State of North Dakota
Multi-Hazard Mitigation Plan

DRAFT

October 2013

Plan Development Managed by:

NDDES
Homeland Security
State Radio

Plan Prepared by:

amec

EXECUTIVE SUMMARY

Disasters can strike at any time in any place. In many cases, actions can be taken before disasters strike to reduce or eliminate the negative impacts. These actions, termed mitigation, often protect life, property, the economy, and other values. The State of North Dakota Multi-Hazard Mitigation Plan addresses thirteen major hazards with respect to risks and vulnerabilities statewide. Through a collaborative and ongoing planning process, including review of local mitigation plans, the North Dakota hazards were identified, researched, profiled, and prioritized.

The major hazards – communicable disease; dam failure; drought; flood; geologic hazards; hazardous material release; homeland security incident; severe summer weather; severe winter weather; shortage or outage of critical materials or infrastructure; transportation accident; urban fire or structure collapse; wildland fire; and windstorm – are each profiled in terms of their description, geographic location, previous occurrences, probability, magnitude, vulnerabilities, data limitations, and other key documents. The vulnerabilities to jurisdictions, state-owned buildings and property, critical facilities and infrastructure, and new and future development are evaluated for each hazard.

Based on the probability and extent of potential impacts, the hazards are prioritized as follows for the State of North Dakota:

- <u>High Hazards</u>: Severe Winter Weather; Severe Summer Weather; Flood; Wildland Fire
- <u>Moderate Hazards</u>: Communicable Disease; Drought; Hazardous Material Release; Shortage or Outage of Critical Materials or Infrastructure; Windstorm
- <u>Low Hazards</u>: Homeland Security Incident; Geologic Hazards; Urban Fire or Structure Collapse; Dam Failure; Transportation Accident

The following purpose statement and goals are outlined in the plan's mitigation strategy, based on the results of the risk assessment:

- Purpose: Minimize the vulnerability of the life and health of people, property, environment, and economy of North Dakota and its communities from the impacts of natural and technological hazards as well as adversarial threats.
- 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.

Associated with each of the goals are objectives and specific mitigation actions. The mitigation actions that can be done at the state government level are prioritized based on cost, project management, feasibility, population benefit, property benefit, effectiveness, and the hazards being mitigated. An implementation plan outlines the suggested course of action, given the limited resources available in the state. The state's overall mitigation strategy includes a process for approving, funding, and implementing local projects. The State Hazard Mitigation Team, through the Department of Emergency Services, is responsible for the maintenance of the plan. Other recommended activities, such integrating this plan into a variety of other federal, state, tribal, and local plans and documents, will further the goals of hazard mitigation in North Dakota.

The State of North Dakota Multi-Hazard Mitigation Plan exceeds the requirements of a state hazard mitigation plan as outlined in the Interim Final Rule published in the Federal Register on February 26, 2002 at Title 44 of the Code of Federal Regulations, Part 201 as part of the Disaster Mitigation Act of 2000. This plan has been approved by the Federal Emergency Management Agency, and therefore, the state continues to be eligible for federal mitigation funds. This plan serves as a guide for understanding the major hazards facing North Dakota and provides a comprehensive, statewide strategy for mitigating some of the impacts.

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Appendices

1. Adoption Documentation

The State of North Dakota Multi-Hazard Mitigation Plan has been adopted by the State of North Dakota through the executive powers of the Governor. A copy of the letters signed by the Governor documenting the adoption of this plan in 2013, 2011, 2008, and 2005 is provided here. Through this adoption North Dakota state government, across all agencies, is continuing 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.

<insert 2014 letter here>

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

600 E Boulevard Ave • Bismarck, ND 58505-0001 • Phone: 701.328.2200 • Fax: 701.328.2205 • www.nd.gov

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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2. Introduction

2.1. Purpose

The State of North Dakota Multi-Hazard Mitigation Plan has been developed to serve the people of North Dakota by providing the impetus for making our homes, businesses, and communities as safe as possible against the impacts of natural and human-caused hazards. This plan contains a wealth of geographic and demographic information, along with a thorough assessment of the hazards faced throughout the state. This plan addresses the overall capability of state and local governments to reduce or eliminate the vulnerability of our communities to these hazards. Most importantly, the plan outlines a coordinated mitigation strategy, adopted by the State of North Dakota, which includes long-term goals, objectives, and a wide variety of mitigation options.

This plan was developed through partnerships and participation across all levels of government and the private sector to represent the perspectives of North Dakota as a whole, rather than that of one state agency. The lead agency in the development of this plan was the North Dakota Department of Emergency Services (DES), Division of Homeland Security. North Dakota DES coordinates mitigation planning through the multi-agency State Hazard Mitigation Team (SHMT).

The mission of the North Dakota State Hazard Mitigation Team is to assist North Dakota citizens, communities, state agencies, local and tribal governments, and businesses in becoming less vulnerable to the impacts of natural hazards through the effective administration of grant programs, hazard risk assessments, wise floodplain management, and a coordinated approach to mitigation policy through state, regional, and local planning activities.

The North Dakota State Hazard Mitigation Team envisions instituting a statewide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable North Dakota. The team continues to aggressively implement a widely recognized, comprehensive program of mitigation that goes beyond that of solely reducing hazard vulnerability, but also incorporates complementary goals that can address multiple community needs and lead to safer, more sustainable communities. In so doing, the team is helping the Division of Homeland Security in carrying forward a revitalized approach to traditional emergency management. Rather than focusing on short-term solutions to inevitably long-term problems, the team's work emphasizes the need to ensure communities become better able to withstand the forces of nature while at the same time improving their residents' overall quality of life. By avoiding unnecessary exposure to known hazards, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazard events. The team has been addressing the needs of current residents and also the needs of future generations. It is hoped that this focus on an integrated, future-oriented approach will result in communities that are less vulnerable and more sustainable. The North Dakota State Hazard Mitigation Team therefore carefully and deliberately embodied the principles and spirit of community sustainability into many sections of this plan.

Shortsighted development patterns have contributed to making some North Dakota communities extremely vulnerable to flooding, wildland fire, and other hazards. The State Hazard Mitigation Team can work with communities to reduce their vulnerability by educating about inappropriate land uses and by encouraging the acquisition, relocation, or retrofitting of existing vulnerable structures, along with the protection of valuable natural resources. If a disaster should strike any one of these communities, the State Hazard Mitigation Team can assist the community in building back better and stronger than before.

Through experience, the team has learned that communities will face significant challenges during post-disaster redevelopment on balancing the driving need for rapid recovery with implementing long-term hazard mitigation. The necessity of meeting basic needs and resettling displaced populations immediately following a disaster often overshadows the more abstract, longer-term sustainability considerations. Once full-scale reconstruction is initiated, it is difficult to modify projects in progress to meet sustainability objectives. This phenomenon highlights the need for pre-disaster mitigation planning that incorporates principles of sustainable development within the context of reconstruction so that communities can more easily rebuild in a manner that will make them less vulnerable to future hazard events and improve their residents' quality of life.

The State Hazard Mitigation Team strongly believes that much of the work in hazard mitigation and sustainable development must be carried out at the local level. It is at the local level where land use decisions are made, growth and development take place, and where the impacts of natural hazards are most direct. The team has always supported local self-sufficiency and reliance, providing assistance to communities where it is needed, but allowing local initiatives to take the lead. As noted within this plan, a major goal of the team is to build and support such local capacity and commitment.

The State Hazard Mitigation Team realizes that establishing a true statewide mitigation ethic will take hard work, and quite possibly will require major paradigm shifts among many different entities. State agencies, units of local and tribal government, non-profit organizations, businesses and industries, and private citizens will have to become more involved. This plan is meant to be the first step in that direction.

The purpose of this Multi-Hazard Mitigation Plan is to:

- Serve as a consolidated, comprehensive source of statewide hazard information
- Educate government leaders and the public on their vulnerabilities
- Prioritize and promote cost-effective mitigation solutions
- Provide guidance to organizations and agencies statewide regarding hazard mitigation

- Support requests for grant funding
- Encourage long-term community sustainability
- Improve coordination of mitigation efforts across the state

Through routine monitoring and updating, this plan will remain the guide for the North Dakota State Hazard Mitigation Team to follow in accomplishing its vision of a safe and sustainable North Dakota.

2.2. Scope

The State of North Dakota Multi-Hazard Mitigation Plan was prepared to address all hazards that pose significant risk to North Dakota. Each hazard has been assessed using consistent methodology, while also providing historical background and assessing vulnerability and potential loss. In addressing North Dakota's capability to mitigate the effects of these hazards, this plan analyzes each of the relevant federal, state, local, and tribal government agencies and their applicable programs and/or policies. The mitigation strategy adopted within this plan establishes the long-term goals and objectives for the State of North Dakota and lists possible actions to achieve them. The strategy was developed through a tremendous amount of input from statewide mitigation stakeholders and will continue to be monitored and updated on a regular basis.

The mitigation priorities adopted within this plan address long-term, permanent solutions to problems caused by hazards throughout the State of North Dakota. While these priorities may shift following a particular disaster event, they are designed to provide the mitigation team with long-term mitigation objectives and solutions. The implementation of this plan is intended to help break the continuing cycle of disaster, damage, and reconstruction, from which our citizens have been suffering, by focusing sharply on the mitigation element of the comprehensive emergency management system. This mitigation element includes policy, planning, and initiatives that will reduce the vulnerability of North Dakota communities to all identified hazards. The mitigation element also includes a strong outreach strategy that will be implemented throughout all phases of emergency management. Disaster preparedness, response, and recovery operations are not focused on within this plan but are instead covered in state and county emergency operations plans (EOPs).

2.3. Organization

This plan is organized around FEMA's mitigation planning process and is divided into eight chapters:

Chapter 1 Adoption Documentation includes the State's adoption of the plan and assurances that the State will comply with all applicable federal statutes and regulations.

Chapter 2 Introduction explains the purpose, organization, scope, and authority of the plan, and provides a general overview of North Dakota.

Chapter 3 Planning Process explains the planning process, including how the plan was prepared, who was involved, and how it was integrated with other related planning efforts.

Chapter 4 Assets at Risk/Future Development includes state-owned buildings and property; critical facilities and infrastructure; population; buildings; economic ecologic, historic, and social values; land use; new development; and future development.

Chapter 5 Risk Assessment features the risk assessment, which identifies the type and location of hazards that can affect North Dakota, analyzes vulnerability to the hazards identified at the state and county level, and serves as the factual basis for the mitigation strategy.

Chapter 6 Mitigation Strategy provides the State's mitigation blueprint. Specifically, it includes goals and objectives, statewide mitigation actions, and local mitigation actions.

Chapter 7 Mitigation Implementation System presents the state capability assessment, mitigation funding sources, local and tribal capability assessment, local and tribal mitigation planning, and project management.

Chapter 8 Plan Maintenance includes the State's approach to plan monitoring, plan evaluation, plan updates, and the plan update process.

Appendices include information and documentation on participation, meeting summaries, references, acronyms, hazard vulnerability calculations, local and tribal hazard mitigation plan approvals.

2.4. Authority

The State of North Dakota Multi-Hazard Mitigation Plan has been prepared by the North Dakota Department of Emergency Services, pursuant to Section 322 of the Disaster Mitigation Act of 2000 (P.L. 106-390), which requires the state to develop mitigation plans that:

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

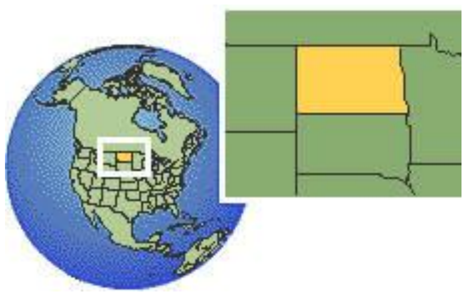
The Disaster Mitigation Act of 2000 became law on October 30, 2000, and amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the "Stafford Act") (P.L. 93-288, as amended). Regulations for this activity can be found in 44 CFR, Part 201.

The North Dakota Century Code 37-17.1, as amended, requires the Department of Emergency Services (DES) to coordinate the development of a hazard mitigation plan. The Governor has the leadership role in the issuance of guidance to all state agencies to minimize the effects of hazards on the citizens of North Dakota. In state and federal recovery agreements following a Presidentially Declared Disaster, the Governor, through the Department of Emergency Services, administers mitigation guidance and funding to state and local applicants.

The Disaster Mitigation Act of 2000 also requires local governments to develop and submit mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) project grants. These plans are an integral part of this state plan and are considered appendices.

2.5. North Dakota Overview

North Dakota is located at the center of the North American continent, bounded on the north by the Canadian provinces of Manitoba and Saskatchewan, on the east by Minnesota, on the south by South Dakota, and on the west by Montana. The state 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. North Dakota is 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.



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. Record temperature extremes exist from –60°F at Parshall on February 15, 1936 to 121°F at Steele on July 6, 1936.

Average monthly snowfall amounts for any location in the state 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 economic catastrophe.

North Dakota has a 2012 estimated population of 699,628. The largest cities in the state include Fargo (109,779 people, 2012 estimate), Bismarck (64,751 people, 2012 estimate), Grand Forks (53,456 people, 2012 estimate), and Minot (43,746 people, 2012 estimate). The state's population ratio is about 9.7 people per square mile. (US Census Bureau, 2010) North Dakota has three Native American reservations within its borders and shares two with South Dakota. The state is comprised of 53 counties and many incorporated cities and townships.

Agriculture is the primary land use and industry in North Dakota. Agricultural production comprises about 90 percent of the roughly 70,700 square miles of land area. Other sectors of the economy include mining (including oil and gas industry), construction, manufacturing, transportation, communications, utilities, wholesale, retail, services, finance, insurance, and real estate.

All of the factors above are important when examining the state's vulnerability to hazards. Fourteen hazards are identified in this plan as having a significant potential threat to the people, environment, and economy of North Dakota. These hazards are:

- Communicable Disease (including human, animal, and plant diseases)
- Dam Failure
- Drought
- Flood (including riverine, levee failure, closed basin, ice jam, and flash floods)
- Geologic Hazards (including landslide, earthquake, and other geologic/mining hazards)
- Hazardous Material Release (including impacts from the oil and gas industry)
- Homeland Security Incident (including multiple types of terrorism and cyber-terrorism)
- Severe Summer Weather (including tornadoes, hail, downbursts, thunderstorm winds, lightning, and extreme heat)
- Severe Winter Weather (including blizzards, heavy snow, ice storms, and extreme cold)
- Shortage or Outage of Critical Materials or Infrastructure
- Transportation Accident (including vehicular, railway, and aircraft accidents)
- Urban Fire or Structure Collapse
- Wildland Fire
- Windstorm

Windstorm was separated from other hazards as its own hazard in the 2014 plan update. This plan, particularly the Risk Assessment (Section 5), outlines each hazard in detail and how it may affect the State of North Dakota. A Statewide Inventory (Section 4) identifies assets and exposures throughout the state that are at risk from the hazards. The Mitigation Strategy (Section 6) outlines solutions to possibly prevent or minimize future damages. The Mitigation Implementation System (Section 7) describes the capabilities and methods used to implement mitigation projects. Each section was developed through a Planning Process (Section 3) designed to involve as many mitigation stakeholders as possible and to incorporate information from a wide variety of other plans and programs related to hazard mitigation. This plan will be monitored, evaluated, and updated as outlined in Plan Maintenance (Section 8).

Additional hazards may exist that were not apparent to the mitigation team or stakeholders through the development of this plan, and certainly, disasters can occur in unexpected ways. Although any and all hazards cannot be fully mitigated, hopefully, this plan will help North Dakotans understand the hazards better and become more disaster resistant.

3. Planning Process

3.1. Background

The State of North Dakota Multi-Hazard Mitigation Plan represents a coordinated effort and ongoing commitment to mitigate potential losses and damages caused by the various hazards that occur in North Dakota. The plan was originally implemented in 1989 and updated in 2000, 2002, 2004, 2007, 2010, and 2013. The State of North Dakota and its political subdivisions are confronted with the possibility of natural, technological, and human caused hazards that pose a threat 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, including response and recovery plans, training, development and management of resources; mitigation is the focus of this particular plan. This Multi-Hazard Mitigation Plan was formally adopted in March 2005 as a Standard State Plan. It was revised significantly and adopted in March 2008, updated and improved in March 2011, and updated and improved again in 2013. State adoption was executed through a letter signed by the Governor, as shown in Section 1, Adoption Documentation. This plan incorporates all changes associated with the implementation of the federal/state hazard mitigation programs, including the applicable sections of the Disaster Mitigation Act of 2000. The State of North Dakota Multi-Hazard Mitigation Plan is updated at least every three years, or after each disaster declaration if needed, by members of the State Hazard Mitigation Team.

The North Dakota Department of Emergency Services (DES) has actively promoted hazard mitigation since 1989. Because of the state's proactive stance on mitigation, in August 1999, North Dakota was designated the first managing state in the western United States.

The key to the development of a sound mitigation plan is the establishment of essential elements of the planning process. The following are some of the elements used to develop this plan:

- Identify the types of natural and human-caused hazards that affect the state and develop a brief history for each.
- Determine the present and future risk and vulnerability of North Dakota citizens to these hazards.
- Determine our present capability to perform hazard mitigation at the local, tribal, state, and federal levels.
- Establish and prioritize the major hazard mitigation issues that should be addressed.
- Determine mitigation measures and strategies for addressing and reducing the state's vulnerability to present and future hazards.
- Outline a system for managing and improving mitigation programs at the state level.

As mitigation planning evolves, improvements and revisions are continuously being made. Beginning in May 2007 and completing in December 2007, a major overhaul of the Multi-Hazard Mitigation Plan resulted in revisions and updates to all sections of the plan to improve readability and usefulness of the plan. Relevant information from the March 2005 edition, with changes, was used where appropriate in the new sections. New information was added to improve the sections, and dated or extraneous information was removed. These changes were made to improve the format of the plan and ensure that federal regulations continued to be met. An additional focus was to improve the usability and credibility of the plan. Data was used that can be easily updated in the future, and whenever possible, statewide data was used to provide a consistent statewide assessment and to minimize assumptions at the state level regarding hazards and activities at the local level.

