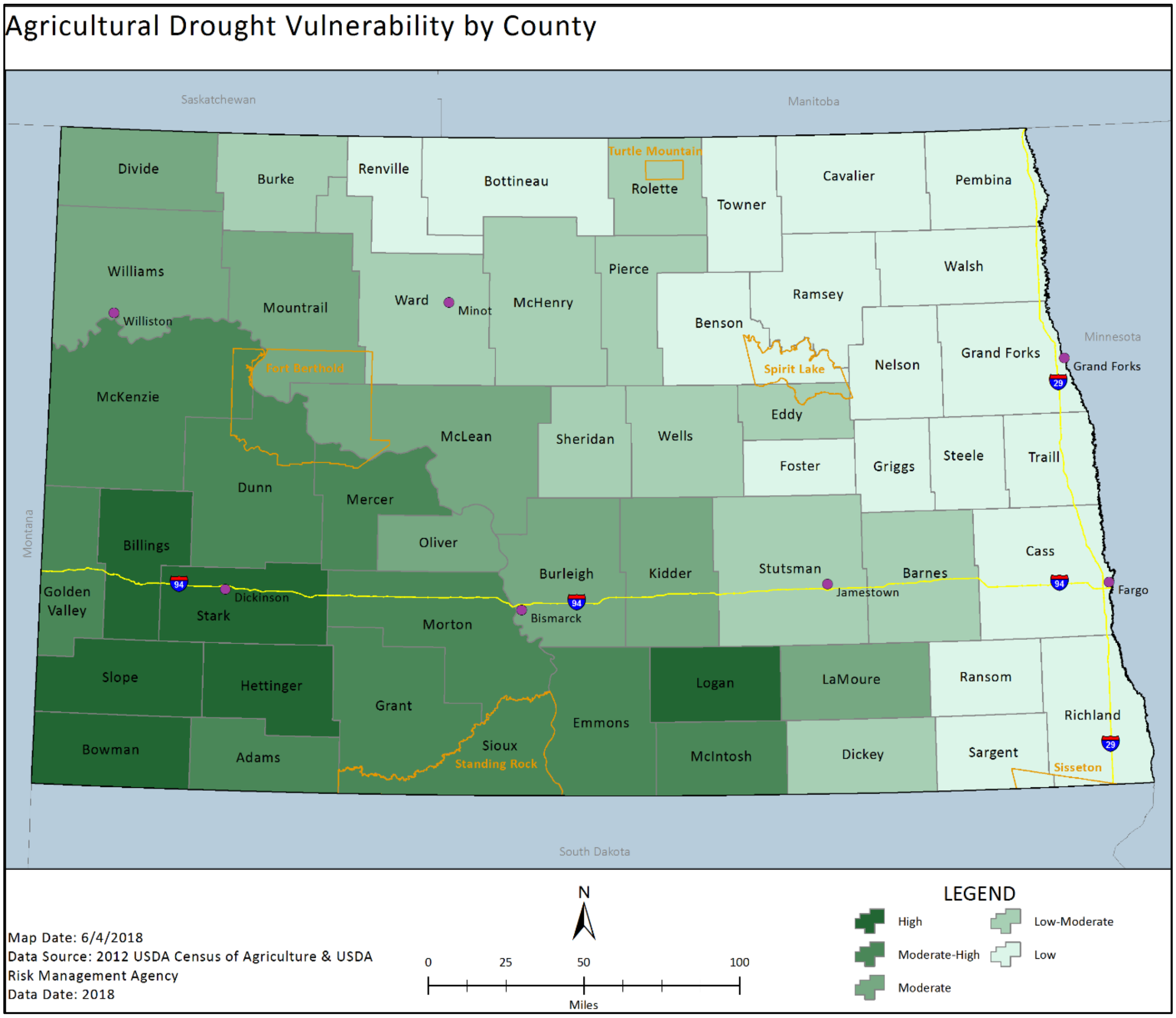
Probability

The NOAA's Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, the paleoclimatic record of past droughts is a better guide than what is provided by the instrumental record alone for what we should expect in terms of the magnitude and duration of future droughts. For example, paleoclimatic data suggest that droughts as severe as the 1950s drought have occurred in central North America several times per century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago. This data indicates that we should be aware of the possibility of such droughts occurring in the future as well. The occurrence of such sustained drought conditions today would be a natural disaster of a magnitude unprecedented in the 20th century. Based on this research, the 1950s drought situation could be expected approximately once every 50 years or 20% chance every ten years. An extreme drought, worse than the 1930s Dust Bowl, has an approximate probability of occurring once every 500 years or a two percent chance of occurring each decade. Therefore, there is approximately a one percent to 49.9% probability that a drought could occur in a given year.

Vulnerability Assessment

A vulnerability and loss analysis were performed to determine agricultural areas of the state that are most vulnerable to the impacts of drought. The full results of this analysis are included in Table 7.4.3-2 in Appendix 7.4.3. The overall vulnerability is determined by analyzing the crop market value, drought-related crop insurance paid, estimated crop damage, and annualized estimated crop damage by county. The results of the analysis are portrayed in Figure 3.7.5-5 below. Slope County is the most vulnerable to the impacts of drought on agriculture in the state, and Pembina is the least vulnerable. Overall, the results indicate the southwest region of the state is the most vulnerable to the impacts of drought on agriculture in North Dakota, and the vulnerability decreases moving east across the state.

Figure 3.7.5-5 Overall Agricultural Drought Vulnerability by County



Based on the impacts reported by the National Drought Mitigation Center as well as the results of the agricultural vulnerability assessment, although the eastern portion of the state has a higher overall market value of agricultural products than the southwestern region, as shown in Figure 3.7.5-6 below, impacts from drought affects the southwestern counties more severely than the eastern counties. The southwest counties experience a higher ratio of losses from drought to market value of crops than the eastern counties.

Figure 3.7.5-6 Market Value of Agricultural Products by County, 2012

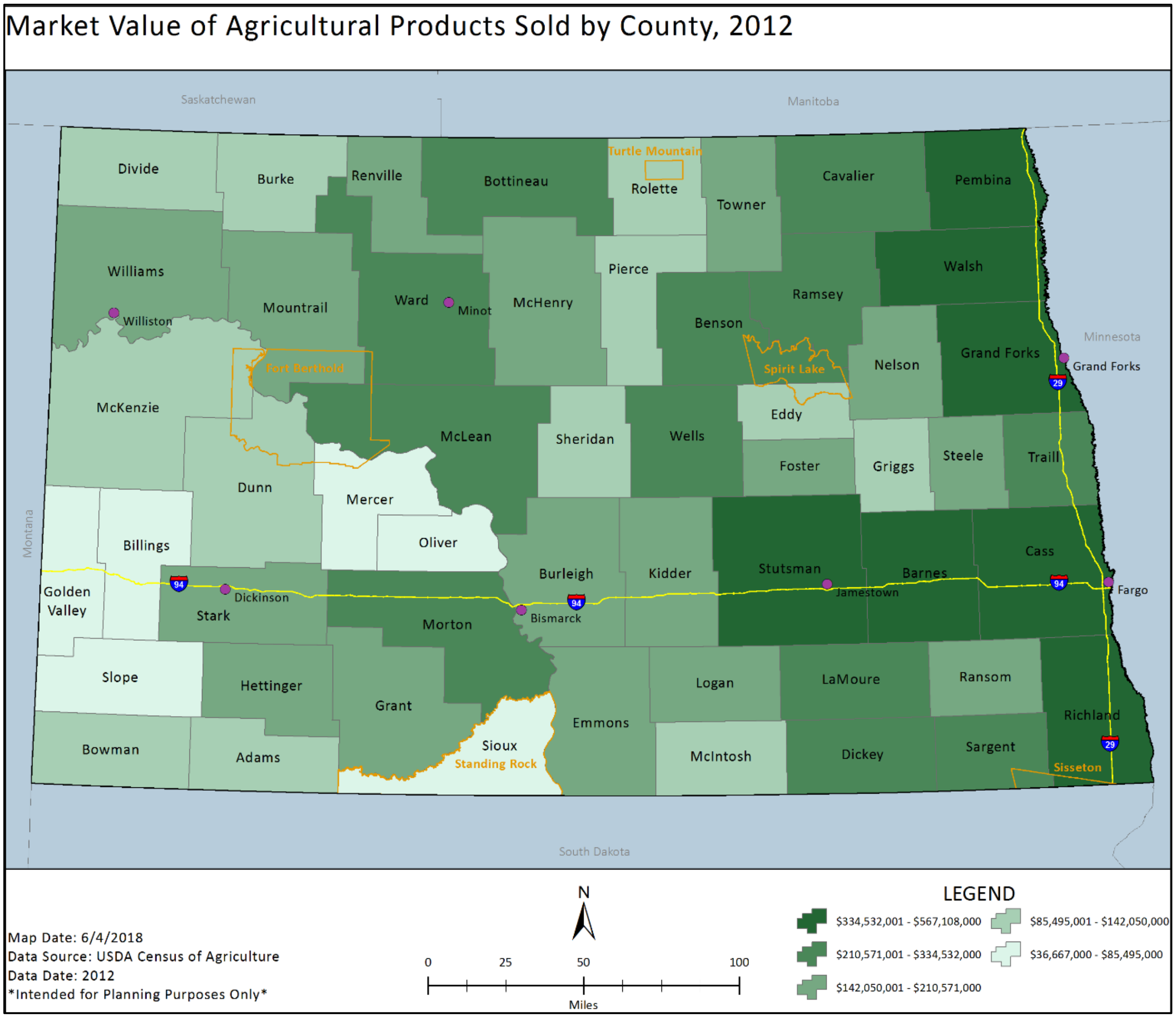
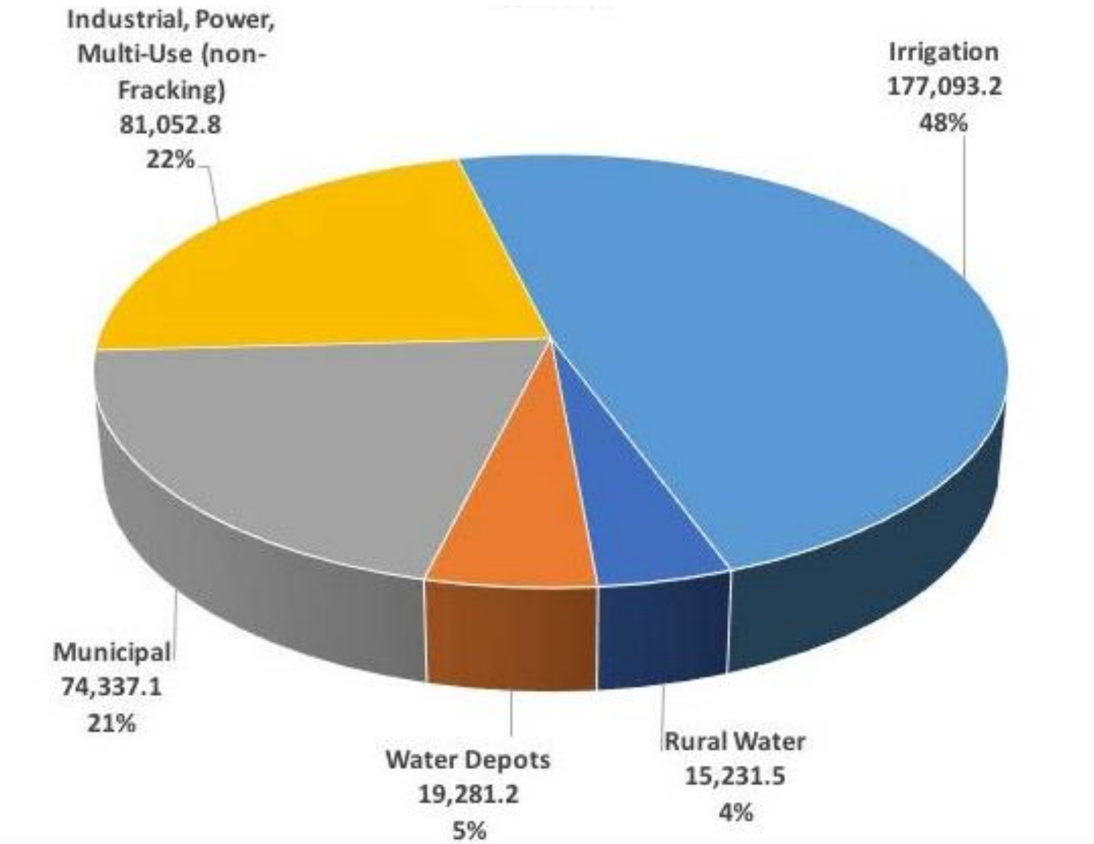


Figure 3.7.5-7 shows the breakdown of water users in North Dakota in 2016. Irrigation is the number one water user in the state, followed by industrial uses (excluding fracking) and then municipal. This data can also be found by county in Appendix 7.4.3, Table 7.4.3-5. These sectors that require large water use are vulnerable to droughts.

Figure 3.7.5-7 North Dakota Consumptive Water Use in 2016



Source: North Dakota State Water Commission, 2016

Appendix 7.4.3 also contains maps of regional water systems, rural water districts and associations, Northwest Area Water Supply (NAWS) and the Southwest Pipeline Project.

State Assets and/or Critical Facilities at Risk

Generally, facilities/buildings themselves are not physically threatened by drought. However, critical infrastructure, particularly those systems that rely on water for operations, can be negatively affected by drought. The current and future risks of state assets to drought are discussed below. Overall, it is difficult to quantify potential losses to state assets and critical facilities from drought. The State Mill and Elevator in Grand Forks is the largest state-owned milling operation in the nation and could be at risk to businesses interruption from drought, but the facility has insurance coverage in case of such events. Major water providers in North Dakota including the SWA have prepared emergency response plans that address continuity of operations if drought or other hazards compromise supply. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Surface water supplies are at the greatest risk from drought. Low water levels can cause operations to cease and damage to systems can occur. In addition to surface water supplies, ground water supplies can also be affected by drought, diminishing the water available from wells. Shallow wells may even dry up. Should a public water or sewer system be affected, the losses could be into the millions of dollars if equipment is damaged and outside water is shipped in. Individuals with residential wells may also be impacted. Figure 7.4.3-1 through Figure 7.4.3-7 in Appendix 7.4.3 describe North Dakota's water supply systems and the different water users that rely on these systems and may be negatively impacted by drought.

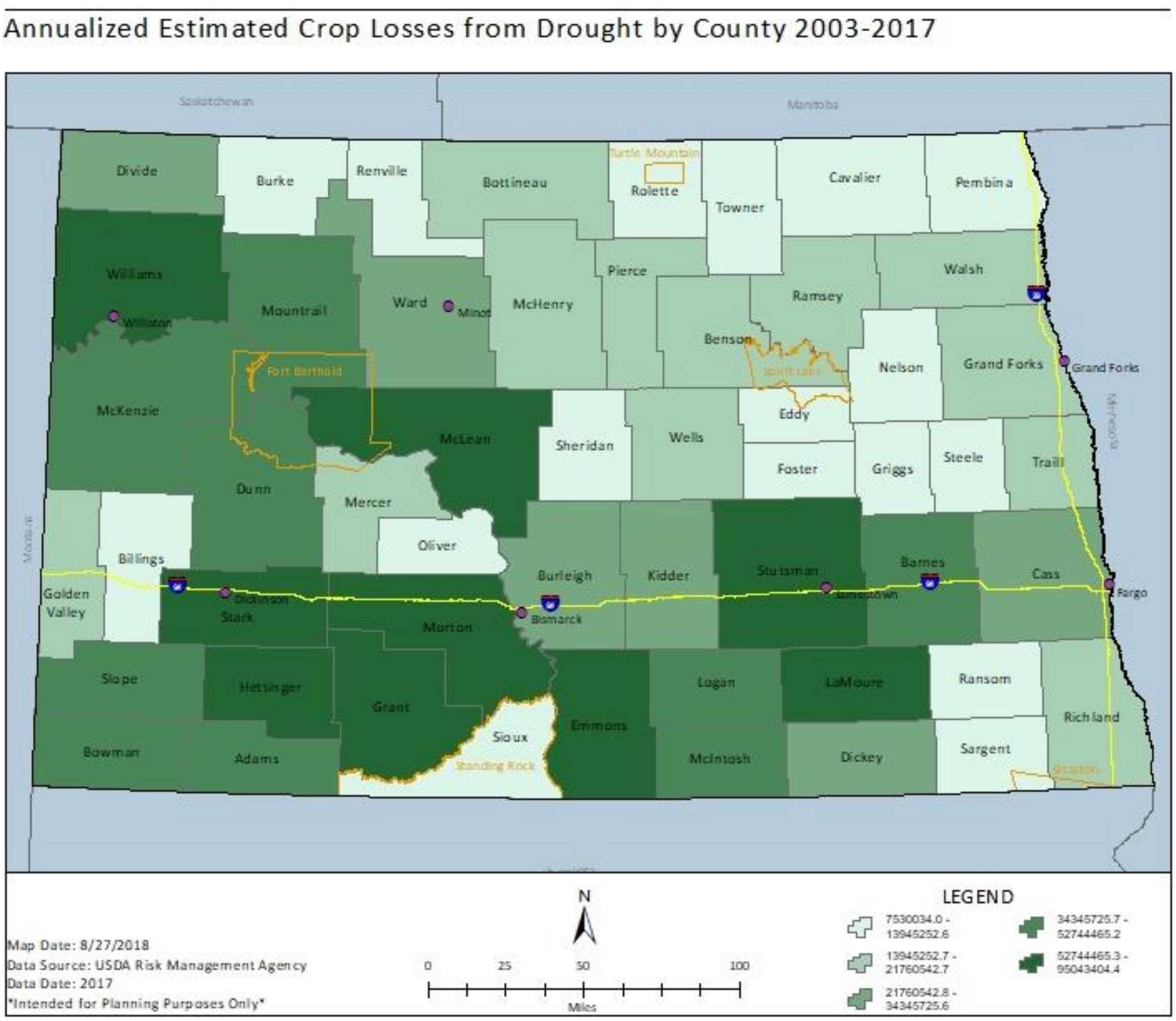
Several major water providers have attempted to design drought responses into the systems by putting the intake structures at the lowest feasible elevations in the river/lake. For instance, the intake for the Southwest

Pipeline Project is set at an elevation comparable to the bottom of the conservation pool of Lake Sakakawea. NDSWC has participated in several occurrences of lowering municipal intakes during droughts and should encourage the extra expense up front to get the intakes as low as possible.

Loss Estimates

Figure 3.7.5-8 displays the annualized estimated crop losses from drought by county based on the same analysis from the vulnerability analysis above. Similar annual losses can be expected if drought conditions are like the pattern in this 15-year period. However, as discussed previously, there is a natural cycle of wet conditions followed by dry conditions. Additionally, the magnitude of dry periods can vary. So, this analysis is limited in determining accurate future loss estimates due to the many variables involved. Based on the analysis, Hettinger County has the highest annualized crop losses from drought, with $7,119,356 annually, followed by Stark then Emmons counties. Griggs County has the lowest annualized crop losses, with $564,047. Crop losses follow a similar trend to agricultural drought vulnerability, where generally, the western portion of the state experiences more losses from drought. The estimated annual crop damage for each county can be found in Table 7.4.3-2 in Appendix 7.4.3.

Figure 3.7.5-8 Annualized Estimated Crop Losses from Drought, by County 2003-2017



Loss and cost estimates for state assets at risk is difficult to compute due to the variability in drought conditions, and variability in subsequent impacts which may affect state assets and infrastructure.

3.7.5.6 Future Conditions

Successful mitigation of drought requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future drought risk.

Climate Change

According to the 2014 National Climate Assessment, the Northern Plains, including North Dakota, will remain vulnerable to periodic drought because much of the projected increase in precipitation is expected to occur in the cooler months while increasing temperatures will result in additional evapotranspiration during the summer months. The warming trend observed in North Dakota is expected to continue, which may contribute to an increase in the frequency and intensity of drought in the state. These projected changes can exacerbate drought impacts on vulnerable water users in the state, including agriculture, industry, and municipal users. State water supply systems in areas with a higher number of previous drought occurrences will likely continue to experience the highest risk from drought in the future. Additionally, climate change may cause these droughts to be more frequent and intense, which could increase the amount of losses resulting from drought.

The following Table 3.7.5-6 presents the best available data relating to the impacts of climate changes on future droughts. The important summary of these changes is that the state should expect an increased risk from droughts in the future.

Table 3.7.5-6 Expected Changes to Drought Future Condition

Condition	Projected Change
Location	Droughts are a threat throughout the state. Location is not projected to change.
Extent / Intensity	Droughts are projected to increase in extent and intensity.
Frequency	Droughts are projected to increase in frequency due to shifts in seasonal precipitation patterns, including drier summers and less precipitation falling as snow in early spring/fall.
Duration	Droughts are projected to have a longer duration due to shifts in seasonal precipitation patterns, including drier summers and less precipitation falling as snow in early spring/late fall.

Changes in Development

As detailed in Section 2.2.2, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 U.S. Census (North Dakota Department of Commerce, 2016). Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

The top four counties expecting population increases from 2010 to 2030 are McKenzie (269% change), Williams (165% change), Mountrail (103% change), and Dunn (88% change). These four counties are also the heart of the oil and gas industry in North Dakota, containing 92% of all oil and gas produced, and all active drilling rigs. Such a large increase in population can stress water resources, increasing the counties' vulnerability during drought conditions. The oil and gas development in these counties also requires water for their operations, again increasing the counties' vulnerability during droughts. As determined in the state risk assessment, generally, western counties have a higher vulnerability to the impacts of drought, particularly on agriculture, and many counties in western North Dakota are projected to experience population growth through 2030. The increase in population could further stress water resources during a drought and exacerbate these impacts. Table 7.4.3-4 in Appendix 7.4.3 shows population change and agricultural drought vulnerability by county. Section 2.2.2 provides detailed information on population projections.

3.7.5.7 Jurisdictions at Risk

Fifty-seven of fifty-eight local and tribal HMPs profile drought. Figure 3.7.5-9 presents a summary of those plans and identifies how they ranked the overall risk presented by drought. Thirteen jurisdictions ranked drought as a high hazard, thirty-three as medium, and eleven as low. One plan did not identify drought as a hazard. This ranks drought as the number four out of 14 hazard according to North Dakota local HMPs. Overall, a concentration of counties in the southwest portion of the state rank drought as a high hazard. This corresponds with the state risk assessment findings that the southwest portion of the state experiences high drought impacts.

Figure 3.7.5-9 Local Hazard Mitigation Plan Drought Rankings

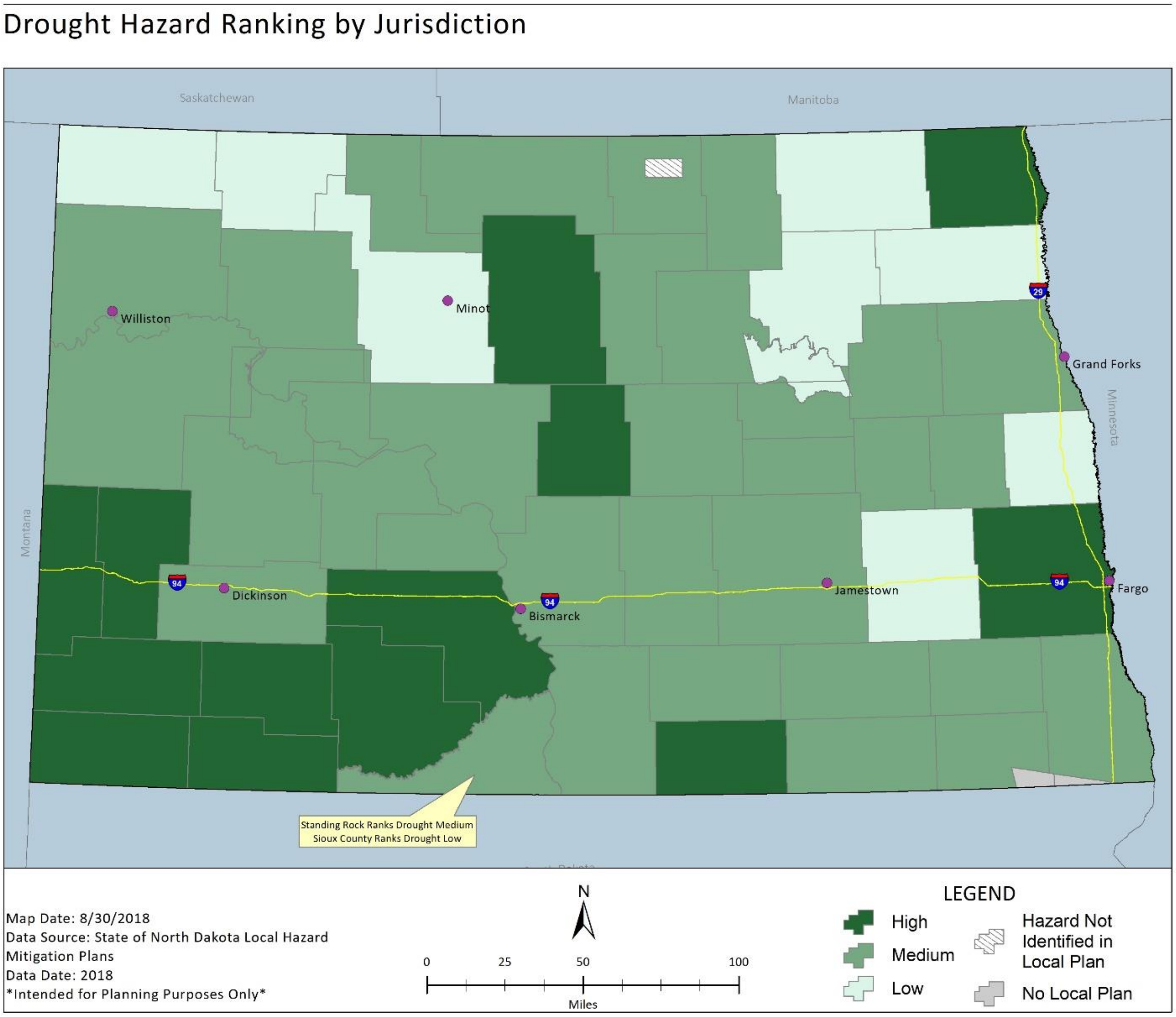


Table 7.4.3-6 in Appendix 7.4.3 includes a compilation of available hazard ranking and loss information, when available, for drought as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. The overall trend in losses identified for drought relates to loss in agriculture across all counties.

3.7.5.8 Summary / Conclusion

Following this plan's risk assessment methodology, the drought risk factor score was 2.7, which is a moderately ranked hazard on a scale of one to four, where four is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Droughts will continue to be a persistent hazard in North Dakota, likely to affect large regions of the state for months at a time and have relatively significant impacts on the economy. Based on the paleoclimate, impacts from climate change, and previous occurrences, it is likely that North Dakota will experience droughts more severe than the droughts of today, with up to a 50% probability of occurring in a given year.

Some of the largest impacts from drought, as seen in Table 3.3-8 in Section 3.3, are experienced in the economic sector, particularly agriculture, which is a major economic driver in North Dakota. Energy development, as well as tourism and recreation, are other sectors that would experience an economic impact. Additionally, drought can impact industry and public water supply. The public, and the environment are other community sectors at high risk of drought. With a projected increase in population, more strain may be placed on an already vulnerable water supply during a drought, making heat-related disease and high food costs more likely. Given also that droughts span statewide and can endure for long periods of time, it is important to mitigate the risks and impacts of drought in North Dakota.

During its strategy discussions, the Drought Committee recommended education as a tool to mitigate the impacts of drought. NDSU Extension Service personnel educate producers about drought-resistant plants, more efficient irrigation strategies and processes to reduce and contain fires. Producers may not be aware of drought relief programs, pointing to a need to promote available assistance.

The Committee recommended rural and regional water suppliers develop contingency plans to address aging infrastructure and prioritized uses for water during drought conditions, particularly if population growth continues. Other strategies included recruitment and training of rural volunteer firefighters and renewed emphasis on the importance of crop insurance.

Committee members emphasized the importance of addressing the personal cost of drought. As evidenced by the 2017 drought, many producers faced both economic and mental health crises, underscoring the importance of outreach and resources provided by public and private partners, such as churches, the members of the Voluntary Organizations Active in Disaster (VOAD) and NDSU Extension Service. It's important to share available resources early in a drought to help producers cope with the personal consequences of drought.

3.7.5.9 Data Limitations / References

A data limitation with drought is the inability to pinpoint the start and end of drought periods and the associated correlation with economic losses. An online database of historical USDA drought declarations with the associated losses would prove beneficial in documenting the effects of drought and directing mitigation activities.

North Dakota has a Drought Response Plan but a process with indices to monitor the development of drought and triggers that would activate programs to help mitigate the effects of drought is needed. This would need to be a coordinated and collaborative initiative with all stakeholders.

There is no statewide collective list of drought vulnerable water suppliers in the state. Many of the major cities have contingency plans that address the loss of their water supply.

Key documents and plans that were used to create this hazard profile include: Climatic and Hydrologic Aspects of the 1988-1992 Drought and the Effect on People and Resources of North Dakota from the North Dakota SWA (1994), North Dakota Drought Response Plan, and the North Dakota Emergency Operations Plan, Drought Overview and Checklist. Additional data and resources were included from NDSWC, North Dakota UES, North Dakota State University Climatologist, North Dakota Stockman's Association, USGS and BOR.

3.7.6 Fire

3.7.6.1 Wildfire

Description

Wildfires are uncontrolled fires in vegetated areas. Wildfires can be beneficial to many ecosystems; however, they can also be very harmful to the human and built environment.

Wildfires are primarily caused by humans; however, they also can be caused by lightning events. Up to 90% of wildland fires are caused by human action, such as agricultural activities, accidental ignition caused by electrical lines, and negligently discarded cigarettes or arson (National Parks Service [NPS], n.d.). Environmental factors can impact the spread of wildfire, where moist and cool conditions can limit the spread of wildfire or limit the ability of fire to ignite. Drier, warmer, and windier conditions can aid wildfire spread. Accumulation of fuel, caused by fire suppression, drought, or flooding, can also lead to larger and more intense fires.

Fires can cause a range of impacts on the State of North Dakota, from minor disruptions to major threats to transportation, critical infrastructure and human life. Development patterns are one of the main factors that can steer the impacts of wildfire. Development patterns have contributed to making some North Dakota communities extremely vulnerable to wildfire. Where wildfire intersects with development, large populations can be at risk to the devastating health and structural impacts of wildfire.

Previous Occurrences

North Dakota has a long history of wildland fires ranging from small to large. According to the North Dakota Fire Service (NDFS), the state experiences over 700 wildfires that burn more than 35,000 acres annually on average. Large wildfires are common during pre-green up and post frost. Past events, described in the Appendix 7.4.4, underscore the threat fires pose to our communities. An October 1999 fire burned 70,000 acres in a matter of hours, resulting in the evacuation of 12 farmsteads and the destruction of an abandoned farm. The Kraft Complex of 2002 rapidly expanded due to multiple lightning ignitions, extreme drought, and weather conditions, requiring the Bureau of Indian Affairs (BIA) to coordinate resources requests that included a mutual aid response of several local fire departments and state agencies, a Type II Incident Management Team deployed through the National Incident Management System (NIMS), North Dakota National Guard assets, and a South Dakota air tanker. The fire destroyed two residences and 21 outbuildings, many of the vacant old structures throughout the Town of Shields and threatened the community of Porcupine. Other fires in 2002 resulted in the death of two firefighters. Challenging terrain makes firefighting difficult, as illustrated by the 2004 Deep Creek Wildfire that burned 3,820 acres of federal, state, and private lands through a portion of a ponderosa pine forest in Slope County. Fires take a financial toll on communities, such as the 2006 Standing Rock complex, which resulted in injuries to two firefighters and the evacuations of least 10 homes and 400 head of livestock. The fire suppression cost of an estimated $430,000 does not include the financial toll on the community for mass care for its displaced residents.

> ***Community Coffee Comments***
>
> Residents of Rolette County consider the Turtle Mountains as one of the area's most beautiful natural resources. But it also presents the area's biggest threat. Wildfires that erupt in the mountains require a multi-agency response. "We spend more time fighting fires" than addressing other hazards, Emergency Manager Mike Stewart said.
>
> Fire calls each year average 90 for the city of Rolette, 600 for Belcourt, 300 for Bureau of Indian Affairs Forestry and 300 for Dunseith.

Some of the more significant wildland fire events that have occurred in North Dakota since 2010 are described below. These events and descriptions were obtained from the NDDES, NDFS, Federal Wildland Fire Occurrence website, NCEI Storm Events Database, and National Interagency Coordination Center.

- April 2010 –1,011 acres burned as a result of a human-caused fire called the Sheflo Wildfire.
- September 2011 -- 3,600 acres burned in a human-caused fire known as the Sheep Fire.
- April 2012 – 1,100 acres burned in the Viking Prairie Fire. This fire was human-caused.

- August 2012 – 3,317 acres burned in the Deep Creek 2 Fire. This fire resulted from natural causes.
- September 2012 -- 2,282 acres burned in the Corn Stalk Fire. This was a human-caused fire.
- October 2012 – A wind-fueled wildfire destroyed 10 residences and 24 in the town of Bucyrus in Adams County displacing 20 residents. The fire burned approximately 4,000 acres and measured eight miles long and 1.5 miles wide also destroyed about 70 electrical utility poles.
- Spring 2015 -- A statewide fire emergency declaration and burn ban was issued due to extremely dry conditions. The active fire season resulted in the following examples of larger fires:
    - March 12 – Standing Rock Reservation Fire (733 acres)
    - March 31 – Oliver County Fire along the river bottoms Oliver County Fire
    - April 13-14 – Fire South of Bismarck in Burleigh County (1,500 acres)
    - April 14 – Tobacco Gardens Fire in McKenzie County (4,500 acres)
    - April 14 – Deering Fire in McHenry County (2,000 acres and 250-300 hay bales)
    - April 14 – Drake Fire in McHenry County (120 acres)
    - April 15 – Multiple fires along I-29 from Grand Forks to the Canadian border
- April 2015 – An abandoned campfire developed into a large wildfire in southwest Burleigh County. Thirty-four separate agencies were involved in the wildfire response, and approximately 2,000 acres were burned. No lives or homes were lost.
- April 2015 – Wildfires ignited all along I-29 April 15 from Joliette, North Dakota, to Grand Forks, driven by high winds and dry weather conditions. The smoke caused a 10-car pileup just north of the Oslo, M.N., interchange that day, sending eight people to Altru Hospital with injuries ranging from minor to critical.
- October 2015 – A grass fire that burned approximately 3,700 acres in Sioux County, on the Standing Rock Nation. Five hundred and fifty residents of Cannon Ball were evacuated, and 54 families were sheltered overnight at Prairie Knights Lodge.
- July 2017 – A 5,400-acre wildfire, named the Magpie fire, burned in the Little Missouri National Grasslands. The cause is unknown.
- 2017 – From March to July, firefighters battled approximately 200 wildfires. McKenzie County had the most fires, with 18; Dunn County had to fight 16 grass fires; and Morton County was right behind them at 15 grass fires. Only 15 counties reported no grass fires, mostly concentrated in the northeast part.

The NDFS provided summary statistics of the number of fire and acres consumed in 2017 Table 3.7.6-1 below. Most fires were caused by debris burning, equipment use, and miscellaneous other reasons. Most of the fires in 2017 were Class B, 0.26 to nine acres in size.

Table 3.7.6-1 Wildfires by Cause and Class, 2017

Number of Fires and Acres by Cause		
Cause	**Number of Fires**	**Number of Acres**
Arson	6	568
Campfire	13	23
Children	1	1
Debris Burning	143	1,420
Equipment Use	134	3,008
Lightning	35	335
Miscellaneous	158	7,978
Railroads	9	25
Smoking	19	148
Total	**518**	**13,506**
Number of Fires and Acres by Class		
Class	**Number of Fires**	**Number of Acres**
Class B – 0.26 to 9 acres	403	779
Class C – 10 to 99 acres	94	1,991
Class D – 100 to 299 acres	14	1,798

Number of Fires and Acres by Cause		
Class E – 300 to 999 acres	5	2,438
Class F – 1,000 to 4,999 acres	1	1,000
Class G – 5,000 acres or more	1	5,500
Total	**518**	**13,506**

Source: NDFS, 2018

Table 3.7.6-2 shows North Dakota wildland fire declared disasters and emergencies. There have been 17 state executive order declarations and one state request for USDA assistance for wildland fire.

Table 3.7.6-2 North Dakota Wildland Fire Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude
State EO	North Dakota	1980	State Declared Fire Disaster
State EO	North Dakota	1981	State Declared Fire Disaster
State EO	North Dakota	1988	State Declared Fire Disaster
State EO	North Dakota	1990	State Declared Fire Disaster
State EO	North Dakota	1999	State Declared Fire Disaster
State Request	North Dakota	2000	Governor's Request for USDA assistance for Montana wildfires
State EO	North Dakota	2000	State Declared Fire Disaster
State EO	North Dakota	2002	State Declared Fire Disaster
State EO	North Dakota	2004	State Declared Drought Disaster / Fire Danger Emergency
State EO	North Dakota	2005	State Declared Fire Disaster
State EO 2005-01	North Dakota	3/10/2005	State declared drought disaster and fire danger emergency
State EO 2006-06	North Dakota	6/28/2006	State declared rural fire emergency potential
State EO 2008-01	North Dakota	4/25/2008	State declared fire emergency
State EO 2012-02	North Dakota	3/30/2012	State declared fire emergency
State EO 2012-09	North Dakota	9/5/2012	State declared fire emergency
State EO	North Dakota	4/1/2015	State declared fire emergency
State EO 2017-07	North Dakota	6/26/2017	Statewide fire and drought emergency

Source: North Dakota Department of Emergency Services

Location and Extent

The greatest potential for major fire occurrence is in the western half of the state where unbroken rangeland is interspersed with woody draws. Annual crops and perennial grasses furnish most of the fuel for North Dakota wildland fires and constitute the largest economic loss. Fire in these areas are characterized by high rates of spread and moderate intensity. Timber lands in North Dakota only account for about two percent of the available fuel for fires. There are six major regions of timber growth within the state: The Turtle Mountains, the Pembina Hills, the area around Devils Lake, and the limited river bottom areas of the Missouri, Red, and Sheyenne Rivers. In contrast to grassland fires, fires in timber areas generally burn hotter but spread slower. Wildland fires can occur at any time of the year, although they occur less frequently during the winter months because cold and snow are excellent mitigating factors. The NDFS continually evaluates the areas impacted by spring fire activity.

Much of western North Dakota experiences favorable wildland fire conditions for a better part of the year, and large wildfires can develop. The largest wildfire on record since 1986 in North Dakota is the 1999 McKenzie County wildfires that burned about 70,000 acres. Wildfires of this magnitude are clearly possible and can be expected in the future. Of greater significance, however, is a wildfire that spreads into communities destroying structures and infrastructure like the Kraft Complex did in 2002.

In North Dakota, it is common practice during spring and fall to burn fields, trees, and debris in agricultural and rural settings. Equipment operators also increase their activities during warmer months. Rural fires can quickly grow out of control, endangering people and wildlife, and causing damage to nearby acreage, buildings, and other property. Inadequate control and burning during elevated fire danger conditions cause the majority of these fires. The United States Forest Service (USFS) issues the North Dakota Fire Danger Rating each morning during fire season; typically, from April 1 to October 31, The USFS calculates the Fire Danger Rating using grassland fuel moisture, forecast temperature, humidity, and wind speed. The rating system serves as a guide to help reduce the number of uncontrollable outdoor fires by forecasting the potential for non-agricultural grasslands to carry fire should a fire ignite. It gives an indication of the potential for fire growth and spread for any fire, rating probability as low, moderate, high, very high and extreme.

Table 3.7.6-3 describes the spatial extent of impacts from a wildland fire in North Dakota.

Table 3.7.6-3 Spatial Extent of Wildfire Impacts

Resources	Extent of Impacts
Impact on Public	Local / Regional
Property	Local / Regional
Infrastructure	Local/Regional/Statewide
Government Operations	Local/Regional
Environment / Natural Resources	Local / Regional
Cultural Resources	Local/Regional

Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.6-4 presents the summary analysis of a wildland fire event. Impacts to property, facilities, and infrastructure, in addition to responders, would be the most severe. Effects on the continuity of operations and delivery of services, the economy, and the public's confidence in government are expected to be the least impactful.

Table 3.7.6-4 Wildland Fire Consequence Analysis

Wildland Fire Impacts	
Public	Generally, the population at risk can evacuate before a wildfire moves into their area. Occasionally when strong winds are in place, wildfires can move very rapidly and catch people by surprise, or people may just refuse to evacuate; fatalities and injuries are possible. Many times, wildfire fatalities of the evacuating population occur when frantic drivers or poor visibilities due to smoke cause a traffic accident. In recent incidents, wildfire deaths have been attributed to landowners trying to protect their own property without adequate firefighting protective equipment. Additionally, fire restrictions may limit open burning, campfires, hunting, and other recreational activities people often enjoy.
Responders	Wildland fires can be extremely dangerous to responders. Firefighters are critical to putting out wildland fires. And when wildfires move rapidly or quickly change direction, firefighters can also be at risk from rapidly moving wildfires.
COOP	COOP is likely to be impacted because resources are being dedicated to fighting the wildfire rather than normal operations. Normal operations would be affected and could lead to a reduced level of service provision or inability to provide certain services.

Wildland Fire Impacts	
Delivery of Services	For many wildfire events, delivery of services may not be impacted. In the case outlined below, when land/road closures are required, this may limit the ability to deliver emergency services. Additionally, if the location of the fire results in damaged property involved in the process of service delivery, then this process may be impacted.
Property, Facilities, and Infrastructure	Depending on the location, historic losses could also occur. Impacts. According to the NDDOT, various lane/road closures have been necessary in the past due to reduced visibility resulting from smoke from grass fires.
Environment	Natural resources are often lost during wildfires, but since wildfires are an important part of the ecosystem, such losses are usually only financial. Animals caught in wildfires may have painful deaths.
State Economy	Wildfires can certainly influence the regional economy. Rapidly moving wildfires can result in livestock, feed, and crop losses. Additionally, ranches may also feel the economic impacts of losing miles of fences and outbuildings. The closures and restrictions in recreation areas could lead to tourism industry losses.
Public Confidence in the State's Governance	Like most hazards, the public's confidence in the State's governance can be dependent on the size of a wildfire event. For large, uncontrolled wildfires that put the public and private property at risk, the public may question their safety and the government's ability to protect them.

State Risk Assessment

Wildfires can result in severe injuries, cause death, and communities can suffer extreme financial loss. Wildfire can cause infrastructure damage and disrupt communications that inhibit efficient coordination of fire operations support during the immediate response and post-emergency period. Even small wildfires can threaten lives, and if not properly controlled, can cause significant destruction of property and the environment. The resources and agencies that manage a large firefighting operation is complex and require aid from many different agencies and jurisdictions. All wildfires have the potential of becoming large and/or catastrophic if not managed properly.

Probability

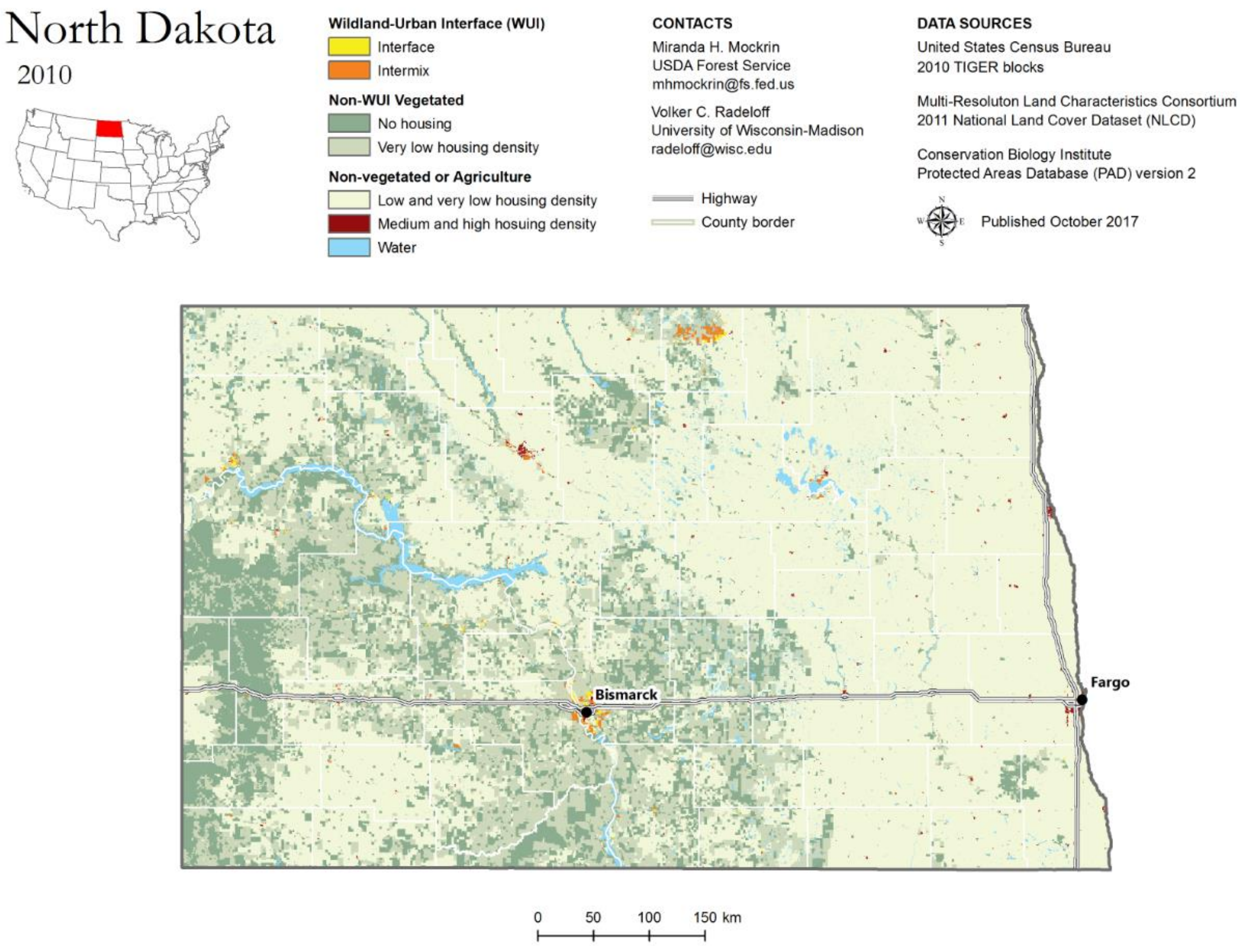
Multiple wildland fires occur on an annual basis in North Dakota. Most fire seasons present the chance for a few significant wildland fires. As a result, the probability of future occurrence in any given year is 100%. Wildland fire occurrence in North Dakota is weather dependent and highly variable from year to year.

Vulnerability Assessment

Homes, ranches, farms, and businesses can all be threatened by North Dakota wildland fires, particularly those in rural areas surrounded by dry vegetation. These areas can be defined as the Wildland Urban Interface (WUI). The WUI is the zone where human development intermingles with undeveloped land. Specifically, the WUI is the territory between sparsely populated agricultural, forest, rangeland and more-populated cities and suburbs.

Structures in the WUI are at a higher risk to wildland fire damage. Figure 3.7.6-1 displays the WUI in North Dakota as of 2010. There are WUI areas dispersed throughout the state. Burleigh County has both the highest population (49,104 people) and highest total housing units (21,363 housing units) in moderate to high WUI risk areas, followed by Morton, Williams, Rolette, and Mercer counties, respectively. In total, 120,949 people and 57,043 housing units are located in moderate or high WUI risk areas statewide. The methodology and full results of the WUI analysis are provided in Appendix 7.4.4.

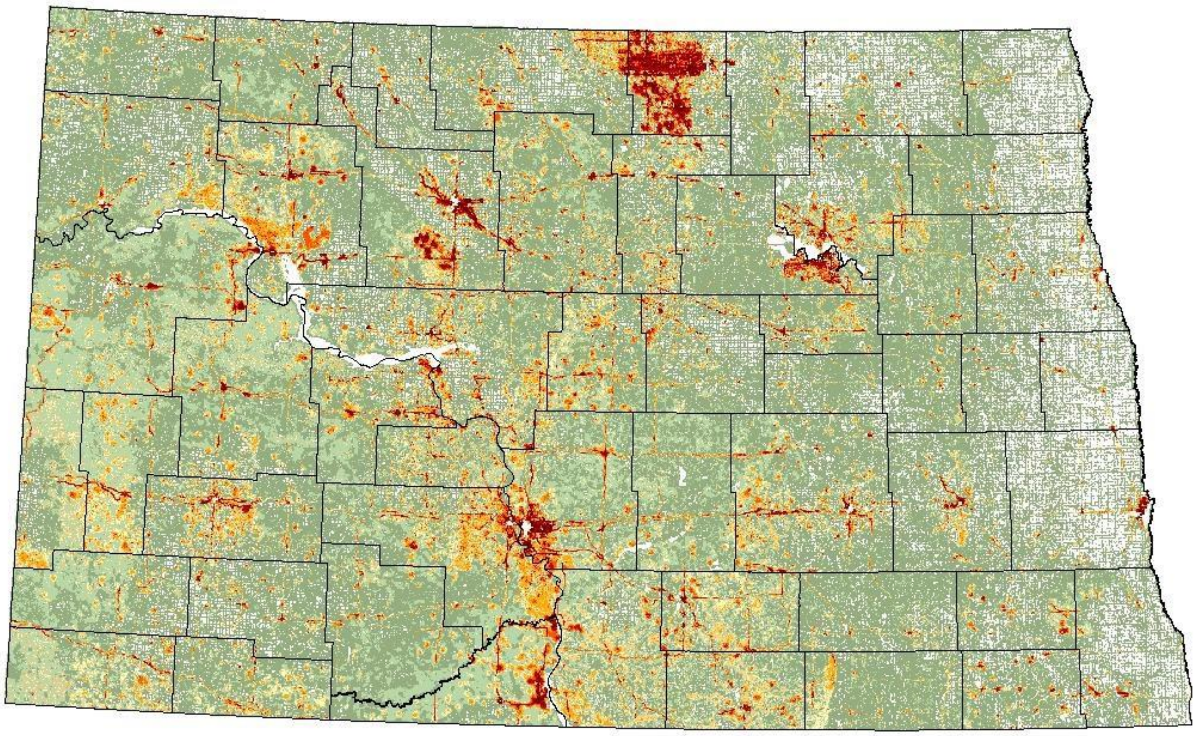
Figure 3.7.6-1 North Dakota Wildland-Urban Interface/Intermix



The 2013 West Wide Wildfire Risk Assessment (WWA) was reviewed during the 2014 plan update and was revisited again for the 2018 plan update. The WWA is a wildfire risk assessment and report for the 17 western states, developed by the Oregon Department of Forestry on behalf of the Council of Western State Foresters and the Western Forestry Leadership Coalition. The WWA used a standardized method to assess wildfire risk across the 17 states. The WWA report for North Dakota revealed similar results to SILVIS and NDDES data, as shown in Figure 3.7.6-2. In the figure, wildfire risk is shown on a graduated color scale where green is low risk and red is high risk. The WWA Risk Summary Statistics for North Dakota consisted of the following:

- 18% of burnable acres in North Dakota is Moderate-to-High wildfire risk (classes four to nine)
- 18 million burnable acres across the State (39% of all lands)
- 751,672 people are living at risk to wildfire within Wildland Development Areas
- 1.1 million acres of forest assets at risk to wildfire

Figure 3.7.6-2 North Dakota Fire Risk Index Based on West Wide Wildfire Risk Assessment



Source: 2013 West Wide Wildfire Risk Assessment

State Assets and/or Critical Facilities at Risk

North Dakota has a history of large and damaging wildland fires. There are scattered government lands and fuels throughout the state. Wildland fires can cause closures related to reduced visibility resulting from smoke on grass fires. Landslides can occur from the loss of vegetation from a wildfire.

Overall, state-owned assets and critical facilities are at risk to wildfires in North Dakota. Due to data limitations and variability of wildfire events, it is difficult to estimate future losses to wildfire events, however an exposure analysis was completed to identify the facilities that are located in mapped areas of higher risk to wildfire. These higher risk areas include the WUI interface and WUI intermix zones. There are 1,048 total critical facilities that are located in the WUI interface and intermix zones. About half of these facilities are communication towers of various types. Overall, there are 1,685 state-owned assets located within the WUI interface and intermix zones that have an insured value of about $928 million. The full results of this exposure analysis are summarized in Table 3.8-1 and Table 3.8-2 in the conclusion of the Risk Assessment.

Wildland fire can affect any vegetated part of North Dakota but is most prevalent in the abundant fuels of the rural areas. Fortunately, most state-owned buildings and property are in developed communities and are at a low risk for wildland fire losses. Additionally, routine mowing, lawns with sprinklers lawns, and pavement that surround most state-owned buildings typically provide a buffer from most wildland fires. However, a wildland fire could result in complete destruction and high dollar losses to a state-owned building or property.

Often regional electric infrastructure passes through wildland and non-irrigated agricultural areas. In particular, electric substations, transmission lines, and telephone lines can be buffered by or overhang natural fuels. A wildfire could disrupt electricity or communications should this infrastructure be damaged. Propane tanks also become hazardous infrastructure when a wildfire encroaches on a structure. Temporary disruptions or low flows on the public water system may occur if large amounts of water are used to fight a fire, particularly during periods of drought or peak usage times.

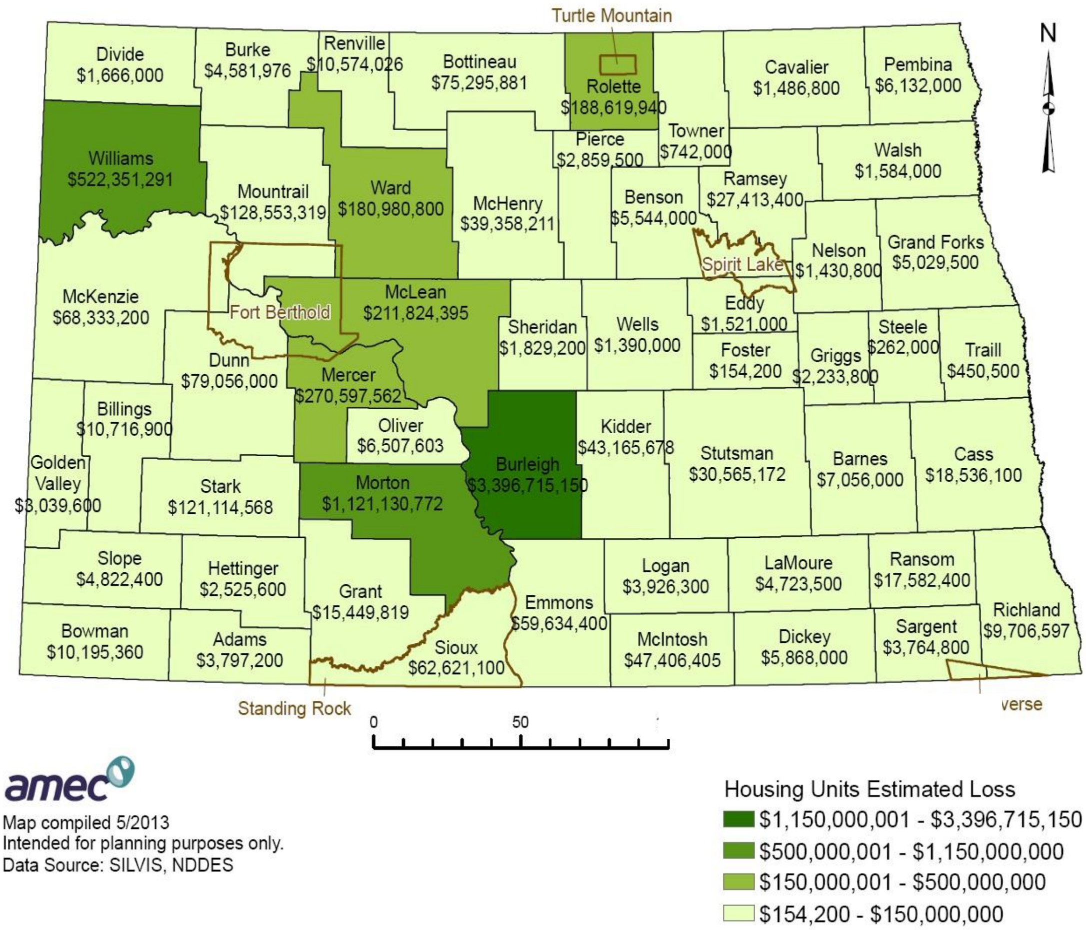
With many acres of land under its jurisdiction, the North Dakota Game and Fish Department is one state agency that is impacted annually by wildland fires. From 2005-2017, the North Dakota Game and Fish Department lost 7,074 acres to wildland fires. Specifics of these losses are provided in Table 7.4.4-3 in Appendix 7.4.4.

The NDFS Fire Management Program focuses on the protection of lives, property and natural resources from wildfire. NDFS programs support the state's 378 fire departments, which are essential for enhancing firefighting capabilities and public safety. The program provides rural fire departments with cost-share funds for organizing, training, planning, and purchasing fire equipment.

Loss Estimates

To estimate losses, an exposure analysis was used based on applying the average value of housing units in each county multiplied by the combined number of housing units in the high and moderate risk categories. For the purposes of estimating potential loss, the total average value is used, as catastrophic fires tend to result in total loss of the structure. It is very unlikely that a wildfire would result in loss of all the structures potentially at risk within a given county, but the results provide an indication of where the highest losses from a fire in the Interface or Intermix areas could occur. Figure 3.7.6-3 shows the estimated losses in terms of housing units exposed to wildfire; additional results from this analysis can be found in Appendix 7.4.4. This map has not been updated for this plan because the SILVIS Wildfire mapping has not changed since 2013 and updated housing stock data was not available at this time. According to this analysis, Burleigh County has the greatest exposure to losses, in addition to several other neighboring counties in central North Dakota. Even though housing unit values are in 2013 dollars, this map is still a helpful planning tool in understanding the areas in the state that have the greatest potential exposure and dollars lost to future wildfires.

Figure 3.7.6-3 Housing Unit Values in High and Moderate Wildfire Risk Areas (2013 dollars)



Agriculture in North Dakota also experiences losses due to wildland fires. According to the USDA Risk Management Agency, from 2003 to 2017, $367,839 in crop insurance was paid as a result of wildland fire damages. By taking into account the uninsured, insurable crops, it is estimated that during this time frame, there may have been as much as $413,302 in wildland fire damage. This translates to an annual average of $24,523 in crop insurance claims. Table 3.7.6-5 shows the crops impacted by fire by year according to the USDA Risk Management Agency. This table does not include the amount of pastureland or hay that burned.

Table 3.7.6-5 Crop Indemnity Amounts from Fire, 2003-2017

Year	County	Commodity	Acres Impacted	Amount
2003	Divide	WHEAT	15.25	$1,020
2003	McHenry	SUNFLOWERS	40	$1,464
2003	Williams	WHEAT	207.35	$8,655
2004	Cavalier	CANOLA	127.1	$9,221
2005	Grant	WHEAT	75	$700
2005	Pierce	WHEAT	43	$1,323
2005	Wells	SUNFLOWERS	45	$2,468
2006	Burleigh	WHEAT	110	$12,278
2006	Emmons	SUNFLOWERS	45	$1,951
2006	Logan	WHEAT	29	$2,997
2006	Sheridan	SUNFLOWERS	18	$1,904
2006	Sheridan	SUNFLOWERS	2	$190

Year	County	Commodity	Acres Impacted	Amount
2007	Cavalier	CANOLA	18	$1,171
2007	Eddy	SUNFLOWERS	78	$6,528
2007	Mountrail	DRY PEAS	136	$1,110
2007	Traill	SUGAR BEETS	203	$149,694
2008	Barnes	SOYBEANS	189	$14,057
2008	Cass	CORN	81	$5,640
2008	Golden Valley	WHEAT	130	$12,516
2008	Golden Valley	WHEAT	26	$4,013
2008	Hettinger	SUNFLOWERS	20	$806
2008	Stutsman	CORN	16	$3,518
2009	McLean	DRY PEAS	24	$4,814
2011	Benson	WHEAT	28	$3,732
2015	Barnes	CORN	22	$9,313
2015	Barnes	CORN	84	-$5,766
2015	Dickey	CORN	407.6	$76,670
2015	La Moure	CORN	389.2	$32,323
2016	Williams	WHEAT	217.34	$3,530
Total			**2,825.84**	**$367,839**

It is evident that the entire state is susceptible to wildland fires. However, based on previous occurrences and this risk assessment, the western portion of the state experiences wildland fire more frequently than the eastern portion of the state, due to fuel availability and climate. Additionally, the central and western counties have more population in the WUI than the eastern counties and may experience more losses due to wildfire.

Future Conditions

Successful mitigation of wildfire requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or decline) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future wildfire risk.

Since many agencies are involved in wildland firefighting efforts across the state, a centralized, accessible, digital database that contains information such as start location, cause, area burned, suppression costs, and damage would allow for a more comprehensive analysis of the history and risk of wildfires in North Dakota. North Dakota Cooperative Fire Protection Grant Program, funded by NDFS and the USFS, provides critical financial, technical and educational assistance to rural fire departments for wildland fire prevention, suppression and mitigation.

The state should promote the Firewise and Comprehensive Watershed Management Plan (CWPP) program and public education. The NDFS can provide financial and technical assistance regarding CWPPs. These plans specifically address mitigation for wildland fires and may be required for jurisdictions to receive wildfire mitigation funding. Improvements can additionally be made to existing plans. Technical and financial assistance through both Environmental Quality Incentives Program (EQIP) and Community Support Program (CSP) is available to individual agricultural producers on a variety of range and pasture practices, as well as forestry practices, that mitigate the potential for wildland fires.

Climate Change

Overall, acres burned from wildfires has increased in the United States since 1960. The average total acres burned per year has risen from approximately 3,000,000 in 1960 to approximately 6,000,000 in 2017. Additionally, the top 10 years with the largest area burned have all occurred since 2000 (North Dakota Department of Emergency Services, 2018). The majority of these acres burned have occurred in the western United States. This increase is attributed to lack of forest management and the long-time management practice of fire suppression, leading to increased fuels as well as higher temperatures due to climate change. Over the past century, North Dakota's average temperature has increased 2.6 degrees. Warmer temperatures combined with increased fuel for wildfires is leading to an increase in frequency of wildfire. Additionally, the increased fuel contributes to high-intensity wildfires. Under drought conditions, these risks are exacerbated. As temperatures continue to rise, the risk to wildfire is likely to increase under these future conditions.

In addition to an increased risk to people and property, wildfires burning in rural areas of North Dakota are often fought by volunteer firefighters. According to the *Bismarck Tribune*, as of October 4, 2017, 96% of fire departments in North Dakota are staffed with volunteers. As the frequency and intensity of wildfires increase, these volunteer firefighters may become stressed for resources and time to respond to these fires. Volunteer fire departments are losing personnel strength when firefighters retire and, in many cases, move to larger towns where medical care is more readily available. In North Dakota, cities with career departments (paid staff) are Fargo, Bismarck, Minot, Grand Forks, and Williston. The cities of Dickinson, Minot Rural, Bismarck Rural, Devils Lake, Mandan, Jamestown, Valley City, and Wahpeton have a combination of career and volunteer firefighters.

The following table presents the best available data relating to climate changes impacts to the hazard of wildland fire. The important summary of these changes is that the state should expect an increased risk to wildland fires in the future.

Table 3.7.6-6 Expected Changes to Wildland Fire Future Condition

Condition	Projected Change
Location	The areas at risk to wildland fires are not projected to change. Studies indicate that wildfires occur in the same locations every three to four years, with larger conflagrations taking place on a 10- to 30-year sequence (NDFS 2009).
Extent / Intensity	Wildland fire extent is projected to increase as burned areas are expected to increase. Intensity is also projected to increase due to warmer temperatures contributing to additional dry vegetation that can serve as fuels.
Frequency	Increases in temperatures combined with increased fuels have increased the frequency of wildland fires. Decreases in overall precipitation levels and increases in droughts are expected to increase the frequency of wildland fires. Droughts are projected to occur more frequently, potentially increasing the frequency of wildfires.
Duration	Fire season generally runs from March 1 through October 31. Within the fire season, there are three distinct peaks of fire activity. The first peak occurs during the spring before vegetation turns green, due to the fuel buildup from the previous growing season, drying winds, decreasing humidity, warmer temperatures, and increased human-caused fire activity outdoors. The second peak in the fire season coincides with the increase in harvesting activities during mid to late summer when temperatures remain hot, humidity is at its lowest, and precipitation has declined significantly. The third and final peak in fire season typically occurs between September 1 and November 30 when wildland fuels are fully cured due to hard frosts, winds are frequent and high, humidity is low, and human activity remains high. This third fire season typically extends until a fire season-ending snowfall.

Changes in Development

Jurisdictions with a higher number of previous wildland fire occurrences will likely continue to experience wildland fires in the future. Additionally, climate change may cause these fires to be more frequent and intense, which could increase the amount of losses resulting from wildland fires. Managing development of state assets in the WUI can help to minimize the risk to future wildland fires.

According to the future population projects as detailed in Section 2, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

National trends show remote, isolated, forested areas are becoming popular places to live or to have a second home, and growth in these parts of North Dakota is possible. Future development could have a negative impact on the state's vulnerabilities to wildland fire, putting more people and property in harm's way. Few North Dakota communities have requirements related to ingress and egress, building sites, densities, water supply, building materials, and fuels maintenance that work to reduce people's risk to wildland fire. As of 2010, Burleigh County had both the highest population (49,104 people) and highest total housing units (21,363 housing units) in moderate to high WUI risk areas. By 2030, the population of Burleigh County is projected to increase by 36%. It is likely that over this time period the number of people and houses in the WUI in Burleigh County will increase. Morton, Williams, Rolette, and Mercer counties, respectively, followed Burleigh with the highest population in the WUI. All of these counties are projected to grow in population from 2010 to 2030, with Williams County projected to grow by 165%. Managing growth and development in the WUI will be important to decrease the risk to wildfire in the future.

Despite the conversion of much of the indigenous prairie to non-native grasses and crops, the majority of the state's fuels are still highly combustible, light fuels that burn readily and rapidly given the right environmental conditions. The western part of the state still contains large unbroken acreage of native mixed grasses. The highly successful Conservation Reserve Program (CRP) has enabled North Dakotans to enroll nearly three million acres of land in highly flammable fuels. Uncontrolled wildfire still remains a threat to North Dakota's people, property and natural resources. Conversely, prescribed burning is an important tool for maintaining and restoring prairie ecosystems.

The techniques for prevention and suppression of wildfires are highly different from those of structural fires considered in this report. Moreover, federal/state governments fund wildland firefighting. Future studies may integrate the economic as well as the environmental costs of wildfires into the total cost of fire. Because forests and related natural resources are valued for the provision of many kinds of market-based and non-market goods and services, it is important to assign costs to wildland fire damage. In a study performed on two years of fire data (2014 and 2015) for the State of North Dakota, a significant trend of incendiary fires was located. This trend exhibited that North Dakota had three times the number of incendiary fires then the national average. There were 9.3% of the fires in North Dakota that were arson compared to the 3.8% for the rest of the country. The Farm Bill requires states to consider existing State Wildlife Action Plans and Community Wildfire Protection Plans as state assessments are being developed.

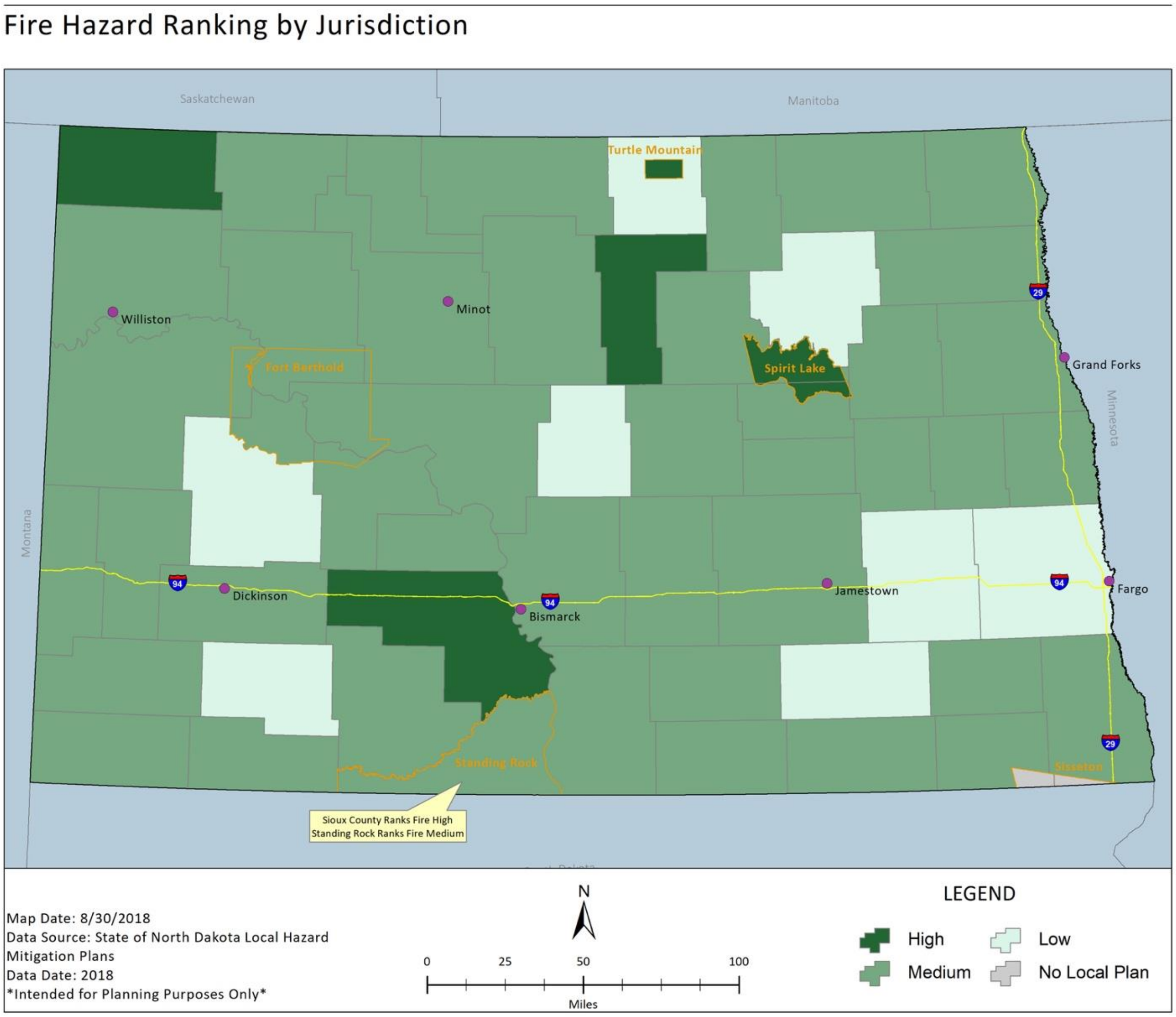
Fire is a tool that should be included in management strategies for rangeland and grasslands in the northern Plains. Fire and grazing are essential ecosystem tools for dealing with today's rangelands. Prescribed fires when properly timed can create positive impacts on plant species diversity and forage production, creating a healthier, more productive rangeland for a variety of species. Fire not only can be used to manipulate the grazing patterns of livestock, but it also can be used to control invasive plants.

Jurisdictions at Risk

All 58 local and tribal HMPs profile fire. The jurisdictions at risk section only looked at fire and did not break out fire into wildfire and urban fire. Figure 3.7.6-6 presents a summary of those plans and also identifies how they ranked the overall risk presented by fire. Six jurisdictions ranked fire as a high hazard, 43 as medium, and nine as low. This ranks fire as the number five out of 14 hazard according to North Dakota local HMPs.

Appendix 7.4.4 includes a compilation of available hazard ranking and loss information, when available, for fire as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. Some jurisdictions note how many housing structures they have in the WUI or moderate/high wildfire risk zones. Many state rural structures and homes are at higher risk to fires.

Figure 3.7.6-6 Fire Hazard Ranking by Jurisdiction



Summary / Conclusion

Following this plan's risk assessment methodology, the wildfire risk factor score was 2.98, which is a moderately ranked hazard on a scale of one to four, where four is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Wildland fires have always been common and widespread in North Dakota and will continue to be a persistent hazard. Wildland fires especially threaten areas with increased dry vegetation and can have negative economic impacts, such as loss of agriculture land and property. Additionally, wildland fires can cause loss of life or injuries. With an increase in population across many counties in North Dakota, as well as the potential for increased frequency and intensity of wildland fires from climate change, it is important to take steps to mitigate the risks and impacts of wildland fires in North Dakota.

A collaborative effort between the North Dakota Department of Emergency Services, local emergency managers, the NDFS, the North Dakota State Fire Marshall (NDSFM), and the North Dakota Fire Council published the Rural Fire Danger Guide. This guide was designed for landowners, equipment operations, and outdoor enthusiasts for when fire danger reaches very high or extreme categories. Under severe, extended dry conditions or drought, the guidelines become mandatory if the Governor issues a proclamation. Failure to comply results in fines and other penalties. Apart from the Governor's proclamation, local governments can institute a burn ban or fire restriction regardless of the fire danger index. The burn ban and fire restrictions are measures of last resort but are necessary to reduce the risk of human-caused fires during unusually high fire danger or burning conditions. Guidance in 2017 states that a local burn ban may only be issued upon a declaration of a local emergency or disaster pursuant to North Dakota Century Code (NDCC) 37-17.1-10. In 2005, the North Dakota legislative session passed a state law enabling cities and counties to declare burn bans and enforce criminal prosecution to those in violation of the ban. Local governments have the authority to issue a burn ban upon declaration of an emergency or disaster outlining burn ban/fire restrictions pursuant to NDCC 37-17.1-10.

The 2017 Burn Ban Guidance states the following factors that should be taken into account before issuing a burn ban/fire restrictions:

- High to Extreme fire danger is predicted
- Frequency of human-caused fires being experienced has increased
- Firefighting resources are diminished
- Potential high-risk occasions (i.e. 4th of July, etc.)

The 2018 Plan goals included reducing the impact of drought and wildland fires to people and property. An additional goal was to reduce the vulnerability of homes and businesses from approaching wildland fires. Overall, North Dakota endeavored to achieve these goals to reduce the impact of all accidents, incidents, and disasters by promoting readiness and resilience. The Fire Committee identified wildfire protection that included the installation of vegetative firebreaks, defensible space and Firewise practices as a means of mitigation. Additional mitigation ideas include tabletop exercises with mutual aid partners, increased public information and education including a cohesive, unified education program by stakeholders to educate the public regarding fire danger levels and ways to reduce risk.

Data Limitations / References

It is important to note that, although the best available data was used to develop this profile section, much of the data used is over five years old, making it potentially out of date. A comprehensive historical wildland fire digital database for the state encompassing all firefighting agencies that includes data on start location, cause, area burned, suppression costs, and damage would prove highly beneficial in better pinpointing the hazard areas.

Other key documents related to the Wildland Fire hazard include:

- North Dakota State Emergency Operations Plan, Fire Annex, 2017
- North Dakota Forest Service, Building Sustainable Communities Through Forestry
- North Dakota Statewide Assessment of Forest Resources and Forest Resource Strategy
- Fire Management Plans for federal lands
- North Dakota Fire Danger Guide
- North Dakota Cooperative Fire Protection Initiative
- Response Alert Notification – Fire State Emergency Operations Plan, March 2018
- 2014 - 2016 Progress Report: Hazard Mitigation in North Dakota
- Burn Ban/Restrictions Guidance – 2017
- FEMA’s State Mitigation Plan Review Guide (Guide)
- NDDES Wildland Fire Frequently Asked Questions
- Community Wildfire Planning
- Statewide Assessment of Forest Resources and Forest Resource Strategy, May 2010
- North Dakota Forest Action Plan, May 2010
- NPS. (n.d.). Wildfire Causes and Evaluation. Retrieved from: https://www.nps.gov/articles/wildfire-causes-and-evaluations.htm.

3.7.6.2 Urban Fire

Description

Urban fires consist of uncontrolled burning in developed areas including structure fires and vehicle fires. Urban fires can be caused by a number of factors, including natural factors such as lightning or wildfire, and human actions such as electrical malfunction, explosions, hazardous material releases, heating appliances, or arson.

Urban fires have a range of impacts, but a small flame can get completely out of control and turn into a major fire within seconds. Thick black smoke can fill a structure within minutes and is oftentimes deadlier than the fire itself. The heat from a fire can be 100 degrees Fahrenheit at floor level and rise to 600 degrees at eye level. It may only take five minutes for a room to reach a temperature where it ignites; this is called flashover. Despite the cause, urban fires and structure collapse can lead to complete building losses in addition to other losses from the causative hazard. In urban areas where there is a large concentration of population, there is significant risk of injuries, loss of life and property while damaging critical infrastructure, all of which hampers a community's ability to function in the short term.

Previous Occurrences

Since before statehood in 1889, urban fires have threated our state's communities. The historic 1882 fire destroyed a large portion of the City of Grand Forks, and half of the City of Devils Lake burned during an 1884 fire. The state's largest city, Fargo, experienced a fire in 1893 that destroyed nearly the entire business section, including City Hall and many of the residences. Fire destroyed the North Dakota Capitol in 1930; all state records were destroyed with the exception of the State constitution, which was saved by the Secretary of State. The highest number of deaths occurred in 1994 when nine people died in a house fire. Below is a summary of some of the more significant urban / structural fires that have impacted the state since 1997

- January 1997 – A portion of the roof of the Winter Show Building in Valley City collapsed postponing events there.
- April 1997 – During the 1997 extreme flood event in Grand Forks, a downtown fire, surrounded by floodwaters, burned eleven businesses covering three blocks, including the Grand Forks Herald building and its 120 years of archives.
- Between 2014-2017 -16 civilian home fire fatalities reported for all cause and residential building types.
- July 22, 2014 – Williston Chemical Fire (Williams County) was a structure fire and explosion reported at the Red River Supply Company in Williston. The building contained diesel fuel and multiple types of other chemicals.

Location and Extent

Structural fires can occur anywhere at any time. Urban fires require areas of densely located structures, which most likely occur in downtown areas and larger cities. Figure 3.7.6-7 provides an overview of the extent that resources could be impacted by urban / structural fire.

Figure 3.7.6-7 Spatial Extent of Impacts from Urban/Structural Fire

Resources	Extent of Impacts
Impact on Public	Local
Property	Local
Infrastructure	Local
Government Operations	Local
Environment / Natural Resources	Local
Cultural Resources	Local

Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.6-7 presents the summary analysis of an urban fire event. Impacts to responders, the environment, and the economy would be the most severe. Effects on the continuity of operations and delivery of services, in addition to the public's confidence in government, are expected to be the least impactful.

Table 3.7.6-7 Urban Fire Consequence Analysis

Urban Fire Impacts	
Public	Depending on the time, location, and safety of the building, a major structure fire could result in the loss of life to building occupants. The potential for this type of loss is difficult to determine due to the installation of sprinkler and alarm systems in many commercial and apartment structures. Those structures lacking smoke detectors are especially dangerous to the population. Should lives be lost, significant resources could be needed to manage the recovery. Property losses are usually covered by insurance, but can be devastating to the building occupants, particularly for primary residences
Responders	Depending on the time and location, a major structure fire could result in the loss of life to firefighters. The potential for this type of loss is difficult to determine due to advances in firefighter safety.
COOP	COOP is likely to be impacted because resources are being dedicated to fighting the fire rather than normal operations. Normal operations would be affected and could lead to a reduced level of service provision or inability to provide certain services.
Delivery of Services	It is unlikely that urban fire would impact delivery of services, however if the location of the urban fire burns critical infrastructure, services including healthcare, water and sanitation services, or transportation could be affected.
Property, Facilities, and Infrastructure	Individual properties are at risk from urban fires and structure collapses. These types of events often do not result in community-wide disasters, unless the structure is critically important to the economy. Fires and collapses that result in a significant loss of life or encompass the large part of a downtown or urban area would present the most significant challenges to local, tribal, and state government.
Environment	It is unlikely that urban fire would severely impact the environment. Fire could affect the air quality surrounding the fire event.
State Economy	The impact on the state economy would depend on the location and extent of the fire. Primarily economic values could be lost if a business district were destroyed in an urban fire or structure collapse. For example, facilities of large employers or central community structures such as grain elevators, if damaged, could lead to significant community losses. Additionally, a fire impacting oil and gas operations could be catastrophic, causing injuring, loss of life, and impacts on the economy. Most historic buildings lack sprinkler systems and would lose much of their historical value in a fire or collapse.
Public Confidence in the State's Governance	Depending on the size and scope of the urban fire event, the public may lose confidence in the State's governance. This is especially true in the case when an event results in loss of lives or a lot of destruction. For an urban fire, people may wonder why smoke detectors or sprinklers or building codes did not aid in mitigating the effects of fire.

State Risk Assessment

According to statistics from State Fire Marshal's Office, rural structure fires typically lead to total loss. Urban fires can result in severe injuries, cause death, and communities can suffer extreme financial loss. Urban fires can cause infrastructure damage and disrupt communications that inhibit efficient coordination of fire operations support during the immediate response and post-emergency period. Even small fires can threaten lives, and if not properly controlled can cause significant destruction of property and the environment. The resources and agencies that manage a large firefighting operation is complex and require aid from many different agencies and jurisdictions. All urban fires have the potential of becoming large and/or catastrophic.

Probability

Approximately 2,500 urban fire events are reported each year by fire departments statewide through the National Fire Incident Reporting System (NFIRS). In a 2016 snapshot of reported fire losses through the NFIRS, North Dakota reported lower deaths and injuries per 1,000 fires than the national average. Of all the reported fires, deaths and injuries were primarily caused by residential or structural fires. According to the NFIRS, residential property types cause the highest number of fire deaths, injuries, and fire dollar loss. However, data from 2015 showed that 41% of all fires in the nation occurred outside, compared to the 30.4% in residential properties. Nationwide in 2016, there were an estimated 364,300 residential building fires compared to 96,800 nonresidential fires. The leading cause for both residential and nonresidential fires was cooking. The other top causes of fire include: unintentional/carelessness, electrical malfunction, intentional, other heat, and open flame. It is important to note that not all fires are reported through NFIRS.

These statistics summarized above generally encompass smaller incidents and fires. The probability of a major urban fire is much more difficult to define. Except for the major fire during the Grand Forks flood, a significant urban fire has not affected North Dakota communities since the 1960s. Similarly, only minor structure collapse incidents have been recorded. Those structures lacking automatic sprinkler systems are more likely to experience a major urban fire; and those structures with large span roofs or not up to building code standards are more likely to collapse. A realistic yet devastating urban fire or structure collapse scenario for North Dakota is the complete and rapid destruction of an occupied building. In this scenario, little warning might exist for occupants and many could become trapped.

Vulnerability Assessment

Counties with higher population are likely to contain more structures at risk to an urban fire. Additionally, the higher the density of buildings, the higher the changes that a fire could spread to neighboring buildings and cause more destruction. Building codes provide additional capability to prevent or minimize damage from structural fire or collapse by establishing setback limits and requiring the installation of sprinklers, among other building requirements.

According to the North Dakota Department of Commerce population estimates, in 2015, Cass County was the most populated county in North Dakota. According to the 2010 Census, Cass County also had the highest housing density of 38.49 housing units per square mile. Despite Cass County having the highest number of code-enforcing jurisdictions, it does not maintain a countywide building code, which can increase the overall vulnerability of this county to future urban fires by allowing certain kinds of risky development.

Burleigh County and Grand Forks County have next highest populations and housing density. Burleigh County has three code-enforcing jurisdictions, as well as a county wide building code, and Grand Forks County has six code-enforcing jurisdictions and also a county wide building code. The buildings codes may help to lower these counties' vulnerability to an urban fire or structural collapse. Section 4 includes a figure that shows all counties and jurisdictions with buildings codes.

State Assets and/or Critical Facilities at Risk

State-owned critical facilities were identified using the State Fire and Tornado Fund database for insured properties. The North Dakota Homeland Security Advisor's priorities provided the parameters for determining state-owned critical facilities from the database. These priorities included emergency services, communications, government facilities/supporting personnel, transportation and food/agriculture. Priorities were then compared with properties listed in a North Dakota Insurance and Reserve Fund database.

Overall, state assets are at risk to urban or structural fires. Vulnerability of state owned and operated facilities and critical facilities in hazard prone areas was assessed. Insurance data from the North Dakota State Fire and Tornado Fund was the primary source of information for this section. Updated data was unavailable, so we were unable to rerun this analysis.

Loss Estimates

The total cost of fire from the years 1980-2014 in the United States is $328.5 billion. The cost of fire includes expenditures and losses. The fire safety costs in building construction is the largest component. The report prepared for the National Fire Protection Agency (NFPA) provided updated prevention, protection, and mitigation costs. This report only considers structural fires; wildfires and vehicle fires are excluded from analysis. Below are two figures that illustrate components of the total fire cost.

Figure 3.7.6-9 Values (in billion $) and percentage shares of the components of the total cost of fire ($328.5 billion) in United States in 2014

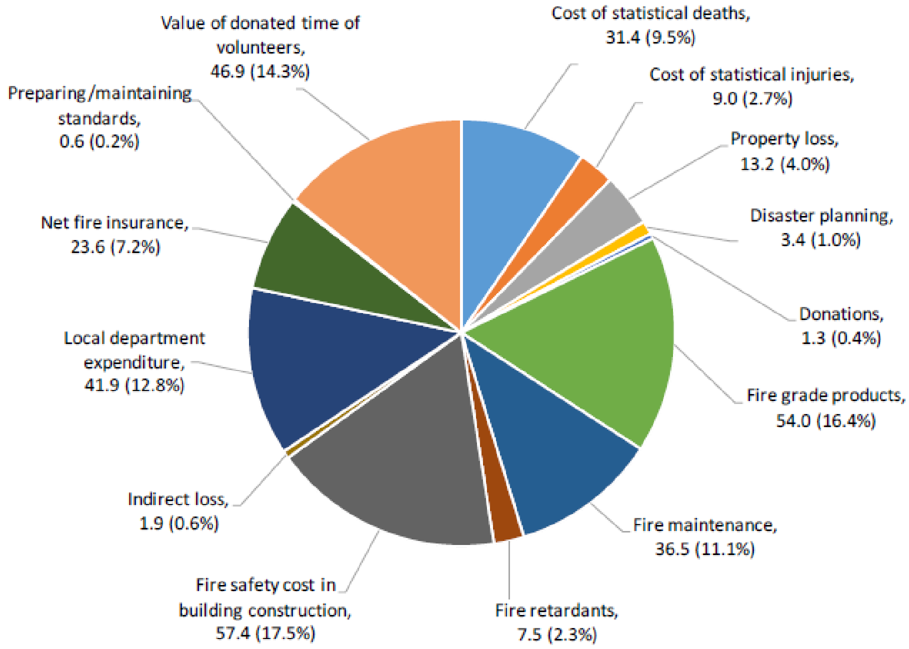
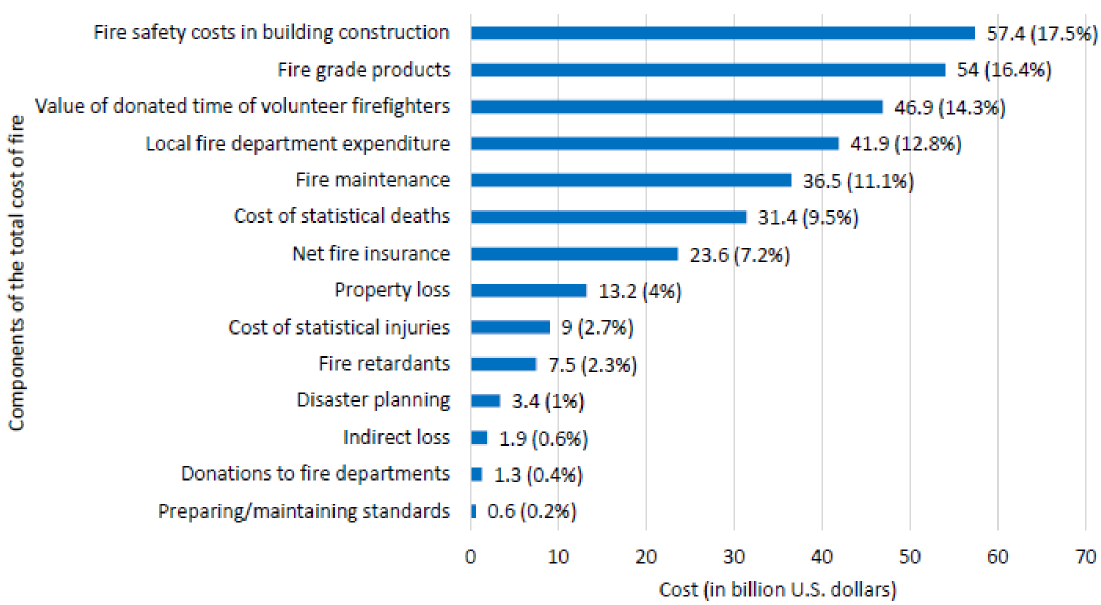


Figure 3.7.6-10 Values (in billion $) and percentage shares of the components of the total cost of fire ($328.5 billion) in the United States in 2014



In the United States, NFPA estimates that the 1,342,000 fires to which the fire service responded in 2016 caused $10.6 billion in property damage, 25.7% less than 2015. Fires in structures not related to wildfires resulted in $7.9 billion in property damage, a decrease of 23.2% from 2015. Each structure fire resulted in an average property loss of $16,609, a decrease of 19.0% from the previous year. From 1977 to 2016, excluding the events of September 11, 2001, the average loss per structure fire was $3,757 in 1977 and $16,610 in 2016, for an overall increase of 342%. When property loss is adjusted for inflation in 2016 dollars, however, the increase in the average structure fire loss between 1977 and 2016 is 12.1%. Of the 2016 property loss in structures, $5.7 billion occurred in home structures, a decrease of 18.8 % from 2015.

In 2015, NFIRS reported over $17,000 in losses for residential property types, and over $34,000 in nonresidential types in North Dakota. In consideration of all other property types, fire dollar losses in 2015 numbered almost $65,000 in losses in 2015 alone. With so many types of fire incidents and death and injury occurrences, it is difficult to predict future fire loss estimates.

Future Conditions

Successful mitigation of urban fire requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or decline) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future fire risk.

Climate Change

While urban / structural fires are not expected to be directly influenced by climate change, occurrences of these events may increase as the state expects to see an increase in wildland fires. This increase is anticipated due to projected decreases in precipitation and projected increases in drought conditions.

Changes in Development

According to the future population projects as detailed in Section 2, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

Although the statewide population is projected to increase, the increase is not shared equally across counties. In many cases, areas with higher populations are expected to continue to grow, and rural counties with low population are projected to have a steady population or lose population. This additional population and associated development add to the risk to urban fires and structural collapse, particularly for jurisdictions and counties without building codes. New construction or remodels in jurisdictions lacking building codes and/or adequate enforcement are at greater risk from urban / structural fire. In 2030, Cass County is projected to have the highest population, with 214,719 people. As mentioned previously, Cass County does not have a county wide building code.

Additionally, McKenzie, Williams, Mountrail, and Dunn counties are the top four counties in terms of percent population change from 2010 to 2030. This development is associated with the boom in the oil and gas industry in these counties. All these counties do have adopted county building codes. Additionally, McKenzie County has two code-enforcing jurisdictions, Williams County three, Mountrail County four, and Dunn County three. The increase in oil and gas infrastructure is also at risk to fire. Explosions and fires are safety concerns for oil and gas development, so the shear increase in oil and gas infrastructure development increases this risk in these counties, although safety regulations help reduce this risk.

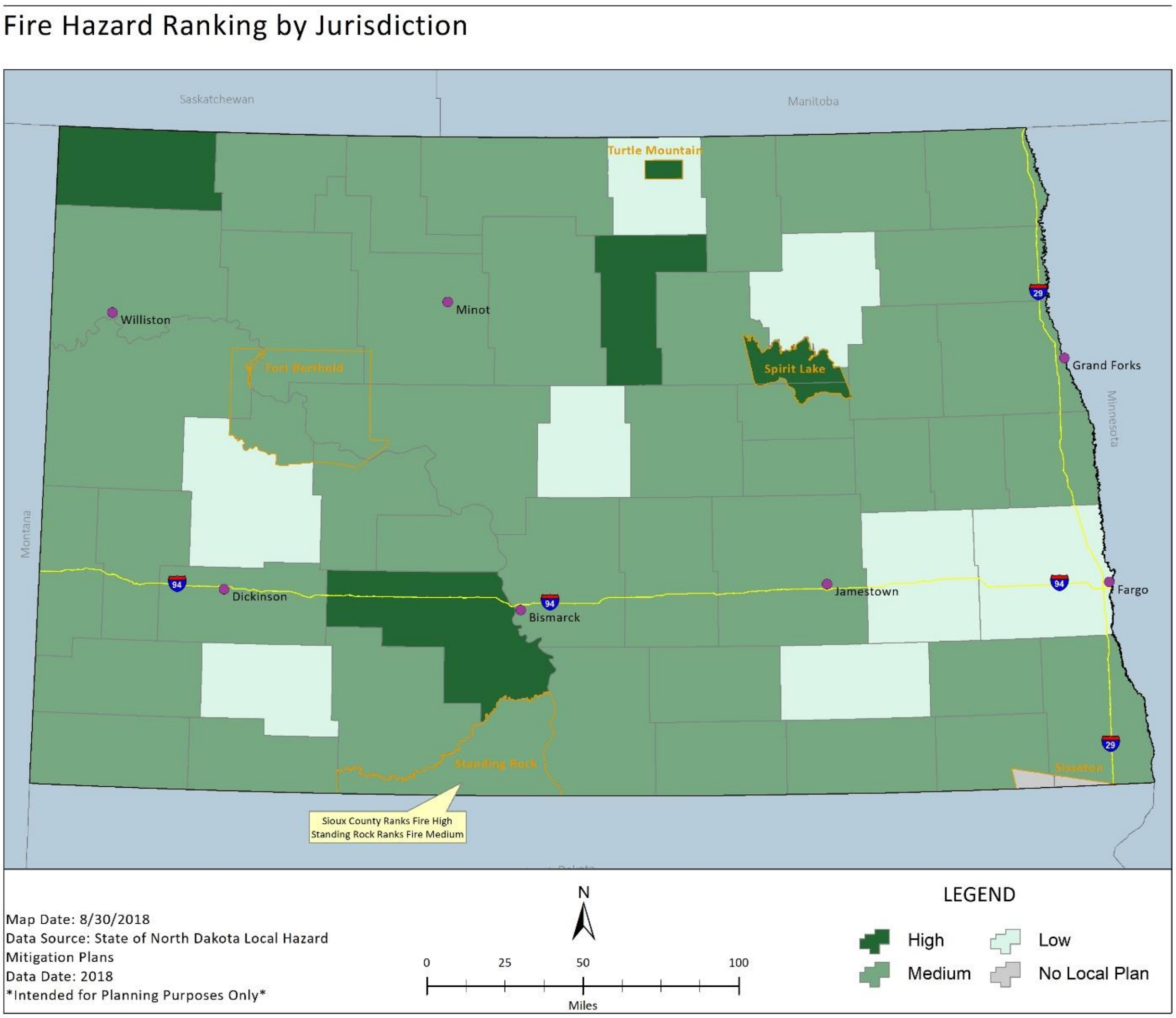
The NOAA Climate Explorer tool example, a user evaluating the NOAA Climate Explorer projects extreme heat days across the state. North Dakota can use the data to compare counties and identify regional and statewide trends in projected extreme heat days. Both the NOAA Climate Explorer data and the 2014 National Climate Assessment can be used to describe projected changes to climate conditions and the resulting effects on hazard location, extent, intensity, frequency, and/or duration. In addition, reviewing case studies, climate reports, and academic papers can provide valuable supplemental information related to specific future conditions hazard information.

Jurisdictions at Risk

All 58 local and tribal HMPs profile fire. The jurisdictions at risk section only looked at fire and did not break out fire into wildfire and urban fire. Figure 3.7.6-11 presents a summary of those plans and identifies how they ranked the overall risk presented by fire. Six jurisdictions ranked fire as a high hazard, 43 as medium, and nine as low. This ranks fire as the number five out of 14 hazard according to North Dakota local HMPs.

Some of the communities in North Dakota do not have a fire inspection process. Therefore, no fire hazards have been abated, which leads to an increased number of fires within the communities. Unfortunately, this produces an attitude among citizens that fire losses are acceptable.

Figure 3.7.6-11 Fire Hazard Ranking by Jurisdiction



Appendix 7.4.4 includes a compilation of available hazard ranking and loss information, when available, for fire as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale.

Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including drought, to create an overall Risk Factor score. Following this methodology, the urban fire risk factor score was 2.65, which is a moderately ranked hazard on a scale of one to four, where four is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

In the past, urban fires have been classified with a lower hazard rating than wildland fires. Urban/structural fires can happen anywhere in the state, but more dense, urban areas are at higher risk to these fires. Additionally, building codes can help reduce the vulnerability to urban/structural fires. Impacts to responders, the environment, and the economy would be the most severe. Urban fires are highly likely to occur on an annual basis; however, this probability mainly defines smaller (lower casualty and damage) fires. The probability of larger fire events is more difficult to define. As North Dakota's population continues to grow, the risk to an urban/structural fire will persist. As with wildland fire, the Fire Committee advocated for increased public education regarding the risk of urban fires and mitigation measures.

Data Limitations / References

Improved tracking of local building code adoptions and enforcement would enable further analysis and potential mitigation at the State level.

References:

- North Dakota State Emergency Operations Plan, Fire Annex
- United States Fire Administration (USFA)
- Fire Loss in the United States During 2016, NFPA

3.7.7 Flood

3.7.7.1 Description

Flooding is an overflow of water on land not normally covered by water. Floods are a natural phenomenon; however, human activities often intensify flood hazards because of the alteration of natural conditions. Floods occur along rivers and streams, along closed basin lakes, in poor drainage areas, or in oversaturated soils. If floodplain areas were left in a natural state, damage would primarily be limited to ecosystems. The economic attractiveness of vacant land adjacent to water sources has resulted in the development of some floodplain areas despite the risk. The urban, industrial, and agricultural encroachment on natural floodplain areas has increased the potential for dangerous flooding and causes the flood waters to adversely affect these areas. The flood potential is increased further due to the introduction of impervious surfaces and tilled ground to areas whose natural state consisted of more pervious and absorptive materials. Rainfall that would normally soak into the ground or take several days to reach a stream or river via a natural drainage basin now quickly runs off streets, parking lots, rooftops, and tilled and ditched agricultural fields through channels and pipes.

2011 Flood Impacts

Source: NDDES

Many floods in North Dakota occur because the ground is frozen and/or saturated with moisture and cannot absorb any further moisture. This moisture can come from several different sources and circumstances. One source is a heavy snowpack, which is affected by a rapid warming trend as well as spring rain falling directly on the snowpack. In addition, more intense summer rain following spring high water can extend or increase flood stages.

Several different types of flooding will be discussed in this section, including: closed basin, flash floods, ice jams, levee failure, high dam release (not from dam failure), and riverine flooding. Each type of flooding is described below.

Closed Basin

Flooding in a closed basin occurs when surface water cannot flow naturally out of the basin as a river does (until a natural overflow elevation is reached), and therefore, normally dry locations can fill in with water during wet periods. The largest terminal lake in North Dakota is Devils Lake, which rose 31 feet during an 18-year span before overflowing through the Jerusalem Channel and into nearby Stump Lake.

The NDSWC data indicates thousands of closed basin lakes, ponds and sloughs throughout the state. Most of these lakes are located north and east of the Missouri River in an area known as the Prairie Pothole Region. These potholes typically fill with snowmelt and rain. Since many water bodies are situated in closed basins, with no natural outlets, water levels continue to rise and, as a result, excess water overtops banks and connects with other potholes, forming larger lakes and sloughs.

Flash Floods

Flash flooding occurs when heavy rain falls in such a short time that the soil cannot absorb it and/or drainage systems (natural or human-made) cannot carry the volume of water away as quickly as it accumulates.

A flash flood is usually caused by severe thunderstorms, heavy rains on snowpack, slow moving storms, dam, dike, or levee failures, or ice jam releases. Flash floods can occur anywhere when a large volume of water inundates an area over a short time period. Because of the localized nature of flash floods and variables in rainfall amounts and duration, clearly defined areas prone to flash flooding are difficult to identify. It is unlikely that every part of the basin will experience the same level of rainfall and flood impacts (USGS, 2018). Moreover, depending on the size of the basin and the inundation from rainfall, flash floods can impact some areas more often than others (USGS, 2018). Some areas may have flash floods that are slower to develop than other areas. Flash floods often occur rapidly with significant impacts. Only a few inches of rapidly moving water can lift people off their feet, and depths of 12 to 18 inches can sweep a car away.

Urban flooding is a type of flash flooding that is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. According to the NOAA, urbanization increases runoff two to six times more than natural terrain. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

Ice Jams

Flooding can also result from ice jamming or blockage along streams. Ice breaking up into pieces, called floes, move along with the flowing rivers or streams. The ice floes can jam at curves, narrow places in the channel, structures, river/stream confluences, or where there is a sharp decrease in river bed gradient, creating an effective dam that produces water backup and overflow. Ice jams can cause considerable increases in upstream water levels, while at the same time downstream water levels may drop. According to the USACE, types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be like that of a flash flood, levee failure, or dam failure.

Levee / Floodwall Failure

Levees are earth embankments constructed along rivers and coastlines to protect adjacent lands from flooding. Floodwalls are concrete structures, often components of levee systems, designed for urban areas where there is insufficient room for earthen levees. Levees are usually engineered to withstand a flood with a computed risk of occurrence. When a larger flood occurs and/or levees and floodwalls and their appurtenant structures are stressed beyond their capabilities to withstand floods, levee failure can result in loss of life and injuries as well as damage to property, the environment, and the economy.

For purposes of this plan, the levee failure hazard will refer to both overtopping and breach of a levee as defined in FEMA's publication, *So You Live Behind a Levee* (USASCE, Inter-Institute Levee Committee, 2010).

- Overtopping: When a Flood Is Too Big - Overtopping occurs when floodwaters exceed the height of a levee and flow over its crown. As the water passes over the top, it may erode the levee, worsening the flooding and potentially causing an opening, or breach, in the levee.
- Breaching: When a Levee Gives Way - A levee breach occurs when part of a levee gives way, creating an opening through which floodwaters may pass. A breach may occur gradually or suddenly. The most dangerous breaches happen quickly during periods of high water. The resulting torrent can quickly swamp a large area behind the failed levee with little or no warning.

High Dam Release

High dam release flooding is caused by intentional water release from dams to prevent water from breaching a spillway or the ends of the dam. A high dam release is typically a slow release of water from the dam over time but can cause flooding in surrounding areas. There are 130 high and medium hazard dams in North Dakota, all of which are at risk of high-water levels that may require an intentional release of water. Refer to the Dam Failure profile of this plan for more details.

Riverine Flooding

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Most riverine floods are slow developing events with a natural, predictable source of water or moisture, such as snowmelt, slow rain, or a controlled dam release. This type of flood can often be forecast based on the amount of moisture or water available. The timing and location of flood conditions can often be calculated to a reasonable degree. If implemented in a timely manner, protective measures can sometimes mitigate the potential damage and loss.

The riverine hazard areas may be mapped as part of the NFIP. Under this program, an area is broken into zones to depict the level of flood hazard. Most commonly, the areas within the 1% annual chance (100-year) floodplain are considered the greatest risk. The 1% annual chance floodplain is that area of the floodplain that has a 1% chance of flooding in any given year. Over a 100-year period, a flood of this magnitude or greater has a 63.5% chance of occurring. According to FEMA, structures in the 1% annual chance floodplain are nearly three times more likely to be damaged by flood than a major fire. Locations outside the 1% annual chance floodplain may also experience flood conditions during greater magnitude floods, localized events, flash flooding, or along unmapped creeks, streams, and ditches. Approximately 25% of all NFIP claims come from areas outside the mapped high-risk flood areas. In the Williston area, Missouri River flooding also threatens area oil rigs.

3.7.7.2 Previous Occurrences

North Dakota's history is colored with many significant flood events. From 1965 to 2018, North Dakota has received the following amount of declarations due to flooding events: 35 Presidential Disaster Declarations, four (4) Emergency Declarations, and one (1) state level declaration that did not result in a presidential disaster or emergency declaration. These events are detailed in Appendix 7.4.5. In general, the eastern portion of the state has experienced more disaster declarations due to flooding than the western region of the state, primarily due to the Devils Lake and Red River Basins.

The summaries that follow include the more significant flood events that have been recorded in the state since 2010. Appendix 7.4.5 contains a detailed narrative of past flood events that date back to 1825. Sources consulted for this information include: State Historical Society of North Dakota; NDDES; USGS; *Minot Daily News*; Interagency Hazard Mitigation Team Reports, varied dates; NCEI; USACE; and the *Bismarck Tribune*.

- 2010 Red River Flood – During the spring of 2010, flooding was forecast across the state but primarily in the Red River valley. The flood depth on the Red River at Fargo reached 36.99 feet. In the Fargo-Moorhead area alone, about 1.5 million sandbags were put in place to protect property. Several bridges over the Red River were closed, but no major damage was reported.
- 2011 Floods – The 2011 flood impacted every river basin in North Dakota, shattered 21 peak records, displaced residents in 28 neighborhoods, and swamped 4,100 homes and businesses alone in Minot. The final cost is not yet fully known. But it is estimated the final cost will easily exceed $1.4 billion. With above normal precipitation and saturated soil conditions experienced during late summer and fall of 2010, the stage was set for a large scale 2011 spring flood. Flood preparedness efforts began in the fall of 2010 based on early flood predictions by the National Weather Service, USGS, and NDSWC. On February 14, 2011, the State Emergency Operations Center (SEOC) received its first report of flooding in the City of Belcourt. This was followed by extensive flooding along the Mouse River, which was particularly devastating to the city of Minot by flooding an estimated 4,700 structures and damaging infrastructure resulting in the loss of potable water. The Missouri River basin flooded as well, with flood records shattered along the River in its entirety affecting every area along the river's path such as Williston, Bismarck/Mandan, Lake Oahe and surrounding communities in the Standing Rock Reservation. The spring melt of a heavy snowpack produced significant flooding and runoff into the Jamestown and Pipestem dams. The latter half of June and all through the month of July saw persistent heavy rains in the upper James River basin which kept summer time runoff high enough to prevent the Jamestown and Pipestem Dams from lowering through normal means such as evaporation. The last weekend in July produced one of the heaviest precipitation events with well over four inches of rain covering a wide area that drained into the two reservoirs, and this last storm in July sent both Jamestown and Pipestem dams uncomfortably close to their emergency spillways and prompted the USACE to plan for unprecedented high releases out of both dams well into October and early November. In the Sheyenne River Valley, the high amount of runoff entering into Baldhill Dam also initiated high releases which caused the Sheyenne River to reach its second highest crest on record in Valley City. The Baldhill Dam releases created such a swift rising of the Sheyenne that every available resource needed to be used to quickly place dikes, Hesco

barriers, and sandbags to prevent the Sheyenne from flooding a majority of the city. Valley City was threatened again in August due to heavy local rains in the middle-Sheyenne basin. But due to the quick response by state agencies and the assistance of the USACE and North Dakota National Guard, the city was protected from becoming another disaster such as Minot. The Red River Valley began its flooding on March 22, with Fargo reaching flood stage on March 29. Due to a rather wet summer, Fargo experienced 150 days above flood stage this spring and finally dropped below flood stage on August 27.

- 2011 Devils Lake Basin Flooding – The Devils and Stump Lake areas which are continuously rising every year went into freeze-up during the 2010 winter at 1451.6 feet. Substantial snowpack melt and near normal precipitation made its way from the upper basin into the combined lake system starting in mid-April culminating in the new peak level of 1454.3 feet on June 27. Evaporation and limited pumping through the west end outlet lowered the lake to an anticipated freeze up height of about 1453.5 feet. Since 1993, Devils Lake has inundated 167,000 acres. In 2011 alone, it claimed 31,000 acres.

> ***Community Coffee Comments***
>
> Floods factored prominently in discussions with Community Coffee participants. One woman who grew up in Mandan remembers being terrified as a child when the 6th Avenue NE underpass flooded from Main Avenue to St. Joseph's Church on Collins Avenue. Her family preserved their belongings by removing them from the basement. More recently, in 2011, another resident helped her daughters remove household items when Missouri River floodwaters inundated the main floor of their homes. "It was very destructive and frightening," she said.

- 2013 Floods – At the end of May 2013, flood waters from flash and overland flooding impacted the cities of Crystal in Walsh County, Belcourt in Rolette County, and Cavalier in Pembina County requiring evacuation of several residents and care facilities in those cities. In Rolette County, fifteen families were placed in a hotel by the American Red Cross due to wind damage to the roofs of their homes and water in their basements. In the town of Crystal, one family was placed in a hotel after evacuating from their home which was threatened by flood water. Mandatory evacuation orders were issued for care facilities in the city of Cavalier in Pembina County.
- 2013 Rain Event – This event was a result of severe storms combined with overland and riverine flooding which resulted in a record-breaking, four-week wet cycle that began on May 17, 2013, and ended June 16, 2013. A federal disaster was declared (DR-4128), including: Benson, Bottineau, Cavalier, Dunn, Kidder, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Sheridan, Stark, Towner, Walsh, Ward and Wells counties, and the Spirit Lake Nation and the Turtle Mountain Band of Chippewa. This severe storm cycle, which began just one day after the incident period for FEMA- DR-4118-ND ended, produced heavy rainfall in excess of 10.5 inches in some areas and created a second catastrophic flood. Drainage areas and main stem rivers and tributaries that were already full from the spring flood rapidly overflowed which resulted in widespread overland flooding. Runoff forced evacuations, damaged 1,400 homes, placed 12 dams in northeast North Dakota at risk, and caused significant personal and public property damage. The late spring flood had already created a serious economic hardship for agricultural producers in terms of delayed planting. Overland and riverine flooding resulting from the May-June storm cycle once again inundated farmland, compounding losses to our state's leading industry.
- August 17, 2014 – Several waves of heavy rain, with embedded non-severe thunderstorms with torrential rain, moved through western and central North Dakota. There was overland, stream, river and flash flooding, mainly over the southern half of the western and central parts of the state. The hardest hit areas were between Williston and Dickinson, and between Bismarck and Jamestown. Up to six inches of rain fell from Kintyre to Napoleon to Menoken. Up to 11 inches was indicated by radar and verified through ground truth rain gauge reports in the Dunn and Mercer County areas. Ten and a half inches of rain was reported nine miles south of Dunn Center, Dunn County. Damage was in the millions of dollars. Some counties had to close roads because of flooding. Weight limits were placed on other roads as the roadbeds softened. The rain was the result of a mid-level atmospheric circulation that moved very slowly across North Dakota. Flood watches were posted for parts of the

area more than a day in advance and were followed by advisories and warnings. Several counties issued disaster declarations.

- June 25, 2015 – Over two inches of rain fell in a very short time and led to flash flooding along parts of North Dakota Highway 1804 southwest of Williston. People were isolated by flood waters and unable to leave their homes at the flood peak. Damage occurred to roads and soil was significantly eroded in several areas. Estimated damage at $500,000.
- February 17 – April 29, 2017 Flooding – Heavy winter snows and a protracted spring snowmelt season produced overland and riverine flooding across the northern regions of North Dakota, leading to a federal disaster declaration (DR-4323). These areas were impacted by excessive summer and fall rain, followed by severe winter storms and heavy, wet snowfall. Emergency managers reported the sheer velocity of water carved new pathways and inundated areas typically not subjected to flooding. Flooding washed out roadways and undermined the structural integrity of bridges as rapid runoff blew out large culverts.

Table 3.7.7-1 presents flood statistics from 1996 to 2018. It is evident that riverine flooding is the most frequent and destructive flooding in North Dakota, with 597 events from 1996 to 2018 and $3.8 billion in reported property and crop damage (NCEI, 2018).

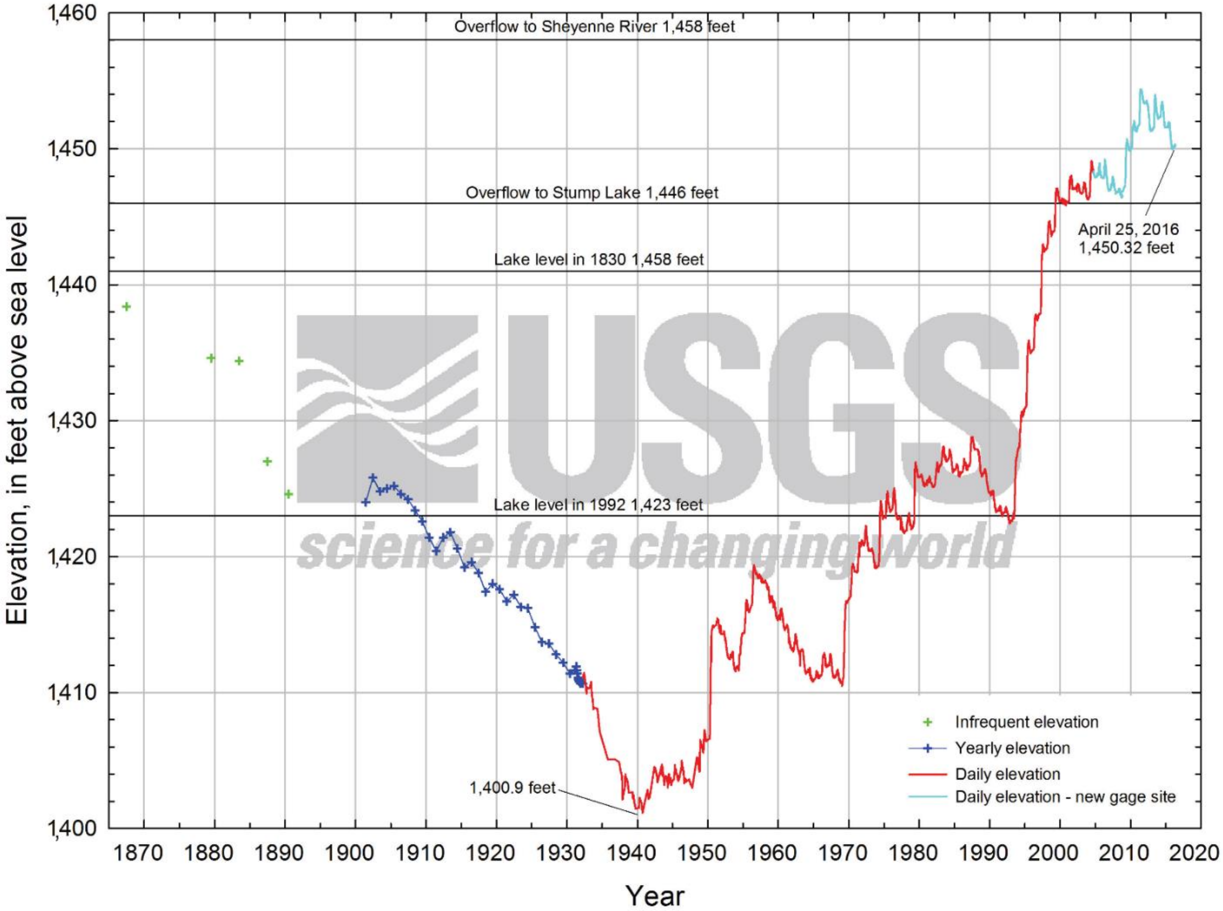
Table 3.7.7-1 Flood Statistics from 1996 to 2018 in North Dakota

<table>
<tr><th>Type of Flooding</th><th># of Events</th><th>Total Property and Crop Damage</th><th>Typical Impacts</th></tr>
<tr><td>Riverine Flooding</td><td>597 (35 declared events in 53 years, 1965 to 2018)</td><td>$3,834,864,000</td><td rowspan="3">Roads, Bridges, Sewer Systems, Homes, Businesses, Public Facilities, Electricity, Agriculture</td></tr>
<tr><td>Ice Jam</td><td>269 (1,236 events between 1881-2018)</td><td>Unknown</td></tr>
<tr><td>Flash Floods</td><td>493 (events reported to NCEI in 21 years)</td><td>$162,789,000</td></tr>
<tr><td>Totals</td><td>1,359</td><td>$3,997,653,000</td><td></td></tr>
</table>

Source: National Centers for Environmental Information, 2018

For closed basin flooding at Devils Lake, Figure 3.7.7-1 shows the water surface elevation for Devils Lake from 1865 to 2016.

Figure 3.7.7-1 Water Surface Elevation for Devils Lake, 1865-2016



Source: North Dakota State Water Commission, 2018

3.7.7.3 Location and Extent

Flooding is North Dakota's most costly and repetitive natural hazard. All 53 counties and four tribal nations have experienced severe damage and losses to public and private properties due to floods. Floodplains in North Dakota are heavily developed with structures such as houses, roads, railroads, industrial sites, businesses, agricultural fields, and recreational facilities. Additionally, growth in the amount of hazardous materials that are being stored, used, and manufactured in the designated floodplains leads to the potential for contamination and potentially increases the extent of damage caused by flooding. Many of these improvements conflict with nature's purpose for the floodway and floodplain. This development results in frequent and mounting flood losses. The effects of flooding depend upon the nature of the flood itself and the settlement pattern of the area inundated. Table 3.7.7-2 provides an overview of the spatial extent that flooding could impact resources.

Table 3.7.7-2 Spatial Extent of Flood Impacts

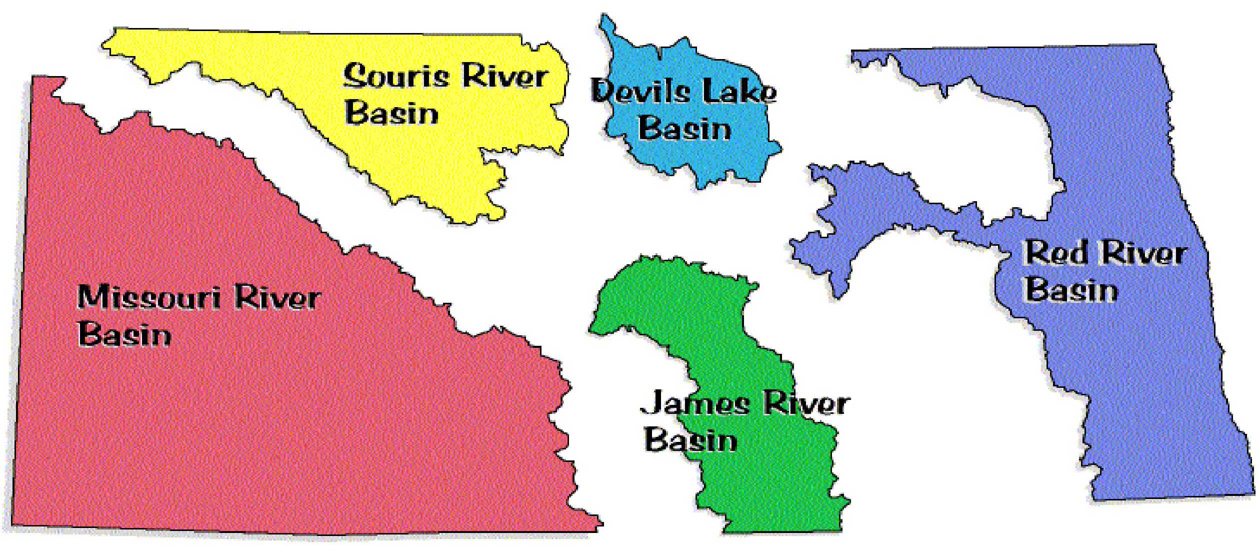
Resources	Extent of Impacts
People	Regional
Property	Regional
Infrastructure	Regional
Government Operations	Regional
Environment / Natural Resources	Regional
Cultural Resources	Regional

North Dakota has two major drainage basins, the Hudson Bay and the Missouri River, that consist of five major hydrologic subdivisions: Missouri River Basin, James River Basin, Red River Basin, Devils Lake Basin, and the Souris River Basin. The northeast portion of the divide falls generally within the Hudson Bay drainage, while the Missouri River drains the southwest part of the divide into the Gulf of Mexico. The Missouri River drainage system includes the major basins of the Missouri and James Rivers. The area is characterized by a combination of post glaciated terrain with badlands and landforms of eroded, soft, sedimentary bedrock in the southwest. The badlands are the colorful cliffs, canyons, gorges, ravines, and gullies that have been created by extensive wind and water erosion.

The Hudson Bay drainage includes the Souris and Red River systems plus the large, noncontributing, closed Devils Lake Basin. Glacial landforms and lake plains characterize this region of the state. Here there are millions of small wetlands, commonly referred to as prairie potholes, which present a special challenge in assessing flood hazard. Prairie potholes are natural depressions in the landscape that provide storage under a range of conditions. An exception to this exists in the case of extreme wet periods when the maximum storage capacity of prairie pothole complexes is reached. A key challenge in modeling the hydrology of this region is capturing the behavior of these numerous potholes and the dynamic linkages among them, in addition to the potential linkages with tributaries that may contribute flows to larger river systems.

Figure 3.7.7-2 shows the location of the five major hydrologic subdivisions that were described above. Each basin's topography and development patterns contribute to unique flooding impacts. For example, the Red River Basin's flat gradient causes widespread overland flooding when the channel capacity is exceeded. A common challenge among many of the basins is the controversy between agricultural drainage versus wetland preservation. A detailed review of each basin is included in Appendix 7.4.5.

Figure 3.7.7-2 North Dakota Basins

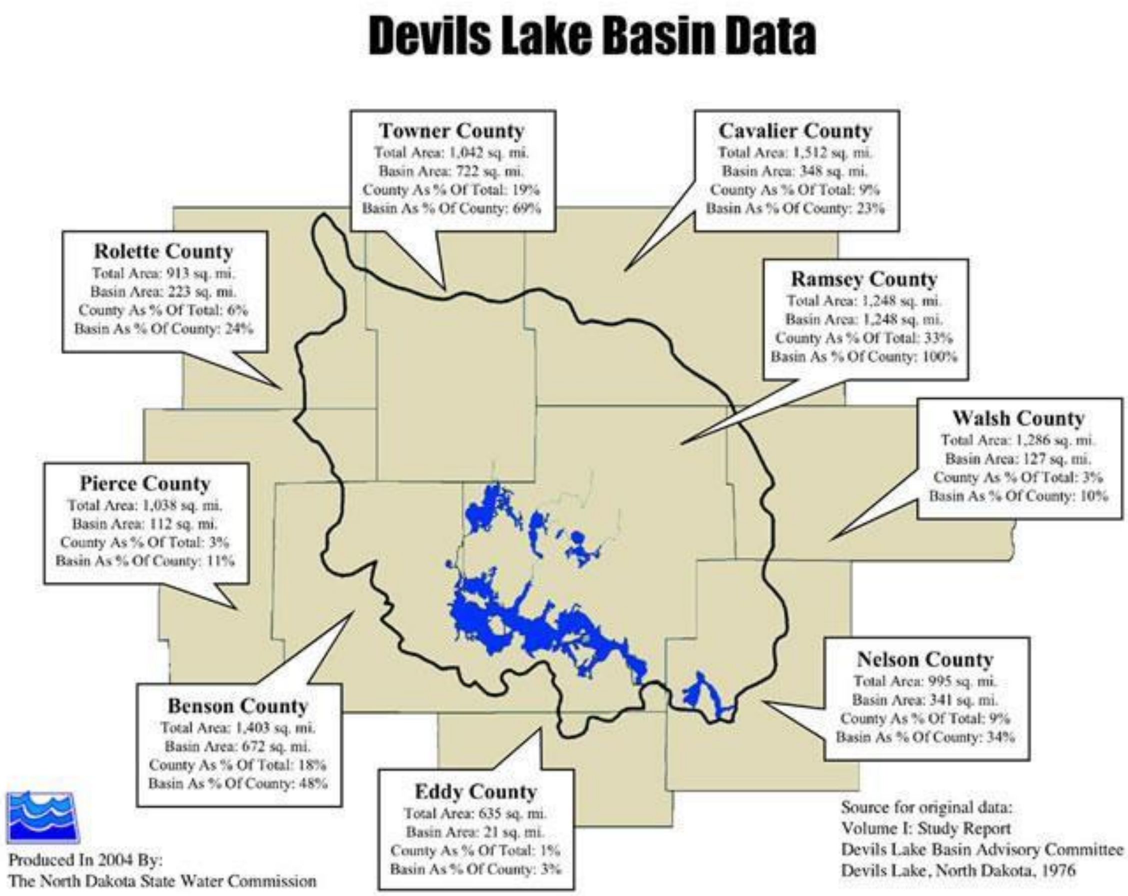


Source: North Dakota State Water Commission, n.d.-b

Closed Basin Flooding

The Devils Lake Basin is a non-contributing sub-basin within the Red River drainage system. The Devils Lake Basin became a closed basin after the last continental ice sheets receded and southerly drainage to the Sheyenne River ceased. The drainage system of the basin is formed by chains of waterways and connecting lakes, with most of the water ultimately flowing into Devils Lake. Figure 3.7.7-3 shows the counties included in the Devils Lake Basin. For more detailed information regarding Devils Lake Basin, see Appendix 7.4.5.

Figure 3.7.7-3 Counties Included in the Devils Lake Basin

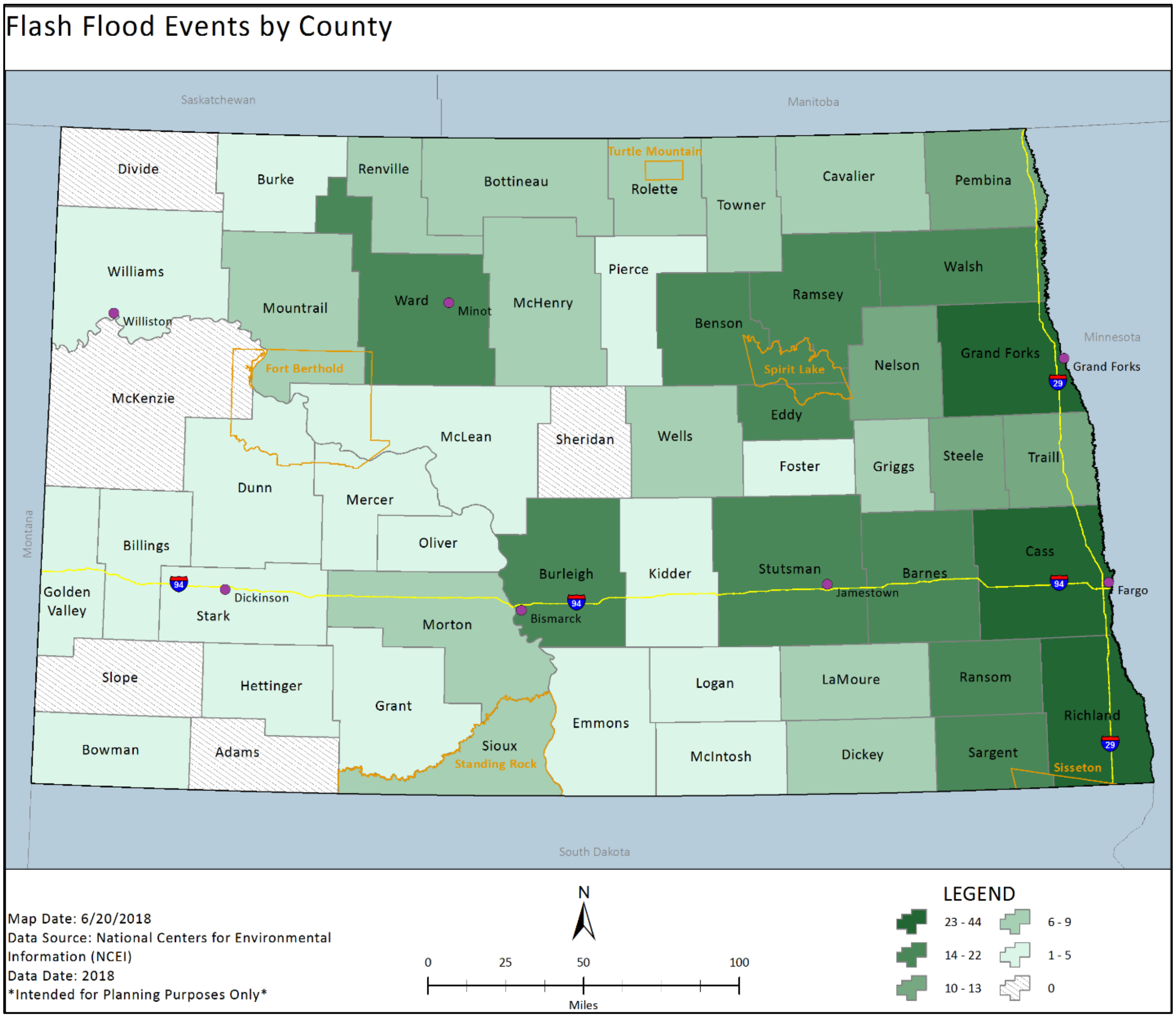


Source: North Dakota State Water Commission, 2004

Flash Flooding

As demonstrated in the Previous Occurrences section, flash floods can occur statewide in North Dakota. According to NCEI, from 1996 to 2018, Richland County experienced the most flash flood events (44), followed closely by Cass County (43) and Grand Forks County (42). Figure 3.7.7-4 summarizes the number of previous flash flood events per county. Flash flooding is generally more prevalent in the eastern portion of the state, especially in the Red River Basin.

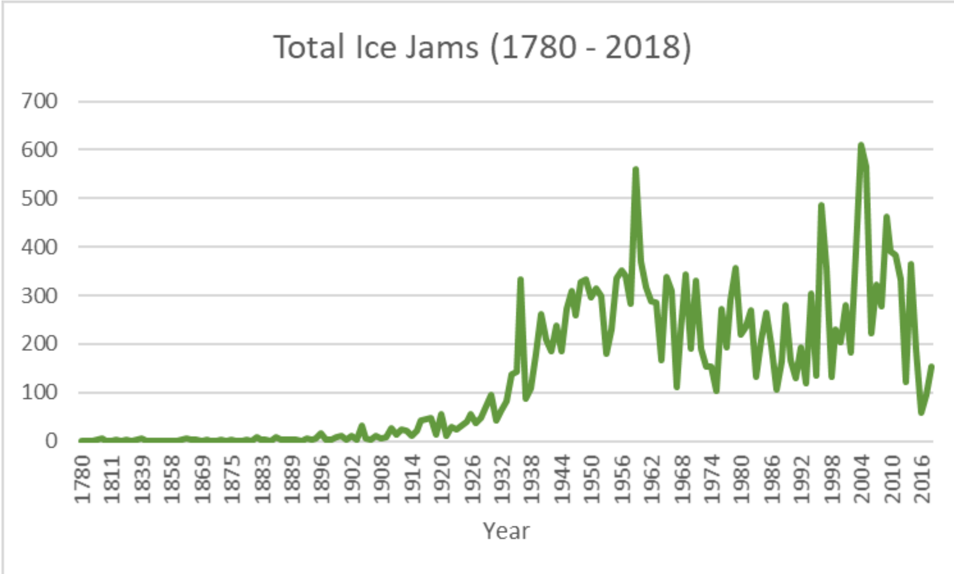
Figure 3.7.7-4 Flash floods by County, 1996-2018



Ice Jams

Ice jams occur statewide in North Dakota. The USACE Cold Regions Research and Engineering Laboratory (CRREL) website has a database and maps of current and historic ice jam events. There is not a particular area in North Dakota that is more prone to ice jams, however, the cities of Williston (50), Neche (40), and Bismarck (38), have the highest amount of ice jams that have occurred between 1881 and 2018 (USACE, 2018). Figure 3.7.7-5 shows the total ice jams that have occurred annually from 1780 to 2018. The variability in annual ice jams is partly due to the annual fluctuations in climate and weather.

Figure 3.7.7-5 Total Ice Jams (1780 – 2018)



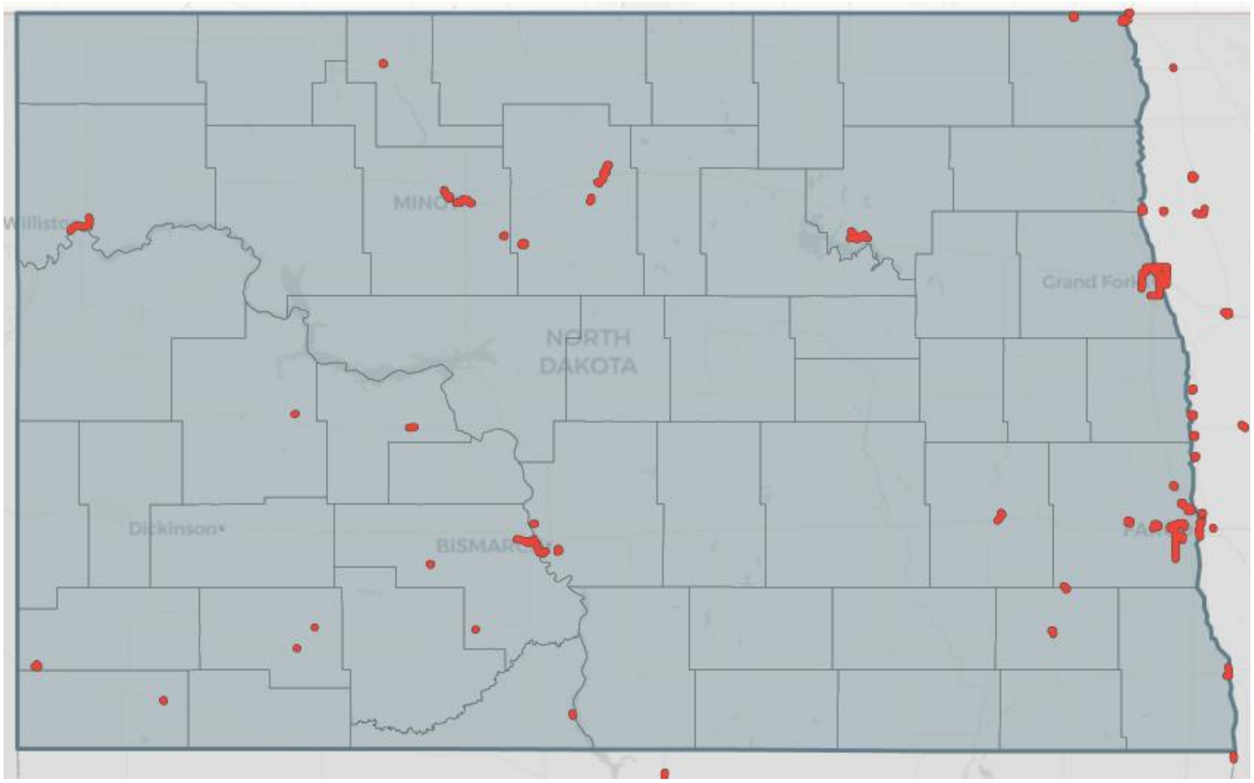
Source: USACE Cold Regions Research and Engineering Laboratory, 2018

Levee Failure

In North Dakota, there are hundreds of levees ranging in size from small agricultural levees that were constructed primarily to protect farmland from high frequency flooding to large urban levees that were constructed to protect people and property from larger, less frequent flooding events. Levees have been constructed across the state by public and private entities with varying levels of protection, inspection oversight, and maintenance. Currently there is no one comprehensive database of all levees in the state. However, significant strides have been made toward compiling such an inventory.

According to the USACE, North Dakota has 74 levee systems, 155 miles of levees, 281 levee structures, and the average age of levees in North Dakota is 58 years. Figure 3.7.7-6 shows the location of the USACE levees throughout the state. Levees maintained by the USACE are particularly concentrated in the eastern part of the state, however, there are other levees in the state that are not mapped in the figure below.

Figure 3.7.7-6 Levees in North Dakota



Source: USACE, 2018b

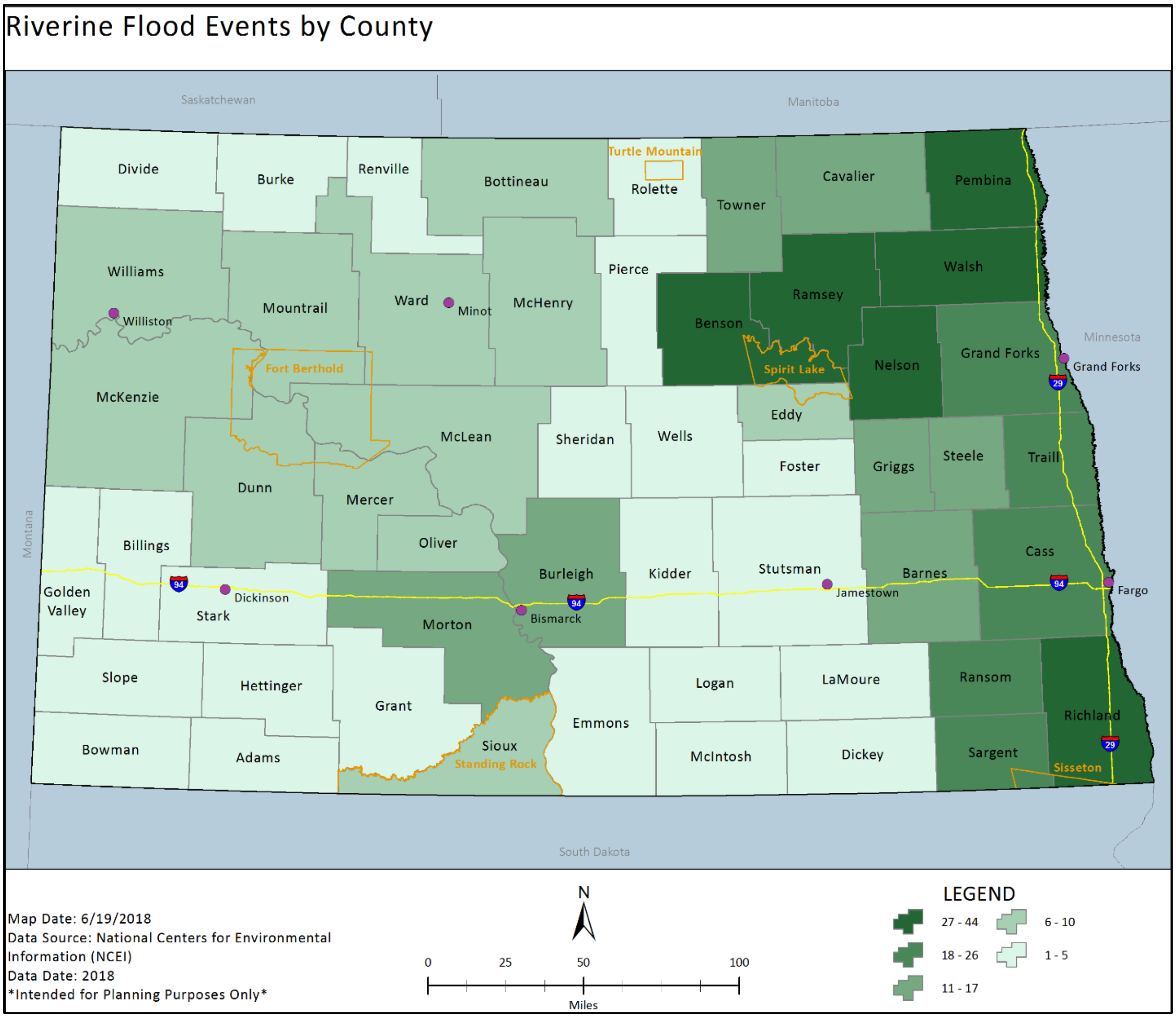
Riverine Flooding

Through the NFIP, FEMA conducts Flood Insurance Studies on select flooding sources. The studies produce a Flood Insurance Rate Map (FIRM) which depicts the extent of flooding for the 1% annual chance flood. Studied streams that are identified as having a Special Flood Hazard Area (SFHA) might also be designated with a floodway and a 0.2% annual chance flooding extent. As part of the study, FEMA will designate a flood zone for the areas within the community. Those areas are either a Zone A or X. Only areas designated with a Zone A are considered within the SFHA. A structure located within that zone may be required to purchase flood insurance and be required to meet floodplain development ordinances adopted by the participating community. In addition to the FIRM, the Flood Insurance Study is used to highlight study details and can also contain stream profiles, Floodway Data Tables and Stillwater flood elevations for use in floodplain management and insurance rate determination.

Select FIRMs have been updated to a more current standard and are known as Digital Flood Insurance Rate Maps (DFIRMS). DFIRMs include enhanced base mapping that have been updated utilizing digital technology and may include an updated SFHA based on improved hydrologic modeling. DFIRM floodplain information is available for communities to incorporate into their data management systems. It is important to note that not all flooding sources within a community are studied, and not all studies include the same level of detail. FIRMs and DFIRMs are often the best available information for flood prone communities, but the limitations of the study should be understood by the community and additional data should be generated to completely capture the true flood risk to the community as well.

Paper copies and digital files (where available) of FIRMs for communities in North Dakota can be ordered from FEMA or accessed online through FEMA's Map Service Center website (FEMA, 2018). According to the NCEI, Ramsey County has experienced the most riverine flooding events (44), followed by Nelson County (43), and Benson County (42) from 1996 to 2018 (Figure 3.7.7-7). Although riverine flooding occurs statewide, eastern counties have experienced the most flooding.

Figure 3.7.7-7 Riverine Flooding Events by County, 1996-2018



3.7.7.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event.

Table 3.7.7-3 Flooding Consequence Analysis

Flood Impacts	
Public	Floods may cause human death or injury. All jurisdictions in North Dakota can experience floods that cause deaths. According to state disaster reports, two people have died from floods (including flash flooding), and three have died indirectly from floods, from January 2008 to June 2018 leading to an average of less than one death per year in the state from flooding (NCEI, 2018).
Responders	Responders would be highly impacted due to limitations to travel. Flood waters could impact roadways, making it difficult for first responders to travel to areas of need. Additionally, responders would also be responsible for emergency protection operations, such as sandbag blockades or emergency levee installation, and would

Flood Impacts	
	require the ability to respond to quickly with sufficient staff during emergency situations. High-rising flood waters could hinder this.
COOP	Transportation, water supply, and water treatment would be heavily impacted by flood events and could subsequently limit the continuity of government operations.
Delivery of Services	The impact extent to government operations is regional. Transportation and emergency services would be highly impacted due to flood events, limiting the ability of government to continue delivery of services. Furthermore, staff could be impacted as well, making it difficult for the government to continue delivery of services. The time and cost of response, such as sandbagging, temporary housing, and other recovery and response initiatives might impact the delivery of other government services. Lastly, flooding may result in reduced property values, which could impact the future delivery of services.
Property, Facilities, and Infrastructure	From 2012 to 2017, 49 sites on state and federal highways flooded, costing $47.62 million in damages (North Dakota Department of Transportation, 2018). Additionally, floods have scoured 77 critical bridges. Hettinger County has experienced the most bridge scouring with 10 total events. Table 7.4.5-3 in Appendix 7.4.5 Flood shows the total bridges scoured by county. Closed basin flooding in Devil's Lake has precipitated the need to raise the grade of roadways in the region numerous times. Just over $608 million ($505 million federal funding, $103 million state/local funding) was spent from 1994 to 2014 to raise roadways in the Devil's Lake Basin that were impacted by high water levels, including $479 million for state highways, $114 million for county roads and $15 million for BIA roads (North Dakota Department of Transportation, 2018). Dirty floodwaters often contaminate or destroy everything they touch. Historic resources have been lost during flood events. Road washouts could disrupt social values as activities are cancelled and travel is limited.
Environment	Floods are an important part of the health of rivers and streams and therefore should not significantly affect ecological values, unless large quantities of toxins are released into the floodwaters. Maintaining and restoring natural systems help mitigate the impact of flood events on the built environment. Floods change the natural environment and hydrology of the affected area. High water can be beneficial to the natural processes within a floodplain and can benefit riparian areas. Animals and wildlife are also at high risk due to floods. Animals, including those on farms, would be at risk of drowning and could be left without food and feed (FEMA, n.d.).
State Economy	Flooding regularly affects the agricultural areas of North Dakota which can lead to impacts on the state economy. Much of the most productive croplands are along rivers and creeks in the lusher parts of the state. Such flooding may reduce profits and delay the beginning of the planting season. Should an extreme flood event occur over a wide area, the economy of the affected area could be seriously impacted. Flood events can cut off customer access to businesses, as well as close businesses for repairs. The closure of key roadways and rail lines (see Transportation Incidents, Section 3.7.14 for additional details) may additionally have an impact on commerce.
Public Confidence in the State's Governance	The public's confidence in the state's government is at high risk due to lack of confidence in the NFIP and whether they have flood insurance. Additionally, depending on the magnitude of the event and the response time following it, the public could lose confidence in the state's government and recovery procedures.

3.7.7.5 State Risk Assessment

Probability

Considering the extensive history of flooding in North Dakota, this history will be used to express the probability of future floods in the state. As history has shown, the probability of future flooding events is likely to occur on an annual basis in all jurisdictions in North Dakota. Table 7.4.5-5 in Appendix 7.4.5 summarizes this data for riverine, flash, and ice jam flooding. Detailed statistical data was not available for all events involving levee failure or high dam releases, therefore, a meaningful probability calculation was not possible. For closed basin flooding, although flood conditions worsen with specific flooding events, the lake levels have risen on a continuous basis precluding calculation of the number of distinct events.

FEMA's FIRMs are one tool that can be used to determine the areas that could be inundated by riverine floods that have a 1% annual chance and a 0.2% annual chance probability of occurring. These maps should be consulted for development and planning purposes to understand the areas that have a future chance of flooding.

Vulnerability Assessment

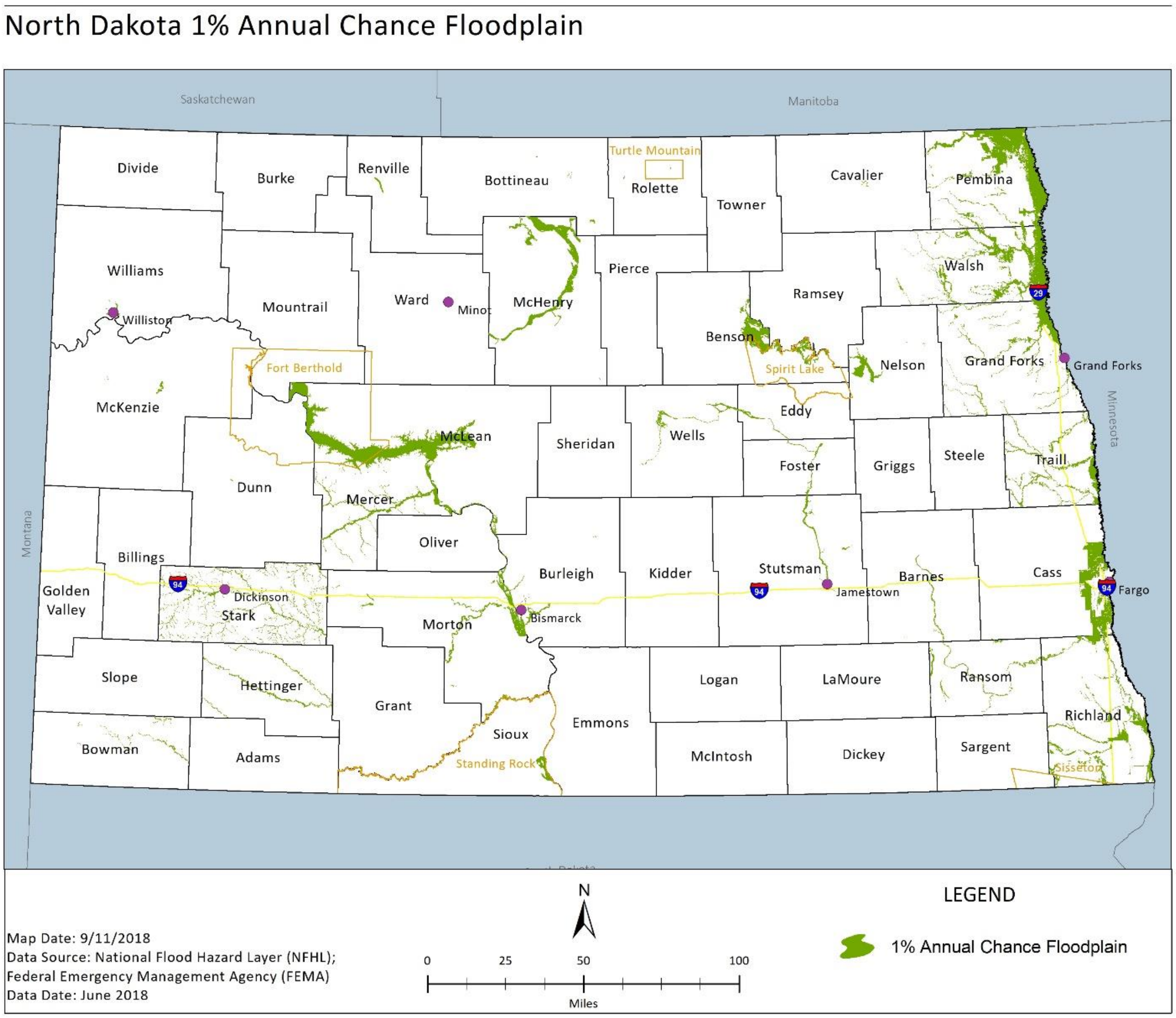
The sections that follow provide details regarding populations and infrastructure at risk to riverine flooding, levee failure, and closed basin flooding. The many variables associated with flash flooding and ice jam flooding preclude specific determinations of populations and infrastructure vulnerable to damage from these types of flooding events. Dams that do not have mapped inundation areas related to high water release put the people and structures surrounding those dams at risk. Due to data limitations, and the variability of some flooding events, it is difficult to estimate losses from certain kinds of flooding hazards.

Slow-rising riverine floods usually have a fair amount of warning time and allow people to evacuate from the hazard areas. Flash floods and ice jam floods may not have lengthy lead times. Heavy rains can quickly inundate areas not typically prone to flooding, roads can washout and become a hazard to vehicle occupants, normally dry channels may fill up with rushing waters, and ice jam breakups can cause rapidly rising waters along rivers, creeks, and streams.

Riverine Flooding

Figure 3.7.7-8 shows the 1% annual chance floodplain in North Dakota based on FEMA's NFHL, which only shows areas with DFIRM data available. There are several counties in North Dakota that do not have digital flood hazard data and, therefore, were not mapped in this figure. The 1% annual chance floodplain is extensive in the eastern part of the state because of several recent mapping and modeling efforts along the Red River. This area of the state is also particularly prone to severe riverine flooding. Other parts of the state also have significant vulnerability to flooding, including parts of Mercer and McLean counties along the Missouri River. Cities with larger populations, such as Fargo, Bismarck, and Grand Forks, have significant exposure to the 1% annual chance floodplain and their populations are vulnerable to future riverine flood events.

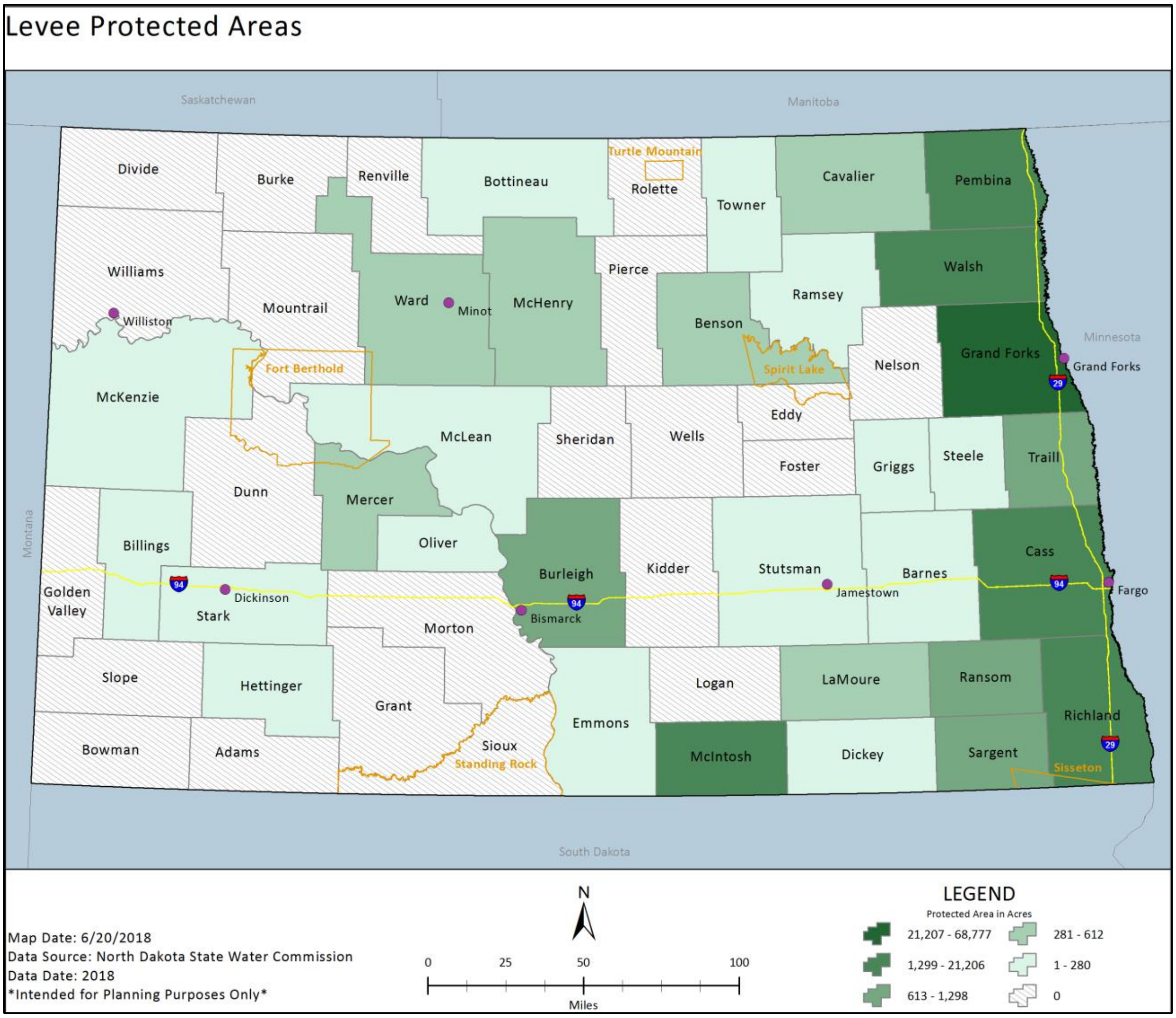
Figure 3.7.7-8 North Dakota 1% Annual Chance Floodplain



Levee Failure

Figure 3.7.7-9 shows the total area protected by levees that is in the USACE safety program. This figure only represents a small portion of the total levees in the state. Counties along the Red River have the largest acreage protected by levees, including Grand Forks County that has the greatest area protected by USACE levees in the state. Counties with greater protected acres could suffer more damage in the event of a levee failure. Levee failure could cause catastrophic flooding in the impacted areas, damaging structures, putting human life and safety at risk, and disrupting business.

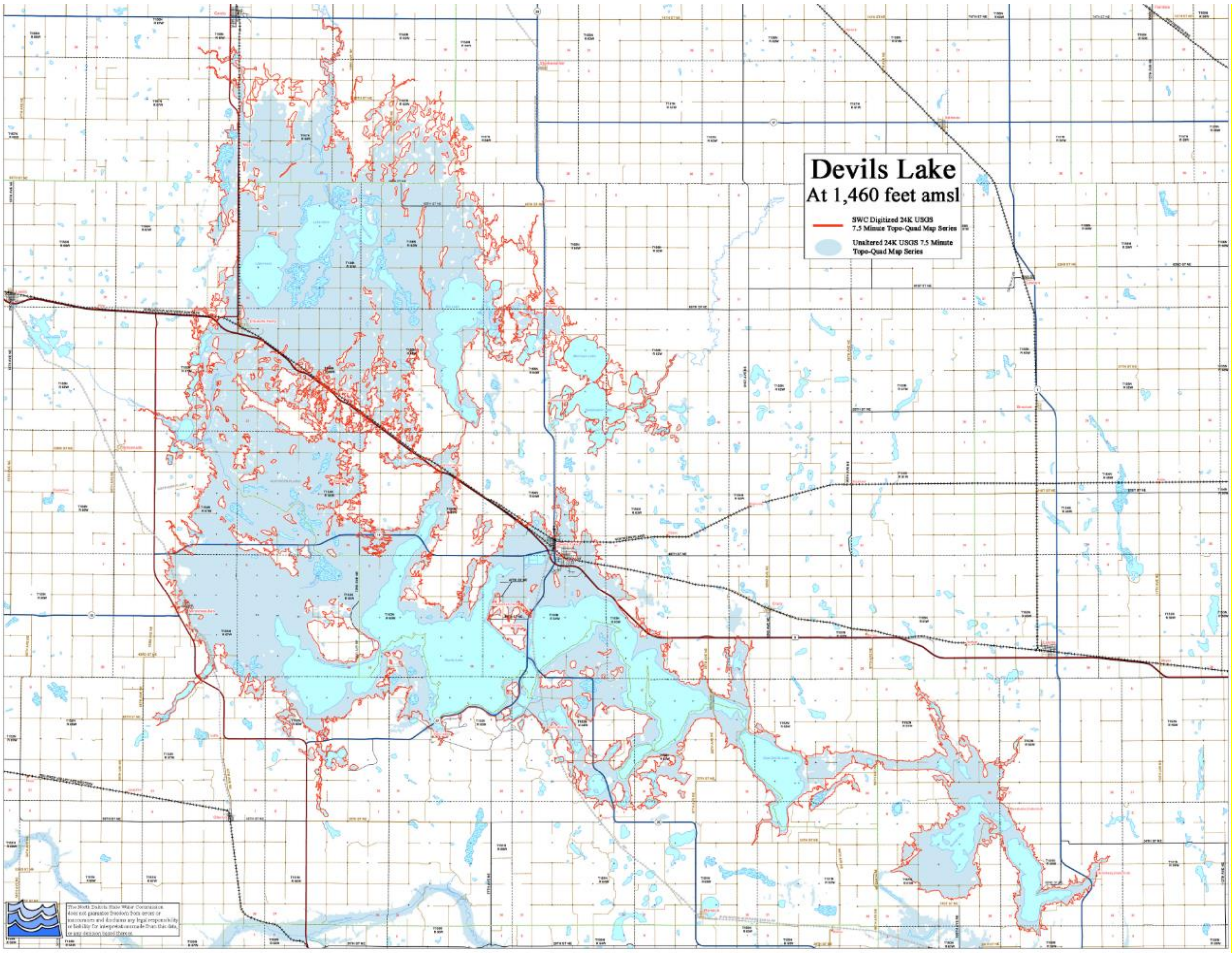
Figure 3.7.7-9 Areas Protected by USACE Levee Safety Program Levees



Closed Basin

From 1993 to 2011, Devils Lake rose 31.68 feet to an elevation of 1,454.3 feet. This led to an increase of 167,070 inundated acres, or about 261 square miles. If the lake rises to 1,458 feet, it will reach the natural outlet elevation to spill into the Sheyenne River. At this elevation, the lake will cover more than 261,000 acres and water would inundate parts of the City of Devils Lake. Figure 3.7.7-10 shows the area that would be covered by Devils Lake if it were to reach an elevation of 1,460 feet. Measures have been taken to protect municipalities and structures from flooding, such as outlets to discharge water, and a levee protecting the City of Devils Lake.

Figure 3.7.7-10 Area Covered by Devils Lake at 1,460 feet



Source: North Dakota State Water Commission, n.d.

State Assets and/or Critical Facilities at Risk

Damage to public water and sewer systems, transportation networks, electric infrastructure, and flood control facilities can hinder the ability of the government to deliver services. Drinking water, surface water, and wastewater services are provided by a variety of entities throughout the state. During flood events, the infrastructure that supports the water service providers can be damaged and sometimes destroyed. Well contamination may also occur during significant floods. Sewer systems, such as municipal facilities and individual septic systems, frequently suffer damage.

Road infrastructure is particularly vulnerable to flooding. Road and culvert washouts are common with heavy runoff. Federal, state, county, city, and township governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Bridges are key points of concern during flood events because they are important links in road networks and provide watercourse crossings. Bridges can be particularly vulnerable to periods of flooding due to scour. Bridges can also be obstructions in watercourses, inhibiting the flow of water during flood events. Section 2.2.3 State Assets and Critical Infrastructure details the number and value of state-owned buildings and properties by county.

Overall, state assets and critical facilities are at risk to flood hazards in North Dakota. Due to data limitations, and variability of flooding events, it is difficult to estimate future losses to flooding events. However, an exposure analysis was run to identify the facilities that are in mapped flood hazard and levee failure areas. Exposure to levee inundation areas was identified using the National Levee Database from the USACE.

There are 813 total facilities located in areas that would be inundated if a levee failure were to occur, including 147 emergency services facilities, healthcare facilities, and schools.

Exposure to flooding was determined using FEMA's NFHL, which shows flood risk for jurisdictions with effective digital flood insurance studies. This dataset does not contain flood hazard areas for the entire state, as several counties in North Dakota only have paper maps which limits the ability to do this kind of exposure analysis.

Using the data that was available, 688 total critical facilities are located inside the 1% annual chance floodplain and 737 facilities in the 0.2% annual chance floodplain. A significant portion of the exposed facilities were cell towers and dikes. Of note, there are 28 public healthcare facilities located in the 1% annual chance floodplain, including hospitals, long-term care facilities, and nursing homes. In addition, there are 36 schools located in the 0.2% annual chance floodplain. While the 0.2% annual chance flood has a lower chance of happening each year floods are generally becoming more frequent and severe due to climate change and these state-owned assets are at risk of flood in the future.

The exposure of state-owned facilities is considerably higher than critical facilities. There are 1,019 facilities exposed to the 1% annual chance floodplain that have an insured value of nearly $472 million. In the 0.2% annual chance floodplain, there are 1,323 exposed state-owned facilities that have an insured value of $1.5 billion. The full results of this exposure analysis are summarized in Table 3.7-1 and 3.7-2 in Section 3.7 Risk Assessment Conclusions.

National Flood Insurance Program (NFIP)

The NFIP offers flood insurance to renters, homeowners, and businesses. Insurance is available to participating communities. The NFIP requires communities to adopt and enforce floodplain management ordinances for property owners to purchase federally backed insurance. These ordinances provide some measure of protection for new construction and significant renovations in the floodplain. Flood insurance is only required for structures located in the SFHA that have a federally backed loan, unless otherwise required by the local community.

As of April 16, 2018, North Dakota had 10,207 policies in force insuring a value of $2,807,331,500. The total policies in force has decreased since the previous plan update when there were 13,859 policies (January 13, 2013). The comparison of flood risk and insurance coverage indicates which areas are most at risk for substantial, uninsured flood losses in the future.

Table 7.4.5-4 in Appendix 7.4.5 that shows the flood insurance claim history by county. Since 1978, the NFIP has paid nearly $259 million in flood insurance claims in North Dakota. Comparing the historical flooding occurrences and losses to the amount of insurance coverage shows that some of the most hazardous areas have very little insurance coverage. Nelson County stands out as having the second highest number of flood events (43) and a low amount of insurance coverage.

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities exceeding minimum NFIP requirements in areas such as public information, mapping and regulations, flood damage reduction, and flood preparedness. In return, the communities receive discounts on their flood insurance premiums. According to data from FEMA, the total premium savings is $243,544, and an average savings of $30 per policy. North Dakota has 12 communities that participate in the CRS: City of Burlington (Ward County), Burlington Township (Ward County), City of Carpio (Ward County), City of Dickinson (Stark County), City of Donnybrook (Ward County), City of Minot (Ward County), City of Sawyer (Ward County), Ward County, City of Valley City (Barnes County), City of Bismarck (Burleigh County), City of Fargo (Cass County), and the City of Grand Forks (Grand Forks County). Besides the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and loses, reduce human suffering, and protect the environment.

Additionally, FEMA Region 8 completed a Penetration Study which looked at the total number of structures located within a SFHA and compared it to how many of those structures have a NFIP flood insurance policy in effect. The results for North Dakota show only 10.7% of high-risk structures have a flood insurance policy. The North Dakota State Fire and Tornado Fund insures the state-owned buildings and property. Although this fund does not typically provide insurance for flood losses, some payments were made because of the devastating flooding in 1997.

Repetitive Loss and Severe Repetitive Loss Analysis

A repetitive loss property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period since 1978. The losses must be within 10 years of each other and be at least 10 days apart. The repetitive loss inventory for North Dakota as of May 17, 2018 includes a total of 514 repetitive loss properties. Twenty-two counties in North Dakota have properties with repetitive losses. Table 3.7.7-4 shows the number of repetitive loss properties by county.

Table 3.7.7-4 North Dakota Repetitive Losses by County

County	# of Repetitive Losses
Cass	157
Burleigh	65
Walsh	40
Ward	38
Ramsey	32
Barnes	30
Grand Forks	30
Pembina	18
Ransom	14
Richland	14
Traill	13
Emmons	12
Morton	12
McHenry	11
Stutsman	8
Hettinger	5
Benson	4
Towner	3
McLean	2
Mercer	2
Nelson	2
Renville	2

Source: Federal Emergency Management Agency, 2018b

A Severe Repetitive Loss (SRL) property is a residential property that has had at least four NFIP claim payments over $5,000 each with two such claims occurring within any ten-year period, or a residential property that has had at least two separate claim payments within any ten-year period that have cumulatively exceeded the value of the property. In 2014, there were 2 validated Severe Repetitive Loss Properties in North Dakota, one being in Cass County and the other in Ramsey County. These properties have had a combined total of 11 losses with a total of $370,991 in payments. There are no SLR properties in North Dakota as of September 2018.

Mitigation activities across the state, particularly acquisitions in the Red River Valley and the Devils Lake Basin have reduced the vulnerabilities to structures. As of 2014, approximately 2,300 structures have been acquired through the various mitigation programs. These acquisitions and associated deed restrictions permanently reduce the jurisdictional vulnerabilities. More work can certainly be done to further reduce vulnerabilities, but the changes in development and land use because of acquisitions positively affects the loss estimates for the area. More details on the acquisition projects can be found in Section 5.1.2. Severe Repetitive Loss Strategy.

Loss Estimates

The damage from floods can be to private property such as homes, businesses, and utility infrastructure, public property such as government owned facilities, roads, and infrastructure, and the economy through agricultural and business disruption losses. These losses can vary from flood to flood and county to county. According to the NCEI, North Dakota has experienced $3,997,653,000 in property and crop damage from flash floods and riverine flooding since 1996. Riverine flooding accounts for $3,834,864,000 of the damage, and flash floods $162,789,000. It is evident that North Dakota experiences extensive damage from flooding, and in particular riverine flooding.

Table 7.4.5-5 in Appendix 7.4.5 summarizes the number of events, injuries, deaths, and damages for riverine and flash flooding, and Figure 3.7.7-11 shows total damage by county on a statewide map. Grand Forks County has sustained the costliest damage due to flooding, totaling over $3 billion in losses. This is approximately seven times higher than the next highest county's damage, which is Cass County with $392,072,500. Richland County has the greater number of events (78), followed by Cass (69) and Grand Forks (62). Grand Forks County also has the highest number of deaths, with three total, followed by LaMoure (two). All counties except Golden Valley and Sheridan have experienced damage from flooding, but the eastern portion of the state, along with Ward and Burleigh counties have sustained the most damage.

Figure 3.7.7-11 Total Damage from Past Floods, 1996-2018

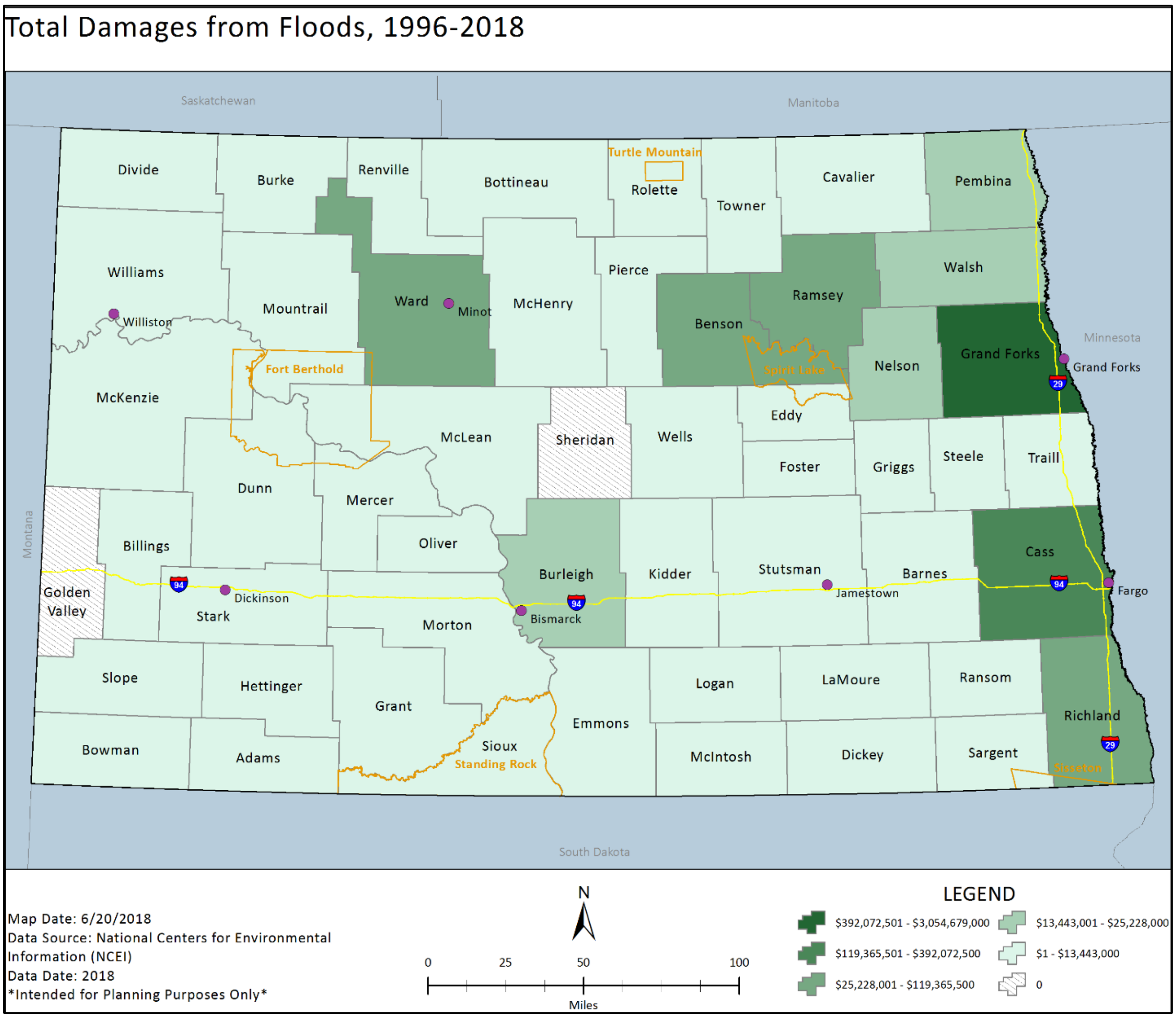
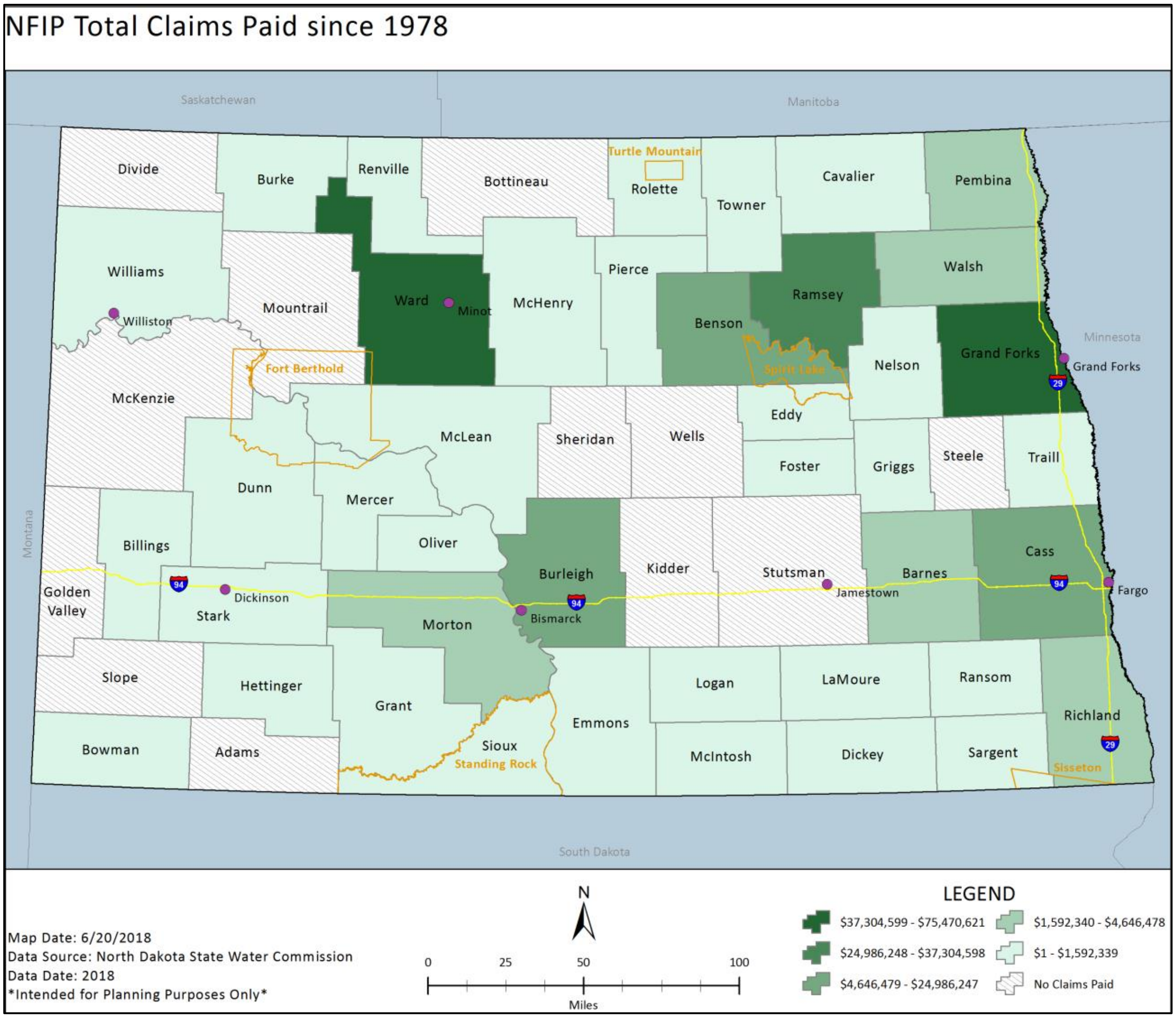


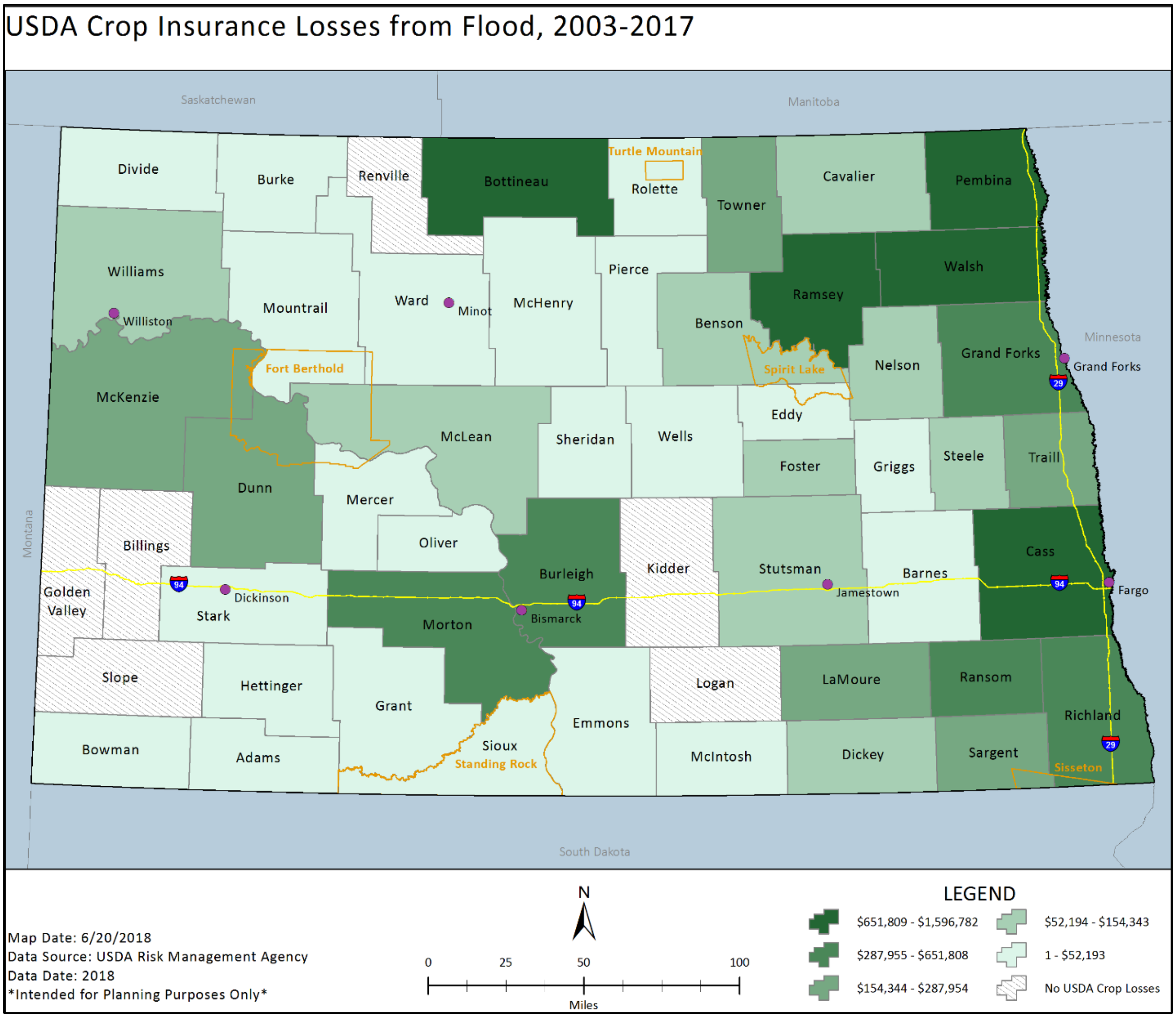
Figure 3.7.7-12 shows total NFIP claims paid by county as of April 2018. Grand Forks County has had the highest in claims paid, with $75,470,621, followed by Ward County with $69,137,919. Adams, Slope, Golden Valley, Bottineau, and McKenzie counties all have had no NFIP claims paid.

Figure 3.7.7-12 NFIP Total Paid as of April 2018



Additionally, crop insurance payments on insured crops that have experienced flood damage in each county were analyzed from 2003 to 2017. During this time, North Dakota experienced total crop losses that exceeded $10.7 million because of flooding. Cass County has experienced the most county-level crop losses at $1,596,782, followed by Walsh County with $1,042,130 in crop losses due to flooding. Losses are experienced statewide, but the eastern region of the state, plus Bottineau, Burleigh, and Morton counties, generally experience the most in insured crop losses due to flood. The results are summarized in Figure 3.7.7-13.

Figure 3.7.7-13 Flood-related Crop Insurance Losses, 2003 to 2017



Overall, when looking at previous occurrences, damage, and losses experienced from flood throughout North Dakota, the eastern region of the state is more vulnerable to these events. These counties have experienced the most previous occurrences, higher damage, high NFIP claims, and high crop losses. Additionally, this region has more levee protected acres that are vulnerable in the event of a levee failure. In general, the urban areas of North Dakota can also expect high losses from flood events due to a greater exposure of assets to the hazard. Ice jams and high dam release can occur statewide. However, if these events occur in areas already more vulnerable to flooding, damage can be more severe. Due to data limitations, and variability of flooding events, it is difficult to estimate future losses due to flooding hazards. However, with a high certainty of flooding occurring in any given year, potential impacts and costs could reach catastrophic levels depending on the size of the event.

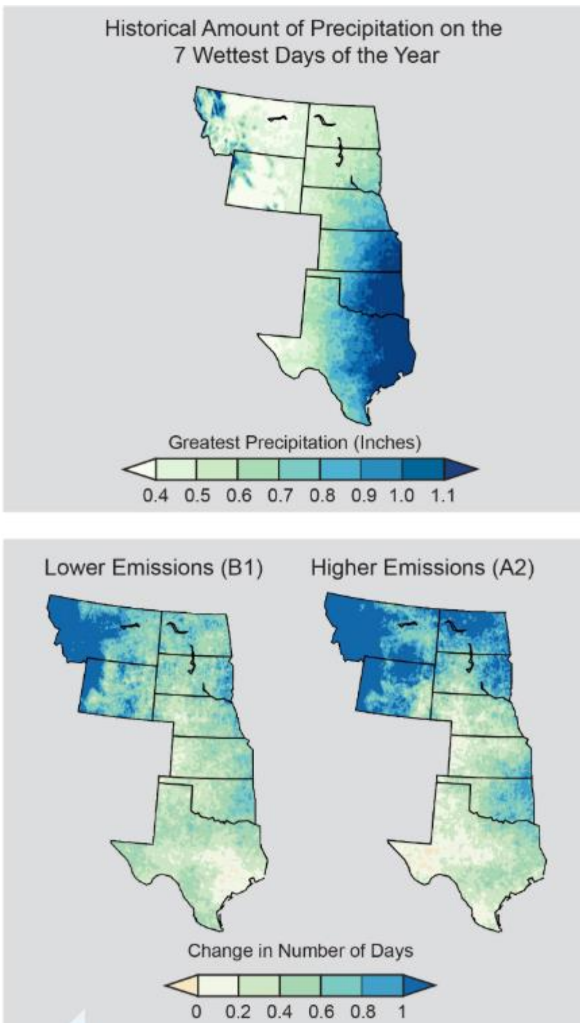
3.7.7.6 Future Conditions

Successful mitigation of flooding requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future.

Climate Change

According to the 2014 National Climate Assessment, winter and spring precipitation is projected to increase in the northern Great Plains region relative to a 1971 to 2000 average. Additional winter and spring precipitation may exacerbate flooding in North Dakota due to the increased amount of precipitation, but also since the precipitation may fall when the ground is frozen and unable to absorb the moisture, leading to flooding. Additionally, the number of days with heavy precipitation is likely to increase by mid-century. These factors increase North Dakota's risk to flooding in the future. Figure 3.7.7-14 shows the projected change in the amount of precipitation on the seven wettest days of the year in the Great Plains region. Under both a lower and higher emissions scenario, North Dakota is projected to experience more wet days.

Figure 3.7.7-14 Change in Number of Wettest Days in the Great Plains



Source: Federal Advisory Committee, 2014

The following Table 3.7.7-5 presents the best available data relating to climate changes impacts to flooding in North Dakota. Overall, climate change is projected to increase precipitation in North Dakota. The important summary of these changes is that the state should expect an increased risk to flood in the future.

Table 3.7.7-5 Expected Changes to Flood Future Condition

Condition	Projected Change
Location	Flood hazard zones are projected to increase in size.
Extent / Intensity	Floods are projected to increase in intensity. It is unknown whether floods will increase in extent.
Frequency	Intense storms are projected to occur more frequently, increasing the frequency of flood events. Additionally, flood events are projected to become

Condition	Projected Change
	more frequent particularly along the Red River, where flooding due to intense rainfall is already a common occurrence.
Duration	It is unknown whether floods will increase in duration.

Changes in Development

As detailed in Section 2.2.2 State Demographics and Culture, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

Table 7.4.5-6 in Appendix 7.4.5 Flood shows the projected increase in housing and population by county from 2010 to 2030, and the past events and damage to flooding. Counties that are projected to double and triple in population (McKenzie, Williams, and Mountrail) have all experienced over $1 million in damage due to flooding since 1996. Additionally, Grand Forks County, which has experienced over $3 billion in flooding damage, is projected to grow by 33% by 2030. This future development can lead to continued losses for these counties.

Unrestricted development may occur in areas prone to flooding that lack floodplain management ordinances. The state has a freeboard requirement that requires all new and substantially improved structures to have their first finished floor elevated to an elevation no less than 1 foot above the Base flood elevation (BFE). Freeboard requirements are an effective measure to reduce the vulnerability of future development to flooding events.

Future flooding resulting from levee failure may not be as predictable based on previous occurrences. Additionally, climate change is projected to cause an increase in precipitation in North Dakota, which can cause more frequent and intense flooding. These factors can be used to predict future vulnerability to state assets and critical facilities to flooding.

Redevelopment is occurring on the north shore of Devils Lake at elevations which could be inundated by an impending revised 1% annual chance flood event for the Devils Lake/Stump Lake system (North Dakota State Water Commission, 2008). Without having mapped inundation areas of high water release from dams, future development could occur in these hazard areas and put more buildings and people at risk to flooding. Based on both previous occurrences, as well as future conditions, flooding will likely remain a high risk, with a probability of greater than 90% of an event occurring in a given year.

3.7.7.7 Jurisdictions at Risk

All 58 local and tribal HMPs analyze flood. Figure 3.7.7-15 presents a summary of those plans and identifies how local jurisdictions ranked the overall risk presented by flood. Seventeen jurisdictions ranked flood as a high hazard, 29 as medium, and 11 as low. One plan identified flooding as a hazard but did not provide a rank. Flood is ranked as the number 3 hazard of the 14 hazards according to North Dakota local HMPs. Overall, a concentration of counties in the eastern and central portions of the state rank flood as a high hazard. This corresponds with the state risk assessment findings that the eastern portion of the state experiences high flood impacts.

Figure 3.7.7-15 Flood Hazard Ranking by Jurisdiction

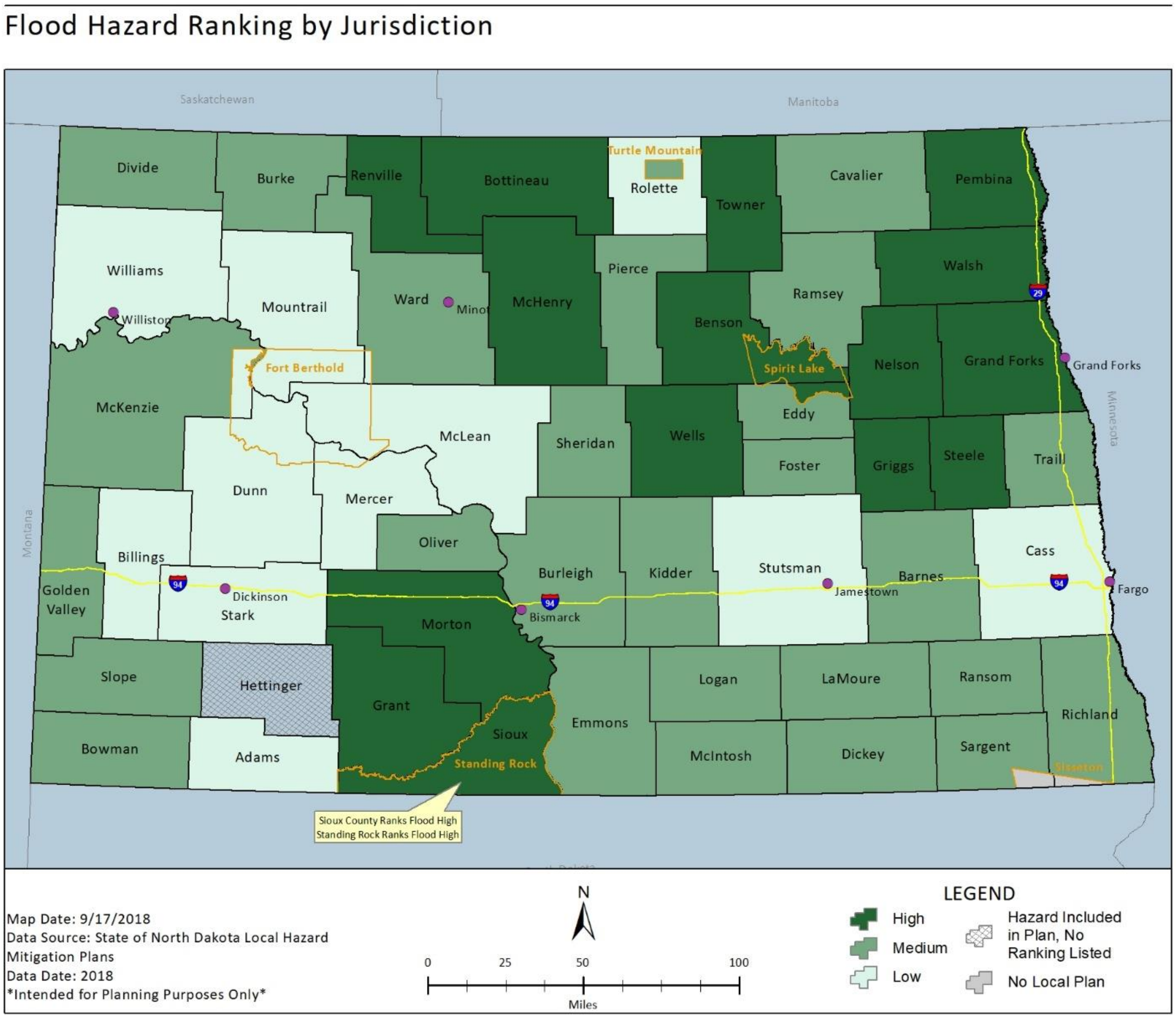


Table 7.4.5-7 in Appendix 7.4.5 includes a compilation of available hazard ranking and loss information, when available, for flood as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale.

3.7.7.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including flood, to create an overall Risk Factor score. Following this methodology, the flood risk factor score was 3.3, which is a highly ranked hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-8 and Table 3.3-9 in Section 3.3 Summary of Data Analysis.

Flood is a high-risk hazard because it has high impacts on most individual community sectors, a high probability of occurrence, and large spatial extent. Critical facilities and infrastructure, property, economy, state operations, and even the public are at high risk of impacts from flood hazards. The spatial extent of impacts from flooding events can range from local to regional, depending on the type of flood hazard and the severity of the event. Similarly, the event, depending on severity, can endure for up to a week, with impacts and damages being felt for months after an event. Depending on the type of flooding, warning time can be between 6 and 12 hours. However, some types of flooding hazards, such as levee failure, come with little to no warning at all.

Flooding is currently North Dakota's most repetitive and costly natural disaster. Counties statewide experience the impacts from floods, including losses across many economic sectors as well as injuries and loss of life. Climate change is projected to increase precipitation in North Dakota which will in turn increase flooding frequency and magnitude. In addition, North Dakota is experiencing an increase in population. As identified in the 2017 THIRA, in the event of a major flood, a very coordinated effort across multiple sectors is required to decrease the potential impacts. Incorporating these findings into planning documents can ensure procedures are in place in the event of a major flood. Actions such as effective communication with the public at risk are imperative to the success of reducing the impact of a flood event.