During 2010, a new hazard capturing the risk from geologic hazards was added and all sections were reviewed, evaluated, and updated, but the basic methodologies and plan layout remained the same. Further focus was added for vulnerabilities to new development. The mitigation capabilities of state, tribal, and local governments were analyzed in more detail.

The 2013 update resulted in further refinements to the plan and risk assessment, including a revised list of hazards. Summer storm was revised to include tornadoes, hail, downbursts, thunderstorm winds, lightning, and extreme heat. Windstorm was added as a separate hazard and included frontal wind events not captured under Severe Summer Storms or Severe Winter Weather. Hazardous Materials Release was expanded to include information related to North Dakota's growing oil and gas industry. Levee failure was added to the Flood profile, and the Homeland Security Incident section discussed the potential for cyber-terrorism. The Hazard Identification/Risk Assessment used new methodologies for assessing risk and vulnerability at the state and county level where possible. The "Mapping" subsections were renamed to "Geographic Location." The "Vulnerabilities to Jurisdictions" subsections were split into "State Risk Assessment" and "Local Risk Assessments." Highlights of the major changes made to the plan are summarized further in Section 3.7.

3.2. Roles and Responsibilities

3.2.1. North Dakota Department of Emergency Services

The Department of Emergency Services (DES) is the lead agency for emergency management in the State of North Dakota. Hazard mitigation is a key component of emergency management, and therefore, the department assumes an all-hazard mitigation leadership role. The State Hazard Mitigation Officer (SHMO) is housed within the Department of Emergency Services and programs such as the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, and Repetitive Flood Loss Programs are managed by the SHMO and staff. Other hazard-specific programs, such as the National Flood Insurance Program and National Fire Plan, are managed by other agencies, but the responsibility of building a state mitigation plan and coordinating overall statewide hazard mitigation lies with DES.

Mitigation planning responsibilities of the North Dakota Department of Emergency Services include:

- Developing and maintaining a statewide multi-hazard mitigation plan based on significant recurring hazards affecting the state.
- Updating mitigation planning documents based on accomplishments, federal and state declared disasters or emergencies, and new information.
- Administering local and state mitigation planning grants and programs, both pre- and post-disaster.
- Coordinating activities of the State Hazard Mitigation Team and Interagency Hazard Mitigation Team.

3.2.2. Federal Emergency Management Agency

The key federal agency in hazard mitigation planning is the Federal Emergency Management Agency (FEMA). FEMA provides financial and technical assistance to states in developing mitigation plans. The agency also reviews and approves state, tribal, and local hazard mitigation plans. Following a disaster, FEMA assists the state in setting up a Disaster Field Office, conducting applicant briefings, and managing post-disaster mitigation programs. FEMA regularly provides technical assistance to the state regarding mitigation programs and projects. During periods with high levels of disaster activity, FEMA has assisted the state with the review of local mitigation plans.

3.2.3. State Hazard Mitigation Team

North Dakota Department of Emergency Services mitigation staff reviewed state laws, executive orders, and regulations and identified state agencies that have a role or stake in natural and human caused hazard mitigation. Experience through past disasters has also demonstrated which key agencies need to be involved in mitigation. During the 2013 update process participation on the State Hazard Mitigation Team was greatly expanded to include representatives from state and local agencies, specific associations, private businesses, and oil and gas industry leaders. Roles of participants on the State Hazard Mitigation Team vary from regulatory enforcement to construction activities. Agencies are added or removed from time-to-time depending on the type of disaster or project reviews.

Responsibilities of the State Hazard Mitigation Team include:

- Coordinating pre- and post-disaster state and local hazard mitigation efforts across individual agencies.
- Working with DES and providing input in the development, update, and maintenance of a statewide multi-hazard mitigation plan based on significant recurring hazards affecting the state.
- Recommending priorities for mitigation in the state.

- Working with the appropriate local agencies in the implementation of mitigation projects and planning initiatives.
- Ensuring that activities, programs, and policies related to hazard vulnerability and management are coordinated by state agencies and contribute to the avoidance and reduction of natural hazards.

Table 3.1 lists the participating agencies on the 2013 State Hazard Mitigation Team. Seventy-nine agencies were invited to attend SHMT meetings during the 2013 update process, and 71 of the agencies attended.

Table 3.1. 2013 State Hazard Mitigation Team

Agency	Invited to Attend SHMT meetings	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
American Red Cross	X	X			X
Bank of North Dakota	X				X
Bismarck Civic Center	X	X			X
Burleigh County	X	X	X	X	X
Cavalier County	X		X		X
City of Bismarck	X	X	X	X	X
City of Fargo	X	X			X
City of West Fargo	X	X			X
Dunn County	X	X	X	X	X
Fargo Fire Department	X	X			X
Federal Highway Administration	X		X		X
FEMA Region VIII	X		X	X	X
Greater North Dakota Chamber	X				X
Lutheran Disaster Response	X	X	X	X	X
N.D. Aeronautics Commission	X	X	X	X	X
N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	X	X	X	X	X
N.D. Association of Rural Electrical Cooperatives	X	X		X	X
N.D. Bureau of Criminal Investigation (BCI)	X	X	X	X	X
N.D. Department of Agriculture	X	X	X	X	X
N.D. Department of Commerce	X	X	X		X
N.D. Department of Commerce, Division of Community Services	X	X			X
N.D. Department of Emergency Services, Division of Homeland Security	X	X	X	X	X
N.D. Department of Emergency Services, Division of State Radio	X				X
N.D. Department of Health	X	X	X	X	X
N.D. Department of Human Services	X	X	X	X	X
N.D. Department of Mineral Resources	X	X			X
N.D. Department of Transportation	X	X	X	X	X
N.D. Division of Animal Health	X				X
N.D. Division of Facilities Management	X				X

Agency	Invited to Attend SHMT meetings	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
N.D. Fire Marshal	X	X			X
N.D. Fire Marshal	X		X		X
N.D. Firefighters Association	X			X	X
N.D. Forest Service	X	X	X		X
N.D. Game and Fish Department	X	X			X
N.D. Game and Fish Department	X				X
N.D. Highway Patrol	X		X	X	X
N.D. Historical Society of North Dakota	X	X		X	X
N.D. Housing Finance Agency	X			X	X
N.D. Housing Finance Authority (NDHFA)	X	X			X
N.D. Indian Affairs Commission	X	X			X
N.D. Information Technology Department	X	X	X	X	X
N.D. Insurance Department	X	X	X		X
N.D. League of Cities	X	X			X
N.D. National Guard	X				X
N.D. National Guard, 81st Civil Support Team	X	X			X
N.D. Office of the Tax Commissioner	X	X	X		X
N.D. Parks and Recreation Department	X				X
N.D. State Water Commission (SWC)	X	X	X	X	X
N.D. Workforce Safety and Insurance	X		X		X
National Weather Service	X	X	X	X	X
Natural Resources Conservation Service	X				X
North Dakota Job Service	X		X	X	X
North Dakota Safety Council	X	X			X
North Dakota State University	X	X			X
North Dakota State University Extension Service	X			X	X
North Dakota Stockmen's Association	X	X			X
North Dakota Township Officers Association	X	X	X	X	X
Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	X	X		X	X
South Central Dakota Regional Council	X	X	X		X
State and Local Intelligence Center (Bureau of Criminal Investigation)	X				X
State and Local Intelligence Center (Highway Patrol)	X	X			X
U.S. Animal Plant and Health Inspection Services (APHIS)	X	X		X	X
U.S. Army Corps of Engineers	X				X
U.S. Bureau of Indian Affairs	X				X
U.S. Bureau of Reclamation	X	X			X
U.S. Department of Homeland Security	X	X			X
U.S. Forest Service	X	X			X

Agency	Invited to Attend SHMT meetings	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
U.S. Geological Survey	X	X	X		X
University of North Dakota, Environmental Research Center for Oil and Gas	X	X			X
Wal-Mart-North Bismarck	X	X			X
Williams County	X	X	X	X	X

The DES Deputy Recovery Chief took the lead coordinating the 2013-2014 plan update. DES undertook an extensive outreach and coordination effort to ensure broad-based participation in the plan. Planning meetings were well attended, with 82 persons represented at the kick of meeting. To help facilitate the update process SHMT members were assigned to hazard-specific committees and/or a steering committee. Committee members assisted with the update process by providing data for hazard profiles, updating the mitigation strategy, and reviewing drafts of the plan update. Committees are further discussed in 3.2.6. The SHMT was given an opportunity to comment on the draft HIRA in July 2013 and the entire draft plan in October 2013.

3.2.4. Local and Tribal Emergency Management Organizations

Local and tribal emergency managers typically have the responsibility for all phases of emergency management, including mitigation. Through their offices or a local planning committee, mitigation plans are written on a county, tribal, or regional scale. These organizations are responsible for writing or coordinating the development of a mitigation plan for their jurisdictions. They also manage related grants and facilitate the implementation of many mitigation activities in their area. The local and tribal emergency management organizations are encouraged to participate in and provide input on the State of North Dakota Multi-Hazard Mitigation Plan. The local and tribal mitigation plans are a critical element of the statewide plan and many of the priorities established in the state plan may have an impact on local mitigation funding.

3.2.5. Other Mitigation Stakeholders

Other organizations and agencies, such as non-profit organizations, businesses, educational institutions, citizen groups, and other federal, state, tribal, and local government agencies, also have roles and responsibilities in mitigation planning, although their involvement may be secondary to other primary missions within their own organization. These stakeholders have a responsibility to participate in mitigation planning where most relevant, to have an awareness of mitigation planning and activities in the state and their area, and to encourage mitigation where possible within their own organizations.

3.2.6. Mitigation Planning Committees

Mitigation Planning Committees were formed, one for each identified hazard and for other key planning areas, 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. Appendix A lists the individuals and agencies represented on the committees. Membership in a committee is 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. These committees discussed and reviewed information and initiatives specific to their hazard throughout the planning process.

3.2.7. Consultant Services

Mitigation planning is a time consuming process that involves coordination with many organizations, written documentation of a comprehensive plan, and an in-depth knowledge of regulations and best practices related to mitigation plans. The state has used consultants to assist with and facilitate the development and updates of the 2008, 2011, and 2014 versions of the State of North Dakota Multi-Hazard Mitigation Plan. Big Sky Hazard Management LLC of Bozeman, Montana provided services to the State of North Dakota in 2008 and 2011. AMEC Environment and Infrastructure (AMEC) was hired to develop the 2014 plan update. Contractor responsibilities included facilitating stakeholder meetings, writing the plan document, collecting and analyzing new data for the risk assessment, rolling up local mitigation plans, soliciting input from stakeholders, and ensuring the regulations related to the Disaster Mitigation Act of 2000 were met.

3.3. Workshops

The state has utilized several planning workshops over the past decade to engage the SHMT and gather input on the plan. A summary of these workshops is provided here in chronological order. The previous versions of the Plan can be referenced for specifics on participation and planning process. The focus of this discussion is on the 2013-2014 planning process.

On April 21, 2003, the North Dakota Division of Emergency Management (since renamed the Department of Emergency Services) convened the Interagency Hazard Mitigation Team. The purpose of this team meeting was to assign team members to review and update the eleven hazards addressed in the state’s multi-hazard mitigation plan and discuss the enhanced and standard mitigation plan crosswalks prior to submission to FEMA Region VIII.

On February 8, 2004, members of the Interagency Hazard Mitigation Team convened to review the state’s revised Multi-Hazard Mitigation Plan. Team members assisted DES staff with the crosswalk and provided comments to various sections of the plan. The plan was submitted and approved by FEMA as a standard plan in March 2005.

During the 2007 update of the Multi-Hazard Mitigation Plan, two stakeholder workshops were held. These workshops featured an extensive broad invitation to many new stakeholders. This broader invitation through individual phone calls and e-mails to an expanded stakeholder list allowed for more participation in the plan's update than its original development and resulted in additional local, private, and non-profit involvement. Topics of discussion at the first workshop, held on June 19, 2007, included a history of mitigation planning in North Dakota, an overview of the updated enhancement of the plan, re-identification and categorization of the hazards, identification of new information sources, a discussion of existing mitigation programs, and a review of mitigation strategies. Hazard planning committees were established.

During the November 6, 2007 workshop, participants considered the draft sections of the plan, reviewed statewide mapping, prioritized hazards, reviewed mitigation initiatives, identified local mitigation capabilities and limitations, and discussed the integration of the final plan into other plans and documents.

Similar to the 2007 update, during the 2010 update of the plan, two stakeholder meetings were held but additional stakeholders were identified and invited to participate to encourage further local, private, and non-profit involvement and new technologies were used to allow others to participate. The meetings were designed to provide broad overviews of the planning process and plan topics. Those interested in details of the specific elements of the plan were invited to participate in the various mitigation planning committees or through plan review. Participants provided input and ideas on updates to the plan and signed up for the various mitigation planning committees as a mechanism to provide more detailed feedback. Participants were also given an opportunity to provide comments on the 2010 plan update during the workshop held in November 2010.

During the 2013-2014 plan update process, NDDES again took the lead in updating the State's hazard mitigation plan. AMEC was hired to facilitate the planning process, collect data, and write the plan update. AMEC followed FEMA state hazard mitigation planning guidance to ensure that all requirements of the Disaster Mitigation Act were met. NDDES and AMEC collaborated to reconvene the SHMT, also expanding participation. An email was sent out in February 2013 inviting the SHMT and other stakeholders to participate in the plan update process.

The first meeting of the 2014 plan update process was held on March 11-12, 2013. The meeting covered planning process requirements, plan development milestones and timelines, the role of the SHMT, a review of identified hazards, data collection needs, and next steps. A summary of the meeting and the record of participation are included in Appendix D and Appendix C, respectively. A follow-on strategy meeting was held on March 12, 2013 with the plan's steering committee members and leads for the hazard specific subcommittees of the SHMT. The meeting included a discussion of the overview of next steps in the plan update process, the oil and gas expansion, land use and future construction and development in the State, and the Threat and

Hazard Identification and Risk Assessment (THIRA). A summary of this meeting and record of participation are also included in Appendices C and D.

A second planning meeting focused on updating the Plan's risk assessment and goals was held on June 5, 2013. AMEC consultants shared the key findings of the risk assessment update with the SHMT. SHMT members and meeting attendees provided feedback and suggestions for enhancing and improving the hazard profiles and analysis. AMEC led a facilitated discussion around revisiting the goals in the previous plan. As a result the goals were validated and some of the goals were adjusted based on the SHMT's input. A summary of the meeting and the record of participation are included in Appendix D and Appendix C, respectively.

A third meeting of the 2014 plan update process was held on July 16, 2013. The focus of this meeting was to update the mitigation strategy. The planning team briefly discussed key issues that arose from the risk assessment before moving on to changes in capabilities at the state and local level. SHMT members provided information on emerging capabilities for all hazards and issues with debris management in the counties and cities. AMEC facilitated a discussion on finalizing the revised and updated goals. The SHMT reached a consensus and used the revised goals to help guide the mitigation strategy update. Team members were then asked to review 2011 mitigation initiatives and work within hazard-specific committees to develop new mitigation initiatives. A summary of the meeting and the record of participation are included in Appendix D and Appendix C, respectively.

3.4. Plan Reviews and Public Participation

Besides the workshops, stakeholders were given other ways to participate in the mitigation planning process. Mitigation planning committees, as outlined in Section 3.2.6, were open to any person or agency that wished to participate. As previously mentioned the draft plan was provided for review and comment to encourage focused participation from key stakeholders.

Public involvement to the level that is required for the local multi-hazard mitigation plans was not feasible at the state level. North Dakota's planning process utilized plans and agencies that represented the interest of the general public, and the local mitigation plans were incorporated into the state plan. A public survey was distributed in July 2013 as part of the 2013-2014 plan update process. The survey was advertised by DES through a press release through various public information channels and respondents were given from July through August 30th to respond. The DES Deputy Recovery Chief was interviewed on Prairie Public Radio about the planning effort and survey. Twenty-four people completed the survey. Respondents ranked hazards by priority, identified primary concerns related to the hazards profiled in the 2014 plan update, suggested mitigation actions, and discussed local hazard mitigation capabilities. Flood, hazardous materials, high wind events, severe summer weather, and severe winter weather received the most votes for "high" priority level. The details of the public survey results are included in an electronic appendix (Appendix I).

3.5. Integration of Other Plans and Programs

The State of North Dakota Multi-Hazard Mitigation Plan was developed in conjunction with other local, tribal, state, and federal agencies, non-profit organizations, businesses, and educational institutions. Those plans and programs within the state that have possible integration opportunities are listed by organization in **Table 3.2**. The specific plans and programs reviewed and incorporated into the State of North Dakota Multi-Hazard Mitigation Plan are shown in **Table 3.3**.