Flood Committee members identified several mitigation actions such as educating the public about the risk of flooding and promoting flood insurance. Flood control projects underway in 2018 for Fargo-Moorhead, Minot, Grafton, and Lisbon, as well as one planned for the Fox Island area in Bismarck, will keep communities safer. FEMA's Large-Scale Base Level Engineering initiative will guide communities with the identification of high-risk flooding areas. The data that will result from this study is important in communities where a Flood Insurance Study (FIS) has not been conducted or it is quite dated with no associated model. Communities can use the base level engineering data to plan for future develop and help create more flood resilient communities. The NDSWC anticipates posting the results of this initiative on its web-based map service. The International Joint Commission (IJC) has initiated a Plan of Study to review the operating agreement for the Souris River Dams. This is a three-year study, due in 2020, and involves agencies and the public from North Dakota, Saskatchewan, and Manitoba. The IJC appointed a Study Board to oversee the study. The NDSWC is contributing $352,500 in cost share, plus $50,000 worth of work-in-kind toward this study.

3.7.7.9 Data Limitations / References

The continued development of digital mapping of the FIRMs in North Dakota allow for more detailed analyses of the flood risk in North Dakota. Understanding the areas at most risk will allow for smarter development and protection of the people in the State. In addition, integration of FEMA's Mid-term Levee Inventory data with the USACE National Levee Database will allow for more detailed analysis of levee protected areas in North Dakota.

Hazard data used for exposure analysis was obtained from a variety of Federal sources. Flood hazard data was collected from the FEMA NFHL. Most of the critical facility data was provided by the NDDES. The data included communications infrastructure and facilities related to, communications, first responders, water treatment, healthcare, education, and government operations. Bridge data was obtained from the DHS Homeland Infrastructure Foundation-Level Data database containing the National Bridge Inventory. Facility data that was not spatially referenced was run through the Esri World Geocoding service to obtain a location that could be used for exposure analysis. The accuracy of each geocode was given a score from 0 - 100 with 100 being the most accurate. All geocoded data with an accuracy below 95 was not used as inaccurate data could skew the exposure analysis.

Key documents used to create this profile include the 2011 Flood Report: Response and Recovery, State Of North Dakota Department of Emergency Services Legislative Flood Mitigation and Response Study (2013), Devils Lake Risk Assessment, North Dakota State Emergency Operations Plan, Flood Annex, North Dakota Water Development Reports, the Floods of 1997: A Special Report, the Red River of the North Flood Disaster, 10 Years Later, and the Interagency Hazard Mitigation Team Reports.

3.7.8 Geologic Hazards

3.7.8.1 Description

The NDGS classifies geologic hazards by common, limited, and remote probability of occurrence. Flooding, traditionally classified as a geologic hazard, is analyzed separately in this plan due to the high probabilities of occurrence and range of impacts to the state.

Geologic Hazards of Common Occurrence

These hazards are common and relatively well known by the scientific and engineering communities across the state. Multiple counties are exposed to various geologic hazards throughout the state.

Landslides

A landslide is the movement of rock, soil, artificial fill, or a combination thereof on a slope in a downward or outward direction. The primary causes of landslides are slope saturation by water from intense rainfall, snowmelt, or changes in ground-water levels on primarily steep slopes, earthen dams, and the banks of lakes, reservoirs, canals, and rivers (USGS, n.d.). Other causative factors include steepening of slopes by erosion or construction, alternate freezing or thawing, earthquake, volcanic eruptions, and the loss of vegetation from construction or wildfires. The saturation or destabilization of a slope allows the material to succumb to the forces of gravity or ground movement.

Many different types of landslides exist: slides, falls, topples, flows, and lateral spreads. Slides involve the mass movement of material from a distinct zone of weakness separating the slide material from the more stable underlying material. The primary types of slides are rotational slides and translational slides. Falls occur when materials, mostly rocks and boulders, fall abruptly from a steep slope or cliff. Falls are strongly influenced by gravity, mechanical weathering, and the presence of interstitial water. Topples are similar to falls, yet they pivot around a connection point at the base of the material and are most often caused by gravity or fluids in the cracks of the rocks. Flows typically have a higher percentage of water material embedded in them and behave more like a liquid than other types of landslides. The five primary categories of flows are: debris flows, debris avalanches, earthflows, mudflows, and creeps. Lateral spreads usually occur on gentle slope or flat surfaces when liquefaction occurs and leads to fractures on the surface. Complex landslides involve any combination of these types (USGS, n.d.).

Abandoned Mine Lands (AML)

Hazardous mine subsidence in North Dakota is usually caused by collapse of abandoned underground coal mines. Abandoned surface mines can be hazardous too. Unstable spoil piles, mine refuse fires and a number of other phenomena associated with AML can also be hazardous.

Expansive/Unstable Soils

Expansive soils are soils that expand when water is added and shrink when they dry out. This continuous change in soil volume can cause infrastructure and homes built on this soil to move unevenly and crack.

Environmental Minerals: Radon

Radon is a colorless, odorless, and tasteless gas that originates from the radioactive decay of uranium minerals found in soils and in igneous rock and their derivative mineral weathering products.

Geologic Hazards of Limited Occurrence

These are geologic hazards that may only occur in one or a few counties and are of limited geographical extent or temporal span.

Environmental Minerals: Erionite, Uranium, Arsenic

The NDGS has conducted several environmental geologic and economic geologic mapping efforts focused on locating and characterizing environmental minerals such as erionite and uranium, respectively. These types of minerals and the rocks that host them could be hazardous with localized and prolonged exposure. Erionite is a microscopic fibrous mineral with properties similar to asbestos that may have the potential to affect public health. Uranium, a metallic weakly radioactive element, is one of the most common elements in the Earth's crusts. Arsenic is a toxic chemical that occurs naturally in the environment in soil, rocks, and minerals.

Earthquake

An earthquake is the sudden movement of the earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the earth's surface. Huge plates slowly move over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free, thus, producing an earthquake (USGS, n.d.). North Dakota is situated in a seismically stable intracratonic region of the North American continent where tectonic earthquakes are rare.

Geologic Hazards with a Remote Probability of Occurrence

These are geologic hazards that have an extremely low probability of occurrence but could have an impact if they were to occur.

Meteorite Falls

Meteorites are samples of early solar system materials. Meteoroids enter the Earth's atmosphere daily but only a small fraction avoid vaporization in our atmosphere and reach the surface to become rock-size meteorites. Most meteorites that have fallen to Earth are pieces of asteroids. In North Dakota, there have been eleven official meteorite specimens found, with the Richardton meteorite fall in 1918 being the most well documented (NDGS, 1998)

Volcanic Hazards: Ash Fall from Regional Volcanic Eruptions – Yellowstone, Wyoming

The nearest volcanic hazard to North Dakota is located at Yellowstone National Park. The Yellowstone Plateau hosts an active volcanic system with subterranean magma (molten rock), boiling, pressurized waters, and a variety of active faults with significant earthquake hazard (USGS, n.d.). A massive eruption, although remote, has the possibility to spew ash for thousands of miles across the United States.

3.7.8.2 Previous Occurrences

Most geologic events in North Dakota go unnoticed or result in very little physical damage. The most frequently reported events are landslides and earthquakes. Some of the more notable landslide events in North Dakota are summarized below from the *Bismarck Tribune*, NDGS, and Barnes County. In total, the NDGS has identified 11,077 landslides from 1994 through January 2017.

- Slope failures along North Dakota Highway 22 in western North Dakota in the late 1990's.
- Slope failures on Riverview Drive in Valley City in the late 1990's.
- Slope failures along the Red River near Drayton in 2005.
- 1997 – Highway 1806 was closed north of Fort Abraham State Park after a landslide.
- A total of 12 homes were lost to landslides in Valley City in 1993, 1997, 1999, 2000, and 2001.
- March 25, 2010 – A train derailed when an embankment failed south of Washburn in McLean County. One railroad worker was killed, and another was injured.
- The University of Mary Campus in Bismarck sits on a bluff over-looking Apple Creek and the Missouri River Valley. The bluff slopes are unstable and slope movements have begun to encroach upon the adjacent University facilities. In 2016, the University underwent an evaluation of the slope stability hazards and proposed mitigation design alternatives. The University applied and received funding under the 2017 PDM Program to stabilize a portion of the bluff near their north dormitory building, and the University plans to apply for funding to stabilize two additional sections of bluff in 2018 and 2019 as well.

In 2011 there were nine landslide areas located along the state highway system. Slope failures in 2011 caused five road closures, cost $5.6 million in emergency repairs, and resulted in nine emergency declarations. The estimated cost for permanent repairs was $14 million (NDDOT, 2012). Spring rains and snowmelt largely caused these events. Slope failure locations in 2011 included:

- The Horseshoe Bend Slide Area along Highway 85 is located roughly one mile north of Long X Bridge and in Theodore Roosevelt National Park North Unit in McKenzie County. Cabins on Lake Sakakawea's Skunk Bay were also affected.
- Highway 8 near Twin Buttes.
- Highway 73, twenty-four miles east of Watford City.
- Interstate 94 in Painted Canyon. This area previously experienced landslides in 1970 and 1979. Movement was detected at this location again in spring 2011. In 2012 voids were found under the pavement and filled using cellular concrete.
- Along Highway 22 roughly 20 miles north of Killdeer. Highway 22 was damaged by landslides in late spring/summer 2011, closing the road from May 20, 2011 to November 9, 2011. It was damaged again in September 2012.

Earthquakes have been felt in North Dakota but usually do not result in damage. Table 3.7.8-1 lists the earthquakes that were felt in North Dakota, whether the epicenter was in North Dakota or in another state. Figure 7.4.6-1 in Appendix 7.4.6 shows previous earthquakes that have had an epicenter in North Dakota on a statewide map.

Table 3.7.8-1 North Dakota Area Earthquakes

Location	Date	Magnitude / Impacts
Southeastern North Dakota	1872	Unknown
Pembina	1900	Unknown
Avonlea, Saskatchewan	05/16/1909	5.5 magnitude Broken dishes and windows cracked plaster and masonry
Williston	08/08/1915	3.7 estimated magnitude, IV intensity
Hebron	04/30/1927	3.2 estimated magnitude, III intensity
Havana	1934	Unknown
Williston	10/26/1946	3.7 estimated magnitude, IV intensity
Selfridge	05/14/1947	3.7 estimated magnitude, IV intensity
Huff	07/08/1968	4.4 magnitude, IV intensity
Morris, MN	1975	Unknown
Grenora	03/09/1982	3.3 magnitude, III intensity
Morris, MN	1993	Unknown
Grenora	11/11/1998	3.5 magnitude, IV intensity
Goodrich	11/15/2008	2.6 magnitude, II intensity
Grenora	01/03/2009	1.5 magnitude, I intensity
Williston (11 miles southeast)	9/28/2012	3.3 magnitude, III intensity

Source: Bluemle, 2007; North Dakota Geological Survey, 2010c.; Anderson 2015

North Dakota has only had one disaster declaration due to a geologic hazard: DR-1279 was declared for severe storms, tornadoes, snow and ice, flooding, ground saturation, and landslides/mudslides. The event occurred from March 1, 1999 to July 19, 1999 and impacted 42 counties and four reservations. Over $100 million in disaster assistance was provided.

3.7.8.3 Location and Extent

Table 3.7.8-2 summarizes the spatial extent of the impacts geologic hazards could have on various resources in a community.

Table 3.7.8-2 Spatial Extent of Geologic Hazard Impacts

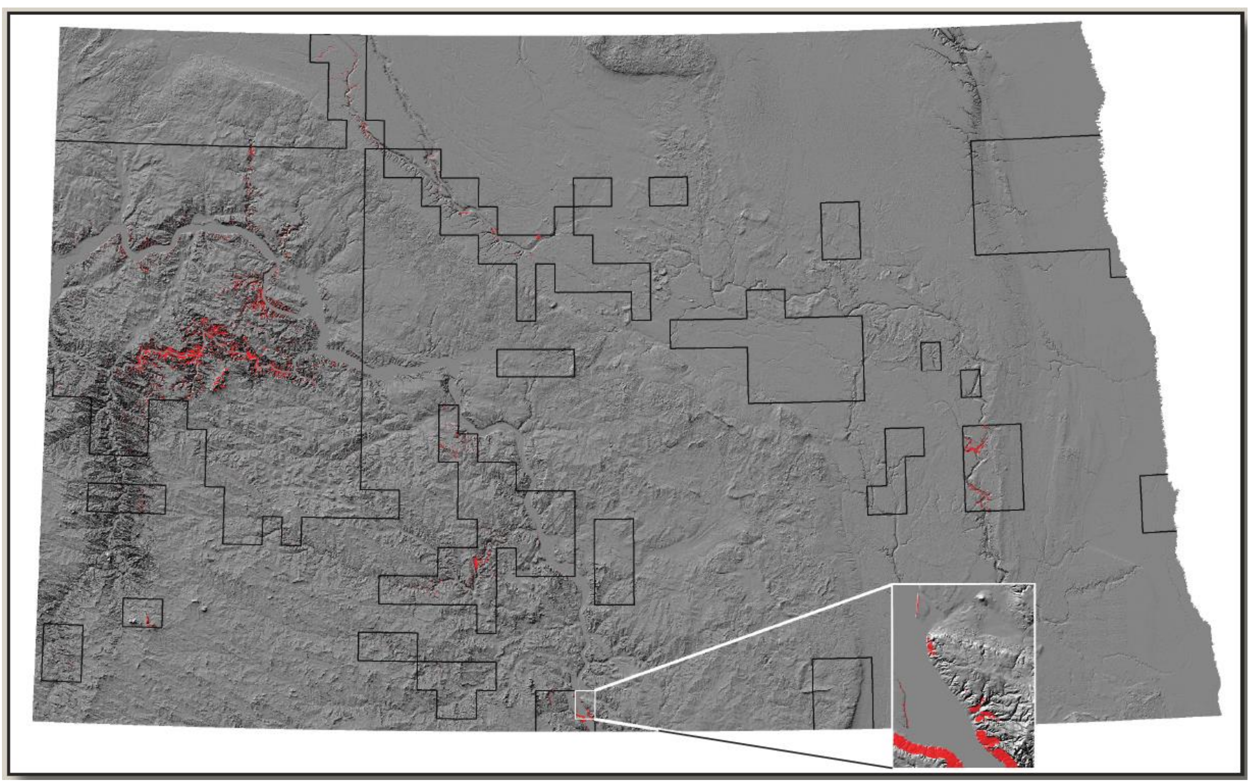
Resources	Extent of Impacts
People	Local/Regional
Property	Local/Regional
Infrastructure	Local/Regional
Government Operations	Regional
Environment / Natural Resources	Local
Cultural Resources	Local

Landslide

Landslides are found primarily in the unglaciated portions of western and southwestern North Dakota and in eastern North Dakota along major river valleys and transportation corridors. The majority of rocks and sediment at or near the surface in North Dakota are relatively soft so a good rule of thumb is the longer and steeper the slope the more unstable it will be. For that reason, the relatively steep river valleys are one of the areas in the state susceptible to landslides. In addition, the Badlands topography and buttes in western North Dakota are also prone to slope failure. The majority of landslides in North Dakota are categorized as rotational slumps, which is when the surface rupture is curved upward (USGS, 2008). The area of most concentrated and persistent landslides occurs along the Little Missouri River Valley from a point just west of the North Unit of the Theodore Roosevelt National Park east to the mouth of the Little Missouri River.

The NDGS is currently mapping landslide areas at the detailed mapping scale of 1:24,000 across the entire state. As of January 2017, the NDGS has mapped nearly 11 million acres in North Dakota (25% of the state) and have identified 11,077 landslides (Figure 3.7.8-1).

Figure 3.7.8-1 Landslides in North Dakota

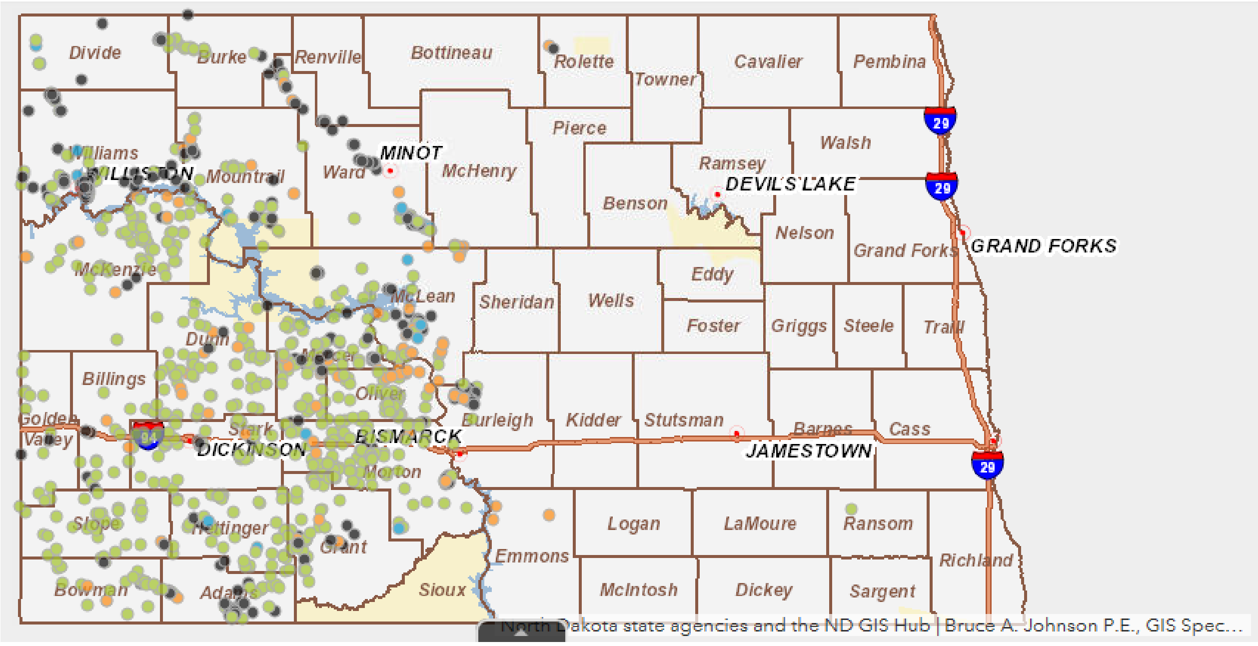


Source: North Dakota Geological Survey, 2017

Abandoned Mine Lands (AML)

Hazardous mine subsidence in North Dakota is usually caused by collapse of abandoned underground coal mines. This happens frequently in western North Dakota. Figure 3.7.8-2 shows locations of AML across the state and the following Table 3.7.8-3 summarizes the location of AML in North Dakota.

Figure 3.7.8-2 Abandoned Mined Lands (AMLs) in North Dakota



Source: North Dakota Public Service Commission, 2018

Table 3.7.8-3 Abandoned Mined Lands (AMLs) in North Dakota

County	# AMLs
Morton	198
Williams	144
Ward	132
Mercer	127
Stark	124
McKenzie	112
McLean	103
Hettinger	95
Mountrail	95
Dunn	89
Grant	87
Oliver	83
Adams	71
Slope	50
Bowman	49
Burleigh	34
Golden Valley	34
Burke	32
Billings	28
Divide	25
Renville	15
McHenry	4
Emmons	3

County	# AMLs
Rolette	2
Ransom	1

Source: North Dakota Public Service Commission, 2018

Expansive/Unstable Soils

Expansive soils can be found within the near-surface glaciolacustrine sediments throughout the Red River Valley and within the surface/near-surface interbedded mudstones of the Cannonball Formation in the Bismarck area.

Environmental Minerals: Radon

All of North Dakota is in EPA Radon Zone 1, as historically homes across North Dakota have tested with elevated amounts above 4pCi/L. Maps that depict the location of EPA Radon Zones for North Dakota can be found online at the EPA's website (EPA, 2018).

Environmental Minerals: Erionite, Uranium, Arsenic

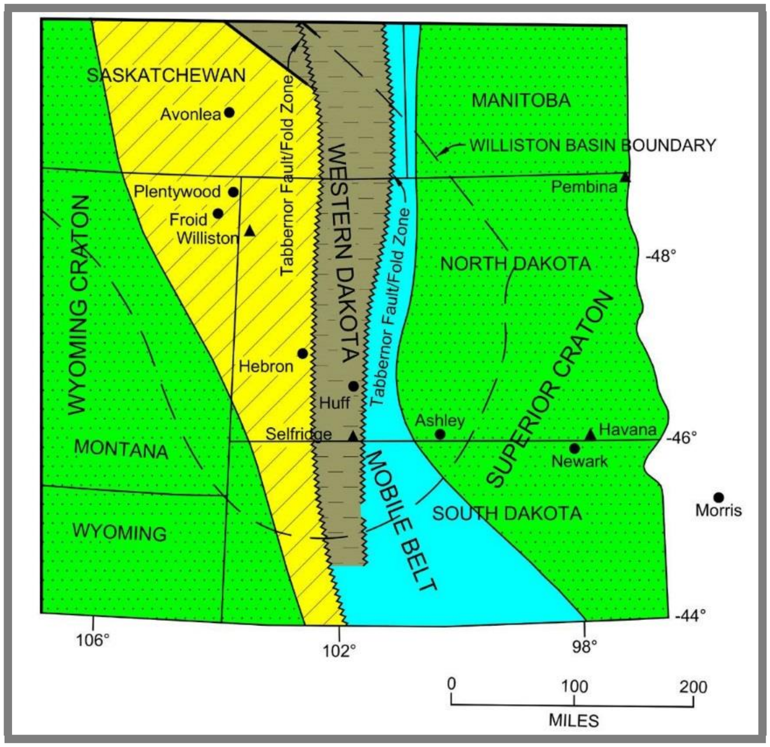
Uranium occurs within the lignites, sandstone, and carbonaceous mudstone containing rock units of the Golden Valley, Sentinel Butte, and Bullion Creek Formations found in southwestern North Dakota along with the groundwaters found in these rocks (Murphy, 2006, 2007, and 2008). Maps that depict the location of Uranium deposits in North Dakota can be found online at the North Dakota Department of Mineral Resources' (NDDMR's) website (NDDMR, n.d.).

Erionite deposits are found within gravels in western North Dakota primarily in western Dunn, western Stark, and southeastern Slope counties. Arsenic in shallow groundwater is a concern for drinking water-well users in southeastern North Dakota in the counties of Richland and Sargent counties. The EPA, in cooperation with the NDDoH and the Southeast Water Users District (SEWUD), has taken steps to remedy the health risk posed by arsenic in the area identified as the Arsenic Trioxide Superfund Site. The area encompasses about 936 square miles in southeast North Dakota and includes 26 townships.

Earthquake

North Dakota is not an area known for its earthquake activity; however, hundreds of miles to the west is the Intermountain Seismic Belt and to the southeast is the New Madrid Seismic Zone. Neither of these areas is close enough to cause significant damage in the state; however, relatively small earthquakes may occur in areas not recognized for regular earthquake activity. One area, termed the Western Dakota Mobile Belt, may have two deeply buried faults, the Tabbernor Fault and Thompson Boundary Fault. Both faults are postulated and may produce small to moderate earthquakes. Low magnitude earthquakes have occurred dominantly in the western part of the state, primarily the northwest, as shown in Figure 3.7.8-3 (NDDMR, 2007).

Figure 3.7.8-3 Western Dakota Mobile Belt



Source: North Dakota Geological Survey, 2007

Earthquake severity is primarily measured in two ways: by magnitude and by intensity. Magnitude is based on the area of the fault plane and the amount of slip. The intensity is based on how strong the shock is felt and the degree of damage at a given location. The most commonly used scales are the Richter magnitude scale, moment magnitude scale, and modified Mercalli intensity scale (National Earthquake Hazards Reduction Program, n.d.). Earthquakes, although rare and of low magnitude and intensity, have occurred in North Dakota at a rate of about once per decade. Table 3.7.8-4 and Table 3.7.8-5 show the Richter Magnitude Scale and the Modified Mercalli Intensity Scale.

Table 3.7.8-4 Richter Magnitude Scale

Richter Magnitude Scale	Modified Mercalli Intensity Scale
1.0 to 3.0	I
3.0 to 3.9	II to III
4.0 to 4.9	IV to V
5.0 to 5.9	VI to VII
6.0 to 6.9	VII to IX
7.0 and Higher	VIII or Higher

Table 3.7.8-5 Modified Mercalli Intensity Scale

Defined Modified Mercalli Intensity Scale Rating	
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations like the passing of a truck.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes,

Defined Modified Mercalli Intensity Scale Rating	
	windows, doors, disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Total damage. Lines of sight and level are distorted. Objects thrown into the air.

Meteorite Falls

Meteorites have been found in North Dakota primarily in the northern Red River Valley and southwestern North Dakota and evidence exists for two other larger type impacts that have occurred over geologic time scales. The NDGS has published a report on some of the specimens that have been found in North Dakota (Murphy and Forsman, 1998).

Volcanic Hazards

The Yellowstone Volcano Observatory places North Dakota within the ash-fall boundaries in the unlikely occurrence of a Yellowstone super eruption (USGS, 2014).

3.7.8.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.8-6 below describes the consequences to each individual sector of a community.

Table 3.7.8-6 Geologic Hazards Consequence Analysis

Geologic Event Impacts	
Public	The public has a risk of high impact due to a geologic event. In 2006, the NDDoH began investigating the potential health effects of erionite and its occurrence in North Dakota through the NDGS and the UND. Exposure to radon is one of the leading causes of lung cancer in the United States, along with smoking. Since all of North Dakota is in EPA Radon Zone 1 (predicted average indoor radon screening levels greater than 4pCi/L), all counties are vulnerable to this hazard. Some people who drink water containing arsenic in excess of the standard over many years could experience adverse health effects, such as skin damage or circulatory system problems, and may have an increased risk of getting cancer. Short-term exposure to high doses of arsenic in drinking water (about a thousand times higher than the 10-ppb drinking water standard) could also cause adverse effects in people. Such

Geologic Event Impacts	
	exposures are not known to occur from public water supplies in the United States that comply with the drinking water standard for arsenic (NDDoH, n.d.).
Responders	Responders would be impacted should geologic events impact transportation routes. Many geologic events, namely landslides, cause railway or roadway damage which could impact emergency response routes. Power outages could also impact responders' ability to reach those in need.
COOP	Damage to state-owned buildings and critical facilities could impact the continuity of operations, particularly if electrical grid facilities and transportation infrastructure are damaged.
Delivery of Services	Damage to state-owned buildings and critical facilities can also impact the delivery of services. Damage to transportation infrastructure could limit the delivery of goods and services throughout the affected area. Damage to electrical power generation facilities could cut off power to large geographic areas for long periods of time, impacting the delivery of medical care and other emergency response functions.
Property, Facilities, and Infrastructure	Geologic threats pose the highest risk to property, facilities, and infrastructure. Landslides pose the greatest threat to state-owned assets and critical facilities in North Dakota. Most landslides damage transportation infrastructure, and result in road closures, detours, and road repairs. Occasionally, structures are involved. These impacts would also be costly and affect the tourism and recreation industry as well. Annually, landslide damage in North Dakota can reach into the millions of dollars. The 2011 landslides cost $5.6 million in emergency repairs and an estimated $14 million in permanent repairs for a total of nearly $20 million (NDDOT, n.d.). Abandoned mines also pose a threat to buildings and infrastructure. Serious safety hazards or expensive repairs can be incurred to structures developed on abandoned mine land. Mine subsidence can cause damage to homes, driveways, sidewalks, streets, water and sewer lines, septic systems, etc. There is also high risk to electrical power grids and transportation that could impact other individual community sectors.
Environment	Geologic hazards could greatly affect the environment. For example, landslides and land subsidence can pollute waterways, and destroy ecosystems (Geertsema, Highland, Vaugeouis. 2009). The release of other hazardous materials from AML is particularly severe to water quality (NPS, n.d.). This could travel to other areas and impact aquatic habitats and ecosystems (NPS, n.d.).
State Economy	Depending on the severity and type of geologic hazard, the state economy could be moderately impacted. Expansive soils, landslides, and earthquakes could damage private and state-owned buildings, including the contents inside. Lost revenue from prolonged business closure could also highly impact the state's economy (FEMA, n.d.). Significant costs could be incurred from repairing damaged property, buildings, and facilities (FEMA, n.d.). Tourism and recreation industries could also experience economic impact to the state. Economic activities could be hindered by blocked transportation infrastructure from geologic hazard events, which would lessen or eliminate economic activity, depending on the specifics of the situation.
Public Confidence in the State's Governance	A geologic hazard would have little to no effect on the public's confidence in the state's governance. The public's confidence in state and local governance could be impacted if zoning and building codes which prohibit development in hazardous areas are not enforced.

3.7.8.5 State Risk Assessment

Landslide

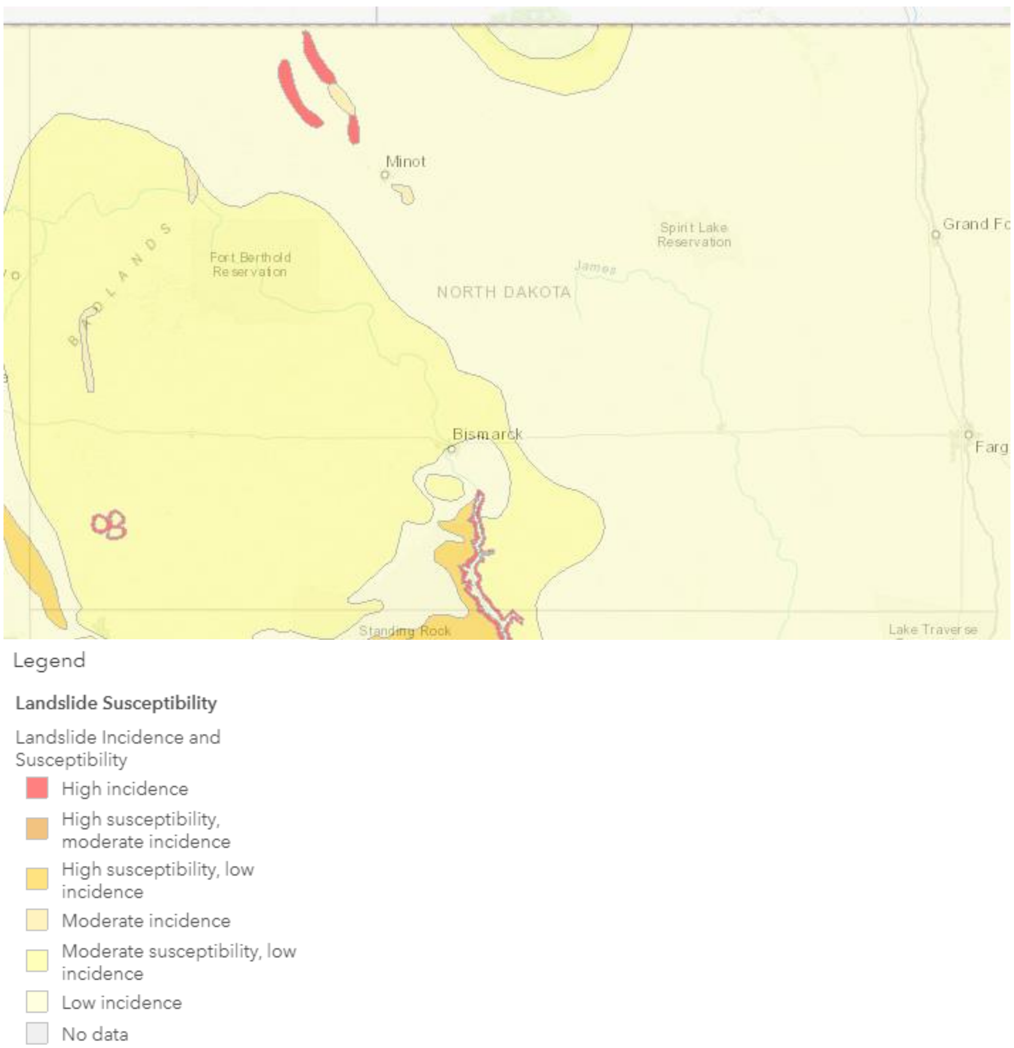
Probability

Landslide occurrences often reflect moisture conditions. Landslides in North Dakota tend to be more frequent during wet years, especially if those have been preceded by a series of dry years. In general, landslides have a relatively low probability of future occurrence in the state.

Vulnerability Assessment

Figure 3.7.8-4 shows landslide susceptibility in North Dakota. Much of western North Dakota has moderate susceptibility to landslides, but low incidence. Parts of Renville, Ward, Slope, counties, along with the southern Missouri River, have high landslide incidence indicating over 15% of the area is involved in landslides. These areas of higher susceptibility correspond with most of the previous occurrences of landslides occurring in the western portion of the state.

Figure 3.7.8-4 Landslide Susceptibility in North Dakota



Source: United States Geological Survey, 2018

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to high incidence geologic hazards in North Dakota. Due to the variability of the types of geologic hazards and limitations of data, it is difficult to determine all the state assets and critical facilities currently at risk. Landslide susceptibility mapping has been completed for North Dakota and can be used to consider where future facilities should be constructed. In general, North Dakota's state-owned buildings and critical facilities are in areas of low to moderate landslide susceptibility. Section 2.2.3 details the number and value of state-owned and critical buildings by county. Section 3.5 summarizes the critical facilities and state-owned assets located in areas susceptible to landslides.

Loss Estimates

Annually, landslide damage in North Dakota can reach into the millions of dollars. The 2011 landslides cost $5.6 million in emergency repairs and an estimated $14 million in permanent repairs for a total of nearly $20 million (NDDOT, 2012). Road and infrastructure projects are particularly at risk of being damaged from a landslide. For example, the BOR experienced landslide issues on infrastructure projects under its jurisdiction along the McClusky Canal in Sheridan County (NDDMR, n.d.). Although these types of losses do not occur every year, similar losses are possible in any year, particularly when similar flood conditions are present.

Abandoned Mines

Probability

Hazardous mine subsidence is caused by the collapse of abandoned underground coal mines and happens frequently in western North Dakota. The probability of these incidents continues to decrease due to the abandoned mine reclamation projects spearheaded by the North Dakota Public Service Commission (NDPSC). The program may end in 2022, but the NDPSC seeks to address 10 miles of highwalls, and over 3,000 acres of areas prone to land subsidence (NDPSC's AML Program, 2018). This may further reduce the probability of future incidents.

Vulnerability Assessment

Counties in the western portion of the state, where more AML are present, are particularly vulnerable to the hazards of an abandoned mine. Hazardous mine subsidence in North Dakota is usually caused by collapse of abandoned underground coal mines, which happens more frequently in western North Dakota. However, abandoned surface mines can be hazardous too. Unstable spoil piles, mine refuse fires and several other phenomena associated with AML can also be hazardous. Serious safety hazards or expensive repairs can be incurred to structures developed on abandoned mine land. Mine subsidence can cause damage to homes, driveways, sidewalks, streets, water and sewer lines, septic systems, etc. Counties with known abandoned mines include Adams, Billings, Bowman, Burke, Burleigh, Divide, Dunn, Emmons, Golden Valley, Grant, Hettinger, McHenry, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Renville, Slope, Stark, Ward, and Williams.

The North Dakota Public Service Commission administers the AML Program on behalf of the State of North Dakota. The mission of the AML Division is to eliminate potential or existing hazards associated with abandoned coal mines in North Dakota for which there is no continuing liability under state or federal law. Program funding comes from a federal reclamation fee on coal that has been mined in the United States since the late 1970's. The North Dakota AML Division applies for federal grants through the Department of Interior, Office of Surface Mining Reclamation and Enforcement.

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to high incidence geologic hazards in North Dakota. State-owned buildings and property are generally not at risk from high incidence geologic hazards, particularly abandoned mines. Abandoned mine could pose a high threat to state assets and critical facilities due to land subsidence, and even hazardous material release from the AML. However, due to the variability of types and severity of geologic hazards, it is difficult to determine all the state assets and/or critical facilities at risk and their loss estimates. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Loss Estimates

AML can negatively impact the built environmental, public health due to hazardous material spills, and the natural environment. In recent years, AML emergency projects have been reported. In 2017, $4,945 was used to fill sinkholes in the 2017 Beulah Highway 200 Emergency AML Project (NDPSC AML Program, 2018). Another $36,130 was spent during the 2015 Haynes Coal Fire Emergency Project and 2015 Lovejoy Avoca Coal Fire Emergency Project (NDPSC AML Program, 2018). However, due to variability of abandoned mine land hazards, as well as variability in the severity of impact, it can be difficult to comprehensively estimate losses.

Expansive/Unstable Soils

Probability

Expansive and unstable soils have also been identified as a high occurrence hazard in North Dakota. Due to the frequent nature of flooding and drought in North Dakota, the probability of expansive soils causing damage is likely to occur on an annual basis throughout the state, due to the constant changes in soil volume (USDA, NRCS, n.d.).

Vulnerability Assessment

Areas around the Red River Valley, including Fargo, are vulnerable to expansive soils. The sediments create unstable subsoil, causing conditions such as the elastic deformation of glaciolacustrine soils, shrink-swell properties, inadequate bearing capacities, and mass movements. These conditions are responsible for structural failures including the Fargo Grain Elevator in 1955 and the Northern Pacific railroad grade. Bank failures along the Red River are common due to the inherent instability of Brenna Formation smectitic clays which are subject to plastic deformation in the subsurface, with resultant block failure of overlying Sherack Formation. Recent alluvial sediments due to typical fluvial action and the continued seasonal saturation of cutbank meanders within the floodplain also add to soil instability.

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to high incidence geologic hazards in North Dakota. Expansive soils could pose a high threat to state assets and critical facilities that have been built in areas with unstable land. However, due to the variability of types and severity of geologic hazards, it is difficult to determine all the state assets and/or critical facilities at risk and the associated loss estimates.

Loss Estimates

Expansive soils can be detrimental to the foundation of all infrastructure and property, leading to potentially high costs of repair and remediation. However, limited data and the variability of expansive soil hazards make it difficult to estimate exact losses.

Environmental Minerals: Radon

Probability

Exposure to radon is possible with greater than 90% chance of occurring in a given year, particularly due to North Dakota's location in EPA Radon Zone 1.

Vulnerability Assessment

Since all of North Dakota is in EPA Radon Zone 1 (predicted average indoor radon screening levels greater than 4pCi/L), all counties are vulnerable to this hazard. As previously stated, exposure to radon is one of the leading causes of lung cancer in the United States, along with smoking. In the United States, radon is responsible for about 21,000 lung cancer deaths every year, and about 2,900 of these deaths occur among people who have never smoked.

State Assets and/or Critical Facilities at Risk

Overall, all state assets and critical facilities are at a risk of being exposed to radon. The inability to operate within these buildings could cause subsequent consequences, including economic impact or impact to delivery of government services. However, there is little expected direct damage to these state assets and critical facilities. Due to the variability of types and severity of geologic hazards, it is difficult to determine all the state assets and/or critical facilities at risk and their loss estimates, particularly from radon. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Loss Estimates

As a means of prevention, the EPA and OSG recommend that all homes below the third floor be tested for radon. Because radon is invisible and odorless, a simple test is the only way to determine if a home has high radon levels. EPA recommends mitigating homes with high radon levels and there are straight-forward reduction techniques that will work in virtually any home. People in homes exposed to radon can experience health impacts, including lung cancer (US EPA, n.d.). Radon is the second highest cause of lung cancer among non-smokers, according to the EPA. Loss estimates for Radon are difficult to predict due to lack of data and inability to estimate associated medical costs.

Environmental Minerals: Erionite, Uranium, Arsenic

Probability

During the past few decades, gravel pits have been excavated in western North Dakota where naturally occurring deposits of erionite have been found (NDDoH, 2018). The gravel was used to surface local county roads, parking lots and other areas. Despite their relatively common occurrence, these environmental minerals have an unlikely chance of causing a future exposure incident.

Vulnerability Assessment

The NDDoH recognizes the potential health implications but has not observed any health-related impacts related to erionite exposure in North Dakota. The NDDoH, in cooperation with the NDGS, has continued to advance the understanding of this environmental mineral. Maps and detailed information about Erionite occurrence in North Dakota can be found on the NDDoH website (NDDoH, n.d.).

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to geologic hazards in North Dakota. State-owned buildings and property are generally not at risk to environmental minerals. Due to the variability of types and severity of geologic hazards, it is difficult to determine all the state assets and/or critical facilities at risk and their loss estimates. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Loss Estimates

The NDGS has conducted several environmental and economic geologic mapping efforts focused on locating and characterizing environmental minerals such as Erionite and Uranium, respectively. The extent of the erionite exposure in western North Dakota is unknown, but given the inherently toxic nature of the material, reducing exposure is recommended. Due to this limited extent data, losses are difficult to estimate. Where found, erionite should not be disturbed. Mining should be prohibited in specific areas. Recommendations for county highway departments, businesses and private landowners include finding alternative sources of gravel and limiting or eliminating exposure to erionite fibers.

To mitigate losses and the impacts of arsenic at the Arsenic Trioxide Superfund Site, the EPA and NDDoH have completed the remediation activities at the site, which has included the connection of cities to public water systems, the expansion of SEWUD water treatment facilities and the installation of pipelines to connect rural users to the public water supply. Ongoing measures include the creation of institutional controls (ICs) by EPA and NDDoH. ICs are “non-engineered instruments,” such as administrative and legal controls, that will help minimize the potential for human exposure to arsenic contamination in the future and protect the integrity of existing remedies.

Earthquake

Probability

Peak horizontal acceleration is the maximum horizontal acceleration experienced by a particle during the earthquake motion. The peak ground acceleration with a two-percent probability of exceedance in fifty years in North Dakota is less than 10%g (USGS, n.d.). To make sense of these values, at 9.2%g-18%g, the earthquake is felt by all with many frightened. Some heavy furniture is moved with a few instances of fallen plaster. Damage is considered slight (Qamar, 2008). Impacts resulting from peak horizontal accelerations up to 18%g are described in Table 3.7.8-7 below.

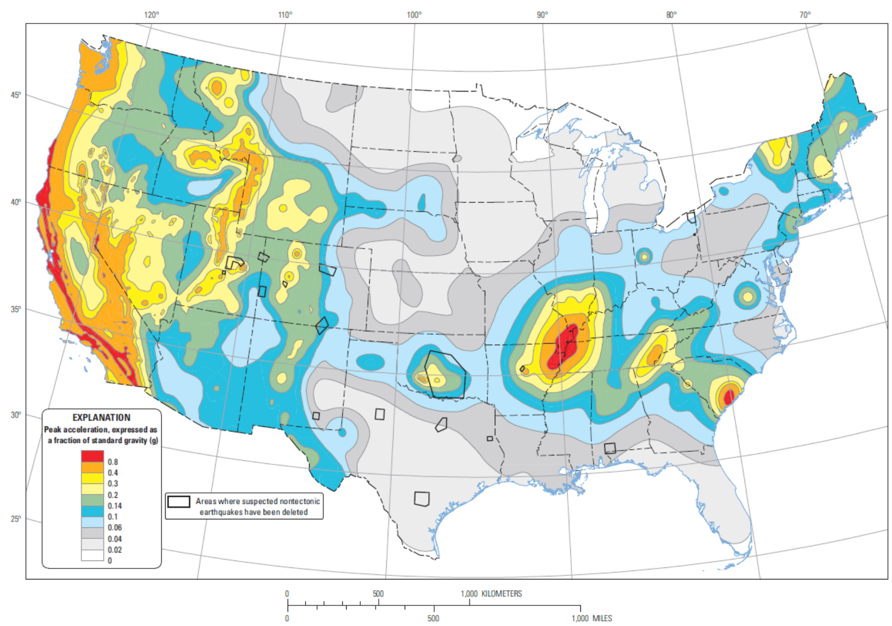
Table 3.7.8-7 Expected Impacts from Peak Horizontal Accelerations

Acceleration	Perceived Shaking	Potential Damage
<0.17%g	Not Felt	None
0.17%g – 1.4%g	Weak	None
1.4 %g – 3.9%g	Light	None
3.9%g – 9.2%g	Moderate	Very Light
9.2%g - 18%g	Strong	Light

Source: Pacific Northwest Seismic Network, 2018.

Figure 3.7.8-5 is a USGS peak ground acceleration map of the United States that shows that North Dakota has a very low probability of exposure to seismic-related (both naturally occurring and induced) hazards.

Figure 3.7.8-5 Peak Ground Acceleration Two-Percent Probability of Exceedance in Fifty years



Two-percent probability of exceedance in 50 years map of peak ground acceleration

Source: USGS, 2014a

Vulnerability Assessment

The primary threats to jurisdictions from the geologic hazards are to county, city, and township road systems and oil pipelines. Overall, the potential for significant earthquake losses in North Dakota is marginal. Counties in the western, and in particularly the northwestern, part of the state are more vulnerable to minor earthquakes. Williams County has experienced the most previous occurrences of earthquakes; however, none have caused major damage.

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to high incidence geologic hazards in North Dakota. Earthquakes are not likely to cause damage to state-owned buildings and critical facilities due to their infrequent occurrence and low magnitude. However, depending on severity and location of earthquake, it could cause damage to critical infrastructure. Due to the variability of types and severity of earthquakes, it is difficult to determine all the state assets and/or critical facilities at risk and their loss estimates. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Although the frequency and impacts of geologic hazards is relatively small in North Dakota, increased development pressure and the impacts of climate change may increase risk to state assets if they are constructed geologic hazard prone areas, particularly those at most risk of earthquakes. The Statewide Interoperable Radio Network (SIRN) 20/20 Feasibility Study also outlines a plan for the incorporation of SIRN to replace aging communication technology. Construction of this type of network could make critical facilities more vulnerable due to a geologic hazard event.

Loss Estimates

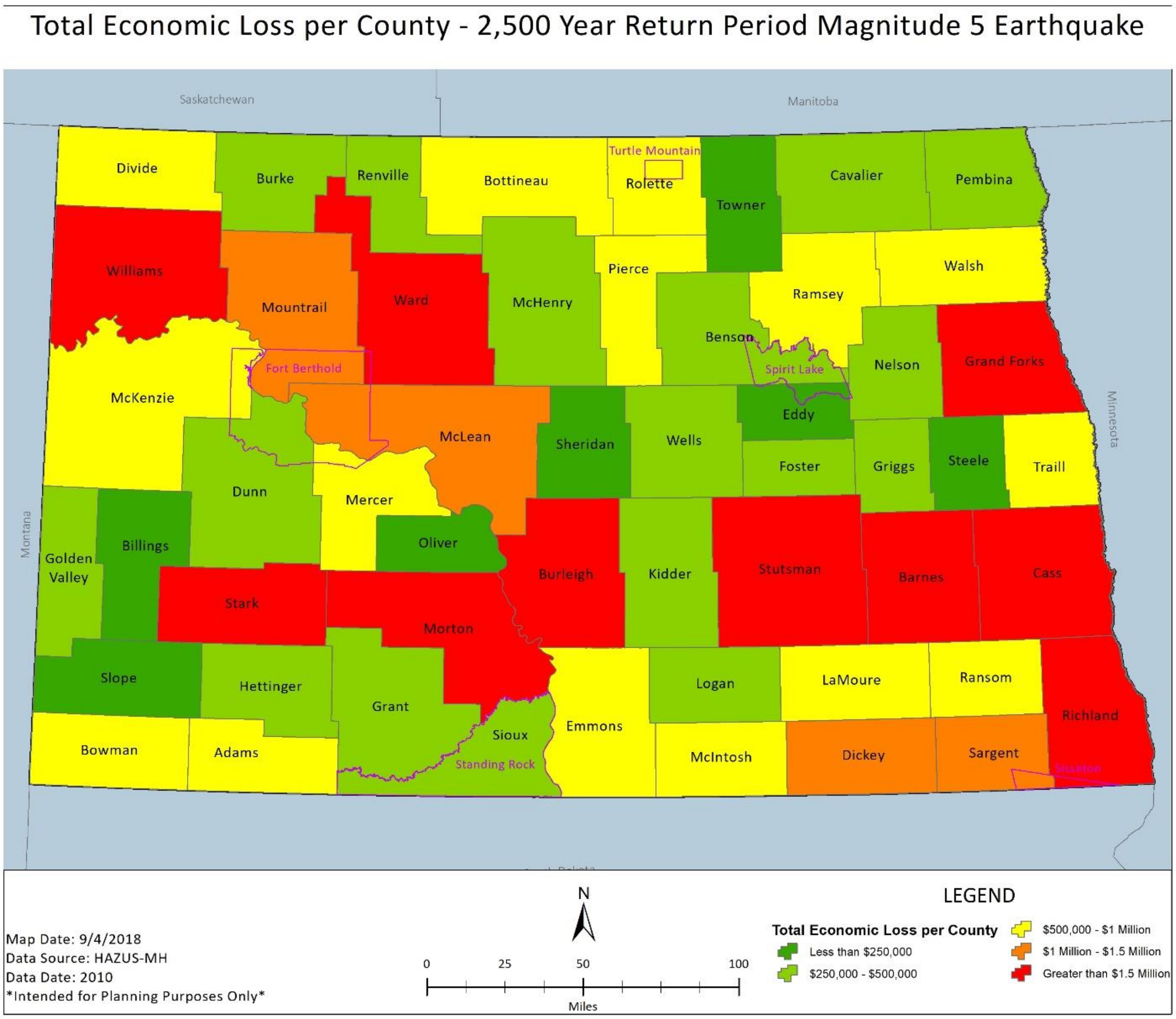
A Hazus analysis was completed to estimate the losses that would occur from a magnitude 5 earthquake. The results from the magnitude 5 earthquake scenario indicate that 1,038 buildings would be at least moderately damaged, with 4 buildings damaged beyond repair. Fifty-four households could be displaced by an earthquake of this magnitude and 30 people may seek temporary shelter in public shelters. Total economic losses could exceed $101.42 million, which includes building and lifeline related losses based on the region's available inventory. Casualty losses are estimated to be relatively small. Table 3.7.8-8 summarizes the results of the scenario. Figure 3.7.8-6 shows the total economic losses summarized by county.

Table 3.7.8-8 HAZUS-MH Magnitude 5 Earthquake Loss Estimation, 2,500-Year Return Period Results

Type of Impact	Impacts to State
Total Buildings Damaged	• Slight: 3,915 • Moderate: 961 • Extensive: 73 • Complete: 4
Building and Income Related Losses	• $86.73 million • 44% of damage related to residential structures • 32% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	• $101.42 million
Casualties (based on 2 a.m. time of occurrence)	• Not requiring hospitalization: 16 • Requiring hospitalization: 1 • Life threatening: 0 • Fatalities: 0
Casualties (based on 2 p.m. time of occurrence)	• Not requiring hospitalization: 22 • Requiring hospitalization: 4 • Life threatening: 0 • Fatalities: 1
Casualties (based on 5 p.m. time of occurrence)	• Not requiring hospitalization: 18 • Requiring hospitalization: 2 • Life threatening: 0 • Fatalities: 0
Displaced Households	• 54
Shelter Requirements	• 30

Source: HAZUS-MH

Figure 3.7.8-6 HAZUS-MH Magnitude 5 Earthquake Loss Estimation, 2,500-Year Return Period



Meteorite Falls

Probability

Meteorites have been found in North Dakota primarily in the northern Red River Valley and southwestern North Dakota and evidence exists for two other larger type impacts that have occurred over geologic time scales. Based on previous occurrences, the probability of a meteorite fall is rare.

Vulnerability Assessment

Since a meteorite fall is a very rare and unpredictable occurrence, it is difficult to evaluate the vulnerability of people and property to this hazard. However, if an event were to occur, the impacts to people and property in the immediate surrounding area could be significant.

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk meteorite falls in North Dakota. Meteorite falls could pose a threat to state assets and critical facilities due if they were to occur. However, due to the infrequent occurrences of meteorite falls, it is difficult to determine all the state assets and/or critical facilities at risk and their loss estimates. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Although the frequency and impacts of geologic hazards is relatively small in North Dakota, increased development pressure and the impacts of climate change may increase risk to state assets if they are constructed geologic hazard prone areas. The SIRN 20/20 Feasibility Study also outlines a plan for the incorporation of SIRN to replace aging communication technology. Construction of this type of network could make critical facilities more vulnerable due to a geologic hazard event.

Loss Estimates

Most of the events that are known are somewhat localized with a potential to cause damage of limited extent, if they are small and consistent to what has been observed to date. Therefore, it is difficult to estimate losses.

Volcanic Hazards

Probability

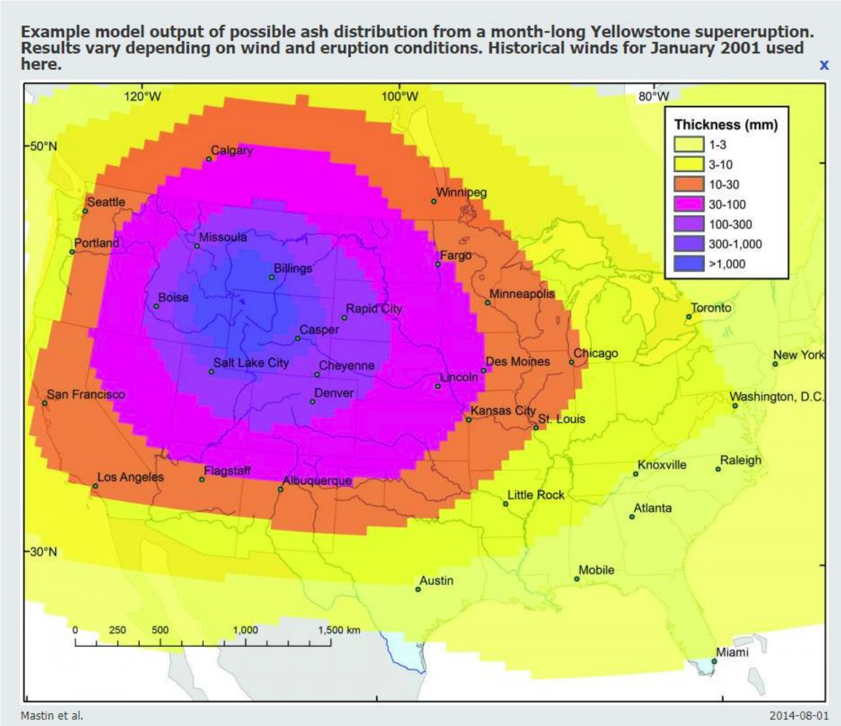
As stated by USGS, within the next few decades, light-to-moderate earthquakes and steam explosions are certain to occur. Volcanic eruptions are less likely but are ultimately inevitable in this active volcanic region.

Of all the possible hazards from a future volcanic eruption in the Yellowstone region, by far the least likely would be another explosive caldera-forming eruption of great volumes of rhyolitic ash. Abundant evidence indicates that hot magma continues to exist beneath Yellowstone, but it is uncertain how much of it remains liquid, how well the liquid is interconnected, and thus how much remains eruptible. Any eruption of sufficient volume to form a new caldera probably would occur only from within the present Yellowstone caldera, and the history of postcaldera rhyolitic eruptions strongly suggests that the subcaldera magma chamber is now a largely crystallized mush. The probability of another major caldera-forming Yellowstone eruption, in the absence of strong premonitory indications of major magmatic intrusion and degassing beneath a large area of the caldera, can be below the threshold of useful calculation." (USGS, 2007).

Vulnerability Assessment

As illustrated in Figure 3.7.8-7, southwestern North Dakota has the potential to be blanketed by up to 300 millimeters of ash, and the remainder of the state with up to 300 millimeters, with the exception of the far northeast where USGS modeling shows up to 30 millimeters.

Figure 3.7.8-7 Yellowstone Super Eruption –Example Model Output of Ash Distribution



Source: USGS, 2014

State Assets and/or Critical Facilities at Risk

Overall, state assets and critical facilities are at a relatively low risk to volcanic hazards. State-owned buildings and property are generally not at risk from geologic hazards, particularly volcanic hazards which are infrequent in the state. This hazard could pose a high threat to state assets and critical facilities if it were to occur. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Loss Estimates

Since volcanos are very rare and unpredictable occurrences, it is considerably difficult to evaluate this hazard. Current geologic activity at Yellowstone has remained relatively constant since scientists first started monitoring more than 30 years ago. Scientists have also found no indication of an imminent smaller eruption of lava. (USGS).

3.7.8.6 Future Conditions

Successful mitigation of geologic hazards requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future geologic hazard risk.

Climate Change

The following Table 3.7.8-9 presents the best available data relating to climate changes impacts to geologic hazards in North Dakota. The effects of climate change on geologic hazards can vary depending on the specific type of hazard. Expansive soils and landslides will increase in frequency and severity as soils swell and slide more from increased precipitation due to climate change. Other hazards such as meteorite falls and earthquakes are less affected by climate change.

Table 3.7.8-9 Expected Changes to Geologic Hazards Future Condition

Condition	Projected Change
Location	The location of geologic hazards is not projected to change.
Extent / Intensity	The extent and intensity of geologic hazards is not projected to change.
Frequency	Intense storms are projected to occur more frequently, which may contribute to an increased frequency of landslides resulting from heavy precipitation and flooding.
Duration	The duration of geologic hazards is not projected to change.

Changes in Development

As detailed in Section 2.2.2, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

Existing and future development may be vulnerable to geologic hazards. Specific to landslide, most land use regulations in the state do not directly address the landslide hazard, however, some may restrict development on excessive slopes and soil types that are inherently more prone to landslides. Landslides are a concern for infrastructure development including issues associated with roads and highways, oil and gas, water supply pipelines, and other utilities and civil construction projects. Increased populations add to the challenges of managing development in geologic hazard areas, especially in locations where landslide mapping has not been completed.

Williams County has experienced the most historical earthquakes and is projecting a 165% change in population from 2010 to 2030. Many counties in western North Dakota, where landslides are more present, are growing in population. Additionally, counties with high numbers of AML are also experiencing population growth. Morton County has the most abandoned mines, and has a projected population change of 31% from 2010 to 2030. Williams County has the second most abandoned mines and is projected to see a 165% increase in population from 2010 to 2030.

Earthquake losses can often be mitigated through building codes. Those jurisdictions lacking building code regulations and enforcement would be more likely to see development that is vulnerable to earthquakes. Building above an underground mine can be dangerous and zoning authorities and developers should determine whether an area is undermined before any construction begins. North Dakota’s growing oil and gas industry is also at risk to geologic hazards.

Most oil and gas development are concentrated in the western portion of the state, particularly McKenzie, Williams, Mountrail, and Dunn counties. These counties have experienced previous earthquake occurrences and have moderate susceptibility to landslides. As oil production increases, more oil production and storage facilities will be exposed to future earthquake hazards. Additionally, all four of the counties have identified abandoned mines that can pose additional dangers to future develop (Table 3.7.8-3).

Although the frequency and impacts of geologic hazards is relatively small in North Dakota, increased development pressure and the impacts of climate change may increase risk to state assets if they are constructed in geologically hazard prone areas. The SIRN 20/20 Feasibility Study also outlines a plan for the incorporation of SIRN to replace aging communication technology. Construction of this type of network could make critical facilities more vulnerable to future geologic hazard events.

3.7.8.7 Jurisdictions at Risk

Twenty of fifty-eight local and tribal HMPs profile geologic hazards. Figure 3.7.8-8 presents a summary of those plans and also identifies how they ranked the overall risk presented by geologic hazards. No jurisdictions ranked geologic hazards as a high hazard, two as medium, and fifteen as low. Three plans identified geologic hazards, but did not provide a ranking, and 38 plans did not identify geologic hazards. This ranks geologic hazards as the number 11 out of 14 hazards according to North Dakota local HMPs. The two jurisdictions that rank geologic hazards as medium are Williams and Cass counties. Williams County has experienced the most historical earthquakes and has a higher susceptibility to landslides. Cass County contains the City of Fargo that experiences issues related to expansive soils. Overall, geologic hazards are not a priority hazard for most jurisdictions.

Figure 3.7.8-8 Local Hazard Mitigation Plan Geologic Hazard Rankings

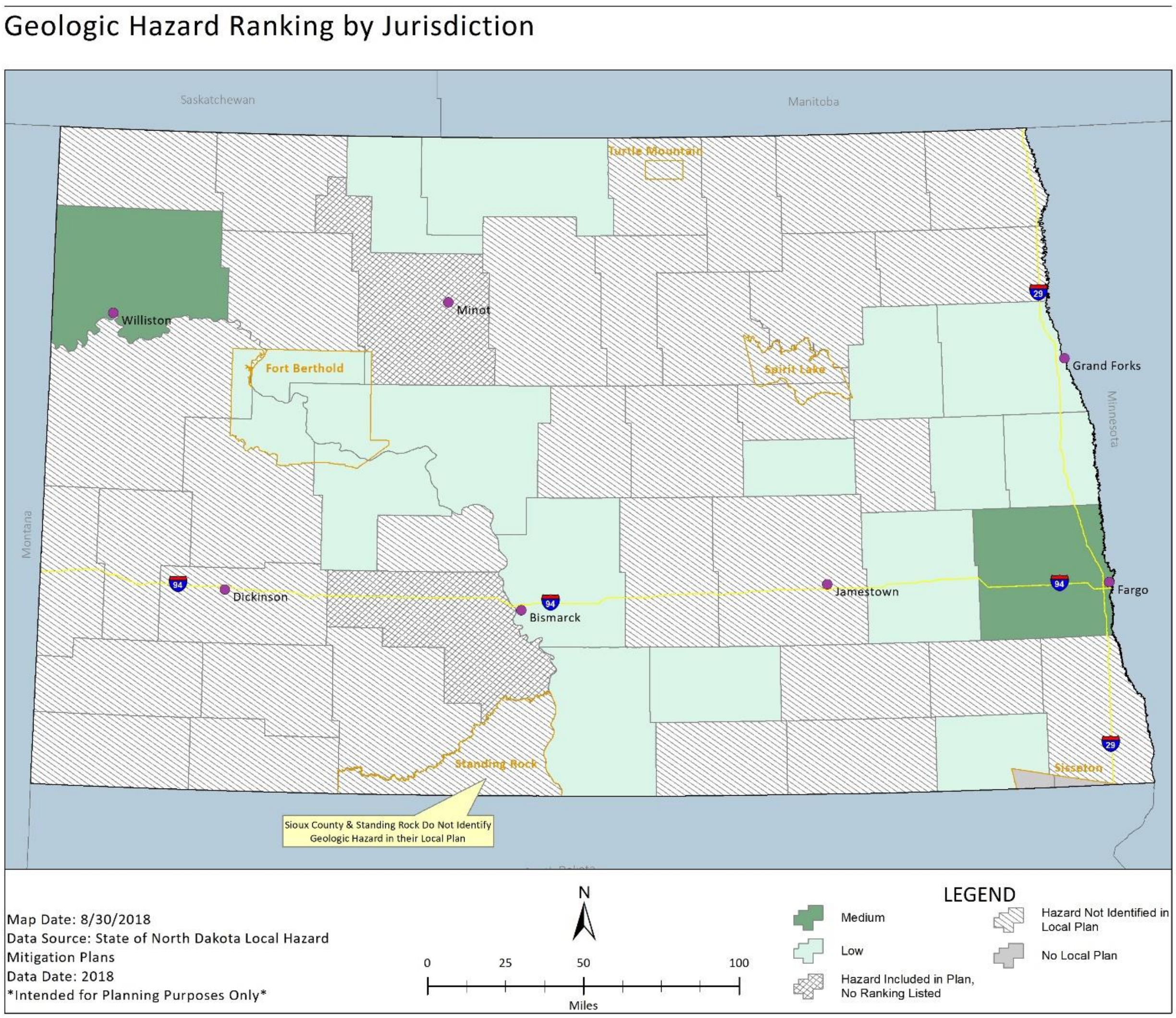


Table 7.4.6-1 in Appendix 7.4.6 includes a compilation of available loss information, when available, as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. Jurisdictions that profiled geologic hazards mostly estimated losses for earthquakes and landslides. Many jurisdictions did not provide loss information. Some geologic hazards, such as landslides, cause millions of dollars in damage, particularly in the western portion of the state.

3.7.8.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including geologic hazard, to create an overall Risk Factor score. Following this methodology, the geologic hazard risk factor score was 2.2, which is a low ranked hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and 3.3-7 in Section 3.3.

Geologic hazards rank as a low risk hazard in North Dakota due to the infrequency of severe events. The probability of geologic hazards can range from a one percent annual chance for high impact events to a 50% chance of annual occurrence for low impact events. The less frequent hazards such as high magnitude earthquakes and volcanos can have a high impact on people, property, critical facilities and infrastructure, which can lead to impacts on state operations and delivery of services. Low impact events that occur frequently in the state include landslides, abandoned mines lands (and land subsidence), expansive soils, and radon exposure. All of these hazards can impact public health, environmental quality, and critical infrastructure to a lesser degree. Particularly as North Dakota begins to develop a framework for SIRN, there could be a larger vulnerability to critical facilities.

Overall, western counties are typically more vulnerable to geologic hazards, particularly earthquakes, landslides, and AML. The Red River Valley area, including Fargo, is vulnerable to expansive soils, and the entire state is vulnerable to radon levels above 4pCi/L, which is the level at which the EPA recommends homes are mitigated.

Transportation infrastructure is likely the most at risk to damage from geologic hazards. Continued efforts to decrease development in geologic hazard-prone areas will continue to mitigate losses resulting from geologic hazards. Future development in the oil and gas industry should be closely monitored for exposure to geologic hazards.

The analysis of local and tribal mitigation plans in comparison to this risk assessment points to the need to conduct outreach and education to help planning teams understand geologic hazards in their areas. The Geologic Hazard Committee also recommends leveraging data sources in the planning and development phases to identify strategies to mitigate the impacts of these geologic hazards. Another strategy includes emphasizing mitigation practices, such as the stabilization of slopes, during trainings such as the G318 Hazard Mitigation Workshop provided to local, tribal, and state planning teams.

3.7.8.9 Data Limitations / References

Geologic hazards, particularly landslide hazard areas, are commonly influenced by local factors. Continued study by the NDGS should aid in identifying those areas at greatest risk and potentially in need of mitigation action. Information and data collection regarding damage and costs of repair related to transportation infrastructure was unavailable at this time since data was not collected in the same mechanism as the previous plan update.

The North Dakota State Emergency Operations Plan was referenced in creating this profile. Additionally, HAZUS software was used to estimate losses from an earthquake. Data and other resources were provided by several state agencies and organizations, including NDDMR, University of Mary, NDPSC, and UND, Environmental Research Center for Oil and Gas (EERC). Information and data were also found with federal agencies, such as FEMA, NPS, and USGS. Hazard data used for exposure analysis was obtained from a variety of Federal sources. General landslide susceptibility data was obtained from the USGS landslide susceptibility national dataset.

3.7.9 Hazardous Material Release

3.7.9.1 Description

Hazardous materials (hazmat) are substances posing an unreasonable risk to safety and health, the environment, and the property of North Dakota citizens. The term hazardous materials encompass a vast array of products, from the relatively innocuous types, such as creosote, to highly toxic or poisonous types, such as anhydrous ammonia. The severity of potential hazards caused by these materials varies, but the primary reason for the designation is their risks to public safety.

The Federal Motor Carrier Safety Administration (FMCSA) designates nine categories of hazardous materials as follows:

- Explosives (Class 1)
- Gases (Class 2)
- Flammable and combustible liquids (Class 3)
- Flammable solids, spontaneously combustible, and dangerous when wet (Class 4)
- Oxidizing substances and organic peroxides (Class 5)
- Toxic/poisonous substances and poison inhalation (Class 6)
- Radioactive materials (Class 7)
- Corrosive substances (Class 8)
- Miscellaneous hazardous materials/products, substances, or organisms (Class 9)

Hazardous material incidents are categorized as uncontrolled releases occurring during transportation (truck, rail, or pipeline) or at a fixed source such as a manufacturing or storage facility. Accidental releases may be due to equipment failure, human error, or a natural or human-caused hazard event. This profile analyzes both transportation and fixed facility releases of chemical and radiological hazardous materials. Although the listed hazardous materials are classified essentially the same in both transportation and fixed facility incidents, the USDOT determines and regulates hazardous materials associated with transportation, including pipelines. The EPA determines and regulates which materials are considered hazardous in fixed facility releases.

The economy of North Dakota is based on agriculture, light manufacturing, coal mining, and petroleum and natural gas extraction. All of these businesses and industries rely on the production, use, storage, and transportation of hazardous materials. In North Dakota, explosives are used principally in mineral extraction, construction, and seismic work.

Hazardous material releases occur as a result of multiple causes but are often initiated by a transportation accident. Almost any hazard that destroys infrastructure can lead to a hazardous material release. For example, floods can wash out bridges or roadways causing transportation accidents as well as infiltrate storage areas causing a hazardous material release at a fixed facility. As periodically occurs in flooding, propane and other chemical tanks can become dislodged and float downstream. Strong winds, poor visibilities, or slippery roadways may also instigate a transportation accident. Hazardous material releases during any hazard event will most certainly compound the complexity of the event.

Community Coffee Comments

Residents with a farming background expressed concern with the use of hazardous materials in farming operations. One retired farmer characterized anhydrous ammonia releases as one of the most dangerous accidents to occur in farming. Another recounted a harrowing experience in which he climbed over his tractor to escape an anhydrous ammonia cloud, moving upwind and seeking help from a nearby farmer to mitigate the impacts.

Oil and Natural Gas Industry

In North Dakota and Montana, the Bakken and Three Forks Shale formations are rich in oil and natural gas which are located within the Williston Basin. The industry began to significantly expand when developers created the horizontal drilling and hydraulic fracturing process. Oil developers looked for known reserves that were difficult to reach and decided to explore North Dakota's Bakken. In 2005, the first major well was horizontally drilled and fracked in the state. North Dakota set a state record in 2014 for oil production, which was then broken in May 2018 with approximately 1.24 million barrels per day (Dura, 2018). In 2018, another record was set with 14,755 active producing wells (Dura, 2018).

The continued development of new oil fields, particularly in the western part of the state, creates additional risk from both new fixed facilities and the associated increase in hazardous material transportation in the area. New and proposed pipelines associated with oil and gas development pose additional threats in parts of the state. The opening of the Dakota Access Pipeline in 2017 greatly increased the capacity to move oil but the North Dakota Pipeline Authority (NDPA) estimates that pipelines will not have the capacity to meet the rate of oil production by the first half of 2019. Pipeline expansion will not circumvent the needs of additional transport methods in the future.

3.7.9.2 Previous Occurrences

The history of hazardous material releases in North Dakota range from farming incidents to large releases due to train derailments. There have not been any Presidential or state-level disaster declarations in North Dakota for hazardous material releases. In accordance with state and federal law, the intentional or unintentional release of hazardous materials beyond a certain quantity must be reported. Notification is made to NDDES through the Division of State Radio.

NDDES maintains record of previous hazardous material release incidents. The statewide total for spills in 2017 was 1,659 incidents (NDDES, 2018). This total includes all Oil Spill Reports (OSRs), Environmental Incident Reports (EIRs) and National Response Center (NRC) Flash Faxes.

Details of other notable previous occurrences of hazardous material release are provided in Appendix 7.4.7.

Fixed Facilities

In total, there have been 3,571 general environmental incident reports, with approximately 229 occurring between August 2017 and August 2018 (NDDoH, 2018). In addition, there have been approximately 688 contained and 303 not contained oilfield environmental incidents between August 2017 and August 2018. There have been 15,389 contained and not contained oilfield environmental incidents between 1900 and 2018, including well releases (NDDoH, 2018).

Transportation

Table 3.7.9-1 and Table 3.7.9-2 summarize the number of trains carrying over 1,000,000 gallons of crude oil through different counties in North Dakota. The state averages about 60 trains per year that carry over 1,000,000 gallons of crude oil. Between 2014 and 2016, the number of trains carrying this large quantity of crude oil decreased on the Canadian Pacific (CP) Railway and stayed relatively the same on the Burlington Northern Santa Fe, LLC (BNSF) Railway.

Table 3.7.9-1 Number of Rail Cars Carrying Crude Oil by County (BNSF Railway)

County	2014	2015	2016	2017	2018
Barnes	185	300	202	45	18
Benson	68	36	36	36	18
Billings	58	60	60	60	30
Burleigh	81	92	63	24	12
Cass	262	307	136	46	30
Eddy	136	172	90	41	18
Foster	136	172	84	41	18
G. Valley	20	18	18	60	30
G. Forks	56	36	36	36	18

County	2014	2015	2016	2017	2018
Griggs	136	172	84	41	18
Kidder	91	98	63	24	12
McHenry	205	174	102	47	24
McKenzie	17	22	12	12	6
Mercer	9	18	18	18	9
Morton	70	108	86	24	12
Mountrail	197	166	90	45	26
Nelson	67	36	36	36	18
Oliver	12	18	18	18	9
Pierce	215	189	102	47	24
Ramsey	67	36	36	36	18
Richland	45	74	23	18	15
Stark	96	98	74	24	12
Steele	136	172	84	41	18
Stutsman	89	98	66	24	12
Traill	67	36	36	36	18
Ward	235	196	108	42	22
Wells	136	172	90	66	33
Williams	195	228	132	78	36

Source: North Dakota Department of Transportation, 2018

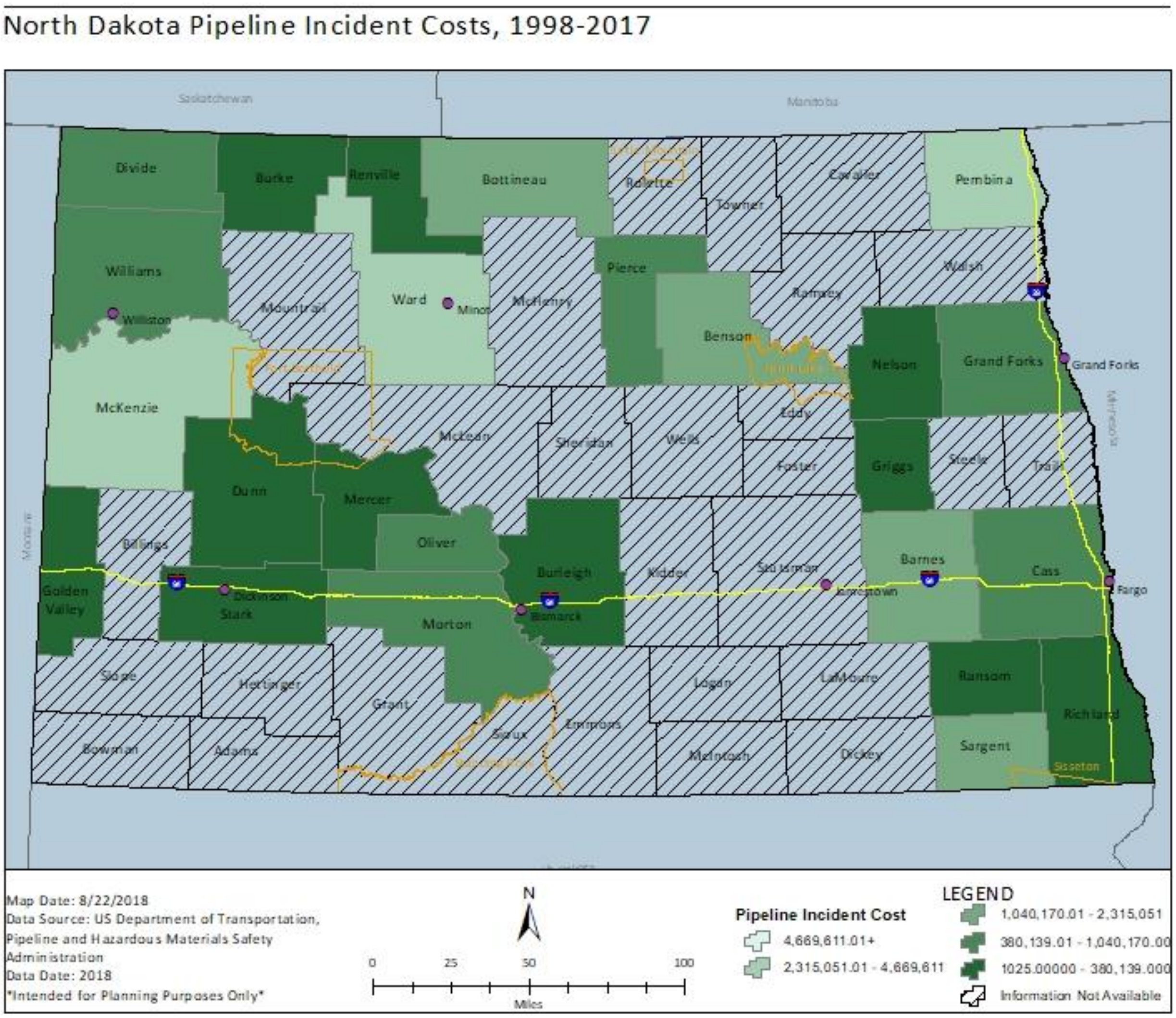
Table 3.7.9-2 Trains Carrying 1,000,000 Gallons or More of Oil, 2014 to 2016 (CP Railway)

County	2014	2016
Barnes	16	8
Burke	11	6
Cass	16	8
Foster	16	8
McHenry	16	8
Mclean	11	8
Mountrail	11	8
Pierce	16	8
Ransom	16	8
Renville	7	6
Richland	16	8
Sheridan	16	8
Stutsman	16	8
Ward	16	8
Wells	16	8

Source: North Dakota Department of Transportation, 2018

Reports from the USDOT's PHSMA provides detail and incident history for the pipeline systems in the State of North Dakota between 1998 and 2017. Significant incidents are those incidents reported by pipeline operators with any of the following conditions met: 1) fatality or injury requiring in-patient hospitalization; 2) $50,000 or more in costs, measured in 1984 dollars; 3) highly volatile liquid releases of five barrels or more or other liquid releases of 50 barrels or more; and 4) liquid releases resulting in an unintentional fire or explosion. According to these reports, there were 112 pipeline incidents that caused one fatality, four injuries, and $55,565,170 in damage over the period of 1998 - 2017. As of August 2018, there have been 16 pipeline incidents with roughly $1,939,461 in damage (USDOT, 2018a). Table 7.4.7-1 in Appendix 7.4.7 summarizes the incident details by counties. Figure 3.7.9-1 shows the cost of hazardous liquid and gas transmission incidents per county. On average, North Dakota experienced six incidents, less than one fatality, less than one injury, and $2,778,259 in damages each year (USDOT, 2018a).

Figure 3.7.9-1 Cost of North Dakota Pipeline Incidents by County, 1998 - 2017



Source: USDOT, Pipeline & Hazardous Materials Safety Administration, National Pipeline Mapping System, 2018a

3.7.9.3 Location and Extent

Hazardous material incidents can happen anywhere, but the most likely locations are associated with the oil and natural gas industry development, at fixed facilities producing, housing, or using hazardous materials or along the interstate, railroad, and pipeline infrastructure. Table 3.7.9-3 provides an overview of the spatial extent that hazardous material releases can impact different resources.

Table 3.7.9-3 Spatial Extent of Hazardous Material Release Impacts

Resources:	Extent of Impacts
People	Local
Property	Local
Infrastructure	Local
Government Operations	Local
Environment / Natural Resources	Regional
Cultural Resources	Local

Fixed Facility Release

Facilities that store or use chemicals considered unusually dangerous to human safety are required by Section 112R of the Clean Air Act Amendments to assess the potential impacts of an accidental release of the chemical at their facility and to prepare risk management plans (RMP). A database with information about North Dakota facilities that have RMPs is available online (US EPA Risk Management System, 2018). Radioactive isotopes are used in the medical profession and are classified as a hazardous material. NDDoH, Environmental Health also inspect and enforce regulations concerning fixed facilities. Table 3.7.9-4 below shows the number of currently monitored or regulated facilities.

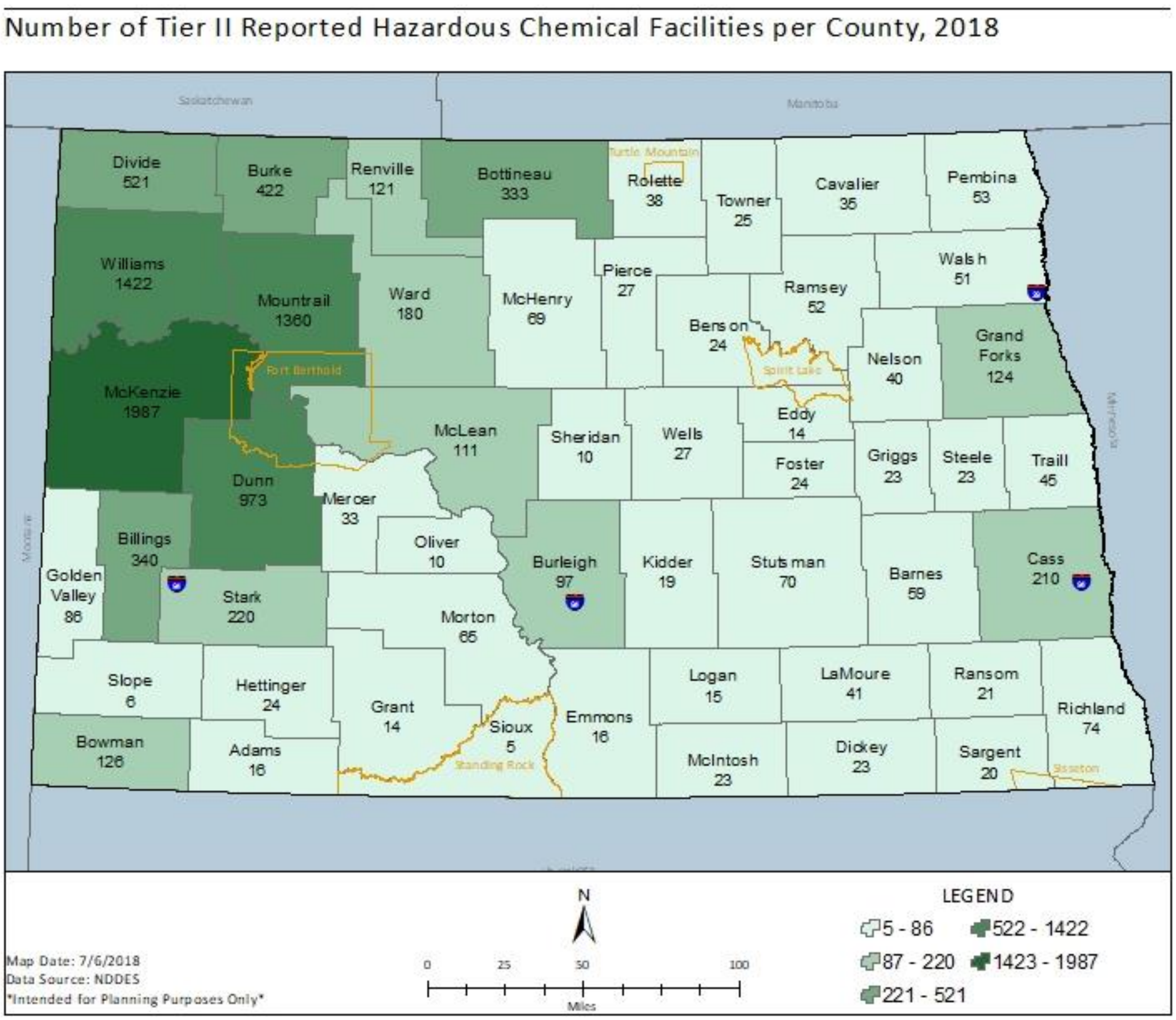
Table 3.7.9-4 Currently Monitored or Regulated Facilities by Program

Program	Active Facilities
Air Permitting	997
Asbestos	321
Drinking Water	411
Environmental Incident	315
Oil Field Incident	993
Solid Waste	1,415
Underground Injection Wells	677
Underground Storage Tank	880
Waste Water Program	4,514
X-Ray	703

Source: North Dakota Department of Health, 2018b

As of 2018, there were 9,777 Tier II reporting facilities housing or using hazardous chemicals in North Dakota identified by the Community Right to Know Act. The facilities must maintain a safety data sheet and submit the list of chemicals to the NDDES Hazardous Chemicals Preparedness and Response Program, the Local Emergency Planning Committee (LEPC) and local fire department. The typical facilities reporting includes bulk fuel plants, anhydrous ammonia plants, propane plants, agricultural processing plants, energy producing sites, and oil producing sites. The number of facilities as of 2018 is illustrated by county in Figure 3.7.9-2. As can been seen, the oil producing counties such as McKenzie have the highest number of hazardous chemical facilities.

Figure 3.7.9-2 North Dakota Tier II Reported Hazardous Chemical Facilities Per County as of 2018



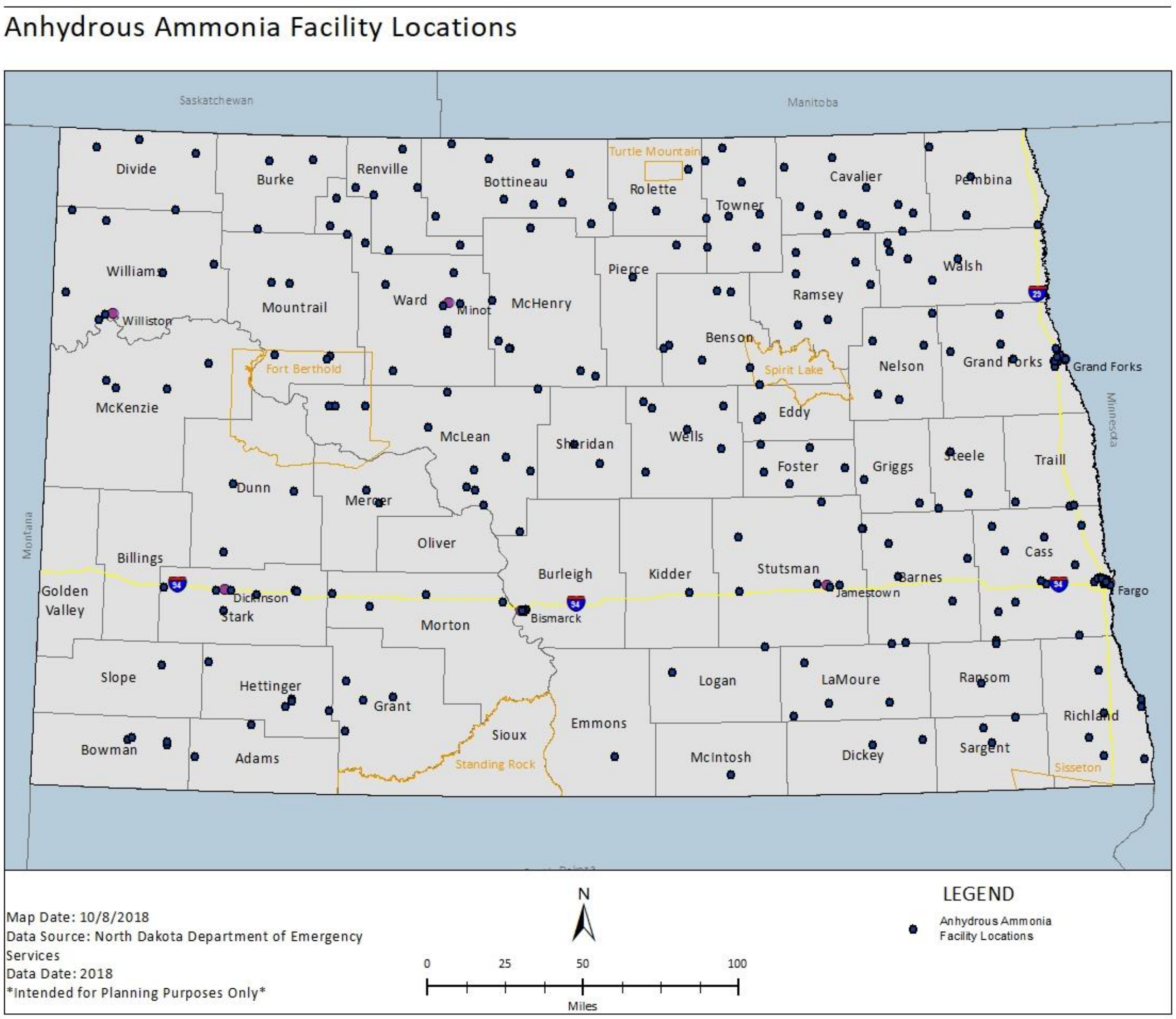
There are many licensed dealers selling hazardous fertilizers and pesticides to accommodate the agriculture industry. Table 3.7.9-5 provides the program statistics from the Pesticide and Fertilizer Division for 2017. Figure 3.7.9-3 shows the dispersion of anhydrous ammonia facility locations across the state of North Dakota.

Table 3.7.9-5 Fertilizer and Pesticide Program Statistics 2017

Fertilizer Program	Number
Licensed Fertilizer Distributors (2017):	750
Registered Fertilizer Products (2017):	1,349
Tons of Fertilizer Sold to End Users (2017):	2.3 million tons 142,405
Anhydrous Ammonia Program	**Number**
Number of Active Anhydrous Storage Facilities in ND	314
Number of Licensed Bulk Anhydrous Tanks (2017):	550
Pesticide Program	**Number**
Registered Pesticide Products:	10,700
Number of Pesticide Registrants:	1292

Source: North Dakota Department of Agriculture, 2017 (Data reflects last year's data or if readily available, an annual average.) The number of active anhydrous storage facilities in the table above was obtained from a different data source than the data shown in the facility locations map below. Therefore, data in the table may not account for all facilities listed in map below.

Figure 3.7.9-3 Anhydrous Ammonia Facility Locations

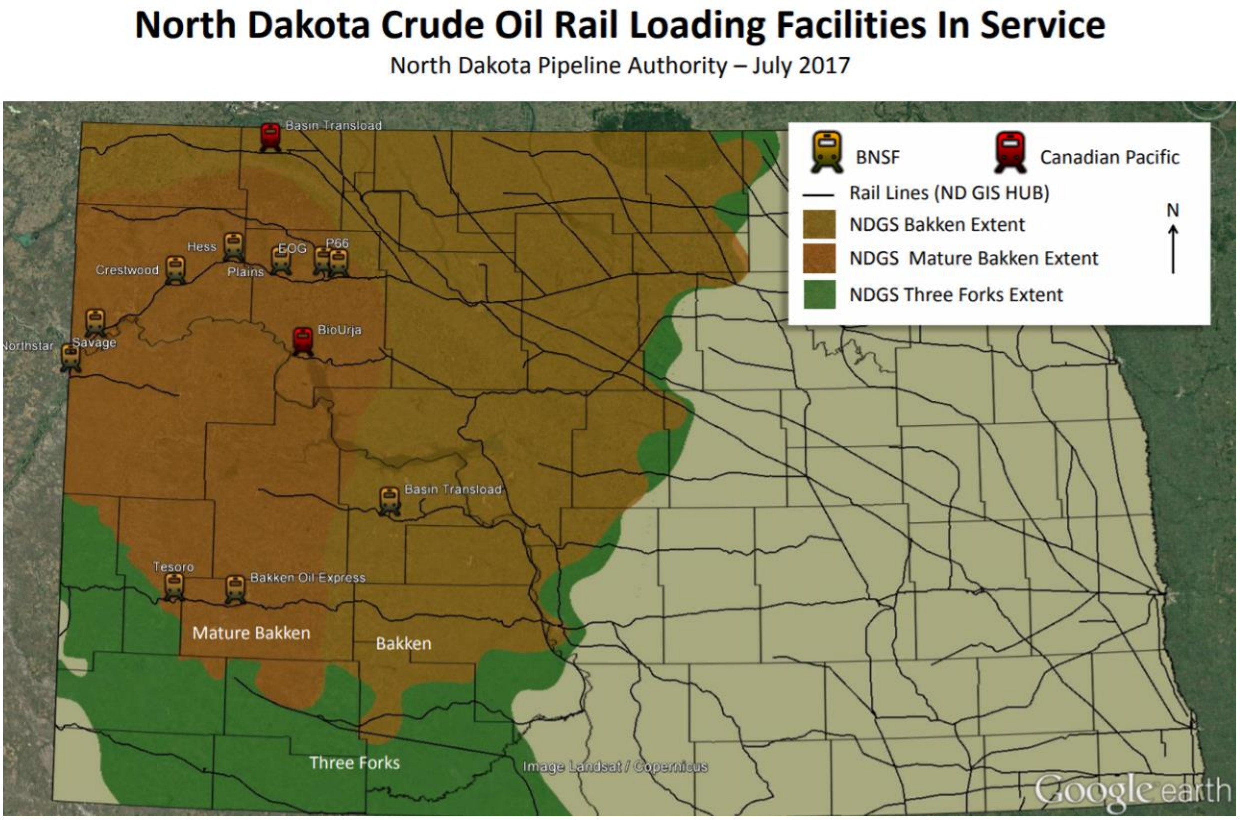


As of July 2018, North Dakota has 14,283 oil producing wells and 66 active drilling rigs according to NDDMR, Oil and Gas Division. Section 2 includes a map of the locations of all oil and natural gas wells.

Transportation Release

Hazardous materials are transported by highway, rail, and pipeline throughout the entire state. Rail lines often create dividing lines in rural communities. Response to a train incident could delay or prevent access for emergency personnel depending on the location of first responder assets. Figure 3.7.9-4 shows the railroad loading facilities being used to transport crude oil.

Figure 3.7.9-4 Oil Loading Rail Facilities



Source: Map by Google Earth and presented by North Dakota Pipeline Authority, July 2017

According to the USDOT Pipeline and Hazardous Materials Safety Administration's (PHSMA's) Pipeline Safety Stakeholder Communications, in 2017, North Dakota had a total of 11,358 miles of pipelines. Table 3.7.9-6 provides additional details on pipeline mileage in the state, which has increased over time.

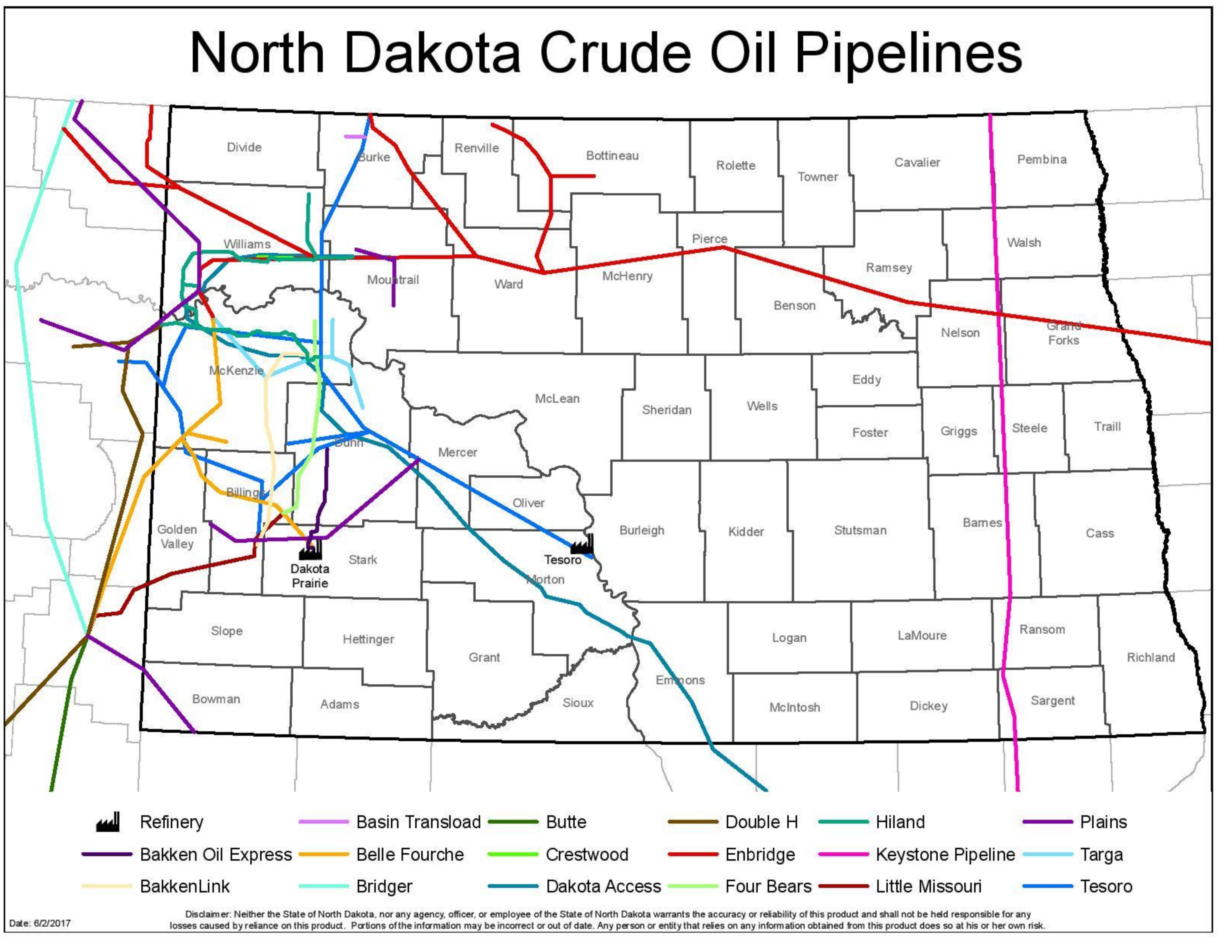
Table 3.7.9-6 North Dakota Pipeline Mileage, 2017

Pipeline System	Mileage
Hazardous Liquid Lines	5,152
Gas Transmission Lines	2,486
Gas Gathering Lines	14
Gas Distribution *	3,706
Pipeline Mileage	**11,358**

Source: USDOT, Pipeline and Hazardous Materials Safety Administration, 2017
https://primis.phmsa.dot.gov/comm/StatePages/NorthDakota.htm
* Gas distribution service lines (the connection between the distribution line and the end user) are not included in the gas distribution mileage.

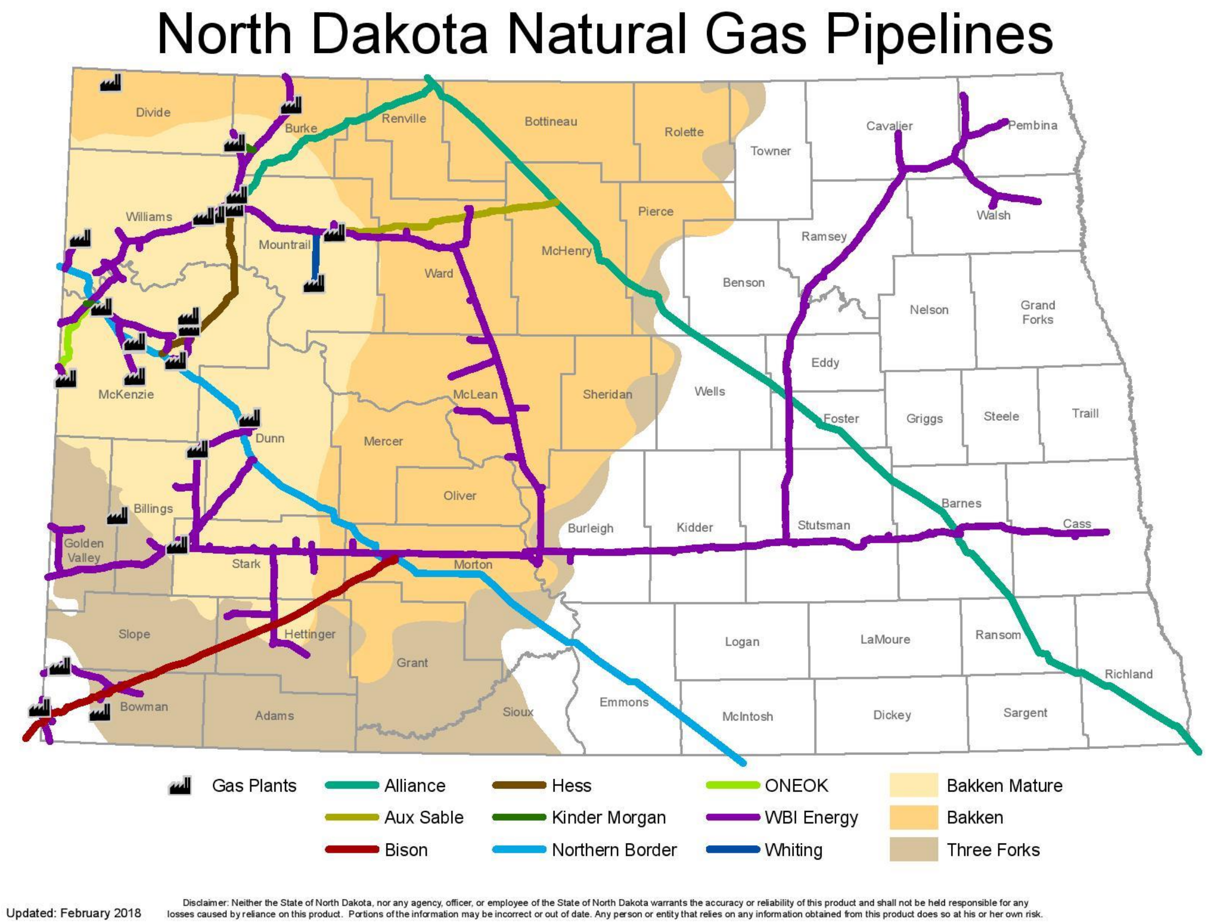
Figure 3.7.9-5 and Figure 3.7.9-6 are statewide maps of the crude oil and natural gas pipelines in North Dakota. Table 7.4.7-2 in Appendix 7.4.7 shows the breakdown of gas transmission line and hazardous liquid line mileage by county as of April 2018.

Figure 3.7.9-5 North Dakota Crude Oil Pipelines



Source: North Dakota Pipeline Authority, 2017b

Figure 3.7.9-6 North Dakota Natural Gas Pipelines



Source: North Dakota Pipeline Authority, 2018b

The June 2018 edition of the NDPA's *The Pipeline Publication* estimated the percentage of oil currently being transported using different modes of transportation from the well heads at Williston Basin:

- Rail – 21%
- Pipeline export – 71%
- Refined – 6%
- Truck to Canadian Pipelines – 2%

The mode of transport of crude oil is changing as production, transportation dynamics, and potential transportation constraints are understood.

3.7.9.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.9-7 summarizes the primary and secondary impacts a hazardous material release incident may have on a community.

Table 3.7.9-7 Hazardous Material Release Consequence Analysis

Hazardous Material Release Impacts	
Public	The impacts to people are often greater than the structural impacts as a result of a hazardous material incident. Hazardous material release can cause significant impacts on health, such as cancer, genetic mutations and birth defects, physical abnormalities, among others (EPA, Date Unknown). Depending on the material, the health impacts to humans can be long and short term. A hazardous material incident could have a greater impact on those areas with higher population concentrations such as cities, special needs facilities, and businesses. In a hazardous material release, those in the immediate isolation area would have little to no warning, whereas, the population further away in the dispersion path may have time to evacuate, depending on the weather conditions, material released, and public notification. Additionally, a release near a special needs facility may present unique evacuation challenges.
Responders	Hazardous material release can be impactful to responders if the release or event obstructs access to communities. Additionally, responders would be at risk responding to emergencies in communities (the level of risk would be dependent on the type of event), which would inhibit their ability to respond, particularly if they did not have the proper resources to address the hazardous material release event.
COOP	Continuity of operations would experience less impact than other community sectors but could still be affected if the event is severe. Continuity of operations could be more heavily impacted and limited if operations were directed towards evacuation and response. Additionally, employee absenteeism related to the event and/or fear of the event would impact the continuity of operations.
Delivery of Services	Delivery of services could be impacted locally, regionally, or statewide depending on the size and scale of a hazardous material release event. Transportation routes may be closed to reduce public exposure to dangerous chemicals, therefore limiting the ability for services to be delivered and preventing employees from getting to work. Businesses and places of commerce may close due to hazardous material release events in the vicinity of the workplace, which could lead to disruption of goods and services.
Property, Facilities, and Infrastructure	A hazardous material release event could severely impact properties, facilities, and infrastructure. The infrastructure containing or transporting the hazardous material, as well as those in close proximity, would be at high risk of damage. Furthermore, any delay in response may cause the event to exacerbate damage at facilities or spread to other facilities.
Environment	Significant losses can occur to the environment and other ecological values. Clean-up efforts may mitigate the effects, but some losses may occur. Sensitive habitats could be damaged or air and water quality reduced. Wildlife and vegetation can be killed or experience reproductive failure which can subsequently disrupt the health and viability of ecosystems (EPA, Date Unknown). In water habitats, wildlife health and populations can decline, which can also pose a threat to human consumption (NOAA, 2018). Chronic exposure to toxic elements is known as chronic toxicity and can impact both animals and humans (EPA, Date Unknown).

Hazardous Material Release Impacts	
Impact on State Economy	The state could incur costs due to clean-up. The party responsible for the hazardous material release is also responsible for proper remediation and removal. The NDDoH can assist on a case-by-case basis using state or federal assistance if the responsible party or local authority does not remove or remediate the site. Costs of clean-up can be high. For example, the Tioga to Black Slough pipeline release incident in Mountrail County was estimated to cost $16.9 million due to soil contamination remediation (Witt | O'Brien's, 2015). Additionally, hazardous material substances such as oil and natural gas could cost the state tax revenue. Losses in revenue could be millions of dollars depending on the type of hazardous material release event (Scheyder, 2013).
Public Confidence in the State's Governance	The public's confidence in the state's governance can be severely impacted by a hazardous material release event, particularly effected by timeliness and quality of clean-up. Confidence is also impacted by public concern over the incident, and what information is or is not available to the public. Delays may be caused by determining best methods to approach hazardous material release, which would further reduce the public's confidence in the state's governance.

3.7.9.5 State Risk Assessment

Probability

There is an average of 81 general environmental incidents per year and an average of approximately 138 (both contained and not contained) oilfield incidents per year in North Dakota. According to NDDES, collected spills data from EIR, NCR, and spills data shows an average of approximately 2289 spills per year (taken from 2013 to 2017 data totals), with consistent decreases in the number of spills per year between 2013 and 2017. North Dakota has also experienced an average of six incidents, less than one fatality, less than one injury and $2,778,259 in damage each year in pipeline incidents (USDOT, 2018a), but the number of incidents has increased in recent years, compared to the number of incidents prior to 2011. Major incidents requiring large scale evacuations and causing mass fatalities or injuries are possible as the historical record indicates. Considering also that North Dakota's Oil and Gas industry continues to grow, hazardous material release events are a likely possibility in the future.

Vulnerability Assessment

Cities within North Dakota with dense populations, especially along major travel routes and within zoned chemical manufacturing sites, are the most vulnerable to hazardous material release incidents. These incidents generally occur due to a transportation accident or an unintended release at a fixed storage facility. The health impacts on humans can be long or short term and can have the potential to cause injury and death depending on the type, amount, and environment in which the substance was released. Surface waters, such as rivers and reservoirs, and underground aquifers used as drinking water sources could each be threatened by releases from fixed facilities, pipelines, and transportation. A single incident that affects a regional water system could impact downstream counties and cities causing cascading impacts. Areas within the immediate isolation area would have little to no warning of an incident, whereas, populations farther away may have some time to evacuate or mitigate exposure.

As shown in Figure 3.7.9-2 there are 9,777 Tier II facilities throughout North Dakota. It is difficult to identify specific state assets at risk due to the variability of hazardous material release events. However, Tier II facility locations provide the best assessment of assets at risk. These facilities, and other facilities within a reasonable proximity, are vulnerable to the effects of a hazardous material release. Chemicals can be corrosive, toxic, and flammable. They may react with the environment and exposure to other chemicals, often explosively. Depending on type of material released, it could potentially limit access to the facility and affect the structural integrity of the facility to the point that it requires demolition.

North Dakota has roughly 2,486 miles of oil transmission lines and over 5,100 miles of hazardous liquid lines (Pipeline and Hazardous Materials Safety Administration, 2018c). These pipelines provide the necessary infrastructure to transport natural gas and other materials to processing facilities within and surrounding North Dakota. Disruption of these pipelines and the potential hazardous material release into the environment and congested urban areas would pose a considerable interruption of operations and the services provided.

Every vehicle and rail car carrying hazardous materials is at risk for an accident that could release the materials on board. North Dakota produced Bakken crude oil is a highly flammable material that poses a considerable risk not only to the environment but also the general public if a release, and subsequent explosion, were to occur. The vehicles could also be used for malicious activity by their drivers or by hijackers.

State Assets and/or Critical Facilities at Risk

Since hazardous material releases can occur virtually anywhere, all state-owned buildings and property are at risk. Fortunately, unless an explosion is present with the release, structures surrounding the incident location are typically not damaged in a hazardous materials release. However, if a state-owned building becomes contaminated from a hazmat release, the building may be uninhabitable for some time. Therefore, the risk to state-owned buildings and property is low; however, those facilities in close proximity to a fixed facility containing hazardous materials, an interstate, a pipeline, or a railroad are at an enhanced risk. Much of the vulnerability depends on specifically where a release occurs in proximity to the critical facilities and infrastructure. Should a hazardous material release affect one of the critical facilities, the level of emergency services available to a community could be reduced, including emergency medical services and firefighting.

It is difficult to determine specific state assets at risk due to the variability of hazardous material release events, and subsequently presents a challenge in estimating costs. Section 2.2.3 details the number and value of state-owned buildings and properties by county, which can be compared to the location of hazardous material storage and transportation locations in the state.

Loss Estimates

Sufficient data is not available at this time to make estimates of potential losses by jurisdiction for all types of hazardous material release incidents. However, the following assumptions have been made that begin the process of estimating these actual losses:

- Most hazmat events are localized and affect only the immediate area.
- Most events are small in nature and are quickly contained and cleaned.
- Fixed sites can be identified through the federal reporting requirements and some historical event data is available by jurisdiction.
- Maps for highways, railroads and pipelines are available thereby designating the jurisdictions at risk to these specific hazards.
- Most hazmat events involve an immediate response and an expedited cleanup with relatively fixed costs. Depending on the size and location of a release, the associated costs can range from a few thousand dollars to hundreds of thousands of dollars.
- Losses could include limited loss of life, injuries and sickness for the general population and for the first responders.
- Losses could include the financial costs for response and cleanup.
- There could be significant loss of reputation or confidence in associated organizations.
- There could be short-term impacts to the local economy due to a major event.

3.7.9.6 Future Conditions

Successful mitigation of hazardous material releases requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future hazardous material release risk.

Climate Change

Although hazardous material releases are largely human-caused, climate change indirectly impacts this hazard. The effects of climate change on other natural hazards, such as wildfire and flood, may increase the frequency of hazardous material releases. Climate change is contributing to more frequent high intensity wildfires in North Dakota, and fixed facilities that store hazardous materials or hazardous wastes are vulnerable to this increase in fires. Additionally, precipitation and high intensity storms are increasing in North Dakota, which contribute to flooding. Floods can cause hazardous material releases, particularly at fixed facilities. Extreme temperatures have the potential to freeze pipes that carry hazardous materials, resulting in spills.

It is unknown how future conditions will impact the extent/intensity and duration of hazardous material events.

Changes in Development

Structures located near fixed facilities, highways, and other high traffic roadways are most at risk to a hazmat event. Any development that takes place in these areas will place more people and structures in the risk area for hazmat events; however, currently most hazardous material spills are associated with the oil and natural gas growth industry.

The western part of the state continues to experience drastic new infrastructure development to accommodate the gas and natural gas industry. The oil and natural gas industry is already huge and will only continue to develop and grow in North Dakota. As stated before, North Dakota is the second-largest oil producing state in the United States. Due to the increased price of petroleum and efficiency in the drilling process, North Dakota is expected to continue to produce large amounts of oil and gas.

The industry has made progress in developing infrastructure to transport the oil and gas pumped from the ground. Since 2010, $987 million in road needs have been funded, and $230 million in capital facilities related to the growth in the oil and gas industry. With this development, it increases the number of people and facilities exposed to hazardous material releases. These industries are regulated for air and water emissions, but unless local ordinances prohibit or regulate such development, the potential for hazardous material releases could increase through future development.

Additionally, the top four oil producing counties are all projected to see significant population growth through 2030. McKenzie County is projected to experience a 269% change in population from 2010 to 2030, Williams County a 165% change, Mountrail County a 103% change, and Dunn County an 88% change. Ward, Burleigh, Stark, Grand Forks, and Morton have also experienced an increase in population in the last year (United States Census Bureau, 2017). A larger population will expose more people in the event of a hazardous material release. However, despite these instances, the state's population is on a decreasing trend year-to-year (United States Census Bureau, 2017).

With the persistent use of chemicals in society combined with an increase in oil and gas production in North Dakota, hazardous materials will continue to be present throughout the state, especially with new changes in development. State assets and critical facilities will continue to be at risk, but the risk will remain low unless development of a fixed facility containing hazardous materials, an interstate, a pipeline, or a railroad occurs close to a state asset or critical facility, or a new building is constructed near these higher risk areas.

3.7.9.7 Jurisdictions at Risk

Fifty-seven of fifty-eight local and tribal HMPs profile hazardous material release. Of those local HMPs that ranked hazardous material release, 13 ranked hazardous material release has a high-risk hazard, 33 categorized hazardous material release as moderate risk hazard, and 9 categorized hazardous material release as low risk hazard. Figure 3.7.9-7 presents a summary of those plans and also identifies how they ranked the overall risk presented by a hazardous material release.

Figure 3.7.9-7 Local Hazard Mitigation Plan Hazardous Material Release Ranking

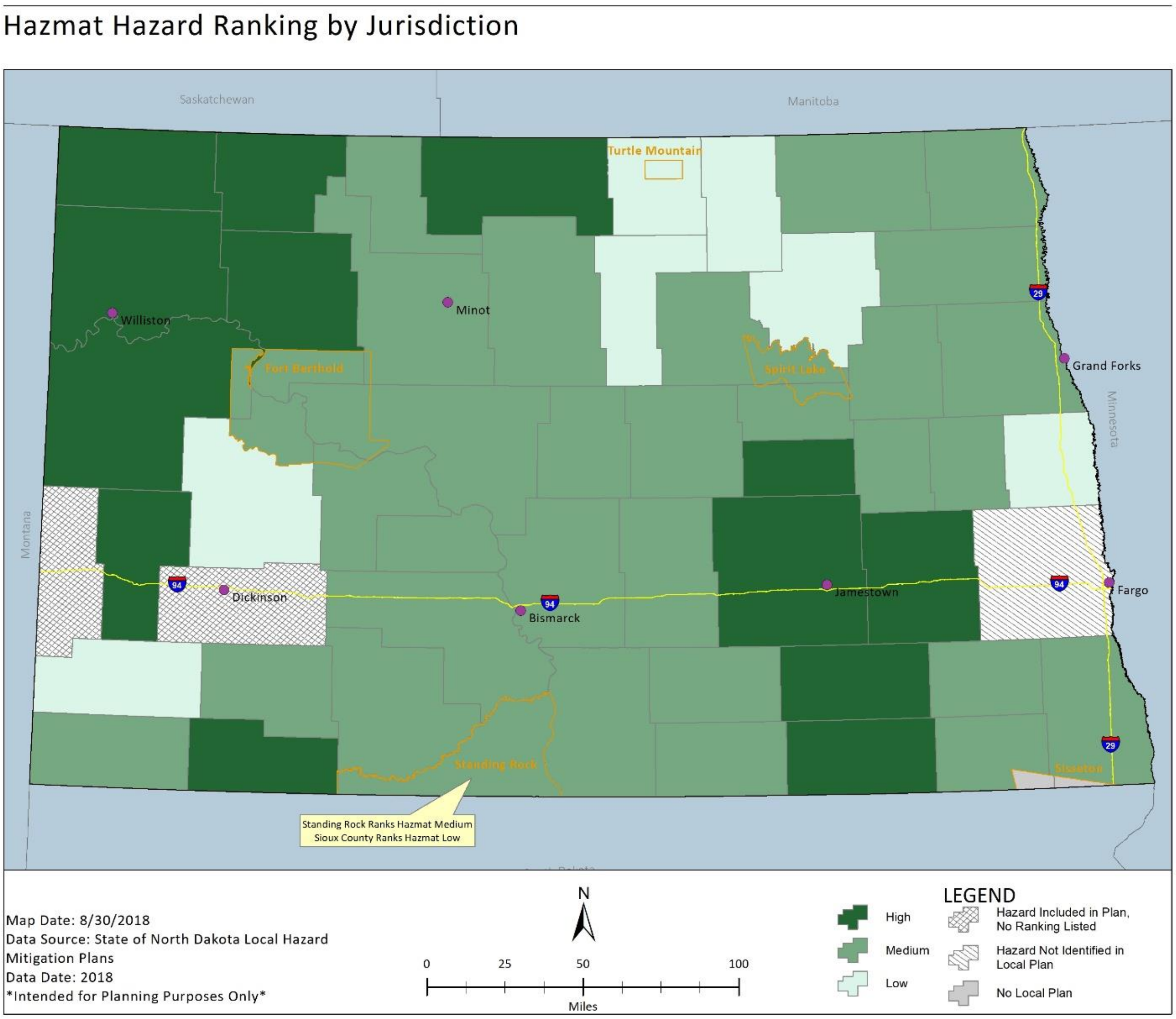


Table 7.4.7-3 in Appendix 7.4.7 includes a compilation of available loss information, when available, as documented in these local HMPs. The hazard ranking results for the City of Bismarck could not be shown in the figure above due to map scale but are included in this table. The overall trend in losses identified for hazardous materials relate to populations within the area affected by incident, damage to property particularly Tier II and Tier III facilities, contamination of water, and loss of agriculture.

3.7.9.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including hazardous material release, to create an overall risk factor score. Following this methodology, the hazardous material release risk factor score was 2.4, which is a moderately ranked hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Hazardous materials are constantly present in North Dakota, and with a growing oil and gas industry, they will be persistent in the future. Hazardous material releases can cause public health and safety concerns such as explosions and exposure to harmful chemicals. It has a high impact on the public due to health concerns, and even the potential of airborne risks.

Additionally, a hazardous material release can contaminate the surrounding environment, requiring costly clean-up efforts. This not only severely impacts the environment, but it also impacts North Dakota's state economy. Property, infrastructure, and facilities are also at high risk depending on the proximity to the hazardous release event, and whether these structures contain or transport hazardous material. Hazardous material release is a moderate risk event due to localized nature. However, these events occur with no warning, and clean-up, removal, and remediation can endure for long periods of time. The need to reduce the risk to hazardous material releases is becoming more apparent as North Dakota's oil and gas industry, as well as event probability, grows. Currently, the chance of an event happening in a given year is "possible," (between 1% and 49%).

Local, state and federal laws heavily regulate the hazardous materials industry. Many laws directly relate to required mitigation measures. The Hazardous Materials Committee identified a need for ongoing training related to regulations and safety precautions. Members expressed concern about compressed training during times of staffing shortages and high production demands. Committee members recommended promoting technology designed to detect issues with pipelines. They also urged promotion of preventive replacement practice -- retiring equipment by the end of its life cycle to avoid potential and costly malfunctions.

NDDES has commissioned a hazardous materials flow study that, once complete, will provide insights into volume and nature of hazardous materials movement into, out of, and within North Dakota. Both NDDES and the State Emergency Response Commission (SERC) have been working to ensure local responders have the right tools, training, and information to respond, protect the public, and have processes in place to address mitigation and/or clean-up operations. The information gained from the study can and will likely be used by first responders to determine capabilities (equipment and training) and to work mutual aid agreements for worst case scenarios. Data from the study will also help local leaders with land and traffic planning, zoning and mitigation plans.

3.7.9.9 Data Limitations / References

Understanding when, where, and what substances are mostly likely to be released in a hazardous materials incident is the greatest limitation in analyzing this hazard. Hazardous substances pass through North Dakota daily without incident. With so many possibilities and sources for hazardous materials releases in the state, fully describing how a release may occur and what areas would be affected is not possible. A study of the number and types of hazardous materials using the highways and railroads in the state would improve this profile, as would GIS mapping of the pipelines traversing the state. Similarly, data collection on the transportation-related incidents would improve this profile. The various hazardous materials response teams in North Dakota, the state fire marshal, and the local fire departments could provide more details on specific types of materials and probable scenarios.

This profile utilized resources from other key documents such as the North Dakota State Emergency Operations Plan, Hazardous Materials Annex, and North Dakota Crude Oil Preparedness Report. Additionally, important data and statistics were provided by North Dakota Department of Agriculture (NDDOA), NDDoH, NDDES Division of Homeland Security, NDPA, and the federal PHSMA.

3.7.10 Infectious Diseases and Pest Infestations

3.7.10.1 Description

For the purposes of this plan, infectious diseases include human, animal, and plant diseases and infestations. Diseases affect humans, animals, and plants continuously. Each species has its own natural immune system to ward off most diseases. The causes and significance of diseases vary. Of consequence in the emergency management realm are infectious diseases and pests with the potential for high infection rates in humans or those which might necessitate the destruction of livestock or livestock products, or crops. Such diseases and infestations can directly or indirectly impact human populations and the economy.

Disease transmission may occur naturally or intentionally, as in the case of bioterrorism, and infect populations rapidly with little notice. New diseases regularly emerge or mutate. Known diseases, such as influenza, can be particularly severe in any given season. Pests have the potential to effect crops, health, food supplies, and vegetation. Furthermore, our increasingly global society results in a continual movement of people and products capable of disseminating diseases rapidly.

Other disasters, such as those resulting in the loss or contamination of water supplies, may result in an increased probability of disease. In fact, following most major disasters, disease is a primary concern due to the lack of sanitation. More specifically, long-term power outages can lead to household food contamination, and flooded properties often develop mold or mildew toxins. Standing water frequently contains hazardous bacteria and chemicals.

Some infectious disease agents relative to North Dakota are listed below and described further in this plan.

Human

- Influenza
- Emerging or Foreign Diseases
- Foodborne illness

Animal

- Tuberculosis
- Foreign Animal Diseases
- Anthrax
- Chronic Wasting Disease (CWD)

Plant

- Karnal bunt disease of wheat
- Black stem rust (race ug99)
- Emerald ash borer
- Large scale grasshopper outbreak
- Pale and/or golden potato cyst nematodes (PCN)
- Khapra beetle
- Cyanobacteria

> ***Community Coffee Comments***
>
> The 2012-2013 outbreak of tuberculosis required a community-wide public health and human services response in Grand Forks County to mobilize resources to mitigate the spread and impacts of the potentially lethal infection. The infection originated among homeless individuals and spread among approximately 30 individuals. Children were placed into the foster care system while their ill parents recovered. However, due to the risk of exposure, not all children could be placed in foster homes. Instead, some were temporarily housed in area hotels and apartments and provided caregivers for to ensure their wellbeing.

3.7.10.2 Previous Occurrences

Human Disease

Fortunately, North Dakota has not experienced any devastating human disease outbreaks within its population in recent years. Following World War I, the Spanish influenza pandemic of 1918 killed 20-40 million people worldwide, including 675,000 Americans (Billings, 1997). In North Dakota, about 2,700 people died and around 6,000 people were infected. Schools, churches, and businesses were closed for a time, and public gatherings were banned. Before that, in 1837, a smallpox epidemic virtually annihilated the village of Mandan Native Americans near Fort Clark. (State Historical Society of North Dakota, 2007)

Measures can be taken to protect high-risk populations such as limiting visits at hospitals and long-term care facilities.

In recent years there have been numerous emerging and foreign diseases that have impacted the United States, either directly or indirectly. Examples of recent emerging diseases and outbreaks include, but are not limited to:

- The Ebola hemorrhagic fever outbreaks in Africa and the outbreak in 2014-2015;
- Zika virus in South, Central and North America starting in 2016;
- Measles outbreaks in several states among pockets of unvaccinated people;
- Emerging coronaviruses causing severe respiratory infections including severe acute respiratory syndrome (SARS) in 2003 and middle east respiratory syndrome (MERS) in 2012, while no cases of SARS have been reported since 2004, MERS transmission continues;
- The current hepatitis A outbreaks occurring among the homeless in several states in the United States;
- The emergence of West Nile virus in the United States in 1999 and in North Dakota in 2003;
- The increasing emergence of antibiotic resistant bacteria in the world, including the United States;
- Increasing numbers of nation-wide outbreaks caused by foodborne pathogens with and an ever-expanding variety of food vehicles and other products that are associated with these outbreaks; and
- The emergence of fungal infections associated with steroid injections or other health care.

In addition to these emerging diseases, there is also a concern regarding the expansion of disease vectors such as mosquitoes and ticks. Among these concerns are:

- Identifying the Asian longhorn tick in several eastern states in 2018, which can spread several diseases that can infect people and animals, including livestock;
- The continuing expansion in the United States, including North Dakota, of the range of the deer tick, which can transmit Lyme disease and anaplasmosis; and
- The expansion of the Asian tiger mosquito which can transmit yellow fever, dengue fever, Chikungunya fever and Usutu virus to people.

Community Coffee Comments

Public and private health care workers in Rolla expressed concern about the rapid spread of diseases. Access to patients becomes difficult for home care professionals when severe winter weather impedes travel. They also worry about continuity of care for patients who may be relocated during a disaster and are in need of medical equipment and medication.

Emerging and foreign diseases require public health departments to remain diligent in disease surveillance activities and prepared for the detection and to the response to these diseases. Efforts to educate health care providers about the emergence and threat of diseases as they are detected must be maintained. Providing technical assistance regarding clinical presentation, laboratory diagnosis and patient management is also a key element to the detection of and response to these emerging threats. Increasing capacity to conduct vector surveillance will be beneficial in more rapidly identifying disease transmission potential.

In 1900, nearly all the leading causes of deaths were infectious; now only pneumonia and influenza remain among the top 10 causes of death. The NDDoH tracks the number of deaths due to pneumonia and influenza beginning each influenza year in September. Table 3.7.10-1 shows the number of influenza cases by influenza season from 2013 to May 5, 2018. Additionally, Table 3.7.10-2 provides the number of deaths due to influenza and pneumonia by influenza season from 2013 to June 29, 2018.

Table 3.7.10-1 Influenza Cases by Influenza Season, 2013-2014 through 2017-2018

Season	Reported Cases	Predominant Strain
2013-2014	2,923	2009 A H1N1
2014-2015	6,443	A H3N2

Season	Reported Cases	Predominant Strain
2015-2016	1,942	2009 A H1N1
2016-2017	7,507	A H3N2
2017-2018*	8,498	A H3N2
Total	**27,298**	

*As of 5/19/2018

Source: NDDoH, 2018

Table 3.7.10-2 Deaths Due to Influenza and Pneumonia by Influenza Season, 2013-2014 through 2017-2018

Season	Pneumonia & Influenza Deaths
2013-2014	483
2014-2015	526
2015-2016	377
2016-2017	483
2017-2018*	467

*As of 6/29/2018

Source: NDDoH, 2018a

Foodborne illness occurs frequently, and infections can be very serious. Table 3.7.10-3 provides the number of cases of salmonella, Shigella, Campylobacter, and Shiga-toxin positive E. coli per 100,000 people from 2005 to 2016.

Table 3.7.10-3 Salmonella, Shigella, Campylobacter, and Shiga-toxin positive E. coli per 100,000 population, 2005-2016

Year	Rate	Year	Rate
2005	32.7	**2011**	31.7
2006	61.7	**2012**	28.0
2007	34.9	**2013**	38.4
2008	37.8	**2014**	35.1
2009	34.2	**2015**	51.3
2010	27.1	**2016**	48.4

Source: NDDoH, 2016; Note: Other significant causes of foodborne illness not included here do occur and are monitored by NDDoH.

Animal Disease

In 2005, a cow from North Dakota tested positive for tuberculosis initiating an extensive investigation and testing to ensure the disease had not spread (North Dakota State Board of Animal Health, 2010). As of November 2017, two herds in North Dakota (one dairy, one beef) are operating under herd plans due to finding tuberculosis (TB) positive animals in the herds. Positive animals have been removed and assurance testing will continue for five years (through 2019) following the last positive case (NDDoH, 2018). In June 2017, bovine TB was identified in Harding County, South Dakota. As a result, the North Dakota Board of Animal Health (BOAH) investigated 57 movements into and out of the affected herds in the last five years, representing 817 cattle. Consequently, over 1,600 cattle were tested, with 47 of those requiring follow-up testing, and 237 being either necropsied or restricted to slaughter under enhanced inspection.

The state typically records a few anthrax cases every year, but in 2005, the disease killed more than 500 head of cattle, bison, horses, sheep, llamas, and farmed deer and elk. The disease occurs most frequently following extreme weather conditions, either flooding or drought, and has been diagnosed in almost every county in the state.

Intentional introduction and unintentional importation of a foreign animal disease are a constant threat to North Dakota animal agriculture with devastating local, state and national economic impacts. One case of bovine spongiform encephalopathy (BSE) in a dairy cow imported into the United States in 2003 was estimated to have resulted in United States beef industry losses due to export restrictions from $3.2 billion to $4.7 billion in 2004 alone.

CWD is a fatal prion disease that affects all cervids, a member of the Cervinae family, such as deer. Once present, it is impossible to remove CWD from the environment because it does not have a known cure. North Dakota's wild deer, elk, and moose populations are particularly at risk of contracting CWD. North Dakota's Deer Hunting Unit 3F2 first discovered CWD in 2009. CWD has not been shown to transfer out of the Cervid family. However, the CDC recommends not to eat the meat of any known animal with a prion disease.

Cyanobacteria, otherwise known as blue-green algae, is important to the aquatic ecosystem because it provides food and oxygen to plants and wildlife (NDDoH, 2018c). However, cyanobacteria can be harmful when it grows at a rate that is detrimental to the health of humans, animals, and the local ecology. According to the Centers for Disease Control and Prevention, this occurs when freshwater bodies become warm, still, and contain high amounts of nutrients, which is typically during the summer months in North Dakota. As cyanobacteria proliferates, higher levels of toxins are released into the local ecosystem. Humans, livestock, and pets are at risk through direct contact or ingestion of affected water, or inhalation of the toxins. The expedient growth of cyanobacteria can also deprive aquatic fish and plants of sunlight, as well as oxygen when the algae decomposes, causing a loss of wildlife. In North Dakota, blue-green algae are frequently a concern during the summer. One of the most recent cases occurred in June 2017 and caused the death of several livestock (Fundingsland, 2017).

Plant Disease

The USDA has designated North Dakota as a disaster area multiple times since 2012 due to damages caused by infectious diseases:

- In 2012, a USDA Disaster Declaration, S3467, was granted on January 9, 2012, for 37 counties in North Dakota related to combined effects of frosts and freezes, flooding, severe thunderstorms, hail, high winds, drought, and weather-related insect and disease damage.
- In 2013, a USDA Disaster Declaration, S3522, was granted on May 8, 2013, for Adams, Bowman, Emmons, and Sioux counties for combined effects of drought, high wind, fire, excessive heat, and insects.
- On December 13, 2013, a USDA Disaster Declaration, S3620, was granted for 47 counties for combined effects of spring snowstorms, significant rainfall, unseasonably cool spring, frosts and freeze damage, flooding, ground saturation, severe thunderstorms, hail damage, high winds, weather-related insects and diseases, and mid-summer drought conditions.
- On January 1, 2015, a USDA Disaster Declaration, S3959, was granted for 25 counties for combined effects of excessive heat, excessive rain, frost, excessive snow, drought, hail, flooding, high winds, lightning, weather-related insects, and diseases.
- On July 27, 2016, a USDA Disaster Declaration, S4000, was granted for Adams and Bowman counties for combined effects of drought, high wind, fire, excessive heat, and insects.
- On September 14, 2016, a USDA Disaster Declaration, S4035, was granted for Bowman, Golden Valley, and Slope counties for combined effects of drought, high wind, fire, excessive heat, and insects.

Invasive plant species can also play a role in the health of an ecosystem. The EPA defines an invasive species as "a species whose presence in the environment causes economic or environmental harm or harm to human health," (Environmental Protection Agency, 2018). They do so by changing ecosystem functions and reducing biodiversity by competing with or killing off other species (Aquatic Nuisance Species Taskforce, 2018). Not only does this worsen environmental health, but invasive species also have subsequent impacts on economic functions as well as human health, including a reduction in agricultural production, decreased water availability and property value, disease, and the pollution of water and soil (Aquatic Nuisance Species Taskforce, 2018).

There are many foreign plant pest and disease outbreaks occurring across the world where active exclusion efforts are in place. International plant protection organizations are in communication and survey results are shared in an effort to prevent or slow the spread of harmful plant pest introductions. As free trade and commerce increases, and increased pathway vigilance is needed. Federal and state import regulations provide a critical line of defense against unwanted pests. Previous occurrences or monitoring of pests or diseases that would trigger either emergency quarantines, or an emergency action response include but are not limited to these pests and diseases:

Karnal bunt disease of wheat: Karnal bunt (*Tilletia indicat*) is a fungal disease of wheat, durum wheat, and triticale which are crops extremely important to North Dakota. The fungus invades the kernels, leaving behind waste products with a disagreeable odor and that makes bunted kernels too unpalatable for use in flour and processing.

The disease occurs in many parts of the world. Grain from these countries is prohibited entry into the United States. It was first discovered in the United States in 1996 in Arizona. Since then, it has also been found in California, New Mexico, and Texas. Quarantines were imposed at these locations and expensive (but successful) eradication and regulatory programs have been conducted with only small quarantine areas in Arizona remaining. A few quarantines have since been lifted, but the USDA continues to monitor the disease throughout wheat producing areas of the United States. In North Dakota, Animal and Plant Health Inspection Service (APHIS) annually provides funds and cooperates with the NDDOA to operate a Karnal bunt detection survey. The Karnal bunt survey began in 1994. The survey samples grain at elevators across the entire state using methods and procedures officially recognized by international plant protection organizations. Karnal bunt has not been detected in North Dakota and is not known to occur in our state.

Black stem rust race Ug99: Black stem rust race Ug99 is another important disease of wheat. Although black stem rust is endemic to the United States, the race Ug99 does not occur and current wheat varieties available in the United States are not resistant to this race. Introduction of this race to North America would cause large scale economic loss, disrupt exports, and cause quarantine restrictions. Barberry is the alternate host of this fungal disease. Barberry was the target of an eradication effort in the 1930’s to reduce the chance of natural mutations of the disease into more virulent races such as Ug99. Controlling naturally occurring mutations would preserve the currently released wheat varieties resistant to the disease. The movement of the disease is subject to intense monitoring worldwide and wheat breeders are very busy building new varieties that are resistant. But the breeding efforts are ongoing and take time. More time is needed to be prepared for the arrival of Ug99.

Emerald Ash Borer: Emerald Ash Borer (EAB) is a wood-boring beetle causing wide spread impact to North American ash tree forest resources but is not known to occur yet in North Dakota. Unfortunately, green ash trees typical of North Dakota forests are susceptible to the insect. Green ash is North Dakota’s most dominant tree and extremely important forest resource. In North Dakota cities, a greater than 40% on average of boulevard trees are ash, and some are as high as 80% ash. Detection trapping has occurred in our state annually since 2008. All results have been negative. As of 2018, the closest known EAB infestations are in Sioux Falls, SD, Minneapolis, MN and Winnipeg, Manitoba Canada.

Large scale grasshopper outbreak: Large scale outbreaks have occurred in North Dakota and the American west many times in history. Federal, State, and private land managers rely on plant protection and quarantine (PPQ) and NDSU to provide current survey data so they can determine if control practices that minimize grasshopper outbreaks are warranted. Millions of acres of North Dakota rangeland have been treated to suppress grasshopper outbreaks. PPQ conducts grasshopper density counts annually in our state’s rangeland areas to identify economic populations, provide technical support to land owners and managers, predict where future problems may occur, and provides cost share and contracting for aerial applicators when cooperative control programs are developed between private, State, and Federal partners. Annual rangeland grasshopper forecast maps are published. Current maps and fact sheets can be found online at United States APHIS’ website (USDA APHIS, n.d.). Cropland surveys are conducted by the NDSU Integrated Pest Management (IPM) Program. Results of the IPM grasshopper and other surveys can be reviewed online at NDSU IPM’s website (NDSU, n.d.). Additionally, surveys are used to publish the Crop and Pest Report (CPR) found at online at NDUS CPR’s website (NDSU, n.d.-b).

Pale and/or Golden potato cyst nematodes (PCN): A national survey was initiated after the 2006 discovery of pale cysts in Idaho. Golden cyst nematode occurs in a few quarantined areas of New York state. To date they have not been found in any other state. A successful eradication and management program was established in Idaho. The program’s goals include stopping the spread, delimiting the infested area, and preserving and restoring lost export markets. Early detection of PCN is critical to minimizing impacts to the export market and agricultural production as well as maintaining product quality, and management/eradication costs. In North Dakota, the PCN Survey is dependent upon cooperation between USDA APHIS PPQ, the North Dakota State Seed Department, the North Dakota Department of Agriculture, and participating growers. In North Dakota, systematic soil sampling is conducted to determine the presence or absence of regulated PCN throughout the state's potato growing region. The primary potato production area is in the Red River Valley which is a very fertile region of the state bordering Minnesota. Procedures used are those described in the United States/Canada agreement for the survey. Following these guidelines officially demonstrates the state's negative pest status, ensuring results will be recognized by Canada, facilitating the movement of seed potatoes across the United States border. North Dakota has participated in the National PCN Survey annually since 2006. PCN sampling to date has been negative and the pest is not known to occur in our state. North Dakota has consistently been the number one exporter of seed potatoes to Canada.

Khapra Beetle: The khapra beetle (*Trogoderma granarium*) is one of the world's most destructive pests of stored grain products and seeds. Its feeding damage often spoils 30% of the product; up to 70% damage has been reported. Previous United States detections of this tiny beetle have required massive, long-term and costly control and eradication efforts. Established infestations are difficult to control because the beetle can survive without food for long periods, requires little moisture, hides in tiny cracks and crevices, and is relatively resistant to many insecticides and fumigants. All the grain crops grown in North Dakota could be damaged by khapra beetle infestation. International trade of commodities has increased the threat of accidental introduction of this pest. Additionally, travelers should comply with United States Customs and Border Protection inspections when traveling internationally. Rice from India and other countries where the Khapra beetle exists is prohibited from entering the United States. The USDA has designated 31 countries as having endemic khapra beetle and are considered as high risk for introduction. Since 2014, the NDDoA conducts annual detection surveys across the state. To date, khapra beetle is not known to occur in our state.

3.7.10.3 Location and Extent

Infectious diseases, whether human, animal, or plant, are not governed by geographic boundaries. However, those jurisdictions with the highest human and livestock populations and crop exposure are at greatest risk from infectious diseases. Table 3.7.10-4 provides an overview of the extent to which resources could be impacted by infectious disease and pest infestation.

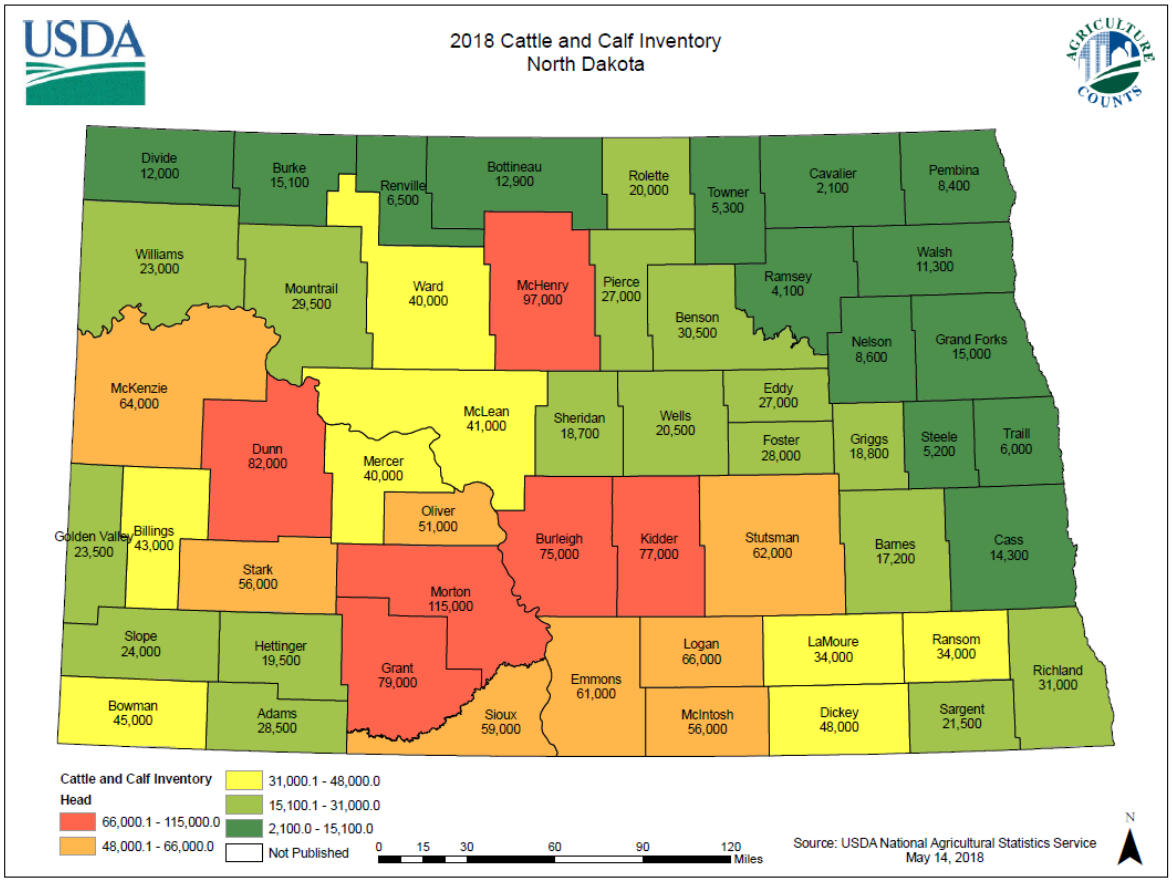
Table 3.7.10-4 Spatial Extent of Impact from Infectious Diseases

Resources	Extent of Impacts
People	Statewide
Property	n/a
Infrastructure	n/a
Government Operations	Statewide
Environment / Natural Resources	Statewide
Cultural Resources	n/a

The magnitude of an infectious disease outbreak varies from every day disease occurrences to widespread infection. During the 1918 influenza pandemic, infection rates approached 28% in the United States (Billings, 1997). Other pandemics produced infection rates as high as 35% of the total population (World Health Organization, 2010). Such a pandemic affecting North Dakota represents a severe magnitude event. A highly contagious, incapacitating disease that enters the North Dakota population has the potential to overwhelm local and state health resources. The magnitude of an infectious disease outbreak is related to the ability of the public health and medical communities to stop the spread of the disease. For example, local health jurisdictions have specific pandemic influenza response plans, and mass prophylaxis plans, but most jurisdictions have only a few staff members.

Section 2 provides additional details regarding those counties with highest populations as well as highest market values of crops and livestock. The USDA National Agricultural Statistics Service map below depicts the 2018 cattle and calf inventory by county (Figure 3.7.10-1).

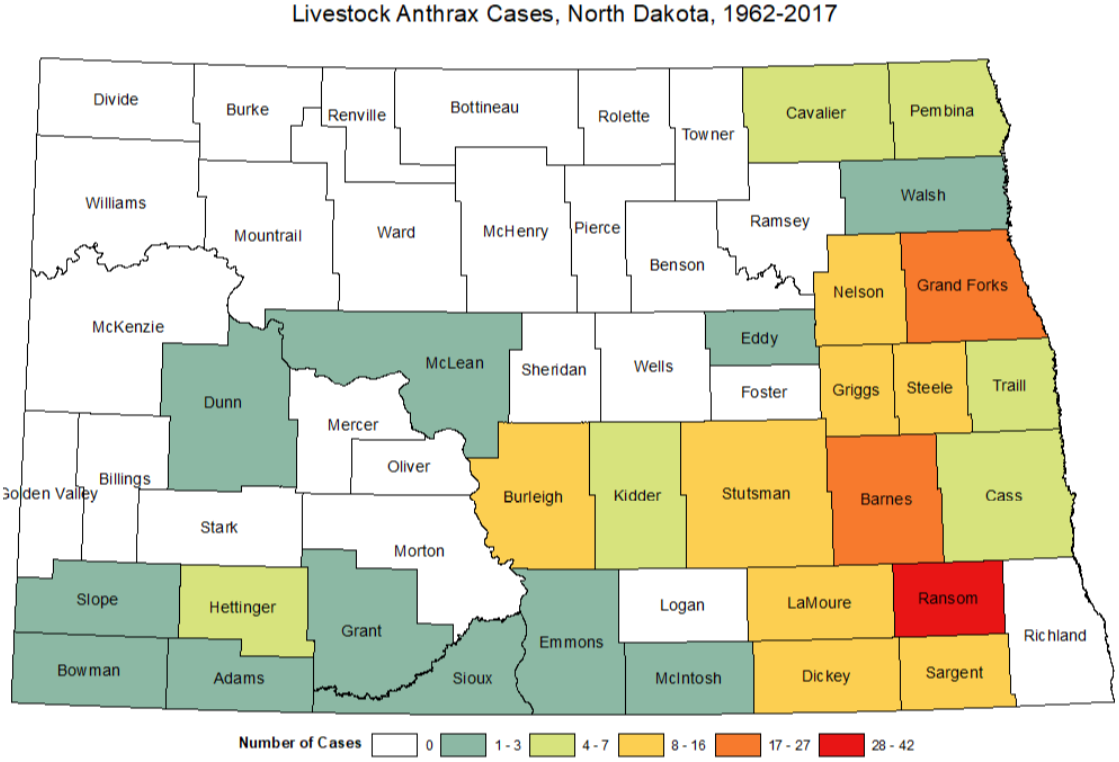
Figure 3.7.10-1 2018 Cattle and Calf Inventory North Dakota



Source: USDA National Agricultural Statistics Service, 2018

Additionally, based on previous occurrences of anthrax cases from 1962 to 2017, eastern counties and the southwest corner of the state have experienced more cases of anthrax than the rest of the state (Figure 3.7.10-2). In 2018, anthrax reports occurred predominantly in northeast, southeast, and southcentral North Dakota.

Figure 3.7.10-2 Livestock Anthrax Cases, 1962-2017



Source: NDDOA and North Dakota BOAH, 2017

3.7.10.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.10-5 outlines the impacts to individual sectors due to an infectious disease or plant pest event.

Table 3.7.10-5 Infectious Disease Consequence Analysis

Infectious Disease Impacts	
Public	Infectious diseases that affect plant and agricultural production could impact farmer suicide rates that already rank highest compared to other professions (Knutson, 2018). Human epidemics may lead to quarantines, large-scale use of the medical care system, and mass fatalities. Typically, the elderly, young children, and those with suppressed immune systems are at greatest risk from infectious diseases.
Responders	Responders would be impacted due to limited resources and staffing should the magnitude of the event increase, particularly since responders and other health care officials could be exposed to the infectious diseases early on. Additionally, social distancing measures and illness may cause further reductions in staff, making it difficult to continue with emergency response procedures.
COOP	The continuity of operations could be heavily impacted should the spread of disease limit personnel availability due to illness or social distancing measures. The lack of staff and the infectious disease event could also have subsequent impacts on the mental health of government staff. Additionally, there is a need for financial support for diagnostic labs and robust surveillance purposes which could further strain government operations. The spatial extent of a rapidly spreading infectious disease could quickly impact government operations statewide.

Infectious Disease Impacts	
Delivery of Services	Infectious diseases would greatly impact the delivery of services, particularly in health care. The capacity of the health care system is limited. For example, local health jurisdictions have specific pandemic influenza response plans, and mass prophylaxis plans, but most jurisdictions have only a few staff members. Many local health jurisdictions would need to rely on volunteers, pre-scripted messages and procedures, and the cooperation of the public to respond effectively to a large-scale pandemic. Similarly, hospitals in North Dakota have emergency response and pandemic influenza plans, but little excess capacity exists to care for and/or isolate hundreds, even thousands of patients. Absenteeism could also impact the delivery of services.
Property, Facilities, and Infrastructure	There is little to no impact on physical property and infrastructure. However, infectious disease could highly impact critical facilities. Disease spread that impacts staff availability, also due to social distancing measures, could affect the maintenance of facilities and infrastructure. Moreover, due to the lack of personnel, facilities could experience shutdowns of 30 days or more. Workers who become ill, need to care for loved ones, or are fearful of contracting the disease may not show up for work. The impact to critical industries and services could be severe.
Environment	Infectious diseases and pests would severely impact the natural environment, particularly plant and animal species. Diseases could kill certain animal and plant species, disrupting the local ecosystem. Secondary impacts on other species could occur, especially those that interact with or depend on the infected species. For example, a spread of the emerald ash borer could cause green ash and other trees of the genus Fraxinus to be eliminated from native plant communities and urban forests across North Dakota. Wildlife species that are dependent on healthy forests would be indirectly impacted. Additionally, should a disease be especially severe for a species, that species could be eradicated from the state resulting in ecologic imbalances.
State Economy	The impacts of an infectious disease on the state economy could be high. North Dakota's prominent agricultural sector could be greatly impacted by infectious diseases and pests, which would in turn affect the agricultural economy. Additionally, because disease spread could cause limitations in personnel due to social distancing measures. Closure of day cares or schools would have a serious impact on the economy as parents might not be able to find child care elsewhere. An outbreak would most certainly limit travel and impact the service and tourism industries. The trickle-down economic impacts to nearly all industries could be overwhelming. Workers who become ill, need to care for loved ones, or are fearful of contracting the disease may not show up for work. The impact to critical industries and services could be severe. Examples of industries and services that could be significantly impacted in North Dakota include health care, education, utility services, and emergency response. Animal diseases extending nationally would have an overarching effect on the national economy. More directly, though, North Dakota's economy relies heavily on the agricultural industry. With an animal disease, over 2 million head of livestock could be affected along with countless wild animals. An infectious livestock or crop disease would negatively affect the agricultural economy and could also limit food supplies. The cost of tree removal to homeowners, urban parks, and hazard trees in other areas of North Dakota is estimated to be in the tens of millions of dollars. Trade restrictions incurred by other states and counties would cause major impacts on the state economy.
Public Confidence in the State's Governance	The public's confidence in the state's governance could be at risk if regular and factual information is not disseminated to the public as well as agricultural producers. Additionally, if absenteeism impacts government operations and delivery of services, the public's confidence could be further reduced.

3.7.10.1 State Risk Assessment

Human Disease

Probability

Quantifying the probability of a human disease affecting North Dakota presents challenges due to a limited history of outbreaks. Medical and public health advances over the past fifty years prevent many disease outbreaks, yet the potential still remains. Much of the state is in a rural setting and therefore is somewhat isolated from the rapid spread of global diseases. However, international and domestic travel is so common that, like the Spanish influenza pandemic of 1918, North Dakotans would most likely be affected at some point. The urban areas and universities could see rapid spread of such diseases through their populations. Four human influenza pandemics have occurred over the past 100 years with one, the 1918 pandemic, severely affecting the United States.

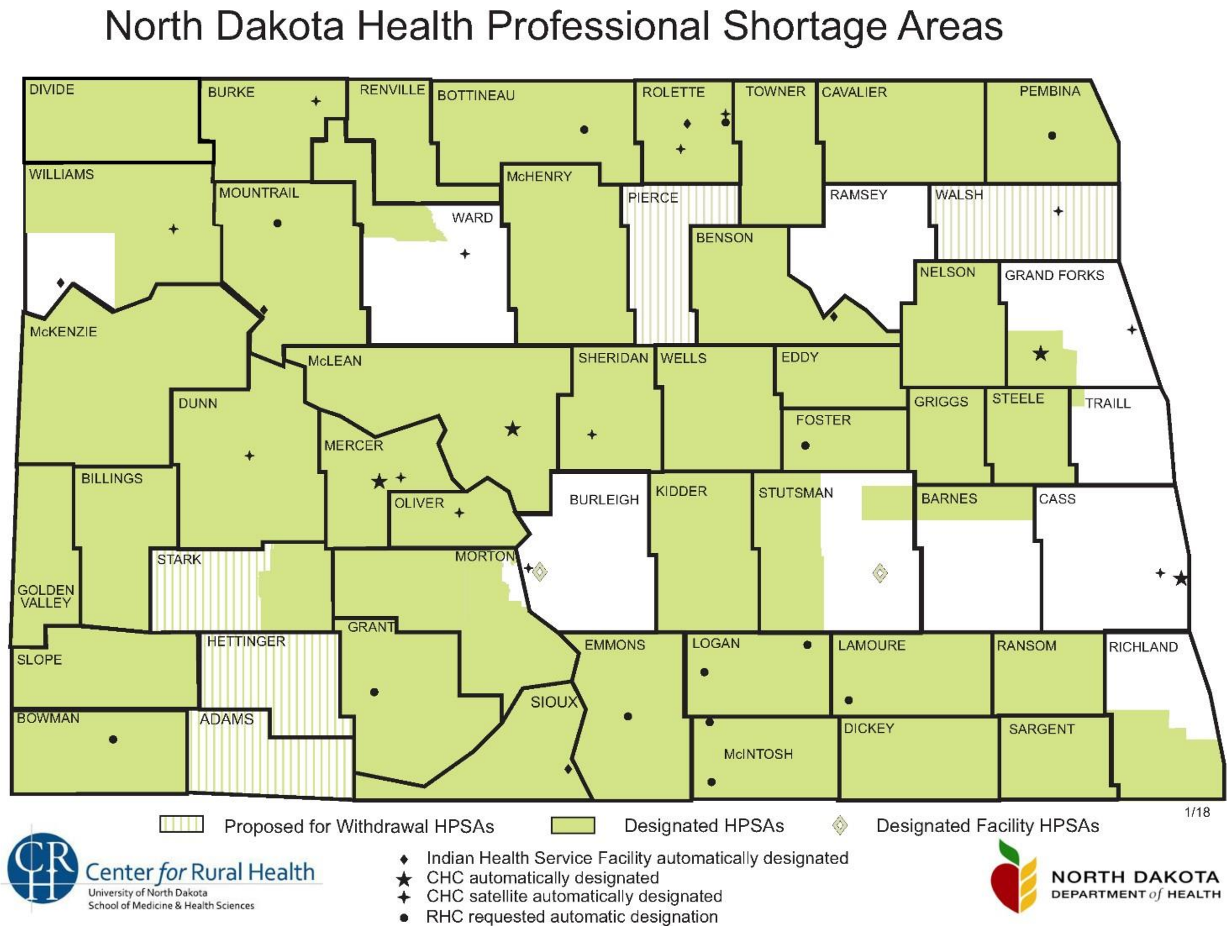
Many of the diseases that have the potential to result in serious outbreaks, such as diphtheria, measles, influenza and polio, are preventable through routine vaccination. Vaccination rates have been rising slowly since 2007. Although higher than United States rates for this indicator, the coverage rate is below the target of 90%, as designated by the CDC.

Vulnerability Assessment

The entire state is vulnerable to a major disease outbreak. As evidenced by annual infectious disease reports and reports of investigations completed by the NDDoH, many counties experience one or multiple disease outbreaks each year. The percentage of uninsured North Dakotans for 2016 was 7% compared to 8.6% nationally according to the U.S. Census Bureau (U.S. Census Bureau, 2017). Potential casualty losses are anticipated to be greatest in counties with higher populations, higher pediatric populations, and higher elderly populations. Table 7.4.8-1 in Appendix 7.4.8 provides data from the 2016 American Community Survey from the U.S. Census Bureau regarding total populations, populations under age 5, and over age 65. McIntosh County has the highest percent of its population under five years old or over 65 years old, at 37%, followed by Griggs County with 35%. Many counties have at least 20% of their population under five or older than 65 years. Cass County has the largest overall population under five or over 65 years, with 29,867 people. Burleigh County follows, with 19,289 people.

Health professional shortage areas and rural areas are more susceptible to having limited medical capabilities, and by extension, are more susceptible to the possibility of being overwhelmed because of a large surge of patients seeking care. Much of the state is a designated health professional shortage area. Figure 3.7.10-3 below shows the health professional shortage areas in North Dakota. McIntosh and Griggs Counties are designated health professional shortage areas and also have the highest populations under age five and over age 65. The lack of health professionals available for these vulnerable populations presents a risk to people receiving adequate and timely health care in these counties.

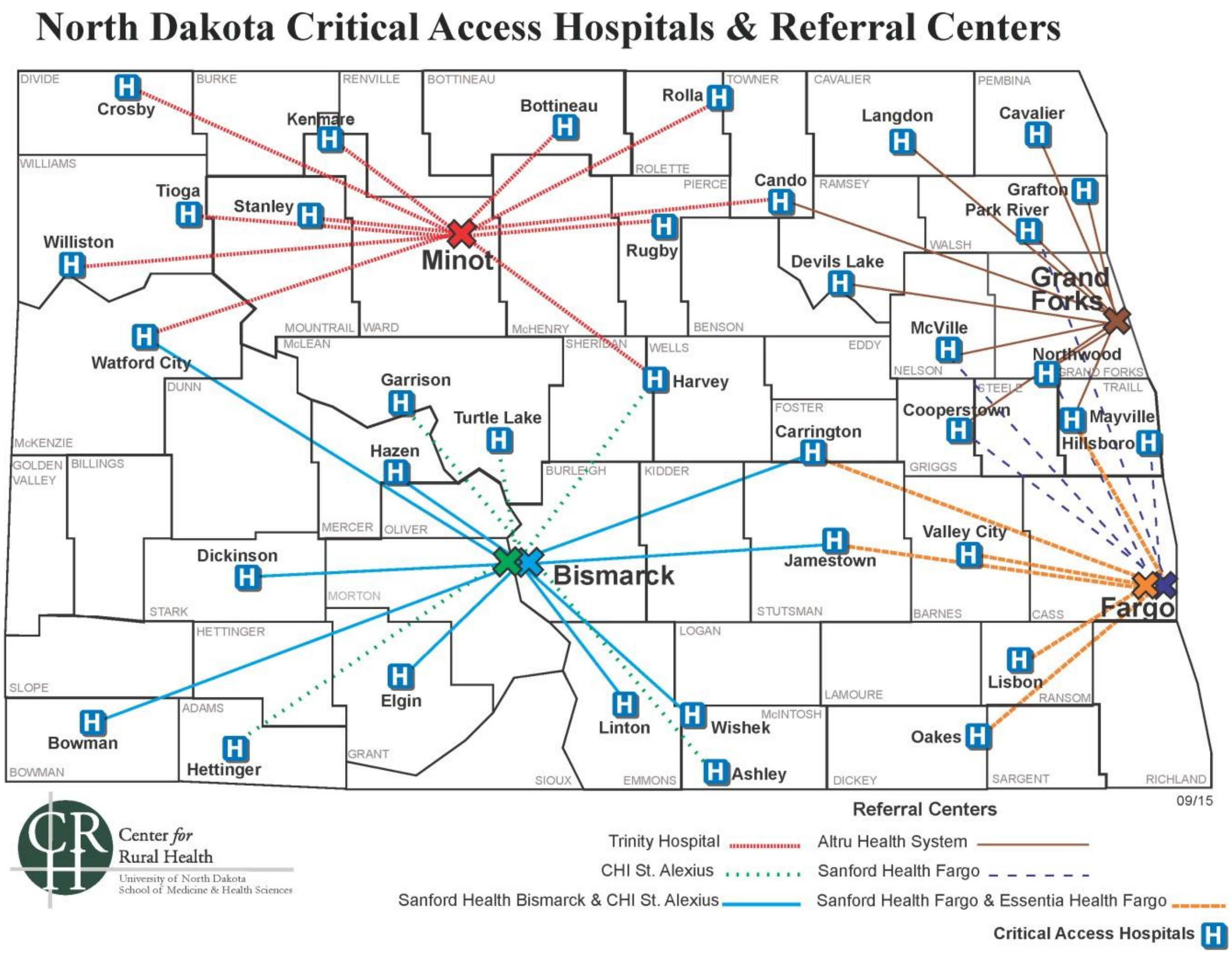
Figure 3.7.10-3 North Dakota Health Professional Shortage Areas



Source: Center for Rural Health, University of North Dakota School of Medicine and Health Sciences, 2018

Populations in outlying rural areas are often served by larger metropolitan areas with respect to medical care needs. Figure 3.7.10-4 below shows the location of Critical Access Hospitals (25 beds or less) and their referring hospitals. The small rural health care system is highly dependent on the referral of patients to major medical centers for many types of health problems. Many small local hospitals have limited staffing and resources available.

Figure 3.7.10-4 North Dakota Critical Access Hospitals and Referral Centers



Source: NDDoH, 2018

Overall, as of 2016, an estimated 41% of North Dakota's population live in a city under 5,000 people in population, a census designated place (CDP), or a rural (non-CDP and unincorporated) community. Twenty percent live in a rural (non-CDP and unincorporated) community (North Dakota Association of Counties). Additionally, all counties with over 30% of their population under five or over 65 years of age have less than 5,000 people as of 2016 (U.S. Census Bureau 2016 American Community Survey [ACS]), who are more vulnerable to infectious disease. Since North Dakota contains many rural communities with a high percentage of their population under 5 or over 65, much of North Dakota is vulnerable to an infectious disease.

Additionally, the NDDoH created a summary matrix of the impacts of different infectious disease outbreaks. Several categories of infectious disease are high frequency with moderate outbreak severity or moderate frequency with moderate outbreak severity; these pose the greatest risk over the next 5 years. High severity disease such as bioterrorism and pandemics are unlikely to happen over the next five years but pose greater long-term risk. The full matrix is shown in Table 7.4.8-2 in Appendix 7.4.8.

State Assets and/or Critical Facilities at Risk

Structurally, state assets and critical facilities are largely not at risk to infectious disease in North Dakota. The contamination of a state-owned building or critical facility could render the facility unusable until it is decontaminated, or the threat has passed. Should a building become contaminated by a human disease agent, significant cleanup costs and the loss of use of the building could result. For example, the cleanup of anthrax in several congressional offices on Capitol Hill in September and October of 2001 cost the Environmental Protection Agency about $27 million (United States General Accounting Office [GAO], 2003).

All state-owned buildings and human-occupied critical facilities are assumed to be at risk of contamination from a communicable disease. If facilities supporting emergency response lost their functionality because of contamination, delays in emergency services could result. Additionally, with a significant human disease outbreak, resources such as the ambulance services, hospitals, and medical clinics could quickly become overwhelmed. In most cases, critical infrastructure would not be affected by communicable disease. Scenarios that would affect infrastructure include the contamination of the water supplies and diseases that require special provisions in the treatment of wastewater. Should an epidemic necessitate quarantine or incapacitate a significant portion of the population, support of and physical repairs to infrastructure may be delayed, and services may be disrupted for a time due to limitations in getting affected employees to work.

Loss Estimates

There is no data currently available on the economic impact of previous influenza pandemic illness in North Dakota. Using pandemic influenza as the worst-case scenario for estimating potential losses, the NDDoH's Pandemic Influenza Planning has developed the following vulnerability estimate: It has been estimated that a medium-level pandemic, using the CDC scenario estimates of a 30% attack rate, a 0.8% hospitalization rate among the ill, and a 0.2% mortality rate among the ill, based on the 2015 estimated population in North Dakota:

- 227,078 persons would become ill and may require outpatient care
- 6,055 persons may require hospitalization
- 1,514 individuals may die

Animal Disease and Plant Disease

Probability

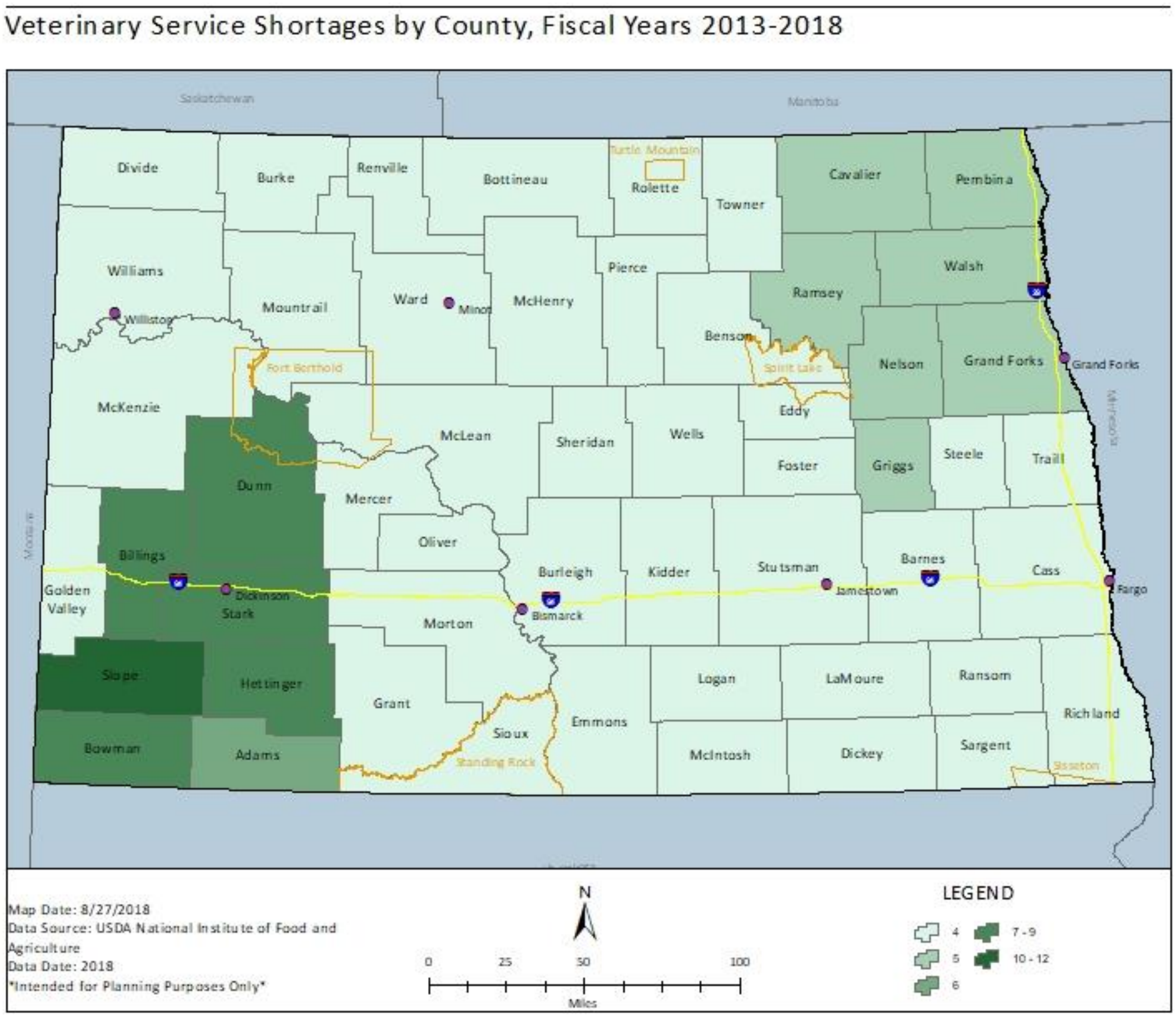
Based on North Dakota's previous occurrences of animal and plant disease, as well as pest infestation, it is highly likely that the state will experience an infectious disease event within a given year.

Vulnerability Assessment

According to the 2012 Census of Agriculture, North Dakota had 30,961 farms that cover 39.2 million acres, with the market value of agricultural products sold at $10.9 billion. Additionally, should a disease be especially severe for a particular wildlife species, that species could be eradicated from the state resulting in ecologic imbalances. Detection of certain plant diseases, such as Karnal bunt disease of wheat, potato cyst nematodes, and black stem rust race Ug99, could result in quarantine of exports from the state, which could be detrimental to the agricultural economy. The eastern portion of the state has the highest market value of agricultural products, but the entire state relies on agriculture as part of the economy.

USDA National Institute of Food and Agriculture (NIFA) annually identifies veterinary services shortage areas in North Dakota and continues to generate a priority shortage listing of "Critical" for food animal and rural general practitioners across multiple counties, and public practice veterinarians across the state. Veterinary medical professionals with chronic critical shortage listings include microbiologists and pathologists, as well as swine, beef cattle and small ruminant private practitioners. These positions are considered essential for surveillance capability, response capacity, and effective control of infectious diseases. Figure 3.7.10-5 below shows the number of all shortage area listings instances for fiscal years 2013 through 2018. The greatest concentration of shortages (Type 1 through Type 3) are in the southwestern part of North Dakota, followed by the northeastern part of the state with the second highest concentration.

Figure 3.7.10-5 Veterinary Service Shortages by County, Fiscal Years 2013-2018



State Assets and/or Critical Facilities at Risk

State assets and critical facilities are not structurally vulnerable to animal and plant disease outbreaks in North Dakota. However, the state's workforce and wildlife resources are vulnerable to these diseases, and a disease occurrence could potentially devastate not only the wildlife population, but also the hunting and tourism industries that depend upon wildlife.

Loss Estimates

From 2003 to 2017, plant disease and mycotoxin caused a total of about $175 million (or $12.4 million annually) in insured crop damages in North Dakota, including losses in every county (Risk Management Agency, 2018). Ward County has experienced the most losses, with $13,166,410, followed by Cavalier County with $11,987,673, and Grand Forks County with $11,229,116. In 2015, two of North Dakota's turkey farms were impacted by the Highly Pathogenic Asian Avian Influenza A (HPAI), forcing approximately 100,000 turkeys to be euthanized (Entis, 2015). In April 2015, it was noted that approximately $300,000 of federal spending authority would be used to address the outbreak (Roos, 2015). A widespread infectious animal or plant disease could have detrimental impacts across the state, causing the quarantine of imports or exports of agricultural goods.

3.7.10.2 Future Conditions

Successful mitigation of infectious diseases and infestation requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future infectious disease risk.

Climate Change

The following Table 3.7.10-6 presents the best available data relating to climate changes impacts to infectious disease in North Dakota. The important summary of these changes is that the state should expect an increased risk to infectious disease in the future.

Table 3.7.10-6 Expected Changes to Infectious Disease Future Condition

Impact	Projected Change
Location	Climate change will influence vector-borne disease prevalence, but the direction of the effects (increased or decreased incidence) will be location and disease specific. Animal and plant diseases may spread to more northern regions as average temperatures increase.
Extent/Intensity	Intensity of human disease is projected to increase. Disadvantaged populations are expected to bear a greater burden from climate change because of their current reduced access to medical care and limited resources for adaptation strategies. Extent of certain human diseases is expected to increase. Additionally, the extent of animal and plant diseases are projected to increase with climate change. Climate change may increase the prevalence of parasites and diseases that affect livestock and crops (i.e., the earlier onset of spring and warmer winters could allow some parasites and pathogens to survive more easily).
Frequency	Additional research is needed to determine the effects of climate change on the frequency of infectious disease.
Duration	Additional research is needed to determine the effects of climate change on the duration of human disease. Under warmer winter temperatures, some existing agricultural pests can persist year-round.

Changes in Development

Changes in development will have considerable impacts on plant or animal disease. Agriculture will continue to play an important role in North Dakota's economy in the future, so the industry remains vulnerable to these diseases. Agricultural worker, veterinary services and animal industry workforce shortages are influenced by development in competing sectors, as are land management practices and land usage patterns. Infrastructure additions reduce available land for animal and arable agricultural practices and increase pressure on wildlife, pollinators, and ecosystems.

Changes in development will also affect to the rate of human disease spread in North Dakota. Higher populations will expose more people to diseases and higher population densities may lead to faster transmission of a disease. As detailed in Section 2.2.2, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Cass County is projected to have the largest population by 2030, with 214,719 people, followed by Burleigh County with 110,932 people.

Age also impacts vulnerability to human disease. With many diseases, the oldest and youngest members of society tend to be the most vulnerable. From 2010 to 2030, the statewide population over 65 years old is projected to increase by 56%. Additionally, the population under 10 years old is projected to increase by 64% from 2010 to 2030. More people in these age groups can increase the vulnerability to human disease statewide.

3.7.10.3 Jurisdictions at Risk

Fifty-five of fifty-eight local and tribal HMPs profile infectious disease. Figure 3.7.10-6 presents a summary of those plans and identifies how local jurisdictions ranked the overall risk presented by infectious disease. Six jurisdictions ranked infectious disease as a high hazard, 26 as medium, and 22 as low. One plan did not rank the hazard. Three plans did not identify infectious disease as a hazard. This ranks infectious disease as the number 7 out of 14 hazards, according to North Dakota local HMPs. Counties ranking infectious disease as high are primarily located in the southern portion of the state. Cass County, which has the highest population in the state and high market value of agricultural products, did not include infectious disease as a hazard in their local HMP.

Figure 3.7.10-6 Local Hazard Mitigation Plan Infectious Disease Rankings

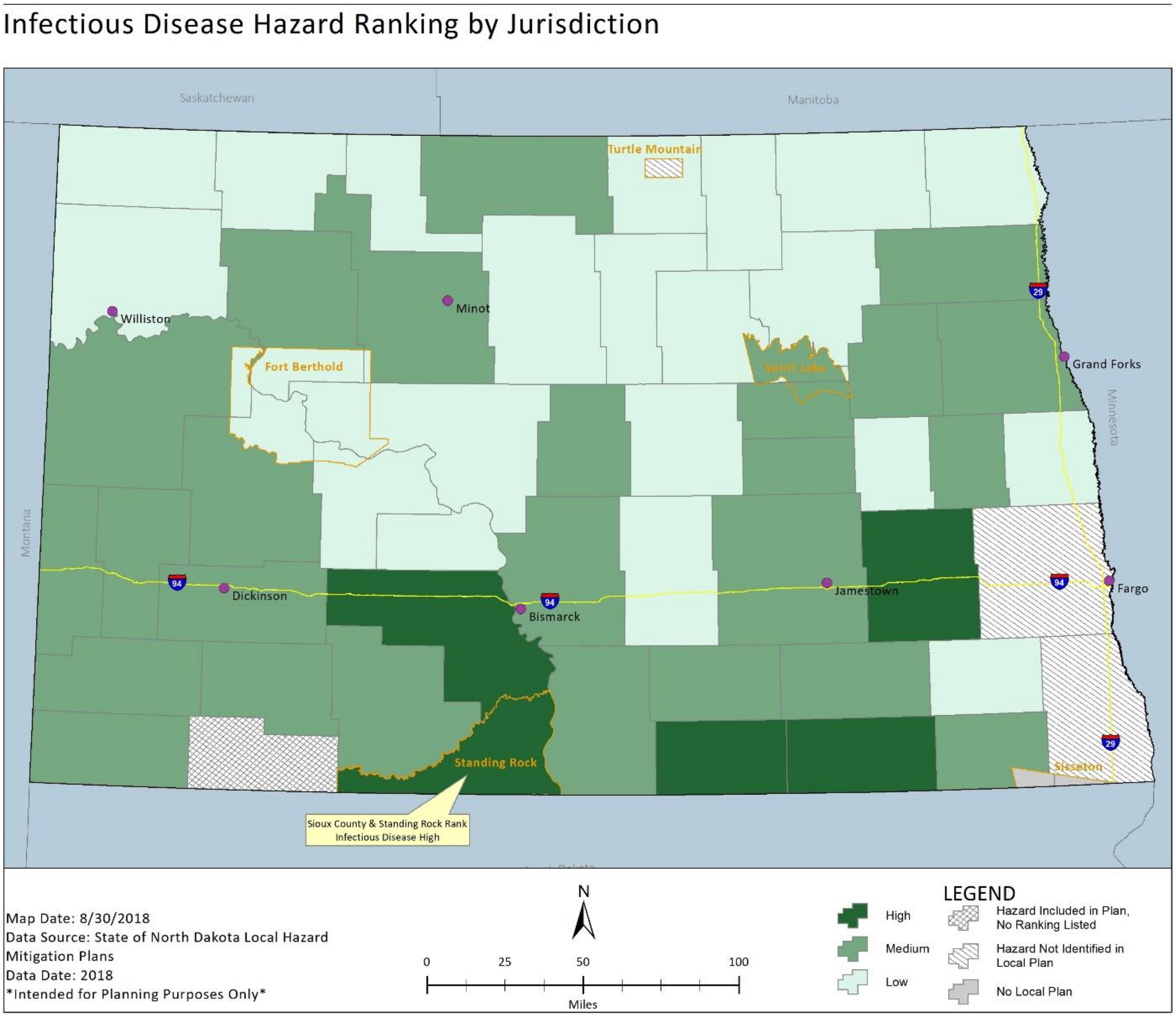


Table 7.4.8-3 in Appendix 7.4.8 includes a compilation of available hazard ranking and loss information, when available, for infectious disease as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. The overall trend in losses identified for infectious diseases relates to vulnerable populations, overwhelmed medical resources, and losses in agriculture.

3.7.10.4 Summary and Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including infectious disease and pest infestations, to create an overall Risk Factor score. Following this methodology, the infectious disease and pest infestation risk factor score was 2.9, which is a moderately ranked hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Infectious diseases have the greatest impact on the natural environment (including wildlife), public health, and the state economy through decreased agricultural production. There are high costs associated with addressing an infectious disease and pest infestation event, particularly with agricultural production and wildlife resources highlighted in the Loss Estimates sections above. Vulnerable populations, particularly those under the age of 5 and over the age of 65, are most at risk of contracting an infectious disease. Based on North Dakota’s previous occurrences of infectious diseases and pests, it is highly likely (greater than 90% probability in a given year) that the state will experience a future infectious disease or pest infestation event.

Infectious diseases can be particularly impactful due to their little warning time, and long duration. However, implementing emergency procedures can prohibit the spread of one of these events. Typically, the spatial extent of an infectious disease outbreak is local or regional (between 1% and 10.9% of area), depending on the severity and type of disease or pest. Furthermore, the State of North Dakota should expect to see an increase in infectious disease and pest infestations with the onset of climate change and changes in development.

In summary, an infectious disease or pest infestation could have major impacts in North Dakota including overwhelming medical centers, deaths, and economic damage to the agriculture industry. As described in the 2017 THIRA, in the event of a human pandemic, there are a lot of moving pieces to reduce the impact. Planning and ensuring North Dakota has the necessary capabilities to respond to an event is an integral part of reducing the impact. The Infectious Diseases and Pest Infestations Hazard Committee members identified several key measures to mitigate the impacts of infectious diseases and pest infestation. These measures include emphasizing public information and education, vaccinations, preventive treatment, therapeutic treatment, supportive therapy, behavioral changes, and enforcement.

3.7.10.5 Data Limitations and References

Diseases are spread in a variety of ways, and without emergency action plans which include accurate, up-to-date descriptions of resources, as well as current response capabilities, the analysis of potential loss estimates suffers. If these documents were available, combined with specific disease transmission modes and infection rates, a more accurate estimate of potential losses could be derived. Additional analysis could provide specific information on the number of ill that could be treated at any one time or any one location using existing supplies and personnel resources.

Other key documents related to infectious diseases and pest infestations include the NDDoH Pandemic Influenza Plan, Public Health & Medical All-Hazards Plan, Specific Disease Agent Plans, the North Dakota Department of Agriculture Foreign Animal Disease Plan, and the North Dakota State Emergency Operations Plan, Animal Health, Infectious Diseases and Plant Health Annexes. Information, data, and other resources were obtained from the following state agencies and organizations: NDDOA, NDDoH, North Dakota Stockmen's Association, NDGFD, and North Dakota University Extension Service. Additional information and data were obtained from the Unite States APHIS.

3.7.11 Severe Summer Weather

3.7.11.1 Description

For the purposes of this plan, severe summer weather includes downbursts, extreme heat, hail, high wind, lightning, tornadoes, high wind, and extreme heat. Downbursts, hail, lightning, and tornadoes are typically associated with a severe thunderstorm. It is also important to note that severe summer weather can create secondary hazards. Lightning in thunderstorms may spark wildfires. When coupled with strong winds, these fires can quickly spread. Slow-moving thunderstorms often trigger flash floods due to the extended duration of the heavy rainfall. The heavy rain, hail, strong winds, and tornadoes in summer storms may become problematic for ground and air travelers. Such conditions can cause accidents and could even possibly lead to a hazardous material release. Should winds be strong enough, they can take down power and communication infrastructure and lead to long-term outages. Severe thunderstorms associated with the passage of a strong cold front may usher in cooler temperatures and relieve extreme heat and drought conditions.

Downbursts

Strong winds can form along the leading edge of a thunderstorm. Downburst winds occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A derecho, or bow echo, is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds more than 100 mph.

Extreme Heat

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities.

Hail

Hail is frozen precipitation that forms and falls from cumulonimbus clouds. Hail occurs when strong rising currents of air within a storm, called updrafts, carry water droplets to a height where freezing occurs. The ice particles grow, finally becoming too heavy to be supported by the updraft and fall to the ground. Hailstones are usually round but can also be conical or irregular in shape. Hail size ranges from pea size to the size of grapefruit, and large hailstones can fall at speeds faster than 100 mph. Hail can fall in swaths that range from a few acres to an area ten miles wide and one hundred miles long (National Severe Storms Laboratory, 2007), however most hail events, only affect relatively small areas.

High Wind

High wind events occur separately from tornadoes and severe thunderstorms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems are, (one high pressure, one low pressure) the stronger the pressure gradient, and therefore, the stronger the winds are.

Lightning

Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000°F and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder (National Weather Service, 2007).

Tornado

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Most tornadoes develop from supercell thunderstorms. Supercell thunderstorms have a persistent rotating updraft and can form when there is sufficient vertical wind shear in the atmosphere. A funnel cloud is a rotating column of air extending out of a cloud base, but not yet touching the ground. Once a funnel cloud reaches the ground, it becomes a tornado. Tornadoes are capable of creating tremendous damage over a small area.

3.7.11.2 Previous Occurrences

From 1950 through May 2018, North Dakota experienced 15,967 reported severe summer weather events (including thunderstorm wind, hail, lightning, tornadoes, extreme heat, and high wind). Extreme climate events are identified as those that are in the "outermost ten percent in that place's history," (National Centers for Environmental Information, n.d.-a). Severe weather is defined as "a destructive storm or weather," (NCEI, n.d.-b). Severe summer weather in North Dakota resulted in an estimated $994 million in property damage, $387 million in crop damage, 30 deaths, and 466 injuries (National Centers for Environmental Information, 2018). In some instances, summer weather events in this database may be listed more than once if they occurred over several regions. The total number of distinct summer weather events is about 3,305, however, the distinction between events was not reported prior to 1995. This equates to about 150 events per year since 1995 (National Centers for Environmental Information, 2018). It should also be noted that since official records can only indicate events that have been reported to the National Weather Service, events are often underreported in rural area and areas lacking trained spotters. The North Dakota Atmospheric Resources Board (ARB) also collects hail data, both severe and non-severe, from an established spotter network. Appendix 7.4.9 includes a synopsis of all significant historical occurrences, while this profile describes notable events that have occurred since 2010.

Community Coffee Comments

Severe summer weather has left indelible memories on Community Coffee participants. One woman recounted the story of how she laid in a ditch, her arms around her children, as a tornado approached. Her children kept asking, "Is it over yet, Mom?"

Another resident remembered storm rescue efforts at a neighboring farm that required breaking windows to reach the trapped family.

Downbursts

Severe winds associated with thunderstorms are not uncommon during the summer months in North Dakota. Between 1955 and 2018, NCEI recorded 4,648 thunderstorm wind events. The highest wind speed recorded among these events was 124 knots, or 142.6 mph. This event occurred on September 15, 1997, in Slope County (NCEI, 2018). The 4,648 thunderstorm wind events resulted in an estimated $256,652,200 in property damage, $4 million in average annualized property damage, $187,678,000 in crop damage, $3 million in average annualized crop damage, 3 deaths, and 62 injuries. The deaths and injuries occurred because of flying debris, collapsed structures, and to those in tractor trailers, vehicles, mobile homes, a camper, an apartment construction site, tents, and an aircraft. According to data from the Risk Management Agency (RMA), crop insurance payments for downbursts (hot wind) losses to North Dakota insured crops totaled $9,155,039 between 2003 and 2017 (Risk Management Agency 2003-2017).

Notable previous downburst occurrences are described below.

- On March 24, 2010, numerous severe thunderstorm and tornado warnings were issued from late in the afternoon until later in the evening. Several reports of hail, multiple reports of severe thunderstorm winds, and several reports of funnel clouds and tornadoes were received during this event. The number of confirmed tornadoes was two. A large fertilizer building north of New Salem sustained heavy damage from extreme straight-line winds associated with a severe thunderstorm. Visual inspection of the damage conducted during a storm survey indicates estimated winds of 95 mph. Much of the damage was to the roof of the building, in which much of the metal roof was peeled back and blown off to the north. Preliminary damage was estimated over one million dollars to the building and loss of fertilizer.

- On July 10, 2011, multiple severe thunderstorm warning and several tornado warnings were issued in southwest North Dakota. Damage assessments found widespread incidences of mature hardwood trees being snapped or uprooted along a 45-mile-long, 4-mile-wide damage swath, along with thousands of acres of crop damage due to wind driven hail. Several communities along the damage path also had severe wind damage. Near Merricourt, damage was observed to a home and to several farm vehicles. In Monango, extensive tree damage was also observed, including a large hardwood tree with a diameter of 22 inches. A pole barn and two grain bins were destroyed two miles south of Fullerton, along with several large trees snapped or uprooted. Around Oakes, numerous buildings sustained heavy damage, along with the destruction of a 200-foot radio station tower. Damage across Dickey County was also extensive.
- On July 15, 2012, intense thunderstorm winds did extensive damage to a farmstead. Damage included a garage destroyed, several grain bins destroyed, a Quonset destroyed, damage to a home, and several trees uprooted.
- On August 6, 2013, a small-scale supercell thunderstorm increased in strength as it approached the city of Dickinson in Stark County and produced several microbursts from the west side of Dickinson, southeast across south central Stark County and into eastern Hettinger County. Winds up to 90 miles per hour were estimated from a storm survey conducted by the National Weather Service. The very high winds blew the roof off a storage unit and blew in doors. The debris from this building was blown to the southeast and resulted in additional damage to several other buildings and vehicles. The damage surveyed was consistent with straight line winds and not a tornado. Property damage estimated at $850,000.
- On July 21, 2014, severe thunderstorm winds of 65 to 105 miles per hour tore across Foster County causing extensive damage on many farms and in towns. Damage included grain bins destroyed, a grain elevator severely damaged, roofs torn off outbuildings, and damage to homes. Vehicle damage was also surveyed, including to a semi-tractor that was struck by a grain bin. Agricultural damage was severe and extensive.
- June 9, 2016, widespread damage occurred in the City of Lansford. A mobile home sustained substantial damage as the roof and part of the wall structure were removed. Permanent homes had roof damage and broken windows. The grain elevator sustained an estimated three to four million dollars in damage as the primary structure along with multiple grain bins, some containing grain, were damaged or destroyed. Tree damage was widespread and extensive, as many very large trees were uprooted or snapped. Winds throughout northwest into north central North Dakota were as high as 70 mph, with winds estimated as high as 100 mph around Lansford. The event at Lansford may have been a microburst, leading to the higher winds and more extensive damage. No injuries or deaths were reported.
- A July 20, 2017, thunderstorm caused substantial infrastructure damage to power infrastructure at exorbitant costs to member-owned RECs. Slope Electric experienced significant damage in Slope and Bowman counties where gusty winds snapped 13 three-phase power poles and 8 single phase poles, leaving several customers without power for five days. Producers and ranchers in Bowman, Dunn, and Slope counties, who were also impacted by the severe drought, reported destroyed farm buildings and equipment, including home damage, because of the storm. The thunderstorm toppled the transmission and service lines for RECs serving three counties and included the destruction of approximately three miles of transmission and distribution lines were knocked to the ground. Approximately 300 members in Dunn County and the Twin Buttes area of the neighboring Three Affiliated Tribes of the Fort Berthold Reservation were without power for an extended period as the rural electric cooperatives (REC) installed a temporary line. Wind speeds were measured up to 73 mph. A Presidential Disaster Declaration was requested by the state but denied.

Extreme Heat

The NCEI database recorded 55 extreme heat incidents in North Dakota between 1950 and 2018. However, the database showed only three unique events in that period, including events on July 16, 2011, and one on July 20, 2016. These events did not result in any human fatalities or injuries. The only recorded damage occurred during the July 16, 2011 event and were related to livestock losses. It is estimated that up to 700 head of cattle died from this heat wave. Estimated at near $1,000 per head, monetary damages are estimated near $700,000. A detailed breakdown by county was not available (NCEI, 2018). Crop insurance payments for extreme heat losses to North Dakota insured crops totaled $129,066,247 from 2003 through 2017 (RMA, 2003-2017).

Data from the NDDoH indicates that there have been 484 heat related illnesses from 2014 to May 2018.

Hail

Since 1955, 7,959 severe hail events were reported in North Dakota with an estimated $551,571,600 in property damage, $8,896,316 in average annualized property damage, $179,740,003 in crop damage, $2,899,032 in average annualized crop damage, 0 fatalities, and 32 injuries. Note that the number of severe hail events over the period does consider the 2010 switch from 0.75-inch diameter to 1-inch diameter severe criteria. Most of the injuries were experienced by golfers and hikers and those driving through storms that received broken windshields (National Centers for Environmental Information, 2018). Crop insurance payments for hail losses to North Dakota insured crops totaled $747,805,861 between 2003 and 2017 (Risk Management Agency, 2003-2017). The largest hail stone recorded in North Dakota was five inches in diameter recorded in Mercer Count (August 3, 1969) and Standing Rock Nation (July 14, 2010).

Note that weather modification, or cloud seeding, over the past 15 years may have reduced hail damage to crops in the western part of the state. Cloud seeding is a process by which glaciogenic agents are introduced to the atmosphere to enhance precipitation. This can reduce hail storms by increasing the amount of ice nuclei as well as the area over which the storm occurs (North American Weather Modification Council, n.d.). Studies in North Dakota have shown a 45% reduction in crop-hail damage (Sell and Leistritz, 1998). Counties currently participating in the cloud modification program include Bowman, Burke, McKenzie, Mountrail, Ward, Williams, and part of Slope (North Dakota State Water Commission, 2018).

Notable previous hail occurrences since 2010 are described below.

- A prolonged severe weather event on July 17, 2011 produced hail damage in several counties. Numerous reports of large hail and severe thunderstorm wind gusts were received, as well as three confirmed tornadoes. The large hail, estimated at 2.75 inches in diameter, caused damage to area crops. The hail also damaged windows, siding, and vehicles. Combined property and crop damage were estimated at $400,000.
- On June 20, 2013 a severe thunderstorm produced 2.75-inch hail over south central North Dakota. The large hail caused home, car, and tree damage in the city of Linton, and crop damage outside of town. An estimated $300,000 in property and crop damage.
- On September 3, 2014 severe storms developed over western North Dakota in the late afternoon as the cold front approached and progressed east into the evening. The storms moved into central North Dakota late in the evening into the early morning of September 4. Hail up to 2.75 inches was reported. There was very significant damage to buildings and automobiles including at a car dealership. Total property damage is estimated at $2 million, and crop damage estimated at $250,000.
- On June 17, 2016 a severe thunderstorm struck northern portions of the city of Bismarck around 4:30 AM CDT. Large hail combined with strong wind gusts to cause substantial damage. The largest hail with a diameter of 3.25 inches fell near Legacy High School. Winds of 75 mph combined with large hail to cause a swath of substantial damage from along Divide Avenue in north Bismarck to approximately five miles north of the city of Bismarck. Siding, roofs, and windows were damaged on homes. Multiple car dealerships sustained hail damage, which included the largest dealership in the city. Property damage were estimated at $50 million, and crop damage at $250,000.
- On July 10, 2016 a slow-moving supercell resulted in an extended period of very large hail and damaging wind gusts in and around the city of Killdeer. Hail up to 3.25 inches in diameter completely covered the ground in many locations. The hail combined with wind gusts of 75 mph to cause extreme damage to buildings, trees, and vehicles in the city. At the Killdeer nursing home windows were broken out and four rooms were damaged to the point where they were not habitable. Two residents sustained minor injuries. The first was injured (direct injury) when they were struck by broken flying glass. The other person was injured (direct injury) as they were evacuating their living area due to broken windows and fell on a wet floor as rain and hail were pouring in. Every field light at the new football stadium was destroyed, and every bus at the school was significantly

damaged. Significant damage occurred to vehicles including those at a dealership. Property damage estimated at $20 million, and crop damage at $1 million.

High Wind

The NCEI database recorded 1,664 high wind events in North Dakota between 1996 and 2018. However, high wind events may occur across several counties at once, and there have been 149 unique events since 1996. These events resulted in 1 fatality, 31 injuries, $9,551,500 in total property damage, and $454,833 in average annualized property damage, $5,470,000 in crop damage, and $260,476 in average annualized crop damage (NCEI, 2013). Crop insurance payments for wind-related crop losses for North Dakota insurable crops totaled $73,619,697 between 2003 and 2017 (Risk Management Agency, 2003 - 2017).

Notable previous high wind occurrences since 2010 are described below.

- On March 11, 2011 a storm mainly produced prolonged and intense winds. Sustained winds more than 40 miles per hour, with gusts to around 70 miles per hour, developed west during the morning and spread east in the afternoon, then persisting through the evening. Estimated peak winds up to 60 mph occurred across Sioux County. An accident between a school bus and a pickup truck, which was caused by strong wings, resulted in seven injuries (NCEI, 2013).
- On July 28, 2015 an unseasonably deep low-pressure system moved from southeast Saskatchewan across Manitoba as a cold front swept through the northern Plains. The tight pressure gradient with combined with strong atmospheric mixing resulted in very gusty winds. The highest wind gust of 76 mph was reported in far northwest Divide County. Fences and trees were damaged. There was also varying degrees of damage to outbuildings on farms. Crop damage was reported. Property damage was estimated at $128,000 and crop damage estimated at $240,000.
- On June 13, 2017 strong winds developed in what is known as a Wake Low, over the central and northern Red River Valley into portions of northwest Minnesota during the late morning and early afternoon. This produced very strong wind gusts in the Grand Forks/East Grand Forks area, which resulted in tremendous damage to trees, fences, signs, light poles, etc. The 70-mph wind gust was measured by the automated surface observing system (ASOS) at the Grand Forks airport and a NDDOT Road Weather Information System (RWIS) site just north of Grand Forks. A 59-mph wind gust was also measured by a North Dakota Agricultural Network (NDAWN) site four miles south of Grand Forks. Property damage estimated at $800,000.

Lightning

In North Dakota, between 1996 and 2018, there were 103 damaging lightning events reported, resulting in about $2,207,500 in property damage, $105,119 in average annualized property losses, $10,000 in estimated crop damage, $476 in average annualized crop losses, 12 deaths, and 9 injuries (NCEI and the NWS, 2018). Specific crop losses due to lightning were not available from RMA data.

Notable previous lightning occurrences since 2010 are described below.

- In August 1996 a 12-unit condominium in Dickinson (Stark County) caught fire when lightning struck it. This left 24 people homeless and caused $300,000 in property damage.
- In July 1997 lightning struck three workers in a sugar beet field near Davenport (Cass County) resulting in one fatality and two injuries.
- In August 2006 two separate oil wells near Lignite (Burke County) were struck by lightning. Both caught on fire and fire crews were unable to get close to the fire due to the intense heat. Loss in production was estimated at $15,000 per day and property damage was estimated at $250,000 (NCEI, 2010).
- Two waves of severe weather on July 30, 2011 produced damaging lightning. A lightning strike to a rural north Bismarck home caused a fire that destroyed the home several hours later (NCEI, 2012).
- On August 31, 2014 a vehicle traveling north on North Dakota Highway 31 north of New Salem was struck by lightning. Airbags in the vehicle deployed. A female passenger in the front right seat of the vehicle suffered injuries and was taken to a hospital by ambulance. The vehicle sustained cosmetic damage and all electronics were inoperable. The vehicle was disabled.

Tornado

During the 67-year period from January 1950 to May 2018, 1,538 tornadoes were reported in North Dakota with an estimated $173,998,270 in property damage, $2,596,989 in average annualized property damage, $14,085,000 in estimated crop damage, $210,224 in average annualized crop damage, 26 deaths, and 360 injuries. Most of the people injured were inside their homes, outside, or driving a vehicle (NCEI and NWS, 2018).

According to data from the RMA, crop insurance payments for tornado and cyclone damage to North Dakota insured crops totaled $453,914 between 2003 and 2017 (RMA 2003-2017). The peak time of the year for tornadoes in North Dakota is from the end of May through the beginning of August, with most tornadoes in the state occurring between 3:00 p.m. and 11:00 p.m. in the months of June, July, and August; however, tornadoes have been reported as early as March 26 and as late as November 1.

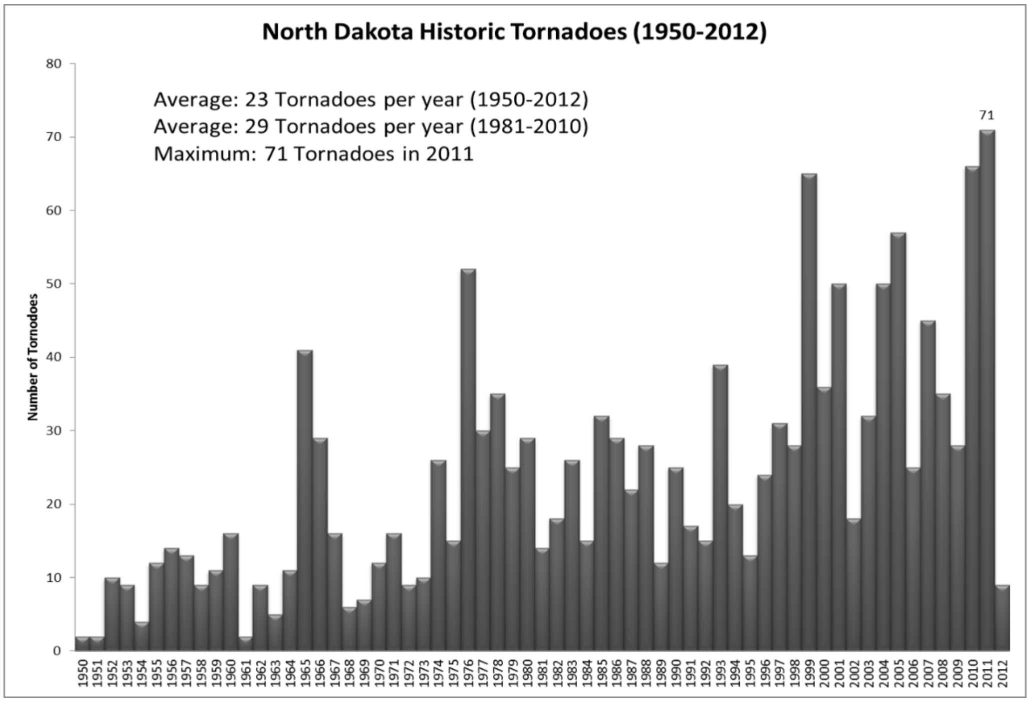
Table 3.7.11-1 shows the deadly tornadoes, magnitude, and injuries in North Dakota from 1950-2018. Figure 3.7.11-1 through Figure 3.7.11-3 show various tornado statistics from 1950 through 2012 provided by the North Dakota State Climate Office. Figure 3.7.11-4 provides images of the November 1, 2000 tornadoes near Bismarck. For a tornado to be counted in these statistics, it must be reported, and it is entirely possible for a tornado to occur in the state without anyone knowing it.

Table 3.7.11-1 Deadly Tornadoes in North Dakota 1950-2018

Location	Date	Magnitude	Fatalities	Injuries
Burleigh and Kidder Counties	July 1, 1952	F4	1	25
Morton County	May 29, 1953	F5	2	20
Richland County	July 2, 1955	F4	2	19
Cass County	June 20, 1957	F5	13	103
Cavalier County	June 24, 1966	F1	1	1
Hettinger County	June 29, 1975	F4	1	4
Elgin, Grant County	July 4, 1978	F4	5	35
12 miles South of Greene Renville County	July 23, 1997	F2	1	2
Northwood, Grand Forks County	August 26, 2007	EF4	1	18
10 miles north-northeast of Niobe, Ward County	August 12, 2010	EF3	1	1

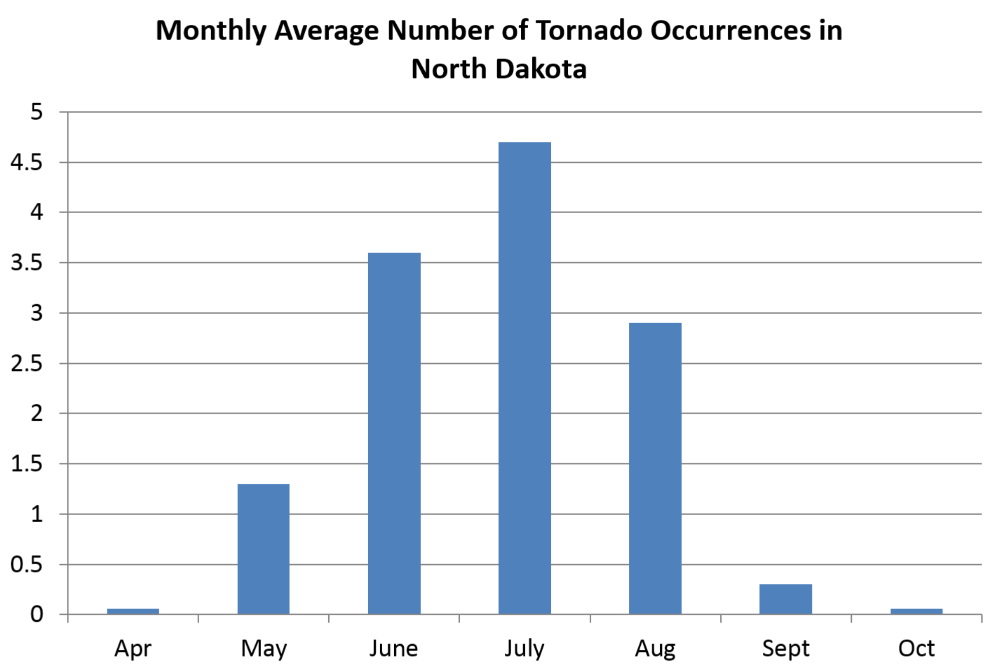
Source: National Centers for Environmental Information, 2018

Figure 3.7.11-1 Number of Tornadoes by Year, 1950 - 2012



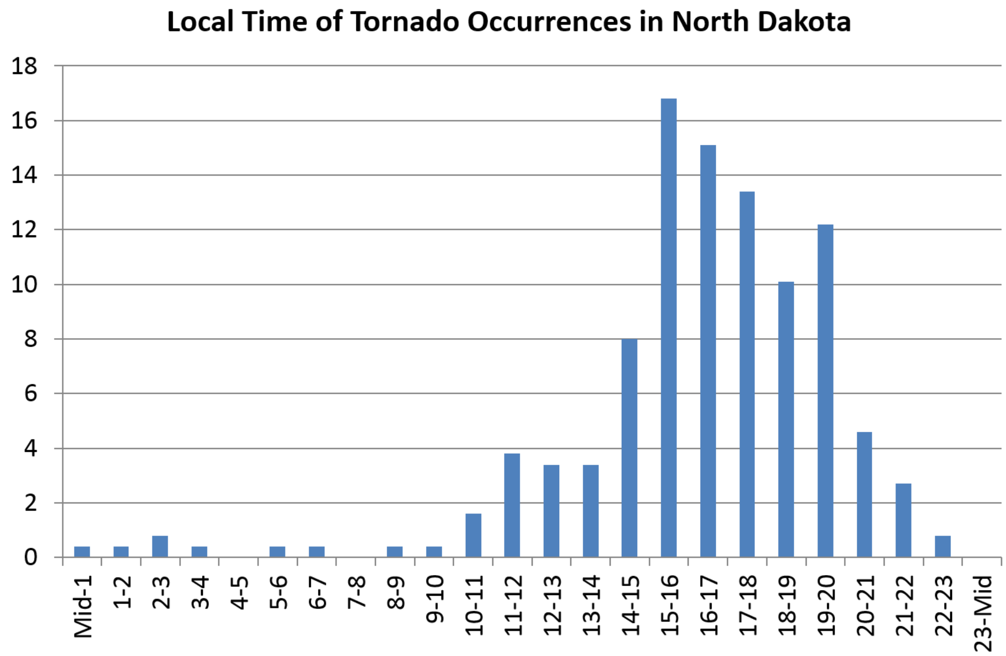
Source: North Dakota State Climate Office, 2018

Figure 3.7.11-2 Monthly Average Number of Tornado Occurrences



Source: North Dakota State Climate Office, 2018

Figure 3.7.11-3 Local Time of Tornadoes



Source: North Dakota State Climate Office, 2018

Figure 3.7.11-4 November 1, 2000 Tornadoes Near Bismarck

Source: Pat Whitlock, KOTVS and Source: 2010 State Hazard Mitigation Plan

As described in Appendix 7.4.9, the most destructive tornado occurred in Fargo in 1957. The tornado killed 13 individuals, injured 103 others and destroyed or badly damaged 1,300 homes. Notable previous tornado occurrences since 2010 are described below.

- A tornado touched down in Ransom County on July 14, 2010. The most extreme tornado damage was observed at two farmsteads, one about four miles west of Lisbon where a barn was ripped off its foundation and destroyed, and another about four miles east-southeast of Lisbon where a well-constructed steel shop was completely blown apart. At least three wooden power poles were snapped at two different locations east of Lisbon. Numerous large trees were blown down or uprooted in Lisbon, and many homes and businesses had extensive roofing damage. The event did not cause any injuries or fatalities but did cause an estimated $2 million in property damage.

- A prolonged severe weather event materialized on July 17, 2011 in LaMoure County. An EF3 tornado touched down around seven miles southeast of Nortonville then moved southeast before lifting six miles south-southeast of Berlin. This was a long-tracked tornado across parts of Russell, Wano, Henrietta, and Badger townships. Damage was observed all along the tornado path, with no fewer than five farmsteads impacted, some very severely. One injury occurred where a farm home was damaged beyond repair. There were no deaths. The worst damage consisted of a farm house destroyed, outbuildings destroyed, a vehicle tossed up to one half mile away from its original location and almost unrecognizable as a motor vehicle, and a significant number of very large hard and soft wood trees both snapped and uprooted. In one case farm animals were killed. Based on the damage, it was determined that windspeeds were on the order of 165 miles per hour.
- On May 26, 2014 early in the evening reports of rotating wall clouds and possible funnel clouds were received from various locations in McKenzie County. A confirmed EF2 tornado touched down six miles south of Watford City, and resulted in extensive damage to an RV park that was serving as a semi-permanent housing facility. Storms then transitioned into a linear convective system before weakening across Dunn County. Thirteen campers, serving as homes, were destroyed and two more were damaged by this tornado. Other damage included a snapped wooden power line pole, automobiles, and fences, both wooden and metal. One automobile was tossed sixty feet and flipped onto its roof, with a trailer parked next to its initial location also flipped and destroyed. About a dozen other vehicles were damage, some destroyed. Eye witness reports indicated two other funnel clouds in the immediate area. There were $2.5 million in estimated property damage and nine direct injuries.
- On August 3, 2016 a long-tracked tornado developed about six miles south of Mylo, Rolette County, North Dakota, and traveled northeast before crossing into Towner County just northeast of Agate, along Highway 66. The tornado did significant damage to two farmsteads in Rolette County, destroying pole barns and grain bins and damaging equipment. Crops were flattened along the tornado path. The tornado was highly publicized as national media showed a live feed from a storm chaser. This was a long-tracked tornado of around 20 miles, about 8 miles in Rolette County and 12 in Towner County. There were no injuries and no deaths with the tornado in either county. Based on the damage done its maximum rating was EF2 in Rolette and EF2 in Towner. There were an estimated $600,000 in property damage and $350,000 in crop damage.
- There have been 37 state and presidential declared disasters and emergencies due to severe summer weather from 1957 to May 2018 that have impacted the entire state. Table 7.4.9-1 in Appendix 7.4.9 describes all disasters and emergencies resulting from severe summer weather events.

Community Coffee Comments

Severe storms place the lives of those who are dependent on medical equipment at risk. When the power goes out, “I don’t have oxygen,” one resident said. Residents find some measure of relief knowing weather sirens are heard throughout Mandan.

First responders in Rolette County remembered a 2008 tornado in which conditions were good on one side of town as a tornado went through the other side of Wolford in neighboring Pierce County.

3.7.11.3 Location and Extent

Severe summer weather events occur statewide in North Dakota. However, generally, the central and eastern portions of the state typically experience more severe summer weather events than the western portion of the state. Table 3.7.11-2 provides an overview of the spatial extent of impacts resources from severe summer weather.

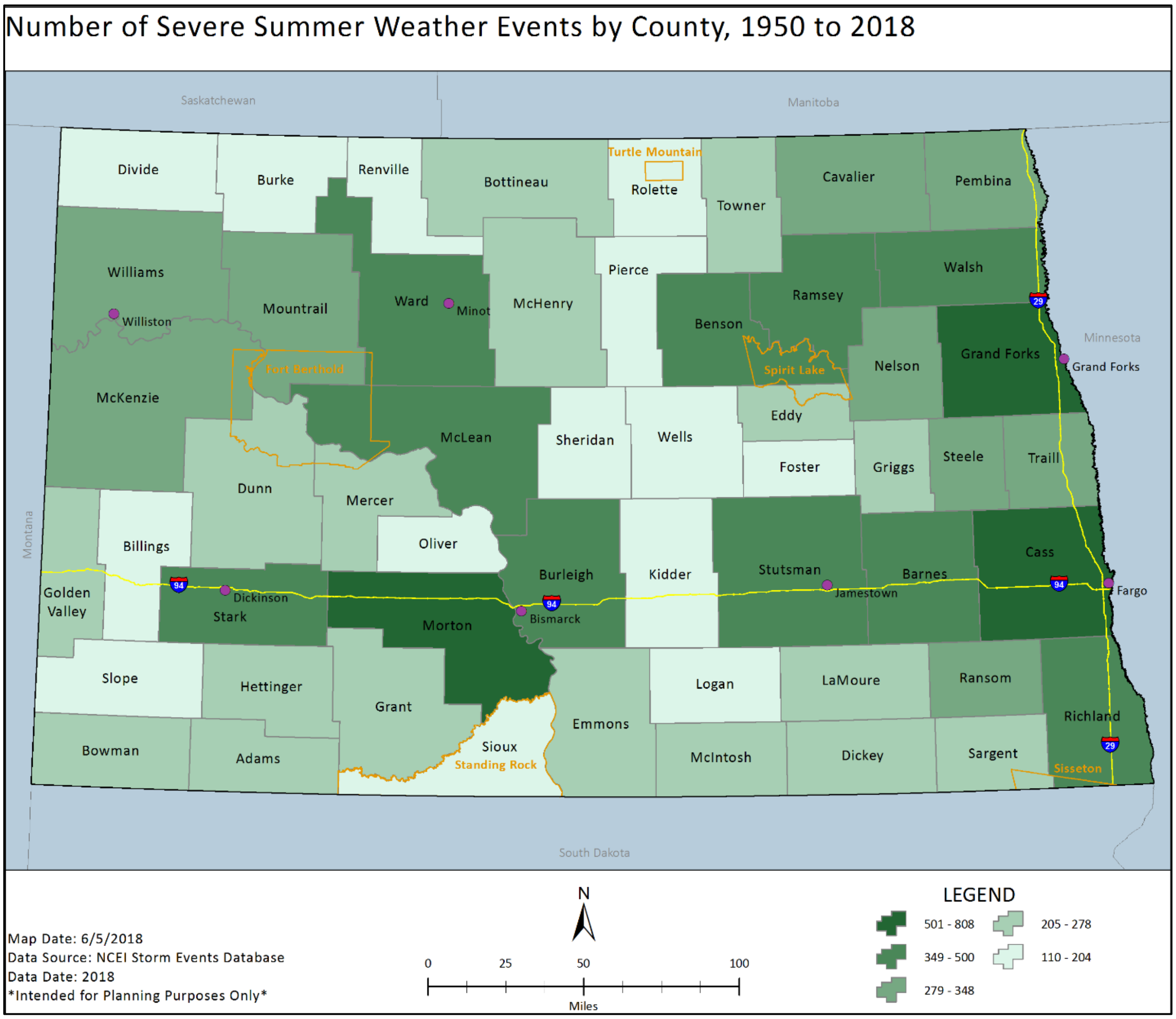
Table 3.7.11-2 Spatial Extent of Severe Summer Weather Impacts

Resources	Extent of Impacts
People	Regional
Property	Local
Infrastructure	Local
Government Operations	Regional

Resources	Extent of Impacts
Environment / Natural Resources	Local
Cultural Resources	Local

Figure 3.7.11-5 summarizes the number of severe summer weather events that have been recorded, by county. Figure 7.4.9-1 through Figure 7.4.9-4 in Appendix 7.4.9 further display the geographic location of previously reported tornado, hail, downburst, and high wind events. There are not enough extreme heat or lightning events to map statewide, but their totals are included in the statewide map below. The east to west gradient of summer weather events remains true for all events except high wind. High wind events increase moving west across the state, and the highest wind events are concentrated in the southwest corner of the state.

Figure 3.7.11-5 Severe Summer Weather Events by County, 1950 to 2018



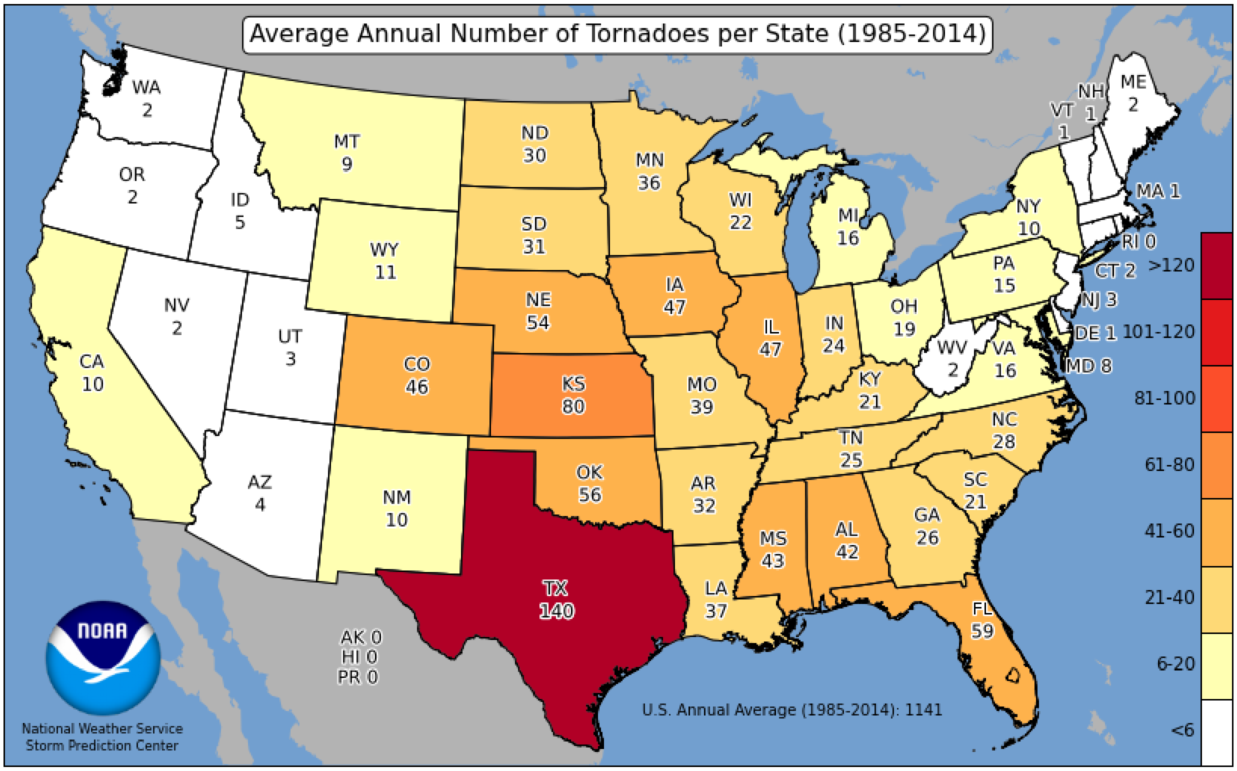
FEMA recognizes four wind zones in the United States, depicted in Figure 3.7.11-6. North Dakota falls into Zones II and III. Winds speeds can reach up to 160 miles per hour in Zone II and 200 miles per hour in Zone III. No special wind regions are identified in North Dakota.

Figure 3.7.11-6 Wind Zones in the United States

Source: Federal Emergency Management Association, n.d.

Figure 3.7.11-7 shows the average annual number of tornadoes per state on a nation-wide scale from 1981 through 2014. North Dakota averaged 30 tornadoes annually during this period, which is a moderate number compared to other states.

Figure 3.7.11-7 Average Annual Number of Tornadoes per State (1985-2014)



Source: Storm Prediction Center, 2010

Tornadoes can cause extensive property and crop damage, as well as injuries and loss of life. In 1971, Dr. Theodore Fujita developed the Fujita tornado damage scale to categorize various levels of tornado damage. In fact, Dr. Fujita's first major case study on tornado damage was the 1957 Fargo tornado (North Dakota State Water Commission, 2007). In 2006, enhancements to this scale resulted in more accurate categorizations of damage and the associated wind speeds. Both scales are shown in Table 3.7.11-3.

Table 3.7.11-3 Tornado Damage Scales

Fujita Scale		Enhanced Fujita Scale	
Scale	**Estimated Wind Speed**	**Scale**	**Estimated Wind Speed**
F0	<73 mph	EF0	65-85 mph
F1	73-112 mph	EF1	86-110 mph
F2	113-157 mph	EF2	111-135 mph
F3	158-206 mph	EF3	136-165 mph
F4	207-260 mph	EF4	166-200 mph
F5	261-318 mph	EF5	>200 mph

Sources: Storm Prediction Center, 2007.

For extreme heat events, the NWS has in place a system to initiate alert procedures (advisories or warnings) when the heat index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days. The NWS offices in Bismarck and Grand Forks can issue the following heat-related advisory as conditions warrant.

- **Excessive Heat Outlook**: are issued when the potential exists for an excessive heat, defined as greater or event in the next 3-7 days. An outlook provides information to heat index forecast map for the contiguous United States those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.

- **Excessive Heat Watch:** is issued when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. A watch provides enough lead time so those who need to prepare can do so, such as cities that have excessive heat event mitigation plans.
- **Excessive Heat Warning/Advisory:** are issued when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurring. The warning is used for conditions posing a threat to life or property, when heat index is greater or equal to 105°F. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property, when heat index is greater or equal to 100°F.

Figure 3.7.11-8 shows the likelihood of heat disorders with prolonged exposure or strenuous activity with the increase in relative humidity. As relative humidity increases, the air seems warmer than it is because the body is less able to cool itself via evaporation of perspiration.

Figure 3.7.11-8 Heat Index

Temperature (˚F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Source: National Weather Service

Note: Since Heat Index (HI) values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

The National Weather Service offices in Bismarck and Grand Forks warn for tornadoes, severe thunderstorms, and high winds events in North Dakota. Meteorologists use a variety of tools such as Doppler radar and weather spotters to predict these hazardous events and issue warnings that are broadcast over NOAA Weather Radio and other media. Therefore, the population may have some lead time to take precautions if they receive the warning.

NOAA has the Weather-Ready Nation program to help communities prepare for extreme weather, water, and climate events. NOAA partners who are committed to improving the nation's readiness and overall resilience against extreme weather, water, and climate events can become a Weather Ready Nation Ambassador. The NWS also administers the StormReady program, which helps communities make sure they have the communication and safety skills needed to save lives and property, before, during, and after a weather event. Figure 3.7.11-9 outlines the StormReady participants in North Dakota.

Figure 3.7.11-9 StormReady Participants in North Dakota

StormReady® in North Dakota

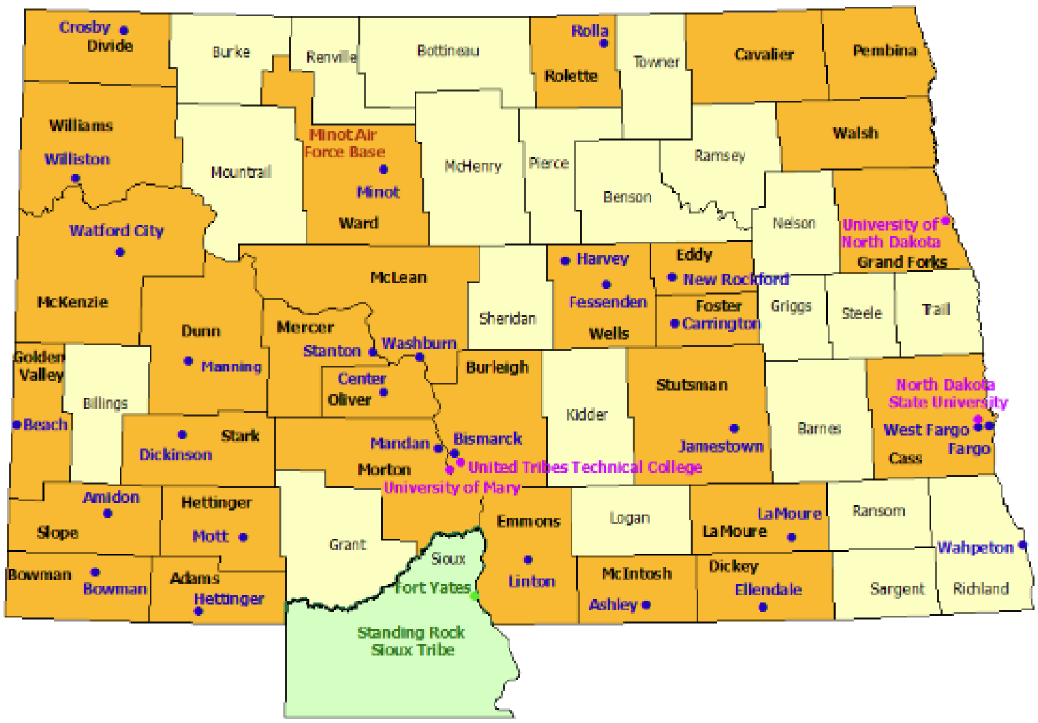
Weather.gov > StormReady > StormReady® in North Dakota

StormReady
National Program

64 Sites:

30 Counties, 29 Communities
1 Indian Nation, 4 Universities

Back to StormReady Communities
StormReady Home

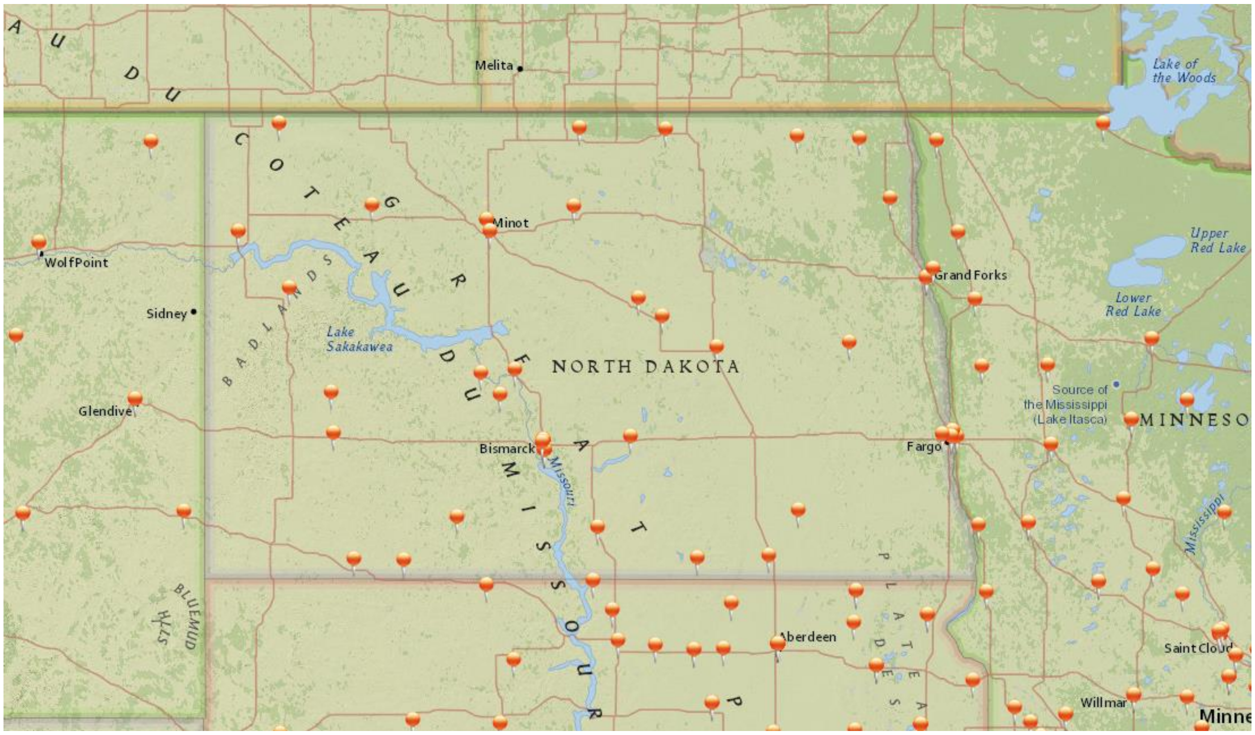


County | Government/Military
Indian Nation | University
Community | Supporter

Counties	Communities	Indian Nation	Universities
• Adams • Bowman • Burleigh • Cass • Cavalier • Dickey • Divide • Dunnn • Eddy • Emmons • Foster • Golden Valley • Grand Forks • Hettinger • LaMoure • McIntosh • McKenzie • McLean • Mercer • Morton • Oliver • Pembina • Rolette • Slope • Stark • Stutsman • Walsh • Ward • Wells • Williams	• Amidon • Ashley • Beach • Bismarck • Bowman • Carrington • Center • Crosby • Dickinson • Ellendale • Fargo • Fessenden • Harvey • Hettinger • Jamestown • Linton • LaMoure • Mandan • Manning • Minot • Mott • New Rockford • Rolla • Stanton • Wahpeton • Washburn • Watford City • West Fargo • Williston	• Standing Rock Sioux Tribe, Fort Yates	• North Dakota State University • United Tribes Technical College* • University of Mary • University of North Dakota

Source: National Weather Service, n.d.-b

Figure 3.7.11-10 Weather Ready Nation Ambassadors



Source: National Weather Service, n.d.-a

3.7.11.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. Table 3.7.11-4 below outlines the impacts to individual sectors of the community due to a severe summer storm event.

Table 3.7.11-4 Severe Summer Weather Consequence Analysis

Severe Summer Weather Impacts	
Public	The impact extent to the public from a severe summer weather event is regional. Individuals caught outside are at risk of injury from blowing dust and debris due to downbursts. Automobiles and mobile homes, even if tied down, are not safe places and at risk of being destroyed or harming individuals inside. According to the American Community Survey, North Dakota has approximately 368,545 housing units, with an estimated 6.7% being mobile homes. Given, then, that there are 24,693 mobile homes across the state, and approximately 2.3 people per housing unit in the state, there are roughly 56,793 people are at enhanced risk from tornadoes and strong winds (United States Census Bureau, 2016a; United States Census Bureau, 2016b; United States Census Bureau, 2016c). Besides structure failure, wind-driven projectiles and shattered glass can injure or kill occupants. In an average year, 75 severe thunderstorm downburst events resulting 1-2 injuries. Fatalities are possible, averaging one every 10 years or more over the past 13 years. Hail can also cause human injury. In an average year, there are 126 severe hail events resulting in 1-2 injuries. Fatalities are possible but have not been noted since 1955. Lightning can be life-threatening. Fatalities and injuries are possible, averaging 1-2 a year since 1996. Lightning can also impact the public by triggering other hazards such as the exposure to noxious gas due to vaporization of materials. Tornadoes can also be dangerous to human life. In an average year, 23 reported tornadoes resulted 5 injuries. Fatalities are possible, averaging one every other year over the past 67 years. Since structures are vulnerable to strong winds, those inside them are also at risk. The state can also expect a fatality once every ten years or more, and 1-2 injuries each year due to high winds. Extreme heat is also dangerous to public health as it may cause heat-related illness. Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise, and heat-related illness may develop. Elderly persons, small children, chronic invalids, those on certain medications or drugs, the homeless, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails. Figure 3.7.11-11 shows possible disorders due to heat based on heat index.
Responders	Responders can be severely impacted due to risk of traveling during a severe summer event (particularly noted with tornadoes, high winds, and downbursts). Impacts to communication and computer equipment could also greatly affect emergency response.
COOP	Severe summer hazards that can cause damage to critical facilities and power lines can also impact continuity of operations. For example, lightning can impact the continuity of operations by triggering other hazards including fires, power surges, interruption of communications, and downed power lines (also caused by high winds). Computer equipment is especially vulnerable to damage from power surges which can jeopardize continuity of operations.
Delivery of Services	Severe summer hazards that can cause damage to critical facilities and power lines can also impact delivery of services. For example, lightning can impact the delivery of services by triggering other hazards including fires, power surges, interruption of communications, and downed power lines (also caused by high winds). Computer equipment is especially vulnerable to damage from power surges which can jeopardize delivery of services.

Severe Summer Weather Impacts	
Property, Facilities, and Infrastructure	Downbursts can damage trees, blow vehicles off the road, break windows, down power lines, damage roofs and fences, and cause other structural damage. Downbursts can also be extremely dangerous to aviation. In an average year, 75 severe thunderstorm downburst events resulting in about $7 million in property and crop damage and 1-2 injuries may occur. Hail causes considerable damage to property in the United States. Similarly, structures can be damaged by hail, so losses can easily total in the millions of dollars in urban areas. In an average year, there are 126 severe hail events resulting in about $12 million in property and crop damage. Additionally, in an average year, 1-2 extreme hail events resulting in about $1.9 million in property and crop damage. Power lines are a susceptible critical infrastructure that can be damaged by hail and can subsequently impact other community sectors. Lightning can also cause property damage by striking aircraft, buildings, or equipment. In an average year, six damaging lightning events resulting in $116,184 in property damage in North Dakota. Tornadoes can cause extensive property damage. In an average year, 23 reported tornadoes resulted in about $2.7 million in combined property and crop damage. High winds can also cause structures and objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase. Strong winds can be particularly dangerous to aviation. **Error! Reference source not found.** further details the damage that can be expected based on wind speed.
Environment	All severe summer hazards can cause extensive crop damage and associated economic losses. Large hail is always a threat to the agricultural community. Hail can damage crops and injure or kill livestock. Severe summer weather in the form of lightning can also a great risk to livestock and wildlife if it were to strike. Extreme heat events can also be a great risk. It can wither crops and kill livestock, as demonstrated in the Previous Occurrences section.
State Economy	A severe hail event that substantially damage an agricultural area could have significant economic impacts. In an average year, there 126 severe hail events resulting in about $12 million in property and crop damage. Additionally, in an average year, 1-2 extreme hail events resulting in about $1.9 million in property and crop damage. Tornadoes can cause extensive property damage. In an average year, 23 reported tornadoes resulted in about $2.7 million in combined property and crop damage.
Public Confidence in the State's Governance	The public's confidence in the state's governance can be impacted by timeliness of hazard warning and response.

Additionally, Figure 3.7.11-11 shows the health impacts due to extreme heat events. The heat index describes how hot the heat-humidity combination makes it feel. As the heat index rises, so do health risks. In addition to public health impacts, extreme heat events can wither crops and kill livestock.

Figure 3.7.11-11 Possible Heat Disorders by Heat Index Level

Heat Index	Category	Possible heat disorders for people in high risk groups
130°F or higher	Extreme Danger	Heatstroke risk extremely high with continued exposure.
105° - 129°F	Danger	Sunstroke, Heat Cramps and Heat Exhaustion likely, Heatstroke possible with prolonged exposure and/or physical activity.
90° - 105°F	*Extreme Caution*	*Sunstroke, Heat Cramps and Heat Exhaustion possible with prolonged exposure and/or physical activity.*
80° - 90 °F	Caution	Fatigue possible with prolonged exposure and/or physical activity.

Source: National Weather Service, n.d.-c

3.7.11.5 State Risk Assessment

Probability

Downbursts

FEMA places the majority of North Dakota in Zone II (160 mph) for structural wind design; however, southeastern and south-central North Dakota are in Zone III (200 mph) (FEMA, 2004). Straight-line winds, or downbursts, are responsible for most thunderstorm wind damage. During the summer in the western states, thunderstorms often produce little rain but very strong wind gusts and dust storms. Based on the previous occurrences recorded, there is a greater than 90% annual chance of downbursts occurring in North Dakota.

Extreme Heat

Based on previous occurrences, there is up to a 50% annual chance of an extreme heat event occurring in the State of North Dakota.

Hail

Hail sizes up to 5.00 inches, or even larger, can be expected throughout the state based on historical reports. In an average year, 126 severe hail events were reported, resulting in about $12 million in property and crop damage and 1-2 injuries. Fatalities are possible, but none have been noted since 1955. Additionally, in an average year, 1-2 extreme hail events were reported, resulting in about $1.9 million in property and crop damage. Based on these historical occurrences, it is highly likely (greater than 90% annual probability) to expect a severe or extreme hail event in a given year.

High Wind

Based on the historical record, North Dakota can expect over 76 high wind events, not related to tornadoes or thunderstorm winds, in any given year. This makes a high wind event highly likely (greater than 90% chance of probability) in a given year. The state may experience one fatality once every ten years or more, and one to two injuries each year. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase.

Lightning

In an average year, about six damaging lightning events are reported, causing about $116,184 in property damage in North Dakota. Fatalities and injuries are possible, averaging 1-2 a year since 1996. Based on average historical records, lightning is highly likely (greater than 90% annual probability) to occur in a given year.

Tornado

Table 3.7.11-5lists the North Dakota tornadoes that were classified using the Fujita or Enhanced Fujita scale during the period 1950 to 2018. Approximately 90% of the tornadoes in the state were either an F0/EF0 or F1/EF1, however, over 55 F3/EF3 and stronger tornados have been recorded in the past. This information suggests that the probability of tornadoes is highly likely in a given year (greater than 90% probability), especially the lower magnitude tornados.

Table 3.7.11-5 Fujita Scale Statistics for North Dakota Tornadoes 1950-2018

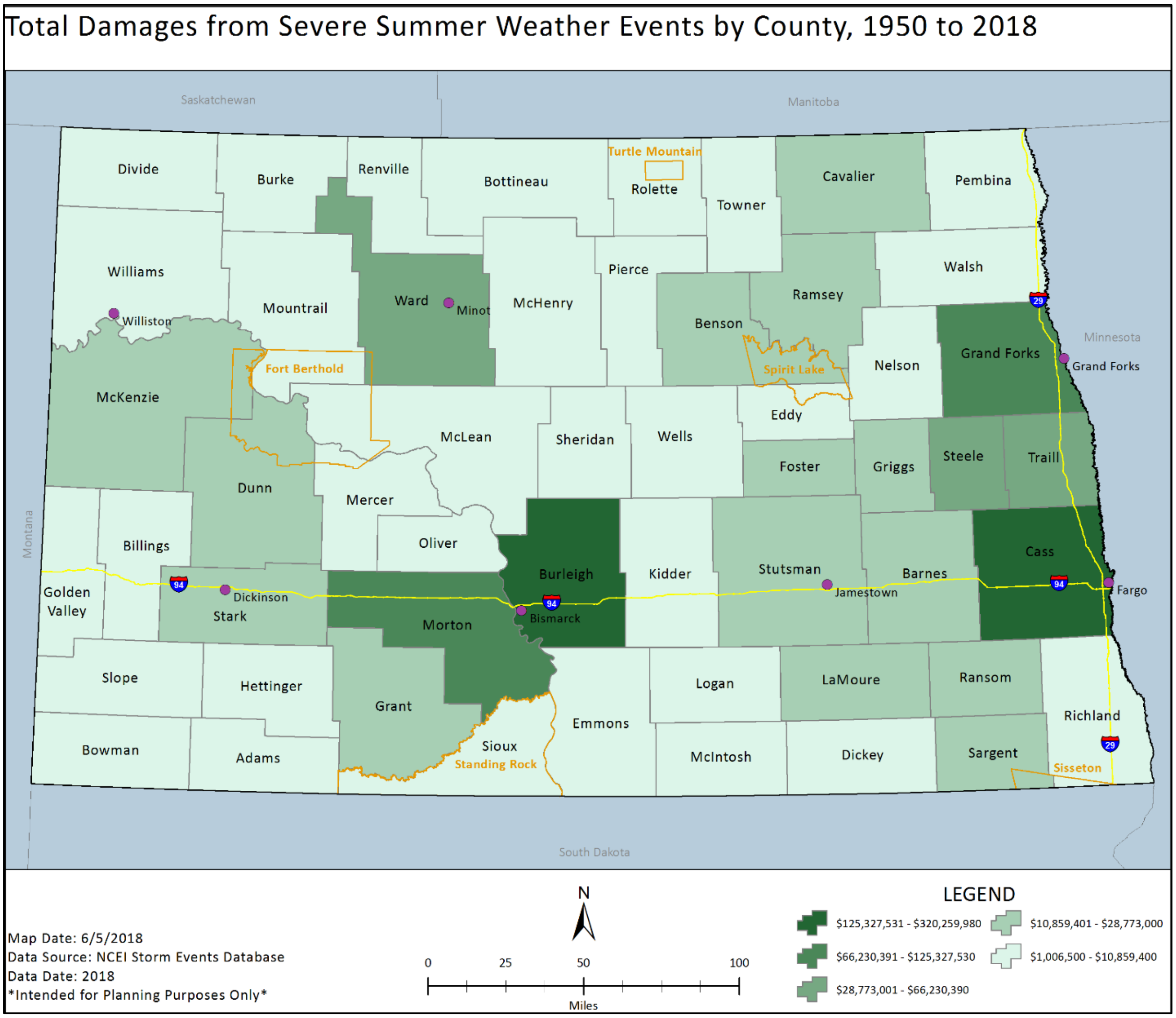
Magnitude	Number of Recorded Tornadoes	Average Frequency
F0/EF0	888	13 per year
F1/EF1	357	5 per year
F2/EF2	136	2 per year
F3/EF3	41	1 every 1.5 years
F4/EF4	13	1 every 4.5 years
F5/EF5	3	1 every 21 years

Source: National Centers for Environmental Information, 2018

Vulnerability Assessment

To further define the potential impacts of severe summer weather events on people and property, combined impacts were assessed for all severe summer weather events by jurisdiction. Cass County has the highest number of previous events (808), the highest number of deaths and injuries (12 and 126, respectively), and the highest in total damage ($320,259,980) from severe summer weather events. Grand Forks County has the second highest number of events, with 648, followed closely by Morton County with 647. Burleigh County has the next highest in damage, with $268,365,730. Figure 3.7.11-12 shows the total damage from severe summer weather events by county, and Table 7.4.9-2 in Appendix 7.4.9 shows the number of previous events, deaths, injuries, property damage, by county. Generally, central and eastern counties experience more in damage from severe summer weather events, which corresponds with the east-west trend in past events.

Figure 3.7.11-12 Severe Summer Weather Damage by County, 1950 to 2018



State Assets and/or Critical Facilities at Risk

The following sections detail the risk of State assets and critical facilities to severe summer weather. Severe summer weather can occur anywhere in the state, which puts all 20,041 state assets and critical facilities at risk, with the central and eastern portions of the state being at higher risk based on historical occurrences. However, state and political sub-division buildings are considered less vulnerable to hail, high winds and lightning damage because of their construction. There are approximately six Insurance Service Office (ISO) construction classes. ISO Class 1 is Frame (combustible walls and/or roof), Class 2 is joisted masonry (noncombustible masonry walls with wood frame roof), Class 3 is non-combustible, Class 4 is masonry non-combustible, Class 5 is modified or semi fire restrictive, and Class 6 is fire resistive (AmRisc, n.d.). At the time of this plan update, information was not available to describe the number of state assets and critical facilities that are classified under the different ISO construction classes. Having this information in the future would allow for a more detailed analysis of structures vulnerable to different wind speeds.

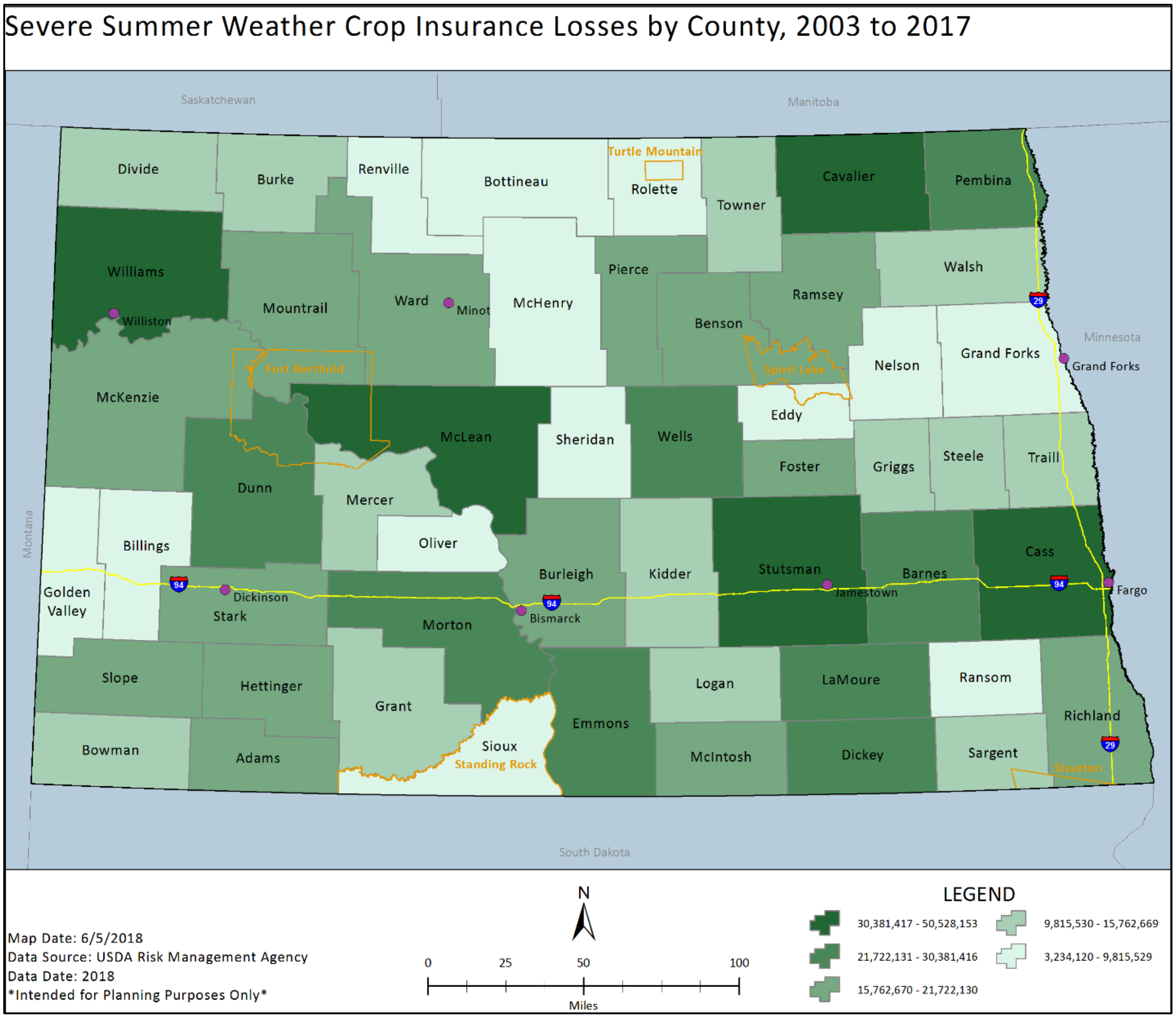
Most damage occurs to buildings that are frame built, have asphalt shingles and steel or vinyl siding. In comparison, most buildings insured by State Fire and Tornado Fund are made of joisted masonry, steel frame with masonry exterior walls, protected steel frame with exterior walls made of masonry material or reinforced concrete frame. These buildings have single-ply rubber membrane roofs or built-up, tar and gravel/rock roofing systems, which are resilient to wind and hail. These buildings are more resilient to severe summer weather and typically only sustain cosmetic damage to roof flashing, aluminum/steel roof vents, air handlers, ventilation systems, and gutters and down spouts. Due to the current frequency of these events, and impacts from climate change as well as changes in development, all 20,041 state assets and critical facilities and future infrastructure will continue to be at risk, depending on current and future construction types. Due to the variability of severe summer weather, it is difficult to estimate specific damage losses to state critical facilities and infrastructure. Section 2 details the number and value of state-owned buildings and properties by county.

Loss Estimates

Loss estimates are based on data from NCEI and the RMA. Based on NCEI event narratives, typical damage from severe summer weather include livestock injury and death; crop loss; downed power lines and power poles; damage to roofs, windows, siding, gutters, outbuildings, and farm equipment; vehicle accidents; damage to cars apart from accidents (especially in the case of tornadoes and hail); and human fatalities and injuries. Total combined damage from all six summer storm hazards in NCEI records included an estimated $994 million in property damage, 30 deaths, and 466 injuries.

Crop loss figures were extrapolated from the RMA crop insurance payment data. According to the 2011 North Dakota Crop Insurance Profile Report issued by the USDA RMA, 89% of North Dakota insurable crops were insured in 2011. Therefore, crop insurance payments have been extrapolated to estimate losses to all insurable crops. Extrapolated crop losses from tornadoes, hail, extreme heat, and winds combined totaled $1,078,589,539 between 2003 and 2017 (Risk Management Agency 2003 – 2017). Figure 3.7.11-13 shows crop losses by county from 2003 to 2017. Cavalier County experienced the most in insured crop losses, with $50,528,153, followed by Cass County with $44,372,182 in losses. Insured crop losses do not follow as distinct of an east-west trend as number of previous events and NCEI recorded property and crop total losses. Counties throughout the state have incurred high amounts of insured crop losses.

Figure 3.7.11-13 Severe Summer Weather Crop Insurance Losses by County, 2003 to 2017



Severe high winds and summer storms with lightning resulted in damage to many overhead facilities since 2013. June 2017 proved to be costly for many cooperatives resulting in damage to transmission and distribution poles/structure broken, wire down and debris. Other major summer storms occurred in July 2014, June 2016, and July 2017. The June 2016 storm impacted Foster County for 8 hours, effected 350 members, and caused $30,000 in facility damage. Table 3.7.11-6 shows reported damage and customers impacted from power outages from summer storms since 2013 from the NDaREC. Additionally, Table 3.7.11-7 shows the cost from electric cooperatives for mitigation projects related to summer storms. In total, $1,131,403 has been incurred to the REC. It is also important to note that the Mor-Gran-Sou Electric Cooperative also reported $1 million in damages due to summer storms over past 4.5 years.

Table 3.7.11-6 Summer Storm Impacts on the North Dakota Association of Rural Electric Cooperatives (NDaRECs) since 2013

Year	Date	Areas Impacted	# Customers Effected	Damage
2017	2017	McKenzie County	Information Unavailable	$1,250,000
	July	Bowman County	Information Unavailable	$11,375

Year	Date	Areas Impacted	# Customers Effected	Damage
		Hettinger County	Information Unavailable	$8,942
		Slope County	Information Unavailable	$2,624
		Beulah area	1,500	$350,000
	June	McIntosh County	20	$10,000
		Information Unavailable	120	$18,000
2016	July	Hillsboro	Information Unavailable	$150,000
		McLean territory	1,247	$ amount unavailable
	June	Mountrail and Williams counties	7,387	$ amount unavailable
		Foster County	350	$30,000
2015	July	Mountrail and Williams counties	5,515	$ amount unavailable
2014	July	Nodak territory	100	$25,000
		Mountrail and Williams counties	3,655	$ amount unavailable
2013	August	Mountrail and Williams counties	8,566	$ amount unavailable
	July	Mountrail and Williams counties	6,300	$ amount unavailable
	2013	Belfied	2,000	$143,000
Total			**36,760**	**$1,998,941**

Source: NDaRECs, 2018

Table 3.7.11-7 Cost from Electric Cooperatives for Mitigation Projects Related to Summer Storms

Year	Project Name	Type	Length (miles)	Estimated Cost of Project	FEMA /State Share	Comments
Northern Plains Electric Cooperative						
2011	Egeland 3 Phase	HMPG	6.5	$400,030	$340,026	Summer Wind Storm
Dakota Valley Electric Cooperative						
2007	Dwight 3 Phase	PDM	4	$255,450	$191,588	2005 Storm Damage
2007	Great Bend 3 Phase	PDM	3	$196,785	$147,589	2005 Storm Damage
2010	Great Bend 3 Phase	HMPG	3	$168,000	$142,800	2005 Storm Damage
2011	Mooreton 3 Phase	HMPG	6.5	$364,000	$309,400	2005 Storm Damage
Total			**23**	**$1,384,265**	**$1,131,403**	

Northern Plains Electric Cooperative and Dakota Valley Electric Cooperative, 2018

3.7.11.6 Future Conditions

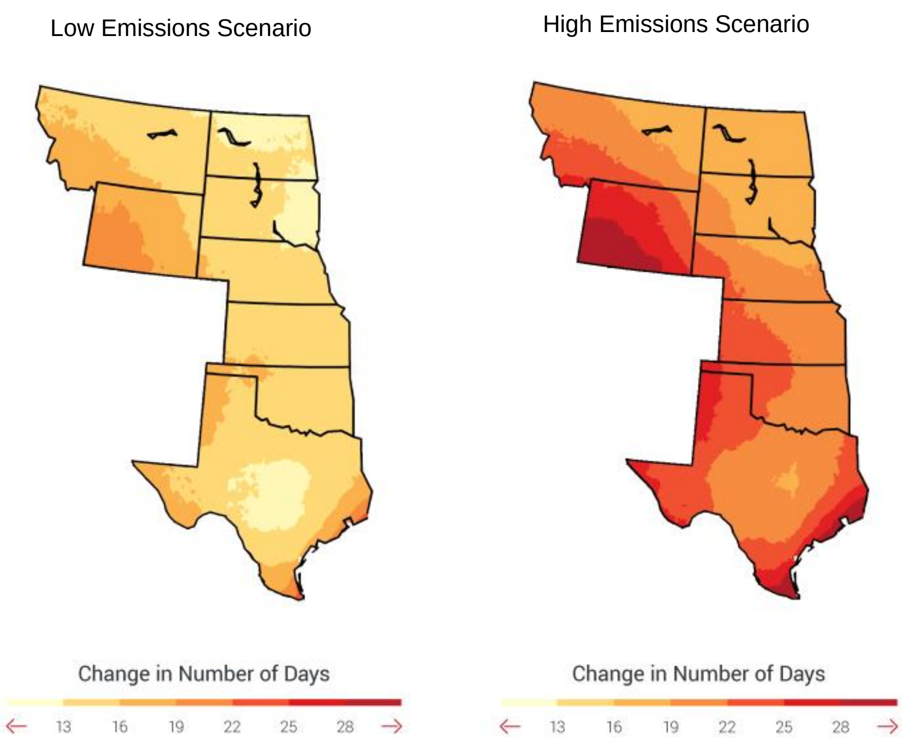
Successful mitigation of severe summer weather requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future severe summer weather risk.

Climate Change

There are much greater uncertainties regarding the changes in severe summer storms as a result of climate change that would impact aspects of severe summer weather events, including downbursts, hail, lightning, tornadoes, and high wind. Additionally, the localized nature of many severe storms is difficult to capture in climate models. However, climate scientists are still actively researching the connections between climate change and severe storms.

According to the 2014 National Climate Assessment, for an average of seven days per year, maximum temperatures reach more than about 95ºF in the northern Plains. These high temperatures are projected to occur much more frequently, even under a scenario of substantial reductions in heat-trapping gas (also called greenhouse gas) emissions, with days over 100ºF projected to double in number. Figure 3.7.11-14 shows the change in number of days of the hottest temperatures under a low emissions scenario (left) and a high emissions scenario (right).

Figure 3.7.11-14 Change in Number of Days with the Hottest Temperatures



Source: Federal Advisory Committee, 2014

Additionally, similar increases are expected in the number of nights with minimum temperatures higher than 60˚F. These increases in extreme heat will have negative consequences, including increases in surface water losses, heat stress, and demand for air conditioning. These negative consequences will more than offset the benefits of warmer winters, such as lower winter heating demand, less cold stress on humans and animals, and a longer growing season, which will be extended by mid-century an average of 24 days relative to the 1971-2000 average. Overwintering insect populations are also expected to increase. Extreme heat may have both positive and negative effects on agriculture in North Dakota. Rising temperatures will lengthen the growing season, possibly allowing a second annual crop in some places and some years. However, warmer winters pose challenges, for example, some pests and invasive weeds will be able to survive the warmer winters. Winter crops that leave dormancy earlier are susceptible to spring freezes. Additionally, increased days with extreme heat will impact the populations that are already vulnerable to impacts from heat the most, including low income, people without air conditioning, elderly, children, and people living with chronic illnesses or comprised immune systems, such as asthma.

The following Table 3.7.11-8 presents the best available data relating to climate changes impacts to severe summer weather in North Dakota.

Table 3.7.11-8 Expected Changes to Severe Summer Weather Future Condition

Condition	Projected Change
Location	The area at risk to severe summer weather events is not projected to change.
Extent / Intensity	It is unknown if severe summer weather events will increase in extent or intensity.
Frequency	Intense summer storms are projected to occur more frequently
Duration	It is unknown if severe summer weather events will increase in duration.

Changes in Development

North Dakota does not have an enforceable statewide building code. The individual jurisdictions have to adopt and enforce the state building code for those regulations to have an impact on development. Therefore, new and future development in those communities that have not adopted the state building code is more vulnerable to summer storms. Newer structures are generally built to withstand strong winds. Mobile homes, however, continue to be the exception. For information on counties and cities that have adopted a building code, see Section 2. New and future development in these jurisdictions is generally more vulnerable to impacts from summer storms.

According to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation. Table 3.7.11-9 shows population projections and past severe summer weather events by county. See Section 2 for additional details about population projections in North Dakota.

The three counties that are expected to over double in population from 2010 to 2030 (McKenzie, Williams, and Mountrail) have experienced a total of 956 events, 1 death, 19 injuries, and $22 million in damage from severe summer weather events. Large increases in population will expose more people to the various severe summer weather hazards, particularly the homeless population. Rapidly growing populations will also increase the depend for housing, likely increasing the number of mobile home and RV parks that are particularly vulnerable to damage from tornados. Additionally, these three counties plus Dunn County are experiencing rapid oil and gas development. Oil and gas infrastructure may incur damage from severe summer storms and populations could be impacted by secondary hazards like hazardous materials spills.

Cass County has experienced the most summer storm events, deaths, injuries, and damage from summer storms, and is projected to experience a 43% increase in population from 2010 to 2030. By 2030, Cass County is also expected to be the largest county in North Dakota, with a total population of 214,719. This puts more people at risk in an area that already experiences the most summer weather events in the state. Additionally, increased density of development can increase damage and destruction from a storm event.

Table 3.7.11-9 Percent Change in Population and Vulnerability to Severe Summer Storms

County	# Previous Events	Deaths	Injuries	Property Damage	Population Change 2010 - 2030
McKenzie	314	0	16	$8,530,560	269%
Williams	344	1	1	$4,046,500	165%
Mountrail	298	0	2	$2,307,530	103%
Dunn	259	0	3	$23,785,500	88%
Stark	401	0	2	$27,768,000	87%
Divide	160	0	0	$908,530	65%
Burke	204	0	0	$2,238,530	57%

County	# Previous Events	Deaths	Injuries	Property Damage	Population Change 2010 - 2030
Billings	174	0	4	$714,000	51%
Ward	471	1	5	$43,222,560	49%
Cass	808	12	126	$167,259,980	43%
McHenry	269	0	0	$1,435,000	38%
Sioux	180	0	12	$4,342,500	37%
Burleigh	497	1	40	$267,755,730	36%
Golden Valley	222	0	3	$1,223,000	35%
Grand Forks	648	1	36	$89,890,390	33%
Morton	647	3	25	$123,802,530	31%
Hettinger	258	1	4	$5,663,000	28%
Rolette	122	1	3	$3,053,530	26%
McLean	451	0	12	$6,674,280	26%
Benson	437	0	0	$9,759,250	21%
Bowman	278	0	1	$2,032,280	19%
Renville	147	1	3	$2,797,000	18%
Slope	167	0	0	$1,973,560	17%
Towner	229	0	0	$611,700	13%
Bottineau	235	0	10	$9,350,030	12%
Sargent	274	0	0	$2,918,500	12%
Mercer	257	0	3	$2,513,000	10%
Oliver	156	0	1	$955,600	7%
Richland	500	2	32	$3,675,750	7%
Pierce	158	0	0	$3,912,030	7%
Ramsey	390	0	17	$18,736,010	5%
Eddy	211	0	0	$396,500	3%
Foster	172	0	2	$13,795,530	3%
Logan	170	0	10	$5,046,000	2%
Barnes	492	0	1	$7,208,250	2%
Stutsman	423	0	9	$16,332,500	1%
Sheridan	110	0	1	$1,225,000	0%
Traill	293	0	1	$4,163,000	-1%
Ransom	290	0	8	$7,214,650	-1%
Adams	254	0	3	$8,146,000	-1%
McIntosh	228	0	0	$3,157,100	-2%
Wells	183	0	1	$1,641,500	-2%

County	# Previous Events	Deaths	Injuries	Property Damage	Population Change 2010 - 2030
Kidder	195	0	1	$8,296,060	-3%
LaMoure	226	0	2	$5,569,780	-3%
Walsh	408	0	2	$2,481,730	-3%
Steele	290	0	4	$7,625,390	-5%
Dickey	249	0	2	$4,608,280	-5%
Grant	258	5	40	$9,525,780	-8%
Cavalier	348	1	3	$6,016,200	-9%
Emmons	264	0	3	$5,612,780	-9%
Nelson	310	0	0	$10,809,400	-10%
Pembina	346	0	11	$3,881,300	-15%
Griggs	252	0	1	$18,071,980	-16%

Source: National Centers for Environmental Information, 2018; North Dakota Department of Commerce, 2016

3.7.11.7 Jurisdictions at Risk

All 58 local and tribal HMPs profile severe summer weather. Figure 3.7.11-15 presents a summary of those plans and also identifies how they ranked the overall risk presented by severe summer weather. Forty-one jurisdictions ranked severe summer weather as a high hazard, 16 as medium, and 1 as low. This ranks severe summer weather as the number 2 out of 14 hazards according to North Dakota local HMPs. It is clear most jurisdictions consider severe summer weather a high hazard across the entire state.

Figure 3.7.11-15 Severe Summer Weather Hazard Ranking by Jurisdiction

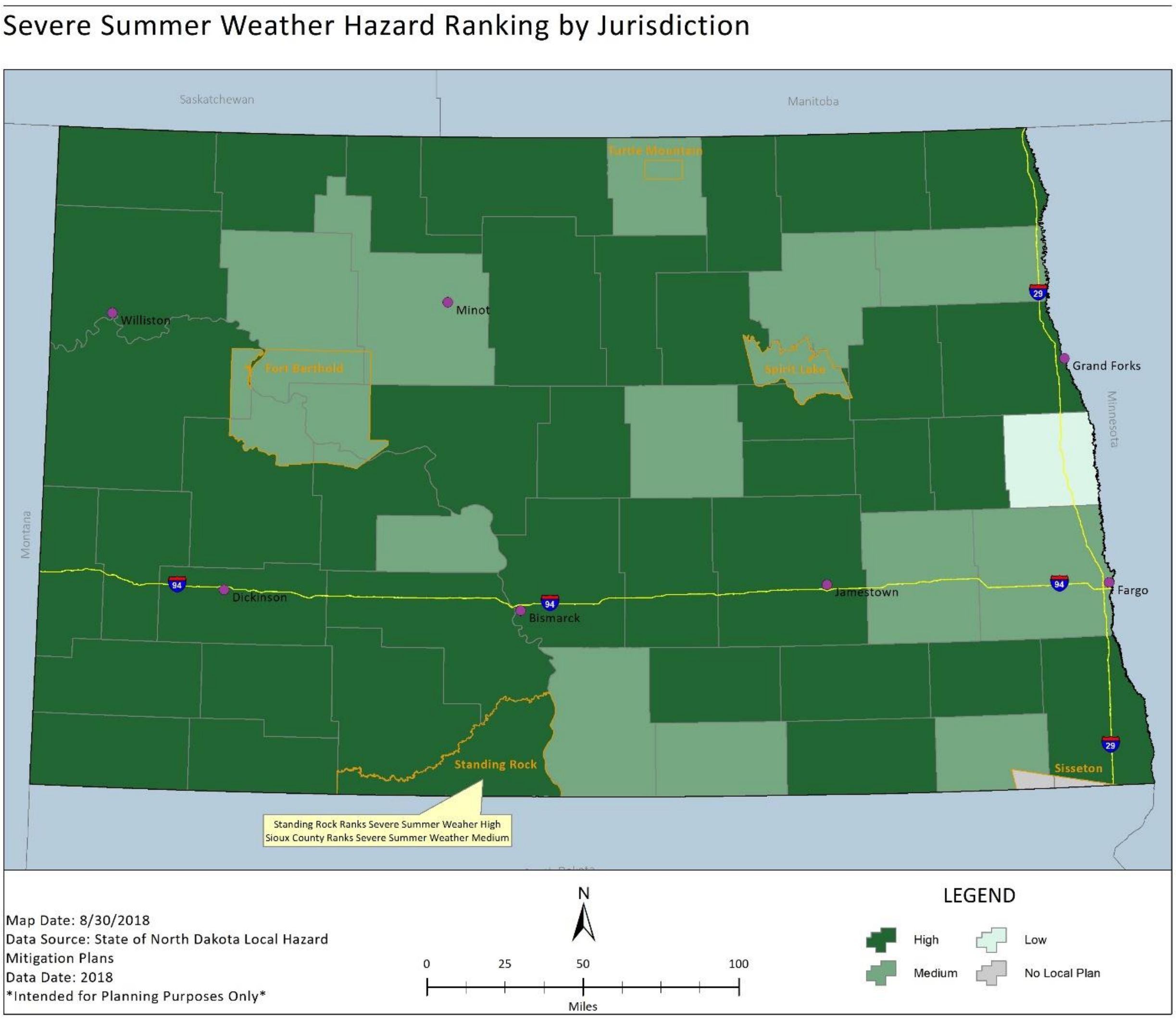


Table 7.4.9-3 in Appendix 7.4.9 includes a compilation of available hazard ranking and loss information, when available, for severe summer weather as documented in these local HMPs. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. This analysis shows the severity of impact of severe summer weather across the state.

3.7.11.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including severe summer storm, to create an overall Risk Factor score. Following this methodology, the Severe Summer Weather risk factor score was 3.2, which is a highly ranked hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and 3.3-7 in Section 3.3.

Due to the variability and severity of severe summer storm events, these events have a high impact on all impact assessment categories. As seen in the Consequence Analysis and Loss Estimates, these events can cause high cost losses. Severe summer weather is also particularly hazardous due to the high likelihood of occurrence. These events have greater than a 90% probability to occur in a given year. However, these events typically occur with a sufficient warning time, and short duration. When severe summer weather events occur, their damages are typically felt regionally at most, impacting less than 10% of the state at any given time.

Severe summer weather can result in loss of life, injuries, and damage to property and crops. The entire State of North Dakota is vulnerable to these events. An increase in population combined with an increase in intense summer storms and extreme heat days due to climate change will contribute to the state's continued risk to severe summer weather events. As identified in the 2017 THIRA, a severe summer weather event such as a tornado can cause fatalities and severe property damage, despite early warning systems for the public. Planning and preparation can aid in mitigating the impacts of such an event.

The Severe Summer Weather Committee discussed several mitigation actions based on the hazard analysis. Ideas included increased public awareness and education and advanced forecasting. Committee members recommended use of storm shelters in communities, pre-positioning of resources, installation of shelters and expanded number of storm spotters.

3.7.11.9 Data Limitations / References

Summer storms can be such isolated events that the vulnerability to a particular area can be hard to determine. Weather data is often limited by the observations taken, and events in the National Centers for Environmental Information database are only recorded if reported to the National Weather Service. The addition of trained spotters to the area may improve data collection.

The North Dakota Emergency Operations Plan, Severe Storm Annex was used to create this Severe Storm hazard profile. Other data and resources were obtained from NWS, NDaRECs, NDDES Division of Homeland Security, NDDoH, NDDOT, NDSWC, North Dakota Parks and Recreation Department, Northern Plains Electric Cooperative, and Dakota Valley Electric Cooperative.

3.7.12 Severe Winter Weather

3.7.12.1 Description

Winter storms take many forms and differ significantly in size, strength, intensity, duration, and impact. The composition of a storm varies with the temperature, wind, and amounts of precipitation. Important factors in winter storms include temperature, wind, wind chill, rain, sleet, snow, and blowing snow. Exceptional winter storms can and do cause problems for the communities, residents, and travelers. Examples of these types of storms include blizzards, ice storms, heavy snow events, and extended extreme cold temperatures. While these types of events may not sound serious, the combinations of cold temperatures, wind, snow, wind chills, ice, and reduced visibilities can make these storms very deadly and costly.

The winter season can begin as early as September and last into May. The bulk of North Dakota's winter weather is from mid-November until early April. There are two major winter storm tracks that occur in the central United States. The northern track produces the Alberta Low Pressure System, commonly called the "Alberta Clipper." This usually is a fast-moving storm capable of producing blizzard conditions for a relatively short period of time. Extremely low temperatures usually follow storms of this nature. The southern track produces the Colorado Low Pressure System. These types of storms move slower and more erratically. Both of these types of storm systems can become very deadly. This profile focuses on five types of winter storms and winter storm impacts, including blizzards, extreme cold/wind chill, heavy snow, ice storms, and structural collapse, as described below.

Blizzards

Blizzards, as defined by the NWS, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for three hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills.

Blizzard conditions can also exist without a major storm system being near the state. Strong surface winds can blow already fallen snow, which is known as a "ground blizzard." Visibility can be reduced to near zero even though the sun is shining, and the tops of power poles and trees are seen easily. These conditions are extremely variable in duration, from hours to even greater than a day. Ground blizzards are usually accompanied by very cold temperatures and wind chill conditions, potentially making them as deadly as a conventional blizzard.

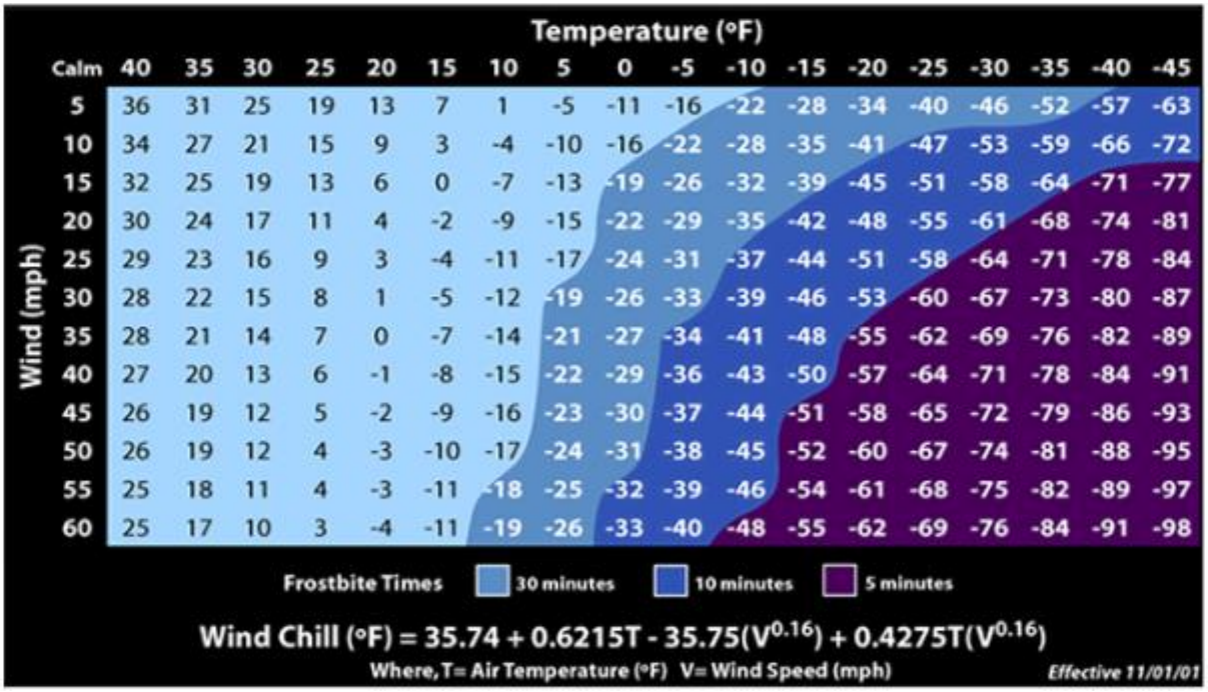
On average, there are 10 winter storms (ice storms, heavy snow events, winter storms, and blizzards) each year in North Dakota. Three to four of these storms reach blizzard intensity which makes North Dakota one of the nation’s leaders in blizzard frequency (National Climatic Data Center, 2010; National Weather Service, 2007).

Extreme Cold/Wind Chill

Extended periods of cold temperatures frequently occur throughout the winter months in North Dakota. Heating systems generally compensate for the cold outside. Most people limit their time outdoors during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it feels when outside. Wind chill is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects (National Weather Service, 2007). Figure 3.7.12-1 shows the National Weather Service wind chill chart.

Figure 3.7.12-1 NWS Wind Chill Chart



Temperature (°F)

Wind (mph)	Calm 40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: National Weather Service, 2009

Heavy Snow

Other hazardous winter storms also exist that do not meet the criteria of a blizzard. Winter storms containing heavy amounts of snow, rapid snowfall rates, or enough wind to reduce visibilities and create hazardous road and outdoor conditions are an annual occurrence in the state. Six inches of snow or more in 12 hours or 8 inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events.

Ice Storms

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into a warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth's surface. Extended periods of freezing rain can lead to accumulations of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulations can bring down trees and power lines. The impacts of ice storms can depend on how severe the storm is, how much wind occurs during the storm, the time of year the storm occurs, and how fast the ice melts.

Structure collapse occurs when the forces of gravity or other external forces overcome the structural integrity of a building. A severe winter weather event, accompanied by ice and heavy snow, can lead to structure failure due to overwhelming ice and snow loads. Power lines and communications towers also topple during winter storms, disrupting supplies to residents, businesses, and agricultural producers. Transportation.

Winter storms can often be associated with other hazards. The most common hazards during winter weather events are transportation accidents. Roadways become hazardous quickly during snow, blowing snow, and ice events. Most accidents involve passenger vehicles; however, an accident involving a commercial vehicle transporting hazardous materials is also possible. Transportation accidents are discussed in further detail in Section 3.7.14.

Strong winds and ice or snow accumulations can take down utility lines. A long-term utility outage becomes more significant during extended cold periods as sheltering and cold weather exposure becomes more challenging. Accessing those in rural areas following heavy snow events to deliver supplies or provide emergency services can be difficult; the need for such services would be compounded by any long-term utility outage. In North Dakota, severe winter seasons often translate to severe flooding potential in the spring.

3.7.12.2 Previous Occurrences

North Dakota has winter storms several times per year. Records show that three to four severe, widespread blizzards occur each decade. The winter of 1996 saw incredible levels of snow almost statewide and the blizzard and rapid thaw of April 1997 produced conditions of such dramatic proportions that records were not available to compare the magnitude of the total loss which occurred. Adverse impacts from severe winter storms have altered the course of history; a severe winter storm in the western part of the Dakota Territory between 1886-1887 ended open range ranching after producers lost up to 75% of their herds. A year later, widespread loss of life occurred during the Schoolhouse Blizzard that illustrated how quickly weather conditions change on the Northern Prairie. The day started with relatively warm temperatures until a precipitous drop of 50 degrees and heavy snow accompanied a blizzard. Many children, dismissed from school, never made it home. In total, an estimated 400 individuals lost their lives, thousands of head of livestock and wild animals perished, and snow-covered buildings collapsed.

Other historic storms, described in the Appendix 7.4.10, resulted in significant loss of life. For example, the March 1941 blizzard claimed the lives of 39 individuals, a 1996 blizzard resulted in 15 deaths, and a sudden storm in February 1984 killed 6 people, including 4 exposed to carbon monoxide after their vehicle was trapped in a Fargo underpass.

The NDDES, the SHSND, and the NCEI provided the following synopses of winter storm events since 2010:

- January 2010 Blizzard – Intense storm systems brought blizzard conditions and wind gusts of 45 to 55 mph to North Dakota. Many roadways and schools statewide were closed due to icy conditions, near zero visibilities, and widespread power outages. An estimated $16.7 million in damage, primarily to electric systems, were reported in western and central North Dakota. This storm received a Presidential Disaster Declaration.
- April 2010 Winter Storm – Heavy wet snow and sleet combined with strong winds to cause widespread damage to electric systems and extended power outages lasting from several days to several weeks. Thousands of power poles and hundreds of high voltage transmission towers collapsed. Travel throughout central North Dakota was nearly impossible. Damage were estimated at over $35 million. This storm received a Presidential Disaster Declaration. The snowfall amounts from the January and April winter storms also contributed to severe spring flooding.
- April-May 2011 Winter Storm – A powerful late spring storm system swept across the northern Plains region April 29 into May 1. Parts of western and north central North Dakota were hit the hardest, experiencing a prolonged period of very strong winds, freezing precipitation, and the heaviest snow of up to 14 inches. Some reporting stations observed peak wind gusts in excess of 75 mph. Impacts in these parts of the state were extreme and devastating, as the ice and heavy wet snow combined with the strong winds to knock down numerous trees and power lines, resulting in the loss of power to thousands, as well as stranding many motorists. Across southwest and central North Dakota impacts were less severe; however, the widespread blizzard conditions still resulted in numerous road closures and travel advisories. Far south central and eastern North Dakota received very little snowfall but still experienced the high winds. A preliminary damage assessment by state officials documented an estimated $6.5 million in damage, leading the North Dakota Governor to issue a State Disaster Declaration. Over 1,500 power transmission structures were damaged, and estimated livestock losses were more than 1,000. Also, one direct fatality and one direct injury were attributed to the storm near New England in Hettinger County, where a two-vehicle head on crash occurred due to low visibilities in the blizzard.

This storm resulted in a Major Disaster Declaration (DR-1986), declared on May 20, 2011. Total damage was $7.9 million.

- April 14-15, 2013 Winter Storm – A late spring winter storm broke multiple records in North Dakota. The record-setting April blizzard that produced well over a foot of snow shuttered most activities for southwestern and south-central North Dakota and wreaked havoc toward the east. Zero visibility and drifting snow led the North Dakota Transportation Department and the Highway Patrol to close Interstate 94 from the Montana border to Fargo, Interstate 29 from Fargo to Grand Forks and United States Highway 83 from Bismarck to Underwood. No-travel advisories were put in place for most other parts of the state. The daily record for April 14 had been 5 inches in 1986; the new record was 17.3 inches. The NWS reported three other records. The record daily snowfall for April had been 15.2 inches set in 1997; the new record is 17.3 inches. Record April snowfall in 1984 measured 18.7 inches; the new record set April 15, 2013, was 21.5 inches. The record snowfall for any calendar day of the year had been 15.5 inches set on March 3, 1966; the new record is 17.3 inches set on April 14, 2013.
- October 4-5, 2013 Winter Storm - An intense very early winter storm impacted southwest and parts of south-central North Dakota, bringing wind gusts over 45 mph and snowfall of 20 inches in some locations at a time when agriculture producers were in the midst of harvesting. A classic Colorado Low storm moved out of the central Rocky Mountains on October 4, then moved slowly northeast before exiting into the Upper Mississippi Valley later on October 5. Bands of heavy snow developed underneath the system's trough of warm air aloft (TROWAL) from over southwest North Dakota into western South Dakota. The heaviest snow with this system occurred over the northern Black Hills of western South Dakota, where over three feet of snow fell due to the TROWAL and a strong upslope northerly low-level flow. Snowfall amounts tapered off into North Dakota but were still significant with over twenty inches reported in southern Hettinger County. Snowfall north of Interstate 94 quickly dropped to less than one inch with decreased forcing aloft, and also near the Missouri River where the rain/snow line was located. In addition to the heavy snow, strong northeast winds with peak gusts over 45 miles per hour during the late afternoon and evening of the 4th resulted in blizzard conditions over Adams, Grant, and Sioux counties. Winds decreased later on October 5 as the surface low moved into Minnesota. Impacts from this storm were severe, with President Obama signing a disaster declaration for parts of the state. Impacts included damage to public infrastructure and power utilities. Significant losses occurred to both cattle and crops. The wet snow and high wind killed cattle and the storm delayed a harvest that was already behind schedule due to a wet fall. At the storm's peak, an estimated 9,849 customers/accounts experienced power outages, many for as long as two weeks. A disruption of power jeopardized operations of a southwestern water system, placing several communities at risk of losing a sanitary source of water. Damage totaled $5.7 million.

Community Coffee Comments

The very nature of their existence places homeless individuals at a unique disadvantage when it comes to hazards and threats. Of all population groups, they face the most exposure to severity of weather extremes since they lack the shelter and often the resources to retreat from sub-zero temperatures, snow, ice and high winds.

During winter, some remain in their vehicles even when the temperature drops well below freezing while others wait for homeless shelters to open in the evening. On bitter, cold days, they seek refuge in public facilities, such as libraries and hospitals. They have learned to keep a low profile to avoid being expelled from these facilities.

- December 25-26, 2016 Ice Storm/Blizzard - Snow developed over western and central North Dakota during the early portion of December 25, while freezing rain developed in the warmer air over the southern James River Valley. Cold air wrapped into the system through the day which led to strong winds and a widespread blizzard. Most roads were closed or blocked throughout the state of North Dakota by the morning of December 26. Over the southern James River Valley where freezing rain fell, widespread power outages occurred as many power poles broke, including primary and secondary feeds. Some smaller communities went without power until December 29. Power outages occurred throughout McIntosh County. The power cooperative that serves mainly rural portions of McIntosh County reported 15-three phased poles near Lehr were snapped, along with multiple other poles and lines. One thousand and fifty meter-services in rural areas experienced outages which are served by nine substations. The investor owned utility which serves many of the communities reported multiple primary and secondary feeds down, with some communities going without power until December 29. Damage estimated at $750,000.

The NCEI has recorded 4,668 winter weather incidents in North Dakota from January 1, 2000, through February 2018. This count includes blizzards, extreme cold/wind chill events, heavy snow, ice storms, winter storms, and winter weather. Note that some winter weather incidents may be listed more than once in the database if they occurred over several reporting jurisdictions. The total number of distinct winter weather events in North Dakota from January 2000 to February 2018 is about 321, which equates to about 18 events per year (NCEI, 2018).

Additionally, North Dakota has experienced 28 winter weather declared disasters and emergencies from 1978 to 2018. Table 7.4.10-1 in Appendix 7.4.10 describes all declared disasters and emergencies from winter weather.

3.7.12.3 Location and Extent

Winter storms can range from localized events that affect small sections of the state, to statewide events that encompass all cities, counties, townships, and tribal reservations across North Dakota. Figure 3.7.12-2 shows the number of severe winter weather events from 2000 to 2018 by county. It is evident that severe winter weather impacts the entire state, but the eastern counties have experienced more events than the central and western counties. Table 3.7.12-1 provides an overview of the extent that severe winter weather could impact resources.

According to the NDDOT, dealing with winter weather on state roads is a primary mission of their agency. When conditions are bad enough, NDDOT works with the North Dakota State Highway Patrol and issues travel alerts, no travel advisories, and road closures, typically accomplished with road closure gates. The gates are situated such that they are located by communities that can handle trucks waiting for the roads to open. Lower volume roads are reported as closed or blocked but typically no physical barrier is placed. When closures occur, some cities open shelters for the stranded motorists. A primary concern for the agency is a winter weather event that results in many people stranded on the roadways. This does not happen frequently and typically is handled with state forces. Once in the last 10 years, conditions were serious enough to get the North Dakota National Guard involved to assist with rescues.

Figure 3.7.12-2 Severe Winter Weather Events by County, 2000 to 2018

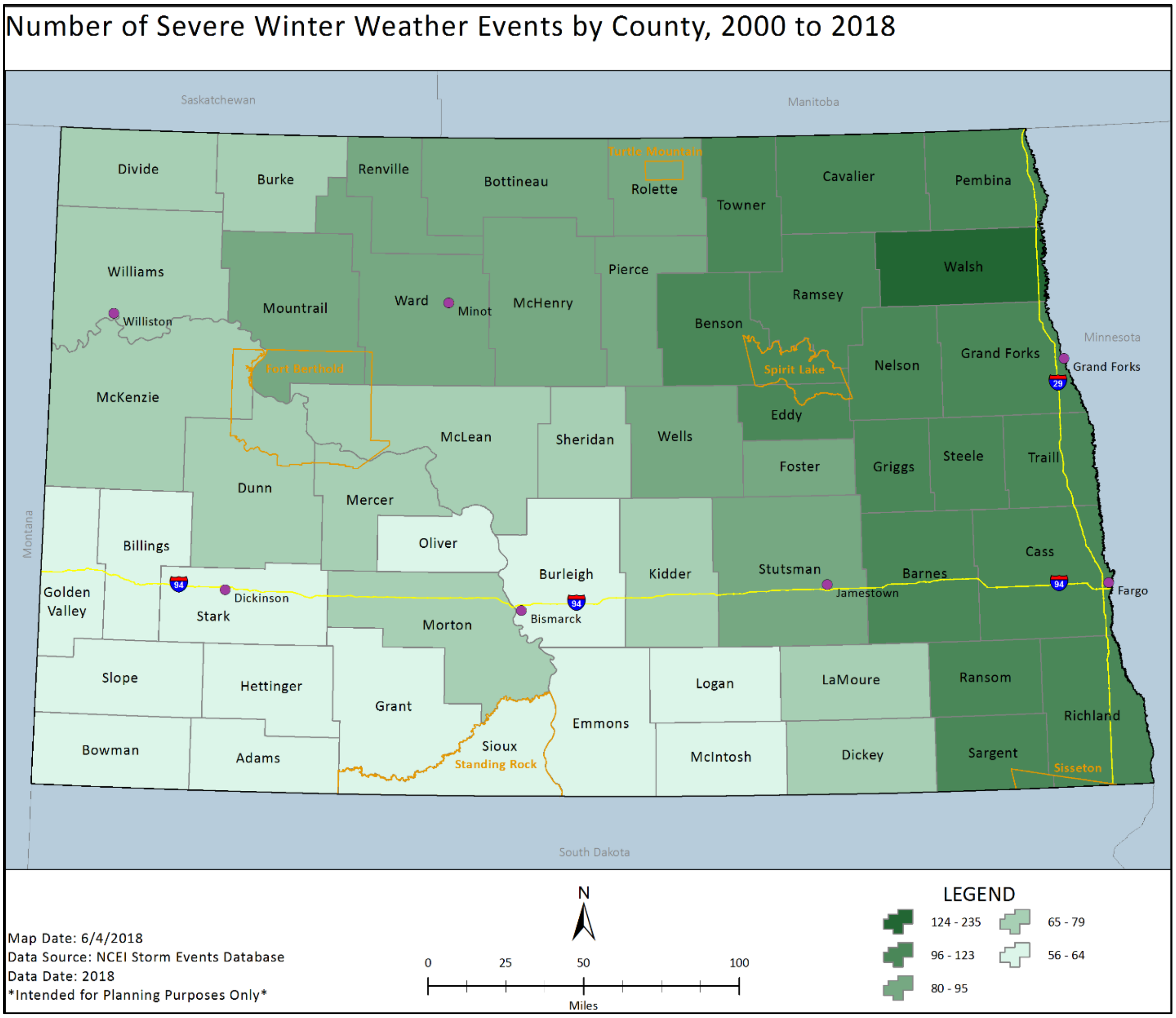


Table 3.7.12-1 Spatial Extent of Severe Winter Weather Impacts

Resources	Impact
People	Statewide
Property	Regional
Infrastructure	Regional
Government Operations	Statewide
Environment / Natural Resources	Regional
Cultural Resources	Regional

3.7.12.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event.

Table 3.7.12-2 presents the consequence analysis of a severe winter weather event. The event evaluated a series of blizzards impacting the entire state. The blizzards bring extreme wind chills, knock out power, and leave residents stranded. For the scenario evaluated, the most severe impacts would be to the economy and the environment. All sectors except the environment and public confidence in government would experience moderate impacts under this scenario.

Table 3.7.12-2 Severe Winter Weather Consequence Analysis

Severe Winter Weather Impacts	
Public	The impact on the public would be moderate. Due to extreme cold, the public may have to face power failures, communication disruption, dangerous driving conditions, and even serious health problems (including frostbite and hypothermia). Extremely cold temperatures, heavy snowfall, and heavy icing of surfaces may lead to property damage, as well as power loss, heat loss, and lack of shelter from the elements. Effects such as hypothermia from severe winter weather events can be most severe to North Dakota's homeless and low-income population. The use of space heaters and fireplaces to sustain warmth increases the risk of household fires and carbon monoxide poisoning. Rural residents are especially hard hit if they are not adequately stocked with food and fuel.
Responders	The impact on responders would be moderate. First responders may face extremely icy and dangerous road conditions as well as risk personal injury due to working in an extremely cold environment. Ice on roads may lead to vehicular crashes and prolonged response times. First responders will also respond to more cold-related injuries, such as hypothermia.
COOP	While the expectation is minimal, the threat may impact the state's ability to COOP based on the hazard's potential to impact facility heating systems or reducing functionality of equipment. If activation of alternate facilities was required, travel to the facility may be difficult due to icy or snowy road conditions.
Delivery of Services	Delivery of services may be impacted by icy and dangerous transportation conditions, causing food, water, and resource systems to be delayed or halted, as well as personal transportation by the public. This can cause school, workplace, and commercial shutdowns. Extreme cold temperatures may also damage or destroy goods if exposed for longer periods of time. Communication services may also malfunction. States may need additional workers from out of state to restore services, in the event of a widespread winter storm hazard.
Property, Facilities, and Infrastructure	The impact on property, facilities, and infrastructure would be moderate. The cascading effects of extreme cold can bring critical infrastructure to a halt. Critical facilities may be shut down or disrupted due to unsafe travel conditions, the risk of serious health problems, or failure of processes, materials, and machinery. Energy consumption escalates during extremely cold periods, straining power sources and causing power outages. Freezing conditions could disrupt water supply and sanitation. There is the potential for pipes to freeze and burst during cold weather, damaging property. **Transportation Impacts:** Severe winter weather events disrupt service, damage expensive infrastructure, and necessitate more frequent maintenance. NDDOT has spent $110,553,118 since 2013 on snow removal on state and interstate systems. From 2013 through 2017, there has been 107 state and federal highway closures related to winter storms (NDDOT, 2018).

Severe Winter Weather Impacts	
Environment	The impact on the environment would be low. Extreme cold can freeze crops and food sources, as well as disrupt ecosystems. Heavy wet snow before the leaves fall from the trees in autumn or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages. Pipe ways and critical facility equipment may freeze and break, causing hazardous and dangerous chemicals and materials to spread into human- and animal-populated areas, as well as water systems and the food supply. Extremely cold temperatures may injure or kill wildlife as well as decreased or destroyed food and water sources. Livestock can be severely impacted. The inability to get feed and water to livestock can become critical quickly. Dehydration is a major cause of livestock casualties. Cattle can't lick enough snow to satisfy their thirst; they die of lack of water before succumbing to cold or suffocation.
State Economy	The impact on state economy would be moderate. Local and state agencies, as well as businesses and general commerce, may face a sharp decline in revenue as individuals stay home due to being unable to get to work. Resources from all levels will be utilized and local government will face fiscal consequences. Energy consumption greatly increases during extremely cold weather due to the increase heating of homes, businesses, and critical facilities during prolonged periods of time. The increase in generating heat energy comes at a high cost for local and state agencies, as well as homeowners.
Public Confidence in the State's Governance	The impact on the public confidence in the state's governance would be low. Extreme cold is a very dangerous threat that can affect the public, first responders, infrastructure, agriculture, economy and overall state operations. Direct, effective and timely response by all levels of government is required for public confidence in the state's governance.

3.7.12.5 State Risk Assessment

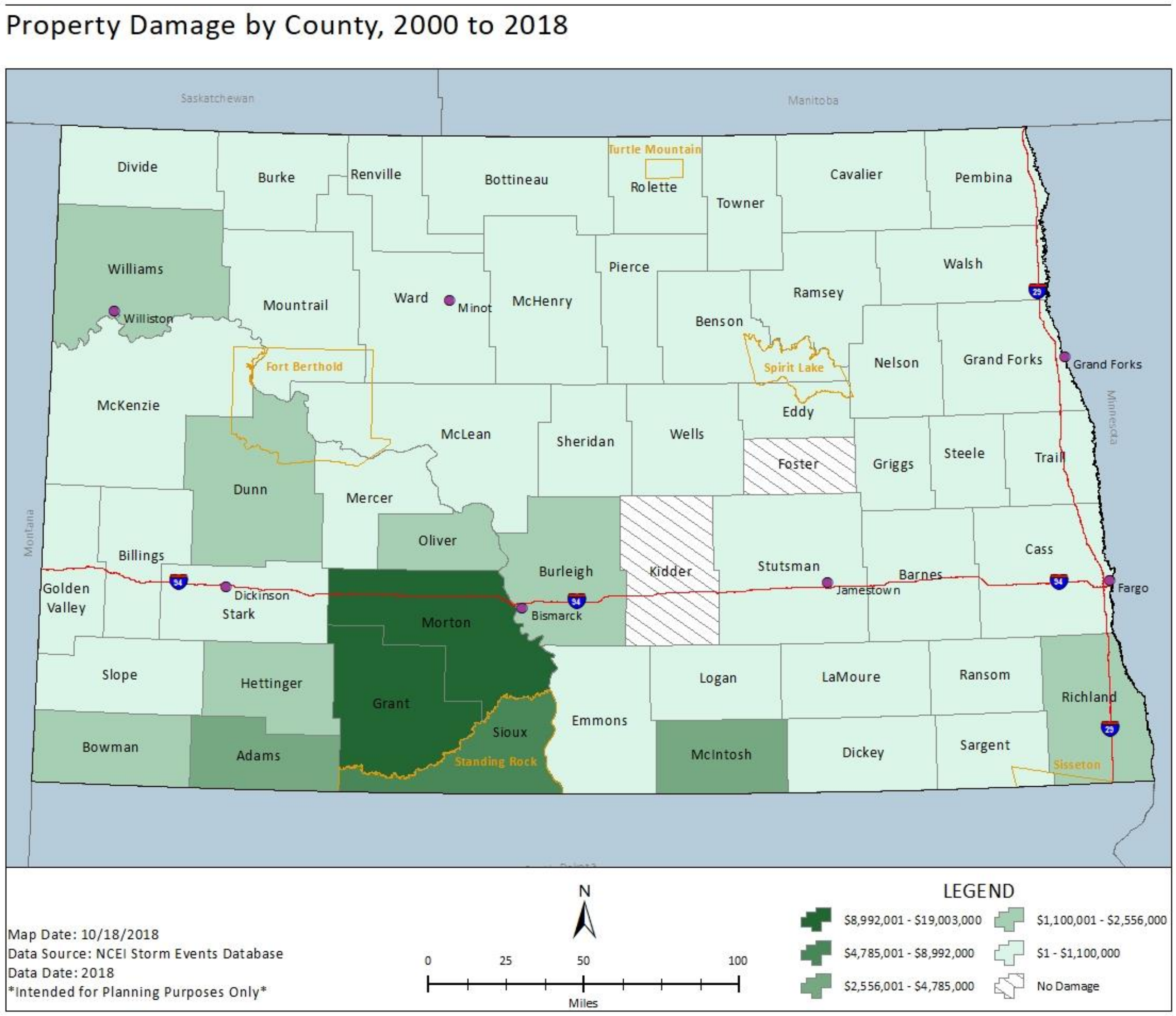
Probability

Seven Presidentially Declared Disasters have been declared in North Dakota since 2000 for snow or ice storms. Based on blizzard studies, about three to four of severe blizzards will occur per decade (Schwartz, 2000; National Weather Service, 2007). The severe blizzards and winter storms that result in the loss of life, extended road closures, long-term power outages, communication failures, or significant isolation problems represent high magnitude winter storm events for North Dakota. Blizzard conditions continuing for two or more days and blocked roadways or power outages for a week or more both represent extreme winter weather conditions that are possible. These types of events present significant transportation, sheltering, and logistical challenges.

Vulnerability Assessment

As mentioned previously, the entire state is vulnerable to severe winter weather events. According to the NCEI Storm Events database, from 2000 to 2018, Walsh County experienced the most severe winter weather events (including blizzards, extreme cold/wind chill events, heavy snow, ice storms, winter storms, and winter weather), with 235 events and $402,000 in reported property damage. This is followed by Cass County with 123 reported events and $300,000 in property damage. Adams County has experienced the least number of events, with 56. However, in terms of damage, Morton County has experienced the most impacts from winter weather events, with $19,003,000 in reported damage and 70 events. Grant County follows with $16,750,000 in damage and 61 events. This is double the amount of the third highest county's property damage, which is Sioux County, with $8,992,000 in damage and 63 events. Based on reported damage, the southwest and west regions of the State are most vulnerable to damage from winter weather events, as shown in Figure 3.7.12-4. Table 7.4.10-2 in Appendix 7.4.10 shows events, damage, injuries, and deaths resulting from winter weather events by county.

Figure 3.7.12-3 Property Damage from Severe Winter Weather by County, 2000 to 2018



Homeless individuals are especially vulnerable to severe winter weather. According to the Missouri Valley Coalition of Homeless People, a point in time (PIT) count is performed every year to collect data on the homeless population. This count is done on one particular day in January. Outreach volunteers search out those who are unsheltered, living in cars, under overpasses, in parks, 24-hour restaurants, etc. The sheltered numbers include emergency shelters and transitional facilities. This data is collected through the Homeless Management Information System (HMIS) PIT count. The shelter numbers do not include domestic violence facilities. This is a snap shot of one particular day and only those who are found through outreach efforts and volunteers can be counted. The main concerns across the state is the lack of open emergency shelters during the day. With no place to go, the homeless population suffers from exhaustion, increased health concerns (physical and mental) as well as the lack of security of not knowing what will happen next as the weather can change in a matter of hours. Table 3.7.12-3 shows the PIT counts across North Dakota since 2013.

Table 3.7.12-3 North Dakota Homeless Population 2013-2018

Year	# Sheltered	# Unsheltered	Total
2013	674	1,395	2,069
2014	794	464	1,258
2015	656	486	1,142
2016	707	216	912
2017	758	331	1,046
2018	494	48	542

Source: Missouri Valley Coalition of Homeless People, 2018

State Assets and/or Critical Facilities at Risk

Buildings typically remain unaffected by winter weather except when heavy snow loads put overwhelming pressure on rooves, very cold temperatures freeze pipes, and utilities failure occurs. Should the weight of the snow on the roof of a state-owned building or critical facility exceed its structural capability, the roof could collapse, as was the case in January 1997 when the roof of the Winter Show Building in Valley City collapsed. This type of loss might be generally categorized as a collapse by the North Dakota State Fire and Tornado Fund, along with other buildings that have collapsed for other reasons. Table 7.4.10-3 in Appendix 7.4.10 shows the collapse claims paid for buildings and property owned by state agencies as well as other state and local critical facilities that are insured by the State Tornado and Fire Fund. This source shows data through 2013, and more updated data was not available. Almost $3.5 million dollars in claims were paid out for collapse on state and other critical facilities between 1989-2013. Although all of these claims may not have resulted from winter weather, it is a demonstration of damage that may result in the event of a structure collapse.

Extremely cold temperatures may cause pipes to freeze and subsequently burst, causing water damage to structures. One of the greatest challenges for critical facilities during significant winter weather is the inaccessibility of such facilities due to poor roadways, utility outages, or dangerous wind chills. First responders such as fire, law enforcement, and ambulance may have a difficult time responding during poor road conditions or may not be able to provide certain services during electrical power outages. Those facilities with back-up generators are better equipped to handle a winter storm situation should the power go out.

Winter weather does pose a threat to key infrastructure. The most difficult network to maintain is the road infrastructure. During periods of heavy snow, ice, or blizzards, roads can quickly become impassable, stranding motorists and isolating communities. Long term road closures during an extended cold period may diminish and threaten propane, fuel, and food supplies. Above ground power and telephone lines can be taken out by falling tree branches or thick ice accumulations. Following severe ice storms, power may take weeks to be restored. Water infrastructure may also be threatened by winter weather, particularly rapid freeze and thaw periods that cause underground water mains to burst. This could result in temporary disruptions of running water.

In lieu of a precise loss estimate, exposure analysis can be used to provide some idea of the quantitative value of state-owned facilities at risk to severe winter weather. The best available data for the exposure value of state-owned facilities was from the State Fire and Tornado Fund, which includes the insured value of these facilities. For this analysis the insured value represents the exposure value. In total, there are about $13.7 billion worth of state-owned facilities are exposed to severe winter weather. See Section 2 for the total exposure value by facility category.

Loss Estimates

Damage from severe winter weather events from 2000 to 2018 included $78,892,000 in property damage, 6 direct deaths, and 16 direct injuries. Based on these numbers, North Dakota could expect roughly $4,382,889 in average annual property damage due to severe winter weather. Based on NCEI event narratives, typical losses due to severe winter weather include livestock injury and death, crop loss, vehicle accidents, downed power lines and utility poles, power outages, damaged and collapsed roofs, delayed traffic and commerce, frozen pipes, and human fatalities or injuries due to exposure or vehicle accidents.

Utility providers often suffer damage from winter weather events. Table 3.7.12-4 and Table 3.7.12-5 shows damage from winter storms reported by the North Dakota electric providers.

Table 3.7.12-4 Winter Storm Damage to the North Dakota Association of Rural Electric Cooperatives since 2013

Date	Location	Damage	Impacted Customers	# Days Impacted
2018	Logan, Emmons, Kidder, and McIntosh counties	$91,000	1,110	4
March 2017	Mountrail and Williams counties		2,730	
December 2016	Dickey County	$200,000	250	5
	LaMoure County	$85,000	175	3
	Logan County	$65,000	150	3
	McIntosh County	$100,000	200	5
	Stutsman County	$20,000	200	3
	Stutsman County	$45,000	350	1
January 2016	Mountrail and Williams counties		3,382	
2015	Ward County	$75,000	2,000	3
	Burke and Divide counties	$50,000	300	
December 2015	Stutsman and Kidder counties	$40,000	200	0.5
	McLean Territory		1,721	
	Mountrail and Williams counties		3,190	
December 2014	Nelson, Walsh, Grand Forks, Ramsey, Steele, and Pembina counties	$55,000	4,800	
October 2013	Adams, Bowman, Hettinger and Slope counties	$2,540,000	1,003	
January 2013	Mountrail and Williams counties		6,023	
Totals		**$3,366,000**	**27,784**	**27.5**

Source: North Dakota Association of Rural Electric Cooperatives, 2018

Table 3.7.12-5 Northern Plains and Dakota Valley Electric Cooperatives Winter Storm Projects

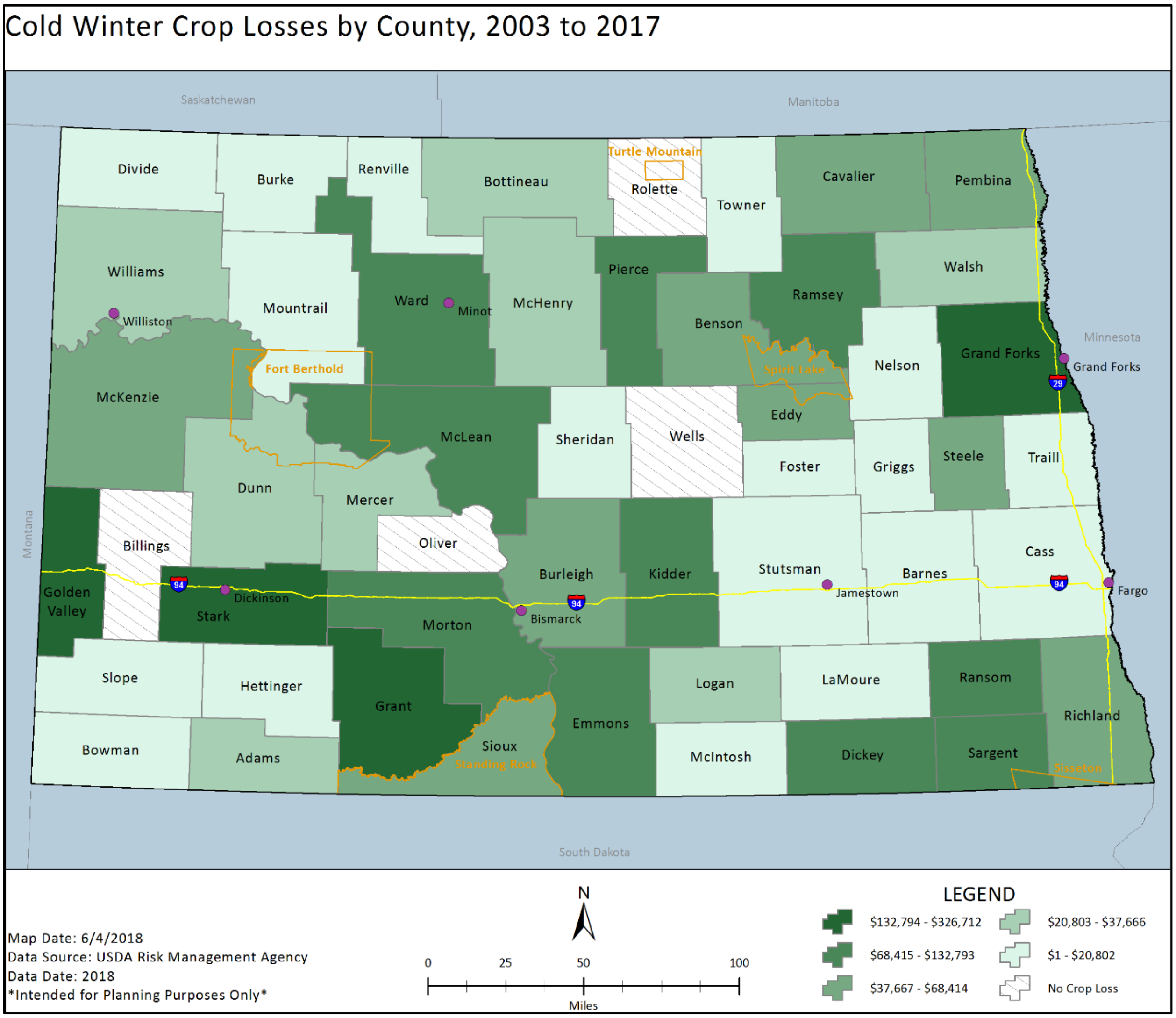
Year	Project Name	Type	Length (miles)	Estimated Cost of Project	FEMA /State Share	Comments
Northern Plains Electric Cooperative						
2010	Rolla 3 phase	HMPG	5	$674,287	$573,144	Winter Storms (multiple events)
2011	Maddock 3 Phase	HMPG	7.5	$486,340	$413,389	Ice Storms (multiple events)
2011	Leeds/Churchs Ferry 3 ph	HMPG	5.5	$439,340	$373,439	Ice Storms (multiple events)
2012	Bowdon 3 Phase	HMPG	3.7	$313,640	$266,594	Winter Storms (multiple events)
2014	Oberon 3 ph	HMPG	3	$261,815	$222,543	Winter Storms (multiple events)
Total Mitigation			**24.7**	**$2,175,422**	**$1,849,109**	
Dakota Valley Electric Cooperative						
2011	Millerton 3 Phase	HMPG	3	$168,000	$142,800	Winter Storms (multiple events)

Year	Project Name	Type	Length (miles)	Estimated Cost of Project	FEMA /State Share	Comments
2012	Milnor 3 Phase	HMPG	3	$201,500	$171,275	Winter Storms (multiple events)
2012	Gackle 3 Phase	HMPG	3	$198,250	$168,513	Winter Storms (multiple events)
Total Mitigation			**9**	**$567,750**	**$482,588**	

Source: Northern Plains Electric Cooperative and Dakota Valley Electric Cooperative, 2018

The agriculture industry is especially at risk to losses from severe winter weather events. According to data from the Risk Management Agency, cold weather crop insurance payments for North Dakota insured crops totaled $2,678,527 between 2003 and 2017 (Risk Management Agency 2003-2017). The 2011 North Dakota Crop Insurance Profile Report, issued by the USDA Risk Management Agency, indicated 89% of North Dakota insurable crops were insured in 2011. Therefore, the crop insurance payments have been extrapolated to estimate losses to all insurable crops. Extrapolated crop losses due to cold winters between 2003 and 2017 totaled $3,009,581 or about $200,639 annually. Grant County has experienced the most in crop losses, with $326,712 since 2003, followed by Stark County with $265,575 in losses. Billings, Oliver, Rolette, and Wells have all experienced no losses due to cold winter events. Unlike property damage reported above, high crop losses are experienced across the entire state, and the southwest region of the state has the most counties with the highest tier of crop losses from cold winters. Figure 3.7.12-4 shows crop losses by county due to cold winter events from 2003 to 2017. It is evident that the entire state is vulnerable to losses from severe winter weather events, and the highest damage do not always correlate with the counties that experience the greatest number of events.

Figure 3.7.12-4 Crop Losses from Cold Winter Events from 2003 to 2017 by County



3.7.12.6 Future Conditions

Successful mitigation of severe winter weather requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future severe winter weather risk.

Climate Change

Overall, winter storms have increased in frequency and intensity since the 1950s, and their tracks have shifted northward over the United States. Extremely heavy snowstorms increased in number during the last century in the northern and eastern parts of the United States but have been less frequent since 2000. Specific to North Dakota, winter and spring precipitation is projected to increase due to climate change. With increasing temperatures in the state, liquid winter precipitation has become more frequent, indicated by more frequent ice storms. Total season snowfall has increased in the northern Great Plains region. These projected increases may benefit agricultural productivity by increasing water availability through soil moisture reserves during the early growing season, but this can be offset by fields too wet to plant. An increase in winter storms that bring heavy snow, ice, and blizzard conditions to North Dakota will continue to impact people and the economy.

The following Table 3.7.12-6 presents the best available data relating to climate changes impacts to the severe winter storms. Overall, the state should expect an increased risk to severe winter weather in the future.

Table 3.7.12-6 Expected Changes to Severe Winter Weather Future Condition

Condition	Projected Change
Location	Severe winter weather events exist statewide. Winter precipitation are projected to increase in the northern portions of the area.
Extent / Intensity	Severe winter weather events are projected to increase in extent and intensity. Increased snowfall will also contribute to urban flooding.
Frequency	Severe winter weather is projected to occur more frequently as a result of additional precipitation in the winter months, particularly in the southern part of the state. Changing extremes in precipitation are projected across all seasons, including higher likelihoods of increasing snow events.
Duration	The amount of winter precipitation and the number of days with heavy snowfall are projected to increase.

Changes in Development

As detailed in Section 2, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation.

Future development could be impacted by winter storm hazards in those communities that lack building codes. Homes and businesses lacking the integrity to hold heavy snow loads could face future damages. Section 4 includes additional information regarding counties and cities that have adopted the state building code. New and future development in those counties that have adopted and enforce the state building code should be better able to withstand extreme winter weather.

Increased population and development could put more people at risk during a severe winter weather event. A higher number of people may be susceptible to vehicle accidents on snowy or icy roads, and events such as power outages would affect more people. However, areas with growing populations may also be less at risk in some ways if people are less isolated and emergency assistance is more accessible during an emergency. Table 7.4.10-4 in Appendix 7.4.10 shows population change from 2010 to 2030 and past to winter weather events by county. By 2030, Cass County is projected to be the most populated county in North Dakota, with a population of 214,719, and have experienced 123 severe winter weather events which is the second highest number of events across all counties. Morton County has experienced the most in property damage from severe winter weather events and is projected to have a 31% increase in population by 2030. Many counties across the state are experiencing population growth, and since severe winter weather events will continue to occur statewide, the overall exposure to these events is increasing in North Dakota.

State assets and critical facilities may be more at risk to severe winter weather events in the future due to the projected increase in intensity and frequency of winter weather events from climate change. Individual storms that produce extreme amounts of heavy snow may put state owned assets at risk to structure collapse. Additionally, an increase in frequency of these storms may make it harder to maintain accessibility to critical infrastructure like roadways and airports.

3.7.12.7 Jurisdictions at Risk

All 58 local and tribal hazard mitigation plans profile severe winter weather. Figure 3.7.12-5 presents a summary of those plans and identifies how they ranked the overall risk presented by severe winter weather. Forty-eight jurisdictions ranked severe winter weather as a high hazard, 9 as medium, and 1 as low. The only jurisdiction to rank severe winter weather as a low hazard is Morton County. This ranks severe winter weather as the number one out of 14 hazards according to North Dakota local hazard mitigation plans. Overall, this corresponds with the State Risk Assessment in that the entire state is vulnerable to severe winter weather.

Figure 3.7.12-5 Severe Winter Weather Hazard Ranking by Jurisdiction

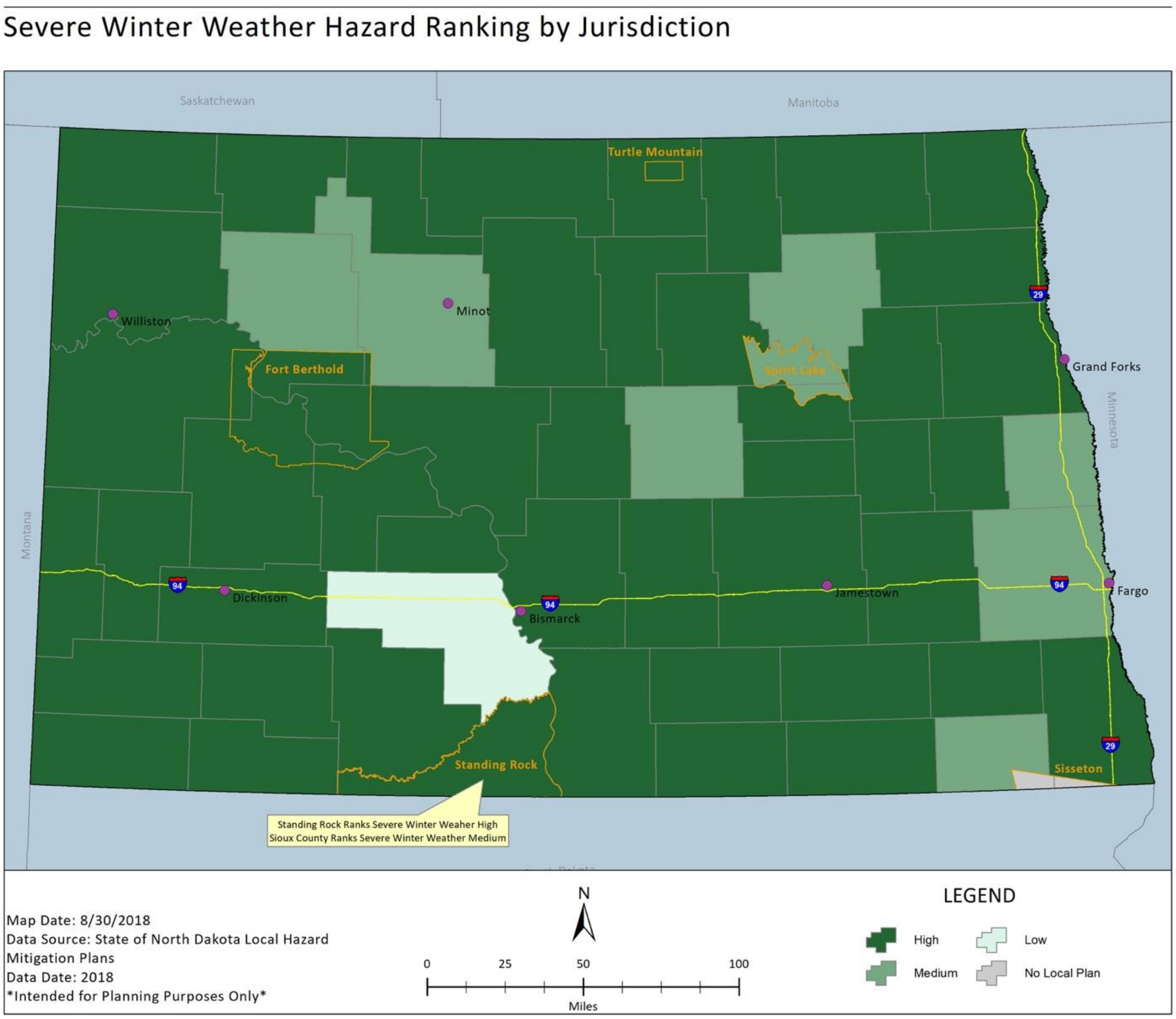


Table 7.4.10-5 in Appendix 7.4.10 includes a compilation of available hazard ranking and loss information, when available, for severe winter weather as documented in these local hazard mitigation plans. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure above due to map scale. The overall trend in losses identified for severe winter weather relate to buildings and homes. Additionally, many jurisdictions identify vulnerable populations, such as the elderly and children.

3.7.12.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including severe winter weather, to create an overall Risk Factor score. Following this methodology, the dam failure risk factor score was 3.21, which is considered a high hazard on a scale of 1 to 4, where 4 is the highest risk threat. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

In summary, severe winter weather events will continue to be a significant hazard for North Dakota. It is expected that the State will experience approximately three to four severe winter storm hazard events per decade. Severe winter weather events can cause significant economic damage, as well as fatalities and injuries. Additionally, winter weather events can cause infrastructural and structural damage throughout the state. Climate change is projected to bring an increase in frequency and intensity of severe winter storms to North Dakota, which can exacerbate impacts that the state already experiences.

The committee discussion produced many ideas for mitigating the effects of severe winter storm hazard. Many of these ideas discussed were preparedness measures, including improved forecasting, pre-positioning of supplies, supplying backup generators, and reinforcing structures.

North Dakota’s Living Snow Fence Initiative, which is currently unfunded, helped reduce future vehicle accidents and casualties caused by severe winter weather events. Living snow fences consist of trees and shrubs strategically placed to trap snow and prevent it from blowing across roadways and into underpasses. These plantings are typically located in the former locations of man-made snow fences installed by NDDOT District Engineers. The 1996/1997 winter storms illustrated the fact that the existing snow fence setback of 165 feet from the centerline of the road was inadequate. This distance was subsequently increased to 200 feet, and the added snow catch area provided by this change was needed during the 2008-2009 winter season.

3.7.12.9 Data Limitations / References

Since major winter storms occur frequently in North Dakota, but do not always cause significant damage, the biggest data limitation is understanding the magnitude of an event that begins to challenge North Dakota communities. Records outlining the winter weather conditions (snow depth, temperature, wind, snowfall rates, water content, and duration) and the problems (number of accidents, condition of roadways, electric damage, and services needed) would increase the understanding of this hazard. Meteorologists can provide more detail on the atmospheric elements of winter storms.

Other key documents related to the Winter Storm hazard include:

- North Dakota State Emergency Operations Plan

3.7.13 Space Weather

3.7.13.1 Description

The NOAA Space Weather Prediction Center describes space weather as the condition in space that affects Earth and its technological systems. Space weather is a consequence of the behavior of the sun, the nature of Earth's magnetic field and atmosphere, and our location in the solar system. The active elements of space weather are particles, electromagnetic energy, and magnetic field, rather than the weather contributors on Earth of water, temperature, and air.

The Space Weather Prediction Center forecasts space weather to assist users in avoiding or mitigating the impacts of severe space weather. These are storms that originate from the sun and occur in space near Earth or its atmosphere. Most disruptions can be categorized into three types of events that can have environmental effects on Earth, as described below by the NOAA Space Weather Prediction Center:

- A **geomagnetic storm** is a major disturbance of Earth's magnetosphere that occurs when there is a very efficient exchange of energy from the solar wind into the space environment surrounding Earth.
- **Solar flares** are large eruptions of electromagnetic radiation from the sun lasting from minutes to hours. The sudden outburst of electromagnetic energy travels at the speed of light, therefore any effect upon the sunlit side of Earth's exposed outer atmosphere occurs at the same time the event is observed.
- **Solar radiation storms** occur when a large-scale magnetic eruption, often causing a coronal mass ejection (CME) and associated solar flare, accelerates charged particles in the solar atmosphere to very high velocities.

These storms can affect critical facility infrastructure and technology in various ways, including blackouts, high-frequency radio disruptions, and disruptions to satellite navigation. NASA describes impacts of a geomagnetic storm on and near Earth as follows: Aurora Borealis and Aurora Australis, communications disruptions, radiation hazards to orbiting astronauts and spacecraft, current surges in power lines, critical degradation, and corrosion in oil pipelines.

Source: Northern Lights, Prairie Journal

3.7.13.2 Previous Occurrences

There are no recorded catastrophic space weather effects in North Dakota. The nearest recorded storm affected Montreal, Canada on March 13, 1989, when a geomagnetic storm took out their commercial electric power for nine hours, effecting six million people. Space weather events that have impacted other parts of the world are documented below (Eastwood et al., 2017).

- **September 1859 -** A solar super storm, named the Carrington event, occurred September 1 to 2, 1859, and is one of the largest recorded geomagnetic storms in history. This storm impacted telegraph systems all over Europe and North America. Auroras were seen as far south as the Caribbean in the northern hemisphere.
- **May 1921** – This geomagnetic storm was estimated to be comparable in size to the Carrington event. Auroras occurred near the equator in Samoa, and geomagnetically-induced currents caused fires at several telegraph stations in Sweden.
- **May 1967** – An extreme solar flare and CME caused significant disruptions to communications

(especially military), radio blackouts, solar radiation storms, and a major geomagnetic storm.

- **March 1989** – The largest geomagnetic storm of the space age caused failure of the Quebec power grid and damaged two transformers in the United Kingdom.
- **October-November 2003** – One of the largest observed solar flares on record, a 90-minute blackout in 2003 impacted 50,000 customers in Sweden.
- **July 2012** – This CME was not Earth-directed, but if it were, it would have generated a very severe "Carrington class" geomagnetic storm. This event can be used for severe space weather planning scenarios.

3.7.13.3 Location and Extent

All jurisdictions and tribes in North Dakota rely on critical infrastructure and technology in some fashion, so the entire state is vulnerable to space weather events. Mapping of utility and communications infrastructure is maintained by the individual services providers. The North Dakota Public Service Commission maintains lists of providers of public utilities in the state for electricity, natural gas, and telecommunications.

The NOAA Space Weather Prediction Center has created Space Weather Scales as a way to communicate to the general public about the possible effects on people and technologies. The scales describe the environmental disturbances for three event types: geomagnetic storms, solar radiation storms, and radio blackouts. The scales have numbered levels (1-5) similar to hurricane, tornado, and earthquake severity ratings and they list the possible effects at each numeric level.

Table 7.4.11-1 in Appendix 7.4.11 describes the G1-G5 severity scale disturbances in the geomagnetic field caused by gusts in the solar wind that blows to earth. The possible effects are on power systems, spacecraft operations (including satellites), and other operation systems.

Table 7.4.11-2 in Appendix 7.4.11 describes the S1-S5 severity scale as elevated levels of radiation occur as the number of energetic particles increases. The possible biological effects are on people, satellite operations, and other operation systems from the solar radiation storm.

Table 3.7.13-1 describes the R1-R5 severity scale disturbances of the ionosphere caused by X-ray emissions from the sun from a radio blackout storm or solar flare. An event could affect high frequency radios and navigation.

Table 3.7.13-1 NOAA Space Weather Scale for Radio Blackouts

Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
R 5	**Extreme**	**High Frequency (HF) Radio:** Complete HF (high frequency**) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and enroute aviators in this sector. **Navigation:** Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 (2×10^{-3})	Less than 1 per cycle
R 4	**Severe**	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. **Navigation:** Outages of low-frequency	X10 (10^{-3})	8 per cycle (8 days per cycle)

Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
		navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.		
R 3	**Strong**	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. **Navigation:** Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	**Moderate**	**HF Radio:** Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. **Navigation:** Degradation of low-frequency navigation signals for tens of minutes.	M5 (5×10^{-5})	350 per cycle (300 days per cycle)
R 1	**Minor**	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. **Navigation:** Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

Source: NOAA Space Weather Prediction Center, http://www.swpc.noaa.gov/NOAAscales/#GeomagneticStorms

* Flux, measured in the 0.1-0.8 nm range, in $W \cdot m^{-2}$. Based on this measure, but other physical measures are also considered.

** Other frequencies may also be affected by these conditions.

Table 3.7.13-2 provides an overview of the spatial extent of impacts on different resources from a space weather event.

Table 3.7.13-2 Spatial Extent Space Weather Impacts

Resources	Extent of Impacts
People	Statewide
Property	Statewide
Infrastructure	Statewide
Government Operations	Statewide
Environment / Natural Resources	N/A
Cultural Resources	Statewide

3.7.13.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. This section summarizes the results of a consequence analysis. It is important to note that the consequences of a space weather event would be cascading.

Table 3.7.13-3 Space Weather Consequence Analysis

Space Weather Impacts	
Public	In general, there is a limited direct impact on the public due to space weather. The exception to this is during solar radiation storms at the S2 or higher level, when passengers and crew in high flying aircraft at high latitudes may be exposed to radiation risk. However, there will likely be widespread secondary impacts from the impact space weather could have on infrastructure (discussed below). Heat, running water, sanitation, communications, grocery stores, pharmacies, and hospitals all require electricity and without these services and facilities, the public will likely suffer. Particularly an ill-timed space weather event, such as a power outage during extreme heat or cold leaving residents dangerously without heat or electricity. Locations in North Dakota with higher populations would likely experience more public impacts.
Responders	In general, there is a limited direct impact on responders. However, if there are other hazard events that responders are acting on – the secondary impacts due to space weather could limit the ability of responders to complete their work. For example, the potential impacts on global positioning system (GPS) technology and satellite communication could limit the ability of responders to navigate to a site and/or communicate.
COOP	COOP will be dependent on the impact space weather has on responders (above) and delivery of service (below).
Delivery of Services	Depending on the scope of the event, service delivery critical to health and safety may become impossible. Delivery of services will likely be dependent on impacts of space weather on property, facilities, and infrastructure (below) and the impact on the state economy (below). Impacts on electricity may substantially impact the delivery of services. Emergency services could be impacted through challenges in calling 911 and responders navigating to the public. Water and sanitation service delivery also rely on electricity. Refrigeration requires energy, which is critical for the distribution of food and pharmaceuticals.
Property, Facilities, and Infrastructure	Space weather will have a limited effect on property and facilities but may have a dramatic effect on infrastructure due to its effect on electricity. Geomagnetic storms can modify the path of radio signals and create errors in the positioning information provided by GPS (NOAA Space Weather Prediction Center). This can disrupt navigation systems as well as the power grid and pipelines. Additionally, electrons create a layer near the bottom of the ionosphere that can absorb HF radio waves making radio communication difficult or impossible. During strong radio blackouts, or solar flares, ionization is produced in the lower, more dense layers of the ionosphere (the D-layer), and radio waves that interact with electrons in layers lose energy due to the more frequent collisions that occur in the higher density environment of the D-layer. This can cause HF radio signals to become degraded or completely absorbed. This results in a radio blackout, the absence of HF communication, primarily impacting the 3 to 30 MHz band. A space weather event that causes power outages could cause severe impacts to the economy and public health in North Dakota. Possibly the most significant outage scenario for North Dakota is the loss of electricity for a week or more. In an extreme scenario, called a black sky event, all utilities based with internet connections could be lost, including gas, water, cell phones, GPS, and electricity. Without generators, an extended power outage could additionally affect the delivery of services (above) leading to the loss of running water, sewer services, and the ability to heat or cool buildings. Any equipment such

Space Weather Impacts	
	as medical equipment, computers, and cell phones requiring power to run would eventually be incapacitated. Facilities with generators would still be able to use appliances, equipment, and heating and cooling systems, however, community water and sewer services may not be available. Such a long-term outage could lead to emergency sheltering and necessitate the activation of other emergency resources.
Environment	Animals may be adversely affected by space weather, when water or food is unable to be delivered and supplied to them.
State Economy	Without electricity, it is likely that there could be a dramatic effect on the economy. Many of North Dakota's largest industries are heavily dependent on electricity (directly or indirectly), such as agriculture, oil production, or fracking. Some of these effects may last beyond the space weather event, for example where crops or refrigerated items could spoil and cause major losses for companies. Locations in North Dakota with higher levels of industry would likely experience more impacts on the economy.
Public Confidence in the State's Governance	The likely impact on public confidence in the State's governance would depend on the extent of the space weather event. For an extreme event, the impact on the infrastructure may create distrust in government – particularly as the impact on the infrastructure will impact the homes.

3.7.13.5 State Risk Assessment

Probability

According to the NERC's Geomagnetic Disturbance Reference Document, there are 200 days during the 11-year solar cycle with strong-severe geomagnetic storms, and approximately four days of extreme conditions.

It is important to know that these solar storms typically occur during solar maximum. The sun undergoes an 11-year cycle where the polarities of the North and South Poles reverse. Most solar storms occur during a four- to six-year period referred to as a solar maximum. Solar cycle 24 reached its maximum in April 2014, and peaked at an average sunspot number of 82, with no significant space weather events. Geomagnetic storms, solar radiation storms, and radio blackouts have the capability to all happen simultaneously, causing a "solar super storm."

The last major solar super storm was the Carrington super storm (described in previous occurrences) in September 1859. Solar super storms are likely to occur once every 500 years. Therefore, solar storm events severe enough to potentially impact the energy infrastructure are relatively rare. The chance of occurrence is also inconsistent from year to year, depending on where the sun is at in its solar cycle. In general, though, space weather is considered to be high impact, low frequency events, meaning that they occur relatively rarely but can have serious impacts when they do happen.

Vulnerability Assessment

In the event of a space weather incident, it is likely the entire state would be impacted. Over the past 100 years, the population has become more dependent on the nation's infrastructure. Heat, running water, sanitation, communications, grocery stores, and pharmacies all require electricity, and without these services in the long term, the population and industry may suffer. Personal and commercial food supplies may spoil during extended power outages. Telephone services are needed to call 911 for emergency assistance. Fresh water is needed for daily uses such as drinking and cleaning but is also essential in hydraulic fracturing. Food processing similarly requires large amounts of water. Sewer is needed for sanitation; failure causes backup and subsequent damage to property. Grocery stores are the most common means of distributing the nation's food supply and pharmacies deliver medications. Each sector is important for the health and safety of communities. Without these services, emergency resources may be needed. Emergency supplies can often hold the populations over temporarily but may take some time before arriving, in which case, individuals may need to rely on their own personal supplies. Agricultural areas of the state are also vulnerable to prolonged outage events as modern agricultural practices are reliant on energy, such as electric milking machines and irrigation pivots. Disruptions of facility operations, such as processing plants and Tier II facilities, could contribute to environmental damages.

Counties with higher populations or higher levels of industry, such as agriculture and oil and gas production, would likely be impacted the most by a space weather event that disrupts utility services. According to the North Dakota Department of Commerce, Cass County has the largest estimated population as of 2015, with 171,588 people, followed by Burleigh (92,903) and Grand Forks (71,328) counties. In addition to the highest population, Cass County has the highest market value of agricultural products sold ($567,108,000), which increases the county's vulnerability during a space weather event. Richland and Stutsman counties have the next highest market value of agricultural products sold, with $535,658,000 and $464,568,000, respectively. Dunn, McKenzie, Mountrail, and Williams counties contain 92% of oil and gas produced in North Dakota. Oil and gas operations rely heavily on utilities such as electricity and GPS to operate, so these counties could also be significantly impacted during a space weather event.

State Assets and/or Critical Facilities at Risk

State-owned assets or critical facilities would not be directly impacted by space weather, however indirect impacts such as power outages could affect operations. State-owned buildings could be without heat during a utility outage, flooded with sewer backups, or without electricity from a space storm. During cold weather, structures without heat may be uninhabitable for a time. Additionally, an electrical power outage during winter could result in frozen and burst water pipes, causing water damage within the interiors of critical facilities. The failure of a sewer lift station could lead to a system back-up, and structures without sewer backflow valves could experience damage from sewer backwater; other structures could be flooded by overflowing sewage as well. Section 2 provides a summary by county of state-owned and operated facilities and critical facilities as well as other critical facilities.

Climatologist's Perspective

The Sun releases significant amounts of plasma called Coronal Mass Ejection (CME) that causes geomagnetic storms. The severity of these storms on Earth mainly depend on the amount and the speed of the coronal mass arriving to the Earth's outer atmosphere. Depending on the intensity, the geomagnetic storms will have an impact on electric power grid, HF radio communication, satellite communication, GPS navigation systems, as well as weather and climate since all meteorological and climatological phenomena are fueled by the energy provided by the sun.

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President of the American Association of State Climatologists

Utility or communication disruptions could also limit the ability to provide emergency services. For example, the medical facilities require electricity and water for certain types of medical equipment to work. Gas station pumps may not operate without electricity, and therefore, emergency vehicles may not have enough fuel during long term outages. Communications are vital to effective emergency operations and the lack of communication capabilities may significantly affect the abilities of emergency response organizations to respond to incidents. Special needs facilities may need to move occupants to alternate locations due their dependence on local utilities.

Many services rely on other utilities to operate. For example, the water supply pumps and sewer lift stations both require electricity to continue operations. One or both may go down during long-term electrical power outages. Propane, oil, and gasoline refills require the transportation network to be open since deliveries are done by truck. This interdependency can lead to more complex utility outage problems. The potential magnitude of an energy disruption from a space weather event on the critical facilities and infrastructure in North Dakota is ultimately difficult to determine. The impact would largely depend on the number of people served by a particular electrical grid, as well as the electrical power provider's ability to repair the grid in a timely manner.

Loss Estimates

Loss estimates from a space weather event specifically in North Dakota are not available. However, studies have estimated economic impacts on a national level. A Carrington-level storm is estimated to have a $0.6–$2.6 trillion economic impact to the power sector in the United States. In the case of a space weather event, losses will also occur in the economic sector, where a long-term event could cause loss in the agricultural or oil industries. Space weather impacts are not necessarily restricted to catastrophic effects. Insurance claim information suggests that the losses to the United States power grid from non-catastrophic disturbances from GICs may be $5 to $10 billion/year." Loss estimates are summarized in Eastwood et al., 2017.

3.7.13.6 Future Conditions

Successful mitigation of space weather requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth (or withdraw) and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future space weather risk.

Climate Change

Climate change will not impact space weather events. Since space weather originates from the sun, the changes in the earth's climate will not affect these events. Space weather, on the other hand does influence the earth's climate, but this effect is minimal (NOAA Space Weather Prediction Center).

Changes in Development

As detailed in Section 2, according to future population projections, the state has experienced population growth since 2010, and expects this growth to continue. The North Dakota projected population for 2030 is 931,506 people, up 38% from the 2010 Census. Increased development can put more people at risk to hazards across the state, so understanding future development trends is an important tool for hazard mitigation. Increased populations add to the challenges of managing a utility outage or a disruption in navigation services resulting from a space weather event. Additionally, the development of industry, such as oil and gas operations, can be impacted by a space weather event. An electricity outage would have widespread impacts on operations. Additionally, magnetic disturbances can directly affect operations that use the magnetic field, including directional drilling.

The vulnerability of state-owned assets and critical infrastructure to space weather events will remain the same in the future. However, if population and industrial development continues to grow in North Dakota, the impacts may affect more people. For example, if a space weather event impacts the electricity grid, more people will be without power. The cascading impacts discussed above, such as a failure of water supply pumps due to a power outage, would be more far-reaching in a larger population than that of today.

3.7.13.7 Jurisdictions at Risk

In a review of local and tribal HMPs, there was no profile of space weather in any county. For future space weather events, jurisdictions are considered at risk and the impacts from an event could be state, region and country wide.

3.7.13.8 Summary / Conclusion

In summary space weather events, while unlikely, could severely impact the State of North Dakota. Utility infrastructure, such as electricity supply, GPS systems, satellites, and pipelines would be primarily impacted by a space weather event. However, given the critical nature of this utility infrastructure in the day to day operations of the State, there would be many secondary impacts to the public, service provision, and the economy if there were to be a long-term space weather event. Although space weather hasn't negatively impacted North Dakota in recorded history, other areas of the world have experienced significant impacts from space weather events and the possibility of a future severe space weather event remains.

According to the results of the risk factor analysis, space weather is the 9th most risky hazard amongst the threats and hazards analyzed for this Enhanced Mitigation MAOP Update. Compared to the other threats and hazards analyzed, this hazard is neither likely nor unlikely to occur. The components of Space Weather's risk factor score include a low probability and a long warning time, coupled with relatively high impacts, a wide spatial extent, and a potentially long duration. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Mitigation measures identified by the SHMT Space Weather Committee focused primarily on educating the public about the potential consequences of geomagnetic and solar storms and radio blackouts. They also encourage redundancies of the power grid system to mitigate any losses of power that could have life-threatening consequences for North Dakotans if an event occurs during winter or disrupts service for those who depend on electricity for operations of their medical equipment.

3.7.13.9 Data Limitations / References

Brief power outages occur regularly in North Dakota but since long-term critical material or infrastructure outages or shortages are not a normal event, understanding the specific problems and concerns of this hazard is the greatest limitation. Studies of each of the critical facilities would allow for a more in-depth discussion of their vulnerabilities, however, such data would likely be kept internal for security purposes. A record of the significant critical material or infrastructure outages and shortages in the state and the associated impacts could help pinpoint vulnerable times and locations.

Other key documents related to the shortage or outage of critical materials or infrastructure and space weather hazards include:

- North Dakota State Emergency Operations Plan, Shortage of Critical Materials Annex
- North Dakota Energy Emergency Response Plan Update, North Dakota State Energy Office, 2013
- NOAA Space Weather Prediction Center, http://www.swpc.noaa.gov/NOAAscales/
- NOAA A Profile of Space Weather, http://www.swpc.noaa.gov/primer/primer_2010.pdf
- Eastwood, J., Biffis, E., Hapgood, M., Green, L., Bisi, M., Bentley, R., Wicks, R., McKinnell, L., Gibbs, M., and Burnett, C. 2017. The Economic Impact of Space Weather: Where Do We Stand? Available https://onlinelibrary.wiley.com/doi/full/10.1111/risa.12765.
- Electric power grid: https://www.swpc.noaa.gov/impacts/electric-power-transmission
- HF radio communication: https://www.swpc.noaa.gov/impacts/hf-radio-communications
- Satellite communication: https://www.swpc.noaa.gov/impacts/satellite-communications
- GPS navigation systems: https://www.swpc.noaa.gov/impacts/space-weather-and-gps-systems
- Weather and climate: https://www.swpc.noaa.gov/impacts/space-weather-impacts-climate

3.7.14 Transportation Incident

3.7.14.1 Description

A transportation incident, for the purposes of this plan, is any large-scale vehicular, railroad, aircraft, or watercraft accident involving mass casualties. Mass casualties can be defined as an incident resulting in a large number of deaths and/or injuries that reaches a magnitude that overtaxes the ability of local resources to adequately respond. In most disasters, death and injury represent one of the effects of the hazard, while in transportation accidents, mass casualties are often the primary impact and focus of the event. Long-duration and/or severe weather events such as winter storms and extremely high winds can also contribute to transportation incidents and may necessitate emergency medical, rescue, and sheltering operations.

Passenger and cargo trains, bus and other highway vehicles, passenger and cargo airplanes, and watercraft pose the highest risks of causing an incident. North Dakota's agricultural economy and large amount of livestock also pose risks to transportation; a 2016 accident involving a truck carrying cattle killed 13 of the animals and contributed to a separate accident that occurred when the area surrounding the truck was closed down to travelers (Grand Forks Herald, 2016). Since North Dakota has vast areas containing sparse population, even an incident involving a small number of deaths and/or injuries could overwhelm local resources. A large event such as a commercial passenger plane crash could possibly overwhelm state resources.

For aviation incidents, accidents and serious incidents must be reported to the National Transportation Safety Board (NTSB), but non-serious incidents do not need to be reported. A reportable accident is defined as "an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. A reportable serious incident is "one of a specific list of events such as a complete loss of information from more than 50% of an aircraft's cockpit displays, according to 49 CFR 830.5(a)(9)." In contrast, a non-serious incident is "an occurrence other than an accident (or serious incident) that affects or could affect the safety of operations." Incidents such as gear-up landings that damage an aircraft many times do not fall under the definition of an accident or serious incident and are therefore not reported (Aircraft Owners and Pilots Association [AOPA] Pilot Protection, 2018). These nuances are important to keep in mind when analyzing aviation data.

Probably the most significant and common hazard associated with transportation incidents is the release of hazardous materials. Many hazardous material releases occur as a result of a transportation incident. Any transportation accident involving the release of hazardous materials significantly increases the complexity and potential damages from such an accident. Additionally, many times, weather hazards lead to transportation accidents. Examples include winter weather when snow and ice make roadways slick; blizzards, smoke, and dust storms leading to reduced driver visibility and increased probability of an accident; and strong winds causing the overturning of a high-profile vehicle. Another example is flood damage to the infrastructure of transportation networks.

Almost any hazard can cause or aggravate a mass casualty transportation incident. Additionally, transportation infrastructure and public transit have been the target of several terror attacks around the world, including the 2004 Madrid train bombings, the 2005 attack on the London Underground, the 2006 Mumbai train bombings, and, more recently, the 2016 attack at Brussels Airport in Belgium.

3.7.14.2 Previous Occurrences

Transportation incidents involving mass casualties have had no significant record of occurrence in North Dakota; there have been no State Executive Order or federal declarations dealing with a transportation accident in North Dakota. Recent transportation incidents in North Dakota have been summarized below. A full listing of all past transportation accidents occurring in North Dakota can be found in Appendix 7.4.12.

May 6, 2015 – The NTSB determined a broken wheel caused six BNSF train cars to derail near Heimdal. Five cars breached and spilled 100,000 gallons of oil, resulting in a massive fire and evacuation of the town's 30 residents.

December 30, 2013 – A BNSF oil train collided with a derailed train near Casselton spilling 400,000 gallons of crude oil. The collision ignited the crude oil and triggered a chain of explosions. A fireball and massive cloud of black smoke prompted a voluntary evacuation of 65% of the 2,300 residents living in Casselton and surrounding areas. The derailment renewed safety concerns regarding transportation of hazardous materials.

A recent example of a mass casualty train event occurred in Canada on July 6, 2013. A train transporting oil from North Dakota's Bakken oil region to a refinery in New Brunswick was parked in an overnight spot but rolled downhill for seven miles before derailing and exploding in the Quebec town of Lac-Megantic. Forty-seven individuals died in the disaster when 27,000 gallons of light crude spilled from the derailed tankers.

The history of transportation accidents in North Dakota consists primarily of small magnitude incidents, some with fatalities, but most with little effect on the entire community. Traffic accidents along the roadways occur regularly, usually inconveniencing travelers, requiring local emergency resources, and occasionally causing delays. Table 3.7.14-1 shows the motor vehicle fatalities and crash data in North Dakota since 2001. Table 3.7.14-2 shows the number of incidents involving railroads, while the table that follows displays aircraft incident statistics. Each table or figure below summarizes the year, number of crashes or incidents, and fatalities and injuries related to those crashes or incidents.

Table 3.7.14-1 North Dakota Motor Vehicle Accident Data

Year	Number of Crashes	Fatalities	Injuries
2001	14,759	105	4,608
2002	16,114	97	4,886
2003	16,552	105	4,817
2004	16,922	100	4,611
2005	15,788	123	4,360
2006	15,094	111	4,141
2007	16,229	111	4,180
2008	16,387	104	4,247
2009	17,673	140	4,462
2010	17,076	105	4,682
2011	18,823	148	5,022
2012	18,356	170	5,311
2013	18,977	148	5,365
2014	16,134	135	5,278
2015	15,077	131	4,917
2016	15,017	113	4,614
2017	N/A	116	N/A
2018	N/A	39*	N/A

Source: North Dakota Department of Transportation, 2018 (Year-to-Date*)
N/A: Data not available

Table 3.7.14-2 Rail Incidents and Causes, 2013-2018

Category	# of Incidents, 2013-2018	Fatalities	Injuries
Equipment Malfunction	10	0	2
Highway-Rail Interchange	8	1	18
Human Error	39	0	0
Track Issues	23	0	0
Miscellaneous	11	0	0
Totals	91	1	20

Source: North Dakota Department of Transportation, 2018. Accident causes.

Aircraft accidents and serious incidents are documented carefully. Since 2000, there have been 175 aircraft accidents and serious incidents, which is an average of 9 events per year that have resulted in about 1-2 fatalities annually in North Dakota (National Transportation Safety Board, 2018). Aircraft incidents in North Dakota are more likely to originate with small airplanes than large commercial flights; although a future incident involving a commercial passenger flight and mass casualties cannot be ruled out despite having a very low probability of occurrence. A recent example of an aircraft accident occurred in June 2016, when a small plane being flown by a 20-year-old crashed into a lake near Wishek, North Dakota. The crash killed the pilot and two other individuals (CBS, 2016). The table below shows the number of aircraft accidents and fatalities per year from 2000-2018.

Table 3.7.14-3 North Dakota Aircraft Incident Data, 2000-2018

Year	Accidents/Serious Incidents	Fatalities
2000	12	1
2001	13	2
2002	7	2
2003	10	0
2004	8	2
2005	12	1
2006	14	2
2007	15	0
2008	7	2
2009	10	2
2010	8	0
2011	14	1
2012	15	2
2013	4	0
2014	6	1
2015	6	0
2016	9	4
2017	3	1
2018*	2	0

Source: National Transportation Safety Board, 2018 (Year-to-date)

3.7.14.3 Location and Extent

Federal and state highways, tribal, county, city, and township roadways, active railways, airports, and air traffic routes pass through North Dakota. Figure 3.7.14-1 shows the major road, rail, and airport networks in the state. Two interstates pass through North Dakota, Interstate 94 and Interstate 29. In all, the state has over 106,966 miles of road and 4,837 bridges, including 18 international highway ports of entry along the Canadian border.

Railroads in North Dakota include Amtrak for passenger service and 3,480 railroad miles operated by BNSF Railway, CP Railway, Dakota, Missouri Valley, and Western Railroad (DMVW), Dakota Northern Railroad, Northern Plains Railroad, Otter Trail Valley, Yellowstone Valley and Red River Valley and Western Railroad for the transportation of goods.

North Dakota has 89 public airports, of which 72 have paved runways and 17 have grass surfaces. There are eight that provide scheduled commercial passenger service located in Bismarck, Devils Lake, Dickinson, Fargo, Grand Forks, Jamestown, Minot, and Williston. Aviation accidents can occur for a multitude of reasons from mechanical failure to poor weather conditions to intentional causes. The size of accidents also varies widely from light single engine aircraft to heavy multi engine aircraft. The location of the accident, such as a remote area versus a populated location, also plays an important role in the potential for injuries, fatalities, and damage.

Often times, transportation incidents can occur as a result of impacts from other hazards. For example, the Canadian Pacific train operations are regularly interrupted from flooded conditions along several areas in the state. Those areas include:

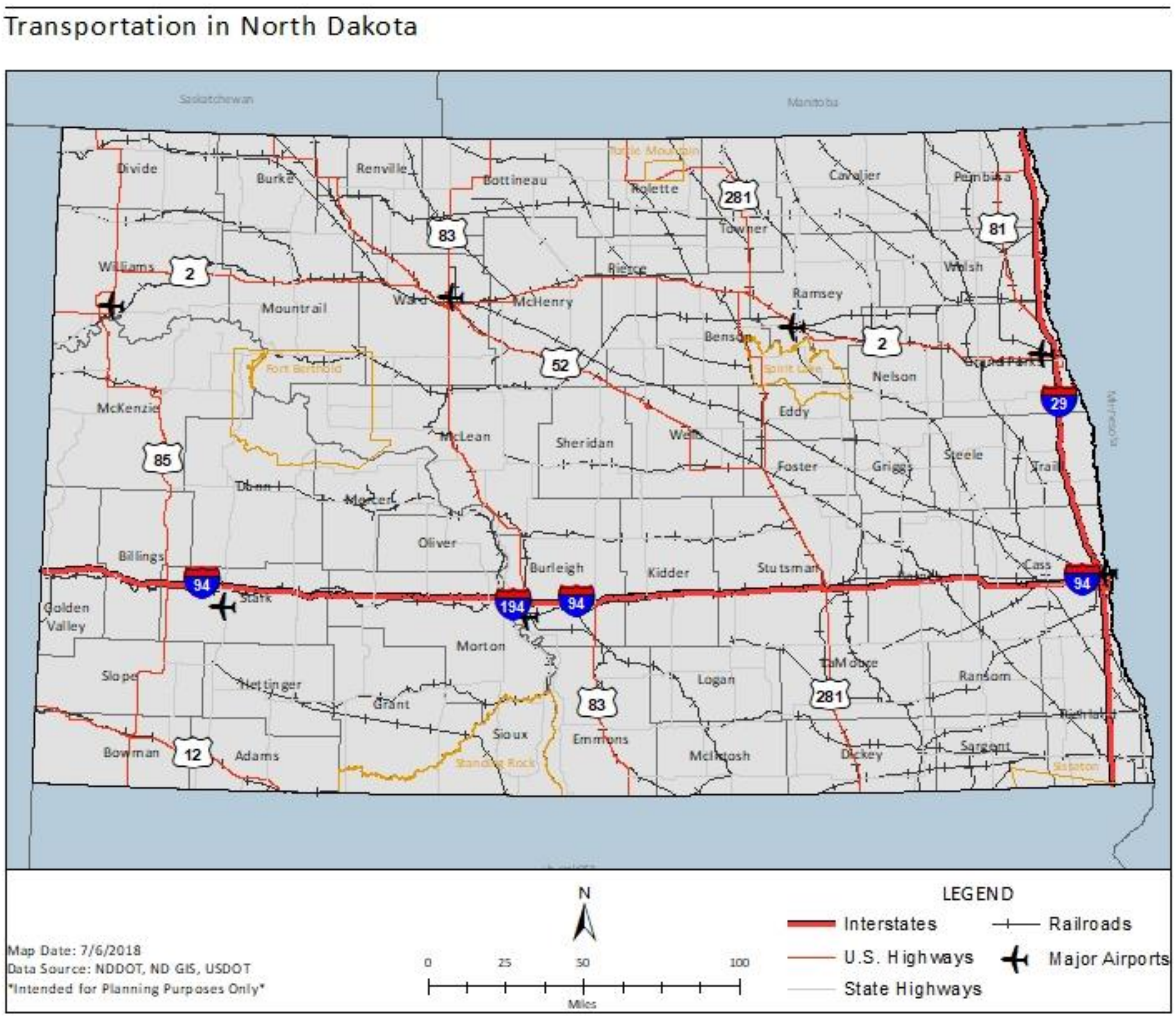
- City of Pembina (Pembina County) along the Red River;
- Walsh County along the Red River;
- City of Minot (Ward County) along the Souris River;
- City of Valley City (Barnes County) along the Sheyenne River;
- City of Enderlin (Ransom & Cass Counties) along the Maple River; and
- City of Kensal (Stutsman County) along the James River.

Table 3.7.14-4 summarizes the spatial extent of the impacts of a transportation incident on different resources in a community. The spatial extent of impacts of a transportation incident on property could be local, whereas the impacts on infrastructure or the environment could be regional, especially in the event of a hazardous material spill.

Table 3.7.14-4 Spatial Extent of Transportation Incident Impacts

Resources	Spatial Extent
People	Regional
Property	Local
Infrastructure	Regional
Government Operations	Regional
Environment / Natural Resources	Regional
Cultural Resources	Local

Figure 3.7.14-1 Transportation in North Dakota



3.7.14.4 Consequence Analysis

As part of a holistic risk and vulnerability assessment, it is important to evaluate the resulting consequences posed to individual sectors of a community from a hazard event. The table below presents the summary analysis of the consequences of a transportation accident event.

Table 3.7.14-5 Transportation Incident Consequence Analysis

Transportation Incident Impacts	
Public	Transportation incidents in North Dakota have historically had little impact on communities but have potentially devastating consequences to the public. Incidents can cause bridge collapses, roadway closures, public transit closures, extreme traffic, evacuation of an area, injuries and fatalities to the public, loss of economic activity, and more. Incidents can also cause health impacts beyond injuries sustained in an incident; hazardous materials releases and other environmental damage resulting from transportation incidents can impact public health.

Transportation Incident Impacts	
Responders	Transportation incidents create a challenge for first responders. First responders may have to manage the evacuation of people from areas impacted by an incident, as well as direct traffic, close down roads, operate shelters, and provide medical care of the injured and sick while potentially having less access to an incident scene by nature of the ingress and egress routes being impacted. Equipment may also be damaged or destroyed due to an incident, which may lead to a decrease in response capabilities.
COOP	In the event of a transportation incident that affects the state's operations, the agency will enact their COOP Plan. To date, there have been few or no major transportation incidents that have shut down state, county, or municipal governmental operations. While expectation is minimal, this threat may impact North Dakota's ability to implement their COOP Plan based on an incident's impact to roadways and transportation access.
Delivery of Services	The ability to deliver services can be impacted locally, regionally, or statewide depending on the severity of the transportation incident. Transit service disruptions may result, and businesses and places of commerce may completely shut down, which leads to the disruption of goods and services.
Property, Facilities, and Infrastructure	Transportation, governmental operations, and communications may be heavily disrupted during a transportation incident. Depending on the nature of the incident, roads, bridges, and public transit may be impacted, which can cause detours, delays, and obstructions. Damage to transportation systems and resources may adversely affect response activities, and power loss to transit systems can lead to disruption of critical infrastructure and technology.
Environment	Damage to materials and facilities due to a transportation incident may allow dangerous chemicals and agents to leak into natural environments and water reservoirs, causing further damage.
State Economy	Transportation incidents can have a large fiscal impact on the local and state governments, even if some of those costs can be recouped through federal grant reimbursements. Damage to property, facilities, and infrastructure and the loss of productivity and economic revenue during recovery may exacerbate the impact of an incident on the economy.
Public Confidence in the State's Governance	The public's confidence in the state's governance is affected by immediate local and state response through direct and effective actions. Efficiency in response and recovery operations is critical in keeping public confidence high.

3.7.14.5 State Risk Assessment

Probability

In general, the more frequently the transportation infrastructure is used in a given area, the more likely a significant transportation accident will occur. Without detailed history of mass casualty transportation accidents, the probability of such an accident can only be expressed qualitatively. The probability is increased during winter storms, periods of poor visibility from snow, smoke, or dust, during holiday festivities with more instances of drinking and driving, and during times of increased traffic volume. Vehicle accidents with minor damage and injuries occur regularly. From 2000-2016, North Dakota had, on average, 16,561 accidents annually. Serious, fatal accidents are less frequent but still occur. On average, North Dakota has 122 traffic fatalities and 4,719 injuries annually (North Dakota Department of Transportation Crash Summary 2016).

Vulnerability Assessment

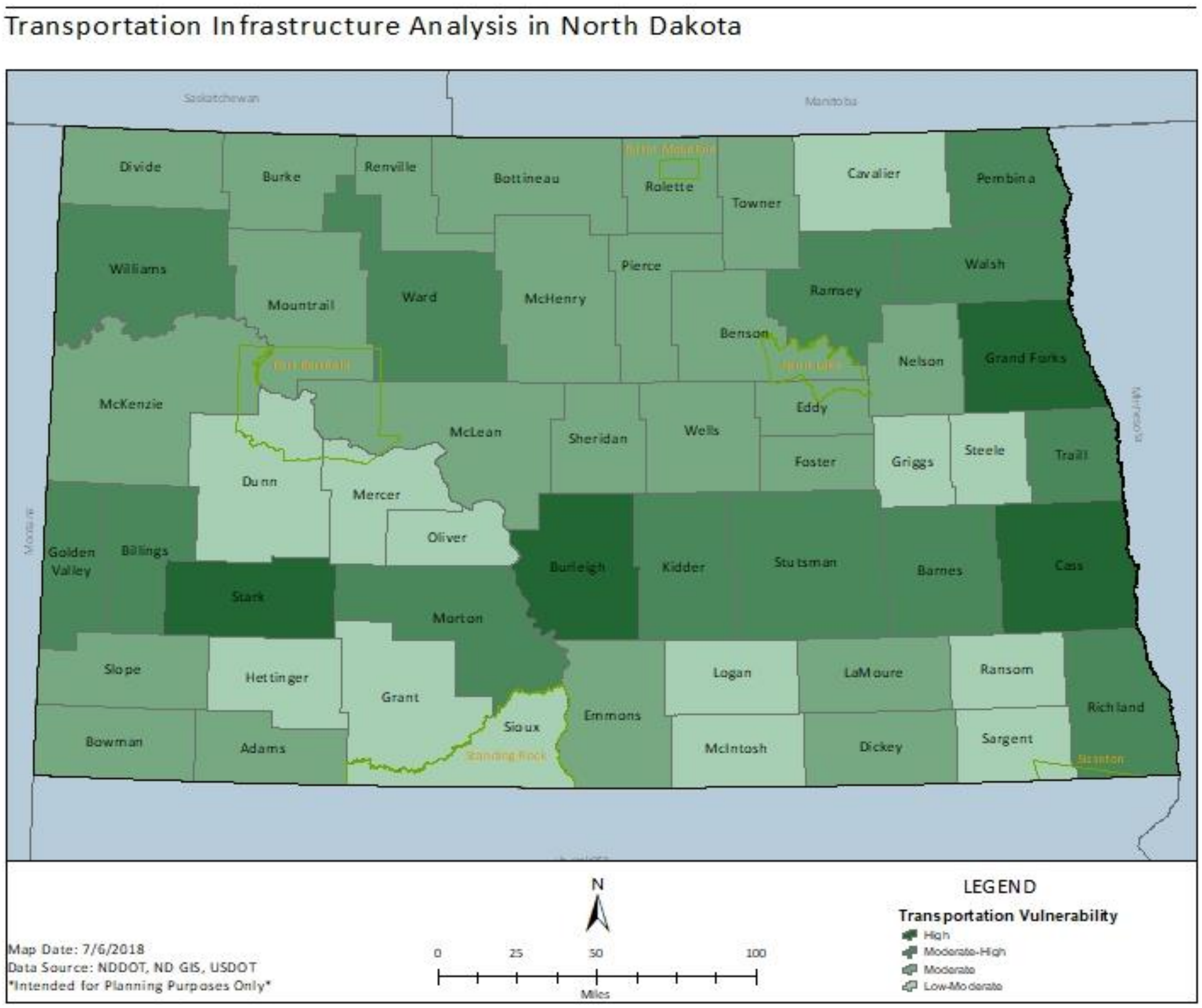
Transportation accidents can almost always be expected to occur in specific areas, on or near airports, roadways, railroads, or other transportation infrastructure. The exception is air transportation accidents that can occur anywhere and at any time, even though safety precautions are in place. However, it is difficult to predict the magnitude of any specific event because these types of events are accidental, and the circumstances surround these events will impact the extent of damage or injuries that occur.

Figure 3.7.14-3 summarizes the results of a transportation analysis by county and reservation. The hazard rating was determined based on presence of the following infrastructure in each county follows:

- High: Jurisdiction has a major airport, interstate, and railroad infrastructure.
- Moderate-High: Jurisdiction has a major airport or interstate and railroad infrastructure.
- Moderate: Jurisdiction has railroad infrastructure and United States highways.
- Low-Moderate: Jurisdiction has railroad infrastructure or United States highways.

The transportation vulnerability assessment in the 2014 Plan included a hazard rating of “low: jurisdiction has state highway only.” In the vulnerability assessment for this Plan update, no jurisdictions were found to only have state highways, therefore the “low” hazard rating was not included. Table 7.4.12-3 in Appendix 7.4.12 further summarizes the results of this analysis.

Figure 3.7.14-2 Transportation Infrastructure Analysis in North Dakota



Presence of specific transportation infrastructure is just one way to consider how vulnerability varies for this hazard. A better indicator of transportation accidents is the volume of traffic utilizing the transportation infrastructure. As certain parts of the state develop, population growth increases traffic volume and the potential for a transportation incident.

Data on cost estimates of previous vehicle events by county also provides some basis to draw conclusions on patterns of traffic volumes. A summary table of motor vehicle crash data by county can be found in Table 7.4.12-2 of Appendix 7.4.12. This table demonstrates that motor vehicle crash amounts are high in the western counties involved the in oil and gas industry. Conclusions can be drawn that this is most likely due to the sheer volume of traffic on roads in these counties associated with the oil and gas production. This information is not available specific to tribal land. According to NDDOT Crash Summary for 2016, 10% of the crashes in the state occurred in urban locations and 90% of the fatal crashes occurred on rural roads (North Dakota Department of Transportation, 2018). Accidents involving hazardous materials threaten the environment with the potential for absorption of contaminants into soil and waterways. Contamination of cropland could potentially result in costly remediation. Damage or destruction of vehicles and fencing comprise the most vulnerable property losses although homes, on rare occasions, have been struck with extensive damages resulting from these incidents.

State Assets and/or Critical Facilities at Risk

While it is rare that an aircraft, train, or vehicle should crash into state-owned buildings, facilities, or infrastructure, an incident that does could impact the state in multiple ways. An accident that affects transportation infrastructure such as bridges or highway overpasses and interchanges may cause significant structural damage and the closure of pieces of infrastructure for extended lengths of time in addition to the impacts on people, responders, and the environment.

Should structures be affected, damages could vary in the tens or hundreds of thousands of dollars depending on the structure or structures impacted. A large commercial jet crash could potentially destroy an entire segment of a populated area, causing substantial damage to properties, facilities, and infrastructure. An accident involving a first response agency or one that blocks a primary transportation route could delay emergency services and cause cascading effects in the community.

In most cases, transportation incidents are minor and do not affect infrastructure. The most likely impact would be the closure of a major roadway due to a vehicular accident, thus resulting in travel inconveniences and long detours. Theoretically, an aircraft or vehicle could take out power lines, telephone lines, or other important pieces of infrastructure, resulting in service disruptions. Section 2.2.3 details the number and value of state-owned buildings and properties by county.

Loss Estimates

The most recent study done to total the costs of transportation incidents has not been updated since 2010. The *Medical and Economic Cost of North Dakota Motor Vehicle Crashes Report*, by the Rural Transportation Safety and Security Center, Upper Great Plains Transportation Institute, North Dakota State University found that a serious motor vehicle crash can have medical costs and substantial economic losses associated with death and injury. They estimated costs of fatalities based on the value of a statistical life as reported by the USDOT not including costs for medical expenses, property damages, or other costs. They estimated costs for non-incapacitating injury to include wage and productivity losses, medical expenses, administrative expenses, motor vehicle damage, and employer's uninsured costs from the Nation Safety Council. According to this comprehensive study, there are $65,070 in losses after a crash with non-incapacitating injuries and $6,899,595 in losses after a crash with fatalities (converted to 2018 dollars) (Rural Transportation Safety and Security Center, 2010).

This per crash cost estimate by crash severity can be used with the NDDOT Crash Summary for 2016 that includes the number of motor vehicle crashes with injuries and fatalities per county to calculate a potential loss estimate per county. This analysis assumes that all crashes were non-incapacitating for planning purposes only.

Table 3.7.14-1 Top 10 Counties with Estimated Injury and Fatality Costs for Motor Vehicle Crashes, 2016

County Name	Costs
Cass	$112,842,255.00
Burleigh	$90,590,490.00
Morton	$73,288,395.00
Ward	$70,353,720.00
McKenzie	$63,525,720.00
Mountrail	$58,124,910.00
McLean	$45,692,190.00
Rolette	$42,829,110.00
Grand Forks	$35,725,605.00
Richland	$33,519,750.00

Source: *North Dakota Crash Summary for 2016*, North Dakota Department of Transportation; *Medical and Economic Cost of North Dakota Motor Vehicle Crashes*, Rural Transportation Safety and Security Center, Upper Great Plains Transportation Institute, North Dakota State University.

Estimated amounts of losses from air transportation and railway transportation are not available for this analysis.

3.7.14.6 Future Conditions

Climate Change

Other hazards can influence or increase the probability of a transportation incident. Climate-change related hazards like long-duration and/or severe weather events such as winter storms and high winds can contribute to accidents and hazardous road conditions. These events may necessitate emergency medical, rescue, and sheltering operations for commuters and travelers as well as first responders. Climate change as it impacts the severity and duration of weather patterns will, in turn, affect the possibility of transportation incidents.

Changes in Development

Successful mitigation of transportation accidents requires an understanding of the current risk posed by the hazard, combined with information relating to how that risk is expected to change in the future. Two of the largest factors influencing future risk relate to how and where population growth and development occurs, in addition to the effects of our changing climate on a hazard. It is also important to consider both the direct and indirect impacts from other hazards and how those may also influence future transportation accident risk.

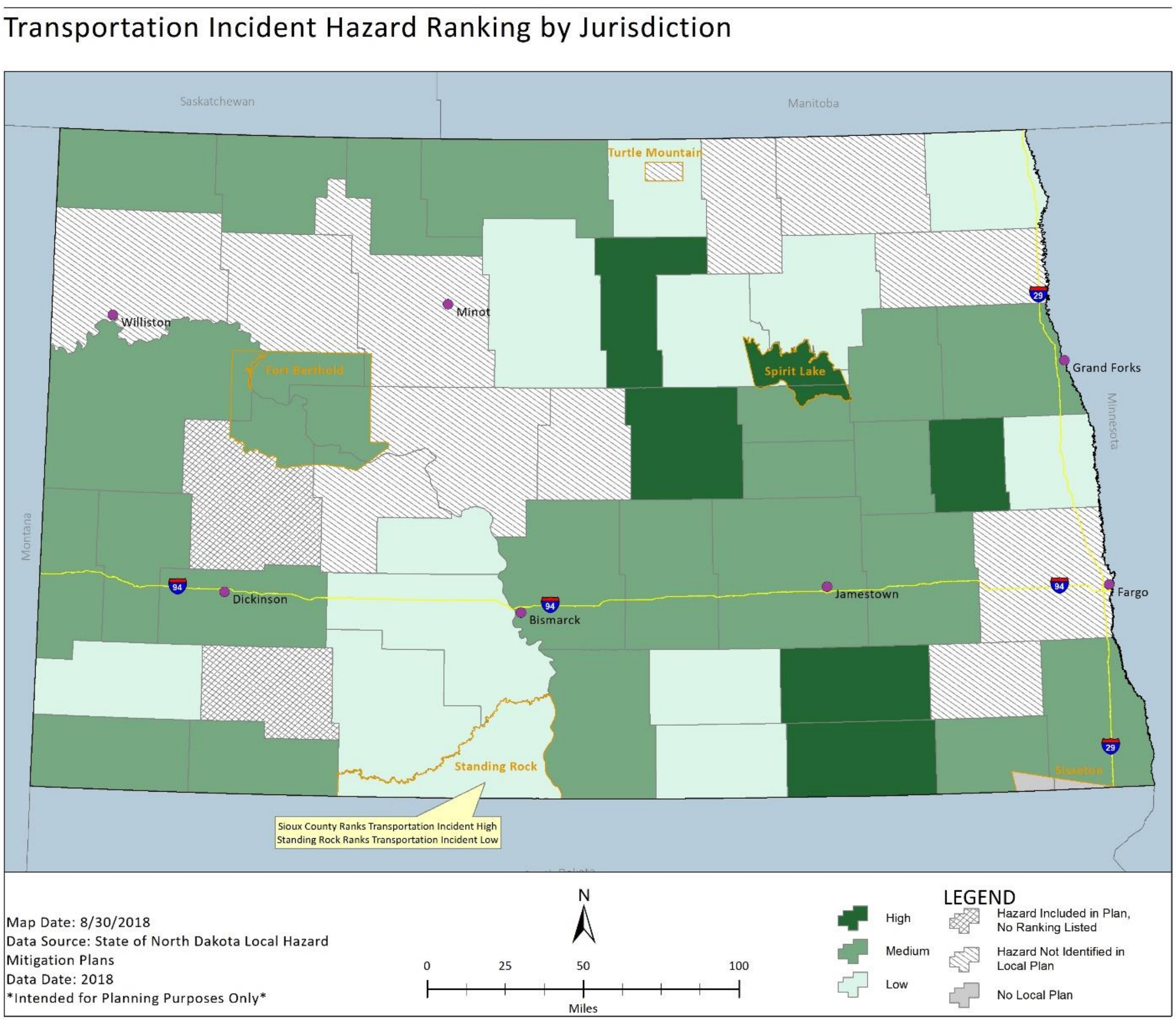
Population increases are being seen in Cass, Burleigh, Williams, Ward, McKenzie, Stark, Grand Forks, Morton, Mountrail, and Dunn Counties. The new and future development may increase the probability of major transportation accidents occurring, especially as traffic increases. In addition, the aging transportation infrastructure throughout the United States must support the growing population and should be monitored and maintained to avoid future infrastructure failure. Otherwise, the specific locations of where and how development occurs, except for possibly in the immediate vicinity of the airports or the railroad, should not significantly affect the vulnerabilities from this hazard.

In addition to population growth and development, transportation failures stemming from aging infrastructure, particularly in regard to highways, bridges, culverts, and railroads, are a growing concern nationwide. Transportation infrastructure requires maintenance and replacement if necessary in order to mitigate transportation incidents. To this end, the North Dakota Department of Transportation is currently expanding and improving state and Federal highway capability. Over 45 construction projects are underway in the following districts: Bismarck, Devils Lake, Dickinson, Fargo, Grand Forks, Minot, Valley City, and Williston (North Dakota Department of Transportation, 2018). A full list of projects can be found in Appendix 7.4.12.

3.7.14.7 Jurisdictions at Risk

All jurisdictions are at risk of transportation incidents. Forty-four of fifty-eight local and tribal HMPs profile transportation incidents. Seven jurisdictions ranked transportation-related incidents as a high hazard, 23 as medium, 13 as low, and 1 as low-medium (the City of Bismarck rated an aircraft incident as low and a train derailment as medium). Twelve plans did not identify transportation-related incidents as a hazard. Table 7.4.12-3 in Appendix 7.4.12 summarizes how these local plans ranked the overall risk presented by transportation-related incidents and identifies any available loss information. This table also includes the hazard ranking information for the City of Bismarck, which could not be shown on the figure due to map scale. The figure below also presents a summary of those plans and identifies how jurisdictions ranked the overall risk presented by the hazard. Overall, all jurisdictions in North Dakota are considered at risk to transportation incidents and should consider mitigative measures in future plans.

Figure 3.7.14-3 Local Hazard Mitigation Plan Transportation Incident Ranking



3.7.14.8 Summary / Conclusion

A full risk factor assessment was completed for all hazards profiled in this plan. Factors including probability, impact, spatial extent, warning time, and duration were evaluated for each hazard, including transportation, to create an overall Risk Factor score. Following this methodology, the transportation risk factor score was 1.53, which is a low-ranking hazard on a scale of 1 to 4, where 4 is the highest threat risk. The full results of this assessment can be seen in Table 3.3-6 and Table 3.3-7 in Section 3.3.

Minor transportation accidents happen frequently in North Dakota; however, a major transportation accident causing mass fatalities is a rare occurrence. A major transportation incident occurring in North Dakota has a one percent probability in any given year. The impact of an incident would likely range from minor to limited. Minor impacts may include very few, if any, injuries, limited property damage, the temporary shutdown of critical facilities, and minimal disruption of quality of life in the surrounding area. Limited impacts may include minor injuries only, more than 10% of property in the affected area damaged or destroyed, and the complete shutdown of critical facilities for more than one day. Regardless of impact, the spatial extent of a transportation incident is likely to be negligible, with less than one percent of the surrounding area affected. Because of the nature of the hazard, there will be little to no warning time for an incident involving transportation; these events are also likely to be over quickly (6 hours or less).

Such an incident would have major impacts on the public and first responders, and could overwhelm local resources, particularly if an accident occurs in a rural area of the state. Factors such as population growth and growth in the oil and gas industry are increasing vehicle miles travelled (VMT) which can lead to an increased risk to a major transportation accident in North Dakota. Additionally, severe weather such as blizzards will continue to occur in North Dakota, which can contribute to a major transportation accident. These factors highlight the importance of reducing risks to transportation accidents in North Dakota.

3.7.14.9 Data Limitations / References

Transportation accidents have had relatively minor impacts on the state in the past, but the level at which such accidents become overwhelming or disastrous varies by jurisdiction. Therefore, understanding the potential damages and impacts that may occur are difficult to quantify. The National Transportation Safety Board keeps very detailed records of damaging aircraft incidents. These records allow for in-depth analysis of individual accidents. The randomness of aircraft accidents, however, limits the usefulness of such information in determining the potential for future losses and areas of greatest hazard. Data outlining the normal flight patterns would help to quantify the potential for a major aircraft accident.

The North Dakota Department of Transportation analyzes the most dangerous traffic locations; however, even detailed data does not rule out a major accident at any given location.

The Federal Railroad Administration records are sufficient for calculating railroad problems over the past 10 years. Where the data is not useful is in determining the probability of a large-scale accident involving hazardous materials. An analysis of the current railroad weaknesses, numbers, and types of materials transported would enhance this profile. Such information would not be placed in a public plan for security reasons.

Other key documents related to the Transportation Accident hazard include:

- North Dakota State Emergency Operations Plan, Transportation Annex
- TransAction III, North Dakota's Statewide Strategic Transportation Plan
- North Dakota 2018 Highway Safety Plan

3.8 Risk Assessment Conclusions

This risk assessment represents an approximate history and estimated risks to the State of North Dakota from the hazards and adversarial threats identified. As with any assessment involving natural or human-caused hazards or adversarial threats, all potential events may not be represented here, and an actual incident may occur in a vastly different way than described. This assessment, however, will be used, where possible, to update the Mitigation Strategy to implement plans, policies, programs, and actions to minimize damages from these events in the future.

The impacts from different hazard and threat events on population, property, and the economy can differ greatly. Incidents also have different probabilities and magnitudes within the hazard. For example, the impacts from a light snowstorm will be different than a blizzard and a moderate flood will be different than a flash flood event. In order to complete the analysis in this section quantitative data was used where available, including estimates of dollar losses and population impacts. When this quantitative data was not available, qualitative information and assessments were used during the risk assessment process. In an attempt to rate hazards and threats, and prioritize mitigation activities, the hazards and threats were summarized based on their historical occurrence, potential losses, and local and tribal hazard assessments.

3.8.1 State-Owned Assets and Other Critical Facilities

The preceding hazard profiles each included a discussion of the exposure of state-owned assets and other critical facilities to hazard risk areas. Table 3.8-1 and Table 3.8-2 below summarize this exposure by county (state-owned facilities) and by sector (critical facilities). Additional details and discussion of the exposure of state-owned assets and critical facilities can be found in Section 2.

Table 3.8-1 Summary of State Owned and Operated Facilities by County

County	1% Annual Chance Floodplain	0.2% Annual Chance Floodplain	WUI	Within Leveed Area	Landslide Susceptibility Area	Total Exposed Facilities*	Total Facilities
Adams	0	0	1	0	144	145	144
Barnes	110	24	5	5	0	144	312
Benson	0	0	0	0	0	0	139
Billings	0	0	31	0	75	106	75
Bottineau	2	2	19	0	150	173	248
Bowman	14	19	0	3	160	196	160
Burke	0	0	2	0	1	3	157
Burleigh	62	183	161	1	725	1132	1355
Cass	133	656	0	445	0	1234	1854
Cavalier	0	1	0	0	0	1	199
Dickey	0	0	5	0	0	5	232
Divide	0	0	9	0	0	9	111
Dunn	0	0	75	4	177	256	177
Eddy	0	0	0	0	0	0	87
Emmons	0	0	37	0	147	184	151
Foster	0	0	0	0	0	0	220
Golden Valley	0	0	7	0	134	141	134
Grand Forks	20	1	0	724	0	745	1005
Grant	0	0	0	0	125	125	125
Griggs	0	0	1	0	0	1	102
Hettinger	20	5	12	0	123	160	123
Kidder	0	0	84	0	0	84	118
LaMoure	0	0	0	0	0	0	203
Logan	0	0	11	0	49	60	89
McHenry	0	4	23	30	0	57	354
McIntosh	0	0	60	0	0	60	110
McKenzie	27	17	56	0	293	393	293
McLean	0	1	64	0	272	337	365
Mercer	64	23	195	76	392	750	397
Morton	42	171	226	194	539	1172	539
Mountrail	0	0	82	0	217	299	317
Nelson	2	0	0	0	0	2	191
Oliver	0	0	0	0	68	68	68
Pembina	136	49	9	67	0	261	353

County	1% Annual Chance Floodplain	0.2% Annual Chance Floodplain	WUI	Within Leveed Area	Landslide Susceptibility Area	Total Exposed Facilities*	Total Facilities
Pierce	0	0	0	0	0	0	153
Ramsey	0	0	10	116	0	126	520
Ransom	7	70	11	59	0	147	244
Renville	0	0	0	0	0	0	120
Richland	113	48	7	58	0	226	553
Rolette	0	0	90	0	141	231	187
Sargent	0	0	9	0	0	9	244
Sheridan	0	0	2	0	0	2	55
Sioux	0	0	17	1	12	30	42
Slope	0	0	0	5	35	40	40
Stark	28	29	88	0	714	859	714
Steele	0	0	0	0	0	0	96
Stutsman	21	0	17	0	0	38	600
Towner	0	0	0	0	0	0	129
Traill	4	0	0	0	0	4	217
Walsh	202	20	0	0	0	222	404
Ward	0	0	59	140	86	285	743
Wells	0	0	0	0	0	0	226
Williams	12	0	200	91	610	913	749
Total	**1019**	**1323**	**1685**	**2019**	**5389**	**11435**	**16543**

*Some facilities are exposed to more than one hazard, therefore some facilities are counted twice in this table.
Source: North Dakota State Fire and Tornado Fund, 2018; Federal Emergency Management Agency, 2018; SILVIS Lab, 2010; USGS, 2018; USACE, 2018

Table 3.8-2 Summary of Vulnerable Critical Facilities and Infrastructure by Sector

Critical Infrastructure Type	1% Annual Chance Floodplain	0.2% Annual Chance Floodplain	Within Leveed Area	WUI	Landslide Susceptibility Area	Total Exposed	Percent Exposed	Total Facilities
Communication Towers	178	456	500	449	2,581	**4,164**	*62%*	*6,751*
Emergency Services	16	29	40	211	181	**477**	*79%*	*602*
Water	388	93	99	162	376	**1,118**	*38%*	*2,935*
Energy	50	1	12	85	23,853	**24,001**	*67%*	*35,621*
Healthcare	23	71	63	55	160	**372**	*69%*	*541*
Airports	12	6	4	6	79	**107**	*34%*	*311*
Schools	7	36	44	42	157	**286**	*64%*	*448*
Government	-	4	9	7	32	**52**	*63%*	*83*
Financial Institutions	14	41	42	31	96	**224**	*70%*	*320*
Total	**688**	**737**	**813**	**1,048**	**27,515**	**30,801**	*65%*	*47,612*

Source: North Dakota Department of Emergency Services, 2018; Federal Emergency Management Agency, 2018; SILVIS Lab, 2010; USGS, 2018; and USACE, 2018

4 Capabilities Analysis

North Dakota has been working toward a culture of pre-disaster mitigation to limit the impacts of future events. Planning initiatives have evolved to the point where 84 different federal, state, local, and tribal agencies, non-profit organizations, associations, and businesses participated in the 2018 Enhanced Mitigation MAOP update. This participation included several members of the North Dakota National Guard, the American Red Cross (ARC), and the North Dakota University System. The diverse hazard-specific committees that participated in this planning process were representative of the integration that occurs across all North Dakota programs. Integration with surrounding states, while not explicit during this planning process, also does occur in North Dakota. Hazards such as fire and flood require cross-state coordination to address different mitigation and response needs.

SHMT members also collaborate with their Canadian counterparts on mitigation initiatives, such as the International Souris River Study Board, created by the International Joint Commission (IJC). The binational study board is reviewing operations of the Rafferty, Grant Devine, Boundary and Lake Darling Reservoirs, and will propose alternative approaches and recommendations to Canadian and US governments on potential measures to reduce the risks of flooding and maximize water supply and water use benefits.

As illustrated by the breadth of the SHMT, mitigation requires the support of federal, state, local, tribal, and private sector partners to enact a results-oriented mitigation strategy designed to increase North Dakota's resiliency to natural and technological hazards and adversarial threats. These partners have a strong history of collaborating to leverage technical, financial, and material resources in pursuit of mitigation actions that have proven effective for the State. Understanding the current and potential role that agencies and organizations play in mitigation is key to developing an effective mitigation strategy. This section discusses North Dakota's statewide commitment to risk reduction, resilience, and mitigation through a number of existing "coordinating structures" which includes organizations, agencies, groups, committees, and teams that carry out activities in support of building resiliency and further identifies additional opportunities statewide for integration based on these existing programs and partnerships.

NDDES has worked extensively to improve its involvement with the local and tribal planning initiatives across the state. NDDES has been invited to, and participated in, a multitude of public meetings held during the development or update of local and tribal mitigation plans. NDDES participation in these planning efforts has helped local and tribal communities feel support from the state in their mitigation planning efforts, while also improving the final planning product. This can easily be seen in the review and approval of these local and tribal HMPs by the State Mitigation Planning Officer who has been granted the authority to approve all local and tribal mitigation plans developed by HMA subrecipients through the PAS Pilot Program. Additionally, the mitigation staff is partnering with local and tribal mitigation planning teams to pursue the NDDES Community Coffee initiative. These Community Coffees are designed to increase public outreach efforts for mitigation planning. Community Coffee participants share their experiences with hazards and threats as well as ideas to mitigate their impacts.

4.1 State Capabilities Analysis and Statewide Integration

Within state government, several agencies and programs are central to mitigation. NDDES is the lead state agency for all federal HMA programs; however, members of the SHMT together lead and take part in many statewide mitigation programs and projects as coordinating structures to advance the principles of risk reduction, resilience, and mitigation outside of the Enhanced Mitigation MAOP planning cycle. Given the importance of multi-agency involvement, interagency teams are often used to establish priorities and assist communities. For more information about the interagency planning teams, see Section 1.

4.1.1 Status of State Resource Implementation

Overall, the State continues to make great strides in hazard mitigation. The State has diversified its funding resources to ensure mitigation projects can be accomplished annually, relying less on HMGP funding. Additionally, encouraging local and tribal mitigation programs, like the NFIP, CRS, and StormReady, promotes a culture of mitigation throughout the state. Since the 2014 plan update, North Dakota has been approved to use the Program Administration by State (PAS) Pilot Program for all delegate authorities therein, which has provided the state with more responsibilities and oversight for HMGP grant management (see Section 5 for more information about North Dakota's PAS status). Additionally, the integration of the THIRA process into the hazard mitigation planning process enhances the capability of the SHMT to better understand hazards and threats and the capabilities required to mitigate impacts.

4.1.2 Programs, Partnerships, and State Plans

There are several different organizations, agencies, and committees in North Dakota that carry out activities on a regular basis that build the state's resiliency to natural disasters. This section of the plan demonstrates these different programs, partnerships, and plans where the goals and objectives of mitigation have been integrated. These efforts span a variety of different sectors, including emergency management, economic development, land use development, housing, health and social services, infrastructure, and natural and cultural resources. Each description below identifies the major partners and describes information about meetings and coordination where appropriate. During each plan update, the programs are evaluated by the appropriate agency regarding their strengths, weaknesses, changes, and potential improvements.

In addition to these programs, partnerships, and plans, members of the SHMT support a number of other hazard mitigation-related initiatives: reduce the risk of flooding in river basins through planning, participate in dam safety exercises, build resilient infrastructure, limit the spread of several human and animal infectious diseases, promote better understanding of hazards and threats, and advance understanding of hazard impacts through the use of technology. As illustrated in Table 4-11, this plan's stakeholders are involved in a myriad of projects, meetings, and organizations that integrate hazard mitigation planning data and actions into their mission and processes.

Emergency Management

Silver Jackets Program **Administered by: NDSWC**

The North Dakota Silver Jackets Program is primarily focused on the communication and collaboration of agencies for the coordination, enhancement, and streamlining of flood-related solutions. The concept was organized in North Dakota as a result of the 2009 floods. Charter members of the Silver Jacket Flood Risk Management Team in North Dakota include FEMA Region VIII, NDDES, NDSWC, and USACE St. Paul and Omaha Districts. The charter goals of the team focus on improving flood mitigation at all levels of government. The North Dakota Silver Jackets Program is managed by the NDSWC and the Flood Management Team meets annually, with additional meetings as necessary on individual projects. Several SHMT members support the work of Silver Jackets.

The Silver Jackets Program provides a mechanism for improvements to the flood mitigation system. It also fosters collaboration and communication across agencies. The program also provides an avenue for local and tribal agencies to receive guidance and information regarding flood-related problems. However, this program does not have a definitive source of funding. The Silver Jackets program is also less than 10 years old, so it continues to be integrated into mitigation programs in North Dakota.

Changes since the 2014 Plan update:

- Completed Mouse River Rural Structure Inventory Study.
- Completed Mouse River Unsteady Flow Hydrologic Engineering Center River Analysis System (HEC-RAS) Model for United States and Canada stretches of Mouse River.
- Completed Phase 1 Mouse River Flood Inundation Mapping Project for Souris River Joint Board.
- Initiated Phase 2 Mouse River Flood Inundation Mapping Project for Souris River Joint Board.
- Requested approval for Phase 3 Mouse River Flood Inundated Mapping Project for Souris River Joint Board.
- Initiated and completed Phase 1 Red River Datum Conversion Project for Red River Basin.
- Requested approval for Phase 2 Red River Datum Conversion Project in progress.
- Completed non-structural Flood Risk Reduction Workshops in Linton and Beulah in support of Corps Section 22 Flood Risk Reduction Studies.
- Completed Flood Specific Emergency Action Plan Workshops in Linton and Beulah in support of Corps Section 22 Flood Risk Reduction Studies.

- Completed Flood Specific Emergency Action Plan Workshops in Jamestown and Lamoure.
- Continue final stages of Corps Section 22 Flood Risk Reduction Studies for Emmons County Water Resource District.
- Prepare request for statewide Probable Maximum Precipitation Study in October 2018.
- Continue final stages of Corps Section 22 Flood Risk Reduction Studies for Mercer County Water Resource District.
- Completed LiDAR acquisition for entire state of North Dakota (at Quality Level III).
- Initiated New LiDAR acquisition for the Red River Basin (at Quality Level II).
- Supporting the Souris River Joint Board with request and support for the Mouse River Basin Corp Feasibility Study – currently underway.
- Prepared request for the statewide Probable Maximum Precipitation Study in October 2018.