Table 3.2. Integration of Other Plans and Programs

Organization	Existing Plans and Programs
North Dakota Aeronautics Commission	▪ Aviation Safety
North Dakota Continuum of Government Team	▪ Continuity of Operations Plan
North Dakota Department of Agriculture	▪ Animal Health
North Dakota Department of Commerce	▪ Community Services Block Grant ▪ Economic Development ▪ State Building Code
North Dakota Department of Emergency Services	▪ Multi-Hazard Mitigation Plan ▪ Disaster Recovery and Mitigation ▪ Emergency Operations Plan ▪ Homeland Security ▪ Threat Hazard Identification and Risk Assessment (THIRA)
North Dakota Department of Health	▪ Disease Prevention ▪ Public Health and Medical All Hazards Plan ▪ Pandemic Influenza Response Plan ▪ Environmental Health
North Dakota Department of Human Services	▪ Vulnerable Population Services
North Dakota Department of Mineral Resources	▪ Geologic Research ▪ Oil and Gas Drilling and Production
North Dakota Department of Public Instruction	▪ North Dakota Curriculum Standards
North Dakota Department of Transportation	▪ State Transportation Infrastructure ▪ TransAction II: North Dakota's Statewide Strategic Transportation Plan ▪ Statewide Transportation Improvement Program
North Dakota Forest Service	▪ Forestry and Fire Management
North Dakota Geographic Information Systems	▪ Geospatial Information and Data
North Dakota Highway Patrol	▪ Traffic Safety
North Dakota Indian Affairs Commission	▪ Tribal-State Relations
North Dakota Legislative Branch	▪ North Dakota Laws and Constitution
North Dakota Office of Attorney General	▪ Crime Prevention ▪ Fire Prevention ▪ Legal Review
North Dakota Office of Independent Review	▪ Workforce Safety
North Dakota Office of Management and Budget	▪ State Facility Safety ▪ Capital Complex Master Plan ▪ Fiscal Management
North Dakota Office of the Governor	▪ Executive Orders
North Dakota Parks and Recreation Department	▪ State Park Management
North Dakota Public Service Commission	▪ Utility and Mining Oversight
North Dakota State Electrical Board	▪ Electric Standards

Organization	Existing Plans and Programs
	▪ Electric Inspections
North Dakota State Historical Society	▪ Historic Preservation
North Dakota State Water Commission	▪ Atmospheric Resources ▪ State Water Management Plan ▪ Drought Disaster Livestock Water Supply ▪ National Flood Insurance Program ▪ Flood Control ▪ Dam Safety ▪ Water Supply Programs
North Dakota University System	▪ Oversight of 11 Public Colleges and Universities

Table 3.3. Integrated North Dakota Plans

Plan	Details
Capitol Complex Master Plan	The master plan for the state capitol complex in Bismarck considers all aspects of future improvements and developments to the complex. Specific to hazard mitigation, the plan considers the mitigation of hazards such as terrorism, winter storms, flood, and transportation accidents. The hazard-related recommendations are in line with the mitigation strategies listed in this plan.
Continuum of Government (COG) and Continuity of Operations Plan (COOP)	The COG/COOP development process is conducted by each agency within the state using tools developed by the state COG team. These plans discuss the people and resources needed to continue government services during times of disaster. Through the development of these response and recovery plans, mitigation activities may be identified and are encouraged to be further explored.
Emergency Operations Plan (EOP) and Threat Hazard Identification and Risk Assessment (THIRA)	The state EOP addresses how the state will respond when a disaster occurs. The plan does not address mitigation, but through the exercise of the plan, mitigation activities may be identified and could be implemented. The THIRA details North Dakota's threats and hazards of concern and provides outcome statements for all 31 Core Capabilities described in the National Preparedness Goal outlined in Presidential Policy Directive 8.
Five-Year Floodplain Management Work Plan	Elements of the state's floodplain management work plan were integrated into the state capabilities section and mitigation strategy. This work plan specifically addresses flood hazards only and the management of the Community Assistance Program (CAP) through the National Flood Insurance Program (NFIP).
Multi-Hazard Mitigation Plans	The 2007, 2010, and previous versions of the state's mitigation plan were integrated into the 2014 update where applicable and relevant. The 2014 version of the statewide mitigation plan replaces all previous versions. All current and approved local mitigation plans were reviewed; information with respect to hazard classifications, potential losses, goals, and mitigation strategies were integrated into this updated state plan.
Public Health and Medical All Hazards Plan Pandemic Influenza Response Plan	The Department of Health's plans address how public health and medical issues are coordinated through the state EOP. Similar to the state EOP, the plans address preparedness and response issues. Mitigation activities identified through the development and exercise of the plans are encouraged. The addition of a communicable

Plan	Details
	disease hazard to the 2007 mitigation plan is one example of how health hazards are becoming better integrated into the state's hazard mitigation plan.
TransAction II: North Dakota's Statewide Strategic Transportation Plan	The transportation plan provides a strategy for transportation improvements across the state. "Safe and secure transportation" is a primarily goal of the plan. A key strategy is the improvement of "communication, cooperation, and collaboration" processes; integration with DES initiatives is specifically listed.
State Water Commission Strategic Plan	This plan lists objectives and action plans for programs managed by the State Water Commission. Many of the objectives and actions listed in the strategic plan are reinforced in this mitigation plan.
State Water Management Plan / Water Development Reports	The water management plan and related reports give priority to flood control projects and are closely related to the flood and drought mitigation strategies listed in this all-hazard mitigation plan. Most of the state's large flood control and water supply projects are listed in these documents, as is the weather modification program. Water supply projects are the highest priority; health and safety is an alternative prioritization scheme. Many of the goals and objectives listed in the plan are compatible with those listed in this mitigation plan.

3.6. Plan Revisions

As part of the 2013-2014 update, each section of the plan was updated with new or revised information. At the outset of the process the plan was reviewed by DES and the planning consultant and it was determined that each section of the plan would need to be revisited. General changes that are made during each update process include:

- 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 local and state mitigation planning
- Incorporation of information and comments collected at stakeholder meetings and through other means
- Additional detail regarding the plan update process
- 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 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 hazard mitigation plans

- Update and refinement of the mitigation strategy based on changes since the previous version of the plan was approved
- Update of the list of possible mitigation funding sources and mitigation-related laws
- Additions and improvements to the plan to meet enhanced state plan criteria

Table 3.4 lists the sections of the plan and highlights changes or improvements made during the 2013-2014 update.

Table 3.4. Highlights of Changes in the 2013-2014 Plan Update

Chapter	Highlights of Update
Chapter 1 Adoption Documentation	• Language revised for 2013 • 2014 State approval letter added
Chapter 2 Introduction	• Language revised for 2013 • Subsection on plan organization added • North Dakota Overview revised for 2013 • List of identified hazards revised
Chapter 3 Planning Process	• Language revised for 2013 • Record of plan changes by chapter added • State Hazard Mitigation Team section revised to include table of participating agencies • Summary of changes in hazard identification added • Summary of 2013 update meetings added
Chapter 4 Statewide Inventory	• New data since 2010 added, including Homeland Security Infrastructure Program (HSIP) data for critical infrastructure/key resources (CIKR) facilities • Details added on historic resources in each county • Added social vulnerability data and specific information from the North Dakota Department of Human Services concerning the post-disaster survey done in 2013 • Added section on oil and gas industry
Chapter 5 Risk Assessment	• New data since 2010 added • New GIS mapping and analysis incorporated • New, more thorough methodologies for assessing risk and vulnerability at state and county level used where possible • Windstorm added as individual hazard • Hazardous Materials Incident expanded to include discussion of impacts of oil and gas industry • Homeland Security Incidents expanded to include discussion of potential cyber-terrorism events • Summer Storm renamed Severe Summer Weather, revised to include extreme heat • Levee failure added to Flood profile • Mapping sections renamed to Geographic Location • Vulnerability to Jurisdictions sections split into State Risk Assessment and Local Risk Assessments • Information from planning process chapter on risk assessment methodology removed from Chapter 3 and added to Chapter 5

Chapter	Highlights of Update
Chapter 6 Mitigation Strategy	• Updated mitigation goals • Added a purpose statement • Updated and refined mitigation actions and progress made on implementation
Chapter 7 Mitigation Implementation System	• Revised to reflect current state and local hazard mitigation capabilities • Updated mitigation programs and funding sources
Chapter 8 Plan Maintenance	• Revised and refined to reflect current processes and procedures

4. Assets at Risk/Changes in Development

An important aspect of mitigation planning is contemplating the effects that identified hazards may have on people, the built environment, natural resources, and the economy. Additionally, changes in development can impact vulnerability to hazards. So, it is important to analyze development trends and determine how vulnerability to hazards will be impacted. This section focuses on the current and future assets at risk in the State of North Dakota. The assets considered include: the population, state-owned buildings/property, critical facilities and infrastructure, the built environment, the economy, the natural environment, historic places, and social values.

4.1. State-owned and Operated Facilities

The State of North Dakota has a specific interest in protecting facilities and property owned by the State. Disasters can damage not only private property but government property as well, 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 (structure) value (BP), personal property (contents) value (PP), outdoor property value (OP), and trailer property value (TP). These values are either replacement values (RV) or actual cash values (ACV). 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. This can also apply to some contents as well. 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.

The database does not contain information in Geographic Information System (GIS) format. This data limitation precludes spatial analysis of state-owned facilities with respect to identified geographic hazard areas. **Table 4.1** provides a summary by county of state-owned buildings and property, not including National Guard property (see **Figure 4.3**) or University/College property (see **Figure 4.2**). **Figure 4.1** that follows provides a map of the state displaying this data.

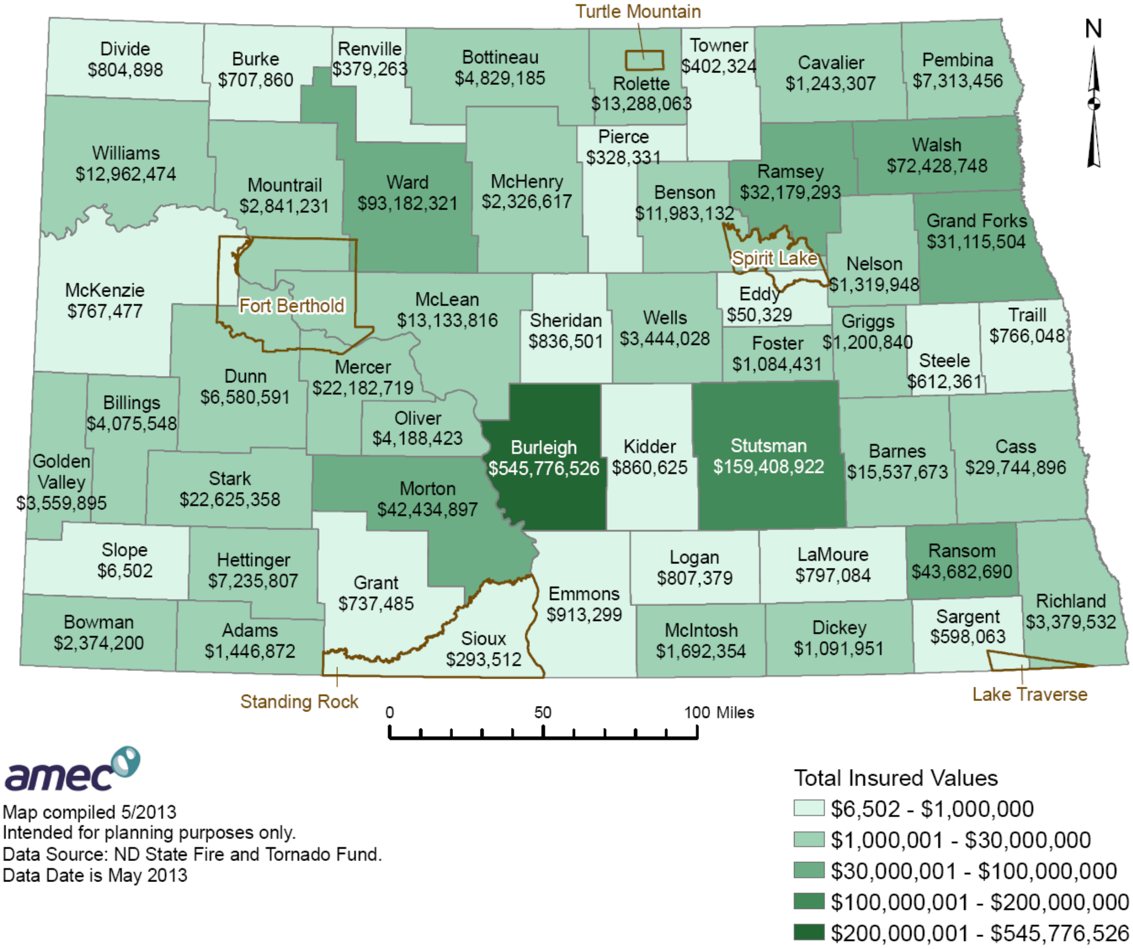
Table 4.1. North Dakota State-Owned Building and Property Insured Values by County

County	# of Building Properties	Building Property Value	# of Personal Property Policies	Personal property Value	# of Outdoor Properties	Outdoor Property Value	# of Trailer Properties	Trailer Property Value	Total Value
Adams	1	$189,702	8	$68,703	6	$1,188,467	0	$0	$1,446,872
Barnes	9	$12,536,080	23	$2,749,697	3	$251,896	0	$0	$15,537,673
Benson	15	$5,109,472	16	$93,685	20	$6,779,975	0	$0	$11,983,132
Billings	10	$2,226,629	11	$202,116	10	$1,640,949	1	$5,854	$4,075,548
Bottineau	43	$3,932,506	31	$659,053	2	$237,626	0	$0	$4,829,185
Bowman	4	$499,516	11	$616,901	10	$1,257,783	0	$0	$2,374,200
Burke	3	$261,609	7	$208,625	2	$237,626	0	$0	$707,860
Burleigh	99	$392,787,722	306	$144,588,992	53	$8,357,079	4	$42,733	$545,776,526
Cass	11	$18,905,677	85	$10,424,860	10	$408,875	1	$5,484	$29,744,896
Cavalier	2	$527,327	11	$328,387	3	$387,593	0	$0	$1,243,307
Dickey	5	$488,862	11	$276,144	3	$326,945	0	$0	$1,091,951
Divide	2	$458,275	6	$213,305	1	$133,318	0	$0	$804,898
Dunn	12	$5,204,039	14	$480,864	11	$889,245	1	$6,443	$6,580,591
Eddy	0	$0	4	$50,329	0	$0	0	$0	$50,329
Emmons	5	$469,823	9	$227,410	2	$216,066	0	$0	$913,299
Foster	3	$639,064	9	$223,560	2	$221,807	0	$0	$1,084,431
Golden Valley	6	$2,124,842	10	$297,921	8	$1,137,132	0	$0	$3,559,895
Grand Forks	36	$22,078,013	63	$8,597,090	10	$440,401	0	$0	$31,115,504
Grant	2	$117,557	6	$203,077	4	$416,851	0	$0	$737,485
Griggs	5	$854,476	8	$133,026	2	$213,338	0	$0	$1,200,840
Hettinger	5	$2,516,206	9	$235,809	16	$4,483,792	0	$0	$7,235,807
Kidder	3	$732,123	6	$40,013	1	$88,489	0	$0	$860,625
LaMoure	11	$756,086	8	$40,998	0	$0	0	$0	$797,084
Logan	2	$568,767	5	$61,634	2	$176,978	0	$0	$807,379
McHenry	13	$1,752,697	18	$396,942	2	$176,978	0	$0	$2,326,617
McIntosh	12	$1,175,636	11	$279,092	2	$237,626	0	$0	$1,692,354
McKenzie	3	$319,244	8	$226,426	2	$221,807	0	$0	$767,477
McLean	40	$10,687,952	36	$2,135,568	3	$310,296	0	$0	$13,133,816
Mercer	7	$19,306,490	13	$240,527	12	$2,630,649	2	$5,053	$22,182,719
Morton	55	$31,192,114	56	$10,058,160	18	$1,184,623	0	$0	$42,434,897
Mountrail	9	$1,591,714	22	$864,704	6	$377,849	1	$6,964	$2,841,231
Nelson	5	$730,533	10	$263,300	3	$326,115	0	$0	$1,319,948
Oliver	13	$1,199,291	10	$327,686	6	$2,657,009	1	$4,437	$4,188,423
Pembina	30	$6,648,527	32	$465,310	2	$176,978	2	$22,641	$7,313,456
Pierce	1	$132,347	9	$107,495	1	$88,489	0	$0	$328,331
Ramsey	47	$26,697,800	59	$5,081,173	6	$400,320	0	$0	$32,179,293

County	# of Building Properties	Building Property Value	# of Personal Property Policies	Personal property Value	# of Outdoor Properties	Outdoor Property Value	# of Trailer Properties	Trailer Property Value	Total Value
Ransom	25	$41,143,825	25	$2,465,219	6	$73,646	0	$0	$43,682,690
Renville	2	$250,802	6	$39,972	1	$88,489	0	$0	$379,263
Richland	8	$2,699,421	22	$531,703	4	$148,408	0	$0	$3,379,532
Rolette	57	$11,408,806	47	$1,641,631	2	$237,626	0	$0	$13,288,063
Sargent	3	$258,795	8	$190,131	1	$149,137	0	$0	$598,063
Sheridan	2	$409,410	5	$205,284	2	$221,807	0	$0	$836,501
Sioux	1	$165,394	8	$39,629	1	$88,489	0	$0	$293,512
Slope	0	$0	2	$6,502	0	$0	0	$0	$6,502
Stark	19	$14,335,394	51	$4,679,870	20	$3,610,094	0	$0	$22,625,358
Steele	2	$176,788	6	$213,766	2	$221,807	0	$0	$612,361
Stutsman	63	$147,519,837	83	$9,684,818	16	$2,204,267	0	$0	$159,408,922
Towner	2	$252,495	6	$61,340	1	$88,489	0	$0	$402,324
Traill	4	$488,829	12	$149,624	2	$127,595	0	$0	$766,048
Walsh	34	$66,389,813	52	$5,858,517	3	$180,418	0	$0	$72,428,748
Ward	42	$83,962,244	74	$6,310,620	30	$2,909,457	0	$0	$93,182,321
Wells	10	$2,847,591	16	$419,459	2	$176,978	0	$0	$3,444,028
Williams	26	$9,243,964	48	$3,304,194	7	$414,316	0	$0	$12,962,474
Total	**829**	**$956,972,126**	**1,432**	**$227,270,861**	**344**	**$49,221,993**	**13**	**$99,609**	**1,233,564,589**

Source: North Dakota State Fire and Tornado Fund, 2013

Figure 4.1. North Dakota State-Owned Building and Property Insured Values by County



The counties with the highest total values of structure, contents, outdoor property, and trailer property are listed in **Table 4.2** along with a summary of the major state-owned complexes.