Implementation challenges:

- Funding may be considered a challenge; overall, implementation is going well.

Suggested improvements to the program:

- Encourage additional agencies to join, such as USGS, USFWS, NWS, and NDNG.
- Increase Silver Jackets program awareness.

StormReady Program (SRP) **Administered by: NWS**

The StormReady Program is a community preparedness program that helps local communities develop plans for dealing with severe weather. The SRP provides guidelines for local emergency managers when handling severe weather operations. To become a StormReady community, several guidelines must be met. The guidelines include the following:

- Establish a 24-hour warning point and emergency operations center;
- Have more than one way to receive severe weather warnings and forecasts and to alert the public;
- Create a system that monitors local weather conditions;
- Promote the importance of public readiness through community seminars and other outreach methods; and
- Develop a formal hazardous weather plan to include training severe weather spotters and conducing emergency exercises.

Becoming nationally recognized as a StormReady community can assist communities in gaining increased scores on the CRS which in turn can lower NFIP insurance rates and broadly assist communities with maintaining local plans and increased public awareness and preparedness.

There are 64 total SRP sites in North Dakota. This includes 30 counties, 29 communities, 1 Tribal Nation, and 4 Universities. These sites are identified in the table below.

Table 4-1 StormReady Sites in North Dakota

Name	Type	Name	Type
Adams	County	Beach	Community
Bowman	County	Bismarck	Community
Burleigh	County	Bowman	Community
Cass	County	Carrington	Community
Cavalier	County	Center	Community
Dickey	County	Crosby	Community
Divide	County	Dickinson	Community
Dunn	County	Ellendale	Community
Eddy	County	Fargo	Community
Emmons	County	Fessenden	Community
Foster	County	Harvey	Community

Name	Type	Name	Type
Golden Valley	County	Hettinger	Community
Grand Forks	County	Jamestown	Community
Hettinger	County	Linton	Community
LaMoure	County	LaMoure	Community
McIntosh	County	Mandan	Community
McKenzie	County	Manning	Community
McLean	County	Minot	Community
Mercer	County	Mott	Community
Morton	County	New Rockford	Community
Oliver	County	Rolla	Community
Pembina	County	Stanton	Community
Rolette	County	Wahpeton	Community
Slope	County	Washburn	Community
Stark	County	Watford City	Community
Stutsman	County	West Fargo	Community
Walsh	County	Williston	Community
Ward	County	Standing Rock Sioux Tribe, Fort Yates	Indian Nation
Wells	County	North Dakota State University	University
Williams	County	United Tribes Technical College	University
Amidon	Community	University of Mary	University
Ashley	Community	University of North Dakota	University

Source: NWS, 2018

Changes since the 2014 Plan update:

- This section is new to the 2018 Plan Update.
- As of September 2018, five new StormReady communities have been added in 2018.

Implementation challenges:

- While the NWS does not charge for jurisdictions to become StormReady, communities may need to upgrade emergency preparedness infrastructure to qualify, which could be a financial challenge for jurisdictions with outdated equipment.

Suggested improvements to the program:

- Work with NWS North Dakota StormReady contacts to identify and support new communities to become StormReady.
- Integrate StormReady into other mitigation programs and practices.

Cloud Modification Program (CMP) **Administered by: NDSWC**

The North Dakota CMP is an operational program that seeds clouds for hail reduction and rain enhancement. The program operates from June 1 through August 31 each year. It operates in the following western North Dakota counties of Bowman, Burke, McKenzie, Mountrail, Ward, Williams, and part of Slope (NDSWC, 2015). Studies have shown a 45% reduction in hail crop losses through this program.

This program has a proven history of reducing hail losses. The program also has an excellent benefit to cost ratio of 16-26:1 for agricultural production and 48-72:1 for gross economic impact. Practitioners believe that the program provides dividends to the state. However, the impacts of the program are limited, as only seven counties in the state participate.

Changes since the 2014 Plan update:

- A study is underway to update the economics of the program; the study will be completed in 2019.

Implementation challenges:

- Funding poses a challenge between available funds and program structure.

Suggested improvements to the program:

- None

Emergency Management Performance Grants (EMPG) **Administered by: NDDES**

The purpose of EMPG is to provide Federal funds to states to assist state, local, territorial, and tribal governments in preparing for all hazards. The EMPG supports the goal to Strengthen National Preparedness and Resilience. The National Preparedness System is the instrument the Nation employs to build, sustain, and deliver the core capabilities across all mission areas: Prevention, Protection, Mitigation, Response, and Recovery needed to achieve the goal of a more secure and resilient Nation.

North Dakota continues to apply for, and be awarded, EMPG funding on an annual basis. Most recently, in FY 2018, the State was allocated $3.1 million in EMPG funding. The State's annual EMPG award has averaged around $3 million since 2014.

Changes since the 2014 Plan update:

- This section is new to the 2018 Plan Update.
- Implementation of Grants Management Software system in 2017 to manage grants electronically with the local Emergency Managers.
- Works with all sections of Emergency Management: Hazard Mitigation, Recovery, Operations and Planning, and Training and Exercise.

Implementation challenges:

- Not getting the Notice of Funding Opportunity in a timely manner and then giving us very little time to get the application completed.
- It is difficult to implement the changes from FEMA when they come out a year after the period of performance begins.
- Turnover of local Emergency Managers.

Suggested improvements to the program:

- Continue to train and assist the local Emergency Managers.
- Continue to work with all sections of Emergency Management at both the state and local level.

Emergency Management Accreditation Program (EMAP) **Administered by: NDDES/EMAP**

EMAP aims to establish credible standards for emergency management and disaster preparedness programs across the United States. EMAP is an independent, non-profit organization that establishes these standards and evaluates programs against the standards for accreditation. There are five steps taken to be an EMAP accredited emergency management program: subscription, self-assessment and application, on-site assessment, committee review and commission decision, and accreditation and maintenance (EMAP, 2018). The Emergency Management Standard is the standard to which the emergency management programs are evaluated, which includes 64 individual standards including topics such as: hazard identification, risk assessment and consequence analysis, and hazard mitigation (EMAP, 2018). The State of North Dakota became EMAP accredited in 2018. EMAP requires the support of 26 state agencies, many of whom are SHMT partners.

Changes since the 2014 Plan update:

- This section is new to the 2018 Plan Update.

Implementation challenges:

- Interpretation of Standards can be subjective.

- Preparation required extensive groundwork to develop or revise plans to ensure compliance.
- Twenty-six agencies supported the process by developing continuity of operations plans when they were balancing other priorities.

Suggested improvements to the program:

- Continue to integrate EMAP requirements into other standard program activities.
- Develop a systematic approach to ensuring periodic updates of proofs of compliance.
- Leverage the consequence analyses found in the plan to help local and tribal planning teams with identifying hazard and threat vulnerabilities of communities.

Integration with Emergency Management Planning

The SHMT has made integration a core tenant of the 2018 Plan Update. Recognizing the importance of mitigation as a backbone for a variety of different emergency management plans and activities, as well as some of the redundancies that occur from the variety of different meetings, the SHMT decided to integrate the 2018 Enhanced Mitigation MAOP Update with the THIRA Update process**.** Evidence of this integration within the plan can be seen in Section 5. Additionally, the SHMT decided to account for the mitigation-related EMAP standards within the 2018 Enhanced Mitigation MAOP Update to make the anticipated process of EMAP reaccreditation streamlined. Evidence of this integration within the plan can be seen throughout this document.

In addition, the composition of the SHMT Committees (Appendix 7.2) was critically organized to allow seamless integration both into the Enhanced Mitigation MAOP Update, and from the Enhanced Mitigation MAOP back to the respective agencies. The following agencies related to emergency management were included in the SHMT: ARC, Bismarck Fire Department, LaMoure County Emergency Management, Lutheran Disaster Response, Mouse River Firefighters Association, North Dakota Bureau of Criminal Investigation (NDBCI), NDSFM, North Dakota Firefighters Association, North Dakota National Guard, NWS, NDDES, NDEMA, North Dakota Fire Chiefs Association (NDFCA), North Dakota Safety Council (NDSC), SLIC, NDSWC, USACE, DHS, and Ward County Emergency Management.

The Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as dam safety plans, agency strategic plans, COOP plans, emergency operations plans, local HMPs, homeland security plans, and local THIRAs.

Economic Development

Main Street North Dakota **Administered by: NNDoC**

The SHMT and NNDoC have taken steps to integrate mitigation into Main Street North Dakota, a gubernatorial initiative designed to strengthen North Dakota communities. The Main Street North Dakota program is designed to help North Dakota cities create vibrant cores to attract and retain talent, enhance workforce skills and to build smart, efficient infrastructure.

Changes since the 2014 Plan update:

- This section is new to the 2018 Plan Update.

Implementation challenges:

- None

Suggested improvements to the program:

- Encourage program presentations include the importance of hazard mitigation as it relates to building stronger and more resilient communities.

Integration with Economic Development Planning

The composition of the SHMT Committees was critically organized to allow seamless integration both into the Enhanced Mitigation MAOP Update, and from the Enhanced Mitigation MAOP back to the respective agencies. The following agencies related to economic development were included in the SHMT**:** North Dakota Insurance Department, North Dakota Stockmen's Association, Office of the Tax Commissioner, and USDA.

The Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as economic development plans, workforce safety plans, and the state building code. As an example, the Economic Recovery Branch Annex of the Recovery MAOP assigns 48 public and private partners to assess commercial sector impacts; protect consumers through systematic and expedited contractor licensing and registration; and implement business recovery programs and initiatives to increase economic sustainability and viability. This branch promotes initiatives to help individuals recover from financial losses and supports implementation of recovery and restoration strategies for the following sectors: commerce, commercial facilities; and financial services.

Land Use Development

Community Assistance Program (CAP) **Administered by: NDSWC**

The NDSWC conducts outreach and provides technical assistance to local and tribal governments through the FEMA CAP-State Support Services Element (SSSE) funding opportunity; one full-time employee provides this service. The policy of the state through the CAP-SSSE program is to provide state coordination and assistance to communities in floodplain management activities, to encourage communities to adopt, administer, and enforce sound floodplain management ordinances, to provide the state engineer with authority necessary to carry out and enforce a floodplain management program, and to coordinate federal, state, and local floodplain management activities in the state. State elements of this program include community assistance visits, community assistance contacts, workshops/training, technical assistance, enrollment, CRS Support, mapping assistance, and disaster assistance. The NDSWC maintains a five-year plan for CAP activities.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- Limited resources prohibit a more robust program.
- The state has experienced staff in the flood management section.
- NDSWC staff has developed familiarity with communities enrolled in the NFIP. However, sustaining a floodplain management understanding in all NFIP participating communities. Community floodplain administrator turnover causes lack of continuity.

Suggested improvements to the program:

- Continue to strengthen the partnership with FEMA to identify and map communities at risk and promote NFIP participation and implementation.
- Increase resources to provide more training opportunities to all communities.

National Fire Plan/Firewise North Dakota/
State Fire Assistance (SFA) Program **Administered by: NDFS**

The Firewise North Dakota and SFA programs promote wildfire awareness, prevention, and mitigation, particularly in fire prone areas. Activities typically involve equipment purchases, fire suppression assistance, outreach, hazardous fuels reductions, planning, and defensible space projects. The NDFS manages these programs.

These programs provide funding priorities that emphasize mitigation, particularly fuels reductions, in wildland urban interfaces. A wide variety of mitigation activities are eligible through this program. Nationally competitive grants provide consistency across the nation. However, the focus can easily shift to preparedness activities rather than mitigation. Funding can vary greatly from year to year. The relatively low number of timbered acres versus dry grassland acres in North Dakota can reduce the number of projects that fit within the usual timber-focused programs.

Changes since the 2014 Plan update:

- Hazardous fuels reduction activities have expanded in Slope County as a result of the 2004 Deep Creek fire and additional funding has been made available annually to implement practices.
- Five private landowners have implemented hazardous fuels reduction activities within ponderosa pine forests.
- To complement activities on private land, the North Dakota Forest Service has entered into a Good Neighbor Authority Agreement with the USFS – Dakota Prairie Grasslands to implement hazardous fuels activities on public land adjacent to private land. Five priority areas have been identified within the agreement.

Implementation challenges:

- Availability of funding to implement hazardous fuels reduction and mitigation activities.
- Coordinating an effective, timely, comprehensive statewide prevention and awareness program remains a challenge.
- Developing a landscape scale model to create fire adapted ecosystems by implementing hazardous fuels reduction activities including mechanical thinning and prescribed fire.
- Engaging the 17 counties that have developed Community Wildfire Protections Plans (CWPPs) and encouraging them to implement mitigation activities.

Suggested improvements to the program:

- Develop a guide of best practices and successes.
- Facilitate a working session that brings together PIOs from a number of organizations to help develop fire messages and create outlets for the information.

Integration with Land Use Development Planning

While NDDES and the SHMT make land use development recommendations, it is ultimately the responsibility of the local jurisdictions to execute land use related mitigation measures and fully integrate mitigation with land use development (Section 4.2.1). The following agencies related to land use development were included in the SHMT: NDDoC, USDA, USFS, and USGS.

The Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as comprehensive and land use plans and economic resiliency plans. NDDCS, a division within the NDDoC, is charged with providing technical assistance related to community planning to local governments and state agencies and can be leveraged to facilitate this integration. The SHMT works with NDDCS to encourage the cross integration of local and tribal mitigation, land use, and economic planning teams to ensure all efforts account for the hazards and threats facing communities as well as strategies to continue making communities more resilient.

Housing

Building Code Program **Administered by: NDDCS**

North Dakota maintains a voluntary building code program that provides technical assistance to communities to adopt and enforce building codes. The NDDCS has the responsibility of updating the North Dakota State Building Code that consists of the 2015 International Building Code, International Residential

Code, International Mechanical Code, International Fuel Gas Code, and International Energy Conservation Code with some state amendments (Building Code Assistance Project, 2018). Communities can join the program by adopting and enforcing the state building code. As of 2018, there are 11 counties and 117 cities that have adopted the state building codes, as summarized in Table 4-2 and Table 4-3.

The program does require local adoption and enforcement of the codes, which can be a financial burden on some communities. Therefore, a significant limitation of this program is that-communities may adopt the state building code but not enforce it, allowing for inconsistent regulation of new development and remodels across the state. The Manufactured Home Installation Program within NDDCS requires all new manufactured/mobile homes installed anywhere in the state be inspected to ensure the unit is properly installed. The NDDCS coordinates with NDDES to provide technical assistance to local mitigation planning teams regarding the code enforcing status of cities and counties; steps to take to ensure enforcement or to adopt building codes; and suggested verbiage for mitigation actions related to building code enforcement.

Table 4-2 Code Enforcing Counties in North Dakota as of 2018

Code Enforcing Counties			
Adams	Dunn	Morton	Williams
Billings	Grand Forks	Mountrail	Ward
Burleigh	McKenzie	Stark	

Table 4-3 Code Enforcing Cities in North Dakota as of 2018

Code Enforcing Cities			
Alexander	Gackle/Logan	Larimore	Reynolds
Amenia	Garrison	Leonard	Richardton
Argusville	Gladstone	Lincoln	Rogers
Barney	Glen Ullin	Lisbon	Ross
Beach	Glenburn	Mandan	Sentinel Butte
Belfield	Glenfield	Manvel	Sherwood
Beulah	Golden Valley	Mapleton	Souris
Bismarck	Goodrich	Mayville	South Heart
Brinsmade	Grafton	McClusky	St Thomas
Buchanan	Grand Forks	McVille	Stanley
Bucyrus	Granville	Medina	Stanton
Burlington	Gwinner	Medora	Surrey
Carrington	Halliday	Milnor	Taylor
Carson	Hankinson	Minnewaukan	Thompson
Casselton	Hannaford	Minot	Tioga
Cavalier	Harwood	Mohall	Tolley
Center	Hatton	Mooreton	Underwood
Christine	Hazelton	New Rockford	Upham
Coleharbor	Hazen	New Salem	Valley City
DesLacs	Hettinger	New Town	Wahpeton
Devils Lake	Horace	North River	Walhalla
Dickinson	Hunter	Northwood	Washburn
Drake	Jamestown	Oakes	Watford City
Dunn Center	Kathryn	Page	West Fargo
Elgin	Kenmare	Pekin	White Earth
Ellendale	Killdeer	Portal	Williston
Enderlin	Kindred	Prairie Rose	Wilton
Fargo	Kulm	Ray	Wyndemere
Fordville	Langdon	Reiles Acres	Zap
Forman			

Changes since the 2014 Plan update:

- Effective January 1, 2017 the North Dakota State Building Code consists of the 2015 International Building Code, International Residential Code, International Mechanical Code, International Fuel Gas Code, and International Energy Conservation Code.

Implementation challenges:

- The state has no inspection authority, which falls to the local governments.
- Enforcement can be costly for local jurisdictions.
- By population, 90% live in a jurisdiction that has adopted building codes, but enforcement is spotty since many jurisdictions lack resources to conduct inspection and enforce the code.
- Few counties adopt the building codes; as a result, rural residents do not have enforcement or inspection of codes.
- Home mortgage banks and insurance companies are increasingly asking whether an applicant lives in an area where building codes are enforced.

Suggested improvements to the program:

- Develop comprehensive outreach materials for statewide dissemination.
- Promote mitigation plans as a resource for guiding facility placement, issuing building permits, and implementing or updating zoning ordinances.
- Expand the web-page for the Mitigation Planning Toolbox to include information on the State's building code program.

Integration with Housing Planning

The Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as affordable housing plans and vulnerable population services. This integration supports the mission of the Housing Branch Annex of the Recovery MAOP for the 40 public and private partner agencies, to assess communities' needs and housing inventories, implement short-term housing programs, and identify long-term sustainable solutions to enhance community resiliency.

Health and Social Services

Hazardous Materials Emergency Preparedness (HMEP) Program **Administered by: NDDES**

The HMEP program through the Pipeline and Hazardous Materials Safety Administration (PHMSA) provides grants for planning and training. Within the planning program, risk assessments and hazard studies are eligible. NDDES provides technical assistance and administers this grant program for the state.

This program promotes hazardous material risk assessments and studies, but the focus is more on preparedness rather than mitigation.

Changes since the 2014 Plan update:

- With HMEP dollars NDDES is conducting a Flow Study across the state. When complete, individual counties will have access to data about what hazardous materials are traveling through or being stored in their counties; identify geographic areas (roads, train routes, pipelines) which are at risk of experiencing an accident/spill; identification of populations, public and private facilities which may be impacted by accidents/spills. The counties can take this information on help mitigate impacts by identify mitigation actions to prevent spills from occurring in those areas (ex., reduced speeds). The Flow Study will be complete by September of 2019.
- HMEP funding establishes opportunities for responders to obtain training for addressing hazardous materials accidents and spills (including awareness level to technician level). During the FY 16-17 grant over 600 volunteer and professional firefighters received training through the HMEP program.

Implementation Challenges:

- The primary challenge in implementing HMEP programs is that the majority of responders are part of departments which are manned by "volunteer" departments. These firefighters already have full-time jobs and professions so finding personal time to participate in training can be difficult forcing participants to take vacation time from their jobs or participate in weekend training taking them away from families.
- Developing plans and organizing exercise events are a challenge simply due to time. Most county emergency managers are part-time positions, and this limits the activities which they can organize.
- The growth of the oil industry in western North Dakota has impacted volunteer departments because of an increase in call-outs. Where a department may have had two or three calls during the month, they now face responding to accidents on a weekly, and in some instances, a daily basis. This is putting a strain on the volunteer system and upon those businesses who have staff participating with volunteer departments. While there has been a bit of a respite with the decline of activity in the oil patch, work is beginning to ramp up again and response activity is increasing. With this type of schedule volunteers have no time for training and exercising.

Suggested improvements to the program:

- None

North Dakota State University Extension Service **Administered by: NDSU**

North Dakota State University Extension provides research-based information to the residents of North Dakota on various topics, including disaster preparedness and recovery. State specialists and county Extension agents provide educational publications, media releases and videos on cleaning and repairing flooded household goods and homes, drought issues, family and children, farm and ranch, and resource materials in multiple languages.

North Dakota State University Extension state specialists and county Extension agents provide research-based information and education to help North Dakotans prepare for and recover from various disasters, including winter storm, drought and flooding Extension provides information, videos, news releases, lesson plans and more. NDSU Extension is active in the national Extension Disaster Education Network (EDEN) that offers courses educators can teach locally. NDSU Extension staff also collaborate with NDDES, other SHMT partners and state agencies staffing the State Emergency Operations Center (SEOC) to develop flood and drought response and mitigation strategies.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- No Extension staff time dedicated to disaster education.
- Staff have other priorities until their community is in a disaster.
- Need to bring new staff into disaster education work for succession planning.

Suggested improvements to the program:

- Dedicate a portion of a new staff member or a graduate assistant to disaster education.

Integration with Health and Social Services Planning

The NDDoH leads efforts to ensure the Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as disease prevention plans, public health and medical all hazards plan, pandemic influenza response plan, and environmental health plans. Along with North Dakota Department of Human Services (NDDHS), the NDDoH works with the 41 agencies assigned responsibility in the Health and Social Services Branch Annex of the Recovery MAOP. The mission is to assess the needs of survivors; restore public health, behavioral health, and social services networks; and promote the resilience, independence, health, and well-being of the whole community.

The following agencies related to education were included in the SHMT**:** NDSU System, NDSU Extension, and University of Mary. The Enhanced Mitigation MAOP will continue to be actively integrated into other relevant plans, such as North Dakota curriculum standards plans.

Infrastructure

Transportation Improvements **Administered by: NDDOT**

The NDDOT regularly conducts mitigation through road improvements. NDDOT prepares risk assessments and designs facilities in anticipation of high water flows and other potential hazards. Minimum design standards are used to determine structure sizes for different road classifications. NDDOT also encourages local officials to adopt design standards. The structures are evaluated for various flood frequencies in relation to overtopping. This information is then used to assess the risks associated with the various structure sizes. NDDOT also works through transportation improvements to reduce traffic accidents and mitigate losses and casualties due to hazardous material releases and other transportation incidents.

NDDOT successfully encourages mitigation when transportation improvements are made. Minimum design standards are used for roadways. State design standards may be used as models for local transportation officials. Hazard mitigation is being considered at the strategic level as well as the individual project level. Bridge inspection program identifies bridge issues before they are a problem. However, hazard mitigation is not the primary focus, so it may at times be overlooked.

Changes since the 2014 Plan update:

- Program priorities have shifted to focus on transportation infrastructure in areas experiencing rapid energy development.

Implementation challenges:

- The State's largest cities receive a larger share of federal funding and need to find matching funds. Other do not get enough federal funds to need to a match.

Suggested improvements to the program:

- None

Living Snow Fence Program **Administered by: NDFS**

Following the 1996-1997 winter season, the Living Snow Fence program was initiated in North Dakota to plant living snow fences to prevent the blowing and drifting of snow along roadways. The program was initially funded through the HMGP. The program is now funded 80% with federal Transportation Enhancement funds and 20% with NDDOT funds. Since 1997, 594 living snow projects have been completed protecting 270 miles of roads. Living Snow Fence program is managed by the NRCS, NDFS, and NDDOT.

The Living Snow Fence Program provides a specific emphasis on living snow fence projects related to the winter storm hazard. There are no local match requirements due to match requirement being met with state NDDOT funds. There are high participation rates. Also, the program is a great example of interagency participation to achieve a specific mitigation goal. However, funding for this program is dependent on grants. Snow fences could be vulnerable during periods of drought. Lastly, more “snow drifting” problems exist across the state than funding can mitigate.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- Lack of available funding through a variety of programs. An incentives package comparable to what was made available from 1998-2008 is no longer available.

- Interest in living snow fences dwindled after multiple years of milder winters.
- The Living Snow Fence Task Force disbanded around 2008.
- Although there are many sites that could use protection, interested landowner saturation was reached.

Suggested improvements to the program:

- Pursue funding through HMA; encourage state agencies to consider reinstatement of funding for this initiative.
- Following a catastrophic winter, when interest is again piqued, the creation of another task force should be explored.
- And incentives program that duplicates past efforts and includes a land rental payment, cost-share for trees and fabric weed barrier, and a maintenance allotment should be created.

National Dam Safety Program **Administered by: NDSWC**

The purpose of North Dakota's Dam Safety Program is to minimize the risk to life and property associated with the potential failure of dams in the State. Functions of the Dam Safety Program include conducting dam inspections, making recommendations to dam owners regarding necessary maintenance and repairs, and maintaining an inventory of dams in North Dakota. There are currently 130 high and medium hazard dams in the State, including 24 federally owned dams. Dam Safety Program staff conduct full inspections of the 106 non-federally owned high hazard and medium hazard dams on a rotational basis. High hazard dams are currently scheduled for inspection at least once every four years. Medium hazard dams are currently scheduled for inspection at frequencies varying up to once every ten years.

The Dam Safety Program is managed by the NDSWC. The program is primarily State funded; however, FEMA provides some federal funding through National Dam Safety Program grants. Federal funding is currently being used to develop new minimum standards for dam design and construction permitting. Federal funding has also been used to review dam hazard classifications, conduct hydrologic analyses of high hazard dams, fund one part-time position, provide training opportunities for dam safety employees, purchase equipment necessary for inspections, provide dam owner educational workshops and seminars for dam owners and the local dam engineering community, and provide assistance to dam owners to develop EAPs, to digitize historic dam records, and other projects. Two full time employees staff the North Dakota Dam Safety Program. Permitting of the construction of dams is handled through NDSWC's Regulatory Section and is not included in this discussion of the Dam Safety Program.

The Dam Safety Program allows for regular inspection of selected dams. The program provides for a comprehensive dam identification and inventory process. Funding is available to dam owners to assist with the development of EAPs.

Changes since the 2014 Plan update:

- The North Dakota Dam Design Handbook is being revised.

Implementation challenges:

- There is a lack of resources to ensure that problems identified by inspections are corrected.
- A part-time, federally funded position to assist with the program was eliminated.

Suggested improvements to the program:

- None

Integration with Infrastructure Planning

The Enhanced Mitigation MAOP will continue to be actively integrated into other relevant plans, such as aviation safety plans, regional infrastructure plans, state transportation infrastructure plans, TransAction III: North Dakota's Statewide Strategic Transportation Plan, traffic safety plans, Statewide Transportation Improvement Program, electric standards, electric inspections plans, and building codes. The following agencies related to infrastructure planning were included in the SHMT: FHWA, NDaRECs, NDDOT, NDHP, North Dakota Petroleum Council (NDPC), North Dakota State Electrical Board (NDSEB), NDSWC, and USACE.

This planning integration also aligns the efforts of 45 public and private partners identified in the Critical Infrastructure Branch Annex of the Recovery MAOP to ensure resilient communities. The mission supports local and tribal governments to assess damages; prioritize repairs; and restore and harden critical infrastructure sectors to include: road infrastructure; information technology; dams; power infrastructure; airport infrastructure; energy sector; railroads; pipeline systems; telecommunications infrastructure; communications.

Natural and Cultural Resources

Cultural Heritage Grant Program **Administered by: SHSND**

The SHSND has managed the Cultural Heritage Grant Program since it was created in 2003 and provides grant funding for local museums and historical societies. Since 2011, the North Dakota Legislature has authorized funding to organizations and property with disaster planning and preparedness projects or has been affected by a recent natural disaster.

The Cultural Heritage Grant Program provides additional cost-share funding sources to assist historical properties affected by natural disasters.

Changes since the 2014 Plan update:

- No funding available due to budget cuts.

Implementation challenges:

- There is a dollar-for-dollar match requirement for applicants and the funding source is not that large.
- Many applicants are part-time or non-professionals who have limited experience writing grants and sometimes have trouble translating ideas into definable projects.

Suggested improvements to the program:

- Pursue restoration of funds, if feasible.

Integration with Natural and Cultural Resources Planning

The following agencies related to natural and cultural resources were included in the SHMT**:** Standing Rock Bureau of Indian Affairs, SHSND, NDSWC, United States APHIS, BOR, USDA, USFS, USGS, UND EERC for Oil and Gas, and Western Dakota Energy Association (WDEA). These agencies help ensure mitigation projects comply with federal, state, local and tribal laws and regulations including the National Environmental Policy Act (NEPA) and the National Historic Preservation Act of 1966.

The Enhanced Mitigation MAOP is actively integrated into other relevant plans, such as state water management plan, drought disaster livestock water supply plan, historic preservation plans, state park management plans, utility and mining oversight plans, animal health plans, geologic research plans, oil and gas drilling and production plans, and forestry and fire management plans. Mitigation factors prominently in the Natural and Cultural Resources Branch Annex of the Recovery MAOP. The mission of the 25 agencies tasked in the plan is to assess damage and identify restoration programs and initiatives to preserve, conserve, rehabilitate, and restore natural and cultural resources.

Integration with FEMA Programs and Initiatives

The section below outlines how North Dakota has integrated FEMA mitigation initiatives and programs into existing state agencies, organizations, and partnerships to advance the state’s mission to reduce risk and build resilience. North Dakota manages a variety of these FEMA programs to fund mitigation projects throughout the state and actively integrates mitigation efforts into a variety of local initiatives. For example, as a participant in the PAS Pilot Program, North Dakota has several delegated authorities related to managing the HMGP applications in the state. The SHMT also included a diverse group of stakeholders, across multiple agencies, that help to administer the FEMA grant programs. These stakeholders in turn bring to the planning process their vast network of working relationships with other local, tribal, state, and federal agencies that promote integration of mitigation plans and FEMA's programs.

Another example of integration into FEMA programs is North Dakota's initiative to integrate the 2018 THIRA update with the 2018 Enhanced Mitigation MAOP update. This integration included utilization of the Enhanced Mitigation MAOP methodologies for the first two steps of the 2018 THIRA update process. It also included merging the THIRA capability target language (Table 4-18) and the mitigation strategy objectives (Section 5). The goals and objectives from the Enhanced Mitigation MAOP are considered in all the other FEMA programs that North Dakota manages, including setting priorities for FEMA HMA grants.

Hazard Mitigation Assistance (HMA) **Administered by: NDDES**

FEMA's HMA grant programs provide funding for eligible mitigation actions that reduce disaster losses and protect life and property from future disaster damages. Currently, NDDES administers HMGP, PDM, and FMA in North Dakota, which fall under the umbrella of HMA.

As part of managing and administering the different HMA programs, NDDES works to ensure they are not duplicating efforts of other agencies or organizations, while still providing technical support and assistance in the planning and implementation of activities that help bolster the state's capabilities and promote mitigation. In these efforts, NDDES works closely with the NDSWC by holding quarterly meetings to ensure each agency is aware of the other's planned or in process activities, and that each agency participates in these activities, when applicable.

Additionally, NDDES has created the State Hazard Mitigation Ranking Team (SHMRT) which consists of representatives from the NDDOT, NDSWC, NDDoH, North Dakota State Historic Preservation Office (SHPO), and NDEMA. The SHMRT is used to review and rank each of the projects that are being submitted for funding under the nationally competitive HMA programs in order to prioritize each of the projects being submitted for competitive grant funding and potential FEMA approval. In addition to the SHMRT consisting of representatives from different state agencies, these are also the main regulatory agencies for the state which helps provide an additional level of review and agency involvement when determining which projects should be submitted and funded through these HMA programs as well.

Hazard Mitigation Grant Program (HMGP) **Administered by: NDDES**

HMGP Section 404 provides federal funding for projects that will significantly reduce or permanently eliminate future risk to lives and property from severe natural hazards. HMGP provides up to 75% of funds necessary for a hazard mitigation project through the FEMA. Mitigation funds available as a result of a Presidentially-declared disaster are based on a percentage of the overall Public Assistance, Individual Assistance, and Federal Mission Assignment funds spent. Mitigation funds can be used anywhere in the state and on any natural hazard. The State Hazard Mitigation Ranking Team (SHMRT) scores and rates hazard mitigation project applications for funding. The HMGP project priorities are set by the SHMT. The state has an administrative plan for HMGP program. The plan defines the roles and responsibilities, procedures, and processes for the program. The North Dakota State Legislature provides up to a 10% match for HMGP. NDDES provides technical assistance and administers this grant program for the State. Details on HMGP grant management can be found in Section 5. From 1998 to July 2018, North Dakota leveraged HMGP funding 27 times, including four times since the 2014 Plan Update. Table 4-4 shows the history of funding available by disaster through HMGP.

Table 4-4 HMGP Funding Received in North Dakota (1997 – July 2018)

Disaster Number	Disaster Year	Total Funding
1174	1997	$55,715,263
1220	1998	$2,498,825

Disaster Number	Disaster Year	Total Funding
1279	1999	$15,221,346
1334	2000	$12,422,225
1353	2000	$131,001
1376	2001	$4,521,039
1431	2002	$196,466
1483	2003	$141,000
1515	2004	$800,138
1597	2005	$1,468,552
1616	2005	$140,130
1621	2005	$130,277
1645	2006	$467,014
1713	2007	$487,514
1725	2007	$5,094
1726	2007	$1,615,257
1829	2009	$28,630,867
1879	2010	$1,170,107
1901	2010	$3,469,426
1907	2010	$181,803
1981	2011	$98,626,510
1986	2011	$644,963
4118	2013	$1,252,182
4128	2013	$1,816,325
4154	2013	$985,348
4190	2014	$359,652
4323	2017	$412,851
	Grand Total:	**$233,511,175**

Source: NDDES

The HMGP is a well-established program, with well-established policies and procedures that have been refined to meet state, tribal, and local needs. The number of disaster declarations that have occurred since 1998 have allowed for regular and significant funding from this program for hazard mitigation projects in North Dakota. Moreover, these ample funding opportunities are not exclusively limited to disaster areas; all entities statewide can apply. However, the continuity of this program depends on future disasters, making it difficult to plan on using this funding source. The program requirements can be complex to understand, such that eligible applicants can be untrained or unaware of HMGP application requirements. This may lead to applicants submitting incomplete or ineligible applications for NDDES and FEMA to review.

Changes since the 2014 Plan update:

- Authority in PAS Pilot Program
- Shift toward using pre-disaster funding as opposed to post-disaster funding due to smaller, and less frequent, disasters.

Implementation challenges:

- Availability of the HMGP is always unknown and unpredictable as it is not only based on having a large scaled natural disaster event that exceeds local and state capabilities, but also receiving a Major Disaster Declaration by the President.
- Lack of interest from State, local, and tribal partners.
- Overall complexity of the programs, including the completion of Benefit Cost Analyses (BCAs).
- Low percentage available for use as Section 324 Management Costs.

Suggested improvements to the program:

- Develop comprehensive outreach materials for statewide dissemination which will create additional awareness of the HMA programs as well as a better understanding of application requirements and the formal review process.
- Provide additional training for application development and project management.

Pre-Disaster Mitigation (PDM) Program **Administered by: NDDES**

The PDM program provides a consistent source of funding to state, local, and tribal governments for pre-disaster mitigation planning and projects primarily addressing natural hazards. Funding for these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM provides 75% funding of project costs, except for communities characterized as small and impoverished communities, which can receive up to 90%. Table 4-5 outlines the PDM funding received by the State. After a break in receiving PDM funding from 2009 – 2015, PDM funding has become an increasingly valuable source of funding for hazard mitigation projects for the State.

Table 4-5 PDM Funding Received in North Dakota (2005 – July 2018)

Year	Total Funding
2005	$3,139,729
2006	$10,395
2007	$366,494
2008	$440,786
2009	$505,780
2015	$227,596
2016	$3,146,122
2017	$7,421,539
Grand Total:	**$15,258,441**

Source: NDDES

The PDM program requires a comprehensive HMP to guide future projects and encourages local- and tribal-level mitigation planning and public participation. The PDM program provides mitigation opportunities, even if federal post-disaster funding is not available, and is a nationally competitive process which strives for consistency across the country. Funding and program priorities change on an annual basis for PDM; however, the program still provides a reliable source of funding for developing or updating mitigation plans and implementing projects. Conversely, the grant application and selection process for PDM is lengthy and can discourage some communities from applying. The lengthy time frame between the grant application submission and federal award occasionally delays implementation of timely projects, but efforts are underway to streamline the process. PDM can also leave funding gaps for beneficial, but not cost-effective mitigation projects, such as early warning sirens or shelter generators that could be funded under HMGP. Many local and tribal HMPs identify these types of mitigation/preparedness projects, but communities cannot apply to fund them under the PDM program. Since the 2014 Plan Update, there has been an increase in national funding to the PDM program, with Fiscal Year (FY) 2014 having $63,000,000, FY 2015 $30,000,000, FY 2016 $90,000,000, FY 2017 $90,000,000 and FY 2018 $235,200,000.

Changes since the 2014 Plan update:

- Shift toward using National programs versus HMGP funding due to smaller, and less frequent, disasters.

Implementation challenges:

- Lack of interest from State, local, and tribal partners.
- Overall complexity of the programs, including the completion of Benefit Cost Analyses (BCAs).
- Applicants can have a potentially high front-end cost to get an application completed due to the requirements of the program and application review criteria, but yet they have no guarantee that those costs will ever get reimbursed because the program is competitive by nature. Introducing a phased project approach to the National programs would allow for better overall project coordination from start to finish and allow applicants to get those front-end costs reimbursed. This would also generate interest in the programs because it would make the initial application process

simpler for applicants to complete and provide the applicants a level of security moving forward with a project that has been approved by FEMA before the preliminary engineering and design phase, not after.

- Availability of programs is annual, but the application period is never static. This can make it hard to rely on this program from a budgeting and scheduling standpoint.
- Timeframe from application period opening to actual award can be up to 9 months or potentially longer if a project has a lot of environmental conditions that must be considered. This again makes it hard to rely on this project from a budgeting and scheduling standpoint.

Suggested improvements to the program:

- Provide additional training for application development and project management.

Flood Mitigation Assistance (FMA) **Administered by: NDDES**

The FMA program provides funding on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the NFIP. Table 4-6 outlines the FMA funding received by the state.

Table 4-6 FMA Funding Received in North Dakota (2009 – July 2018)

Year	Total Funding
2009	$12,595,643
2017	$147,762
Grand Total:	**$12,743,405**

Source: NDDES

The Biggert-Waters Flood Insurance Reform Act of 2012 (found in H.R. 4348) eliminated two NFIP funded mitigation programs, the SRL program and Repetitive Flood Claim (RFC) program. Aspects of both the SRL and RFC Programs have been merged into the currently existing FMA program to simplify and broaden the accessibility of all three programs and their activities.

The FMA program specifically targets and offers financial relief for properties suffering regular and repetitive losses through the NFIP, thus, focusing on those properties that cause the most losses. Using this program, the State of North Dakota does not currently have any properties identified as severe repetitive loss; however, the program is still made available for all NFIP insured properties that may have experienced losses due to flooding. Unfortunately, many homeowners are not interested in acquisition opportunities if they have not been repetitively flooded, so some program funding may go unused for property acquisitions. FMA also does not provide funding for large scale flood mitigation activities, such as community levee or floodwall systems, which are eligible flood mitigation activities under HMGP and PDM.

Changes since the 2014 Plan update:

- Shift toward using other sources of other HMA funding sources versus HMGP funding due to smaller, and less frequent, disasters.

Implementation challenges:

- Lack of interest from State, local, and tribal partners.
- Overall complexity of the programs, including the completion of Benefit Cost Analyses (BCAs).
- Applicants can have a potentially high front-end cost to get an application completed due to the requirements of the program and application review criteria, yet they have no guarantee that those costs will ever get reimbursed because the program is competitive by nature. Introducing a phased project approach to the National programs would allow for better overall project coordination from start to finish and allow applicants to get those front-end costs reimbursed. This would also generate interest in the programs because it would make the initial application process simpler for applicants to complete and provide the applicants a level of security moving forward with a project that has been approved by FEMA before the preliminary engineering and design phase, not after.
- Availability of programs is annual, but the application period is never static. This can make it hard to rely on this program from a budgeting and scheduling standpoint.

- Timeframe from application period opening to actual award can be up to 9 months or potentially longer if a project has a lot of environmental conditions that must be considered. This again makes it hard to rely on this project from a budgeting and scheduling standpoint.

Suggested improvements to the program:

- Develop comprehensive outreach materials for statewide dissemination.
- Develop a guide of best practices and successes.
- Provide additional training for application development and project management.

Public Assistance (PA) Grant Program **Administered by: NDDES**

FEMA's PA grant program provides federal funding to state, local, and tribal government organizations, and eligible Private Non-Profit (PNP) organizations to reimburse eligible disaster related expenses following a Presidential disaster declaration. The grants provided through the PA program are used by the grant Recipient (usually the state department of emergency services) and eligible subrecipients to reimburse costs associated with debris removal, life-saving emergency protective measures, and the repair, replacement, and restoration of disaster damaged publicly-owned facilities, as well as damages to facilities and infrastructure owned and operated by eligible PNP organizations. The federal cost share is generally 75% of the eligible disaster related expenses but can be raised to as much as 90% for larger disaster events. States are typically the Recipient of PA grants; however, federally recognized Indian Tribes can also be Recipients for the PA program if they choose. Recipients of a PA grant will determine how the non-federal share (generally 25% of eligible expenses) will be paid, whether it is entirely the subrecipients (eligible applicants) responsibility, or if the Recipient will provide a portion of the non-federal cost share.

The permanent work done to repair, replace, and restore damaged facilities under the PA program is broken down into specific categories of work, primarily Categories C through G. These categories correspond to different types of infrastructure that were damaged by the declared disaster event, including roads and bridges, water control facilities, public buildings and contents, public utilities, and parks/recreational/other facilities.

The State of North Dakota is a PA managing state, meaning that the state is authorized to manage all aspects of PA field operations, including the completion of damage assessments, site inspections, project worksheet development, and the submittal of project worksheets for federal review and approval. FEMA still retains final obligation authority to ensure compliance with environmental and historic preservation laws, while providing technical assistance and quality control reviews for the state. As aforementioned, the typical federal cost share for PA projects is 75%. The North Dakota State Legislature also provides up to a 10% match for the PA Program, leaving 15% as the subrecipient responsibility.

Section 406 Hazard Mitigation funding is also available under the FEMA PA Program, and can be used to improve and protect facilities and infrastructure that were damaged by the federally declared disaster event in order to prevent similar damages in the future. Section 406 Hazard Mitigation work must be cost effective, be reasonably implemented as part of the eligible repair work, and be technically feasible in reducing or preventing damages to facilities or infrastructure from future disaster events. Sometimes, a combination of Section 406 and 404 (HMGP) funding may be deemed appropriate if additional funding is required for the mitigation activity to be implemented.

The PA program funds mitigation work under Section 406 during the completion of permanent facility repairs because Section 406 Hazard Mitigation funding is site specific and only eligible for the damaged sites that were identified and funded under PA Categories C-G following a declared disaster event. Additionally, there is increased awareness of hazards immediately following major disasters, so that the public, including local officials, may be more open and motivated to implementing mitigation measures during the recovery period immediately following a major disaster. Recovery, not mitigation, is typically the primary objective of communities immediately following a disaster; mitigation opportunities that would otherwise be funded may be missed due to a focus on repairing damaged infrastructure and returning to normal function. Moreover, identifying mitigation costs versus repair costs can be difficult to document and time consuming for a damaged facility.

Changes since the 2014 Plan update:

- NDDES has developed a State Recovery MAOP to tie Recovery and Mitigation into a cohesive, whole community approach.
- FEMA is developing a new Program Delivery Model to improve the effectiveness of the PA Program at the national, state, local, and tribal levels.

Implementation challenges:

- Sustaining trained personnel to fill the required roles of the new Program Delivery Model due to lack of available funding to keep a permanent staff.
- The size of future disasters will most likely dictate the ability of the state to sustain state managed aspects of PA field operations.
- Ensuring cooperative support, between both MB3 Inc. and FEMA, to develop in a timely manner the ability to have the State's MB3 software upload into FEMA's Grants Manager software, prior to any future State Presidential Disaster Declaration.

Suggested improvements to the program:

- Provide additional training for application development and project management.
- Develop, schedule, and conduct classes to train new reservist personnel for future State Presidential Disaster Declarations.
- Seek additional funding at both the State and Federal government level.

Table 4-7 Public Assistance Funding Received in North Dakota (1993 – 2018)

Disaster Number	Year	Closeout Date	Current 100% Totals
1001	1993	9/14/98	$8,571,646.00
1032	1994	10/1/98	$4,310,380.00
1050	1995	4/6/00	$12,293,559.00
1118	1996	5/10/00	$12,593,103.00
1157	1997	9/14/98	$18,910,011.00
1174	1997	5/13/10	$208,538,688.39
1220	1998	3/8/05	$12,239,524.00
1279	1999	5/13/10	$52,274,232.98
1334	2000	8/10/10	$43,171,922.90
1353	2000	7/10/03	$1,031,341.10
1376	2001	4/4/12	$30,242,080.47
1431	2002	1/25/07	$1,450,730.21
1483	2003	4/6/05	$1,144,553.19
3196	2004	3/10/05	$408,754.01
1515	2004	7/5/12	$16,248,089.49
1597	2005	8/2/12	$18,579,370.43
1616	2005	9/5/08	$2,622,915.82
1621	2005	6/2/11	$2,537,340.72
1645	2006	10/16/12	$9,477,556.52
1713	2007	2/26/13	$3,766,458.33
1725	2007	3/31/10	$911,890.13
1726	2007	2/26/13	$10,143,540.87
1829	2009	4/3/18	$128,443,637.28
1879	2010	3/12/15	$16,999,869.04
3309	2010	11/19/13	$6,442,741.19
1901	2010	2/12/16	$35,485,534.99
1907	2010	7/24/18	$25,141,371.91
1981	2011	Not Completed	$251,716,913.99
1986	2011	12/8/15	$7,905,925.17
4118	2013	Not Completed	$9,501,642.15
4128	2013	Not Completed	$13,419,731.25

Disaster Number	Year	Closeout Date	Current 100% Totals
4154	2013	Not Completed	$5,714,999.67
4190	2014	Not Completed	$3,196,415.23
4323	2017	Not Completed	$6,610,364.15

Source: NDDES

Community Development Block Grant (CDBG) **Administered by: NDDoC Division of Community Services (NDDCS)**

CDBG funds are used to improve communities, particularly low to moderate income communities. Many projects such as property acquisitions and infrastructure improvements can also qualify as hazard mitigation. CDBG funds are unique in that they can be used as grant match in some cases. Historically, CDBG funds in North Dakota have been used for acquisitions following flood events. Grand Forks and Fargo both had substantial acquisition programs using CDBG funds. However, CDBG funding often prioritizes other issues besides hazard mitigation, and the funds are generally limited to low- or moderate-income communities.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- Mitigation is not always a priority for funding.
- Funding is limited to low- or moderate-income communities.
- Community awareness and capacity for grant development required.
- Different requirements compared to other government grants.

Suggested improvements to the program:

- None

Community Development Block Grant Supplemental Disaster Recovery (CDBG-DR) **Administered by: NDDCS**

The CDBG Supplemental Disaster Recovery (CDBG-DR) funds are to be used toward meeting unmet housing, infrastructure, public service, public facility, and other needs in counties designated as Presidential Disaster areas. Table 4-8 displays the amount of CDBG-DR North Dakota has received from 1993 to 2018.

Table 4-8 North Dakota CDBG-DR Funding (1993 – 2018)

Year	Grantee	Total Funding
1993	City of Bismarck	$2,303,000
1993	City of Fargo	$2,069,000
1993	State of North Dakota	$15,035,000
1993	Grand Forks	$219,000
1997	State of North Dakota	$10,200,140
1997	Fargo	$5,943,963
1997	Cass County	$1,400,000
1997	Pembina County	$1,000,000
1997	City of Devil’s Lake	$3,500,000
1997	Richland County/Wahpeton	$3,326,264
1997	Walsh County	$504,504
1997	Grand Forks County	$2,176,049
1997	City of Grand Forks	$121,567,707
1997	Mercer County	$500,000
1997	Traill County	$1,000,000
1998	North Dakota	$1,500,000
2011	State of North Dakota	$11,782,684

Year	Grantee	Total Funding
2011	City of Minot	$67,575,964
2011-2013	State of North Dakota	$6,576,000
2011-2013	City of Minot	$109,396,000
	Grand Total:	**$367,575,275**

Source: United State Housing and Urban Development Agency (HUD), 2017

Changes since the 2014 Plan update:

- None; no implementation of the program has occurred.

Implementation challenges:

- Funding is dependent on a federally-declared disaster declaration.

Suggested improvements to the program:

- None

National Flood Insurance Program (NFIP) **Administered by: NDSWC**

The Federal Disaster Protection Act of 1973 requires state and local governments to participate in the NFIP as a condition to the receipt of any federal loan or grant for construction projects in identified flood prone areas. The NFIP has three main elements: hazard identification and mapping, floodplain management, and federal flood insurance. Participation in the NFIP requires communities to adopt floodplain regulations that meet or exceed minimum NFIP standards. In 2012, the Biggert-Waters Reform Act was signed and contains many reforms that will impact the NFIP moving forward. Some of the changes directly impacting flood insurance include the phasing out of subsidies (including grandfathering) and issuing new insurance policies at full-risk rates.

Communities have received assistance through the North Dakota Floodplain Management Act of 1981 which directs the state engineer to aid local governments in reducing flood damages through sound floodplain management.

As of April 2018, 330 North Dakota communities participate in the NFIP, of which 322 are in the regular program and eight are in the emergency program (FEMA, 2018). There are 85 NFIP participating communities that have no special flood hazard areas identified and 64 communities have only minimal flood hazard areas identified in their community (FEMA, 2018). There are 26 communities that are sanctioned and do not participate in the NFIP (FEMA, 2018). Four of these communities have been suspended from the regular NFIP and one was withdrawn (FEMA, 2018). All 26 sanctioned communities have identified hazard areas (FEMA, 2018).

Historically, after North Dakota's most significant flood events in 1979, 1997, 2009, and 2011 flood insurance claims spiked upward. Over $259 million dollars in flood insurance claims has been paid within North Dakota over the period of 1978 – June 2018. The majority of the claims occurred from the 1997 and 2011 spring floods. Most of the state's flood insurance losses have occurred in the six Red River Valley counties and in two counties bordering Devils Lake. The 2011 flood was different in that it impacted every river basin in North Dakota.

An important strength of the NFIP in North Dakota is the statewide policy of elevating the lowest floor to an elevation no less than one foot above the base flood elevation. The higher standard provides additional protection for structures during floods greater than the 1% annual chance flood and is an important and effective flood mitigation strategy across the state for future development.

The NFIP is a critical component of mitigation in the state. Individuals can purchase insurance for flood, and North Dakota has a high level of participation in the program. State law exceeds NFIP minimums addressing elevating on fill or dry floodproofing above the base flood elevation; compliance means eligibility for a letter of map revision. Moreover, model ordinances used in North Dakota exceed minimum NFIP requirements. The companion Risk Mapping, Assessment, and Planning (RiskMAP) program works to improve community flood maps which help strengthen communities' abilities to practice floodplain management. However, NFIP requires local adoption and enforcement of floodplain ordinances. The State NFIP Coordinator supports local and tribal mitigation plans by reviewing communities' NFIP status and guiding development of mitigation action related to program maintenance and enforcement.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- Floodplain management does not always work well at the local level, due to issues such as developer influence and politics.
- Despite new efforts, mapping is often outdated and can lead to inequalities in mapped areas versus unmapped areas.
- In most areas, permits are issued only very rarely, so continuing education and active participation are challenges.
- One third of all communities in the NFIP have no flood hazard map.
- State zoning law for cities, counties and townships can confuse the practice of floodplain management in rural areas and where urbanization may be occurring.
- Floodplain management is often just one responsibility among numerous other job duties for community floodplain administrators.
- Community floodplain administrator turnover causes floodplain management inconsistencies, often there is no transition of information.

Suggested improvements to the program:

- Continue working with FEMA to identify and map communities at risk and promote NFIP participation and implementation.
- Support FEMA's Moonshot of doubling the number of properties covered by flood insurance by 2022.
- Provide more training to local communities and floodplain administrators who are responsible for regulating floodplain development.
- Encourage local jurisdictions to incorporate higher building standards to create a more flood resilient community.

Risk Mapping, Assessment, and Planning (RiskMAP) Program **Administered by: NDSWC**

Congress passed the National Flood Insurance Act of 1968, thereby creating the NFIP. As a part of making insurance available to citizens, it also required the Federal Government to: identify the highest risk areas by creating flood hazard zone mapping on what are now most commonly released as FIRM and ensure that local communities implement standards for safe development around the highest risk areas when they choose to participate in the NFIP.

Congress appropriated funding for FEMA to implement a five-year "Flood Map Modernization" effort. Map Modernization was a multi-year effort to upgrade the paper FIRM inventory into seamless flood hazard data publicly available in a geographic GIS format nationwide. The ability to leverage the resources and expertise of the local communities who had participated in the Cooperating Technical Communities (CTC) Program was an important component of Map Modernization. Additionally, during this time there was an understanding of the need for expansion of the program to include additional partners such as states and regional agencies on a larger scale. As such, the program was renamed to the Cooperating Technical Partners Program. The Cooperating Technical Partners (CTP) Initiative was formally recognized as a Program and from here on is referred to the CTP Program.

Program Management funding became available under the CTP Program. The program titled Map Modernization Management Support (MMMS) which was intended to be a five-year grant program and provided program management costs, closely aligned with Map Modernization. The final years of funding for Map Modernization, FY 2008 and FY 2009, served as transition years. In 2009, Congress approved the RiskMAP, the successor to Map Modernization. RiskMAP expanded on Map Modernization by providing high-quality flood maps and information, tools to better assess the impacts of the risk from flooding as well as mitigation planning and outreach support to communities to help them better understand their risk and be able to act to reduce (or mitigate) flood risk. Each RiskMAP flood risk project is tailored to the needs of each community and may involve different products and services.

FEMA started a Base Level Engineering (BLE) effort in 2017 in partnership with the NDSWC to assess county-wide floodplains in the entire state of North Dakota through the RiskMAP program. The project was broken into two phases: phase one kicked off in Summer 2017 and included the 32 eastern counties in the state, and phase two kicked off in Summer 2018 and included the western 21 counties. This BLE effort will create statewide flood risk assessments using elevation data derived from LiDAR information, in combination with powerful geographic analysis software and hydrology modeling techniques.

Since the early 2000s, NDSWC has been partnering with other local and federal entities in an effort to fund LiDAR collections for the entire State of North Dakota. To date, this effort has yielded complete LiDAR coverage statewide. Because of the breadth of LiDAR coverage, FEMA was able to leverage the State’s data for the purpose of this 53 county project.

Through the use of this BLE data, every stream, creek, river, or otherwise identified water source will have an identified level of flood risk, with flood elevations that will be provided to every county and city across the state for use in planning future development and their internal building permit processes. One of the main focuses of this BLE data is a push to help communities and residents be better educated about where and how to build in the hopes that this will help prevent damages to public and private property from flooding. In addition, this BLE data can also be used as the best available data for the development of Benefit Cost Analyses which are required to show a project is cost effective for FEMA funding through each of the current HMA programs. Without this data, communities would be required to hire engineering firms to identify the same levels of flood information, which can be a very significant cost that many local communities cannot afford without a guarantee that these costs will be reimbursed. This BLE data will help prevent those types of engineering expenses that are required to simply develop a project application for FEMA review and funding, which will also make the HMA application process more accessible for all North Dakota communities, large or small, moving forward.

NDDES has also participated in the Western Cass County and Ward County Community Coordination and Outreach (CCO) meetings which are used to inform communities of their new and completed RiskMap products which will be used for the implementation and enforcement of flood insurance and NFIP building requirements within these participating communities once the final floodplain maps are completed and adopted. As part of these CCO meetings, NDDES presented information on the different available HMA programs and how they can be used to help prevent damages to property and reduce the risk to human life and safety in order to promote community involvement and generate interest with these programs moving forward.

The NDSWC has served as a FEMA CTP since October 18, 2004 and has one full-time employee dedicated to this program. As of Fall 2018, the BLE is completed for the eastern 32 counties in North Dakota. The SWC is currently conducting Discovery Meetings in the remaining western counties and final BLE for these western counties is expected to be completed in Spring 2019. NDSWC has the following active and completed RiskMAP projects as of September 2018 (Table 4-9).

Table 4-9 RiskMAP Projects

<table>
<tr><th colspan="2">Active RiskMAP Projects</th></tr>
<tr><td>Western Cass County</td><td>Ward County</td></tr>
<tr><td>Williams County</td><td>Stark County</td></tr>
<tr><td>Upper James River – Stutsman, LaMoure, Eddy</td><td>Burleigh County</td></tr>
</table>

<table>
<tr><th colspan="3">Completed RiskMAP Projects</th></tr>
<tr><td>Barnes County</td><td>McKenzie County</td><td>Richland County</td></tr>
<tr><td>Benson County</td><td>McLean County</td><td>Rolette County</td></tr>
<tr><td>Bottineau County</td><td>Mercer County</td><td>Slope County</td></tr>
</table>

Active RiskMAP Projects		
Bowman County	Morton County	Stark County
Burleigh County	Nelson County	Stutsman County
Grand Forks County	Pembina County	Traill County
Hettinger County	Ramsey County	Upper James River – Eddy, Foster, Stutsman, and Wells Counties
McHenry County	Ransom County	Walsh County

Note: Updated list includes completed projects and newly funded FY18 Grants.

Changes since the 2014 Plan update:

- None

Implementation challenges:

- Consistent federal funding.
- Community Buy-in: The willingness of a community to support the effort and regulate to the new standards.
- Staffing/Support: FEMA funds one position to oversee all RiskMAP activities. It can be very hard to find a balance for one employee to manage a number of active grants.
- Statewide Base Level Engineering (BLE) Data: The state now has a massive flood risk dataset and “needs” list throughout the state. Need to determine how quickly can this data be leveraged before it becomes outdated.

Suggested improvements to the program:

- Continue to strengthen partnership with FEMA to identify and map communities at risk and promote NFIP participation and implementation.

Community Rating System (CRS) **Administered by: FEMA and NDSWC**

The CRS is a voluntary incentive program within the NFIP. Through participation in this program, communities can receive discounts on flood insurance premiums by conducting flood mitigation activities, communicating flood risk, and enforcing standards that exceed NFIP minimum requirements in order to reduce their long-term risk. Technical assistance for this program is provided by the NDSWC. As of 2018, 12 North Dakota communities are part of the CRS program, which represent 72% of all federal flood insurance policies in North Dakota. Since the previous plan update, ten communities entered the CRS program and no communities left the program (Table 4-10).

Table 4-10 CRS Communities in the North Dakota

Community Name	CRS Entry Date	Current Effective Date	Current Class
Bismarck, City of	10/1/17	10/1/17	8
Burlington Township	05/1/17	05/1/17	8
Burlington, City of	05/1/17	05/1/17	8
Carpio, City of	05/1/17	05/1/17	9
Dickinson, City of	05/1/18	05/1/18	9
Donnybrook, City of	05/1/17	05/1/17	9
Fargo, City of	05/1/06	10/1/17	5
Grand Forks, City of	10/1/91	10/1/01	5
Minot, City of	10/1/16	05/1/17	8
Sawyer, City of	05/1/17	05/1/17	9
Valley City, City of	05/1/17	05/1/17	9
Ward County	05/1/17	05/1/17	7

Source: FEMA, 2018

Changes since the 2014 Plan update:

- The City of Minot was added in 2016.

- The City of Bismarck, Township of Burlington, City of Burlington, City of Carpio, City of Donnybrook, City of Sawyer, City of Valley City, and Ward County were added in 2017.
- The City of Dickinson was added in 2018 and the City of Fargo advanced to a class 5 community.

Implementation challenges:

- This program is beneficial as it provides discounts on flood insurance for the communities that participate. However, limited resources may discourage a community from participating, as the program is voluntary and primarily requires local efforts. Additionally, for communities with only a few NFIP policies, there is little incentives to participate.

Suggested improvements to the program:

- Encourage more communities with significant flood insurance policy numbers to participate in the CRS program.
- Provide move educational services.

Additional Statewide Integration

As outlined in the list below, the SHMT partners support a variety of initiatives that exemplify the extensive integration of hazard mitigation principles and practices throughout the state.

Table 4-11 Additional Statewide Mitigation-Related Projects, Meetings, and Organizations

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
American Association of State Highway and Transportation Officials (AASHTO)	ND Department of Transportation Federal Highway Administration Transportation Research Board	Annual meeting with committee meetings throughout the year.	Scope of many of the AASTHO Committees related directly to mitigation and resiliency. NDDOT has representation on the committees discussing resiliency and other FHWA initiatives related to mitigation.
Annual Operating Plan Meetings (James River and Missouri River)	Bureau of Reclamation USACE NWS Bismarck NDSWC Local emergency management officials	Annually	Review annual operating plans with local stakeholders. Analyzes potential impact and mitigation measures related to potential dam failure and flooding.
Blue Cross Blue Shield Meridian Health	BCBS NDDoH	Long term, quarterly	Enhancement of the North Dakota Immunization Information System.
Community Planning Group	NDDoH Community-Based Organizations Affected community	Long term, quarterly	Promote the prevention of bloodborne infections, share best practices for community education and prevention activities. Serve as a conduit to the at-risk population.
Department of Emergency Services Advisory Committee	NDDES ND Peace Officers Associati0n ND Emergency Management Association Counties	Twice per year	Provides a direct communication link among NDDES and supported and supporting agencies, and organizations for the purpose of providing advice and

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
	ND Association of Counties ND League of Cities ND 911 Association ND Fire Services ND Emergency Medical Services Association ND Sheriff's and Deputies Association ND Hospital Association ND Bureau of Criminal Investigation **or** ND Highway Patrol (rotate every 4 years) ND State Interoperable Executive Committee ND Indian Affairs Commission ND Department of Public Instruction ND Department of Transportation ND VOAD ND INFRAGARD ND Chief Information/Information Security Officer		feedback on the strategic direction of the Department, including the mitigation section. The committee also ensures the agency is prepared to respond and to mitigate natural and technological hazards and adversarial threats.
Devils Lake Joint Water Board	DLJWD NWS Grand Forks Representatives of water districts	Monthly	Ongoing Flood Mitigation
Devils Lake Outlets Management	ND Governor's Office ND DES NWS Grand Forks Local and tribal representatives	Various	Ongoing Flood Mitigation
Emergency Action Plan Tabletop Exercises for Various Dams	Dam Owner NDSWC North Dakota Silver Jackets USACE USBOR USFWS Local Water Resource Districts NWS Grand Forks and Bismarck Local Emergency Managers Local Law Enforcement USFWS	Varies – typically once approximately every 5 years for a given dam	To familiarize participants with the dam, the contents of the EAP, and their roles and responsibilities during an emergency at the dam.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
Emergency Medical Services Advisory Council	EMS Association NDDoH ND Legislative Representative Office of Rural Health NDHA Local EMS Agencies	Long term, quarterly	Response coordination and sustainability. Training for infectious disease transport and mass casualty.
Forest River Watershed Plan	Forest River Joint Water Resource District USDA-NRCS Red River Retention Authority ND SWC USACE USDI-USFWS Walsh County	Started October 2015, plan (EA) scheduled to be completed in June 2019. Approximately $1.4 million in federal (NRCS), state (NDSWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be 2020-2021, followed by construction.	Locally led, public watershed planning effort on a 364,000-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land, public/private infrastructure, and the communities of Forest River and Minot.
HIV/Hepatitis Stakeholders	NDDoH UND Center for Rural Health Board of Pharmacy DHS-Behavioral Health NDAG Indian Affairs Commission Local Public Health	New, quarterly, and short term	To review available data and assess vulnerability related to bloodborne pathogen outbreaks in North Dakota counties
Immunization Advisory Committee	NDDoH Local Public Health Private health Third party payers	Long term, monthly	Provide updates and share best practices and provide guidance to NDDoH.
Influenza Surveillance and Response	USDA NDDoH NDGF NDDA USFWS	Long term, annually	Review and sharing of influenza related activities that were conducted are that are being planned.
International Souris River Board (ISRB)	NDGF NDSWC NDDoH NWS Bismarck North Central River Forecast Center Environment and Climate Change Canada	Meet (face to face) minimum twice a year; conference calls are more frequent and are held to support the ISRB agenda and mission	Provides international collaboration on common issues regarding the Souris River which is an international body of water.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
	USFWS USACE USGS		
International Souris River Study Board – Resource and Agency Advisory Group	NDSWC ND State Engineer NDGF USFWS USACE Canadian agencies (Department of Fisheries and Oceans, Environment and Climate Change Canada, Agriculture and Agri-Food Canada) Saskatchewan and Manitoba agencies Souris River Joint Board City of Minot City of Estevan City of Weyburn Sask Power	Twice a year through June 2020; webinars as needed	Created by the Study Board to understand how the modification of the operating plan may affect use of the river. RAAG serves as a conduit for communication with stakeholders regarding the study process; identifies potential conflicts with policies or interests; suggests ideas or approaches to improve the results of the study; and ensures all business needs and risks of interest to the study are accounted for and appreciated.
Local Emergency Planning Commissions	NWS Bismarck and Grand Forks NDDES Local Officials	At least twice per year	Discuss hazards and threats planning; often leveraged by emergency managers to discuss hazard mitigation plans.
Multi-State Partnership meeting	AZ, CO, IL, IN, IA, KS, KY, MI, MN, MO, NE, NM, NC, ND, OH, OK, SD, TX, WI Departments of Agriculture, State Animal Health Officials, Divisions of Emergency Management, USDA APHIS, USDA FSIS, State Universities and other industry representatives	Monthly conference call, annual meeting; ongoing	Interstate and interagency awareness, resource sharing, emergency planning and response
NOAA-Climate Program Office-Sectoral Applications Research Program James River Stakeholder Advisory Team	NDDES NDSU State Climatologist Office ND Department of Agriculture US Geological Survey National Weather Service USDA NRC National Drought Mitigation Center	Short-term project in 2018 with meetings as needed	The James River Stakeholder Advisory Team (referenced as the Drought Stakeholder Advisory Team in 2014 - 2016 Progress Report: Hazard Mitigation in North Dakota) provided feedback on the Decadal Drought Risk Assessment and Scenario Development for food and bio-fuels Agriculture in Four Sub-basins in the Missouri River Basin. The Team

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
	The Center for Research on the Changing Earth Systems Farm Service Agency North Dakota Soybean Council South Dakota State Climatologist Office		defined decadal drought information needs of agricultural stakeholders and participated in a scenario-planning exercise. Project lead applying for additional funding to expand the scope of the study. Data from the drought profile was used by to support development of the study profile.
North Branch Antelope Creek Watershed Plan	Pembina County Water Resource District USDA-NRCS Red River Retention Authority ND SWC USACE USDI-USFWS Richland County	As required	Locally led, public watershed planning effort on a 111,327-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land, rural residences, the community of Mooreton, and public/private transportation and drainage infrastructure.
North Branch Park River Watershed Project	Park River Joint Water Resource District USDA-NRCS Red River Retention Authority NDSWC USACE USDI-USFWS Cass County	Started October 2015, plan (EA) scheduled to be completed in June 2019. Approximately $700,000 in federal (NRCS), state (ND SWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be 2020-2021, followed by construction.	Locally led, public watershed planning effort on a 165,245-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land, public/private infrastructure, and the community of Crystal.
North Dakota Board of Animal Health	NDDA NDDoH NDGF USFWS	Long term, quarterly	Animal regulatory authority including those designed to mitigate the spread of disease.
North Dakota Chapter of the Association for Professionals in Infection Control	NDAPIC NDDoH	Long term, quarterly	Share best practices, provide updates on emerging issues related to infection control.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
North Dakota Drought / Wildfire Readiness Level Webinars	NWS Bismarck and Grand Forks NDDES NDFS NDNG	Drought / wildfire conditions dictate meeting frequency. Meeting typically last less than 30 minutes.	Determine current and expected drought / wildfire conditions across the state. Based on the conditions, determine a Wildfire Readiness Level for state agencies to mitigate potential impacts.
North Dakota Drought / Wildfire Unified Command	NDDES Director Homeland Security Director NDSWC State Engineer ND State Forester ND Agriculture Commissioner (support agencies added as needed)	Meeting frequency by operational periods which are based drought and fire severity and response requirements	Provide analysis of drought conditions across the state, along with forecasts and outlooks of weather / climate. Recommend implementation of mitigation measures.
North Dakota Fire Council	NWS Bismarck and Grand Forks NDDES NDFS USFS BIA BLM NPS	Two regularly scheduled meetings (face to face) along with various conference calls as needed	Preparation and discussion / summary of wildfire seasons. Discussions regarding resources and fire weather expectations. NWS also provides Spot Forecasts as requested for prescribed burns (along with wildfires). Supports mitigation of fires.
North Dakota GIS Technical Committee	ND Department of Agriculture ND Army National Guard ND Department of Emergency Services ND Game & Fish Department ND Geological Survey ND Department of Health ND Information Technology Department ND Oil & Gas Division North Dakota Parks & Recreation Department ND Public Service Commission ND State Water Commission ND Department of Transportation ND Department of Trust Lands	Monthly	Provide updates and gathering interagency feedback on ongoing geologic and geologic hazards mapping projects and LiDAR elevation mapping projects. Aerial imagery data acquisition and updates are also provided. This committee provides technical recommendations on how agency GIS data is produced and disseminated between agencies and the public.
North Dakota Homeland Security	NDDES NDDA NDDoH	Long term, quarterly	Briefings regarding homeland security issues and activities.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
Integration Meetings			
North Dakota Hospital Preparedness	NDDoH Hospitals Long Term Care Association Regional EPR Staff	Long term, monthly	Coordinate hospital preparedness and planning
North Dakota Infection Preventionists	Infectious disease preventionists, NDDoH	Long term, monthly	Education and community building in the area of health care infection prevention.
North Dakota Infectious Disease Specialists	Infectious disease doctors NDDoH	Long term, quarterly	Education and team building among infectious disease specialists and the department.
North Dakota State Water Commission meetings	Nine-member board, consisting of the Governor as chairman, Commissioner of Agriculture as an ex-officio member, and seven appointed members	Every 2 months (6 times per year)	Make decisions on cost-share funding for projects, including flood control projects.
North Dakota Stockmen's Association Inspectors Meeting	North Dakota Stockmen's Association Brand Inspectors and Livestock Inspectors Law Enforcement	Annual, one-day	Share inspection, livestock, and animal health information and to review related policies and laws.
North Dakota Voluntary Organizations Active in Disaster	Members of VOAD NDDHS NDDES NWS Grand Forks and Bismarck	Quarterly	Prepare for potential hazard and threat impacts; support state mitigation plan development.
One Health Working Group	NDDoH NDDA NDGF USFWS	Annual meeting; conference calls as necessary; ongoing	Serve as a forum for communication and coordination concerning emerging, invasive, and infectious threats to animal and public health in North Dakota.
Red River Basin Commission Meetings	Red River Basin Commission NWS Grand Forks Representatives throughout the basin	Bi-monthly, plus Annual summit	Analyzes measures for flood damage reduction, flood mitigation projects, water quality and quantity issues.
Red River Basin Gage Cooperators	USGS NWS Grand Forks USACE NDSWC Local Stakeholders	Annual	Flood season preparation
Regional Public Health Emergency Preparedness and	Regional Emergency Preparedness and Response Staff	Long term, twice/month	Coordinate emergency public health response and planning.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
Response Meetings	NDDoH NWS Grand Forks		
Rush River Watershed Plan	Cass County Joint Water Resource District USDA-NRCS Red River Retention Authority NDSWC USACE USDI-USFWS Cass County	Started October 2015, plan (EA) scheduled to be completed in June 2019. Approximately $700,000 in federal (NRCS), state (ND SWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be 2020-2021, followed by construction.	Locally led, public watershed planning effort on a 141,929-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood risk for the City of Armenia (certified flood protection to the 100-year) and reducing flood damages to transportation infrastructure.
Shortfoot Creek Watershed Plan	Cass County Joint Water Resource District USDA-NRCS Red River Retention Authority NDSWC USACE USDI-USFWS Cass County	Started May 2016, plan (EA) scheduled to be completed in March 2020. Approximately $700,000 in federal (NRCS), state (ND SWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be 2021-2022, followed by construction.	Locally led, public watershed planning effort on a 74,247-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land as well as public and private infrastructure.
SKYWARN Classes	NWS Bismarck and Grand Forks work with local emergency management in holding the classes	Each county typically holds them every 1 to 2 years; sometimes counties will partner with each other to hold meetings	Help train weather spotters so they can provide accurate reports of severe and hazardous weather. The classes also provide public outreach and education regarding severe summer weather and preparation for severe summer weather.
State Emergency Response Commission	Office of the Governor NDDES, Division of Homeland Security	Quarterly	Emergency Response planning and reports related to hazardous materials;

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
	NDDES, Division of State Radio State Fire Marshal ND Department of Health Office of Management and Budget Office of the Attorney General Workforce Safety and Insurance Department of Agriculture NDDOT Office of the Adjutant General Oil and Gas Division Insurance Department Dakota Plains COOP Tesoro Refinery ND Motor Carriers Association		discuss spill maps, and grants.
Statewide exercises	Federal, state, local, tribal, and private partners	Regularly throughout the year	Helps provide realistic weather scenarios for emergency preparation, response, and potential mitigation actions. Increasing emphasis of exercises on recovery and mitigation.
TB Nurses Meeting	NDDOH Local Public Health	Long term, quarterly	Review TB cases, treatment updates, investigation updates, new and emerging information.
Tongue River Watershed Plan	Pembina County Water Resource District USDA-NRCS Red River Retention Authority NDSWC USACE USDI-USFWS Pembina County	Started October 2016, plan (EA) scheduled to be completed in June 2020. Approximately $700,000 in federal (NRCS), state (ND SWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be	Locally led, public watershed planning effort on a 67,000-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land and public/private infrastructure.

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
		2021-2022, followed by construction.	
Unified Spill Reporting	NDDES NDDA NDDoH Environmental (soon to be renamed Department of Environmental Quality)	As needed	Create unified spill reporting system.
United States Animal Health Association	50 states, federal government agencies and 4 foreign country leaders, and 34 allied groups representing universities, veterinarians, livestock producers, national livestock and poultry industry, laboratorians, researchers, and extension services	Annual plenary session; committee meetings and forums; monthly national calls	Protects animal and public health; develops and promotes sound animal health solutions for public good including disease eradication, emergency preparedness, response and recovery, food safety and emerging animal disease issues.
Upper Maple River Watershed Plan	Cass County Joint Water Resource District USDA-NRCS Red River Retention Authority NDSWC USACE USDI-USFWS Cass County	Started October 2015, plan (EA) scheduled to be completed in June 2019. Approximately $700,000 in federal (NRCS), state (ND SWC), and local funds (RRJB, WRD) invested in technical support for the planning effort currently. Design phase for selected flood control alternatives anticipated to be 2020-2021, followed by construction.	Locally led, public watershed planning effort on a 74,247-acre sub-watershed of the Red River to address flooding and related natural resource issues. Specific goals include reducing flood damages to agricultural land, rural residences, and public/private transportation and drainage infrastructure.
USDA APHIS VS National Training and Exercise Program	State, Territorial, Tribal and Federal Departments of Agriculture, Health and Homeland Security	Biennial multi-state exercise; ongoing	To prepare the nation for potential health emergencies that threaten US economy or animal agriculture industries. Training and exercises help to maintain levels of preparedness and support capacity.
Weather Ready Nation (WRN) Ambassador Program	All levels of government	Information provided to WRN Ambassadors can vary, but generally information is sent by	Recognizes NOAA partners who are improving the nation’s readiness, responsiveness, and overall resilience against extreme

Project/Meeting/ Organization	Partners*	Frequency of Meetings or Project Duration	Purpose
		NOAA / NWS during Severe Summer Weather and Winter Weather Awareness Campaigns	weather, water, and climate events.

*Listing of partner agencies is based on best available information.

4.1.3 Legislation, Regulations, and Policies

State laws, regulations, and policies are important to disaster mitigation, particularly as it relates to new development. An evaluation of the NDCC and other documents with respect to hazard mitigation was originally conducted in 2005. Most of the laws and regulations have not changed and only minor additions occurred for the 2018 update.

SHMT members have been instrumental in other mitigation meetings and initiatives, including the Creative Financing Collaborative Session, hosted by FEMA on February 5-6, 2018, in Minot, at the request of Senator John Hoeven. This initiative brought together federal, state and local officials to discuss parallel efforts to reduce flood risk in the Souris Basin, which included the Mouse River Enhanced Flood Protection Project by the Souris River Joint Board (SRJB); the Feasibility Study to Secure Federal Involvement by the USACE and the SRJB; a Plan of Study to Modify Reservoir Operations by the International Joint Board and the SRJB; and the National Disaster Resilience Competition (NDRC) Activities by the City of Minot. Participants discussed potential funding avenues to include U.S. Department of Transportation, U.S. Department of Agriculture, the Natural Resources Conservation Service, the USACE, and the U.S. Economic Development Administration, HMA through NDDES, NDSWC funding, North Dakota Public Finance Authority bonds, and NDDoH's State Revolving Fund. A panel of representatives from Climate Resilience Consulting; the Colorado Resiliency and Recovery Office; Willis Towers Watson; and Re:Focus Partners discussed innovative financing, and the Center for Disaster Philanthropy president discussed philanthropic approaches to financing.

NDDES staff also leverages opportunities to present on HMA and mitigation planning. As an example, NDDES, NWS, SWC and other SHMT partners discussed flood mitigation, funding resources and mitigation planning during the Souris River Flood Workshop and Tabletop Exercise on September 17-18 in Minot. NDDES recently joined the NDWSC, other provincial, federal, state, and local partners for the Resource and Agency Advisory Group (RAAG). The International Joint Commission, upon the request of the governments and the United States, has studied operating plans for the Souris River Dam, which include the Rafferty, Grant Devine, Boundary and Lake Darling. The study board is analyzing flood control, water supply, erosion, environmental, cultural and recreation.

Legislation and policy are key components of developing a culture of mitigation in North Dakota. Table 4-12 outlines the related legislation and policy in North Dakota to hazard mitigation, while Table 4-14 outlines legislation and policy recommendations to further the culture of mitigation within the State. A summary of the state policies related to mitigation can be found in Table 4-13. Areas considered in this section include laws, regulations, and policies that hinder mitigation efforts and opportunities for the integration of mitigation into new areas.

Table 4-12 North Dakota Laws and Regulations Related to Hazard Mitigation

Law Title and *Reference*	Summary	Strengths/Limitations/Obstacles
Emergency Management		
Disaster Act of 1985 Emergency Services *NDCC 37-17.1*	Establishes the Department of Emergency Services and its authorities and responsibilities, including mitigation. Amendments in 2005, 2007, 2009, 2011 and 2013. Refer to the North Dakota Law Books for more detail.	• Has a stated purpose to "reduce vulnerability of people and communities of this State to damage, injury, and loss of life and property resulting from natural or manmade disasters or emergencies, threats to homeland security, or hostile military or paramilitary action." • NDCC 37-17.1-11 specifically covers disaster or emergency mitigation. • Challenges with implementation are limited funding and employee turnover. • Another challenge is integrating federal law with state laws and policy.
Land Use and Future Development		
State Building Code *NDCC 54-21.3*	Establishes a state building code and an advisory committee. Establishes the North Dakota Manufactured Home Installation Program that inspects manufactured homes to ensure they are installed property. *Updated in 2009 to prohibit the requirement for fire sprinklers in single family dwellings or residential buildings with less than three units in state or local building codes.* *Updated in 2005 to add the Manufactured Home Installation Program.*	• The building code relies on individual jurisdictions to adopt and enforce the code. • Requires all modular and prebuilt residential structures to meet the code and local amendments and be in. • The NDDoC leads a team of architects, inspectors, engineers, home builders associations, state fire marshal, and the electrical board to assess the process for adoption of codes. In March 2020, the new code will be effective and updated every three years. The process for State building codes is vetted thoroughly and tailored for North Dakota.
Capitol Grounds Planning Commission *NDCC 48-10*	Establishes a planning commission and capitol building fund for the capitol grounds.	• The commission advises the director of the office of management and budget and the Legislative Council on matters relating to the physical and aesthetic features of the interior of all buildings on the capitol grounds. • Does not provide any reference to disaster resistance of the grounds.
Municipal Master Plans and Planning Commissions *NDCC 40-48*	Authorizes master plans and subdivision regulations by the municipalities. *Updated in 2009 to address joint jurisdiction zoning and subdivision authority.* *Updated in 2007 to address unincorporated areas outside municipal boundaries and approval procedures.*	• "In the preparation of the master plan, the planning commission shall make careful and comprehensive surveys and studies of present conditions and future growth…" • Does not require that subdivision regulations provide for public safety.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Regional Planning and Zoning Commissions *NDCC 11-35*	Authorizes the formation of Regional Planning and Zoning Commissions.	• Requires coordination between multiple jurisdictions.
Regional Planning Councils *NDCC 54-40.1*	Authorizes regional planning councils.	• Requires coordination between multiple jurisdictions.
County Zoning *NDCC 11-33*	Authorizes county governments to regulate and restrict the location of structures in the county. *Updated in 2007 regarding approval procedures and farming and ranching regulations.* *Updated in 2005 to address institutional controls for environmental concerns.*	• Townships and cities may have their own zoning regulations or relinquish powers to the county. • The adoption and enforcement of zoning is the responsibility of the county. • Not all counties have zoning.
City Zoning *NDCC 40-47*	Authorizes city governments to regulate and restrict the location of structures in the city and in some cases immediately surrounding. *Updated in 2009 to address joint jurisdiction zoning and subdivision authority.* *Updated in 2007 to address unincorporated areas outside city boundaries and approval procedures.* *Updated in 2005 to address institutional controls for environmental concerns.*	• The adoption and enforcement of zoning is the responsibility of the city. • Enforcement is spotty.
Powers of Township and Electors of the Township *NDCC 58-03*	Outlines the powers of townships and authorizes zoning regulations. *Updated in 2007 regarding approval procedures, farming and ranching regulations, and violation penalties.* *Updated in 2005 to address institutional controls for environmental concerns.*	• The adoption and enforcement of zoning is the responsibility of the township.
Subdivision Regulation *NDCC 11-33.2*	Authorizes county governments to regulate and restrict the subdivision of land. *Updated in 2007 regarding approval procedures and farming and ranching regulations.* *Updated in 2005 to address institutional controls for environmental concerns.*	• Lists provisions that may be included in the subdivision regulations. • Establishes parameters through which the regulations can be managed and enforced. • Contains requirements with respect to the floodplain.
Airport Zoning *NDCC 2-04*	Authorizes and provides procedures to establish airport zoning.	• Allows any political subdivision of the state to establish airport zoning.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Water Management – Flood and Drought		
Water Commission *NDCC 61-02*	Establishes the State Water Commission, including its authorities and duties. Law also includes provisions for the state water development program, flood control, the Devils Lake outlets, water rights, and the emergency municipal, tribal, and rural water system drinking water grant program. *Updated in 2013 to reflect the construction and operation of the East Devils Lake outlet.* *Updated in 2007 to add the emergency municipal, tribal, and rural water system drinking water grant program and to update the Red River valley water supply project regulations.* *Updated in 2005 to address operation of the Devils Lake Outlet.*	• Provides a wide range of responsibilities for the State Water Commission, including flood and drought mitigation.
Flood Control or Reduction Projects *NDCC 61-02.1*	Declares "the general welfare and the protection of the lives, health, property, and the rights of all the people of this state require that the conservation, management, development, and control of waters in this state, public or private, navigable or non-navigable, surface or subsurface, the control of floods, and the management of the atmospheric resources, involve and necessitate the exercise of the sovereign powers of this state and are affected with and concern a public purpose."	• Underscores the importance of flood control and reduction projects. • The State Water Commission may issue bonds for flood control and reduction projects that meet specific criteria. • Implementation challenge is funding.
State Engineer *NDCC 61-03*	Authorizes the state engineer to require operating plans from reservoir operators, inspect structures, and order the modification or removal of unsafe or unauthorized works (dams, dikes, wells, or other devices for water conservation, flood control, regulation, storage, diversion, or carriage of water).	• Allows for dam safety activities. • Provides the authority to enforce dam safety regulations. • Implementation challenges are staffing and funding.
State Engineer *NDCC 61-16.1-38*	Stipulates that no dikes, dams, or other devices for water conservation, flood control regulation, watershed improvement, or storage of water which are capable of retaining, obstructing, or diverting more than fifty acre-feet [61674.08 cubic meters] of water or twenty-five acre-feet [30837.04 cubic meters] of water for a medium-hazard or high-hazard dam, may be constructed within any district except in accordance with the provisions of this chapter.	• Requires a permit to construct or modify a dam, dike, or other device.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Weather Modification *NDCC 61-04.1*	Establishes an atmospheric resource board as a division of the State Water Commission. States that "…weather modification affects the public health, safety, and welfare, and that, properly conducted, weather modification operations can improve water quality and quantity, reduce losses from weather hazards, and provide economic benefits for the people of the state."	• Allows counties to establish ten-year weather modification authorities if a petition from the citizens allows.
Irrigation Districts *NDCC 61-05 through 61-11*	Establishes irrigation districts, including the powers and duties.	• Provides for controlled and locally managed irrigation.
Flood Irrigation Projects *NDCC 61-12*	Regulates flood irrigation projects such as dam construction.	• Provides for fees to maintain dams and damage payments to affected landowners.
General Rules Governing Irrigation *NDCC 61-14*	Establishes general rules governing irrigation.	• Addresses irrigation through amounts of water, measuring devices, and rights to use of water. • Limits amounts of water to that which can be "beneficially used". • Does not clarify length of time the water can be "beneficially used".
Water Conservation *NDCC 61-15*	Regulates water conservation, including allowing municipal corporations to dam the Red River.	• Requires municipalities to obtain the consent of United States or Minnesota governments prior to damming the Red River, if required by treaty. • Section is very brief and may not be adequate to address full range of water issues arising from drought.
Floodplain Management *NDCC 61-16.2*	Regulates floodplain management and places the state management responsibility on the state engineer. One of the purposes of the law is "to guide development of the floodplains of this State in accordance with the enumerated legislative findings, to reduce flood damages through sound floodplain management, stressing nonstructural measures such as floodplain zoning and floodproofing, acquisition and relocation, and flood warning practices; and to ensure as far as practicable that the channels and those portions of the floodplains of watercourses which are the floodways are not inhabited and are kept free and clear of interference or obstructions which may cause any undue restriction of the capacity of the floodways."	• Encourages flood mitigation and lists possible measures. • Thoroughly describes duties of state engineer in floodplain management, delineates permissible floodway uses, and provides for enforcement. • Clearly states that communities that choose not to participate in the NFIP are ineligible for state flood disaster assistance.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Road Closures *NDCC 39-10-21.1*	Provides authority to the NDDOT and the NDHP to close roads because of hazardous conditions, road construction, or at any other time it may be necessary to prevent the public from driving on the roadways.	• Ensures the safety of the traveling public when hazards or threats pose a risk to drivers. • Provides for the safety of first responders and workers. • Requires coordination with local jurisdictions.
Drainage Projects *NDCC 61-21*	Regulates drainage projects. *Updated in 2007 to address assessment drain culverts and ditch clearing.*	• Thoroughly describes the construction, maintenance, repair, improvement, and extension of watercourses, ditches, and drains.
Waterbank Program *NDCC 61-31*	Authorizes the commissioner of agriculture to enter into agreements with landowners for the conservation of wetlands, including regulation of haying and grazing of grasslands in a drought.	• Adequately addresses this issue by permitting the commissioner of agriculture to regulate haying and grazing of wetlands during times of drought and to prevent the destruction of wetlands.
Wetlands *NDCC 61-32*	Regulates wetlands.	• Addresses the permitting process for draining wetlands. • Only applies to a watershed area comprised of 80 acres or more.
Devils Lake Outlet Committee *NDCC 61-36*	Establishes a Devils Lake outlet management advisory committee and requires it to develop an annual operating plan for the Devils Lake outlet. *Updated in 2013 to reflect construction and operation of the East Devils Lake outlet, and modified membership to include representatives from Minnesota and Manitoba.* *Updated in 2005 to add a member of the upper Sheyenne River joint water resource board.*	• Requires the Devils Lake outlet advisory committee to advise the governor and the State Water Commission regarding operations of all Devils Lake outlets.
Fire Prevention		
Fire Marshal Department *NDCC 18-01* 18-01	Outlines the duties of the state fire marshal and deputy state fire marshals.	• NDCC 18-01-04 authorizes the fire marshal to establish a State Fire Code.
Fire Prevention Code for School Buildings *NDCC 18-12*	Establishes a fire code for the construction of, addition to, and remodel of public and private elementary and secondary schools and all instructional areas of all institutions of higher education.	• Requires fire alarm systems and that schools also meet the state building code. • Many schools in North Dakota are older buildings, especially in rural communities, and are exempt unless remodeling occurs.
Wildland Fire Mitigation		
Firebreaks in Counties *NDCC 18-07*	Establishes a mechanism for communities to petition and counties to pay for firebreaks.	• Allows citizens to initiate process for creating firebreaks. • A legal firebreak is 200 feet wide through plowing and controlled burning.

Law Title and *Reference*	Summary	Strengths/Limitations/Obstacles
Hazardous Material Release Prevention		
Liquefied Petroleum Gas Regulation *NDCC 18-09*	Regulates the use of liquefied petroleum (LP) gas.	• Allows the state fire marshal to make rules regulating equipment using liquefied petroleum gas. • Prohibits state agencies from banning the installation of a furnace or other appliance that uses LP gas, so long as it is located in the structure's basement.
Anhydrous Ammonia Facilities *NDCC 19-20.2*	Regulates anhydrous ammonia facilities.	• Follows the 1989 American national standard safety requirements for the storage and handling of anhydrous ammonia, with some exceptions. • Establishes licensing for all facilities and siting requirements for new facilities. • Enforcement is provided by the agriculture commissioner.
Hazardous Substances Labeling Act *NDCC 19-21*	Regulates the labeling of hazardous substances.	• Provides authorities regarding the sale, delivery, and labeling of hazardous materials. • Authorizes the examination and inspection of hazardous substances by health officials.
Hazardous Waste Management *NDCC 23-20.3*	Establish a program to regulate hazardous waste from the time of generation through transportation, storage, treatment, and disposal. *Updated in 2007 to address the requirements of the federal Resource Conservation and Recovery Act and the federal Energy Policy Act of 2005.* *Updated in 2005 to address institutional controls of contaminated properties.*	• Regulates facilities that generate or manage hazardous waste. • Provides regulations for underground storage tanks. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level. • There are inherent challenges in regulating hazardous waste from the time of generation through transportation, storage, treatment, and disposal. • Some wastes may be of concern to human health but are not regulated as hazardous waste. • Hazardous waste has been regulated for several decades and facilities are generally familiar with their requirements.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Air Pollution Control *NDCC 23-25*	Establishes air quality standards	• Protects air quality through standards and permit system for controlled releases. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level. • Industry expanding in the state adding to regulatory workload.
Solid Waste Management and Land Protection *NDCC 23-29*	Regulates solid waste, including hazardous and infectious materials.	• Requires proper treatment of infectious waste before disposal in landfill. • Prohibits disposal of lead-acid batteries, used motor oil, and major appliances in landfills. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level.
Ground Water Protection *NDCC 23-33*	Establishes means for ground water protection, including chemical registration, sales data, and ground water standards.	• Protects ground water through a degradation prevention program, education programs, monitoring, standards, and notification requirements. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Control, Prevention, and Abatement of Pollution of Surface Waters *NDCC 61-28*	Regulates the control and abatement of pollution of surface waters and establishes the state water pollution prevention agency board.	• Describes the composition of the state water pollution control board and the powers and duties of the state board of health regarding water pollution. • Prohibits the pollution of any waters of the state. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level.
Safe Water Drinking Act *NDCC 61-28.1*	Authorizes NDDoH to establish a safe drinking water program and a drinking water revolving loan fund.	• Establishes regulations for safe drinking water. • Authorizes the state department of health to establish a plan for provision of safe drinking water under emergency circumstances. • Authorizes below-market interest rate loans to assist public water systems finance infrastructure improvements needed to maintain SDWA compliance. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level.
Water Pollution Control Revolving Loan Fund* *NDCC 61-28.2*	Authorizes NDDoH to establish a water pollution control revolving loan fund.	• Authorizes below-market interest rate loans to assist the funding of conventional wastewater and non-point pollution control needs. • Increasing regulations and requirements from EPA. • Increased demands on staff to implement regulation. • Maintaining well trained staffing levels. • Budgets are decreasing from both Federal and State level.

Law Title and *Reference*	**Summary**	**Strengths/Limitations/Obstacles**
Infectious Disease Control		
Reportable Diseases *NDCC 23-07*	Requires NDDoH to designate reportable diseases and authorizes power for quarantines, temporary hospitals, and destruction of contaminated clothing. *Updated in 2007 regarding immunization requirements.*	• Addresses disease surveillance and includes provisions for emergency reporting of imminent or emerging conditions, including actual or threatened terrorism. • Reporting is passive. There is one major laboratory left in the state to submit reports electronically and they are not all that interested in working with us.
Communicable Disease Confinement Procedure *NDCC 23-07.6*	Provides authority to order a quarantine or isolation.	• Authority for confinement is listed as, "…state health officer or any local health officer may order any person or group into confinement by a written directive if there are reasonable grounds to believe that the person or group is infected with any communicable disease." • Involves attorneys and the courts which is unfamiliar ground for us. Preference is for local health officers to issue orders. When used, enforcement is always an issue. Providing supportive services is labor intensive. Locating a suitable residence is a challenge. If isolation is occurring in the hospital, expenses accrue rapidly.
Vector Control Districts *NDCC 23-24*	Establishes vector control districts.	• Authorizes the Board of District Commissioners to declare that a public health hazard exists and take necessary steps to eradicate public health vectors. • Law is dated and needs to be revised or eliminated.

Law Title and *Reference*	Summary	Strengths/Limitations/Obstacles
Contagious and Infectious Diseases Generally *NDCC 36-14*	Generally, establishes procedures for importing, inspecting, containing, and disposing of livestock with contagious and infectious diseases.	• Gives the state veterinarian, as an agent of the Board of Animal Health, the authority to inspect and order the destruction of infected livestock to prevent the disease spread. Implementation challenge is enforcement of confinement and timely disposal of animals is limited by lack of police powers, small staff within NDDA, laboratory capacity, few legal requirements for testing or examination and identification or documentation of animals prior to movement. Disease surveillance and interstate movement is also limited by time delay of receipt and review of health certificates or reporting of movements failing to meet import requirements. Indemnity for animals diagnosed with infectious diseases is complicated process. Slaughter surveillance of zoonotic diseases within the state is minimal, and relies on federal surveillance in neighboring states.
Weapons Control and Population Protection		
Machine Guns, Automatic Rifles, Silencers, Bombs *NDCC 62.1-05*	Sets restrictions for the purchase, sale, and possession of machine guns, fully automatic rifles, silencers, and bombs loaded with explosives or poisonous or dangerous gases.	• People that violate this regulation are guilt of a Class C felony. • Does allow law enforcement, the military, and others with special permits to carry the prohibited weapons. • There are no planned changes to this law as of October 2018. • Federal law allows for the possession of these items (referred to as National Firearms Act [NFA] items) and this section of law follows federal law in that regard.
Temporary Roadblocks *NDCC 24-15*	Establishes the authority to establish temporary roadblocks.	Provides authority to duly authorized law enforcement officers for the purpose of apprehending wanted persons.
Infrastructure Protection		
State Highway System *NDCC 24-01*	Provides for the management, operations, and maintenance of highway transportation. *Updated in 2009 to require metropolitan planning organizations to develop transportation plans and programs.*	• Emphasizes the coordination of state, county, city, and township highway systems. • Requires metropolitan transportation plans or master street plans for municipalities over 5,000 people.

Law Title and *Reference*	Summary	Strengths/Limitations/Obstacles
Road Closures *NDCC 39*	Provides authority to NDDOT, North Dakota Highway Patrol (NDHP), and local law enforcement to close roads because of hazardous conditions	• Aids in emergency response.
Construction and Maintenance of State Highway System *NDCC 24-03*	Regulates the construction and maintenance of the state highway system.	• Authorizes the state department of transportation to construct and maintain the state highway system and to close state highways.
Bridges *NDCC 24-08*	Regulates the building and maintenance of bridges.	• Mandates the regular inspection and closure of unsafe bridges.
Railroad Crossings *NDCC 24-09*	Regulates railroad crossing systems and signage.	• Allows jurisdictions to create stricter regulations. • Warning systems must be approved by the State Department of Transportation.
Railroad Bridges, Crossings, Intersections, and Fences *NDCC 49-11*	Regulates the construction and maintenance of railroad bridges, crossings, intersections, and fences.	• Requires railroad corporations to keep bridges and abutments in good repair. • Limits blocking or obstructing crossings by a train.
Insurance		
State Fire and Tornado Transportation Fund *NDCC 26.1-22*	Establishes the authority and operation of the state fire and tornado fund. *Updated in 2007 to allow for blanket coverage of personal property.*	• Addresses how the state fire and tornado fund is to be managed and how claims are to be paid.

Table 4-13 Important North Dakota Mitigation Policies

Policy	Agency
NFIP standards are one foot above the base flood elevation.	NDSWC
Property acquisition is the top priority for flood mitigation.	NDDES
The state provides funding for 10% of the project as local cost share for mitigation grant programs. In special circumstances, such as the 2009 floods, the state has only required 3% in local cost share for Public Assistance.	NDDES

Table 4-14 North Dakota Recommended Legislative and Policy Changes

Section	Recommended Changes
Title 11 – Counties and/or Title 58 – Townships	Improve state zoning laws to make floodplain management more efficient in rural areas. For example, townships have zoning authority but not typically the resources to enforce floodplain ordinances or conduct flood fighting operations. The flood fighting responsibilities and costs can then fall on the county jurisdictions that did not approve the developments being protected.
Title 37-17.1 – Emergency Services	Establishment of a state-funded all-hazard mitigation grant program.

Section	Recommended Changes
Title 37-17.1 – Emergency Services	Local jurisdiction access to the Bank of North Dakota for emergency purposes (including mitigation cost-share).
Title 61 – Waters	Establishment of a comprehensive dam safety program and requirements.
NDDES policy	Develop improved performance objectives and mitigation projects through the PA program.

4.1.4 Funding for Mitigation

Funding for mitigation projects exist from a multitude of sources. Some sources may be specifically designed for disaster mitigation activities, while others may have another overarching purpose that certain mitigation activities may qualify for. Most mitigation funding sources are recurring through legislation or government support, some may be from an isolated instance of financial support. Whenever possible, creative financing is encouraged. Often, additional funding sources are found through working with other agencies and businesses to identify common or complementary goals and objectives. Table 4-15 the current state mitigation funding sources that are used in North Dakota and Table 4-16 shows the current federal mitigation funding sources that are used in North Dakota. Table 4-17 shows less traditional funding sources that may be used to fund future mitigation activities.

While mitigation funding opportunities are primarily at the federal level, there are some existing mitigation funding opportunities at the state level.

Table 4-15 Current State Mitigation Funding Sources

Name	Description	Managing Agencies	Funding Analysis
State Water Commission Cost-Share Program	Provides cost-share assistance for flood control, water supply, recreation, studies, irrigation, bank stabilization, dam emergency action plans, and technical assistance projects.	NDSWC	During the 2015-2017 biennium, the NDSWC had a total project budget of $1.025 billion, $421.1 million of which was for flood control projects. Funding also supported water supply, irrigation, and general water projects. Actual project expenditures totaled $526.9 million, $217.5 million of which was for flood control projects.
Cultural Heritage Grant Program	Provides cost-share assistance for local museums and historical societies, including for recovery efforts of historical properties affected by flooding throughout the state.	SHSND	This program has not been funded for the last two bienniums. SHSND is considering requesting reinstatement of funds for the next legislative session.

Table 4-16 Current Federal Mitigation Funding Sources (NDDES, NDFS, NDSWC, NDDOT)

Source	Description	Managing Agencies	Funding Analysis
CAP	Provides funding to states to assist communities in complying with NFIP requirements.	FEMA; NDSWC	$7,500 CAP-SSSE funding from FEMA

Source	Description	Managing Agencies	Funding Analysis
FMA	Provides pre-disaster funding for repetitive flood loss property reduction.	FEMA NDDES	See Table 4-6
HMGP	Provides post-disaster mitigation funding.	FEMA NDDES	See Table 4-4
CDBG-DR	Provides funds for the effects of the 2011 flooding disaster and recovery needs.	North Dakota Department of Commerce (NDDoC) HUD	$11.7 million in 2012 and $6.5 million scheduled in 2013
Living Snow Fence Program	Provides funding to plant living snow fences along roadways.	Federal Highway Administration (FHWA) NDDOT HMA FEMA	Currently unfunded.
National Dam Safety Program	Provides funding to the state to promote dam safety.	FEMA	Funding is limited for this program.
RiskMAP	Provides funding to establish or update floodplain mapping.	FEMA NDSWC	Total $330,000 yearly.
National Fire Plan/ Wildfire Mitigation	Provides pre-disaster funding for primarily wildland fire mitigation, but also wildfire planning. Most of the funding in North Dakota has been used for equipment.	USFS NDFS	$188,000 annually on average over the past 6 years
PDM Program	Provides grants through a competitive process for specific mitigation projects, including planning.	FEMA NDDES	See Table 4-5
PA (C-G) and Section 406	Following a disaster, funds can repair and mitigate hazards to damaged property of government organizations and certain PNPs.	NDDES FEMA-Region VIII	

Table 4-17 Potential Federal Mitigation Funding Sources

Name	Description	Managing Agencies
AmeriCorps	Provides funding for volunteers to serve communities, including disaster prevention.	Corporation for National and Community Service
Assistance to Firefighters Grant	Provides funding for fire prevention and safety activities and firefighting equipment.	DHS
Clean Water Act Section 319 Grants	Provides grants for a wide variety of activities related to non-point source pollution runoff mitigation.	EPA
CDBG	Provides funding for sustainable community development, including disaster mitigation projects.	HUD
Economic Development Administration (EDA) Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities.	United States Economic Development Administration

Name	Description	Managing Agencies
Emergency Management Performance Grant (EMPG)	Enhances and sustains all-hazard emergency management capabilities, including mitigation.	NDDES FEMA
Emergency Watershed Protection	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds.	United States NRCS
Environmental Quality Incentives Program	Provides funding and technical assistance to farmers and ranchers to promote agricultural production and environmental quality as compatible goals.	United States NRCS
Hazardous Fuels Mitigation Program	Provides funding for the reduction of hazardous wildfire fuels.	United States Bureau of Land Management
Homeland Security Grants	Through multiple grants, provides funding for homeland security activities. Some projects can be considered mitigation.	NDDES United States DOJ DHS
HUD Grants	Provides several grants related to safe housing actions.	HUD
IA	Following a disaster, funds can mitigate hazards when repairing individual and family homes.	NDDES FEMA – Region VIII
Law Enforcement Support Office 1033 Program	Provides surplus military property to local law enforcement agencies	North Dakota National Guard
National Wildlife Wetland Refuge System	Provides funding for the acquisition of lands into the federal wildlife refuge system.	USFWS
North American Wetland Conservation Fund	Provides funding for wetland conservation projects.	USFWS
NRCS Conservation Programs	Provides funding through several programs for the conservation of natural resources.	United States NRCS
Partners for Fish and Wildlife	Provides financial and technical assistance to landowners for wetland restoration projects in “Focus Areas” of the state.	USFWS
PA (C-G)	Following a disaster, funds can mitigate hazards to damaged property of government organizations and certain PNPs.	NDDES FEMA-Region VIII
Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas.	USDA Rural Development
Rural Fire Assistance Grant (RFA)	Funds fire mitigation activities in rural communities.	National Interagency Fire Center
SBA Pre-Disaster Mitigation Loan Program	Provides low-interest loans to small businesses for mitigation projects.	United States Small Business Administration (SBA)
Small Flood Control Projects	Authority of USACE to construct small flood control projects.	USACE
Streambank and Shoreline Protection	Authority of USACE to construct streambank stabilization projects.	USACE
Wetland Program Development Grants (WPDGs)	Provides funding for studies related to water pollution prevention.	EPA

Name	Description	Managing Agencies
Water pollution control and drinking water revolving loan fund programs	Provides loan assistance for conventional wastewater, non-point pollution control and drinking water infrastructure improvement needs.	NDDoH EPA

This list of potential funding sources is certainly not all inclusive. Opportunities for mitigation funding from other sources may exist. Additionally, state agencies continue to identify and work with foundations and non-government entities to secure outside funding for mitigation purposes.

An example of pursuing alternative funding sources is the success of the City of Minot in pursuing the NDRC to provide resilient solutions for recovering from flooding, mitigating future risk, and providing affordable housing in the impacted areas. HUD sponsored the two-phase competition for communities and states with unmet needs from disasters that occurred between 2011 and 2013. Minot competed successfully in both phases of the competition and was awarded $74 million in January 2017. Minot held more than 60 public meetings in the city and throughout the Souris River Basin throughout the competition to design projects to address the recovery and mitigation needs from flooding disasters, as well as address affordable housing, economic, and transportation needs in the impacted areas. Infrastructural solutions were identified that included grey and green infrastructure, as well as non-structural elements to reduce the identified risks and ensure the areas were resilient to impacts from climate change. Projects also identified affordable housing solutions to ensure the residents who took part in the buy-out program were able to stay in Minot. Additionally, projects focused on economic resilience and diversification, including developing a Center for Technical Education, relocating the Minot State University Art Department Complex, and relocating and developing a new social services facility in the new City Hall.

Many of the federal grants have a cost sharing requirement. In some cases, the state provides a portion of this funding; however, the local governing bodies or subrecipients must also cover a percentage of the project. Often, in-kind services cover this local match, but in the case of some of the larger projects, local sales taxes or mil levies have been used. Entities, such as the rural electric cooperatives, often provide cash match or in-kind services for their projects.

In general, there are many strengths to the mitigation funding sources for the State of North Dakota. The state provides a monetary match in many cases. The state can leverage funding from the state emergency fund for mitigation. However, there are a couple of noticeable weaknesses in these mitigation funding sources. This includes the fact that the local match requirement can be a large deterrent in some communities. Some communities do not have a clear understanding of what is eligible for a local match and all jurisdictions may not be able to generate income for mitigation purposes. Lastly, most of the current funding sources require studies and design prior to the grant application; these studies and designs can be costly for local jurisdictions for projects when funding is not guaranteed.

Funding to Prevent Repetitive Loss and Severe Repetitive Loss

Previously, FEMA Repetitive Flood Claims and SRL Programs were authorized to provide funding specifically for Repetitive Loss (RL) and SRL properties (FEMA, 2015). In July 2013, the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) eliminated these programs (FEMA, 2015).

Currently, funding to mitigate the risk to RL and SRL properties can be gained from FEMA's HMA programs. While funding from all of the HMA programs can be used for RL and SRL properties, the FMA program specifically focuses on mitigation risk to RL and SRL properties, as consistent with the BW-12 (FEMA, 2017). As outlined in Section 4.1.4, NDDES has been awarded FMA grants in the past, and actively promotes the FMA grant program annually. Use of these funding programs and active floodplain management policies have resulted in no SRL properties identified within the State of North Dakota at the time of this plan's development.

Like FEMA HMGP and PDM programs, while not targeting RL and SRL properties specifically, many of the funding opportunities discussed in Section 4.1.4 can be utilized in reducing the burden of repetitive losses on the NFIP.

4.1.5 Core Capability Assessment

Seven of the 32 core capabilities identified in the National Preparedness Goals are related to mitigation (FEMA, 2018). Through the integration of the hazard mitigation planning process and the THIRA process, capability targets for each of the seven core capabilities were developed through step three of the THIRA process. The target capability language then acted as the basis for the objectives of the 2018 Mitigation Strategy and guided the redevelopment of the mitigation goals. These capability targets represent the State's long-term capability goals. Table 4-18 outlines an assessment of the core capabilities related to mitigation, including the capability target language, and the strengths and weaknesses for each core capability.

Table 4-18 Analysis of Core Capabilities Related to Hazard Mitigation

Core Capability	Target Language	Strengths	Weaknesses
Threat and Hazard Identification	• Every three years, starting in 2019, identify the frequency, magnitude, and impacts of hazards and threats that can occur in North Dakota using modeling and industry best practice.	• Well-established THIRA process has enhanced products such as the Hazard Identification and Risk Assessment (HIRA). • Gaining better data for trend analysis for mapping and mitigation.	• Providing guidance to local hazard mitigation planners for better and more depth of analysis of their HIRA is needed.
Risk and Disaster Resilience Assessment	• Every five years, starting in 2019, conduct a review of vulnerabilities, resilience capabilities, and estimate impacts of hazards and threats across government, private and community organizations.	• Breadth of hazard mitigation experience, institutional knowledge, and ongoing training and awareness at the state level. • Well-established THIRA process has enhanced assessment of previous mitigation strategies and informed the development of future ones.	• No information available.
Community Resilience	• Every five years, starting in 2019, provide technical assistance, emergency preparedness training, and risk management education programs to local emergency managers, private partners, and residents throughout the state. • Within five years, starting in 2019, reduce the vulnerability of people, property, and natural and cultural resources to hazards and threats.	• Focused teams, such as the Devils Lake Basin Technical Review Team, provide technical assistance on specific problems.	• A mitigation curriculum through the North Dakota League of Cities for local officials.

Core Capability	Target Language	Strengths	Weaknesses
Long-Term Vulnerability Reduction	• Within five years, starting in 2019, significantly reduce risk to buildings and infrastructure located in hazard- or threat-prone areas (including floodplains). • Within five years, starting in 2019, encourage adoption and enforcement of disaster resilient building codes and wise land use planning, appropriate to local and tribal risks.	• The state managed PA program allows for closer linkages to local damages and potential mitigation projects in the HMA Grant Programs. • NDSWC also has mitigation funding assistance. • NDDOT has the Local Road Safety Program (started in 2013) with $1 million in funds for counties and cities to improve safety of roads. • Most effective mitigation program in North Dakota is the HMGP, as it is the program best understood and used the most by local jurisdictions; the PDM and FMA programs are becoming more effective but are limited due to the national competitiveness and NFIP requirements, respectively (See Section 5 for more information in the Losses Avoided Study). • Use of the Statewide Seamless Map for mitigation project engineering and design and hazardous structure identification. • Two Devils Lake outlets have been built capable of reducing the lake levels by one foot per year; infrastructure has been built to protect major structures and public works above the overflow lake elevation.	• The state has very little control or influence over development in hazard prone areas. • Complexities with the major flood areas and the associated complexities with the possible solutions, including possible impacts downstream, can make mitigation strategies difficult to pursue, fund, and implement. • Difficulties with promoting and using the NFIP due to its solvency problems and insurance rate changes.

Core Capability	Target Language	Strengths	Weaknesses
Planning	• Every five years, starting in 2019, state, local, and tribal governments update MHMPs in accordance with federal, state, and local requirements. Support the development, maintenance and implementation of one state, 53 county, 2 city, and 4 tribal MHMPs.	• Sound approach to synchronizing planning across Mission Areas (including Mitigation) via Mission Areas Operations Plans (MAOPs). The MAOPs provide the opportunity to deliver individual Core Capabilities within each Mission Area in a mutually supportive manner. • NDDES has developed and continues to develop a GIS program that can be used for mitigation planning and project development. • Legislature is more aware mitigation projects in the state because of the state's financial commitment of providing 10% match for HMA grants.	• Develop minimum qualifications standards for mitigation planners including consultants, state, and local staff.
Public Information and Warning	• Communicate risk to the public (including people with access or functional needs and individuals with limited English proficiency) annually, starting in 2019; conveying how their actions can reduce the impacts from the hazards and threats to their homes, workplaces, and communities. • Encourage and support community and individual/family preparedness efforts across the whole community annually starting in 2019 through information dissemination and public notification.	• Continued outreach and education on the mitigation programs.	• Lack of awareness for the availability of potentially eligible mitigation project types other than acquisition/demolitions, acquisition/ relocations, early warning sirens, generators, lift station relocations, and overhead line burial conversions, which create the majority of mitigation projects in North Dakota.
Operational Coordination	• Coordinate across state, local, and federal jurisdictions	• Strong relationships with other organizations and integrated	• Relationships with local emergency managers can be

Core Capability	Target Language	Strengths	Weaknesses
	and integrate with partners from across the whole community in order to effectively invest mitigation funding (e.g. PDM, HMGP), within the program's period of performance.	processes due to a high number of recent disasters. • Strong interagency coordination, such as the Hazardous Materials Conference that brings together stakeholders from the public, private, and non-profit sectors to address specific hazards. • NDDES Advisory Committee and membership on other advisory committees. • All of FEMA's HMA programs are managed by one agency. • Proactive regional councils and associated outreach to local jurisdictions. • Silver Jackets Program in North Dakota providing increased coordination. • Further development of NDDES Regional Emergency Management Coordinator positions that can help specific regions of the state focus on and engage in mitigation initiatives tailored to the needs of individual jurisdictions. • Improved relationships with the tribal nations. • Growing and improving relationships with the regional councils and the associated regional mitigation plan possibilities. • Coordination efforts, such as the Silver Jackets Program, to coordinate state and federal agencies on specific issues.	inconsistent due to high turnover rates. • The time-consuming nature of recent disasters has made it difficult for state agencies to devote as much time to mitigation.

4.1.6 Conclusions on Statewide Mitigation Capabilities and Integration

North Dakota has made great strides in their mitigation capabilities since the last plan update. The State continues to utilize a variety of funding sources, including a higher proportion of non-disaster depending funding sources that help make mitigation funding more consistently available. NDDES is committed to making the process of hazard mitigation as streamlined as possible, integrating the THIRA process and EMAP requirements into the Enhanced Mitigation MAOP, thus giving more resources to implementing the mitigation strategy. North Dakota achieved PAS status in 2017, which has also contributed to enhancing their grant management capabilities since the last update. NDDES also works in concert with federal, state, local, and tribal agencies, non-profit organizations, associations, and businesses to integrate HMA planning and project initiatives at every level to improve the effectiveness and implementation of all HMA programs.

Just as data from other state plans and programs was integrated into this mitigation plan, information from this plan has been integrated into other plans and programs. Mitigation planning and activities have been a part of North Dakota state government for many years; therefore, many other plans, programs, and legislation already have mitigation concepts integrated into them. The Capabilities Analysis discussed existing programs and partnerships in North Dakota that coordinate to advance principles of risk reduction, resilience, and mitigation. Mitigation has become embedded in state planning, decision making, and development, and other state agency planning initiatives help to inform the state's overall mitigation strategy. The SHMT plays a critical role in this process and will continue to integrate hazard mitigation information into their agency plans and programs and those of their partner agencies.

4.2 Local Capabilities Analysis and Integration

4.2.1 Status of Local Resource Implementation

Most mitigation takes place at the local and tribal levels. The jurisdictions typically understand the local problems best, develop creative solutions for mitigating their problems, apply for grant funding, come up with a portion or all of the grant match, and implement the projects. Since much of North Dakota is rural with limited local and tribal government resources, accomplishing mitigation is challenging. In many cases, the local emergency manager or elected or appointed officials coordinate the mitigation efforts with input from other local government employees. In many cases, these positions are part-time. Even in communities with full-time emergency managers, their job responsibilities extend far beyond mitigation and include many other aspects of emergency management. Without the support of their local officials, mitigation can become a low priority.

Local and tribal governments have shown their commitment to mitigation through past mitigation successes, the development of their local mitigation plans, and participation in the development of this Enhanced Mitigation MAOP Update. Following a disaster, local jurisdictions regularly assist the Interagency Hazard Mitigation Team and attend SHMT meetings when invited.

The local mitigation expectations and responsibilities are:

- Develop, update, and implement their local mitigation plans, supplements, and updates.
- Provide input to the state Enhanced Mitigation MAOP and programs.
- Adopt appropriate hazard mitigation measures including land use and construction standards.
- Apply for mitigation grant funding and conduct specific mitigation activities identified in their local mitigation plans.

Ideally, all communities would participate in some form of hazard mitigation; however, due to differences in local capabilities and priorities, the degree of participation varies greatly from community to community. The status of local mitigation planning can be seen in Appendix 7.7. The capabilities of local and tribal governments in the State of North Dakota vary widely from the large cities that have hundreds of employees to townships with volunteer boards. The size of a jurisdiction, however, is not typically a good indicator of its mitigation effectiveness. Every jurisdiction is unique in its capabilities and needs, but the common strengths, weaknesses, emerging capabilities, and needs in many jurisdictions follow.

The results of the local plan roll-up are summarized in Appendix 7.7. This analysis reiterates the sentiment that the local jurisdictions of North Dakota have variable, but generally strong capabilities. This includes 53% of local and tribal jurisdictions participating in the NFIP, three percent participating in CRS, 52% administering zoning ordinances, 29% administering subdivision regulations, 41% having adopted building codes, 24% having a comprehensive plan, 21% having capital improvement plans (CIPs), 21% having a full-time planner, 7% having a full-time engineer, and 21% having a full time CFM.

Strengths of Local and Tribal Capabilities

- High level of local institutional knowledge in many jurisdictions.
- Due to a high number of recent disasters, many local officials, emergency managers, and the public are aware of the need for mitigation and possible solutions for their jurisdictions.
- Creative funding solutions such as local sales taxes or mill levies.
- Local and tribal governments have the authority to perform most mitigation activities.
- State and local training programs.
- Educational resources available.
- Generally, local officials and the public care deeply about their communities and can provide lots of support for mitigation activities.

Weaknesses of Local and Tribal Capabilities

- The time-consuming nature of recent disasters has overwhelmed jurisdictions both financially and with personnel time. Emergency managers do not have as much time to devote to mitigation.
- Many local and tribal emergency managers are part-time with many other areas of responsibility and priorities that may take precedence.
- Many small jurisdictions exist, such as townships and cities with less than 100 people, that don’t have the staff capabilities to undertake mitigation in their jurisdictions.
- Jurisdictions have many other competing priorities for their time and financial resources.
- Complexities and regional nature of the major flood areas (Red River, Devils Lake, and Mouse River Basins) require a large time commitment and coordination with many other jurisdictions to find effective solutions; simple, local solutions are generally not effective for the larger problems.
- Not enough local land use planners in State.
- High turnover rates for local officials and emergency managers can slow mitigation progress.
- During periods of low disaster activity, the need for mitigation, based on public perceptions, can become less important.
- Projects and concepts that have very little public support are not usually implemented.
- The capability to implement, execute, govern, and enforce zoning laws can be very limited.
- Townships have zoning authority, so this can make county-level zoning difficult if not impossible.
- Many jurisdictions do not have a clear understanding of program requirements (such as acquisition and the NFIP).
- Local NFIP enforcement can be difficult and politically charged.
- Problems often result when a lack of clear and consistent direction from federal and state government is present.
- The local match requirements of many grants can be cost prohibitive in some communities.
- The HIRA in local plans lack depth.
- The lack of implementation of HMPs is an issue, as well as plans expiring.
- Do not have the capacity for debris of all kinds.
- The inability of local jurisdictions to execute land use mandates or recommendations without state or federal incentives.

Emerging Local and Tribal Capabilities

- Growing and improving relationships with the regional councils and the associated regional mitigation plan possibilities.
- Local officials are continuing to grasp the importance of mitigation, its definition, and program eligibility requirements.
- Zoning, comprehensive planning, and other land management policies are all local decisions, and the state does not have control over these policies. In jurisdictions such as townships with very few government resources, adopting and enforcing these policies, such as floodplain management, can be particularly problematic. Understanding these limitations, the state places a priority on public

education and awareness to assist local governments in making informed and responsible decisions.

Additional Needs

- Qualified local contractors for mitigation planning assistance.
- Continued mitigation and grant application training.

Capability to Address Repetitive Loss and Severe Repetitive Loss

NDSWC and NDDES work with local communities to address their local RL/SRL properties using the programs outlined in Section 4.1.2. These agencies provide technical assistance for local and tribal communities.

The local plans that identified their RL/SRL properties and also included RL/SRL in their mitigation strategy (goals, objectives, and actions) are included in the local plan roll-up (Appendix 7.7). There are 27 out of the 58 local plans that currently address RL and SRL properties.

4.2.2 Funding for Local Mitigation

Funding for local hazard mitigation can come from a variety of local, state, and federal sources. For planning, some local jurisdictions use a portion of their EMPG to fund a position to manage the update and implementation of their HMP. Other jurisdictions apply for FEMA grants (HMGP and PDM) to fund the update of their HMPs. A summary of the HMGP and PDM awards made to local hazard mitigation planning projects since 2013 can be found in Table 4-19 below. Depending on the scope of the work, different types of hazard mitigation projects can be funded from a variety of sources, including several different State and Federal funding programs outlined in Table 4-20.

Table 4-19 HMGP and PDM Awards for Local Hazard Mitigation Planning, 2013 to Present

Program	Year	Applicant	Description	Total Funding
PDM	2017	Dunn County	Billings/Dunn/Golden Valley/Stark County MHMP	$100,000.00
PDM	2017	Divide County	Burke/Divide County MHMP	$57,200.00
PDM	2017	Cass County	MHMP Update	$54,000.00
PDM	2017	Dickey County	MHMP Update	$27,333.34
PDM	2017	Oliver County	MHMP Update	$25,094.15
PDM	2017	Hettinger County	MHMP Update	$33,733.33
PDM	2017	LaMoure County	MHMP Update	$35,609.54
PDM	2017	Adams County	MHMP Update	$32,000.00
PDM	2016	Steele County	MHMP	$39,489.48
PDM	2016	Ward County	MHMP Update	$64,000.00
PDM	2016	Pierce County	MHMP Update	$41,200.00
PDM	2016	NDDES	Enhanced MHMP	$209,834.00
PDM	2016	Cavalier County	MHMP Update	$35,666.67
PDM	2016	Spirit Lake Nation	MHMP Update	$66,225.33
PDM	2015	Benson County	MHMP Update	$21,972.53
PDM	2015	Eddy/Wells County	MHMP Update	$28,533.33
PDM	2015	McHenry County	MHMP Update	$28,666.67
PDM	2015	Renville County	MHMP Update	$32,666.67
PDM	2015	Logan County	MHMP Update	$31,066.67
PDM	2015	Grant County	MHMP Update	$31,200.00
PDM	2015	McIntosh County	MHMP Update	$32,800.00
HMGP	2017 Spring Flood	Rolette County	MHMP Update	$26,823.53
HMGP	2014 Summer Flood	Walsh County MHMP	MHMP Update	$14,918.00

Program	Year	Applicant	Description	Total Funding
HMGP	2013 Fall Flood	Ramsey County MHMP	MHMP Update	$31,765.00
HMGP	2013 Fall Flood	Bottineau County MHMP	MHMP Update	$27,000.00
HMGP	2013 Fall Flood	Sheridan County MHMP	MHMP Update	$27,608.00
HMGP	2013 Summer Rain Flood	Towner County MHMP	MHMP Update	$21,279.00
HMGP	2013 Summer Rain Flood	McLean County MHMP	MHMP Update	$26,959.00
HMGP	2013 Summer Rain Flood	Ransom County MHMP	MHMP Update	$31,765.00
HMGP	2013 Summer Rain Flood	Williams County MHMP	MHMP Update	$44,249.00
HMGP	2013 Spring Snowmelt Flood	Nelson County MHMP	MHMP Update	$26,471.00
HMGP	2013 Spring Snowmelt Flood	Mercer County MHMP	MHMP Update	$20,000.00
HMGP	2013 Spring Snowmelt Flood	Traill County MHMP	MHMP Update	$31,765.00
Total:				**$1,358,894.24**

Source: NDDES, 2018

Table 4-20 Potential State and Federal Mitigation Funding Sources for Local Jurisdictions

Name	Description	Managing Agencies
CAP	Provides funding to states to assist communities in complying with NFIP requirements.	FEMA; NDSWC
FMA	Provides pre-disaster funding for repetitive flood loss property reduction.	FEMA NDDES
HMGP	Provides post-disaster mitigation funding.	FEMA NDDES
CDBG-DR	Provides funds for the effects of disaster and recovery needs.	NDDoC HUD
Living Snow Fence Program	Provides funding to plant living snow fences along roadways.	FHWA HMA NDDOT
NDSWC Cost-Share Program	Provides funding to the state to promote sustainable water-related projects.	NDSWC
RiskMAP	Provides funding to establish or update floodplain mapping.	FEMA NDSWC
National Fire Plan / Wildfire Mitigation	Provides pre-disaster funding for primarily wildland fire mitigation, but also wildfire planning. Most of the funding in North Dakota has been used for equipment.	USFS NDFS
PDM Program	Provides grants through a competitive process for specific mitigation projects, including planning.	FEMA NDDES

4.2.3 Local Integration Opportunities

The 2018 Enhanced Mitigation MAOP Update provides a framework for local jurisdictions in North Dakota to develop and update their individual HMP. The Enhanced Mitigation MAOP does not dictate which mitigation goals and objectives to establish or mitigation actions to complete. The state mitigation framework provides guidance for local jurisdictions to plan for mitigation, but local jurisdictions must agree to support the actions that are most appropriate for their area, given their limited resources. Section 5.4.1 further details the process and timeframe by which North Dakota reviews, coordinates, and links the local plans to the Enhanced Mitigation MAOP.

Beyond local HMPs, the 2018 Enhanced Mitigation MAOP, is integrated into other local plans, such as: local comprehensive plans, local emergency management plans, local post-disaster redevelopment plans, local THIRAs, and local HMA program applications.

4.2.4 Conclusions on Local Mitigation Capabilities

Local communities have a variety of capabilities and funding opportunities for hazard mitigation projects. While some jurisdictions have a greater capacity than others, all local jurisdictions are beginning to develop hazard mitigation practices. A huge accomplishment for developing a culture of mitigation throughout North Dakota is all jurisdictions having either a FEMA-approved HMP or a HMP under development. Moreover, many local jurisdictions have taken advantage of federal grant programs to fund their mitigation projects. Given these improvements, there are still a variety of limitations to the local and tribal mitigation capabilities that the state will continue to actively address.

5 Execution

5.1 Direction of the State's Mitigation Strategy

5.1.1 Mitigation Program Goals and Objectives

Hazard mitigation, as defined by the Disaster Mitigation Act of 2000, is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The National Institute of Building Sciences (NIBS) 2017 Interim Report found that for every dollar spent on mitigation, the nation is saving six dollars in future disaster costs. The same study also found for every dollar spent on developing and enforcing higher building codes, four dollars is saved in future damage costs. The development of a Mitigation Strategy allows the State of North Dakota to coordinate with federal, state, tribal, and local agencies, non-governmental organizations, and private partners to create a vision for preventing future disasters, establish a purpose, agree on a common set of mitigation goals and objectives, prioritize actions, and evaluate the success of such actions. The North Dakota Mitigation Strategy is based on the results of the statewide risk and capabilities assessment, local and tribal risk assessments and mitigation strategies, and additional recommendations by mitigation stakeholders. The Mitigation Strategy also integrates the 2018 THIRA capability target language in order to promote integration between the hazard mitigation planning and the THIRA processes.

As stated in the Executive Summary, the strategy looks at the short term, enhancing local plans and regulations and expanding education and outreach, while focusing on the long term by expanding the state's capabilities to integrate planning efforts; applying studies and technologies; building more resiliently with a focus on structural, natural systems and environmental projects; and improving worker safety and protection of public health. Additionally, repetitive loss and severe repetitive loss remains a continuing and long-term strategy for the state. Within the context of the State's Mitigation Strategy, the SHMT considers short-term strategies, goals, objectives and associated actions as those that can be completed within 12 months. The team defines medium strategies, goals, objectives and actions as can be completed within 12 to 36 months and establishes long-term strategies, goals, objectives and actions as those that extend 36 months or longer.

The framework of the State's Mitigation Strategy has the following parts:

- The **Purpose** is an overarching philosophical or value statement regarding the primary function of the Mitigation Strategy.
- The **Goals** are broad and outline the overall direction the State. Goals are ideals to which the State and jurisdictions should strive for as they develop and implement mitigation projects in order to develop a holistic culture of mitigation within the State.
- The **Objectives** link the goals and actions and help organize the plan for efficient implementation and evaluation. Objectives are measurable milestones that are fundamentally based on the State's THIRA target language.

The following is the overall Hazard Mitigation Strategy for the State of North Dakota that includes a purpose statement, four overarching goals, and measurable objectives. Many of the objectives have been written to include a baseline to measure their progress of implementation starting in 2019. This does not mean that this work is not continuing, the baseline will be adjusted as the plan is updated.

Purpose: Minimize the vulnerability of the public, property, infrastructure, environment, and economy of North Dakota and its communities to the impacts of natural and technological hazards as well as adversarial threats.

The SHMT prioritized goals as follows from short to long-term; and, within those goals, objectives may be short, medium-term and long-term based on the definitions outlined in paragraph 2.

Goal 1: Develop and implement state, local, and tribal mitigation plans that reflect a sound understanding of hazards and threats.

Objective 1.1: Every five years, starting in 2019, state, local, and tribal governments update HMPs in accordance with federal, state, and local requirements. Support the development, maintenance, and implementation of one state, 53 county, two city, and four tribal HMPs.

Objective 1.2: Every three years, starting in 2019, identify the frequency, magnitude, and impacts of hazards and threats that can occur in North Dakota using modeling and industry best practice.

Objective 1.3: Every five years, starting in 2019, provide technical assistance, emergency preparedness training, and risk management education programs to local emergency managers, private partners, and residents throughout the state.

Objective 1.4: Coordinate across state, local, and federal jurisdictions and integrate with partners from across the whole community in order to effectively invest mitigation funding (e.g. PDM, HMGP), within the program's period of performance.

Objective 1.5: Every five years, starting in 2019, conduct a review of vulnerabilities, resilience capabilities, and estimate impacts of hazards and threats across government, private, and community organizations.

Goal 2: Promote hazard and threat awareness and preparedness within the whole community, inclusive of individuals with access and functional needs and limited English proficiency.

Objective 2.1: Communicate risk to the public (including people with access and functional needs and individuals with limited English proficiency) annually, starting in 2019; conveying how their actions can reduce the impacts from the hazards and threats to their homes, workplaces, and communities.

Objective 2.2: Encourage and support community and individual/family preparedness efforts across the whole community annually starting in 2019 through information dissemination and public notification.

Goal 3: Promote resiliency of current and future buildings and infrastructure systems from the impacts of hazards and threats.

Objective 3.1: Within five years, starting in 2019, significantly reduce risk to buildings and infrastructure located in hazard- or threat-prone areas (including floodplains).

Objective 3.2: Within five years, starting in 2019, encourage adoption and enforcement of disaster resilient building codes and wise land use planning, appropriate to local and tribal risks.

Goal 4: Preserve/protect people, property, and natural and cultural resources from the impacts of hazards and threats. Ensure that communities are resilient to the impacts of hazards and threats.

Objective 4.1: Within five years, starting in 2019, reduce the vulnerability of people, property, and natural and cultural resources to hazards and threats.

As part of the 2018 plan update, the goals, goal owners, objectives, and objective owners from the previous plan were assessed to determine if they addressed current and anticipated future conditions. The intention of the SHMT is to establish mitigation goals that had applicability over the long term. Given this motivation, the number of goals in the plan was reduced from eight goals to four goals. Five of the eight goals in the previous plan's goals targeted specific hazards and threats. The goals were combined and reworded to have applicability to all hazards and threats identified by the SHMT. In this way, the goals and objectives focused more on the mitigation outputs and will better anticipate changing priorities of the State. These goals will continue to provide direction to State, local and tribal mitigation efforts for many years through future updates and revisions.

Next, the objectives were reworked using the THIRA capability target language, with some minor additions. The decision was made to integrate the THIRA capability target language into the mitigation objectives to streamline emergency management in North Dakota and limit the burden of planning on the stakeholders.

NDDES worked with the consultant team to determine this process of integrating the THIRA and mitigation planning processes in developing the Mitigation Strategy. FEMA Region VIII took part in this discussion and identified their expectations for the integration and Mitigation Strategy.

The SHMT members were introduced to a working version of the revised mitigation goals and objectives during the August 22, 2018 webinar. NDDES received holistic consensus and buy-in on these revisions.

5.1.1.1 Repetitive Loss and Severe Repetitive Loss Strategy

Mitigating risk to RL and SRL properties is a high priority for the State of North Dakota. The State's RL Strategy highlights how the 2019 Mitigation Strategy prioritizes mitigating risk to RL and SRL properties. The connection between the State Mitigation Strategy and the RL Strategy is inherent, as the State is commitment to mitigating losses to flood prone properties and reducing the vulnerability of the public to natural hazards. This motivation for the RL Strategy directly connects to the Mitigation Strategy purpose discussed in Section 5.1.1. The North Dakota Mitigation Strategy outlined in Section 5.1.1 directly supports the Repetitive Loss Strategy. Table 5-1 outlines the connection between the Mitigation Strategy objectives and the Repetitive Loss Strategy, where appropriate.

Table 5-1 Connecting Mitigation Strategy Objectives to RL/SRL Strategy

Objective	Connection to RL/SRL Strategy
1.1 - Every five years, starting in 2019, state, local, and tribal governments update HMPs in accordance with federal, state, and local requirements. Support the development, maintenance, and implementation of 1 state, 53 county, 2 city, and 4 tribal HMPs.	NDDES continues to work with local and tribal jurisdictions to have updated FEMA approved HMP (Section 5.4.1.1). Through this process, NDDES will continue to emphasize inclusion of RL and SRL properties in their HMPs at the local level. NDDES will work with local and tribal jurisdictions to develop criteria related to RL and SRL properties.
1.2 - Every three years, starting in 2019, identify the frequency, magnitude, and impacts of hazards and threats that can occur in North Dakota using modeling and industry best practice.	Prioritizing accurate identification of frequency, magnitude, and impacts of hazards and threats will be integral in understanding how to mitigate RL and SRL properties.
1.3 - Every five years, starting in 2019, provide technical assistance, emergency preparedness training, and risk management education programs to local emergency managers and residents throughout the state.	NDDES has a strong commitment to technical assistance and relationship building throughout the State (Section 5.4.1.4). Training and technical assistance will continue to be provide to local and tribal jurisdictions related to hazard mitigation and planning. The State incorporates the most current FEMA guidance and trainings when providing technical assistance. This includes the plan review criteria, so that jurisdictions with RL/SRL properties clearly understand the importance and how to obtain FEMA approval. A particular focus will be working with local and tribal jurisdictions that have the most RL and SRL properties.
1.5 - Every five years, starting in 2019, conduct a review of vulnerabilities, resilience capabilities, and estimate impacts of hazards and threats across government, private, and community organizations.	As part of this review, RL and SRL properties will be identified and studied to determine vulnerabilities and estimate financial impacts from future flooding events.
2.1 - Communicate risk to the public (including people with access and functional needs and individuals with limited English proficiency) annually, starting in 2019; conveying how their actions can reduce the impacts from the hazards and threats to their homes, workplaces, and communities.	Communication with communities regarding individual preparedness related to RL and SRL properties within the State of North Dakota involves accurately communicating risk and communicating the importance of prioritizing RL and SRL mitigation actions. In order to accurately communicate risk, communities will be provided with current lists of RL and SRL properties in order to target mitigation efforts annually.

Objective	Connection to RL/SRL Strategy
	Communities should be aware of how the State prioritizes funding for RL and SRL properties.
2.2 - Encourage and support community and individual/family preparedness efforts across the whole community annually starting in 2019 through information dissemination and public notification.	The State will encourage communities to understand their risk to RL and SRL properties and identify opportunities to mitigate these risks. The State will emphasize community wide programs, such as CRS, for which community preparedness will collectively mitigate risks for RL and SRL properties.
3.1 - Within five years, starting in 2019, significantly reduce the risk to buildings and infrastructure located in hazard/threat prone areas (including floodplains).	The State will prioritize mitigation projects that mitigate RL and SRL properties at the state, local, and tribal level.
3.2 - Within five years, starting in 2019, encourage adoption and enforcement of disaster resilient building codes and wise land use planning, appropriate to local and tribal risks.	Achieving this objective will help prevent RL and SRL properties from being constructed in high risk areas.
4.1 - Within five years, starting in 2019, reduce or eliminate vulnerability of people, property, and natural and cultural resources to hazards and threats.	The State will prioritize mitigation projects that mitigate RL and SRL properties at the state, local, and tribal level and protect people and property.

5.1.1.2 Repetitive Loss and Severe Repetitive Loss Successes

North Dakota has had success in mitigating risk to RL and SRL properties in the State. Flooding is an annual repetitive disaster for North Dakota, and consequently flood mitigation projects have been a priority for the State. As of September 2018, FEMA has reported zero SRL properties in the State of North Dakota. To determine success of mitigation projects in the State, an analysis was conducted for the most recent federally declared disaster in April 2017 (DR-4323). This analysis found that while the impacts of the disaster were large, with an estimated $8.6 million in damages, the damages and associated costs would have been far greater if not for our state's results-driven hazard mitigation programs. As an example, through the use of the HMA and CDBG Programs, the state has created green space along rivers and lakes by acquiring more than 1,400 properties in flood prone areas, including properties that had been identified as RL or SRL properties by the NFIP. These acquired properties have an estimated cost benefit of $386,400,000 by using the national pre-determined benefit value of $267,000 per property. These benefits are considered losses avoided and were saved due to the success of North Dakota's Hazard Mitigation Program, with immeasurable benefits to residents (NDDES, 2017).

North Dakota is actively planning projects to be implemented to avoid RL and SRL in all communities. This includes community wide projects as well as property specific projects. The State is committed to focus on areas of known RL including the Mouse River, Red River, and Devils Lake Basin where the majority of HMA funding has been utilized in the State. The State is also tracking RL and SRL properties in order to fund acquisition projects which will reduce the burden of the NFIP on property owners and enhance the resiliency of communities. As mentioned previously in Section 5.1.1.1, these efforts to reduce risk for RL and SRL are being integrated with local and tribal hazard mitigation planning efforts.

Another measure of success for RL and SRL mitigation is local and tribal inclusion of RL and SRL in HMPs. There were 27 local and local plans (out of the 58) that incorporated consideration of RL and SRL in their mitigation strategy.

5.1.2 Relation to Local and Tribal Mitigation Priorities

The SHMT analyzed the goals of the FEMA-approved local and tribal HMPs, recently expired local and tribal HMPs, and draft local and tribal mitigation plans to assess their consistency with State goals. The analysis involved rolling up and comparing the goals from local and tribal HMPs with the categories of the

State goals. The results are shown in Table 5-2. The analysis indicates that the highest percentage of goals are focused on minimizing losses, public education, and risk reduction.

Table 5-2 Local Jurisdictional HMP Goals Summary

Local Goal Type	Number in Local/Tribal Plans	Percent of Total Plans Reviewed	Corresponding State Goal
Policy Development and COOP	26	45%	Goal 1
Public Education	38	66%	Goal 2
Minimize Losses	48	83%	Goal 3
Risk Reduction	37	64%	Goals 3 and 4
Protect the Environment	23	40%	Goal 4
Capability Development	25	43%	Goal 1
Communications	9	16%	Goal 2
Protect Critical Facilities	31	53%	Goal 3
Vulnerable Populations	22	38%	Goal 4
Source: FEMA Approved Local and Tribal HMPs, Draft Local and Tribal HMPs, and Recently Expired Local and Tribal HMPs in North Dakota.			

5.2 Mitigation Progress

The updated Plan must identify the mitigation action status from the previously approved Plan. The SHMT revisited the 2014 mitigation actions during the planning process in 2018. The SHMT was provided a summary table in July 2018 of the actions and instructed to provide a detailed status report including information on if the action was ongoing, completed, deferred, or should be deleted. This table also includes the following information: statewide mitigation action title, action description, the lead agency, support agencies, the 2013 status, priority level and status update. Additionally, at the third planning meeting, in August 2018, the SHMT members were encouraged to review the 2014 mitigation actions. Table 7.6-1 in Appendix 7.6 outlines the results of this SHMT engagement. One of the 36 mitigation actions listed in the previous plan was completed so that 35 of the 36 mitigation actions listed in the previous plan were listed as ongoing. The SHMT, however, retooled the focus of these ongoing actions to ensure their applicability to the State's Mitigation Strategy. These recrafted actions are the basis for the development of the 2019 Mitigation Action Plan (Section 5.3). As evidenced by the *2014-2016 Progress Report: Mitigation in North Dakota*, in Appendix 7-6, the SHMT periodically reviews and revises the wording of mitigation actions to reflect progress toward achieving goals or changes in priorities. The reporting of this information provides a measure of progress towards meeting the State's mitigation goals.

5.3 2019 Mitigation Action Plan

This section describes the intentions of the SHMT to address State, tribal, and local vulnerabilities identified in the risk and capability assessments through specific mitigation actions that contribute to an overall mitigation strategy. Many mitigation projects across the State are initiated and implemented at the local or tribal level. Often state government provides technical assistance and support the local implementation of mitigation activities. Mitigation actions are specific activities that provide the detail on how the State will accomplish identified objectives, and meet the mission and goals outlined in this plan.

The 2019 Mitigation Action Plan was developed from the 2014 Mitigation Action Plan, the 2019 Risk Assessment, and critical contributions from the SHMT. Ongoing mitigation actions from the 2014 Mitigation Action plan were reviewed for potential revisions and integrated into the 2019 Mitigation Action Plan. The SHMT members were a critical resource for development of the 2019 Mitigation Action Plan. Committee members were given time at the second planning meeting in July 2018 to discuss the risk assessment associated with their hazard(s)/threat(s) and ideas for mitigating the risks outlined in the risk assessment which were integrated into the 2019 Mitigation Action Plan. Additionally, NDDES mitigation staff met with committee leads during July and August 2018 to discuss revisions to content and to develop profile summaries that serve as the foundation for developing mitigation actions included in this plan. During the third planning webinar in August 2018, the SHMT was able to express its priorities for mitigation which were integrated into the 2019 Mitigation Action Plan. Common priorities for mitigation included flooding and infrastructure/property structural protection. Lastly, SHMT and committee members were asked to complete a *New Mitigation Action Form* which asked for details of proposed new mitigation actions. Seven new mitigation actions were developed using these forms. Submitted forms can be reviewed in Appendix 7.6.

5.3.1 Mitigation Action Identification and Prioritization Methodology

Each of the proposed actions has value; however, time and financial constraints do not permit all of the proposed actions to be implemented immediately. By prioritizing the actions, the most critical, cost effective projects can be achieved in the short term. The prioritization of the projects serves as a guide for choosing and funding projects; however, depending on the funding sources and personnel resources, this prioritization may not always be used.

To ensure that statewide goals, benefit/cost, and other factors are considered when prioritizing actions, a prioritization model that uses the following factors has been developed: cost, project management, feasibility, population benefit, property benefit, effectiveness, and hazard rating. An explanation of this prioritization criteria is outlined in Table 5-3. Planning and related projects generally do not result in direct population or property benefits, but they can contribute to increased hazard understanding and project implementation, so their value is seen in other ways.

Each of the factors was ranked qualitatively for each of the projects. The highest possible score is 22. Some factors have a greater range than others, thus indicating a higher weighting. These weightings allow for appropriate prioritization of the project. More specifically, 8 of 22 points account for benefits (population benefit and property benefit), 6 of 22 points account for direct and indirect costs (cost and project management), 4 of 22 points account for the hazard rating (incorporates hazard probability and impacts), and 4 of 22 points account for feasibility and effectiveness.

Table 5-3 North Dakota Mitigation Action Plan Prioritization Description and Criteria

Factor	Description	Threshold	Rating	Score
Cost	The annual direct expenses associated with the initiative.	Little to no direct expenses	L	4
		Less than $100,000	LM	3
		$100,000-$499,999	M	2
		$500,000-$999,999	MH	1
		$1,000,000 or greater	H	0
Project Management	The evaluation of the amount of time needed by public and private partners to complete or coordinate the project.	Less than 40 hours of staff time	L	2
		40-80 hours of staff time	M	1
		Greater than 80 hours of staff time	H	0
Feasibility Range	Assessment of the political, social, and/or environmental ramifications of the project and the likelihood such a project would proceed through permitting, public review, and/or legislative processes. Summary of FEMA's STAPLEE evaluation criteria as shown in Appendix 7-6.	Positive support for the project	H	2
		Neutral support for the project	M	1
		Negative support for the project	L	0
Population Benefit	Considers the possible prevention of deaths and injuries through the action's implementation.	Potential to reduce more than 20 casualties	H	4
		Potential to reduce 10-20 casualties	MH	3
		Potential to reduce 5-10 casualties	M	2
		Potential to reduce 1-5 casualties	LM	1
		No potential to reduce casualties	L	0
Property Benefit	Estimates the reduction of property losses, including structures, infrastructure, and values, from the hazard being mitigated.	Potential to reduce losses to 100 or more buildings or severe damage to infrastructure or values	H	4
		Potential to reduce losses to 25-99 buildings or substantial damage to infrastructure or values	MH	3
		Potential to reduce losses to 10-24 buildings or moderate damage to infrastructure or values	M	2
		Potential to reduce losses to 1-9 buildings or slight damage to infrastructure or values	LM	1
		No potential to reduce property losses	L	0
Effectiveness	Evaluation of the successfulness of similar projects in North Dakota or the action's potential and amount of maintenance required to keep the mitigation measure effective and useful.	Proven to be very effective	H	2
		Expected to be moderately effective	M	1
		Effectiveness unknown or high maintenance	L	0
Hazard Rating	Measure of the history, probability, severity, and vulnerabilities of the hazard.	See Risk Factor Assessment, Section 5. When multiple hazards are listed, the highest hazard ranking was used.	H	4
			M	2
			L	0
Rating Acronyms: H (High), MH (Medium-High), M (Medium), LM (Low-Medium), L (Low)				

Table 5-4 shows a summary of the evaluation of each statewide mitigation action in the 2019 – 2024 Mitigation Action Plan. Please note that all actions listed in this strategy are considered valuable. Therefore, even though an action may be listed as a low priority, the action is still an important piece of the State's Mitigation Strategy. Table 7.6-4 in Appendix 7.6 shows the complete evaluation and Table 7.6-3 in Appendix 7.6 shows the STAPLEE analysis completed contributing to the prioritization analysis.

Table 5-4 Mitigation Action Prioritization Summary

Prioritization	Mitigation Action Titles
High	2019-1: Mitigation Planning 2019-5: Basin-wide Water Management Planning 2019-8: Firewise and Community Wildfire Protection Plan 2019-9: Debris Management Plans 2019-12: GIS Data Improvement/Data Creation 2019-14: Losses Avoided Study 2019-19: Tornado Safe Rooms and Shelters 2019-20: Flood Mitigation Measures 2019-21: Floodproofing Critical Facilities 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-27: Protect Communication Sites 2019-30: Snow Fences 2019-32: Hazardous Fuels Reduction 2019-34: Insurance Moonshots 2019-36: StormReady Program 2019-40: Medical Surge 2019-46: Isolation and Quarantine 2019-47: Social Distancing
Medium	2019-2: Hazard Mitigation Planning Toolbox 2019-4: Cultural and Historical Preservation 2019-7: Integration of Mitigation and Comprehensive Planning 2019-10: Disaster Recovery Planning Toolbox 2019-15: North Dakota Silver Jackets 2019-17: Drought Contingency Plans 2019-24: Outdoor Warning Systems 2019-25: Emergency Notification Systems 2019-28: Secure Electronic Systems 2019-29: Transportation Engineering and Systems 2019-31: Drought Mitigation 2019-35: NFIP, RiskMAP, and CRS Program 2019-37: Cyber Security Threats Education 2019-28: Public Education and Outreach 2019-41: Community Health Safety Resiliency 2019-42: Vaccination 2019-43: Disease and syndromic surveillance 2019-44: Chemoprophylaxis

Prioritization	Mitigation Action Titles
Low	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-11: Dam EAPs 2019-13: Geologic Mapping 2019-16: Souris Basin Dams 2019-18: Hazardous Materials Flow Study 2019-26: Dam Status Review 2019-33: Hazardous Materials Storage and Disposal 2019-39: Dam Owner Education 2019-45: Disease and Infestation Prevention and Control Technical Assistance 2019-48: Depopulation of ill or exposed animals or plants 2019-49: Control plant disease and infestation 2019-50: Genetic Modification

5.3.2 2019 – 2024 Mitigation Actions

The 2019 – 2024 Mitigation Action Plan is presented below in Table 5-5. The Statewide Mitigation Strategy categorizes actions as follows:

- Local Plans and Regulations – Actions designed to improve the quality of mitigation planning and the promotion of building codes and zoning ordinances;
- Planning Integration – Initiatives designed to integrate mitigation planning into other planning initiatives;
- Technology and Application of Technology – Actions that will increase understanding of hazards and threats;
- Structural Projects and Infrastructure Resiliency – Actions designed to increase resiliency of facilities and infrastructure, and install alert systems and shelters;
- Natural Systems and Environmental Protection – Actions that encourage preservation of natural systems and the environment;
- Education and Outreach – Actions that increase the public's capacity to understand their risks and the actions they can take to reduce these risks; and
- Worker Safety and Health Protection – Actions that focus on the safety of workers and first responders and the health of the public, inclusive of new Americans.

Each action was given an Action ID # for tracking purposes and are listed in order of the primary goal and objective they are designed to help achieve. The related goal and objective are also indicative of how each action contributes to the overall Mitigation Strategy. The Implementation Timeframe column indicates whether a project is ongoing, short, medium or long term.

As demonstrated in Appendix 7.5, the *2014-2016 Progress Report: Hazard Mitigation in North Dakota*, SHMT members periodically revised mitigation actions associated with goals and objectives from the past plan to ensure they remained current and to reflect changes in program parameters and implementation requirements. Based on these revisions, the SHMT considered only one of the previous plan's actions, data digitization, as completed. The remaining actions were revised to ensure continued applicability and viability.

Table 5-5 2019 Mitigation Action Plan

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
Local Plans and Regulations									
2019-1	Mitigation Planning	Provide technical and financial assistance to local and tribal jurisdictions developing or updating multi-HMPs.	All local and tribal jurisdictions are encouraged to develop and adopt mitigation plans that fulfill the requirements of the Disaster Mitigation Act of 2000, enhance community resiliency, and meet the needs of the jurisdictions. This action also calls for NDDES to continue its Community Coffee initiative, collaborating with local and tribal mitigation planning teams to elicit public feedback on hazards, threats, risks, vulnerabilities, and mitigation actions.	1.1	FEMA PDM, HMGP, USFS, BLM	Ongoing	Ongoing - Already initiated and continuing	High	NDDES (Lead); NDFS; NDSWC; NDDA; NDSFM; NDSU Extension Service
2019-2	Hazard Mitigation Planning Toolbox	Develop a web-based Hazard Mitigation Planning Toolbox.	This action supports State, local, and tribal planning teams by providing links to hazard- and threat-related information and mitigation-related webinars; guidance for developing plans that involve the Whole Community; information on	1.3	FEMA HMA	Long-Term (> 36 months)	New to 2018 Plan	Medium	NDDES (Lead) SHMT members with hazard- and threat-specific expertise

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			the State's building code program; and samples of best practices.						
2019-3	Building Codes and Zoning Ordinances	Encourage local jurisdictions to develop and update building codes and zoning ordinances.	Building codes and zoning ordinances promote mitigation principles by outlining requirements and restrictions to keep communities safer. Examples include: • Floodplain ordinances • Defensible space (fire prevention) • Snow load building requirements	3.2	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Low	NDDoC (Lead); NDDES
2019-4	Cultural and Historical Preservation	Promote the participation of cultural and historical preservation organizations in the planning process.	This Whole Community action calls for leveraging the expertise of cultural and historical preservation organizations when analyzing risk and vulnerability and identifying mitigation measures designed to protect cultural and historical resources.	1.4	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Medium	NDDES (Lead); SHSND; NDSU Extension Service

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
Planning Integration									
2019-5	Basin-wide Water Management Planning	Conduct comprehensive basin-wide watershed management planning in the five major basins in North Dakota.	This action ensures comprehensive basin-wide water development planning in the seven major basins in North Dakota – the upper and lower Missouri River Basins, the James River Basin, the Mouse River Basin, the Red River Basin, and the Devils Lake Basin – to allow for a consistent and collaborative approach to flood and drought mitigation plans and projects particularly in large population areas. Looking at the issues that face the basins from a regional and watershed perspective rather than through single jurisdictions typically results in a more favorable and thorough plan of action.	1.5	FEMA HMA	Ongoing	Ongoing - Already initiated and continuing	High	NDSWC (Lead); USACE

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-6	Local Master/ Comprehensive Planning	Encourage local zoning and planning boards and commissions to develop and maintain master and/or comprehensive plans.	Analyses of local and tribal mitigation plans indicate local master and comprehensive plans are outdated in many communities. This action supports development of these plan as vehicles to regulate development in hazard-prone areas. Hazard mitigation becomes much more cost effective when handled before structures and infrastructure are placed in hazard-prone areas.	3.2	Existing State and Federal Budgets/ Programs; EMPG; USDA RD	Long-Term (> 36 months)	Ongoing - Already initiated and continuing	Low	NDDoC (Lead); NDSFM; NDDES; NDSWC
2019-7	Integration of Mitigation and Comprehensive Planning	Promote integration of mitigation and comprehensive plans.	Integration of both mitigation and comprehensive planning will link mitigation strategies with a community's vision, goals, objectives, policies and strategies for future growth and development.	4.1	FEMA HMA	Long-Term (> 36 months)	New to 2018 Plan	Medium	NDDES (Lead); NDDoC
2019-8	Firewise and Community Wildfire Protection Plan	Promote the Firewise and CWPP program.	NDFS provides financial and technical assistance regarding CWPPs. These plans specifically address mitigation for wildland fires and may be required for jurisdictions to receive	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NDFS (Lead); NDSFM; BIA

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			wildfire mitigation funding. This action calls for integrating data from the CWPPs into mitigation plans and leveraging mitigation plan data to inform the CWPPs.						
2019-9	Debris Management Plans	Support the development of local and tribal debris management plans.	Debris management plans help mitigate potential public health impacts following a disaster. This action requires facilitating education, planning, and developing tools to properly address debris management.	4.1	USDA Grant	Medium-term (12-36 months)	Ongoing - Already initiated and continuing	High	NDDoH (Lead); NDDES
2019-10	Disaster Recovery Planning Toolbox	Develop a web-based Disaster Recovery Planning Toolbox that promotes community resiliency.	This action promotes a Whole Community approach to pre- and post-disaster planning by providing planning and programmatic resources. The web page will provide information on land use strategies; hardening of critical infrastructure; protecting environmental and cultural resources; sustainability; and revitalization of the economy, and social and	1.3	EMGP; Other FEMA sources	Long-Term (> 36 months)	New to 2018 Plan	Medium	NDDES (Lead)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			natural environment systems.						
2019-11	Dam EAPs	Review EAPs to ensure these plans address actions to reduce the potential consequences of dam failure.	Dam owners are required to develop, update, and periodically test EAPs for all high and medium hazard dams under NDCC 61-03-25. This action reduces both the risk of dam failure and potential consequences if a failure were to occur.	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Low	NDSWC (Lead); BOR; USACE; North Dakota Game and Fish (NDGF); NRCS; BIA
Studies and Application of Technology									
2019-12	GIS Data Improvement/ Data Creation	Identify possible GIS Improvements or Data Creation	This action promotes collaboration with the North Dakota Geographic Information Systems Technical Committee (GISTC) and the SHMT to share data in support of the development of State, local, and tribal mitigation plans. This includes: interagency sharing of GIS data for inundation mapping, and geologic mapping data.	1.2	Existing State and Federal Budgets/ Programs	Ongoing	New to 2018 Plan	High	NDDES (Lead); NDITD; NDSWC; NDDOT; NDSFM; NDDoH; NDDA; NDFS; NDDMR

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			Additionally, the action calls for resolving identified gaps in GIS data, if feasible. It requires an evaluation of the feasibility and sustainability for the appropriate steward agency to undertake prior to the next plan update cycle.						
2019-13	Geologic Mapping	Promote geologic mapping efforts.	Surface geologic mapping activities continue to focus in North Dakota's urban areas with current mapping projects being conducted in the greater Bismarck-Mandan area. Geologic hazards (landslide areas) mapping continues to focus in the most landslide prone areas in western North Dakota where mapping has not been completed. Updating of older mapping work is also being conducted with the inclusion of recently available LiDAR elevation data and contemporary aerial imagery products.	1.5	Currently funded directly through State agency budget. USGS-Federal Geologic Mapping (FEDMAP), State Geologic Survey Mapping (STATEMAP), EDMAP	Ongoing	Ongoing - Already initiated and continuing	Low	NDGS (Lead)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-14	Losses Avoided	Conduct a comprehensive losses avoided study.	This action requires hiring a firm that would conduct a statewide loss avoidance study that would compile project level information from the different mitigation partner agencies in order to catalog and analyze projects, determine potential damages and benefits, and provide a narrative for each identified project to determine its general effectiveness in mitigating damages. If funding is unavailable, an alternative would be to form a Loss Avoidance Committee.	1.5	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	New to 2018 Plan	High	NDDES (Lead); NDSWC; NDGS; NDFS; NDITD; NDDoH; NRCS; NDDOT; USACE
2019-15	North Dakota Silver Jackets	Enact basin wide hydrologic studies.	The North Dakota Silver Jackets program fosters an interagency approach to reduce the threat, vulnerability, and consequence of flooding. The program promotes basin-wide hydrological studies to determine potential flood control projects, measures, and mitigation activities. These	1.5	Existing State and Federal Budgets Programs $175,000 in HMGP funding	Ongoing	Ongoing - Already initiated and continuing	Medium	NDSWC (Lead); USACE

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			efforts currently encompass the Mouse, James, Sheyenne, and Red River Basins and may be expand to other basins.						
2019-16	Souris Basin Dams	Analyze operating agreements for the Souris River Dam.	As part of flood mitigation efforts, the IJC is reviewing operating agreement for the Souris River Dams. This three-year study, due in 2020, involves agencies and the public from North Dakota, Saskatchewan, and Manitoba. The IJC appointed a Study Board to oversee the study.	1.5	NDSWC cost share of $352,500 and $50,000 worth of in-kind work	Medium-term (12-36 months)	New to 2018 Plan	Low	NDSWC (Lead)
2019-17	Drought Contingency Plans	Encourage rural and regional water suppliers to develop drought contingency plans.	This action prepares water suppliers and farmers for potential drought conditions by developing priorities for water use during drought.	4.1	BOR WaterSMART	Medium-term (12-36 months)	New to 2018 Plan	Medium	NDDA (Lead); NWS; NDSWC; NDDOT; NDDCS; NDDES; State Climate Office

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-18	Hazardous Materials Flow Study	Assist local and tribal jurisdictions with hazardous materials planning.	NDDES has commissioned a hazardous materials flow study that, once complete, will provide insights into volume and nature of hazardous materials movement into, out of, and within North Dakota. Data from the study will also help local leaders with land and traffic planning, zoning, and mitigation plans.	1.3	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	New to 2018 Plan	Low	NDDES (Lead)
Structural Projects and Infrastructure Resiliency									
2019-19	Tornado Safe Rooms and Shelters	Support the establishment of tornado safe rooms and shelters.	NDDES has been working with local and tribal communities to promote the use of safe rooms and shelters. These rooms and shelters protect the public from injury or death caused by tornadoes and other high wind events.	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NDDES

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-20	Flood Mitigation Measures	Support the implementation of flood mitigation measures at the local and tribal level.	This action places priority on flood mitigation projects for Special Flood Hazard Areas. This action encompasses projects that prevent damage to structures, such as critical facilities and homes, bank stabilization, bank armoring, acquisitions, floodwalls, and relocation of critical facilities (such as lift stations).	3.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NDSWC (Lead); NDDES
2019-21	Floodproofing Critical Facilities	Promote flood proofing activities to protect critical facilities, utility infrastructure, government buildings, and residential structures.	Floodproofing measures include anchoring buildings and tanks, reinforcement of walls with water resistant materials, installing watertight doors and windows, sealing basements and walls to prevent seepage, installing permanent pumps, installing backflow prevention valves on utilities, elevating utility systems and other equipment, and taking measures to protect water and sewer systems from floodwaters.	3.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NDDES (Lead); NDSWC

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-22	Power Redundancy at Critical Facilities	Encourage redundancies within power systems	This action ensures continued emphasis on back-up generators or alternative solutions of emergency power until the service is restored for critical facilities, special needs facilities, utility infrastructure, and emergency shelters. Alternative solutions include solar panels.	3.1	Existing State and Federal Budgets/ Programs and HMGP funding	Ongoing	Ongoing - Already initiated and continuing	High	NDDES (Lead); NDaRECs; SLIC; United States DHS
2019-23	Electric Infrastructure Protection	Promote electrical infrastructure mitigation measures.	This activity would primarily occur through the burial of electrical power lines but also include other electrical mitigation activities, including: redundancies of the power grid.	3.1	Existing State and Federal Budgets/ Programs and HMGP funding	Ongoing	Ongoing - Already initiated and continuing	High	NDDES (Lead); NDaRECs; SLIC; United States DHS
2019-24	Outdoor Warning Systems	Support installation and update of outdoor warning systems.	Local and tribal mitigation plans identify outdoor warning systems as a priority mitigation action for the State's communities. Federal, State, local, tribal, and territorial alerting authorities can use Integrated Public Alert and Warning System (IPAWS) and integrate local systems that use Common	2.2	Existing State and Federal Budgets/ Programs and HMGP funding	Ongoing	Ongoing - Already initiated and continuing	Medium	NDDES (Lead)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			Alerting Protocol standards with the IPAWS infrastructure. IPAWS provides public safety officials with an effective way to alert and warn the public about serious emergencies using the Emergency Alert System (EAS), Wireless Emergency Alerts (WEA), the NOAA Weather Radio, and other public alerting systems from a single interface.						
2019-25	Emergency Notification Systems	Procure and implement all-hazards emergency notification systems.	NDDES supports Federal, State, local, and tribal agencies with the update and installation of emergency notification systems to include: next generation interaction 911, phones, smart TVs, and smart message boards.	1.4	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	Ongoing - Already initiated and continuing	Medium	NDDES

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-26	Dam Status Review	Periodically review dam status, conditions, designs, permitting of new dams; encourage owners to maintain and repair dams.	This would improve North Dakota's State Dam Safety Program to reduce the risk of dam failure and reduce the potential consequences if a failure were to occur.	3.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Low	NDSWC (Lead); BIA; United States BOR; USACE; NDGF; NDDMR; NRCS
2019-27	Protect Communication Sites	Retrofit communication sites to mitigate risk of threats and hazards.	Mitigation of potential losses of critical communications requires retrofitting sites with protective security measures, which include: installing guy wires and ensuring system redundancies through satellites, portable towers, and new technology devices.	3.1	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	Ongoing - Already initiated and continuing; Combined with 2014-30	High	NDDES (Lead); NDDOT; NDITD; NDDES; SLIC; United States DHS
2019-28	Secure Electronic Systems	Procure and install secure electronic systems	This action focuses on protecting data by employing next generation firewalls and implementing industry best practices. This action promotes adoption of processes that promote secure electronic systems.	3.1	Existing State and Federal Budgets/ Programs	Long-Term (> 36 months)	Ongoing - Already initiated and continuing	Medium	North Dakota SLIC (Lead); NDDES; NDITD

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-29	Transportation Engineering and Systems	Improve transportation infrastructure to reduce transportation accidents and prevent mass casualty and hazardous material release incidents.	This action will be completed through engineering, including the design of subsequent roads, railways, and barriers. Managed transportation through the implementation of hazardous truck routes and bypasses may prevent hazardous material releases, particularly in populated areas. Regulations related to railway speeds could reduce the probability of accidents in urban areas and provide consistency across the State. Additional considerations could be given to those communities experiencing growth or development in industries requiring heavy use of the transportation systems. This outreach/ education would also include adversarial (e.g. HVE, Terrorism, Hacktivists) threats (purposed or imminent).	3.1	Existing Budgets/Programs and new Legislative funds	Ongoing	Ongoing - Already initiated and continuing	Medium	NDDOT (Lead); SLIC; NDDoH; North Dakota Aeronautics; NDDMR; United States DHS

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
Natural Systems and Environmental Protection									
2019-30	Snow Fences	Support the development of natural and artificial snow fences at the local and tribal levels.	Several local and tribal mitigation plans identify snow fences as a strategy. Enactment of this action will require emphasis on obtaining sources of funding for Snow Fences since State funding sources are no longer available.	3.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NDDES (Lead); NDDOT; NDFS
2019-31	Drought Mitigation	Identify and implement drought mitigation strategies.	This action requires implementation of programs and projects that mitigate water supply shortages for domestic, rural, municipal, industrial, and agricultural uses, and assist vulnerable populations with heat induced health risks; promotes crop insurance and drought-resistant farming practices.	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-6 months)	Ongoing - Already initiated and continuing; renamed 2014-5 action	Medium	NDDA (Lead); NWS; NDSWC; NDDOT; NDDCS; NDDES; State Climate Office
2019-32	Hazardous Fuels Reduction	Mitigate ponderosa pine hazard fuel mitigation site; Identify and mitigate	The ponderosa pine hazard fuel mitigation site is within a 1000-acre area representing the northeastern most extent of ponderosa pine in North	4.1	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	Ongoing - Already initiated and continuing	High	NDFS

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		hazardous fuel sites.	America and one of two native pine areas in North Dakota. The mitigation site includes both private and Federal lands. The project provides risk mitigation by removing hazardous fuel thus providing a higher degree of protection to communities and homes that may be at risk.						
2019-33	Hazardous Materials Storage and Disposal	Promote and enforce safe handling, storage, and disposal of hazardous materials.	The action promotes and maintains available hazardous materials and waste collection and disposal programs and provide enforcement and education on storage and use regulations to reduce the potential for intentional or unintentional spills or releases to harm the environment.	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Low	NDDA (Lead); NDDoH; SLIC
Education and Outreach									
2019-34	Insurance Moonshots	Encourage homeowners to purchase insurance.	This action supports FEMA's goal of doubling the number of properties covered by flood insurance by 2022. Education will be key to ensuring citizens	3.1	$7,500 CAP-SSSE funding from FEMA -- insurance agent training for this year. Other	Ongoing	New to 2018 Plan	High	NDSWC

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			understand their level of threat, types of insurance are available. This action requires educating several different industries in order to convey the message. The State NFIP Coordinator will work with the State Insurance Commission on setting up workshops. The State NFIP Coordinator will continue to hold training with specific target markets (e.g., Emergency Managers, Realtors, Floodplain Administrators, Public) annually as funding becomes available.		potential sources in include HMA, Insurance Commission, Realty Associations				
2019-35	NFIP, RiskMap and CRS Program	Promote the NFIP, CRS, and RiskMAP program and provide guidance to communities who participate in the NFIP and CRS Program to ensure their achievement in the flood loss	This action provides guidance to communities who participate in the NFIP to ensure their achievement in the flood loss objectives under the NFIP. This is accomplished by providing technical assistance, evaluating community performance, implementing NFIP floodplain management	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Medium	NDSWC (Lead); NDDES; ND Insurance Department

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
		objectives under the NFIP.	activities, and strengthening community floodplain management expertise. Communities that go beyond the minimum Federal standards are eligible to join the CRS. Through this program, communities are becoming more flood resilient and property owners are rewarded with discounts on their NFIP flood insurance premium. RiskMAP provides high quality flood maps and information, tools to better assess the risk from flooding and planning and outreach support to communities to help them take action to reduce, or mitigate, flood risk.						
2019-36	StormReady Program	Promote use of NOAA's National Weather Service's StormReady Program.	The StormReady program will help mitigate the impacts of storms by giving communities the communication and safety skills needed to save lives and property, before and during the event. StormReady helps	2.2	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	High	NWS (Lead); NDDES; City, County and Tribal Emergency Management

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			community leaders and emergency managers strengthen local safety programs.						
2019-37	Cyber Security Threats Education	Educate and support the Whole Community on ways to mitigate cyber threats affecting personal, private, and State security and other sensitive information.	An attack can impact business revenue, services offered by State, local, or tribal governments and other organizations, and the functionality of infrastructure and other physical systems. North Dakota has placed a higher priority on building prevention systems and countermeasures to mitigate the impacts of this hazard, but the prevalence and varied approaches of cyberattacks means that this remains a threat.	1.3	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Medium	NDITD (Lead); SLIC
2019-38	Public Education and Outreach	Develop and implement an all-hazard and all-threat public education and outreach program.	This program would include: • Engaging media and social media during hazardous awareness months, prior to spring flooding, and other seasonal weather hazards.	2.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing Combined with 2014-36	Medium	NDDES (Lead); NWS; United States DHS; North Dakota SLIC;

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			• Providing education about the potential consequences of geomagnetic and solar storms and radio blackouts. • Encouraging personal mitigation measures for property and community. • Promoting educational activities designed to protect the public, including weather spotter training, adversarial threat training and CERT. • Providing the public information to make informed decisions about how to prevent infections or infestations or avoid spreading diseases.						NDDoH; NDDA
2019-39	Dam Owner Education	Work with Federal, State, local and tribal agencies to secure additional financial support to improve dams and educate dam owners.	Ensure dams are properly maintained and necessary repairs are made. This outreach/ education would also include adversarial (e.g. HVE or Terrorism) threats (purposed or imminent). This would also improve North Dakota's State Dam Safety Program to reduce the risk of dam	1.4	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing - Already initiated and continuing	Low	NDSWC (Lead); United States BOR; USACE; NDGF; BIA; NRCS; SLIC; United States DHS

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			failure and reduce the potential consequences if a failure were to occur.						
Worker Safety and Public Health Protection									
2019-40	Medical Surge	Increase the capacity to provide acute and long-term care for people with infectious diseases.	This action increases the capacity within communities to provide acute and long-term care for people with infectious diseases, including comfort care. Medical surge is labor and cost intensive as well as resource and space intensive. Shortages of qualified healthcare workers and medical supplies or equipment will be a challenge.	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-12 months)	New to 2018 Plan	High	NDDoH (Lead)
2019-41	Community Health and Safety Resiliency	Increase safety and health of workers, first responders and new Americans	The action emphasizes efforts to promote safety and health measures designed to protect workers, first responders and new Americans. These initiatives include, but are not limited to, safety training, risk management training, public health screening,	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-12 months)	Ongoing - Already initiated and continuing; renamed to Community Health and Safety Resiliency	Medium	NDDoH and North Dakota WSI (Leads); NDDHS; RMD; NDDOT; NDDES

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			and assistance for new Americans.						
2019-42	Vaccination	Promote vaccinating the affected population to induce active immunity to a disease and develop herd immunity or slow disease progression.	Promote vaccinations to prevent and control diseases and stopping outbreaks in both humans and animals. It is the best tool for preventing disease in people and animals. Vaccines are not available for all diseases. Vaccine may be in short supply. It may take six months or longer to produce an influenza and foot-and-mouth disease (FMD) vaccines specific for an outbreak. Vaccination programs are labor and resource intensive. Record keeping for the purposes of tracking can be labor intensive.	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	Medium	NDDoH and NDDA (Leads); United States APHIS; North Dakota Stockmen's Association
2019-43	Disease and syndromic surveillance	Enact the system collection of the occurrence of disease or disease syndrome.	Surveillance enables the more rapid detection of outbreaks and s capable of providing consistent data for comparison over time or by population. Disease reporting isn't always timely and may occur after an outbreak	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing – Already Initiated and continuing; mitigation action in previous	Medium	NDDoH and NDDA (Leads); United States APHIS

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			has started. It requires cooperation from several areas of the health care industry. There may also be delays due to disagreements over or lack of funds available funds for indemnity payments.				plan refined		
2019-44	Chemopro-phylaxis	Give people or animals who may have been exposed to a disease-causing agent an antibiotic, antifungal or antiviral medication to prevent illness.	Chemoprophylaxis can be effective in preventing and controlling disease and outbreaks in both human and animal populations.	4.1	Existing State and Federal Budgets/ Programs	Ongoing	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	Medium	NDDoH and NDDA (Leads)
2019-45	Disease and Infestation Prevention and Control Technical Assistance	Providing technical information to health care professionals, agronomists, vector control boards or others	The action requires education on regarding the regulation pertaining to importation, diagnosis, treatment and management of people, animals or plants relating to the prevention and control of diseases or infestations, including infection prevention. This action focuses on	4.1	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	Low	NDDoH and NDDA (Leads)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
			providing the latest science on diagnosis and management of diseases and infestations. It can be difficult to reach all providers with information. Information and best-practice recommendations may be conflicting or not available when responding to novel or emerging threats.						
2019-46	Isolation and Quarantine	Separate people, animals or produce who are ill or are contaminated or that may have been exposed from the general population.	Isolation and quarantine are effective for selected situations only and used more extensively in animal health and sometimes in plant health. The action requires human resources to ensure compliance and to provide humane living conditions, and such, is labor and resource intensive. It may require providing a specific location for isolation or quarantine. May require considerable work determining if animals or people have been infected or exposed.	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-12 months)	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	High	NDDoH and NDDA (Leads)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-47	Social Distancing	Provide community or population-based strategies to reduce events that lead to crowding during an infectious disease outbreak.	Examples include canceling public events, canceling classes, encouraging sick people to stay at home and discouraging non-essential travel. This is less labor intensive than other mitigation strategies. These measures may result in economic impacts such as canceling concerts or sporting events or closing retail centers. Closing daycares and schools can create workforce problems as parents are forced to stay at home with children. From an animal health perspective, this might include closing auction markets, agricultural fairs, and competitions. Closing markets creates possible humane concerns during stop movements. Generally, not enforceable unless there is a legal order issued.	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-12 months)	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	High	NDDoH and NDDA (Leads)

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-48	Depopulation of ill or exposed animals or plants	Used to control animal and plant diseases, this is the process of removing ill and/or exposed animals or plants through euthanasia or other methods.	Depopulation is effective in eliminating ill animals or plants or those that pose a risk for transmitting disease. However, it can be labor and resource intensive, and it often has an economic impact on the producer. Social outcry or poor public acceptance is another concern. Depopulation may also lead to decreased protein availability in the food supply.	4.1	Existing State and Federal Budgets/ Programs	Medium-term (12-36 months)	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	Low	NDDoH and NDDA (Leads)
2019-49	Control plant disease and infestation	Spray or apply insecticides/ fungicides/ pesticides/ herbicides/ larvicides.	This action is used to control plant diseases and infestations. In some cases of animal and human disease spread my ticks, mosquitoes, or other vectors. It is effective if applied appropriately. Larvicides used to control mosquitoes tend to be more specific in their targets. This can be labor intensive, is not effective in eliminating the problem completely, and not always target specific.	4.1	Existing State and Federal Budgets/ Programs	Short-term (0-12 months)	Ongoing – Already Initiated and continuing; mitigation action in previous plan refined	Low	NDDoH and NDDA (Leads); NDGF

Action ID #	Action Title	Action (Statement)	2018 Action Description	Goal and Objective ID	Potential Funding	Implementation Timeline	2018 Status	Priority	Agency
2019-50	Genetic Modification	Used mostly in helping to control plant diseases and pests. This involves the development of hybrid plants that are resistant to common diseases.	Genetic modification is very effective in preventing known diseases. Social acceptance of genetically modified organisms (GMOs) is conflicted along with poor public perception. Time, resource, and labor intensive. New technology may cost producers more to implement. One disease may be replaced by another to which the plant is still susceptible.	4.1	Existing State and Federal Budgets/Programs	Long-Term (> 36 months)	New to 2018 Plan	Low	NDDA (lead)

Table 5-6 shows a summary the types of hazards and threats mitigated as an indication that the State has developed strategies to address each hazard profiled in this Plan's risk assessment. Several actions can reduce losses for more than one hazard. Table 7.6-5 in Appendix 7.6 shows the complete analysis for each hazard per each mitigation action.

Table 5-6 Hazard Addressed Summary

Type of Hazard Addressed	Mitigation Actions
Civil Disturbance	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection
Criminal Terrorist Nation Attack	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-11: Dam EAPs 2019-16: Souris Basin Dam 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-39: Dam Owner Education
Cyber Attack	2019-22: Power Redundancy at Critical Facilities 2019-28: Secure Electronic Systems 2019-37: Cyber Security Threats Education
Dam Failure	2019-3: Building Codes and Zoning Ordinances 2019-5: Basin-wide Water Management Planning 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-11: Dam EAPs 2019-16: Souris Basin Dam 2019-20: Flood Mitigation Measures 2019-21: Floodproofing Critical Facilities 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-26: Dam Status Review 2019-39: Dam Owner Education
Drought	2019-3: Building Codes and Zoning Ordinances 2019-5: Basin-wide Water Management Planning 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-17: Drought Contingency Plans 2019-31: Drought Mitigation
Fire (Wildfire)	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-8: Firewise and Community Wildfire Protection Plan 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-32: Hazardous Fuels Reduction
Fire (Urban)	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-8: Firewise and Community Wildfire Protection Plan 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-29: Transportation Engineering and Systems

Type of Hazard Addressed	Mitigation Actions
Flood	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-8: Firewise and Community Wildfire Protection Plan 2019-9: Debris Management Plants 2019-15: North Dakota Silver Jackets 2019-20: Flood Mitigation Measures 2019-21: Floodproofing Critical Facilities 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-34: Insurance Moonshots 2019-35: NFIP, RiskMAP, and CRS Program 2019-36: StormReady Program
Geologic	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-13: Geologic Mapping 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection
HazMat Release	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-29: Transportation Engineering and Systems 2019-33: Hazardous Materials Storage and Disposal
Infectious Disease	2019-40: Medical Surge 2019-41: Community Health and Safety Resiliency 2019-42: Vaccination 2019-43: Disease and syndromic surveillance 2019-44: Chemoprophylaxis 2019-45: Disease and Infestation Prevention and Control Technical Assistance 2019-46: Isolation and Quarantine 2019-47: Social Distancing 2019-48: Depopulation of ill or exposed animals or plants 2019-49: Control plant disease and infestation 2019-50: Genetic Modification
Severe Summer Weather	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-19: Tornado Safe Rooms and Shelters 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-24: Outdoor Warning Systems 2019-36: StormReady Program
Severe Winter Weather	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-30: Snow Fences 2019-36: StormReady Program
Space Weather	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities

Type of Hazard Addressed	Mitigation Actions
	2019-23: Electric Infrastructure Protection
Transportation Incident	2019-3: Building Codes and Zoning Ordinances 2019-6: Local Master/Comprehensive Planning 2019-9: Debris Management Plants 2019-22: Power Redundancy at Critical Facilities 2019-23: Electric Infrastructure Protection 2019-29: Transportation Engineering and Systems
All Hazards	2019-1: Mitigation Planning 2019-2: Hazard Mitigation Planning Toolbox 2019-4: Cultural and Historical Preservation 2019-7: Integration of Mitigation and Comprehensive Planning 2019-10: Disaster Recovery Planning Toolbox 2019-12: GIS Data Improvement/Data Creation 2019-14: Losses Avoided 2019-25: Emergency Notification Systems 2019-27: Protect Communication Sites 2019-28: Public Education and Outreach

Table 5-7 shows a summary the types of mitigation actions included in the 2019 Mitigation Action Plan as an indication that the State has developed strategies to address type of mitigation action. Table 7.6-6 in Appendix 7.6 shows the complete analysis for type of mitigation action per each mitigation action.

Table 5-7 Type of Mitigation Action Summary

Type of Mitigation Action	Number of Mitigation Actions
Local Plans and Regulations	2019-1: Mitigation Planning 2019-2: Hazard Mitigation Planning Toolbox 2019-3: Building Codes and Zoning Ordinances 2019-5: Basin-wide Water Management Planning 2019-6: Local Master/Comprehensive Planning 2019-7: Integration of Mitigation and Comprehensive Planning 2019-8: Firewise and Community Wildfire Protection Plan 2019-9: Debris Management Plans 2019-11: Dam EAPs 2019-17: Drought Contingency Plans
Structural Projects	2019-19: Tornado Safe Rooms and Shelters 2019-20: Flood Mitigation Measures 2019-23: Electric Infrastructure Protection 2019-27: Protect Communication Sites 2019-29: Transportation Engineering and Systems
Natural Systems Projects	2019-30: Snow Fences 2019-31: Drought Mitigation 2019-32: Hazardous Fuels Reduction
Education Programs	2019-37: Cyber Security Threats Education 2019-38: Public Education and Outreach 2019-39: Dam Owner Education

Type of Mitigation Action	Number of Mitigation Actions
Preparedness and Response Actions	2019-4: Cultural and Historic Preservation 2019-10: Disaster Recovery Planning Toolbox 2019-12: GIS Data Improvement/Data Creation 2019-13: Geologic Mapping 2019-14: Losses Avoided 2019-15: North Dakota Silver Jackets 2019-16: Souris Basin Dams 2019-18: Hazardous Materials Flow Study 2019-22: Power Redundancy at Critical Facilities 2019-24: Outdoor Warning Systems 2019-25: Emergency Notification Systems 2019-26: Dam Status Review 2019-28: Secure Electronic Systems 2019-33: Hazardous Materials Storage and Disposal 2019-34: Insurance Moonshots 2019-35: NFIP, RiskMAP, and CRS Program 2019-36: StormReady Program 2019-40: Medical Surge 2019-41: Community Health and Safety Resiliency 2019-42: Vaccination 2019-43: Disease and syndromic surveillance 2019-44: Chemoprophylaxis 2019-45: Disease and Infestation Prevention and Control Technical Assistance 2019-46: Isolation and Quarantine 2019-47: Social Distancing 2019-48: Depopulation of ill or exposed animals or plants 2019-49: Control plant disease and infestation 2019-50: Genetic Modification

5.4 Mitigation Implementation System

Local planning and project implementation are a core component of mitigation in the State of North Dakota. Section 5.4.1 outlines the State's local planning development and review process and Section 5.4.2 outlines the State's role in managing federal grants to implement projects across the State.

In the fall of 2017, NDDES published the *2014-2016 Progress Report* that outlined the State's successes in achieving their mitigation goals and ensuring that the *2014 State Of North Dakota Multi-Hazard Mitigation Plan* was implemented to its fullest. This report provided an interim review of the progress the State had made towards implementing the Mitigation Strategy and actions outlined in the 2014 plan.

5.4.1 Mitigation Planning Program

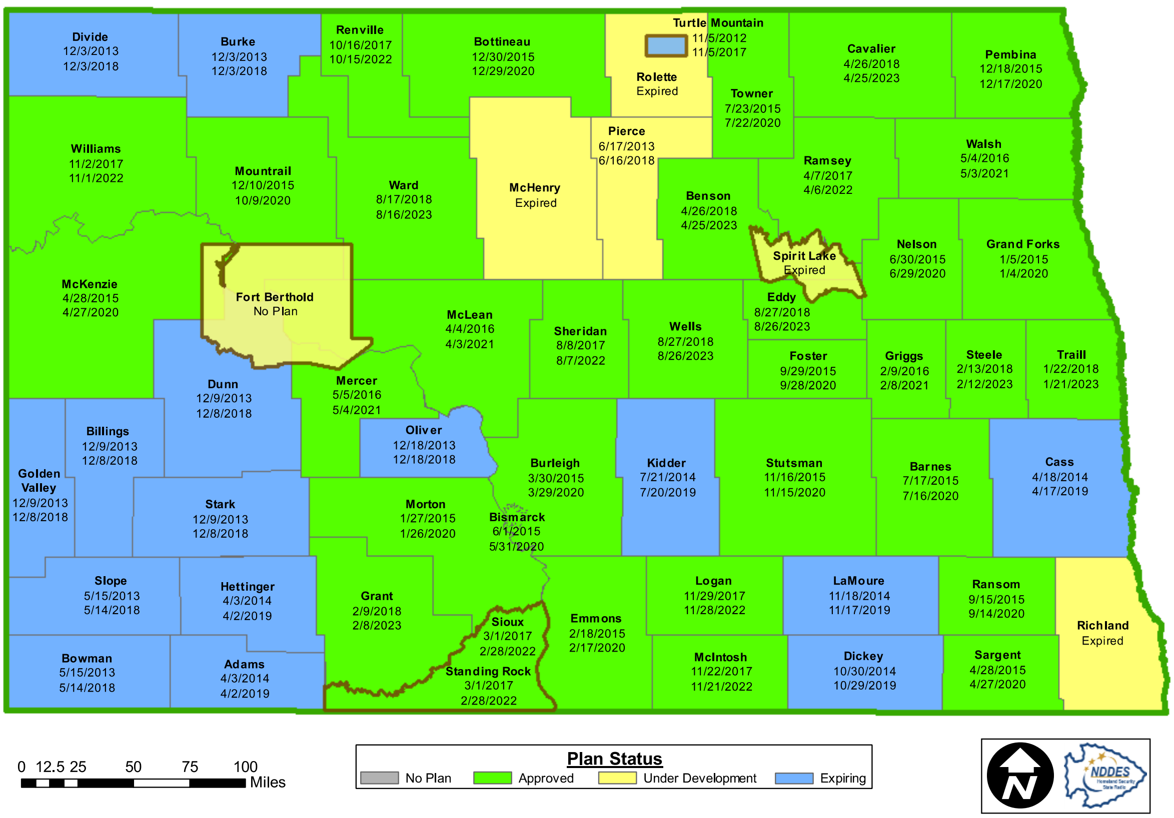
5.4.1.1 Progress Building Local and Tribal Plans

Prior to the Disaster Mitigation Act of 2000, local and statewide mitigation planning has been a high priority in North Dakota. Even before Federal regulations were developed for HMPs, many counties already had mitigation plans. Many of those plans were then modified to reflect the new Federal requirements. In 2011, about one-half of the State's jurisdictions had a FEMA approved HMP. As of September 2018, one city, all 53 counties, and all four tribal nations in North Dakota have a federally approved plan or have a plan that is under development (Figure 5-2). This is a considerable achievement.

The barriers for building local and tribal plan development still include ensuring that local officials are trained on HMP development and plan funding. Measures to address these barriers are addressed in Section 5.4.1.4 and Section 5.4.1.5.

The local HMPs are normally stand-alone documents covering the entire county. Any jurisdiction within a county or tribe may prepare a mitigation plan specific to that jurisdiction, separate from the county mitigation plan. The terms "county plan" and "local plan," as used in this Plan, refer to the HMP for the mentioned county or tribe and all incorporated jurisdictions within that county, unless otherwise stated.

Figure 5-2 State of North Dakota Multi-Hazard Mitigation Plan Status



5.4.1.2 State-Managed Plan Review Process

Upon submission, initial reviews of local and tribal HMPs are conducted by NDDES mitigation staff (except during extended disaster situations when additional assistance is requested). All local and tribal HMPs must meet the Federal plan requirements, address the specific hazard mitigation needs of the applicable jurisdictions, and complement the Enhanced Mitigation MAOP. NDDES mitigation staff use the FEMA Local Mitigation Plan Review Tool to ensure the Federal requirements are met. Given the State of North Dakota's PAS status, NDDES is authorized to review, require revisions, and approve local and tribal mitigation plans (see Section 5.4.4 for more information on North Dakota's PAS status). If the State reviewer decides the plan meets the requirements, the Senior Community Planner at FEMA signs the plan and delivers an approval letter to NDDES. If the plan does not meet the criteria, the plan is returned by NDDES to the jurisdiction with specific comments on changes or additions that need to be made. Reviews by the State will be completed within 45 days of receipt of the HMP; however, they are usually completed sooner. Once the plan has received conditional Federal approval, local and tribal jurisdictions must formally adopt the plan.

All levels of government understand that the success of the North Dakota mitigation program depends on the degree to which everyone works together toward a common goal. This is accomplished by involving as many interested groups as possible in the planning process. State mitigation staff meets with local and tribal jurisdictions throughout the planning process to ensure understanding the State and Federal hazard mitigation planning requirements, as requested by the jurisdictions.

5.4.1.3 Linking Local/Tribal/State Mitigation Plans

Once the local and tribal plans are approved, they are integrated into the Enhanced Mitigation MAOP by:

- Updating risk classifications and potential loss estimations in the hazard profiles;
- Listing any considerations for future growth and development;
- Cumulatively serving as the basis for the hazard prioritizations;
- Researching development of mitigation actions that solve local concerns;
- Reviewing existing State actions to determine if they are still meeting the overall mitigation needs; and
- Changing or eliminating existing mitigation actions that have not produced the anticipated results.

The results of the reviews are incorporated into the Enhanced Mitigation MAOP at a minimum during the regular five-year update process. Changes can be implemented sooner, depending on circumstances involved.

Future State mitigation projects and actions will be based on the local and tribal plans; however, it is understood that funding, situations, and priorities change. Jurisdictions will be allowed to have the needed flexibility to add or subtract established mitigation projects as priorities, funding, and situations change. Because of this, the review and incorporation process is a vital part of the overall Mitigation Strategy for the State and local jurisdictions.

5.4.1.4 Training and Technical Assistance

Most jurisdictions in North Dakota require some form of assistance in developing their local and tribal HMPs. NDDES has a mitigation section available to provide technical assistance to jurisdictions in the development of their local plans. The technical assistance provided by the NDDES for local and tribal mitigation planning includes the following:

- Hazard mitigation planning workshops (FEMA G318 Mitigation Planning Workshop) that provide opportunities for an exchange of ideas and the development of mitigation actions based on evaluations of State and local needs. NDDES hosts these workshops every other year and focuses on specific issues of concern including: floodplain management, historical and cultural considerations, fire management, and the impacts of tornadoes.
    - The most recently held G318 Hazard Mitigation Workshop, held in 2017, was moved from Bismarck to Dickinson to accommodate a field trip to an area that frequently floods along the South Heart River and Red Trail Energy, LLC, in Richardton. The workshop also featured presentation related to fire mitigation and the 2009 Dickinson tornado.
- Technical assistance on team building, risk assessment, private and public-sector relationships, and viable mitigation projects.
- Annual workshops with county/tribal emergency managers. Topics include mitigation planning, risk assessment, cost benefit, and public/private partnerships.
- Recipient briefings for disaster programs. Recipients are provided information on disaster programs, the planning process, and viable mitigation projects.
- State and local mitigation planning how-to guides. All 53 counties and 4 tribal governments have copies of the planning guide.

The State will incorporate most current FEMA guidance and training when it delivers training and assistance. NDDES will continue to provide similar types of technical assistance for local and tribal mitigation planning to those jurisdictions lacking approved plans and those requiring updates.

5.4.1.5 Funding Leveraged to Support Efforts

Funding sources that can be used to develop local and tribal HMPs include the FEMA's PDM Program, the HMGP, and the FMA Program. The specific grant funding source used per local and tribal HMP is outlined in Appendix 7.7. FEMA grants have been used to fund 55 of the local HMPs, of which 17 are currently funded by a PDM grant and 38 are currently funded by the HMGP. The remaining plans used local funding. Some jurisdictions have a full-time staff member dedicated to the development of HMPs. In these cases, jurisdictions often leverage their own funding to support this role, sometimes using EMPG grant funding as well.

5.4.2 Mitigation Program Management

5.4.2.1 Approach

Most mitigation projects are managed and implemented at the local level; however, the State does provide a fair amount of coordination, prioritization, grant management, technical assistance, and oversight for the mitigation projects. The Capability Analysis (Section 4) holistically outlines the mitigation programs in the State and the agencies that manage the process. The committees outlined in Appendix 7.2 are all involved in mitigation throughout the State. High priority mitigation programs are outlined in Table 5-8.