Table 4.2. North Dakota Counties with the Highest Insured Values of State-Owned Buildings and Property

County	Primary City	Major State Facilities/Complexes
Burleigh County	Bismarck	North Dakota State Capitol Complex Main Offices for Most State Agencies North Dakota State Penitentiary Missouri River Correctional Center Bank of North Dakota
Stutsman County	Jamestown	North Dakota State Hospital James River Correctional Center
Ward County	Minot	North Dakota State Fair Center
Walsh County	Grafton	North Dakota State Developmental Center
Ransom	Lisbon Fort Ransom	Veteran's Home North Dakota Information Technology Department North Dakota Parks and Recreation
Morton County	Mandan	North Dakota Youth Correctional Center Fort Abraham Lincoln State Park

Source: North Dakota State Fire and Tornado Fund, 2013.

4.1.1. State-Owned and Operated Critical Facilities

Other important critical facilities include specific state-owned facilities. This section details State-owned facilities in the following categories: Administrative/Government, Special Needs, Educational, and National Guard.

Administrative/Government Facilities

State owned/operated critical administrative facilities are listed in **Table 4.3.**

Table 4.3. State Owned Critical Facilities

Facility	County
State Capitol Complex and State Offices	Burleigh
State Emergency Operations Center/Fusion Center	Burleigh
State Bureau of Criminal Investigation Lab	Burleigh
Bank of North Dakota	Burleigh
State Department of Health Lab and Morgue	Burleigh
State Radio	Burleigh
Game & Fish	Burleigh
State Mill	Grand Forks

Source: North Dakota Critical Infrastructure Program

Special Needs Facilities

Often, special population groups, such as children, the disabled, the elderly, and the incarcerated, require more attention and services during times of disaster. Their needs can be unique in terms of medical equipment, transportation, and staffing. Given their specialized needs, they are often more vulnerable during disasters, and their considerations require more critical attention. **Table**

4.16 lists the major state owned or operated special needs facilities in North Dakota that have not been otherwise identified as critical facilities.

Table 4.4. Large State Owned Special Needs Facilities in North Dakota

Facility	County
North Dakota State Developmental Center	Walsh
North Dakota State Hospital	Stutsman
North Dakota State Penitentiary	Burleigh
North Dakota Youth Correctional Center	Morton

Source: North Dakota Critical Infrastructure Program

Educational Facilities

Educational facilities can be critical in that they often contain a large concentration of people and important research activities. These institutions can present unique and significant challenges during a disaster. The North Dakota University System (NDUS) has eleven public colleges and universities governed by the State Board of Higher Education. The NDUS facilities, coupled with their associated insured values, can be found in **Table 4.5**. The NDUS insured values can be found by county in **Figure 4.2**.

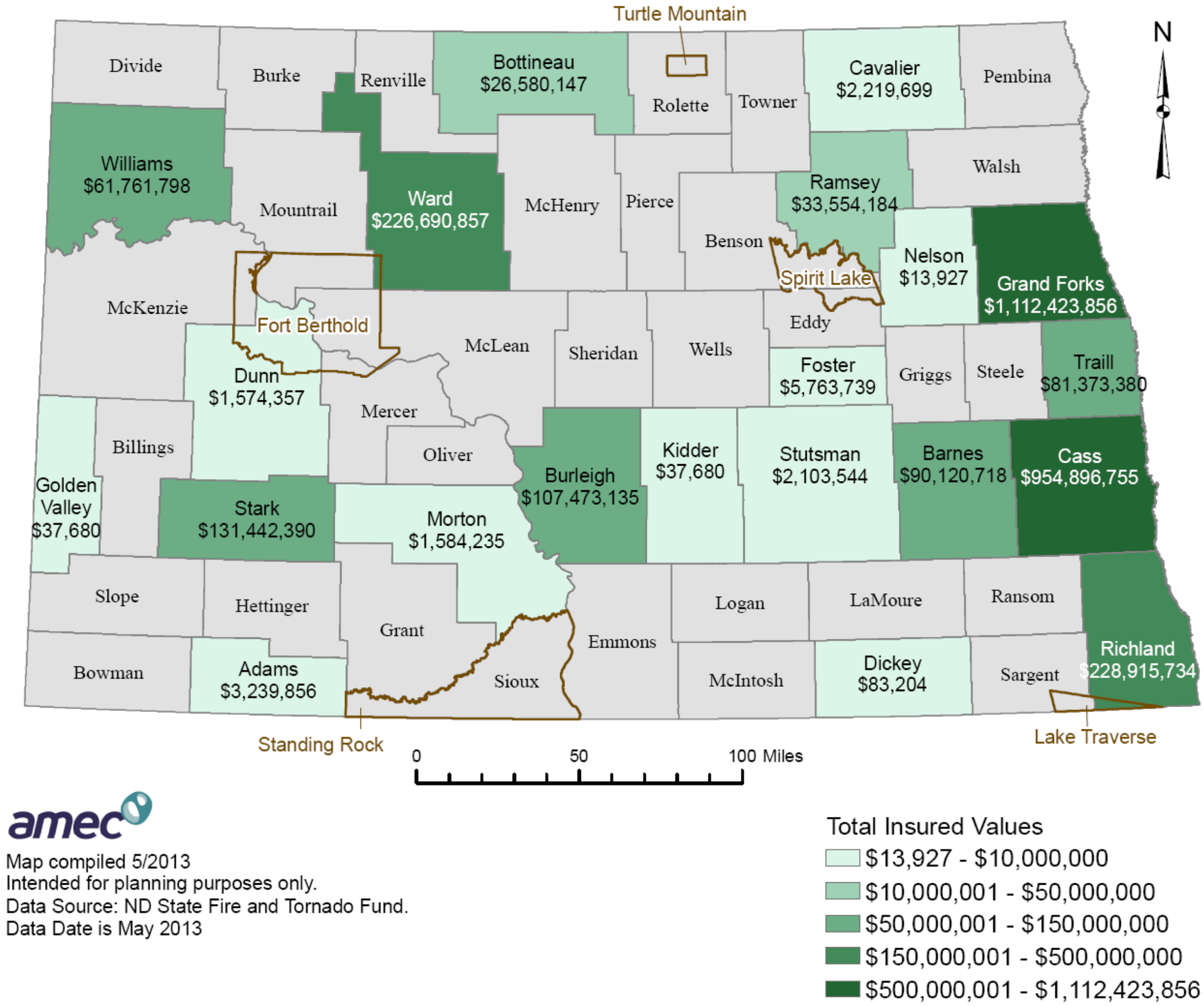
Table 4.5. North Dakota University System Insured Values

College/University Main Campus Location Typical Enrollment	Building Property (Structure) Value	Personal Property (Contents) Value	Outdoor Property Value	Trailer Property Value	Total Value
Bismarck State College Bismarck, Burleigh County Fall 2012 Enrollment: 2,416 students	$67,300,107	$38,757,369	$1,032,226	$0	$107,089,702
Dakota College at Bottineau Bottineau, Bottineau County Fall 2012 Enrollment: 774 students	$23,645,554	$2,934,593	$0	$0	$26,580,147
Dickinson State University Dickinson, Stark County Fall 2012 Enrollment: 1,837 students	$112,154,327	$13,350,937	$637,799	$0	$126,143,063
Lake Region State College Devils Lake, Ramsey County Fall 2012 Enrollment: 1,974 students	$27,596,549	$6,006,750	$0	$0	$33,603,299
Mayville State University Mayville, Traill County Fall 2012 Enrollment: 1,020 students	$68,621,937	$12,538,671	$138,387	$0	$81,298,995
Minot State University Minot, Ward County Fall 2012 Enrollment: 3,560 students	$184,897,858	$31,605,914	$1,891,066	$0	$218,394,838
North Dakota State College of Science Wahpeton, Richland County Fall 2012 Enrollment: 3,066 students	$200,250,786	$29,064,806	$236,841	$0	$229,552,433
North Dakota State University* Fargo, Cass County Fall 2012 Enrollment: 14,433 students	$586,829,753	$323,269,507	$1,796,279	$0	$911,895,539
University of North Dakota Grand Forks, Grand Forks County Fall 2012 Enrollment: 15,250 students	$879,527,856	$232,313,608	$7,745,504	$3,732	$1,119,590,700

College/University Main Campus Location Typical Enrollment	Building Property (Structure) Value	Personal Property (Contents) Value	Outdoor Property Value	Trailer Property Value	Total Value
Valley City State University Valley City, Barnes County Fall 2012 Enrollment: 1,362 students	$72,898,397	$17,077,075	$223,458	$0	$90,198,930
Williston State College Williston, Williams County Fall 2012 Enrollment: 808 students	$50,177,069	$6,288,205	$0	$0	$56,465,274
University System Research Facilities					
Carrington Research Center Total	$5,330,018	$231,423	$202,298	$0	$5,763,739
Casselton Research Center Total	$1,755,017	$84,533	$395,309	$0	$2,234,859
Central Grasslands Research Center Total	$1,806,190	$230,671	$25,419	$3,584	$2,065,864
Dickinson Research Center Total	$5,837,333	$538,662	$104,574	$8,288	$6,488,857
Hettinger Research Center Total	$2,663,524	$419,044	$157,288	$0	$3,239,856
Langdon Research Center Total	$2,030,975	$147,394	$41,330	$0	$2,219,699
NDSU Ag Experiment Research Total	$34,670,688	$1,086,787	$302,120	$0	$36,059,595
North Central Research Center Total	$6,183,831	$1,048,050	$369,526	$0	$7,601,407
Oakes Research Center Total	$75,509	$7,333	$0	$362	$83,204
Williston Research Center Total	$4,847,311	$260,163	$213,401	$0	$5,320,875
North Dakota University System Fall 2012 Enrollment: 33,538 students	$2,339,100,589	$717,261,495	$15,512,825	$15,966	$3,071,890,875

Source: Enrollment from 2013 Legislative Session Resource Guide, http://www.ndus.edu/uploads/reports/114/2013-resource-guide.pdf; values from ND State Fire and Tornado Fund

Figure 4.2. North Dakota University System Insured Values



Several private and tribal community colleges governed by other bodies also exist throughout the state and are listed in **Table 4.14** in **Section 4.4**, Other Critical Facilities and Infrastructure.

National Guard Facilities

The North Dakota Fire and Tornado Fund also maintains records for the Adjutant General, or the National Guard. **Figure 4.3** shows the counties in which these assets are located and also shows the two US Air Force bases and two National Guard bases in the state. **Table 4.6** that follows provides the locations of all National Guard Armories in the State.

Figure 4.3. National Guard and Military Bases

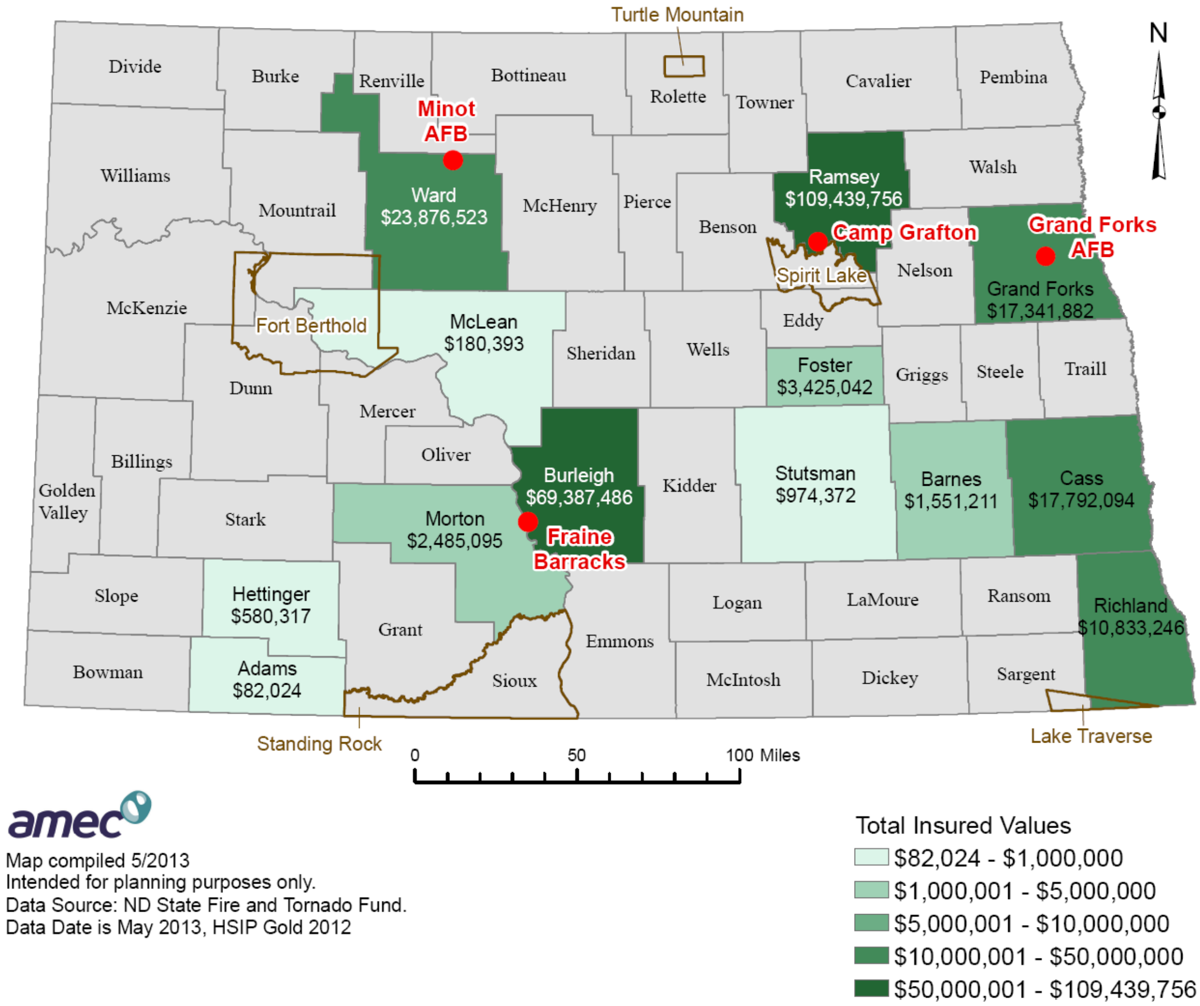


Table 4.6. National Guard Armories

Unit / Organization	City
Army Aviation Support Facility Complex	Bismarck
Bottineau Armory	Bottineau
Camp Grafton Training Center	Devils Lake
Cando Armory	Cando
Carrington Armory	Carrington
Cavalier Armory	Cavalier
Dickinson Armory	Dickinson
Edgeley Armory	Edgeley
Fargo Armed Forces Reserve Center Complex	Fargo
Grafton Armory	Grafton

Unit / Organization	City
Grand Forks Armory Complex	Grand Forks
Hazen Armory	Hazen
Hettinger Armory	Hettinger
Jamestown Armory	Jamestown
Lisbon Armory	Lisbon
Mayville Armory	Mayville
Minot Armed Forces Center Complex	Minot
Mott Armory	Mott
Oakes Armory	Oakes
Raymond J. Bohn Armory Complex	Bismarck
Rugby Armory	Rugby
Valley City Armory	Valley City
Wahpeton Armory	Wahpeton
Williston Armory	Williston
Wishek Armory	Wishek

Source: North Dakota National Guard, 2013

4.2. Other Critical Facilities and Infrastructure

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.

When developing the critical facilities and infrastructure list for this plan, the critical facilities listed in local Multi-Hazard Mitigation Plans were considered and included where and if applicable, but generally, the local plans contain more facilities and more specific data on the facilities. By generalizing the data to the county level using publically available data, this allowed for a more consistent statewide approach and also provided some measure of protection for those with security concerns.

Several data sources were used to analyze the level of critical facilities by county, including previous versions of the North Dakota Multi-Hazard Mitigation Plan, Homeland Security Infrastructure Program (HSIP) Gold data, North Dakota Critical Infrastructure Program, North Dakota Fire and Tornado Fund data, and internet research. Using these sources, the critical facilities and infrastructure can be assessed by county in a very general sense with several limitations. As one would expect, the level of critical facilities and infrastructure in an area generally trends with the population of that area.

4.2.1. Critical Infrastructure/Key Resources

Homeland Security Infrastructure Program (HSIP) Data

One data source that was utilized to analyze critical infrastructure/key resources in North Dakota was the HSIP Gold Data maintained by the National Geospatial-Intelligence Agency. This data is a compilation of common operational geospatially enabled base-line data to support Homeland Security, Homeland Defense, and National Preparedness – prevention, protection, mitigation, response and recovery. From this data, the following classes of facilities were inventoried and summarized by county: Energy, Public Health, Transportation, Emergency Services, Communications, and Water. **Table 4.7** provides a tabular summary of this data.