Table 5-8 Critical Mitigation Programs Administered by State Agencies

Program	Lead Agency
FEMA HMA Grants (HMGP, PDM, FMA)	NDDES
RiskMAP	NDSWC
National Fire Plan Program	NDFS
Living Snow Fence Program	NDFS; NDDOT
Hazardous Materials Emergency Preparedness Program	NDDES

Each program has its own set of eligibility criteria and priorities; however, the information outlined in this section provides a general overview of the project management system for the programs. Much of this information is also available in the North Dakota Hazard Mitigation Grant Program Administrative Plan.

Each program also has its own timeline for notice, grant application submission, and grant completion. A timeline for the HMGP follows as an example:

- HMGP Recipient Briefings – within 60 days of the declaration
- Request for HMGP Notice of Intent – within 90 days of the declaration
- Assembly of the SHMT to Review HMGP Applications – within 6 months of the declaration
- Community Meetings on Mitigation – within 6 months of the declaration, as needed
- HMGP Project Application Submissions – within one year of declaration

The process for tracking the initiation, status, and completion of mitigation activities has not changed since 2005; however, more detail was added to the plan during the 2007 update to clarify the process. The primary exception is the addition of the annual "Mitigation Year in Review" reports from 2006-2010; these reports consolidate information on an annual basis found in other reporting mechanisms such as quarterly grant reports and mitigation success stories. NDDES plans to reinstate this as part of the annual review process. NDDES recently complete the *2014–2016 Progress Report* (Appendix 7.5), which outlined mitigation progress for a two-year time period, rather than annually.

For the various FEMA mitigation grant programs, local and tribal government entities (or certain private non-profit entities) must apply through the State for approval on proposed projects. This process necessitates the interaction between the State and the applicant and the State and FEMA. Local governments and other recipients may require technical assistance to successfully develop and apply for mitigation grants. FEMA provides technical information and guidance for specific types of projects and programs that then needs to be passed on to the local recipients. State agencies, specifically the NDDES and the NDSWC, fulfill these roles by providing technical assistance.

Specific to the HMGP, following the disaster, the State gets the funding amounts from FEMA, presents information at the applicant briefings, notifies the public of the availability of funds, and requests notices of interest from those organizations interested in the program. From there, the State can provide technical assistance to those organizations and agencies interested in submitting an application. North Dakota is a PAS State, which gives NDDES extra responsibilities for management of the HMGP program including: reviewing project applications, completing BCA, approving scope-of-work modifications, and moving funds between applicable projects. This provides North Dakota with increased control, oversight, and responsibility over these projects. North Dakota's PAS status is discussed further in Section 5.4.4.

Similarly, when FEMA issues guidance for the pre- and post-disaster programs, that information is shared with counties and tribes. Those jurisdictions expressing an interest in applying for a particular grant are then given technical assistance regarding their project development and application. Reminders are periodically sent to the jurisdictions encouraging them to participate in the pre-disaster programs and advising them of important deadlines.

5.4.2.2 Evaluating and Prioritizing Projects

The ultimate goal in North Dakota is to fund projects that:

- Are cost effective;
- Are designed to solve a problem to reduce injuries, loss of life, and damage or destruction of property (including damage to critical state or local government services and facilities); and
- Complement current State, local and tribal mitigation goals and objectives.

If these basic criteria are met, the proposed projects can be evaluated for eligibility through the various mitigation grant programs. In addition to the following criteria listed, projects must also meet the specific eligibility criteria outlined in the grant guidance of the grant for which they are applying; this guidance may change from year to year and vary from program to program. This grant eligibility generally requires a BCA and an environmental review (Section 5.4.4.2). If the specific mitigation grant program eligibility is met, then the mitigation projects will be prioritized using criteria set by the State.

The State of North Dakota has established priorities for hazard mitigation projects. The Governor establishes these priorities based on recommendations provided by the SHMT. At any time, the Governor may change these priorities, but typically follows the recommendations of the SHMT or NDDES mitigation team.

Historically, North Dakota has not had to extensively use prioritization schemes. By the time the possible projects are reduced down to those that are within the eligibility criteria, meet the benefit-cost minimums, and are environmentally feasible, funding is generally available to fund all of the projects or submit the applications on to FEMA for further analysis. Should prioritizations be needed, the SHMT is convened to review and prioritize the projects. This team, made up of representatives from many agencies, provides an objective prioritization based on the criteria outlined below. To date, this approach for prioritization has worked well in North Dakota. The greatest challenge is having enough projects that meet the funding requirements and need prioritization.

Following a disaster, a priority list for the HMGP is developed. An example for a flood disaster follows:

- Acquisition and relocation of private and public structures and land (the State targets repetitive loss structures based upon the NFIP repetitive loss structure list)
- Acquisition of vacant land
- Infrastructure protective measures (road and bridges)
- Other non-construction
- Storm water management (culverts, diversions, flap gates, floodgates, detention/retention basins, and other local flood control measures)
- Elevation of private and public structures
- Water and sanitary sewer system protective measures
- Vegetation management
- Wet and dry floodproofing of private and public structures
- Equipment purchases and installation to facilitate all-hazard mitigation
- Generators
- Utility protective measures
- Mitigation planning (State, local, and tribal)
- Public awareness activities
- Flood control
- Retrofitting of structures
- Safe rooms
- Management costs
- Warning systems (as a component of a planned, adopted, and exercised risk reduction plan)
- Engineering studies, codes enforcement, and applied research

- Landslide and shoreline stabilization
- Wetland restoration
- Miscellaneous

Acquisitions are the top priority on the above list because generally acquisitions have a 100% mitigation success rate. Priority is also given to government entities; non-profit organizations receive lower priority.

In addition to the type of project, the following considerations are prioritized:

- Does the project address repetitive loss properties or severe repetitive loss properties?
- Which community has the highest risk from the hazard being mitigated?
- Will the project mitigate losses to future development and is the project in a community experiencing or potentially experiencing growth and/or intense development pressure?
- Which project has the greatest benefit-cost ratio?

Mitigation Planning Program

Since funding for mitigation planning grants is limited, available funds must be distributed to those communities that have clearly demonstrated both the ability and the desire to complete the plan and to follow through with the actions developed in the plan. The desire to comply with the actions in the local and tribal mitigation plan should not be dependent on the availability of State or Federal funds. In an effort to allow some flexibility in the distribution of mitigation planning funds, the following general guidelines have been developed. These guidelines are not all inclusive, and compliance with all of the issues listed below may not be required for approval of a planning grant. The SHMT and/or NDDES will consider:

- If the community meets the criteria for the specific source of funds;
- Past experience in dealing with the community on other grants (e.g., disaster grants, mitigation projects);
- The susceptibility of the community to natural and human-caused disasters by reviewing the State and local risk assessments;
- Previous Presidential disaster declarations to determine the number of times the requesting community has been impacted by declared disasters and the magnitude of damage resulting from those disasters to consider the impact to community infrastructure as well as families and businesses;
- The number of non-declared disasters that have impacted the community to consider the impact to community infrastructure as well as families and businesses;
- NFIP participation;
- The number of insured repetitive loss structures in the community;
- The community’s status as a small and impoverished community and communities with special developmental pressures, if applicable;
- If the community has identified hazards and threats in areas under its jurisdiction; and,
- If the community has demonstrated its ability to form effective public-private hazard mitigation partnerships.

5.4.2.3 Monitoring Mitigation Measures and Project Closeouts

Projects through the PDM, HMGP, and NFIP programs are monitored by the NDDES. NDDES uses spreadsheets, project files, quarterly reports (Section 5.4.4.3), and other methods to track and monitor projects. If needed, NDDES contacts the subrecipients to ensure the projects will be completed on time or to determine if they will need an extension. Upon project completion, NDDES collects the documentation for project closeout (Section 5.4.4.4).

5.4.2.4 Analyzing Achievement of Goals

Determining the actual cost avoidance and effectiveness of many mitigation projects during the development of the projects can be very difficult. Initially, the potential impact of these mitigation projects and actions can only be estimated; however, based on past experience with similar projects, State agencies can make an educated determination as to the potential for success of the proposed mitigation project.

Evaluation of future disasters and their impact on a community is another means of evaluating the success of a mitigation project. This method is often used in evaluating the success of the acquisition program. In simple terms, removing a structure from a flood hazard area reduces the potential threat to that family and the associated disaster assistance costs. For example, the flood of 1997 was a catastrophic disaster for the State of North Dakota. This disaster caused an estimated $3.7 billion in economic losses. Following the flood, more than 800 flood-damaged structures were acquired through the HMGP and CDBG programs at a cost of approximately $75.7 million. Acquisitions dramatically reduce the costs of future floods because the properties are no longer there. The NFIP paid out approximately $6,390,987 in claims in the 1997 floods. In 2006, a similar magnitude flood (within 2 feet) occurred in the same area; economic losses in North Dakota totaled about $7 million, compared to $3.7 billion in 1997. Much of the loss reduction has been attributed to the acquisition program.

NDDES uses GIS and GPS technology to document acquisition and other projects and to further refine the monitoring of the projects. In addition, NDDES uses GIS coordinates to mark and map lots acquired through the acquisition programs to monitor compliance with open space deed restrictions. Several local floodplain managers are also implementing procedures for monitoring open space deed restrictions to ensure that at risk areas are not inappropriately re-developed.

These systems of monitoring and evaluating completed projects will continue as future events occur and projects are completed. NDDES is responsible for assessing the effectiveness of the mitigation activities but may be assisted by a variety of agencies relevant to the type of project. Typically, these assessments occur within 90 days of a declared disaster if the disaster affected an area where relevant mitigation has taken place.

Losses Avoided Study

As part of the 2018 update to the State of North Dakota's Enhanced Mitigation MAOP, NDDES conducted a loss avoidance study on prior mitigation activities that were funded through the different HMA programs administered by our offices. Projects that were chosen for this analysis were all the Regular projects funded under the 2016 and 2017 PDM Program, as well as the DR-4323 HMGP, which required a BCA to determine the total project's cost versus the total project's benefits. For FEMA BCA purposes, project benefits are viewed as potential damages being prevented by the proposed mitigation action, so the net value of benefits after the project costs have been taken into account becomes the effective losses avoided.

Table 5-9 2016 PDM Regular Projects – Losses Avoided

Project #	Title	Total Cost	Total Benefits	Losses Avoided
3	Morton County Harmon Lake Storm Shelter	$47,678.00	$93,504.00	$45,826.00
5	City of Oakes Lift Station Improvements	$1,050,470.00	$1,937,887.00	$887,417.00
10	2016 Grafton Lift Station Generators	$85,556.00	$110,993.00	$25,437.00
			Grand Total	$958,680.00

Table 5-10 2017 PDM Regular Projects – Losses Avoided

Project #	Title	Total Cost	Total Benefits	Losses Avoided
1	University of Mary Slope Stability Project	$4,018,696.00	$12,337,397.00	$8,318,701.00
4	City of Flasher Lift Station Generator	$21,659.00	$165,639.00	$143,980.00
5	City of Grafton 2017 PDM Project	$266,364.00	$366,708.00	$100,344.00
9	Washburn Intake Improvements	$3,699,500.00	$4,840,209.00	$1,140,709.00

Project #	Title	Total Cost	Total Benefits	Losses Avoided
10	Grand Forks County Storm Shelters	$209,760.00	$595,778.00	$386,018.00
11	Nelson County -- Nodak Electric Line Burial	$107,702.00	$131,963.00	$24,261.00
20	Central Valley Health District Generator	$112,497.00	$162,445.00	$49,948.00
21	Jamestown Main Lift Station Generator	$273,378.00	$2,298,440.00	$2,025,062.00
			Grand Total	$12,189,023.00

Table 5-11 DR-4323 Regular Projects – Losses Avoided

Project #	Title	Total Cost	Total Benefits	Losses Avoided
2-R	Walsh County Eden Township Bank Stabilization	$39,074.00	$46,254.00	$7,180.00
4-R	NDDES and NDDoH Warehouse Generator	$366,557.00	$395,678.00	$29,121.00
5-R	Eddy County Critical Facility Generators	$138,024.00	$267,878.00	$129,854.00
7-R	City of Burlington Lagoon Road Stabilization	$229,895.00	$1,000,596.00	$770,701.00
			Grand Total	$936,856.00

There are numerous other projects that have been completed throughout the State by partner agencies that are also developed with the intent of reducing or preventing damages to public and private property and infrastructure caused by natural hazards, however, many of these partner agencies do not require a BCA for their projects to be funded. Without the use of a BCA, or completing an in-depth analysis of each individual project, it becomes very difficult to identify specific losses avoided beyond generalized project level information. This is determined to be an obstacle in the planning process from the State level and will be something that is addressed during future plan updates and during the plan maintenance process.

NDDES has developed two options to address this obstacle during future plan updates and revisions. The preferred, and planned for, option is to hire a firm that would conduct a statewide loss avoidance study that would compile project level information from the different mitigation partner agencies in order to catalog and analyze projects, determine potential damages and benefits, and provide a narrative for each identified project to determine its general effectiveness in mitigating damages. This method, however, does require funding to be implemented, and could only be completed when there is funding under the 5% Initiative budget of the HMGP available following a disaster event. The second option to address this obstacle would be developing a Loss Avoidance Committee comprised of individuals from different mitigation partner agencies that would work to catalog and analyze the different mitigation activities being conducted throughout the State in order to provide a final loss avoidance study. Potential partner agencies include the NDSWC, NDGS, NDFS, NDITD, NDDoH, NRCS, NDDOT, and USACE. Creating this committee is a feasible option, however it is not the preferred method because it would require additional stakeholder participation and resources that the State is not necessarily prepared to fund. If the Loss Avoidance Committee is created, it will be critical to integrate their activities into SHMT's efforts to review and evaluate the implementation of mitigation strategies.

Regardless of the final method chosen to complete this statewide loss avoidance study, NDDES plans to implement this project within the next two years, and have the entire project completed before the next statewide plan update.

5.4.2.5 Analyzing Project Implementation

Project implementation can be considered using grant closeout information. Where projects and grants are closed out in a timely manner, this indicates successful project implementation.

5.4.3 Public Education Strategy

Public Education is an important component of a holistic Mitigation Strategy. Public Education not only includes working with communities to inform them of hazard and threat risk, but also to provide technical assistance for reducing vulnerabilities to risk. This broad vision for public education is outlined in Goal 2 and Objective 1.2 of the Mitigation Strategy and through Mitigation Actions.

In terms of technical assistance, NDDES and NDSWC play a key role in assisting communities develop projects to reduce risk and being awarded grant funding to assist in this process. This includes community assistance visits and community assistance contacts as well as general technical assistance.

5.4.4 Commitment to Enhanced Planning Requirements

North Dakota is committed to their hazard mitigation program in all aspects, including grant program management. Although no longer a concept used by FEMA, North Dakota was a managing state through the HMGP from August 1999 through 2009. By being a managing state, North Dakota was delegated additional authority in managing the HMGP, and through this designation, demonstrated its ability to manage the program and its commitment to mitigation.

In November 2017, FEMA approved North Dakota’s application to participate in the PAS Pilot program. The application letter, acceptance letter, and operational agreement are all included in Appendix 7.6. This application and approval reiterate the State’s commitment to FEMA’s enhanced planning requirements. The PAS operational agreement delegates the following activities required for grant management and compliance to North Dakota, including:

- Application Review
    - Review and approve all HMGP subrecipient applications and amendment requests by using expedited application approval processes and project summaries for FEMA’s use in obligating funds for:
        - Project Applications
        - Planning Applications
- Benefit Cost Analysis
    - Review and approve benefit cost analyses submitted by subrecipient without FEMA review. NDDES will also prepare its own benefit cost analyses without FEMA review.
- Grants Management
    - Approve post-award subrecipient scope of work modifications that have no change to the project activity and no resulting need for additional Federal funds without FEMA review.
    - Approve time limit extensions for sub-applications with no impact to grant period of performance.
    - Administer HMGP for specific project types submitted by the subrecipient. NDDES requests this ability for all project types.
- Fiscal Management
    - Approve post-award budget revisions using funds available as a result of cost underruns from other approved subaward without prior FEMA approval. These funds can be moved to previously approved sub-grants with cost-overruns as long as they are within the same HMGP grant.
    - Determine the eligible amount for reimbursements for each subrecipient claims and process payments without approval from FEMA.
- Mitigation Planning
    - Review Local and Tribal Mitigation Plans. NDDES will review local and tribal mitigation plans. Upon the State’s finding that the plan is approvable, FEMA will deliver an approval letter to NDDES.
- Environmental and Historic Preservation (EHP)

- NDDES will designate a liaison to work with FEMA EHP to coordinate EHP compliance efforts both pre and post award. All EHP clearances and approvals must be given by FEMA prior to initiating any construction activities (reference Addendum Environmental and Historic Preservation Compliance in Appendix 7.6).

In order to obtain PAS status, North Dakota needed to outline their ability to meet all requirements in their application (Appendix 7.6). Some of these requirements are highlighted below.

5.4.4.1 Grant Requirement Compliance

The North Dakota Hazard Mitigation Grant Program Administrative Plan, quarterly reporting system, and HMGP applications have all been used as models for other states. North Dakota has an exceptional track record for meeting established deadlines for submitting applications, quarterly financial and progress reports, hazard mitigation administrative plans, and state multi-hazard mitigation plans. For disasters declared after April 1, 2013, State Administration Plans have been submitted to FEMA for approval within 90 days of declaration dates and 100% of applications submitted for review and approval within the past 5 quarters of the PAS application have been approved within 90 days. Any required grant application extensions have been submitted more than 30 days in advance. In addition, FEMA Headquarters has used the standard HMGP acquisition application and quarterly reports developed by North Dakota as the National Emergency Management Information System (NEMIS) standard.

During the application process, NDDES provides FEMA with project summaries and the complete application. NDDES has submitted all HMGP applications electronically through NEMIS and submitted all project review tools. NDDES also assists local governments with the cost share and ensures the matching funds are committed.

Once awarded, each project gets its own individual file containing all of the relevant information regarding the project. Information about the project is entered into NEMIS or other management system. Each project also has its own accounting sheet that is linked to a summary sheet for each disaster/grant program. These sheets are also linked to FEMA's Smartlink account used for drawdowns.

5.4.4.2 Environmental Review and Benefit-Cost Analysis Process

Projects receive initial consideration of environmental impacts during the application's initial review. Unless significant environmental impacts are expected, most projects are evaluated for eligibility, cost effectiveness, and prioritization before moving on for environmental review. Once a project appears to be closer to approval and the scope of the project has been clearly identified, NDDES contacts the relevant agencies to collect information needed for the environmental review relevant to impacts the project may have on historic resources, endangered and threatened species, and other concerns. Applicable Federal and State environmental laws and executive orders are identified, and coordination with FEMA environmental staff begins. Information for the environmental questionnaire is entered into NEMIS, FEMA's electronic information system, or other management system. FEMA then does the formal federal review and issues a categorical exclusion or performs additional levels of review in coordination with the State. Once reviewed, the conditions during the construction phase of the project are monitored to ensure compliance with the stated conditions.

The BCA is an assessment of the mitigation project application data to determine whether the cost of investing Federal, State, and local funds in a hazard mitigation project is justified by the prevented or reduced damage from future disasters. A key criterion for mitigation projects is that they must be cost effective. If the project benefits are higher than the projects costs, then the project is cost-effective. With limited project data and streamlined benefit-cost methods, a cost effectiveness determination can usually be made quickly and accurately.

In 2009, the State began using the BCA Tool Kit software to conduct benefit-cost analyses for FEMA mitigation grant projects. This software streamlines the analysis process. In the past, the State would collect data and conduct the analyses using modules provided by FEMA. With this new software, local officials can input their data and conduct the analyses which are then validated by the State before being sent to FEMA.

A positive benefit cost ratio (> 1.0) does not necessarily guarantee that a hazard mitigation project will be approved; however, by applying project specific information, the mitigation potentials associated with that project become evident. The results of this analysis can also help communities evaluate current and future mitigation projects and adjust their overall mitigation strategy accordingly.

Conducting a BCA through the BCA Tool Kit can determine three things: the project is cost effective (BCA > 1.0), the project is not cost effective (BCA < 1.0), or additional data is required. If the project is cost effective, the application moves to the next level in the funding process. If it is not cost effective, the project is rejected or may be considered if amended. In some cases, additional information may be requested, or the applicant may be shown how the mitigation effort can be redirected.

In the past 8 quarters from when North Dakota applied for PAS status, 100% of BCAs were completed within 60 days, and approved within 90 days. Moreover, staff members managing BCA analyses have completed E-276 Introduction to Benefit Cost Analysis, E-212 Unified Hazard Mitigation Assistance Application Development and have four years of experience completing BCA reviews for HMGP projects.

5.4.4.3 Quarterly Progress and Financial Reports

In order to maintain grant compliance, North Dakota is required to submit quarterly progress reports to FEMA, due on January 30, April 30, July 30, and October 30. NDDES monitors the progress of the projects through local contacts to ensure the projects are on time and within budget. NDDES submits quarterly reports for each disaster and active grant program. Once work has commenced, invoices and documentation invoices were submitted by the subrecipients, are verified by NDDES, and paid. NDDES ensures project progress; the communication of such information is passed on through quarterly reports and regular conference calls with FEMA Region VIII. One hundred percent of state progress reports for the four quarters previous to the State's PAS application have been submitted in advance of the deadline. North Dakota continues to be committed to maintaining this record of submission.

5.4.4.4 Project Completion Requirements

Once a project is completed, NDDES and/or the SHMT inspect the project site, collect open space certifications, and complete the NEMIS property site inventory, as applicable. NDDES then completes the paperwork required to close out the project and eventually the disaster or program. If a project will not be completed within the performance period, NDDES works with the subrecipient to request a 60-day extension prior to the end of the performance period and subsequently encourages project completion. Projects are then monitored for future losses mitigated.

The State completes HMA projects within established performance periods, including financial reconciliation. As of the 2017 PAS application, all grant closeouts have been submitted within 90 days of the end of period of performance. Federal Financial Report (FFR) SF-425 and performance reports have been submitted to FEMA on time. An SF-270 request for advance or reimbursement or request to de-obligate funds is completed and submitted. The State has not had any late drawdowns, and all actual expenditures have been consistent with form SF-424A. Lastly, the State has had no major findings for their past audit at the time of this plan development.

5.5 Execution Conclusions

Mitigation in North Dakota is an integrated, multi-agency concept that is achieved through a variety of federal and non-federal programs, laws, and policies; all of which strive towards the common purpose of minimizing the vulnerability of the public, property, infrastructure, environment, and economy of North Dakota and its communities to the impacts of natural and technological hazards as well as adversarial threats.

Each mitigation program is managed differently depending on the funding available and grant requirements. The more traditional FEMA mitigation programs are managed by NDDES (HMGP, PDM, and FMA). NDDES relies on a SHMT, with representation from many State agencies, and an SHMT, with State and Federal representatives, to provide guidance and support in the implementation of mitigation. Funding for mitigation activities varies from year to year, but improvements to legislation ensure some level of mitigation is performed on an annual basis. Each jurisdiction and agency have its own capabilities and limitations with respect to hazard mitigation, but technical assistance, training, and education attempt to overcome many of the obstacles.

North Dakota has a comprehensive mitigation planning program that encourages all jurisdictions in the State to create and maintain their own HMP. These plans are integral to the statewide plan and serve as the basis for many locally driven mitigation actions.

The State of North Dakota encourages the successful implementation of hazard mitigation through clear grant and project management and technical assistance. A typical project funded through a grant program begins as a local concept, develops into a project, and is submitted to the State through an application, checked for eligibility, reviewed by several agencies, analyzed for cost effectiveness through a BCA, prioritized against other projects if needed, reviewed for environmental impacts, and may be awarded funding. Once awarded, the jurisdiction implements the project while the State provides grant management and technical support. Eventually, the project is completed, the grant is closed out, and the project is monitored for its success in mitigating future impacts. Through all of these steps, the State of North Dakota has been and continues to be successful in facilitating and implementing mitigation actions that save lives, property, and money.

6 Plan Maintenance

6.1 Method for Monitoring, Evaluating, and Updating the Plan

6.1.1 Background

Hazard mitigation planning is a continuous and ongoing process. Policies and procedures established in this plan reflect the current hazard mitigation philosophy at both the state and national levels. Changes in hazard mitigation programs and/or priorities, including changes in legislation and available funding, may necessitate modifications to this plan. To facilitate and ensure this plan remains viable for the State of North Dakota for many years, the plan maintenance responsibilities lie with the NDDES and the SHMT. These plan maintenance concepts are current to 2018 best practices to better reflect the maintenance process used in recent years. This allows for more manageable maintenance during times of disaster.

The NDDES Planning Section Chief assigns the mitigation planners to maintain the Plan, including all monitoring, evaluation, and update activities in collaboration with the SHMT. As part of the 2018 plan update process, NDDES reviewed the strategy detailed in previous plan versions for monitoring, evaluating, and updating the plan and compared it to the plan maintenance activities that occurred since plan adoption. As evidenced by the 2014-2016 Progress Report: Mitigation in North Dakota, in Appendix 7-6, NDDES and the SHMT members have modified plan content, particularly the mitigation actions, to best meet the needs of the State.

The Plan and its appendices are developed, monitored, evaluated, maintained, and revised in accordance with the NDDES-HLS Six Step Planning Process outlined in the NDDES *Plan Development and Maintenance Policy for Emergency Management Plans and Procedures.* The following provides additional direction for plan monitoring, evaluation and update.

6.2 Plan Monitoring

The plan will be monitored by the NDDES Planning Chief or designee. At a minimum, the plan is reviewed annually, prior to the annual State-FEMA consultation and after each disaster. Each time the SHMT convenes, the NDDES Planning Section mitigation planners will lead the team to review progress toward mitigation goals and completion of mitigation activities. The project status on or any new project ideas are discussed. Each agency maintains its own list of projects completed, and these projects are added to the plan during the state plan update process. As part of the monitoring process, NDDES and/or the team will complete the following tasks:

- Review hazard mitigation projects and initiatives to ensure that there are no potential conflicts with ongoing agency initiatives;
- Review hazard mitigation projects and initiatives to ensure that they complement the statewide mitigation strategy; and
- Review existing state and federal programs to ensure that the state takes full advantage of possible funding sources in implementing the state hazard mitigation program.

6.3 Plan Evaluation

Annually and/or after each disaster, the NDDES Planning Section will conduct a review of the plan. Each year, the NDDES Planning Section staff will evaluate plan content in advance of the FEMA-State annual meeting. The criteria utilized to evaluate the Plan will be obtained from the FEMA Enhanced Plan Review Crosswalk. All disaster or emergency incidents will be evaluated for general/specific mitigation recommendations that should be added to the plan. A general evaluation of the plan is conducted as needed by the SHMT. Methods of implementing and maintaining the plan are evaluated for successes and improvements. Changes to the implementation schedule or plan maintenance will be made as needed and captured in each update cycle to ensure hazard mitigation activities continue. New stakeholders and interested parties will be identified and invited to participate in the implementation and update process.

Should a hazard event have occurred in which a mitigation project was a factor, either positive or negative, a summary report, including avoided losses, will be written by NDDES for incorporation in future plan updates.

Additionally, the NDDES Planning Staff will issue mitigation reports focused on plan implementation. The goal will be to issue annual reports; however, operational tempo may require reports span a longer time period. These reports will include the following:

1) State responses to hazards and threats, which will serve as the foundation for updating the hazard identification, risk assessment and consequence analysis processes during the five-year update.
2) Progress report on mitigation actions identified in the plan in coordination with Whole Community partners tasked in the plan.
3) Accomplishments of SHMT members toward the mitigation strategy.

6.4 Plan Updates

As disasters occur, projects are completed, and hazard and threat information is improved, the Plan will be updated by the NDDES Planning Section mitigation planners in coordination with the SHMT. The Plan will be updated and re-submitted to FEMA for re-approval every five years, as required by law. Updates will be based on the latest available FEMA guidance and incorporate new technologies and methods so that the plan is kept current and relevant. The Mitigation Strategy actions are updated annually and/or post-disaster, based on operational tempo, through the annual reports. All other sections of the plan are updated every five years including, but not limited to, the Executive Summary, Mitigation Planning Partners, Planning Process, Situation, Hazard and Threat Profiles and Risk Assessments, Execution Capabilities Analysis, Plan Maintenance Section and Appendices.

The plan may also be subject to interim updates if any of the following conditions apply:

- At the request of the Governor;
- When significant new risks or vulnerabilities are identified; or
- If the findings of the annual / post-disaster review and evaluation warrant and update.

The two sections below describe the procedures for interim and five-year updates, respectively.

6.4.1 Updates Resulting from Interim Evaluations

The nature of plan updates will be determined by the evaluation process described above. In general, the NDDES Planning Section will notify the SHMT that the Agency is initiating an interim plan update and describe the circumstances that created the need for the update. NDDES will determine if the full SHMT should be consulted regarding the potential changes. If it is determined that the SHMT should be involved, the nature of the involvement will be at the discretion of NDDES. When interim updates are completed, NDDES mitigation planners will advise all SHMT members that the plan has been updated and describe the nature of the update.

6.4.2 Updates Related to the Required Five-Year Plan Review

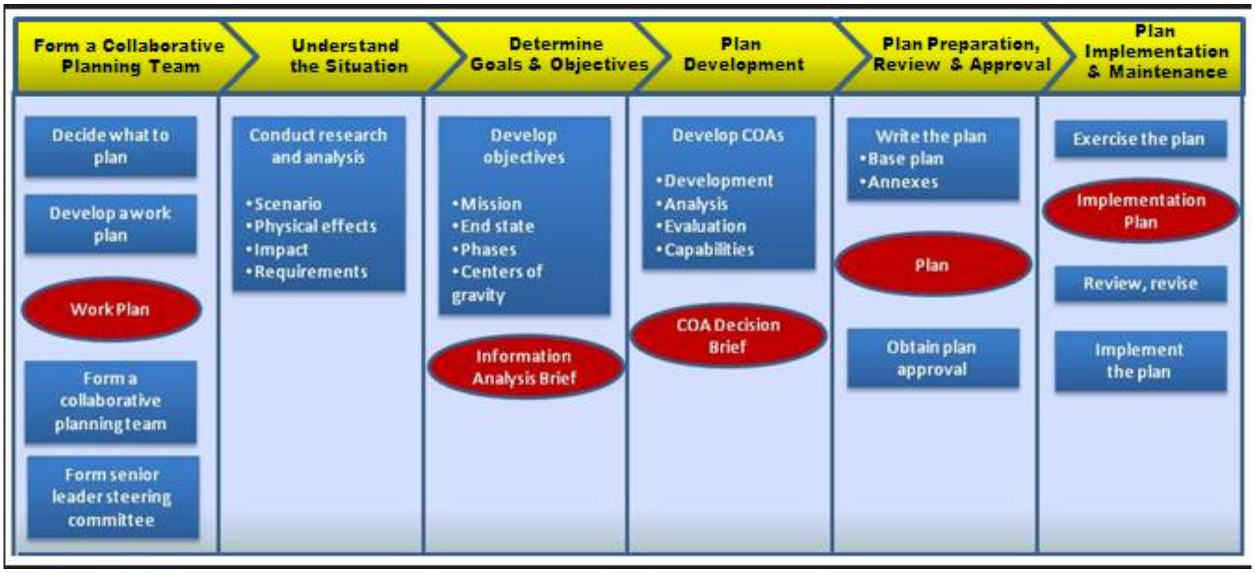
As required by law, every five years the plan will be updated for re-submission and re-approval by FEMA. In those years, the evaluation process will be substantially more rigorous and will examine all aspects of the plan in detail. It is anticipated that several meetings of the SHMT will be required, and that the plan will be formally readopted by the State.

At least 12 months prior to the update deadline, NDDES will initiate the plan update process by contacting SHMT members and other appropriate agencies and organizations to determine a schedule and process for updating the plan. Based on time constraints, a survey will be distributed to the SHMT as well as local representatives to understand how the previous plan benefited them and the changes that would improve utilization. Feedback from this survey will inform the detailed and structured re-examination of all aspects of the plan, followed by recommended updates. The recommendations will be presented to the SHMT for consideration and approval. It is expected that the Director of NDDES will then approve the plan and send it via email or Teams to the Governor for final approval.

6.5 Plan Update Process

The process for updating this plan is not a single-agency effort, rather a multi-agency, multi-jurisdictional effort that attempts to coordinate and integrate the data, observations, goals, objectives, actions, and capabilities from a wide variety of entities performing or desiring to perform mitigation activities. The plan update process follows the Six-Step Planning Process and generally takes about a year or more to be effectively completed. Figure 6-1: provides a snapshot of the Six-Step Planning Process.

Figure 6-1: NDDES Six Step Planning Process



Source: NDDES

The following table provides a synopsis of the tasks to be taken when updating this plan:

Table 6-1: Plan Update Task List

Step/Task
1. Begin tracking communications associated with the plan update.
2. Review existing plan and crosswalk and identify needed updates.
3. Identify who will be responsible for updating the plan (i.e. agency personnel, contractors) and the timeframe for completing the update.
4. Secure any necessary funding sources.
5. If necessary, develop a request for proposals, evaluate proposals, and award contract(s).
6. Begin tracking significant plan changes.
7. Evaluate and update the planning process.
8. Review the stakeholder contact list, make necessary changes, and identify new stakeholders.
9. Initiate plan outreach and discussion, including a stakeholder meeting.
10. Consider the addition, removal, or modification of hazards identified in the plan.
11. Update and revise membership of the mitigation planning committees.
12. Evaluate risk assessment methodologies and data sources.
13. Evaluate and update state inventory information.
14. Evaluate and update the hazard profiles, including interaction with the mitigation planning committees.
15. Evaluate and update the risk assessment summary.

Step/Task
16. Evaluate and update the mitigation strategy, including interaction with the mitigation planning committees.
17. Evaluate and update the mitigation implementation system, including interaction with relevant state agencies.
18. Evaluate and update the plan maintenance.
19. Develop the necessary annual mitigation reports.
20. Integrate new and updated local and tribal mitigation plans.
21. Integrate new and updated related state plans.
22. Evaluate and update other plans sections (i.e. table of contents, adoption documentation, introduction, appendices).
23. Identify and add any additional sections or information needed.
24. Review updated plan in its entirety.
25. Conduct updated plan outreach, including public information, comment period, and stakeholder meeting.
26. Integrate additional comments received.
27. Finalize plan document.
28. Complete crosswalk and submit final plan to FEMA for review and approval.
29. If necessary, make additional modifications as required.
30. Obtain signed letter from the Governor adopting the plan.

6.6 Monitoring Progress of Mitigation Activities

6.6.1 Monitoring Mitigation Measures and Project Closeouts

The process used to monitor mitigation project completions and closeouts funded by FEMA is described in the HMGP Administration Plan. Projects must be completed and reconciled within three years of the disaster declaration. For project completions, subrecipient shall submit a letter with all final project documentation and a final inspection report to NDDES requesting closeout. The State Hazard Mitigation Officer (SHMO), mitigation staff, and financial officer are responsible to review all paperwork for completion and determine that all eligible work was completed within the performance period. Site visits and inspections are conducted when deemed necessary. Procedures regarding the transmittal of closeout documents to FEMA are also described in the HMGP Administration Plan. For FEMA-funded projects, quarterly progress reports are required from subrecipients, which are to reflect project and cost status. These reports are reviewed by Mitigation staff and the State Hazard Mitigation Officer and submitted to FEMA.

NDDES also monitors mitigation measures and project closeouts outside of those funded by FEMA. These projects are monitored by established NDDES processes and reviewed by Mitigation staff and the State Hazard Mitigation Officer.

6.6.2 System for Reviewing Progress on Achieving Mitigation Strategy Goals

Progress towards achieving this plan's goals will be reviewed annually through the meeting of the SHMT. Mitigation actions supporting the plan goals will be evaluated and assessed updated annually and/or post-disaster, based on operational tempo, through the annual reports. As the progress on these recommended actions is tracked, progress on achieving mitigation strategy goals will also be monitored. If any of the goals are not receiving adequate attention, it will become apparent as the table of mitigation actions is periodically updated.

6.6.3 System for Reviewing Progress on Implementing Mitigation Strategy Activities and Projects

The procedures for reviewing the progress associated with implementing activities and projects related to the mitigation strategy were discussed in Section 5: Execution. It is further recommended that the NDDES prepare an annual report on progress towards mitigation projects and incorporate this information into other agencies' periodic reports where applicable (e.g., NDSWC, NDDOT, NDDA, etc.). As stated earlier, the SHMT plans to institute an annual progress report as a methodology for tracking progress on implementation of strategies as well as evaluation of the applicability of the current risk assessment. If a Loss Avoidance Committee is created (see Section 5.4.2.4), their efforts to track activity implementation will be integrated into the SHMT's annual progress reporting to avoid duplication of efforts. Annual review by NDDES and the SHMT will also consider recommendations provided by FEMA through the Enhanced Plan Review Crosswalk.

6.2 Record of Changes

Date	Summary of Changes
9/15/2020	NDDES issued the: North Dakota's Collaborative Approach to Hazard Mitigation, spanning January 2019 to July 2020
9/15/2021	NDDES issued the: North Dakota Hazard Mitigation Progress Report: Smart, Efficient Infrastructure, spanning August 2020 to July 2021
9/30/2022	NDDES issued the: 2022 North Dakota Hazard Mitigation Progress Report: Resilience in a Changing Environment, spanning August 2021 to July 2022
3/31/2023	Execution Section revised to clarify seven elements of the mitigation strategy
3/31/2023	Plan maintenance section updated to reflect the *Plan Development and Maintenance Policy for Emergency Management Plans and Procedures*

7 Appendices

Appendix 7.1 Acronyms and Terminology

7.1.1 Acronyms

Table 7.1-1: Acronyms

Acronym	Definition
AASHTO	American Association of State Highway and Transportation Officials
ACS	American College of Surgeons
ACS	American Community Survey
ADSCI	Accumulated Drought Severity and Coverage Index
AMBER	America's Missing: Broadcast Emergency Response
AML	Abandoned Mine Lands
AOPA	Aircraft Owners and Pilots Association
APHIS	Animal and Plant Health Inspection Service
ARB	Atmospheric Resource Board
ARC	American Red Cross
ASI	Annual Site Inspection
ASOS	Automated Surface Observing System
BCA	Benefit Cost Analysis
BFE	Base Flood Elevation
BIA	Bureau of Indian Affairs
BLE	Base Level Engineering
BNSF	Burlington Northern Santa Fe, LLC
BOAH	Board of Animal Health
BOR	United States Bureau of Reclamation
BSE	Bovine Spongiform Encephalopathy
BU	Bushel
BW-12	Biggert-Waters Flood Insurance Reform Act of 2012
CAP	Community Assistance Program
CBC	Country Boy Crips
CCEC	Cass County Electrical Cooperative
CCO	Community Coordination and Outreach
CDBG	Community Development Block Grant
CDBG-DR	Community Development Block Grant - Disaster Recovery
CDC	Centers for Disease Control and Prevention
CDP	Census Designated Place

Acronym	Definition
CFR	Code of Federal Regulations
CHI	Catholic Health Initiatives
CIKR	Critical Infrastructure/Key Resources
CIP	Capital Improvement Plan
CME	Coronal Mass Ejection
CMI	Crop Moisture Index
CMP	Cloud Modification Program
COA	Courses of Acton
COOP	Continuity of Operations
CP	Canadian Pacific
CPG	Comprehensive Preparedness Guide
CPI	Consumer Price Index
CPR	Crop and Pest Report
CR	Comprehensive Review
CRP	Conservation Reserve Program
CRREL	Cold Regions Research and Engineering Laboratory
CRS	Community Rating System
CSO	Crime Statistics Online
CSP	Community Support Program
CTC	Cooperating Technical Communities
CTP	Coordinating Technical Partner
CWD	Chronic Wasting Disease
CWMP	Comprehensive Watershed Management Plan
CWPP	Community Wildfire Protection Plan
CWT	Hundredweight
DAPL	Dakota Access Pipeline
DDoS	Distributed Denial of Service
DFIRM	Digital Flood Insurance Rate Map
DHS	United States Department of Homeland Security
DMVW	Dakota, Missouri Valley, and Western
DSCI	Drought Severity and Coverage Index
EAB	Emerald ash borer
EAPs	Emergency Action Plan
EAS	Emergency Alert System
EDDI	Evaporative Demand Drought Index
EDEN	Extension Disaster Education Network
EERC	Energy & Environmental Research Center
EHP	Environmental and Historic Preservation
EIR	Environmental Incident Report

Acronym	Definition
EMAP	Emergency Management Accreditation Program
EMCAPS	Electronic Mass Casualty Assessment and Planning Scenarios
EMPG	Emergency Management Performance Grant
EMS	Emergency Medical Services
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
EVA	Extra-Vehicular Activity
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEDMAP	Federal Geologic Mapping
FEMA	Federal Emergency Management Agency
FFR	Federal Financial Report
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FMCSA	Federal Motor Carrier Safety Administration
FMD	Foot-and-Mouth Disease
FPMS	Flood Plain Management Services Program
FTO	Foreign Terrorist Organizations
FY	Fiscal Year
GAO	General Accounting Office
GDP	Gross Domestic Product
GF	Cyclosarin
GFZ	GeoForschungsZentrum
GICs	Geomagnetically Induced Currents
GIS	Geographic Information System
GISTC	Geographic Information Systems Technical Committee
GPS	Global Positioning System
H&H	Hydrologic & Hydraulic
Hazus	Hazards US
Hazus-MH	Hazards US Multi-Hazard Earthquakes, Hurricanes, and Floods
HEC-RAS	Hydrologic Engineering Center River Analysis System
HF	High Frequency
HI	Heat Index
HILF	High Impact Low Frequency
HIRA	Hazard Identification and Risk Assessment
HMA	Hazard Mitigation Assistance
HMEP	Hazardous Materials Emergency Preparedness

Acronym	Definition
HMGP	Hazard Mitigation Grant Program
HMIS	Homeless Management Information System
HMP	Hazard Mitigation Plan
HPAI	Highly pathogenic Asian avian influenza A
HSIP	Homeland Security Infrastructure Program
HUD	Housing and Urban Development Agency
HVE	Homegrown Violent Extremist
IA	Individual Assistance
IC	Institutional Control
IED	Improvised Explosive Device
iGETT	Integrated Geospatial Education and Technology Training
IJC	International Joint Commission
INCA	Immigration and Nationality Act
IPAWS	Integrated Public Alert and Warning System
IPM	Integrated Pest Management
ISO	Insurance Service Office
ISRB	International Souris River Board
IT	Information Technology
KKK	Klu Klux Klan
LEPC	Local Emergency Planning Committee
LiDAR	Light Detection and Ranging
LLC	Limited Liability Company
LP	Liquefied Petroleum
LSBLE	Large Scale Base Level Engineering
MAOP	Mission Area Operations Plan
MERS	Middle East Respiratory Syndrome
MHA	Mandan, Hidatsa, and Arikara
MHMP	Multi-Hazard Mitigation Plan
MMMS	Map Modernization Management Support
MRLC	Multi-Resolution Land Characteristics
MRRIC	Missouri River Recovery Implementation Committee
NASA	National Aeronautics and Space Administration
NAWAS	National Warning System
NAWS	Northwest Area Water Supply
NCDC	National Climatic Data Center
NCIC	National Crime Information Center
NDaRECs	North Dakota Association of Rural Electric Cooperatives
NDAWN	North Dakota Agricultural Network
NDBCI	North Dakota Bureau of Criminal Investigation

Acronym	Definition
NDCC	North Dakota Century Code
NDDCS	North Dakota Department of Community Services
NDDES	North Dakota Department of Emergency Services
NDDHS	North Dakota Department of Human Services
NDDMR	North Dakota Department of Mineral Resources
NDDOA	North Dakota Department of Agriculture
NDDOC	North Dakota Department of Commerce
NDDOH	North Dakota Department of Health
NDDOT	North Dakota Department of Transportation
NDEMA	North Dakota Emergency Management Association
NDFA	North Dakota Firefighters Association
NDFCA	North Dakota Fire Chiefs Association
NDFS	North Dakota Fire Service
NDGF	North Dakota Game and Fish Department
NDGS	North Dakota Geological Survey
NDHP	North Dakota Highway Patrol
NDHS	North Dakota Department of Human Services
NDITD	North Dakota Information Technology Department
NDNG	North Dakota National Guard
NDPA	North Dakota Pipeline Authority
NDPC	North Dakota Petroleum Council
NDPSC	North Dakota Public Service Commission
NDRC	National Disaster Resilience Competition
NDSA	North Dakota Stockmen's Association
NDSC	North Dakota Safety Council
NDSEB	North Dakota State Electrical Board
NDSFM	North Dakota State Fire Marshal
NDSU	North Dakota State University
NDSWC	North Dakota State Water Commission
NEMIS	National Emergency Management Information System
NEPA	National Environmental Policy Act
NFA	National Firearms Act
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NFIRS	National Fire Incident Reporting System
NFPA	National Fire Protection Association
NIBS	National Institute of Building Sciences
NIFA	National Institute of Food and Agriculture
NIMS	National Incident Management System

Acronym	Definition
NLETS	National Law Enforcement Telecommunications System
NOAA	National Oceanic and Atmospheric Administration
NPG	National Preparedness Goal
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NSF	National Science Foundation
NTSB	National Transportation Safety Board
NWS	National Weather Service
OHWM	Ordinary High Water Mark
OSG	Office of the Surgeon General
OSR	Oil Spill Report
P.L.	Public Law
PA	Public Assistance
PAS	Program Administration State
PCN	Potato cyst nematodes
PDM	Pre-Disaster Mitigation Program
PDSI	Palmer Drought Severity Index
PHSMA	Pipeline and Hazardous Materials Safety Administration
PII	Personal Identifying Information
PIO	Public Information Officer
PIT	Point in Time
PNP	Private Non-profits
POST	Peace Officer Standards and Training
PPQ	Plant Protection & Quarantine
PR	Periodic Review
PSAP	Public Safety Answering Point
PW	Project Worksheet
QuickDRI	Quick Drought Response Index
RAAD	Roads acting as dams
RAAG	Resource Agency Advisory Group
RDI	Reclamation Drought Index
REC	Rural Electric Cooperatives
RFA	Rural Fire Assistance Grant
RFC	Repetitive Flood Claims
Risk MAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
RMA	Risk Management Agency
RMP	Risk management plans

Acronym	Definition
ROD	Radiological Dispersal Devices
RRBC	Red River Basin Commission
RV	Recreational Vehicle
RWIS	Road Weather Information System
SAR	Suspicious Activity Report
SARS	Severe acute respiratory syndrome
SBA	Small Business Administration
SCD	Soil Conservation District
SEOC	State Emergency Operations Center
SEOP	State Emergency Operations Plan
SERC	State Emergency Response Commission
SEWUD	Southeast Water Users District
SFA	State Fire Assistance
SFHA	Special Flood Hazard Areas
SHMO	State Hazard Mitigation Officer
SHMRT	State Hazard Mitigation Ranking Team
SHMT	State Hazard Mitigation Team
SHPO	State Historic Preservation Office
SHSND	State Historical Society of North Dakota
SIRN	Statewide Interoperable Radio Network
SLIC	State and Local Intelligence Center
SLO	Sponsoring Local Organization
SPI	Standardized Precipitation Index
SPR	State Preparedness Report
SRL	Severe Repetitive Loss
SRP	StormReady Program
SSSE	Community Assistance Program - State Support Services Element
STATEMAP	State Geologic Survey Mapping
SWA	Southwest Water Authority
SWIF	System Wide Improvement Framework
SWPC	Space Weather Prediction Center
SWSI	Surface Water Supply Index
TAC	Technical Advisory Committee
TB	Tuberculosis
THIRA	Threat and Hazard Identification and Risk Assessments
TROWAL	Trough of warm air aloft
TSC	Terrorist Screening Center
TTPs	Tactics, Techniques, and Procedures
UASI	Urban Areas Security Initiative

Acronym	Definition
UES	University Extension Service
UND	University of North Dakota
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USDOJ	United States Department of Justice
USDOT	United States Department of Transportation
USFA	United States Fire Administration
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
VMT	Vehicle miles traveled
VOAD	Voluntary Organizations Active in Disaster
WAN	Wire Area Network
WDEA	Western Dakota Energy Association
WEA	Wireless Emergency Alerts
WHO	World Health Organization
WMP	Weather Modification Project
WPDGs	Wetland Program Development Grants
WRD	Water Resources District
WRN	Weather Ready Nation
WSI	Workforce Safety and Insurance
WUI	Wildland-Urban Interface
WWA	West Wide Wildfire Risk Assessment

7.1.2 Terminology

1% flood (100-year flood) – A flood that has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. The term "100-year flood" can be misleading; it is not the flood that will occur once every 100 years. Rather, it is the flood elevation that has a 1- percent chance of being equaled or exceeded each year. Therefore, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management to determine the need for flood insurance.

0.2 % flood (500-year flood) – A flood that has a 0.2-percent chance of being equaled or exceeded in any one year.

Aggregate Data – Data gathered together across an area or region (for example, census tract or census block data).

Annualized Loss – The estimated long-term value of losses from potential future hazard occurrences of a particular type in any given single year in a specified geographic area. In other words, the average annual loss that is likely to be incurred each year based on frequency of occurrence and loss estimates. Note that the loss in any given year can be substantially higher or lower than the estimated annualized loss.

Annualized Loss Ratio – Represents the annualized loss estimate as a fraction of the replacement value of the local building inventory. This ratio is calculated using the following formula: Annualized Loss Ratio = Annualized Losses / Exposure at Risk. The annualized loss ratio gauges the relationship between average annualized loss and building value at risk. This ratio can be used as a measure of relative risk between hazards as well as across different geographic units

Asset – Any man-made or natural feature that has value, including but not limited to people, buildings, infrastructure (such as bridges, roads, and sewer and water systems), and lifelines (such as electricity and communication resources or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks).

At-Risk – Exposure values that include the entire building inventory value in census blocks that lie within or border the inundation areas or any area potentially exposed to a hazard based on location.

Base Flood – Flood that has a 1-percent probability of being equaled or exceeded in any given year. It is also known as the 100-year flood.

Base Flood Elevation (BFE) – Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The BFE is used as the standard for the National Flood Insurance Program.

Benefit – Net project outcomes, usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of conducting a benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including a reduction in expected property losses (building, content, and function) and protection of human life.

Benefit-Cost Analysis (BCA) – Benefit-cost analysis is a systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Blizzard – Characterized by low temperatures, wind gusts of 35 mph or more and falling and/or blowing snow that reduces visibility to 0.25 miles or less for an extended period of time (three or more hours).

Building – A structure that is walled and roofed, principally aboveground and permanently fixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Building Codes – Regulations that set forth standards and requirements for construction, maintenance, operation, occupancy, use, or appearance of buildings, premises, and dwelling units. Building codes can include standards for structures to withstand natural disasters.

Capability Assessment – An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.

Climate – The meteorological elements, including temperature, precipitation, and wind, which characterizes the general conditions of the atmosphere over a period of time (typically 30years) for a particular region.

Community Rating System (CRS) – CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specific activities, the insurance premiums of these policyholders in communities are reduced.

Comprehensive Plan – A document, also known as a "general plan," covering the entire geographic area of a community and expressing community goals and objectives. The plan lays out the vision, policies, and strategies for the future of the community, including all of the physical elements that will determine the community's future development. This plan can discuss the community's desired physical development, desired rate and quantity of growth, community character, transportation services, location of growth, and siting of public facilities and transportation. In most states, the comprehensive plan has no authority in and of itself, but serves as a guide for community decision-making.

Critical Facility – Facilities that are critical to the health and welfare of the population and that are especially important following a hazard. Critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities.

Debris – The scattered remains of assets broken or destroyed during the occurrence of a hazard. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Digital Elevation Model (DEM) – U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data files that are digital representations of cartographic information in a raster form. DEMs include a sampled array of elevations for a number of ground positions at regularly spaced intervals. These digital cartographic/geographic data files are produced by USGS as part of the National Mapping Program.

Digital Flood Insurance Rate Maps (DFIRMs) – These maps are used to calculate the cost insurance premiums, establish flood risk zones and base flood elevations to mitigate against potential future flood damages to properties.

Displacement Time – After a hazard occurs, the average time (in days) that a building's occupants must operate from a temporary location while repairs are made to the original building due to damages resulting from the hazard.

Disaster Mitigation Act of 2000 (DMA 2000) – Law that requires and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening state-wide mitigation planning.

Duration – The length of time a hazard occurs.

Earthquake – A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.

Essential Facility – A facility that is important to ensure a full recovery of a community or state following the occurrence of a hazard. These facilities can include: government facilities, major employers, banks, schools, and certain commercial establishments (such as grocery stores, hardware stores, and gas stations).

Exposure – The number and dollar value of assets that are considered to be at risk during the occurrence of a specific hazard.

Extent – The size of an area affected by a hazard or threat or the occurrence of a hazard or threat.

Federal Emergency Management Agency (FEMA) – Independent agency (now part of the Department of Homeland Security) created in 1978 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery.

Flash Flood – A flood occurring with little or no warning where water levels rise at an extremely fast rate.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas resulting from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Depth – Height of the flood water surface above the ground surface.

Flood Elevation – Height of the water surface above an established datum (for example, the National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or mean sea level).

Flood Hazard Area – Area shown to be inundated by a flood of a given magnitude on a map.

Flood Information Tool (FIT) – Hazard U.S. Multi-Hazard (HAZUS-MH) - related tool designed to process and convert locally available flood information to data that can be used by the HAZUS-MH Flood Module. The FIT is a system of instructions, tutorials and geographic information system (GIS) analysis scripts. When provided with user-supplied inputs (such as ground elevations, flood elevations, and floodplain boundary information), the FIT calculates flood depth and elevation for river and coastal flood hazards.

Flood Insurance Rate Map (FIRM) – Map of a community, prepared by the FEMA that shows both the special flood hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Flood Mitigation Assistance (FMA) Program – A program created as a part of the National Flood Insurance Report Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurance structures, with a focus on repetitive loss properties.

Floodplain – Any land area, including a watercourse, susceptible to partial or complete inundation by water from any source.

Flood Polygon – A geographic information system vector file outlining the area exposed to the flood hazard. HAZUS-MH generates this polygon at the end of the flood computations in order to analyze the inventory at risk.

Freezing Rain – Rain that falls as a liquid but freezes into glaze upon contact with the ground.

Frequency – A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1-percent chance of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

Fujita Scale of Tornado Intensity – Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 (wind speed less than 73 mph) indicates minimal damage such as broken tree limbs or signs, while an F5 (wind speeds of 261 to 318 mpg) indicated severe damage sustained.

Geology – The scientific study of the earth, including its composition, structure, physical properties, and history.

Goals – General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term in nature, and represent global visions.

Geographic Information System (GIS) – A computer software application that relates data regarding physical and other features on the earth to a database to be used for mapping and analysis.

GIS Shape Files – A type of GIS vector file developed by ESRI for their ArcView software. This type of file contains a table and a graphic. The records in the table are linked to corresponding objects in the graphic.

Hailstorm – Storm associated with spherical balls of ice. Hail is a product of thunderstorms or intense showers. It is generally white and translucent, consisting of liquid or snow particles encased with layers of ice. Hail is formed within the higher reaches of a well-developed thunderstorm. When hailstones become too heavy to be caught in an updraft back into the clouds of the thunderstorm (hailstones can be caught in numerous updrafts adding a coating of ice to the original frozen droplet of rain each time), they fall as hail and a hailstorm ensues.

Hazard – A source of potential danger or an adverse condition that can cause harm to people or cause property damage. For this risk assessment, priority hazards were identified and selected for the pilot project effort. A natural hazard is a hazard that occurs naturally (such as flood, wind, and earthquake). A man-made hazard is one that is caused by humans (for example, a terrorist act or a hazardous material spill). Hazards are of concern if they have the potential to harm people or property.

Hazards of Interest – A comprehensive listing of hazards that may affect an area.

Hazards of Concern – Those hazards that have been analytically determined to pose significant risk in an area, and thus the focus of the particular mitigation plan for that area (a subset of the Hazards of Interest).

Hazard Identification – The process of identifying hazards that threaten an area.

Hazardous Material Facilities – Facilities housing industrial and hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.

Hazard Mitigation – Sustained actions taken to reduce or eliminate the long-term risk and effects that can result from the occurrence of a specific hazard. For example, building a retaining wall can protect an area from flooding.

Hazard Mitigation Grant Program (HMGP) – Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.

Hazard Profile – A description of the physical characteristics of a hazard, including a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazards U.S. (HAZUS) – A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA. HAZUS was replaced by HAZUS-MH (see below) in 2003.

Hazards U.S. – Multi-Hazard (HAZUS-MH) – A GIS-based nationally standardized earthquake, flood, and wind loss estimation tool developed by FEMA. The purpose of this pilot project is to demonstrate and implement the use of HAZUS-MH to support risk assessments.

HAZUS-MH Risk Assessment Methodology – This analysis uses the HAZUS-MH modules (earthquake, wind--hurricane and flood) to analyze potential damages and losses. For this pilot project risk assessment, the flood and hurricane hazards were evaluated using this methodology.

HAZUS-MH-Driven Risk Assessment Methodology – This analysis involves using inventory data in HAZUS-MH combined with knowledge such as (1) information about potentially exposed areas, (2) expected impacts, and (3) data regarding likelihood of occurrence for hazards.

Heavy Snow – Snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.

High Potential Loss Facilities – Facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

Hydrology – The science of dealing with the waters of the earth (for example, a flood discharge estimate is developed through conduct of a hydrologic study).

Infrastructure – The public services of a community that have a direct impact on the quality of life.

Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, transportation system (such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways).

Ice Jam – An accumulation of ice in a river that acts as a natural dam and can flood low-lying areas upstream. They occur when warm temperatures and heavy rains cause rapid snow melt.

Ice Storm – Term used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication.

Intensity – A measure of the effects of a hazard occurring at a particular place.

Inventory – The assets identified in a study region. It includes assets that can be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Level 1 Analysis – A HAZUS-MH analysis that yields a rough estimate or preliminary analysis based on the nationwide default database included in HAZUS-MH. A Level 1 analysis is a great way to begin the risk assessment process and prioritize high-risk communities without collecting or using local data.

Level 2 Analysis – A HAZUS-MH analysis that requires the input of additional or refined data and hazard maps that will produce more accurate risk and loss estimates. Assistance from local and tribal emergency management personnel, city planners, GIS professionals, and others may be necessary for this level of analysis.

Level 3 Analysis – A HAZUS-MH analysis that yields the most accurate estimate of loss and typically requires the involvement of technical experts such as structural and geotechnical engineers who can modify loss parameters based on the specific conditions of a community. This level analysis will allow users to supply their own techniques to study special conditions such as dam breaks and tsunamis. Engineering and other expertise is needed at this level.

Lifelines – Critical facilities that include utility systems (potable water, wastewater, oil, natural gas, electric power facilities and communication systems) and transportation systems (airways, bridges, roads, tunnels and waterways).

Lightning – A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds or between a rain cloud and the ground.

Loss Estimation – The process of assigning hazard-related damage and loss estimates to inventory, infrastructure, lifelines, and population data. HAZUS-MH can estimate the economic and social loss for specific hazard occurrences. Loss estimation is essential to decision making at all levels of government and provides a basis for developing mitigation plans and policies. It also supports planning for emergency preparedness, response, and recovery.

Lowest Floor – Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure. For the HAZUS-MH flood model, this information can be used to assist in assessing the damage to buildings.

Magnitude – A measure of the strength of a hazard or threat occurrence. The magnitude (also referred to as severity) of a given hazard occurrence is usually determined using technical measures specific to the hazard. For example, ranges of wind speeds are used to categorize tornados.

Major Disaster Declaration – Post-disaster status requested by a state's governor when local and state resources are not sufficient to meet disaster needs. It is based on the damage assessment, and an agreement to commit state funds and resources to the long-term recovery. The event must be clearly more than the state or local government or tribal nation can handle alone.

Mean Return Period (MRP) – The average period of time, in years, between occurrences of a particular hazard (equal to the inverse of the annual frequency of exceedance).

Mitigation Actions – Specific actions that help you achieve your goals and objectives.

Mitigation Goals – General guidelines that explain what you want to achieve. They are usually broad policy type statements, long term, and represent global visions.

Mitigation Objectives – Strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Multi-Hazard Mitigation Plan – A collaborative document in which hazards affecting the community are identified, vulnerability to hazards assessed, and consensus reached on how to minimize or eliminate the effects of these hazards. The plan that documents the process used for a systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in a state or community. The plan includes a description of actions to minimize future vulnerability to hazards. This plan should be developed with local experts and significant community involvement.

National Flood Insurance Program (NFIP) – Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 Code of Federal Regulations (CFR) §60.3.

Objectives – Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.

Occupancy Classes – Categories of buildings used by HAZUS-MH (for example, commercial, residential, industrial, government, and “other”).

Ordinance – A term for a law or regulation adopted by local or tribal government.

Outflow – Associated with coastal hazards and follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.

Parametric Model – A model relating to or including the evaluation of parameters. For example, HAZUSMH uses parametric models that address different parameters for hazards such as earthquake, flood and wind (hurricane). For example, parameters considered for the earthquake hazard include soil type, peak ground acceleration, building construction type and other parameters.

Planimetric – Maps that indicate only man-made features like buildings.

Planning – The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.

Post-Disaster Mitigation – Mitigation actions taken after a disaster has occurred, usually during recovery and reconstruction.

Presidential Disaster Declaration – A post-disaster status that puts into motion long-term federal recovery programs, some of which are matched by state programs, and designed to help disaster victims, businesses, and public entities in the areas of human services, public assistance (infrastructure support), and hazard mitigation. If declared, funding comes from the President’s Disaster Relief Fund and disaster aid programs of other participating federal agencies.

Preparedness – Actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Priority Hazards – Hazards considered most likely to impact a community based on frequency, severity, or other factors such as public perception. These are identified using available data and local knowledge.

Provided Data – The databases included in the HAZUS-MH software that allow users to run a preliminary analysis without collecting or using local data.

Probability – A statistical measure of the likelihood that a hazard event will occur.

Public Education and Outreach Programs – Any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.

Q3 Flood Zone Data – FEMA flood data that delineate the 100- and 500-year flood boundaries. The Q3 Flood Data are digital representations of certain features of FEMA’s Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and GIS technology.

Recovery – The actions taken by an individual or community after a catastrophic event to restore order and lifelines in the community.

Regulation – Most states have granted local jurisdictions broad regulatory powers to enable the enactment and enforcement of ordinances that deal with public health, safety, and welfare. These include building codes, building inspections, zoning, floodplain and subdivision ordinances, and growth management initiatives.

Recurrence Interval – The average time between the occurrences of hazardous events of similar size in a given location. This interval is based on the probability that the given event will be equaled or exceeded in any given year.

Repetitive Loss Property – A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10-year period since 1978.

Replacement Value – The cost of rebuilding a structure. This cost is usually expressed in terms of cost per square foot and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

Resolutions – Expressions of a governing body's opinion, will, or intention that can be executive or administrative in nature. Most planning documents must undergo a council resolution, which must be supported in an official vote by a majority of representatives to be adopted. Other methods of making a statement or announcement about a particular issue or topic include proclamations or declarations.

Resources – Resources include the people, materials, technologies, money, etc., required to implement strategies or processes. The costs of these resources are often included in a budget.

Risk – The estimated impact that a hazard or threat would have on people, services, facilities, and structures in a community; the likelihood of a hazard or threat occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard or threat. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard or threat.

Risk Assessment – A methodology used to assess potential exposure and estimated losses associated with priority hazards. The risk assessment process includes four steps: (1) identifying hazards, (2) profiling hazards, (3) conducting an inventory of assets, and (4) estimating losses. This pilot project report documents this process for selected hazards addressed as part of the pilot project.

Risk Factors – Characteristics of a hazard that contribute to the severity of potential losses in the study area.

Riverine – Of or produced by a river (for example, a riverine flood is one that is caused by a river overflowing its banks).

Scale – A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.

Scour – Removal of soil or fill material by the flow of floodwaters. This term is frequently used to describe storm-induced, localized, conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.

Special Flood Hazard Area (SFHA) – An area within a floodplain having a 1-percent or greater chance of flood occurrence in any given year (that is, the 100-year or base flood zone); represented on FIRMS as darkly shaded areas with zone designations that include the letter "A" or "V."

Stafford Act – The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-107 was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

Stakeholder – Stakeholders are individuals or groups, including businesses, private organizations, and citizens, that will be affected in any way by an action or policy.

State Hazard Mitigation Officer (SHMO) – The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local and tribal units of government in the planning and implementation of pre- and post-disaster mitigation activities.

Structure – Something constructed (for example, a residential or commercial building).

Study Area – The geographic unit for which data are collected and analyzed. A study area can be any combination of states, counties, cities, census tracts, or census blocks. The study area definition depends on the purpose of the loss study and in many cases will follow political boundaries or jurisdictions such as city limits.

Substantial Damage – Damage of any origin sustained by a structure in a SFHA, for which the cost of restoring the structure to its pre-hazard event condition would equal or exceed 50 percent of its pre-hazard event market value.

Thunderstorm – A local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder. It forms from a combination of moisture, rapidly rising warm air and a force capable of lifting air such a warm and cold front, a sea breeze, or a mountain.

Topographic – Map that shows natural features and indicate the physical shape of the land using contour lines based on land elevation. These maps also can include man-made features (such as buildings and roads).

Tornado – A violently rotating column of air extending from a thunderstorm to the ground.

Transportation Systems – One of the lifeline system categories. This category includes: airways (airports, heliports, highways), bridges, tunnels, roadbeds, overpasses, transfer centers; railways (tracks, tunnels, bridges, rail yards, depots), and waterways.

Utility Systems – One of the lifeline systems categories. This category includes potable water, wastewater, oil, natural gas, electric power facilities and communication systems.

Vulnerability – Description of how exposed or susceptible an asset is to damage. This value depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. If an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct affects.

Vulnerability Assessment – Evaluation of the extent of injury and damage that may result from a hazard or threat event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard and threat occurrences on the existing and future built environment.

Watershed – Area of land that drains down gradient (from areas of higher land to areas of lower land) to the lowest point; a common drainage basin. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves downstream, eventually reaching an estuary, lake, or ocean.

Zone – A geographical area shown on a National FIRM that reflects the severity or type of flooding in the area.

Zoning Ordinance – Designation of allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

Appendix 7.2 Planning Process Supporting Documentation

This appendix includes the materials, records of attendance, and notes from all of the meetings held during the 2018 Enhanced Mitigation MAOP planning process, including:

Contents

7.2.1 State Hazard Mitigation Team Committees

Table 7.2-1: State Hazard Mitigation Team Committees

Agency		Hazard-Specific Committees												Planning Committees				
	NDHMP Technical Advisory Committee	Adversarial Threats*	Dam Failure	Drought	Fire	Flood	Geologic Hazards	Hazardous Materials Release	Infectious Diseases	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident	Critical Facilities and Infrastructure	Land Use & Future Construction and Development	Long-Term Climate Change	Mitigation Strategy and Implementation	Oil and Gas Industry Expansion
American Red Cross		x			x					x	x							
Bismarck Emergency Management		x			x			x										
Bureau of Indian Affairs		x	x															
Branch, Wildland Fire Management		x	x															
Safety of Dams Program		x	x															
Burleigh County Emergency Management										x								
City of West Fargo Emergency Management					x	x												
Division of Facilities Management														x				
Dunn County Planning and Zoning															x			x
Federal Highway Administration							x						x					
Foster County Emergency Management																x		
Housing Finance Agency														x				
Job Service North Dakota															x			x
LaMoure County Emergency Management											x		x					
Logan County Emergency Management							x											
Lutheran Social Services Disaster Response					x	x												
Minot Air Force Base		x								x								
Missouri Valley Coalition of Homeless People										x	x							
Mouse River Firefighters Association					x												x	
National Weather Service	x	x	x	x	x	x		x		x	x	x				x	x	
Natural Resources Conservation Service		x	x		x	x								x				
North Dakota Aeronautics Commission										x	x	x	x					
North Dakota Association of Counties															x			x
North Dakota Association of Rural Electrical Cooperatives					x	x					x			x			x	

Agency	NDHMP Technical Advisory Committee	Hazard-Specific Committees												Planning Committees				
		Adversarial Threats*	Dam Failure	Drought	Fire	Flood	Geologic Hazards	Hazardous Materials Release	Infectious Diseases	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident	Critical Facilities and Infrastructure	Land Use & Future Construction and Development	Long-Term Climate Change	Mitigation Strategy and Implementation	Oil and Gas Industry Expansion
North Dakota Bureau of Criminal Investigation		x																
North Dakota Community Foundation										x	x							
North Dakota Department of Agriculture		x		x				x	x									
North Dakota Department of Commerce										x	x			x	x			
North Dakota Department of Emergency Services, Division of Homeland Security	x	x		x	x	x	x	x			x	x	x	x	x	x	x	
North Dakota Department of Emergency Services, Division of State Radio														x				
North Dakota Department of Health		x						x	x						x		x	x
North Dakota Department of Human Services	x				x					x	x							
North Dakota Department of Mineral Resources		x	x		x	x		x							x		x	x
North Dakota Department of Public Instruction										x	x							
North Dakota Department of Transportation	x				x	x				x	x		x				x	x
North Dakota Division of Animal Health									x									
North Dakota Emergency Management Association/Ward County	x				x	x											x	x
North Dakota Fire Chiefs Association					x													
North Dakota Fire Marshal					x												x	
North Dakota Firefighters Association					x			x										
North Dakota Forest Service					x												x	
North Dakota Game and Fish Department		x	x		x				x									
North Dakota Geological Survey							x											
North Dakota Highway Patrol		x											x					
North Dakota Indian Affairs Commission										x	x				x			
North Dakota Information Technology Department		x												x				
North Dakota Insurance Department														x				
North Dakota League of Cities														x				

Agency		Hazard-Specific Committees												Planning Committees				
	NDHMP Technical Advisory Committee	Adversarial Threats*	Dam Failure	Drought	Fire	Flood	Geologic Hazards	Hazardous Materials Release	Infectious Diseases	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident	Critical Facilities and Infrastructure	Land Use & Future Construction and Development	Long-Term Climate Change	Mitigation Strategy and Implementation	Oil and Gas Industry Expansion
North Dakota National Guard		x			x	x		x										
North Dakota National Guard, Civil Support Team		x						x										
North Dakota Office of Management and Budget, Risk Management Division		x								x	x		x					
North Dakota Parks and Recreation Department		x	x		x	x				x								
North Dakota Peace Officer Standards and Training Board														x				
North Dakota Petroleum Council																		x
North Dakota Public Service Commission							x											
North Dakota Safety Council										x	x							x
North Dakota State Electrical Board					x					x	x							
North Dakota State University Climatology				x	x	x				x	x	x				x		
North Dakota State University Extension Service				x	x	x												
North Dakota State Water Commission	x	x	x	x	x	x				x		x				x	x	
North Dakota Stockmen's Association				x					x				x					
North Dakota Township Officers Association					x	x									x			
North Dakota University System										x	x							
Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative														x				
Office of the Tax Commissioner																		x
Pembina County Emergency Management					x	x												
State and Local Intelligence Center		x																
State Historical Society of North Dakota					x	x	x			x	x							
United States Animal Plant and Health Inspection Services									x									
United States Army Corps of Engineers		x	x		x	x											x	

Agency	NDHMP Technical Advisory Committee	Hazard-Specific Committees												Planning Committees				
		Adversarial Threats*	Dam Failure	Drought	Fire	Flood	Geologic Hazards	Hazardous Materials Release	Infectious Diseases	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident	Critical Facilities and Infrastructure	Land Use & Future Construction and Development	Long-Term Climate Change	Mitigation Strategy and Implementation	Oil and Gas Industry Expansion
United States Bureau of Reclamation		x	x		x	x	x											
United States Department of Agriculture, Rural Development					x	x												
United States Department of Homeland Security		x												x				
United States Forest Service					x													
United States Geological Survey				x	x	x												
University of Mary					x	x	x											
Western Dakota Energy Association															x			x
Workforce Safety and Insurance																		x

* Civil Disturbance; Cyber Attack; Criminal, Terrorist or Nation/State Attack

7.2.2 State Hazard Mitigation Team Meeting Attendance

Table 7.2-2: SHMT Meeting Attendance by Organization

Agency/Organization	First Meeting (April 2018)	Second Meeting (July 2018)	Third Meeting (August 2018)	Fourth Meeting (September 2018)
American Red Cross	X			
Bismarck Emergency Management			X	
Bureau of Indian Affairs				
Branch, Wildland Fire Management	X	X		
Safety of Dams Program				
Burleigh County Emergency Management			X	X
City of West Fargo Emergency Management			X	X
Division of Facilities Management				
Dunn County Planning and Zoning	X		X	X
Federal Highway Administration			X	
Foster County Emergency Management	X	X		
Job Service North Dakota	X	X	X	X
LaMoure County Emergency Management	X	X	X	X
Logan County Emergency Management	X	X		X
Lutheran Social Services Disaster Response	X	X		
Minot Air Force Base	X			
Missouri Valley Coalition of Homeless People	X	X		
Mouse River Firefighters Association				
National Weather Service	X	X	X	X
Natural Resource Conservation Service	X	X	X	
North Dakota Aeronautics Commission	X	X	X	X
North Dakota Association of Counties	X			
North Dakota Association of Rural Electrical Cooperatives	X		X	X
North Dakota Bureau of Criminal Investigation	X	X	X	X
North Dakota Community Foundation	X	X	X	X
North Dakota Department of Agriculture	X	X	X	X
North Dakota Department of Commerce	X			X
North Dakota Department of Emergency Services, Division of Homeland Security	X	X	X	X
North Dakota Department of Emergency Services, Division of State Radio	X		X	X
North Dakota Department of Health	X	X	X	X
North Dakota Department of Human Services	X	X	X	X
North Dakota Department of Mineral Resources	X	X	X	X
North Dakota Department of Public Instruction	X			
North Dakota Department of Transportation	X		X	X
North Dakota Division of Animal Health	X	X	X	X
North Dakota Emergency Management Association/Ward County	X	X	X	X
North Dakota Fire Chiefs Association	X			
North Dakota Fire Marshal	X	X		
North Dakota Forest Service	X	X	X	X
North Dakota Game and Fish Department				X
North Dakota Geological Survey	X		X	
North Dakota Housing Finance Agency		X		

Agency/Organization	**First Meeting (April 2018)**	**Second Meeting (July 2018)**	**Third Meeting (August 2018)**	**Fourth Meeting (September 2018)**
North Dakota Highway Patrol	X	X	X	
North Dakota Indian Affairs Commission				
North Dakota Information Technology Department	X	X	X	X
North Dakota Insurance Department	X			X
North Dakota League of Cities				
North Dakota National Guard	X	X		X
North Dakota National Guard, Civil Support Team	X	X		
North Dakota Office of Management and Budget, Risk Management Division		X	X	
North Dakota Parks and Recreation Department	X	X	X	X
North Dakota Peace Officer Standards and Training Board	X			
North Dakota Petroleum Council				X
North Dakota Public Service Commission			X	X
North Dakota Safety Council	X			
North Dakota State Electrical Board	X			
North Dakota State University Climatology	X	X		X
North Dakota State University Extension Service		X	X	
North Dakota State Water Commission	X	X	X	X
North Dakota Stockmen's Association		X	X	
North Dakota Township Officers Association	X			
North Dakota University System				
Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	X	X		
Office of the Tax Commissioner	X	X	X	
Pembina County Emergency Management	X	X	X	
State and Local Intelligence Center	X	X	X	
State Historical Society of North Dakota	X			X
United States Animal and Plant Inspection Service		X		X
United States Army Corps of Engineers	X	X	X	
United States Bureau of Reclamation		X	X	
United States Department of Agriculture, Rural Development			X	
United States Department of Homeland Security	X			
United States Forest Service		X		
United States Geological Survey	X			
University of Mary	X			
Western Dakota Energy Association				
Workforce Safety and Insurance	X	X	X	X

7.2.3 Data Collection Guide

Agency/ Organization	Suggested Data Needs	Data Provided
American Red Cross	• Summary of assistance provided from 2012 to present. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe winter weather impacts • Brief summary of response to urban fires for since 2013; cost expended to assist survivors.	• No Data Provided
Dunn County Planning and Zoning	• A brief summary of impacts of oil production on Dunn County.	• A brief summary of impacts of oil production on Dunn County.
Federal Highway Administration	• Data related to ER funds allocated to North Dakota since 2013, including the Devils Lake roads. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flooding. • Analysis of causes of transportation accidents to include data on accidents and injuries since 2013.	• No Data Provided
Greater North Dakota Chamber	• Reports (annual, special) about the growth of business in ND. • Reports related to oil industry growth.	• No Data Provided
Job Service North Dakota	• Data related to numbers of individuals working in the state; types of industry. • Data related to unemployment insurance. • Data on labor market information on wages and economics. • Data related to oil and gas production job numbers, openings, if applicable.	• Data related to numbers of individuals working in the state; types of industry. • Data related to unemployment insurance. • Data on labor market information on wages and economics. • Data related to oil and gas production job numbers, openings, if applicable.
Lutheran Social Services Disaster Response	• Summary of LSS assistance provided from 2012 to present (also see NDVOAD entry). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters.	• Summary of LSS assistance provided from 2012 to present (also see NDVOAD entry). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters.
Missouri Valley Coalition of Homeless People	• Data related to the number of homeless individuals and trends in homelessness (contributing factors to increases) since 2013. • Summary of weather-related concerns for homeless individuals -- availability, location, and number of shelters.	• PIT Count. • Summary of weather-related concerns for homeless individuals -- availability, location, and number of shelters.

Agency/ Organization	Suggested Data Needs	Data Provided
	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address the needs of homeless individuals during severe summer and severe winter weather.	
National Weather Service	• - Long-term climate change analysis. • Review dam failure section for weather description. • A summary of the extent and impact of drought in ND last year (Allen Schlag's summary). • Projections for continuation of drought conditions. • Analysis of flood events during 2012-2017. • Define space weather and why it is important for our planning efforts. • Link to Space Weather Matrix - http://www.swpc.noaa.gov/NOAAscales/. • Link to Space Weather Primer - http://www.swpc.noaa.gov/primer/primer_2010.pdf. • Discuss what threats are posed by space weather. • NCDC data on significant hail, lightning, thunderstorm winds, heavy rain, extreme heat, drought tornado events, and flash flooding, including links. • Map of ND tornado events from 1950 to present. •	• Long-term climate change analysis. • Projections for continuation of drought conditions. • Analysis of flood events during 2012-2017. • Define space weather and why it is important for our planning efforts. • Discuss what threats are posed by space weather. • NCDC data on significant hail, lightning, thunderstorm winds, heavy rain, extreme heat, drought tornado events, and flash flooding, including links. • Map of ND tornado events from 1950 to present. • ND Severe Weather History link.[1] • Local Storm Report links for Bismarck.[2]
ND Aeronautics Commission	• Description, if applicable, of flood damages to airports. • Data related to ER funds allocated to North Dakota since 2013, including the Devils Lake roads.	• Data related to ER funds allocated to North Dakota since 2013, including the Devils Lake roads. • Data related to city, destination and airlines' service for each destination, state destinations, number of daily flights and domestic hubs, and average general aviation daily flights. • Data related to the number of aviation-related accidents in ND since 2013.

[1] https://www.weather.gov/bis/ndtorhistory

[2] https://forecast.weather.gov/product.php?issuedby=BIS&product=LSR&site=bis> and Grand Forks

Agency/ Organization	Suggested Data Needs	Data Provided
	• Data related to city, destination and airlines' service for each destination, state destinations, number of daily flights and domestic hubs, and average general aviation daily flights. • Listing of ND major airports. • Listing of public airports by county. • Link to air service route chart - http://www.nd.gov/ndaero/airlines/. • Data related to the number of aviation-related accidents in ND since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address the needs of homeless individuals during severe summer and severe winter weather.	
ND Association of Counties	• A brief summary of members' concerns of growth and development related to the oil boom. • Data related to trends in populations moving into cities from rural areas.	• Data related to trends in populations moving into cities from rural areas.
ND Association of Oil and Gas Producing Counties & ND Coal Conversion Counties Association	• Data on trends and issues related to the state's oil production	• No Data Provided
ND Association of Rural Electric Cooperatives	• Brief summary of flood impacts experienced by members from 2013 to present. • Brief summary of mitigation strategies used/being considered to lessen flood impacts on RECs. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flooding. • Brief summary of severe summer weather impacts experienced by members from 2013 to present. • Brief summary of mitigation strategies used/being considered to lessen flood impact on RECs.	• Brief summary of flood impacts experienced by members from 2013 to present. • Brief summary of mitigation strategies used/being considered to lessen flood impacts on RECs. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flooding. • Brief summary of severe summer weather impacts experienced by members from 2013 to present. • Brief summary of mitigation strategies used/being considered to lessen flood impact on RECs.

Agency/ Organization	Suggested Data Needs	Data Provided
	• List of widespread outages -- number of days without power per county, if possible, # of customers affected, cost of infrastructure to repair/replace. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe summer weather. • Brief summary of severe winter weather impacts experienced by members from 2013 to present. • List of widespread outages -- number of days without power per county, if possible, # of customers affected, cost of infrastructure to repair/replace. • Brief summary of mitigation strategies used/being considered to lessen severe winter weather impacts on RECs. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe winter weather impacts.	• List of widespread outages -- number of days without power per county, if possible, # of customers affected, cost of infrastructure to repair/replace. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe summer weather. • Brief summary of severe winter weather impacts experienced by members from 2013 to present. • List of widespread outages -- number of days without power per county, if possible, # of customers affected, cost of infrastructure to repair/replace. • Brief summary of mitigation strategies used/being considered to lessen severe winter weather impacts on RECs. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe winter weather impacts.
ND Bureau of Criminal Investigation	• Data related to the number of crimes and trends since 2013. • Information related to human trafficking -- trends in North Dakota (surfacing as a concern for disaster recovery). • A list of agency capabilities and resources (technical/staffing, financial/programmatic and material). • Data related to the trends in criminal activity in the oil and gas fields since 2013.	• Data related to the number of crimes and trends since 2013. • Information related to human trafficking -- trends in North Dakota (surfacing as a concern for disaster recovery). • A list of agency capabilities and resources (technical/staffing, financial/programmatic and material). • Data related to the trends in criminal activity in the oil and gas fields since 2013.
ND Community Foundation	• Overview of assistance provided to communities during disaster recovery. • Summary of support provided by the NDCF to communities during disaster recovery.	• Overview of assistance provided to communities during disaster recovery. • Summary of support provided by the NDCF to communities during disaster recovery.
ND Department of Agriculture	• Analysis of security concerns dealing with potential food and animal incidents. • North Dakota Mediation Service Summary -- current total case load, oil and gas cases, agricultural credit cases, other, past biennium, staffing, legislative changes). • Obtain latest ND market value of agricultural products sold. • Brief summary of potential impacts of drought on livestock and crop producers. • Data related to yield loss on crops -- 10 years of data.	• Analysis of security concerns dealing with potential food and animal incidents. • Brief summary of potential impacts of drought on livestock and crop producers. • Data related to yield loss on crops -- 10 years of data. • Brief summary of programs that have implemented to help producers (such as Drought Disaster Livestock Water Assistance Program).

Agency/ Organization	Suggested Data Needs	Data Provided
	• Brief summary of programs that have implemented to help producers (such as Drought Disaster Livestock Water Assistance Program). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Crop insurance data. • Current ND Plant Industries Program Statistics Report. • N.D. Reportable Conditions List (Animal Health). • North Dakota Livestock Numbers (number and types of inspections for dairy, poultry, livestock, auctions, wool , slaughter plants, plant food, retail outlets for commercial feed, manufacturers of commercial feed). • Annual statistics on the cooperative agreement with USDA Wildlife Services. • Brief summary and/or news release on animal health disease concerns since 2013. • Sensitive Crops Registry information. • Information regarding the Northern Plains Detection Network. • Information regarding the current Bio-control programs being implemented for noxious weeds. • General information regarding the link between Extension and disease reporting – also some information regarding currently recommended IPM practices. • Copies of the most recent North Dakota Animal Emergency Response Plan and Animal Health Annex. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • Program Statistics for the Fertilizer Division Program (license distributers, registered products, tons sold to end users, number of samples collected), since 2013. • Program Statistics for the Pesticide Program (registered products, registrants, active section 24[C] registrations and section 18 exceptions, total pesticide inspections). • NDDA pesticide inspections by category since 2013.	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • N.D. Reportable Conditions List (Animal Health). • Brief summary and/or news release on animal health disease concerns since 2013. • Sensitive Crops Registry information. • Information regarding the current Bio-control programs being implemented for noxious weeds. • General information regarding the link between Extension and disease reporting – also some information regarding currently recommended IPM practices. • Copies of the most recent North Dakota Animal Emergency Response Plan and Animal Health Annex. • Program Statistics for the Fertilizer Division Program (license distributers, registered products, tons sold to end users, number of samples collected), since 2013.

Agency/ Organization	Suggested Data Needs	Data Provided
	• Number of pesticide compliance assistance visits since 2013. • Number of participants at pesticide compliance assistance events since 2013. • Program Statistics for the Anhydrous Ammonia Program (number of Anhydrous active facilities, number of licensed bulk tanks, number of bulk storage tanks inspected, number of compliance assistance visits on nurse tanks since 2013). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents.	
ND Department of Commerce	• Narrative, if applicable, of CDBG dollars that have been leveraged to mitigate hazards. • Narrative of CDBG dollars leveraged since 2011 to address flooding in North Dakota. • Narrative of efforts to promote zoning and building ordinances throughout the state. • Listing of communities enforcing building codes and zoning ordinances. • Listing of business growth announcements from 2013 to present (provide link to announcements).	• Narrative of efforts to promote zoning and building ordinances throughout the state. • Listing of communities enforcing building codes and zoning ordinances.
ND Department of Emergency Services, Division of Homeland Security	• Brief summary describing amount of Homeland Security grants ND has received and how they have equipped local and tribal governments to prepare and respond to a Homeland Security incident. • Copies of the Recovery and Response MAOPs. • Listing of types and numbers of incidents since 2013. • Most recent THIRA/SPR report. • Analysis of trends in incidents since 2013. • Obtain from U.S. Census Bureau and the Center for Social Research at NDSU, a listing of population statistics and projections to 2025. • Obtain ND housing unit statistics by county from the American Community Survey. • Obtain ND per capita personal income and poverty statistics from the American Community Survey.	• Brief summary describing amount of Homeland Security grants ND has received and how they have equipped local and tribal governments to prepare and respond to a Homeland Security incident. • Copies of the Recovery and Response MAOPs. • Listing of types and numbers of incidents since 2013. • Most recent THIRA/SPR report. • Analysis of trends in incidents since 2013. • Obtain from U.S. Census Bureau and the Center for Social Research at NDSU, a listing of population statistics and projections to 2025. • Obtain ND housing unit statistics by county from the American Community Survey. • Obtain ND per capita personal income and poverty statistics from the American Community Survey.

Agency/ Organization	Suggested Data Needs	Data Provided
	• Obtain ND social vulnerability to environmental hazards maps from the American Community Survey. • Obtain data for population change map from 2011 to present (U.S. Census Bureau). • Obtain data on total number of housing units from 2011 to present (U.S. Census Bureau and the Center for Social Research at NDSU). • Obtain data on new, privately-owned housing units and costs, 2017 building permits (U.S. Census Bureau). • Obtain data on new, privately-owned residential permits from 2013 to present (U.S. Census Bureau). • Update state and federal lands map. • Update state and federal ecologic areas map. • NDDES/FEMA Disaster costs since 1993-Present. • Listing of mitigation projects since 1998 and losses avoided. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • Presidential Disaster Declaration Request Letters. • Flood Presentations. • Summary of PA costs for flood incidents since 2013. • List of repetitive loss/severe repetitive loss properties. • List of flood mitigation measures and estimated losses avoided. • Listing of Tier II Facility Inventory with GIS coordinates. • Data on number of hazardous materials incidents for 2013-2017. • Obtain data from energy information administration regarding ND energy features and existing and planned oil refineries in ND. • Summary of PA costs for severe summer weather incidents since 2013. • Summary of PA costs for severe winter weather incidents since 2013. • Obtain data from Association of American Railroads for rail traffic originated and terminated in ND.	• Obtain ND social vulnerability to environmental hazards maps from the American Community Survey. • Obtain data for population change map from 2011 to present (U.S. Census Bureau). • Obtain data on total number of housing units from 2011 to present (U.S. Census Bureau and the Center for Social Research at NDSU). • Obtain data on new, privately-owned housing units and costs, 2017 building permits (U.S. Census Bureau). • Obtain data on new, privately-owned residential permits from 2013 to present (U.S. Census Bureau). • Update state and federal lands map. • Update state and federal ecologic areas map. • NDDES/FEMA Disaster costs since 1993-Present. • Listing of mitigation projects since 1998 and losses avoided. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. Presidential Disaster Declaration Request Letters. • Flood Presentations. • Summary of PA costs for flood incidents since 2013. • List of repetitive loss/severe repetitive loss properties. • List of flood mitigation measures and estimated losses avoided. • Listing of Tier II Facility Inventory with GIS coordinates. • Data on number of hazardous materials incidents for 2013-2017. • Obtain data from energy information administration regarding ND energy features and existing and planned oil refineries in ND. • Summary of PA costs for severe summer weather incidents since 2013. • Summary of PA costs for severe winter weather incidents since 2013. • Obtain data from Association of American Railroads for rail traffic originated and terminated in ND.

Agency/ Organization	Suggested Data Needs	Data Provided
	• Obtain data from Association of American Railroads for the miles of freight railroad operated listing in ND. • Obtain data from Association of American Railroads the rail line ownership in ND. • Wildland Fire FAQs. • State Emergency Operations Plan -- Fire Annex.	• Obtain data from Association of American Railroads for the miles of freight railroad operated listing in ND. • Obtain data from Association of American Railroads the rail line ownership in ND. • Wildland Fire FAQs. • State Emergency Operations Plan -- Fire Annex.
ND Department of Emergency Services, Division of State Radio	• Data related to number of communities/jurisdictions served by State Radio; recent updates to infrastructure; redundancy capabilities. • Information about interoperability initiatives.	• Data related to number of communities/jurisdictions served by State Radio; recent updates to infrastructure; redundancy capabilities. • Information about interoperability initiatives.
ND Department of Health	• Brief summary of NDDoH perspective on ND's vulnerability to biological and chemical attacks and strategies for mitigating those impacts. • Brief summary of public health resources to deal with biological and chemical threats. • Brief analysis of capacity of the state health care system to deal with biological and chemical threats. • Data on vulnerable populations in North Dakota. • Infectious Disease Outbreak -- Likelihood, Severity, Impact, Response, and Recovery -- 5 Year Outlook. • Draft Indicators analysis produced by the NDDoH to understand potential trends in infectious diseases. • Spreadsheet outlining potential for a pandemic based on various flu scenarios (including 1918 flu). • Brief summary of annual flu rates for the 2013-2014, 2015-2016, 2016-2017 season; and estimates for 2017-2018 season. • Listing of hospitals/trauma centers in ND by hospital and county. • Listing of all hospitals, by county, in ND. A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • What are the impacts on waste water and drinking water sources?	• Brief summary of NDDoH perspective on ND's vulnerability to biological and chemical attacks and strategies for mitigating those impacts. • Brief summary of public health resources to deal with biological and chemical threats. • Brief analysis of capacity of the state health care system to deal with biological and chemical threats. • Data on vulnerable populations in North Dakota. • Infectious Disease Outbreak -- Likelihood, Severity, Impact, Response, and Recovery -- 5 Year Outlook. • Draft Indicators analysis produced by the NDDoH to understand potential trends in infectious diseases. • Spreadsheet outlining potential for a pandemic based on various flu scenarios (including 1918 flu). • Brief summary of annual flu rates for the 2013-2014, 2015-2016, 2016-2017 season; and estimates for 2017-2018 season. • Listing of hospitals/trauma centers in ND by hospital and county. • Listing of all hospitals, by county, in ND. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • What are the impacts on waste water and drinking water sources?

Agency/ Organization	Suggested Data Needs	Data Provided
	• Environmental Incident Statistics for North Dakota since 2013 (spills/fires/releases). • Analysis of debris management needs in North Dakota (solid waste program statistics since 2013, numbers of licensed landfills, debris management training conducted since 2013). • Preliminary results and/or description of HazMat Flow Study. • Analysis of state laws and regulations related to hazardous materials. • A brief summary of concerns regarding oil production and public health risks. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents. • Data related to the need to expand our landfill capabilities. • Information on heat-related deaths or injuries due to heat within the last 10 years	• Environmental Incident Statistics for North Dakota since 2013 (spills/fires/releases). • Analysis of debris management needs in North Dakota (solid waste program statistics since 2013, numbers of licensed landfills, debris management training conducted since 2013). • Preliminary results and/or description of HazMat Flow Study. • Analysis of state laws and regulations related to hazardous materials. • A brief summary of concerns regarding oil production and public health risks. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents. • Data related to the need to expand our landfill capabilities. • Information on heat-related deaths or injuries due to heat within the last 10 years.
ND Department of Human Services	• Narrative regarding outreach efforts to help clients develop personal emergency preparedness plans. • Data on the numbers of vulnerable populations in North Dakota. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • Description of LiHEAP and numbers of enrolled North Dakotans.	• Narrative regarding outreach efforts to help clients develop personal emergency preparedness plans. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters.
ND Department of Mineral Resources	• Current Survey publications related to flooding in North Dakota. • Map of earthquakes in ND. • Data for a GIS layer of the landslide hazard area. • Information on earthquakes -- links, analysis, and presentations.	• Current Survey publications related to flooding in North Dakota[3]. • Map of earthquakes in ND.[4] • Information on oil and gas well drilling and well stimulation activities.[5] • Link to USACE strong motion seismometers.[6]

[3] https://www.dmr.nd.gov/ndgs//Publication_List/pdf/geoinv/GI_39.pdf

[4] http://earthquake.usgs.gov/earthquakes/states/north_dakota/history.php

[5] http://fracfocus.org/

[6] http://www.minotdailynews.com/page/content.detail/id/535976/Haiti-earthquake-recorded-in-North-Dakota.html.

Agency/ Organization	Suggested Data Needs	Data Provided
	• Information on oil and gas well drilling and well stimulation activities. • Information related to oil and gas well stimulation activities. • Link to energy released during the microseismic events associated with rock fracture propagation due to hydraulic fracturing. • Updated presentations of Bakken Growth. • List of SCADA System bonded operators. • Data provided regarding growth of industry.	• Information related to oil and gas well stimulation activities.[7] • Link to energy released during the microseismic events associated with rock fracture propagation due to hydraulic fracturing[8]. • Link to USACE strong motion seismometers.[9] • Landslide Program Inventory Mapping Presentation and links.[10]
ND Department of Public Instruction	• Listing of ND public school enrollments by county.	• Listing of ND public school enrollments by county.
ND Department of Transportation	• All vehicle and truck-only VMT for all counties from 2013 to present. • Data on transportation-related delays for trains and major highway from flood. • Data on number of state and federal highways that flooded in 2012 to 2017. • Scoured bridge listing. • Data of road closings that are under water. • Information on train delays since 2012. • Data on the number and amount of grade raises in the Devils Lake Basin. • Data demonstrating the amount of funding spent for dams (formerly Roads Acting as Dams). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • Hazardous Materials awareness course and statistics since 2013.	• All vehicle and truck-only Vehicle Miles of Travel (VMT) for all counties from 2013 to present. • Data on transportation-related delays for trains and major highway from flood. • Data on number of state and federal highways that flooded in 2012 to 2017. • Scoured bridge listing. • Data of road closings that are under water. • Costs associated with cleanup of debris following summer storms from 2012 to present. • Data related to closure of state and federal highway systems for 2013-2017. • Data related to the number of transportation related accidents since 2013. • Analysis of causes of transportation accidents to include data on accidents and injuries since 2013.

[7] https://www.dmr.nd.gov/OaGIMS/viewer.htm

[8] https://www.dmr.nd.gov/ndgs/newsletter/nlsummer2010/World's%20Largest%20Buried%20Microseismic%20Array.pdf

[9] http://www.minotdailynews.com/page/content.detail/id/535976/Haiti-earthquake-recorded-in-North-Dakota.html

[10] https://www.dmr.nd.gov/ndgs//landslides/ND100klandslide.asp and http://www.dot.nd.gov/divisions/materials/materials.htm

Agency/ Organization	Suggested Data Needs	Data Provided
	• Brief summary of projects underway to expand capacity in oil boom jurisdictions. • Costs associated with cleanup of debris following summer storms from 2012 to present. • Estimate of snow removal costs from 2013 to present for interstate and state systems. • Data related to closure of state and federal highway systems for 2013-2017. • Data related to the number of transportation related accidents since 2013. • Analysis of causes of transportation accidents to include data on accidents and injuries since 2013. • Analysis of traffic volume trends. • A brief summary on the increased traffic patterns resulting from the oil boom. • Data on railroad accidents charts since 2013 - documenting accident causes, numbers of incidents, etc. • Structurally deficient and functionally obsolete structures, by county listing. • A brief summary on aging infrastructure; repairs being made to upgrade across the state. • A brief summary of agency firefighting capabilities or training operators have received. • Data on fire-related road closures since 2013. • Data on fire responses since 2013.	• Data on railroad accidents charts since 2013 -- documenting accident causes, numbers of incidents, etc. • Structurally deficient and functionally obsolete structures, by county listing.
ND Facilities Management	• Policy for inclement weather. • Narrative on building security efforts (such as fire drills). • Data related to inclement weather-related closures since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • State buildings inventory, storage capacity, alternate locations, types/materials.	• Policy for inclement weather. • Narrative on building security efforts (such as fire drills). • Data related to inclement weather-related closures since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • State buildings inventory, storage capacity, alternate locations. types/materials.
ND Fire Chiefs Association	• Assessment regarding equipment, capability to respond to hazmat incidents	• No Data Provided

Agency/ Organization	Suggested Data Needs	Data Provided
ND Firefighters Association	• Assessment regarding equipment, capability to respond to hazmat incidents. • Needs Assessment survey of NDFA members (most current), applicable to both wildland and urban. • Needs Assessment prepared for the USDHS (applicable to both wildland and urban). • Status report on the Living Snow Fence Project; lack of funding for continuation, previous accomplishments. • Narrative on recent efforts to build capacity to address wildland fires.	• No Data Provided
ND Forest Service	• Status report on the Living Snow Fence Project; lack of funding for continuation; previous accomplishments. • Data on Wildfire occurrences since 2013. • Spring fire outlook reports and presentations (provided during FEMA wildland fire briefings) since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address wildland fires.	• Data on Wildfire occurrences since 2013.
ND Game and Fish Department	• Potential impacts due to recreational losses if a failure of one of their dams occurred. • Inventory of state regulated dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Burn summary activities since 2013 by district, date, legal description, acres, RX or WF, WMA/county and habitat. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address wildland fires.	• Inventory of state regulated dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • Burn summary activities since 2013 by district, date, legal description, acres, RX or WF, WMA/county and habitat. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address wildland fires.
ND Highway Patrol	• Data related to the number of transportation related accidents since 2013. • Analysis of traffic volume trends. • Number of personnel trained in traffic incident management. • A brief summary on the increased traffic patterns resulting from the oil boom.	• Data related to the number of transportation related accidents since 2013. • Analysis of traffic volume trends. • Number of personnel trained in traffic incident management. • A brief summary on aging infrastructure impacts troopers see as a public safety threat.

Agency/ Organization	Suggested Data Needs	Data Provided
	• A brief summary on aging infrastructure impacts troopers see as a public safety threat. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address transportation incidents.	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address transportation incidents.
ND Housing Finance Agency	• Updated ND statewide housing needs assessments. • Brief summary of housing concerns -- supply/demand -- in rapid growth areas.	• Updated ND statewide housing needs assessments.
ND Indian Affairs Commission	• Brief summary of impacts of the oil boom on tribal nations as it relates to expansion of land, influx of residents.	• No Data Provided
ND Information Technology Department (ITD)	• Analysis of cyber threats facing the state and the nation to include vulnerabilities and ways to mitigate impacts. • Update on cyber security planning and training since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Number of state agencies and local governments served by ITD.	• Analysis of cyber threats facing the state and the nation to include vulnerabilities and ways to mitigate impacts. • Update on cyber security planning and training since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Number of state agencies and local governments served by ITD.
ND Insurance Department and Insurance Reserve Fund	• Listing of critical facilities with geodata (FT BP list). Insurance Reserve Fund -- insurance value for properties by city and county for all insured (A11F&T property). • State owned and operated buildings listing by counties (building property value, personal property value, outdoor property value, trailer property value).	• No Data Provided
ND League of Cities	• A brief summary of members' concerns of growth and development related to the oil boom. • Data related to trends in populations moving into cities from rural areas.	• No Data Provided
ND National Guard	• Listing of National Guard armories and facilities by city. Data on NDNG hazmat concerns, efforts to mitigate impacts and recent incidents since 2013 (spill logbook). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents. • A brief summary of agency firefighting capabilities or training operators have received.	• No Data Provided

Agency/ Organization	Suggested Data Needs	Data Provided
	• Data on fire responses during the past 10 years.	
ND National Guard, 81st Civil Support Team	• Brief summary of capacity to deal with a Homeland Security incident; overview of CST, training, capabilities. • Data on responses in the state for hazmat releases. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents.	• Brief summary of capacity to deal with a Homeland Security incident; overview of CST, training, capabilities.
ND Office of the Tax Commissioner	• Analysis of tax revenues since 2013. • Gross value of oil production analysis since 2013 for oil extraction tax, gross production tax, sales tax, and individual income tax.	• Analysis of tax revenues since 2013. • Gross value of oil production analysis since 2013 for oil extraction tax, gross production tax, sales tax and individual income tax.
ND Parks and Recreation Department	• A brief summary of past and potential flood impacts since 2012 on ND parks -- including numbers and locations of parks. • What are the annual costs associated with cleanup after summer storm events, park closings or issues with power lines & facilities being affected? • A brief summary of burn activities since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address wildland fires.	• No Data Provided
ND Peace Officer Standards and Training	• A brief analysis of trends in licensure and training related to our state's oil and gas production since 2013.	• A brief analysis of trends in licensure and training related to our state's oil and gas production since 2013.
ND Petroleum Council	• Data analyzing trends in the oil and gas industry since 2013; links to council publications.	• No Data Provided
ND Planning Association	• Data analyzing land use trends in North Dakota during the past 10 years.	• No Data Provided
ND Safety Council	• A brief summary of changes in demand for training and the types of training provided during the past 10 years. • Number of work related deaths and injuries since 2013. • Numbers of participants in safety training since 2013. • Data related to oilfield injuries and fatalities since 2013 (may need to reference OSHA).	• A brief summary of changes in demand for training and the types of training provided during the past 10 years. • Number of work related deaths and injuries since 2013. • Numbers of participants in safety training since 2013. • Data related to oilfield injuries and fatalities since 2013 (may need to reference OSHA).

Agency/ Organization	Suggested Data Needs	Data Provided
ND State Electrical Board	• Summary of services provided by the State Electrical Board; weather related data regarding restoration.	• Summary of services provided by the State Electrical Board; weather related data regarding restoration.
ND State Fire Marshal's Office	• Current number of fire departments in the state. • Number and location of fire departments with capabilities to address a hazardous materials incident. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address hazmat incidents. • Update of the North Dakota Fire Statistics from 2013 to current for total number of fire incidents, estimated losses, structural fires, vehicle fires, wildland fires and fatalities. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address urban fire/structural collapse. • Data for Number of fire Incidents from 2010 to current.	• No Data Provided
ND State University Extension Service	• Brief summary of programs leveraged to assist drought-impacted communities. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Brief summary of efforts since 2012 to assist flood-impacted communities. • Summary of educational programs to help with flooding. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood. • A brief analysis of major crop and pest concerns since 2013. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • Data regarding crop damage or insurance claims relating to summer storms. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe summer weather.	• Brief summary of programs leveraged to assist drought-impacted communities. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. Brief summary of efforts since 2012 to assist flood-impacted communities. • Summary of educational programs to help with flooding. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood. • A brief analysis of major crop and pest concerns since 2013.Link to NDSU Crop and Pest Report.[11] • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • Data regarding crop damage or insurance claims relating to summer storms.

[11] https://www.ag.ndsu.edu/cpr

Agency/ Organization	Suggested Data Needs	Data Provided
		• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe summer weather.
ND State University State Climatologist	• Long-term climate change analysis. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address natural hazards. • A summary of the extent and impact of drought in ND during the past five years and potential for 2018. • Projections for continuation of drought conditions. • Climate trends state of ND seasonal/annual. • Climate trends state of ND seasonal/annual. • Numbers of occurrences of wind storms and estimated damages during the past 10 years.	• Long-term climate change analysis. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address natural hazards. • A summary of the extent and impact of drought in ND during the past five years and potential for 2018. • Projections for continuation of drought conditions. • Climate trends state of ND seasonal/annual. • Climate trends state of ND seasonal/annual. • Numbers of occurrences of wind storms and estimated damages during the past 10 years.
ND State Water Commission	• Analysis of the Dam Safety Program Update to include: yearly number of inspections, Emergency Action Plans, incidents during the 2013-2018 time frame and concerns. • Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • Listing of high hazard dams. Map of high hazard dams. • Listing of medium hazard dams. • Map of medium hazard dams. • Current North Dakota Dam Design Safety Handbook. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Analysis of surface water supply shortages during the past 5 years (stream flow data) -- list of jurisdictions, summary of impacts. • Link to drought index. • Updated list of largest water users. • Information on the Weather Modification system. • Current active water permits (cumulative count chart and active water permit maps).	• Analysis of the Dam Safety Program Update to include: yearly number of inspections, Emergency Action Plans, incidents during the 2013-2018 time frame and concerns. • Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • Listing of high hazard dams. • Map of high hazard dams. • Listing of medium hazard dams. • Map of medium hazard dams. • Update on North Dakota Dam Design Safety Handbook. • Updated list of largest water users. • Information on the Weather Modification system. • Current active water permits (cumulative count chart and active water permit maps). • Charts of water permit applications in the water permit database. • Consumptive water use chart, by permitted use type. • Active water system charts. • Reports related to Devils Lake flooding -- including land lost to flooding, lake levels since 2012 and update on outlet projects.

Agency/ Organization	Suggested Data Needs	Data Provided
	• Charts of water permit applications in the water permit database. • Consumptive water use chart, by permitted use type. • Active water system charts. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • FEMA mid-term levee inventory geodatabase. • Reports related to Devils Lake flooding -- including land lost to flooding, lake levels since 2012 and update on outlet projects. • Flood related Reports since 2013, by river basin. • Update on Mouse River projects -- brief overview of projects and status. • Summary of property acquisition projects. • CRS Status -- current participating jurisdiction listing. • CRS Insurance Savings report. • NFIP Policy and Loss Statistics since 2013 (changes in program, impacts in ND). • Communities participating in NFIP. • NFIP Insurance report total claims paid, from 1978 to present. • Link to SWC map service. • Preliminary DFIRM data. • Analysis of Silver Jackets program status and mitigation efforts since 2013. • Copies, if relevant, of Silver Jackets presentations. • Silver Jackets charter. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Data from ARB/SWC on severe summer weather as it relates to hail and heavy rainfall. • Description of the precipitation observing network across the state numbering over 600 volunteers. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address severe summer weather.	• Flood related Reports since 2013, by river basin. • Update on Mouse River projects -- brief overview of projects and status. • Summary of property acquisition projects. • CRS Status -- current participating jurisdiction listing. • CRS Insurance Savings report. • NFIP Policy and Loss Statistics since 2013 (changes in program, impacts in ND). • Communities participating in NFIP. • NFIP Insurance report total claims paid, from 1978 to present. • Analysis of Silver Jackets program status and mitigation efforts since 2013. • Copies, if relevant, of Silver Jackets presentations. • Silver Jackets charter. • Data from ARB/SWC on severe summer weather as it relates to hail and heavy rainfall. • Description of the precipitation observing network across the state numbering over 600 volunteers.

Agency/ Organization	Suggested Data Needs	Data Provided
ND Stockmen's Association	• Brief summary of concerns Stockmen's Association has regarding infectious diseases and past impacts to producers. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases. • Listing of concerns that producers face during drought conditions (how have they addressed limited water supplies in the past). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Number of accidents involving livestock in the last 5 years (deaths, injuries, and illnesses).	• No Data Provided
ND Township Officers Association	• Brief summary of flooding concerns experienced by Townships. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood.	• No Data Provided
ND University System	• Listing of Universities and enrollment numbers.	• Listing of Universities and enrollment numbers.
ND Voluntary Agencies Active in Disaster	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters. • Summary of disaster-related assistance provided from 2012 to present.	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address disasters.
ND Workforce Safety and Insurance	• Cause of injury detail report for claims filed between 7/1/2013 and 6/30/2017 (burn or scald heat, or cold exposure; caught in or between; cut, puncture, scrape or injured by; fall or slip injury; miscellaneous causes; motor vehicle; rubbed or abraded by; strain or injury by; striking against or stepping on; struck or injured by; unknown). • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address workplace incidents. • Data related to the number of oil field-related deaths and injuries since 2013. • Oil and gas production data (petroleum payroll/claims and petroleum reported employees/claims since 2013). • Number of transportation-related injuries and deaths since 2013.	• Cause of injury detail report for claims filed between 7/1/2013 and 6/30/2017 (burn or scald heat, or cold exposure; caught in or between; cut, puncture, scrape or injured by; fall or slip injury; miscellaneous causes; motor vehicle; rubbed or abraded by; strain or injury by; striking against or stepping on; struck or injured by; unknown). • Data related to the number of oil field-related deaths and injuries since 2013. • Oil and gas production data (petroleum payroll/claims and petroleum reported employees/claims since 2013). • Number of transportation-related injuries and deaths since 2013.

Agency/ Organization	Suggested Data Needs	Data Provided
Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	• Chart/narrative and pictures of mitigation projects (line burials). • Brief summary of power outage frequency and duration. • Brief summary of capacity and capabilities. Population served, demographics of population. How many lines/miles of lines. General locations.	• Chart/narrative and pictures of mitigation projects (line burials). • Brief summary of power outage frequency and duration. • Brief summary of capacity and capabilities. Population served, demographics of population. How many lines/miles of lines. General locations.
State and Local Intelligence Center	• Provide an updated brief overview of the SLIC -- mission, executive order, organizational overview, definitions of hate and terrorist organizations, use of information in communications and number of incidents deterred since 2013. • Update description of the types of Domestic Hate and Terrorism Organization and Movements. • Update listing of Homeland Security incidents reported in ND since 2013. • Provide updates to Probability and Magnitude Section. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address adversarial threats. • Summary of CI/KR efforts since 2013 to assist private and public partners with security concerns. • Listing of critical infrastructure by county by 7 critical sectors (food/ag, energy, public health, transportation, emergency services, communications, water). • HSA's priorities for 18 critical infrastructure sectors	• Provide an updated brief overview of the SLIC -- mission, executive order, organizational overview, definitions of hate and terrorist organizations, use of information in communications and number of incidents deterred since 2013. • Update description of the types of Domestic Hate and Terrorism Organization and Movements. • Update listing of Homeland Security incidents reported in ND since 2013. • Provide updates to Probability and Magnitude Section. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address adversarial threats. • Summary of CI/KR efforts since 2013 to assist private and public partners with security concerns. • Listing of critical infrastructure by county by 7 critical sectors (food/ag, energy, public health, transportation, emergency services, communications, water). • HSA's priorities for 18 critical infrastructure sectors
State Historical Society of North Dakota	• Listing of historic places that are officially listed in the National Register of Historic Places, in the State Historic Register, or is a State Historic Site (owned by the State Historical Society).	• Listing of historic places that are officially listed in the National Register of Historic Places, in the State Historic Register, or is a State Historic Site (owned by the State Historical Society).
University of Mary	• No Data Suggested	• University of Mary Slope Stability Evaluation Final Report
University of North Dakota, Environmental Research Center for Oil and Gas	• Data on trends and issues related to the state's oil production	• Data on trends and issues related to the state's oil production

Agency/ Organization	Suggested Data Needs	Data Provided
US Army Corps of Engineers	• List of levee failure/overtopping incidents in ND during 2013-2018. • USACE Levee Safety Program levees. • National Inventory of Dams - http://nid.usace.army.mil (password required). • Status report from the St. Paul District on Devils Lake embankment projects • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure • Data from St. Paul District on technical, resource assistance for ND floods during the past 10 years • Data from the Omaha District on technical, resource assistance for ND floods during the past 10 years • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood.	• List of levee failure/overtopping incidents in ND during 2013-2018 • USACE Levee Safety Program levees • National Inventory of Dams - http://nid.usace.army.mil (password required). - Status report from the St. Paul District on Devils Lake embankment projects • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Data from St. Paul District on technical, resource assistance for ND floods during the past 10 years. • Data from the Omaha District on technical, resource assistance for ND floods during the past 10 years. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood.
US Bureau of Indian Affairs	• Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure	• No Data Provided
US Bureau of Reclamation	• Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Data on the impact of drought conditions of low reservoir levels and their impacts during the last 5 years. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Copies of agency reports for flooding - 2012-2017. • Summaries of projects since 2013 to improve water intake systems. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address flood.	• Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address drought. • Summaries of projects since 2013 to improve water intake systems
US Department of	• Review/expand listing of threat groups in ND. • Provide data on number of CI/KR visits since 2013	• No Data Provided

Agency/ Organization	Suggested Data Needs	Data Provided
Homeland Security		
US Forest Service	• A brief summary of fires that have occurred on federal lands from 2013 to current including cost, magnitude. • Wildland Urban Interface and Inter Mix Sites Map data. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address wildland fires.	• No Data Provided
US Geological Survey	• Listing of ND land cover. • Listing of land classification. • Description of trigger for drought concerns when monitoring stream flows data. • Brief summary of agency's interpretation of state's drought conditions and continued trend. • Agency reports related to ND flooding since 2012 and forecasted trends. • Data on Devils Lake trends during the past 5 years. • Data related to our state's risk for landslides and earthquakes.	• Listing of ND land cover. • Listing of land classification. • Description of trigger for drought concerns when monitoring stream flows data. • Brief summary of agency's interpretation of state's drought conditions and continued trend. • Agency reports related to ND flooding since 2012 and forecasted trends. • Data on Devils Lake trends during the past 5 years. • Data related to our state's risk for landslides and earthquakes.
US Natural Resources Conservation Services	• - Inventory of dams including the hazard class (high, significant, and low) and if there is an Emergency Action Plan (EAP) for each of the dams. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Brief summary of activities by the Emergency Watershed Program that has been implemented for flooding. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure. • Brief summary of activities by the Emergency Watershed Program that has been implemented for flooding. • A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address dam failure
US Department of Agriculture Animal Plant and Health Inspection Services	• A list of the top 5 plant and disease issues for ND that have the potential of causing major disruptions in agriculture production/exports or significant damage to native plant communities and associated wildlife. Previous listing included brief summations of the following: name of disease: background; impact and regulation; link to PPQ website; and subject matter experts and stakeholders. • A brief summary regarding efforts to eliminate the threat of disease (DAPL protest firewood precautions).	• A list of the top 5 plant and disease issues for ND that have the potential of causing major disruptions in agriculture production/exports or significant damage to native plant communities and associated wildlife. Previous listing included brief summations of the following: name of disease: background; impact and regulation; link to PPQ website; and subject matter experts and stakeholders. • A brief summary regarding efforts to eliminate the threat of disease (DAPL protest firewood precautions).

Agency/ Organization	Suggested Data Needs	Data Provided
	• A list of capabilities and resources (technical/staffing, financial/programmatic and material) to address infectious diseases	
Western Dakota Energy Association	• No data suggested	• Research about oil-related impacts, growth projections, and future needs

7.2.4 Outreach

7.2.4.1 Outreach Strategy

This outreach strategy was created at the onset of this planning process to outline a menu of outreach tactics and options. This strategy originally included an option to build out an advanced website for NDDES through the augmentation of the scope of services. This website was subsequently not pursued and therefore the final outreach strategy included below has been amended to remove this option.

OUTREACH STRATEGY

Enhanced Mitigation Mission Area Operations Plan

Ensuring a safe and secure homeland for all North Dakotans

Table of Contents

Background

In January 2018 the State of North Dakota initiated the 2018 Standard State Mitigation Mission Area Operations Plan (MAOP) Update process, in collaboration with Hagerty Consulting, Inc. (Hagerty) and the Mission Area Operations Plan (MAOP). In line with federal regulations for plan update process, the state will engage in public engagement and outreach to inform the plan.

North Dakota may choose a number of paths to meet the intent of the Federal Emergency Management Agency regulations related to enhanced mitigation planning processes, however successful outreach has been defined as those that have the following characteristics[1]:

- Informs and educates about hazards and risks
- Invites interested parties to contribute their views and ideas for mitigation
- Identifies conflicts and incorporates different perspectives and priorities early in the process
- Provides data and information that improves overall quality and accuracy of the plan
- Ensures transparency and builds trust
- Maximizes opportunities for implementation through greater consensus and acceptance

The following pages identify a communication strategy with specific goals and tactics identified that meet both the intent of the regulation, and the vision for successful outreach.

Strategy

The Outreach Strategy will be achieved by four general goals and specific tactics during the planning process for the HMP Update.

Figure 1: Outreach Strategy Goals and Tactics

Tactic 1: Continue community outreach to previously identified organizations

Tactic 2: Leverage existing "cohorts" and stakeholder/ public engagement activities

Tactic 3: Ensure meeting materials and plan elements are available for stakeholder and public review

Tactic 4: Generate awareness and engagement through social media, email distribution, newsletters and "coffee breaks"

Tactic 5: Document outreach activities

Outreach Tactics

[1] Center for Sustainable Community Design within the Institute for the Environment at the University of North Carolina at Chapel Hill and the Institute for Sustainable Coastal Communities at Texas A&M University

Tactic 1: Outreach to critical partners

- The Hagerty Team will coordinate with the Technical Advisory Committee (TAC) to engage with the full State Hazard Mitigation Team (SHMT).
- Hagerty will coordinate with the TAC to identify additional stakeholders to involve in the SHMT. The identified members of the SHMT are listed in Attachment A. The identified organizations represent all of the types of organizations. FEMA encourages engagement with during the planning process[2]:
  - Emergency Management
  - Economic Development
  - Land Use and Development
  - Housing
  - Health and Social Services
  - Infrastructure
  - Natural and Cultural Resources
- Data provided by partners will be used to inform the state's Threat and Hazard Identification and Risk Assessment (THIRA) process. The planning process also takes into account the 32 core capabilities identified in the National Preparedness Goal: https://www.fema.gov/core-capabilities.

Tactic 2: Leverage existing planning committees and stakeholder/ public engagement activities

- Within the emergency management structure, North Dakota has identified working groups arranged around planning areas as well as all natural and technological hazards and adversarial threats relating to the Mitigation MAOP.
  - Actions:
    - **NDDES:** Notify sub group representatives of Mitigation MAOP planning process
    - **Hagerty:** Provide planning guidance to committees
- Additional Stakeholder groups meetings and community meetings may meet on regular intervals, allowing for a natural placement to provide engagement opportunities on the Mitigation MAOP. Leveraging pre-existing events / meetings allows for a coordinated planning approach.
  - Actions:
    - **NDDES:** Identify potential opportunities for public engagement coordination
- A stakeholder meeting calendar will be developed to codify the in-person outreach strategy. In-person meetings will occur according to the calendar.
  - Actions:
    - **Hagerty:** Draft calendar
    - **NDDES:** Approve and advertise calendar

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[2] State Mitigation Planning Key Topics Bulletins: Planning Process, July 2016, https://www.fema.gov/media-library-data/1468867403587-36535211c7c892fb7b1956e961d05a49/PlanningProcess_KeyTopics_Bulletin_508.pdf

Tactic 3: Ensure meeting materials and plan elements are available for stakeholder and public review

» FEMA requires all mitigation plans to be a publicly available resource. Because of this, the entire 2018 HMP Update was made available through the NDDES website for stakeholder and public review.
  - Web Presence Actions:
    - **Hagerty:** Draft web content copy
    - **Hagerty:** Provide draft documentation for upload
    - **NDDES:** Upload copy and documentation

» Conduct in-person meetings to gather information and validate findings for each of the elements being updated during the planning process, including: hazard analysis and risk assessment, mitigation strategy development, and draft plan review.
  - Actions:
    - **Hagerty:** Develop meeting materials

Tactic 4: Generate awareness and engagement through social media, email distribution, newsletters and "community coffees"

» Draft and deliver pre-scripted social media messages regarding the planning process at appropriate intervals during the project. **Screen shot and different sections of newsletter.**
  - Actions:
    - **Hagerty:** Draft messaging
    - **NDDES:** Deliver messaging

» Draft and deliver pre-scripted email messages to stakeholders and identified stakeholder groups.

» Work with identified stakeholder groups to facilitate "community coffees" with interested public and private parties to ensure adequate coverage. See Attachment B for full Community Coffee Plan.
  - Actions:
    - **Hagerty:** Draft materials
    - **NDDES:** Deliver meetings

» Draft and deliver monthly SHMT newsletters providing an update on the process and upcoming planning expectations. Stakeholders may be encouraged to sign-up for this Newsletter distribution as possible through technological advancements made through efforts in Tactic 5.
  - Actions:
    - **Hagerty:** Draft and deliver newsletter
    - **NDDES:** Approve draft content

Example Newsletter excerpt:

Alabama State
Hazard Mitigation Plan
Monthly Newsletter

April 2018

Welcome to the latest issue of the ***Alabama State Hazard Mitigation Plan Monthly Newsletter***, an e-publication that curates news about the development of the plan, innovations in mitigation, and opportunities to get involved!

The Latest: Turning Attention to Mitigation Strategies

During the first few months of the year, the Planning Team built hazard profiles for each of the thirteen hazards facing Alabama, culminating in the Risk Assessment Meeting last month in Clanton. As the Planning Team incorporates revisions and adds the finishing touches to these hazard profiles, the project moves into the next phase: mitigation strategy assessment and development. **As you**

Tactic 5: Document outreach activities

- Capture all meeting materials and record planning activities in the HMP document. Upload meeting materials and planning announcements on website, as described in Tactic 3.
  - Actions:
    - **Hagerty:** Capture outreach activities within the Mitigation MAOP according to federal guidance and requirements
- Develop ongoing outreach strategy for the Plan Maintenance portion of the Mitigation MAOP.
  - Actions:
    - **Hagerty:** Capture strategy and incorporate into Plan Maintenance
    - **NDDES:** Develop ongoing outreach strategy

Attachment A: Identified Partners

Organization	Point of Contact	Type of Organization
American Red Cross	Christine Cherry	Health and Social Services
Burleigh County	Mary Senger	Emergency Management, Infrastructure, Housing
City of Bismark	Gary Stockert	Emergency Management, Infrastructure, Housing
City of West Fargo	Pierre Freeman	Infrastructure, Emergency Management, Housing
Division of Facilities Management	Jon Boyle	Infrastructure
Dunn County Planning and Zoning	Sandy Rohde	Land Use and Development,
Federal Highway Administration	David E. Ferrell, P.E	Infrastructure
Foster County	Jess Earle	Infrastructure, Emergency Management, Housing
Greater North Dakota Chamber	Brent Bogar	Economic Development, Land Use and Development
Job Service North Dakota	Darren Brostrum	Economic Development, Health and Social Services, Land Use and Development
LaMoure County Emergency Management	Kimberly Robbins	Emergency Management, Housing
Logan County	Daniel Schwartz	Emergency Management, Infrastructure, Housing
Lutheran Social Service Disaster Response	Shirley Dykshoorn	Emergency Management, Housing
Missouri Valley Coalition of Homeless People	Jeannie Messall	Housing, Health and Social Services
Mouse River Fire Fighters Association	Amanda Schooling	Emergency Management
Natural Resources Conservation Service	Christi Fisher	Natural and Cultural Resources, Infrastructure. Land Use and Management
National Weather Service	Corey King	Emergency Management
ND Aeronautics Commission	Lydia Wiff	Infrastructure
ND Association of Counties	Terry Traynor	Emergency Management, Land Use and Development

Organization	Point of Contact	Type of Organization
ND Association of Oil and Gas Producing Counties & ND Coal Conversion Counties Association	Vicky Steiner	Natural and Cultural Resources, Infrastructure, Land Use and Development
ND Association of Rural Electric Cooperatives	Paul Davis	Infrastructure
NDDES, Division of Homeland Security	Kathleen Donahue	Emergency Management
NDDES State and Local Intelligence Center	Kirk Hagel	Infrastructure
NDDES	Gary Simmons	Emergency Management, Infrastructure, Land Use and Development
NDDoH	Curt Erickson	Infrastructure, Emergency Management, Land Use and Development
ND Bureau of Criminal Investigation	Ben Leingang	Emergency Management
ND Center for Persons with Disabilities	Kari Schmidt	Health and Social Services
ND Community Foundation	Kevin Dvorak	Health and Social Services, Housing
ND Division of Animal Health	Dr. Susan Keller	Natural and Cultural Resources
ND Department of Agriculture	Kent Theurer	Land Use and Development
ND Department of Commerce	Adele Sigl	Economic Development, Land Use and Development
ND Department of Energy Services, HS Division		Infrastructure
ND Department of Emergency Services, Division of State Radio	Mike Lynk	Emergency Management
ND Department of Health	L. David Glatt	Health and Social Services
ND Department of Human Services	Russ Korzeniewski	Health and Social Services, Housing
ND Department of Mineral Resources	Fred Anderson	Natural and Cultural Services, Land Use and Development
ND Department of Public Instruction	Valerie Fischer	Health and Social Services
ND Department of Transportation	Brad Darr	Infrastructure
ND Emergency Management Association	Amanda Schooling	Emergency Management

Organization	Point of Contact	Type of Organization
ND Facilities Management	Jon Boyle	Infrastructure
ND Fire Chiefs Association	Joel Boespflug	Emergency Management
ND Fire Fighters Association	Rob Knuth	Emergency Management
ND Fire Marshal	Ken Sisk	Emergency Management
ND Forest Service	Ryan Melin	Natural and Cultural Resources, land use and management
ND Game and Fish Department	Bob Timian	Natural and Cultural Resources
ND Highway Patrol	Patrick Hudson	Infrastructure
ND Housing Finance Agency	Jolene Kline	Economic Development, Housing
ND Indian Affairs Commission	Todd Hauge	All
ND Insurance Department	Jeff Bitz	Economic Development
ND Information Technology Department	Sean Wiese	Infrastructure
ND League of Cities	Blake Crosby	Infrastructure, Economic Development
ND State Electrical Board	James Schmidt	Infrastructure
ND State University Extension Office	Becky Koch	Land Use and Development
ND Safety Council	John Woutat	Emergency Management
ND State Water Commission	Laura Ackerman	Emergency Management, Infrastructure, Land Use and Management
ND Stockman's Association	Stan Misek	Natural and Cultural Resources
ND National Guard	CAPT Robert Peleschak	Infrastructure, Emergency Management
ND National Guard, 81st Civil Support Team	LTC Lila Teunissen	Emergency Management, Infrastructure
ND Petroleum Council	Ron Ness	Natural and Cultural Resources
ND Peace Officer Standards and Training Board	Duane Stanley	Infrastructure, Emergency Management
ND Parks and Recreation Department	Jason Johnston	Natural and Cultural Resources, Health and Social Services, Land Use and Development

Organization	Point of Contact	Type of Organization
North Dakota Township Officers Association	Larry Syverson	Infrastructure, Land Use and Development
Natural Resources Conservation Service	Christi Fisher	Natural and Cultural Resources, Land Use and Development
Office of Tax Commissioner	Ryan Rauschenberfer	Economic Development, Infrastructure
Pembina County	Andrew Kirking	Emergency Management, Infrastructure, Housing
Standing Rock Bureau of Indian Affairs	James Condon	All
State Historical Society of North Dakota	Lorna Meidinger	Natural and Cultural Resources
State and Local Intelligence Center (Bureau of Criminal Investigation)	Ben Leingang	Infrastructure
Supervisory Hydrologist	Steve Robinson	Natural and Cultural Resources
State Water Commission	Laura Ackerman	Emergency Management, Land Use and Development
U.S. Army Corps of Engineers	Teri Alberico	Infrastructure, Emergency Management, Natural and Cultural Resources, Land Use and Development
U.S. Animal Plant and Health Inspection Services	David Hirsch	Natural and Cultural Resources, Health and Social Services
U.S. Department of Agriculture, Rural Development	Mark Wax	Natural and Cultural Resources, Land Use and Development
U.S. Department of Homeland Security	Don Ronsberg	Infrastructure
U.S. Bureau of Reclamation	Randy Ehlis	Infrastructure
U.S. Department of Mineral Resources	Fred Anderson	Natural and Cultural Resources
U.S. Geological Survey	Steve Robinson	Natural and Cultural Resources, Land Use and Development
University of Mary	Carla Reinbold	Emergency Management, Natural and Cultural Resources
University of North Dakota, Environmental Research Center for Oil and Gas	Bethany Kurz	Natural and Cultural Resources
Walmart North Bismark	Tim Morris	Economic Development

Organization	Point of Contact	Type of Organization
Ward County	Amanda Schooling	Emergency Management, Infrastructure
Workforce Safety and Insurance	Ryan Maddock	Economic Development, Health and Social Services

Attachment B: Coffee Break Plan

Strategy

The Outreach Strategy will be achieved by the four previously mentioned general goals and specific tactics during the planning process for the Mitigation MAOP. The goal for direction engagement is to facilitate six (6) Stakeholder and public meetings to be conducted during the month of July 2018 throughout the state. To ensure comprehensive outreach, these in-person meetings may be held in various regions state-wide.

- Draft and deliver pre-scripted email invitations to stakeholders and identified stakeholder groups to join in-person "coffee breaks" with in the community.
    - **Hagerty:** Draft messaging
    - **NDDES:** Deliver messaging
- Work with identified stakeholder groups to facilitate "coffee breaks" with interested public and private parties to ensure adequate coverage.
    - Actions:
        - **Hagerty:** Draft meeting materials
        - **NDDES:** Identify locations
        - **NDDES:** Provide representation during facilitated "coffee breaks"

Proposed Coffee Break Meeting Timeline

- Proposed time line: 1.5 hours
    - 5 minutes: Introductions and housekeeping
    - 30 minutes: Overview of NDDES Hazard Mitigation project
    - 30 minutes: facilitated survey
    - 20 Minutes: Q &A
    - 5 minutes: Thank you and contact for further information

Proposed Coffee Break Meeting Agenda

- Welcome
- Overview of Hazard Mitigation Plan
- Review of previous activities taken by the State
- Review of previous activities regarding current and enhanced mitigation efforts
- Facilitated Survey with immediate feedback captured
- What this means for you and future opportunities
- Questions?
- Thank you and contact information

Proposed Coffee Break Meeting Survey Questions

- Based on the information you have seen today, what hazards (e.g. floods, storms, hazardous materials, transportation) have impacted you the most? Both in terms of frequency and severity.
- How have these hazards impacted you? (e.g. home flooded and cost X amount of dollars to repair)
- What has caused the greatest risk to these hazards? (e.g. for a flood, residing in a low-lying area, or flood plain).
- What actions have you taken, or seen been taken that have reduced the impact or frequency of the above-mentioned hazards? (e.g. raising a home that was in a flood plain)

- What ideas do you have or have you heard that you would like to see be taken to reduce the impact or frequency of the above mentioned-hazards? (e.g. change land use laws to prevent building in floods plains).

7.2.4.2 Newsletters

June 2018

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NORTH DAKOTA Mitigates

North Dakota State Enhanced Mitigation Mission Area Operations Plan Monthly Newsletter

June 2018

Welcome to the first issue of the ***North Dakota State Hazard Mitigation Plan Monthly Newsletter***, an e-publication that curates news about the development of the plan, innovations in mitigation, and opportunities to get involved!

The Latest: Tackling the Risk Assessment

As summer approaches, the Planning Team is in high gear, preparing the risk assessment for the Plan Update and looking ahead to begin brainstorming for the rest of the plan. The assessment is critical for the development of the rest of the plan, as it will provide detailed information about the risks and vulnerabilities associated with each hazard that the State Hazard Mitigation Team will consider when identifying mitigation actions to reduce these risks.

Hazard Overview: Take a Peek Inside the Risk Assessment

Many people would be surprised to discover the number of hazards discussed in the North Dakota Hazard Mitigation Plan. The Planning Team is profiling 16 different hazards, identifying the location, extent, and probability of these identified hazards.

There are three different types of hazards: **Natural Hazards**, **Technological Hazards**, and **Adversarial Threats**.

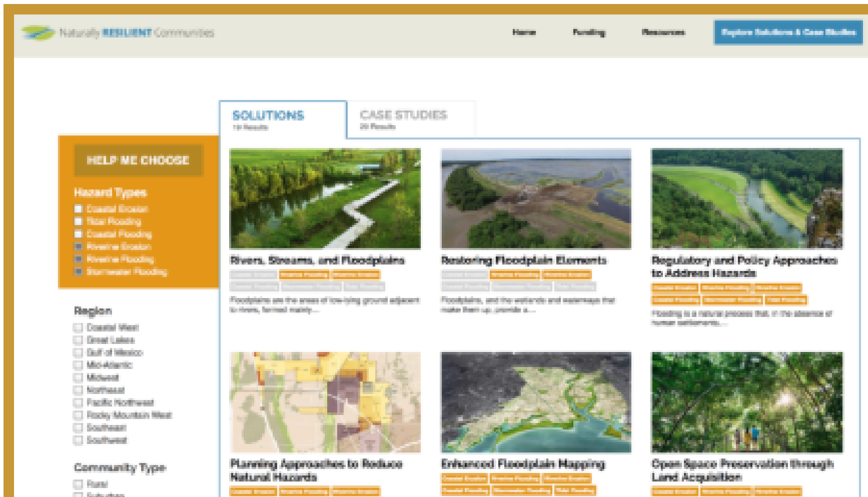
Natural Hazards	Technological Hazards	Adversarial Threats
Drought	Dam Failure	Chemical, Biological, and Radiological Attack
Fire	Hazardous Materials Release	Cyber Attack
Flood	Transportation Incident	Civil Disturbance
Geologic		Nuclear Attack
Infectious Diseases		Terrorism
Severe Summer Weather		
Severe Winter Weather		
Space Weather		

Mitigation in the News: New Tools to Identify Sustainable Mitigation Solutions

Naturally Resilient Communities is **an interactive tool** featuring 30 case studies of places that rely on nature-based solutions to protect themselves against storm-related hazards.

The tool prompts users to select a hazard their city faces as well as their region, community type (urban, suburban, or rural), and desired scale and cost of a project. Then, a menu pops up listing relevant mitigation efforts around natural infrastructure, such as green streets that reduce the flow of stormwater and wetland habitats that combat flooding.

Naturally Resilient Communities also features **a webpage that outlines funding options** that cities can explore to support these innovative strategies!



Naturally Resilient Communities provides planners a tool to customize mitigation solutions to the needs of their own community.

North Dakota Mitigates: Tackling the Challenge of Devils Lake

It's no secret that the flooding at Devils Lake is a major challenge for mitigation professionals. Devils Lake, North Dakota's largest natural lake, entered its 24th straight year of flooding as of Fall 2017 and has required an investment of up to $1.58 billion in federal, state, local, and private resources to mitigate flood impacts on nearby communities.

What have these investments gone towards? There have been some major successes in working towards mitigating the effects of the flooding around devils lake. Efforts have included:

- Devils Lake Embankment System (United States Army Corps of Engineers (USACE))
- Aquisitions
- Roads Acting as Dams (North Dakota Department of Transportation, Federal Highway Administration, North Dakota National Guard, Spirit Lake Nation, USACE, and the State Water Commission)
- Assistance to Individuals (Federal Emergency Management Agency (FEMA))
- Public Assistance (FEMA)
- Raised Tribal Roads (Central Federal Lands Highway Division and Bureau of Indian Affairs)
- Devils Lake Outlets (State of North Dakota)
- Tolna Coulee Control Structure (State of North Dakota and USACE)
- Upper Basin Water Management Support to Agricultural Producers (National Resources Conservation Service and Farm Service Agency)
- Enhance Hydrologic Prediction (National Weather Service and United States Geologic Survey)
- Restoration of Wetlands and Grasslands (United States Fish and Wildlife Service)
- Community Development (United States Department of Housing and Urban Development)

While flood waters remain high, Statewide efforts to mitigate the effects of the rising lake water continue to prevent the worst of the effects.

Flooded, abandoned structure. (Johnson, Paul. "Devils Lake North Dakota Barn." *Passion Passport*, September 11, 2015, http://passionpassport.com/photo-essay-devils-lake-north-dakota/.)

Looking Ahead: Upcoming Events

July

25

The Planning Team will host a **Risk Assessment Review and Mitigation Opportunities Meeting** on Wednesday, July 25, 2018 from 1:00 pm - 4:30 pm at the State Capitol Brynhild Haugland Room (600 E Boulevard Ave, Bismarck, ND). At this meeting, you will be invited to **provide feedback on the current risk assessment** and to help **identify potential mitigation actions!** You can register to attend this meeting **here** or by clicking on the link in the invite you received via email.

Get Involved

The Planning Team welcomes your input! If you would like more information on specific elements of the project, or if you believe that you may be able to supply critical information during the planning process, please reach out to our Planning Team leadership:

Kathleen Donahue
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July 2018

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NORTH DAKOTA Mitigates

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July 2018

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The Latest:
Tackling the Risk Assessment

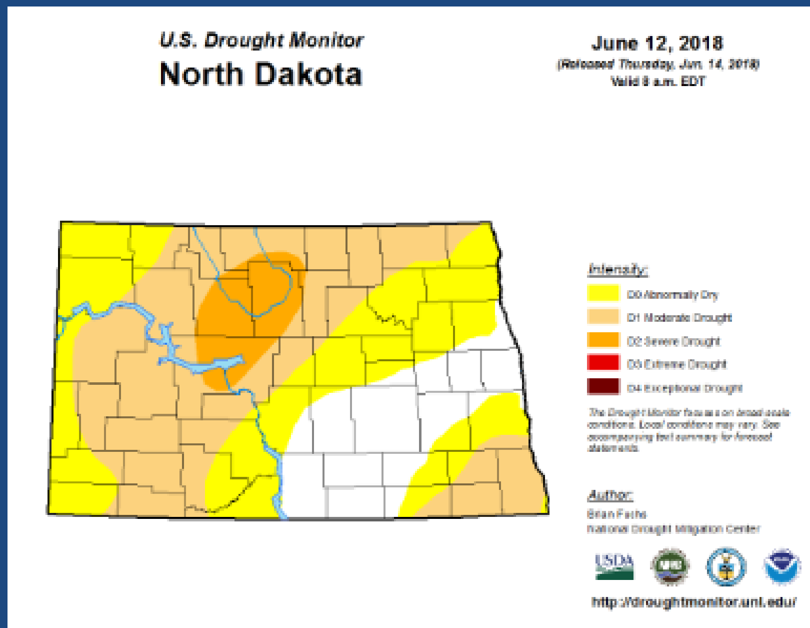
The State Hazard Mitigation Team (SHMT) has been working hard to complete the first draft of the risk assessment. The risk assessment is a critical component of the plan. It provides detailed information about the risks and vulnerabilities associated with each hazard and threat the SHMT will consider when identifying mitigation actions to reduce these risks. SHMT members are studying the following natural hazards: drought, fire, floods, geologic, infectious diseases, severe summer weather, severe winter weather, and space weather. Technological hazards under review are dam failure, hazardous materials releases, and transportation incidents. Adversarial threats include cyber attack, civil disturbance, and criminal, terrorist, or nation-state attack.

Hazard Overview: Drought

Drought is a challenging hazard to define because of its slow onset and variable impacts. Generally, drought is considered to be a prolonged period of low rainfall, but the "period" and definition of "low" can vary by location and climate region. The indicators of drought can include: amount of rainfall, soil moisture levels, discharge or volume of water rivers and reservoirs, and production of goods/services reliant on water supplies.

The recorded history of drought in the State of North Dakota extends as far back as the Dust Bowl of the 1930s which devastated the state, particularly the state's agricultural economy. The most recent drought event in 2017 brought severe drought to North Dakota, where 6% of the state was classified as being in the "exceptional drought" category. Impacts of drought are typically measured by economic impact, notably the impact on crop loss. Since 2002, North Dakota has experienced $81.3 billion in drought losses, with an estimated $43.9 billion in drought losses occurring in 2012 alone.

Drought can effect any part of the state and is mapped by the **U.S. Drought Monitor** on its website.



The U.S. Drought Monitor provides a visualization of the current drought conditions across the United States. This map displays the current drought conditions for June 12, 2018.

Mitigation in the News: National Drought Resilience Partnership

Drought leads to national annual losses of about $9 billion. FEMA is working to support mitigation by funding green infrastructure projects aimed at reducing the impacts of drought and flooding, including aquifer storage and recovery, floodplain and stream restoration, and flood diversion and storage, through their Hazard Mitigation Assistance program. Additionally, the National Drought Resilience Partnership was formed in 2016 in order to increase long-term national drought resilience. The partnership is a federal inter-agency partnership formed to make resources more accessible and make spending more effective. For more information, see the diagram below or visit the **National Drought Resilience Partnership** page on Drought.gov.

The National Drought Resilience Partnership aims to improve long-term national drought resilience.

North Dakota Mitigates: Assessing Missouri River Decadal Drought Risk

North Dakota is already tackling the risk drought poses to the state, initially through researching the causes and effects of the drought cycle through the *Decadal Drought Risk Assessment and Scenario Development for Food and Bio-fuels Agriculture in Four Missouri River Sub-basins Project*. This initiative is funded by the National Oceanic and Atmospheric Administration's (NOAA's) Climate Program Office Sectoral Applications Research Program.

This project has several objectives, including defining decadal drought information needs of agricultural stakeholders in four selected sub-basins of the Missouri River Basin and conducting a scenario-planning exercise for coping with multi-year to decadal droughts in the four sub-basins selected for study. A Stakeholder Advisory Team, which included members of the SHMT, was formed in each of the four sub-basins in order to meet all of the project objectives.

This project is ongoing, with results that will be extremely valuable in the long-term for the State, as the effects of drought become more frequent and pronounced due to changing climactic and environmental factors.

Comparison of the same pasture before (top photo, 2016) and after (bottom photo, 2017) the impacts of drought. Photos are courtesy of the North Dakota State University (NDSU) Extension Service via the 2014-2016 Progress Report: Hazard Mitigation in North Dakota.

Looking Ahead: Upcoming Events

July

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August

22

Save the date! The Planning Team will host a **Mid-Planning Mitigation Strategy Review Meeting** on Wednesday, August 22, 2018. At this meeting, you will be invited to **provide feedback on the updated Mitigation Strategy and discuss potential gaps!** Look out for upcoming registration information.

Get Involved

The Planning Team welcomes your input! If you would like more information on specific elements of the project, or if you believe that you may be able to supply critical information during the planning process, please reach out to our Planning Team leadership:

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kdonahue@nd.gov
701.328.8113

Hope Winship
Hagerty Consulting, Inc., Project Manager
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August 2018

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NORTH DAKOTA Mitigates

North Dakota State Enhanced Mitigation Mission Area Operations Plan Monthly Newsletter

August 2018

Welcome to the third issue of the ***North Dakota State Enhanced Mitigation Area Operations Plan Monthly Newsletter***, an e-publication that curates news about the development of the plan, innovations in mitigation, and opportunities to get involved!

The Latest: The Risk Assessment and Mitigation Strategy are Underway

The State Hazard Mitigation Team (SHMT) reviewed the first draft of the risk assessment at its July 25, 2018 meeting. As we discussed in the last issue of the monthly newsletter, the risk assessment is a critical component of the plan. It provides detailed information about the risks and vulnerabilities associated with each hazard and threat. Revisions to the risk assessment are currently underway. The SHMT also began to review and update the mitigation actions from the previous plan. These mitigation actions will work to reduce the risks and vulnerabilities identified in the risk assessment.

Hazard Overview: Geologic Hazards

North Dakota experiences a wide range of geologic hazards, including earthquakes, landslides, expansive soils, land subsidence, mining, and radon.

- Earthquakes cause sudden movement of the earth - which can cause major damage to buildings and infrastructure.
- Landslides are movements of rock and soil downhill, caused by saturation of soil from intense precipitation like rain or snowmelt.
- Expansive soils are soils that expand when wet, and shrink when they dry out.
- Land subsidence, in short, is the lowering of the earth surface, most often caused by extraction of ground water and mining.
- Mining hazards are caused by a failure or collapse of land that has been undermined.
- Radon is a natural radioactive gas that comes from the breakdown of uranium - with mines being a source of radon in North Dakota.

North Dakota's most common geologic hazard are landslide events, but all other geologic hazards have been experienced in the state to some extent. However, there has only been one presidential disaster declaration in 1999 (DR-1279), where severe storms, tornadoes, snow, ice, and flooding caused ground saturation, and landslides/mudslides.

Landslide blocks road winding up to the stop of Sentinel Butte, blocking access to a dozen steel towers which provide an important communication link for cellphones and State Radio dispatch (Bismarck Tribune, 2011).

Mitigation in the News: Seismic Retrofitting

As the Planning Team begins to identify mitigation strategies to implement in North Dakota, it is worth considering creative and effective mitigation projects implemented in other states and communities. The City of Los Angeles recognized that structural modification is only part of mitigating against earthquakes. By looking for non-structural solutions, **Los Angeles Unified School District (LAUSD) was able to remove a serious hazard to hundreds of thousands of students**--and do so in a cost-conscious manner.

In past earthquakes, the suspended ceiling and pendant lighting common in most classrooms has proved to be highly dangerous to anyone who happens to be underneath them. Using **Hazard Mitigation Assistance** funding from FEMA, LAUSD was able to retrofit or replace the hazardous light fixtures in its schools, greatly reducing the risk of injury or death to all students.

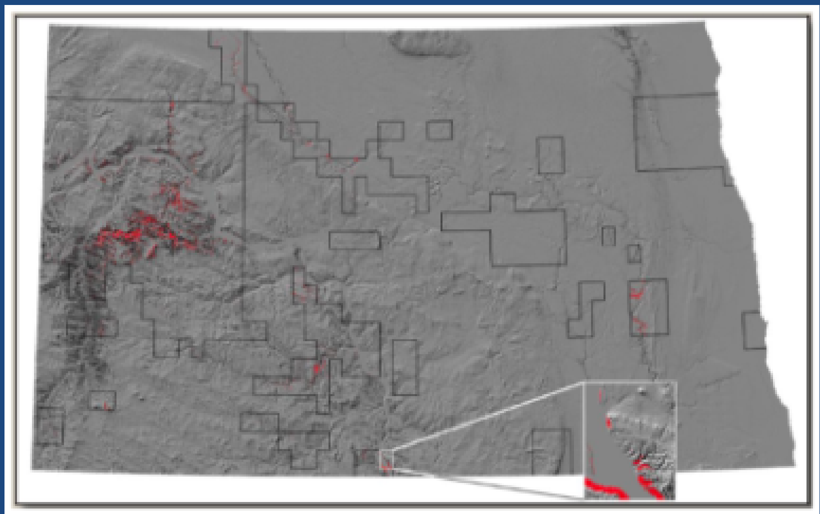
As described above in Hazard in Focus, North Dakotans face a real threat from earthquakes. **Communities across the state can look to projects like the one sponsored by LAUSD for creative ways to eliminate simple but dangerous hazards!**

Source: FEMA, 2017

North Dakota Mitigates: Geological Survey Landslide Identification Program

The North Dakota Geological Survey (NDGS) began a landslide mapping program in 2003 and as of 2017, has mapped about 25% of the state (approximately 11 million acres). Through this mapping process, the NDGS has identified 11,077 landslides.

The goal of the landslide mapping program is to **identify unstable landslide slopes, and route infrastructure** (roads, pipelines, transmission lines, and buildings) around these slopes. Additionally, the program has been critical in siting wind farms that will be installed throughout the state. Identifying unstable land prevents investment in infrastructure that may have otherwise been easily damaged or destroyed from landslide hazard events.



Identified Landslides in North Dakota by the North Dakota Geological Survey (NDGS, 2017)

Looking Ahead: Upcoming Events

August

22

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Get Involved

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September 2018

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September 2018

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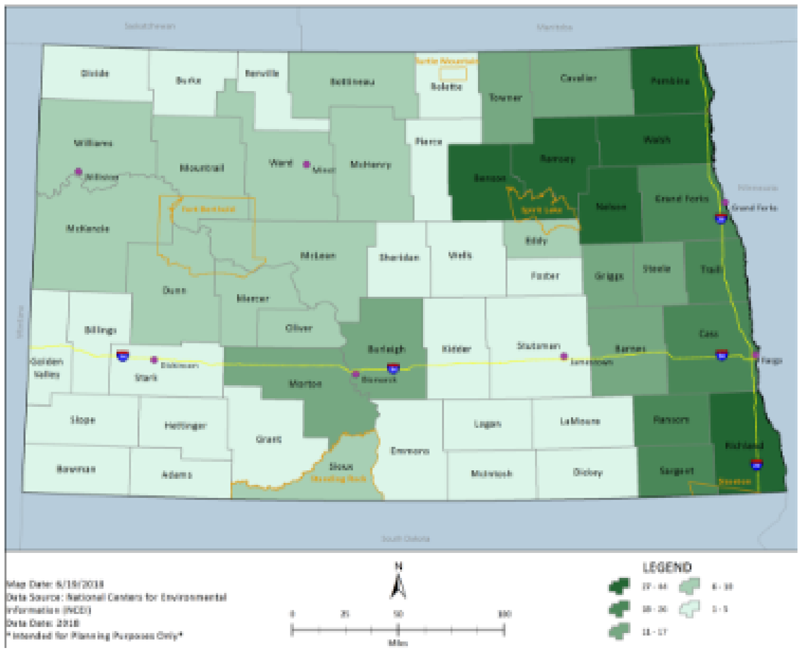
The Latest:
Updating the Mitigation Strategy

As the State Hazard Mitigation Team (SHMT) finishes its revisions of the risk assessment, we are moving ahead with updating the mitigation strategy. The mitigation strategy outlines mitigation goals and objectives as well as specific mitigation actions for the State. Mitigation goals and objectives provide an **overarching framework for reducing risk** to the identified natural hazards, technological hazards, and adversarial threats. Mitigation actions are **projects, activities, or processes taken to reduce or eliminate long-term risk** to people and property from hazards and threats and their impacts. We have been actively collecting feedback on the previous mitigation actions and ideas for any new mitigation actions. The mitigation strategy was also reviewed at the Mitigation Strategies Webinar on August 22, 2018.

Hazard Overview: Flooding

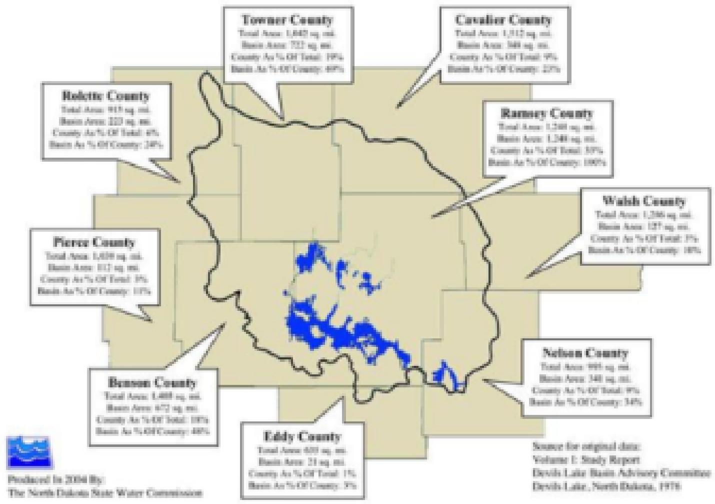
According to the 2018 Enhanced Mitigation MAOP risk factor analysis, flooding hazard events are the top ranking natural hazard for the State. North Dakota has a long history of flooding, including riverine flooding, flash, and closed basin flooding. By far, the most frequent and costly type of flooding in North Dakota is riverine flooding, particularly from the Red River and the Missouri River. There have been over 597 recorded riverine flooding events in North Dakota from 1996-2018 with the total property and crop damage exceeding $3.8 billion. The map below features riverine flood events by county from 1996-2018 and is featured in the flooding hazard profile of the 2018 Enhanced MAOP Update.

Riverine Flood Events by County



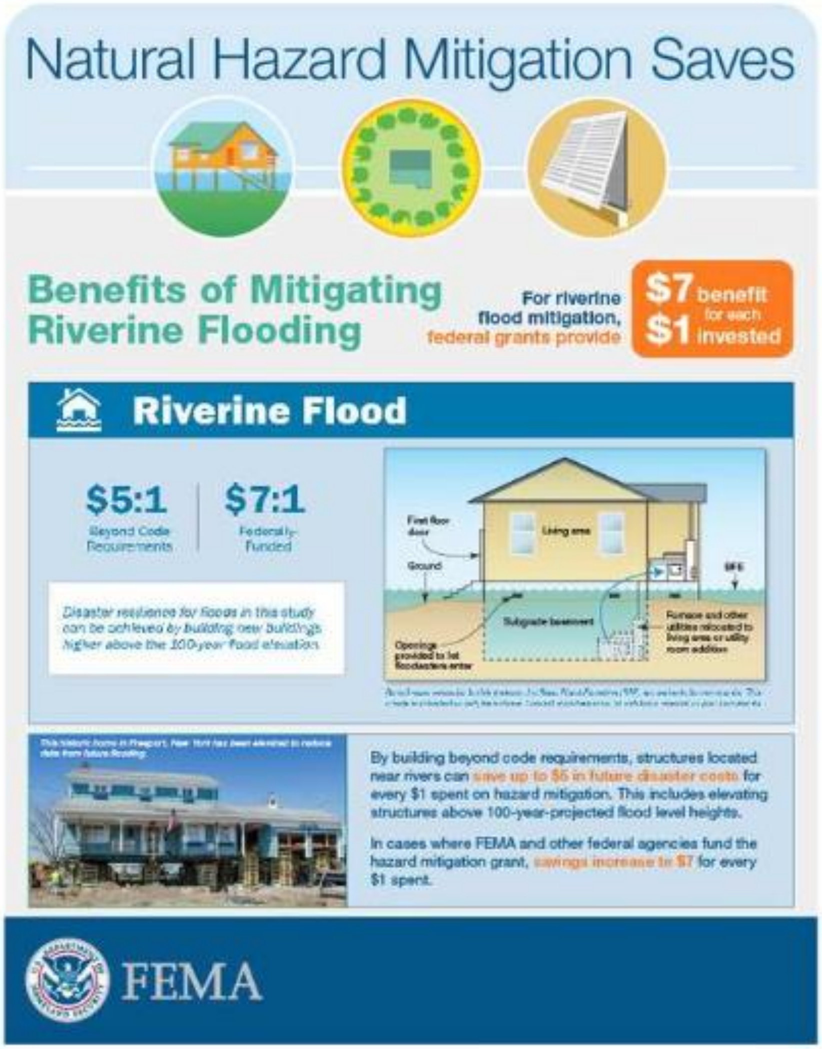
Besides riverine flooding, one of the most notable examples of flooding is the closed basin flooding of Devils Lake. Devils Lake is approximately 330 square miles in area and has expanded beyond Benson and Ramsey Counties and the Spirit Lake Nation into Towner County and to Nelson County. Eighty-six percent of the Devils Lake Basin catchment area, which is approximately 3,800 square miles and includes areas in nine counties, flows into Devils Lake which has no outlet. The geography of the lake is outlined in the figure below. This flood event was featured in the first *North Dakota State Enhanced Mitigation Mission Area Operations Plan Newsletter* in June, where interagency mitigation successes around Devils Lake were outlined.

Devils Lake Basin Data



Mitigation in the News:
Flooding Mitigation Pays Off!

At the Risk Assessment and Mitigation Strategies Meeting in July 2018, FEMA Region VIII Senior Community Planner Nicole Aimone outlined the study done by FEMA and the National Institute of Building Sciences *National Hazard Mitigation Saves* in January 2018, which published updated benefit-cost ratios for mitigation actions. This study outlines the direct benefit to implementing riverine flood mitigation measures, where there is a **Benefit Cost Ratio (BCR) of $5:1** for measures taken beyond code requirements and a **BCR of $7:1** for federally funded projects. Preparing for flooding events can protect state and community assets.



North Dakota Mitigates: Encouraging Public Participation through Community Coffees

Community Coffees are a planned component of the 2018 MAOP Update outreach strategy in order to educate the public on the hazard mitigation planning progress and gain specific feedback from attendees to this meeting. **Four community coffee meetings** have been conducted to date by NDDES staff members this summer. These groups have included: Residents of Library Square Independent Living Center in Mandan, Ministry on the Margins of Bismarck, N.D. Voluntary Organizations Active in Disaster, and first responders and the public in Rolette County.

Get Involved

The Planning Team welcomes your input! If you would like more information on specific elements of the project, or if you believe that you may be able to supply critical information during the planning process, please reach out to our Planning Team leadership:

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These community coffee break meetings provided some extremely valuable feedback to integrate into the planning process and reaffirm the need for mitigation in the State of North Dakota. Experiences included:

- One resident of the Library Square Independent Living Center capturing the essence of mitigation when he said, "We should be saving money. Do it right the first time."
- Homeless individuals emphasized the need for safe spaces during extreme weather. They ranked infectious diseases as the most concerning of all hazards since they are at increased risk of exposure.
- Members from the NDVOAD Group mentioned that education and warning systems were great tools for mitigation, but from their experience there was still work to be done to promote the mitigation message.

Looking Ahead: Upcoming Events

September

20

Save the Date! The Planning Team will host a **Plan Review Webinar** at 1:00 p.m., Thursday, September 20, 2018. At this meeting, we will review the contents of the entire updated plan and you will be invited to **provide feedback on the completed draft plan**. Look out for upcoming registration information.

October 2018

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October 2018

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The Latest:
Updating the Mitigation Strategy

The Enhanced Mitigation Mission Area Operations Plan (MAOP) Update Draft is complete. The MAOP has been sent out to the plan stakeholders and is available for the public at on the **NDDES webpage**. We are asking stakeholders to review this draft plan, and provide the State Hazard Mitigation Team (SHMT) with feedback utilizing adjudication matrices. We developed a survey for the public to provide feedback to the SHMT. We look forward to reviewing the draft plan feedback by October 11, 2018 and integrating it into the final plan.

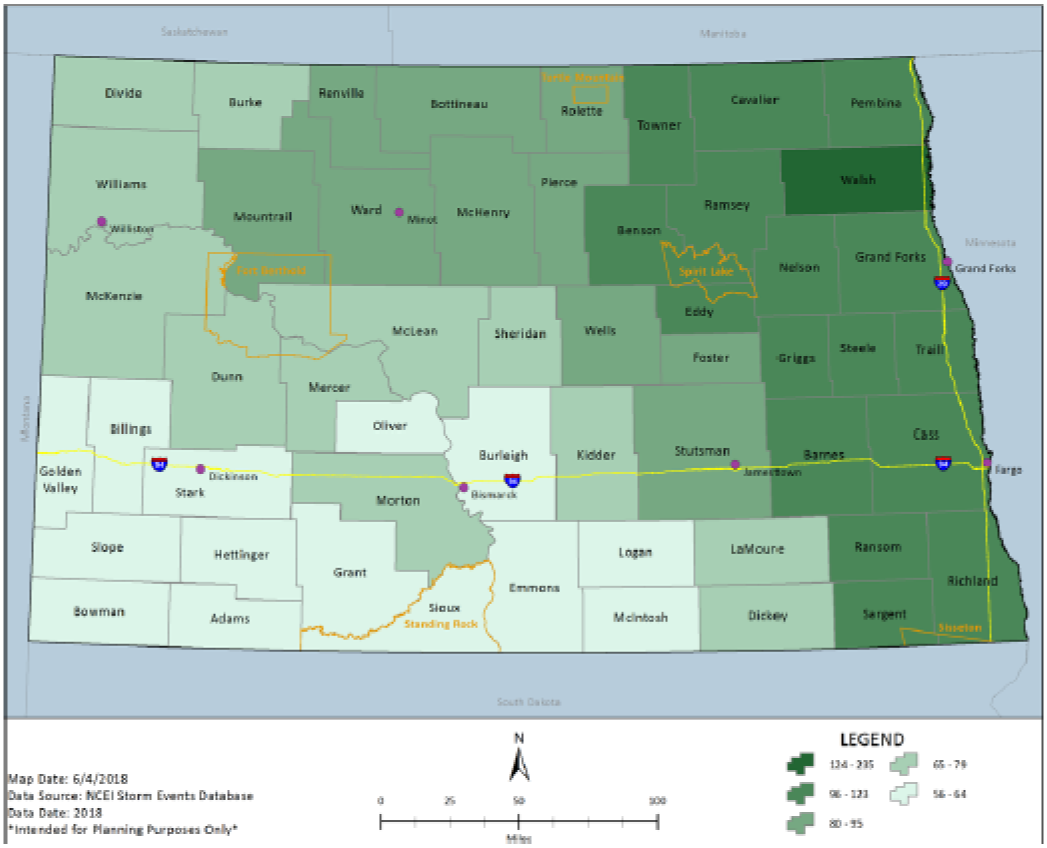
Hazard Overview: Severe Winter Weather

Severe Winter Weather is a top-ranked hazard according to the 2018 Enhanced Mitigation MAOP risk factor analysis. While no one wants to think about winter given the current season, severe winter storms are just a few months away and are highly disruptive to North Dakotans. Winter storms take many forms in the state, including: blizzards, extreme cold/wind chill, heavy snow, and ice storms. Generally, North Dakota experiences several winter storms per year, with three to four severe winter storms per decade; there have been seven federally-declared disasters for snow and ice storms declared in North Dakota since 2000.

Snow piled after the ice storm/blizzard on December 25-26, 2016 (NWS, 2016).

Severe Winter Weather can be both a localized hazard as well as a statewide event. Winter storms can affect any area of the state; the graphic below illustrates that the northeastern portion of the state has experienced more winter storm events than the southwestern portion of the state between 2000 and 2018.

Number of Severe Winter Weather Events by County, 2000 to 2018



(Enhanced Mitigation MAOP Update, 2018)

Depending on the extent and size of the extent of the storm, the impacts of a winter storm hazard can vary. Critical impacts include: blocked and damages roads and public health impacts.

Simple Solutions:
Personal Preparedness Pays Off!

Mitigation does not only have to be a top-down effort by local or state emergency management agencies. **Personal preparedness measures can be key for reducing winter storm related injury and death.** **FEMA and DHS** outline several different effective measures to take to reduce the human impact of winter storms, these include:

- Staying off roads
- Staying indoors
- Dressing warmly
- Preparing for power outage
- Knowing the signs of hypothermia and frostbite
- Checking on neighbors

Emergency managers can assist with personal preparedness by ensuring that the public knows and understands the risk for winter storms both during and after the event. Emergency managers can also implement **mitigation projects** which will assist in protecting critical infrastructure including power lines and roadways.

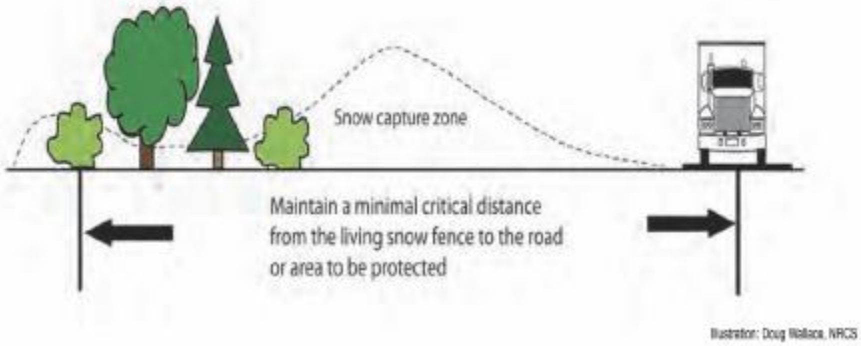
When The Sky Turns Gray - Animated Video for Winter Storm (FEMA, 2014).

North Dakota Mitigates: Snow Fence Success!

Snow fences are designed to help capture drifting snow before it can collect on the roads. When funding was available, the state successfully implemented living snow fences, which are rows of trees and shrubs strategically planted to slow down, catch or channel drifting snow. Natural snow fencing, an alternative to artificial fencing, improves the environment while trapping the drifting snow away from the road, thus improving visibility, keeping roads and intersections clear, and providing a habitat for wildlife.

Snow Fences, McClean County (NDDOT, 2018)

As of 2016, 40 counties have initiated 594 projects throughout the state since the projects inception in 1998. A cost-share through the United States Department of Agriculture (USDA) Farm Service Agency, Natural Resources Conservation Service (NRCS), and the North Dakota Statewide Conservation Tree Planting Initiative.



Living Snow Fence Design

Get Involved

The Planning Team welcomes your input! If you would like more information on specific elements of the project, or if you believe that you may be able to supply critical information during the planning process, please reach out to our Planning Team leadership:

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NDDES, Mitigation Planning Project Manager
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November 2018

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NORTH DAKOTA Mitigates

NDDES

North Dakota State Enhanced Mitigation Mission Area Operations Plan Monthly Newsletter

November 2018

Welcome to the final issue of the ***North Dakota State Enhanced Mitigation Mission Area Operations Plan (MAOP) Monthly Newsletter***, an e-publication that curates news about the development of the plan, innovations in mitigation, and opportunities to get involved!

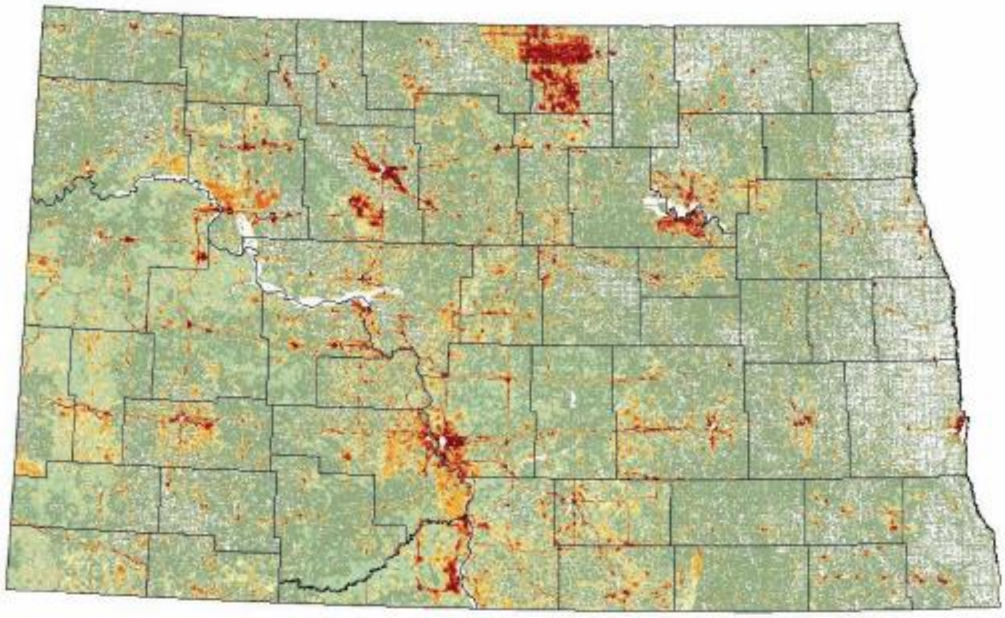
The Latest: The Enhanced Mitigation Mission Area Operations Plan has been submitted to FEMA for review!

The Enhanced Mitigation MAOP was submitted to the Federal Emergency Management Agency (FEMA) Region VIII on October 26, 2018. Thank you to those who took the time to review the draft plan and provide feedback. The feedback received from the State Hazard Mitigation Team (SHMT) was integrated into the Plan that was submitted to FEMA.

The North Dakota Department of Emergency Services (NDDES) is grateful to everyone who participated in all stages in the development of the Enhanced Mitigation MAOP. If there are any questions from FEMA during the review period, NDDES will be in contact with stakeholders. NDDES will notify all SHMT members when FEMA has approved the plan, pending adoption, and when enhanced plan status is received. The Enhanced Mitigation MAOP will be adopted by the Governor by the end of 2018, replacing the 2014 version of the plan.

Hazard Overview: Fire (Wildland and Urban)

Wildfire is an uncontrolled fire in a vegetated area. Wildfire can either be caused by humans (intentionally or non-intentionally) or natural events (such as lightning strikes). Wildfire can be a natural component of ecosystems; however, it poses a severe hazard to humans and the built environment, particularly individuals living in the wildland urban interface/intermix (WUI). The 2013 West Wide Wildfire Risk Assessment (WWA) assesses wildfire risk in 17 western states using a standardized methodology. The results of this assessment for North Dakota are outlined in the image below where the darker red colors represent more likely fire occurrence areas.



North Dakota Fire Risk Index Based on West Wide Wildfire Risk Assessment

(West Wide Wildfire Risk Assessment, 2013)

Wildfires are expected annually in the State of North Dakota, but the impacts depend on the size and scope of the event. Wildfires that burn in wildland areas may cause limited financial impacts on the state. However, wildfires destroy crops, kill livestock and wildlife, and destroy buildings and infrastructure if they occur in agricultural or developed areas. From 2003 to 2017, $367,839 in crop insurance was paid as a result of wildland fire.

Wildland fire in western North Dakota (West Fargo Pioneer, 2017)

Urban fire, on the other hand, consists of uncontrolled burning in developed areas including structure fires and vehicle fires. Urban fires can be caused by natural events (e.g., lightning or wildfire) or by humans (either intentionally or non-intentionally). Urban fires can occur anywhere there are areas of dense structures, likely downtown areas and larger cities. Urban fires are highly likely to impact properties and people, and are mostly localized events. Approximately 2,500 urban fire events are reported each year in North Dakota.

Fire Destroys Motorhome in Beulah, ND (Buckman, 2018).

Mitigation in the News: Improved Building Codes Fight Wildfires!

A study conducted by researchers with the National Institute of Building Sciences (NIBS) examined specific mitigation strategies to reduce the impact of wildfires in wildland-urban interface (WUI) areas. NIBS is a non-profit group dedicated to the advancement of best practices in building construction, that comprehensively explored the costs and benefits of federally funded mitigation projects. The researchers found that **structures built to exceed the provisions of the 2015 International Wildland-Urban Interface Code (IWUIC) saved up to $4 in future wildfire losses for every $1 invested in wildfire mitigation!**

The study also examined federally-funded mitigation grants that supported wildfire mitigation strategies outside of new construction. Federal grant dollars spent on replacing roofs, managing vegetation to reduce fuels, and replacing wooden water tanks were found to save $3 for every $1 spent on wildfire mitigation.

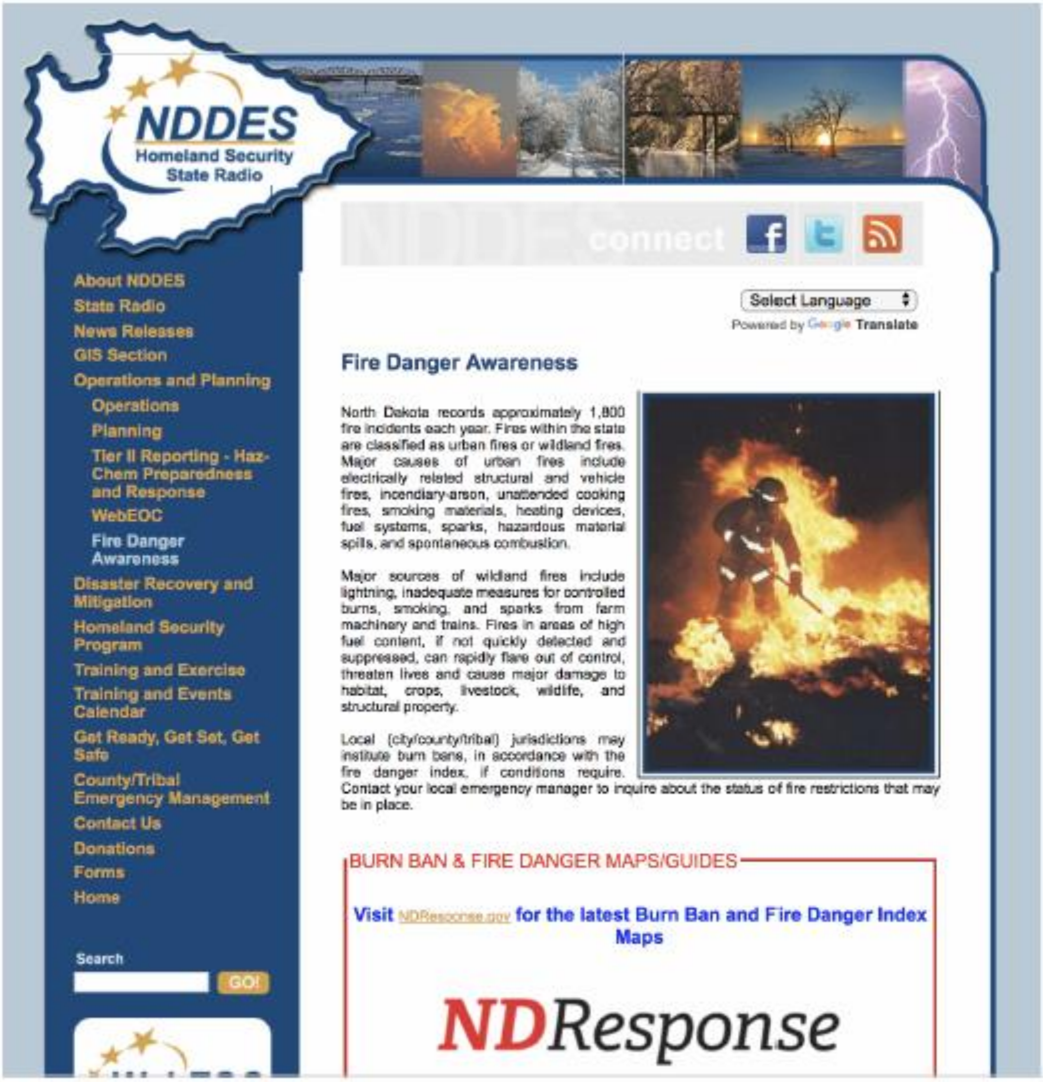
FEMA, 2017.

North Dakota Mitigates: Fire Education

The State Fire Marshal abates and investigates all fires that occur in the state. The State Fire Marshal works to mitigate the effects of fires through the fire code, inspections, education, and mitigation planning. Fire education is a key component in protecting the public from the risk of fire hazards. Some of the highlights of the State Fire Marshal's education program are outlined below.

- Education of children through schools including **Learn Not to Burn Program**

- Programs such as **Firewise**, **Fire Sprinkler Initiative**, and **TakeAction**
- **National Wildfire Community Preparedness Day**
- Fire Danger Awareness on **NDDES website**



NDDES, 2018.

Get Involved

The Planning Team welcomes your input! If you would like more information on specific elements of the project, or if you believe that you may be able to supply critical information during the planning process, please reach out to our

Planning Team leadership:

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7.2.5 Project Planning Conference Call

7.2.5.1 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan (MAOP)

Project Planning Conference Call

February 20, 2018, 2:00 p.m.

Call-In Information: 866-906-7447; 7584607#

***Meeting Purpose:* Outline expectations for NDDES and Hagerty for development of the Enhanced Mitigation MAOP.**

Meeting Notes

Attendees:

- NDDES –
  - Cody Schulz – Director
  - Sean Johnson – State Plans Chief
  - Kathleen Donahue – State Mitigation Planning Officer
  - Terry Traynor – Mitigation
  - Justin Messner – State Mitigation Planning Officer
  - Brandon – Log
  - Amy Anton – Operations and Planning Chief
- Hagerty –
  - Hope Winship - Deputy Project Manager
  - April Geruso – Project Manager

Going for Enhanced Plan:

- North Dakota has been going for the Enhanced Hazard Mitigation Plan since Cody has worked with NDDES
- NDDES has been leaning forward, the time is right to go for the enhanced plan
- Hagerty will work closely with NDDES during plan development to make sure all expectations are understood and met
- NDDES wants a plan that will meet and exceed the Region's expectations for Enhanced Plan
- Plan should focus on data conclusions, including what this data means for the local jurisdictions and tribes
- Referenced the MAOP Visual
- Need ONE threats and hazards list (aligned with the THIRA)
- Cory from NWS sits in the EOC every week and can help with the climate change portion of the document
- Make expectations on the planning process and on implementation clear from the outset
- Suggestions:

  - Newsletter – bring stakeholders along more in the planning process (can be from Kathleen)

Stakeholders:

- A lot of good work with stakeholders was done in the last cycle
- Hagerty will receive a list of stakeholders and data requirements
  - Hagerty will provide feedback to help clarify the process and make it more efficient
  - Hagerty will help NDDES identify ways to engage the local level stakeholders more in the process
- In general, North Dakota's stakeholders have been engaging, they have changed, and they are adapting

Enhanced Mitigation Plan and THIRA:

- The state's goal is to have the THIRA and Enhanced Mitigation Plan align
- One output of the Enhanced Mitigation Plan process is the HIRA, which will inform the update of the THIRA
- Even if it means holding longer meetings, North Dakota would like to synchronize with all the planning, T&E, funding, policy
- North Dakota uses the 6-step planning process to update the THIRA
  - Looking to develop a worksheet that shows synchronization with the Enhanced Mitigation Plan process
- Outstanding questions/issues regarding THIRA:
  - What data is needed to inform this process?
  - Needs to be included in time to update all cross-cutting: response, recovery, and mitigation
  - Tribal governments will need to step in to participate
  - Kick-off needs to be a joint kick-off to tackle all of these pieces
  - Develop a process to integrate and a timeline for integration

Next Steps/Take Aways:

- Plan needs to be given to FEMA by mid-October
- Monthly calls between Hagerty and Kathleen, Justin, and Possibly Terry
- Make sure there is a good feedback loop – bi-weekly check-ins for progress if necessary
- We will provide timely responses
- Need to develop a process to integrate Mitigation MAOP and THIRA and a timeline for this integration
- Data will be given to Hagerty as fast as possible
- Review MAOP Purpose/Process and bring key stakeholders up to speed on strategy and goals for the project
- NDDES to give Hagerty the worksheet, data sets/requirements

7.2.6 THIRA Meeting

7.2.6.1 Agenda

State of North Dakota Enhanced Mitigation Area Operations Plan

NDDES Conference Room

March 2, 2018, 10:30 a.m.

Call-In Information: 866-906-7447; 7584607#

Meeting Purpose*: *Identify data sets required for development of the Threat and Hazard Identification and Risk Assessment (THIRA).

Agenda

1	Overview and Introductions • NDDES • Hagerty Consulting • FEMA	Kathleen Donahue, Mitigation Planning Officer, NDDES
2	North Dakota's THIRA Process and Six-Step Planning Process Worksheet	Sean Johnson, Planning Officer, NDDES
3.	Review of Data Sets Requirements	Sean Johnson April Geruso, Project Manager, Hagerty Consulting Hope Winship, Deputy Project Manager, Hagerty Consulting
4	Next Steps and Dates • Conduct conference call with Hagerty to Discuss Mitigation Plan Logistical Concerns *(March 2018)* • Conduct Technical Advisory Committee Meeting *(March 6, 2018)* • Schedule Stakeholder Meeting *(March 2018)* • Finalize Project Management Plan *(March 2018)*	Kathleen Donahue, April Geruso and Hope Winship
5	Questions and Closing Comments	Justin Messner, State Hazard Mitigation Officer, NDDES

7.2.6.2 Slide Deck

9/6/2018

State of North Dakota
Enhanced Mitigation Area
Operations Plan

THIRA Meeting

March 2, 2018

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Proposed Risk Analysis Process

- Perform quantitative analysis to determine risk and vulnerability
- Gain additional feedback and insight from Technical Advisory Committee and THIRA/MAOP Stakeholders
  - Surveys (pre-meeting, at meeting, and post-meeting)
  - Facilitated discussion
  - Mapping exercises
- Finalize the analysis and develop narratives around risk and vulnerability

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Proposed Risk Analysis Methodology

- Each level has an index level of 1 – 4

Category	Levels	Weight Value
Probability *What is the likelihood of a hazard event occurring in a given year?*	Highly Likely, Likely, Possible, Unlikely	30%
Impact *What is the impact of the hazard when it occurs?*	Catastrophic, Critical, Limited, Minor	30%
Spatial Extent *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	Large, Moderate, Small, Negligible	20%
Warning Time *Is there usually some lead time associated with the hazard event?*	<6, 6-12, 12-24, 24+	10%
Duration *How long does the hazard event usually last?*	<1 week, 1 week+, <24 hours, <6 hours	10%

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Proposed Risk Analysis Methodology: Impact Factors

- People/Public
- Responders
- State Operations
  - Continuity of Operations
  - Continued Delivery of Services
- Property
- Facilities and Infrastructure
- Economic Condition of the State
- Environment
- Public Confidence in the State's Governance

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Data Set Requirements: Vulnerability and Other Risk Factors

Purpose	Potential Public Data Sources	Potential State Data Sources
Determine location, extent, and past occurrences of hazards, identify any vulnerability assessments	NOAA, FEMA, USGS, EPA, CDC, FHA, USACE, Forest Service, Climate Change Studies	Dept. of Agriculture, NDDES, Dept. of Health, Dept. of Mineral Resources, Dept. of Transportation, Highway Patrol, State Water Commission, ND State University, University of North Dakota Environ. Research Center for Oil and Gas
Identify Severe Repetitive Loss and Repetitive Loss Information	FEMA (Bureau Net)	State Water Commission (NFIP Coordinator) and NDDES (SHMO)
Determine development since last plan and development trends		Dept. of Commerce Division of Community Services, Dept. of Mineral Resources
Determine the location and potential impact and loss estimates of assets and critical infrastructure		Division of Facilities Management, Insurance Dept., Office of Tax Commissioner

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Data Set Requirements: Impact

Purpose	Potential Public Data Sources	Potential State Data Sources
Determine the impact on the public	US Census, DOH, CDC	Dept. of Commerce Division of Community Services, Dept of Health, Dept of Human Services, Dept. of Indian Affairs, Counties
Determine the impact on the responders	DHS	NDDES, Highway Patrol
Determine the impact on the environment		Parks and Recreation Department, University of North Dakota Environ. Research Center for Oil and Gas
Determine the impact on State Operations and the ability to COOP		Workforce Safety and Insurance, NDDES
Determine the impact on property	Hazus	Office of Tax Commissioner
Determine the impact on the economic condition		Office of Tax Commissioner, Dept. of Commerce

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7.2.6.3 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Mitigation MAOP THIRA Meeting

NDDES Conference Room

March 2, 2018; 10:30 a.m. – 12:00 p.m.

Call-In Information: 866-906-7447; 7584607#

***Meeting Purpose*: Identify data sets required for development of the Threat and Hazard Identification and Risk Assessment (THIRA).**

Meeting Notes

North Dakota's THIRA Process

- A Threat and Hazard Identification and Risk Assessment (THIRA) will be used to partially inform the Enhanced Mitigation Area Operations Plan (MAOP).
- North Dakota's Threat and Hazard Identification and Risk Assessment process occurs in four steps:
    - Step 1: Identify Threats and Hazards of Concern
    - Step 2: Give Threats and Hazards Context
    - Step 3: Establish Capability Targets
    - Step 4: Apply Results
- The THIRA process corresponds with Steps 1-3, with the creation of the MAOP an aspect of Step 4.
- North Dakota currently has 19 identified hazards, with nine hazards or threats that are identified as of utmost concern.
    - All identified hazards will be given a corresponding mitigation target.
- The THIRA process is changing across the county, there is a two year grace period to incorporate this process into plans.

Identification of Datasets

- Additional datasets are needed to inform the HIRA.
- Hagerty will help conduct a quantitative analysis to determine risk and vulnerability and gain additional insight from the Technical Advisory Committee and THIRA/MAOP Stakeholders.
    - Surveys, facilitated discussions, and mapping exercises will all be utilized.
- Hagerty's proposed risk analysis methodology considers the following aspects of all identified hazards:
    - Probability,
    - Impact,
    - Spatial extent,
    - Warning time, and
    - Duration.
- For each hazard and threat, a ranking of one to four is assigned to determine the severity of the risk.
    - There is also the option to take a more qualitative approach.
    - Each numeric vulnerability designation will be given an explanation for that designation.

- » Impact factors will also be considered, and each can be given different weight in the overall ranking of a hazard.
- » Michael Baker will be working with Hagerty as a subcontractor to conduct substantial data analysis.

Mitigation Planning

- The MAOP is required to look at response, recovery, and cross cutting capabilities—mitigation capabilities will be added too.
- The MAOP is viewed as an opportunity to integrate with other plans across the state.
- Hagerty will create narratives for all hazards that are determined to face North Dakota.
    - Specific scenarios for each hazard will help tell the story to generate additional products.
- Response and recovery capabilities should be briefly discussed before mitigation capabilities in the plan.
    - As an enhanced mitigation plan, the primary component of this plan is a mitigation strategy that shows the integration of mitigation programs.
- Results from the THIRA should not inform the overall results of the mitigation plan, but rather enhance the mitigation planning within the plan.
    - Steps are going to be taken with mitigation planning that are concurrent with the THIRA process.
    - A comprehensive planning process is going to occur that can inform other efforts as well, but hazard mitigation planning will not become secondary to additional planning efforts.
- The MAOP will show the integration with other relevant plans and departmental stakeholders.
    - The plan will also formalize actions and procedures that need documentation.
- This mitigation plan is the main plan for the year, but the planning process needs to help inform other planning efforts.

Stakeholder Meeting

- The 19 hazards and threats already identified by the state will be reviewed at stakeholder meetings.
    - Conversations will be facilitated to avoid threats that are secondary consequences. (e.g. tornados are a byproduct of summer storms)
- The joint process and product kickoff meeting is anticipated for the week of March 26, 2018.
    - Wednesday, March 28, 2018 is the projected date for this meeting.

Action Items

- The project timeline will be updated and language in the Project Management Plan (PMP) will be modified to align more with North Dakota’s project methodology.
    - The updated PMP will be delivered to North Dakota by Monday, March 5, 2018.
- Hagerty will send North Dakota proposed datasets and processes anticipated in developing the mitigation plan.
    - North Dakota will review data sources and let Hagerty know by March 9, 2018.
- North Dakota will send Hagerty the most current THIRA and state preparedness report.
    - Both documents are semi-classified and not to be shared.
- The date of March 28, 2018, to host the stakeholder meeting will be confirmed by next Tuesday, March 6, 2018.
- North Dakota will share sample templates with Hagerty to help develop the one pager template.
- Hagerty will set up a SharePoint site for North Dakota to collect local plans.

7.2.7 TAC Meeting

7.2.7.1 Agenda

State of North Dakota Enhanced Mitigation Area Operations Plan

Technical Advisory Committee

NDDES Conference Room

Friday, March 9, 2018, 10 a.m.

Webinar at Adobe Connect at https://share.dhs.gov/nddeshlsplans

accompanied by an audio bridge hosted at 877-820-7831 Pin Code 950503

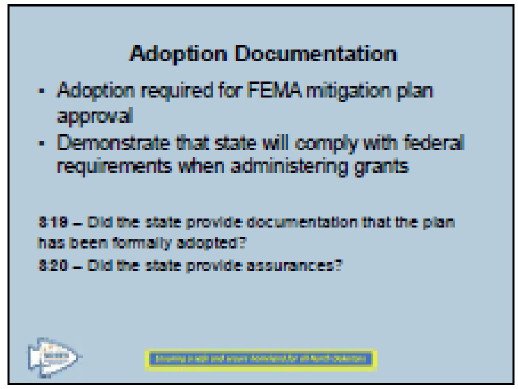
Meeting Purpose: Outline strategies for development of the Enhanced Mitigation Mission Area Operations Plan (MAOP).