Table 4.7. Select HSIP Data Critical Facility Summary by County

County:	Energy	Public Health	Transportation	Emergency Services	Communications	Water
Adams	26	3	12	7	6	-
Barnes	45	6	63	31	31	-
Benson	45	2	16	16	28	-
Billings	1,708	-	26	10	7	-
Bottineau	2,303	3	20	31	8	-
Bowman	1,543	3	19	10	5	-
Burke	1,585	1	16	20	7	-
Burleigh	96	18	65	53	132	1
Cass	54	35	181	93	255	-
Cavalier	54	4	13	17	10	-
Dickey	28	8	8	10	8	-
Divide	726	3	3	18	7	-
Dunn	1,391	3	27	7	13	-
Eddy	18	3	9	5	9	-
Emmons	49	4	25	10	12	-
Foster	25	3	5	11	3	-
Golden Valley	310	1	17	11	9	-
Grand Forks	61	16	97	55	160	1
Grant	44	1	13	12	2	-
Griggs	36	2	5	9	3	-
Hettinger	46	3	10	8	14	-
Kidder	20	1	20	16	25	-
LaMoure	34	4	11	18	5	-
Logan	30	3	2	10	7	-
McHenry	195	2	20	27	18	-

County:	Energy	Public Health	Transportation	Emergency Services	Communications	Water
McIntosh	31	5	2	14	9	-
McKenzie	3,638	5	31	17	27	-
McLean	177	6	26	32	36	-
Mercer	65	2	20	18	22	-
Morton	75	11	107	32	105	-
Mountrail	1,779	5	13	16	29	-
Nelson	66	6	5	14	24	-
Oliver	38	1	6	6	17	-
Pembina	43	5	66	39	26	-
Pierce	66	3	4	11	9	-
Ramsey	65	6	19	15	25	-
Ransom	12	8	6	8	5	-
Renville	1,432	1	8	18	3	-
Richland	35	3	100	32	24	-
Rolette	73	7	9	20	5	-
Sargent	16	2	7	14	4	-
Sheridan	25	2	17	10	4	-
Sioux	9	2	18	8	1	1
Slope	362	-	9	6	4	-
Stark	662	12	66	31	63	-
Steele	37	1	8	7	9	-
Stutsman	62	6	59	44	65	-
Towner	41	3	18	12	3	-
Traill	22	8	48	16	61	1
Walsh	34	7	72	37	30	-
Ward	527	19	52	53	98	2
Wells	48	3	18	16	9	-
Williams	2,251	10	31	35	55	-
	22,163	281	1,548	1,096	1,556	6

For those hazards with available GIS-based data depicting geographic areas of risk, analysis was completed utilizing the HSIP Gold data to determine the facilities within each of the above classes that is vulnerable to those hazards. This type of analysis was completed for the following: Flood (see Section 5.4.7), Levee Failure (see Section 5.4.7), and Wildland Fire (see Section 5.13.7).

North Dakota Critical Infrastructure

The North Dakota Critical Infrastructure Program has inventoried specific CIKR facilities in the following sectors that may be vulnerability to Homeland Security Incidents:

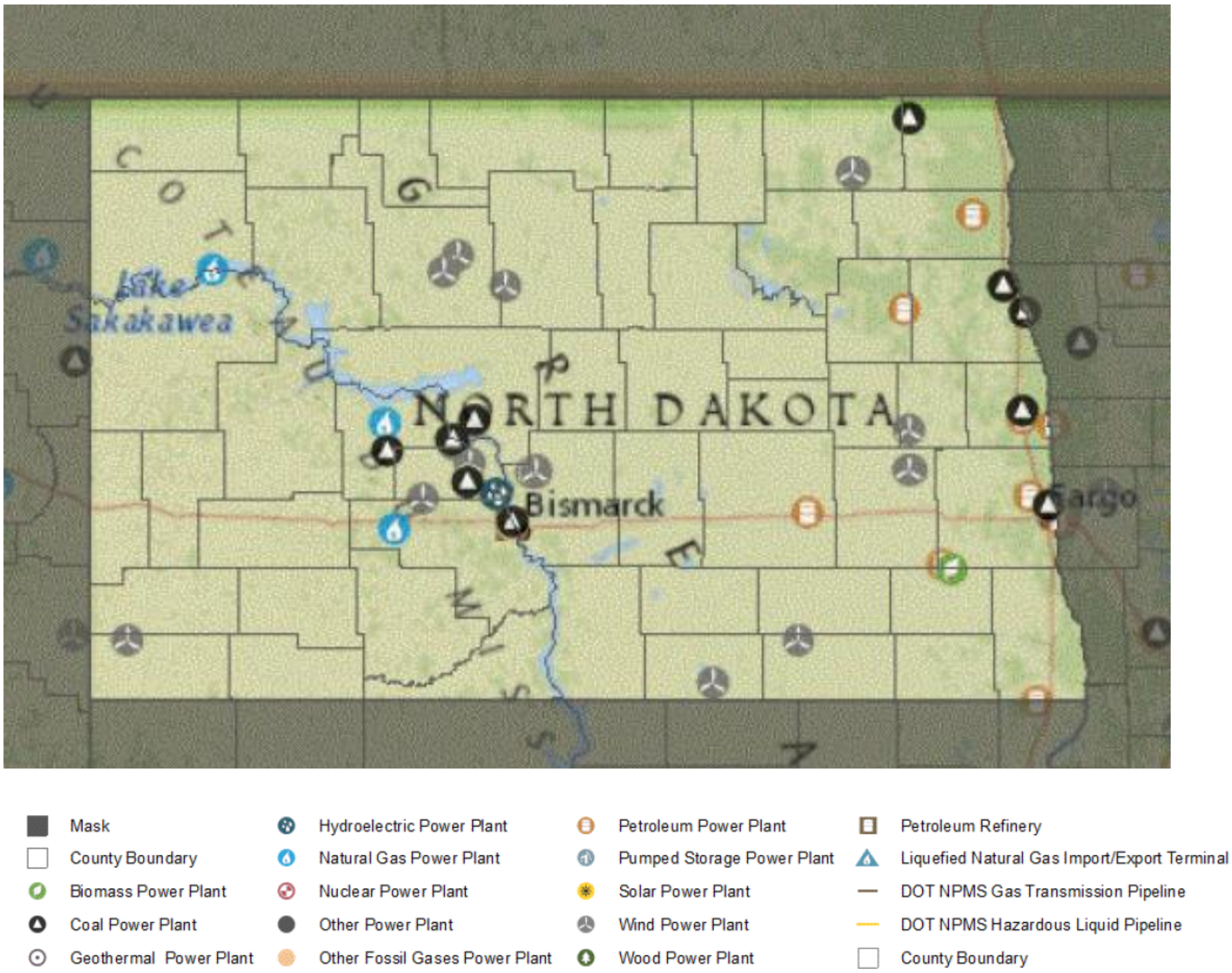
- Food / Agriculture: major food distribution centers
- Energy: power generation and chemical facilities
- Public Health: hospitals and public health offices
- Transportation: bridges and major highways
- Emergency Services: police, fire and dispatch centers
- Communications: major communications towers
- Water: treatment facilities

Additional county-level information for this data is provided in Section 5.7.7.

Energy Sector

Figure 4.4 shows the major energy features in the state.

Figure 4.4. North Dakota Energy Features



Source: Energy Information Administration, http://www.eia.gov/state

North Dakota has and uses a considerable amount of energy-related commodities. According to the US 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.

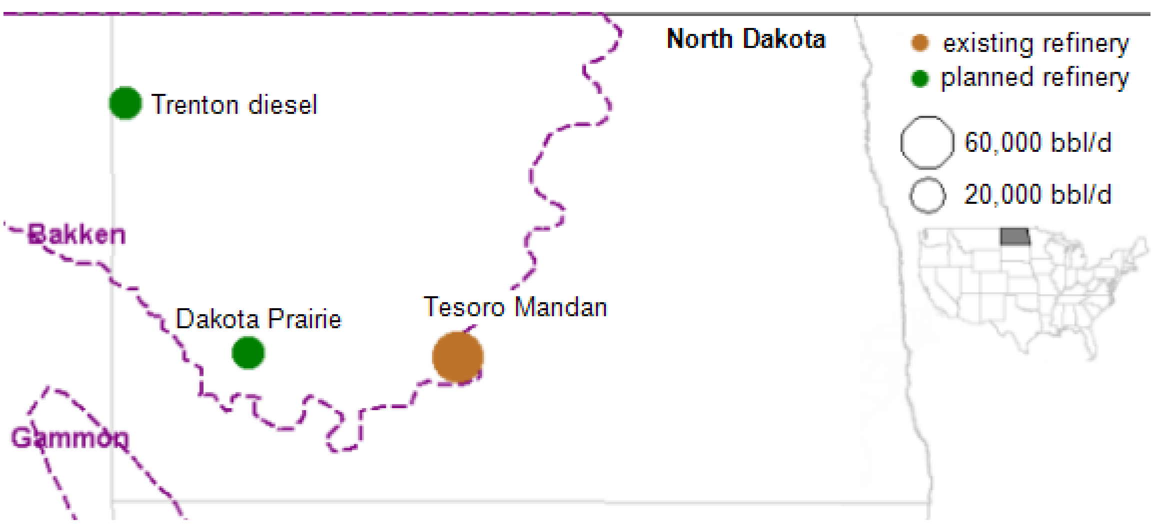
Industry accounts for over one-half of the state's total energy consumption. Nearly all of the electricity generated in North Dakota is produced by coal-fired power plants. Much of this coal is extracted from large surface mines in central North Dakota. The state is also a substantial producer of wind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

Oil and Gas

In 2012, North Dakota oil production trailed only Texas and the U.S. Federal Offshore region accounting for 10 percent of total U.S. crude oil production. 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, Montrail, and William—in the northwest area of the state, harsh weather in these areas can reduce the state's total crude oil production, as happened in November 2012 and again in January 2013.

North Dakota currently has one operational refinery. However, during development of this plan, two new refineries were in the process of being built. The existing refinery is the Tesoro Mandan refinery located near Bismarck. This refinery has a capacity of 60,000 bbl/d, and its primary products include diesel fuel, jet fuel, heavy fuel oils, and liquefied petroleum gas. The two new refineries are smaller, both rated at 20,000 bbl/d capacity, and both will be fairly simple units that focus on creating the diesel and kerosene that are needed locally. The Dakota Prairie refinery, which broke ground in March 2013, is a joint venture of MDU Resources Group and Calumet Specialty Products and will primarily make diesel fuel. The Trenton Diesel Refinery is also planned, but no start-up date has been announced; it received an air quality permit from the North Dakota Department of Health in early 2012. **Figure 4.5** provides the locations of the existing and planned refineries.

Figure 4.5. Existing and Planned Oil Refineries in North Dakota



Source: Energy Information Administration, http://www.eia.gov/todayinenergy/detail.cfm?id=10551

Canadian crude oil pipelines also pass through the state en-route to the Midwest refining markets.

North Dakota also has substantial natural gas reserves. Natural gas production in North Dakota has more than doubled since 2005, largely due to associated natural gas from the growing oil production in the Bakken shale formation. Gas production averaged over 485 million cubic feet per day (MMcfd) in September 2011, compared to the 2005 average of about 160 MMcfd.

However, due to insufficient natural gas pipeline capacity and processing facilities in the Bakken shale region, over 35 percent of North Dakota's natural gas production in 2011 was flared (burned off) or otherwise not marketed. (It is generally better to flare natural gas than to vent it into the atmosphere because natural gas—methane—is a much more powerful greenhouse gas than carbon dioxide.) The percentage of flared gas in North Dakota is considerably higher than the national average; in 2009, less than 1 percent of natural gas produced in the United States was vented or flared. Two major natural gas pipelines pass through North Dakota from Montana and Canada to the Midwest with several smaller regional pipelines. Additional information on the Oil and Gas Industry and how development in this area relates to vulnerability to hazards is included in **Section 4.7.4**, and within each hazard section in Chapter 5, particularly in Section 5.6 on Hazardous Materials.

Electricity

According to the Energy Information Administration, Increased oil and natural gas production in the State has driven the growth in industrial demand for electricity. Rising economic activity and population in the state have also increased commercial and residential electricity use, although at a lower rate than in the industrial sector. The amount of electricity delivered for end use in North Dakota falls into three main categories: commercial, industrial, and residential. In 2012, sales of electricity in the commercial and industrial sector each made up 35 percent of total sales, with the remaining 30 percent going to residential customers.

A recent study by the North Dakota Industrial Commission forecasted an 88 percent increase in total electric demand in the state between 2012 and 2017, mainly due to adding oil and natural gas wells, building and operating more infrastructures to support the oil and natural gas production, and the growing population and employment.

The volume of sales for electricity in the residential and commercial sectors typically peaks in the winter months in North Dakota as demand for electricity increases to heat homes and businesses. Overall, a variety of fuels are used throughout the state as shown in 5.10, Shortage or Outage of Critical Materials or Infrastructure. Most systems, however, ultimately require electricity to run their thermostats and blowers.

North Dakota has taken advantage of harnessing the wind to generate electricity. North Dakota is now a leading U.S. state in wind power generation with 14.7 percent of the state’s electricity generation coming from wind in 2011.

Transportation Sector

Transportation is essential for international, interstate, and intrastate commerce, including the transportation of critical materials such as food and other goods. The primary transportation networks in North Dakota consist of road, rail, and air systems. **Figure 4.8** shows these networks. Two interstates pass through North Dakota, Interstate 94 and Interstate 29. Highway 2 and Highway 83 are also important travel routes. In all, the state has over 105,000 miles of road, including 18 international highway ports of entry along the Canadian border. According to the North Dakota Department of Transportation, North Dakota has more miles of road per capita than any other state. The North Dakota Department of Transportation maintains about 8,410 miles of highway. (North Dakota Department of Commerce)

North Dakota has a total of 4,978 bridges on three highway systems: state, county, and urban. Of those bridges, 1,714 are on the state highway system (I-29, I-94, and other high traffic volume highways), 3,160 are on the county highway system (county and rural roads), and 104 are on the urban highway system (highways located in a city). The following definitions for bridge ratings were provided by the North Dakota Department of Transportation:

- Structurally Deficient (SD) – A bridge designated "structurally deficient" does not mean that the bridge is unsafe; it simply means that the deck, the superstructure, or the substructure has a condition that warrants attention. This can be as simple as a concrete bridge deck needing work and requiring a bridge deck overlay.
- Functionally Obsolete (FO) – A bridge designated "functionally obsolete" means that some part of the bridge does not meet a design standard such as vertical clearance, deck width, etc. It has nothing to do with the structural integrity of the bridge.

Table 4.8 lists the bridge ratings done by the North Dakota Department of Transportation as of June 2013 by type.

Table 4.8. North Dakota Bridge Ratings as of June 2013

Structurally Deficient and Functionally Obsolete Structures by County June 2013

County	State Structures			County Structures On		County Structures off			Urban			Totals
	SD	FO	Total	SD	FO	SD	FO	Total	SD	FO	Total	
Adams			0			6	2	8			0	**8**
Barnes	3	4	7			2	1	3		1	1	**11**
Benson	1		1			3	1	4			0	**5**
Billings	1	2	3		1	1		2			0	**5**
Bottineau	1		1			32	10	42			0	**43**
Bowman		1	1				4	4			0	**5**
Burke			0			4		4			0	**4**
Burleigh	1	1	2			7	1	8			0	**10**
Cass.	2	1	3	1	2	35	6	44		3	3	**50**
Cavalier			0			15	4	19			0	**19**
Dickey	1		1					0			0	**1**
Divide			0			3		3			0	**3**
Dunn	1		1			5	2	7			0	**8**
Eddy	1		1				1	1			0	**2**
Emmons			0		1	3	1	5			0	**5**
Foster			0			1	2	3			0	**3**
Golden Valley		2	2			3	2	5			0	**7**
Grand Forks	1	3	4	4		31	10	45	1		1	**50**
Grant			0		2	9	3	14			0	**14**
Griggs	1		1			1	3	4			0	**5**
Hettinger			0	2		19	5	26			0	**26**
Kidder			0					0			0	**0**
LaMoure	1		1			9	1	10			0	**11**
Logan			0	1		1	1	3			0	**3**
McHenry			0	1		26	14	41			0	**41**
McIntosh	1		1		1	2		3			0	**4**
McKenzie	4		4	1		6	3	10			0	**14**
McLean			0			2	3	5			0	**5**
Mercer		1	1				3	3			0	**4**
Morton	1	3	4	4	1	45	15	65			0	**69**
Mountrail			0			3	1	4			0	**4**
Nelson			0		1	2	1	4			0	**4**
Oliver			0					0			0	**0**
Pembina	1	7	8	2		26	5	33			0	**41**
Pierce			0			4		4			0	**4**
Ramsey	1		1	1		11	3	15			0	**16**
Ransom			0			3		3			0	**3**
Renville			0					0			0	**0**
Richland	6		6			38	12	50			0	**56**
Rolette	1		1			2		2			0	**3**
Sargent	1		1	1		4	2	7			0	**8**
Sheridan			0			1		1			0	**1**
Sioux	1		1					0			0	**1**
Slope	2		2			3		3			0	**5**
Stark	6		6			28	8	36		1	1	**43**
Steele	1		1		1	5	2	8			0	**9**
Stutsman	1	2	3	1	1	2	1	5		1	1	**9**
Towner			0			12		12			0	**12**
Traill	6	1	7	3		25	19	47			0	**54**
Walsh	1		1	4		60	16	80	1		1	**82**
Ward			0			5	3	8	1	3	4	**12**
Wells			0			6	1	7			0	**7**
Williams	3	2	5		1	27	7	35			0	**40**
Totals	52	30	82	26	12	538	179	755	3	9	12	**849**

Source: North Dakota Department of Transportation, 2013; SD=Structurally Obsolete, FO=Functionally Obsolete

The North Dakota Department of Transportation also keeps a listing of scour critical bridges. Scour is erosion within a streambed due to flowing water. A bridge is scour critical if the bridge foundation is determined to be unstable for the calculated scour conditions. These types of bridges can be especially vulnerable during flood events. North Dakota has a total of 79 scour critical bridges as shown in **Table 4.9**. Some of the county bridges listed are on very low volume roads and others are on the list due to unknown foundations and may not actually be scour critical.

Table 4.9. North Dakota Scour Critical Bridges

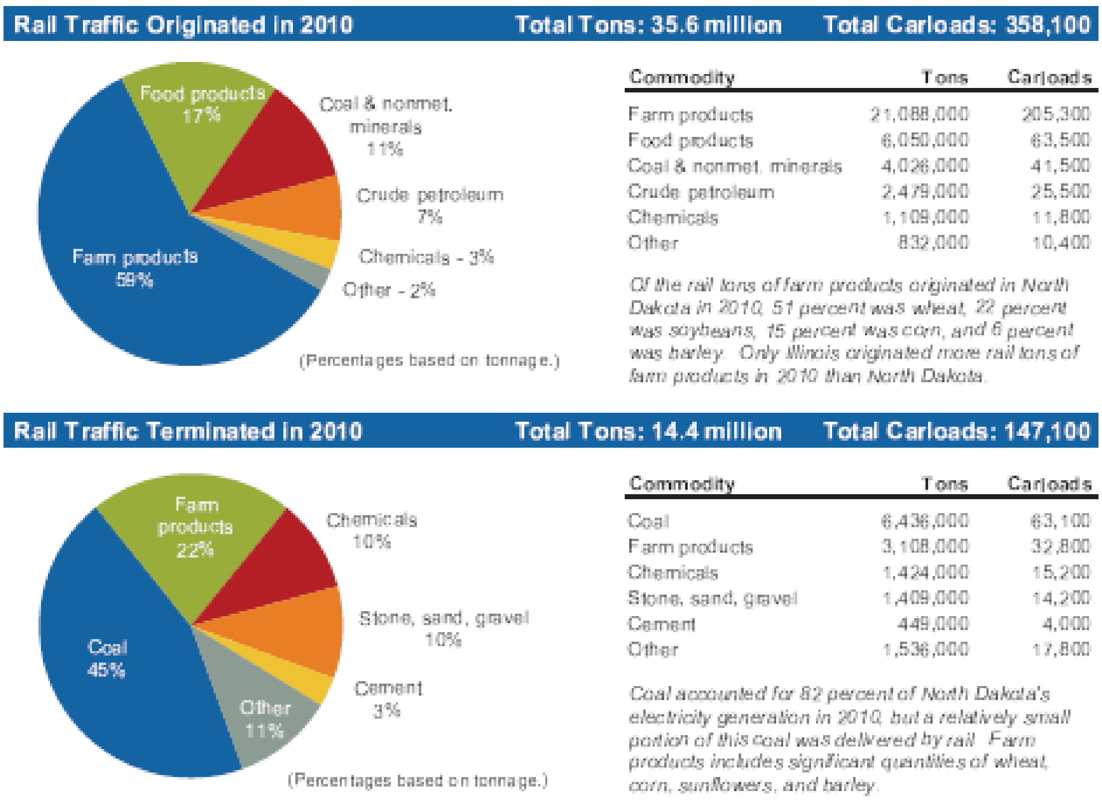
County	State	County	Urban	Total
State of ND	11	65	3	79
Adams	2	2	0	4
Barnes	0	2	0	2
Benson	0	0	0	0
Billings	1	0	0	1
Bottineau	0	1	0	1

County	State	County	Urban	Total
Bowman	0	2	0	2
Burke	1	0	0	1
Burleigh	0	2	0	2
Cass	0	3	0	3
Cavalier	0	0	0	0
Dickey	0	2	0	2
Divide	0	1	0	1
Dunn	0	0	0	0
Eddy	0	1	0	1
Emmons	2	3	0	5
Foster	0	0	0	0
Golden Valley	0	2	0	2
Grand Forks	0	0	0	0
Grant	1	5	0	6
Griggs	0	0	0	0
Hettinger	2	8	0	10
Kidder	0	0	0	0
LaMoure	0	2	0	2
Logan	0	2	0	2
McHenry	0	2	0	2
McIntosh	0	0	0	0
McKenzie	0	1	0	1
McLean	0	2	0	2
Mercer	0	3	0	3
Morton	0	7	0	7
Mountrail	0	0	0	0
Nelson	1	0	0	1
Oliver	0	1	0	1
Pembina	0	0	0	0
Pierce	0	0	0	0
Ramsey	0	1	0	1
Ransom	0	0	0	0
Renville	0	0	0	0
Richland	0	0	0	0
Rolette	0	0	0	0
Sargent	0	0	0	0
Sheridan	0	0	0	0
Sioux	0	0	0	0
Slope	0	2	0	2
Stark	1	2	0	3
Steele	0	2	0	2
Stutsman	0	0	0	0
Towner	0	0	0	0
Traill	0	0	0	0
Walsh	0	1	0	1
Ward	0	2	2	4
Wells	0	1	0	1
Williams	0	0	1	1

Source: North Dakota Department of Transportation, June 2013

Railroads have long been an important way to transport agricultural goods and supplies in North Dakota. According to the Association of American Railroads, North Dakota has 3,346 freight railroad miles. Considering both rail traffic originated and terminated in North Dakota in 2010, 50 million tons of freight was transported by rail. At more than 21 tons in 2010, the primary products transported by the railroads originating in North Dakota were farm products. Coal was the primary product transported into North Dakota for use in the state. **Figure 4.6** provides additional statistics about rail traffic originated and terminated n North Dakota in 2010, which is the most current information available at the time of this plan update.

Figure 4.6. Rail Traffic Originated and Terminated in North Dakota, 2010



Source: Association of American Railroads, https://www.aar.org/keyissues/Documents/Railroads-States/North-Dakota-2010.pdf, website accessed 5/16/2013

Table 4.10 shows the number of miles of freight railroad operated in North Dakota. Amtrak provides passenger rail service to Williston, Stanley, Minot, Rugby, Devils Lake, Grand Forks, and Fargo. **Figure 4.7** that follows shows rail ownership based on the 2011 National Transportation Atlas Database.

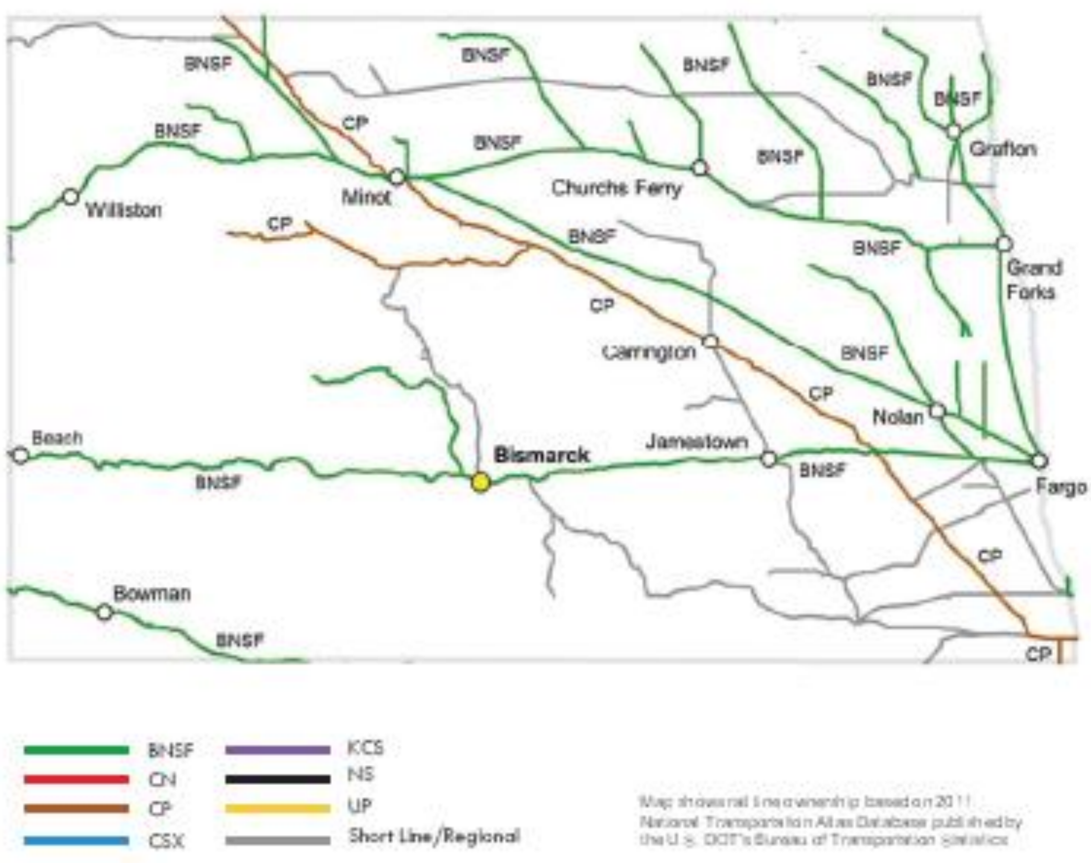
Table 4.10. Miles of Freight Railroad Operated in North Dakota in 2010

Railroad	Miles in North Dakota
Class I Railroads	
BNSF Railway Company	1,732 miles
Soo Line Railroad Company (part of Canadian Pacific Railway)	482 miles
Regional Railroads	
Dakota, Missouri Valley, and Western Railroad	402 miles
Red River Valley and Western Railroad Company	543 miles
Local Railroads	
Dakota Northern Railroad	79 miles

Railroad	Miles in North Dakota
Northern Plains Railroad	294
Otter Tail Valley Railroad	5 miles
Yellowstone Valley Railroad	9 miles

Source: Association of American Railroads, https://www.aar.org/keyissues/Documents/Railroads-States/North-Dakota-2010.pdf, website accessed 5/16/2013

Figure 4.7. Rail Line Ownership in North Dakota, 2011



Source: Association of American Railroads, https://www.aar.org/keyissues/Documents/Railroads-States/North-Dakota-2010.pdf, website accessed 5/16/2013

Air transportation in North Dakota is provided through a variety of public, private, and government airports. North Dakota has 89 public airports, including eight that provide scheduled commercial passenger service as shown in **Table 4.11**. The eight major commercial airports offer daily flights to ten domestic hubs.

Table 4.11. North Dakota Major Commercial Airports

Airport	County
Bismarck Airport	Burleigh
Devils Lake Airport	Ramsey
Dickinson Airport	Stark
Fargo Airport	Cass

Airport	County
Grand Forks Airport	Grand Forks
Jamestown Airport	Stutsman
Minot Airport	Ward
Williston Airport	Williams

Source: Federal Aviation Administration

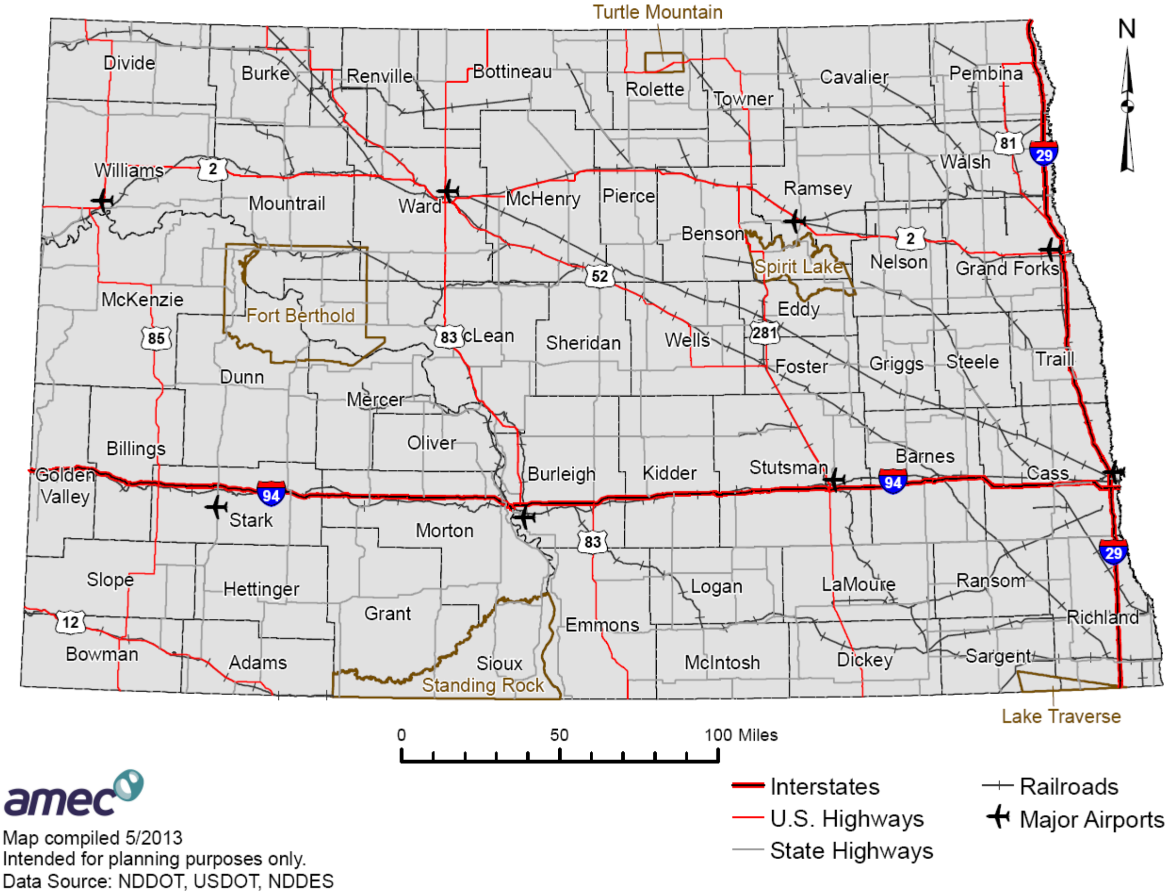
Table 4.12. Public Airports by County

County	Number of Public Airports
Adams	1
Barnes	1
Benson	2
Bottineau	2
Bowman	1
Burke	2
Burleigh	1
Cass	6
Cavalier	1
Dickey	2
Divide	1
Dunn	1
Eddy	1
Emmons	2
Foster	1
Golden Valley	1
Grand Forks	3
Grant	1
Griggs	1
Hettinger	1
La Moure	3
Logan	2
Mc Henry	1
Mc Intosh	2
Mc Kenzie	1
Mc Lean	4
Mercer	2
Morton	2
Mountrail	4
Nelson	2
Pembina	4
Pierce	1
Ramsey	1
Ransom	2
Renville	1
Richland	2
Rolette	3
Sargent	2
Sheridan	1
Sioux	1
Stark	2
Stutsman	1
Towner	1
Traill	2
Walsh	4
Ward	2
Wells	2
Williams	2

County	Number of Public Airports
Total	**89**

Source: Federal Aviation Administration, current as of 5/2/2013, http://www.faa.gov/airports/airport_safety/airportdata_5010/

Figure 4.8. Transportation Infrastructure in North Dakota



Education

Primary education facilities also exist throughout the state. Often, these facilities have a smaller student population than the secondary institutions. The total number of North Dakota public school enrollees during the 2012-2013 school year is shown in **Table 4.13**. Note that the North Dakota State Fire and Tornado Fund maintains insurance policies for many school districts in the state; some larger districts, such as the Fargo School District, however, are not covered by the fund, so the usefulness of the data as it pertains to school districts is limited.

Table 4.13. North Dakota Public School Enrollments by County, 2012-2013 School Year

County	Total
Adams	280
Barnes	1,492

County	Total
McLean	1,582
Mercer	1,276

County	Total
Benson	1,022
Billings	67
Bottineau	795
Bowman	595
Burke	319
Burleigh	11,675
Cass	21,295
Cavalier	428
Dickey	826
Divide	340
Dunn	476
Eddy	340
Emmons	544
Foster	543
Golden Valley	313
Grand Forks	8,506
Grant	237
Griggs	370
Hettinger	421
Kidder	370
LaMoure	650
Logan	355
McHenry	909
McIntosh	377
McKenzie	1,275

County	Total
Morton	4,223
Mountrail	1,616
Nelson	443
Oliver	200
Pembina	1,231
Pierce	583
Ramsey	1,759
Ransom	929
Renville	596
Richland	2,250
Rolette	2,904
Sargent	649
Sheridan	106
Sioux	421
Slope	16
Stark	3,562
Steele	221
Stutsman	2,558
Towner	261
Traill	1,329
Walsh	1,575
Ward	9,428
Wells	548
Williams	4,106
Total	**99,192**

Source: North Dakota Department of Public Instruction, 2013, http://www.dpi.state.nd.us/finance/resources/ accessed 5/24/2013

Colleges and universities can also be considered critical facilities that warrant special planning considerations. The State owned universities are summarized in **Section 4.1** above. **Table 4.14** below provides a summary of private and tribal Community Colleges and Universities in the State.

Table 4.14. Private and Tribal Community Colleges and Universities in North Dakota

College/University	Main Campus Location	Fall 2010 Enrollment
Cankdeska Cikana Community College	Fort Totten, Benson County	220
Fort Berthold Community College	New Town, Mountrail County	215
Jamestown College	Jamestown, Stutsman County	972
Medcenter One College of Nursing	Bismarck, Burleigh County	91
Rasmussen College – Bismarck	Bismarck, Burleigh County	482
Rasmussen College - Fargo	Fargo, Cass County	1,249
Sitting Bull College*	Fort Yates, Sioux County	314
Trinity Bible College	Ellendale, Dickey County	285
Turtle Mountain Community College	Belcourt, Rolette County	969
United Tribes Technical College	Bismarck, Burleigh County	600
University of Mary	Bismarck, Burleigh County	3,317

Source: Wikipedia, http://en.wikipedia.org/wiki/Bismarck,_North_Dakota website accessed 5/24/2013; * has a Disaster-Resistant University Pre-Disaster Mitigation Plan

Hospitals/Trauma Centers

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 4.15. Hospitals/Trauma Centers in North Dakota

Hospitals	County
Sanford Medical Center, Bismarck	Burleigh
St. Alexius Medical Center, Bismarck	Burleigh
Essential Health, Fargo	Cass
Sanford Medical Center, Fargo	Cass
Altru Health System, Grand Forks	Grand Forks
Trinity Hospital, Minot	Ward

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

Other Special Needs Facilities

Table 4.16 lists the major special needs facilities in North Dakota that have not been otherwise identified as critical facilities or state owned/operated special needs facilities (**see Table 4.4**).