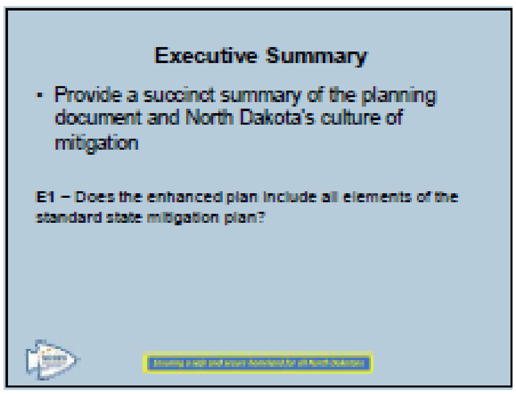
Agenda

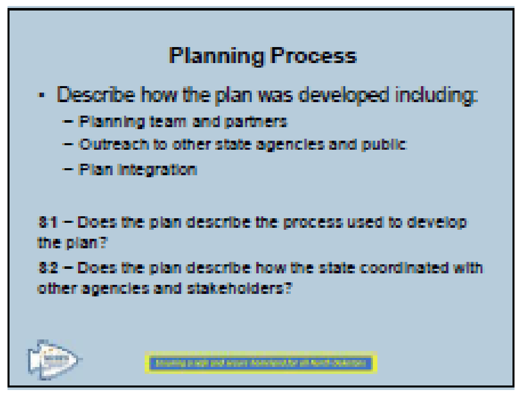
1	Welcome and Introductions	Justin Messner, CFM, Co-Chair, State Hazard Mitigation Team (SHMT), NDDES
2	Project Overview • Grant Requirements • Timelines	Justin Messner
3	Roles and Expectations • NDDES • Technical Advisory Committee (TAC) • State Hazard Mitigation Team (SHMT) • Hagerty Consulting, Inc.	Kathleen Donahue, Co-Chair, SHMT, NDDES
4	Direction of the Enhanced Mitigation MAOP • Content Proposal • SHMT Charter	Kathleen Donahue
5	Standard and Enhanced Mitigation Planning Requirements	April Geruso, Project Manager, Hagerty Consulting Hope Winship, Deputy Project Manager, Hagerty Consulting
6	Mitigation MAOP Six-Step Planning Process Worksheet	Sean Johnson, Plans Officer, NDDES
7	Project Management Plan	April Geruso and Hope Winship
8	Next Steps and Dates • Review SHMT Membership Listing *(March 16, 2018 -- TAC)* • Review Data Collection Guide *(March 16, 2018 – TAC)* • Conduct the Stakeholders Process Meeting *March/April 2018 – NDDES and Hagerty)*	Kathleen Donahue, April Geruso and Hope Winship
9	Questions and Closing Comments	Justin Messner

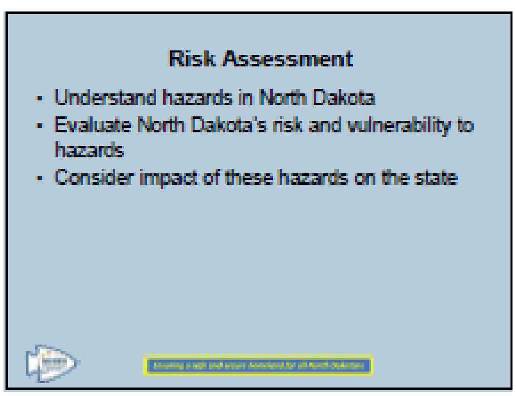
7.2.7.2 Slide Deck

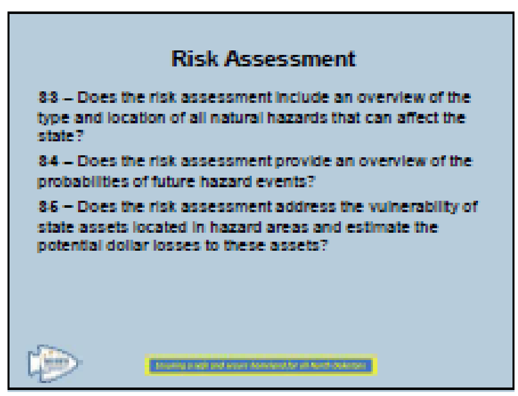
Planning Requirements Presentation

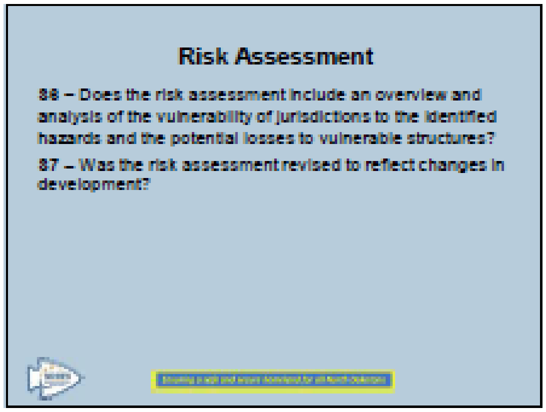


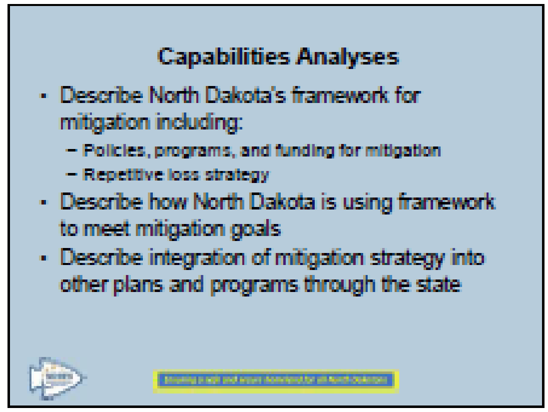


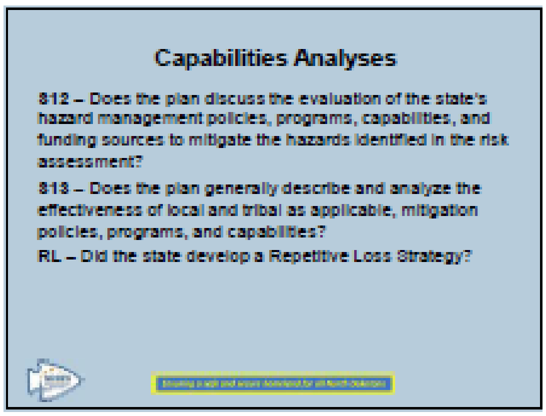


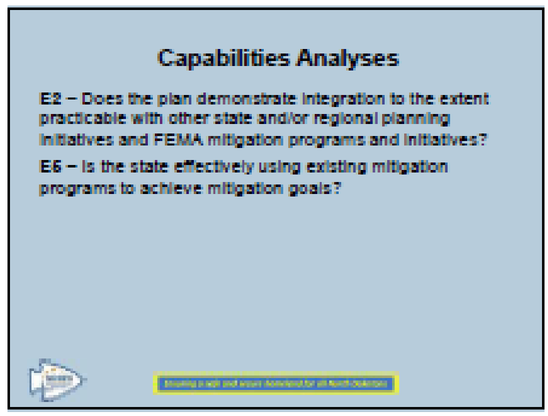


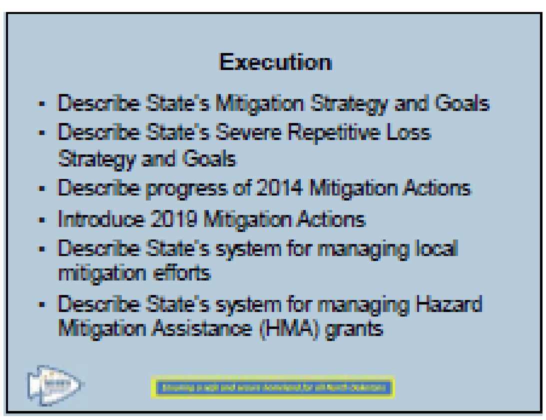


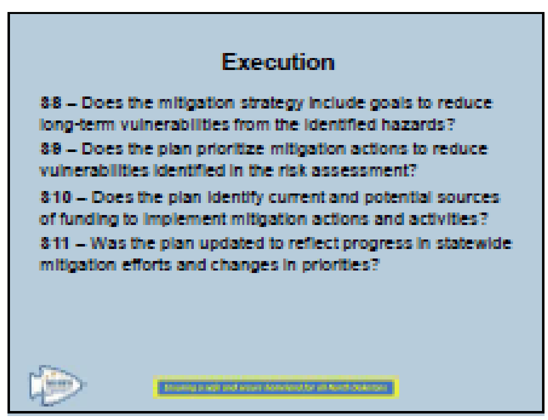

Risk Assessment
S6 – Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures?
S7 – Was the risk assessment revised to reflect changes in development?


Capabilities Analyses
• Describe North Dakota's framework for mitigation including:
– Policies, programs, and funding for mitigation
– Repetitive loss strategy
• Describe how North Dakota is using framework to meet mitigation goals
• Describe integration of mitigation strategy into other plans and programs through the state


Capabilities Analyses
S12 – Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment?
S13 – Does the plan generally describe and analyze the effectiveness of local and tribal as applicable, mitigation policies, programs, and capabilities?
RL – Did the state develop a Repetitive Loss Strategy?


Capabilities Analyses
E2 – Does the plan demonstrate integration to the extent practicable with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives?
E6 – Is the state effectively using existing mitigation programs to achieve mitigation goals?


Execution
• Describe State's Mitigation Strategy and Goals
• Describe State's Severe Repetitive Loss Strategy and Goals
• Describe progress of 2014 Mitigation Actions
• Introduce 2019 Mitigation Actions
• Describe State's system for managing local mitigation efforts
• Describe State's system for managing Hazard Mitigation Assistance (HMA) grants


Execution
S8 – Does the mitigation strategy include goals to reduce long-term vulnerabilities from the identified hazards?
S9 – Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment?
S10 – Does the plan identify current and potential sources of funding to implement mitigation actions and activities?
S11 – Was the plan updated to reflect progress in statewide mitigation efforts and changes in priorities?

Execution

S14 – Does the plan describe the process to support the development of approvable local and tribal, as applicable, mitigation plans?

S16 – Does the plan describe the criteria for prioritizing funding?

S18 – Does the plan describe the process and timeframe to review, coordinate, and link local and tribal, as applicable, mitigation plans with the state mitigation plan?

RL – Did the state develop a Repetitive Loss Strategy?

Execution

E2 – Does the plan demonstrate integration to the extent practicable with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives?

E3 – Does the state demonstrate commitment to a comprehensive mitigation program?

E4 – Does the Enhanced plan document capability to implement mitigation actions?

E6 – With regard to HMA, is the state maintaining the capability to meet application timeframes and submitting complete project applications?

Execution

E7 – With regard to HMA, is the state maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses?

E8 – With regard to HMA, is the state maintaining the capability to submit complete and accurate quarterly progress and financial reports on time?

E9 – With regard to HMA, is the state maintaining the capability to complete HMA projects within established performance periods, including financial reconciliation?

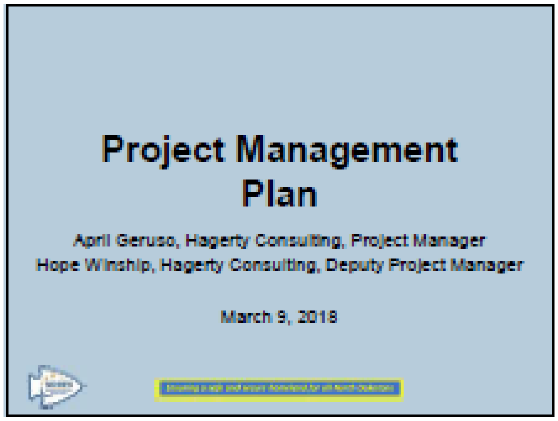
Plan Maintenance

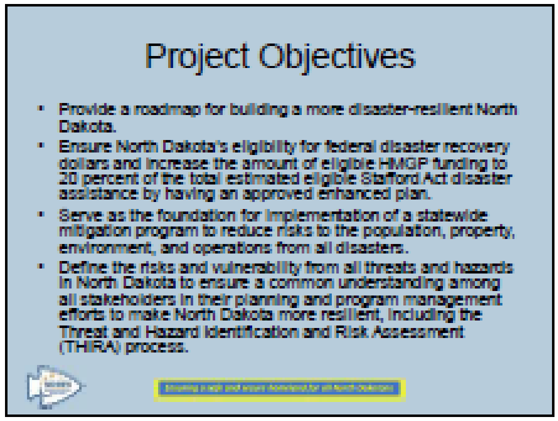
- Describe how the plan will be kept current

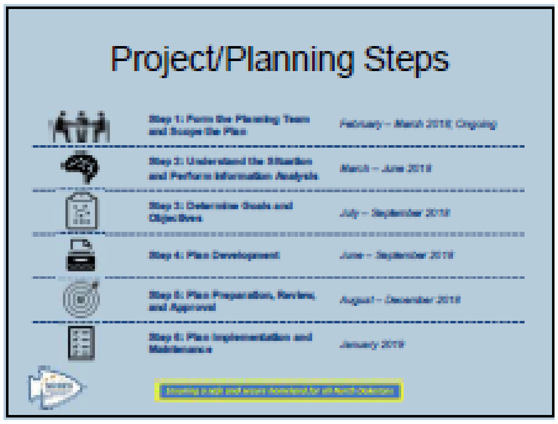
S17 – Is there a description of the method and schedule for keeping the plan current?

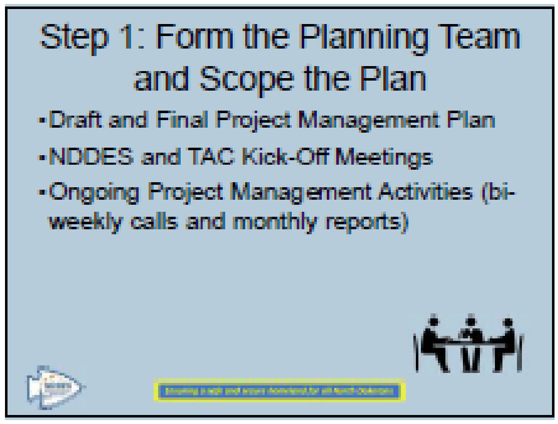
S18 – Does the plan describe the systems for monitoring implementation and reviewing progress?

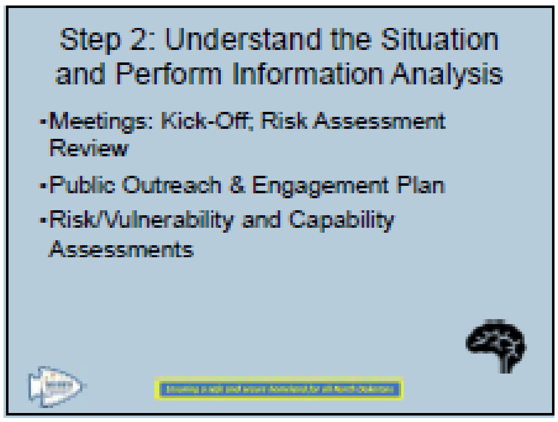
Project Management Plan Presentation

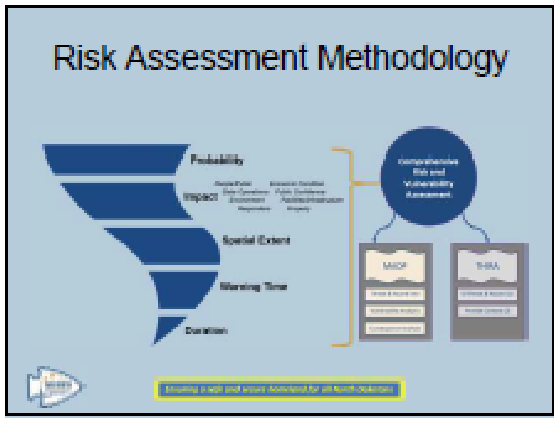


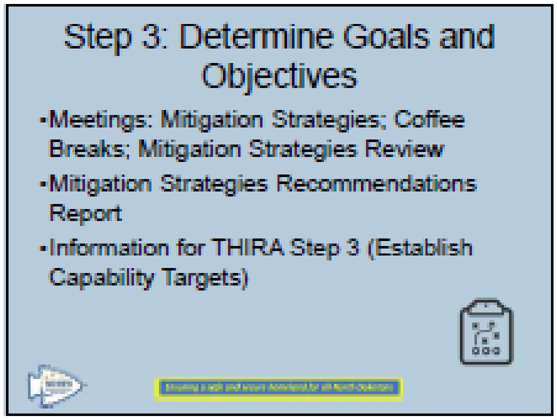


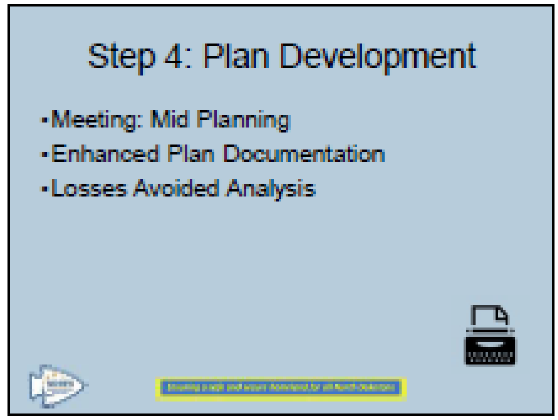


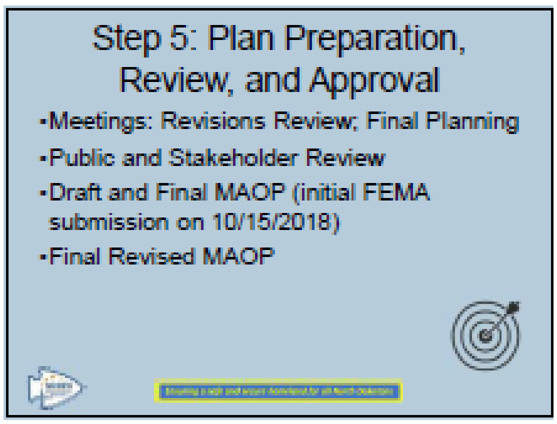


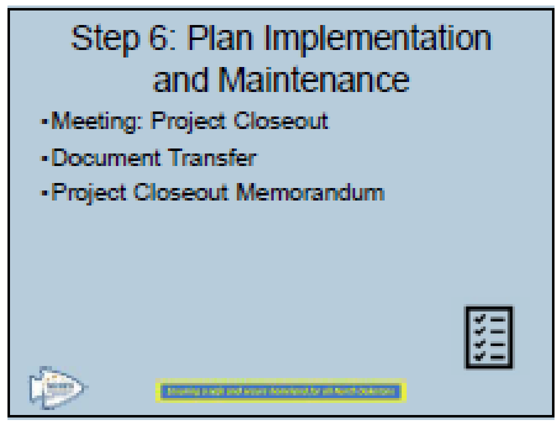












7.2.7.3 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Technical Advisory Committee

NDDES Conference Room

Friday, March 9, 2018, 10 a.m.

Webinar at Adobe Connect at https://share.dhs.gov/nddeshlsplans

accompanied by an audio bridge hosted at 877-820-7831 Pin Code 950503

***Meeting Purpose*: Outline strategies for development of the Enhanced Mitigation Mission Area Operations Plan (MAOP).**

Meeting Notes

Attendees:

- North Dakota Department of Emergency Services (NDDES)
  - Justin Messner
  - Russ

  - Brad Bauer
  - Gary
  - Kathleen Donahue
  - Amanda Schooling
  - Laura Ackerman
  - Sean Johnson
  - Christine McCombs
- Hagerty
  - Hope Winship
  - April Geruso
  - Michelle Bohrson

Project Overview

- Why plan?
  - Public Assistance – Permanent Work
  - HMA Program Funding
  - Beyond best practices and helps the state
- Enhanced Mitigation Plan
  - Standard work for a hazard mitigation plan plus need to show how the state coordinates interagency activities and coordinates funding
  - North Dakota is starting in a very good place to achieve enhanced status
  - PAS – ability to APPROVE applications, cost overruns and underruns etc.
  - Starting this project with a condensed timeline:
    - 2/14/2019 – Current State Plan expires
    - Complete and Submitted plan to FEMA by mid-October
    - Final plan approved and adopted by end of the year
  - Unforeseen items took precedence and delayed the start of the hazard mitigation plan update (e.g. EMAP)

Roles and Expectations

See Guidance Memo for the North Dakota State Hazard Mitigation Team

- NDDES will work with Hagerty to make a plan that is <u>ACTIONABLE</u>
- State needs to provide better guidance for Emergency Managers
- The Technical Advisory Committee will set the overall priorities beyond the requirements from FEMA; the committee is based on expertise
- Consists of a committee lead for each of the hazards and threats
- Hagerty will facilitate the collection of information and ensure that the team meets all the planning deadlines
  - Foster discussion to identify additional mitigation activities to identify actionable activities
  - Bring a focus to national outlook

Direction of the Enhanced Mitigation MAOP

(See Enhanced Mitigation Mission Area Operations Plan Diagram)

- Goal is to educate people on what mitigation means
- Natural, technological, and adversarial hazards
  - FEMA only requires natural, but others are important for ND.
- ND State Hazard Mitigation Team Guidance Memo similar to “Charter” for other plans

- Representatives of TAC are from specific ND departments
- NDDES is especially excited to work with Hagerty on Climate Change
- For this plan update, need to focus on how ND will address all of the comments from FEMA's 2014 review
- Another focus area will be incorporating climate change and the effect that will have on individual components of the plan
- EMAP requirement – Prioritize EMAP and THIRA
- Emphasized progress report (additions, etc.)
- Governor with passion of land use
    - Mainstreet Initiative – Land Use Group

Committees

- Committee Structure:
    - Hazard- and Threat- Specific Committees
        - Infectious Diseases (formerly Communicable Diseases)
        - Dam Failure
        - Drought
        - Flood
        - Geologic Hazards
        - Hazardous Materials Release and Disposal
        - Homeland Security Incident
            - Note - Need to look at each of the types of incidents separately
        - Severe Summer Weather
        - Severe Winter Weather
        - Transportation Incident (formerly Transportation Accident)
        - Urban Fire or Structural Collapse
        - Wildland Fire
        - Windstorm
        - Supply Chain Disruption (formerly Shortage or Outage of Critical Materials and Infrastructure).
        - Space Weather – Homeland security incident
            - In consideration
    - Planning Committees
        - Critical Facilities and Infrastructure
        - Oil and Gas Industry Expansion
        - Land Use and Future Construction and Development
        - ~~Threat and Hazard Identification and Risk Assessment (THIRA) Incorporation (consider eliminating this committee since we are already leveraging THIRA)~~ (Do not need this – already exists)
        - ~~Mitigation Strategy~~ (Do not need – everyone is involved)
        - Mitigation Implementation System
        - Climate Change Committee Declared – Discussion about "What to call it"
- What is the difference between the hazard specific committees and the planning committees
    - Hazard specific – about figuring out how to gather the technical data
    - Planning committees – focus on broader, overarching strategies
- Need to develop a timeline for committee involvement

Standard and Enhanced Mitigation Planning Requirements

(See PowerPoint from Hagerty)

- Focus on making risk assessment hazard evaluation in order to make it less like a term paper
- Changing future conditions vs. climate change

4 Step THIRA Process

- Streamline process in order to reduce burden of repeating the process
- Focus on making sure each of the outcomes are obtained
- Uniform list and uniform processes moving forward
- Plan on using THIRA as a tool for justifying HMP
- Sean will Call Hope to confirm the details of the alignment with THIRA and HMP

Next Steps and Dates

- Stakeholder Meeting – First Week of April 4

7.2.8 Local and Tribal Integration Meeting

7.2.8.1 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Local and Tribal Integration Meeting

Tuesday, March 20, 2018, 1:30 p.m.

Webinar at Adobe Connect at https://share.dhs.gov/nddeshlsplans

accompanied by an audio bridge hosted at 877-820-7831 Pin Code 950503

***Meeting Purpose*: Outline strategies for development of the Enhanced Mitigation Mission Area Operations Plan (MAOP).**

Meeting Notes

Attendees

- North Dakota
  - Kathleen Donahue
  - Amanda Schooling
- Hagerty Consulting
  - Hope Winship
  - Michelle Bohrson

Discussion Notes

- Most of what we look at is local risk assessment
- Mitigation strategies at the state level vs. state taking on local strategies
  - NDDES prioritize funding based on locals need, and tries to incorporate additional State strategies (e.g. education programs, policies within state agencies)
- Goal is to cultivate local involvement in the hazard mitigation committee – and consider how NDDES can use this local involvement

- Discussed what the interactive element of the Kick-off meeting will look like: break out groups by committee. Also discussed the information needed prior to the kick-off meeting.
- Discussed the need to incorporate Climate Change into this plan update.

7.2.9 Mitigation Planning and Stakeholder Meeting

7.2.9.1 Invitation

Subject: Save the Date -- Hazard Mitigation and Stakeholder Processes Meeting
When: Thursday, April 05, 2018 1:30 PM-4:00 PM (UTC-06:00) Central Time (US & Canada).
Where: Brynhild Haugland Room, State Capitol

Please see the message below from Cody Schulz, Director, North Dakota Homeland Security

Hello NDDES Partners:

We are asking you to save the date for 1:30 p.m. to 4:00 p.m., Thursday, April 5, 2018, for a Mitigation Planning/Stakeholder Processes Meeting, at the Brynhild Haugland Room of the State Capitol.

In an effort to minimize the number of meeting requests you receive from our agency, we are combining efforts at NDDES to hold joint process meetings. With your support, we have positioned our mitigation planning and program efforts to minimize the impacts of our state's hazards and threats, and to move to enhanced mitigation planning status, which will translate into more mitigation dollars during a federally-declared disaster.

We will send an agenda closer to the meeting date. Our objectives with the meeting will be to identify our state's hazards and threats and to discuss how the Threat and Hazard Identification Risk Assessment (THIRA) process will be leveraged to support our mitigation planning, response and exercise and training efforts.
If you cannot attend, please send a representative from your office.

Thank you for making the protection of our citizens a priority. Your insights will ensure we have a roadmap for a more disaster-resilient North Dakota.

Cody Schulz
Director, Homeland Security
N.D. Department of Emergency Services

7.2.9.2 Agenda

Mitigation Planning and Stakeholder Processes Meeting

Thursday, April 5, 2018, 1:30 p.m.

Brynhild Haugland Room, State Capitol

Conference Call: 866-906-7447; PIN: 7584607#

Webinar: https://global.gotomeeting.com/join/253755909

***Meeting Purposes*: Identify natural and technological hazards and adversarial threats that could adversely impact the state; outline the processes for analyzing these hazards and threats; and discuss how these processes will support our statewide initiatives to protect the homeland.**

Mitigation Plan Objective: Protects the citizens of North Dakota from natural and technological hazards and adversarial threats.

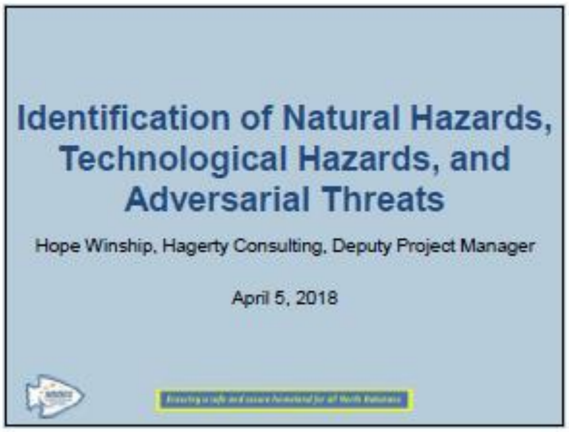
Agenda

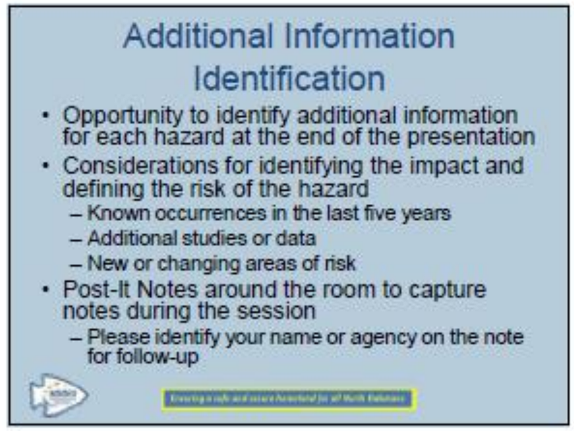
1	Welcome and Introductions	Cody Schulz, Director, Division of Homeland Security, N.D. Department of Emergency Services (NDDES)

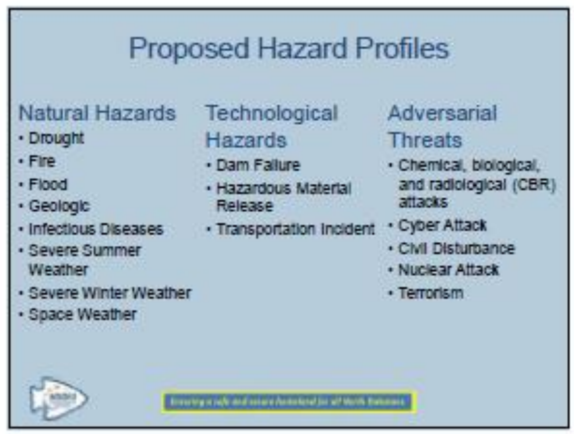
2	Meeting Purposes and the Direction of Hazard Mitigation Planning in North Dakota	Russ Korzeniewski and Kathleen Donahue, Technical Advisory Committee, State Hazard Mitigation Team
3	Developing an Enhanced Mitigation Plan	Hope Winship, Deputy Project Manager, Hagerty Consulting
4	Risk Assessment Methodology for Mitigation Plan and THIRA	Hope Winship
5	Identification of Natural Hazards, Technological Hazards and Adversarial Threats	Hope Winship
6	Leveraging the THIRA Process to Achieve Goals	Sean Johnson, Plans Officer, NDDES
7	Integrating Training and Exercises with Risk Assessment Processes	Brenda Vossler, Training and Exercise Officer, NDDES
8	Next Steps and Dates • Partners provide data to NDDES (April 20, 2018) • Risk Assessment drafted and distributed to Committee Leads for Review and Discussion with Team Members (May-June 2018) • Next meeting – June 26, 2018 (tentative)	Kathleen Donahue
9	Questions and Closing Comments	Cody Schulz

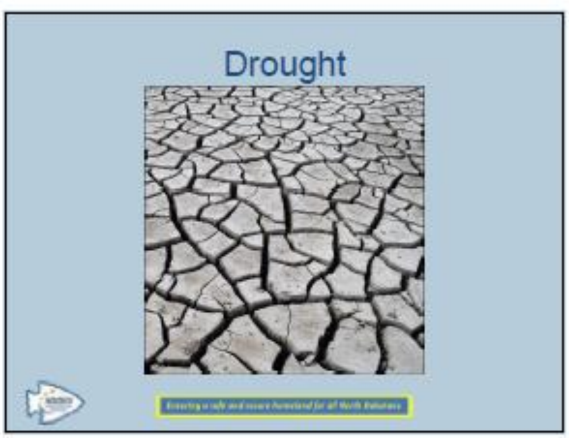
7.2.9.3 Slide Deck

Hazard and Threat Identification Presentation









Floods

- Closed basin
- Flash floods
- Ice jam
- Levee failure
- Riverine flooding

Geologic

- Earthquake
- Landslide
- Other (expansive soil, land subsidence, mining)

Infectious Diseases

- Animal disease
- Human pandemic
- Plant disease

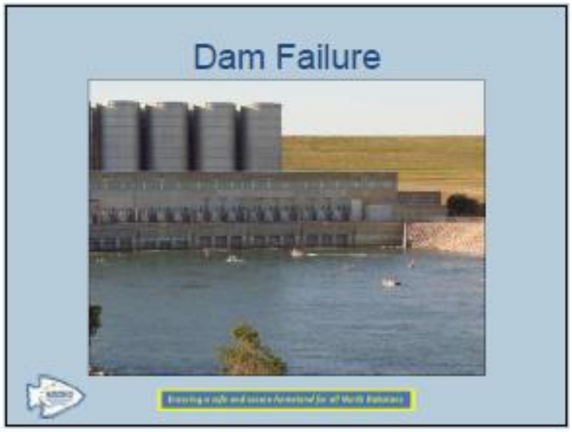
Severe Summer Weather

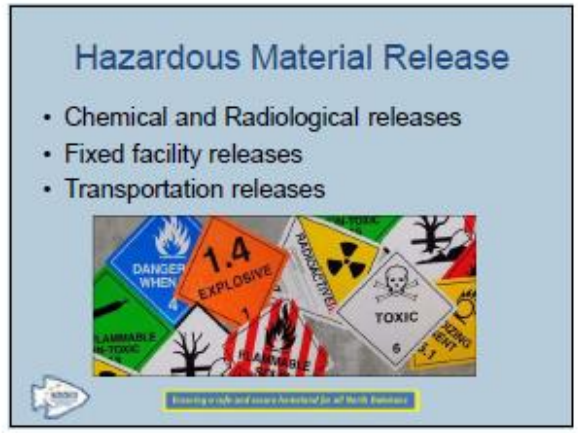
- Downbursts
- Extreme heat
- Hail
- Lightning
- Tornado
- High wind

Severe Winter Weather

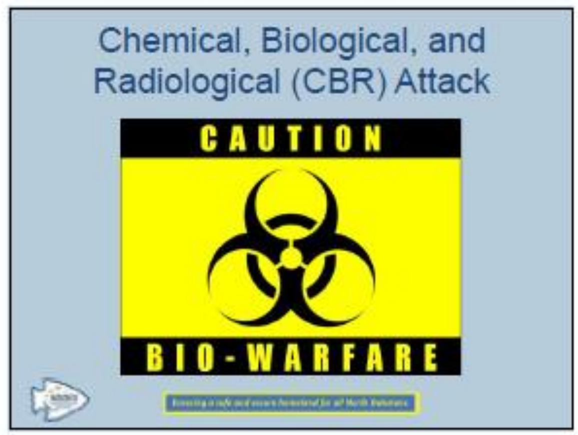
- Blizzard
- Extreme cold/wind chill
- Heavy snow
- Ice storms
- Structural collapse

Space Weather

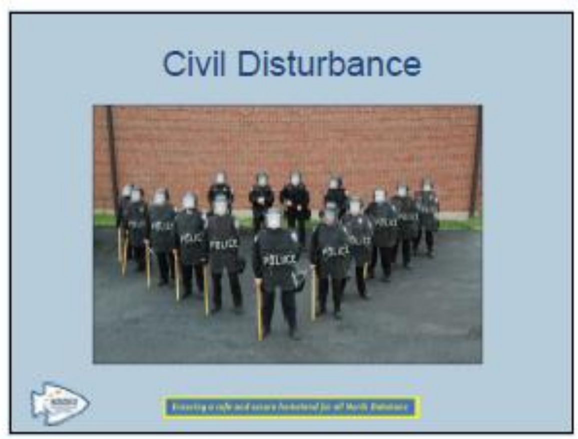

Dam Failure


Hazardous Material Release
• Chemical and Radiological releases
• Fixed facility releases
• Transportation releases
1.4
EXPLOSIVE
TOXIC

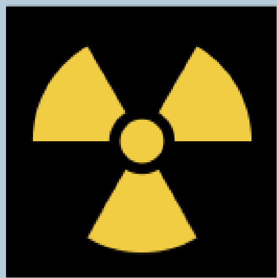

Transportation Incident


Chemical, Biological, and Radiological (CBR) Attack
CAUTION
BIO-WARFARE


Cyber Attack


Civil Disturbance

Nuclear Attack



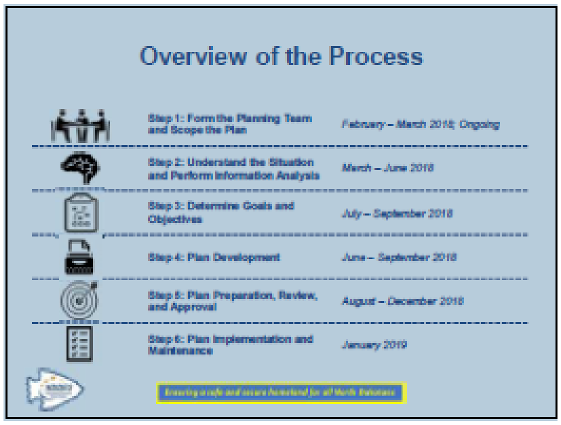
Terrorism

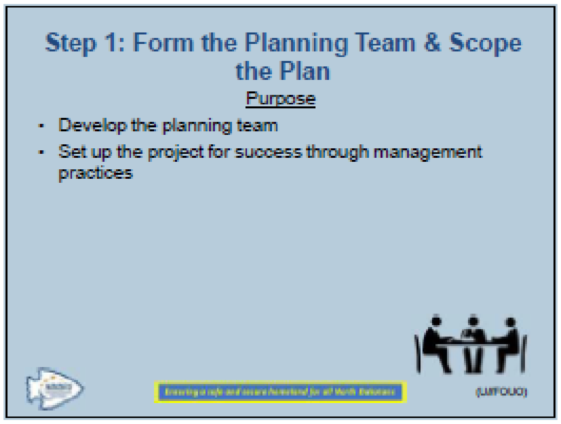
- Aircraft/vehicle as weapon
- Armed assault
- Explosive attack
- Food/food production attack

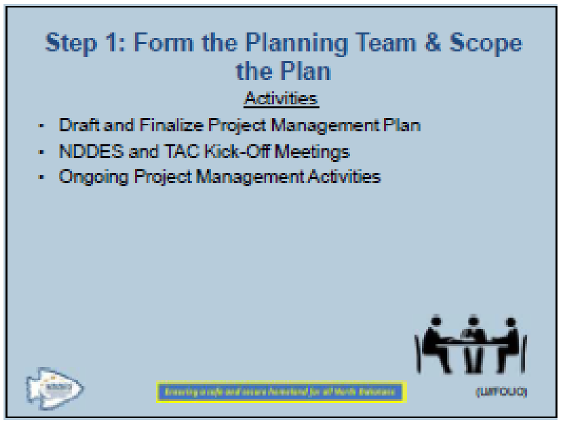
Additional Information Identification

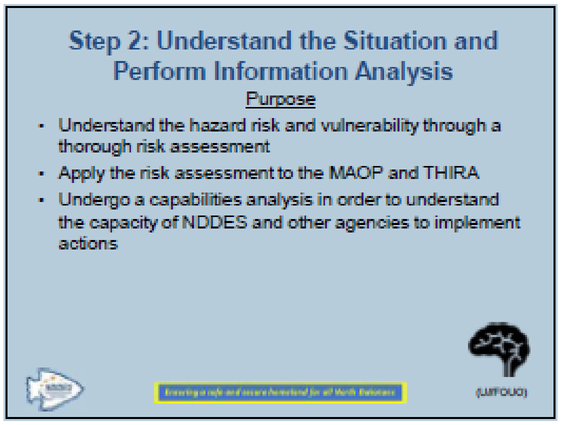
- Considerations for identifying the impact and defining the risk of the hazard
  - Known occurrences in the last five years
  - Additional studies or data
  - New or changing areas of risk
- Use Post-It Notes to capture information for each hazard
  - Please identify your name or agency on the note for follow-up

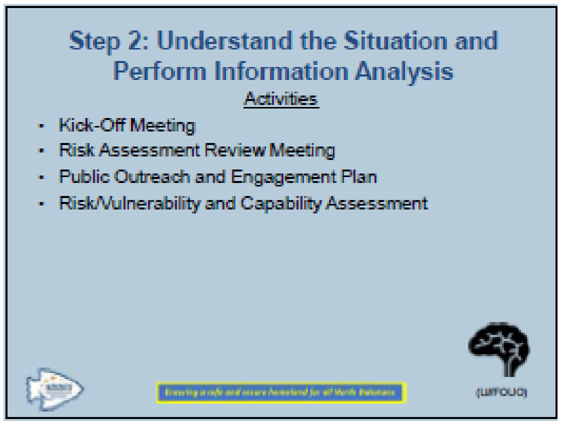
Planning Process Presentation











Step 3: Determine Goals and Objectives

Purpose

- Heart of hazard mitigation planning
- Develop a motivation for the mitigation actions and action plan
- Ensure the action plan is comprehensive and holistic in its implementation
- Make the developed actions implementable

(U//FOUO)

Step 3: Determine Goals and Objectives

Activities

- Mitigation Strategies Meeting
- Coffee Breaks
- Mitigation Strategies Review
- Mitigation Strategies Recommendations Report
- Information for THIRA Step 3 (Establish Capability Targets)

(U//FOUO)

Step 4: Plan Development

Purpose

- Compile the results of previous analysis and meetings in order to complete the comprehensive mitigation plan
- Compare the developing plan with the FEMA State Mitigation Plan Review Guide Requirements in order to ensure the plan will be approved by FEMA

(U//FOUO)

Step 4: Plan Development

Activities

- Mid-Planning Meeting
- Enhanced Plan Documentation Assembled
- Avoided Losses Analysis

(U//FOUO)

Step 5: Plan Preparation, Review, and Approval

Purpose

- Ensure that all stakeholders have had ample opportunity to contribute to the plan development and comment
- Required by FEMA to be formally adopted
- Ensure that the plan is useful and actionable

(U//FOUO)

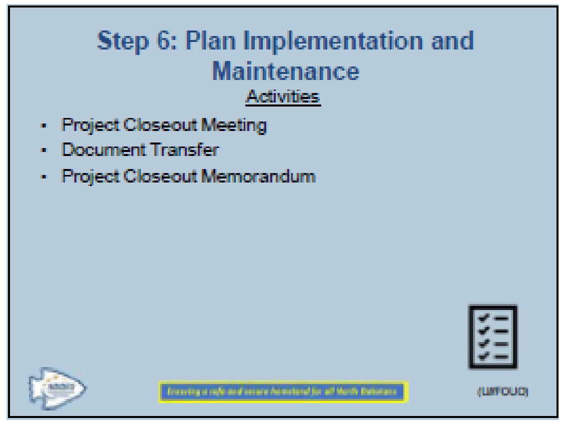
Step 5: Plan Preparation, Review, and Approval

Activities

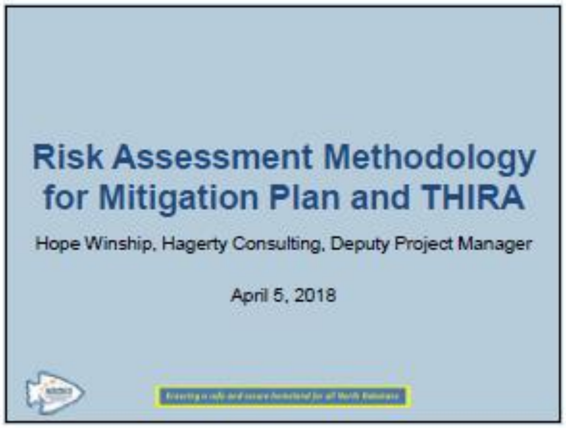
- Revision Review & Final Planning Meeting
- Public and Stakeholder Review
- Draft MAOP and Final MAOP (initial FEMA submission on 10/15/2018)
- Final Revised MAOP

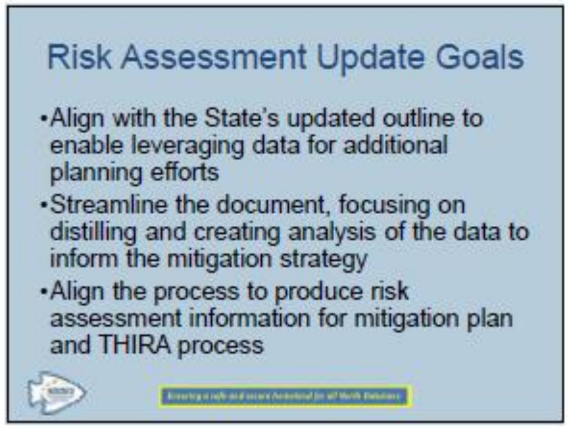
(U//FOUO)

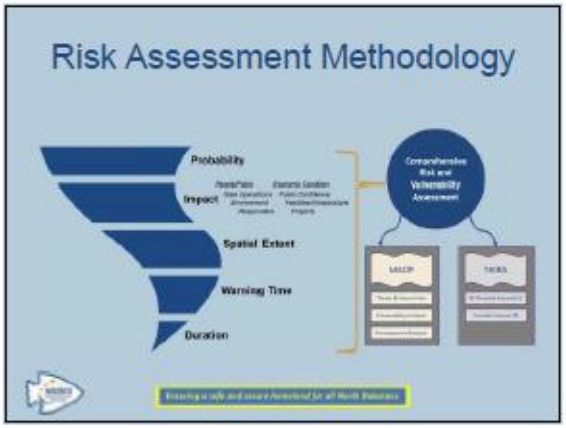

Step 6: Plan Implementation and Maintenance
Purpose
• Aim to keep the Hazard Mitigation Plan as a living document
• Allow for plan adjustments, for circumstances such as:
– New information
– Severe hazard events
• Effectively contribute to developing a culture of mitigation in North Dakota

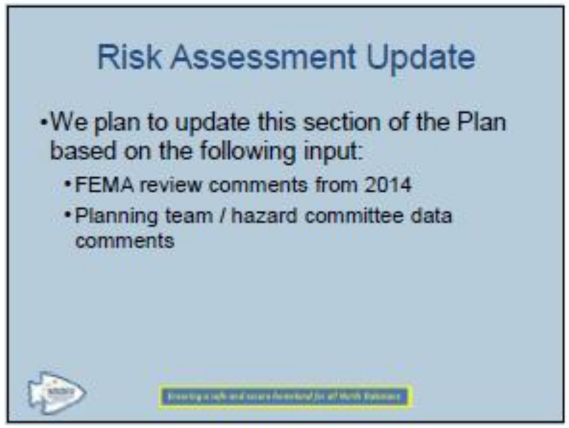

Step 6: Plan Implementation and Maintenance
Activities
• Project Closeout Meeting
• Document Transfer
• Project Closeout Memorandum

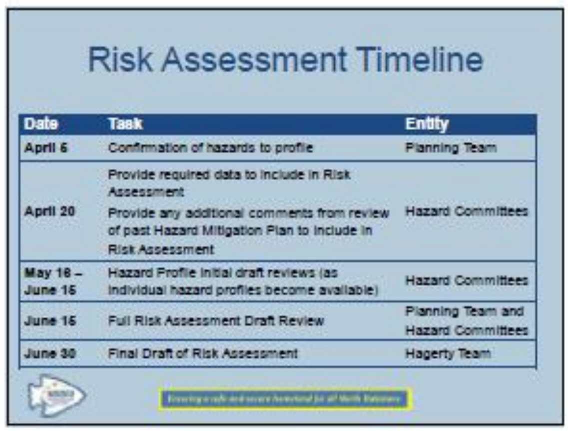
Risk Assessment Methodology Presentation











7.2.9.4 Handout Materials

State Hazard Mitigation Team Guidance Memo

Guidance Memo for the North Dakota State Hazard Mitigation Team

Revised: April 2, 2018

Purpose

This guidance memo provides the State Hazard Mitigation Team (SHMT) guidance for the North Dakota statewide mitigation plan development and program implementation. The SHMT is comprised of local/tribal, state, federal, non-governmental and private organizations with authorities, responsibilities and/or expertise required to ensure North Dakota's resiliency to natural and technological hazards and adversarial threats.

SHMT Objectives

The SHMT objectives are as follows:

- Provide a roadmap for building a more disaster-resilient North Dakota by developing and maintaining an effective statewide hazard mitigation program that is supported by all levels of government, non-governmental organizations and the private sector.
- Promote hazard mitigation efforts to reduce loss of life and property by lessening the impact of disasters.
- Ensure North Dakota's continued eligibility for federal disaster recovery dollars.
- Ensure the *State of North Dakota Enhanced Mission Area Operations Plan (MAOP)* serves as the foundation for enactment of a statewide mitigation program.

SHMT Responsibilities

SHMT are requested to provide the following in support of objectives:

- Identify natural and technological hazards and adversarial threats that could potentially impact the state.
- Provide data to support analyses of hazards and threats.
- Determine capabilities required to mitigate these hazards and threats.
- Identify resources required to strengthen these capabilities.
- Recognize and resolve policy issues critical to the implementation of mitigation planning and program.
- Communicate effectively with public and private partners to meet identified needs.
- Identify problems and design solutions for anticipated events.
- Identify anticipated related impacts.
- Guide identification of viable mitigation strategies.
- Enact and track mitigation actions in support of program implementation.
- Support program implementation to include review of local, tribal and state project applications for the Hazard Mitigation Assistance programs.

- Identify and pursue sources of funding for mitigation planning and programs.
- Support mitigation project application development and review.
- Participate in SHMT meetings and events.
- Provide periodic updates regarding changes in risk and vulnerability posed by the identified natural and technological hazards and adversarial threats.
- Provide annual updates regarding mitigation action implementation.

N.D. Department of Emergency Services (NDDES) Responsibilities

NDDES has oversight for development, implementation and maintenance of a comprehensive statewide hazard mitigation program. NDDES Disaster Recovery staff members coordinate with the SHMT team members to:

- Assign the State Hazard Mitigation Officer (SHMO) and Mitigation Planning Officer to serve as co-chairs of the SHMT.
- Ensure development of an actionable *Mitigation MAOP*.
- Provide oversight for enactment of the statewide mitigation program.
- Encourage development of local and tribal mitigation capabilities.

Organizational Structure

The SHMT is comprised of a Technical Advisory Committee, Hazard- and Threat-Specific Committees and Planning Committees, as required.

<u>Technical Advisory Committee (TAC)</u>

The TAC provides overall guidance for mitigation plan and program development, implementation and maintenance. TAC membership includes representation of the following organizations:

- N.D. Department of Emergency Services (NDDES)
- N.D. Emergency Management Association (NDEMA)
- N.D. Department of Human Services (NDDHS)
- N.D. Department of Transportation (NDDOT)
- N.D. State Water Commission (SWC)
- National Oceanic and Atmospheric Administration (NOAA) National Weather Service

The TAC analyzes data and analyses from the SHMT Committees to determine mitigation planning and program priorities when developing and updating the *State of North Dakota Enhanced Mission Area Operations Plan (MAOP).*

The TAC provides oversight for committee activities and designates teams, as required, to focus on research, development and review of mitigation policies and procedures.

Hazard and Threat Committees

The TAC establishes hazard and threat specific committees based on identified natural and technological hazards and threats. These committees provide expertise to analyze the hazards and threats and then identify viable mitigation actions to reduce risk.

Hazard and Threat Committee Leads

The Hazard and Threat Committee Leads ensure identification of stakeholders and data collection requirements. The Leads facilitate review of the hazard- and threat-specific risk assessments with committee members. The Leads may elect to meet in person or electronically with committee members. The Leads also coordinate with the committees to identify mitigation actions.

Planning Committees

The TAC designates committees to address issues specific to mitigation planning concerns and program implementation.

Planning Committee Leads

The Committee Leads have oversight for identification of stakeholders and data required to examine mitigation planning-related issues. The Leads may elect to meet in person or electronically with committee members. The Leads also coordinate with the committees to identify mitigation actions.

Enhanced Mitigation MAOP Visual

April 2, 2018

Enhanced Mitigation Mission Area Operations Plan

Objectives:

- *Provide a roadmap for building a more disaster-resilient North Dakota.*
- *Ensure North Dakota's eligibility for federal disaster recovery dollars.*
- *Serve as the foundation for enactment of a statewide mitigation program.*

Key Action Steps:

- *Identify natural and technological hazards and adversarial threats.*
- *Analyze risk, impacts and vulnerability.*
- *Consider long-term climate changes that may affect or influence long-term vulnerability to natural hazards.*
- *Evaluate capabilities and resources.*
- *Develop a statewide mitigation strategy.*

State Hazard Mitigation Team Responsibilities:

- *Provide data to support analyses of hazards, threats and capabilities.*
- *Guide identification of viable mitigation strategies.*
- *Enact mitigation actions in support of program implementation.*

Proposed List of Hazards and Threats

Please let us know if you have any changes to the List of Hazards and Threats:

Kathleen Donahue, 701.328.8113, kdonahue@nd.gov

Roxanne Anderson, 701.328.8158, roxanneanderson@nd.gov

Hazard/Threat Profiles

Natural Hazards

- Drought
- Fire
- Flood
- Geologic
- Infectious Diseases
- Severe Summer Weather
- Severe Winter Weather
- Space Weather

Technological Hazards

- Dam Failure
- Hazardous Material Release
- Transportation Incident

Adversarial Threats

- Criminal, Terrorist, or Nation/State Attack
- Cyber Attack
- Civil Disturbance

SharePoint Instructions and Best Practices MEMO

MEMO

To: North Dakota Hazard Mitigation Plan Partners
From: Hagerty Team
Date: March 29, 2019
Re: SharePoint Best Practices

Overview

The North Dakota project team has set up a SharePoint site in order for their hazard committees to access materials for review and provide input. In order to maximize this tool, the Hagerty Team prepared this memo. It addresses:

- Determining your account information;
- Accessing SharePoint; and
- Troubleshooting issues.

Determining Your Account Information

The first step in accessing this tool is to determine which email you have used in the past to access the Microsoft Office environment. Please note: this may not be the email you use at work. If you have not previously created a Microsoft account, you can disregard this and provide the Hagerty Team with your preferred email. Once you have this information, please send it to the Hagerty Team point of contact (michelle.bohrson@hagertyconsulting.com). This is the email to which the invitation to access the site will be sent.

Accessing SharePoint

You will receive an invitation to access the site via the email account that you provided to Hagerty. **The link in this original email invitation will only be active for 24 hours.** For this reason, Hagerty recommends that once you have navigated to the site, you add it as a bookmark in your browser so that you can easily access it in the future.

Troubleshooting Issues

If you are unable to log on to SharePoint, please check the following things:

- Are you attempting to log in with the email that you gave to Hagerty?
- Are you attempting to log in using the expired invitation link?
- Are you logged into another account on your computer?
    - If so, try accessing the site through an incognito tab.

If you are still having issues, please reach out to Hagerty's SharePoint support team at 847-492-8454 ext. 117 or laura.scherb@hagertyconsulting.com.

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7.2.9.5 Meeting Notes

Mitigation Planning and Stakeholder Processes Meeting

Thursday, April 5, 2018, 1:30 p.m.

Brynhild Haugland Room, State Capitol

Conference Call: 866-906-7447; PIN: 7584607#

Webinar: https://global.gotomeeting.com/join/253755909

Meeting Purposes*: *Identify natural and technological hazards and adversarial threats that could adversely impact the state; outline the processes for analyzing these hazards and threats; and discuss how these processes will support our statewide initiatives to protect the homeland.

Mitigation Plan Objective: Protects the citizens of North Dakota from natural and technological hazards and adversarial threats.

Meeting Notes

Introductions-*Kathleen Donahue*

- North Dakota has seen changes in population demographics, changes in weather, climate change among other factors affecting mitigation and preparedness efforts.

Members Role-*Kathleen Donahue*

- Driving towards what is practical and feasible for the stakeholders
- Desire for the public's viewpoint; improving on the 24 responses received during the previous plan update (FEMA made comments on this)
- Key stakeholders have an important role as subject matter experts
- Yearly update of mitigation action for ongoing accreditation
- Review of data collection guide and SharePoint. Review of previous submissions in data
- 2013 items uploaded to SharePoint-Roxanne is the point of contact for these documents

Review of tools available to members-*Russ Korzeniewski*

- FEMA documented solid hazard mitigation strategies
- No questions from the Key stakeholders

Developing an Enhanced Mitigation Plan-*Hope Winship*

- Review of the Process to develop an Enhanced Mitigation Plan
- Synced up with NDDES planning process
- We are at step 2 and we have the technical advisory committee
- Established management processes and communications plans

Risk Assessment Methodology for Mitigation Plan and THIRA- *Hope Winship*

- **Step-1**- Forming the planning team and scope- *already completed*.
- **Step 2**- New risk assessment - *the majority of what we are doing today*
    - This process used for Mitigation Plan and THIRA process
    - Next steps:
        1. Risk assessment review meeting

    2. Public outreach and engagement plan- people are aware and how they can inform the planning process

- **Step 3**- How are we actually reducing the risks we have identified?
    - What are the local mitigation priorities from tribal and local governments?
    - Make implementation goals- answering the who, when, and where is funding coming from?
    - Hagerty Activities:
        1. Mitigation strategies meeting- this will be a webinar
        2. Conduct coffee breaks in communities
        3. Mitigation strategies review meeting
        4. Mitigation strategies recommendations report
        5. Information for THIRA step 3
- **Step 4**- Plan development - *when we actually put pen to paper*
    1. Activities: Mid-planning meeting
    2. Enhanced plan documentation
    3. Avoided losses analysis- what have we learned from previous mitigation actions during a hazard?
- **Step 5**- Plan preparation, review and approval

- Questions from Key Stakeholders*: Question asked to explain THIRA*
    - Hope*: THIRA is a process, not a deliverable like HIRA is. First step of THIRA and hazard mitigation plan is to define risk. THIRA is a process to identify and categorize the threats and hazards facing North Dakota.*
- Question asked*: For other agencies that receive federal grants that also require THIRA, can we still combine the process?*
    - Sean*: yes, as long as data requirements are known*.
- Data requirement collection guide is out for review. Please identify if data points are missing.
- Review of 2014 plan, looking to streamline analysis a bit better, utilize appendices and data point summaries.
- **Feedback on past profile- review specific hazards**
- Committee responsibilities:
    1. Working on a tight turn around. Please communicate if data is going to take longer
    2. April 20th timeline for the hazard committee reports
    3. Identification of Natural Hazards and Technological and Adversarial Threats
    4. Previously Identified Hazards and Threats

Hazards

- Drought- In 2014, this was ranked a moderate hazard. Is the impact higher now? Has probability changed?
    - Comment from stakeholders:
        - *Discussion regarding changes in crops and agricultural production in ND.*
- Fire- In 2014, this hazard was split between technological and natural
    - Comments from stakeholders:
        - *They are both in both categories- recommended keeping them together- North Dakota Fire Fighers Assoctiation*

        - *State Health Department of Emergency Preparedness- agreed. Past fires regarding prairie land is very different and causes urban problems- keep them together.*
        - *Fire Forest Services- fuel type doesn't lead to catastrophic fires- shorter duration- 24-48 hours- urban interface becomes more critical.*
        - *Agriculture structures that are impacted by fires is when it becomes critical*
    - **Recommendation**: Moving forward- they will be kept together.
- Floods- In 2014, this was a high hazard
    - Comments from Stakeholders:
        - *Does the state water commission agree?*
        - *Yes- Dam failure- will be an included profile*
        - *Separate higher released from dam failure.*
        - *Damage from ground water flooding, higher ground water tables- state water commission*
- Geologic- In 2014, this was a low hazard
    - Comments from Stakeholders:
        - *North Dakota Geological Survey (geologist) - exposure to environmental minerals*
        - *Looking at radon*
        - *NDSU extension service- expansive soils number of issues with pressure against basement walls*
        - *Pembina County EM- top soil erosion should be discussion referenced to causes*
        - *DES- question for geologic- volcanic questions?*
- Infection Diseases-
    - Comments from Stakeholders:
        - *Center of Disease control- human pandemic is too specific, keep it with human disease, might not reach pandemic level. Likes one health approach- thank you.*
        - *State epidemiologist - one health approach- includes environmental impact factor- flooding questions, make sure we are looking at that piece.*
        - *Department of mineral resources – invasive species placement? Create their own profile, impact on other threats and hazards- is it a cause? Hope asked them to look through the data collection guide- what area would they like us to evaluate?*
        - *NDSU extension service- questions about environmental health such as mold. Look at the impact of that from other hazards.*
- Severe Summer Weather- All sub-hazards ranked as high in the previous plan.
    - Comments from Stakeholders:
        - *High wind was separate*
        - *North Dakota Fire Service- see these in advance of a catastrophic fire- always tied to high wind/lightening.*
        - *From a medical facility perspective- general utility loss, could lead to fire, etc. Consequence analysis will be performed.*
        - *NWS- high wind was broken out before- referring to convective wind.*
            - *Gathering information from NWS, define downburst, look at severe winds from tornado, what is the impact on property and fires? Describing and defining the impact.*
            - *Pembina County EM: straight line winds impact us a lot*
            - *NWS: downbursts lead to high winds*
        - *Fire Department service- salt water tanks, and oil rigs identification of lightning strikes in oil fields.*
- Severe winter weather- In 2014, this was ranked high

- Comments from Stakeholders:
  - *Hope: Severe winter weather impact on structural collapse*
  - *NWS: pull structural collapse out of winter weather?*
    - *Hope- include it in multiple hazards*
  - *Dept. of Health- Road closures?*
    - *Hope- yep, just like utility failure*
    - *NDSU extension service- years with a lot of snow fall, excessive load on the structures, this is an item that should be addressed under severe winter weather*
    - *Sean-it doesn't matter when we are looking at planning, when we are looking at a multi hazard, it's not the specific hazard, like how many times does evacuation pop up? Don't be afraid to point out that it should fall under a specific hazard, but it might get pulled out across other hazards.*
    - *Hope- what do we need to address those in response, recovery, prevention and protection, it will inform all the other processes*

- Space Weather- impacted by the sun and space environment
  - Comments from Stakeholders:
    - *Hope- wide spread loss of electric power. Wide spread impact on systems.*
    - *Shuts down social media could be a good thing.*
    - *National Guard- can we just say space? Chinese satellite fell out of the sky, etc.*
      - *Hope- yes that is a good point, we can look at defining those impacts*
      - *DHS- space weather office was set up. You can get space weather warnings. Department of energy and defense has started to look at pulling off of major grids. Looking at mini electrical grids.*
      - *Sean- latest boogie men is the EMPs very similar to space weather impacts.*
- Dam failure- In 2014 this was a low
  - Comments from Stakeholders:
    - *Are we looking at International dams?*
    - *Hope- yes, if you have info please share.*
- Hazardous Materials Release
  - No comments from Stakeholders
- Transportation Incident
  - Comments from Stakeholders:
    - *County EM- Maybe here or winter storms- semi's backed up for miles*
    - *ND Airport Authority- there are significant differences between accident (significant loss of life) and incident (air craft issues) from the FAA*
- Criminal, terrorist and National State Attack- Everything including Cyber
  - *Hope- this is an area we are looking for a lot of info on, not a lot of data in the last profile.*
- Cyber Attack- *Separated this hazard as its own standalone profile. Looking to collect a lot of new information since there has been a lot forthcoming in the last 5 years.*
- Civil Disturbance- *This is a new hazard based on the response mission and past events, including events related to Operations and Economy. Looking at getting more data.*
  - Comments from Stakeholders:
    - *Cyber Security analyst for telephone company-do you want feedback now, or when we break out into our committee's?*
    - *Questions about Committee's? Health and Behavior piece? What are we identifying as risk?*
    - *Hope- there are hazard committees and planning committees. The responses to the hazards are the same, send in the information and list the hazards it would respond to.*

- *Identifying the considerations for very specific events and impacts. If its applicable for every hazard, only send it once. Then tell us its applicable for every hazard.*

THIRA Process Leverage-*Sean Johnson*

- **Comments from the Stakeholders:**
  - *Kathleen- will be sending out the presentation via e-mail.*

Integrating Training and Exercises with Risk Assessment Processes- *Brenda Vossler*

- **Comments from Stakeholders:**
  - *Sean- if we need 4-7, let's take a look at them, let's talk about it and get it in there, let's do this as few times as possible.*

Reviewed the data collection guide-*Kathleen Donahue*

- **Comments from Stakeholders:**
  - **None**

7.2.9.6 Attendance

Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)

Initials	Last Name	First Name	Title	Agency	Office	E-Mail
LCA	Ackerman	Laura	Investigations Section Chief	ND State Water Commission (SWC)	701.328.4868	lcackerman@nd.gov
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	Davis	Scott	Director	ND Indian Affairs Commission	701.328.2432	sjdavis@nd.gov
	Delzer	Eric	Pesticide and Fertilizer Division Director	ND Department of Agriculture	701.328.1508	delzer@nd.gov
	Donahue	Kathleen	Deputy Chief, Recovery and Mitigation	NDDES, Division of Homeland Security	701.328.8113	kdonahue@nd.gov
	Dvorak	Kevin	President/CEO	ND Community Foundation	701.222.8349	kdvorak@ndcf.net
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	Ehlis	Randy	Emergency Action Plan Coordinator	U.S. Bureau of Reclamation	701.221.1283	rehlis@usbr.gov
	Erickson	Curt	Manager of the Hazardous Waste Program	ND Department of Health	701.328.5160	cerickso@nd.gov

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Initials	Last Name	First Name	Title	Agency	Office	E-Mail
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	Freeman	Pierre	Code Enforcement Officer/Emergency Preparedness Coordinator	City of West Fargo	701.433.5439	Pierre.Freeman@westfargond.gov
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	Haberstroh	Gary	Environmental Engineer	ND Department of Health	701.328.5206	ghaberst@nd.gov

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Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)

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	Korzeniewski	Russ	Disaster Preparedness Administrator/Risk Manager	ND Department of Human Services	701.328.4190	rkorzeniewski@nd.gov
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Initials	**Last Name**	**First Name**	**Title**	**Agency**	**Office**	**E-Mail**
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Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)						
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	Morris	Tim	Store Manager	Wal-Mart N. Bismarck	701.226.9789	morris41504@hotmail.com
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	Odell	Michael	Cooperative Fire Manager	ND Forest Service	701.328.9196	michael.odell@ndsu.edu
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RP	Peleschak	CPT Robert	Joint Operations Center Planning Officer	ND National Guard	701.333.2304	robert.n.peleschak.mil@mail.mil
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Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)

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DR	Ronsberg	Don	Protective Security Advisor	US Department of Homeland Security	701.516.3940	donald.ronsberg@hq.dhs.gov

Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)						
Initials	**Last Name**	**First Name**	**Title**	**Agency**	**Office**	**E-Mail**
	Sanford	Janet	Permit Operator and Treasurer	ND Oil/Gas & ND Coal Conversion Counties Assn	701.566.5576	janet@ndteamworks.com
JNS	Savadel	Jeffrey	Meteorologist-in-Charge	National Weather Service	701.250.4495	jeffrey.savadel@noaa.gov
TJS	Schenfisch	Tim	IT Director	ND Workforce Safety and Insurance	701.328.5945	tschenfisch@nd.gov
	Schlag	Allen	Service Hydrologist	National Weather Service	701.250.4495	allen.schlag@noaa.gov
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AS	Schooling	Amanda	Emergency Manager, Ward County	ND Emergency Management Association	701.857.6560	amanda.schooling@wardnd.com
DS	Schwartz	Daniel	Emergency Manager	Logan County	701.750.5731	loganem@nd.gov
	Schwert	Donald	Professor & Chair of Geosciences	North Dakota State University	701.231.7496	donald.schwert@ndsu.edu
	Schulz	Cody	Director	N.D. Division of Homeland Security	701.328.8256	cjschulz@nd.gov
	Semerad	Jim	Air Quality, Manager Permitting and Compliance	ND Department of Health	701.328.5179	jsemerad@nd.gov
	Senger	Mary	Southwest Emergency Management Representative	Burleigh County	701.222.6727	msenger@nd.gov
JS	Sickler	Juli	Public Health Emergency Preparedness & Response Division Director	ND Department of Health	701.328.2270	jsickler@nd.gov
AS	Sigl	Adele	Community Development Block Grant Program Manager	ND Department of Commerce	701.328.2618	asigl@nd.gov
[illegible]	Simmons	Gary	Mitigation Specialist	NDDES, Division of Homeland Security	701.328.8255	gsimmons@nd.gov
	Simosko	Ken	Meteorologist	National Weather Service	701.250.4495	ken.simosko@noaa.gov
KS	Sisk	Ken	Deputy Fire Marshal	ND Fire Marshal	701.328.5555	ksisk@nd.gov

Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)

Initials	Last Name	First Name	Title	Agency	Office	E-Mail
	Stanley	Duane	Executive Secretary	ND Peace Officer Standards & Trng Board	701.328.5516	ds417@nd.gov
	Steiner	Vicky	Executive Director	ND Oil/Gas & ND Coal Conversion Counties Assn	701.290.1339	vsteiner@ndsupernet.com
	Stockert	Gary	Emergency Manager	City of Bismarck	701.255.5212	gstockert@nd.gov
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SCJ	Syverson	Larry	Secretary/Director of Governmental Relations	ND Township Officers Association	701.430.1735	Larry.ndtoa@gmail.com
[illegible]	Teunissen	LTC Lila	Commander of the Civil Support Team	ND National Guard, 81st Civil Support Team	701.333.6901	lila.l.teunissen.mil@mail.mil
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JAT	Thompson	Jeff	Hazardous Chemical Officer	ND Department of Emergency Services	701.328.8216	jathompson@nd.gov
	Timian	Bob	Game Warden Chief	ND Game and Fish Department	701.328.6324	rtimian@nd.gov
[illegible]	Tomac	MAJ Waylon	Deputy Commander of Civil Support Team	ND National Guard, 81st Civil Support Team	701.333.6902	waylon.d.tomac.mil@mail.mil
	Tonder	Rick	Director, Facility Management	North Dakota University System	701.777.4270	richard.tonder@ndus.edu
[illegible]	Traynor	Terry	Assistant Director of Policy and Programs	ND Association of Counties	701.328.7321	terry.traynor@ndaco.org
	Wangler	Ken	Environmental Performance Assessment Manager	ND National Guard	701.333.2010	kenneth.w.wangler.nfg@mail.mil
	Washek	Sandy	Lead-Based Paint Coordinator	ND Department of Health	701.328.4216	swashek@nd.gov
	Wavra	Greg	Program Manager, Drinking Water, Municipal Facilities	ND Department of Health	701.328.5224	gwavra@nd.gov
	Wax	Mark	Community Program Director	USDA, Rural Development	701.328.2029	Mark.Wax@nd.usda.gov

Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)						
Initials	Last Name	First Name	Title	Agency	Office	E-Mail
	White	Phil	St. Paul District Chief, Emergency Management	U.S. Army Corps of Engineers	651.290.5205	thomas.p.white@usace.army.mil
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	Wiese	Sean	Division Director	ND Information Technology Department	701.328.1985	swiese@nd.gov
LJW	Wiff	Lydia	Airport Planner	ND Aeronautics Commission	701.328.9657	lwiff@nd.gov
	Woutat	John	Warning Coordination Meteorologist	ND Safety Council	701.751.6107	johnw@ndsc.org
	Yearous	Jenny	Curator of Collections Management	ND Historical Society	701.328.2099	jyearous@nd.gov
MZ	Ziesch	Michael	EGIS Staff Officer	ND Department of Mineral Resources	701.328.8029	mdziesch@nd.gov

Name	Position	Agency

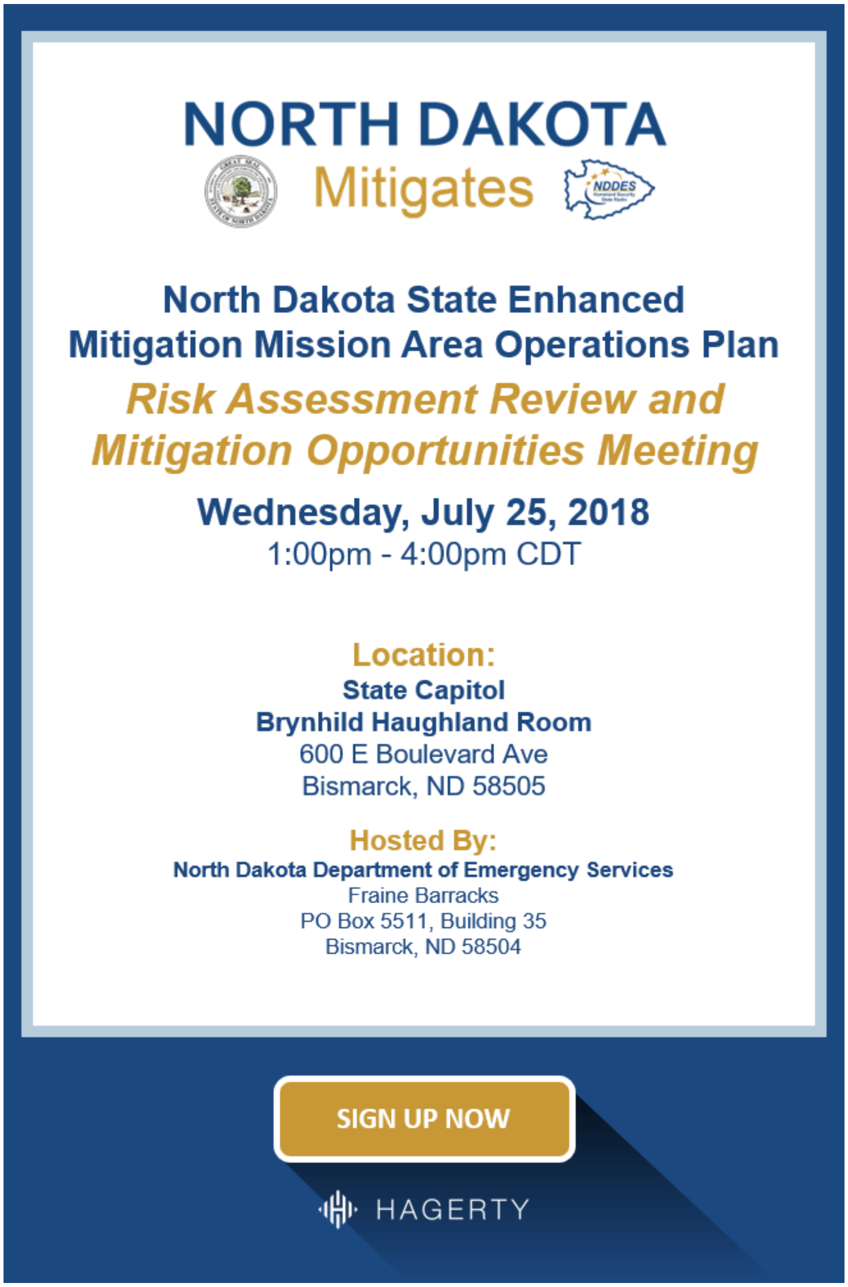
Mitigation Planning/Stakeholder Processes Meeting Check-in (April 5, 2018)

Initials	Last Name	First Name	Title	Agency	Office	E-Mail
Other Attendees						
	DRESSLER	GARRETT	SPECIAL PROJECTS COORDINATOR	NDDES	701.328.8267	GJDRESSLER@ND.GOV
RA	Anderson	Roxanne	Mitigation Specialist	NDDES	701-328-858	roxanneanderson@nd.gov
BK	Kahl	Brent	Large project closeout Sp.	NDDES	701-328-818	brkahl@nd.gov
JV	Vining	Janine	Natnl Weather Service/Fire	NWS	701-223-4582	janine.vining@noaa.
CS	Schulz	Cody	NDDES		701-328-8256	cjschulz@nd.gov
JG	Galloway	Joel	~~USGS~~ Hydrologic studies chief	USGS	701-250-7402	jgalloway@usgs.gov
LR	Regorrah	Larry	NDDES		701-328-8264	lregorrah@nd.gov
BV	Vossler	Brenda	NDDES			
RF	Ferderer	Robert	operations NCO 81st WMD-CST	81st WMD-CST	701-333-6918	Robert.P.Ferderer.mil@mail.mil

Virtual attendees included Greg Gust (NWS), James Condon (Standing Rock Bureau of Indian Affairs), Rick Tonder (NDSU), and members of the NDSU Extension Office and USACE – Omaha.

7.2.10 Risk Assessment and Mitigation Opportunities Meeting

7.2.10.1 Invitation



7.2.10.2 Agenda

State of North Dakota Enhanced Mitigation Area Operations Plan

Risk Assessment Review and Mitigation Opportunities Meeting

State Capitol - Brynhild Haugland Room

July 25, 2018, 1 p.m.

Call-In Information: Dial 847-492-0453 and Enter 323#

***Meeting Purpose*: Review the findings of the risk assessment and initiate a discussion of mitigation goals and actions given those findings.**

Agenda

1	Welcome and Introductions	Justin Messner, NDDDES	1:00 pm – 1:10 pm
2	Mitigation *Matters:* Investing in Mitigation Making the Case to Decision Makers	Kathleen Donahue, Mitigation Planning Officer, NDDES Nicole Aimone, Senior Community Planner, FEMA Region VIII	1:10 pm – 1:35 pm
3	Overview of Risk Assessment Findings	Sydney Delmar, Deputy Project Manager, Hagerty Consulting	1:35 pm – 2:15 pm
4	Breakout Sessions by Hazard Planning Committee: • Discuss Risk Assessment Findings • Brainstorm Mitigation Actions		2:15 pm – 3:15 pm
5	Break		3:15 pm – 3:30 pm
6	Facilitated Group Discussion of Risk Assessment and Potential Mitigation Actions	Sydney Delmar, Deputy Project Manager Hagerty Consulting	3:30 pm – 4:15 pm
7	Questions and Closing Comments	Kathleen Donahue, Mitigation Planning Officer, NDDES Sydney Delmar, Deputy Project Manager, Hagerty Consulting	4:15 pm – 4:30 pm

7.2.10.3 Slide Deck

Agenda Item	Time	Presenter
Welcome and Introductions	1:00 pm – 1:10 pm	Justin Messner, NDDES
Mitigation Matters: Investing in Mitigation Making the Case to Decision Makers	1:10 pm – 1:35 pm	Kathleen Donahue, Mitigation Planning Officer, NDDES Nicole Aimone, Senior Community Planner FEMA Region VIII
Overview of Risk Assessment Findings	1:35 pm – 2:15 pm	Sydney Delmar, Hagerty Consulting
Breakout Sessions by Planning Committee	2:15 pm – 3:15 pm	N/A
BREAK (3:15 pm – 3:30 pm)		
Facilitated Group Discussion of Risk Assessment and Potential Mitigation Actions	3:30 pm – 4:15 pm	Sydney Delmar, Hagerty Consulting
Questions and Closing Comments	4:15 pm – 4:30 pm	Kathleen Donahue, NDDES Sydney Delmar, Hagerty Consulting

Tavis Road Flood Control

Investment in People

- Protect Life and Property
- Prevent Injury
- Preserve Our Environment

Watford City

July 10, 2018

Tornado Shelter

Graner Park Morton County

Mitigation at Work in ND

- Mitigation Plans in Every Jurisdiction
- Data Digitization
- Hazardous Fuel Reduction
- Flood Insurance
- Local Zoning Support
- Silver Jackets
- Basin-Wide Planning
- FireWise
- Outdoor Warning Systems
- Retrofitted Communications Equipment
- Drought Livestock Water Supply Program
- Cyber Security Education

Blueprint for a Safer ND

- Build Partnerships
- Understand Hazards and Threats
- Develop Strategies

How You Make ND Safer

- Expertise
- Skills
- Solutions

Benefits to the Team

- Aligns with Overall Mission
- Amplifies Messages
- Creates Awareness of Resources
- Highlights Concerns in Our Community
- Advances Projects
- Supports Team Members' Plan Development

Investing in Mitigation
Making the Case to Decision Makers

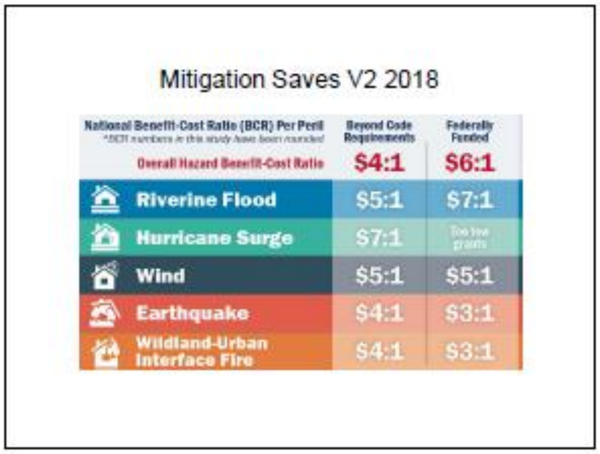
Nicole Aimone, Senior Community Planner
Region VIII Mitigation Planning

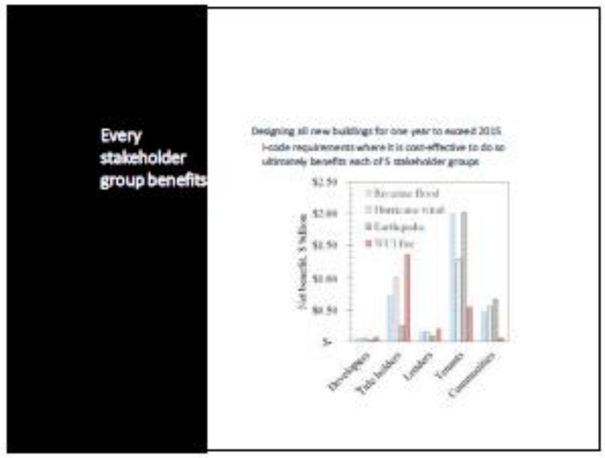
FEMA

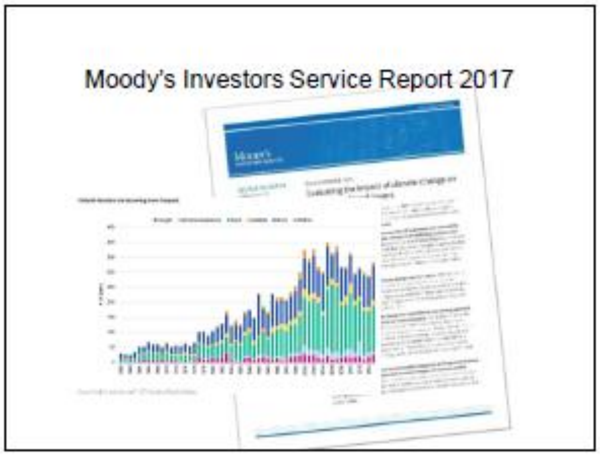
During

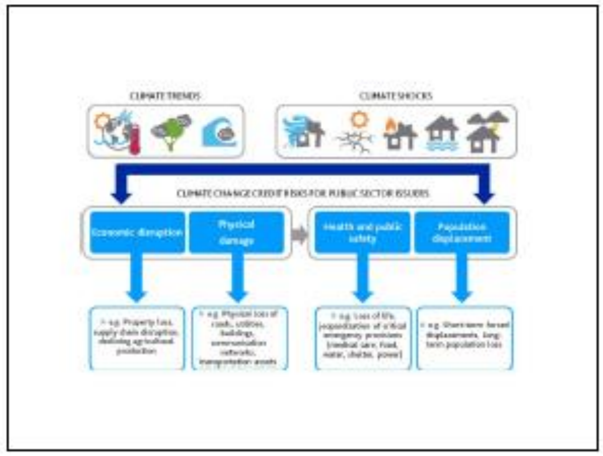
After

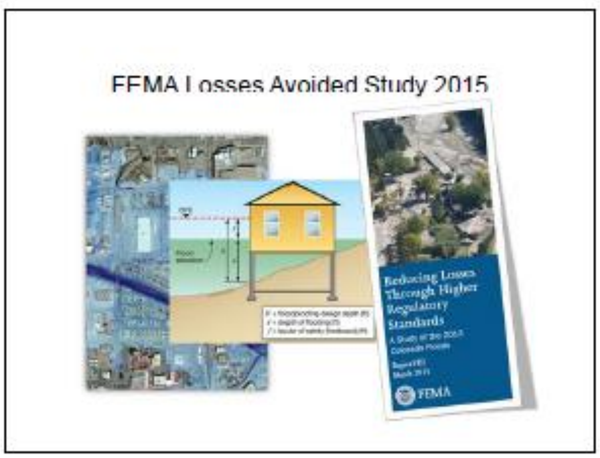
Communicating the Benefits of Mitigation Investment to Local Decision Makers

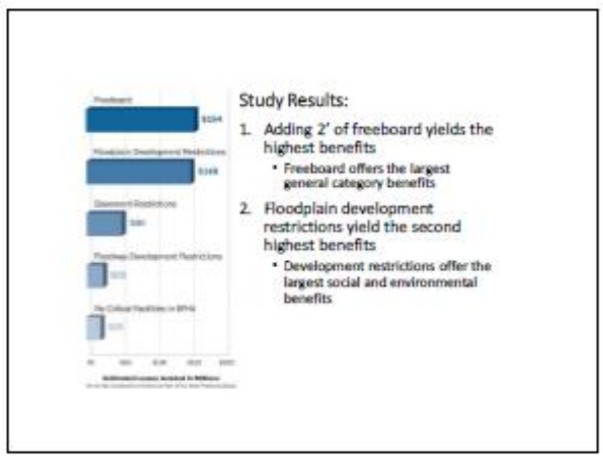

Mitigation Saves V2 2018
National Benefit-Cost Ratio (BCR) Per Peril
Beyond Code Requirements
Federally Funded
Overall Hazard Benefit-Cost Ratio
$4:1
$6:1
Riverine Flood
$5:1
$7:1
Hurricane Surge
$7:1
Too few grants
Wind
$5:1
$5:1
Earthquake
$4:1
$3:1
Wildland-Urban Interface Fire
$4:1
$3:1

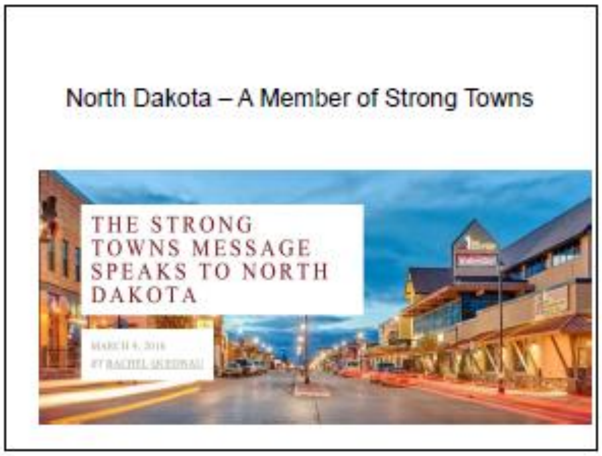

Every stakeholder group benefits
Developers
Title holders
Lenders
Tenants
Communities

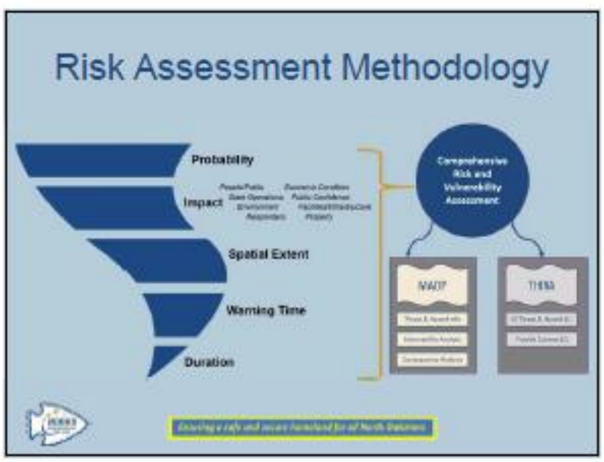

Moody's Investors Service Report 2017

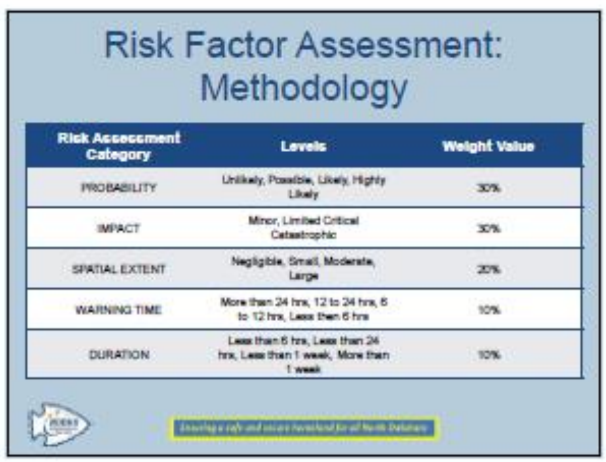

CLIMATE TRENDS
CLIMATE SHOCKS
Economic disruption
Physical damage
Health and public safety
Population displacement


FEMA Losses Avoided Study 2015
Reducing Losses Through Higher Regulatory Standards
FEMA


Study Results:
1. Adding 2' of freeboard yields the highest benefits
• Freeboard offers the largest general category benefits
2. Floodplain development restrictions yield the second highest benefits
• Development restrictions offer the largest social and environmental benefits







Risk Assessment Category	Levels	Weight Value
PROBABILITY	Unlikely, Possible, Likely, Highly Likely	30%
IMPACT	Minor, Limited Critical Catastrophic	30%
SPATIAL EXTENT	Negligible, Small, Moderate, Large	20%
WARNING TIME	More than 24 hrs, 12 to 24 hrs, 6 to 12 hrs, Less than 6 hrs	10%
DURATION	Less than 6 hrs, Less than 24 hrs, Less than 1 week, More than 1 week	10%

Risk Factor Assessments: Results

1. Cyber Attack
2. Flood
3. Severe Winter Weather
4. Severe Summer Weather
5. Fire
6. Infectious Diseases
7. Drought
8. Hazardous Materials
9. Space Weather
10. Dam Failure
11. Criminal Terrorist Nation Attack
12. Geologic Hazards
13. Civil Disturbance
14. Transportation Incident

Cyber Attack

- Attack or hijack of the information technology infrastructure that is critical to the functions controlled by computer networks
- 3 notable previous occurrences in the past 5 years

Risk Factor	Degree of Risk
Probability	Likely
Impact	Critical/ Catastrophic
Spatial Extent	Large
Warning Time	Less than 6 Hrs
Duration	More than 1 Week

Flood

- Includes: closed basin, flash floods, ice jams, levee failure, high dam release, riverine flooding
- 34 notable previous occurrences (1826 – 2018)

Risk Factor	Degree of Risk
Probability	Highly Likely
Impact	Critical/ Catastrophic
Spatial Extent	Moderate
Warning Time	6 to 12 Hrs
Duration	Less than 1 Week

Severe Winter Weather

- Includes blizzards, ice storms, heavy snow events, extended extreme cold temperatures
- Approximately 3-4 widespread blizzard events per decade

Risk Factor	Degree of Risk
Probability	Highly Likely
Impact	Limited/Critical
Spatial Extent	Large
Warning Time	More than 24 Hrs
Duration	Less than 1 Week

Severe Summer Weather

- Includes downbursts, hail, lightning, tornadoes, high wind, and extreme heat
- Approximately 250 severe summer weather events annually

Risk Factor	Degree of Risk
Probability	Highly Likely
Impact	Critical/ Catastrophic
Spatial Extent	Small
Warning Time	6 to 12 Hrs
Duration	Less than 6 Hrs

Fire

- Includes urban and wildland fire – both human and natural caused
- 14 + previous urban fire events (from 1882 – 2018) and 25 + wildland fire events (from 1988 – 2018)

Risk Factor	Degree of Risk
Probability	Highly Likely
Impact	Limited/Critical
Spatial Extent	Small
Warning Time	Less than 6 Hrs
Duration	Less than 24 Hrs

Infectious Disease

- Human, animal, and plant diseases with high infection rates or those that can destroy livestock/crops
- Cases annually

Risk Factor	Degree of Risk
Probability	Highly Likely
Impact	Limited/Critical
Spatial Extent	Small
Warning Time	More than 24 Hrs
Duration	More than 1 Week

Drought

- Reduction of soil moisture below the minimum to sustain life
- 6 notable drought events – 1930s, 1950s, 1970s and 1980s, 2000-2007, 2012, 2017

Risk Factor	Degree of Risk
Probability	Possible
Impact	Limited/Critical
Spatial Extent	Large
Warning Time	More than 24 Hrs
Duration	More than 1 Week

Hazardous Material Release

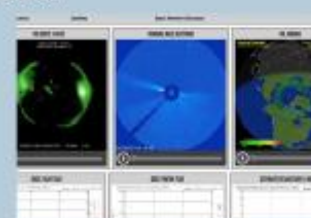
- Substances posing unreasonable risk to safety and health, the environment, and property of citizens
- 7 notable previous occurrences – 1965, 1987, 2002, 2006, 2010, 2016, 2017

Risk Factor	Degree of Risk
Probability	Possible
Impact	Critical/ Catastrophic
Spatial Extent	Negligible
Warning Time	Less than 6 Hrs
Duration	Less than 1 Week

Space Weather

- Consequence of the behavior of the sun, Earth's magnetic field and atmosphere, and location in solar system which affects technology
- No recorded previous occurrences

Risk Factor	Degree of Risk
Probability	Unlikely
Impact	Limited/Critical
Spatial Extent	Large
Warning Time	Less than 6 Hrs
Duration	Less than 1 Week



Dam Failure

- Sudden and uncontrolled release of water impounded by dam, can be caused by hydrological failures or seepage failures
- No recorded previous occurrences

Risk Factor	Degree of Risk
Probability	Possible
Impact	Limited/Critical
Spatial Extent	Small
Warning Time	Less than 6 Hrs
Duration	Less than 6 Hrs

Criminal, Terrorist, or Nation-State Attack

- Includes: chemical, explosive, biological, radiological, nuclear, and food/food production attacks and armed assault
- Approximately 7 previous notable events/threats

Risk Factor	Degree of Risk
Probability	Unlikely
Impact	Critical/ Catastrophic
Spatial Extent	Small
Warning Time	Less than 6 Hrs
Duration	Less than 6 Hrs

Geologic

- Includes: Earthquake, Landslide, Expansive Soils, Land Subsidence, Mining Hazards, Radon
- 11,077 identified landslides, 16 earthquakes felt

Risk Factor	Degree of Risk
Probability	Possible
Impact	Limited/Critical
Spatial Extent	Small
Warning Time	Less than 6 Hrs
Duration	Less than 6 Hrs

Civil Disturbance

- Occurs when large groups take action due to political grievances, economic disputes, or social discord, terrorism, or foreign agitators
- 3 notable civil disturbance events – 1993, 1969, 2016-2017

Risk Factor	Degree of Risk
Probability	Likely
Impact	Limited/Critical
Spatial Extent	Negligible
Warning Time	More than 24 Hrs
Duration	Less than 24 Hrs

Transportation Accident

- Large-scale vehicular, railroad, or aircraft accident involving mass casualties
- No notable previous occurrences with mass casualties

Risk Factor	Degree of Risk
Probability	Unlikely
Impact	Minor/Limited
Spatial Extent	Negligible
Warning Time	Less than 6 Hrs
Duration	Less than 6 Hrs

Mitigation Opportunities

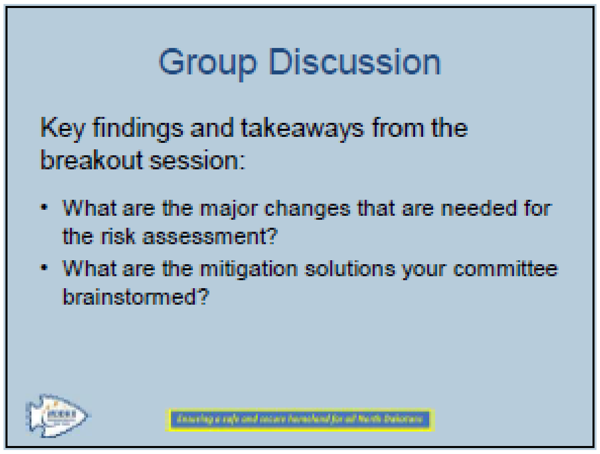
- Risk Assessment results will be used to develop mitigation actions
- **Mitigation Action:** specific action, project, activity, or process taken to reduce or eliminate long-term risk to people, property or the environment from threats and hazards
  - Local plans and regulations
  - Structural projects
  - Natural systems protection
  - Education programs
  - Preparedness and response actions

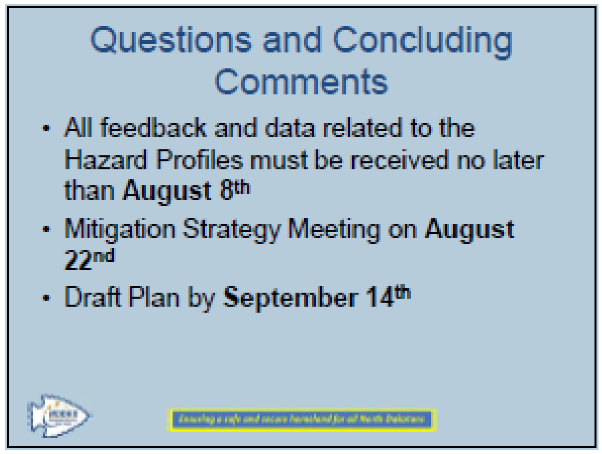
Breakout Sessions

- Meet with your planning committee to discuss hazard profiles and mitigation opportunities.
- Please fill out the provided worksheet.
- We will discuss the results from the individual sessions as a group afterwards.

Breakout Session Questions

- Is there anything in the hazard risk profile that should be changed, added, or removed? How would you prioritize each change: high, medium, or low priority?
- Please describe the impacts this hazard can have on:
  - State Operations (including Continuity of Operations and Continued Delivery of Services)
  - Public Confidence
  - Economic Condition
- Is there a vulnerability identified in this hazard risk profile that is a top priority to address? What are some actions that you think can be taken to mitigate these risks?
- What other actions can you think of that would be helpful in mitigating risk to this hazard?


Group Discussion
Key findings and takeaways from the breakout session:
• What are the major changes that are needed for the risk assessment?
• What are the mitigation solutions your committee brainstormed?


Questions and Concluding Comments
• All feedback and data related to the Hazard Profiles must be received no later than August 8th
• Mitigation Strategy Meeting on August 22nd
• Draft Plan by September 14th


Key Contacts
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Nicole Almone
Senior Community Planner
FEMA Region VIII, Mitigation Division
Nicole.Almone@fema.dhs.gov

7.2.10.4 Handout Materials and Exercises

Breakout Discussion Instructions

Committee Lead Instructions

Thank you for leading your committee's discussion during the upcoming Risk Assessment and Mitigation Opportunities Meeting on July 25th, 2018 for the North Dakota Enhanced Mitigation Area Operations Plan 2018 Update. To assist you in this role, we have prepared the following guide to help you prepare for and lead a break out session to discuss your hazard profile. If you have any further questions, please feel free to reach out to Kathleen Donahue, kdonahue@nd.gov.

Pre-Meeting Preparation

- Review assigned hazard and threat profiles
- Review the breakout session questions outlined in the "Risk Assessment and Mitigation Opportunities Breakout Session Handout" (also outlined below):
  - Is there anything in the hazard risk profile that should be changed, added, or removed? What would you prioritize each change: high, medium, or low priority?
  - Please describe the impacts this hazard can have on:
    - State Operations (including Continuity of Operations and Continued Delivery of Services)
    - Public Confidence
    - Economic Condition
  - Is there a vulnerability identified in this hazard risk profile that is a top priority to address? What are some actions that you think can be taken to mitigate these risks?
  - What other actions can you think of that would be helpful in mitigating risk to this hazard?
- Communicate with your assigned committee to ensure they are prepared for the meeting, including:
  - Reading the assigned hazard/threat profile
  - Reading through the discussion questions
  - Bringing a printed or electronic copy of the hazard profile to the meeting

During the Meeting

- Lead the discussion
  - Address all the questions in the Breakout Session Handout
  - Note the time to ensure that all the questions can be adequately addressed
- Identify a notetaker (can be yourself) to capture the discussion for the planning process
- Prepare for a Brief-Out to the main group after the Break-Out Sessions
  - Please identify 2-3 main points that were discussed to be presented to the larger group

- Identify a spokesperson (can be yourself) who will present these main points

Breakout Discussion Worksheet

NORTH DAKOTA
Mitigates

Risk Assessment and Mitigation Opportunities
Breakout Session

Hazard Profile: ____

Name (First, Last): ____

Organization: ____

Title/Position: ____

Is there anything in the hazard risk profile that should be changed, added, or removed? How would you prioritize each change: high, medium, or low priority?

____

____

____

____

____

Please describe the impacts this hazard can have on:

State Operations (including Continuity of Operations and Continued Delivery of Services):

____

____

Public Confidence:

Economic Condition

Is there a vulnerability identified in this hazard risk profile that is a top priority to address? What are some actions that you think can be taken to mitigate these risks?

What other actions can you think of that would be helpful in mitigating risk to this hazard?

7.2.10.5 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Risk Assessment and Mitigation Opportunities Meeting

State Capitol - Brynhild Haugland Room

July 25, 2018, 1 p.m. – 4:30 p.m.

Call-In Information: Dial 847-492-0453 and Enter 323#

***Meeting Purpose*: Review the findings of the risk assessment and initiate a discussion of mitigation goals and actions given those findings.**

Meeting Notes

Justin Messner – Provides Introduction

- Explanation of why mitigation planning is a requirement but also a priority for the state

Kathleen Donahue – Mitigation *Matters*

- Discussion of why we should invest in mitigation
    - Mitigation - when leaders choose to stop the process of continuing repair and choose to invest in people
    - Consider vulnerable populations
        - Older North Dakotans who have specific medical needs
- Mention of current hazard events and their relevance to mitigation:
    - High water of the Missouri River
        - The majority of the room did not think of mitigation when the flooding happened
        - Tavis Road Flood Control Project
    - Watford City – July 10 Tornado
        - Loss of life
        - Mentioned a tornado shelter (Graner park, Morton County)
        - Watford City has been struck twice in the last few years – need for mitigation
- Discussion of Mitigation Successes:
    - Every community either has a plan or is working on a plan
    - Driven by local (stakeholder efforts)
- Drive to create a State Hazard Mitigation Plan that is a “living” document
- Reminder that 4 Community Coffees have been conducted – Senior Citizens, Homeless Individuals, VOADs, First Responders
- Discussion of what the benefits of this plan are to the stakeholder team:
    - Aligns with overall mission (of various stakeholder agencies)
    - Amplifies messages (of various stakeholder agencies)
    - Creates an awareness of interagency of resources
    - Highlights concerns in our community (e.g. homeless coalition)
    - Advances other plans and projects (e.g. division of animal health, mobile animal shelter)

Nicole Aimone – Senior Community Planner at FEMA

- A bottom line argument for mitigation to leadership is the financial benefits:
    - Economic Resiliency
    - Competing priorities in the budget – how do we make the case for long term viability?
        - Both for hazards that are rare/haven’t happened yet
        - Common Hazards
- Discussion of 3 Different Reports underscoring the need for mitigation:
    1. Natural Hazard Mitigation Saves 2.0 (National Institute of Building Saves)
        - Reduction of loss of revenue (given hazard mitigation)
        - Reduction of loss of economic activity (given hazard mitigation)

        - Huge improvements of injury, death, post-traumatic stress (given hazard mitigation)
        - Lenders and developers benefit from hazard mitigation measures
    2. Moody's Investors Service Report 2017
        - Biggest credit rater in the US
        - Evaluating local government's investment in future resilience/climate change
        - Climate Trends/Climate Shocks
    3. Reducing Losses Through Higher Regulatory Standards (CO)
    4. 1000-year rainfall events
        - Examine impact of floodplain management policies
        - Losses before/losses after regulatory measures were developed
        - Mitigation works – challenges floodplain policies are challenging but actually benefits the communities
- Strong Towns – Podcast
    - North Dakota Main Street Initiative
    - Look at Infrastructure and Land Use
    - Economic Resiliency in North Dakota

Sydney Delmar – Risk Assessment

- List of specific threats
- What are the priorities for risk assessment methodology?
    - Probability
    - Impact
    - Spatial Extent
    - Warning Time
    - Duration
- Reminder that there are two separate ongoing processes that will use this HIRA data: MAOP and THIRA
- Review of Risk Factor Assessment methodology and results
- Discussion of Mitigation Opportunities
    - Review of the 5 types of mitigation actions

Various Stakeholders – Brief Out from Break Out Groups

<u>Adversarial Threat</u>
- Reported having a pretty complicated discussion
- Discussion of needing to adapt the risk factor assessment methodology
- Discussion of cyber probability
    - What is the probability of the cyber-attack making it through the protection mechanisms vs actually being attempted?
    - Can list out some of the types of technology that can mitigate the cyber threat (without actually listing the technologies)
- Their committee went through the profiles in detail, and Kirk Hagel would like to be provided with a Microsoft Word doc of the profile section to make his changes

<u>Dam Failure</u>
- Discussion of the limits of how the profile discusses dam failure: other types of dam failure
- Discussion of how the impact of dam failure is dependent on which dam you are discussing (e.g. Garrison Dam = High)
- Discussion of mitigation actions/barriers:
    - Information gap for inundation mapping
        - Lack of inundation mapping for high/medium hazard dams
        - Desire for consolidation to one GIS location but committee believes they might face technical and info sharing issues

    - Better communicate risk to people downstream (consider potential ways of doing that)

<u>Drought</u>

- Reported some general formatting and grammatical issues in the section
- Discussion of the “Drought unified command team” – multiple agencies involved
- Discussion of how the energy and agricultural sectors should be engaged
- Discussion of mitigation actions/barriers:
    - Discussion of how public confidence in the state’s government can be reduced during times of drought
    - Discussion of the necessity for clear communication
        - Consider: how is the state responding and how can the public find out about it?
    - Discussion of balancing types of water usage
        - Identify priorities and ways to address increased demand
    - Discussion of aging water infrastructure
        - Review of maintenance plan
        - Are there plans on addressing these issues
    - Discussion of how the main mitigation action includes awareness through public information
        - Importance of taking advantage of good year
        - Using assistance when available
    - Discussion of planning: do all cities know where their water is coming from?
    - Discussion of utilization of crop insurance

<u>Fire</u>

- Ryan Melin mentions having a lot of suggested changes to the document
    - Main comment: too much of a drought emphasis throughout the document as a cause of wildland fire
        - Drought usually not the *cause* of fire in North Dakota
        - Fire in North Dakota is “Pre-green” and “Post-frost” or March/April and October/November
            - Once fuels dry, they are readily consumable
        - Data in the document showed this but provided too much emphasis on drought
    - Suggestion of including suppression cost in the profile
        - Currently discuss lost cost
        - For large fire events, suppression cost should be available
        - Budgets in rural fire departments make firefighting challenging
    - Generally, the document was lengthy and hard to read
        - Document jumped back and forth between wildland and urban fire
    - Should include a discussion of initial vs. extended attack
    - There was some irrelevant data in the document
    - The duration of fire events is usually much longer then 24hrs
- Discussion of mitigation actions/barriers:
    - Local, county and state and federal partners all work together
    - Public info and education during high fire danger seasons
    - Hazard fuels mitigation projects
    - Need to standardize training for fire departments throughout the state
    - TTX based on threat assessments with mutual aid partners

<u>Flood</u>

- Overall, the document is laid out well
- Committee mentioned that most comments have already been submitted
    - Updates to the dollar amounts from federal disasters (page 2 of annex)
- Large costs can be associated with flooding (2009/2011 flooding, cities, agricultural lands)
- Ongoing effort to prepare maps and identify high risk areas
- Discussion of mitigation actions/barriers:

    - Outreach and public education of the risks
    - 10.7% of high risk structures are insured through the NFIP in the state
    - Public confidence
    - Zoning – on the local jurisdiction to develop and enforce
- Discussion of the uncertainty surrounding the NFIP expiration

Geologic
- Committee had some suggestions for reorganization of the document
- Right now, the formatting seems a little chaotic to the committee
- Discussion of inclusion of the Siren 2020 and Wind Energy Facility in impact assessment
- Committee was interested in having more clarification on how the numbers are arrived at in the risk methodology
- North Dakota conducted the landslide surface mapping

Hazardous Materials/Transportation
- Mentioned how this is a different group because mitigation is ongoing all the time due to legal requirements
- Committee has some content additions
- Discussion of mitigation actions/barriers:
    - Improved public awareness and notification
    - Already regulations abound
    - General improvements to infrastructure
    - Utilization of technology

Infectious Diseases
- Initial suggestion: add “And Pests” to title
- Committee felt like there was still a lot of work to be done and requested a Microsoft Word version of the document
    - Committee felt like there also needed to be input from the Department of Agriculture and Game and Fish
    - Committee mentioned that they felt that rabies and pneumonia are not pertinent to this discussion
    - Major focus: tuberculosis and influenza (human and animal)
- Public information and enforcement are important – to support measures that are already in place (e.g. vaccination and preventive treatments)

Severe Winter Weather
- Ice storms in North Dakota have a major impact
    - Transportation
    - Communications
    - Energy
    - Structure collapse
        - Committee felt like the definition in the profile does not capture what they were looking for
- Important to note that the time of the year determines impact – earlier results in more impact, later results in less impact
- Discussion of mitigation actions/barriers:
    - Public confidence in state governance
        - Good communication
        - Being more preemptive
    - Improved forecasting ability
    - Natural snow fences and tree rows (they work!)
    - Pretreatment of roads and pre-positioning of supplies

Space Weather

- Main discussion was about how the current profile focuses on catastrophic space weather
- Space Weather can have had NON-catastrophic space weather events (e.g. Auroras)
    - Should include a discussion of lower and mid-level events
- Mitigation mostly through awareness

<u>Severe Summer Weather</u>

- Discussion of how there are some inconsistencies in time period and varied sources
    - e.g. wind events (what constitutes as an event?)
    - Noted that there are nuances at the state level
    - Committee suggested starting locally (local NWS office) in terms of gathering data and then build out from there (NCEI Storm Database)
- Discussion of how there are some definitions that can be clarified and cleaned up
- Discussion of mitigation actions/barriers:
    - Noted that warning is getting better and better
    - Storm Spotter training
    - Help public in getting out of the way of these events

Follow Up

- Kathleen will meet with committee heads individually in order to make sure all of their issues are resolved
- August 22 – Mitigation Strategies Webinar

7.2.10.6 Attendance

Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)

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Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)						
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Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)

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Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)						
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	Traynor	Terry	Assistant Director of Policy and Programs	ND Association of Counties	701.328.7321	terry.traynor@ndaco.org
	Vining	Janine	Meteorologist	National Weather Service	701.223.4582	janine.vining@noaa.gov
	Wangler	Ken	Environmental Performance Assessment Manager	ND National Guard	701.333.2010	kenneth.w.wangler.nfg@mail.mil
	Wavra	Greg	Program Manager, Drinking Water, Municipal Facilities	ND Department of Health	701.328.5224	gwavra@nd.gov
	Wax	Mark	Community Program Director	USDA, Rural Development	701.328.2029	Mark.Wax@nd.usda.gov
	White	Phil	St. Paul District Chief, Emergency Management	U.S. Army Corps of Engineers	651.290.5205	thomas.p.white@usace.army.mil
Tw	Wiedrich	Tim	Director, Emergency Preparedness and Response	ND Department of Health	701.328.4520	twiedric@nd.gov
SW	Wiese	Sean	Division Director	ND Information Technology Department	701.328.1985	swiese@nd.gov
	Wiff	Lydia	Airport Planner	ND Aeronautics Commission	701.328.9657	lwiff@nd.gov
	Woutat	John	Warning Coordination Meteorologist	ND Safety Council	701.751.6107	johnw@ndsc.org

Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)						
Initials	Last Name	First Name	Title	Agency	Office	E-Mail
	Yearous	Jenny	Curator of Collections Management	ND Historical Society	701.328.2099	jyearous@nd.gov
	Zahn	Linda		ND Department of Health	701.328.4724	lzahn@nd.gov
	Ziesch	Michael	EGIS Staff Officer	ND Department of Mineral Resources	701.328.8029	mdziesch@nd.gov

Mitigation Planning/Stakeholder Processes Meeting Check-in (July 25,2018)						
Initials	Last Name	First Name	Title	Agency	Office	E-Mail
Other Attendees						
[illegible]	Messner	Brad	Mitigation	2418 Peach Tree Bismarck		bmessner@nd.g.
NA	Aimone	Nicole	FEMA - Mitigation			nicole.aimone@fema.dhs
SM	McMerty	Sandy	Deputy Tax Comm			samcmerty@nd.gov
D.N.	Nelson	Doug	State Fire Marshal	4205 State St. Bismarck, ND		ddnelson@nd.gov
KVH	Ver Helst	Kayla	Public Affairs	~~ND HFA~~ ND HFA		kverhelst@nd.gov
ST	Thorson	Sheila	~~EPR~~ HPP Division Director	EPR		smthorson@nd.gov
[illegible]	Ellingson	Julie	EVP	NDSA		jellingson@ndstockmen.org

Virtual attendees included Becky Koch (ND State University Extension Service), Shirley Dykshoorn (Lutheran Disaster Response), and Kim Ellabay (North Dakota State University).

7.2.11 Mitigation Strategies Webinar

7.2.11.1 Invitation

7.2.11.2 Agenda

State of North Dakota Enhanced Mitigation Area Operations Plan

Mitigation Strategy Webinar

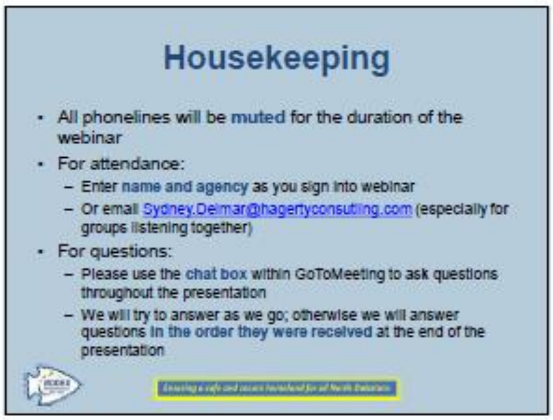
August 22, 2018, 1:00 – 2:30 p.m. CST

Webinar Information: https://global.gotomeeting.com/join/773248485
Call-In Information: Dial 847-492-0453 and Enter 323#

Webinar Purpose*: *Review the mitigation goals and objectives, status of the previous mitigation actions, and new mitigation actions.			
Agenda			
1.	Welcome and Introductions	Justin Messner, Disaster Recovery Chief, NDDES Sydney Delmar, Deputy Project Manager, Hagerty Consulting	1:00 – 1:10 p.m.

2.	Mitigation Successes	Kathleen Donahue, Mitigation Planning Officer, NDDES Justin Messner	1:10 – 1:25 p.m.
3.	Overview of Mitigation Goals and Objectives	Sydney Delmar	1:25 – 1:45 p.m.
4.	Review of Ongoing Mitigation Actions and New Mitigation Actions	Sydney Delmar	1:45 – 2:20 p.m.
5.	Questions and Closing Comments	Kathleen Donahue Sydney Delmar	2:20 – 2:30 p.m.

7.2.11.3 Slide Deck



Mitigation Successes

- 2017 Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) Applications
  - Submitted 22 Projects
  - 17 Selected for Further Review
  - Current Total Approximately $7,000,000
    - Fed Share = $5,000,000
  - Receiving 5-6% of the National Budget

Infrastructure Projects

- Minot Water Treatment Plant Flood Protection
  - Currently $30,012,091.00
  - Consists of the Installation of a ¾ mile earthen levee and concrete floodwall
  - Project is substantially complete, applicant is working on closeout

Infrastructure Projects

Infrastructure Projects

- Fargo Broadway Interceptor Sewer System Upgrade
  - Currently $23,255,747.00
  - Consists of installing a new force main from Main St. to the WWTP and the modification of 2 city owned lift stations
  - Project was bid into 13 segments to properly manage the force main installation.

Storm Shelters

- Graner Park Totaled - $44,467
- Harmon Lake Totaled - $46,141
- Projects consist of the purchase and installation of pre-cast concrete storm shelters
- Low Cost, Easily Completed
- Meet FEMA Community Shelter Requirements

Storm Shelters

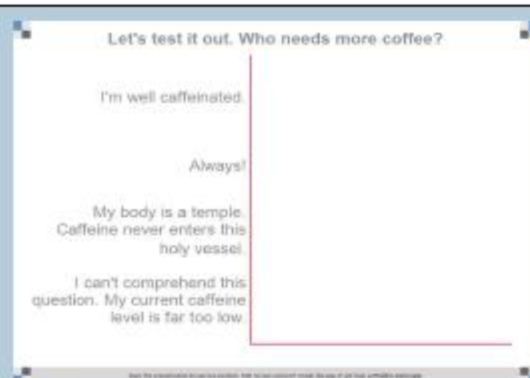
Storm Shelters

2018 PDM and FMA Cycle

- Official Notice of Funding Opportunity has been released
- PDM and FMA Grants will be open from October 1, 2018 through January 31, 2019
  - 120 Day Application Period
- PDM Funding = $238 Million
- FMA Funding = $160 Million

We Want to Hear from You!

- To join **Poll Everywhere**, text **HAGERTY** to **22333**
- Or respond online at www.PollEv.com/hagerty
- Answers are anonymous



Mitigation Strategy Overview

What is a Mitigation Strategy?

- Long-term **blueprint** for reducing the potential losses identified in the risk assessment
- Describes how the state will accomplish the overall purpose, or mission, of the planning process – to **reduce risk from the identified hazards**
- Reflects the **values and priorities** of the community
- Addresses **current and future** threats

Mitigation Strategy Overview

Defining Goals, Objectives, and Actions

- **Goals:** General guidelines that describe what the state would like to achieve
- **Objectives:** Define strategies that must be implemented to achieve the identified goal
- **Actions:** The specific activities the state will take to reduce or eliminate risks
  - There must be at least one mitigation action for each identified hazard
  - Mitigation actions should be realistic and sustainable

Mitigation Strategy Overview

Example:

- **Goal**: Develop and implement state, local and tribal mitigation plans that reflect a sound understanding of hazard and threats.
- **Objective**: Increase and improve mitigation planning efforts at the state, tribal, and local levels through technical assistance.
- **Action**: Provide technical and financial assistance to local and tribal jurisdictions developing or updating their mitigation plan.

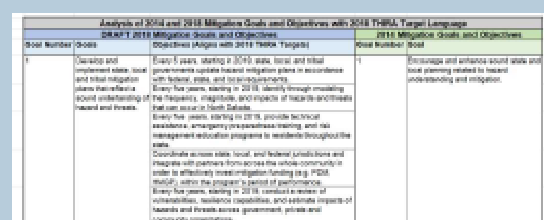
2014 State Hazard Mitigation Goals

- **Goal 1:** Encourage and enhance sound state and local planning related to hazard understanding and mitigation.
- **Goal 2:** Enhance the public's awareness of hazards.
- **Goal 3:** Reduce impacts to future development through the encouragement of wise land use planning.
- **Goal 4:** Reduce impacts of flooding to people and property in North Dakota.
- **Goal 5:** Reduce impacts of severe summer and winter weather to people and property.
- **Goal 6:** Reduce impacts of drought and wildland fires to people and property.
- **Goal 7:** Reduce impacts of human-caused threats to people and property.
- **Goal 8:** Reduce impacts of communicable disease, geological hazards, transportation accidents, urban fire or structural collapse, and windstorm to people and property in North Dakota.

Updates to 2014 Mitigation Goals

- Created broader goals and objectives that are not hazard specific
- Aligned mitigation objectives with the 2018 THIRA capability targets

Proposed 2018 State Hazard Mitigation Goals



We will now walk you through this spreadsheet

Types of Mitigation Actions

- Local Plans and Regulations
- Structural Projects
- Natural Systems Protection
- Education Programs
- Preparedness and Response Actions

Local Plans and Regulations

- Support local jurisdictions to develop local hazard mitigation plans, floodplain management plans, and debris management plans
- Encourage and support local enforcement of building codes and zoning ordinances

Structural Projects

Oxbow, ND, March 28, 2009 – Flooded farms and rural communities adjacent to the Red River of the North. (Source: Andrea Booher/FEMA)

- Retrofitting existing state-owned infrastructure (ex. saferooms)
- Assisting local jurisdictions with acquisition, relocation, elevation, and floodproofing existing structures

Ensuring a safe and secure homeland for all North Dakotans

Natural Systems Protection

- Encouraging local jurisdictions to protect and preserve wetland areas
- Promote the preservation and zoning of greenspace at the local level
- Provide funding for stream corridor restoration

A prairie pothole in North Dakota (Photo by Jim Ringelman, Ducks Unlimited, on Flickr, Creative Commons license)

Ensuring a safe and secure homeland for all North Dakotans

Preparedness and Response Activities

- Developing and deploying emergency notification systems
- Forming mutual aid agreements
- Regularly updating state emergency response plans

Ensuring a safe and secure homeland for all North Dakotans

Ongoing Mitigation Actions

Action Type	Count of Actions
Local Plans and Regulations	11
Structural Projects	11
Natural Systems Protection	0
Education Programs	9
Preparedness and Response Actions	12

Ensuring a safe and secure homeland for all North Dakotans

Ongoing Mitigation Actions

Hazard Addressed	Count of Actions	Hazard Ranking
Cyber Attack	4	1
Flood	13	2
Severe Winter Weather	9	3
Severe Summer Weather	10	4
Fire	9	5
Infectious Disease	2	6
Drought	6	7
Hazardous Material Release	7	8
Space Weather	5	9
Dam Failure	13	10
Civil Terrorist Nation Attack	10	11
Geologic	7	12
Civil Disturbance	7	13
Transportation Incident	7	14
All Hazards	7	N/A

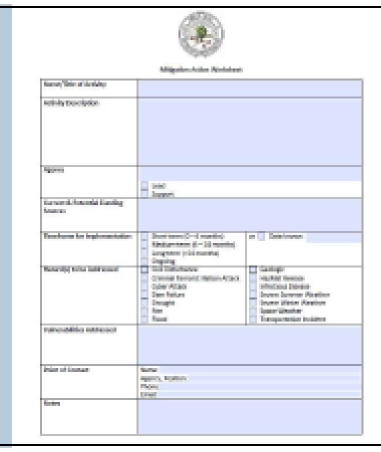
Ensuring a safe and secure homeland for all North Dakotans

What is the number one mitigation priority for your agency or organization?

Ensuring a safe and secure homeland for all North Dakotans

Proposed New Mitigation Actions

- Data Sharing:
  - Create a Interagency Data Sharing Committee that supports the collection and sharing of data
    - Especially GIS data for inundation mapping
- Drought Contingency Plans:
  - Encourage rural and regional water suppliers to develop drought contingency plans
    - Work with the suppliers and farmers to develop priorities for water use during drought



Next Steps

- New Mitigation Actions by **September 3rd**
- Draft Plan by **September 14th**
- Final Planning Meeting on **September 20th**

Questions?

Key Contacts

Sydney Delmar
Deputy Project Manager
Hagerty Consulting
Sydney.delmar@hagertyconsulting.com

Kathleen Donahue
State Project Manager
North Dakota Department of Emergency Services
kdonahue@nd.gov

Hope Winship
Project Manager
Hagerty Consulting
Hope.winship@hagertyconsulting.com

7.2.11.4 Handout Materials and Exercises

Poll Everywhere Results

What is the number one mitigation priority for your agency or organization?

Response		Created At
Critical infrastructure resilience		8/22/2018 14:04
Critical Infrastructure Systems Protection		8/22/2018 14:05
Cyber	2	8/22/2018 14:03
Cyber awareness security		8/22/2018 14:05
Cybersecurity planning/preparation	2	8/22/2018 14:04
data digitalization		8/22/2018 13:37
Data visualization - understand risk		8/22/2018 14:05
Flood	7	8/22/2018 14:04
Flood Control		8/22/2018 14:06
flood education		8/22/2018 14:04
Helping communities understand how to use the new HMA funding opportunities.		8/22/2018 14:04
Helping people floodproof their homes and/or helping communities develop mitigation plans		8/22/2018 13:37
Information dissemination		8/22/2018 14:04
Information privacy		8/22/2018 14:04
Natural hazards		8/22/2018 14:05
Pre-sheltering for tornado event is a major gap		8/22/2018 14:04
Preparing local agencies to use our fundraising told to help with recovery.		8/22/2018 14:04
Providing safe camping.		8/22/2018 14:05
Public education and information	2	8/22/2018 14:04
Reclamation of hazardous abandoned mine lands		8/22/2018 14:06
Reducing Flood Hazard		8/22/2018 14:04
Severe summer weather (including hail & tornado)	3	8/22/2018 14:05
Water supply and flood control		8/22/2018 14:05
Water-related actions		8/22/2018 14:04
winter storms		8/22/2018 14:05

What is the number one mitigation priority for your agency or organization?

Response	Created At
Critical infrastructure resilience	8/22/2018 14:04
Critical Infrastructure Systems Protection	8/22/2018 14:05
Cyber	8/22/2018 14:03
Cyber and Flooding	8/22/2018 14:04
Cyber awareness security	8/22/2018 14:05
Cybersecurity planning/preparation	8/22/2018 14:04
Cybersecurity planning/preparation	8/22/2018 13:37
data digitalization	8/22/2018 13:37
Data visualization - understand risk	8/22/2018 14:05
Flood	8/22/2018 14:04
Flood	8/22/2018 14:04
Flood	8/22/2018 13:37
Flood Control	8/22/2018 14:06
flood education	8/22/2018 14:04
Flooding	8/22/2018 14:04
Flooding	8/22/2018 14:03
Floods	8/22/2018 14:04
Fundraising told should be fundraising tools... Dang autocorrect.	8/22/2018 14:06
Helping communities understand how to use the new HMA funding opportunities.	8/22/2018 14:04
Helping people floodproof their homes and/or helping communities develop mitigation plans	8/22/2018 13:37
Information dissemination	8/22/2018 14:04
Information privacy	8/22/2018 14:04
Natural hazards	8/22/2018 14:05
Pre-sheltering for tornado event is a major gap	8/22/2018 14:04
Preparing local agencies to use our fundraising told to help with recovery.	8/22/2018 14:04
Providing safe camping.	8/22/2018 14:05
Public education	8/22/2018 14:06
Public education and information	8/22/2018 14:04
Reclamation of hazardous abandoned mine lands	8/22/2018 14:06
Reducing Flood Hazard	8/22/2018 14:04
Severe summer weather	8/22/2018 14:05
Summer storms	8/22/2018 14:04
Summer storms/Hail Tornado	8/22/2018 14:04
Water supply and flood control	8/22/2018 14:05
Water-related actions	8/22/2018 14:04
winter storms	8/22/2018 14:05

7.2.11.5 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Mitigation Strategies Webinar

August 22, 2018, 1 p.m. – 2:30 p.m.

https://global.gotomeeting.com/join/773248485

Call-In Information: Dial 847-492-0453 and Enter 323#

***Meeting Purpose*: Introduce the goals and objectives of the mitigation strategy and collect stakeholder feedback about mitigation priorities.**

Meeting Notes

Welcome and Introductions

- Overview of the presentation
- Switched phone lines to: Dial 866-906-7447 and Enter 7584607#

Mitigation Successes

- All counties have, or are working on, mitigation plans
- SHMT ranks and reviews project applications
- Discussion of specific mitigation successes for the state
    - Minot Water Treatment Plant Flood Protection
    - Fargo Broadway Interceptor Sewer System Upgrade
    - Storm Shelters
        - Reach out to state agencies for storm shelter development – this includes local artists to make the intense storm shelter structures more
- Discussion of 2018 funding:
    - Overall increase in PDM funding awarded, less reliance on HGMP (storm dependent) funding

Overview of Mitigation Goals and Objectives

- Provided overview of strategy, goals, objectives, and actions
- New goals were developed:
    - Consider all hazards
    - Goals are not aligned to specific hazards so that goals can continue as the hazards or priorities of the state change.
    - Goals should have a longer life and be more broad
- Used a separate spreadsheet to illustrate what the new goals are, how they compare to the targets developed for THIRA process and also how they compare to the previous goals.

Review of Ongoing Mitigation Actions and New Mitigation Actions

- Overview of types of actions
    - Limited natural systems protection
- Discussion of how there is at least one action per hazard, which provides an opportunity to think through the uncommon hazards now to have a better chance at reducing the risk
    - Limited cyber and infectious disease actions
- Provided an overview of new proposed actions
- Explained how to brainstorm new mitigation actions using the provided mitigation action worksheet
- Poll Everywhere Question: What is the number one mitigation priority for your agency or organization?
    - Critical infrastructure resilience
    - Critical infrastructure systems protection
    - Cyber (2)
    - Cyber awareness security
    - Cybersecurity planning/preparation (2)
    - Data digitalization
    - Data visualization - understand risk
    - Flood (7)
    - Flood control
    - Flood education
    - Helping communities understand how to use the new HMA funding opportunities.

- Helping people floodproof their homes and/or helping communities develop mitigation plans
- Information dissemination
- Information privacy
- Natural hazards
- Pre-sheltering for tornado event is a major gap
- Preparing local agencies to use our fundraising told to help with recovery
- Providing safe camping
- Public education and information (2)
- Reclamation of hazardous abandoned mine lands
- Reducing flood hazard
- Severe summer weather (including hail & tornado) (3)
- Water supply and flood control
- Water-related actions
- Winter storms

Questions and Closing Comments

- Reviewed next steps and the timeline for the remainder of the project.
- Questions from the audience:
  - What is the extent of protection for cyber security?
    - State Assets
  - Would climate profiles help with development of the emergency plants?
    - Yes, generally
    - Some profiles available at the MN Dept. of Health – forwarding to Kathleen

7.2.11.6 Webinar Attendance

Participant Name	Meeting Role	Agency/Organization (if provided)
Kathleen Donahue	Presenter	NDDES
Justin Messner	Presenter	NDDES
Sydney Delmar	Presenter	Hagerty Consulting
Hope Winship	Presenter	Hagerty Consulting
Michelle Bohrson	Notetaker	Hagerty Consulting
Alexis Cook	Stakeholder	ND State Water Commission
Amanda Schooling	Stakeholder	ND EMA/Ward County
Amy Anton	Stakeholder	NDDES
Andrew C. Kirking	Stakeholder	
Becky Koch	Stakeholder	
Bill Brown	Stakeholder	NDDES
Blaine Northrop	Stakeholder	N.D. Stockmen’s Association
Brad Darr	Stakeholder	
Brenda Vossler	Stakeholder	NDDES
Christi Fisher	Stakeholder	NRCS Bismarck, ND

Christy Roemmich	Stakeholder	
Corey King	Stakeholder	NOAA-NWS Bismarck, ND
Curtis Erickson	Stakeholder	
Dan Farrell	Stakeholder	ND State Water Commission
Darin Hanson	Stakeholder	NDDES
Darin Langerud	Stakeholder	ND State Water Commission
Darren Brostrom	Stakeholder	
David Ferrell	Stakeholder	FHWA
Dawn Moen	Stakeholder	
Debbie LaCombe	Stakeholder	NDDES
Dionne Haynes	Stakeholder	ND State Water Commission
Eric Pederson	Stakeholder	
Fred Anderson	Stakeholder	
Gary Stockert	Stakeholder	
Jared H.	Stakeholder	ND State Water Commission
Jason Johnston	Stakeholder	
John Martin	Stakeholder	NOAA-NWS Bismarck, ND
Juli Sickler	Stakeholder	
Justin Messner	Stakeholder	NDDES
Karen Goff	Stakeholder	ND State Water Commission
Karl H. Rockeman	Stakeholder	NDDoH
Kathleen Donahue	Stakeholder	NDDES
Kenneth Hellevang	Stakeholder	
Kent D. Theurer	Stakeholder	
Kevin Dvorak	Stakeholder	
Kimberly Robbins	Stakeholder	
Kirby Kreuger	Stakeholder	
Kirk Hagel	Stakeholder	NDDES
Larry D. Lee	Stakeholder	
Larry H. Regorrah	Stakeholder	NDDES
Laura Ackerman	Stakeholder	ND State Water Commission
Mark Sayler	Stakeholder	ND Bureau of Criminal Investigation
Mary Senger	Stakeholder	
Michelle Bohrson	Stakeholder	Hagerty Consulting
Mike Hall	Stakeholder	ND State Water Commission

Mike McHugh	Stakeholder	
Pierre A. Freeman	Stakeholder	
Randy Ehlis	Stakeholder	
Randy Reimer	Stakeholder	NDDES
Robert (Joe) Lies	Stakeholder	
Roxanne Anderson	Stakeholder	NDDES
Russ Korzeniewski	Stakeholder	
Ryan P. Maddock	Stakeholder	WSI
Sand McMerty	Stakeholder	Office of Tax Commissioner
Sandy Rohde	Stakeholder	
Sarah Bailey	Stakeholder	NDDA, AHD
Sean Johnson	Stakeholder	NDDES
Susan J. Keller	Stakeholder	
Teri Alberico	Stakeholder	CIV USARMY CEMVP (US)
Tim Dodd	Stakeholder	ND State Water Commission
Tim Schenfisch	Stakeholder	
Todd Joersz	Stakeholder	NDDES
Tom Claeys	Stakeholder	NDFS
William Dodd	Stakeholder	

7.2.12 Plan Review Webinar

7.2.12.1 Invitation

7.2.12.2 Agenda

State of North Dakota Enhanced Mitigation Area Operations Plan

Plan Review Meeting Webinar

September 20th, 2018, 1 p.m. – 2 p.m. CST

Webinar: https://attendee.gotowebinar.com/register/9060202705503439875

Meeting Purpose: **To evaluate and collect feedback from stakeholders of the State Enhanced Mitigation Mission Operations Plan (MAOP) to: 1) ensure accuracy; 2) bridge any information gaps; and 3) ensure that the MAOP captures coordination between state and local planning.**			
Agenda			
1	Welcome, Introductions, & Agenda	Kathleen Donahue, NDDES Sydney Delmar, Hagerty Consulting	1:00 pm – 1:05 pm
2	Plan Review	Sydney Delmar	1:05 pm – 1:45 pm
3	Next Steps	Sydney Delmar	1:45 pm – 1:55 pm
4	Questions and Feedback	Open	1:55 pm – 2:00 pm

7.2.12.3 Meeting Notes

State of North Dakota Enhanced Mitigation Area Operations Plan

Risk Assessment and Mitigation Opportunities Meeting

September 20, 2018, 1 p.m. – 2 p.m.

Webinar Information:
https://attendee.gotowebinar.com/register/9060202705503439875

Meeting Purpose*: *Review the planning process and discuss the plan review process.

Meeting Notes

Kathleen Donahue – Provides Introduction

- K. Donahue thanked members of the SHMT for their assistance in producing this draft plan
- K. Donahue noted that the plan is much better because of the involvement of the SHMT

Sydney Delmar – Plan Review Overview

- Overview of Agenda
- Project Overview
- Discussion of the draft plan: what can be found in the draft plan, where the draft can be viewed by members of the SHMT and the public
- Review of the Plan (most of the details of this section were provided in the meeting materials, below outlines distinctive notes or additional details):
  - Planning Process -
    - Eight planning meetings (total)
    - SHMT Structure – Over 200 participants
  - Situation -
    - Discussed importance of state assets and critical facilities in considering mitigation in the state
    - Land Use – "Rural" nature of the state is changing. Considering population growth moving forward will be critical.
  - Risk Assessment -
    - Local and Tribal Plan Integration – evaluate what local plans identified as being valuable to them
    - Discussed the process of developing the risk factor assessment
    - State Facilities are vulnerable to flood (14%) and wildland fire (10%)
    - Critical Facilities ~50 vulnerable to flood
  - Capability Assessment -
    - S. Delmar has requested that stakeholders focus their attention to this section.
    - Summary by program of different mitigation programs in the state
      - Review program description, who its administered by, have there been changes? What improvements could be made?
    - Important to note: 27/58 local plans identify RL/SRL prosperities and created mitigation actions to address those properties
  - Execution -
    - The goals and objectives that were reviewed at the previous meeting did not change
    - S. Delmar commended members of the SHMT for achieving the alignment with THIRA
    - There was utilization of the local plan roll up to consider gaps in state's strategy
    - S. Delmar reminded the SHMT of the need to complete the 2014 mitigation action plan update

- Overview of the prioritization strategy for mitigation actions
- Encouraging participants to continue to suggest actions despite the draft plan being completed
- Discussion of PAS Status – and how this contributes to the enhanced planning requirements

Follow Up

- S. Delmar provided an overview of how to access the plan
- Feedback should be sent to S. Delmar (Sydney.delmar@hagertyconsulting.com) by October 2
- No questions from the audience

7.2.12.4 Attendance

Name	Organization (as provided)
Adele Sigl	
Adnan Akyuz	
Al Hanson	
Alexis Cook	State Water Commission
Amanda Schooling	
Brad Darr	NDDOT
Casey Anderson	
Christina Roemmich	
Corey King	
Curtis Erickson	
Dan Farrell	State Water Commission
Daniel Schwartz	
Darin Langerud	State Water Commission
Darren Brostrom	
Dave Hirsch	
Dionne Haynes	State Water Commission
Fred Anderson	
Gary Allen	
Jason Johnston	
Jenny Yearous	
Karen Goff	State Water Commission
Kari Cutting	
Kathleen Donahue	NDDES
Kent Theurer	
Kevin Dvorak	
Kimberly Robbins	
Kirby Kruger	
Larry Lee	
Laura Ackerman	
Laura Horner	State Water Commission
Mark Sayler	
Mary Senger	
Michael Ziesch	
Mike Hall	State Water Commission
Mike McHugh	
Pierre Freeman	
Rober Lies	

Name	Organization (as provided)
LTC Rob Fugere	ND National Guard
CPT Rob Peleschak	ND National Guard
Robert Timian	
Russ Korzeniewski	
Ryan Maddock	
Ryan Melin	
Sandra Rohde	
Sarah Bailey	
Susan Keller	
Lt Col Tad Schauer	ND National Guard
Teri Alberico	
Tracy Miller	
William Brown	
William Dodd	
Michelle Bohrson	Hagerty Consulting
Sydney Delmar	Hagerty Consulting

7.2.13 Community Coffees – Engaging the Public in Mitigation

The SHMT and the NDDES initiated a series of Community Coffees during the summer of 2018 as part of efforts to develop the Enhanced Mitigation MAOP.

NDDES partnered with the FEMA and emergency managers who were in the process of updating their local and tribal MHMPs.

Community Coffees targeted specific sectors of communities, many of whose voices had never been heard in mitigation planning: senior citizens, homeless individuals, volunteers, public and private health care workers, first responders, service providers, individuals with functional and access needs, federal, state and local elected officials, and local and tribal government employees.

More than 100 North Dakotans shared their stories, experiences and concerns about the state’s natural and technological hazards and adversarial threats. The Community Coffees also offered citizens a chance to share their ideas for minimizing the impacts of these hazards and threats on our communities.

NDDES staff heard resounding support for the concept of mitigation and for pursuing initiatives to make North Dakota more resilient. As one meeting participant noted, it’s important to move beyond short-term, temporary fixes and to look at longer-term solutions.

NDDES plans to continue the initiative in support of local and tribal mitigation planning efforts and to inform the next update to the Enhanced Mitigation MAOP.

Following is a summary of comments shared during the Community Coffees.

7.2.13.1 Library Square, Mandan, 2 p.m., June 27, 2018

Residents at Library Square in downtown Mandan have survived floods, hazardous materials accidents, drought, severe winter weather and severe summer weather. They have suffered losses only to rebuild again. They have helped their community recovery efforts.

Twenty-six residents shared their experiences and their recommendations to make their community safer during the first ever Community Coffee hosted by NDDES and supported by partners with FEMA. The North Dakota Housing Finance Agency provided Low Income Housing Tax Credits to support the construction of the affordable housing complex in Mandan that has 91 one- or two-bed room apartments. Residents of the independent living center include senior citizens, many of whom have functional and access needs.

Hazards and Threats

Floods factored prominently in discussions with Community Coffee participants. One woman who grew up in Mandan remembers being terrified as a child when the 6th Avenue NE underpass flooded from Main Avenue to St. Joseph's Church on Collins Avenue. Her family preserved their belongings by removing them from the basement. More recently, in 2011, another resident helped her daughters move household items when Missouri River floodwaters inundated the main floor of their homes. "It was very destructive and frightening," she said.

Rising Missouri River floodwaters this summer brought back memories of past floods as the U.S. Army Corps of Engineers released more water from Garrison Dam to accommodate Montana snowmelt. As one resident pointed out, "It has to come this way." Nicole Aimone, Senior Community Planner with FEMA, told the residents that one inch of water can cause $25,000 in damages. The fact surprised some participants.

Last year's drought brought back memories of challenges encountered during dry periods. One retired farmer discussed how drought translates into inadequate feed for livestock, dried wells and low dam levels. Residents also worry about the spread of infectious diseases, particularly since there are nearly 100 people living in close proximity of each other. "It's part of apartment living," one woman said.

Severe summer weather has left indelible memories. One woman told the story of how she laid in a ditch, her arms around her children, as a tornado approached. Her children kept asking, "Is it over yet, Mom?" Another resident remembered storm rescue efforts at a neighboring farm that required area farmers to break windows in a home to reach a family trapped by debris.

Severe storms place the lives of those who are dependent on medical equipment at risk. When the power goes out, "I don't have oxygen," one resident said. The covered portion of the Library Square parking area becomes congested with cars whose drivers are trying to avoid storm damages. Residents find some measure of relief knowing weather sirens are heard throughout the city. However, they worry about how they would be notified if a hazardous materials release event occurred. "You can't fix what you don't know," one resident said.

Residents discussed the use of hazardous materials in farming operations, particularly anhydrous ammonia. One resident characterized anhydrous ammonia releases as one of the most dangerous accidents to occur in farming. "It plumes like a cloud," requiring the area to be watered down to mitigate its impacts, she said. A retired farmer recounted a harrowing experience where he climbed over the tractor to escape an anhydrous ammonia cloud, moving upwind and seeking help from an area resident.

Residents also are concerned about fires and severe storms since many face mobility challenges that could hinder them when time is of the essence. Uncertainty exists as to where they would safely gather during a storm, or how they would escape flames. They worried about how the fire department would respond, particularly with the ledges on the fourth floor. One resident pointed out the facility is equipped with lifts. When a fire alarm was tripped one night, only four people vacated the building. Others stepped into the hallways debating the best course of action. As one resident explained, "It is human nature to wait until you are sure there is danger."

The building's location across the street from the Morton County Law Enforcement Center and Fire Department offers a measure of reassurance but also concern. They worry about criminal activity occurring if someone confronts law enforcement.

Mitigation Ideas

One resident captured the essence of mitigation when he discussed the need for long-range planning to reduce risk. Short-term fixes are precisely just that – a temporary solution to a problem, he said. He urged long-range planning to develop permanent solutions to hazard-related problems. "We should be saving money," he said. "Do it right the first time. Every once in a while someone has an idea that works."

As participants pointed out, viable mitigation projects that have proven the test of time include elevating infrastructure, and using tie-downs for mobile homes. They also agreed tornado shelters would offer protection for mobile home residents since they have no basement where they could retreat to safety.

Residents identified the need for education on steps they can take to ensure their safety. They plan to ask the Mandan Fire Department for a meeting to discuss fire risk and evacuation protocols. Other projects include generators for critical facilities and building safety plans.

Additionally, residents stressed the importance of carbon monoxide detectors and smoke detectors, the latter of which are located throughout Library Square. They use hand sanitizers to stop the spread of disease.

7.2.13.2 Ministry on the Margins, Bismarck, 7 p.m., June 27, 2018

As with other population groups in North Dakota, homeless individuals have formed a strong network of support, sharing ideas on good places to seek shelter and where to obtain assistance. In Bismarck-Mandan, Jeannie Messall, Regional Director for the Missouri Valley Coalition of Homeless People, serves an integral role in helping homeless individuals find those resources.

Mrs. Messall organized a Community Coffee for homeless individuals on June 27, 2018, at Ministry on the Margins, an ecumenical ministry committed to supporting individuals who fall through the cracks during times of transition. Eleven individuals, including Jeannie, shared their perspectives with staffs from NDDES and FEMA regarding how natural and technological hazards, and adversarial threats have impacted their lives.

Hazards and Threats

The very nature of their existence places homeless individuals at a unique disadvantage when it comes to hazards and threats. Of all population groups, they face the most exposure to severity of weather extremes since they lack the shelter and often the resources to retreat from sub-zero temperatures, snow, ice, high winds, extreme heat, hail, rainstorms and lightning. In summer, many seek refuge in parks and along rivers where they can set up camp, out of sight of the public. Flooding jeopardizes those locations, particularly at the “desert,” Kimball Bottoms south of Bismarck, where many increased releases from the Garrison Dam this summer threatened to inundate these riverside camps. Living outdoors, they also run the risk of exposure to wildlife, insects and livestock, and they rely on questionable water sources. One individual discussed how prairie dogs and cattle have tormented him when he has camped outside. Two others recounted how they survived lightning strikes, still amazed at their good fortune.

Some individuals find shelter in their vehicles, the locations of which they are reluctant to discuss. As one Community Coffee participant said, it’s important to remain discreet to avoid detection. During winter, some remain in those vehicles even when the temperature drops well below freezing while others wait for homeless shelters to open in the evening. But not everyone gains admittance if they are exhibiting behavioral issues related to mental illness or addiction. During the day, particularly during the extreme heat or bitter cold, they seek refuge in public facilities, such as libraries and hospitals. They have learned to keep a low profile to avoid being expelled from these facilities, which occurs when someone is intoxicated, belligerent or falls asleep. If these facilities are closed, they worry about where they would retreat during a storm.

Of all of the hazards, infectious diseases ranked as the greatest threat. As Mrs. Messall pointed out, homeless shelters do their best to keep clients safe. However, diseases have the potential to spread rapidly in congregate quarters, particularly if residents have limited access to disinfectants. Community Coffee participants complained about bed bugs that could result in secondary infections if bites are not cleaned and disinfected. One woman discussed how she required antibiotics to treat a staphylococcal infection after scratching bed bug bites.

Community Coffee participants also noted they are exposed to colds, hepatitis and Lyme disease, the latter of which one individual theorizes may have attributed to his job loss when flu-like symptoms and exhaustion made him too sick to work for several days. Mosquitoes also plague those living outside. As one man said, “They drive me mad.”

Transportation incidents were not viewed as much of a threat, although one man recounted how he bounced three times in rocks when he failed to catch a train. They also worry about people “slinging stuff” and the potential to succumb to purchasing illegal drugs. Mrs. Messall pointed out that those who are released from prison, whether related to drugs or another criminal activity, are often released into homelessness.

Mitigation Ideas

The homeless men and women who supported the Community Coffee want a safe place to go during weather's extremes. They advocated for the construction of storm shelters for community residents as a whole – those who are homeless and those who do not have basements in their homes.

Other ideas shared by the participants included ensuring building codes are enforced at shelters, using tie-downs for mobile homes, and providing trailers to serve as temporary housing for homeless individuals, if available from FEMA or other organizations.

Although not in the realm of hazard mitigation, they discussed how loss of jobs, alcoholism and addiction, among many factors, contributed to their homelessness. They would like to see an increase in homeless shelters – both dry and wet, the latter of which is for those who are intoxicated by alcohol or drugs. Many don't have phones, which makes it hard for potential employers to contact them. The participants also want inclusion in the community and respect. As one man said, "It could be your brother. It could be your family. It could be you."

7.2.13.3 N.D. Voluntary Organizations Active in Disaster (NDVOAD) Meeting, Jamestown, 12 p.m., July 12, 2018

It's been said that disaster volunteers are the "heart beat" of response and recovery efforts. They understand emergency management issues from the perspectives of both the survivors they assist and as citizens. Their experiences have taught them the benefit of mitigation.

Members of the NDVOAD shared these points of view during a Community Coffee held during the organization's regular meeting on July 12, 2018. Twelve members from throughout the state attended in person and four participated via teleconference. They represented the Great Plains Food Bank, Child Care Aware of America, Adventists Community Service, Presbytery of the Northern Plains of the Presbyterian Church, Northern Plains Conference of the United Church of Christ, NDEMA/Stutsman County Emergency Management, NDSU Extension Service, Lutheran Social Services of North Dakota, Options, First Link, FEMA, NDDHS and the NDDES.

Russ Korzeniewski, Disaster Preparedness Administrator/Risk Manager for the] NDDHS, facilitated the meeting. He serves as a member of the TAC of the SHMT.

Hazards and Threats

Based on their professional and personal experiences, NDVOAD members rated flooding as a major hazard in North Dakota. Members discussed the assistance they provided during catastrophic flood events of recent years, from volunteer coordination to case management. They have placed sandbags, either as volunteers or to protect their personal property, and have delivered meals to responders and displaced individuals. They have provided survivors with temporary shelter and care and then have helped them rebuild their homes. They have organized unmet needs committees and fundraising events to help communities recover.

The NDVOAD members have also experienced the impacts of severe summer and winter weather events, as both responders and as citizens, since damage not only occurs to personal property but public infrastructure as well. A winter storm disrupted service provided by a cell phone tower, leaving rural residents, including two NDVOAD members, without communications. Widespread power outages lasted as long as six weeks for some farmers. Warning for summer and winter storms makes one member "almost neurotic" as she worries about impacts to our state's communities.

A tornado that struck a Watford City RV Park earlier in the week underscored the integral role of volunteers. The July 10, 2018 tornado claimed the life of a newborn; initial reports indicated the storm destroyed 122 structures, caused moderate to severe damage to 79 structures and minor damages to another 120 structures. The tornado required a coordinated effort by the members of VOAD to provide sheltering, meals, counseling, debris removal, and to secure temporary and permanent housing for survivors. The American Red Cross established a Multi-Agency Resource Center staffed by voluntary, governmental and private agencies to address the needs of residents.

Drought also has required voluntary agencies to mobilize resources. “It is hard to see and it comes on gradually; whereas with a flood, the impacts are more visual,” one member noted. Even though weather conditions this year alleviated drought conditions, farmers and ranchers are still addressing the impacts. Fluctuating commodity prices and trade agreements compound their challenges. One of the least concerning hazards is wildfire, which they perceived as more of a problem for other parts of the nation.

A lessening of regulations has heightened the potential for a hazardous materials incident. NDVOAD members discussed how the impacts of a chemical plant fire in eastern North Dakota could have been greatly reduced if fire retardant had been available on site.

One member noted climate change will continue to adversely impact weather conditions. There also is a growing trend in the public to be reliant on government during an emergency or disaster. “Government does not have the resources to do what is expected,” one participant explained. “Citizens are waiting for the public to fix it, and we are losing self-reliance.” In rural areas, the need for self-reliance has increased given the greater distance of neighbors as older farmers retire and, as is often the case, adjoining ranchers and farmers purchase the land.

Mitigation Ideas

The most visual representation of a mitigation action came from a Fargo area member who described seeing a large home being transported from its riverside location to a safer area. The home was being relocated as part of a mitigation program to remove structures from floodplains.

Based on the recent tornado, participants identified the need for shelters in mobile home and recreational parks. However, liability issues could surface if the shelter is closed during an event. The NDVOAD identified other mitigation measures taking place in North Dakota communities such as development of the Fargo diversion, levee systems in the Devils Lake area, and periodic reviews of building ordinances.

Education and warning systems were viewed as good mitigation tools. As an example, a Morton County participant receives a Code Red call when an event is imminent or has occurred. NWS has improved its warning capabilities, and NDDOT closes major arterial roadways with gates to protect the traveling public during winter storms. LSS is providing training and education to new Americans on personal preparedness. Stutsman County Emergency Management develops a publication, *Are You Prepared?,* that every citizen receives through the mail. Emergency management set up booths at community events and distributed the publication, and ensured 1,000 students at Jamestown College received copies.

Even with outreach and education, the public sometimes chooses not to heed warnings. As witnessed by a participant, a rural Morton County resident braved the roadways during a no-travel advisory to demonstrate the fact that he could boast, “I made the trip to town.” As they discussed, stranded motorists who defy advisories and warnings are placing the lives of law enforcement at risk. They agreed a mitigation tactic would be charging stranded motorists the cost of rescue efforts.

For individual preparedness, a NDVOAD member keeps a flashlight in every room in case of emergency. Other personal preparedness and mitigation measures include ensuring a disaster supply kit is on hand, using drain tiles, installing generators, purchasing flood insurance and creating snowlines on property to stop drifts.

NDVOAD members agreed mitigation measures would reduce or eliminate many of the impacts that survivors experience as a result of an emergency or disaster. One member summarized the impact of mitigation by stating, “It saves not only money but lives and a lot of stress.”

7.2.13.4 Rolette County Emergency Operations Center (EOC), 2 p.m., August 7, 2018

Rolette County, located in north central North Dakota along the Canadian border, is home to one of the state’s most robust network of first responders. Emergency Manager Mike Stewart explains many incidents, particularly fires, require the collaboration of local, tribal, federal and Canadian responders given the unique, rugged terrain of the Turtle Mountain that spans 939 square miles. “We have had some pretty volatile fires spread quickly,” Mr. Stewart explained. “We worry about the perfect storm of dry fuel and wind" that could result in the need for air support. Fire chiefs in adjoining communities, including the Canadian border, are beginning the dialogue of how mutual aid would unfold.

These first responders have a long history of working together and supporting each other as demonstrated by the response to Mike Stewart's invitation to join the Community Coffee. First responders, public and private health care residents and citizens discussed their concerns about hazards and threats. In a relatively isolated area of the state, Rolette County and Turtle Mountain Band of Chippewa residents are required to be more self-reliant. "We are miles from fire, EMS and law enforcement. It can take 15-25 minutes for emergency services to get to you, and that is dependent on weather," Mr. Stewart explained.

Hazards and Threats

Residents of Rolette County consider the Turtle Mountains as one of the area's most beautiful natural resources. But it also presents the area's biggest threat. Wildfires that erupt in the mountains during dry periods require a multi-agency response. "We spend more time fighting fires" than addressing other hazards, Mr. Stewart said. Fire calls each year average 90 for the city of Rolette, 600 for Belcourt, 300 for Bureau of Indian Affairs Forestry and 300 for Dunseith.

Fires occur every spring in April and May and then in the fall during the August through October time frame. Farming operations ignite some fires but the majority occur in the Turtle Mountains where rugged terrain makes firefighting challenging. These fires often require a strong mutual aid response. Air bombers and spray planes have sometimes been used to battle blazes. "We have identified areas along Highway 43 where water tenders can tap hydrants," Mr. Stewart said.

Public and private health care workers in Rolla expressed concern about the rapid spread of diseases. Access to patients becomes difficult for home care professionals when severe winter weather impedes travel. They also worry about continuity of care for patients who may be relocated during a disaster and are in need of medical equipment and medication.

In the spring, the area enters a "thaw-freeze-thaw" cycle that occurs when temperatures warm up and then drop below freezing a few days later. As a result, frozen culverts cannot accommodate the melt that occurs a few days later when temperatures warm up. "We get hammered by water" in the Belcourt area, which is located near Fish Lake, one participant said.

As for other hazards, hazardous material releases seldom occur since the county does not have a good traffic corridor, and the threat of dam failure has been greatly reduced by repairs made to Gordon Lake.

The water treatment plant in Rolla, however, presents a concern for those working in the nearby law enforcement center. Staff and the incarcerated would need to shelter in place if a chlorine release occurs. The unpredictable nature of tornadoes also is disconcerting to the participants. One responder recalled the 2008 tornado that occurred south of Rolette County in the Pierce County city of Wolford. "One minute is was nice on one side of town, and the next a tornado was going through the other side of town."

Winter storms concern first responders who place their lives at risk when responding to stranded motorists. The lives of individuals who are isolated or stranded are in jeopardy if they can't call for help because of limited cell phone coverage. Access to patients becomes difficult for home care professionals when severe winter weather impedes travel. They also worry about continuity of care for patients who may be relocated during a disaster and are in need of medical equipment and medication.

Adversarial threats are a concern, particularly if an incident jeopardizes a water system or the electrical grid. "We border a foreign country," one volunteer said. They also worry about active shooter incidents. A nursing home administrator worries a cyber incident could disrupt critical systems, making it difficult to use a web-based notification system used to alert staff.

Mitigation Ideas

During the Community Coffee, participants made connections to resources that could help mitigate the impacts of a disaster. A representative of the U.S. Board Patrol offered his agency's nationally recognized training to address workplace shootings. Home health care employees discussed how they could support the Emergency Operations Center during an infectious diseases response. Another participant noted

AT&T offers a program to ensure cell phone coverage for first responders during disasters when the competition for bandwidth is fierce.

One participant recommended a “back up to a backup plan” to ensure alternate sources of communications during disaster. He also recommended travelers havesurvival equipment. As he said, “What if you are stuck in the car for two days?” Many rural residents rely on generators, but the cost is prohibitive for those living at poverty level.

Participants identified the need for generators to ensure power for critical facilities such as nursing homes and community centers. Outages jeopardize the safety of residents dependent on electricity for medical equipment, pointing to a need to pre-plan by identifying resources and potential shelter locations for vulnerable populations. Health workers underscored the importance of tracking patients who may be relocated during and after a disaster to ensure they receive medication and medical equipment. “People who clear roads should know who people are with major health issues,” one health care worker said. Another participant stressed the importance of keeping landlines to ensure communications when power outages occur.

Another mitigation actions participants would like to pursue are sirens. As some pointed out, the sirens are not always audible. The group also agreed storm shelters are needed in communities.

Mr. Stewart pointed out that hazard mitigation is a citizen responsibility. “We are forced by where we live and Mother Nature to be self-reliant. We have to mitigate (an incident) until fire, EMS and law enforcement can reach us,” He said. “People have to know first aid, carry fire extinguisher, and clear fuel on their property.”

7.2.13.5 Grand Forks Emergency Operations Center (EOC), 1:30 p.m., October 3, 2018

Only a few of the 25 Community Coffee participants raised their hands when Grand Forks Emergency Manager Kari Goelz asked, “How many know what hazard mitigation is?” As Ms. Goelz explained, hazard mitigation is any defined action taken to reduce or eliminate the long-term risk to life and property from hazard events.

As with other Community Coffees, participants may have not known precisely how to define mitigation, but they understood the impacts of hazards and threats that posed the greatest risk to their jurisdiction. As they learned the basic concepts of mitigation, the Grand Forks participants shared a number of valid options to keep their communities safer.

A broad-base of stakeholders responded to Grand Forks Emergency Management’s request to attend the Community Coffee. They represented the U.S. Air Force Base in Grand Forks, Grand Forks Public Health, The Salvation Army, Emerado Police Department, the State’s Attorney’s Office, Senator John Hoeven’s Office, Grand Forks Sheriff’s Office, University of North Dakota, Weather Enterprise, Development Homes, Altru Health Systems, Grand Forks Fire Department, Grand Forks County Commission, Options, FEMA, Grand Forks Correctional Center, Sanford Health Care Accessories, Grand Forks Emergency Management and private citizens.

Hazards and Threats

Disaster apathy occurs when events are few and far between. But, as one participant pointed out, ask survivors of the 1997 flood that inundated much of the City of Grand Forks and rural areas, “they still remember like it was yesterday.” At the time, it was the worst disaster in the state’s history in terms of anxiety, pain and dollar loss.

The Red River of the North flooded 2,200 square miles in North Dakota and Minnesota, an area twice the size of Rhode Island. In its pathway were cities like Grand Forks, where residents fought hard for months to keep flood waters out of their communities and homes. And yet, despite the best of efforts, dikes collapsed as flood waters exceeded forecasted levels. In the end, water swamped 75 percent of Grand Forks, forever altering the community’s way of life. The flood left images that will remain part of our collective conscious in years to come – rescue workers airlifting stranded North Dakotans from swift flood waters; rows of cots at shelters for thousands of evacuees; and firefighters lugging heavy equipment through waist-high, ice-cold water to fight flames that destroyed 11 historic buildings in downtown Grand

Forks. Participants who remembered said: “How could it not impact you?” “You never forget not having clean drinking water.” “It brought the community together.”

As one participant pointed out, there are other hazards that could be just as catastrophic and could result in a mass casualty event. Trains transporting hazardous materials bisect towns, posing a concern as to how first responders would respond and mitigate spills. During harvest time, the number of vehicular accidents increases as drivers slam into big trucks filled with sugar beets. Participants also worry about the potential for school shootings and the response required. A UND information technology student expressed concern about the lack of cyber security measures. A dam failure could be catastrophic in terms of losses for downstream communities. The threat could originate for dams inside county boundaries as well as those in adjacent communities. One longtime resident commented, a dam failure would “make 1997 look like a leaking bathtub.”

Community Coffee participants also discussed health and safety concerns. One audience member identified abduction as a community concern, particularly after the 2003 kidnapping and murder of UND student Dru Sjodin. The 2013 outbreak of tuberculosis required a community-wide public health response in Grand Forks County to rapidly mobilize resources to mitigate the spread and impacts of the potentially lethal infection. The infection originated among homeless individuals and spread rapidly among approximately 30 individuals. Response required the resources of both private and public health partners as well human service agencies. Children were placed into the foster care system while their ill parents recovered. However, due to the risk of exposure, children couldn’t be placed in foster homes. Instead, the community housed children in area hotels and apartments and provided care givers for the children to ensure their wellbeing.

Participants also identified another public health concern – the opioid epidemic, which one individual pointed out could place drug users at an increased risk for exposure for an infectious disease. The risk of exposure of individuals increases as they come in contact with the general public, including those who are incarcerated.

As Ms. Goelz pointed out, as impacts cascade, it results in a “larger and larger humanitarian effort.”

Mitigation Ideas

Following the 1997 flood, Grand Forks responded to the threat of flooding by instituting a number of mitigation measures including acquisition of properties along the Red River. In their place is “The Greenway,” 2,200 acres of natural open space in Grand Forks and its sister city, East Grand Forks in Minnesota. This area, once occupied by homes, includes parks, a campground, two golf courses, trails and shore bank fishing sites. Grand Forks County and its cities have enacted several mitigation projects to keep communities safer to include the Greenway along the Red River.

County officials have also purchased three tornado shelters (two for Larimore Dam Recreation Area and one for Fordville Dam Recreation Area) and an outdoor warning siren for Larimore Arvilla township. Participants identified the need for all long-term care and medical facilities to have a preparedness plan. A concern for responders is the potential failure of communication systems, which they identified push-to-talk radios as a potential mitigation measure.

Community Coffee participants also mentioned outreach and education as an effective mitigation tool. As they commented, it’s important to be able to answer the questions: “Where are shelters?” “How do you protect your family?”

7.2.14 Public Survey Results

Five total respondents. Responses captured below.

Question 1: Please select your county of residence.

- 3 responded: Bottineau
- 1 responded: Burleigh
- 1 responded: LaMoure

Question 2: Which options below best define your role in the community?

- 1 responded: Business Owner
- 4 responded: Local Government Employee

Question 3: Do you feel the plan sufficiently addresses the hazards of concern to you and your community?

- 4 responded: Yes
- 1 responded: Somewhat

Question 4: If not, please list below the hazards of concern that you feel were not sufficiently addressed in the plan.

- 1 commented: “None”
- 1 commented: “Drought and wildfires”

Question 5: Please indicate your level of agreement with the following statement: I believe that the plan as a whole will help my community reduce risk from hazards.

0 being disagree, 100 being agree.

- 1 indicated: 62
- 1 indicated: 98
- 1 indicated: 71
- 1 indicated: 80
- 1 indicated: 79
- *Average of 78*

Question 6: Please indicate your level of agreement with the following statement: I believe the mitigation projects included in the plan will effectively reduce risk from hazards in my community.

0 being disagree, 100 being agree.

- 1 indicated: 81
- 1 indicated: 74
- 1 indicated: 82
- 1 indicated: 85
- 1 indicated: 90
- *Average of 82*

Question 7: Which elements of the plan do you believe are successful?

- 1 commented: “Most everything looks well thought out”
- 1 commented: “Information regarding incidents. Most of the mitigation projects.”
- 1 commented: “Flood abetment issues”
- 1 commented: “Mitigation Actions/Projects

Question 8: What do you feel could be improved about the plan?

- 1 commented: “Looks good”
- 1 commented: “THIRA explanation is confusing- Table 4-16.”

- 1 commented: “More focus on issues other than flooding, but that is the greatest and most occurring threat.”

Question 9: Please share any other suggestions or comments about the plan.

- 1 commented: “None.”

Appendix 7.3 Situation

Table 7.3-1 Federal Disaster Declarations by Year and Type

Year	Type	Declaration Number
2017	Flooding	DR-4323
2014	Severe Storms and Flooding	DR-4190
2013	Flooding (2)	EM-3364; DR-4118
	Severe Storms and Flooding	DR-4128
	Standing Rock Sioux Tribe Severe Storms and Flooding	DR-4123
	Severe Winter Storm	DR-4154
2011	Flooding (2)	EM-3318; DR-1981
	Severe Winter Storm	DR-1986
2010	Severe Winter Storm (2)	DR-1879; DR-1901
	Flooding (2)	EM-3309; DR-1907
2009	Severe Storms and Flooding	DR-1829
2007	Severe Storms and Flooding	DR-1713
	Severe Storms and Tornadoes (2)	DR-1726; DR-1725
2006	Severe Storms, Flooding, and Ground Saturation	DR-1645
2005	Severe Storms, Flooding, and Ground Saturation	DR-1597
	Severe Winter Storm	DR-1621
	Severe Winter Storm and Record and/or Near Record Snow	DR-1616
	Hurricane Katrina Evacuation	EM-3247
2004	Severe Storms, Flooding, and Ground Saturation	DR-1515
	Snow	EM-3196
2003	Severe Storms and High Winds	DR-1483
2002	Fire	FSA-2435
	Severe Storms, Tornadoes, and Flooding	DR-1431
2001	Flooding	DR-1376
2000	Severe Storms and Flooding	DR-1334
	Winter Storm	DR-1353
1999	Severe Storms, Tornadoes, Snow and Ice, Flooding, Ground Saturation, Landslides and Mudslides	DR-1279
1998	Flooding and Ground Saturation	DR-1220
1997	Severe Winter Storms/Blizzards	DR-1157
	Severe Storms and Flooding	DR-1174
1996	Flooding	DR-1118
1995	Severe Storms, Flooding, Ground Saturation	DR-1050
1994	Severe Storm, Flooding	DR-1032
1993	Flooding, Severe Storms	DR-1001
1989	Flooding	DR-825
1982	Flooding	DR-658
1979	Storms, Snowmelt, Flooding	DR-581
1978	Storms, Ice Jams, Snowmelt, Flooding	DR-554
	Severe Storms and Tornadoes	EM-3065
	Blizzard and Snowstorms	EM-3061
1976	Flooding (2)	EM-3012; DR-501
	Drought	EM-3016
1975	Severe Storms, Flooding	DR-475
	Flooding from Rains, Snowmelt	DR-469

Year	Type	Declaration Number
1974	Heavy Rains, Snowmelt, Flooding	DR-434
1972	Severe Storms, Flooding	DR-335
1970	Severe Storms, Flooding	DR-287
1969	Flooding	DR-256
1966	Severe Storms, Flooding	DR-220
	Flooding	DR-216
1965	Flooding	DR-195
1957	Tornado	DR-79

Table 7.3-2 Population Demographics by County and Projected Growth through 2040

County	2010	2015	2020	2025	2030	2035	2040
Adams County	2,343	2,396	2,390	2,364	2,317	2,260	2,199
Barnes County	11,066	11,167	11,227	11,271	11,263	11,219	11,149
Benson County	6,660	6,859	7,185	7,577	8,075	8,570	9,040
Billings County	783	931	1,034	1,116	1,179	1,222	1,252
Bottineau County	6,429	6,699	6,904	7,085	7,200	7,241	7,236
Bowman County	3,151	3,268	3,437	3,614	3,750	3,895	3,974
Burke County	1,968	2,312	2,610	2,888	3,098	3,255	3,374
Burleigh County	81,308	92,903	100,986	107,205	110,932	112,983	113,937
Cass County	149,778	171,588	188,810	203,784	214,719	222,826	228,895
Cavalier County	3,993	3,822	3,720	3,672	3,643	3,626	3,620
Dickey County	5,289	5,119	5,036	5,010	5,031	5,059	5,095
Divide County	2,071	2,529	2,866	3,174	3,414	3,588	3,720
Dunn County	3,536	4,619	5,437	6,147	6,654	7,006	7,249
Eddy County	2,385	2,374	2,379	2,414	2,455	2,484	2,503
Emmons County	3,550	3,391	3,299	3,259	3,232	3,209	3,190
Foster County	3,343	3,370	3,384	3,409	3,434	3,446	3,438
Golden Valley County	1,680	1,863	2,010	2,155	2,270	2,353	2,411
Grand Forks County	66,861	71,328	76,955	82,966	89,081	94,535	98,121
Grant County	2,394	2,349	2,299	2,258	2,207	2,150	2,089
Griggs County	2,420	2,295	2,196	2,114	2,039	1,965	1,897
Hettinger County	2,477	2,706	2,873	3,034	3,178	3,294	3,396
Kidder County	2,435	2,422	2,402	2,378	2,355	2,330	2,302
LaMoure County	4,139	4,153	4,108	4,061	4,002	3,937	3,869
Logan County	1,990	1,932	1,927	1,972	2,033	2,102	2,177
McHenry County	5,395	6,141	6,675	7,130	7,461	7,677	7,817
McIntosh County	2,809	2,804	2,775	2,760	2,751	2,749	2,754
McKenzie County	6,360	12,193	16,568	20,480	23,492	25,691	27,361
McLean County	8,962	9,737	10,332	10,870	11,275	11,519	11,673
Mercer County	8,424	8,819	9,059	9,215	9,283	9,271	9,206
Morton County	27,471	30,418	32,712	34,670	36,006	36,877	37,418
Mountrail County	7,673	10,314	12,364	14,191	15,587	16,607	17,367
Nelson County	3,126	3,028	2,947	2,881	2,828	2,773	2,718
Oliver County	1,846	1,850	1,875	1,918	1,973	1,999	2,022

County	2010	2015	2020	2025	2030	2035	2040
Pembina County	7,413	7,052	6,758	6,494	6,267	6,062	5,866
Pierce County	4,357	4,415	4,475	4,555	4,641	4,704	4,752
Ramsey County	11,451	11,587	11,734	11,877	12,007	12,097	12,150
Ransom County	5,457	5,445	5,410	5,403	5,408	5,407	5,399
Renville County	2,470	2,613	2,715	2,817	2,911	2,983	3,035
Richland County	16,321	16,478	16,723	17,058	17,406	17,709	17,968
Rolette County	13,937	14,765	15,628	16,521	17,556	18,527	19,415
Sargent County	3,829	3,961	4,084	4,212	4,288	4,322	4,334
Sheridan County	1,321	1,330	1,336	1,331	1,316	1,300	1,284
Sioux County	4,153	4,478	4,834	5,228	5,682	6,124	6,550
Slope County	727	774	807	830	847	857	862
Stark County	24,199	31,919	37,462	42,117	45,329	47,537	49,063
Steele County	1,975	1,948	1,924	1,905	1,882	1,856	1,829
Stutsman County	21,100	21,139	21,207	21,314	21,379	21,352	21,232
Towner County	2,246	2,324	2,398	2,474	2,527	2,563	2,588
Traill County	8,121	8,065	8,031	8,039	8,064	8,074	8,073
Walsh County	11,119	10,925	10,803	10,755	10,749	10,756	10,769
Ward County	61,675	71,243	79,053	86,157	91,644	96,037	99,607
Wells County	4,207	4,187	4,143	4,120	4,109	4,087	4,053
Williams County	22,398	34,583	44,039	52,628	59,276	64,302	68,221
North Dakota Total	672,591	756,927	824,344	884,874	931,506	966,375	991,522

Source: North Dakota Census Office, 2016

Table 7.3-3 Population by County, 2017

County	Population
Cass	177,787
Burleigh	95,030
Grand Forks	70,795
Ward	68,946
Williams	33,349
Morton	30,796
Stark	30,209
Stutsman	21,087
Richland	16,351
Rolette	14,531
McKenzie	12,724
Ramsey	11,519
Walsh	10,855
Barnes	10,734
Mountrail	10,265
McLean	9,685
Mercer	8,465
Traill	8,013
Pembina	6,972
Benson	6,936
Bottineau	6,530
McHenry	5,900

County	Population
Ransom	5,297
Dickey	4,861
Sioux	4,376
Dunn	4,289
Pierce	4,099
LaMoure	4,087
Wells	4,022
Sargent	3,858
Cavalier	3,762
Emmons	3,301
Foster	3,257
Bowman	3,166
Nelson	2,937
McIntosh	2,606
Hettinger	2,483
Kidder	2,482
Renville	2,463
Grant	2,376
Adams	2,318
Eddy	2,316
Divide	2,288
Griggs	2,258
Towner	2,253
Burke	2,131
Oliver	1,940
Logan	1,918
Steele	1,917
Golden Valley	1,789
Sheridan	1,353
Billings	940
Slope	771

Table 7.3-4 Number and Value of Buildings by County

County	Total Building Count	Total Building Exposure (in 1,000s)
Adams	1,967	$335,192
Barnes	7,512	$1,433,052
Benson	4,423	$592,939
Billings	814	$115,578
Bottineau	6,385	$974,645
Bowman	2,657	$438,186
Burke	2,544	$277,676
Burleigh	28,319	$8,282,489
Cass	43,320	$16,383,158
Cavalier	3,598	$674,153
Dickey	4,698	$663,899
Divide	3,827	$340,638
Dunn	3,478	$363,438
Eddy	2,265	$274,007

County	Total Building Count	Total Building Exposure (in 1,000s)
Emmons	4,741	$395,022
Foster	2,886	$516,048
Golden Valley	1,594	$245,937
Grand Forks	25,209	$8,088,076
Grant	3,106	$339,417
Griggs	2,774	$395,892
Hettinger	2,971	$311,507
Kidder	2,277	$291,192
LaMoure	4,009	$549,557
Logan	2,576	$265,260
McHenry	5,019	$579,726
McIntosh	3,150	$424,691
McKenzie	3,863	$563,420
McLean	8,332	$1,160,771
Mercer	4,778	$1,027,056
Morton	12,747	$2,509,973
Mountrail	4,404	$706,495
Nelson	4,047	$486,024
Oliver	1,436	$193,161
Pembina	6,393	$1,211,523
Pierce	4,207	$627,541
Ramsey	6,632	$1,416,002
Ransom	4,134	$693,175
Renville	2,590	$373,051
Richland	10,566	$2,381,906
Rolette	6,032	$979,534
Sargent	3,328	$521,880
Sheridan	1,806	$176,746
Sioux	1,219	$202,998
Slope	472	$61,939
Stark	11,578	$2,581,806
Steele	2,283	$283,664
Stutsman	11,728	$2,378,397
Towner	3,186	$408,054
Traill	5,682	$1,208,293
Walsh	8,368	$1,671,790
Ward	27,477	$6,480,432
Wells	4,381	$640,656
Williams	12,057	$2,723,413
Total	349,845	$77,221,075

Source: HAZUS MH 2.1

Table 7.3-5 Historic Places in North Dakota by County

County	Federal Register Individual Listings	Federal Register Districts	Resources in the Federal Register Districts	Federal Register Formally Determined Eligible	State Register Listings
Adams	3	0	N/A		0
Barnes	12	0	N/A	1	6
Benson	7	0	N/A	1	2
Billings	9	1	6		4
Bottineau	4	0	N/A		0
Bowman	2	0	N/A		1
Burke	3	0	N/A		0
Burleigh	21	2	188	3	6
Cass	26	7	524	3	6
Cavalier	2	0	N/A	1	0
Dickey	7	0	N/A		2
Divide	4	0	N/A		2
Dunn	3	0	N/A	2	1
Eddy	5	0	N/A		1
Emmons	18	0	N/A		1
Foster	6	0	N/A		1
Golden Valley	2	1	2		0
Grand Forks	63	4	685	7	1
Grant	4	0	N/A		2
Griggs	4	0	N/A		3
Hettinger	5	0	N/A	1	0
Kidder	3	0	N/A		4
LaMoure	3	0	N/A		0
Logan	2	0	N/A		0
McHenry	12	0	N/A		1
McIntosh	7	0	N/A		0
McKenzie	3	0	N/A	7	0
McLean	7	0	N/A		1
Mercer	4	1	47	2	2
Morton	8	1	38	1	6
Mountrail	3	0	N/A		0
Nelson	3	0	N/A		0
Oliver	0	1	153		2
Pembina	9	1	5	1	4
Pierce	8	0	N/A		0
Ramsey	12	1	59	1	0
Ransom	9	0	N/A		3

County	Federal Register Individual Listings	Federal Register Districts	Resources in the Federal Register Districts	Federal Register Formally Determined Eligible	State Register Listings
Renville	2	0	N/A		0
Richland	12	0	N/A		2
Rolette	2	0	N/A		1
Sargent	1	0	N/A		1
Sheridan	1	0	N/A		0
Sioux	0	0	0	0	1
Slope	3	0	N/A		1
Stark	6	0	N/A	1	1
Steele	3	0	N/A		0
Stutsman	10	1	72	2	3
Towner	1	0	N/A		0
Traill	21	1	34		0
Walsh	13	1	3		2
Ward	12	3	196		0
Wells	5	0	N/A		0
Williams	7	0	N/A		2
Total	**402**	**26**	**2012**	**34**	**76**

Appendix 7.4 Risk Assessment

This appendix includes the additional materials, maps, data, and other information related to hazards and threats referenced in Section 3. Contact the NDDES Planning Section at 701.328.8100 for more details.

7.4.1 Criminal, Terrorist, or Nation/State Attack

7.4.1.1 Loss Estimate Scenarios

****THE FOLLOWING HYPOTHETICAL SCENARIOS ARE FOR INSTRUCTIONAL AND ILLUSTRATIVE PURPOSES ONLY****

Chemical Attack – Sarin

***Scenario Overview*:** Sarin nerve gas is released into the air from a light aircraft onto an enclosed stadium during a home football game using a carbon dioxide powered sprayer. Ventilation and air intake systems provide a path for chemical entry into the stadium, but the extent to which the agent dispersed into the surrounding areas is dependent upon the environmental conditions. This particular type of attack would cause harm to humans and could render portions of the stadium unusable for a short time period in order to allow for a costly clean-up. There might also be a fear by the public of long-term contamination of the stadium and subsequent boycott of games resulting in a loss of revenue and tourism dollars.

Assumptions: (1) The population density at the stadium on game day is high – approximately 93 percent of the seats, 18,600 are filled and an additional 2,000 persons remain outside the stadium in the adjacent parking areas for a total of 20,600 people potentially exposed; (2) quantity of agent released is 7.5 kg. (3) Wind speed is 6 knots.

Described Losses:

Level of Exposure	Number of Persons
Those impacted by small exposure to the nerve gas will experience non-disabling effects such as miosis, rhinorrhea, slight bronchoconstriction, secretions, and muscular fasiculations at site.	6,143 persons
Those impacted by moderate exposure to the nerve gas will experience some irreversible or other serious, long lasting effects, including all of the above as well as nausea, vomiting, and generalized weakness.	455 persons
Those impacted by large exposure to the nerve gas will experience life threatening effects or death, including all of the effects listed in moderate exposure as well as loss of consciousness, convulsions, generalized fasciculations, flaccid paralysis, apnea, involuntary micturation/defecation possible with seizures.	161 persons
Cost of Decontamination at $12/person X 20,600 people total	$247,200

Notes: Victims will require decontamination and both long and short-term treatment. Services may need to be suspended at the area until all investigations are conducted.

Biological Attack – Pneumonic Plague

Scenario Overview: Canisters containing aerosolized pneumonic plague bacteria are opened in public bathrooms. Each release location will directly infect 110 people; hence, the number of release locations dictates the initial infected population. The secondary infection rate is used to calculate the total infected population. This particular WMD attack method would not cause damages to buildings or other infrastructure, only to human populations.

Assumptions: (1) The population density at the stadium on game day is high. (2) The number of dispersion devices is 15. (2) Pneumonic plague has a 1-15 percent mortality rate in treated cases and a 40- 60 percent mortality rate in untreated cases. (3) The rate of worried well is equal to 9 times the number of infected cases.

Described Losses:

Population Type	Number of Persons
Initial Infected Populations	1,650 persons
Secondary Infected Population	3,311 persons
Total Plague Cases	4,961 persons
Total Deaths (Treated Cases 7%)	347 persons

Population Type	Number of Persons
Total Worried Well Cases (9 times the number of infected cases)	44,649 persons

Improvised Explosive Device Attack – ANFO

Scenario Overview: An IED utilizing an ANFO mixture is carried in a panel van to a parking area during a time when stadium patrons are leaving their cars and entering the stadium and detonated. Potential losses with this type of scenario include both human and structural assets.

Assumptions: (1) The population density in the parking lot during the beginning and ending of the games is high, at least 1 person /50 square feet. (2) The quantity of ANFO used is 4,000 lbs, similar to that used by Timothy McVeigh in the Oklahoma City bombing. (3) The Lethal Air Blast Range for such a vehicle is 200 feet according to the BATF Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

Loss Type	Number of Persons
Total Dead	695 persons
Total Traumatic Injuries	1,218 persons
Total Urgent Care Injuries	5,967 persons
Injuries not Requiring Hospitalization	2,233 persons
Structures and Other Physical Assets (Damages would certainly occur to vehicles and depending on the proximity of other structures, damages would occur to the stadium complex itself. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners.)	Vehicles – Replacement cost for approximately 100 vehicles @ $15,000 per vehicle inside the 200 ft BATF described Lethal Air Blast range = $ 150,000 Repair / repainting cost for approximately 500 vehicles @ $ 4,000 per vehicle inside the BATF described Falling Glass Hazard = $2,000,000

Radiological Dispersion Device – Dirty Bomb Attack

Scenario Overview: An IED utilizing an ANFO mixture is carried in a panel van to a parking area during a time when stadium patrons are leaving their cars and entering the stadium and detonated. Potential losses with this type of scenario include both human and structural assets. The bomb also contains 2,700 Curies of Cesium-137 (Cs-137).

Assumptions: (1) The population density in the parking lot during the beginning and ending of the games is high, at least 1 person /50 square feet. (2) The quantity of ANFO used is 4,000 lbs., like that used by Timothy McVeigh in the Oklahoma City bombing. (3) The Lethal Air Blast Range for such a vehicle is 200 feet according to the BATF Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

Loss Type	Number of Persons
Total dead	695 persons
Total traumatic injuries	1,218 persons
Total urgent care injuries	5,967 persons
Injuries not requiring hospitalization	2,233 persons
Radiological poisoning injuries that need aggressive treatment	6
Radiological poisoning injuries that need non-critical treatment	220

Loss Type	Number of Persons
Radiological poisoning injuries that could self-medicate with proper public information = remaining people up to 20,600 total.	10,261 persons
Structures and Other Physical Assets (Damages would certainly occur to vehicles and depending on the proximity of other structures, damages would occur to the stadium complex itself. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners.)	Vehicles – Replacement cost for approximately 100 vehicles @ $15,000 per vehicle inside the 200 ft BATF described Lethal Air Blast range = $ 150,000 Repair / repainting cost for approximately 500 vehicles @ $ 4,000 per vehicle inside the BATF described Falling Glass Hazard = $2,000,000

7.4.1.2 Vulnerability Assessment Tables

Table 7.4.1-1 North Dakota, Population Density by County (Statistical Atlas, 2015)

County	Population Density, Persons by Square Mile
Cass County	87.3
Burleigh County	51.4
Grand Forks County	46.9
Ward County	31.8
Stark County	19.2
Rolette County	15.7
Morton County	14.5
Williams County	12.0
Richland County	11.3
Ramsey County	9.7
Stutsman County	9.5
Traill County	9.4
Walsh County	8.7
Mercer County	8.1
Barnes County	7.4
Pembina County	6.5
Ransom County	6.3
Foster County	5.3
Benson County	4.8
Dickey County	4.7
Sargent County	4.5
Pierce County	4.3
McLean County	4.3
Mountrail County	4.5
Bottineau County	3.9
Sioux County	3.9
Eddy County	3.8
LaMoure County	3.6
Griggs County	3.3
Wells County	3.3
Nelson County	3.2

County	Population Density, Persons by Square Mile
McHenry County	3.0
McIntosh County	2.9
Renville County	2.9
Steele County	2.8
Bowman County	2.7
Cavalier County	2.7
McKenzie County	2.7
Oliver County	2.5
Adams County	2.4
Emmons County	2.3
Hettinger County	2.2
Towner County	2.2
Logan County	2.0
Burke County	1.9
Dunn County	1.9
Kidder County	1.8
Golden Valley County	1.7
Divide County	1.7
Grant County	1.4
Sheridan County	1.4
Billings County	0.8
Slope County	0.6

Table 7.4.1-2 Vandalism and Theft Claims Paid on State Facilities and Other Critical Facilities Insured by the State Since 1989

County Name	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
Adams	$0	$0	$0	$0	$2,394
Barnes	$2,206	$0	$3,474	$9,695	$11,859
Benson	$0	$0	$0	$2,126	$9,226
Billings	$0	$0	$0	$0	$400
Bottineau	$5,398	$0	$45	$9,626	$6,613
Bowman	$0	$0	$0	$1,500	$684
Burke	$0	$0	$0	$0	$0
Burleigh	$56,286	$0	$12,077	$15,736	$115,250
Cass	$0	$0	$83,516	$40,659	$21,919
Cavalier	$0	$0	$0	$110	$1,676
Dickey	$0	$0	$0	$231	$6,835
Divide	$0	$0	$0	$423	$748
Dunn	$0	$0	$0	$619	$5,960
Eddy	$0	$0	$0	$4,390	$11,544
Emmons	$0	$0	$0	$2,527	$10,803
Foster	$0	$0	$0	$1,127	$12,824
Golden Valley	$0	$0	$0	$0	$35,272

County Name	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
Grand Forks	$2,828	$0	$84,081	$12,607	$24,873
Grant	$0	$0	$0	$8,636	$11,527
Griggs	$0	$0	$0	$4,511	$0
Hettinger	$0	$0	$0	$579	$0
Kidder	$0	$0	$0	$866	$7,765
LaMoure	$0	$0	$0	$2,468	$11,550
Logan	$0	$0	$0	$0	$3,675
McHenry	$0	$0	$0	$6,703	$37,518
McIntosh	$0	$0	$0	$0	$17,590
McKenzie	$0	$0	$0	$6,408	$18,192
McLean	$0	$0	$0	$5,462	$17,571
Mercer	$0	$0	$0	$17,389	$187,521
Morton	$8,306	$0	$0	$3,404	$33,604
Mountrail	$0	$0	$0	$5,186	$46,823
Nelson	$0	$0	$0	$9,194	$427
Oliver	$0	$0	$0	$5,873	$1,846
Pembina	$0	$0	$0	$953,613	$11,359
Pierce	$0	$0	$0	$871	$3,328
Ramsey	$939	$0	$8,394	$1,730	$8,093
Ransom	$0	$0	$0	$5,139	$7,799
Renville	$0	$0	$0	$610	$12,700
Richland	$0	$0	$5,549	$30,541	$43,296
Rolette	$0	$0	$0	$7,525	$130,952
Sargent	$0	$0	$0	$576	$7,267
Sheridan	$0	$0	$0	$3,036	$281
Sioux	$0	$0	$0	$7,558	$16,492
Slope	$0	$0	$0	$0	$692
Stark	$818	$0	$734	$21,602	$50,342
Steele	$0	$0	$0	$680	$573
Stutsman	$11,319	$0	$0	$19,952	$13,299
Towner	$0	$0	$0	$667	$5,784
Traill	$0	$0	$0	$2,069	$5,155
Walsh	$0	$0	$0	$9,032	$62,629
Ward	$1,205	$0	$14,613	$24,872	$29,510
Wells	$0	$0	$0	$264	$8,514
Williams	$0	$0	$0	$4,624	$77,963
Total	**$89,305**	**$0**	**$212,483**	**$1,273,014**	**$1,170,517**

Table 7.4.1-3 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

County/Tribe	Ranking (High, Medium, Low)	Loss Information
Adams	M	None specifically listed. General loss of life and damage.
Barnes	H	11 Key Resource facilities in the County.

County/Tribe	Ranking (High, Medium, Low)	Loss Information
Benson	L	Key facilities at risk. No specific impacts identified.
Billings (B,D,GV,S)	M	Possible impacts to local government facilities, no large-scale impacts.
Bismarck (City of)	M	None specifically listed. General loss of life and damage.
Bottineau	M	6 facilities critical to homeland security.
Bowman	M	None specifically listed. General loss of life and damage.
Burke	M	No significant impact.
Burleigh	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Cass	NI	N/A.
Cavalier	L	Key facilities at risk. No specific impacts identified.
Dickey	L	Critical infrastructure and key resources at risk.
Divide	M	No significant impact.
Dunn (B,D,GV,S)	L	Possible impacts to local government facilities, no large-scale impacts.
Eddy	L	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure.
Emmons	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Fort Berthold^	M	None specifically listed. General loss of life and damage.
Foster	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Golden Valley (B,D,GV,S)	M	Possible impacts to local government facilities, no large-scale impacts.
Grand Forks	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Grant	M	None specifically listed. General loss of life and damage.
Griggs	M	Possible impacts to local government facilities, no large-scale impacts.
Hettinger	M	Possible impacts to local government facilities, no large-scale impacts.
Kidder	L	Impacts to key facilities and the ability of the County to respond to emergencies.
Lake Traverse^	NP	N/A
LaMoure	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Logan	M	Impacts to key facilities and the ability of the County to respond to emergencies.
McHenry	L	Impacts to key facilities and the ability of the County to respond to emergencies.
McIntosh	L	Impacts to key facilities and the ability of the County to respond to emergencies.
McKenzie	M	Impacts to key facilities and the ability of the County to respond to emergencies.
McLean	L	Impacts to key facilities and the ability of the County to respond to emergencies.
Mercer	L	Impacts to key facilities and the ability of the County to respond to emergencies.

County/Tribe	Ranking (High, Medium, Low)	Loss Information
Morton	M	Injury, illness, death, psychological trauma, economic, political, and social impacts.
Mountrail	NI	N/A
Nelson	M	N/A. Hazard ranked, but not profiled.
Oliver	L	Schools, government facilities most at risk. No known immediate threats.
Pembina	M	Impacts to key facilities and the ability of the County to respond to emergencies.
Pierce	L	Impacts to key facilities and the ability of the County to respond to emergencies.
Ramsey	NI	N/A
Ransom	L	Potential for hundreds of injuries. Specifics unknown.
Renville	M	4 key facilities potentially impacted from terrorist event.
Richland	M	Key facilities at risk. No specific impacts identified.
Rolette	L	Key facilities at risk. No specific impacts identified.
Sargent	L	4 critical facilities.
Sheridan	NI	N/A
Sioux	L	School closures, protests, bomb threats, vandalism to county facilities.
Slope	M	None specifically listed. General loss of life and damage.
Spirit Lake	L	Possible impacts to local government facilities, no large-scale impacts.
Standing Rock^ (And Sioux)	L	School closures, protests, bomb threats, vandalism to tribal facilities.
Stark (B,D,GV,S)	NL	Possible impacts to local government facilities, no large-scale impacts.
Steele	M	4 critical facilities most at risk, large scale potential for many injuries and fatalities.
Stutsman	L	Critical infrastructure and key resources at risk.
Towner	L	4 critical facilities most at risk, large scale potential for many injuries and fatalities.
Traill	NI	N/A
Turtle Mountain^	NI	N/A
Walsh	L	Key facilities at risk. No specific impacts identified.
Ward	NI	N/A
Wells	L	Population at risk: 716 under 20 years old, 514 above 65, along with crops and infrastructure.
Williams	L	16 critical infrastructure and key facilities.