Table 4.16. Large Special Needs Facilities in North Dakota

Facility	County
Missouri River Correctional Center	Burleigh
North Dakota Veterans Home	Ransom

4.2.2. Local Government's Critical Facilities and Infrastructure

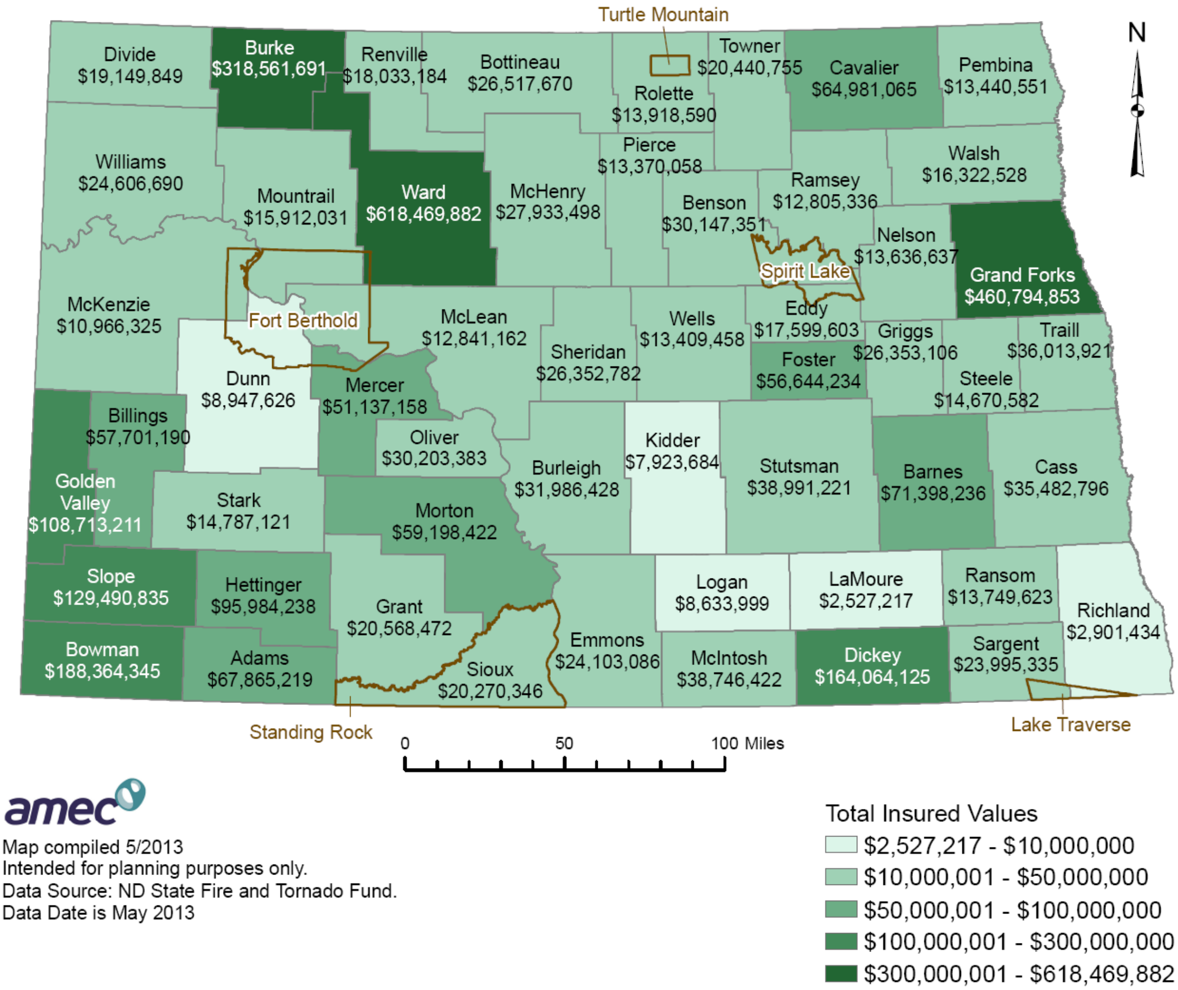
An additional source of critical facility data was the North Dakota Fire and Tornado Fund. This fund provides insurance not only to state government, but to local governments and districts as well. In fact, most facilities and infrastructure owned by county governments and many cities and townships are insured through the North Dakota Fire and Tornado Fund. Therefore, this data source provides a nearly complete assessment of the replacement values of local government facilities. Certainly all facilities owned by local governments may not be considered critical, but many are. Therefore, the insurance data for counties, cities, townships, airport authorities, fire districts, water districts and others such as ambulance services are summarized in **Table 4.17** and **Figure 4.9**. The types of facilities and infrastructure covered by this list include the following: county courthouses, city halls, community centers, as well as pump houses, communications buildings, towers, and equipment, police stations, emergency operation centers, ambulance buildings, road shops, lift stations, fairgrounds, jails, park facilities, water and wastewater treatment plants, fire stations, museums, warning sirens, municipal airport facilities, and storage buildings.

Table 4.17. Critical Facilities and Infrastructure Owned by Local Governments

County	# of Building Properties	Building Property Value	# of Personal Property Policies	Personal property Value	# of Outdoor Properties	Outdoor Property Value	# of Trailer Properties	Trailer Property Value	Total Value
Adams	30	$10,835,669	19	$1,615,492	7	$989,390	0	$0	$13,440,551
Barnes	104	$52,153,787	49	$6,742,328	41	$6,084,950	0	$0	$64,981,065
Benson	60	$15,718,072	40	$1,426,909	27	$3,295,774	0	$0	$20,440,755
Billings	29	$16,475,758	25	$2,011,517	19	$607,732	1	$54,842	$19,149,849
Bottineau	111	$20,721,608	55	$2,258,522	64	$3,537,540	0	$0	$26,517,670
Bowman	55	$13,474,686	28	$2,922,067	27	$1,636,431	0	$0	$18,033,184
Burke	39	$9,452,617	24	$1,531,395	12	$2,934,578	0	$0	$13,918,590
Burleigh	149	$279,713,226	83	$28,502,071	52	$10,346,394	0	$0	$318,561,691
Cass	338	$469,674,790	189	$54,007,502	475	$94,787,590	0	$0	$618,469,882
Cavalier	56	$19,276,808	36	$2,710,579	23	$2,619,303	0	$0	$24,606,690
Dickey	80	$23,159,539	40	$1,803,787	49	$2,970,172	0	$0	$27,933,498
Divide	34	$13,715,130	24	$1,150,142	5	$1,046,759	0	$0	$15,912,031
Dunn	46	$10,016,972	28	$2,395,382	13	$942,850	1	$14,854	$13,370,058
Eddy	33	$9,783,835	28	$1,228,980	17	$1,792,521	0	$0	$12,805,336
Emmons	60	$11,931,383	35	$2,024,142	43	$2,367,003	0	$0	$16,322,528
Foster	52	$25,607,850	30	$2,168,476	21	$2,371,025	0	$0	$30,147,351
Golden Valley	55	$9,969,159	34	$1,673,717	9	$1,993,761	0	$0	$13,636,637
Grand Forks	253	$384,729,780	96	$18,466,913	129	$57,531,300	2	$66,860	$460,794,853
Grant	42	$8,097,932	29	$1,175,027	15	$1,693,366	0	$0	$10,966,325
Griggs	57	$9,053,657	25	$2,175,882	13	$1,611,623	0	$0	$12,841,162
Hettinger	56	$21,741,066	33	$3,123,674	21	$1,488,042	0	$0	$26,352,782
Kidder	50	$10,677,393	21	$2,001,785	17	$730,280	0	$0	$13,409,458
LaMoure	71	$14,630,512	45	$1,190,969	28	$1,778,122	0	$0	$17,599,603
Logan	34	$6,504,854	21	$901,836	14	$1,540,936	0	$0	$8,947,626
McHenry	110	$20,976,464	48	$2,198,735	41	$3,177,907	0	$0	$26,353,106
McIntosh	37	$11,418,251	26	$966,298	15	$2,286,033	0	$0	$14,670,582
McKenzie	85	$28,995,237	39	$4,086,571	37	$2,229,701	13	$702,412	$36,013,921
McLean	136	$44,120,464	84	$4,502,417	69	$8,017,657	1	$3,696	$56,644,234
Mercer	129	$37,498,778	63	$5,843,734	97	$7,793,526	1	$1,120	$51,137,158
Morton	134	$89,703,316	64	$8,938,976	136	$10,070,919	0	$0	$108,713,211
Mountrail	112	$50,785,085	45	$4,585,212	26	$2,230,952	2	$99,941	$57,701,190
Nelson	116	$24,471,304	70	$4,168,145	47	$3,340,485	1	$6,494	$31,986,428
Oliver	26	$5,817,522	11	$808,158	7	$1,298,004	0	$0	$7,923,684
Pembina	107	$30,255,814	64	$4,940,066	53	$3,795,341	0	$0	$38,991,221
Pierce	46	$26,155,416	25	$2,205,174	19	$1,842,793	0	$0	$30,203,383
Ramsey	94	$59,933,809	69	$5,978,621	104	$5,480,142	1	$5,664	$71,398,236
Ransom	67	$25,505,260	37	$2,037,967	36	$7,939,569	0	$0	$35,482,796

County	# of Building Properties	Building Property Value	# of Personal Property Policies	Personal property Value	# of Outdoor Properties	Outdoor Property Value	# of Trailer Properties	Trailer Property Value	Total Value
Renville	55	$10,202,971	25	$3,037,287	9	$1,546,863	0	$0	$14,787,121
Richland	109	$42,092,123	70	$7,290,796	91	$9,815,503	0	$0	$59,198,422
Rolette	77	$16,211,410	49	$2,117,457	17	$2,239,605	0	$0	$20,568,472
Sargent	79	$18,844,733	57	$1,822,752	40	$3,435,601	0	$0	$24,103,086
Sheridan	36	$6,676,675	23	$683,299	11	$1,274,025	0	$0	$8,633,999
Sioux	10	$1,835,909	10	$426,347	2	$584,161	1	$55,017	$2,901,434
Slope	7	$1,745,893	5	$605,580	3	$175,744	0	$0	$2,527,217
Stark	128	$72,865,050	70	$9,525,019	106	$13,535,969	6	$58,200	$95,984,238
Steele	45	$10,799,829	28	$1,308,130	7	$1,641,664	0	$0	$13,749,623
Stutsman	191	$94,654,310	78	$7,290,885	97	$27,545,640	0	$0	$129,490,835
Towner	45	$16,755,076	28	$968,635	28	$2,546,635	0	$0	$20,270,346
Traill	88	$31,810,609	49	$3,211,958	53	$3,723,855	0	$0	$38,746,422
Walsh	121	$53,189,397	76	$10,261,385	63	$4,414,437	0	$0	$67,865,219
Ward	198	$104,407,896	136	$38,118,429	166	$21,537,800	0	$0	$164,064,125
Wells	60	$15,443,124	50	$4,763,009	29	$3,789,202	0	$0	$23,995,335
Williams	145	$165,437,715	79	$13,788,988	50	$8,711,987	7	$425,655	$188,364,345
Total	**4,487**	**2,585,725,523**	**2,515**	**301,689,124**	**2,600**	**372,719,162**	**37**	**1,494,755**	**$3,261,628,564**

Figure 4.9. Critical Facilities and Infrastructure Owned by Local Governments



To facilitate the analysis of the vulnerability of critical facilities and infrastructure to the specific hazards, a summary has been developed and is shown in **Table 4.18**.

Table 4.18. Critical Facilities and Infrastructure Summary by County

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Adams	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $1,446,872 in State Agency Assets $82,024 in National Guard Assets $3,239,856 in State University Assets	HSIP Facilities: 54 $13,440,551 in Local Government Critical Facilities 280 in public school enrollment
Barnes	State Agency Building Properties :9 State Agency Critical Facilities: 0 $15,537,673 in State Agency Assets $1,551,211 in National Guard Assets Valley City State University $90,120,718 in State University Assets	HSIP Facilities: 176 $64,981,065 in Local Government Critical Facilities 1,492 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Benson*	State Agency Building Properties :15 State Agency Critical Facilities: 0 $11,983,132 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 107 $20,440,755 in Local Government Critical Facilities 1,022 in public school enrollment Cankdeska Cikana Community College
Billings	State Agency Building Properties :10 State Agency Critical Facilities: 0 $4,075,548 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,751 $19,149,849 in Local Government Critical Facilities 67 in public school enrollment Interstate and Railroad Transportation Infrastructure
Bottineau	State Agency Building Properties :43 State Agency Critical Facilities: 0 $4,829,185 in State Agency Assets $0 in National Guard Assets $26,580,147 in State University Asset	HSIP Facilities: 2,365 $26,517,670 in Local Government Critical Facilities 795 in public school enrollment Dakota College at Bottineau
Bowman	State Agency Building Properties :4 State Agency Critical Facilities: 0 $2,374,200 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,580 $18,033,184 in Local Government Critical Facilities 595 in public school enrollment
Burke	State Agency Building Properties :3 State Agency Critical Facilities: 0 $707,860 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,629 $13,918,590 in Local Government Critical Facilities 319 in public school enrollment Portal Oil Import Site
Burleigh	State Agency Building Properties :99 State Agency Critical Facilities: 7 -State Capital Complex and State Office -State Emergency Operations Center/Fusion Center -State Bureau of Criminal Investigation Lab -Bank of North Dakota -State Department of Health Lab and Morgue -State Radio -Game & Fish $545,776,526 in State Agency Assets Missouri River Correctional Center North Dakota State Penitentiary $69,387,486 in National Guard Assets -Fraine Barracks $107,473,135 in State University Assets -Bismarck State College	HSIP Facilities: 365 $318,561,691 in Local Government Critical Facilities Bismarck Airport Sanford Medical Center St. Alexius Medical Center Medcenter One College of Nursing Rasmussen College – Bismarck United Tribes Technical College University of Mary 11,675 in public school enrollment Interstate and Railroad Transportation Infrastructure
Cass	State Agency Building Properties: 11 State Agency Critical Facilities: 0 $29,744,896 in State Agency Assets $17,792,094 in National Guard Assets $954,896,755 in State University Asset -North Dakota State University	HSIP Facilities: 618 $618,469,882 in Local Government Critical Facilities Fargo Airport Essential Health Sanford Medical Center Rasmussen College - Fargo 21,295 in public school enrollment Interstate and Railroad Transportation Infrastructure
Cavalier	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $1,243,307 in State Agency Assets $0 in National Guard Assets $2,219,699 in State University Assets	HSIP Facilities: 98 $24,606,690 in Local Government Critical Facilities 428 in public school enrollment Langdon Wind Power Plant

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Dickey	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,091,951 in State Agency Assets $0 in National Guard Assets $83,204 in State University Assets	HSIP Facilities: 62 $27,933,498 in Local Government Critical Facilities Trinity Bible College 826 in public school enrollment
Divide	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $804,898 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 757 $15,912,031in Local Government Critical Facilities 340 in public school enrollment
Dunn*	State Agency Building Properties: 12 State Agency Critical Facilities: 0 $6,580,591in State Agency Assets $0 in National Guard Assets $1,574,357 in State University Assets	HSIP Facilities: 1,441 $13,370,058 in Local Government Critical Facilities 476 in public school enrollment
Eddy*	State Agency Building Properties: 0 State Agency Critical Facilities: 0 $50,329 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 44 $12,805,336 in Local Government Critical Facilities 340 in public school enrollment
Emmons	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $913,299 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 100 $16,322,528 in Local Government Critical Facilities 544 in public school enrollment
Foster	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $1,084,431in State Agency Assets $3,425,042 in National Guard Assets $5,763,739 in State University Assets	HSIP Facilities: 47 $30,147,351 in Local Government Critical Facilities 543 in public school enrollment
Golden Valley	State Agency Building Properties: 6 State Agency Critical Facilities: 0 $3,599,895 in State Agency Assets $0 in National Guard Assets $37,680 in State University Assets	HSIP Facilities: 348 $13,636,637 in Local Government Critical Facilities 313 in public school enrollment Interstate and Railroad Transportation Infrastructure
Grand Forks	State Agency Building Properties: 36 State Agency Critical Facilities: 1 -State Mill $31,115,504 in State Agency Assets $17,341,882 in National Guard Assets $1,112,423,856 in State University Assets - University of North Dakota	HSIP Facilities: 390 $460,794,853 in Local Government Critical Facilities 8,506 in public school enrollment Grand Forks Air Force Base Altru Health System Grand Forks Airport Interstate and Railroad Transportation Infrastructure
Grant	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $737,485 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 72 $10,996,325 in Local Government Critical Facilities 237 in public school enrollment
Griggs	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,200,840 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 55 $12,841,162 in Local Government Critical Facilities 370 in public school enrollment

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Hettinger	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $7,235,807 in State Agency Assets $580,317 in National Guard Assets $0 in State University Assets	HSIP Facilities: 81 $26,352,782 in Local Government Critical Facilities 421in public school enrollment
Kidder	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $860,625in State Agency Assets $0 in National Guard Assets $37,680 in State University Assets	HSIP Facilities: 82 $13,409,458 in Local Government Critical Facilities 370 in public school enrollment Interstate and Railroad Transportation Infrastructure
LaMoure	State Agency Building Properties: 11 State Agency Critical Facilities: 0 $797,084 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 72 $17,599,603 in Local Government Critical Facilities 650 in public school enrollment
Logan	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $807,379 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 52 $8,947,626 in Local Government Critical Facilities 355 in public school enrollment
McHenry	State Agency Building Properties: 13 State Agency Critical Facilities: 0 $2,326,617 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 262 $26,353,106 in Local Government Critical Facilities 909 in public school enrollment
McIntosh	State Agency Building Properties: 12 State Agency Critical Facilities: 0 $1,692,354 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 61 $14,670,582 in Local Government Critical Facilities 377 in public school enrollment
McKenzie*	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $767,477 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 3,718 $36,013,921 in Local Government Critical Facilities 1,275 in public school enrollment
McLean*	State Agency Building Properties: 40 State Agency Critical Facilities: 0 $13,133,816 in State Agency Assets $180,393 in National Guard Assets $0 in State University Assets	HSIP Facilities: 277 $56,644,234 in Local Government Critical Facilities 1,582 in public school enrollment Coal Creek Power Plant Garrison Hydroelectric Power Plant
Mercer*	State Agency Building Properties: 7 State Agency Critical Facilities: 0 $22,182,719 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 127 $51,137,158 in Local Government Critical Facilities 1,276 in public school enrollment Great Plains Synfuels Plant Antelope Valley Power Plant Coyote Power Plant Garrison Hydroelectric Power Plant Leland Olds Power Plant Stanton Power Plant
Morton	State Agency Building Properties: 55 State Agency Critical Facilities: 0 $42,434,897 in State Agency Assets $2,485,095 in National Guard Assets $1,584,235 in State University Assets	HSIP Facilities: 330 $108,713,211 in Local Government Critical Facilities 4,223 in public school enrollment R.M. Heskett Power Plant Tesoro West Coast Refinery North Dakota Youth Correctional Center Interstate and Railroad Transportation Infrastructure