7.4.2 Dam Failure

Table 7.4.2-1 Dams in Adjacent States/Provinces with Potential Impacts to North Dakota in the Event of Failure

State/ Province	County/ Division	Dam Name	Owner	River	Feeds to	Maximum Storage (acre-ft)	North Dakota Border County/ Distance to North Dakota Border (approximately river miles)	Downstream North Dakota Community	Distance to Downstream Communities (approximately river miles, from border)
Montana	Sheridan	Box Elder Creek Dam	City of Plentywood	Box Elder Creek	Missouri River	6,620	Williams/ 86	Williston	34
Montana	Fallon	Upper Baker Dam	City of Baker	Tr Sandstone Creek	Yellowstone River	3,000	Williams/ 147	Williston	46
Montana	Fallon	Lower Baker Dam	Fallon County	Sandstone Creek	Yellowstone River	1,100	Williams/ 147	Williston	46
Montana	McCone	Fort Peck Dam	USACE	Missouri River	Missouri River	19,100,000	Williams/ ~164	Williston	34
Saskatchewan	Div. No. 1	Rafferty Dam	Saskatchewan Watershed Authority	Souris River	Souris River	359,146	Renville/ Renville/ 77	Burlington	58
Saskatchewan	Div. No. 2	Weyburn Dam	City of Weyburn	Souris River	Souris River	5,099	Renville/ 122	Burlington	58
Saskatchewan	Div. No. 2	Rough Bark Creek Dam	Can Govt PFRA	Rough Bark Creek	Souris River	1,714	Renville/ 115	Burlington	58
Saskatchewan	Div. No. 1	Rafferty Downstream Wetland Dam	Saskatchewan Watershed Authority	Souris River	Souris River	1,099	Renville/ 75	Burlington	58
Saskatchewan	Div. No. 1	Boundary Res	Sask Power Corp	Long Creek	Souris River	49,100	Renville/ 74	Burlington	58
Saskatchewan	Div. No. 1	Grant Devine Dam	Saskatchewan Watershed Authority	Moose Mountain Creek	Souris River	85,530	Renville/ 30	Burlington	58

Sources: USACE National Inventory of Dams, National Resource Information System, 2013

Table 7.4.2-2 Dam Failure Vulnerability Analysis Results Table

County	# Medium Hazard Dams (x 2 pts.)	# High Hazard Dams (x 3 pts.)	# of Medium and High Hazard Dams w/o EAP (x 2 pts.)	Weighted Vulnerability Analysis Score	Vulnerability
Billings	0	0	0	0	Low
Bottineau	0	0	0	0	Low
Divide	0	0	0	0	Low
Eddy	0	0	0	0	Low
Foster	0	0	0	0	Low
Griggs	0	0	0	0	Low
Kidder	0	0	0	0	Low
Logan	0	0	0	0	Low
McHenry	0	0	0	0	Low
McIntosh	0	0	0	0	Low
Pierce	0	0	0	0	Low
Renville	0	0	0	0	Low
Richland	0	0	0	0	Low
Sheridan	0	0	0	0	Low
Slope	1	0	0	2	Low-Moderate
Traill	1	0	0	2	Low-Moderate
Mercer	0	1	0	3	Low-Moderate
Sioux	0	1	0	3	Low-Moderate
Emmons	1	0	1	4	Low-Moderate
LaMoure	1	0	1	4	Low-Moderate
Sargent	2	0	0	4	Low-Moderate
Towner	1	0	1	4	Low-Moderate
Wells	2	0	0	4	Low-Moderate
Grant	1	1	0	5	Low-Moderate
Hettinger	1	1	0	5	Low-Moderate
Ramsey	0	1	1	5	Low-Moderate
Burke	2	0	1	6	Moderate
Dickey	2	0	1	6	Moderate
Ransom	2	0	1	6	Moderate
Rolette	0	2	0	6	Moderate
Stutsman	0	2	0	6	Moderate
Bowman	1	1	1	7	Moderate
Burleigh	1	1	1	7	Moderate
Dunn	1	1	1	7	Moderate
Golden Valley	1	1	1	7	Moderate
McLean	1	1	1	7	Moderate
Mountrail	1	1	1	7	Moderate
Ward	1	1	1	7	Moderate
Steele	3	0	1	8	Moderate-High
Adams	3	0	3	12	Moderate-High
McKenzie	3	0	3	12	Moderate-High
Nelson	4	0	2	12	Moderate-High
Stark	1	2	2	12	Moderate-High
Barnes	2	2	2	14	Moderate-High
Cavalier	5	1	1	15	Moderate-High
Oliver	3	2	2	16	Moderate-High
Williams	4	2	2	18	High
Walsh	5	3	1	21	High

County	# Medium Hazard Dams (x 2 pts.)	# High Hazard Dams (x 3 pts.)	# of Medium and High Hazard Dams w/o EAP (x 2 pts.)	Weighted Vulnerability Analysis Score	Vulnerability
Grand Forks	5	4	0	22	High
Pembina	6	2	2	22	High
Morton	7	1	5	27	High
Cass	7	3	3	29	High
Benson	0	10	0	30	High

Source**:** North Dakota State Water Commission, 2018

Table 7.4.2-3 Population Change and Dam Failure Vulnerability by County

County	2010 Population	2030 Projected Population	Change	Percent Change	Vulnerability
McKenzie	6,360	23,492	17,132	269%	Moderate-High
Williams	22,398	59,276	36,878	165%	High
Mountrail	7,673	15,587	7,914	103%	Moderate
Dunn	3,536	6,654	3,118	88%	Moderate
Stark	24,199	45,329	21,130	87%	Moderate-High
Divide	2,071	3,414	1,343	65%	Low
Burke	1,968	3,098	1,130	57%	Moderate
Billings	783	1,179	396	51%	Low
Ward	61,675	91,644	29,969	49%	Moderate
Cass	149,778	214,719	64,941	43%	High
McHenry	5,395	7,461	2,066	38%	Low
Sioux	4,153	5,682	1,529	37%	Low-Moderate
Burleigh	81,308	110,932	29,624	36%	Moderate
Golden Valley	1,680	2,270	590	35%	Moderate
Grand Forks	66,861	89,081	22,220	33%	High
Morton	27,471	36,006	8,535	31%	High
Hettinger	2,477	3,178	701	28%	Low-Moderate
Rolette	13,937	17,556	3,619	26%	Moderate
McLean	8,962	11,275	2,313	26%	Moderate
Benson	6,660	8,075	1,415	21%	High
Bowman	3,151	3,750	599	19%	Moderate
Renville	2,470	2,911	441	18%	Low
Slope	727	847	120	17%	Low-Moderate
Towner	2,246	2,527	281	13%	Low-Moderate
Bottineau	6,429	7,200	771	12%	Low
Sargent	3,829	4,288	459	12%	Low-Moderate

County	2010 Population	2030 Projected Population	Change	Percent Change	Vulnerability
Mercer	8,424	9,283	859	10%	Low-Moderate
Oliver	1,846	1,973	127	7%	Moderate-High
Richland	16,321	17,406	1,085	7%	Low
Pierce	4,357	4,641	284	7%	Low
Ramsey	11,451	12,007	556	5%	Low-Moderate
Eddy	2,385	2,455	70	3%	Low
Foster	3,343	3,434	91	3%	Low
Logan	1,990	2,033	43	2%	Low
Barnes	11,066	11,263	197	2%	Moderate-High
Stutsman	21,100	21,379	279	1%	Moderate
Sheridan	1,321	1,316	-5	0%	Low
Traill	8,121	8,064	-57	-1%	Low-Moderate
Ransom	5,457	5,408	-49	-1%	Moderate
Adams	2,343	2,317	-26	-1%	Moderate-High
McIntosh	2,809	2,751	-58	-2%	Low
Wells	4,207	4,109	-98	-2%	Low-Moderate
Kidder	2,435	2,355	-80	-3%	Low
LaMoure	4,139	4,002	-137	-3%	Low-Moderate
Walsh	11,119	10,749	-370	-3%	High
Steele	1,975	1,882	-93	-5%	Moderate-High
Dickey	5,289	5,031	-258	-5%	Moderate
Grant	2,394	2,207	-187	-8%	Low-Moderate
Cavalier	3,993	3,643	-350	-9%	Moderate-High
Emmons	3,550	3,232	-318	-9%	Low-Moderate
Nelson	3,126	2,828	-298	-10%	Moderate-High
Pembina	7,413	6,267	-1,146	-15%	High
Griggs	2,420	2,039	-381	-16%	Low

Table 7.4.2-4 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Pierce	H	None specifically listed; general loss of life and damage
Spirit Lake	H	3 critical facilities potentially impacted by dam failure
Burleigh	M	$1.5b in potential damage, 6,000+ properties at risk
Cass	M	3 high hazard dams, significant damage; 7 medium-risk dams, damaging isolated homes; 17 low risk, no or minimal damage
Grand Forks	M	327 structures, $602,007 in direct exposure
Mercer	M	471 structures within inundation zone, 900 persons at risk
Nelson	M	Potential impact not quantified; buildings in inundation zone not known
Pembina	M	None specifically listed; general loss of life and damage
Renville	M	4,100 homes impacted, 11,000 people evacuated downstream
Richland	M	No high-hazard dams in the county
Slope	M	None specifically listed; general loss of life and damage
Walsh	M	143 homes in inundation areas of all dams in the County
Adams	L	None specifically listed; general loss of life and damage
Barnes	L	3,427 in Valley City, 21 County-owned buildings
Benson	L	183 structures potentially impacted
Billings	L	None specifically listed; general loss of life and damage
City of Bismarck	L	$270,685,894 in critical facility loss potential and $2,075,902,000 in property impact; potentially population displaced
Bottineau	L	No significant damage
Bowman	L	$2m in potential losses
Burke	L	No impacts described
Dickey	L	County shops in Fullerton and Oakes, as well as 4 museums
Divide	L	No impacts described
Dunn	L	$5.8m in direct damage
Eddy	L	None specifically listed.; general loss of life and damage
Emmons	L	Agricultural losses, no loss of life
Foster	L	No structures vulnerable
Golden Valley	L	$3.3m in direct damage
Grant	L	Damage to agricultural land; no loss of life expected
Griggs	L	Minimal losses; no moderate or high-hazard dams in the county
Hettinger	L	None specifically listed; general loss of life and damage

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
LaMoure	L	$5.4m in potential damage to county-owned buildings
Logan	L	None specifically listed; general loss of life and damage
McHenry	L	Possible losses in agriculture; no medium or high hazard dams in the County
McIntosh	L	Some agricultural land damaged; no loss of life, no M or H-risk dams
McLean	L	25% of the County's population vulnerable (330 residents)
Oliver	L	Approximately 12 homes in inundation zones
Ramsey	L	1,000 homes potentially impacted, many critical facilities impacted
Traill	L	Some critical facilities at risk; total impacts unknown
Turtle Mountain^	L	Upwards of 15 residents potentially impacted
Wells	L	None specifically listed; general loss of life and damage
Williams	L	Approximately 15000 residents living in inundation zones of dams throughout the County
Cavalier	No rank listed	20 homes, 100+ people at potentially impact
Morton	No rank listed	Approximately 9,600 people affected
Standing Rock^ (And Sioux)	No rank listed	Loss of power, mass casualties; specifics not available
Fort Berthold	Not included in local plan	N/A
Kidder	Not included in local plan	N/A
McKenzie	Not included in local plan	N/A
Mountrail	Not included in local plan	N/A
Sargent	Not included in local plan	N/A
Sheridan	Not included in local plan	N/A
Ward	Not included in local plan	N/A

7.4.3 Drought

Table 7.4.3-1: North Dakota Drought Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damage
DR 3016	North Dakota	1976	Presidential Emergency Declaration; Driest year in North Dakota since 1936	None	Unknown
State EO	North Dakota	1980	State Declared Drought Disaster	Unknown	Unknown
State EO	North Dakota	1981	State Declared Drought Disaster	Unknown	Unknown
State Request	North Dakota	1990	Governor's Request for USDA assistance for Adverse Weather/Drought	Unknown	Unknown
State EO	North Dakota	1993	State Declared Agricultural Emergency	Unknown	Unknown
State Request	North Dakota	2000	Governor's Request for USDA assistance for Dry and Flood Conditions	Unknown	Unknown
State Request	North Dakota	2002	Governor's Request for USDA assistance for Drought	Unknown	Unknown
State EO	North Dakota	2002	State Declared Drought Disaster	Unknown	Unknown
State EO	North Dakota	2003	State Declared Drought Emergency	Unknown	Unknown
State EO	North Dakota	2004	State Declared Agricultural Emergency/Drought Disaster	Unknown	Unknown
State EO 2005-01	North Dakota	2005	State Declared Drought Disaster/Fire Danger Emergency	Unknown	Unknown
USDA S2198	Adams, Bowman, and Sioux Counties	January 1,2005 through December 31, 2005	Also included impacts from hail, wildfires, high winds, excessive heat, and winter storms.	None	Unknown
USDA S2344	Adams, Emmons, McIntosh, and Sioux Counties	January 1, 2006 through December 31, 2006	Also included impacts from hail, insects, wildfires, high winds, excessive heat, and winter storms.	None	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S3457	Adams, Bowman, Dickey, and McIntosh Counties	January 1, 2006 through December 31, 2006	Also included impacts from hail, insects, lightning, wildfires, high winds, excessive heat, and winter storms.	None	Unknown
USDA S2388	Entire State of North Dakota	January 1, 2006 through December 31, 2006	Also included impacts from hail, high winds, excessive heat, winter storms, and excessive moisture.	None	Unknown
USDA S2392	Dickey and Sargent Counties	January 1, 2006 through December 31, 2006	Also included impacts from hail, insects, lightning, wildfires, high winds, excessive heat, and winter storms.	None	Unknown
USDA S2454	Divide and Williams Counties	January 1, 2006 through December 31, 2006	Also included impacts from hail, tornadoes, severe storms, wildfires, high winds, excessive heat, and winter storms.	None	Unknown
USDA S2457	McKenzie and Williams Counties	January 1, 2006 through December 31, 2006	Also included impacts from hail, insects, severe storms, wildfires, high winds, and excessive heat.	None	Unknown
State EO 2006-05	South central and southwestern North Dakota	June 28, 2006	State declared agricultural drought emergency	Unknown	Unknown
State EO 2006-05.1	North Dakota	July 12, 2006	State declared agricultural drought emergency	Unknown	Unknown
USDA Secretarial	Entire State of North Dakota	January 1, 2007 through December 31, 2007	Also included impacts from frost, high temperatures, overland flooding, torrential rainfall, severe storms, hail, and high winds.	None	Unknown
USDA Secretarial	Bottineau, McHenry, McLean, Pierce, Renville, Sheridan, and Ward Counties	January 1, 2007 through December 31, 2007	Also included impacts from freeze and frost damage, high temperatures, hail, and high winds.	None	Unknown
State EO 2007-01	Three affiliated tribes, Fort Berthold Reservation	March 26, 2007	State declared water shortage emergency	Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
State EO 2007-02	Upper Missouri River Basin	April 2, 2007	State declared water emergency	Unknown	Unknown
USDA Secretarial	Bowman, Divide, Golden Valley, McKenzie, Slope, and Williams Counties	January 1, 2008 through December 31, 2008	Also included impacts from excessive heat, hail, severe storms, high winds, wildfires, and insects.	None	Unknown
USDA Secretarial	Entire State of North Dakota	January 1, 2008 through December 31, 2008	Also included impacts from frost, general lack of timely precipitation, high temperature, insect and disease pressure, heavy rainfall, overland flooding, hail, and high winds.	None	Unknown
State EO 2008-02	North Dakota	May 9, 2008	State declared early-phase agricultural drought emergency	Unknown	Unknown
USDA S2921	McKenzie and Williams Counties	January 1, 2009 through June 21, 2010	Also includes impacts from a cool and wet spring, late spring frosts, hail, excessive moisture at harvest, and weather-related insect damage.	None	Unknown
USDA S2942	42 counties in Central and Eastern North Dakota	January 1, 2009 through July 26, 2010	Also includes impacts from frost, cool temperatures, excessive rain, excessive late-season snowfall, flooding, ground saturation, hail, high winds, and weather-related losses from insects and diseases.	None	Unknown
USDA S2982	Richland County	April 1, 2009 through November 8, 2010	Also includes impacts from excessive rain, flooding, flash flooding, unseasonably cool temperatures, frosts, and freezes.	None	Unknown
USDA S3374	Adams, Bowman, Dickey, Emmons, Sargent and Sioux Counties	January 1, 2012 – continuing	Drought	Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S3377	Barnes, Benson, Cass, Eddy, Foster, Grand Forks, Griggs, La Moure, Nelson, Ramsey, Ransom, Richland, Steele, Stutsman, Trail, Walsh Counties	July 10, 2012 through September 3, 2012	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3390	Cass, Grand Forks, Richland, Trail and Walsh Counties	July 17, 2012 – continuing	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3393	Emmons and McIntosh Counties	March 1, 2012 – continuing	Also includes impacts from excessive heat	Unknown	Unknown
USDA S3400	Dickey, Eddy, Emmons, Foster, Griggs, Kidder, La Moure, Logan, McIntosh, Stutsman, Wells Counties	July 24, 2012 through September 17, 2012	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3405	Benson, Billings, Cavalier, Dunn, Eddy, Foster, Golden Valley, Griggs, McKenzie, Nelson, Pierce, Ramsey, Slope, Stark, Towner, Walsh, Wells Counties	July 24, 2012 through September 24, 2012	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3467	Bowman, Burleigh, Cavalier, Dunn, Emmons, Grand Forks, Grant, Hettinger, Kidder, Logan, McIntosh, McKenzie, McLean, Mercer, Morton, Mountrail, Nelson, Oliver, Pembina, Pierce, Ramsey, Rolette, Sheridan, Sioux, Slope, Stark, Stutsman, Towner, Walsh, Ward, Wells & Williams Counties	January 1, 2012 – continuing	Also includes impacts from flood, severe storms, hail, high winds, frost, insects, and disease.	Unknown	Unknown
USDA S3468	Richland & Sargent Counties	May 1, 2012 – continuing		Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
State EO 2012-08	North Dakota	8/14/2012	State declared early phase agricultural drought emergency		
USDA S3424	Billings, Dunn, Grant, Hettinger, Mercer, Morton, Slope, & Stark Counties	August 28, 2012 through October 22, 2012	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3433	Dickey, Ransom, Richland, & Sargent Counties	September 4, 2012 to October 29, 2012	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S3436	Burke, Divide, Mountrail, Renville, Ward, Williams & Counties	September 11, 2012 through November 5, 2012	Also includes impacts from high winds, fire, excessive heat, and insects	Unknown	Unknown
USDA S3408	Pembina and Walsh Counties	September 25, 3012 through continuing	Also includes impacts from high winds, wildfire, excessive heat, and insects	Unknown	Unknown
USDA S3522	Adams, Bowman, Emmons, & Sioux Counties	May 1, 2013 – continuing	Also includes impacts from high winds, fire, excessive heat, and insects	Unknown	Unknown
USDA S3620	46 Counties throughout the entire state	January 1, 2013 – continuing	Combined effects of spring snowstorms, significant rainfall, unseasonably cool spring, frosts and freeze damage, flooding, ground saturation, severe thunderstorms, hail damage, high winds, weather-related insects and diseases, and mid-summer drought conditions	Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S3959	Benson, Burke, Burleigh, Cavalier, Divide, Eddy, Grand Forks, Griggs, Kidder, McHenry, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Renville, Sheridan, Steele, Towner, Traill, Walsh, Ward, Wells, & Williams Counties	January 1, 2015 – continuing	Also includes impacts from excessive heat, excessive rain, frost, excessive snow, hail, flooding, high winds, lightning, weather-related insects, and diseases	Unknown	Unknown
USDA S3960	Benson, Billings, Burke, Cavalier, Divide, Dunn, Eddy, Foster, Golden Valley, Grant, Griggs, Hettinger, McKenzie, Mercer, Morton, Mountrail, Nelson, Ramsey, Slope, Stark, Towner, Walsh, Wells, & Williams Counties	March 1, 2015 through October 1, 2015	Also includes impacts from frost and freeze.	Unknown	Unknown
USDA S3961	Benson, Billings, Burleigh, Dunn, Eddy, Emmons, Foster, Golden Valley, Kidder, LaMoure, Logan, McHenry, McIntosh, McKenzie, McLean, Mercer, Morton, Mountrail, Nelson, Oliver, Pierce, Ramsey, Sheridan, Sioux, Slope, Stutsman, Towner, Ward, & Wells Counties	March 15, 2015 through October 30, 2015	Also includes impacts from excessive heat, high winds and hail.	Unknown	Unknown
USDA S4000	Adams and Bowman Counties	July 19, 2016 - NA	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S4035	Bowman, Golden Valley, and Slope Counties	July 19, 2016 - NA	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S4036	Adams, Bowman, and Slope Counties	July 19, 2016 - NA	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S4039	Adams County	July 19, 2016 - NA	Also includes impacts from high winds, fire, excessive heat, and insects.	Unknown	Unknown
USDA S4138	Adams, Billings, Bowman, Burleigh, Dunn, Emmons, Golden Valley, Grant, Hettinger, Kidder, Logan, McIntosh, McKenzie, Mercer, Morton, Sioux, Slope, and Stark Counties	April 1, 2016 through October 1, 2016		Unknown	Unknown
USDA S4185	Divide, McKenzie, and Williams Counties	June 20, 2017 – NA		Unknown	Unknown
USDA S4186	Adams, Billings, Bowman, Burke, Burleigh, Divide, Dunn, Emmons, Golden Valley, Grant, Hettinger, Kidder, McHenry, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Renville, Sheridan, Sioux, Slope, Stark, Ward, and Williams Counties	June 20, 2017 – NA		Unknown	Unknown
USDA S4187	Dickey, Emmons, and McIntosh Counties	June 20, 2017 – NA		Unknown	Unknown
USDA S4190	Bowman, Golden Valley, McKenzie, and Slope Counties	June 27, 2017 – NA		Unknown	Unknown
USDA S4191	Adams, Billings, Burke, Burleigh, Dickey, Dunn, Emmons, Golden Valley, Grant, Hettinger, Kidder, LaMoure, Logan, McIntosh, McKenzie, McLean, Mercer, Morton, Mountrail, Sioux, Stark, Stutsman, Ward, and Williams Counties	June 27, 2017 – NA		Unknown	Unknown
USDA S4193	McKenzie and Williams Counties	July 4, 2017 - NA		Unknown	Unknown
USDA S4194	Adams, Emmons, and Sioux Counties	July 4, 2017 - NA		Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S4196	Bottineau, Burleigh, Dickey, Emmons, Kidder, LaMoure, Logan, McHenry, McIntosh, McLean, Pierce, Ransom, Renville, Sargent, Sheridan, Stutsman, Ward, and Wells Counties	July 11, 2017 – NA		Unknown	Unknown
USDA S4198	Adams and Bowman Counties	July 18, 2017		Unknown	Unknown
USDA S4200	Barnes, Bottineau, Burke, Dickey, Divide, LaMoure, Logan, McHenry, McIntosh, Mountrail, Ransom, Renville, Stutsman, Ward, and Williams Counties	June 6, 2017 - NA		Unknown	Unknown
USDA S4201	Dickey and Sargent Counties	June 6, 2017 - NA		Unknown	Unknown
USDA S4204	Benson, Bottineau, McHenry, Pierce, Rolette, Sheridan, Towner, and Wells Counties	June 13, 2017		Unknown	Unknown
USDA S4227	Bottineau, McHenry, Pierce, Renville, and Rolette Counties	July 25, 2017		Unknown	Unknown
USDA S4263	Barnes, Benson, Bottineau, Cass, Dickey, Eddy, Foster, Griggs, Kidder, LaMoure, Logan, Nelson, Pierce, Ramsey, Ransom, Richland, Rolette, Sargent, Steele, Stutsman, Towner, Traill, and Wells Counties	May 30, 2017 – continuing		Unknown	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damage
USDA S4277	Barnes, Cass, Cavalier, Eddy, Foster, Grand Forks, Griggs, Nelson, Pembina, Ramsey, Steele, Stutsman, Towner, Traill, and Walsh Counties	May 30, 2017 – continuing		Unknown	Unknown
State EO – 2017-06	Adams, Billings, Bowman, Burleigh, Divide, Golden Valley, Hettinger, McLean, Mercer, Morton, Oliver, Slope, Stark, Ward, Williams, and all adjacent counties	June 22, 2017		Unknown	Unknown
State EO – 2017-07	North Dakota	June 26, 2017	Also included fire emergency.	Unknown	Unknown
State EO - 2017-12	North Dakota	June 26, 2017		Unknown	Unknown

Sources: Federal Emergency Management Agency, 2018; North Dakota Department of Emergency Services, 2018; USDA Farm Service Agency, 2018.

Vulnerability Analysis

To determine agricultural areas of the state that are most vulnerable to the impacts of drought, an analysis was completed based on crop exposure as well as the crop loss data based on crop insurance payments. The drought-related crop insurance payments have been extrapolated to estimate damage to insurable crops that are not insured. This is based on the percent of insurable crops that are covered by crop insurance. According to the *2011 North Dakota Crop Insurance Profile Report* issued by the USDA Risk Management Agency, 89 percent of North Dakota's crops were insured in 2011. The crop market value from the 2012 Census of Agriculture is provided as the basis for a ratio of annualized losses to crop exposure. The overall vulnerability is based on the estimated crop damage ratio. Table 7.4.3-2: provides the results of this analysis.

Table 7.4.3-2: Drought Agricultural Vulnerability Analysis

County Name	Crop Market Value (2012)	Drought Related Crop Insurance Paid (2003 - 2017)	Estimated Crop Damage	Annualized Crop Damage	Estimated Crop Damage Ratio	Overall Vulnerability
Slope	$48,647,000	$45,747,802	$51,402,024	$3,426,802	0.0704	High
Billings	$17,648,000	$12,682,153	$14,249,610	$949,974	0.0538	High
Stark	$118,697,000	$84,844,747	$95,331,176	$6,355,412	0.0535	High
Hettinger	$145,397,000	$95,043,404	$106,790,342	$7,119,356	0.0490	High
Bowman	$60,312,000	$38,807,548	$43,603,987	$2,906,932	0.0482	High
Logan	$86,069,000	$52,744,465	$59,263,444	$3,950,896	0.0459	High
Dunn	$75,570,000	$44,238,266	$49,705,917	$3,313,728	0.0438	Moderate-High

County Name	Crop Market Value (2012)	Drought Related Crop Insurance Paid (2003 - 2017)	Estimated Crop Damage	Annualized Crop Damage	Estimated Crop Damage Ratio	Overall Vulnerability
Emmons	$138,632,000	$71,639,109	$80,493,381	$5,366,225	0.0387	Moderate-High
Grant	$110,368,000	$56,792,025	$63,811,265	$4,254,084	0.0385	Moderate-High
McKenzie	$78,937,000	$38,861,243	$43,664,318	$2,910,955	0.0369	Moderate-High
Adams	$83,073,000	$40,332,116	$45,316,985	$3,021,132	0.0364	Moderate-High
Golden Valley	$43,647,000	$21,099,074	$23,706,825	$1,580,455	0.0362	Moderate-High
McIntosh	$105,232,000	$46,863,358	$52,655,458	$3,510,364	0.0334	Moderate-High
Sioux	$29,552,000	$12,586,821	$14,142,495	$942,833	0.0319	Moderate-High
Morton	$152,179,000	$62,314,024	$70,015,758	$4,667,717	0.0307	Moderate-High
Mercer	$56,262,000	$21,760,543	$24,450,048	$1,630,003	0.0290	Moderate-High
Divide	$85,291,000	$28,709,015	$32,257,321	$2,150,488	0.0252	Moderate
Williams	$167,572,000	$55,670,266	$62,550,860	$4,170,057	0.0249	Moderate
Mountrail	$134,483,000	$38,633,367	$43,408,277	$2,893,885	0.0215	Moderate
Kidder	$107,062,000	$29,772,312	$33,452,036	$2,230,136	0.0208	Moderate
Oliver	$51,510,000	$13,945,253	$15,668,823	$1,044,588	0.0203	Moderate
Burleigh	$130,901,000	$29,239,816	$32,853,726	$2,190,248	0.0167	Moderate
McLean	$270,674,000	$58,380,051	$65,595,563	$4,373,038	0.0162	Moderate
LaMoure	$259,863,000	$55,769,090	$62,661,899	$4,177,460	0.0161	Moderate
Dickey	$235,211,000	$34,345,726	$38,590,703	$2,572,714	0.0109	Low-Moderate
Burke	$96,392,000	$13,499,512	$15,167,991	$1,011,199	0.0105	Low-Moderate
Stutsman	$418,246,000	$56,816,052	$63,838,261	$4,255,884	0.0102	Low-Moderate
Sheridan	$98,135,000	$13,304,143	$14,948,475	$996,565	0.0102	Low-Moderate
Pierce	$128,604,000	$16,629,145	$18,684,432	$1,245,629	0.0097	Low-Moderate
McHenry	$143,323,000	$15,758,706	$17,706,411	$1,180,427	0.0082	Low-Moderate
Barnes	$366,867,000	$38,894,617	$43,701,817	$2,913,454	0.0079	Low-Moderate
Ward	$256,070,000	$26,586,848	$29,872,863	$1,991,524	0.0078	Low-Moderate
Rolette	$97,999,000	$9,720,916	$10,922,377	$728,158	0.0074	Low-Moderate
Eddy	$94,787,000	$9,024,960	$10,140,404	$676,027	0.0071	Low-Moderate

County Name	Crop Market Value (2012)	Drought Related Crop Insurance Paid (2003 - 2017)	Estimated Crop Damage	Annualized Crop Damage	Estimated Crop Damage Ratio	Overall Vulnerability
Wells	$258,646,000	$21,506,824	$24,164,970	$1,610,998	0.0062	Low-Moderate
Bottineau	$241,696,000	$19,904,574	$22,364,690	$1,490,979	0.0062	Low
Renville	$153,007,000	$12,491,556	$14,035,456	$935,697	0.0061	Low
Benson	$222,997,000	$17,942,887	$20,160,547	$1,344,036	0.0060	Low
Foster	$136,197,000	$10,839,411	$12,179,113	$811,941	0.0060	Low
Ramsey	$228,172,000	$15,079,616	$16,943,389	$1,129,559	0.0050	Low
Griggs	$117,015,000	$7,530,034	$8,460,712	$564,047	0.0048	Low
Steele	$207,081,000	$12,873,493	$14,464,599	$964,307	0.0047	Low
Nelson	$136,013,000	$8,222,362	$9,238,609	$615,907	0.0045	Low
Sargent	$219,934,000	$13,052,838	$14,666,110	$977,741	0.0044	Low
Ransom	$153,108,000	$9,022,339	$10,137,460	$675,831	0.0044	Low
Cass	$549,222,000	$29,294,104	$32,914,723	$2,194,315	0.0040	Low
Traill	$306,729,000	$15,014,338	$16,870,042	$1,124,669	0.0037	Low
Towner	$179,530,000	$8,528,792	$9,582,913	$638,861	0.0036	Low
Walsh	$416,885,000	$18,213,445	$20,464,545	$1,364,303	0.0033	Low
Grand Forks	$406,463,000	$15,640,098	$17,573,144	$1,171,543	0.0029	Low
Cavalier	$328,472,000	$10,284,915	$11,556,084	$770,406	0.0023	Low
Richland	$509,246,000	$15,921,822	$17,889,688	$1,192,646	0.0023	Low
Pembina	$400,662,000	$10,685,393	$12,006,060	$800,404	0.0020	Low
Total	**$9,664,287,000**	**$1,563,105,333**	**$1,756,298,127**	**$117,086,542**	**0.0121**	

Source: USDA Risk Management Agency, 2017; United States Department of Agriculture, 2012

Table 7.4.3-3: Categories of Potential Drought Losses

Drought Type / Severity	Loss Type	Causes
Agricultural	Costs and losses to agricultural producers	- Annual and perennial crop losses - Damage to crop quality - Reduced crop yields - Reduced productivity (wind erosion, loss of organic matter) - Insect infestation - Plant disease - Wildlife damage to crops - Increased irrigation costs - Water resource development (wells, dams, pipelines)
Agricultural	Costs and losses to livestock producers	- Reduced productivity of rangeland - Reduced milk production - Forced reduction of foundation stock - Closure/limitation of public lands to grazing - High cost/unavailability of water/feed for livestock - Water resource development (wells, dams, pipelines) - Increased feed transportation costs - High livestock mortality rates

Drought Type / Severity	Loss Type	Causes
		- Disruption of reproduction cycles - Decreased stock weights - Increased predation - Range fires
Agricultural	Loss from timber production	- Wildland fires - Tree disease - Insect infestation - Impaired productivity of forest land - Direct loss of tress, especially young ones
Agricultural	General economic effects	- Decreased land prices - Loss to industries directly dependent on agricultural production (machinery, fertilizer, food processors, dairies) - Unemployment from declines in production - Strain on financial institutions (foreclosures, more credit risk, capital shortfalls) - Revenue losses to government (reduced tax base) - Reduction of economic development - Fewer agricultural producers (due to bankruptcies, new occupations) - Rural population loss
Hydrological	Loss from fish production	- Damage to fish habitat - Loss of fish and other aquatic organisms due to decreased flows
Hydrological	Loss to recreation and tourism industry	- Loss to manufacturers and sellers of recreational equipment - Losses related to curtailed activities: hunting, fishing, bird watching, boating
Hydrological	Damage to animal species	- Reduction and degradation of fish and wildlife habitat - Lack of feed and drinking water - Greater mortality (increased contact with producers) - Disease - Increased predations - Migration and concentration - Increased stress to endangered species - Loss of biodiversity
Hydrological	Hydrological effects	- Lower water levels in reservoirs, lakes, and ponds - Reduced flow from springs - Reduced streamflow - Loss of wetlands - Increased groundwater depletion, land subsidence, reduced recharge - Water quality effects (salt concentration, increased water temperature, pH, dissolved oxygen, turbidity)
Socioeconomic	Energy-related effects	- Increased energy demand and reduced supply because of power curtailments - Costs associated with substituting more expensive fuels for hydroelectric power
Socioeconomic	Water suppliers	- Revenue shortfalls and/or windfall profits - Cost of water transport or transfer - Water resource development costs (wells, dams, pipelines)

Drought Type / Severity	Loss Type	Causes
Socioeconomic	Decline in food production/disrupted food supply	- Increase in food prices - Increased importation of food (higher costs)
Socioeconomic	Damage to plant communities	- Loss of biodiversity - Loss of trees from urban landscapes, shelterbelts, wooded conservation areas
Socioeconomic	Health and values	- Mental and physical stress - Hydrologic problems - Reductions in nutrition - Loss of human life (heat stress, suicides) - Public safety from forest and range fires - Increased respiratory ailments - Increased disease caused by wildlife concentrations - Increased conflicts (water use, political, management) - Increased poverty in general - Population migrations - Loss of aesthetic values - Reduction or modification of recreational activities - Disruption of cultural belief systems - Reevaluation of social values - Dissatisfaction with government response - Perceptions of inequity in relief - Loss of cultural sites - Increased data/informational needs - Recognition of institutional restraints on water use

Source: City of Bismarck, 2015.

Table 7.4.3-4: Population Change and Agricultural Drought Vulnerability by County

County	2010 Population	2030 Projected Population	Change	Percent Change	Agricultural Drought Vulnerability
McKenzie	6,360	23,492	17,132	269%	Moderate-High
Williams	22,398	59,276	36,878	165%	Moderate
Mountrail	7,673	15,587	7,914	103%	Moderate
Dunn	3,536	6,654	3,118	88%	Moderate-High
Stark	24,199	45,329	21,130	87%	High
Divide	2,071	3,414	1,343	65%	Moderate
Burke	1,968	3,098	1,130	57%	Low-Moderate
Billings	783	1,179	396	51%	High
Ward	61,675	91,644	29,969	49%	Low-Moderate
Cass	149,778	214,719	64,941	43%	Low
McHenry	5,395	7,461	2,066	38%	Low-Moderate
Sioux	4,153	5,682	1,529	37%	Moderate-High
Burleigh	81,308	110,932	29,624	36%	Moderate
Golden Valley	1,680	2,270	590	35%	Moderate-High
Grand Forks	66,861	89,081	22,220	33%	Low
Morton	27,471	36,006	8,535	31%	Moderate-High
Hettinger	2,477	3,178	701	28%	High
Rolette	13,937	17,556	3,619	26%	Low-Moderate
McLean	8,962	11,275	2,313	26%	Moderate
Benson	6,660	8,075	1,415	21%	Low

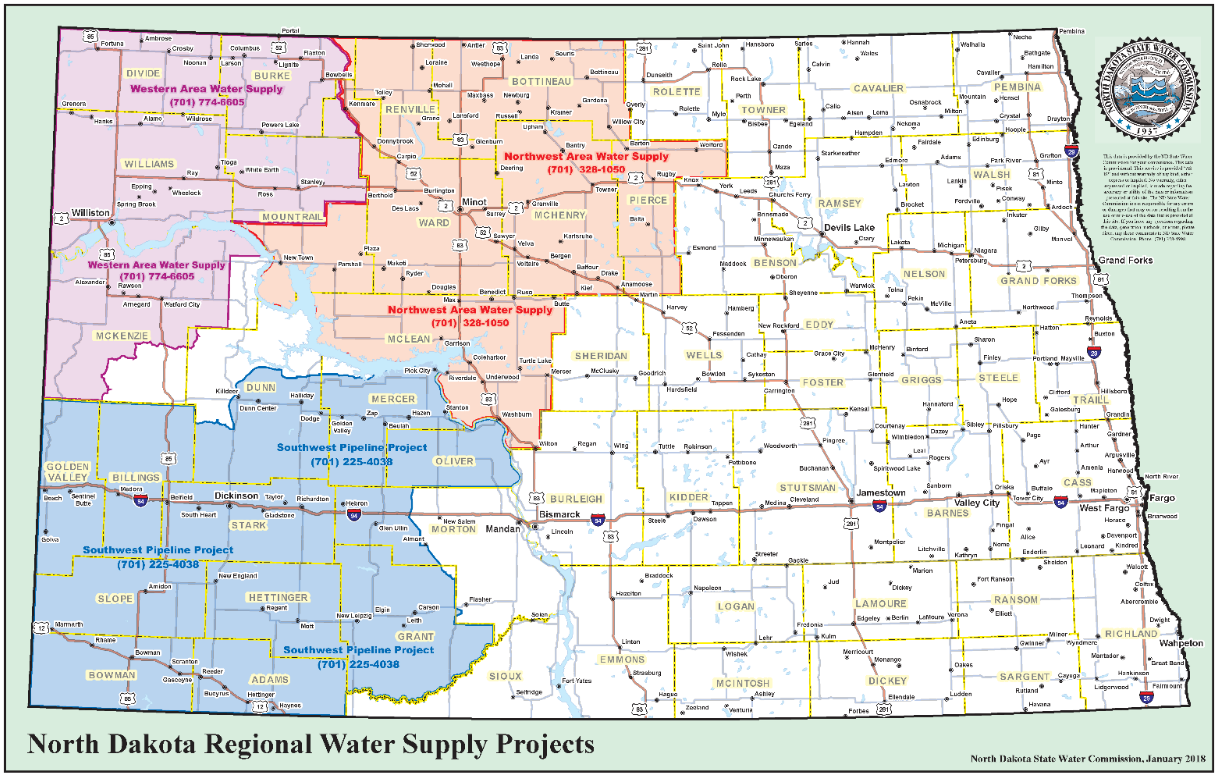
County	2010 Population	2030 Projected Population	Change	Percent Change	Agricultural Drought Vulnerability
Bowman	3,151	3,750	599	19%	High
Renville	2,470	2,911	441	18%	Low
Slope	727	847	120	17%	High
Towner	2,246	2,527	281	13%	Low
Bottineau	6,429	7,200	771	12%	Low
Sargent	3,829	4,288	459	12%	Low
Mercer	8,424	9,283	859	10%	Moderate-High
Oliver	1,846	1,973	127	7%	Moderate
Richland	16,321	17,406	1,085	7%	Low
Pierce	4,357	4,641	284	7%	Low-Moderate
Ramsey	11,451	12,007	556	5%	Low
Eddy	2,385	2,455	70	3%	Low-Moderate
Foster	3,343	3,434	91	3%	Low
Logan	1,990	2,033	43	2%	High
Barnes	11,066	11,263	197	2%	Low-Moderate
Stutsman	21,100	21,379	279	1%	Low-Moderate
Sheridan	1,321	1,316	-5	0%	Low-Moderate
Traill	8,121	8,064	-57	-1%	Low
Ransom	5,457	5,408	-49	-1%	Low
Adams	2,343	2,317	-26	-1%	Moderate-High
McIntosh	2,809	2,751	-58	-2%	Moderate-High
Wells	4,207	4,109	-98	-2%	Low-Moderate
Kidder	2,435	2,355	-80	-3%	Moderate
LaMoure	4,139	4,002	-137	-3%	Moderate
Walsh	11,119	10,749	-370	-3%	Low
Steele	1,975	1,882	-93	-5%	Low
Dickey	5,289	5,031	-258	-5%	Low-Moderate
Grant	2,394	2,207	-187	-8%	Moderate-High
Cavalier	3,993	3,643	-350	-9%	Low
Emmons	3,550	3,232	-318	-9%	Moderate-High
Nelson	3,126	2,828	-298	-10%	Low
Pembina	7,413	6,267	-1,146	-15%	Low
Griggs	2,420	2,039	-381	-16%	Low

Source: North Dakota Department of Commerce, 2016

State Assets and/or Critical Facilities

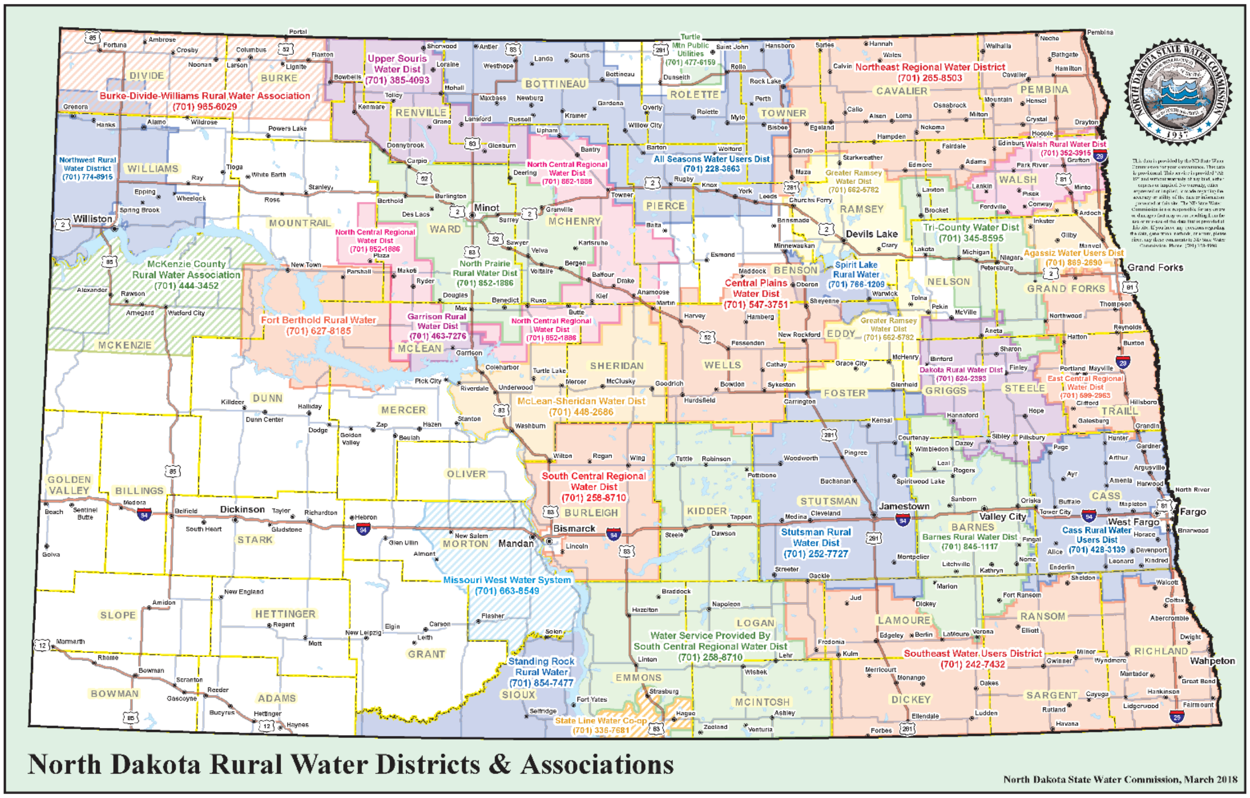
The following Figure 7.4.3-1: through Figure 7.4.3-4: describe North Dakota's water infrastructure systems and water supply projects. Additional sources of water supply may help to mitigate the impacts of drought on water users when water supply may be low.

Figure 7.4.3-1: Regional Water Systems



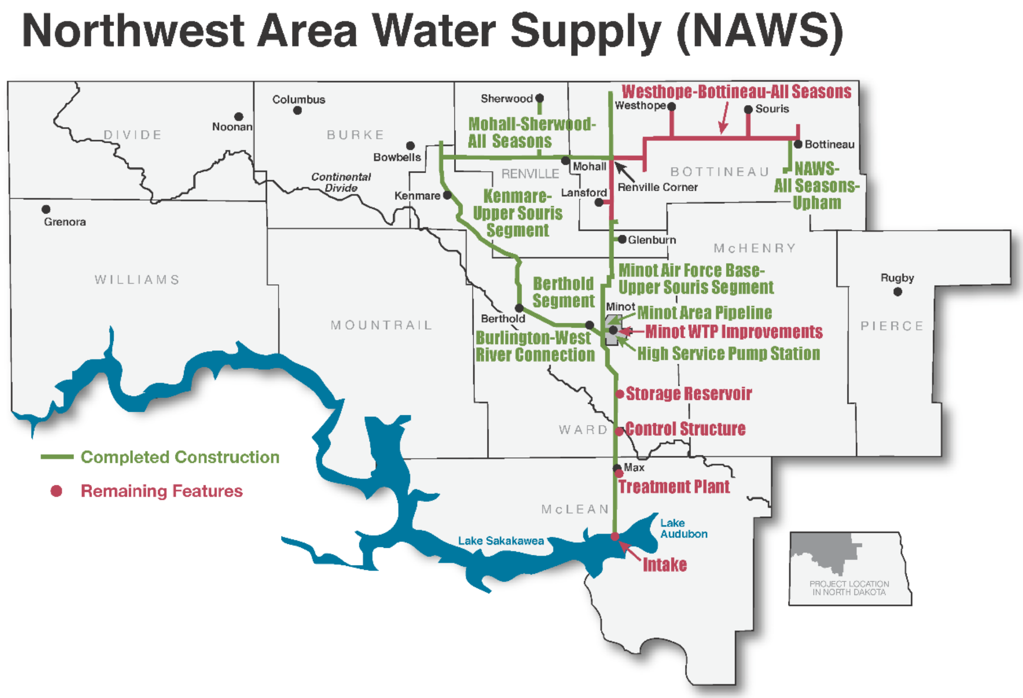
Source: North Dakota State Water Commission, 2018b

Figure 7.4.3-2: Rural Water Districts and Associations



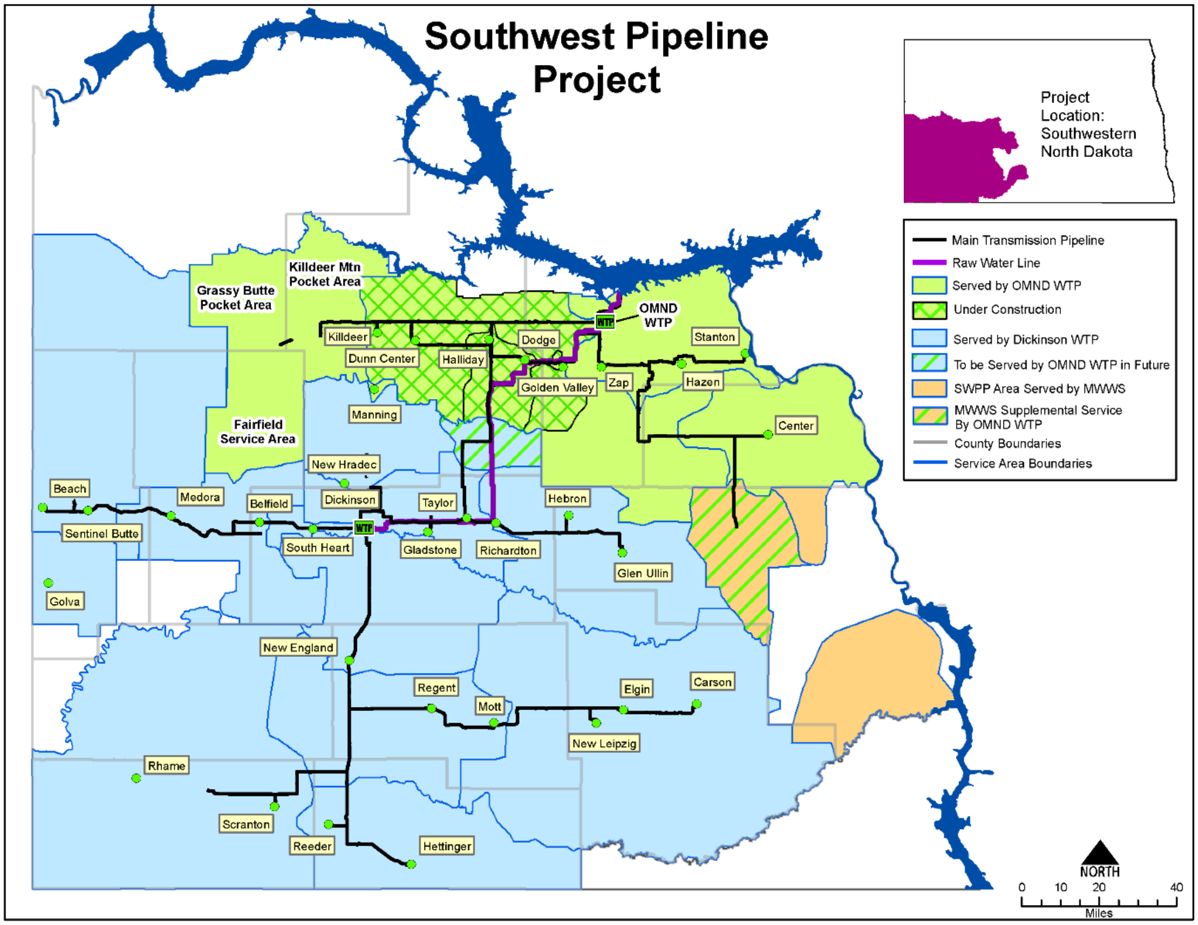
Source: North Dakota State Water Commission, 2018c

Figure 7.4.3-3: Northwest Area Water Supply



Source: North Dakota State Water Commission, n.d.

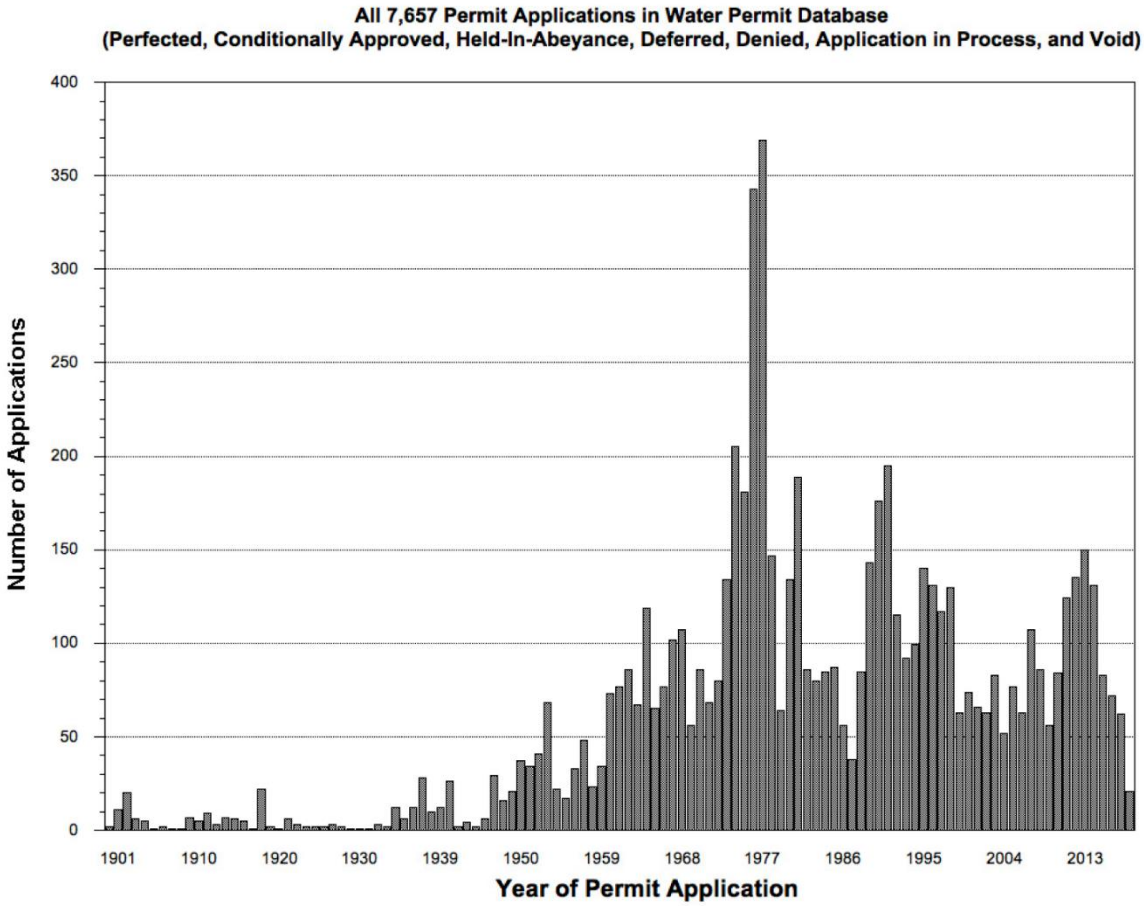
Figure 7.4.3-4: Southwest Pipeline Project



Source: North Dakota State Water Commission, 2018d

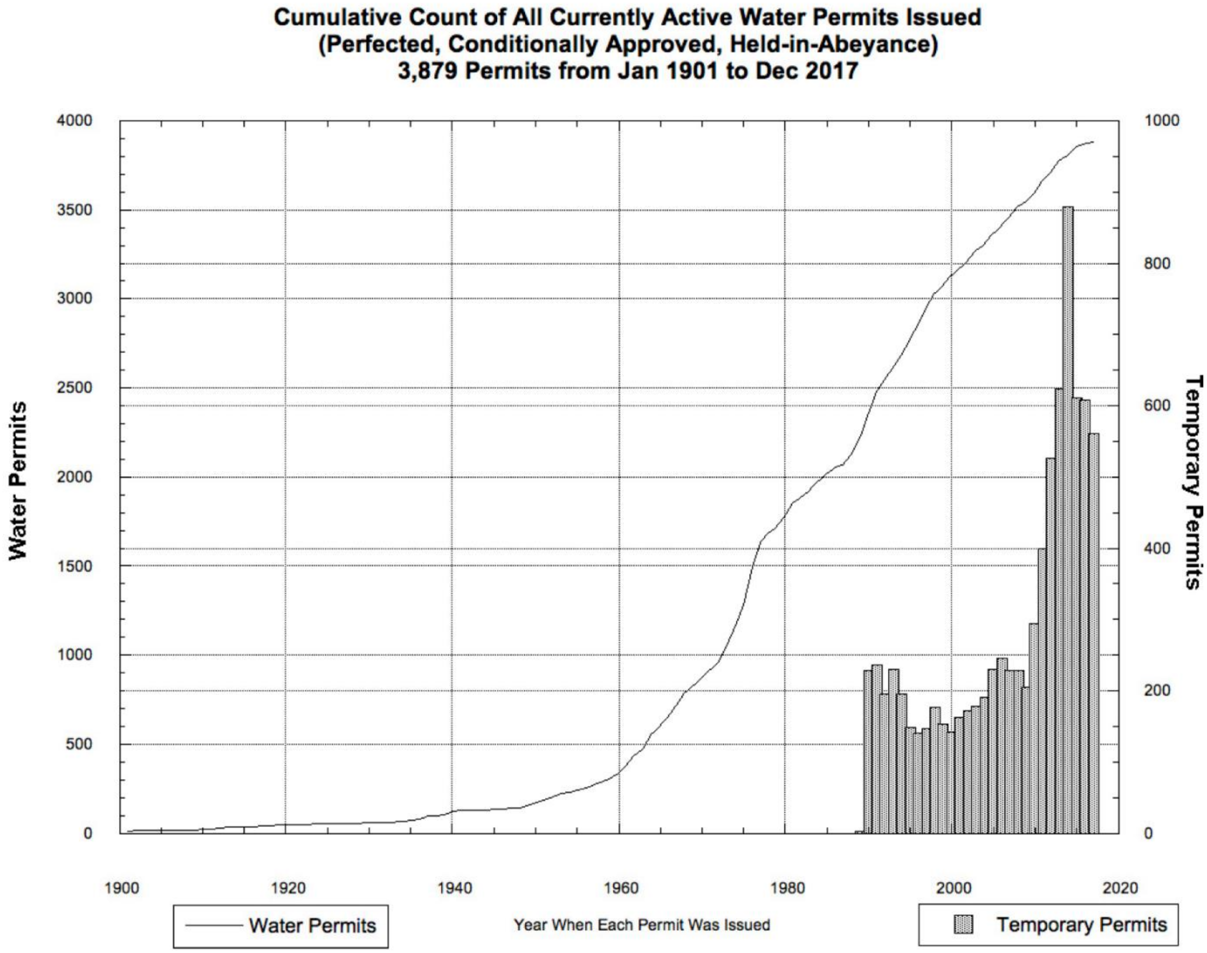
The following Figure 7.4.3-5: through Figure 7.4.3-7: show the water users that rely on North Dakota's water infrastructure. The figures demonstrate the high number of users that rely on water infrastructure throughout the state. Irrigation proves to be the largest water user and could be negatively impacted by a drought that puts stress on water supplies.

Figure 7.4.3-5: All 7,657 Permit Applications in Water Permit Database (Perfected, Conditionally Approved, Held-in-Abeyance, Deferred, Denied, Application in Process, and Void)



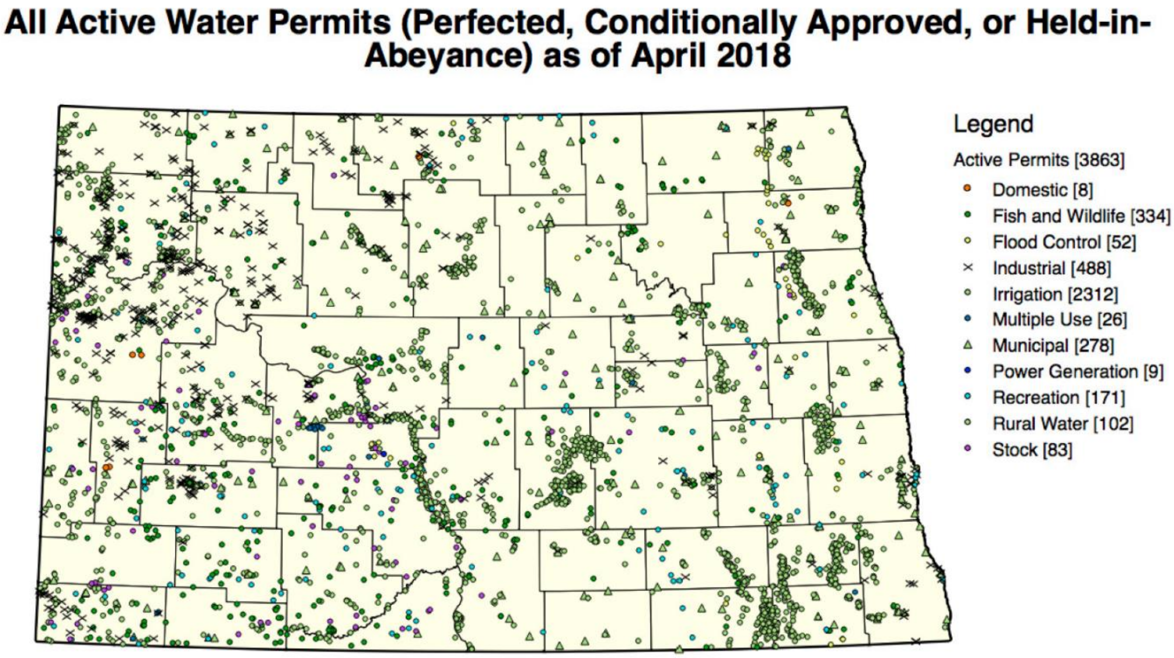
Source: North Dakota State Water Commission, 2018e

Figure 7.4.3-6: Cumulative Count of All Currently Active Water Permits Issued (Perfected, Conditionally Approved, Held-in-Abeyance)



Source: North Dakota State Water Commission, 2018f

Figure 7.4.3-7: Active Water Permits (Perfected, Conditionally Approved, or Held-in-Abeyance) as of April 2018



Source: North Dakota State Water Commission, 2018g

Table 7.4.3-5: shows the largest water users in each county. Irrigation accounts for the highest number of counties as the largest water user, being the highest water user in 21 counties. Municipal water use comes closely behind irrigation, being the highest water user in 19 counties. Figure 7.4.3-8: shows this information on a statewide map. This is data obtained from the 2016 water use reports received by the Water Appropriations Division of the SWC from permitted water users. Note that surface water provides nearly 86 percent of the water documented and groundwater provides about 14 percent of the water documented for the largest users in each county.

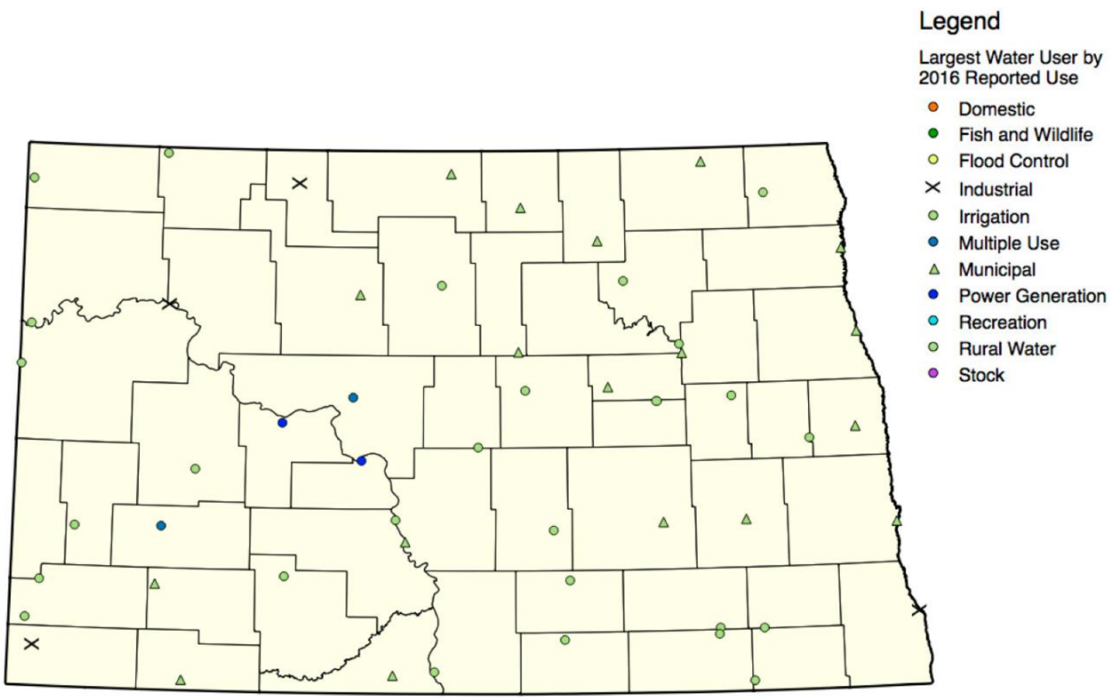
Table 7.4.3-5: Largest Water User in Each County by 2016 Reported Water Use

COUNTY	PERMIT	TYPE	SOURCE (Surface Water or Ground Water)	ANNUAL USE (acre-feet)
ADAMS	1297P	Municipal	SW	0.2
BARNES	1096	Municipal	SW	1,099.3
BENSON	2668	Irrigation	GW	100.9
BILLINGS	5508	Irrigation	SW	167.8
BOTTINEAU	764	Municipal	GW	311.7
BOWMAN	5825	Industrial	GW	1,028.7
BURKE	4393	Irrigation	SW	340.0

COUNTY	PERMIT	TYPE	SOURCE (Surface Water or Ground Water)	ANNUAL USE (acre-feet)
BURLEIGH	647	Municipal	SW	9,593.2
CASS	749	Municipal	SW	13,884.4
CAVAILER	4832	Municipal	SW	162.1
DICKEY	4888	Rural Water	GW	231.0
DIVIDE	2500	Irrigation	GW	296.0
DUNN	1967	Irrigation	SW	192.0
EDDY	5751	Municipal	GW	855.0
EMMONS	2757	Irrigation	SW	745.7
FOSTER	2149	Irrigation	GW	528.5
GOLDEN VALLEY	2799	Irrigation	SW	62.6
GRAND FORKS	4354	Municipal	SW	7,005.5
GRANT	250B	Irrigation	SW	7,311.0
GRIGGS	2388	Rural Water	GW	268.6
HETTINGER	4033	Municipal	SW	40.3
KIDDER	5040	Irrigation	GW	327.1
LAMOURE	2306	Irrigation	GW	258.5
LOGAN	3232	Irrigation	GW	272.2
MCHENRY	7D	Irrigation	SW	4,560.0
MCINTOSH	5930	Irrigation	GW	177.4
MCKENZIE	214B	Irrigation	SW	2,890.0
MCLEAN	1416	Multiple Use	SW	21,537.0
MERCER	2179	Power Gen	SW	9,595.1
MORTON	647	Municipal	SW	9,593.2
MOUNTRAIL	6124	Industrial	SW	1,823.4
NELSON	5751	Municipal	GW	855.0
OLIVER	1964	Power Gen	SW	3,867.0
PEMBINA	4897	Rural Water	GW	609.6
PIERCE	3130	Municipal	GW	305.4
RAMSEY	1799	Irrigation	SW	140.0
RANSOM	2187	Irrigation	GW	546.1
RENVILLE	5913	Industrial	GW	73.4
RICHLAND	4861	Industrial	SW	792.5
ROLETTE	5260	Municipal	GW	460.0
SARGENT	4729	Irrigation	GW	599.7
SHERIDAN	2452	Irrigation	GW	147.3
SIOUX	1205	Municipal	GW	20.7
SLOPE	2999	Irrigation	SW	123.3
STARK	250A	Multiple Use	SW	335.0
STEELE	5862	Rural Water	GW	777.9
STUTSMAN	1120	Municipal	GW	3,806.2
TOWNER	3709	Municipal	GW	288.8
TRAILL	1165P	Municipal	GW	153.1
WALSH	893	Municipal	SW	618.7
WARD	1743	Municipal	GW	4,355.5
WELLS	4091	Rural Water	GW	212.0
WILLIAMS	222B	Irrigation	SW	9,350.0

Source: North Dakota State Water Commission, 2016

Figure 7.4.3-8: Largest Water User by 2016 Reported Use



Source: North Dakota State Water Commission, 2016

Table 7.4.3-6: Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

County	Ranking (High, Medium, Low)	Loss Information
Adams	H	General loss of agriculture
Billings	H	190,000 cattle at risk divided between Billings, Dunn, Golden Valley, and Stark
Bowman	H	$43m livestock, $35m crops
Cass	H	General loss of agriculture
Golden Valley	H	190,000 cattle at risk divided between Billings, Dunn, Golden Valley, and Stark
Grant	H	$2.4m in annualized losses
Hettinger	H	General loss of agriculture
McHenry	H	General loss of agriculture
McIntosh	H	$3.7m in annual losses to crops
Morton	H	$4.5m in annualized crop losses
Pembina	H	Potential loss of crops
Sheridan	H	$600.2k in annualized crop damage
Slope	H	$16m livestock, $31m crops

County	Ranking (High, Medium, Low)	Loss Information
Benson	M	$1m+ in indemnity possible annually
Bottineau	M	$1.7m annually in crop losses
Burleigh	M	General loss of agriculture
Dickey	M	$1.4m in losses annually
Dunn	M	190,000 cattle at risk divided between Billings, Dunn, Golden Valley, and Stark
Eddy	M	$1.4m in losses annually
Emmons	M	General loss of agriculture
Fort Berthold	M	General loss of agriculture, and potable water supplies
Foster	M	$700k annualized losses
Grand Forks	M	$1.1m in annualized losses
Griggs	M	Annual average of $903k at risk
Kidder	M	$1.5m in annualized losses
LaMoure	M	$2.3m in annualized crop losses
Logan	M	General loss of agriculture
McKenzie	M	$3.4m in annualized losses
McLean	M	2,018 residents above the age of 65; ~$1m to crops annually
Mercer	M	1,460 persons above the age of 65; ~$1m to crops annually
Mountrail	M	Potential loss of crops, economic impacts as a result
Nelson	M	$528k in annualized crop losses
Oliver	M	$24.3m in crops, $29m in livestock could be potentially impacted
Pierce	M	Potential loss of crops
Ransom	M	Reduced rangeland productivity, high cost of water/unavailability for livestock
Renville	M	$7.2m in annualized crop damage
Richland	M	General loss of agriculture
Rolette	M	General loss of agriculture
Sargent	M	$765k in annualized crop losses
Standing Rock^ (And Sioux)	M	3,215 people under 20 years old, 722 over 65 in the planning area
Stark	M	190,000 cattle at risk divided between Billings, Dunn, Golden Valley, and Stark
Steele	M	$697k in annualized crop damage
Stutsman	M	Estimated $2.4m per year in crops impacted annually
Towner	M	General loss of agriculture
Wells	M	$1.4m in losses annually
Williams	M	General loss of agriculture
Barnes	L	$1.6m on average annually
Bismarck (City)	L	None specifically listed; general loss of life, property, facilities; damage also possible.
Burke	L	General loss of agriculture
Cavalier	L	667 farms at potential risk
Divide	L	General loss of agriculture
Ramsey	L	$236m in total crop exposure
Sioux	L	General loss of agriculture
Spirit Lake	L	General loss of agriculture
Traill	L	$860k in annualized crop damage
Walsh	L	$153.3k from annual losses
Ward	L	General loss of agriculture

County	Ranking (High, Medium, Low)	Loss Information
Turtle Mountain^	Hazard Not Identified in Plan	N/A

^ Includes only North Dakota parts of the reservation

7.4.4 Fire

7.4.4.1 Wildfire

Previous Occurrences

Some of the more significant wildland fire events that have occurred in North Dakota during 1988 to 2009 are described below. These events and descriptions were obtained from the NDDES, NDFS, Federal Wildland Fire Occurrence website, NCEI Storm Events Database, and National Interagency Coordination Center.

- 1988 Fire Season – The 1988 season represented an extreme fire season across the region. North Dakota had at least nine separate fires that were larger than 2,000 acres, including a 10,000-acre fire in Mountrail County.
- October 1999 McKenzie County Wildfire – Strong winds pushed two wildfires in McKenzie and Divide Counties, burning about 70,000 acres in a matter of hours. Twelve farms were evacuated, and one abandoned farm was destroyed. This fire was called the Gap/Rough Creek fire according to the Federal Wildland Fire Occurrence Website.
- August 2000 Blacktail Wildfire – The Blacktail Fire burned nearly 6,000 acres in Billings County in deep pocket of cedar. No structures were threatened. Earlier in the season, a large fire burned in McKenzie County. Later in the season, another large fire burned in Golden Valley County.
- June-July 2002 Kraft Complex – The Kraft Complex burned approximately 48,000 acres in Sioux and Grant Counties, destroyed 17 residences and 21 outbuildings, burned most of the Town of Shields, and threatened the community of Porcupine. In smaller unrelated fires, two people were killed while fighting fires in Burleigh and Kidder Counties in May 2002. A large fire also burned in Bowman County.
- April 2003 McLean Bottoms Wildfire – The 5,000-acre wildfire along the Missouri River in Emmons County injured one firefighter and forced evacuations of some areas.
- September 2004 Deep Creek Wildfire – 3,820 acres burned on federal, state, and private lands in Slope County through part of a ponderosa pine forest. Two ranches were evacuated.
- April 2005 Wilton Wildfire – Three firefighters suffered burn injuries fighting the 1,200-acre fire southwest of Wilton in Burleigh and McLean Counties. One structure was lost.
- September 2005 Clearwater Lake Wildfire – 7,000 acres burned on federal, state, and private lands in Mountrail County east of Stanley destroying four abandoned farmstead structures.
- July 2006 Standing Rock Complex – This complex burned nearly 9,500 acres on the Standing Rock Reservation. Two firefighters were injured. At least ten homes and 400 head of livestock were evacuated. Suppression costs were estimated at $430,000.
- August 2007 Muskrat Lake Wildfire – 2,800 acres burned on the Fort Berthold Reservation south of New Town. Eight structures were lost with suppression costs estimated at $150,000.
- July 2008 – The Brown Wildfire burned 2,405 acres. This fire started from natural causes.
- November 2009 – This late-season fire, known as the Squaw Creek Fire burned 1,580 acres and resulted from human causes.

State Risk Assessment

Vulnerability Assessment

An additional source consulted to demonstrate how wildland fire risk varies across the state is the wildland-urban interface/intermix data from the SILVIS Lab at the University of Wisconsin-Madison. This data is available in GIS format which enabled analysis of population and housing units in those areas identified as Wildland Urban Interface (WUI) or Intermix areas. While this data has not been updated since 2010, it is still considered one of the best available sources for WUI analysis.

This vulnerability analysis involved the use of GIS to quantify the population and buildings at risk within wildfire risk zones. The SILVIS data is classified into 13 categories, based on 2010 Census housing unit density and percent of vegetation in the area. In both interface and intermix communities, housing units meet or exceed a minimum density of one structure per 40 acres. Intermix communities are areas where housing and vegetation intermingle, and vegetation exceeds 50 percent. Interface communities are areas with housing in the vicinity of contiguous vegetation having less than 50 percent vegetation, and within 1.5 miles of an area that exceeds 1,325 acres and more than 75 percent vegetation. For the purposes of this plan, these areas were further classified into High, Moderate, and Low risk threat zones as follows:

High Risk Threat Zone (areas of various housing unit density within areas of high vegetation)

- High Density Intermix
- Medium Density Intermix
- High Density Interface

Moderate Risk Threat Zone (areas of lower housing unit density within areas of high vegetation)

- Medium Density Interface
- Low Density Intermix

Low Risk Threat Zone (either no vegetation, or no housing density)

- Low Density Interface
- High Density No Vegetation
- Medium Density No Vegetation
- Wildland Intermix
- Uninhabited Vegetation
- Uninhabited No Vegetation
- Low Density No Vegetation
- Wildland No Vegetation

The SILVIS Census Blocks that met the high or moderate risk threat zone definitions above were selected within GIS. The number of housing units within the high or moderate risk threat zones are represented in Figure 7.4.4-1. The total population and number of housing units within each zone was summarized by county, based on 2010 Census Block data included in the SILVIS data set. Because the SILVIS data has not been updated since the last plan update, the figure from the 2014 plan was carried forward to this plan update. The results of this analysis are also summarized in Table 7.4.4-1. Burleigh County has the highest building and population exposure by far compared to the other counties, followed by Morton and then Williams Counties.

Figure 7.4.4-1 Housing Units in WUI High and Moderate Risk Threat Zones

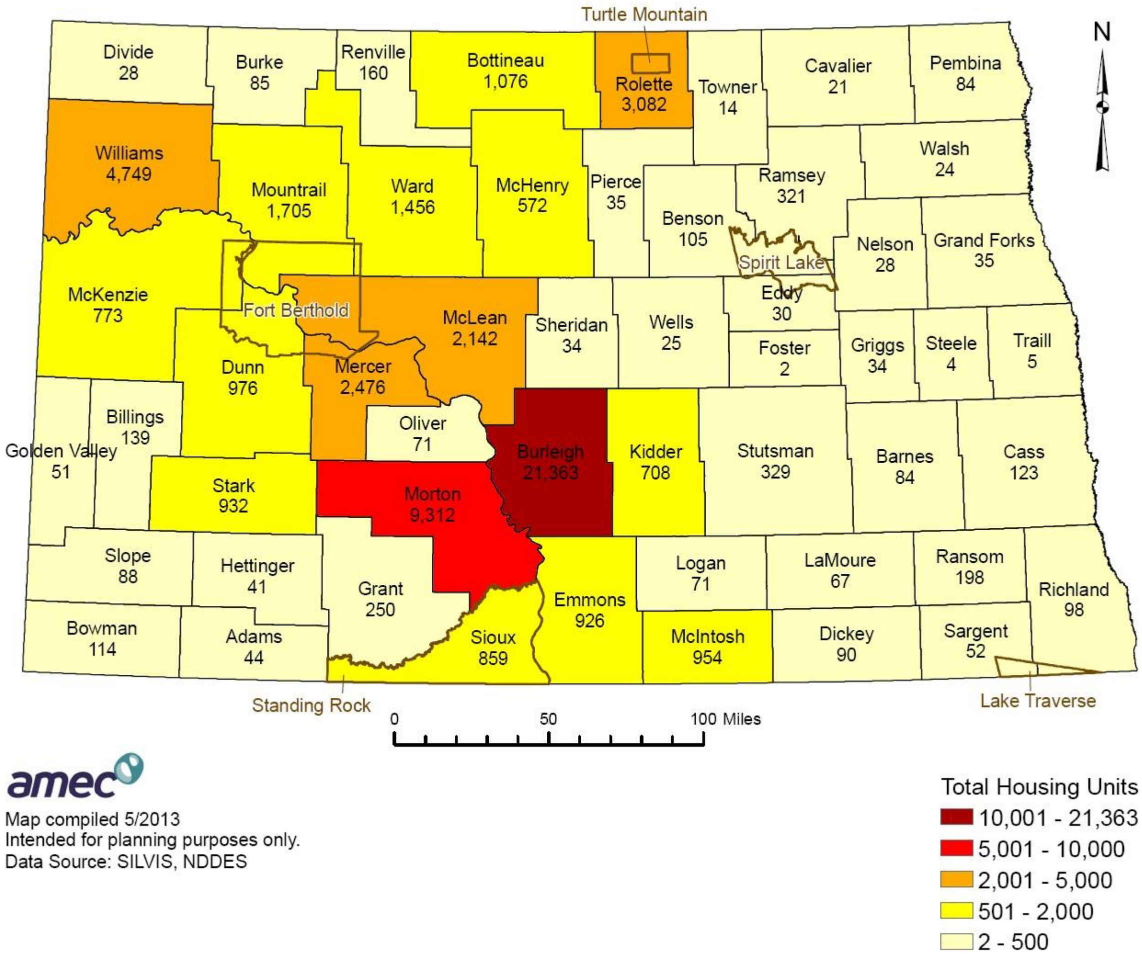


Table 7.4.4-1 Population and Housing in Moderate and High-Risk Areas

County	Pop – in High Risk	Housing Units in – High Risk	Pop – in Moderate Risk	Housing Units- in Moderate	Total Population in High and Moderate Risk	Total Housing Units in High and Moderate Risk
Adams	33	22	37	22	70	44
Barnes	83	55	41	29	124	84
Benson	10	13	281	92	291	105
Billings	56	44	103	95	159	139
Bottineau	142	265	531	811	673	1,076
Bowman	62	33	151	81	213	114
Burke	51	44	56	41	107	85
Burleigh	27,687	13,216	21,416	8,147	49,104	21,363
Cass	267	96	53	27	320	123
Cavalier	8	12	8	9	16	21

County	Pop – in High Risk	Housing Units in – High Risk	Pop – in Moderate Risk	Housing Units- in Moderate	Total Population in High and Moderate Risk	Total Housing Units in High and Moderate Risk
Dickey	145	87	4	3	149	90
Divide	18	16	5	12	23	28
Dunn	576	552	778	424	1,354	976
Eddy	28	27	4	3	32	30
Emmons	791	490	725	436	1,516	926
Foster	2	1	0	1	2	2
Golden	22	15	60	36	82	51
Grand	9	3	80	32	89	35
Grant	64	103	51	147	115	250
Griggs	12	29	10	5	22	34
Hettinger	38	22	44	19	82	41
Kidder	206	119	928	589	1,134	708
LaMoure	79	37	50	30	129	67
Logan	37	30	54	41	91	71
McHenry	239	151	729	421	968	572
McIntosh	609	420	971	534	1,580	954
McKenzie	953	476	720	297	1,673	773
McLean	1,082	787	2,281	1,355	3,363	2,142
Mercer	1,654	963	2,820	1,512	4,473	2,476
Morton	12,886	5,941	8,158	3,371	21,044	9,312
Mountrail	1,266	913	1,462	792	2,728	1,705
Nelson	25	13	27	15	52	28
Oliver	44	20	112	51	156	71
Pembina	115	60	51	24	166	84
Pierce	44	26	22	9	66	35
Ramsey	329	152	394	169	723	321
Ransom	270	148	85	50	355	198
Renville	43	70	29	90	72	160
Richland	49	26	142	72	191	98
Rolette	2,286	959	5,816	2,123	8,102	3,082
Sargent	47	29	37	23	84	52
Sheridan	16	14	22	20	38	34
Sioux	1,021	318	1,828	541	2,849	859
Slope	20	10	117	78	137	88
Stark	1,020	453	1,144	478	2,164	932
Steele	4	4	0	0	4	4
Stutsman	269	129	276	200	545	329
Towner	9	5	14	9	23	14
Traill	0	0	10	5	10	5
Walsh	25	17	13	7	38	24
Ward	1,119	586	1,878	870	2,997	1,456
Wells	29	14	10	11	39	25

County	Pop – in High Risk	Housing Units in – High Risk	Pop – in Moderate Risk	Housing Units- in Moderate	Total Population in High and Moderate Risk	Total Housing Units in High and Moderate Risk
Williams	6,700	3,265	3,710	1,483	10,411	4,749
Total	**62,599**	**31,301**	**58,350**	**25,743**	**120,949**	**57,043**

Source: SILVIS Lab Wildland Urban Interface Data

Loss Estimates

To estimate losses an exposure analysis was used based on applying the average value of housing units in each county multiplied by the combined number of housing units in the high and moderate risk categories. For the purposes of estimating potential loss, the total average value is used, as catastrophic fires tend to result in total loss of the structure. It is very unlikely that a wildfire would result in loss of all the structures potentially at risk within a given county, but the results provide an indication of where the highest losses from a fire in the Interface or Intermix areas could occur.

Table 7.4.4-2 Housing Unit Values in High and Moderate Wildfire Risk Areas

County Name	Total Housing Units in High and Moderate Risk Categories	Median Housing Value	Housing Unit Values in High and Moderate Wildfire Risk Areas
Adams	44	$86,300	3,797,200
Barnes	84	$84,000	7,056,000
Benson	105	$52,800	5,544,000
Billings	139	$77,100	10,716,900
Bottineau	1,076	$70,000	75,320,000
Bowman	114	$89,600	10,214,400
Burke	85	$54,000	4,590,000
Burleigh	21,363	$159,000	3,396,717,000
Cass	123	$150,700	18,536,100
Cavalier	21	$70,800	1,486,800
Dickey	90	$65,200	5,868,000
Divide	28	$59,500	1,666,000
Dunn	976	$81,000	79,056,000
Eddy	30	$50,700	1,521,000
Emmons	926	$64,400	59,634,400
Foster	2	$77,100	154,200
Golden Valley	51	$59,600	3,039,600
Grand Forks	35	$143,700	5,029,500
Grant	250	$61,700	15,425,000
Griggs	34	$65,700	2,233,800
Hettinger	41	$61,600	2,525,600
Kidder	708	$61,000	43,188,000
LaMoure	67	$70,500	4,723,500
Logan	71	$55,300	3,926,300
McHenry	572	$68,800	39,353,600
McIntosh	954	$49,700	47,413,800
McKenzie	773	$88,400	68,333,200

County Name	Total Housing Units in High and Moderate Risk Categories	Median Housing Value	Housing Unit Values in High and Moderate Wildfire Risk Areas
McLean	2,142	$98,900	211,843,800
Mercer	2,476	$109,300	270,626,800
Morton	9,312	$120,400	1,121,164,800
Mountrail	1,705	$75,400	128,557,000
Nelson	28	$51,100	1,430,800
Oliver	71	$91,100	6,468,100
Pembina	84	$73,000	6,132,000
Pierce	35	$81,700	2,859,500
Ramsey	321	$85,400	27,413,400
Ransom	198	$88,800	17,582,400
Renville	160	$66,200	10,592,000
Richland	98	$99,000	9,702,000
Rolette	3,082	$61,200	188,618,400
Sargent	52	$72,400	3,764,800
Sheridan	34	$53,800	1,829,200
Sioux	859	$72,900	62,621,100
Slope	88	$54,800	4,822,400
Stark	932	$130,000	121,160,000
Steele	4	$65,500	262,000
Stutsman	329	$92,800	30,531,200
Towner	14	$53,000	742,000
Traill	5	$90,100	450,500
Walsh	24	$66,000	1,584,000
Ward	1,456	$124,300	180,980,800
Wells	25	$55,600	1,390,000
Williams	4,749	$110,000	522,390,000
Total	**57,043**		**$6,852,588,900**

Source: SILVIS Wildland Urban Interface Data, U.S. Census American Community Survey 5-yr Estimates 2007-2011

Table 7.4.4-3 North Dakota Game and Fish Department Wildfire Losses

Date	Acres	WMA/County	Habitat
2/13/2005	0.5	Oahe/Burleigh	Native prairie (McLean Bottoms-rifle range)
4/1/2005	6	Riverdale/McLean	Native Prairie
4/2820/05	75	deTrobriand/McLean	Native Garrison RFD
4/28/2005	1	deTrobriand/McLean	Native
5/1/2005	1,000	Oahe/Burleigh	Woodland (river bottom), cattails, grass
5/3/2005	6	Oahe/Morton	Woodland (river bottoms), grass
4/4/2006	1700	Riverdale WMA/McLean Co.	Riparian Woodland
4/15/2006	160	Rice Lake/Burleigh	Cattails / slough grass
6/26/2006	10	Lonetree WMA/Wells Co	1/2 native 1/2 DNC
6/7/2006	10	Van Hook WMA	DNC
7/12/2006	100	Lonetree WMA Sheridan County	Native Prairie
7/13/2006	10	Lonetree WMA Sheridan County	Tame Grass
8/3/2006	40	Lonetree WMA/Wells County	DNC

Date	Acres	WMA/County	Habitat
8/12/2006	1	Cedar Lake/Slope	Native grass
6/28/1905	1	Lonetree WMA/Wells Co	
3/6/2007	3	Badlands/Billings	Native
11/1/2007	300	Apple Crk/Burleigh	Tame Grass
4/25/2008	2	N Beulah Mine/Mercer	Native Prairie
7/12/2008	491	Johnsons Gulch/Dickey	Native Prairie
9/1/2008	383	Hille/Mercer	Tame Grass
4/22-24/2009	700	Oahe (Graner Bottoms)/Burleigh	grass (brome), woods (cottonwood), and wetland
7/2-3/2010	220.6	Lonetree/ Sheridan	CSN/WSN -Native
4/3/2012	220	Erie Dam WMA	Native
4/1/2012	800	Oahe WMA	Tame
5/1/2012	65	Oahe WMA	Tame
11/1/2012	1.2	Oahe WMA	Rifle Range
6/1/2012	10	Lewis & Clark WMA	Rifle Range
4/2013	5	Oahe WMA	Rifle Range
4/20/2014	35	Ochs Pt. /McKenzie	Tame Grass
5/19/2014	80	N.Beulah Mine/Mercer	Native
9/2014	2.4	Lewis & Clark WMA/McKenzie	DNC
4/10/2015	1	Rifle Range/McKenzie	Rifle Range
4/4/2015	525	Oahe/Burleigh	Woodland/Tame
4/13/2015	60	Wilbur Boldt/Oliver	Woodland/Tame
5/15/2016	48	Art Brazda/Burleigh	DNC
7/15/2017	2	DeTrobriand/McLean	CSN/WSN/NATIVE

Source: North Dakota Game and Fish Department, 2018; WMA=Wildlife Management Area

Hazard Ranking Information

Table 7.4.4-4 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Divide	H	Rural areas of the county
Morton	H	Crops potentially impacted from wildfire, older homes impacted by structural fire
Pierce	H	Specific impacts not listed; general loss of life and property
Sioux	H	$44.1k in property damages annually, 3388 home-sites located in WUI
Spirit Lake	H	All structures vulnerable
Turtle Mountain^	H	4 critical facilities, most homes in non-defended areas
Adams	M	$25m in structures at highest risk
Benson	M	Whole population, all buildings
Billings	M	$53,584,007 at risk regionally
Bottineau	M	265 homes in High and Moderate risk areas, total of $26.8m in potential losses
Bowman	M	$2,530,629 in potential losses
Burke	M	Rural areas of the county
Burleigh	M	21,363 houses in High and Moderate Risk areas

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Cavalier	M	Older buildings (no stock or count), cropland
Dickey	M	Rural areas of the county, including homes and critical facilities, most at risk
Eddy	M	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure
Emmons	M	926 housing units in high and moderate risk areas
Fort Berthold	M	Extensive WUI Interface
Foster	M	$4,889 per fire incident, $14,666 annually
Golden Valley	M	$53,584,007 at risk regionally
Grand Forks	M	$1.9m in losses annually, 35 housing units in moderate to high risk areas
Grant	M	150 housing units potentially impacted from moderate-high risk areas
Griggs	M	Older buildings (no stock or count), cropland, rural buildings
Kidder	M	Rural areas, mobile homes most at risk, 708 total housing units at risk
Logan	M	Specific impacts not listed; general loss of life and property
McHenry	M	Specific impacts not listed; general loss of life and property
McIntosh	M	Rural homes and structures most at risk. Very little time for response teams.
McKenzie	M	Mobile/RV parks, rural lodging facilities at most potential risk
McLean	M	Approximately 4,230 residents vulnerable to wildfire, 5,880 residents vulnerable to urban fire
Mercer	M	1,970 residents vulnerable to wildfire
Mountrail	M	Rural structures and crops most at risk
Nelson	M	Average of $45k per urban fire, 52 people in mod to high-risk areas, as well as 28 housing units
Oliver	M	1,290 residents outside of urban center potentially impacted by wildfires, $21.8m in potential structural impacts
Pembina	M	Rural structures and crops most at risk
Ransom	M	2,560 residents vulnerable to wildfire, 3,285 vulnerable to urban fire
Renville	M	160 housing units in moderate to high-risk areas
Richland	M	Specific impacts not listed; general loss of life and property
Sargent	M	84 people, 52 housing units in high and moderate risk areas
Slope	M	$47,805 in potential losses
Standing Rock^ (And Sioux)	M	$44.1k in property damages annually, 3388 home-sites located in WUI
Stark	M	$53,584,007 at risk regionally
Steele	M	4 housing units in high and moderate risk areas

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Stutsman	M	Average annual loss of $1m in structure fires, rural areas and intermix areas most susceptible to wild fires
Towner	M	890 residents in rural areas, and 143 additional in intermix areas potentially impacted, 1427 residents vulnerable to urban fires
Traill	M	Rural and intermix areas most at risk
Walsh	M	2,706 people under the age of 20, and 2,237 over the age of 65 most at risk
Ward	M	30,210 homes in the county vulnerable to fire
Wells	M	Population at risk: 716 under 20 years old, 514 above 65, along with crops and infrastructure
Williams	M	8275 residents vulnerable to wildfire, 42 workforce lodging facilities
Barnes	L	On average, 97 annual instances
City of Bismarck	L	Total potential loss $516,000,000.
Cass	L	Negligible impacts
Dunn	L	$53,584,007 at risk regionally
Hettinger	L	Specific impacts not listed; general loss of life and property
LaMoure	L	Rural buildings most at risk, annual average of $2100 in crop losses
Ramsey	L	321 housing units in high-risk zones, potential of $27.4m in damages
Rolette	L	Older and rural buildings most at risk from potential impacts of fire
Sheridan	L	$149k in annualized losses (urban), $1.9m in property value, 34 housing units, 38 residents in high-moderate risk zones (wildfire)

^ Includes only North Dakota parts of the reservation

7.4.4.2 Urban Fire

Previous Occurrences

Below is a summary of some of the more significant urban / structural fires that have impacted the state.

- 1882 – Fire destroyed a large portion of Grand Forks.
- 1884 – Fire destroyed half of the City of Devils Lake.
- 1893 – Fire destroyed almost the entire business section of Fargo, including City Hall and many of the City‘s residences, covering 160 acres.
- 1894 – Fire destroyed four city blocks, including City Hall, in LaMoure.
- 1898 – Fire almost destroyed the entire Bismarck business section.
- 1930 – The North Dakota Capitol was destroyed by fire on December 28. The original State constitution was saved by the Secretary of State. Many State records were completely lost. A new Capitol building was constructed by 1934.
- 1947 – An explosion and fire killed three people and destroyed four city blocks, including nine businesses in Minot on July 21.
- 1966 – Fire destroyed Fargo Central High School on April 19. Losses were estimated at $1 million.
- 1968 – On March 27, seven Jamestown businesses, including the historic Gladstone Hotel were lost to fire.

Hazard Ranking Information

See Table 7.4.4-4 for the summary of hazard ranking information for Urban Fire.

7.4.5 Flood

7.4.5.1 Previous Occurrences

Sources consulted for this information include: State Historical Society of North Dakota; NDDES; USGS; Minot Daily News, 1969; Interagency Hazard Mitigation Team Reports, varied dates; National Centers for Environmental Information; USACE; and the Bismarck Tribune. The following details the previous occurrences including and prior to 2009.

- 1826 Red River Flood – This flood on the Red River occurred prior to the area being settled. Flood flows are estimated to have reached 144,000 cfs where Grand Forks now sits.
- 1897 Red River Flood – This flood is estimated to have reached a flood depth of 50.2 feet and a flow of 85,000 cfs at Grand Forks. Flooding on all tributaries between Grand Forks and Emerson, Manitoba was reported, and a serious situation developed at Grafton.

Figure 7.4.5-1 First Avenue South from Eighth Street in Fargo during the Flood of 1897

Source: US Geological Survey, 2007 Photo by R.M. Stene

- March 1945 Red River Flood – US Geological Survey photos show that Fargo suffered serious flooding on March 20, 1945.
- 1950 Red River Flood – High soil moisture, frozen ground, snowmelt, ice jams, and precipitation all contributed to the spring 1950 flood along the Red River from Grand Forks north. More than 225 families were forced from their homes in Grand Forks and East Grand Forks.
- April 1969 Flood – Snowmelt along the Des Lacs and Souris Rivers severely flooded Minot with an estimated $11 million in damages. Nearly a third of Minot was evacuated. Damages in the James River Basin were estimated at $16 million.
- 1975 Flood – Following a severe winter, the floods that followed cost North Dakota $1 billion in damages. This flood had two peaks, one in spring and one in summer.
- April 1979 Red River Flood – Heavy snowpack and rapid snowmelt led to the 1979 flooding along the Red River. Heavy flooding caused much of Hillsboro in Traill County along the Goose River to be evacuated. The Red River flood depth at Grand Forks reached 48.63 feet and flowed at 82,000 cfs. North Dakota damages were estimated at $64.8 million.
- 1989 Red River Flood – This flood was a result of heavy spring snowmelt combined with moderate spring rains. In Breckenridge, the river crested at 17.34 feet and in Wahpeton at 17.84 feet. Approximately 103 homes in North Dakota were damaged, including 13 that sustained major damage. Bridges, roads, water systems, parks, golf courses, an airport, and a zoo were also damaged. Livestock from 80 farms sites were relocated. Power outages in Walsh County were reported. Twelve businesses suffered serious damages.

- 1993 Flood – Statewide, excessive rains during the spring destroyed crops, and heavy thunderstorms on July 15-16 (4-7 inches of rain), July 22-27 (6-10 inches of rain), and August 21-22 (up to 7 inches of rain) caused flash flooding and damage to public and private property. Minor to moderate flooding occurred in the Missouri, James, Souris, and Devils Lake basins. Moderate flooding occurred in the Red River basin, particularly along the Sheyenne River. Much of the state went from mild to severe drought in June to moist to extremely moist in July. Two flood-related deaths occurred. Homes and businesses (6,893 individuals registered for assistance), roads, bridges, culverts, parks, utilities, and public buildings were all damaged. Damages were estimated at $600 million ($500 million to agriculture, $80 million to the private sector, and $20 million to the public sector).
- 1994 Flood – Snowmelt and heavy thunderstorms coupled with still saturated soils from 1993 led to flooding in many parts of the state. Major impacts were to low-lying cropland, roads, and lake levels. Many homes suffered basement water seepage and septic tank failures.
- 1995 Flood – Continued moisture and a rapid snowmelt in March led to flooding during the spring of 1995. Damages to individual septic systems, municipal sewage systems, roads, and agriculture were reported. The City of Devils Lake was threatened by rising lake levels. The loss of cropland and delayed planting of about 1.8 million acres resulted in about $15 million in agricultural losses. Many ranchers had to sell livestock due to lost grazing lands. Damages to about 120 Federal Aid System (FAS) road sites were estimated at over $16 million. Figure 7.4.5-2 shows the Officers Club at Camp Grafton being battered by floodwaters during this event.

Figure 7.4.5-2 Devils Lake Batters the Officers Club at Camp Grafton in 1995

Source: Devils Lake Journal, 1995

- 1996 Flood – An early spring thaw in February, a refreeze period, and then an extremely rapid snowmelt in April led an ice build-up and subsequent flooding. Many roads and bridges were damaged. Storm drains, flood control facilities, sewer systems, and electric infrastructure were also damaged. The 1996 flood along the Red River was relatively minor compared to the flood the following year. The river reached 45.93 feet and 58,400 cfs at Grand Forks.
- 1997 Flood – Five years of high precipitation coupled with record and late season snowfall led to the extreme flood event of 1997. As the record snows began melting and an April blizzard compounded the problem, water levels across the state began rising to unprecedented levels, forcing many people from their homes. Hospitals began transferring patients to areas in North Dakota and Minnesota that were outside of the flood-stricken region. On April 20-21, the Grand Forks levees broke, resulting in mass evacuation of city residents who had not previously left. The 1997 flooding of the Red River of the North was the costliest North Dakota flood disaster recorded. The flooding caused $3.7 billion in economic losses. The flood depth on the Red River at Grand Forks reached 54.35 feet with a flow of 114,000 cfs. Many other rivers and streams in North Dakota

were affected by ice jams and high-water levels including the Knife River, Cannonball River, Little Missouri River, Heart River, James River, Beaver Creek, and Sheyenne River. All basins in the state were affected in some way. Dramatic rises continued in the Devils Lake basin. An estimated 60,000 people were evacuated during this catastrophic flood event. Substantially damaged homes exceeded 1,300 and an estimated 1,200 businesses in Grand Forks suffered direct losses, only 45 of which had flood insurance. The resultant structure fires destroyed several businesses and buildings in downtown Grand Forks. A total of 2,500 businesses received loans from the Small Business Administration totaling nearly $50 million. Public infrastructure such as streets, roads, highways, buildings, sewer systems, and water treatment facilities suffered significant losses. Even parts of Interstate 29 and 94 were inundated. Significant power and natural gas outages occurred. Losses to agriculture were also heavy with an estimated 120,000 head of cattle lost and direct and indirect crop losses of about $350 million. The emotional loss for many was significant. By late May 1997, 33,000 residents of the state had reported personal property damage. In Grand Forks alone, 34,100 tons of household debris and 92,225 tons of levee material had been removed by the end of May. This was a massive catastrophic statewide disaster, clearly the worst situation in the state's history in terms of anxiety, pain, and dollar loss.

- 1998 Flood – Excess groundwater and heavy snow led to the spring floods. The annual influx of moisture into the closed Devils Lake basin led to significant increases in lake levels that continued to threaten the surrounding communities. The Pembina River flooded following snowmelt and continued saturated soils. Much of the damage in 1998 was caused by overland sheet flooding. Damages to roads and sewer systems were common. High water tables increased the instances of mold and mildew growth in basements.
- 1999 Flood – Seven years of flooding and excessive soil moisture led to riverine and flash flooding during the spring of 1999. Roads, utilities, homes, and public facilities all suffered damages. Delayed crop planting set the schedule back for farmers. Some of the cropland was not planted because of flooding.
- June 12, 2000 Flash Floods - The Turtle River flooded after 15-20 inches of rain fell in its basin. The Turtle River at Manvel crested at 18 feet on June 17. Communities affected included Grand Forks County and its cities of Manvel and Gilby, and Nelson County. Property damages were estimated at $3 million as over 150 dwellings suffered major to minor damage. People had to be rescued when many roads washed out or were inundated. Two deaths and two injuries were reported. The drinking water supply in Gilby was temporarily lost. The Goose River also flooded covering some county roads with 1-5 feet of water. One-third of Grand Forks County's croplands, 270,000 acres were destroyed, with $31 million in crop losses reported. In Nelson County, 45 percent of the cropland was destroyed, resulting in an estimated $12 million in crop damage. Damages to Turtle River State Park were estimated at $500,000.
- June 19, 2000 Flash Floods – Fargo received between 6.82 and 7.31 inches of rain within a 24-hour period. The heavy rain halted traffic, inundated storm sewers, and knocked out electricity and phones. Twenty thousand customers lost power when a power station was submerged and sump pumps ceased operating without power. Fifty-four percent of Fargo residents had water damage. At one point, fifty percent of the city streets were flooded. The major traffic arteries, Interstates 29 and 94, were flooded and closed for several days. The bottom level of the Fargo dome filled with 8-12 feet of water, and North Dakota State University had water in nearly all its 88 buildings. The campus library had four feet of water in the periodical section. The Fargo flash food resulted in an estimated $10 billion in property damage. Amazingly, there were no fatalities or injuries reported.
- 2001 Red River Flood – Heavy snowpack followed by rain in early April led to flooding in the Red River basin. The Red River crested at 44.80 feet at Grand Forks and 36.69 feet at Fargo. Significant damages and closures occurred on roads, streets, and bridges. Many homes north of West Fargo to Harwood and farmsteads in Great Bend were surrounded by water and 26 homes in the Burke addition (Grand Forks) were isolated. A section of temporary dike failed, flooding a golf course. The West Fargo airport was temporarily closed. Property damage was estimated at $10 million.

Figure 7.4.5-3 USGS Personnel Measuring Flood Overflow at a Bridge on the Red River Near Thompson, April 15, 2001

Source: US Geological Survey, 2007

- 2001 Devils Lake Closed Basin Flood – Significant rises in lake levels since 1940 and even more rapid increases since 1993 continued to slowly cause losses in the Devils Lake Basin. In August 2001, the lake levels were at 1,448.15 feet, compared to 1,424 feet in 1993. In 2001 alone, $37.5 million was spent on highway construction due to flooded, damaged, and threatened roads and bridges. Utilities were similarly threatened. Parks around the lake, such as Grahams Island, Shelvers Grove, and Black Tiger Bay continued to suffer losses. Basement flooding continued and increased.
- 2002 Flash Floods – Heavy rainfall during June and July led to flash flooding in the northeastern part of the State and some riverine flooding along the Red River at Drayton. Many streets, roads, highways, and even Interstate 29 were flooded and damaged or impassable. A section of the railroad tracks north of Hillsboro was washed out. Basement flooding occurred throughout the region, including in several University of North Dakota buildings. High creek and coulee levels threatened some homes and crop losses were substantial.
- 2004 Red River Flood – Flooding occurred on many of the Red River tributaries, including the Forest, Goose, Park, Pembina, and Turtle Rivers. The entire community of Emerado was evacuated and 42 homes were damaged there, totaling about $705,000. The community of Hamilton was isolated due to overland flooding and roads needed to be cut to allow for water drainage. In Crystal, power and drinking water were lost and city streets were damaged resulting in about $600,000 in losses. The City of Grafton had nearly 100 homes with water, either through basements or sewer backups, causing about $1 million in damage. Highways, roads, and streets were closed due to flooding. Flooding of 26 homes occurred in Minto and 6 homes in Park River. In Walsh County, 100 miles of county/township roads were closed with nearly 400 road sites damaged, totaling about $2.4 million. Total property damages during the period were estimated at $4.2 million.
- 2006 Red River Flood – During this flood along the Red River and its tributaries, damages occurred to roads, homes, and businesses. The flood depth on the Red River at Grand Forks reached 47.88 feet with a flow of 72,700 cfs and 37.18 feet at Fargo. Along the Wild Rice River south of Fargo, 75 homes were threatened. West of Fargo near the confluence of the Maple and Sheyenne Rivers, water surrounded several homes. Near Lidgerwood, a retirement center was threatened. Temporary dikes were constructed throughout the Fargo and Wahpeton areas to protect structures. Interstate 29 was closed in several locations due to high water. Over 40 county roads and over 35 bridges were also closed. One person was killed. Because of mitigation efforts following the 1997 flood, losses were limited to around $7-8 million for state and local infrastructure and about $1 million for individual farm and home properties.
- 2007 Flash Floods – In June 2007, damages were reported to basements, culverts, roadbeds, and driveways following heavy thunderstorm rains. Flooding also led to substantial crop losses totaling

about $3 million. Losses and road closures were primarily seen in Barnes, Bowman, Grant, Ransom, Richland, Sargent, and Stutsman Counties.

- 2009 Flood – Record-breaking winter and spring snowfall led to flooding throughout North Dakota with records broken in every major drainage basin in the state. The flood depth on the Red River at Fargo reached 40.84 feet, approximately the 500-year flood. Some of the flooding was river and stream related, while some was overland flooding away from rivers and streams. Ice jams were more numerous and severe than past years, including many in the Bismarck area that led to evacuations, road closures, and blasting of the ice jams. Valley City was evacuated when the sewer system there filled with backwater and failed. The North Dakota Air/Marine Operations Branch conducted 139 human rescues and 135 animal rescues. Over 430 homes were flooded, some completely destroyed, and many state, county, city, and township roads were damaged with several bridges washed out. Parts of Interstate 94 were closed for a time. Throughout the state, 17 dams were damaged. Property damage was estimated at $5.5 million. The flooding prevented an estimated 1.7 million acres from being planted with an estimated value of $490 million. Including losses from the harsh winter conditions and flooding, an estimated 78,000 calves, 19,100 cows, 180 horses, and 3,000 other farm and ranch animals perished at a cost of about $50 million with the impact on society much greater. The total cost of temporary levees, clean-up, and repairs was estimated to exceed $78 million. Total losses from the 2009 floods are estimated at $623 million, including over $184 million in federal disaster losses.
- 2009 Devils Lake Closed Basin Flood – The closed basin problems of Devils Lake continued and lake levels reached another modern-day record in June 2009 of over 1,450 feet. New losses were estimated at $2.0 million.
- June 15, 2009 Flash Floods – Heavy thunderstorm rains of over 10 inches in the greater Bismarck area led to significant flash flooding. Many homes suffered basement flooding, a flat roof of a bowling alley collapsed, and two schools were damaged. Many Bismarck city streets were flooded, including water damages to cars; Interstate 94 near Sterling had water over 1 foot deep flowing over it. Property damages were estimated at $2.8 million.

Table 7.4.5-3 shows North Dakota’s flood declared disasters and emergencies.

Table 7.4.5-3 North Dakota Flood Declared Disasters and Emergencies

Declaration	Location	Date	Other Information	Casualties	Damages
DR 195	North Dakota	1965		Unknown	Unknown
DR 216	North Dakota	1966		Unknown	Unknown
DR 220	North Dakota	1966	Also included impacts from severe storms.	Unknown	Unknown
DR 256	North Dakota	1969		None	$27,000,000
DR 287	North Dakota	1970	Also included impacts from severe storms.	Unknown	Unknown
DR 335	North Dakota	1972	Also included impacts from severe storms.	Unknown	Unknown
DR 434	North Dakota	1974	Flooding from heavy rains and snowmelt.	Unknown	Unknown
DR 469	North Dakota	1975	Flooding from heavy rains and snowmelt.	Unknown	$1,000,000,000
DR 475	North Dakota	1975	Also included impacts from severe storms.	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
EM 3012	North Dakota	1976	Emergency declaration for —severe flooding.	Unknown	Unknown
DR 501	North Dakota	1976		Unknown	Unknown
DR 554	North Dakota	1978	Flooding from ice jams and snowmelt. Also included impacts from storms.	Unknown	Unknown
DR 581	North Dakota	1979	Flooding from snowmelt. Also included impacts from storms.	Unknown	$64,800,000
DR 658	North Dakota	1982		Unknown	Unknown
DR 825	6 counties in Eastern North Dakota	March – April 1989	Approximately 103 homes in North Dakota were damaged, 13 with major damage.	None	$2,719,000*
DR 1001	39 counties mostly in Central and Eastern North Dakota	June – July 1993	Public Assistance and Individual Assistance Also included impacts from severe storms.	2 deaths	$48,446,044* $600,000,000 estimated total
DR 1032	25 counties mostly in Central North Dakota	March – July 1994	Public Assistance Also included impacts from severe storms.	1 death	$4,073,939*
DR 1050	32 counties in Central and Eastern North Dakota	March – May 1995	Public Assistance Flooding from ground saturation. Also included impacts from severe storms.	3 deaths 1 injury	$15,637,415* $102,000,000 estimated total
DR 1118	33 counties in Central and Eastern North Dakota	March 12 – June 21, 1996	Public Assistance	2 deaths	$13,348,768*
DR 1174	All 53 counties in North Dakota	February 28 – May 24, 1997	Public Assistance and Individual Assistance Also included impacts from severe storms.	7 deaths 2 injuries	$557,503,842* $3,700,000,000 estimated total
DR 1220	16 counties and 2 tribes in Eastern North Dakota	March 2 – July 18, 1998	Public Assistance and Individual Assistance Flooding from ground saturation.	None	$18,054,727*

Declaration	Location	Date	Other Information	Casualties	Damages
DR 1279	34 counties and 3 tribes in Central and Eastern North Dakota	March 1 – July 19, 1999	Public Assistance and Individual Assistance Flooding from ground saturation. Also included impacts from severe storms, tornadoes, snow, ice, landslides, and mudslides.	None	$124,391,622*
DR 1334	26 counties and 3 tribes in Central and Eastern North Dakota	April 5 – August 12, 2000	Public Assistance and Individual Assistance Also included impacts from severe storms.	2 deaths	$91,944,041*
DR 1376	36 counties and 2 tribes mostly in Central and Eastern North Dakota	March 1 – July 31, 2001	Public Assistance	3 injuries	$27,858,168*
DR 1431	5 counties and 1 tribe in Eastern North Dakota	June 8 – August 11, 2002	Public Assistance Also included impacts from severe storms and tornadoes.	5 injuries	$1,266,549*
State EO	North Dakota	2003	State Declared Flood and Severe Summer Weather Disaster	Unknown	Unknown
DR 1515	19 counties and 2 tribes in Northern North Dakota	March 26 – June 14, 2004	Public Assistance Flooding from ground saturation. Also included impacts from severe storms.	None	$7,459,705*
State EO 2005-03	Devils Lake Basin	6/9/2005	State declared flood emergency	Unknown	Unknown
State EO 2005-04	Devils Lake Basin	7/1/2005	State declared flood disaster	Unknown	Unknown
DR 1597	26 counties and 3 tribes mostly in Northern and Eastern North Dakota	June 1 – July 7, 2005	Public Assistance Flooding from ground saturation. Also included impacts from severe storms.	None	$20,350,276*
State EO 2006-03	Eastern North Dakota	3/31/2006	State declared flood emergency	Unknown	Unknown
State EO 2006-04	Red River Basin	5/10/2006	State declared flood disaster	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
DR 1645	11 counties and 1 tribe in Eastern North Dakota	March 30 – April 30, 2006	Public Assistance Flooding from ground saturation. Also included impacts from severe storms.	2 deaths	$10,388,198*
State EO 2007-04	Red River Valley Basin	6/4/2007	State declared flood disaster	Unknown	Unknown
State EO 2007-05	North Dakota	6/18/2007	State declared state-wide flood disaster	Unknown	Unknown
DR 1713	13 counties mostly in Southeastern North Dakota	June 2 – June 18, 2007	Public Assistance Also included impacts from severe storms.	None	$4,375,932*
State EO 2009-05	North Dakota	3/13/2009	State declared flood emergency	Unknown	Unknown
State EO 2009-06	North Dakota	3/24/2009	State declared statewide flood emergency	Unknown	Unknown
State EO 2009-09	North Dakota	3/27/2009	State declared statewide flood emergency	Unknown	Unknown
DR 1829	48 counties and 4 tribes	March 13 – August 10, 2009	Public Assistance and Individual Assistance Also included impacts from severe storms.	2 deaths 50 injuries	$184,696,371* $623,000,000 estimated total
State EO 2010-05	North Dakota	2/26/2010	State declared flood emergency	Unknown	Unknown
EM 3309	18 counties and 1 tribe mostly in Eastern and Central North Dakota	February 26 – April 30, 2010	Emergency Protective Measures	None	$4,312,500*^
DR 1907	29 counties and 1 tribe mostly in Eastern North Dakota	February 26 - July 15, 2010	Public Assistance	None	$6,221,213*^
State EO 2011-01	Devils Lake Basin including the Spirit Lake Nation and counties of Benson, Nelson, Ramsey, and Towner	1/11/2011	State declared emergency flood protection	Unknown	Unknown
State EO 2011-03	North Dakota	3/10/2011	State declared statewide flood emergency	Unknown	Unknown
State EO 2011-07	North Dakota	4/8/2011	State declared flood emergency	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
State EO 2011-08	Devils Lake Basin	4/29/2011	State declared flood protection, Stump Lake	Unknown	Unknown
State EO 2011-10	North Dakota	5/5/2011	State declared statewide flood disaster	Unknown	Unknown
EM-3318	21 counties and 2 tribes	April 5-July 1, 2011	Public Assistance	None	$893,946^
DR-1981	44 counties and 4 tribes	February 14- July 20, 2011	Public Assistance and Individual Assistance	2 deaths 3 injuries	$1,066,608,966*^
State EO 2012-05	Ward County	6/15/2012	State declared flood emergency	Unknown	Unknown
State EO 2012-06	Devils Lake Basin, including the Spirit lake Nation and the counties of Benson, Nelson, Ramsey, and Towner	6/15/2012	State declared flood emergency	Unknown	Unknown
State EO 2013-03	Mouse (Souris), Devils Lake, Sheyenne, James, Pembina, and Red River of the North Basins	3/29/2013	State declared flood emergency	Unknown	Unknown
EM-3364	6 counties along eastern ND border	April 22- May 7, 2013 (Declared on April 26)	Emergency Protective Measures	None Reported	TBD
DR-4118	16 counties and 1 tribe; eastern and central North Dakota	April 22- May 16, 2013 (Declared May 29)	Public Assistance	None Reported	TBD
State EO 2013-06	Benson, Bottineau, Cass, Cavalier, Eddy, foster, McHenry, Pembina, Ramsey, Renville, Richland, Rolette, Towner, Traill, Walsh, and Wells Counties and the Spirit Lake Reservation	5/20/2013	State declared flood disaster	Unknown	Unknown
State EO 2013-07	North Dakota	5/21/2013	State declared flood emergency	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
DR-4123	Standing Rock Sioux Tribe	May 25, 2013 (Declared June 25, 2013)	Public Assistance	None Reported	TBD
DR-4128	Benson, Bottineau, Cavalier, Dunn, Kidder, McHenry, McKenzie, McLean, Mountrail, Nelson, Pembina, Pierce, Ramsey, Sheridan, Stark, Towner, Walsh, Ward and Wells Counties and Spirit Lake Reservation and Turtle Mountain Band of Chippewa	May 17-June 16, 2013 (Declared July 12, 2013)	Public Assistance	Unknown	TBD
State EO	North Dakota	July 2, 2013	State declared flood disaster	Unknown	Unknown
DR-4190	Benson, Bottineau, Divide, Eddy, McHenry, Mountrail, Pierce, Renville, and Ward counties; Standing Rock Sioux Indian Reservation	June 25 – July 2, 2014	Public Assistance	Unknown	$2,416,454*
State EO	North Dakota	July 3, 2014	Emergency declaration to assist counties hard hit by overland and riverine flooding	Unknown	Unknown
State EO	Northwestern and central North Dakota	September 9, 2014	Severe summer storm and flooding disaster	Unknown	Unknown
State EO 2017-01	Morton and Sioux counties	February 15, 2017	Emergency evacuation due to flooding	Unknown	Unknown
State EO 2017-02	Walsh County	March 24, 2017	State of emergency due to flood threat	Unknown	Unknown
DR-4323	Benson, Bottineau, Cavalier, McHenry, Pembina, Pierce, Renville, Rolette, Towner, and Walsh counties	February 17 – April 29, 2017	Public Assistance	None	$4,919,609*

Declaration	Location	Date	Other Information	Casualties	Damages
State EO 2017-02.1	Bottineau, Cavalier, McHenry, Pembina, Pierce, Renville, Rolette, Towner, and Walsh counties	April 14, 2017	State declared state of emergency due to flood threat	None	Unknown
State EO 2017-03	Benson, Bottineau, Cavalier, McHenry, Pembina, Pierce, Renville, Rolette, Towner, and Walsh counties; Turtle Mountain Band of Chippewa Indian Reservation	May 19, 2017	State declared flood disaster	None	Unknown

* Federal Share (includes Individual and Family Grant, Disaster Housing, Manufactured Housing, Crisis Counseling Immediate and Regular Programs, Disaster Unemployment Assistance, Hazard Mitigation Grant Program, Public Assistance, FEMA Mission Assignments, and SBA Home, Business, and Economic Injury Loans).
^ preliminary numbers, subject to change.
Sources: Federal Emergency Management Agency, North Dakota Department of Emergency Services; National Climatic Data Center; Interagency Hazard Mitigation Team Reports, varied dates

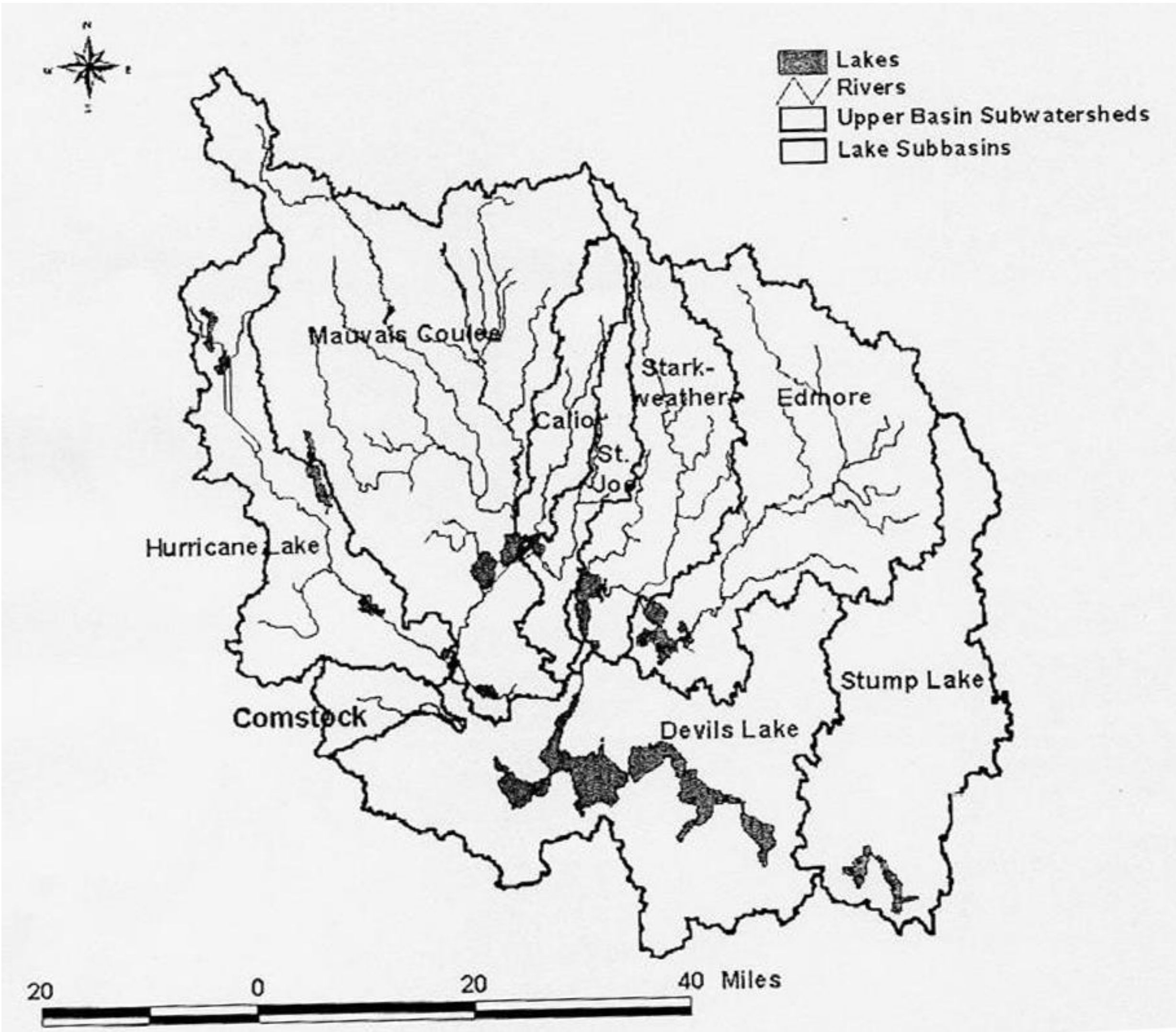
7.4.5.2 Location and Extent

North Dakota Basin Descriptions

The Devils Lake Basin is a non-contributing sub-basin within the Red River drainage system. The Devils Lake Basin became a closed basin after the last continental ice sheets receded and southerly drainage to the Sheyenne River ceased. The drainage system of the basin is formed by chains of waterways and connecting lakes, with the majority of the water ultimately flowing into Devils Lake. The North Dakota counties included in the Devils Lake Basin include the following:

Figure 7.4.5-4 shows the sub-basins within the Devils Lake Basin.

Figure 7.4.5-4 Devils Lake Sub-Basins



Source: US Fish and Wildlife Service, 2002

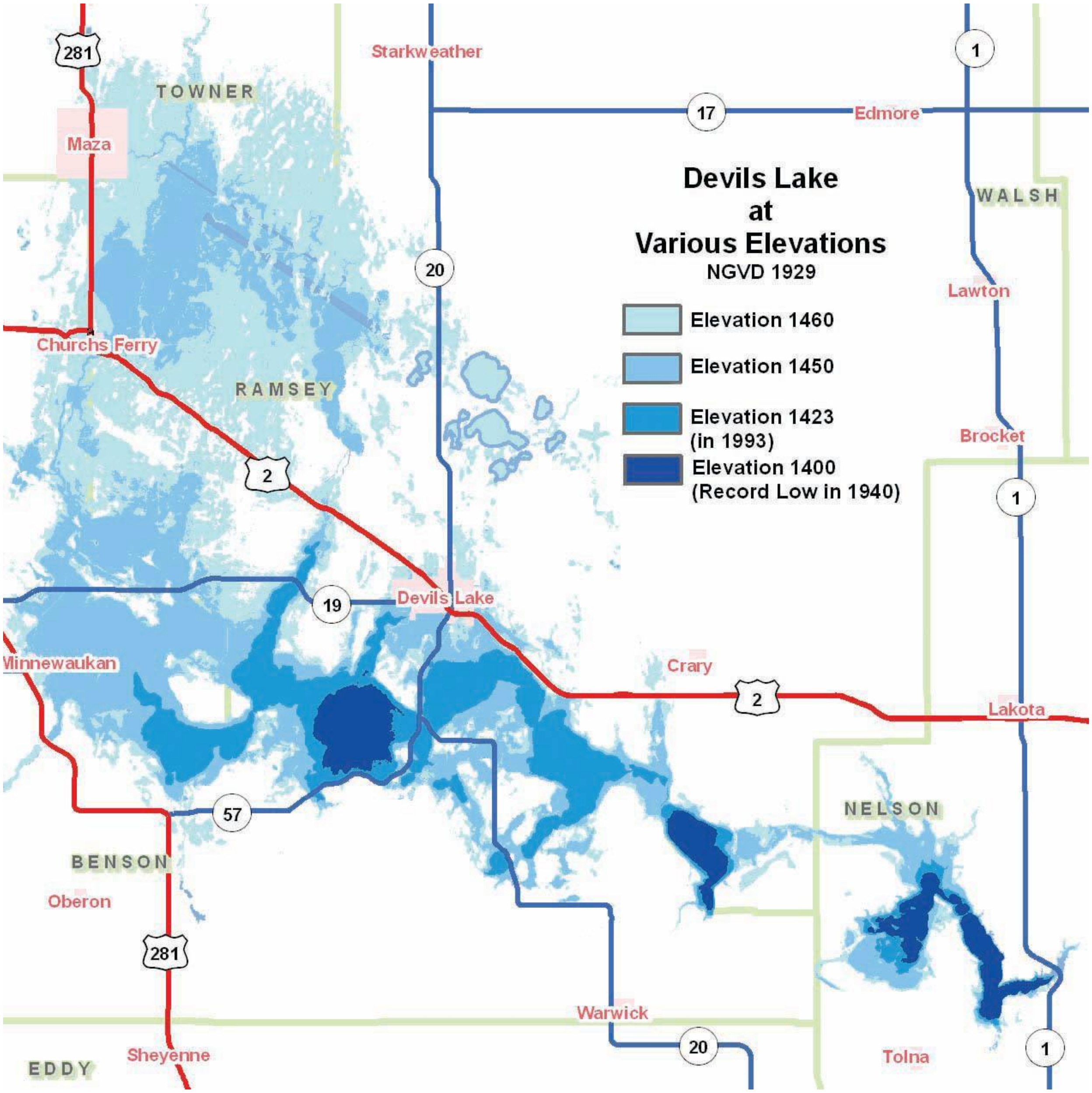
The water levels of Devils Lake fell 37.5 feet between 1867 and 1940. Since 1940, the trend has reversed. Between February 1993 and June 1999, the lake rose approximately 22 feet, thereby tripling the volume of water in the lake. The lake area expanded from 42,000 acres in 1993 to 82,200 acres in 1996. These increases created significant concerns from land and property owners in the area. In addition, as the lake level changes, so do water quality parameters. Lower water levels are generally associated with a very high total of dissolved solids. Devils Lake is the largest natural lake in North Dakota.

The basin's topography contributes greatly to the flooding problems experienced in the area. Much of the region's land is rolling, but the general slope is relatively flat. Small streams, shallow lakes, and numerous wetland depressions are typical. Agricultural development is extensive and much of the flood damages are agricultural in nature. At its current elevation, Devils Lake covers approximately 204,000 acres, or 318 square miles.

The major flood problems in the Devils Lake Basin are due to a wet cycle (extended period of time of wetter than average weather) that has lasted for 20 years. The potential increase in the water level of the Devils Lake Basin presents a flood threat to substantial amounts of public, commercial, and private development. On the other hand, low levels, especially on Devils Lake itself, have an extremely negative impact on the highly visible sport fishing industry that exists in the basin. Soil erosion is a serious problem contributing to sedimentation and nutrient enrichment of area streams and lakes. Land management to enhance agricultural production versus wetland preservation is also a major concern in the basin.

Even though Devils Lake is considered a closed basin, the lake does have a natural outlet into Stump Lake when lake levels reach 1,446' msl. Then, at 1,458' msl, the combined lakes flow into the Sheyenne River via the Tolna Coulee. (Ramsey County Emergency Management Office, 2005) If the lake continues to rise until the outflow balances the inflow, the elevation is estimated to be about 1,463' msl at the west end of the lake with an approximate surface area of 354,000 acres (553 square miles) (Federal Emergency Management Agency, 2006). Figure 7.4.5-5 shows the coverage of Devils Lake at various elevations.

Figure 7.4.5-5 Coverage of Devil's Lake at Various Elevations



Source: North Dakota State Water Commission, 2013

Closed basin flooding is unique when compared to standard riverine flooding because river levels tend to rise rapidly and the flood has a duration of days to weeks, whereas, closed basin flooding like Devils Lake occurs relatively slowly and can last for years or indefinitely. The flood problems are compounded by wave action on the lake.

As a part of a strategy for identifying a more permanent comprehensive solution to flooding in the Devils Lake Basin, a comprehensive risk assessment of known flooding potential was conducted in partnership by the Federal Emergency Management Agency and the State of North Dakota. The objective was to develop a product that is user-friendly, easily accessible to a wide range of users, and one that could be easily maintained and managed. Data consists of roads, structures, sewer systems, transmission lines, pump stations, treatment facilities and electric systems. Features of the risk assessment include a structure inventory, GIS overlays, infrastructure feature descriptions such as road names and utility ownership, one-foot contour elevations, aerial photography, LIDAR elevation data, and zoom in and out capability. The Devils Lake Risk Assessment, completed in 2000, is now considered out-of-date, but current and future projects look to build upon the work that was done. This tool was most useful for identifying which infrastructure and private property was at greatest risk when lake levels raised.

Since 1994, structures around the expanding Devils Lake/Stump Lake system that carried flood insurance have qualified for demolition, salvage, or relocation through the waiver of flood insurance rules prior to August 2, 1999 and through the closed basin lake endorsement feature of the flood insurance policy since August 2, 1999. Structures imminently threatened by the waters of the Devils Lake/Stump Lake system can qualify for relocation though their effective flood policy in four select NFIP communities - Benson County, Minnewaukan, Devils Lake, and Creel Township. Over 150 structures have been removed from inundation from the Devils Lake/Stump Lake system through flood insurance and mitigation programs since 1994 (North Dakota State Water Commission, 2008). All of the acquisitions include deed restrictions. Within cities and unincorporated areas a warranty deed and restricted covenant is placed on the property. These provisions keep new development from occurring on acquired lots.

Other actions taken within the basin include embankments, levees, and outlets, but to date, all of these types of actions have been only successful as temporary or partial mitigation measures.

James River Basin

The James River, the largest river in the basin, is a major tributary of the Missouri River. The principal tributary of the James River is Pipestem Creek. Other important tributaries to the James River include Maple, Beaver, Bone Hill, and Cottonwood Creeks. These creeks all drain the area to the west of the river, while Bear Creek is the only major east-side tributary.

Jamestown and Pipestem Dams, both just north of Jamestown, hold water throughout the year and provide flood protection to communities along the James River from Jamestown to the South Dakota state line. These dams provide over 90 percent flood damage reduction along the James River. The river becomes permanent below these dams, but periods of no flow are not uncommon. Countless wetlands store water in the noncontributing portions of the basin.

Flooding has occurred in the basin. Major floods occurred in 1881, 1920, 1922, 1942, 1950, 1969, 1993-1997, 1999, and 2009. In addition, at least 17 minor floods are known to have taken place since 1881. Flooding in the James River Basin is most often caused by rapid runoff from relatively steep tributaries to the nearly flat main channel of the James River which may be obstructed along its route by small jams, log jams, vegetation, sediment deposits, and inadequate bridge capacities. It is not uncommon for tributary discharges to exceed the channel capacity of the James.

The major water problems in the James River Basin relate to periodic flooding of agricultural cropland, hay land, pasture, and several communities. Communities most severely affected include Jamestown, Carrington, Spiritwood Lake, Oakes, LaMoure, and Edgeley. A major issue within the basin is the controversy involving agricultural drainage versus wetland preservation. River channel obstructions and stream bank erosion exist in many areas along the James River below the Jamestown Dam.

Missouri River Basin

Comprised of seven major sub-basins, the Missouri River Basin, the state’s largest, drains nearly 48 percent of the state’s total area. The climate is mostly semiarid. Buttes, hills, and smaller valleys characterize the topography and are most prominent in the Badlands along the Little Missouri River. The area east of the Missouri River is marked with numerous small lakes and wetlands. Annual mean precipitation ranges from 13 inches in the northwest to 17 inches in the east.

Flood control measures in the basin include Fort Peck Dam located in northeast Montana, the Garrison Dam which forms Lake Sakakawea, Oahe Dam in South Dakota which forms Lake Oahe, and the Heart Butte and Dickinson Dams on the Heart River.

Flood losses occur primarily on the Missouri River’s many smaller tributaries. Periodic flooding of agricultural land and some communities is a problem in the basin. Serious riverbank erosion is occurring along the Missouri River below Garrison Dam, along reaches of the Heart River, and also to archaeological sites along the Knife River. Erosion of topsoil has contributed to sedimentation and accelerated aging of many lakes and reservoirs throughout the basin. Ice jam flooding is relatively common and significant in the basin.

Red River Basin

The Red River Basin is the most populated basin of the state. The Red River is the principal river of the basin. It serves as the border between North Dakota and Minnesota and winds nearly 400 river miles from its origin at the confluence of the Otter Tail and Bois de Sioux Rivers at Wahpeton, North Dakota and Breckenridge, Minnesota, north to the Canadian border. The Red River continues to flow about 155 river miles to Lake Winnipeg in Manitoba. The valley through which the river flows is the flat lakebed of pre-historic Lake Agassiz. The very flat gradient causes widespread overland flooding when the channel capacity is exceeded. Other major North Dakota rivers in the basin include the Wild Rice, Sheyenne, Maple, Elm, Goose, Turtle, Forest, Park, Pembina, and Tongue Rivers. The 506 river mile Sheyenne River is the longest river in North Dakota. Annual mean precipitation varies from 17 inches in the western portions of the basin to 22 inches in the southeastern portion. The Red River is unique in that it flows north. Therefore, in the spring, snow in the headwaters to the south melts first when areas downstream to the north are still frozen.

Flood control structures in the basin include the Lower Sheyenne Flood Diversion, Lake Ashtabula formed by Bald Hill Dam, the English Coulee Diversion, and the Maple River Dam.

The Red River Basin has suffered numerous major floods since the first recorded event in 1882. The Red River flows north through what was once the bottom of glacial Lake Agassiz and is now the most productive farmland in North Dakota. The flow of the Red River through this flat topography is extremely sluggish with such intricate meander curves that it takes 397 miles of channel to cover the 187 mile straight-line distance between Wahpeton and Pembina. As a result of the region’s flat topography, extensive floodplain areas border the Red River and its tributaries. When a flood occurs, water overflows the banks of the river and its tributaries and moves overland, often affecting as many as two million acres.

The major problem in the Red River Basin is the destructive, widespread urban and agricultural flooding by the Red River and its many tributaries. Because of the mild channel gradient of the Red River and the nearly level floodplain, flooding along the Red’s main stem covers wide areas and can persist for many weeks. Soil erosion is a serious problem contributing to the loss of valuable topsoil and to the pollution of receiving lakes and streams by sediment and nutrient deposits. Illegal diking, inadequate storage of flood waters, and drainage maintenance are also problems within the basin. The Red River and many of its tributaries require snagging and clearing of dead trees to improve channel flow capacity. Flood damage to crops and pastures has been considerable. Often, major spring flooding causes delay in planting; thus, the growing season is cut short for appropriate crop maturation.

Since nearly 90 percent of the basin’s land is used for agricultural purposes, flood damages often take the form of losses from delayed seeding or destruction of growing crops. North Dakota’s largest urban center, Fargo, and third largest, Grand Forks, are both located on the Red River and have suffered from the recurring floods, as have Wahpeton and a number of smaller communities. Information derived from the Red River of the North Reconnaissance Report completed in 1980 by the Gulf South Research Institute indicated current and future average annual flood damages for the North Dakota portion of the Red River Basin would increase over several of the following decades. (Gulf South Research Institute, 1980) As the subsequent decades showed, this prediction was accurate. Figure 7.4.5-6 shows water surface elevations of five major Red River floods.

Figure 7.4.5-6 The Obelisk at Grand Forks Showing Water-Surface Elevations of Five Major Red River Floods

Source: US Geological Survey, 2004

In many areas of the basin, protective diking has been a successful way to limit flood damages, although, indiscriminate private diking activities have fostered problems. Farm diking constructed along both sides of the Red River has become a particular problem, which has been contested in court. Some of the dikes on the North Dakota side were removed in 1987.

In order to find equitable solutions to the basin's many flood related problems, the various Water Resource Districts in 1978 pooled their efforts in the form of a Joint Powers Agreement. Improved cooperation and coordination fostered by this agreement aids the basin's residents in implementing measures that mitigate flood losses.

Since 1997, acquisition projects have been successful in removing properties from flood prone areas. Over 800 flood-damaged structures have been removed from the Red River Valley. The acquired land is then restricted with respect to future development. Studies such as the Red River Valley Losses Avoided Study and the HAZUS Analysis of Economic Losses and Losses Avoided – Fargo Region demonstrate the success of such programs (North Dakota Department of Emergency Services, 2007; Federal Emergency Management Agency, 2010). These studies are discussed in further detail in the Execution section of this plan.

Souris River Basin

The main tributary in the Souris River Basin is the Souris River which originates in southeastern Saskatchewan. The basin drains portions of Saskatchewan, Montana, North Dakota, and Manitoba. The river length in North Dakota is 357 river miles. The channel of the Souris River follows a meandering course, averaging slightly less than 100 feet wide and 15 to 25 feet deep. Principal tributaries include the Des Lacs River, Moose Creek, Long Creek, Wintering River, Willow Creek, and Deep River.

Flood control projects in the basin include Lake Darling Reservoir and levees at Velva, Sawyer, and Minot. Another flood control project is the Souris River Basin Project, which consists of flood storage in the Alameda and Rafferty Dams in Saskatchewan, a gated spillway at Lake Darling, upgraded levees at Sawyer, Renville County Park, and six subdivisions between Burlington and Minot, structural and non-structural measures for rural residents along the Souris, modifications of US Fish & Wildlife structures in the upper Souris and J. Clark Salyer National Wildlife Refuge, and a flood warning system. Since 1936, Lake Darling Reservoir, owned and operated by the U.S. Fish and Wildlife Service, has been a major factor in reducing damages in the Souris River Valley by controlling several small floods.

Nearly every year, both the Souris River and the Des Lacs River overflow their banks. Most of these floods are small and short in duration causing only minor problems. Floods that result in more severe damages originate primarily from snowmelt in the Canadian portion of the Souris River Basin and have occurred eight times since 1969.

The one-half to one-mile wide valley along the river reach, between the upper Souris and J. Clark Salyer National Wildlife Refuge, usually sustains the basin's most significant flood losses. In most major floods, more than 90 percent of the dollar damages are incurred in Minot. Other areas are primarily affected by agricultural losses. River channel obstructions and stream bank erosion occur in many areas along the Souris River and its tributaries. Agricultural drainage versus wetland preservation is a controversial issue.

7.4.5.3 State Risk Assessment

Table 7.4.5-3 Bridges Scoured from Flooding by County

County	State	County	Urban	Total
Total	11	63	3	77
Adams	2	2		4
Barnes		2		2
Benson				0
Billings	1			1
Bottineau		1		1
Bowman		1		1
Burke	1			1
Burleigh		2		2
Cass		2		2
Cavalier				0
Dickey		2		2
Divide		1		1
Dunn				0
Eddy		1		1
Emmons	2	3		5
Foster				0
Golden Valley		2		2
Grand Forks				0
Grant	1	5		6
Griggs				0
Hettinger	2	8		10
Kidder				0
LaMoure		2		2
Logan		2		2

County	State	County	Urban	Total
McHenry		2		2
McIntosh				0
McKenzie				0
McLean		2		2
Mercer		3		3
Morton		7		7
Mountrail				0
Nelson	1			1
Oliver		1		1
Pembina				0
Pierce				0
Ramsey		1		1
Ransom				0
Renville				0
Richland				0
Rolette				0
Sargent				0
Sheridan				0
Sioux				0
Slope		2		2
Stark	1	2		3
Steele		1		1
Stutsman		1		1
Towner				0
Traill		1		1
Walsh		1		1
Ward		2	2	4
Wells		1		1
Williams			1	1

Source: NDDES

Vulnerability Assessment

Table 7.4.5-4 National Flood Insurance Policy and Loss Statistics, as of 4/16/2018

County	# Policies	Coverage	# Claims Paid since 1978	Total Paid since 1978
Adams	1	$140,000	0	$0
Barnes	224	$36,440,000	380	$2,684,123
Benson	32	$9,525,000	571	$13,477,648
Billings	15	$3,336,400	12	$81,047
Bottineau	12	$1,405,300	2	$0
Bowman	4	$701,700	13	$15,702
Burke	2	$204,000	1	$4,219
Burleigh	813	$236,468,800	677	$15,255,878
Cass	4,022	$1,210,323,700	3,312	$24,986,247
Cavalier	2	$210,100	6	$5,821
Dickey	2	$87,000	6	$20,331
Dunn	4	$1,660,000	7	$48,098
Eddy	4	$623,000	6	$19,677
Emmons	19	$3,118,500	72	$1,047,095
Foster	5	$1,190,000	9	$97,992
Golden Valley	4	$876,200	2	$0
Grand Forks	654	$173,537,700	2,987	$75,470,621
Grant	2	$50,600	7	$45,095
Griggs	5	$1,575,000	6	$27,159
Hettinger	2	$250,000	106	$320,013
LaMoure	8	$1,051,600	9	$78,230
Logan	1	$350,000	1	$252,920
McHenry	82	$24,275,900	66	$671,971
McIntosh	1	$350,000	2	$7,285
McKenzie	50	$11,088,400	1	$0
McLean	5	$1,380,000	9	$66,661
Mercer	94	$12,839,500	88	$923,577
Morton	237	$67,814,000	223	$2,768,109
Nelson	1	$175,000	41	$872,097
Oliver	6	$507,200	3	$4,603
Pembina	178	$34,387,300	540	$3,104,163
Pierce	1	$16,000	6	$45,786
Ramsey	143	$50,420,200	1,031	$37,304,598
Ransom	81	$10,979,500	138	$675,290
Renville	7	$642,700	57	$156,633
Richland	74	$17,983,500	218	$2,224,868

County	# Policies	Coverage	# Claims Paid since 1978	Total Paid since 1978
Rolette	8	$2,117,000	3	$23,024
Sargent	1	$105,000	6	$89,160
Sioux	3	$385,000	5	$872
Slope	1	$350,000	1	$0
Stark	101	$19,870,800	25	$69,105
Stutsman	74	$16,860,700	116	$662,634
Towner	4	$1,207,200	28	$340,500
Traill	50	$9,685,200	151	$1,592,339
Walsh	508	$53,194,100	1,183	$4,646,478
Ward	2,613	$775,441,400	1,060	$69,137,919
Williams	47	$12,131,300	16	$99,925
Unknown	0	$0	1	$0
Total	**10,207**	**$2,807,331,500**	**13,210**	**$259,425,513**

Source: North Dakota State Water Commission, current as of April 16, 2018

Loss Estimates

Table 7.4.5-5 Number of Events, Injuries, Deaths, and Damages for Riverine and Flash Flooding

County	Flash Flood Events	Flash Flood Deaths	Flash Flood Injuries	Flash Flood Property Damage	Flash Flood Crop Damage	Flood Events	Flood Deaths	Flood Injuries	Flood Prop Damage	Flood Crop Dmg	Total Events	Total Deaths	Total Injuries	Total Damages
Grand Forks	42	2	0	$17,462,000	$85,000	20	1	0	$3,006,132,000	$31,000,000	62	3	0	$3,054,679,000
Cass	43	0	0	$106,378,500	$220,000	26	1	0	$265,399,000	$20,075,000	69	1	0	$392,072,500
Ramsey	15	0	0	$50,500	$200,000	44	0	1	$117,015,000	$2,100,000	59	0	1	$119,365,500
Ward	15	0	0	$6,514,000	$0	9	0	0	$101,731,000	$250,000	24	0	0	$108,495,000
Richland	44	0	0	$277,500	$765,000	34	0	0	$79,215,000	$100,000	78	0	0	$80,357,500
Benson	20	0	0	$3,000	$30,000	42	0	0	$61,970,000	$2,075,000	62	0	0	$64,078,000
Pembina	11	0	0	$541,000	$350,000	32	0	0	$22,322,000	$2,015,000	43	0	0	$25,228,000
Nelson	13	0	0	$2,063,500	$12,207,000	43	0	0	$9,165,000	$30,000	56	0	0	$23,465,500
Burleigh	16	0	0	$1,595,000	$125,000	13	0	0	$21,288,000	$100,000	29	0	0	$23,108,000

County	Flash Flood Events	Flash Flood Deaths	Flash Flood Injuries	Flash Flood Property Damage	Flash Flood Crop Damage	Flood Events	Flood Deaths	Flood Injuries	Flood Prop Damage	Flood Crop Dmg	Total Events	Total Deaths	Total Injuries	Total Damages
Walsh	16	0	0	$101,000	$155,000	35	1	0	$15,090,000	$265,000	51	1	0	$15,611,000
Morton	8	0	0	$2,000,000	$0	11	0	0	$11,343,000	$100,000	19	0	0	$13,443,000
Traill	12	0	0	$10,500	$50,000	19	0	0	$11,192,000	$1,000,000	31	0	0	$12,252,500
Renville	7	0	0	$1,165,000	$0	4	0	0	$5,096,000	$50,000	11	0	0	$6,311,000
Mclean	5	0	0	$395,000	$0	6	0	0	$5,555,000	$0	11	0	0	$5,950,000
Mercer	3	0	0	$85,000	$0	7	0	1	$5,008,000	$500,000	10	0	1	$5,593,000
McHenry	7	0	0	$183,000	$0	9	0	0	$5,327,000	$0	16	0	0	$5,510,000
Barnes	16	0	0	$485,000	$170,000	14	0	3	$1,025,000	$2,945,000	30	0	3	$4,625,000
La Moure	7	0	0	$756,000	$35,000	3	2	0	$2,493,000	$0	10	2	0	$3,284,000
Wells	7	0	0	$159,000	$10,000	5	0	0	$2,450,000	$0	12	0	0	$2,619,000
Stutsman	17	0	0	$1,190,000	$20,000	4	0	0	$1,065,000	$250,000	21	0	0	$2,525,000
Dunn	3	0	0	$10,000	$0	8	0	0	$1,820,000	$400,000	11	0	0	$2,230,000
Bottineau	7	0	0	$759,000	$0	9	0	0	$1,297,000	$100,000	16	0	0	$2,156,000
Dickey	7	0	0	$945,000	$45,000	4	0	0	$879,000	$0	11	0	0	$1,869,000
Cavalier	6	0	0	$27,500	$280,000	17	0	0	$1,292,000	$250,000	23	0	0	$1,849,500
Foster	4	0	0	$1,120,000	$0	2	0	0	$605,000	$0	6	0	0	$1,725,000
McKenzie	0	0	0	$0	$0	7	0	0	$1,444,000	$250,000	7	0	0	$1,694,000
Steele	11	0	0	$60,000	$150,000	15	0	0	$340,000	$1,090,000	26	0	0	$1,640,000
Kidder	4	0	0	$120,000	$35,000	3	0	0	$1,345,000	$0	7	0	0	$1,500,000
Williams	3	0	0	$565,000	$0	8	0	0	$675,000	$55,000	11	0	0	$1,295,000
Ransom	17	1	0	$26,000	$210,000	24	0	0	$978,000	$0	41	1	0	$1,214,000
Sioux	7	0	0	$391,000	$50,000	6	0	0	$730,000	$0	13	0	0	$1,171,000
Hettinger	4	0	0	$45,000	$0	3	0	0	$1,078,000	$0	7	0	0	$1,123,000
Emmons	3	0	0	$40,000	$0	3	0	0	$1,048,000	$0	6	0	0	$1,088,000

County	Flash Flood Events	Flash Flood Deaths	Flash Flood Injuries	Flash Flood Property Damage	Flash Flood Crop Damage	Flood Events	Flood Deaths	Flood Injuries	Flood Prop Damage	Flood Crop Dmg	Total Events	Total Deaths	Total Injuries	Total Damages
Mountrail	7	0	0	$215,000	$0	8	0	0	$706,000	$100,000	15	0	0	$1,021,000
Stark	3	0	0	$65,000	$0	3	0	0	$580,000	$175,000	6	0	0	$820,000
Oliver	4	0	0	$20,000	$0	6	0	0	$687,000	$0	10	0	0	$707,000
Sargent	22	0	0	$35,000	$150,000	21	0	0	$510,000	$0	43	0	0	$695,000
Rolette	9	0	0	$213,000	$0	3	0	0	$450,000	$0	12	0	0	$663,000
Bowman	1	0	0	$50,000	$0	3	0	0	$437,000	$150,000	4	0	0	$637,000
Grant	4	0	0	$125,000	$0	5	0	0	$467,000	$0	9	0	0	$592,000
Towner	8	0	0	$20,000	$110,000	14	0	0	$414,000	$0	22	0	0	$544,000
Logan	3	0	0	$269,000	$100,000	3	0	0	$171,000	$0	6	0	0	$540,000
Griggs	7	0	0	$35,000	$100,000	13	0	0	$270,000	$20,000	20	0	0	$425,000
Divide	0	0	0	$0	$0	2	0	0	$298,000	$100,000	2	0	0	$398,000
McIntosh	1	0	0	$225,000	$0	3	0	0	$127,000	$0	4	0	0	$352,000
Pierce	1	0	0	$0	$0	3	0	0	$296,000	$0	4	0	0	$296,000
Eddy	15	0	0	$202,000	$25,000	10	0	0	$15,000	$0	25	0	0	$242,000
Adams	0	0	0	$0	$0	3	0	0	$179,000	$25,000	3	0	0	$204,000
Burke	1	0	0	$75,000	$0	1	0	0	$50,000	$25,000	2	0	0	$150,000
Billings	3	0	0	$40,000	$0	3	0	0	$100,000		6	0	0	$140,000
Slope	0	0	0	$0	$0	1	0	0	$50,000	$50,000	1	0	0	$100,000
Golden Valley	4	0	0	$0	$0	1	0	0	$0	$0	5	0	0	$0
Sheridan	0	0	0	$0	$0	1	0	0	$0	$0	1	0	0	$0
Total	**493**	**3**	**0**	**$147,112,000**	**$15,677,000**	**596**	**5**	**5**	**$3,769,219,000**	**$65,645,000**	**1089**	**8**	**5**	**$3,997,653,000**

Source: National Centers for Environmental Information, 2018

7.4.5.4 State Assets and Critical Facilities

North Dakota State Parks damages from past flooding events.

Year 1993:

- Lewis and Clark State Park: Rain event causing a creek in the park to flood – damage to culverts, guardrail and asphalt on roadway.
- Fort Abraham Lincoln State Park: Ice jam at mouth of Heart River caused water from the Heart River to flood the campground at Fort Lincoln State Park. Damage limited to replacement of electric pedestals and silt cleanup.
- Fort Ransom State Park: Significant rain event in June caused flooding on a creek in the park. Flooding of park picnic areas, trails and trail bridge damage, erosion around vehicle abutments.
- Devils Lake State Parks: Heavy rains and rising water on Devils Lake resulted in damaged roadways at The Narrows, Shelver's Grove, and Black Tiger Bay Recreation Areas. Three of the four areas listed here currently have been abandoned.

Year 1997:

- Fort Lincoln State Park: Spring melt water along with heavy rains flooded campground. Numerous electrical pedestals had to be replaced, silt and debris cleanup
- Fort Ransom State Park: Spring melt water and heavy rains caused overland flooding in low areas. Debris cleanup required, some road and vehicle bridge repairs needed.
- Pembina Gorge snowmobile trail: Significant trail damage due to snowmelt runoff. Snowmobile trails had to be rebuilt, culverts replaced.
- Grahams Island State Park: Rising waters of Devils Lake required relocation of all major facilities in the park. All facilities were relocated to elevations well above foreseeable flood water elevations.

Year 2000:

- Turtle River S.P: Heavy rainfall event in the Turtle River drainage basin resulted in a flood well above the 100 year flood elevations. Significant damage to park roads, bridges, trails and historic facilities.

Year 2009:

- Fort Abraham Lincoln State Park: Ice jam on the Missouri River caused water backup into the campground. Replacement of electrical service, repair of park buildings in the campground was necessary.
- Fort Ransom State Park: Heavy snow melt in the Sheyenne River drainage resulted in record flood elevations on the Sheyenne River. Significant preventative sandbagging limited damage. Post flood debris cleanup required, repair of trail bridges, cleaning/repair of park facilities, and repair of damaged vehicle bridge ice nose required. Significant erosion of the banks on the Sheyenne River within the state park.

Year 2011:

- Fort Abraham Lincoln State Park: Historic water releases from Garrison Dam resulted in inundation of the park campground for approximately 90 days. Major silt and debris cleanup was required. Several hundred shade trees were drowned out or fell over due to over saturation of the ground. Cleaning and repair of campground support buildings was required.
- Sully Creek State Park: Major flooding throughout the park due to the significant meltwater combined with a huge rain event. Significant cleanup required, re gravel roads, clean and sanitize public facilities.
- Little Missouri State Park: Spring snow melt and rain caused severe hill slides at the park. Major portions of the non-motorized trail were damaged. Repairs completed in 2012. Park sewer systems were inundated for the first 2 months of park operations in 2011.

- Cross Ranch State Park: Historic water releases from Garrison Dam caused flooding and closure of the park for most of 2011. Significant pre-flood mitigation (sandbagging, removal of support facilities, equipment etc.) was required. Post flood cleanup included graveling roads, removal of dead and deadfall trees, cleaning/sanitizing public facilities.

Riverine Flooding and Levee Failure Vulnerability Analysis

The North Dakota Department of Transportation provided data on costs to repair road infrastructure damaged by floods in 2011 and 2013. Floods were incredibly damaging to road infrastructure in 2011 with a total repair cost of $351,935,162. The total repair cost in 2013 was $20,358,438. Data for other years was not available. These figures give an indication of the magnitude of losses that could be experienced during a major flood event.

7.4.5.5 Future Conditions

Changes in Development

Table 7.4.5-6 Percent Change in Population and Vulnerability to Riverine Flooding

County	Total Events	Total Deaths	Total Injuries	Total Damages	2010 Population	2030 Population	Population Percent Change
McKenzie	7	0	0	$1,694,000	6,360	23,492	269%
Williams	11	0	0	$1,295,000	22,398	59,276	165%
Mountrail	15	0	0	$1,021,000	7,673	15,587	103%
Dunn	11	0	0	$2,230,000	3,536	6,654	88%
Stark	6	0	0	$820,000	24,199	45,329	87%
Divide	2	0	0	$398,000	2,071	3,414	65%
Burke	2	0	0	$150,000	1,968	3,098	57%
Billings	6	0	0	$140,000	783	1,179	51%
Ward	24	0	0	$108,495,000	61,675	91,644	49%
Cass	69	1	0	$392,072,500	149,778	214,719	43%
McHenry	16	0	0	$5,510,000	5,395	7,461	38%
Sioux	13	0	0	$1,171,000	4,153	5,682	37%
Burleigh	29	0	0	$23,108,000	81,308	110,932	36%
Golden Valley	5	0	0	$0	1,680	2,270	35%
Grand Forks	62	3	0	$3,054,679,000	66,861	89,081	33%
Morton	19	0	0	$13,443,000	27,471	36,006	31%
Hettinger	7	0	0	$1,123,000	2,477	3,178	28%
Rolette	12	0	0	$663,000	13,937	17,556	26%
McLean	11	0	0	$5,950,000	8,962	11,275	26%
Benson	62	0	0	$64,078,000	6,660	8,075	21%
Bowman	4	0	0	$637,000	3,151	3,750	19%
Renville	11	0	0	$6,311,000	2,470	2,911	18%
Slope	1	0	0	$100,000	727	847	17%
Towner	22	0	0	$544,000	2,246	2,527	13%
Bottineau	16	0	0	$2,156,000	6,429	7,200	12%
Sargent	43	0	0	$695,000	3,829	4,288	12%
Mercer	10	0	1	$5,593,000	8,424	9,283	10%
Oliver	10	0	0	$707,000	1,846	1,973	7%
Richland	78	0	0	$80,357,500	16,321	17,406	7%
Pierce	4	0	0	$296,000	4,357	4,641	7%
Ramsey	59	0	1	$119,365,500	11,451	12,007	5%
Eddy	25	0	0	$242,000	2,385	2,455	3%
Foster	6	0	0	$1,725,000	3,343	3,434	3%

County	Total Events	Total Deaths	Total Injuries	Total Damages	2010 Population	2030 Population	Population Percent Change
Logan	6	0	0	$540,000	1,990	2,033	2%
Barnes	30	0	3	$4,625,000	11,066	11,263	2%
Stutsman	21	0	0	$2,525,000	21,100	21,379	1%
Sheridan	1	0	0	$0	1,321	1,316	0%
Traill	31	0	0	$12,252,500	8,121	8,064	-1%
Ransom	41	1	0	$1,214,000	5,457	5,408	-1%
Adams	3	0	0	$204,000	2,343	2,317	-1%
McIntosh	4	0	0	$352,000	2,809	2,751	-2%
Wells	12	0	0	$2,619,000	4,207	4,109	-2%
Kidder	7	0	0	$1,500,000	2,435	2,355	-3%
LaMoure	10	2	0	$3,284,000	4,139	4,002	-3%
Walsh	51	1	0	$15,611,000	11,119	10,749	-3%
Steele	26	0	0	$1,640,000	1,975	1,882	-5%
Dickey	11	0	0	$1,869,000	5,289	5,031	-5%
Grant	9	0	0	$592,000	2,394	2,207	-8%
Cavalier	23	0	0	$1,849,500	3,993	3,643	-9%
Emmons	6	0	0	$1,088,000	3,550	3,232	-9%
Nelson	56	0	0	$23,465,500	3,126	2,828	-10%
Pembina	43	0	0	$25,228,000	7,413	6,267	-15%
Griggs	20	0	0	$425,000	2,420	2,039	-16%

Source: National Centers for Environmental Information, 2018; North Dakota Department of Commerce, 2016

7.4.5.6 Jurisdictions at Risk

Table 7.4.5-7 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

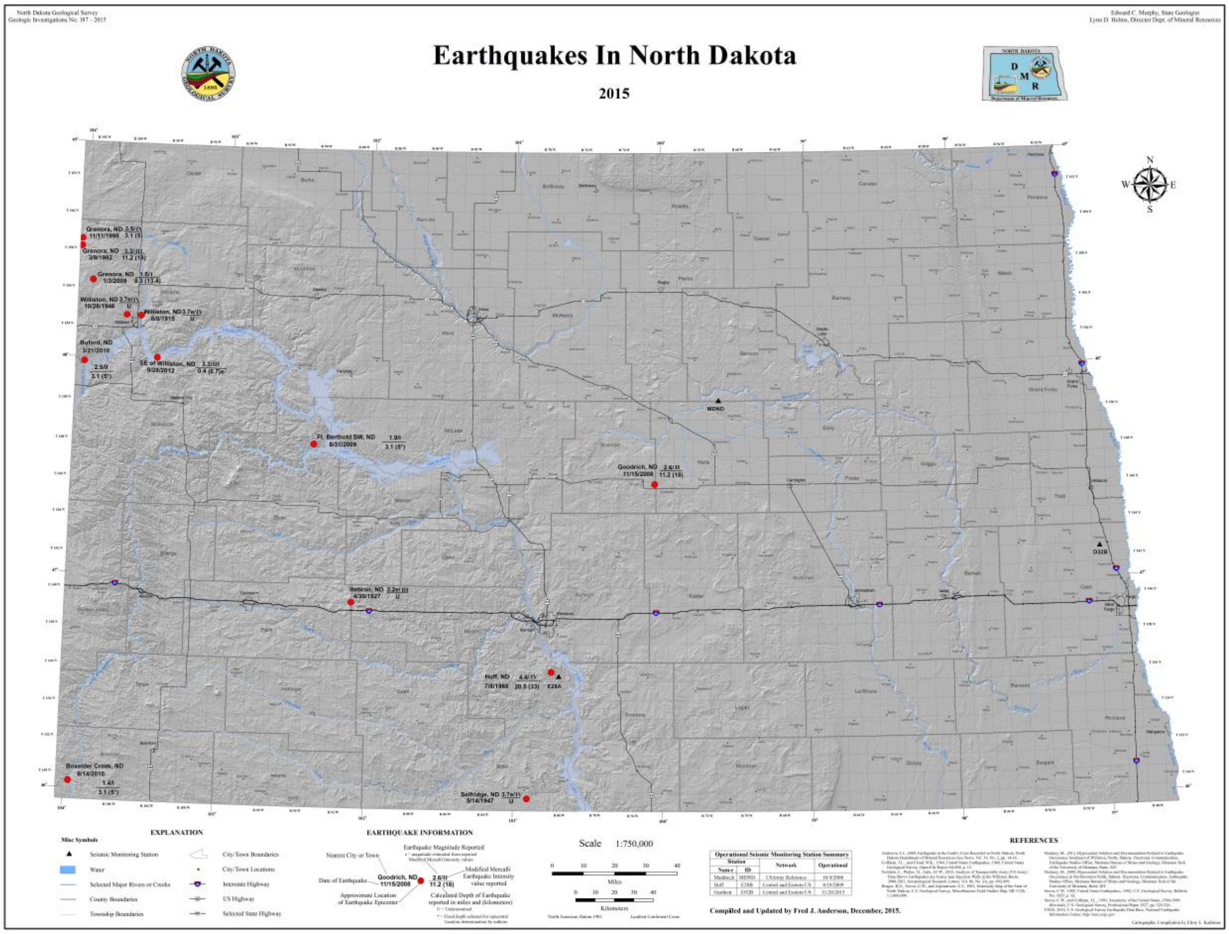
Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Benson	H	38 buildings in the SFHA
Bottineau	H	$414,000 in direct losses (Hazus)
Grand Forks	H	$6.2m in total exposure
Grant	H	$123,000 annualized losses to flooding
Griggs	H	No repetitive loss structures, $1m+ in crop damages during large events
McHenry	H	Several hundreds of thousands in potential damages to crop and properties
Morton	H	$40m in building losses, $45m in content losses, $115m total losses
Nelson	H	$20k in potential building losses, $6.5m in annual crop losses
Pembina	H	Specific impacts not listed; general loss of life and property
Renville	H	$127k in building losses (Hazus), $12m in annualized crop loss
Sioux	H	$17.7k in property damages, $757 in crop damages annually throughout the planning area
Spirit Lake	H	69 homes have the potential to be impacted by floods, as well as 3 critical facilities
Standing Rock^ (And Sioux)	H	3,215 people under 20 years old, 722 over 65, $17.7k in property damages, $757 in crop damages annually throughout the planning area
Steele	H	$5.7 in annualized damages
Towner	H	1 repetitive loss property in the county
Walsh	H	612 NFIP policies in place in A-zones
Wells	H	$396,000 average annualized impacts from flooding
Barnes	M	$19.5m in County-owned property, 18 rep loss buildings
Bismarck (City)	M	Specific impacts not listed; general loss of life and property
Bowman	M	4 potential structures impacted
Burke	M	$3,203,954 in building risk
Burleigh	M	5 repetitive loss buildings
Cavalier	M	3 buildings at risk
Dickey	M	$377,766 in county building at risk from flooding
Divide	M	$2,620,292 in building risk
Eddy	M	$58,000 annualized impacts possible
Emmons	M	3 repetitive loss buildings
Fort Berthold^	M	$1.35 million in damage between 1997 and 2016.
Foster	M	$21,000 at risk
Golden Valley	M	None listed
Kidder	M	$885k in potential losses (Hazus)
LaMoure	M	Mostly crop losses, upwards of $30k
Logan	M	5 homes at risk
McIntosh	M	County buildings at risk
McKenzie	M	Specific impacts not listed; general loss of life and property

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Oliver	M	25 residents in the 1% floodplain, as well as 3 critical facilities. $47m in replacement damage (Hazus)
Pierce	M	Specific impacts not listed; general loss of life and property
Ramsey	M	$1.35 billion in potential damages, 4,947 buildings potentially impacted (HAZUS)
Ransom	M	$9.4m in annualized losses pose potential impact
Richland	M	2 repetitive loss buildings
Sargent	M	$322k in residential, commercial, economic losses, $13m in annualized crop losses
Sheridan	M	$1.6m in annualized crop losses, $23k in buildings and content losses annually
Slope	M	3 potential structures impacted
Traill	M	~$1 billion in building replacement (Hazus), $9m in annualized crop losses
Turtle Mountain^	M	Whole population potentially impacted, no specifics listed
Ward	M	1 County building in the SFHA
Adams	L	$200k in Direct Economic Losses (Hazus)
Billings	L	Damages limited to City of Medora, $450,000 impact in 2009
Cass	L	$441,367,284 in total losses from 100-year flood
Dunn	L	None listed
McLean	L	Damages of over $500k
Mercer	L	438 structures potentially impacted, 994 residents
Mountrail	L	Specific impacts not listed; general loss of life and property
Rolette	L	Hazardous materials in floodplain potentially creates secondary effects
Stark	L	No impact
Stutsman	L	615 people, 291 buildings, $6,211,000 in building value potentially impacted
Williams	L	256 residential addresses in floodplain, 598 of population in floodplain
Fort Berthold	L	None listed
Hettinger	Rank not listed	N/A

^ Includes only North Dakota parts of the reservation

7.4.6 Geologic Hazards

Figure 7.4.6-1 Location of Historical Earthquakes in North Dakota



Source: North Dakota Geological Survey, 2015

Table 7.4.6-1: Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Cass	M	1 condo complex and 12 residences at risk of slumping issues
Williams	M	3,750 persons at enhanced risk to earthquakes, 50 critical facilities vulnerable to landslides
Barnes	L	20 single-family homes vulnerable to sliding
Bottineau	L	$20m in potential losses from landslides
Burleigh	L	Potential for roads washed out due to land or mudslide
Emmons	L	Potential for roads washed out due to land or mudslide
Fort Berthold	L	None specifically listed.
Foster	L	$20m in potential losses from landslides
Grand Forks	L	$20m in potential losses from landslides
Logan	L	Potential property damage
McLean	L	Approximately 2000 people with enhanced vulnerability to earthquake

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Mercer	L	840 residents at enhanced risk to earthquakes
Nelson	L	$20m in potential losses from landslides
Renville	L	$20m in potential losses from landslides
Sargent	L	32-bed nursing home most at risk from earthquake
Steele	L	$20m in potential losses from landslides
Traill	L	1 construction sand and gravel pit, as well as land near water
Bismarck (City)	Hazard Rank Not Listed	Points of vulnerability, high priority identified; critical infrastructure facilities at high vulnerability, no loss estimates included
Morton	Hazard rank not listed	Water level decline, changes in groundwater flow, increased loading, and deterioration of water as a result of land subsidence
Ward	Hazard rank not listed	Between $500k and $2m in estimated damages per landslide event
Adams	Hazard not identified in plan	N/A
Benson	Hazard not identified in plan	N/A
Billings	Hazard not identified in plan	N/A
Bowman	Hazard not identified in plan	N/A
Burke	Hazard not identified in plan	N/A
Cavalier	Hazard not identified in plan	2 highways could suffer impacts from landslides
Dickey	Hazard not identified in plan	N/A
Divide	Hazard not identified in plan	N/A
Dunn	Hazard not identified in plan	N/A
Eddy	Hazard not identified in plan	N/A
Golden Valley	Hazard not identified in plan	N/A
Grant	Hazard not identified in plan	N/A
Griggs	Hazard not identified in plan	N/A
Hettinger	Hazard not identified in plan	N/A
Kidder	Hazard not identified in plan	N/A
LaMoure	Hazard not identified in plan	N/A
McHenry	Hazard not identified in plan	N/A
McIntosh	Hazard not identified in plan	N/A

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
McKenzie	Hazard not identified in plan	N/A
Mountrail	Hazard not identified in plan	N/A
Oliver	Hazard not identified in plan	N/A
Pembina	Hazard not identified in plan	N/A
Pierce	Hazard not identified in plan	N/A
Ramsey	Hazard not identified in plan	N/A
Ransom	Hazard not identified in plan	N/A
Richland	Hazard not identified in plan	N/A
Rolette	Hazard not identified in plan	N/A
Sheridan	Hazard not identified in plan	N/A
Sioux	Hazard not identified in plan	N/A
Slope	Hazard not identified in plan	N/A
Spirit Lake	Hazard not identified in plan	N/A
Standing Rock^ (And Sioux)	Hazard not identified in plan	N/A
Stark	Hazard not identified in plan	N/A
Stutsman	Hazard not identified in plan	N/A
Towner	Hazard not identified in plan	N/A
Turtle Mountain^	Hazard not identified in plan	N/A
Walsh	Hazard not identified in plan	N/A
Wells	Hazard not identified in plan	N/A

^ Includes only North Dakota parts of the reservation

7.4.7 Hazardous Material Release

Previous Occurrences

The following details previous occurrences of hazardous material release in North Dakota.

- August 28, 1985: A truck hauling drums of uranium oxide collided with a freight train near Bowdon. Thirty to 40 first responders were exposed to the chemical but none was hospitalized.
- April 5, 1987: An agricultural chemical warehouse fire in Minot forced the evacuation of 10,000 people. Approximately 42 people, including first responders, were taken to hospitals for treatment. The fire consumed 54 herbicides and pesticides in liquid and powder form.
- January 18, 2002: One of the most significant spills of anhydrous ammonia in North Dakota occurred near Minot. An excerpt from the associated National Transportation Safety Board report follows: “At approximately 1:37 a.m. on January 18, 2002, an eastbound Canadian Pacific Railway freight train 292-16, traveling about 41 mph, derailed 31 of its 112 cars about ½ mile west of the city limits of Minot, North Dakota. Five tank cars carrying anhydrous ammonia, a liquefied compressed gas, catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. About 11,600 people occupied the area affected by the vapor plume. One resident was fatally injured, and 60 to 65 residents of the neighborhood nearest the derailment site were rescued. As a result of the accident, 11 people sustained serious injuries, and 322 people, including the two train crewmembers, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation.”
- September 2008: A natural gas explosion demolished a duplex and injured 13 people in the city of Fargo.
- July 23, 2010: A truck lost several containers of Govern, a flammable, poisonous, insecticide chemical long I-94 east of Medina. This caused the closure of I-94 for approximately seven hours while cleanup was conducted. The truck also lost containers of Trophy Gold, a chemical deemed not a concern.
- October 11, 2013: – A Tioga area farmer discovered a Tesoro Corp. pipeline break that spilled 840,000 gallons of oil in a wheat field, covering an estimated 13 acres. The spill, considered one of the largest onshore oil spills for the nation, did not contaminate water sources or injure wildlife. Cleanup continued in 2018 for the oil spill that resulted in changes in North Dakota law regarding reporting requirements from producers.
- December 30, 2013: – A Burlington Northern Santa Fe (BNSF) oil train collided with a derailed train near Casselton spilling 400,000 gallons of crude oil. The collision ignited the crude oil and triggered a chain of explosions. A fireball and massive cloud of black smoke prompted a voluntary evacuation of 65 percent of the 2,300 residents living in Casselton and surrounding areas. The derailment renewed safety concerns regarding transportation of hazardous materials.
- May 6, 2015: – The National Transportation Safety Board (NTSB) determined a broken wheel caused six BNSF train cars to derail near Heimdal. Five cars breached and spilled 100,000 gallons of oil, resulting in a massive fire, the evacuation of the town’s 30 residents and an estimated $5 million in damages. (NTSB, 2015)
- December 5, 2016: The Belle Fourche Pipeline spilled an estimated 529,830 gallons of oil into the Ash Coulee Creek, a tributary of the Little Missouri River, 16 miles northwest of Belfield. (Dalrymple 2017a)
- July 28, 2017: A natural gas liquids (NGL) spill occurred approximately nine miles southeast of Watford City due to damage sustained when a contractor bored under the NGL line. Roughly 126,000 gallons of gas was released and no injuries or deaths were reported. (Dalrymple 2017b; North Dakota Department of Health 2017)
- February 18, 2018: – A large fuel oil tank caught fire at the West Fargo Magellan Midstream Partners tank farm. Company officials reported the fire occurred on piping connections adjacent to a storage tank.

Table 7.4.7-1 Details of North Dakota Pipeline Incidents by County, 1998 - 2017

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
07/16/2003	Barnes	Hazardous Liquid	0	0	$1,211,000	$1,587,615	7,324	7,324
08/04/2003	Barnes	Hazardous Liquid	0	0	$93,375	$122,414	3,283	3,283
07/17/2007	Barnes	Hazardous Liquid	0	0	$102,306	$119,663	0	0
05/07/2016	Barnes	Hazardous Liquid	0	0	$280,868	$285,891	1	0
09/27/2005	Benson	Hazardous Liquid	0	0	$350,000	$434,127	350	30
01/26/2013	Benson	Hazardous Liquid	0	0	$158,934	$169,101	0	0
05/02/2013	Benson	Hazardous Liquid	0	0	$359,706	$382,716	2	0
07/15/2013	Benson	Hazardous Liquid	0	0	$518,642	$551,818	2	0
12/10/2010	Billings	Gas Transmission	0	0	$474,239	$524,073	0	0
05/15/2012	Billings	Hazardous Liquid	0	0	$75,485	$81,710	150	35
12/05/2016	Billings	Hazardous Liquid	0	0	$11,334,049	$11,536,734	12,615	7,776
12/27/2017	Billings	Hazardous Liquid	0	0	$7,150	$7,150	2	0
04/01/2001	Bottineau	Hazardous Liquid	0	0	$885,000	$1,201,390	27,660	27,660
06/16/2006	Bottineau	Hazardous Liquid	0	0	$40,000	$48,052	0	0
11/24/2007	Bottineau	Hazardous Liquid	0	0	$10,300	$12,048	84	0
03/21/2014	Bottineau	Hazardous Liquid	0	0	$1,379,751	$1,446,007	200	0
09/28/2002	Burke	Hazardous Liquid	0	0	$14,054	$18,777	7	5
05/08/2016	Burke	Hazardous Liquid	0	0	$68,475	$69,700	31	0

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
03/30/2008	Burleigh	Gas Distribution	0	0	$250,250	$286,750	0	0
03/01/2002	Cass	Hazardous Liquid	0	0	$1,200	$1,603	1	0
03/26/2002	Cass	Hazardous Liquid	0	0	$420	$561	1	0
04/23/2002	Cass	Hazardous Liquid	0	0	$13,520	$18,063	0	0
04/22/2003	Cass	Hazardous Liquid	0	0	$42,810	$56,124	0	0
09/02/2008	Cass	Gas Distribution	0	4	$152,000	$174,191	0	0
12/07/2010	Cass	Hazardous Liquid	0	0	$5,700	$6,401	1	0
10/06/2014	Cass	Hazardous Liquid	0	0	$1,040	$1,090	0	0
03/21/2016	Cass	Hazardous Liquid	0	0	$654,309	$666,010	20	0
03/27/2017	Cass	Hazardous Liquid	0	0	$366,509	$366,509	65	5
09/21/2006	Divide	Hazardous Liquid	0	0	$514,905	$618,552	100	100
03/18/2016	Divide	Hazardous Liquid	0	0	$520,050	$529,350	150	0
10/17/2017	Divide	Hazardous Liquid	0	0	$5,215	$5,215	1	0
08/31/2002	Dunn	Hazardous Liquid	0	0	$7,800	$10,421	34	24
05/01/2011	Dunn	Gas Transmission	0	0	$103,000	$76,469	0	0
05/19/2013	Dunn	Gas Transmission	0	0	$208,506	$178,140	0	0
02/09/2015	Dunn	Gas Transmission	0	0	$55,320	$56,631	0	0
06/20/2016	Dunn	Hazardous Liquid	0	0	$425	$433	0	0
11/04/2017	Dunn	Hazardous Liquid	0	0	$5,088	$5,088	0	0

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
12/30/2014	Golden Valley	Gas Transmission	0	0	$185,700	$194,617	0	0
11/03/2002	Grand Forks	Hazardous Liquid	0	0	$12,000	$16,033	2	0
04/10/2008	Grand Forks	Gas Transmission	0	0	$302,000	$344,704	0	0
05/07/2013	Grand Forks	Hazardous Liquid	0	0	$231,412	$246,215	1	0
06/07/2017	Griggs	Hazardous Liquid	0	0	$161,302	$161,302	40	0
04/30/2006	McKenzie	Hazardous Liquid	0	0	$26,000	$31,234	25	5
01/11/2008	McKenzie	Hazardous Liquid	0	0	$5,889	$6,749	265	5
05/21/2008	McKenzie	Hazardous Liquid	0	0	$6,282	$7,199	4	4
11/05/2009	McKenzie	Hazardous Liquid	0	0	$20,725	$23,475	10	3
12/06/2011	McKenzie	Hazardous Liquid	0	0	$21,232	$23,385	800	150
12/09/2011	McKenzie	Hazardous Liquid	0	0	$59,525	$65,562	1,000	530
07/09/2013	McKenzie	Hazardous Liquid	0	0	$575,000	$611,781	870	50
08/15/2013	McKenzie	Hazardous Liquid	0	0	$17,900	$19,045	118	0
11/30/2013	McKenzie	Gas Transmission	0	0	$47,302	$40,705	0	0
02/13/2014	McKenzie	Hazardous Liquid	0	0	$885,000	$927,498	800	0
02/19/2014	McKenzie	Hazardous Liquid	0	0	$72,700	$76,191	65	0
03/20/2014	McKenzie	Hazardous Liquid	0	0	$1,446,356	$1,515,810	475	100
08/06/2014	McKenzie	Hazardous Liquid	0	0	$73,972	$77,524	0	0

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
03/06/2015	McKenzie	Hazardous Liquid	0	0	$51,474	$53,227	390	5
10/12/2015	McKenzie	Hazardous Liquid	0	0	$375,131	$387,905	27	2
01/19/2016	McKenzie	Hazardous Liquid	0	0	$7,530	$7,665	1	0
01/27/2016	McKenzie	Hazardous Liquid	0	0	$15,000	$15,268	22	0
09/16/2016	McKenzie	Hazardous Liquid	0	0	$22,203	$22,600	4	0
04/28/2017	McKenzie	Hazardous Liquid	0	0	$203,780	$203,780	610	5
07/13/2017	McKenzie	Hazardous Liquid	0	0	$15,110	$15,110	2	2
07/27/2017	McKenzie	Hazardous Liquid	0	0	$721,500	$721,500	3,000	3,000
01/26/2013	McKenzie	Gas Transmission	0	0	$194,993	$206,836	0	0
03/05/2017	Mercer	Hazardous Liquid	0	0	$1,025	$1,025	0	0
01/27/2008	Morton	Gas Distribution	0	0	$355,500	$404,976	0	0
07/21/2009	Morton	Hazardous Liquid	0	0	$1,430	$1,620	3	0
07/31/2012	Morton	Gas Transmission	0	0	$80,960	$71,488	0	0
02/25/2016	Morton	Gas Transmission	0	0	$293,617	$298,868	0	0
12/23/2013	Morton	Gas Transmission	0	0	$18,560	$16,158	0	0
04/08/2017	Morton	Hazardous Liquid	0	0	$79,490	$79,490	23	0
11/02/2005	Mountrail	Hazardous Liquid	0	0	$12,000	$14,884	6	0
12/14/2005	Mountrail	Hazardous Liquid	0	0	$10,100	$12,528	12	2
01/25/2007	Mountrail	Hazardous Liquid	0	0	$75,750	$88,602	215	15

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
11/08/2010	Mountrail	Gas Transmission	1	0	$42,596	$39,063	0	0
07/29/2013	Mountrail	Hazardous Liquid	0	0	$16,986,690	$18,073,289	20,600	14,744
10/31/2013	Mountrail	Hazardous Liquid	0	0	$98,287	$104,574	5	0
01/17/2015	Nelson	Hazardous Liquid	0	0	$169,860	$175,644	0	0
06/08/2004	Oliver	Hazardous Liquid	0	0	$805,000	$1,029,844	400	400
01/08/2010	Pembina	Hazardous Liquid	0	0	$4,194,715	$4,710,373	3,784	2,237
07/22/2013	Pierce	Hazardous Liquid	0	0	$737,394	$784,563	0	0
04/13/2011	Ransom	Hazardous Liquid	0	0	$2,572	$2,833	1	1
12/09/2014	Ransom	Hazardous Liquid	0	0	$181,345	$190,053	6	0
02/27/2015	Ransom	Hazardous Liquid	0	0	$22,154	$22,908	1	0
04/11/2002	Renville	Hazardous Liquid	0	0	$3,014	$4,027	25	1
03/11/2007	Renville	Hazardous Liquid	0	0	$32,000	$37,429	1	1
08/20/2010	Renville	Hazardous Liquid	0	0	$11,025	$12,380	0	0
12/15/2004	Richland	Hazardous Liquid	0	0	$168,000	$214,924	2,500	2,500
05/07/2011	Sargent	Hazardous Liquid	0	0	$1,316,000	$1,449,468	400	0
01/28/2010	Stark	Hazardous Liquid	0	0	$11,170	$12,543	20	7
11/13/2011	Stark	Hazardous Liquid	0	0	$40,343	$44,435	200	80
01/28/2013	Stark	Gas Transmission	0	0	$49,621	$49,548	0	0

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
02/12/2002	Ward	Hazardous Liquid	0	0	$2,000	$2,672	0	0
07/26/2009	Ward	Hazardous Liquid	0	0	$1,500	$1,699	5	4
02/25/2011	Ward	Hazardous Liquid	0	0	$3,000	$3,304	0	0
09/25/2011	Ward	Hazardous Liquid	0	0	$229,250	$252,500	20	0
11/13/2012	Ward	Hazardous Liquid	0	0	$2,403,151	$2,601,347	76	0
12/08/2012	Ward	Gas Distribution	0	0	$120,390	$130,311	0	0
11/02/2013	Ward	Hazardous Liquid	0	0	$375,131	$399,127	9	0
04/21/1998	Williams	Hazardous Liquid	0	0	$10,000	$14,371	175	5
11/19/2000	Williams	Hazardous Liquid	0	0	$371,000	$515,812	83	83
08/22/2005	Williams	Hazardous Liquid	0	0	$665	$825	0	0
06/07/2010	Williams	Hazardous Liquid	0	0	$10,070	$11,308	1	0
12/21/2012	Williams	Hazardous Liquid	0	0	$77,332	$83,710	0	0
03/06/2014	Williams	Hazardous Liquid	0	0	$41,300	$43,283	3	0
03/13/2014	Williams	Hazardous Liquid	0	0	$30,000	$31,441	5	0
09/25/2014	Williams	Hazardous Liquid	0	0	$2,000	$2,096	1	1
07/31/2016	Williams	Gas Transmission	0	0	$11,592	$12,831	0	0
11/20/2017	Williams	Hazardous Liquid	0	0	$2,625	$2,625	1	0
05/10/2010	Williams	Hazardous Liquid	0	0	$5,100	$5,727	40	0
11/03/2014	Williams	Gas Transmission	0	0	$40,427	$34,323	0	0

Date	County	System Type	Fatalities	Injuries	Total Cost As Reported	Total Cost Current Year Dollars	Barrels Spilled	Net Barrels Lost
10/07/1999	Williams	Hazardous Liquid	0	0		$0	90	5

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration, 2018

Table 7.4.7-2 Gas Transmission Line and Hazardous Liquid Line Mileage by County as of April 2018

County Name	Gas Transmission Mileage	Hazardous Liquid Mileage	Total Mileage	Percent
Adams	0.00	0.00	0.00	0.00%
Barnes	93.86	145.96	239.82	3.31%
Benson	20.76	33.33	54.09	0.75%
Billings	94.01	162.20	256.20	3.54%
Bottineau	33.42	84.86	118.28	1.63%
Bowman	86.75	36.10	122.84	1.70%
Burke	84.68	110.57	195.25	2.70%
Burleigh	67.48	35.78	103.26	1.43%
Cass	54.01	139.38	193.39	2.67%
Cavalier	42.29	7.35	49.63	0.69%
Dickey	0.00	25.62	25.62	0.35%
Divide	1.78	129.11	130.89	1.81%
Dunn	111.54	332.35	443.88	6.13%
Eddy	24.86	25.72	50.57	0.70%
Emmons	43.15	0.00	43.15	0.60%
Foster	49.49	53.03	102.52	1.42%
Golden Valley	65.68	56.02	121.70	1.68%
Grand Forks	0.56	62.26	62.82	0.87%
Grant	3.96	0.00	3.96	0.05%
Griggs	0.00	28.48	28.48	0.39%
Hettinger	76.78	0.00	76.78	1.06%
Kidder	30.28	28.95	59.22	0.82%
LaMoure	0.00	25.83	25.83	0.36%
Logan	0.00	0.00	0.00	0.00%
McHenry	71.92	129.68	201.60	2.78%
McIntosh	19.70	0.00	19.70	0.27%
McKenzie	205.33	1016.10	1221.43	16.87%
McLean	103.43	0.00	103.43	1.43%
Mercer	41.14	40.69	81.84	1.13%
Morton	195.73	21.30	217.03	3.00%
Mountrail	118.80	368.01	486.81	6.72%
Nelson	0.00	63.52	63.52	0.88%
Oliver	0.00	30.09	30.09	0.42%
Pembina	34.04	240.09	274.13	3.79%
Pierce	25.35	62.29	87.64	1.21%
Ramsey	48.69	39.42	88.11	1.22%
Ransom	33.04	58.16	91.20	1.26%
Renville	29.19	18.71	47.90	0.66%
Richland	62.79	42.30	105.10	1.45%
Rolette	0.00	0.00	0.00	0.00%

County Name	Gas Transmission Mileage	Hazardous Liquid Mileage	Total Mileage	Percent
Sargent	0.00	26.58	26.58	0.37%
Sheridan	0.00	0.00	0.00	0.00%
Sioux	0.00	0.00	0.00	0.00%
Slope	24.59	0.00	24.59	0.34%
Stark	135.80	72.29	208.10	2.87%
Steele	0.00	35.05	35.05	0.48%
Stutsman	94.62	79.26	173.89	2.40%
Towner	0.00	0.00	0.00	0.00%
Traill	0.00	32.09	32.09	0.44%
Walsh	26.57	26.05	52.62	0.73%
Ward	129.89	147.81	277.70	3.83%
Wells	26.86	54.73	81.59	1.13%
Williams	98.33	603.33	701.66	9.69%
Statewide	2511.14	4730.46	7241.60	100.00%

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration, National Pipeline Mapping System, 2018
https://www.npms.phmsa.dot.gov/GeneralPublic.aspx

Table 7.4.7-3 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Adams	H	Population within 5 miles potentially affected by hazmat spills
Barnes	H	None specifically listed; general loss of life and damage
Billings (B,D,GV,S)	H	None specifically listed; general loss of life and damage
Bottineau	H	25 Tier II facilities, 63 pipeline miles
Burke	H	Approximately 4950 residents regionally at risk
Dickey	H	All buildings at risk. General loss of life and property
Divide	H	Approximately 4950 residents regionally at risk
Foster	H	$50k or more, loss of life and property
LaMoure	H	None specifically listed; general loss of life and damage
McKenzie	H	None specifically listed; general loss of life and damage
Mountrail	H	None specifically listed; general loss of life and damage
Stutsman	H	749 mobile homes most at risk from incidents
Williams	H	18,816 residents within 1 mile of hazard areas
Benson	M	All key facilities
Bismarck (City)	M	General loss of life and damage; critical facilities, infrastructure, as well as schools and vulnerable populations at risk
Bowman	M	388 Title III reporting facilities
Burleigh	M	None specifically listed; general loss of life and damage
Cavalier	M	None specifically listed; general loss of life and damage

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Eddy	M	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure
Emmons	M	None specifically listed; general loss of life and damage
Fort Berthold^	M	General loss of life and damage; none specifically listed
Grand Forks	M	$50k or more, loss of life and property
Grant	M	20 Tier II facilities
Griggs	M	Potential impacts unknown; there are 6 hazmat facilities in the county
Hettinger	M	Population within 5 miles potentially affected by hazmat spills
Kidder	M	17 Tier II facilities with chemical storage
Logan	M	None specifically listed; general loss of life and damage
McHenry	M	83 facilities at risk for releasing chemicals
McIntosh	M	None specifically listed. General loss of life and damage.
McLean	M	Population within 1/2 mile of rail or highway (approximately 2030 residents)
Mercer	M	Population within 1/2 mile of rail or highway (approximately 8104 residents)
Morton	M	214 Tier II in the County. Up to 819 residents at risk.
Nelson	M	Specific impacts not listed. General loss of life and property.
Oliver	M	1,560 residents within 1/2 mile of all hazard areas
Pembina	M	Residents and facilities within 1/2 mile of hazard areas
Ransom	M	4,294 residents within 1/2 mile of hazard areas
Renville	M	29 Tier II facilities
Richland	M	Specific impacts not listed; general loss of life and property
Sargent	M	32-bed nursing home potentially impacted
Sheridan	M	Up to 50% of the population affected
Spirit Lake	M	Specific impacts not listed; general loss of life and property
Standing Rock^ (And Sioux)	M	Possible contamination of drinking water; specifics not given
Steele	M	No specified impacts; general loss of life and property
Walsh	M	Residents and facilities within 5 mile of hazard areas
Ward	M	Population within 1/2 mile of hazmat incidents most vulnerable; no specific potential impacts listed
Wells	M	Population at risk: 716 under 20 years old, 514 above 65, along with crops and infrastructure
Dunn (B,D,GV,S)	L	Most potential, large energy producer, 246 past incidents
Pierce	L	Specific impacts not listed; general loss of life and property
Ramsey	L	8,066 people within five miles of railroad main line
Rolette	L	Population within 1/2 mile of Tier II facilities
Sioux	L	Possible contamination of drinking water; specifics not given
Slope	L	29 Title III facilities; population adjacent potentially impacted; no specifics

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Towner	L	1506 people within 1/2 mile of hazardous materials facilities potentially impacted
Traill	L	None specifically listed; general loss of life and damage
Turtle Mountain^	L	None specifically listed; general loss of life and damage
Golden Valley (B,D,GV,S)	Included in local plan, but no classification listed	None listed
Stark (B,D,GV,S)	Included in local plan, but no classification listed	Large industrial center, 35 past incidents
Cass	Not identified in local plan	N/A

^Includes only part of the North Dakota parts of the reservation

7.4.8 Infectious Diseases and Pest Infestations

Table 7.4.8-1: 2016 ACS Data for Population, Under Age 5, and Over Age 65

County	Total Pop.	# Under 5 Years	% Under 5 Years	# Over 65 Years	% Over 66	Total Under 5 and Over 66	% Under 5 and over 66
Adams	2,348	96	4.10%	524	22.30%	620	26%
Barnes	11,033	596	5.40%	2,251	20.40%	2,847	26%
Benson	6,802	633	9.30%	837	12.30%	1,469	22%
Billings	936	76	8.10%	161	17.20%	237	25%
Bottineau	6,650	386	5.80%	1,423	21.40%	1,809	27%
Bowman	3,238	227	7.00%	644	19.90%	871	27%
Burke	2,239	154	6.90%	394	17.60%	549	25%
Burleigh	90,560	6,249	6.90%	13,041	14.40%	19,289	21%
Cass	166,852	12,013	7.20%	17,853	10.70%	29,867	18%
Cavalier	3,867	244	6.30%	1,017	26.30%	1,261	33%
Dickey	5,160	289	5.60%	1,120	21.70%	1,409	27%
Divide	2,369	166	7.00%	564	23.80%	730	31%
Dunn	4,284	278	6.50%	698	16.30%	977	23%
Eddy	2,370	180	7.60%	495	20.90%	675	29%
Emmons	3,426	171	5.00%	932	27.20%	1,103	32%
Foster	3,345	181	5.40%	739	22.10%	920	28%
Golden Valley	1,895	116	6.10%	328	17.30%	443	23%
Grand Forks	69,793	4,746	6.80%	7,887	11.30%	12,633	18%
Grant	2,369	130	5.50%	640	27.00%	770	33%
Griggs	2,311	129	5.60%	682	29.50%	811	35%
Hettinger	2,639	174	6.60%	699	26.50%	874	33%
Kidder	2,419	150	6.20%	503	20.80%	653	27%
LaMoure	4,111	210	5.10%	1,003	24.40%	1,213	30%
Logan	1,939	91	4.70%	555	28.60%	646	33%
McHenry	5,912	372	6.30%	1,147	19.40%	1,519	26%
McIntosh	2,737	129	4.70%	879	32.10%	1,007	37%
McKenzie	10,718	1,040	9.70%	922	8.60%	1,961	18%
McLean	9,576	536	5.60%	2,088	21.80%	2,624	27%
Mercer	8,671	555	6.40%	1,483	17.10%	2,038	24%
Morton	29,633	1,956	6.60%	4,445	15.00%	6,401	22%
Mountrail	9,675	726	7.50%	1,074	11.10%	1,800	19%
Nelson	3,032	152	5.00%	852	28.10%	1,004	33%
Oliver	1,768	88	5.00%	396	22.40%	484	27%
Pembina	7,136	414	5.80%	1,534	21.50%	1,948	27%
Pierce	4,373	289	6.60%	1,006	23.00%	1,294	30%

County	Total Pop.	# Under 5 Years	% Under 5 Years	# Over 65 Years	% Over 66	Total Under 5 and Over 66	% Under 5 and over 66
Ramsey	11,578	753	6.50%	2,119	18.30%	2,871	25%
Ransom	5,457	289	5.30%	1,135	20.80%	1,424	26%
Renville	2,573	226	8.80%	422	16.40%	648	25%
Richland	16,329	865	5.30%	2,564	15.70%	3,429	21%
Rolette	14,607	1,475	10.10%	1,490	10.20%	2,965	20%
Sargent	3,889	183	4.70%	770	19.80%	953	25%
Sheridan	1,395	82	5.90%	353	25.30%	435	31%
Sioux	4,431	452	10.20%	328	7.40%	780	18%
Slope	665	64	9.60%	157	23.60%	221	33%
Stark	29,837	2,357	7.90%	3,819	12.80%	6,176	21%
Steele	1,969	98	5.00%	455	23.10%	553	28%
Stutsman	21,108	1,245	5.90%	3,715	17.60%	4,960	24%
Total	736,162	51,431	7.00%	104,762	14.20%	156,193	21.20%
Towner	2,292	133	5.80%	559	24.40%	692	30%
Traill	8,075	460	5.70%	1,510	18.70%	1,970	24%
Walsh	10,995	671	6.10%	2,265	20.60%	2,936	27%
Ward	68,954	5,309	7.70%	7,999	11.60%	13,308	19%
Wells	4,179	201	4.80%	1,220	29.20%	1,421	34%
Williams	31,643	2,626	8.30%	3,069	9.70%	5,696	18%

Source: U.S. Census Bureau, 2016 American Community Survey

Table 7.4.8-2: Infectious Disease Outbreak - Likelihood, Severity, Impact, Response, and Recovery - 5 Year Outlook

Definitions

- Local Likelihood - How likely are localized disease outbreaks affecting one to a few counties over a five-year period
- Regional or state Likelihood - How likely are disease outbreaks affecting a multi-county region or the entire state over a five-year period
- Potential Disease Severity - How serious could the illness be regardless of the number of people impacted
- Potential Outbreak Severity - How serious could the outbreak be considering health consequences, number of people impacted or both
- Hospitalization - To what extent is the outbreak likely to result in hospitalization (few to many)
- Mortality - To what extent is the outbreak likely to result in deaths (few to many)
- Multi-agency response - How likely is the outbreak to lead to a multi-agency response in North Dakota
- Federal response - How likely is the outbreak to result in mobilization of federal resources to the state (state or federally initiated)
- Recovery Impact - Likelihood of causing durable damage requiring post-disaster mitigation

Scale 1 Lowest, 5 Highest

Disease Categories*	Examples	*Local Likelihood*	*Regional Likelihood*	*Potential Disease Severity*	*Potential Outbreak Severity*	*Hospitalization*	*Mortality*	*Multi- Agency Response*	*Federal Response*	*Recovery Impact*
Bioterrorism**	Smallpox, Anthrax, Tularemia	1	1	5	5	5	5	5	5	5
Foodborne, Enteric***	Salmonella,Shig a toxin E. coli,	5	2	3	3	2	1	1	2	1
Foodborne, Non-enteric	Botulism, Nitrate	2	1	5	5	2	2	1	3	1
Waterborne	Shigella, Giardia, cryptosporidium	5	1	3	3	2	1	1	2	1
Vector borne	WNV, Lyme, RMSF	3	3	4	3	3	2	2	1	1
Vaccine Preventable	Hepatitis A, Pertussis, Mumps	5	3	4	4	2	2	2	2	1
Vaccine Preventable	Measles	3	2	4	5	4	3	4	2	2
Influenza, Seasonal	Influenza	5	5	5	2	3	3	1	1	1
Influenza, pandemic	Influenza	3	3	5	5	5	5	5	5	5
Influenza, avian, variant or swine	Influenza	2	2	3	4	2	2	5	3	2
Other and emerging	Coronovirus, Ebola, Zika	1	1	5	5	5	5	5	5	5

Disease Categories*	Examples	Local Likelihood	Regional Likelihood	Potential Disease Severity	Potential Outbreak Severity	Hospitalization	Mortality	Multi- Agency Response	Federal Response	Recovery Impact
Non-vaccine Preventable, low severityƗ	Giardia, norovirus	5	3	2	2	1	1	1	1	1
Non- Vaccine Preventable, high severityƗ	Tuberculosis, Tularemia, Legionella	5	1	5	4	2	2	1	2	1
Health Care	Microbial Resistance, Contaminated Product	4	3	3	2	3	2	1	2	3
HIV/AIDS¥	HIV Out-break	3	3	3	2	2	3	2	1	1
Other Bloodborne	Hepatitis B and C	2	3	4	4	2	2	2	2	2
Sexually Transmitted¥	Syphilis	4	4	2	1	1	2	2	2	1

Source: Department of Health, 2018c

*Disease Category lumps a large number of diseases into a single category, but the actual diseases in the category may vary substantially for the factors listed
**Bioterrorism includes any infectious disease caused by intent to do harm and excludes spontaneous occurrences of the disease
***Primarily gastrointestinal illness
Ɨ Category includes a broad range of infectious disease of varying characteristics
¥ Excludes endemic

Table 7.4.8-3: Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Barnes	H	43.5% of population, both older and younger
Dickey	H	2,695 people under the age of 19 or above 65.
McIntosh	H	19.58% of the population
Morton	H	Infections disease could affect a large swath of the population and overwhelm existing resources.
Sioux	H	Large segments of the population, crops, and livestock potentially affected.
Standing Rock^ (And Sioux)	H	3,215 people under 20 years old, 722 over 65
Billings	M	Whole population
Bottineau	M	Upwards of 2,250 infected with 1,286 fatalities, $12m livestock, $130m agriculture
Bowman	M	1,300 potentially infected, 26 deaths; $43m livestock, $35m crops
Burleigh	M	31,723 residents under 18 and over 65
Dunn	M	Whole population
Eddy	M	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure
Emmons	M	Up to 35% of the population.
Foster	M	Up to 35% of the population, 1,178 people infected, 235 fatalities.
Golden Valley	M	Whole population
Grand Forks	M	Up to 35% of the population, 23,615 infected, 2,723 fatalities
Grant	M	Large segments of the human population, $62,781 in crop losses
Hettinger	M	$9.8m in livestock at risk, $86.7m in crops
LaMoure	M	$90k of annualized crop losses, 21.5% under the age of 19, 28% above the age of 65
Logan	M	$172m in agriculture, 64,000 in cattle, whole population
McKenzie	M	8.1% under 5, 14.2% over 65, $28m in livestock, $50m in crops
Mountrail	M	Large segments of the human population potentially impacted from pandemic diseases
Nelson	M	$15.5m in potential crop losses, 3,126 residents over the age of 65, $1.6m in livestock
Sargent	M	5.4% age of 5 or younger, 19% age of 65 or older are the most vulnerable. $127m in livestock exposure, $104 in crop exposure
Sheridan	M	$107.7m in agricultural products, 25-50% of human population impacted
Slope	M	307 potentially infected, 6 deaths;
		$16m livestock, $31m crops
Spirit Lake	M	35% of the population would become ill, 295 would die
Stark	M	Whole population
Steele	M	391 persons would become ill, 3 require hospitalization, 1 person dead, $42.1m in crops lost, $698k in livestock

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Stutsman	M	4,922 people under 19 years, 2,175 people over the age of 65
Walsh	M	2,706 people under the age of 20, and 2,237 over the age of 65 most at risk
Ward	M	5,110 people under the age of 5, and 7,949 above the age of 65 most at risk
Benson	L	All 6,794 residents vulnerable, especially elderly and children. $222m in crops, $17m in livestock
Bismarck (City)	L	Ash trees and Elm Trees at high risk from Emerald Ash Borer and Dutch Elm Disease. No loss estimates provided.
Burke	L	$55.3 in crop, $6.3 in livestock
Cavalier	L	1,340 residents could be infected, up to 268 deaths
Divide	L	$74m in crops, $7m in livestock
Fort Berthold^	L	None specifically listed
Griggs	L	$278k in crop annually at risk, 1,133 population under 18 and over 65
Kidder	L	35% of the human population at risk of infection, 63,000 cattle at risk, $9.3m in crops
McHenry	L	Crops, livestock, and humans all potentially impacted by diseases
McLean	L	2,020 residents above the age of 65 most at risk, $54m in crop loss, $5m in livestock loss
Mercer	L	1,460 residents above the age of 65 and 530 under the age of 5, $11m in crop loss, $4m in livestock
Oliver	L	300 residents above the age of 65, and 99 residents under the age of 5 most at risk.
Pembina	L	Crops, livestock, and humans all potentially impacted by diseases
Pierce	L	Crops, livestock, and humans all potentially impacted by diseases
Ramsey	L	Possibility of 3,916 infections and 783 fatalities
Ransom	L	Potential impacts include 1,655 falling ill, 13 hospitalized, 3 deaths
Renville	L	900 residents infected, 180 fatally. 2,571 residents over the age of 65
Rolette	L	Specific vulnerable population not listed.
Towner	L	560 residents above 65 years old, and 140 residents below 5 years old most at risk. 695 potentially ill, 5 hospitalized, 1 fatality
Traill	L	6.3% of population under the age of 5, and 18.7% of population above the age 65
Wells	L	Population at risk: 716 under 20 years old, 514 above 65
Williams	L	3,020 over the age of 65, and 2,250 below the age of 5, crop losses of $34m or more, livestock losses of $2m
Adams	No ranking listed	$31.3m in livestock, $39.3m in crops
Cass	Hazard not identified	N/A

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Richland	Hazard not identified	N/A
Turtle Mountain^	Hazard not identified	N/A

^ Includes only North Dakota parts of the reservation

7.4.9 Severe Summer Weather

7.4.9.1 Previous Occurrences

Table 7.4.9-1 North Dakota Summer Storm Declared Disasters and Emergencies

Declaration	Location	Date	Other Information	Casualties	Damages
DR 79	North Dakota	1957	Tornadoes	13 deaths 103 injuries	$25,000,000 estimated total
DR 220	North Dakota	1966	Severe Storms Also included impacts from flooding.	death^ injuries^	$1,356,000^ estimated total
DR 287	North Dakota	1970	Severe Storms Also included impacts from flooding.	9 injuries^	$135,000^ estimated total
DR 335	North Dakota	1972	Severe Storms Also included impacts from flooding.	1 injury^	$350,000^ estimated total
DR 475	North Dakota	1975	Severe Storms Also included impacts from flooding.	1 death^ 9 injuries^	$2,830,000^ estimated total
DR 3065	North Dakota	1978	Severe Storms and Tornadoes	5 deaths 35 injuries	$3,590,000 estimated
State EO	North Dakota	1980	State Declared Severe Summer Weather Disaster	Unknown	Unknown
State Request	North Dakota	1981	Governor's Request for USDA assistance for heat, hail, wind, heavy rain, and insects.	Unknown	Unknown
State EO	North Dakota	1981	State Tornado Disaster Proclamation	Unknown	Unknown
State Request	North Dakota	1982	Governor's Request for USDA assistance for high wind, hail, and heavy rain.	Unknown	Unknown
State Request	North Dakota	1989	Governor's Request for USDA assistance for severe storms.	Unknown	Unknown
DR 1001	39 counties mostly in Central and Eastern North Dakota	June – July 1993	Severe Storms Public Assistance and Individual Assistance Also included impacts from flooding.	None^	$48,446,044* ~$600,000,000 ~ estimated total
DR 1032	25 counties mostly in Central North Dakota	March – July 1994	Severe Storms Public Assistance Also included impacts from flooding.	4 injuries^	$4,073,939* ~$9,670,000^ estimated total

Declaration	Location	Date	Other Information	Casualties	Damages
DR 1050	32 counties in Central and Eastern North Dakota	March – May 1995	Severe Storms Public Assistance Also included impacts from flooding and ground saturation.	3 deaths~ 1 injury~	$15,637,415*~ $102,000,000~ estimated total
DR 1174	All 53 counties in North Dakota	February 28 – May 24, 1997	Severe Storms Public Assistance and Individual Assistance Also included impacts from flooding.	7 deaths~ 2 injuries~	$557,503,842*~ $3,700,000,000~ estimated total
DR 1279	34 counties and 3 tribes in Central and Eastern North Dakota	March 1 – July 19, 1999	Severe Storms and Tornadoes Public Assistance and Individual Assistance Also included impacts from snow, ice, flooding, ground saturation, landslides, and mudslides.	1 death^ 1 injury^	$124,391,622*~ $117,864,000 ^ estimated total
DR 1334	26 counties and 3 tribes in Central and Eastern North Dakota	April 5 – August 12, 2000	Severe Storms Public Assistance and Individual Assistance Also included impacts from flooding.	1 death^ 25 injuries^	$91,944,041*~ $21,985,000^ estimated total
State Request	North Dakota	2001	Governor's Request for USDA assistance for adverse summer weather conditions	Unknown	Unknown
DR 1431	5 counties and 1 tribe in Eastern North Dakota	June 8 – August 11, 2002	Severe Storms and Tornadoes Public Assistance Also included impacts from flooding.	14 injuries^	$1,266,549*~ $283,797,000 ^ estimated total
DR 1483	Barnes County	June 24-25, 2003	Severe Storms and High Winds Public Assistance	None	$924,742* $1,900,000 estimated total
DR 1515	19 counties and 2 tribes in Northern North Dakota	March 26 – June 14, 2004	Severe Storms Public Assistance Also included impacts from flooding and ground saturation.	None	$7,459,705*~
DR 1597	26 counties and 3 tribes mostly in Northern and Eastern North Dakota	June 1 – July 7, 2005	Severe Storms Public Assistance Also included impacts from flooding and ground saturation.	1 death^ 1 injury^	$20,350,276*~ $16,305,000^ estimated total
DR 1645	11 counties and 1 tribe in Eastern North Dakota	March 30 – April 30, 2006	Severe Storms Public Assistance Also included impacts from flooding and ground saturation.	None^	$10,388,198*~

Declaration	Location	Date	Other Information	Casualties	Damages
State EO 2006-07	City of Coleharbor and McLean County	7/14/2006	State declared severe summer weather emergency	Unknown	Unknown
DR 1713	13 counties mostly in Southeastern North Dakota	June 2 – June 18, 2007	Severe Storms Public Assistance Also included impacts from flooding.	Unknown	$4,375,932*~
DR 1725	Cass and Steele Counties	July 15, 2007	Severe Storms and Tornadoes Public Assistance	Unknown	$935,462* $270,000,000 estimated total
State EO 2007-11	South central and southeastern North Dakota	7/26/2007	State declared severe summer weather emergency	Unknown	Unknown
State EO 2007-13	Northwood area of North Dakota	8/27/2007	State declared summer storm emergency	Unknown	Unknown
DR 1726	Grand Forks County	August 26-27, 2007	Severe Storms and Tornadoes Public Assistance	Unknown	$12,775,075* $50,000,000 estimated total
State EO 2007-14	Northwood area of North Dakota	8/31/2007	State declared severe summer weather emergency	Unknown	Unknown
State EO 2009-13	Dickinson and Stark Counties	7/9/2009	State declared summer storm emergency	Unknown	Unknown
DR 1829	48 counties and 4 tribes in Central and Eastern North Dakota	March 13 – August 10, 2009	Severe Storms Public Assistance and Individual Assistance Also included impacts from flooding.	Unknown	$184,696,371 *~
State EO 2010-08	North Dakota	4/2/2010	State declared spring storm emergency	Unknown	Unknown
State EO 2010-10	Adams, Benson, Burleigh, Eddy, Emmons, Grant, Hettinger, Kidder, McLean, McHenry, Mercer, Morton, Oliver, Sheridan, Sioux, Ward, Wells, Standing Rock Sioux reservation	4/11/2010	State declared spring storm emergency	Unknown	Unknown
State EO 2011-23	Dickey and LaMoure Counties	7/21/2011	State declared severe summer weather emergency	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
DR-4190	Standing Rock Sioux Reservation, and the counties of Benson, Bottineau, Divide, Eddy, McHenry, Mountrail, Pierce, Renville, and Ward	June 25, 2014 – July 2, 2014	Severe storms and flooding public assistance	None	$2,416,454*~
State EO	Northwestern and Central North Dakota	9/9/2014	State declared summers storm and flood disaster	Unknown	Unknown

Sources: Federal Emergency Management Agency, 2007; North Dakota Department of Emergency Services, 2007; National Climatic Data Center, 2010; Interagency Hazard Mitigation Team Reports, varied dates; North Dakota Department of Emergency Services, 2007; North Dakota Department of Emergency Services, 2010

Legend: ^ Summer Storm portion; ~ includes Flood and Summer Storm; * Federal Share (includes Individual and Family Grant, Disaster Housing, Manufactured Housing, Crisis Counseling Immediate and Regular Programs, Disaster Unemployment Assistance, Hazard Mitigation Grant Program, Public Assistance, FEMA Mission Assignments, and SBA Home, Business, and Economic Injury Loans).

The following is a synopsis of historical occurrences of severe summer weather. The Severe Summer Weather profile contains a description of events from 2010 to 2018.

Downbursts

- In 1919, a windstorm hit Williams and Divide Counties killing 8 and injuring 40. In 1930, North Dakota's most severe windstorm damaged 1,847 buildings (State Historical Society of North Dakota, 2007).
- In June 2005, severe summer storms significantly hit the Dickinson area in western North Dakota and the Langdon/Walhalla area in eastern North Dakota. The Dickinson area had an estimated 4,000 insurance claims that totaled over $14 million in insurable damage and the Langdon/Walhalla area had about 500 claims with $4 million in damage. Many of the claims in Dickinson were for minor roof damage because of wind and hail, and in the Langdon and Walhalla areas, most of the damages were to grain bins, storage sheds, and other farm property. These estimates do not include crop damages (North Dakota Insurance Department, 2007).
- In July 2006, the small community of Coleharbor in McLean County was devastated by severe thunderstorm winds, a wet microburst with estimated winds at 125 mph. Nearly every building in town was damaged (National Climatic Data Center, 2010). Insured damages totaled about $1.4 million and about 60 claims were made (North Dakota Insurance Department, 2007).
- On July 15, 2007, Cass and Steele Counties were significantly impacted by downburst winds of 80 mph and some localized areas over 100 mph. Roofs, windows, siding, and crops through the area suffered damages with property losses estimated at $15-$20 million and crop losses of $250 million (National Climatic Data Center, 2010).

Hail

- In August 1995, a severe thunderstorm moved through Ward County in the early morning hours injuring three people. Hail the size of walnuts to grapefruit did extensive damage to crops and property. A camper-bus convention was occurring at the time with extensive damage done to campers ranging in value up to $500,000. Many wheat crops that were at or near maturity were completely destroyed with no hope of any harvest. The storm resulted in $40 million in property damage and $10 million in crop damage (National Climatic Data Center, 2010).
- In June 2001, a hailstorm caused an estimated $230 million in property damage in Burleigh and Morton Counties; an estimated 57,000 insurance claims were filed (North Dakota Insurance

Department, 2007). This hailstorm affected the urban Bismarck and Mandan areas. As the most damaging hailstorm in the state's history, the insurance industry was severely impacted. Insurance availability and premiums were affected statewide; many insurance companies pulled out of the state after the storm (North Dakota State Water Commission, 2007c). According to the state situation report, officials estimated the North Dakota State Capitol Complex received approximately $100,000 worth of damage. Thirteen windows in the tower were broken; shingles on the State Library were damaged as well as the skylight in the atrium of the Judicial Wing. The exteriors of the State Office Building and the Grounds Maintenance Building were also damaged. Officials estimated that 400 North Dakota State Fleet vehicles suffered hail damage. Approximately 50 required glass replacement (North Dakota Department of Emergency Services, 2007).

- In July 2005, nickel size to tennis ball size hail combined with 70 mph winds and caused extensive and widespread damage in Bismarck. The larger hail fell on the north side of the city where most of the damage occurred. Numerous homes and vehicles were damaged. There was damage to siding and roofs, and windows were broken. (National Climatic Data Center, 2010) The Hettinger area also suffered similar damage. Property damage was estimated at over $100 million to insured property; over 20,000 insurance claims were filed (North Dakota Insurance Department, 2007).
- Baseball sized hail fell in the Fargo area during a late season severe thunderstorm in September 2007. Insurance data indicates approximately 14,000 property insurance claims were made following the storm totaling $43.4 million. (North Dakota Insurance Department, 2007)
- Thunderstorms in the late evening hours of Tuesday, July 13, 2010, produced damaging hail. The hardest hit areas included Hettinger, Grant, Sioux, and Emmons Counties where baseball to softball sized hail fell. Some homes had hailstones crash completely through the roof. The large hail also killed several farm animals and injured other livestock and pets. A North Dakota record-tying hailstone, five inches in diameter, fell at Prairie Knights Resort located in eastern Sioux County. Property damages from this series of storms were estimated at $2 million.

High Wind

- On July 31, 2000, a three-story apartment building under construction in southwest Fargo collapsed after strong winds hit. No thunderstorms were in the area, but temperature and moisture boundaries were present. Twelve construction workers were inside the structure when it collapsed. One of the workers went into cardiac arrest and later died. This event caused 1 fatality, 11 injuries, and $3 million in property damage. (National Climatic Data Center, 2013)
- On June 11, 2008, high winds developed across portions of east central and southeast North Dakota. The winds were thought to be the result of a wake low. Many large trees and a grain bin were blown down in Litchville. Many trees were also blown down in Valley City, and in the area between Litchville and Valley City. Some trees and branches knocked down power lines, which resulted in sporadic power outages. A barn was blown down 10 miles north of Valley City. Combined property and crop damages were estimated at $500,000. (National Climatic Data Center, 2013)

Lightning

Notable previous lightning occurrences are described below.

- In August 1996, a 12-unit condominium in Dickinson (Stark County) caught fire when lightning struck it. This left 24 people homeless and caused $300,000 in property damage.
- In July 1997, lightning struck three workers in a sugar beet field near Davenport (Cass County) resulting in one fatality and two injuries.
- In August 2006, two separate oil wells near Lignite (Burke County) were struck by lightning. Both caught on fire and fire crews were unable to get close to the fire due to the intense heat. Loss in production was estimated at $15,000 per day and property damage was estimated at $250,000 (National Climatic Data Center, 2010).

Tornado

- The longest tornado track in North Dakota was 47.5 miles. This tornado occurred on May 5, 1964, and moved across parts of Emmons, McIntosh, and Logan Counties. The widest tornado path was 6,000 feet, over a mile wide, and it occurred in Bottineau County on June 26, 1986.
- The most destructive tornado in North Dakota history occurred in Fargo during the evening of June 20, 1957. This tornado outbreak consisted of five different tornadoes, each taking its turn on the ground as the storm traveled 27.4 miles across Cass County and into Clay County, Minnesota. The tornadoes were 1,500 feet wide and the one that hit Fargo was classified as an F5 (winds of 261-318 mph). There were 13 fatalities, 103 injuries, and over 1,300 homes were badly damaged or destroyed.
- The earliest occurring tornado in a calendar year occurred on March 26, 2003. The tornado touched down about two miles southwest of Edmunds in Stutsman County. The tornado caused minor damage.
- On August 26, 2007, a tornado impacted the community of Northwood in Grand Forks County. Two mobile home parks were destroyed, one person was killed, and eighteen were injured. Approximately 90 percent of the 500 homes in Northwood were damaged with about 100 uninhabitable. Businesses and municipal buildings also suffered heavy losses. Damages were estimated at about $50 million (Grand Forks County, 2009).
- In the mid-afternoon hours of Wednesday, July 8, 2009, Tornado Watch 563 was issued for all western, and parts of central, North Dakota due to the widespread and dangerous development and rapid intensification of thunderstorms near a surface trough along the western North Dakota border. Multiple severe thunderstorm and tornado warnings were issued. Numerous reports of large hail and severe thunderstorm wind gusts were received throughout this event. Several tornadoes occurred, including an EF3 within city limits on the south side of Dickinson. That tornado alone resulted in over twenty million dollars in damage. Over 450 structures were damaged, nearly 100 of which were declared completely destroyed or beyond repair. Numerous vehicles were damaged or destroyed, and some had been flipped onto their roofs. Power lines were snapped, knocking out power to most of Dickinson, and tree damage was extensive. Two minor injuries were reported, and no fatalities. The injuries were to a 23-year-old male and a 42-year-old male. Both occurred in homes.

7.4.9.2 Location and Extent

Figure 7.4.9-1 through Figure 7.4.9-4 display tornado, hail, downburst, and high wind across North Dakota.

Figure 7.4.9-1 Tornado Events by County, 1950 to 2018

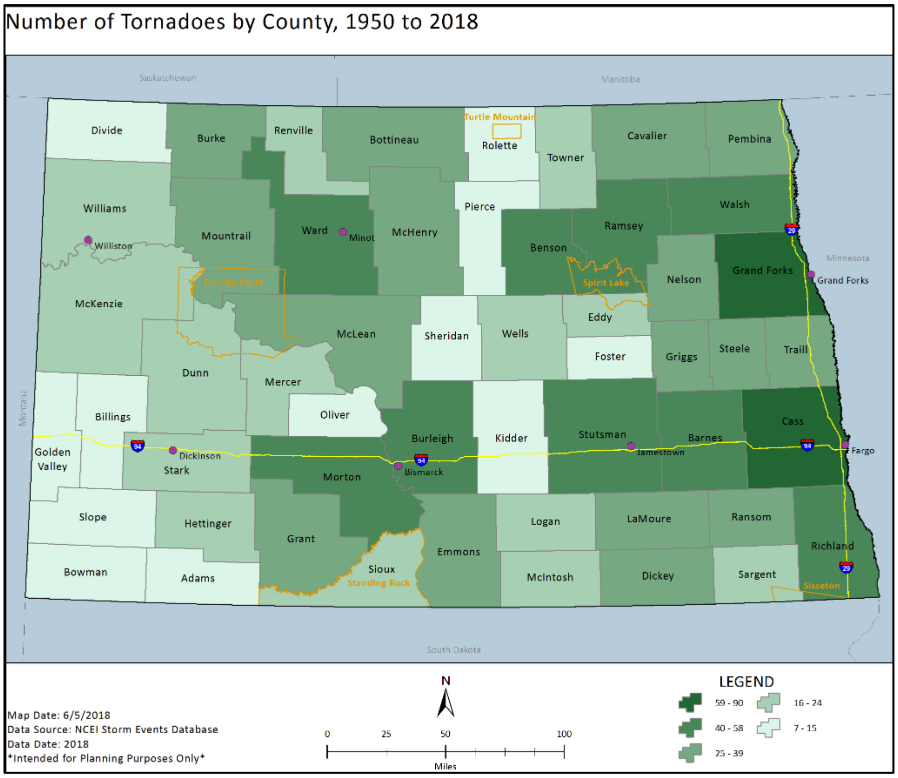


Figure 7.4.9-2 Hail Events by County, 1955 to 2018

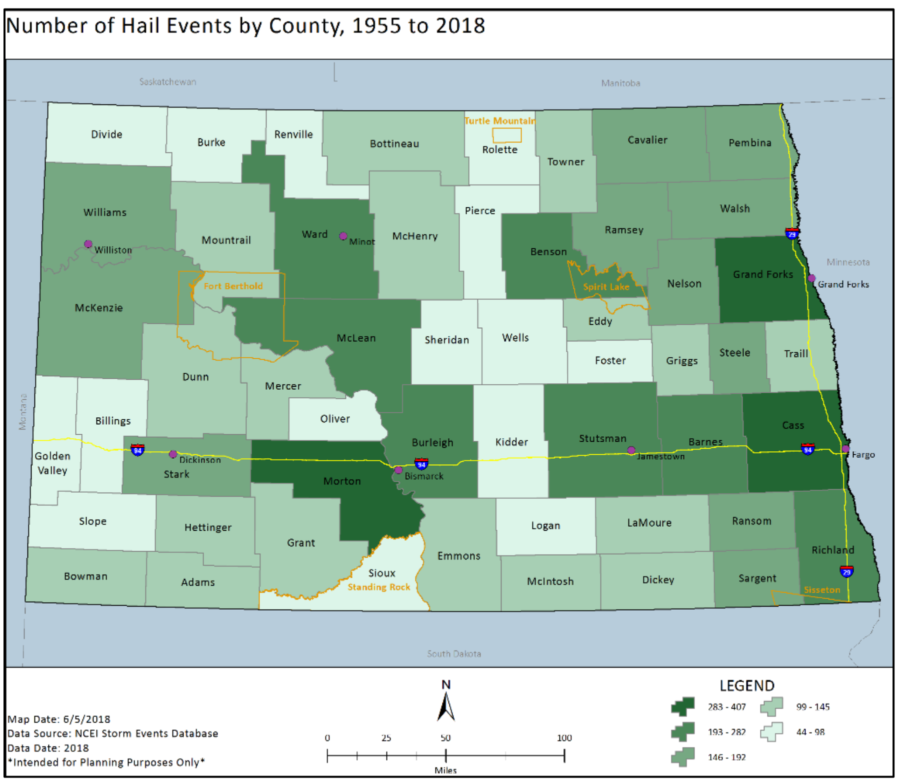


Figure 7.4.9-3 Downburst Events by County, 1955 to 2018

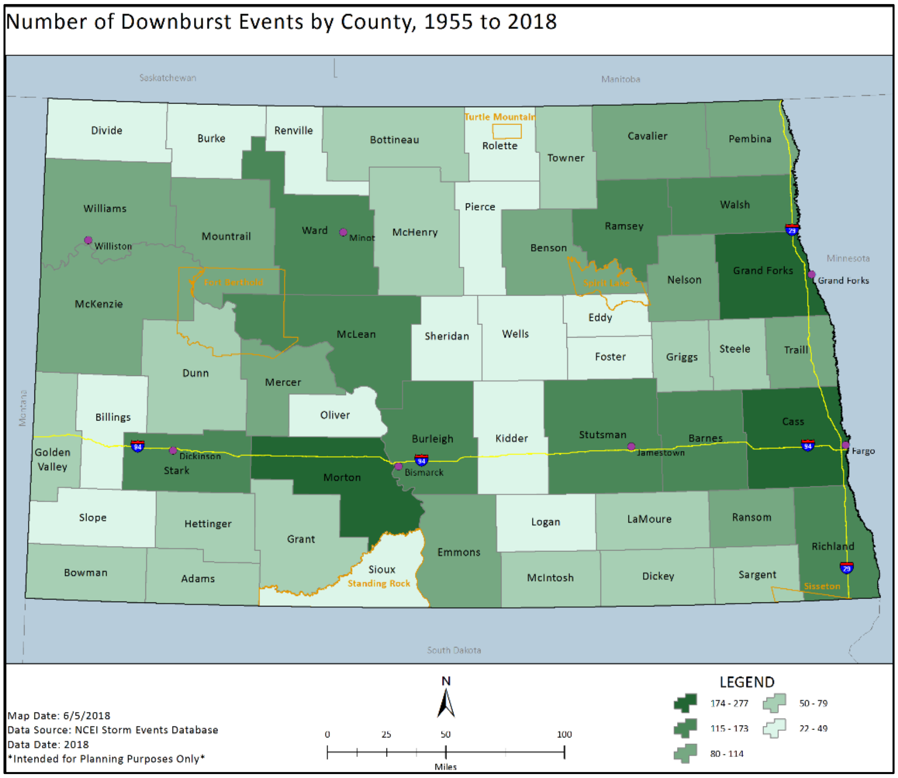
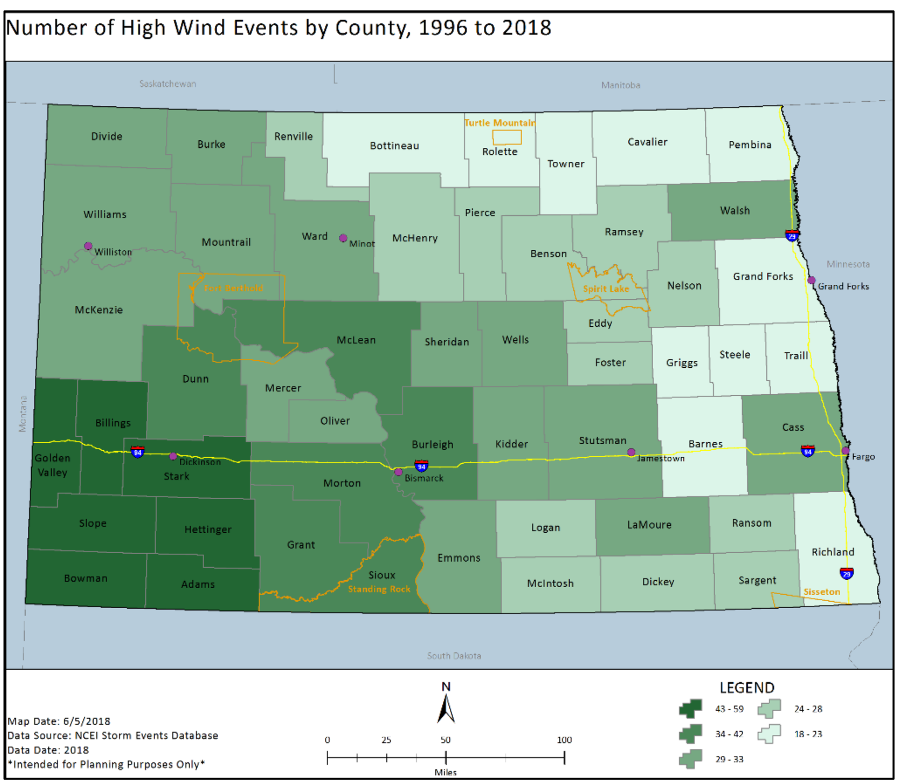


Figure 7.4.9-4 High Wind Events by County, 1996 to 2018



7.4.9.3 State Risk Assessment

Vulnerability Assessment

Table 7.4.9-2 Previous Events, Deaths, Injuries, and Damage by County

County	# Previous Events	Deaths	Injuries	Property Damage
Cass	808	12	126	$167,259,980
Burleigh	497	1	40	$267,755,730
Morton	647	3	25	$123,802,530
Grand Forks	648	1	36	$89,890,390
Steele	290	0	4	$7,625,390
Ward	471	1	5	$43,222,560
Traill	293	0	1	$4,163,000
Stark	401	0	2	$27,768,000
Dunn	259	0	3	$23,785,500
Cavalier	348	1	3	$6,016,200
Griggs	252	0	1	$18,071,980
Barnes	492	0	1	$7,208,250
Ramsey	390	0	17	$18,736,010
Ransom	290	0	8	$7,214,650
Sargent	274	0	0	$2,918,500
Stutsman	423	0	9	$16,332,500
Foster	172	0	2	$13,795,530
McKenzie	314	0	16	$8,530,560
Benson	437	0	0	$9,759,250
Grant	258	5	40	$9,525,780
LaMoure	226	0	2	$5,569,780
Nelson	310	0	0	$10,809,400
Bottineau	235	0	10	$9,350,030
Adams	254	0	3	$8,146,000
Kidder	195	0	1	$8,296,060
Dickey	249	0	2	$4,608,280
Emmons	264	0	3	$5,612,780
McLean	451	0	12	$6,674,280
Hettinger	258	1	4	$5,663,000
Logan	170	0	10	$5,046,000
Divide	160	0	0	$908,530
Richland	500	2	32	$3,675,750
Sioux	180	0	12	$4,342,500
Williams	344	1	1	$4,046,500
Renville	147	1	3	$2,797,000
McIntosh	228	0	0	$3,157,100
Pierce	158	0	0	$3,912,030
Walsh	408	0	2	$2,481,730
Pembina	346	0	11	$3,881,300
Rolette	122	1	3	$3,053,530
Golden Valley	222	0	3	$1,223,000
Burke	204	0	0	$2,238,530
Mountrail	298	0	2	$2,307,530
Mercer	257	0	3	$2,513,000
Bowman	278	0	1	$2,032,280
Wells	183	0	1	$1,641,500

County	# Previous Events	Deaths	Injuries	Property Damage
Slope	167	0	0	$1,973,560
McHenry	269	0	0	$1,435,000
Towner	229	0	0	$611,700
Billings	174	0	4	$714,000
Sheridan	110	0	1	$1,225,000
Oliver	156	0	1	$955,600
Eddy	211	0	0	$396,500
Totals	**15,927**	**30**	**466**	**$994,681,070**

Source: National Centers for Environmental Information, 2018

7.4.9.4 Jurisdictions at Risk

Table 7.4.9-3 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Adams	H	$12.8m to structures
Benson	H	All 6,794 residents vulnerable, 2,280 homes
Billings	H	$616m at risk regionally
Bottineau	H	1,493 homes vulnerable
Bowman	H	$37m in potential damages
Burke	H	$16.4m in building exposure
Burleigh	H	Specific impacts not listed; general loss of life and property
Cavalier	H	3 elementary schools, 7 daycares, hospital, and 2 community living centers most at risk, 127 mobile homes (tornado)
Dickey	H	All residents and buildings at risk
Divide	H	$33,404,431 in building exposure
Dunn	H	$616m at risk regionally
Eddy	H	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure
Foster	H	1,530 homes at risk
Golden Valley	H	$616m at risk regionally
Grand Forks	H	400 structures at risk, $50m in exposure
Grant	H	$137,700 in property damage, $52k in crop damage
Griggs	H	$4.4m in annual crop damages
Hettinger	H	Specific impacts not listed; general loss of life and property
Kidder	H	Entire population and all structures at potential risk, depending on circumstances
LaMoure	H	$7m in annualized losses, 291 people at risk, 128 mobile homes
Logan	H	$265k in total building exposure, $39.5m in crop exposure
McHenry	H	Specific impacts not listed; general loss of life and property
McKenzie	H	$563k building exposure, $28m livestock exposure, $144k crop exposure
McLean	H	1,510 people with enhanced vulnerability to severe summer weather

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Mercer	H	581 mobile housing units in the county, 607 cabins
Morton	H	Mobile homes, campers, temporary buildings most potentially impacted. $74m in potential damages (tornado)
Nelson	H	$77m in potential crop exposure, $486 in building exposure, $8m in livestock exposure
Pembina	H	Specific impacts not listed; general loss of life and property
Pierce	H	Specific impacts not listed; general loss of life and property
Ransom	H	160 occupied mobile homes, 370 persons potentially impacted
Renville	H	400 structures at risk, $50m in exposure (Tornado), $373k in building exposure, $3.2m in livestock exposure, $36.5k in annual crop losses
Richland	H	Specific impacts not listed; general loss of life and property
Sheridan	H	Specific impacts not listed; general loss of life and property
Slope	H	$700K in potential damages
Spirit Lake	H	Whole population potentially impacted, no specifics listed
Standing Rock^ (And Sioux)	H	$66.9k in property damages, $22.8k in crop damages in the planning area annually, 392 mobile homes
Stark	H	$616m at risk regionally
Steele	H	$210m in crop exposure
Stutsman	H	Possible displacement of 1768 people (tornado), $551k in annual property damage, $9.8m in annual crop losses
Towner	H	15 mobile homes, 33 persons potentially impacted; nursing homes most at risk from power losses
Williams	H	Whole population and all critical facilities potentially impacted
Barnes	M	Possible 639 people displaced
Bismarck (City)	M	Specific impacts not listed; general loss of life and property
Cass	M	$451,606,178 in total losses from tornado scenario
Emmons	M	$1,923 annual property damage, $236,555 annual crop losses
Fort Berthold^	M	None specifically listed; general loss of life and damage (which highlights campground vulnerability)
McIntosh	M	Annual average of $3.7m per year in crops
Mountrail	M	Specific impacts not listed; general loss of life and property

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Oliver	M	App. $14m in property damage from worst-case scenario storm
Ramsey	M	Specific impacts not listed; general loss of life and property
Rolette	M	Specific impacts not listed; general loss of life and property
Sargent	M	91 mobile homes potentially impacted, $522k total building exposure, $23.3m in livestock exposure, $113k annual crop loss
Sioux	M	$66.9k in property damages, $22.8k in crop damages in the planning area annually
Turtle Mountain^	M	Whole population potentially impacted, no specifics listed
Walsh	M	1,090 people at risk of displacement, 466 mobile homes
Ward	M	All 67,736 people, 30,210 housing units potentially impacted; 5,110 people under the age of 5, and 7,949 above the age of 65 most at risk
Wells	M	Population at risk: 716 under 20 years old, 514 above 65, along with crops and infrastructure
Traill	L	Whole population potentially impacted, no specifics listed

7.4.10 Severe Winter Weather

Previous Occurrences

- 1886-1887 Winter – A severe winter in the western part of the Dakota Territory put an end to open range ranching after ranchers lost 60 to 75 percent of their herds.
- January 1888 Blizzard – Also called the Schoolhouse Blizzard, the blizzard of 1888 swept through the Dakota Territory during the afternoon of January 12. The day started off with relatively warm temperatures and caught many people off guard. Reportedly, the temperature dropped from 32°F to - 20°F in five minutes and the wind blew so strong that people were knocked off their feet. Many children, sent home from school, did not make it home. The blizzard was so withering that people lost their sense of direction and wandered about until they died of hypothermia. Thousands of head of livestock and wild animals perished. Many buildings were covered with snow or destroyed, and all transportation stopped. Although the storm lasted less than one day, an estimated 400 people died in the Dakotas.
- March 1920 Blizzard – The blizzard, lasting three days with winds to 70 mph, killed 34 people. In front of the Oliver County Courthouse, this storm is remembered by a statue of Hazel Miner, killed on her way home from school near Center.
- March 1941 Blizzard – The Red River Valley blizzard killed 39 people in North Dakota.
- March 1966 Blizzard – This remarkable blizzard hit the Northern Plains and is noted for its long duration. Bismarck had near zero visibility for 42 consecutive hours with 22.4 inches of snow (Figure 7.4.10-1). The livestock losses were extreme; over 100,000 head of livestock were lost in the Dakotas. One farm in eastern North Dakota lost 7,000 turkeys. An estimated 15 people died in this storm.

Figure 7.4.10-1 March 1966 Blizzard

Source: NOAA, 2007

- January 1975 Blizzard – A blizzard with 60-70 mph winds and -20°F temperatures resulted in the deaths of 12 North Dakotans and countless cattle.
- February 1984 Blizzard – The sudden onset of the blizzard that struck eastern North Dakota claimed six lives in North Dakota, including four people that died at the Fargo 19th Avenue North underpass of carbon monoxide poisoning.
- 1996-1997 Winter - The heavy snows of late 1996, accompanied by severe winds in early January 1997, resulted in near statewide disruption of transportation with major road blockage as well as rail and local airport disruptions. The January 9, 1997, blizzard left cumulative snow amounts across the state from 13 to 65 inches. Wind chills of 80 degrees below zero were

recorded. Interstates 1-29 and 1-94 were closed for four days. Nine storm-related deaths occurred, several of which were due to cold exposure. Snow- and ice-blocked vents preventing adequate air circulation resulted in numerous residents being treated for carbon monoxide poisoning in Mandan. A rapid spring thaw created flooding in west central and southwestern North Dakota in mid to late March. Another blizzard moved into western North Dakota on April 4 and 5, leaving an additional 10 to 24 inches of snow throughout the state. The life-threatening conditions caused massive power outages and shut down road systems. Freezing rain, combined with high winds, toppled government and commercial radio and television towers, leaving many without access to emergency information. Reports from ten electric power cooperatives stated that hundreds of transmission towers and about 4,300 power poles toppled. Propane and food shortages were reported by some rural residents. Many farm buildings collapsed under the weight of the snow. Snow blocked roadways compounded many problems. At least 100,000 cattle were lost. Damages were estimated at $317 million with at least 8 deaths and 91 injuries.

- April 1999 Ice Storm – The eastern part of North Dakota experienced ice and snow that collected on power lines and resulted in widespread power outages. Thousands were without power and city foresters spent weeks hauling away downed tree branches.
- November 2000 Winter Storm and Ice Storm – Early season heavy snowfall in north-central and western North Dakota, up to 18 inches, closed roads and caused numerous accidents, injuring seven seriously in a bus accident. In the northwest part of the state, at least 500 power poles were damaged at a cost of about $1 million. In Cavalier and Ramsey Counties, ice accumulations caused power outages of up to 12 hours for some.
- January 2004 Winter Storm – A persistent winter storm brought snow up to 12 inches to northwest and central North Dakota. The storm began as freezing rain before changing to snow. Winds of 15-25 mph caused considerable blowing and drifting snow and wind chills to 30 below zero. Travel was significantly impacted.
- October 2005 Blizzard – An early season blizzard in western and northern North Dakota dropped up to 22 inches of heavy wet snow, downing power lines and closing many roadways, including 155 miles of Interstate 94. The National Guard was called in to rescue hundreds of stranded motorists. Damages were estimated at $2.6 million. This storm received a Presidential Disaster Declaration.
- November 2005 Ice Storm – An accumulation of ice covered trees and power lines in southeastern North Dakota. When the wind picked up, the power lines snapped. Thousands of power poles and a high voltage transmission line snapped and thousands were without power. Airports and interstates in the Fargo area were closed. Damages totaled over $2.5 million. This storm received a Presidential Disaster Declaration. The October and November events also contributed to severe spring flooding.
- April 2006 Blizzard – A late season winter storm with winds gusting in the 35 to 45 mph range created visibilities near zero in some areas. In Williams County alone, 184 power poles were damaged or destroyed and an estimated 1,500 people were without power throughout the region. Vehicle accidents due to poor road conditions and electric system repairs lead to 3 deaths and 4 injuries. About 100 miles of Interstate 94 were closed. The storm caused major disruption to transportation, commerce, and electrical service with property damage estimated at $1,500,000. Deaths of newborn calves and school closures were also reported.
- January 2010 Blizzard – Intense storm systems brought blizzard conditions and wind gusts of 45 to 55 mph to North Dakota. Many roadways and schools statewide were closed due to icy conditions, near zero visibilities, and widespread power outages. An estimated $16.7 million in damages, primarily to electric systems, were reported in western and central North Dakota. This storm received a Presidential Disaster Declaration.

Table 7.4.10-1 North Dakota Winter Weather Declared Disasters and Emergencies

Declaration	Location	Date	Other Information	Casualties	Damages
DR 3061	North Dakota	1978	For blizzards and snowstorms.	Unknown	Unknown
State EO	North Dakota	1983	For ice storm.	Unknown	Unknown
DR 1157	All counties in North Dakota	January 2-31, 1997	Public Assistance. For blizzards and severe winter storms.	8 deaths 91 injuries	$14,801,246* $317,000,000 estimated total
DR 1279	34 counties and 3 tribes in Central and Eastern North Dakota	March 1 – July 19, 1999	Public Assistance and Individual Assistance. For snow and ice. Also included impacts from severe storms, tornadoes, flooding, ground saturation, landslides, and mudslides	None	$124,391,622 *~
DR 1353	Benson, Bowman, Cavalier, Divide, Golden Valley, McKenzie, Ramsey, Towner, and Williams Counties	November 1-20, 2000	Public Assistance. For winter storms.	7 injuries	$1,202,000 estimated total
State EO	North Dakota	2003	State Declared Winter Emergency	Unknown	Unknown
EM 3196	Dunn, McHenry, McKenzie, McLean, Mercer, Ward Counties and Fort Berthold Reservation	January 23-27, 2004	Public Assistance. For snow.	None	Unknown
State EO 2005-09	North Dakota	10/6/2005	State declared snow emergency	Unknown	Unknown
DR 1616	23 counties and 1 tribe in western and north central North Dakota	October 4-6, 2005	Public Assistance. For severe winter storms and record/near record snow.	None	$2,689,148* $2,200,000 estimated total
State EO	North Dakota	10/31/2005	State declared	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
2005-11			snow disaster		
State EO 2005-12	North Dakota	11/29/2005	State declared snow emergency	Unknown	Unknown
DR 1621	Cass, Ransom, Richland, and Sargent Counties	November 27-30, 2005	Public Assistance. For severe winter storms.	None	$2,728,807* $3,000,000 estimated total
State EO 2005-13	North Dakota	12/20/2005	State declared snow disaster	Unknown	Unknown
State EO 2009-02	North Dakota	1/22/2009	State declared winter storm emergency	Unknown	Unknown
State EO 2009-03	North Dakota	1/28/2009	State declare winter storm emergency	Unknown	Unknown
State EO 2009-04	North Dakota	2/20/2009	State declared winter storm emergency	Unknown	Unknown
State EO 2010-01	North Dakota	1/22/2010	State declared severe winter storm emergency	Unknown	Unknown
State EO 2010-03	North Dakota	1/27/2010	State declared winter storm disaster	Unknown	Unknown
DR 1879	25 counties and 1 tribe mostly in western and south central North Dakota	January 20-25, 2010	Public Assistance. For severe winter storms.	None	$17,820,975* ^
DR 1901	12 counties and 1 tribe in central North Dakota	April 1-3, 2010	Public Assistance. For severe winter storms.	None	$25,879,643* ^
State EO 2010-16	North Dakota	12/30/2010	State declared winter storm emergency	Unknown	Unknown
State EO 2011-04	North Dakota	3/11/2011	State declared winter storm emergency	Unknown	Unknown
DR 1986	9 counties in northwestern North Dakota	April 29-May 2, 2011	Public Assistance. For severe winter storms.	None	$4,873,419*
State EO 2011-09	Western and central North Dakota	5/3/2011	State declared winter storm emergency	Unknown	Unknown
State EO 2011-11	North Dakota	5/13/2011	State declared winter storm disaster	Unknown	Unknown
USDA S3620	46 counties	1/1/2013 – continuing	Winter Storms, Ice Storms,	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
			Snow, Blizzard		
State EO	Southwest and Southcentral ND	10/15/2013	State declared winter storm emergency	Unknown	Unknown
State EO	North Dakota	10/22/2013	State proclaimed a winter storm disaster	Unknown	Unknown
DR 4154	Morton, Grant, Sioux, Hettinger, Adams, Bowman, and Slope counties	10/31/2013	Severe winter storm major disaster declaration	None	$5,712,342.81
USDA S3959	25 counties	1/1/2015 – continuing	Winter Storms, Ice Storms, Snow, Blizzard	Unknown	Unknown

Sources: Federal Emergency Management Agency, 2007; North Dakota Department of Emergency Services, 2007b; National Climatic Data Center, 2010; Interagency Hazard Mitigation Team Reports, varied dates; North Dakota Department of Emergency Services, 2007e; Federal Emergency Management Agency, 2010b, North Dakota Department of Emergency Services, 2010b; North Dakota Department of Emergency Services, 2010c, Federal Emergency Management Agency, 2012; North Dakota Department of Emergency Services, 2018, Federal Emergency Management Agency, 2018.

Legend: * Federal Share (includes Individual and Family Grant, Disaster Housing, Manufactured Housing, Crisis Counseling Immediate and Regular Programs, Disaster Unemployment Assistance, Hazard Mitigation Grant Program, Public Assistance, FEMA Mission Assignments, and SBA Home, Business, and Economic Injury Loans; primarily includes flood impacts; ^ preliminary numbers, subject to change.

Table 7.4.10-2 North Dakota Winter Weather Property Damages, Events, Deaths, and Injuries

County	Property Damages	# of Events	Deaths	Injuries
Morton	$19,003,000	70	1	0
Grant	$16,750,000	61	0	0
Sioux	$8,992,000	63	0	0
Adams	$4,785,000	56	0	0
McIntosh	$3,050,000	63	0	0
Hettinger	$2,556,000	58	1	1
Burleigh	$2,025,000	60	0	0
Richland	$2,023,000	112	0	0
Bowman	$1,825,000	59	0	7
Dunn	$1,662,000	74	0	0
Oliver	$1,271,000	61	0	0
Williams	$1,235,000	69	1	0
Emmons	$1,100,000	60	0	0
Billings	$1,044,000	62	0	0
Slope	$1,005,000	57	0	0
McKenzie	$859,000	72	0	0
Dickey	$821,000	74	0	0
Mountrail	$729,000	82	0	0
Sheridan	$700,000	79	0	0
Stark	$685,000	57	0	0
Divide	$623,000	67	0	0
Burke	$610,000	76	0	0

County	Property Damages	# of Events	Deaths	Injuries
LaMoure	$500,000	77	0	0
McLean	$450,000	77	0	0
Cavalier	$414,000	117	0	0
Ramsey	$414,000	118	0	0
Towner	$414,000	112	0	0
Pembina	$402,000	120	0	0
Walsh	$402,000	235	0	0
Cass	$300,000	123	0	0
Ward	$300,000	91	3	6
Barnes	$272,000	120	0	0
Ransom	$272,000	111	0	0
Sargent	$272,000	104	0	0
Mercer	$203,000	67	0	0
Golden Valley	$161,000	57	0	0
Rolette	$150,000	89	0	0
Bottineau	$130,000	94	0	0
Logan	$123,000	64	0	0
Pierce	$110,000	89	0	0
Renville	$108,000	88	0	0
McHenry	$100,000	95	0	0
Benson	$14,000	119	0	0
Eddy	$14,000	114	0	2
Grand Forks	$5,000	117	0	0
Traill	$3,000	114	0	0
Griggs	$2,000	114	0	0
Nelson	$2,000	114	0	0
Steele	$2,000	109	0	0
Foster	$0	89	0	0
Kidder	$0	69	0	0
Stutsman	$0	82	0	0
Wells	$0	87	0	0

Source: NCEI Storm Events Database, 2018

Table 7.4.10-3 Claims Paid for Collapse on State Facilities and Other Critical Facilities Insured by the State, 1989-2013

County	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
Barnes	$2,846,226	$0	$0	$1,150	$50,804.5700
Benson	$0	$0	$0	$0	$5,000.0000
Bottineau	$3,909	$0	$0	$0	$0
Bowman	$0	$0	$0	$0	$1,154.4100
Burleigh	$12,827	$0	$0	$0	$8,978.9600
Cass	$0	$0	$2,752	$301,447	$200.9500
Dickey	$0	$0	$0	$1,002	$0
Divide	$0	$0	$0	$5,764	$0
Dunn	$0	$0	$0	$0	$59,377.7800
Eddy	$0	$0	$0	$3,236	$0
Foster	$0	$0	$0	$735	$0
Grand Forks	$0	$0	$0	$62,143	$1,758.2900
Grant	$0	$0	$0	$3,601	$0
Griggs	$0	$0	$0	$0	$5,769.5400
McHenry	$0	$0	$0	$0	$1,971.8100

County	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
Morton	$0	$0	$0	$0	$3,481.0000
Oliver	$0	$0	$0	$0	$824.7900
Ramsey	$0	$0	$0	$0	$8,748.0000
Sioux	$0	$0	$0	$0	$10,498.2400
Stutsman	$0	$0	$0	$0	$1,833.0000
Traill	$0	$0	$0	$0	$16,506.9300
Walsh	$0	$0	$0	$0	$3,924.6200
Wells	$0	$0	$0	$0	$4,010.0000
Total	$2,862,962	$0	$2,752	$379,078	$184,842.8900

Source: North Dakota Tornado and Fire Fund, 2013

Table 7.4.10-4 Projected Population Change from 2010 to 2030 and Severe Winter Weather Events by County

County	2010 Population	2030 Population	Percent Change	# Events 2000-2018	Property Damage 2000-2018
McKenzie	6,360	23,492	269%	72	$859,000
Williams	22,398	59,276	165%	69	$1,235,000
Mountrail	7,673	15,587	103%	82	$729,000
Dunn	3,536	6,654	88%	74	$1,662,000
Stark	24,199	45,329	87%	57	$685,000
Divide	2,071	3,414	65%	67	$623,000
Burke	1,968	3,098	57%	76	$610,000
Billings	783	1,179	51%	62	$1,044,000
Ward	61,675	91,644	49%	91	$300,000
Cass	149,778	214,719	43%	123	$300,000
McHenry	5,395	7,461	38%	95	$100,000
Sioux	4,153	5,682	37%	63	$8,992,000
Burleigh	81,308	110,932	36%	60	$2,025,000
Golden Valley	1,680	2,270	35%	57	$161,000
Grand Forks	66,861	89,081	33%	117	$5,000
Morton	27,471	36,006	31%	70	$19,003,000
Hettinger	2,477	3,178	28%	58	$2,556,000
Rolette	13,937	17,556	26%	89	$150,000
McLean	8,962	11,275	26%	77	$450,000
Benson	6,660	8,075	21%	119	$14,000
Bowman	3,151	3,750	19%	59	$1,825,000
Renville	2,470	2,911	18%	88	$108,000
Slope	727	847	17%	57	$1,005,000
Towner	2,246	2,527	13%	112	$414,000
Bottineau	6,429	7,200	12%	94	$130,000
Sargent	3,829	4,288	12%	104	$272,000
Mercer	8,424	9,283	10%	67	$203,000
Oliver	1,846	1,973	7%	61	$1,271,000
Richland	16,321	17,406	7%	112	$2,023,000
Pierce	4,357	4,641	7%	89	$110,000
Ramsey	11,451	12,007	5%	118	$414,000
Eddy	2,385	2,455	3%	114	$14,000
Foster	3,343	3,434	3%	89	$0
Logan	1,990	2,033	2%	64	$123,000

County	2010 Population	2030 Population	Percent Change	# Events 2000-2018	Property Damage 2000-2018
Barnes	11,066	11,263	2%	120	$272,000
Stutsman	21,100	21,379	1%	82	$0
Sheridan	1,321	1,316	0%	79	$700,000
Traill	8,121	8,064	-1%	114	$3,000
Ransom	5,457	5,408	-1%	111	$272,000
Adams	2,343	2,317	-1%	56	$4,785,000
McIntosh	2,809	2,751	-2%	63	$3,050,000
Wells	4,207	4,109	-2%	87	$0
Kidder	2,435	2,355	-3%	69	$0
LaMoure	4,139	4,002	-3%	77	$500,000
Walsh	11,119	10,749	-3%	235	$402,000
Steele	1,975	1,882	-5%	109	$2,000
Dickey	5,289	5,031	-5%	74	$821,000
Grant	2,394	2,207	-8%	61	$16,750,000
Cavalier	3,993	3,643	-9%	117	$414,000
Emmons	3,550	3,232	-9%	60	$1,100,000
Nelson	3,126	2,828	-10%	114	$2,000
Pembina	7,413	6,267	-15%	120	$402,000
Griggs	2,420	2,039	-16%	114	$2,000

Source: North Dakota Department of Commerce and NCEI Storm Events Database, 2018

Table 7.4.10-5 Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Adams	H	$2,602,047 in structures at risk
Oliver	H	$273 in potential property impacts; residents in mobile homes most at risk
Fort Berthold^	H	Specific impacts not listed; general loss of life and property
City of Bismarck	H	Specific impacts not listed; general loss of life and property
Burke	H	$28,835,585 in building exposure
Divide	H	$36,029,019 in building exposure
Renville	H	$373k in building exposure, $3.2m in livestock exposure, $396 in annual crop losses
Bowman	H	$5.2 in potential damages
Sheridan	H	$54k in annual property damages, $724 in crop damages annually
Standing Rock^ (And Sioux)	H	$609.6k annually throughout the planning area, 3,215 people under 20 years of age, 722 above 65 years of age, 392 mobile homes
Cavalier	H	$674k in building exposure, $2.4m in livestock, $252m in crops likely to be impacted
Nelson	H	$77m in potential crop exposure, $486 in building exposure, $8m in livestock exposure
Grant	H	$882k property damage annually, $24,305 crop damage annually
Billings	H	$89m regionally
Dunn	H	$89m regionally
Golden Valley	H	$89m regionally

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Stark	H	$89m regionally
Bottineau	H	$974,645 in property exposure, $2,806 in annual crop losses
Steele	H	~700 residents over the age of 65
Walsh	H	1,090 people at risk of displacement, 466 mobile homes
McLean	H	1,510 people with enhanced vulnerability to severe winter weather, market value of livestock $22.7m, stranded motorists
Slope	H	100K in potential damages
Towner	H	15 mobile homes, 33 persons potentially impacted; nursing homes most at risk from power losses, 560 residents above the age of 65
Ransom	H	160 occupied mobile homes, 370 persons impacted by direct damages, 1,125 residents over the age of 65
Williams	H	190 workforce lodging facilities with a total population of 18,235, travel delays affecting 39,736 people in workforce, $11m in livestock at risk
Dickey	H	2,054 single-family homes, 1,347 mobile homes, 460 multifamily units at risk
Kidder	H	20.8% of the population is above the age of 65
LaMoure	H	291 people at risk, 128 mobile homes
McIntosh	H	34% of population is over 65, 5% under 5
Grand Forks	H	34,749 people at risk of power outages
Mercer	H	581 mobile homes, 1,550 people above the age of 65, $20.4m in livestock
Benson	H	596 residents over 65 and under 18
Stutsman	H	749 mobile homes potentially impacted, 23.3% under the age of 20, and 17.1% above the age of 65
Foster	H	98 manufactured homes at risk, $1,178 annually in damages
Griggs	H	Elderly populations, older buildings most at risk
Burleigh	H	Specific impacts not listed; general loss of life and property
Emmons	H	Specific impacts not listed; general loss of life and property
Logan	H	None specifically listed. General loss of life and damage.
McHenry	H	Specific impacts not listed; general loss of life and property
McKenzie	H	Specific impacts not listed; general loss of life and property
Eddy	H	Population at risk: 602 under 20 years old, 507 above 65, along with crop and infrastructure
Barnes	H	Possible 639 people displaced
Hettinger	H	Specific impacts not listed; general loss of life and property

Jurisdiction	Ranking (High, Medium, Low)	Loss Information
Pembina	H	Specific impacts not listed; general loss of life and property
Pierce	H	Specific impacts not listed; general loss of life and property
Richland	H	Specific impacts not listed; general loss of life and property
Rolette	H	Specific impacts not listed; general loss of life and property
Turtle Mountain^	H	Whole population potentially impacted, no specifics listed
Traill	M	$1.2b in building exposure, $177.2m in crop exposure
Ramsey	M	$1.4m in building exposure, $2.4m in livestock exposure, $11.7k in annual crop losses
Sioux	M	$609.6k annually throughout the planning area
Sargent	M	91 mobile homes potentially impacted
Cass	M	Specific impacts not listed; general loss of life and property
Wells	M	Population at risk: 716 under 20 years old, 514 above 65, along with crops and infrastructure
Mountrail	M	Specific impacts not listed; general loss of life and property
Spirit Lake	M	Specific impacts not listed; general loss of life and property
Ward	M	Specific impacts not listed; general loss of life and property
Morton	L	Specific impacts not listed; general loss of life and property

^ Includes only North Dakota parts of the reservation

7.4.11 Space Weather

Table 7.4.11-1 NOAA Space Weather Scale for Geomagnetic Storms

Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
G 5	**Extreme**	**Power systems:** widespread voltage control problems and protective system problems can occur; some grid systems may experience complete collapse or blackouts. Transformers may experience damage. **Spacecraft operations:** may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. **Other systems:** pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.)**.	Kp = 9	4 per cycle (4 days per cycle)
G 4	**Severe**	**Power systems:** possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. **Spacecraft operations:** may experience surface charging and tracking problems, corrections may be needed for orientation problems. **Other systems:** induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.)**.	Kp = 8, including a 9-	100 per cycle (60 days per cycle)
G 3	**Strong**	**Power systems:** voltage corrections may be required; false alarms triggered on some protection devices. **Spacecraft operations:** surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. **Other systems:** intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.)**.	Kp = 7	200 per cycle (130 days per cycle)
G 2	**Moderate**	**Power systems:** high-latitude power systems may experience voltage alarms; long-duration storms may cause transformer damage. **Spacecraft operations:** corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. **Other systems:** HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.)**.	Kp = 6	600 per cycle (360 days per cycle)

Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
G 1	**Minor**	**Power systems:** weak power grid fluctuations can occur. **Spacecraft operations:** minor impact on satellite operations possible. **Other systems:** migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine)**.	Kp = 5	1700 per cycle (900 days per cycle)

Source: NOAA Space Weather Prediction Center, http://www.swpc.noaa.gov/NOAAscales/#GeomagneticStorms
* The Kp-index used to generate these messages is derived from a real-time network of observatories the report data to SWPC in near real- time. In most cases the real-time estimate of the Kp index will be a good approximation to the official Kp indices that are issued twice per month by the German GFZ (Research Center for Geosciences).
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings

Table 7.4.11-2 NOAA Space Weather Scale for Solar Radiation Storms

Scale	Description	Effect	Physical measure (Flux level of >= 10 MeV particles)	Average Frequency (1 cycle = 11 years)
S 5	**Extreme**	**Biological:** unavoidable high radiation hazard to astronauts on EVA; passengers and crew in high- flying aircraft at high latitudes may be exposed to radiation risk.*** **Satellite operations:** satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage to solar panels possible. **Other systems:** complete blackout of HF (high frequency) communications possible through the polar regions, and position errors make navigation operations extremely difficult.	10^5	Fewer than 1 per cycle
S 4	**Severe**	**Biological:** unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** **Satellite operations:** may experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. **Other systems:** blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.	10^4	3 per cycle
S 3	**Strong**	**Biological:** radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** **Satellite operations:** single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. **Other systems:** degraded HF radio propagation through the polar regions and navigation position errors likely.	10^3	10 per cycle
S 2	**Moderate**	**Biological:** passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.*** **Satellite operations:** infrequent single-event upsets possible. **Other systems:** small effects on HF propagation through	10^2	25 per cycle

Scale	Description	Effect	Physical measure (Flux level of >= 10 MeV particles)	Average Frequency (1 cycle = 11 years)
		the polar regions and navigation at polar cap locations possibly affected.		
S 1	**Minor**	**Biological:** none. **Satellite operations**: none. **Other systems:** minor impacts on HF radio in the polar regions.	10	50 per cycle

Source: NOAA Space Weather Prediction Center, http://www.swpc.noaa.gov/NOAAscales/#GeomagneticStorms

* Flux levels are 5-minute averages. Flux in particles·s^{-1}·$ster^{-1}$·cm^{-2}. Based on this measure, but other physical measures are also considered.

** These events can last more than one day.

*** High energy particle measurements (>100 MeV) are a better indicator of radiation risk to passenger and crews. Pregnant women are particularly susceptible.

7.4.12 Transportation Incidents

Previous Occurrences

- 1906 – Charles Service of Park River became North Dakota's first automobile fatality.
- 1945 – A train wreck on the outskirts of Michigan, North Dakota killed 34 people.
- 1968 – Eight teenagers were killed in a traffic accident near Jamestown.
- 1974 – The first attempted airplane hijack in the state occurred at the Grand Forks Airport.
- 2002: One of the most significant spills of anhydrous ammonia in North Dakota occurred near Minot. An excerpt from the associated National Transportation Safety Board reports that at approximately 1:37 a.m. on January 18, 2002, eastbound Canadian Pacific Railway freight train 292-16, traveling about 41 mph, derailed 31 of its 112 cars about ½ mile west of the city limits of Minot, North Dakota. Five tank cars carrying anhydrous ammonia, a liquefied compressed gas, catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. About 11,600 people occupied the area affected by the vapor plume. One resident was fatally injured, and 60 to 65 residents of the neighborhood nearest the derailment site were rescued. As a result of the accident, 11 people sustained serious injuries, and 322 people, including the two train crewmembers, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation.

Table 7.4.12-1: Transportation Infrastructure Analysis to Jurisdictions

County	Transportation Infrastructure
Adams	Moderate
Barnes	Moderate-High
Benson	Moderate
Billings	Moderate-High
Bottineau	Moderate
Bowman	Moderate
Burke	Moderate
Burleigh	High
Cass	High
Cavalier	Low-Moderate
Dickey	Moderate
Divide	Moderate
Dunn	Low-Moderate
Eddy	Moderate
Emmons	Moderate
Foster	Moderate
Golden Valley	Moderate-High
Grand Forks	High
Grant	Low-Moderate
Griggs	Low-Moderate
Hettinger	Low-Moderate
Kidder	Moderate-High
LaMoure	Moderate
Logan	Low-Moderate
McHenry	Moderate
McIntosh	Low-Moderate
McKenzie	Moderate
McLean	Moderate
Mercer	Low-Moderate
Morton	Moderate-High

County	Transportation Infrastructure
Mountrail	Moderate
Nelson	Moderate
Oliver	Low-Moderate
Pembina	Moderate-High
Pierce	Moderate
Ramsey	Moderate-High
Ransom	Low-Moderate
Renville	Moderate
Richland	Moderate-High
Rolette	Moderate
Sargent	Low-Moderate
Sheridan	Moderate
Sioux	Low-Moderate
Slope	Moderate
Stark	High
Steele	Low-Moderate
Stutsman	Moderate-High
Towner	Moderate
Traill	Moderate-High
Walsh	Moderate-High
Ward	Moderate-High
Wells	Moderate
Williams	Moderate-High

Table 7.4.12-2: NDDOT Motor Vehicle Crash Data Per County, 2016

County Name	Total Injuries	Total Fatalities	Total Crashes
Adams	11	0	33
Barnes	75	2	206
Benson	10	3	32
Billings	7	1	32
Bottineau	33	2	81
Bowman	0	0	4
Burke	13	2	36
Burleigh	756	6	2,758
Cass	1,204	5	3,998
Cavalier	14	1	42
Dickey	16	3	52
Divide	9	3	29
Dunn	43	1	108
Eddy	8	0	32
Emmons	19	0	54
Foster	6	0	26
Golden Valley	5	2	25
Grand Forks	443	1	1,469
Grant	14	1	29
Griggs	5	3	17
Hettinger	13	0	21
Kidder	31	2	72
La Moure	19	1	42
Logan	4	0	14
McHenry	39	3	82
McIntosh	7	0	30

County Name	Total Injuries	Total Fatalities	Total Crashes
McKenzie	128	8	354
McLean	66	6	122
Mercer	37	4	119
Morton	172	9	644
Mountrail	45	8	119
Nelson	13	1	40
Oliver	4	0	3
Pembina	27	0	67
Pierce	16	2	30
Ramsey	68	2	174
Ransom	15	2	51
Renville	16	1	18
Richland	91	4	230
Rolette	22	6	27
Sargent	20	0	27
Sheridan	2	0	17
Sioux	23	2	40
Slope	4	0	7
Stark	132	3	683
Steele	2	0	6
Stutsman	161	3	553
Towner	0	0	1
Traill	34	0	117
Walsh	42	3	147
Ward	445	6	1,249
Wells	15	0	47
Williams	210	1	801
Statewide	4,614	113	15,017

Source: *2018 North Dakota Highway Safety Plan*, North Dakota Department of Transportation

Construction Projects Underway

Bismarck District:

- ND Highway 3 from Steele to Tuttle
- ND Highway 200 from Denhoff to the Hurdsfield
- ND Highway 200 from Mercer to the east of McClusky
- ND Highway 6 from junction of ND Highway 21 to Mandan

Devils Lake District:

- ND Highway 20 in Devils Lake
- ND Highway 20 frontage roads in Devils Lake
- US Highway 281 from west of Fort Totten to south of Minnewaukan
- Downtown Devils Lake
- US Highway 2 southeast of Devils Lake
- ND Highway 30 from Maddock to junction of ND Highway 19
- ND Highway 57 from the junction of US Highway 281 to Fort Totten

Dickinson District:

- Billings County Little Missouri River Crossing Draft Environmental Impact Statement
- ND Highway 8 from Richardton to south of Halliday
- ND Highway 16 from Beach to 2 miles north of Beaver Creek

- Bridge work at the east and west Medora Interchanges

Fargo District:

- Exit 346 (Sheyenne St) interchange and Sheyenne Street from 32nd Ave to 19th Ave in West Fargo
- I-29 southbound from north of Galchutt to Christine
- 10th St from 4th Ave N to 12th Ave N in Fargo
- US Highway 81 (University Dr) from south of I-94 to 18th Ave in Fargo
- ND Highway 18 five miles north of Lidgerwood
- West Fargo Interchange Exit 343
- Intersection of 9th St E and 13th Ave S in West Fargo

Grand Forks District:

- Kennedy Bridge on US Highway 2 over the Red River in Grand Forks
- Pembina Border Crossing improvements on I-29 northbound
- I-29 northbound from north of Grand Forks to Oslo
- US Highway 2 eastbound from Lakota to Michigan
- US Highway 81 from north of St. Thomas to Hamilton
- Washington St from Hammerling to 8th Ave in Grand Forks

Minot District:

- U.S. 83/Broadway Bridge Replacement
- US Highway 83 Northwest Bypass in Minot
- Burdick Expressway from 9th Street SE to 15th Street SE in Minot
- US Highway 2 at 42nd St SE in Minot
- US Highway 52 from south of Donnybrook to Brooks Junction
- ND Highway 3 from Hurdsfield to Harvey
- US Highway 52 from Harvey to Fessenden
- ND Highway 50 from north of Lostwood to the junction of US Highway 52

Valley City District:

- I-94 eastbound from west of Crystal Springs to east of Cleveland
- I-94 westbound near Exit 290 in Valley City

Williston District:

- US 85 – I-94 to Watford City Bypass
- New Town NW Truck Reliever Route
- ND Highway 1804 from County Road 5 to County Road 21
- ND Highway 73 three miles west of the junction of ND Highway 22
- US Highway 2 eastbound from Williston north 10 miles
- ND Highway 23A in Watford City
- ND Highway 1804 from the east side of Williston to Epping
- US Highway 2 from 32nd Ave to 11th St in Williston

Table 7.4.12-3: Hazard Ranking and Loss Information in Local and Tribal Hazard Mitigation Plans

County	Ranking (High, Medium, Low)	Loss Information
Adams	M	None specifically listed; general loss of life and damage
Barnes	M	None specifically listed; general loss of life and damage
Benson	L	None specifically listed; general loss of life and damage

County	Ranking (High, Medium, Low)	Loss Information
Billings (B,D,GV,S)	M	None specifically listed; general loss of life and damage
Bismarck, City of	L-M	None specifically listed; general loss of life and damage
Bottineau	M	$5.8m per fatality, $84K per injury, general loss of life and property
Bowman	M	Areas within 0.25 miles of major highways or rail lines
Burke	M	No significant impact.
Burleigh	M	None specifically listed; general loss of life and damage
Cass	NI	N/A
Cavalier	NI	N/A
Dickey	H	Possible damage to infrastructure
Divide	M	No significant impact
Dunn (B,D,GV,S)	NL	None specifically listed; general loss of life and damage
Eddy	M	66 crashes per year.
Emmons	M	None specifically listed; general loss of life and damage
Fort Berthold^	M	None specifically listed; general loss of life and damage
Foster	M	5 traffic fatalities per year
Golden Valley (B,D,GV,S)	M	None specifically listed; general loss of life and damage
Grand Forks	M	5 traffic fatalities per year
Grant	L	Approximately 30 crashes per year
Griggs	M	27 accidents per year
Hettinger	NL	None specifically listed; general loss of life and damage
Kidder	M	Fatalities and injuries possible, costing upwards of $19m
Lake Traverse^	NP	NP
LaMoure	H	None specifically listed. General loss of life and damage.
Logan	L	Several dozen crashes per year
McHenry	L	None specifically listed; general loss of life and damage
McIntosh	L	None specifically listed; general loss of life and damage
McKenzie	M	None specifically listed; general loss of life and damage
McLean	NI	N/A
Mercer	NI	N/A
Morton	L	None specifically listed; general loss of life and damage
Mountrail	NI	N/A
Nelson	M	Several dozen crashes per year

County	Ranking (High, Medium, Low)	Loss Information
Oliver	L	Entire population at risk; death and injury possible
Pembina	L	None specifically listed; general loss of life and damage
Pierce	H	None specifically listed; general loss of life and damage
Ramsey	L	Entire population at risk; death and injury possible
Ransom	NI	N/A
Renville	M	$57k per non-fatal crash, $6m per fatal crash
Richland	M	None specifically listed; general loss of life and damage
Rolette	L	None specifically listed; general loss of life and damage
Sargent	M	Highway intersections have the highest chance of impacts
Sheridan	NI	N/A
Sioux	H	7 crashes involving property, 5 injuries, 2 fatalities per year throughout the planning area
Slope	L	Areas within 0.25 miles of major highways or rail lines
Spirit Lake	H	Traffic delays, injuries, and deaths possible. Specifics not listed
Standing Rock^ (And Sioux)	L	12 crashes per year, weekly "fender benders", injuries and fatalities possible
Stark (B,D,GV,S)	M	None specifically listed; general loss of life and damage
Steele	H	$54,700 per non-injurious crash, $214k per injury crash, $6m per fatal crash
Stutsman	M	671 accidents per year, injuries, and fatalities possible
Towner	NI	N/A
Traill	L	None specifically listed; general loss of life and damage
Turtle Mountain^	NI	N/A
Walsh	NI	N/A
Ward	NI	N/A
Wells	H	135 crashes per year
Williams	NI	N/A

^Includes only part of the North Dakota parts of the reservation

Appendix 7.5 2014-2016 Progress Report: Mitigation in North Dakota

The following pages include the 2014-2016 Progress Report: Mitigation in North Dakota is included as an attachment to this appendix. Page numbering of this document will not be continuous into this attachment.

The document can be found online at: https://www.des.nd.gov/sites/www/files/documents/docs/HLS-RECOV-Tab_3_2014-2016_Progress_Report_Mitigation_in_ND_(006)_20170901.pdf.

Appendix 7.6 Execution

7.6.1 Mitigation Progress

Table 7.6-1 2014 Mitigation Action Status

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-1	Mitigation Planning	**NDDES:** Initiated outreach to help local and tribal emergency managers build stronger MHMPs that meet or exceed federal requirements. All 53 counties, 1 city and 4 tribal nations either have plans approved or under development or are interested in applying for grants. Conducted training on the THIRA to underscore its use in mitigation planning. Conducted G318 Hazard Mitigation Workshop in 2015 and 2017 to guide emergency managers and contractors through the mitigation planning process. Tailored workshops to meet participant needs as followed: - 2015 – Included presentations on the NFIP and RiskMAP; and the value of cultural and historical organizations for plan development, presented by the State Historical Society of North Dakota and the Plains Art Museum in Fargo, ND. - 2017 –Moved course to Dickinson where several plans are due within the next few years. Featured presentations included fire mitigation and the 2009 Dickinson tornado. Conducted a field trip to South Heart River south of Dickinson and Red Trail Energy LLC in Richardton to discuss vulnerabilities and potential mitigation actions. **NDFS:** Provides technical assistance to local and tribal jurisdictions regarding fire data and living snow fence strategies. **NDSWC:** Communicates flood risk and enforces NFIP regulations based on the Flood Insurance Rate Maps developed by FEMA. Assists communities with their floodplain development ordinances, while encouraging higher standards to create a more flood-resilient community. Provides training and guidance to local floodplain administrators and private individuals. **NDDA:** Grew partnerships with emergency managers with Commissioner Doug Goehring's appointment of an Agricultural Emergency Management Specialist. Provided requested support to one jurisdiction with its mitigation plan. Laid groundwork with groups of emergency managers to evaluate local needs and brainstorm future local and state capabilities to handle a variety of agricultural-related disasters and impacts. Conducted presentations at the N.D. Emergency Management Association and NDDES Hazardous Materials Conference in 2014, outlining special topics and resources available. In 2016, continued to grow partnerships with emergency managers with Commissioner Goehring's appointment of an Agricultural Emergency Management Specialist. Expanded groundwork with groups of emergency managers to continue evaluating local needs and brainstorm future local and State capabilities to handle a variety of agricultural-related disasters and impacts. Conducted presentations as requested outlining special topics and resources available from NDDA. **NDSFM:** Conducts fire investigation and prevention services at the state, local, and tribal levels in order produce information and data to understand fire hazards and vulnerabilities of communities to fire. Provides fire data to assist mitigation planners in plan development and updates. **NDSU Extension Service:** Supported local and tribal mitigation plan development by providing agricultural-related data, such as soils and water conditions.	**State Climatologist:** The state climatologist is currently assisting NDDES with the state hazard mitigation plans in drought, flood, severe summer storms and winter storms, and space weather. **NDDA:** NDDA has continued to seek opportunities to connect with emergency managers with Commissioner Doug Goehring's continued support of an Agricultural Emergency Management Specialist at NDDA. It has continued to identify strengths and gaps from emergency managers to evaluate local needs and brainstorm future local and state capabilities to handle a variety of agricultural related disasters and impacts. It has conducted presentations, reviewed plans or resources or shared information as requested outlining special topics and resources available from NDDA. **NDSWC:** Ongoing
2014-2	Mitigation Planning with Cultural and Historical Preservation Component	**NDDES:** Coordinated with the FEMA, SHSND and Plains Art Museum of Fargo to emphasize the role of cultural and historical preservation organizations as a mitigation planning resource during the 2015 G318 Hazard Mitigation Planning Workshop. Encourage local and tribal mitigation planners to involve cultural and historical organizations as part of their planning teams. **SHSND:** Collaborated with the Plains Art Museum of Fargo staff to develop and provide a presentation for a G318 Hazard Mitigation Planning Workshop course outlining mitigation planning support available through cultural and historical organizations. **NDSU Extension Service:** Provides soil testing and instructional guidance on soil testing prior to composting of animals.	Ongoing

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2014-3	Data Digitization	**NDDES:** Continued development of a statewide seamless base map with spatially accurate digital imagery to one foot and sub- meter accuracy with vectors for all roads and improved trails. The map will be the foundation for unlimited data sets to support preparedness, response, recovery and mitigation planning initiatives. **ND ITD:** Continued data digitization efforts. ITD stores the data for various agencies and it is then available via the GIS system. **ND ITD:** Continued to maintain inundation and flood risk maps with its current filing system and is working to centralize these geospatial files. **NDDOT:** Supported development of the statewide base map as resource for hazard mitigation. **NDSFM:** Conducts fire investigations and inspections to improve the understanding of fire risk reduction by analyzing digital data and information collected through fire hazard assessments. Conducts fire investigations and inspections to improve the understanding of fire risk reduction by analyzing digital data and information collected through the National Fire Incident Reporting System, which is a requirement of the United States Fire Administration. In addition, fire investigations may use fire modeling programs such as Fire Dynamic Simulator, Smoke View, and FDS and EVAC software to visualize driven fluid flow patterns of smoke and heat transport from fires. **NDDoH:** Collaborates with NDDES to maintain database of service areas for certified emergency medical service providers. **NDDA:** Verified and maintained apiary updates (hive locations) and noxious weed updates. NDDA continues to maintain these GIS based-data products. **NDFS:** Continues to quantify forested acres including windbreaks, riparian areas and community trees in smaller towns. **ND Department of Mineral Resources:** Oil and Gas Division - Provide communication with partner entities and mapping capabilities as the agency with expertise in mineral development in the state.	**NDDOT:** supported completion of statewide base maps as a resource for hazard mitigation. No longer have the capability for computer fire modeling (smoke view, etc.). However, funds not in place to keep anticipated maintenance schedule for map. Routable network developed has potential for hazard mitigation. Currently, being used by NDDOT for Snow Plow route optimization. **NDDA**: continued verification and maintained apiary updates (hive locations) and noxious weed updates. NDDA continues to maintain these GIS based data products, while exploring opportunities to utilize this visual aid to present additional information, like the use of GIS to display producer contact information from Hay Hotline in times of drought. **NDSWC:** Ongoing, we have all the old paper FIRM, but FEMA has added them to their Map Service Center to make them more accessible.
2014-4	Debris Management Plans	**NDDoH:** Coordinated with the North Dakota Solid Waste and Recycling Association to develop debris management workshops. Discussed debris management planning with emergency managers and invited their participation at workshops. **NDDES:** Coordinated with NDDoH to conduct outreach with the emergency managers to encourage development of debris managements plans.	**NDDoH:** Continue to coordinate with the North Dakota Solid Waste and Recycling Association on presenting debris management during workshops. Discuss debris management planning with emergency managers and invite their participation at these workshops.
2014-5	Public Education	**NDDES:** Initiated the Ready for Winter Weather and Resolve to be Ready campaigns during 2014-2016 and supported the hazardous materials conference in October 2014 and 2016. **NWS:** Bismarck and Grand Forks Offices -- Continue to support awareness weeks across the state of North Dakota. Severe Summer Weather Awareness Week was April 28 – May 2, 2014 and Severe Winter Weather Awareness Week was October 27 – 31, 2014. Supported awareness weeks across the state of North Dakota. Awareness weeks for Severe Summer Weather and Severe Winter Weather were held in both 2015 and 2016. **DHS:** Promoted the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborated and/or assisted in conducting site vulnerability and security assessments to assess security postures, uncover. vulnerabilities and present options for consideration to mitigate vulnerabilities. Assists in developing, facilitating and promoting a statewide program for public and private infrastructure stakeholders with the U.S. DHS "See Something Say SomethingTM" campaign. **NDSWC:** In addition to ongoing efforts, added a flood risk aspect to its water education program targeting grade and middle schoolers. The NDSWC hired a PIO in 2014 to coordinate information and educate the public about the activities of the NDSWC **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with the public.	**NDSWC:** In May 2018 the NDSWC engaged in a public awareness campaign to educate the public on the dangers of low head dams in conjunction with National Dam Safety Awareness Day. **NWS:** The Bismarck and Grand Forks Offices have continued to support seasonal severe weather awareness weeks in 2017 and 2018. **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.

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2014-6	Support Local Zoning	**NDDoC, NDDES, and NDSWC:** Provided technical support to local and tribal mitigation planners; identified need to evaluate development of strategies regarding facility placement, building permits and zoning. Encouraged local and tribal mitigation planners to include land use experts as part of the mitigation planning teams.	**NDDoC:** The agency has initiated the three-year process to update the State Building Code. **NDDES and NDSWC**: both agencies continue to promote implementation of zoning ordinances and building codes as good mitigation practices.
2014-7	Local Mitigation Effectiveness	**NDDoC, NDDES, and NDSWC:** Encouraged local and tribal mitigation planners to outline methods to incorporate risk assessment data and mitigation actions into master/comprehensive plans, in keeping with federal mitigation planning requirements. Identified the need to develop recommendations for outreach to local and tribal jurisdictions to promote disaster resistance measures as part of future development. **NDSFM:** Supports state, local and tribal jurisdictions to provide zoning of land in order to reduce fire hazard abatement prior to using the land to construct buildings, which may pose undue risks to disaster mitigation and management practices. Encourages state, local and tribal jurisdictional zoning, planning board, and commissions to adopt and regulate fire, building, residential, mechanical, gas, plumbing and electrical codes and ordinances through the master or comprehensive planning processes, which recognizes the communities' vulnerability to fires, and can effectively and efficiently abate the fire risk by implementing zoning and land management policies and practices to encourage construction and maintenance of fire resistive structures and infrastructures. Supports state, local and tribal jurisdictions to adopt the most recent fire, building, residential, mechanical, gas, plumbing and electrical codes in order to maintain an effective and efficient fire hazard abatement mitigation policy.	Ongoing
2014-8	Local Master/Comprehensive Plans	**NDDES:** Encouraged local and tribal mitigation planners to consider discussing building codes and zoning ordinances when developing/updating mitigation plans; nearly all plans reviewed in late 2013 and 2014 identified the need to review outdated building codes and zoning ordinances with planning teams and developing mitigation actions to evaluate these codes and ordinances. Efforts continued in 2015 and 2016. **NDDoC:** Helps local jurisdictions to ensure adoption and implementation of building codes; provided guidance and sample ordinances to communities.	Ongoing
2014-9	North Dakota Silver Jackets	**NDSWC:** Recorded the following: - Completed the James River investigations study and LiDAR for the basin. - Completed Knife River and Beaver Creek HandH studies. - Accomplished the Sheyenne River hydrologic and hydraulic analysis for the stretch from Baldhill Dam through Valley City in support of Valley City flood protection. - Supported the Mouse River Enhanced Flood Protection Project with numerous studies; completed the HandH model for the entire basin. The U.S. Army Corps of Engineers is developing a new unsteady state model for the entire basin (US and Canada). **USACE:** Recorded the following: - Completed Mouse (Souris) River Hydrometeorological Data Network Analysis Study. - Completed the Mouse River SWIF/Interim Risk Reduction Measures Study. - Completed pre-flood Planning Information Packages (including Burlington, Sawyer, and Velva). - Completed the Emergency Action Plan Guidebook Template. - Completed the Red River of the North – Design Handbook for Earthen Ring Berms. - Initiated the Mouse River Flood Plain Rural Structures Inventory which is in progress. - Completed the on-structural Flood Risk Reduction measures workshop. Completed the Mouse River Basin Emergency Action Plan Workshops in June 2015. - Began the Mouse River Unsteady Flow HEC-RAS Model – began June 2015 – Ongoing. - Completed Mouse River hydrology (HEC-HMS) and hydraulics (HEC-RAS) models under the FPMS (while not Silver Jackets, it is a related activity). - Initiated the Mouse River flood Inundation Mapping Project, Phase 1, Burlington to Verendrye.	**NDSWC and USACE:** For this project: the James River Feasibility study and LiDAR acquisition for the James River Basin has been completed; the Knife River and Beaver Creek HandH studies for Corps Section 22 studies has been completed; the Sheyenne River hydrologic and hydraulic analysis for the stretch from Baldhill Dam through Valley City in support of Valley City flood protection/Corps Feasibility Study has been completed; the Mouse (Souris) River Hydrometeorological Data Network Analysis Study has been completed; the Mouse River SWIF/Interim Risk Reduction Measures Study has been completed; the pre-flood Planning Information Packages (including Burlington, Sawyer, and Velva) has been completed, the Emergency Action Plan Guidebook Template for cities and counties has been completed; the Red River of the North – Design Handbook for Earthen Ring Berms has been completed; the Mouse River Flood Plain Rural Structures Inventory has been initiated; the non-structural Flood Risk Reduction measures workshop and

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			Emergency Action Plan Workshops for the Mouse River Basin and Joint Water Resource District has been completed; the Mouse River Unsteady Flow HEC-RAS Model is ongoing; the Mouse River hydrology and hydraulics models for ND Mouse River Basin is ongoing; the Mouse River flood Inundation Mapping Project, Phase 1, Burlington to Verendrye has been completed; the Flood Specific Emergency Action Plan Workshops throughout the Red River Basin from Pembina to Wahpeton has been completed; the Mouse River Rural Structure Inventory Study has been completed; Phase 1 Mouse River Flood Inundation Mapping Project for Souris River Joint Board has been completed; Phase 2 Mouse River Flood Inundation Mapping Project for Souris River Joint Board has been completed; Phase 3 Mouse River Flood Inundated Mapping Project for Souris River Joint Board has been requested; Phase 1 Red River Datum Conversion Project for Red River Basin has been initiated and completed; Phase 2 Red River Datum Conversion Project approval is in progress; non-structural Flood Risk Reduction Workshops in Linton and Beulah in support of Corps Section 22 Flood Risk Reduction Studies has been completed; Flood Specific Emergency Action Plan Workshops in Linton and Beulah in support of Corps Section 22 Flood Risk Reduction Studies has been completed. - Completed Flood Specific Emergency Action Plan Workshops in Jamestown and Lamoure. - Continue final stages of Corps Section 22 Flood Risk Reduction Studies for Emmons County Water Resource District. - Continue final stages of Corps Section 22 Flood Risk Reduction Studies for Mercer County Water Resource District. - Completed LiDAR acquisition for entire state of ND (at Quality Level III). - Initiated New LiDAR acquisition for the Red River Basin (at Quality Level II). - Preparing request for statewide Probable Maximum Precipitation Study in October 2018. - Support the Souris River Joint Board with request and support for the Mouse River Basin Corp Feasibility Study – currently underway.

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2014-10	Basin-wide Water Management Planning	**NDSWC:** Recorded the following: - Provide support to the Souris River in the form of the Minot Flood Control Project and address downstream concerns. - Continued support to the Devils Lake Basin by continued operation of the East and West End Outlets. - Updated the OHWM on the Missouri River north of Bismarck. - Continues to be an active participant in the MRRIC which includes the USACE and basin wide partners. - Continues to develop and improve models focusing on the Knife River, Beaver Creek, Pembina River, and other tributaries of the Red River. - Monitors water levels of several closed basin lakes including Rice Lake. - Completed the Central North Dakota Water Supply Project Alternative Study report which evaluates several options that would supplement the Red River Valley current water supply with Missouri River water. - Support Devils Lake, Red River, Missouri River, and Upper Sheyenne River basin joint boards to manage water on a watershed basis, with regular meetings, and the development of basin water management plans. - As part of the Red River Watershed Feasibility Study, hydrology models for all sub-watersheds in the Red River watershed in the U.S. have been updated. A distributed detention analysis is also being completed for each sub-watershed (only the Park River and Pembina River watersheds remain to be completed). The analysis will determine the amount of temporary flood water storage necessary to meet the 20% peak flood flow reduction on the Red River and the corresponding volume and peak flow reduction required for each sub-watershed. The 20% reduction goal is described in the RRBC Long Term Flood Study Report. Hydraulic models are also being updated in order to analyze hydrographs of various scenarios on the Red River and lower portions of each tributary. - The Corps of Engineers and the RRBC are co-chairing committees to develop/update a Comprehensive Watershed Management Plan and Natural Resources Framework Plan for the Red River watershed. **USACE:** Initiated development of a CWMP as part of the Corps specifically authorized Red River basin-wide feasibility study; the Minnesota Red River Watershed Management Board and the North Dakota Red River Joint Water Resource District are the study sponsors. See the "Comprehensive Study of the Red River Underway" portion of the 2014-2016 Progress Report: Mitigation in North Dakota.	**NDSWC:** The cost share for the Mouse River Enhanced Flood Protection Project, Fargo-Moorhead Area Diversion Project, and flood control projects in Grafton, Lisbon, and Valley City has been provides; The support for Devils Lake Basin by continued operation of the East and West End Outlets continues; active participation in the MRRIC which includes the USACE and basin wide partners continues; development and improvement of models focusing on the Knife River, Beaver Creek, and other rivers as needed continues; water levels of several closed basin lakes throughout the state is monitored; support Devils Lake, Red River, Missouri River, Upper Sheyenne River, and Souris River basin joint boards to manage water on a watershed basis, with regular meetings, and the development of basin water management plans continues; technical and cost share support to the Souris River Plan of Study, which is a three-year study to review the operating agreement for the Souris River Dams in Saskatchewan and North Dakota has been provided.

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2014-11	NFIP, RiskMap and CRS Program	**NDSWC:** Overseeing the project management of seven active FEMA Risk MAP projects through FEMA's CTP Program. Burleigh County received new Flood Insurance Rate Maps dated 8/4/2014. During 2014, 33 community assistance visits/contacts were made, in addition to the countless technical assistance that was provided on a daily basis to the 327 communities in ND who participate in the NFIP. The purpose of this strategy is to educate communities on flood risk, encourage enrollment in the program, identify risk, implement and maintain development regulations, and create FIRMs. Support the State's requirement for structures to be built at least one foot above the base flood elevation and encourage communities to adopt standards higher than the state and federal minimum NFIP requirements. Promote the CRS as a way to acknowledge the higher standards communities are implementing and extend a discount to flood insurance policy premiums. Provide guidance to communities who participate to ensure their achievement in the flood loss objectives of the NFIP. This is accomplished by providing technical assistance, evaluating community performance, implementing NFIP **NDDES:** Coordinated with the NDSWC to provide NFIP data to emergency managers regarding participation in the program as well as severe repetitive loss structures. Participated in CCO and Public House Meetings held by the NDSWC, NFIP, and RiskMAP Program for the development and implementation of new floodplain maps for western Cass County, to include the cities of Mapleton and Harwood, and also Ward County, to include the cities of Minot, Sawyer, and Burlington. Participated in the initial kickoff meetings for the development of LSBLE being developed by the NDSWC, NFIP and RiskMAP Program for the eastern 34 counties of North Dakota. The purpose of the LSBLE is to develop usable flood and risk analysis data for every stream mile in each of the identified counties. The level of analysis for each area is dependent on community development, flood risk and the need for base level data. **ND Insurance Department:** Encourages homeowners, business owners and political subdivision to purchase flood insurance if they have building property in areas known to flood.	**NDSWC:** During 2017, general technical assistance was provided over 250 times and community assistance visits and contacts were made an additional 31 times. These activities are important to continue positive local floodplain management activities and maintain compliance with state and federal regulations. Through these efforts, 3 new communities joined the NFIP, which brings the total number of participating communities in ND to 330. ND now has 12 communities participating in the CRS. This is a huge achievement, equating to $250,000 saved in flood insurance premiums each year! 72% of all NFIP insurance policies in ND are receiving a discount due to their community's commitment to floodplain management.
2014-12	Property Acquisition, Relocation, Elevation and Floodproofing	**NDSWC:** Continued effort to purchase properties impacted by the Mouse River Enhanced Flood Protection Project. This large-scale project entails purchasing vacant lots, businesses, homes and properties to make room for the flood protection planned for the City of Minot. Provide information regarding flood insurance claims and Increased Cost of Compliance. Encourage acquisition, relocation, elevation and floodproofing as mitigation measures while implementing NFIP regulations. **NDDES:** Guided communities to leverage the HMA Programs and CDBG to create green space along rivers and lakes by acquiring more than 1,400 properties in flood-prone areas. The estimated cost benefit is $386,400,000 using the national pre- determined benefit amount of $276,000 per property. Many of these properties were located in north central and northeastern North Dakota where it flooded in spring 2017.	**NDSWC:** Ongoing. NDDES works with PDM and HMGP. NDDES tracks repetitive flood losses.
2014-13	Dam Safety	Conducting an ongoing project to review and update the hazard classification of dams in the state, development of emergency action plan guidelines, and holding a Dam Engineering Fundamentals seminar with the goal of increasing the level of knowledge in the local engineering community regarding dams and dam safety.	**NDSWC:** NDSWC has recently begun a project to update outdated state dam design guidance to bring it in line with current state-of-the-practice. The agency is also in the process of updating hazard classification definitions and developing hazard classification guidelines.

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2014-14	Dam Status Review	**NDSWC:** Inspects non-federally owned high hazard and medium hazard dams and makes recommendations to the dam owners regarding necessary maintenance and repairs. The NDSWC also issues construction permits for the construction of new dams or modification of existing dams. An inventory of dams in the state and their status is also maintained. **BIA:** Ensures safe operations of dams by adhering to a schedule for maintenance and inspections. These efforts are in coordination with North Dakota's tribal nations. **US BOR:** Conducting an eight-year schedule for reviewing our three dams in North Dakota; E.A. Patterson Dam in Dickinson; Jamestown Dam; and Heart Butte Dam. Every fourth year of the cycle, the Reclamation conducts a PR and every eighth year a CR. An ASI is done on the remaining years. Jamestown is due for a CR in 2019, and Heart Butte and Patterson Dams are scheduled for a CR in 2018**.** **USACE:** Implemented new risk-informed inspections and evaluations. A periodic assessment (to be done every 10 years) was completed for Baldhill Dam in 2013; and one was conducted for Homme Dam in 2015. **ND Game and Fish Department:** Coordinates with the State Water Commission regarding safety checks, cost share issues and technical expertise regarding fisheries dams. **ND Department of Mineral Resources:** North Dakota Geological Survey, a division within Department of Mineral Resources, offers geotechnical expertise for the state. Specific topics include landslides and flood mapping repositories. **Natural Resource Conservation Service:** Assist the SLOs of all project dam sites on which NRCS provided assistance. The NRCS has an active Operation and Maintenance Agreements in the Annual OandM Inspections for the sites. NRCS informs the SLOs upon the expiring of the OandM agreement that the site will continue to function as designed if OandM actions continue. NRCS assists the NDSWC, as needed, with formal 5-Year Inspections of all NRCS project sites. In addition to that work, we occasionally provide engineering services for repair/maintenance work. Currently we are working on a principal spillway repair for Fish Creek Dam.	**NRCS:** All high hazard dams in the program are funded on an annual basis for routine Operation and Maintenance. Regional Safety of Dams Engineer also conducts an annual inspection of each structure. Specifically, technical assistance for Fish Creek Dam has been delivered. **NDSWC:** NDSWC has just begun a multiyear process to bring outdated state design guidance in line with current state-of-the-practice. **ND Department of Mineral Resources:** Revising progress report status to state - NDGS, a division within Department of Mineral Resources, offers geological expertise for the state. Specific topics include landslides, geologic, and geologic hazards mapping.
2014-15	Dam Owner Education	**NDSWC:** Inspects non-federally owned high hazard and medium hazard dams and makes recommendations to the dam owners regarding necessary maintenance and repairs. In May 2016, a Dam Engineering Fundamentals seminar was held with the goal of increasing the level of knowledge in the local engineering community regarding dams and dam safety. An effort is currently underway to develop a dam maintenance manual for ND dam owners to increase their level of knowledge regarding dam maintenance. Funding for both the seminar and the manual was obtained through federal National Dam Safety Program grants administered by FEMA. **US BOR:** Reclamation Dams in North Dakota are federally owned. BOR invites local agencies to our dam operator training and dam safety trainings when they are offered. **USACE:** Implementing a new policy for inspecting, operating and maintaining local flood protection projects (most commonly associated with levees). Much of the new policy is being implemented in cooperation with FEMA. Programs and funding authorities for USACE dams are limited to operating and maintaining federal projects. **ND Game and Fish Department:** Coordinate with the State Water Commission regarding cost share issues opportunities. **BIA:** Provides funding to tribal nations for routine operations and maintenance. **Natural Resource Conservation Service:** Provides assistance, as resources allow, to SLOs/local dam owners for inspection and dam safety training. NRCS has launched and maintains a national web- based dam monitoring tool called DamWatch that provides real- time monitoring of nearly 12,000 dams on which NRCS provided assistance to local sponsors throughout the United States. In addition to being a monitoring tool, the application provides a "one-stop" source for critical dam documentation such as drawings, inspections, historical photos, and emergency action plans. ND NRCS has reached out to nearly all SLOs to introduce the DamWatch tool and to solicit them to become users. All data for data for those dams on which NRCS provided assistance on at one point have been uploaded for the state. **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss with dam owners/ operators about adversarial (HVE or Terrorism) threats (purposed or imminent). **DHS:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities.	**NDSWC:** All high hazard dams in the program are funded on an annual basis for routine Operation and Maintenance. Regional Safety of Dams Engineer also conducts an annual inspection of each structure. Dam Tender Training is required every 3 years for the dam operator. The information from the progress report: Inspects non-federally owned high hazard and medium hazard dams and makes recommendations to the dam owners regarding necessary maintenance and repairs, is no longer relevant. **NRCS:** Dam Watch continues to be utilized and supported, Water Resource Districts, NDSWC, and others are users. **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.

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2014-16	Review Dam EAPs	**NDSWC:** Enacting House Bill 1097, which was passed by the 2015 ND Legislature and went into effect August 1, 2015. This bill requires the owners of all high and medium hazard dams to develop, periodically test and update EAPs. Approximately 85% of high hazard and 52% of medium hazard dams in the state currently have an EAP. **US BOR:** Exercises EAPs on an eight-year schedule. Every fourth year of the cycle BOR conducts a Table Top Exercise and every eighth year of the cycle BOR conducts a Functional Exercise. An Orientation meeting is conducted yearly to review the EAP. Jamestown and Heart Butte conducted Functional Exercises in 2014, and Dickinson conducted a Functional Exercise in 2013. **USACE:** Developed new inundation mapping for all its dams under a center of expertise using national standards and formats. New mapping for Baldhill and Homme dams were in final review stage. An EAP exercise was conducted for Homme and Baldhill Dams at Lac Qui Parle April 2015. **NDGF:** Reviews EAPs to ensure safe operations of fisheries dams. The SWC requested/required all owners of dams in the state that fell into a high hazard classification to develop Emergency Action Plans. **Natural Resource Conservation Service:** Provides technical assistance, as resources allow, to owners of dams with which the agency has previously provided financial and/or technical assistance. In 2016, the agency worked with the Morton WRD on an update to the Harmon Lake Dam EAP by completing a revised hydraulic model and inundation mapping at their request. NRCS also provided a review for the Renwick Dam EAP developed by Houston Engineering.	**NDSWC:** EAPs are required for all high hazard and medium hazard dams under North Dakota Century Code (N.D.C.C.) § 61-03-25, which became effective August 1, 2015. N.D.C.C. § 61-03-25 requires the owners of all high and medium hazard dams to develop, periodically test and update EAPs. Approximately 89% of high hazard and 55% of medium hazard dams in the state currently have an EAP. Cost share assistance for the development of EAPs is available through the SWC's cost share program. EAPs are reviewed on an annual basis to update contact lists. They are also exercised every 5 years during a Table Top Exercise unless they have been active within the 5-year span. If activated, the incident is reviewed to ensure the EAP met the needs of all parties involved in the response. **NRCS:** Status remains unchanged.
2014-17	Outdoor Warning Systems	**NDDES:** Encourages local and tribal jurisdictions to apply for funding through the HMGP 5% Initiative fund whenever a disaster is declared, and funds are available. The NDDES Homeland Security Grants section works with local jurisdictions to purchase and install Outdoor Warning Systems during its program grant periods as well. **NWS:** Support the updating of outdoor warning systems in local communities through technical assistance and public education. Financial assistance may also be provided by NDDES.	Support the updating of outdoor warning systems in local communities through technical assistance and public education. Financial assistance may also be provided by NDDES.
2014-18	Emergency Notification Systems	Developed and received funding for the City of Minot to update its Citywide Communications System to provide Emergency Notifications associated within impending hazards. The communications upgrade allowed coverage for up to 90% of the City population through the use of cell phones, warning sirens, TV broadcasts, and radios. Upgrades included the installation of High-Speed WAN connections to replace digital subscribers' lines and Virtual Private Networks, higher speed internet connections for control and SCADA monitoring of critical infrastructure, the purchase and installation of three 20 KW generators are communications sites, and installation of two monopoles.	Ongoing

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-19	Retrofit Communication Sites	**NDDES:** Completed and closed an HMGP approved project to purchase and install emergency backup generators at ten (NDDOT communications sites across the State of North Dakota. Coordinates with ITD to ensure protective measures are in place at State Radio tower sites. Educates the public and private sectors regarding protection of critical communications through the Critical Infrastructure Protection Program to address HVE incidents or threats. Protective measures include such actions as target hardening, card access, installation of fences, use of secure cameras, guards and safety bollards. **NDDOT:** Continuing upgrades to communication tower sites. The tower sites are used for NDDOT communications as well as by law enforcement and emergency response personnel. FAA requires that towers over 300' need to have lights (most NDDOT towers fall into that requirement). The existing buildings at the radio tower sites house the electronics for the NDDOT, NDDES, and in some instances the National Guard, USAF, FBI, NDBCI, FAA, USFWS, and other state and federal agencies that utilize our towers. The existing buildings are located right next to the base of the towers. Over the years ice that has built up on the towers and cables has fallen on and damaged the structural integrity of the buildings. Many buildings have had two or three roofs replaced over the last number of years. Damaged, leaky roofs put the electronics at risk, and made the buildings susceptible to mice and rodent infestation which has also damaged equipment. The propane tanks are being replaced as they are old, rusty and a safety hazard. In some cases, because the valve is outdated, and NDDOT is having problems getting them refilled. The generators are being replaced because they are old, unreliable, and in many cases a serious maintenance issue as DOT workers frequently have to fill oil. Fencing is installed around the entire site, to include the tower, building, propane tank, and guy wires. The fence installation is for security and safety. There have been instances around the state where snowmobilers and ATV riders have been injured or killed when they impacted unfenced guy wires. Initially there were 37 tower sites that needed upgrading. This will be the third phase of a four-phase replacement process. We have completed 18 upgrades through the first two phases. NDDOT has completed phase three of the building replacement project. Phase four would involve the final 10 existing sites/building replacements, this is planned for the 2017/2019 biennium if funds are available. The NDDOT has completed the construction of 4 new tower sites. Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities. **NWS:** These agencies been removed as a stakeholder after clarifying they do not have a role in this mitigation action. **ND ITD:** Employs stringent physical security measures at the enterprise Primary Data Center, Secondary Data Center, Agency Data Center and other ITD-controlled facilities. These measures include ITD ID Badges, ITD Visitor Badges, and video surveillance cameras. **SLIC**: Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with critical facility operators.	NWS removed as partner.
2014-20	Tornado Safe Rooms and Shelters	Developed and received funding for the purchase and installation of two pre-cast concrete emergency storm shelters that have been placed in Graner Park and Harmon Lake Recreational Area in Morton County, ND. These pre-cast units are engineered to meet FEMA community shelter specifications to include proper storm doors and venting, they are sized based on the average number of people that would need emergency shelter in those area, and can withstand the wind speeds of an EF 5 level tornado (250 MPH).Based on the success of these shelters, additional communities across the state are also planning to apply for storm shelters for recreational areas, mobile home parks, and larger community venues where shelter is not currently available.	Ongoing

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-21	Snow Fences	**NDFS:** Continue to support this initiative as important; however, funding is no longer available; however, as if it comes available, agencies would make this a priority. A living snow fence is a windbreak of trees and shrubs strategically planted to slow down, catch or channel snow, keeping it from reducing visibility and blocking roads or intersections. Since 1998, 40 counties initiated 594 projects. 951.4 miles of trees were planted to protect 270 miles of roads. Current sources of cost-share can be found at the UDSA Farm Service Agency and Natural Resources Conservation Service. The North Dakota Association of Soil Conservation Districts administers the Outdoor Heritage Fund Grant - ND Statewide Conservation Tree Planting Initiative that provides cost-share for a variety of conservation tree plantings including living snow fences. **NDDOT:** Continue to support this initiative as important; however, funding is no longer available; however, as if it comes available, agencies would make this a priority. A living snow fence is a windbreak of trees and shrubs strategically planted to slow down, catch or channel snow, keeping it from reducing visibility and blocking roads or intersections. Since 1998, 40 counties initiated 594 projects. 951.4 miles of trees were planted to protect 270 miles of roads. Current sources of cost-share can be found at the UDSA Farm Service Agency and Natural Resources Conservation Service. The North Dakota Association of Soil Conservation Districts administers the Outdoor Heritage Fund Grant - ND Statewide Conservation Tree Planting Initiative that provides cost-share for a variety of conservation tree plantings including living snow fences.	Ongoing
2014-22	Electric Infrastructure Protection	**NDDES:** Enacted 32 projects at an estimated cost of $13,340,424.17 to bury power lines, replace standard transmission lines with heavy duty line structures and install guy wires. As an example, a $1,823,739 mitigation project allowed Minnkota Power Cooperative to replace 34 standard transmission lines structures with heavy duty line structures designed to reduce the number of power lines that fall during severe storm events. Approximately 89 miles of power lines owned by RECs have been buried and 54 structures replaced or improved. We have had active participation in the program by our RECS, which have included Minnkota, Dakota Valley, Northern Plains, Sheyenne Valley, Square Butte, Cavalier Rural, Great River Energy, Central Power and Cass County. The cities of Lakota and Underwood have also pursued projects to convert all above ground power lines to underground lines to provide uninterrupted power to residents. **ND RECs:** RECs have retired approximately 45.24 miles of overhead lines. We have installed approximately 185.9 miles of new underground lines. RECs continue to retire overhead lines as system updates are needed. They continue to install underground utility lines throughout ND whenever feasible. CCEC installed a total of 133 miles of underground cable in 2014. The breakdown is as follows: 83 miles for new construction, 28 miles for cable replacement, and 22 miles for other system improvements including customer revamps. **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with power providers. **DHS:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities.	Ongoing **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-23	Emergency Power at Critical Facilities	**NDDES:** Continuously working with applicants to develop project applications to purchase and install emergency backup power for critical facilities including lift stations, water treatment plants and waste water treatment plants. Currently working with applicants to develop applications to fund generators to power emergency services such as police and fire departments, as well as hospitals. **NDARECs:** Promotes use of back-up generators or alternative solutions. RECs report a balance of diesel generators owned by members. Renewable energy facilities are interconnected with distribution systems. Three new double throw meters have been installed. This allows for backup generator use in the event of an emergency power outage. CCEC has an active load management program that promotes the use of back-up generation for load control purposes. There are 150+ units at member sites that are member owned. In addition, there is a 925-methane generator connected to the distribution grid. RECs report a balance of diesel generators owned by members. Renewable energy facilities are interconnected with distribution systems. Double throw meters have been installed. This allows for backup generator use in the event of an emergency power outage. **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with critical facility operators. **DHS:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities.	Ongoing **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.
2014-24	Floodproofing Critical Facilities	**NDDES:** Developed and received funding to create permanent flood protection around the City of Minot's Water Treatment Plant. The City's water systems were infiltrated during the 2011 record flood, and the City was placed on a boil order for 6-8 weeks until the water systems could be repaired and brought back to normal function and capacity. The current project will protect the City's Water Treatment Plant to the 2011 flood event plus 5.6 feet to ensure the estimate 102,000 people (city and rural residents) that depend on this facility will always have clean drinking water in the future. Developed and received funding to place permanent flood protection around the City of Fargo's Waste Water Treatment Plant. The critical facility is located in the 100-year floodplain and could potentially be damaged in high storm events and leave approximately 160,000 city and rural residents without waste water services which could lead to sewage backups into public and private properties, as well as uncontrolled dumping of waste water into the Red River of the North and its tributaries. The proposed flood protection will protect the Waste Water Treatment plant to the 500-year flood event level. **NDSWC:** Involved with following flood-proofing activities: road raises for access during high water; dike or levee construction; installing sump pumps/storm water lift stations; redirecting rain and snow runoff; cleaning culverts; redirecting rain/snow runoff; cleaning culverts, canals and waterways of debris; weed control in and along waterways; property acquisition in floodways; channel improvements/diversions to move flood waters around/away from critical infrastructure; detention areas/flood control dams; and having personnel and equipment that can respond quickly to flooding situations or ice jams.	**NDSWC:** Ongoing

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-25	Drought Task Force	**NDDA:** Worked with one emergency manager conduct mitigation plan review regarding impact of drought on the community but nothing else of measure. Leverages an online database called Haynet and Grazenet to assist producers. **NWS:** Provides information statements on drought. NWS offices in North Dakota collaborate with the North Dakota State Climatologist regarding drought across the state. The NWS also participates in meetings of the Drought Task Force. **NDSWC:** Activates, as required, its Drought Disaster Livestock Water Supply Program to mitigate the impacts of drought on ranchers and farmers. **NDDOT:** Waives applicable trucking rules to facilitate hay movement as well as potentially facilitating more haying of state highway ditches. **DCS:** Assists with identifying resources to help with recovery. **NDDES:** Coordinates with local and tribal mitigation planners to identify communities' vulnerabilities to drought encourage consideration of drought mitigation strategies.	**NWS:** NWS offices in North Dakota collaborate with the North Dakota State Climatologist regarding drought across the state, and coordinate with bordering states and provinces as necessary. The NWS also participates in meetings of the Drought Task Force. **State Climatologist:** The state climatologist continued to provide weekly updates on the NDSU Drought page as well as attended drought task force meetings and conference calls while providing intelligence to the other state agencies. **NDDA:** NDDA worked closely with other unified command agencies to identify local needs, and work with respective agencies to coordinate the delivery of resources where available and appropriate to be provided by state government, including the NDDA Hay hotline, an emergency commission request for the Hay Transportation Program and direct communication from the Commissioner's office at federal, state and local levels to relay the needs and conditions in North Dakota's Counties. **NDSWC:** Ongoing
2014-26	Firewise and Community Wildfire Protection Plan	**NDFS:** Continues to promote Firewise and Community Wildfire Protection Plans. A Barnes County CWPP was developed in 2016 identifying issues of high priority including: reducing fuel loads, improving fire prevention in the WUI, prevention education, and directing outreach to rural landowners at risk. The Barnes County SCD is implementing a WUI grant to provide cost-share opportunities to landowners for creating defensible space around homes and structures, providing Firewise assessments, developing Forest Resource Management Plans focusing on guiding the successful establishment of young fuel breaks, and updating the Barnes County CWPP. The project also involves coordinating with the communities of Hastings, Kathryn, Litchville, Sanborn, Valley City and areas surrounding Lake Ashtabula and Bald Hill Dam recreation areas in meeting their fuel reduction priorities as listed in the Barnes County CWPP, and providing education materials to county residents by mailings, radio spots, newsletter/newspaper articles, information on the district web-site, and one-on-one contacts, with the overall goal of reaching 5,000 residents. **NDSFM:** Promotes wild land fire protection philosophies through public education programs like FireWise, National Wild Fire Community Preparedness Day, and Take Action, Teens for Wild Fire Safe Communities. These programs are distributed throughout the North Dakota fire service. **BIA:** Updating fire management plans, which haven't been updated since 1998. This major undertaking includes meeting today's policy and moving toward incorporation such as GIS. Plan to share information with local and tribal mitigation planners.	**NDFS**: The current WFPP 10-year plan, 2015-2024 meets the BIA standards for a CWPP. This plan identifies the close partnership the Bureau of Indian Affairs has with the State of North Dakota, Municipal, Rural and Volunteer Fire Departments for Prevention, detection and suppression of Wildfires.
2014-27	Hazardous Fuels Reduction	N.D. Forest Service -- Forest Stewardship Management plans were created by NDFS Forest Stewardship Staff by integrating landowner objectives and outlining forest management/hazardous fuels reduction prescriptions. The stand prescriptions and objectives are reviewed by Forest Stewardship and fire staff and then certified NDFS fire staff sawyers implement the prescriptions by pruning, thinning and removing timber and brush in designated areas. Additional NDFS fire staff utilizing both mechanical and handwork, piled material in strategic locations for burning at a later date. Cutting activities were aimed at opening the canopy and removing the ladder fuels to prevent another catastrophic wildfire and recreate a more fire adapted ecosystem. The areas targeted are adjacent to USDA Forest Service lands identified as having a potential for a large catastrophic fire directly impacting local landowners.	**NDFS**: In 2017, the NDFS and USFS Dakota Prairie Grasslands (DPG) entered into a Good Neighbor Authority Agreement to treat adjacent federal lands. Implementation of hazardous fuels reduction treatment on Federal Lands began in summer of 2018.

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-28	Cyber Security Threats	**ND ITD:** Dedicated a cyber security specialist to support the SLIC. The 64th Legislative Assembly approved the addition of an ITD Security cybersecurity position. Previously, the ITD Security proactively partnered with the SLIC by rotating staff members in/out of the SLIC to determine needs and analyze data. In addition, ITD Security and the SLIC have established formal communication channels to analyze cyber-related incidents impacting entities within the state's borders. These efforts are in conjunction with the NDDES, ND Bureau of Criminal Investigation, and the DHS. ITD Security has staff with a secret- level security clearance through the DHS. **SLIC:** Provides needed cyber security analysis and has expanded to include additional staffing, as noted in the ITD section below.	Ongoing
2014-29	Secure Electronic Systems	**ND SLIC and NDDES:** Enact processes to ensure security; coordinate with ITD as the provider for the state's information technology infrastructure. **ND ITD:** On April 4, 2014, ITD published the ITD Cybersecurity Framework based on NIST standards to prioritize to ensure confidentiality, integrity and availability of data entrusted to the State of North Dakota. The five functions of the framework used to protect the data are Identify, Protect, Detect, Respond and Recover. In addition, ITD has employed next generation firewalls to protect the data, implemented using industry best practices.	Ongoing
2014-30	Protection of Critical Communication	**NDDES:** Coordinates with ITD to ensure protective measures are in place at State Radio tower sites. Educates the public and private sectors regarding protection of critical communications through the Critical Infrastructure Protection Program to address HVE incidents or threats. Protective measures include such actions as target hardening, card access, installation of fences, use of secure cameras, guards and safety bollards. **ND ITD:** Employs stringent physical security measures at the enterprise Primary Data Center, Secondary Data Center, Agency Data Center and other ITD-controlled facilities. These measures include ITD ID Badges, ITD Visitor Badges, and video surveillance cameras. **SLIC**: Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with critical facility operators. **NDDOT:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities.	Ongoing

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-31	Hazardous Materials Storage and Disposal	**NDDA:** Operates Project Safe Send which is a safe, simple and non- regulatory program that helps people safely and legally get rid of unusable pesticides free of charge. Since 1992, thousands of people have brought in over 4 million pounds of pesticides to Project Safe Send. Additionally, inspectors and staff from NDDA Pesticide and Fertilizer Division provide compliance assistance and enforcement for distributers, producers and applicators to ensure products are stored, sold and applied safely according to registered labels. **NDDoH:** Enforces state regulations regarding the generation, storage, treatment, transportation and disposal of hazardous waste. The agency also provides technical and monitoring assistance of sites impacted by improper releases. Environmental scientists visit up to 50 sites a year and also monitor ongoing cleanup efforts. **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with hazardous waste collection program managers.	**NDDoH:** Continue to enforce state regulations regarding the generation, storage, treatment, transportation and disposal of hazardous waste. The agency also provides technical and monitoring assistance of sites impacted by improper releases. Hazardous Waste Program staff inspect and visit approximately 50 facilities a year and also monitor ongoing cleanup efforts at regulated facilities. **NDDA:** Operates Project Safe Send which is a safe, simple and nonregulatory program that helps people safely and legally get rid of unusable pesticides free of charge. Since 1992, over ten thousand people have brought in almost 5 million pounds of pesticides to Project Safe Send. Additionally, inspectors and staff from NDDA Pesticide and Fertilizer Division provide compliance assistance and enforcement for distributers, producers and applicators to ensure products are stored, sold and applied safely according to registered labels.
2014-32	Transportation Engineering and Systems	**NDDOT:** Continues to constantly work on mitigating hazards to include additional warning signs to call attention to unexpected conditions not readily apparent; added left turn arrows at signals; added roundabouts, rumble strips/rumble strips, safety edges on pavement; pursue educational opportunities and efforts to reduce secondary crashes. **SLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with local and tribal public works operators and railroad operators. **NDDoH:** Enforces regulations designed to ensure hazardous waste is transported in proper containers and accompanied by the appropriate paperwork, from labeling to manifests. **ND Aeronautics Commission:** Provide technical assistance to the state's 89 public use airports to focus on infrastructure solutions at the airports. The Aeronautics Commission plays an integral coordination role with the airports, the Federal Aviation Administration and project sponsors. **ND Department of Mineral Resources:** Provides support as a member of the State Emergency Response Commission and contributes to the mission and activities. Oil and Gas Division staff enforces rules and regulations related to the safe development of mineral resources in the state. **DHS:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities.	**NDDOT:** The NDDOT has placed more emphasis on coordinating the 4 e's Engineering, Education, EMS and Enforcement including the implementation of " Vision Zero" and our Highways Safety Improvement plan. **NDDoH:** Continue to enforce regulations designed to ensure hazardous waste is transported in proper containers and accompanied by the appropriate paperwork, from labeling to manifests. **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-33	Communicable Disease	**NDDoH and NDDA:** Created a brochure on bovine tuberculosis in humans and animals for livestock producers. NDDoH and the Animal Health Division also gave presentations to producers, human health professionals and animal health professions on bovine tuberculosis in humans and animals. NDDoH and the Animal Health Division also gave presentations to producers, human health professionals and animal health professions on avian influenza and other zoonotic diseases. **US APHIS:** Actively monitors potential and actual incidents of pests in coordination with the NDDA. APHIS also provides technical assistance to state mitigation plan development. APHIS coordinated with the Cherokee Nation to ensure wood transported to the Standing Rock Sioux Reservation was not from quarantined areas in Oklahoma where emerald ash bore is present. **ND Stockmen's Association:** Supports education efforts to mitigate the spread of livestock diseases.	**NDDA**: Worked cooperatively with NDDoH and NDSU extension on education to promote biosecurity and minimize zoonotic disease issues at fairs. Distributed educational materials regarding ticks and the diseases they can carry; promoted tick surveillance. Supported and promoted the construction of a new veterinary diagnostic laboratory at NDSU with expanded capabilities (to replace an outdated facility) to improve early disease detection. Annual training in foreign animal disease diagnosis and response continues for Reserve Veterinary Corps. Created a brochure on bovine tuberculosis in humans and animals for livestock producers. NDDoH and the Animal Health Division also gave presentations to producers, human health professionals and animal health professions on bovine tuberculosis in humans and animals. NDDoH and the Animal Health Division also gave presentations to producers, human health professionals and animal health professions regarding avian influenza, brucellocois and other zoonotic diseases.
2014-34	Community Resiliency	**NDDoH and ND Workforce Safety and Insurance:** Contributed to development of the State of North Dakota Recovery Mission Area Operations Plan and branch annexes to ensure they reflected this mitigation action. **NDDHS:** Coordinated with partner agencies to support worker and first responders with Disaster Mental Health services. **NDDOT:** Conducts traffic incident management training on the local level. **NDDES:** Initiated the following campaigns such as: Get Ready for Winter Weather (Posted 10/27/2014); Hazardous Materials Conference Held (Posted 10/31/2014, 2016); and North Dakotans urged to Resolve to be Ready (12/31/2014).	**NDDOT**: The NDHP is the lead for first responder training. Also, the NDHP and NDDOOT recently worked to get legislation and processes in place for quick clearance of crashes. Highway Patrol and NDDOT added to this task. **WSI:** Contributed to development of the State of North Dakota Recovery MAOP and branch annexes to ensure they reflected this mitigation action. WSI offers organizations such as political subdivisions, civic groups, churches, etc. with volunteers to establish a volunteer policy to provide coverage for volunteers.
2014-35	StormReady Program	Continue to promote the program and encourage local participation. The National Weather Service Offices serving the state of North Dakota continue to expand the StormReady Program across the state. As of November 2, 2016, there were 49 StormReady sites in North Dakota. A current listing of North Dakota StormReady sites can be found at: http://www.stormready.noaa.gov/com-maps/nd-com.htm.	**NWS:** Continue to promote the program and encourage local participation. The National Weather Service Offices serving the state of North Dakota continue to expand the StormReady Program across the state. As of August 6, 2018, there were 64 StormReady sites in North Dakota, and increase of 15 locations in the past 2 years. A current listing of North Dakota StormReady sites can be found at: https://www.weather.gov/stormready/nd-sr.

2014 Action ID #	2014 Action Title	Progress Report Status (2014-2016)	Current Status (2018)
2014-36	Public Education Programs	**NDDES:** Continues to support SKYWARN opportunities; offered training for staff members. **NWS:** Collaborated with local emergency managers to conduct SKYWARN training classes during the spring of 2014. Conducted SKYWARN C training classes during the springs of 2015 and 2016. SKYWARN is a volunteer program established by NOAA's National Weather Service with partner organizations. In North Dakota, SKYWARN spotters consist mostly of emergency response officials and amateur radio operators. Each year, SKYWARN spotters donate their time and equipment to provide information which helps the NWS issue more timely and accurate severe weather warnings. A series of YouTube videos consisting of material from a SKYWARN training session were created in 2016. The material is presented by NWS Bismarck Warning Coordination Meteorologist. The video series was created to reach those interested in SKYWARN but are not able to attend a training session in person. The videos can also serve as a refresher for those wanting to review the material. The videos are available on the NWS Bismarck SKYWARN page: http://www.weather.gov/bis/skywarn. **NDDoH:** Provides training for the Public Health Emergency Volunteer Reserve/Medical Reserve Corps. Deploys teams to incident sites and to community events. **NSLIC:** Developing a strategy which involves leveraging opportunities to educate and discuss adversarial (HVE or Terrorism) threats (purposed or imminent) with the public. **DHS:** Promote the use of target hardening measures (i.e. perimeter fencing, CCTV, alarms, entry control procedures, robust cyber security systems and software applications, security staffing at key sites etc.). Collaborate and / or assist in conducting site vulnerability and security assessments to assess security postures, uncover vulnerabilities and present options for consideration to mitigate vulnerabilities. Provide Active Shooter Training when requested for public and private infrastructure stakeholders following the "Run, Hide, Fight" methodology. Provide infrastructure stakeholders resources in developing and facilitating protocols and training methodologies from the U.S. DHS Active Shooter Resources website: https://www.dhs.gov/active-shooter-preparedness.	**NWS**: In like fashion, NWS offices in Bismarck and Grand Forks have continued to collaborate with local emergency managers to conduct SKYWARN training classes during the springs of 2017 and 2018. Hosted the 16th annual Climate Prediction Application Science workshop at NDSU during the week of May 21. Presented "Climate Change: Opportunities and Risks in the Northern Plains" in a conference format. Continued to visit K12 for climate information and education. **DHS:** Mission priorities for DHS have now swung towards – K12 schools, cyber, elections infrastructure, and large outdoor events.

7.6.2 2019 – 2024 Mitigation Action Plan

7.6.2.1 Mitigation Action Worksheets

SHMT members provided the following Mitigation Action Worksheets to document new mitigation actions for this planning process

Mitigation Action Worksheet Instructions

Please use the following worksheet to capture any new mitigation actions you would like to add to North Dakota's 2018 Enhanced Hazard Mitigation Plan. The following instructions will help you to fill out this worksheet. Please feel free to return any completed worksheets to Michelle Bohrson, with Hagerty Consulting, no later than September 3, 2018.
Michelle.Bohrson@hagertyconsulting.com

Activity Description: Describe the mitigation activity, and please be as specific as possible. In order to meet FEMA requirements, proposed activities must include specific risk reduction measures and not be focused on emergency preparedness or response activities.

Lead Agency: Identify the lead department and division/office with primary responsibility for implementation of the activity. Please be as specific as possible. It is also acceptable to list secondary agencies that may provide implementation support

Estimated Cost: Provide a general estimate of the anticipated total costs required to complete the activity. In addition to dollar estimates, it is acceptable to include "staff time" or "in-kind resources" or simply "N/A" for those actions not requiring direct funding assistance.

Current and Potential Funding Sources: Identify potential funding sources, including any known Federal, State, or non-governmental funding sources. Identify if benefit-cost reviews will be used to determine cost effectiveness of projects.

Timeframe for Completion: Target timeline (duration) or specific completion date (month/year) for the proposed activity. It is acceptable to include "ongoing/continuous" for those actions already underway and/or to be continued with no end date.

Hazard(s) to be Addressed: Identify the hazards that the activity is designed to mitigate against. This may include any combination of one or more hazards. Proposed activities should be focused on mitigating the highest risk hazards for the state.

Vulnerabilities Addressed: Similar to hazards to be addressed, identify vulnerabilities that this action will address. This can be completed through a statement of what the problem/gap currently is, for example a lack of public education of individual hazard mitigation measures.

Mitigation Action Worksheet

Name/Title of Activity	Integration of Mitigation Into Comprehensive Planning	
Activity Description	Promote the incorporation of mitigation planning risk assessments, vulnerability analyses and actions into local/tribal comprehensive plans.	
Agency	N.D. Department of Emergency Services ☒ Lead ☐ Support	
Current & Potential Funding Sources	Hazard Mitigation Assistance	
Timeframe for Implementation	☐ Short-term (0 – 6 months) ☐ Medium-term (6 – 24 months) ☒ Long-term (>24 months) ☐ Ongoing	or ☐ Date known:
Hazard(s) to be Addressed	☐ Civil Disturbance ☐ Criminal Terrorist Nation Attack ☐ Cyber Attack ☐ Dam Failure ☐ Drought ☐ Fire ☐ Flood	☐ Geologic ☐ HazMat Release ☐ Infectious Disease ☐ Severe Summer Weather ☐ Severe Winter Weather ☐ Space Weather ☐ Transportation Incident
Vulnerabilities Addressed	This initiative would address all hazards and would ensure that communities are aware of vulnerabilities to hazards and threats when developing comprehensive plans.	
Point of Contact	Name: Kathleen Donahue Agency, Position: Mitigation Planning Officer Phone: 701-328-8113 Email: kdonahue@nd.gov	
Notes	This mitigation action will require partnering with the N.D. Department of Commerce's Main Street ND project managers and the N.D. Planning Association. FEMA is coordinating with the USDA Rural Development Innovation Center on linking economic resilience and mitigation planning in rural communities with populations <30k. Normally, USDA RD assists with economic development planning through the Stronger Economies Together program. However, this is a pilot program that would be nationwide and making the connection to local hazard mitigation plans.	

Mitigation Action Worksheet

Name/Title of Activity	Insurance Moonshots
Activity Description	The FEMA "moonshot" is set to double the number of properties covered by flood insurance by 2022. Education is going to be key in getting more people to buy insurance. People will not buy insurance if they don't understand the level of threat, believe there is a threat, or understand what Flood Insurance is. To do that, we need to educate several different industries in order to convey the message. The State NFIP Coordinator will be working with the State Insurance Commission on setting up a workshop. The State NFIP Coordinator will continue to hold training with specific target markets (Emergency Managers, Realtors, Floodplain Administrators, Public, etc.) annually as funding becomes available. This should be an ongoing effort – the goal is by 2022, but continuing growth past that year is even better!
Agency	N.D. State Water Commission ☒ Lead ☐ Support
Current & Potential Funding Sources	$7,5000 CAP-SSSE funding from FEMA -- insurance agent training for this year. Other potential sources in include HMA, Insurance Commission, Realty Association, EM Association
Timeframe for Implementation	☐ Short-term (0 – 6 months) ☐ Medium-term (6 – 24 months) ☐ Long-term (>24 months) ☒ Ongoing or ☐ Date known:
Hazard(s) to be Addressed	☐ Civil Disturbance ☐ Criminal Terrorist Nation Attack ☐ Cyber Attack ☐ Dam Failure ☐ Drought ☐ Fire ☒ Flood ☐ Geologic ☐ HazMat Release ☐ Infectious Disease ☐ Severe Summer Weather ☐ Severe Winter Weather ☐ Space Weather ☐ Transportation Incident
Vulnerabilities Addressed	The moonshot likely would pertain to all hazards and threats covered by insurance. However, the Moonshot program appears to target flood insurance indicating survivors with flood insurance recover more quickly than those without coverage.
Point of Contact	Name: Dionne Haynes Agency, Position: State NFIP Coordinator Phone: 701-328-4961 Email: dfyanes@nd.gov
Notes	Refer to Moonshot documents provided earlier.

Mitigation Action Worksheet

Name/Title of Activity	Disaster Recovery Planning Toolbox	
Activity Description	Promote the development of local and tribal disaster recovery plans that focus on the whole community recovery inclusive of hazard mitigation initiatives. Through continual outreach with communities, the development of recovery and hazard mitigation plans, and the identification of hazards and risks, communities are better able to identify weaknesses and develop strategies to prevent damages to public and private property, as well as reduce the risk to human life and safety. Implementing these strategies will ultimately lead to more disaster resilient communities statewide.	
Agency	N.D. Department of Emergency Services ■ Lead ☐ Support	
Current & Potential Funding Sources	Emergency Management Grant Program, other FEMA sources	
Timeframe for Implementation	☐ Short-term (0 – 6 months) ☐ Medium-term (6 – 24 months) ■ Long-term (>24 months) ■ Ongoing	or ☐ Date known:
Hazard(s) to be Addressed	☐ Civil Disturbance ☐ Criminal Terrorist Nation Attack ☐ Cyber Attack ☐ Dam Failure ☐ Drought ☐ Fire ☐ Flood	☐ Geologic ☐ HazMat Release ☐ Infectious Disease ☐ Severe Summer Weather ☐ Severe Winter Weather ☐ Space Weather ☐ Transportation Incident
Vulnerabilities Addressed	This initiative would address all hazards and would ensure that communities are aware of vulnerabilities to hazards and threats when developing strategies to rebuild communities.	
Point of Contact	Name: Kathleen Donahue Agency, Position: Mitigation Planning Officer Phone: 701-328-8113 Email: kdonahue@nd.gov	
Notes	Successful recovery requires implementation of mitigation strategies designed to reduce or eliminate the impact to lives and property to future disasters. These measures, designed to increase community resiliency; include: hazard mitigation and land use planning strategies; hardening of critical infrastructure, protection of environmental and cultural resources; and sustainability practices to reconstruct infrastructure and revitalize the economy, as well as social and natural environment systems.	

Mitigation Action Worksheet

Name/Title of Activity	Hazard Mitigation Planning Toolbox
Activity Description	The web-based Hazard Mitigation Planning Toolbox would include tools to help local and tribal hazard mitigation teams build viable mitigation plans. The site would include links to hazard- and threat-related information, guidance for developing plans including samples of best practices from local and tribal mitigation plans, and links to mitigation related webinars.
Agency	N.D. Department of Emergency Services ☒ Lead ☐ Support
Current & Potential Funding Sources	Hazard Mitigation Assistance
Timeframe for Implementation	☐ Short-term (0 – 6 months) ☐ Medium-term (6 – 24 months) ☒ Long-term (>24 months) ☐ Ongoing or ☐ Date known:
Hazard(s) to be Addressed	☐ Civil Disturbance ☐ Criminal Terrorist Nation Attack ☐ Cyber Attack ☐ Dam Failure ☐ Drought ☐ Fire ☐ Flood ☐ Geologic ☐ HazMat Release ☐ Infectious Disease ☐ Severe Summer Weather ☐ Severe Winter Weather ☐ Space Weather ☐ Transportation Incident
Vulnerabilities Addressed	The Hazard Mitigation Planning Toolbox would address all hazards listed above. The goal would be to strengthen mitigation plans by making resources for risk assessments and vulnerability analyses more readily available to communities.
Point of Contact	Name: Kathleen Donahue Agency, Position: Mitigation Planning Officer Phone: 701-328-8113 Email: kdonahue@nd.gov
Notes	

7.6.2.2 Mitigation Action Identification and Prioritization Methodology

Table 7.6-2 STAPLEE Criteria (used for *Feasibility* Consideration of Prioritization Criteria)

Criteria	Considerations
Social	Community Acceptance Effects on Segment of Population
Technical	Technical Feasibility Long-Term Solution Secondary Impacts
Administrative	Staffing Funding Allocated Maintenance/Operations
Political	Political Support Local Champion or Proponent Public Support
Legal	State Authority Local Authority Subjectivity to Legal Challenges
Economic	Benefit of Action Cost of Action Contribution to Economic Goals Outside Funding Requirement
Environmental	Effects on Land/Water Bodies Effects on Endangered Species Effects on Hazardous Material and Waste Sites Consistency with Community Environmental Goals Consistency with Federal Laws

Table 7.6-3 2019 Mitigation Action STAPLEE Analysis

Action ID #	Action Title	Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Results
2019-1	Mitigation Planning	0	1	1	0	1	-1	0	2
2019-2	Hazard Mitigation Planning Toolbox	0	1	0	0	1	0	0	2
2019-3	Building Codes and Zoning Ordinances	-1	1	0	0	1	1	1	3
2019-4	Cultural and Historical Preservation	0	1	0	1	1	1	0	4
2019-5	Basin-wide Water Management Planning	0	1	0	0	1	-1	1	2
2019-6	Local Master/Comprehensive Planning	-1	1	0	0	1	1	1	3
2019-7	Integration of Mitigation and Comprehensive Planning	0	1	1	0	1	0	1	4

Action ID #	Action Title	Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Results
2019-8	Firewise and Community Wildfire Protection Plan	1	1	-1	1	1	1	0	4
2019-9	Debris Management Plans	0	1	0	0	1	-1	1	2
2019-10	Disaster Recovery Planning Toolbox	0	1	0	0	1	0	0	2
2019-11	Dam EAPs	0	1	-1	0	1	1	1	3
2019-12	GIS Data Improvement/ Data Creation	0	1	0	0	1	1	0	3
2019-13	Geologic Mapping	0	1	1	0	1	1	0	4
2019-14	Losses Avoided	0	1	1	1	1	0	0	4
2019-15	North Dakota Silver Jackets	0	1	1	0	1	1	1	5
2019-16	Souris Basin Dams	0	1	1	0	1	0	0	3
2019-17	Drought Contingency Plans	0	1	-1	0	1	-1	0	0
2019-18	Hazardous Materials Flow Study	0	1	1	1	1	0	1	5
2019-19	Tornado Safe Rooms and Shelters	1	1	1	1	1	1	0	6
2019-20	Flood Mitigation Measures	0	1	1	0	1	1	1	5
2019-21	Floodproofing Critical Facilities	1	1	1	1	1	1	0	6
2019-22	Power Redundancy at Critical Facilities	0	1	1	0	1	1	0	4
2019-23	Electric Infrastructure Protection	0	1	0	0	1	1	0	3
2019-24	Outdoor Warning Systems	1	1	0	1	1	1	0	5
2019-25	Emergency Notification Systems	1	1	0	1	1	1	0	5
2019-26	Dam Status Review	0	1	-1	0	1	1	1	3
2019-27	Protect Communication Sites	0	1	0	0	1	1	0	3
2019-28	Secure Electronic Systems	0	1	1	0	1	1	0	4
2019-29	Transportation Engineering and Systems	0	1	0	1	1	1	0	4
2019-30	Snow Fences	0	1	0	1	1	1	-1	3
2019-31	Drought Mitigation	0	1	-1	0	1	1	0	2
2019-32	Hazardous Fuels Reduction	1	1	1	1	1	-1	1	5

Action ID #	Action Title	Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Results
2019-33	Hazardous Materials Storage and Disposal	0	1	0	1	1	1	1	5
2019-34	Insurance Moonshots	0	1	1	0	1	1	0	4
2019-35	NFIP, RiskMap, and CRS Program	1	1	0	0	1	1	1	5
2019-36	StormReady Program	0	1	1	1	1	1	0	5
2019-37	Cyber Security Threats Education	0	1	-1	0	1	1	0	2
2019-38	Public Education and Outreach	1	1	0	1	1	1	0	5
2019-39	Dam Owner Education	0	1	0	0	1	-1	1	2
2019-40	Medical Surge	1	1	1	1	1	0	0	5
2019-41	Community Health and Safety Resiliency	1	1	0	1	1	1	0	5
2019-42	Vaccination	1	1	1	1	1	0	0	5
2019-43	Disease and syndromic surveillance	1	1	0	1	1	0	0	4
2019-44	Chemoprophylaxis	1	1	1	1	1	0	0	5
2019-45	Disease and Infestation Prevention and Control Technical Assistance	1	1	1	1	1	0	0	5
2019-46	Isolation and Quarantine	1	1	1	1	1	0	0	5
2019-47	Social Distancing	1	1	1	1	1	0	0	5
2019-48	Depopulation of ill or exposed animals or plants	1	0	1	1	1	0	1	5
2019-49	Control plant disease and infestation	1	0	0	1	1	0	1	4
2019-50	Genetic Modification	1	0	0	1	1	0	0	3

Table 7.6-4 2019 Mitigation Action Prioritization Analysis

Action ID #	Action Title	Cost	Project Management	Feasibility	Population Benefit	Property Benefit	Effectiveness	Hazard Rating	Prioritization Total	Priority
2019-1	Mitigation Planning	2	0	2	0	4	2	4	14	High
2019-2	Hazard Mitigation Planning Toolbox	3	1	2	0	0	1	4	11	Medium

Action ID #	Action Title	Cost	Project Management	Feasibility	Population Benefit	Property Benefit	Effectiveness	Hazard Rating	Prioritization Total	Priority
2019-3	Building Codes and Zoning Ordinances	2	0	2	0	0	2	4	10	Low
2019-4	Cultural and Historical Preservation	4	1	2	0	0	2	4	13	Medium
2019-5	Basin-wide Water Management Planning	2	0	2	0	4	2	4	14	High
2019-6	Local Master/Comprehensive Planning	3	1	2	0	0	0	4	10	Low
2019-7	Integration of Mitigation and Comprehensive Planning	4	1	2	0	0	1	4	12	Medium
2019-8	Firewise and Community Wildfire Protection Plan	3	1	2	4	4	2	4	20	High
2019-9	Debris Management Plans	4	2	2	0	0	2	4	14	High
2019-10	Disaster Recovery Planning Toolbox	3	1	2	0	0	1	4	11	Medium
2019-11	Dam EAPs	2	0	2	0	0	2	0	6	Low
2019-12	GIS Data Improvement/ Data Creation	1	0	2	3	4	2	4	16	High
2019-13	Geologic Mapping	3	2	2	0	0	2	0	9	Low
2019-14	Losses Avoided	4	1	2	1	1	2	4	15	High
2019-15	North Dakota Silver Jackets	3	2	2	0	0	2	4	13	Medium
2019-16	Souris Basin Dams	4	2	2	0	0	1	0	9	Low
2019-17	Drought Contingency Plans	4	2	1	0	0	2	2	11	Medium
2019-18	Hazardous Materials Flow Study	2	2	2	0	0	2	2	10	Low
2019-19	Tornado Safe Rooms and Shelters	3	1	2	4	0	2	4	16	High
2019-20	Flood Mitigation Measures	2	1	2	0	4	2	4	15	High
2019-21	Floodproofing Critical Facilities	3	1	2	0	3	2	4	15	High
2019-22	Power Redundancy at Critical Facilities	2	2	2	3	0	1	4	14	High
2019-23	Electric Infrastructure Protection	3	2	2	4	0	2	4	17	High
2019-24	Outdoor Warning Systems	2	2	2	1	0	2	2	11	Medium

Action ID #	Action Title	Cost	Project Management	Feasibility	Population Benefit	Property Benefit	Effectiveness	Hazard Rating	Prioritization Total	Priority
2019-25	Emergency Notification Systems	2	2	2	1	0	2	4	13	Medium
2019-26	Dam Status Review	2	0	2	0	0	2	0	6	Low
2019-27	Protect Communication Sites	2	2	2	2	4	2	4	18	High
2019-28	Secure Electronic Systems	1	0	2	3	3	2	0	11	Medium
2019-29	Transportation Engineering and Systems	0	0	2	4	2	2	2	12	Medium
2019-30	Snow Fences	3	1	2	3	0	1	4	14	High
2019-31	Drought Mitigation	3	1	2	2	0	1	2	11	Medium
2019-32	Hazardous Fuels Reduction	3	3	2	2	2	2	4	18	High
2019-33	Hazardous Materials Storage and Disposal	2	0	2	0	0	2	2	8	Low
2019-34	Insurance Moonshots	4	1	2	0	2	1	4	14	High
2019-35	NFIP, RiskMap, and CRS Program	2	0	2	0	4	1	4	13	Medium
2019-36	StormReady Program	2	2	2	4	4	2	4	20	High
2019-37	Cyber Security Threats Education	3	1	2	3	0	2	0	11	Medium
2019-38	Public Education and Outreach	3	1	2	0	0	2	4	12	Medium
2019-39	Dam Owner Education	3	0	2	0	0	2	0	7	Low
2019-40	Medical Surge	3	2	2	4	0	2	2	15	High
2019-41	Community Health and Safety Resiliency	3	1	2	0	0	1	4	11	Medium
2019-42	Vaccination	2	1	2	4	0	2	2	13	Medium
2019-43	Disease and syndromic surveillance	1	0	2	4	0	2	2	11	Medium
2019-44	Chemoprophylaxis	2	1	2	4	0	2	2	13	Medium
2019-45	Disease and Infestation Prevention and Control Technical Assistance	3	1	2	0	0	2	2	10	Low
2019-46	Isolation and Quarantine	3	2	2	4	0	2	2	15	High
2019-47	Social Distancing	4	2	2	4	0	1	2	15	High
2019-48	Depopulation of ill or exposed animals or plants	2	1	2	0	0	1	2	8	Low
2019-49	Control plant disease and infestation	2	1	2	0	0	1	2	8	Low
2019-50	Genetic Modification	1	0	1	0	0	1	2	5	Low

7.6.2.3 2019 – 2024 Mitigation Actions

Table 7.6-5 2019 Mitigation Action Hazards Addressed

Action ID #	Action Title	Civil Disturbance	Criminal Terrorist Nation Attack	Cyber Attack	Dam Failure	Drought	Fire (Wildfire)	Fire (Urban)	Flood	Geologic	HazMat Release	Infectious Disease	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident
2019-1	Mitigation Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-2	Hazard Mitigation Planning Toolbox	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-3	Building Codes and Zoning Ordinances	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
2019-4	Cultural and Historical Preservation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-5	Basin-wide Water Management Planning				Y	Y			Y							
2019-6	Local Master/Comprehensive Planning	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
2019-7	Integration of Mitigation and Comprehensive Planning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-8	Firewise and Community Wildfire Protection Plan						Y									
2019-9	Debris Management Plans	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
2019-10	Disaster Recovery Planning Toolbox	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-11	Dam EAPs		Y		Y											
2019-12	GIS Data Improvement/ Data Creation	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-13	Geologic Mapping									Y						
2019-14	Losses Avoided	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-15	North Dakota Silver Jackets								Y							

Action ID #	Action Title	Civil Disturbance	Criminal Terrorist Nation Attack	Cyber Attack	Dam Failure	Drought	Fire (Wildfire)	Fire (Urban)	Flood	Geologic	HazMat Release	Infectious Disease	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident
2019-16	Souris Basin Dams		Y		Y											
2019-17	Drought Contingency Plans					Y										
2019-18	Hazardous Materials Flow Study										Y					
2019-19	Tornado Safe Rooms and Shelters												Y			
2019-20	Flood Mitigation Measures				Y				Y							
2019-21	Floodproofing Critical Facilities				Y				Y							
2019-22	Power Redundancy at Critical Facilities	Y	Y	Y	Y		Y	Y	Y	Y			Y	Y	Y	Y
2019-23	Electric Infrastructure Protection	Y	Y		Y		Y	Y	Y	Y			Y	Y	Y	Y
2019-24	Outdoor Warning Systems												Y			
2019-25	Emergency Notification Systems	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-26	Dam Status Review				Y											
2019-27	Protect Communication Sites	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-28	Secure Electronic Systems			Y												
2019-29	Transportation Engineering and Systems							Y			Y					Y
2019-30	Snow Fences													Y		
2019-31	Drought Mitigation					Y										

Action ID #	Action Title	Civil Disturbance	Criminal Terrorist Nation Attack	Cyber Attack	Dam Failure	Drought	Fire (Wildfire)	Fire (Urban)	Flood	Geologic	HazMat Release	Infectious Disease	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident
2019-32	Hazardous Fuels Reduction						Y									
2019-33	Hazardous Materials Storage and Disposal										Y					
2019-34	Insurance Moonshots								Y							
2019-35	NFIP, RiskMap, and CRS Program								Y							
2019-36	StormReady Program								Y				Y	Y		
2019-37	Cyber Security Threats Education			Y												
2019-38	Public Education and Outreach	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2019-39	Dam Owner Education		Y		Y											
2019-40	Medical Surge											Y				
2019-41	Community Health and Safety Resiliency											Y				
2019-42	Vaccination											Y				
2019-43	Disease and syndromic surveillance											Y				
2019-44	Chemoprophylaxis											Y				
2019-45	Disease and Infestation Prevention and Control Technical Assistance											Y				
2019-46	Isolation and Quarantine											Y				
2019-47	Social Distancing											Y				
2019-48	Depopulation of ill or exposed animals or plants											Y				

Action ID #	Action Title	Civil Disturbance	Criminal Terrorist Nation Attack	Cyber Attack	Dam Failure	Drought	Fire (Wildfire)	Fire (Urban)	Flood	Geologic	HazMat Release	Infectious Disease	Severe Summer Weather	Severe Winter Weather	Space Weather	Transportation Incident
2019-49	Control plant disease and infestation											Y				
2019-50	Genetic Modification											Y				

Table 7.6-6 2019 Mitigation Actions Types

Action ID #	Action Title	Local Plans and Regulations	Structural Projects	Natural Systems Protection	Education Programs	Preparedness and Response Actions
2019-1	Mitigation Planning	Y				
2019-2	Hazard Mitigation Planning Toolbox	Y				
2019-3	Building Codes and Zoning Ordinances	Y				
2019-4	Cultural and Historical Preservation					Y
2019-5	Basin-wide Water Management Planning	Y				
2019-6	Local Master/Comprehensive Planning	Y				
2019-7	Integration of Mitigation and Comprehensive Planning	Y				
2019-8	Firewise and Community Wildfire Protection Plan	Y				
2019-9	Debris Management Plans	Y				
2019-10	Disaster Recovery Planning Toolbox					Y
2019-11	Dam EAPs	Y				
2019-12	GIS Data Improvement/ Data Creation					Y
2019-13	Geologic Mapping					Y
2019-14	Losses Avoided					Y
2019-15	North Dakota Silver Jackets					Y
2019-16	Souris Basin Dams					Y
2019-17	Drought Contingency Plans	Y				
2019-18	Hazardous Materials Flow Study					Y
2019-19	Tornado Safe Rooms and Shelters		Y			
2019-20	Flood Mitigation Measures		Y			
2019-21	Floodproofing Critical Facilities		Y			
2019-22	Power Redundancy at Critical Facilities					Y
2019-23	Electric Infrastructure Protection		Y			
2019-24	Outdoor Warning Systems					Y

Action ID #	Action Title	Local Plans and Regulations	Structural Projects	Natural Systems Protection	Education Programs	Preparedness and Response Actions
2019-25	Emergency Notification Systems					Y
2019-26	Dam Status Review					Y
2019-27	Protect Communication Sites		Y			
2019-28	Secure Electronic Systems					Y
2019-29	Transportation Engineering and Systems		Y			
2019-30	Snow Fences			Y		
2019-31	Drought Mitigation			Y		
2019-32	Hazardous Fuels Reduction			Y		
2019-33	Hazardous Materials Storage and Disposal					Y
2019-34	Insurance Moonshots					Y
2019-35	NFIP, RiskMap, and CRS Program					Y
2019-36	StormReady Program					Y
2019-37	Cyber Security Threats Education				Y	
2019-38	Public Education and Outreach				Y	
2019-39	Dam Owner Education				Y	
2019-40	Medical Surge					Y
2019-41	Community Health and Safety Resiliency					Y
2019-42	Vaccination					Y
2019-43	Disease and syndromic surveillance					Y
2019-44	Chemoprophylaxis					Y
2019-45	Disease and Infestation Prevention and Control Technical Assistance					Y
2019-46	Isolation and Quarantine					Y
2019-47	Social Distancing					Y
2019-48	Depopulation of ill or exposed animals or plants					Y
2019-49	Control plant disease and infestation					Y
2019-50	Genetic Modification					Y

7.6.3 Program Administration by State Documentation

The Program Administration by State documentation for North Dakota is included as an attachment to this appendix. Page numbering of this document will not be continuous into this attachment.

Appendix 7.7 Local and Tribal Plans

7.7.1 Local and Tribal Plan Status

Table 7.7-1 Local and Tribal Plan Status

Jurisdiction	Plan Status (*Approval Date*)	Other Jurisdiction(s) Included in Plan	Responsible Entity for Local Plan Development	Funding Source
Adams County	Approved Update (*4/3/2014*)	Hettinger County	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local
Barnes County	Approved Update (*7/7/2015*)		South Central Dakota Regional Council, Barnes County Commission, Barnes County Emergency Management	HMGP/ State/ Local
Benson County	Approved Update (*4/26/2018*)		Benson County Emergency Management	PDM/Local
Billings County	Approved (*12/9/2013*)	Dunn, Golden Valley, and Stark Counties	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local
City of Bismarck	Approved (*6/1/2015*)		City of Bismarck Emergency Management	Local
Bottineau County	Approved Update (*12/30/2015*)		Bottineau County Office of Emergency Management	HMGP/ State/ Local
Bowman County	Approved Update (*5/15/2013*)	Slope County	Bowman and Slope Counties Emergency Management	HMGP/ State/ Local
Burke County	Approved (*12/3/2013*)	Divide County	Burke and Divide Counties Emergency Management	HMGP/ State/ Local
Burleigh County	Approved Update (*3/30/2015*)		Burleigh County Emergency Management, Bismarck Emergency Management	Local
Cass County	Approved Update (*4/18/2014*)		Cass Fargo Emergency Management	HMGP/ State/ Local
Cavalier County	Approved Update (*4/26/2018*)		Paramount Planning, Cavalier County Emergency Management	PDM/Local
Dickey County	Approved Update (*10/30/2014*)		Dickey County Commission, South Central Dakota Regional Council	HMGP/ State/ Local
Divide County	Approved (*12/3/2013*)	Burke County	Burke and Divide County Emergency Management	HMGP/ State/ Local
Dunn County	Approved (*12/9/2013*)	Billings, Golden Valley, and Stark Counties	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local
Eddy County	Approved Update (*8/27/2018*)		Eddy and Wells Counties Emergency Management	PDM/Local

Jurisdiction	Plan Status (*Approval Date*)	Other Jurisdiction(s) Included in Plan	Responsible Entity for Local Plan Development	Funding Source
Emmons County	Approved Update (*2/12/2015*)		Emmons County Emergency Management	Local
Foster County	Approved Update (*9/29/2015*)		Foster County Emergency Management	HMGP/ State/ Local
Golden Valley County	Approved (*12/9/2013*)	Billings, Dunn, and Stark Counties	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local
Grand Forks County	Approved Update (*1/5/2015*)		Grand Forks County Emergency Management Office	HMGP/ State/ Local
Grant County	Approved Update (*2/9/2018*)		Grant County Commission, Grant County Emergency Management	PDM/Local
Griggs County	Approved Update (*2/9/2016*)		Griggs County Commission, Griggs county Emergency Management, South Central Dakota Regional Council	HMGP/ State/ Local
Hettinger County	Approved Update (*4/3/2014*)	Adams County	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local
Kidder County	Approved Update (*7/21/2014*)		Kidder County Emergency Management	HMGP/ State/ Local
LaMoure County	Approved Update (*11/18/2014*)		LaMoure County Commission, LaMoure County Emergency Management, South Central Dakota Regional Council	HMGP/ State/ Local
Logan County	Approved Update (*11/18/2014*)		Logan County Emergency Management	PDM/Local
McHenry County	Under Development (*Expired)*		McHenry County Department of Emergency Management	PDM/Local
McIntosh County	Approved Update (*11/22/2017*)		McIntosh County Commission, McIntosh County Emergency Management, South Central Dakota Regional Council	PDM/Local
McKenzie County	Approved (*4/28/2015*)		McKenzie County Emergency Management	HMGP/ State/ Local
McLean County	Approved Update (*4/4/2016*)		McLean County, Department of Disaster and Emergency Services	HMGP/ State/ Local
Mercer County	Approved Update (*5/5/2016*)		Mercer County, Department of Emergency Services	HMGP/ State/ Local
Morton County	Approved Update (*1/27/2015*)		Morton County	HMGP/ State/ Local

Jurisdiction	**Plan Status (*Approval Date*)**	**Other Jurisdiction(s) Included in Plan**	**Responsible Entity for Local Plan Development**	**Funding Source**
Mountrail County	Approved 10/6/2015		Mountrail County Emergency Management Services	HMGP/ State/ Local
Nelson County	Approved Update (*6/30/2015*)		Nelson County	HMGP/ State/ Local
Oliver County	Approved Update (*12/18/2013*)		Oliver County	HMGP/ State/ Local
Pembina County	Approved Update (*12/18/2015*)		Pembina County	HMGP/ State/ Local
Pierce County	Under Development (*Expired*)		Pierce County Emergency Management	PDM/Local
Ramsey County	Approved Update (*4/7/2017*)		Ramsey County	HMGP/ State/ Local
Ransom County	Approved Update (*9/15/2015*)		Ransom County	HMGP/ State/ Local
Renville County	Approved Update (*10/16/2017*)		Renville County Emergency Management Office	PDM/Local
Richland County	Under Development (*Expired*)		Richland County Emergency Management	HMGP/ State/ Local
Rolette County	Under Development (*Expired*)		Rolette County Emergency Management	HMGP/ State/ Local
Sargent County	Approved Update (*4/28/2015*)		Sargent County	HMGP/ State/ Local
Sheridan County	Approved (*8/8/2017*)		Sheridan County - Commission and Emergency Management	HMGP/ State/ Local
Sioux County	Approved Update (*3/1/2017*)	Standing Rock Tribal Reservation	Sioux County and Standing Rock Sioux Tribe	PDM/Local
Slope County	Approved Update (*5/15/2013*)	Bowman County	Bowman and Slope Counties Emergency Management	HMGP/ State/ Local
Spirit Lake Tribal Reservation	Under Development (*Expired*)		Tribal Reservation -- located within Benson, Eddy, Nelson, and Ramsey Counties	PDM/Local
Standing Rock Tribal Reservation	Approved Update (*3/1/2017*)	Sioux County	Sioux County and Standing Rock Sioux Tribe	PDM/Local
Stark County	Approved (*12/9/2013*)	Billings, Dunn, and Golden Valley Counties	Roosevelt-Custer Regional Council for Planning	HMGP/ State/ Local

Jurisdiction	Plan Status (*Approval Date*)	Other Jurisdiction(s) Included in Plan	Responsible Entity for Local Plan Development	Funding Source
Steele County	Approved Update (*2/13/2018*)		Steele County	PDM/Local
Stutsman County	Approved Update (*11/16/2015*)		Stutsman County - Commission and Emergency Response	HMGP/ State/ Local
Three Affiliated Tribes of the Fort Berthold Tribal Reservation	Under Development (*No Plan*)		Mandan, Hidatsa and Arikara Nation, Stantec	PDM/Local
Towner County	Approved Update (*7/23/2015*)		Towner County	HMGP/ State/ Local
Traill County	Approved Update (*1/22/2018*)		Traill County	HMGP/ State/ Local
Turtle Mountain Tribal Reservation	Approved (*11/5/2012*)		Turtle Mountain Band of Chippewa Tribal Planning & Economic Development Office	PDM/Local
Walsh County	Approved Update (*5/4/2016*)		Walsh County Commission and Emergency Management	HMGP/ State/ Local
Ward County	Approved Update (*8/17/2018*)		Ward County	PDM/Local
Wells County	Approved Update (*8/27/2018*)	Eddy County	Eddy and Wells County Emergency Management	PDM/Local
Williams County	Approved (*11/2/2017*)		Williams County	HMGP/ State/ Local

Source: FEMA-Approved Local Hazard Mitigation Plans (when available), Expired FEMA-Approved Local Hazard Mitigation Plans, Draft Local Hazard Mitigation Plans

7.7.2 Local Capability Table

Table 7.7-2 summarizes the local mitigation capabilities of each jurisdiction with a hazard mitigation plan in North Dakota. This information is collected from the most recent FEMA-approved update of the local hazard mitigation plan for each county or the draft versions of future local hazard mitigation plans. The table assesses capabilities across the following dimensions:

- **HMP:** Has the jurisdiction adopted a hazard mitigation plan that has been approved by FEMA?
- **NFIP:** Is the jurisdiction a regular member of the National Flood Insurance Program?
- **CRS:** Does the jurisdiction participate in the Community Rating System Program, and if so, what is its class?
- **ZON:** Does the jurisdiction administer a zoning ordinance?
- **SUB REG:** Does the jurisdiction administer subdivision regulations?
- **BLDG CODE:** Does the jurisdiction administer building codes?

- **BCEGS:** What is the ISO classification of the jurisdiction under the Building Code Effectiveness Grade Schedule?
- **PPC:** What is the ISO classification of the jurisdiction under the Property Protection Classification for fire protection?
- **COMP PLAN:** Does the jurisdiction have a comprehensive plan to guide the community's long-term (10- to 25-year) growth and development has been adopted within the last five years or its preparation or update is in progress?
- **CIP:** Does the jurisdiction program its annual capital expenditures on a multi-year capital improvements plan?
- **MIT PROJ EXP:** What is the jurisdiction's level of experience with mitigation projects funded through a FEMA grant program? (0 = no experience, 1 = limited experience, 2 = moderate experience, 3 = significant experience)
- **PLNR:** Does the jurisdiction have a full-time professional planner on staff?
- **ENGR:** Does the jurisdiction have a full-time professional engineer on staff?
- **CFM:** Does the jurisdiction have a Certified Floodplain Manager on staff to administer its floodplain management ordinance?
- **BLDG INSP:** Does the jurisdiction have a full-time building inspector on staff?
- **CAPAB RAT:** What is the community's overall capabilities to carry out mitigation activities, based on the above criteria? (1 = very limited capabilities, 2 = limited capabilities, 3 = moderate capabilities, 4 = substantial capabilities, 5 = very substantial capabilities)

Where information is available, most fields have been filled either with a **"Y"** in the case that the jurisdiction possesses that capability, or with an **"N"** in the case that the jurisdiction does not possess that capability. Other selected fields in Table 7.7-2 are populated with the following abbreviations:

- **A:** Adopted, not implemented
- **AP**: Approvable pending adoption
- **E:** Exempt
- **NA:** Not applicable
- **NM:** Not mapped
- **R:** Rescinded
- **S:** Sanctioned

Table 7.7-2 Local Capability Table by Jurisdiction

Jurisdiction	Type	HMP	NFIP	CRS	ZON	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
Adams	County	Y	Y	N	Y	Y	Y			Y	N		N	N	N	N	
Barnes	County	Y	Y	N	Y	Y	N			N	Y		N	N	Y	N	
Benson	County	Y	Y	N	Y	N	N			N	N		N	N	Y	N	
Billings	County	Y	N	N	Y	Y	Y			Y	N		N	N	N	N	
Bottineau	County	Y	Y	N	Y	Y	Y			N	N		Y	N	Y	Y	
Bowman	County	Y	N	N	Y	Y	N			Y	N		N	N	N	N	
Burke	County	Y	N	N	Y	Y	Y			N	N		N	N	N	N	
Burleigh	County	Y	Y	N	Y	N	N			Y	N		N	Y	Y	N	
Cass	County	Y	N	N	Y	N	N			Y	N		Y	Y	Y	N	
Cavalier	County	Y	Y	N	Y	N				Y	N		N	Y	Y	Y	
City of Bismarck	City	Y	Y	N	Y	Y	Y			N	Y		Y	Y	Y	Y	
Dickey	County	Y	Y	N	N	N	N			N	N		N	N	N	N	
Divide	County	Y	N	N	Y	N	Y			N	N		N	N	N	N	
Dunn	County	Y	Y	N	Y	Y	Y			Y	N		N	N	N	N	
Eddy	County	Y	Y	N	N	N	N			N	N		N	N	Y	N	
Emmons	County	Y	Y	N	Y	N	N			N	N		N	N	Y	N	
Foster	County	Y	Y	N	Y	Y	Y			N	Y		Y	Y	N	N	
Golden Valley	County	Y	N	N	Y	Y	Y			Y	N		N	N	N	N	
Grand Forks	County	Y	Y	N	N	Y	Y			Y	N		Y	N	Y	N	
Grant	County	Y	Y	N	Y	N	N			Y	N		Y	N	N	N	
Griggs	County	Y	Y	N	N	N	N			N	N		Y	Y	Y	N	
Hettinger	County	Y	Y	N	Y	Y	Y			Y	N		N	N	N	N	
Kidder	County	Y	N	N	N	N	Y			N	N		N	N	N	N	
LaMoure	County	Y	Y	N	Y	N	Y			N	Y		N	Y	Y	N	
Logan	County	Y	Y	N	Y	N	N			N	N		N	N	Y	Y	
McHenry	County	Y	Y	N	Y	N	Y			Y	N		Y	Y	Y	N	
McIntosh	County	Y	Y	N	Y	N	Y			Y	Y		Y	N	N	N	

Jurisdiction	Type	HMP	NFIP	CRS	ZON	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
McKenzie	County	Y	N	N	N	N	N			N	N		N	N	N	N	
McLean	County	Y	Y	N	Y	Y	N			N	N		Land Use Admin.	N	N	Custodian and Supervisor	
Mercer	County	Y	Y	N	Y	Y	N			N	Y		Land Use Admin.	N	N	N	
Morton	County	Y	Y	N	Y	N	N			Y	Y		Commissioners	Cities do have engineers, county does not	Emergency Manager and Homeland Security Director	N	
Mountrail	County	Y	N	N	Y	N	Y			N	N		N	N	Y	N	
Nelson	County	Y	Y	N	Y	Y	Y			N	Y		Commissioners	N	Emergency Manager	N	
Oliver	County	Y	Y	N	Y	Y	Y			Y	N		N	N	Y	N	
Pembina	County	Y	Y	N	Y	N	Y			Y	N		Commissioners	N	Emergency Manager	N	
Pierce	County	Y	Y	N	Y	N	Y			N	N		Y	N	N	N	
Ramsey	County	Y	Y	N	Y	Y	Y			Y	Y		Commissioners	N	Emergency Manager	N	
Ransom	County	Y	Y	N	Y	N	N			N	N		N	N	Emergency Manager	N	
Renville	County	Y	Y	N	Y	Y	Y			Y	Y		N	N	N	N	
Richland	County	Y	Y	N	Y	N	Y			N	N		Y	N	N	N	
Rolette	County	Y	Y	N	Y	N	Y			Y	Y		Y	Y	Y	N	
Sargent	County	Y	Y	N	N	Y	N			N	N		N	N	Emergency Manager and Homeland Security Director	N	
Sheridan	County	Y	N	N	Y	N	N			N	N		Y	N	PT	N	
Sioux and Standing Rock	County and Tribe	Y	Y	N	Y	Y	Y			Y	N		Y	N	Y	N	

Jurisdiction	Type	HMP	NFIP	CRS	ZON	SUB REG	BLDG CODE	BCEGS	PPC	COMP PLAN	CIP	MIT PROJ EXP	PLNR	ENGR	CFM	BLDG INSP	CAPAB RAT
Slope	County	Y	N	N	Y	N	N			N	N		N	N	N	N	
Spirit Lake	Tribal Reservation	Y	Y	N	N	N	N			N	N		N	N	N	N	
Stark	County	Y	Y	N	Y	Y	Y			Y	N		N	N	N	N	
Steele	County	Y	N	N	Y	Y	Y			N	Y		N	N	N	N	
Stutsman	County	Y	Y	N	Y	Y	Y			N	Y		Y	N	Y	N	
Three Affiliated Tribes	Tribes	N	Y	N	N	N	N			N	N		N	N	N	N	
Towner	County	Y	Y	N	Y	Y	Y			N	N		N	N	N	N	
Traill	County	Y	Y	N	Y	Y	Y			N	N		N	N	N	N	
Turtle Mountain	Tribal Reservation	Y	Y	N	Y	N	Y			N	N		N	N	N	N	
Walsh	County	Y	Y	N	Y	Y	Y			Y	Y		Y	N	Y	N	
Ward	County	N	Y	Y	Y	Y	Y			Y			Y	Burlington City has a FT Engineer, not the County	Local Emergency Planning Committee	Y	
Wells	County	Y	Y	N	N	N	N			N	N		Y	N	Y	N	
Williams	County	Y	Y	N	Y	Y	Y			Y	Y		N	N	Y	Y	

7.7.3 Local Mitigation Actions

Table 7.7-3 Local Mitigation Action Analysis

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
Adams	x			x				x	x				x		x					
Barnes						x		x			x	x	x	x	x	x	x	x		
Benson	x	x		x		x		x		x		x	x			x	x	x		
Billings	x					x	x	x	x		x		x		x	x	x	x		Instituting and enforcing burn bans
Bottineau	x			x		x					x	x	x		x	x	x	x		Drainage ditches and fire safety measures
Bowman	x			x		x			x		x		x			x	x			
Burke												x	x	x		x	x	x		School lockdown and safety procedures
Burleigh			x		x	x	x		x					x	x	x	x	x		Water conservation practices
Cass	x	x								x	x	x	x	x		x	x			
Cavalier	x					x	x				x	x		x	x	x	x	x		
City of Bismarck	x			x		x	x	x	x		x	x		x	x	x	x		x	
Dickey	x			x		x			x			x	x		x	x		x		Supplying first responders with WMD response equipment

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
Divide												x	x	x		x	x	x		School lockdown and safety procedures
Dunn	x					x	x	x	x		x		x		x	x	x	x		Instituting and enforcing burn bans
Eddy	x					x		x	x			x	x		x	x	x		x	
Emmons	x					x			x		x	x			x	x	x			
Foster	x			x		x		x	x				x	x	x	x	x	x		Security camera installation
Golden Valley	x					x	x	x	x		x		x		x	x	x	x		Instituting and enforcing burn bans
Grand Forks	x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	
Grant	x					x		x				x	x		x	x	x		x	Create a hazard incidence reporting system
Griggs	x					x			x			x	x		x	x	x			
Hettinger	x			x				x	x				x		x					
Kidder		x				x		x	x		x		x				x	x		
LaMoure	x					x		x	x		x	x	x		x	x	x			
Logan	x					x					x		x	x	x	x	x			
McHenry						x	x				x		x		x	x	x	x		
McIntosh	x			x		x							x		x	x	x	x		
McKenzie	x			x		x		x	x				x		x	x	x		x	

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
McLean						x					x	x	x	x	x	x	x			
Mercer						x	x			x				x	x	x	x		x	
Morton	x	x		x		x		x			x		x	x	x	x	x	x		Increases physical security and cybersecurity at government offices
Mountrail	x		x			x							x			x	x		x	Weed control measures (mowing)
Nelson	x	x		x		x	x			x	x	x	x	x	x	x	x	x	x	Install helipad, increase security for government buildings, replace fire hydrants, repair water tower, establish fire department sub-station, bury electrical power lines
Oliver	x					x							x			x		x		
Pembina						x					x	x	x	x	x		x		x	Engineering study for levee and drainage practices,
Pierce	x			x		x	x		x			x	x		x	x	x		x	
Ramsey	x	x		x		x			x	x	x	x	x	x		x	x	x	x	Create and maintain emergency snow routes, security fencing for key infrastructure,

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
																				create and maintain wind breaks, water conservation efforts, mosquito control program, monitor water and soil quality,
Ransom	x			x		x	x			x	x	x	x	x	x	x				
Renville				x		x	x				x		x	x		x	x	x		water conservation, security fencing around city lagoon and landfill sites, install drain field for septic system at fairgrounds/campgrounds, storage for equipment
Richland	x			x		x					x	x	x		x	x	x	x		
Rolette	x					x	x						x		x	x	x	x		
Sargent				x		x			x		x	x	x	x	x	x	x	x	x	
Sheridan	x					x	x		x					x		x	x	x		Vector control and prevent spread of disease
Sioux and Standing Rock	x			x		x	x	x	x	x	x		x	x	x	x	x	x	x	Protect cultural sites, install fire breaks
Slope	x			x		x			x		x		x			x	x			
Spirit Lake	x					x			x		x	x				x				

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
Stark	x					x	x	x	x		x		x		x	x	x	x		
Steele	x			x		x		x			x		x	x	x	x	x	x		Designate emergency snow routes, mosquito control, cap unused water wells, implement reverse 911 system
Stutsman	x	x		x		x	x	x	x		x		x	x	x	x	x			Develop CIP to protect vulnerable infrastructure, reloc ate propane, fuel tanks, and fertilizer plants away from residential communities, construct overpass over railroad, construct second fire department, develop a hazard incident reporting system
Three Affiliated Tribes				x		x										x		x	x	
Towner		x				x	x				x	x	x	x	x	x	x		x	Install security fencing around water plant; reverse 9-1-1 system
Traill	x					x					x	x	x	x	x	x	x	x		Replace city-owned septic tanks;

County	Mitigation Planning	Basin-Wide Water Management Planning	Data Digitization	Hazardous Materials Studies	Wildland Fire Database	Public Education	Insurance Education	Building Codes	Zoning and Ordinances	Bank Stabilization	Flood Control	Property Acquisition, Relocation, and Elevation	Storm Water Management & Roadway Protection	Floodproofing	National Flood Insurance Program	Public Warning, Signage, and Communications	Purchase generator and other equipment	Law enforcement and emergency personnel training	Safe Rooms	Other
																				reduce the slope of ditches to reduce risk of rollover when mowing; additional pipes to expand sewage system; mosquito management program; storm warning and awareness; enforce fire bans
Turtle Mountain						x		x	x			x	x		x	x		x	x	
Walsh	x	x				x	x	x	x	x	x	x	x	x	x	x	x		x	Increase awareness of water conservation and drought resistant farming
Ward	x	x	x			x	x		x		x	x	x	x	x	x	x		x	Enforce burn bans; GIS data
Wells	x					x		x			x		x		x	x	x	x	x	
Williams	x	x				x					x		x	x	x	x	x		x	Video surveillance and access control at schools

Table 7.7-4 Local and Tribal Plans Considering Repetitive Loss

Jurisdiction	Plan Incorporates (Severe) Repetitive Loss
Adams	Y
Barnes	Y
Benson	Y
Billings	N
Bottineau	Y
Bowman	N
Burke	N
Burleigh	N
Cass	Y
Cavalier	Y
City of Bismarck	Y
Dickey	Y
Divide	N
Dunn	N
Eddy	Y
Emmons	N
Foster	N
Golden Valley	N
Grand Forks	Y
Grant	N
Griggs	N
Hettinger	Y
Kidder	N
LaMoure	Y
Logan	N
McHenry	Y
McIntosh	N
McKenzie	N
McLean	N
Mercer	N
Morton	Y
Mountrail	N
Nelson	Y
Oliver	N
Pembina	Y
Pierce	N
Ramsey	Y
Ransom	Y
Renville	Y

Jurisdiction	Plan Incorporates (Severe) Repetitive Loss
Richland	Y
Rolette	Y
Sargent	N
Sheridan	N
Sioux and Standing Rock	N
Slope	N
Spirit Lake	Y
Stark	N
Steele	N
Stutsman	Y
Three Affiliated Tribes	N
Towner	Y
Traill	Y
Turtle Mountain	N
Walsh	Y
Ward	N
Wells	Y
Williams	N

Enhanced Multi-Hazard Mitigation Plan – Grants Management Performance Requirements

The ND Department of Emergency Services (NDDES) has worked diligently to ensure all Hazard Mitigation Assistance (HMA) program, planning, and finance related activities are completed per the Unified HMA Guidance and any associated regulations therein. By following these regulations, NDDES has been able to meet the Grants Performance Requirements of the Program Administration by State (PAS) Pilot Program, and has been approved to manage all of the delegated authorities of the DR-4323 Hazard Mitigation Grant Program (HMGP) as well.

For further verification, NDDES is also providing a self-assessment of the specific Grants Management Performance Requirements required for the approval of an Enhanced Multi-Hazard Mitigation Plan (MHMP) to verify that the State of North Dakota is eligible to receive Enhanced status.

Element	Requirements	Self-Verification of Compliance
E6. With regard to Hazard Mitigation Assistance (HMA) Programs, is the Recipient maintaining the capability to meet application timeframes and submitting complete project applications? [44 CFR §201.5(b)(2)(iii)(A)]	a. All applications and amendments are submitted by the end of each program's respective application period.	All applications have been submitted by the end of any applicable application periods within the past 4 quarters
	b. All applications are entered into FEMA's electronic data systems (such as, NEMIS and/or eGrants).	NDDES has submitted all HMGP applications electronically through the National Emergency Management Information System (NEMIS) and eGrants
	c. Eligibility and Completeness Checklist is prepared for all applications.	NDDES submitted all project review tools such as the Eligibility and Completeness Checklists for Project and Planning Subapplications, and Environmental Checklists as required by project type, at the time of application submittal.
	d. All applications are determined to be complete by FEMA within 90 days of submittal or selection for further review. Required environmental and historic preservation reviews and consultations will not be included in the 90-day review timeframe calculation.	100% of all applications submitted for approval within the past 4 quarters, save those that required additional environmental and historic preservation reviews, have been determined to be complete within 90 days by FEMA.

Element	Requirements	Self-Verification of Compliance
E7. With regard to HMA Programs, is the Recipient maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses? [44 CFR §201.5(b)(2)(iii)(B)]	All applications and amendments are determined to be complete by FEMA within 90 days of submittal or selection for further review, including all data requested by FEMA to support Cost Effectiveness determinations and environmental/historic preservation compliance reviews. Required environmental and historic preservation reviews and consultations will not be included in the 90-day review timeframe calculation.	100% of all applications submitted for approval within the past 4 quarters, save those that required additional environmental and historic preservation reviews, have been determined to be complete, and any additional documentation that has been required for project review and approval has been submitted to FEMA within 90 days.
E8. With regard to HMA Programs, is the Recipient maintaining the capability to submit complete and accurate quarterly progress and financial reports on time? [44 CFR §201.5(b)(2)(iii)(C)]	a. All progress reports must be complete and submitted on time. Information in reports must accurately describe grant activities, including data related to the completion of individual property acquisitions. Incomplete progress reports that do not provide information on all open grants and subgrants or include all information required by the Unified HMA Guidance are not considered on time.	100% of state progress reports for the past 4 quarters have been submitted on time and provide an accurate representation of program implementation and activities.
	b. All Federal financial reports (FFR), Standard Form (SF) SF-425 are submitted on time. Information in reports must accurately describe grant activities, as described in the Unified HMA Guidance.	All Federal Financials Report (FFR) and Standard Form (SF)-425 have been submitted to FEMA on time for the past 4 quarters, and create a picture of grant activities, in combination with the grant progress reports, in the case any extension requests would be required.
	c. State consistently complies with the Financial Management Standard requirements described in 2 CFR §§200.300 to 200.309.	NDDES consistently complies with all Financial Management Standard Requirements as found in 2 CFR 200.300 to 200.309, 2 CFR Part 215.21, and (for all older grants still being completed) 44 CFR Part 13.21.

Element	Requirements	Self-Verification of Compliance
E9. With regard to HMA Programs, is the Recipient maintaining the capability to complete [mitigation grant program] projects within established performance periods, including financial reconciliation? [44 CFR §201.5(b)(2)(iii)(D)]	a. All work as part of [mitigation grant program] subawards must be completed by the end of Period of Performance as described in the Unified HMA Guidance.	The scopes of work and all EHP requirements for all subawards have been completed as approved by the end of the Program Period of Performance for all projects within the past 4 quarters.
	b. No major findings on last single audit obtained by the state related to HMA programs. For states without HMA grants, FEMA will review other Federal grants prepared by the responsible agency (such as state Emergency Management Agency).	There have been no major findings (recommendations) on the agency's last single audit obtained by the state related to any HMA Programs.
	c. All grant close-out activities, including financial reconciliation, are completed within 90 days from the end of the performance period including: 1. Final FFR SF-425 and Performance Reports were submitted within 90 days from the end of the performance period unless an extension is granted by FEMA. 2. Statement submitted that approved Scope of Work and all environmental and historic preservation requirements have been satisfied. 3. SF-270 Request for Advance or Reimbursement or request to deobligate funds is completed, if applicable due to cost underruns. 4. Other documentation as required in the [mitigation grant program] Guidance. 5. No late drawdowns are requested or performed after the liquidation period has ended.	All Grant Closeout activities have been completed and submitted within 90 days of the end of the Program period of performance, to include all Final Financials Report (FFR) SF-425 and performance reports; statements supporting that the scopes of work and environmental/historic preservation requirements for all subapplication have been completed as approved by FEMA; an SF-270 Request for Advance or Reimbursement, or request to deobligate funds, has been completed and submitted to FEMA as required, and the State has not had any late drawdowns performed after the liquidation period has ended.
	d. Actual expenditures have been documented and are consistent with SF- 424A or SF-424C.	All expenditures are documented and submitted for FEMA review at closeout. All expenditures are documented and remain

Element	Requirements	Self-Verification of Compliance
		consistent with the final SF-424A or SF-424C.

State Mitigation Plan Review Tool

This section is organized as follows:

B.1 Plan Review Tool Summary

B.2 Standard State Mitigation Plan Regulation Checklist

B.3 Enhanced State Mitigation Plan Regulation Checklist

B.4 Strengths and Opportunities for Improvement

FEMA uses the State Mitigation Plan Review Tool (**"Plan Review Tool"**) to document how the state mitigation plan meets the regulation. If plan requirements are not met, FEMA informs the state of the changes it needs to make in each of the Required Revisions sections.

The **"Strengths and Opportunities for Improvement"** summary offers FEMA an opportunity to provide more comprehensive feedback to the state.

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The FEMA Plan Approver must reference the State Mitigation Plan Review Guide when completing the Plan Review Tool. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.'

The **"Required Revisions"** summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate number, where applicable. Requirements for each Element and sub-element are described in detail in the *State Mitigation Plan Review Guide*.

FEMA will provide a narrative summary of the review findings that includes a discussion of **"Strengths and Opportunities for Improvement"** as a means to offer more comprehensive feedback to the state to acknowledge where the plan exceeds minimum requirements as well as provide suggestions for improvements. FEMA will describe the strengths that are demonstrated and highlight examples of best practices.

FEMA may provide suggestions for improvement as part of the Pl*an Review Tool* or in a separate document. FEMA's suggestions for improvement are not required to be made for plan approval.

Required revisions from the Regulation Checklist are not documented in the **"Strengths and Opportunities for Improvement"** section.

Plan Review Summary

State: North Dakota	**Title and Date of Plan:** North Dakota Enhanced Mitigation Mission Area Operations Plan	**Date of Submission:** November 9, 2018
State Point of Contact (Name / Title): Justin Messner/Disaster Recovery Chief		**Address:** Fraine Barracks Rd, Bismarck, ND 58504
Agency: North Dakota Department of Emergency Services		
Phone Number: 701-328-8100	**E-Mail:** jmessner@nd.gov	

Date Received in FEMA Region:	
FEMA Reviewer (Planning – Name / Title):	**Date:**
FEMA Reviewer (HMA – Name / Title):	**Date:**
FEMA Reviewer (Name / Title):	**Date:**
FEMA Reviewer (Name / Title):	**Date:**
FEMA Approver (Name / Title):	**Date:**
Plan Status (Not Approved, Approvable Pending Adoption, Approved):	**Date:**

SUMMARY	YES	NO
STANDARD STATE MITIGATION PLAN		
Does the plan meet the standard state mitigation plan requirements?		
REPETITIVE LOSS STRATEGY		
Does the plan include a Repetitive Loss Strategy? [see S6 / RL1; S8 / RL2; S9 / RL3; S10 / RL4; S13 / RL5; and S15 / RL6]		
ENHANCED STATE MITIGATION PLAN		
Does the plan meet the enhanced state mitigation plan requirements?		

Standard State Mitigation Plan Regulation Checklist

REGULATION CHECKLIST – STANDARD PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
STANDARD (S) STATE MITIGATION PLAN		
Planning Process		
S1. Does the plan describe the planning process used to develop the plan? [44 CFR §§201.4(b) and (c)(1)]	Section 1 (pg. 1-7)	
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)]	Section 1.2 (pg. 3-5); Section 1.3 (pg. 5)	
Required Revisions:		
Hazard Identification and Risk Assessment		
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)]	Section 3.7 (pg. 47-268)	
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)]	Section 3.7 (pg. 47-268)	
S5. Does the risk assessment address the vulnerability of state assets located in hazard areas and estimate the potential dollar losses to these assets? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	Section 3.7 (pg. 47-268)	
S6. Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	Section 3.7 (pg. 47-268)	
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)]	Section 3.7 (pg. 47-268)	
Required Revisions:		
Mitigation Strategy and Priorities		
S8. Does the mitigation strategy include goals to reduce / avoid long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)]	Section 5.1.1 (pg. 323-326)	
S9. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(3)(iii) and (iv)]	Section 5.3.1 (Pg. 327-331)	
S10. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR §201.4(c)(3)(iv)]	Section 5.3.2 (pg. 331-363)	
S11. Was the plan updated to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities? [44 CFR §201.4(d)]	Section 5 (pg. 323-374)	

REGULATION CHECKLIST – STANDARD PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
Required Revisions:		
State Mitigation Capabilities		
S12. Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment? [44 CFR §201.4(c)(3)(ii)]	Section 4 (pg. 273-322)	
Required Revisions:		
Local Coordination and Mitigation Capabilities		
S13. Does the plan generally describe and analyze the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)]	Section 4.2 (pg. 318-322); Appendix 7.7.2 (pg. 765-769)	
S14. Does the plan describe the process to support the development of approvable local and tribal, as applicable, mitigation plans? [44 CFR §§201.3(c)(5) and 201.4(c)(4)(i)]	Section 5.4.1 (pg. 363-365); Section 5.4.2 (pg. 366-371); Section 4.2.5 (pg. 320-321)	
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)]	Section 5.4.2 (pg. 366-371)	
S16. Does the plan describe the process and timeframe to review, coordinate and link local and tribal, as applicable, mitigation plans with the state mitigation plan? [44 CFR §§201.3(c)(6), 201.4(c)(2)(ii), 201.4(c)(3)(iii), and 201.4(c)(4)(ii)]	Section 5.4.1 (pg. 363-365)	
Required Revisions:		
Plan Review, Evaluation, and Implementation		
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§201.4(c)(5)(i) and 201.4(d)]	Section 6 (pg. 375-378)	
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§201.4(c)(5)(ii) and 201.4(c)(5)(iii)]	Section 6.6 (pg. 378); Section 5.4.2 (pg. 366-371)	

REGULATION CHECKLIST – STANDARD PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
Required Revisions:		
Adoption and Assurances		
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR §201.4(c)(6)]	Adoption (pg. xiv-xix) (Note: Previous adoption documents currently included, and a new adoption letter will be included after FEMA review.)	
S20. Did the state provide assurances? [44 CFR §201.4(c)(7)]	Adoption (pg. xiv-xix); Section 6 (pg. 375-378)	
Required Revisions:		
Repetitive Loss (RL) Strategy		
RL1. Did Element S6 (risk assessment) address RL and SRL properties? [44 CFR §§201.4(c)(2)(ii), 201.4(c)(2)(iii), and 201.4(c)(3)(v)]	Section 3.7.7 (pg. 142)	
RL2. Did Element S8 (mitigation goals) address RL and SRL properties? [44 CFR §§201.4(c)(3)(i) and 201.4(c)(3)(v)]	Section 5.1.1.1 (pg. 324-326)	
RL3. Did Element S9 (mitigation actions) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iii) and 201.4(c)(3)(v)]	Section 5.1.1.2 (pg. 326) and Section 5.3.2 (pg. 331-363)	
RL4. Did Element S10 (funding sources) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iv) and 201.4(c)(3)(v)]	Section 5.3.2 (pg. 331-363)	
RL5. Did Element S13 (local and tribal, as applicable, capabilities) address RL and SRL properties? [44 CFR §§201.4(c)(3)(ii) and 201.4(c)(3)(v)]	Section 4.2.4.1 (pg. 320); Appendix 7.7 (pg. 762-777)	
RL6. Did Element S15 (prioritizing funding) address RL and SRL properties? [44 CFR §§201.4(c)(4)(iii) and 201.4(c)(3)(v)]	Section 4.2.5 (pg. 320-321); Section 5.4.2.2 (pg. 367-368)	
Required Revisions:		

Enhanced State Mitigation Plan Regulation Checklist

REGULATION CHECKLIST – ENHANCED PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
ENHANCED (E) STATE MITIGATION PLAN		
Meet Standard State Mitigation Plan Elements		
E1. Does the Enhanced plan include all elements of the standard state mitigation plan? [44 CFR §201.5(b)]	Entire Document	
Required Revisions:		
Integrated Planning		
E2. Does the plan demonstrate integration to the extent practicable with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives? [44 CFR §201.5(b)(1)]	Section 4 (pg. 273-322)	
Required Revisions:		
State Mitigation Capabilities		
E3. Does the state demonstrate commitment to a comprehensive mitigation program? [44 CFR §201.5(b)(4)]	Section 5 (pg. 323-374)	
E4. Does the enhanced plan document capability to implement mitigation actions? [44 CFR §§201.5(b)(2)(i), 201.5(b)(2)(ii), and 201.5(b)(2)(iv)]	Section 4 (pg. 273-322); Section 5.4.2 (pg. 366-371)	
E5. Is the state effectively using existing mitigation programs to achieve mitigation goals? [44 CFR §201.5(b)(3)]	Section 4.1.2 (pg. 273-295); Section 4.1.3 (pg. 295-307)	
Required Revisions:		
HMA Grants Management Performance		
E6. With regard to HMA, is the state maintaining the capability to meet application timeframes and submitting complete project applications? [44 CFR §201.5(b)(2)(iii)(A)]	Section 5.4.4 (pg. 371-373)	
E7. With regard to HMA, is the state maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses? [44 CFR §201.5(b)(2)(iii)(B)]	Section 5.4.4.2 (pg. 372-373)	

REGULATION CHECKLIST – ENHANCED PLAN *M=Met; NM=Not Met	Location in Plan	M / NM*
E8. With regard to HMA, is the state maintaining the capability to submit complete and accurate quarterly progress and financial reports on time? [44 CFR §201.5(b)(2)(iii)(C)]	Section 5.4.4.3 (pg. 373)	
E9. With regard to HMA, is the state maintaining the capability to complete HMA projects within established performance periods, including financial reconciliation? [44 CFR §201.5(b)(2)(iii)(D)]	Section 5.4.4 (pg. 371-373)	
Required Revisions:		

Strengths and Opportunities for Improvement

STRENGTHS AND OPPORTUNITIES FOR IMPROVEMENT
INSTRUCTIONS: The purpose of the "Strengths and Opportunities for Improvement" section is for FEMA to provide more comprehensive feedback on the state mitigation plan to help the state advance mitigation planning. The intended audience is the state staff responsible for the mitigation plan update. FEMA will address the following topics: 1. Plan strengths, including specific sections in the plan that are above and beyond the minimum requirements; and 2. Suggestions for future improvements. FEMA will provide feedback and include examples of best practices, when possible, as part of the *Plan Review Tool,* or, if necessary, as a separate document. The state mitigation plan elements are included below in italics for reference but should be deleted as the narrative summary is completed. FEMA is not required to provide feedback for each element. Required revisions from the **Regulation Checklist** are not documented in the **Strengths and Opportunities for Improvement** section. Results from the **Strengths and Opportunities for Improvement** section are not required for Plan Approval, but may inform discussions during the Program Consultation.
Describe the mitigation plan strengths, including areas that may exceed minimum requirements. • *Planning process* • *Hazard identification and risk assessment* • *Mitigation strategy* • *State mitigation capabilities* • *Local and tribal, as applicable, coordination and mitigation capabilities* • *Plan review, evaluation, and implementation* • *Adoption and assurances* • *Repetitive loss strategy, if applicable* • *Integrated planning process, if applicable* • *Commitment to a comprehensive mitigation program, if applicable* • *HMA grants management performance, if applicable*
Describe areas for future improvements to the mitigation plan. • *Planning process* • *Hazard identification and risk assessment* • *Mitigation strategy* • *State mitigation capabilities* • *Local and tribal, as applicable, coordination and mitigation capabilities* • *Plan review, evaluation, and implementation* • *Adoption and assurances* • *Repetitive loss strategy, if applicable* • *Integrated planning process, if applicable* • *Commitment to a comprehensive mitigation program, if applicable* • *HMA grants management performance, if applicable*