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Mountrail*	State Agency Building Properties: 9 State Agency Critical Facilities: 0 $2,841,231in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 1,842 $57,701,190 in Local Government Critical Facilities 1,616 in public school enrollment Fort Berthold Community College
Nelson*	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,319,948 in State Agency Assets $0 in National Guard Assets $13,927 in State University Assets	HSIP Facilities: 115 $31,986,428 in Local Government Critical Facilities 443 in public school enrollment
Oliver	State Agency Building Properties: 13 State Agency Critical Facilities: 0 $4,188,423in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 68 $7,923,684 in Local Government Critical Facilities 200 in public school enrollment Milton R. Young Power Plant
Pembina	State Agency Building Properties: 30 State Agency Critical Facilities: 0 $7,313,456 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 179 $38,991,221 in Local Government Critical Facilities 1,231 in public school enrollment Neche Oil Import Site Interstate and Railroad Transportation Infrastructure
Pierce	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $328,331 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 93 $30,203,383 in Local Government Critical Facilities 583 in public school enrollment
Ramsey*	State Agency Building Properties: 47 State Agency Critical Facilities: 0 $32,179,293 in State Agency Assets $109,439,756 in National Guard Assets - Camp Grafton $33,554,184 in State University Assets -Lake Region State College	HSIP Facilities: 130 $71,398,236 in Local Government Critical Facilities 1,759 in public school enrollment Devils Lake Airport
Ransom	State Agency Building Properties: 25 State Agency Critical Facilities: 0 $43,682,690 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 39 $35,482,796 in Local Government Critical Facilities 929 public school enrollment North Dakota Veterans Home
Renville	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $379,263 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 1,462 $14,787,121 in Local Government Critical Facilities 596 in public school enrollment
Richland*	State Agency Building Properties: 8 State Agency Critical Facilities: 0 $3,379,532 in State Agency Assets $10,833,246 in National Guard Assets $228,915,734 in State University Assets -- North Dakota State College of Science	HSIP Facilities: 194 $59,198,422 in Local Government Critical Facilities 2,250 public school enrollment Interstate and Railroad Transportation Infrastructure
Rolette*	State Agency Building Properties: 57 State Agency Critical Facilities: 0 $13,288,063 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 114 $20,568,472 in Local Government Critical Facilities 2,904 in public school enrollment Turtle Mountain Community College
Sargent*	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $598,063 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 43 $24,103,086 in Local Government Critical Facilities 649 in public school enrollment

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Sheridan	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $836,501in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 58 $8,633,999 in Local Government Critical Facilities 106 in public school enrollment
Sioux*	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $293,512 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 39 $2,901,434 in Local Government Critical Facilities 421 in public school enrollment Sitting Bull College
Slope	State Agency Building Properties: 0 State Agency Critical Facilities: 0 $6,502 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 381 $2,527,217 in Local Government Critical Facilities 16 in public school enrollment
Stark	State Agency Building Properties: 19 State Agency Critical Facilities: 0 $22,625,358 in State Agency Assets $0 in National Guard Assets $131,442,390 in State University Assets - Dickinson State University	HSIP Facilities: 834 $95,984,238 in Local Government Critical Facilities 3,562 in public school enrollment Dickinson Airport Interstate and Railroad Transportation Infrastructure
Steele	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $612,361 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 62 $13,749,623 in Local Government Critical Facilities 221 in public school enrollment
Stutsman	State Agency Building Properties: 63 State Agency Critical Facilities: 0 North Dakota State Hospital $159,408,922 in State Agency Assets $974,372 in National Guard Assets $2,103,544 in State University Assets	HSIP Facilities: 236 $129,490,835 in Local Government Critical Facilities 2,558 in public school enrollment - Jamestown College Jamestown Airport Interstate and Railroad Transportation Infrastructure
Towner	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $402,324 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 77 $20,270,346 in Local Government Critical Facilities 261 in public school enrollment
Traill	State Agency Building Properties:4 North Dakota State Developmental Center State Agency Critical Facilities: 0 $766,048 in State Agency Assets $0 in National Guard Assets $81,373,330 in State University Assets - Mayville State University	HSIP Facilities: 156 $38,746,422 in Local Government Critical Facilities 1,329 in public school enrollment Interstate and Railroad Transportation Infrastructure
Walsh	State Agency Building Properties: 34 State Agency Critical Facilities: 0 $72,428,748 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 180 $67,865,219 in Local Government Critical Facilities 1,575 in public school enrollment Interstate and Railroad Transportation Infrastructure
Ward*	State Agency Building Properties: 42 State Agency Critical Facilities: 0 $93,182,321 in State Agency Assets $23,876,523 in National Guard Assets $226,690,857 in State University Assets - Minot State University	HSIP Facilities: 751 $164,064,125 in Local Government Critical Facilities 9,428 in public school enrollment Minot Air Force Base Trinity Hospital Minot Airport

County	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Wells	State Agency Building Properties: 10 State Agency Critical Facilities: 0 $3,444,028 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 94 $23,995,335 in Local Government Critical Facilities 548 in public school enrollment
Williams	State Agency Building Properties: 26 State Agency Critical Facilities: 0 $12,962,474 in State Agency Assets $0 in National Guard Assets $61,761,798 in State University Assets - Williston State College	HSIP Facilities: 2,382 $188,364,345 in Local Government Critical Facilities 4,106 in public school enrollment Williston Airport

Sources: North Dakota Tornado and Fire Fund,2013; Homeland Security Infrastructure Program (HSIP) Gold Data, 2013; Association of American Railroads, 2013; Federal Aviation Administration, 2013; Wikipedia, 2013; North Dakota Department of Public Education, 2012; L=Low, LM=Low-Moderate, M=Moderate, MH=Moderate-High, H=High; N/A=overall vulnerability rating not available; * includes at least part of the reservation. See Hazard Profile sections for tribal vulnerability rating where available; **flood vulnerability rating is for riverine flooding only; ***transportation accident vulnerability rating is based on presence of infrastructure only and does not include analysis of volume. See Transportation Accident Hazard Profile for additional details on volume

4.3. Population

People are vulnerable to both natural and human-caused hazards. Based on the 2010 census, the State of North Dakota had a population of 672,591, ranking 49th in the nation. With recent growth in population that has occurred as a result of the boom in the oil and gas industry, 2012 population estimates for North Dakota total 699,628, moving North Dakota up to 48th in the nation based on population. **Table 4.19** provides the census population data including number and percent change from the 2000 census as well as population projections out to 2025 for the counties, urban cities, and tribal areas in North Dakota.

Table 4.19. Population Statistics, 200-2010 Decennial Census and Projections to 2025

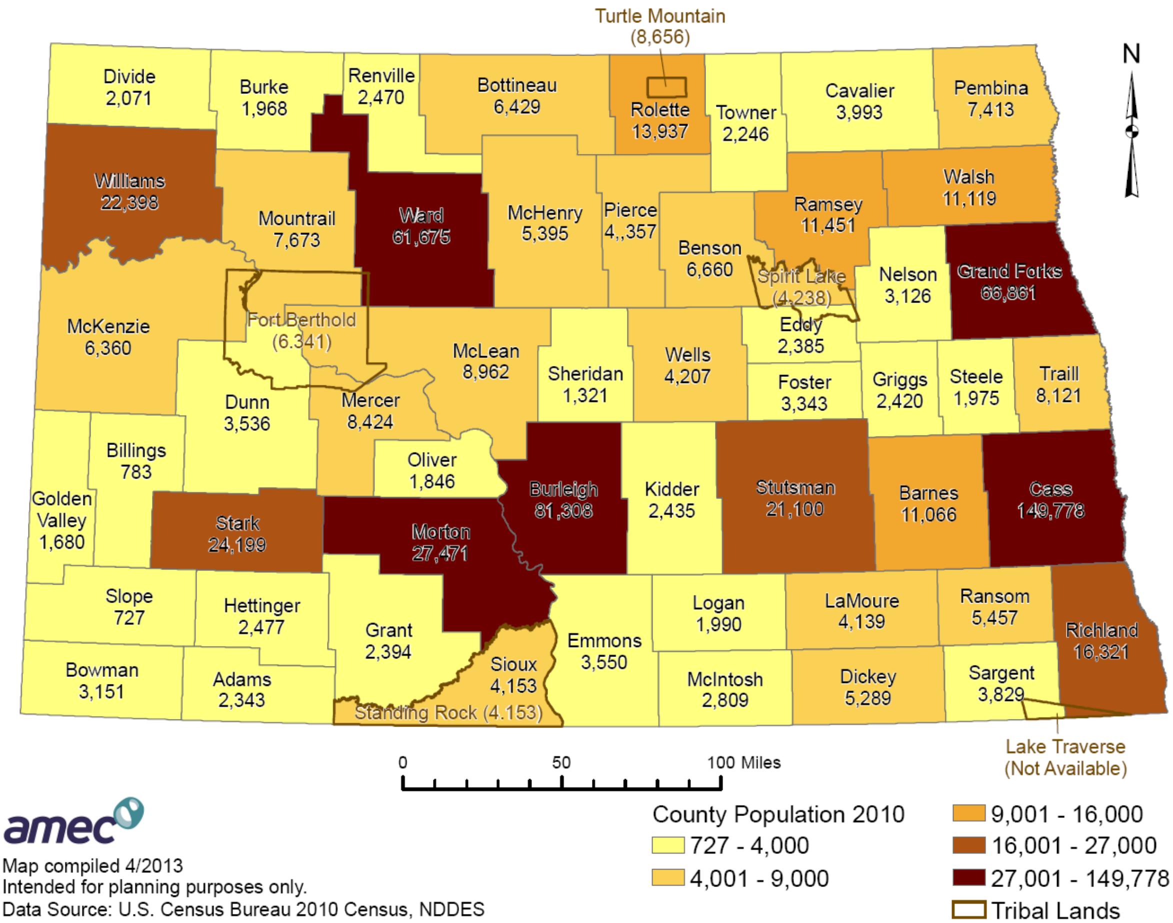
	Census			Projections			
Area	2000	2010	% change: 2000 to 2010	2015	2020	2025	% change: 2010 to 2025
North Dakota	642,200	672,591	4.70%	750,023	806,541	841,820	25.20%
Adams County	2,593	2,343	-9.60%	2,356	2,338	2,360	0.70%
Barnes County	11,775	11,066	-6.00%	11,372	11,574	11,743	6.10%
Benson County	6,964	6,660	-4.40%	6,970	7,322	7,686	15.40%
Billings County	888	783	-11.80%	997	1,183	1,315	67.90%
Bottineau County	7,149	6,429	-10.10%	9,984	10,691	10,721	66.80%
Bowman County	3,242	3,151	-2.80%	3,357	3,563	3,804	20.70%
Burke County	2,242	1,968	-12.20%	2,921	3,043	2,989	51.90%
Burleigh County	69,416	81,308	17.10%	88,543	96,055	104,154	28.10%
Cass County	123,138	149,778	21.60%	161,283	172,921	185,071	23.60%
Cavalier County	4,831	3,993	-17.30%	3,909	3,805	3,773	-5.50%
Dickey County	5,757	5,289	-8.10%	5,315	5,313	5,296	0.10%
Divide County	2,283	2,071	-9.30%	3,273	4,313	4,948	138.90%
Dunn County	3,600	3,536	-1.80%	4,550	5,254	5,433	53.60%
Eddy County	2,757	2,385	-13.50%	2,254	2,182	2,139	-10.30%
Emmons County	4,331	3,550	-18.00%	3,606	3,575	3,593	1.20%
Foster County	3,759	3,343	-11.10%	3,153	3,018	2,974	-11.00%
Golden Valley County	1,924	1,680	-12.70%	1,954	2,205	2,354	40.10%
Grand Forks County	66,109	66,861	1.10%	69,268	72,014	74,894	12.00%
Grant County	2,841	2,394	-15.70%	2,291	2,192	2,133	-10.90%
Griggs County	2,754	2,420	-12.10%	2,393	2,352	2,314	-4.40%
Hettinger County	2,715	2,477	-8.80%	2,920	3,341	3,506	41.50%
Kidder County	2,753	2,435	-11.60%	2,389	2,319	2,246	-7.80%
LaMoure County	4,701	4,139	-12.00%	3,926	3,771	3,620	-12.50%
Logan County	2,308	1,990	-13.80%	1,884	1,861	1,886	-5.20%
McHenry County	5,987	5,395	-9.90%	7,116	7,687	7,784	44.30%
McIntosh County	3,390	2,809	-17.10%	2,767	2,766	2,747	-2.20%
McKenzie County	5,737	6,360	10.90%	11,771	15,550	17,110	169.00%
McLean County	9,311	8,962	-3.70%	9,158	9,277	9,237	3.10%
Mercer County	8,644	8,424	-2.50%	8,684	8,817	8,927	6.00%
Morton County	25,303	27,471	8.60%	29,048	30,498	31,976	16.40%
Mountrail County	6,631	7,673	15.70%	12,819	13,527	13,575	76.90%

	Census			Projections			
Area	**2000**	**2010**	**% change: 2000 to 2010**	**2015**	**2020**	**2025**	**% change: 2010 to 2025**
Nelson County	3,715	3,126	-15.90%	3,047	2,976	2,857	-8.60%
Oliver County	2,065	1,846	-10.60%	1,803	1,747	1,699	-8.00%
Pembina County	8,585	7,413	-13.70%	7,278	7,174	7,060	-4.80%
Pierce County	4,675	4,357	-6.80%	4,958	5,202	5,295	21.50%
Ramsey County	12,066	11,451	-5.10%	11,428	11,472	11,452	0.00%
Ransom County	5,890	5,457	-7.40%	5,166	4,907	4,699	-13.90%
Renville County	2,610	2,470	-5.40%	3,337	3,593	3,589	45.30%
Richland County	17,998	16,321	-9.30%	16,171	15,971	15,701	-3.80%
Rolette County	13,674	13,937	1.90%	14,596	15,172	15,651	12.30%
Sargent County	4,366	3,829	-12.30%	3,794	3,763	3,733	-2.50%
Sheridan County	1,710	1,321	-22.70%	1,255	1,183	1,091	-17.40%
Sioux County	4,044	4,153	2.70%	4,415	4,693	4,937	18.90%
Slope County	767	727	-5.20%	837	1,056	1,095	50.60%
Stark County	22,636	24,199	6.90%	31,547	39,195	42,191	74.40%
Steele County	2,258	1,975	-12.50%	1,824	1,689	1,595	-19.20%
Stutsman County	21,908	21,100	-3.70%	21,861	22,623	23,598	11.80%
Towner County	2,876	2,246	-21.90%	2,277	2,301	2,315	3.10%
Traill County	8,477	8,121	-4.20%	8,084	8,033	8,000	-1.50%
Walsh County	12,389	11,119	-10.30%	10,913	10,636	10,314	-7.20%
Ward County	58,795	61,675	4.90%	73,574	77,682	77,490	25.60%
Wells County	5,102	4,207	-17.50%	4,142	4,071	4,044	-3.90%
Williams County	19,761	22,398	13.30%	35,485	47,075	51,106	128.20%
Cities							
Bismarck city	55,532	61,272	10.30%	66,849	72,556	78,731	28.50%
Devils Lake city	7,222	7,141	-1.10%	7,146	7,149	7,133	-0.10%
Dickinson city	16,010	17,787	11.10%	23,121	28,628	30,721	72.70%
Fargo city	90,599	105,549	16.50%	113,539	121,494	130,065	23.20%
Grand Forks city	49,321	52,838	7.10%	54,800	56,859	58,981	11.60%
Jamestown city	15,527	15,427	-0.60%	15,992	16,512	17,224	11.60%
Mandan city	16,718	18,331	9.60%	19,390	20,348	21,310	16.30%
Minot city	36,567	40,888	11.80%	48,632	51,138	50,887	24.50%
Valley City city	6,826	6,585	-3.50%	6,772	6,882	6,994	6.20%
Wahpeton city	8,586	7,766	-9.60%	7,767	7,699	7,576	-2.40%
West Fargo city	14,940	25,830	72.90%	27,843	29,906	31,912	23.50%
Williston city	12,512	14,716	17.60%	23,481	30,756	32,860	123.30%
Reservations							
Fort Berthold Reservation	5,915	6,341	7.20%	6,569	6,798	7,026	10.80%
Spirit Lake Reservation	4,435	4,238	-4.40%	4,374	4,510	4,646	9.60%
Standing Rock Reservation (ND portion)	4,044	4,153	2.70%	4,209	4,265	4,321	4.00%
Turtle Mountain Reservation	8,307	8,656	4.20%	8,838	9,020	9,201	6.30%
Lake Traverse	191	N/A	N/A	N/A	N/A	N/A	N/A

Sources: U.S. Census Bureau and the Center for Social Research at NDSU; The 2010 population and projections were not available for the ND portion of Lake Traverse

Figure 4.10 displays relative population data for the counties and tribal areas in North Dakota.

Figure 4.10. 2010 Population



4.4. Buildings

Besides 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. **Table 4.20** provides the total number of buildings and building value by county. **Figure 4.11** that follows displays this data in a statewide map.

Table 4.20. North Dakota, 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
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

County	Total Building Count	Total Building Exposure (in 1,000s)
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

Figure 4.11. North Dakota Building Exposure, Values of Buildings

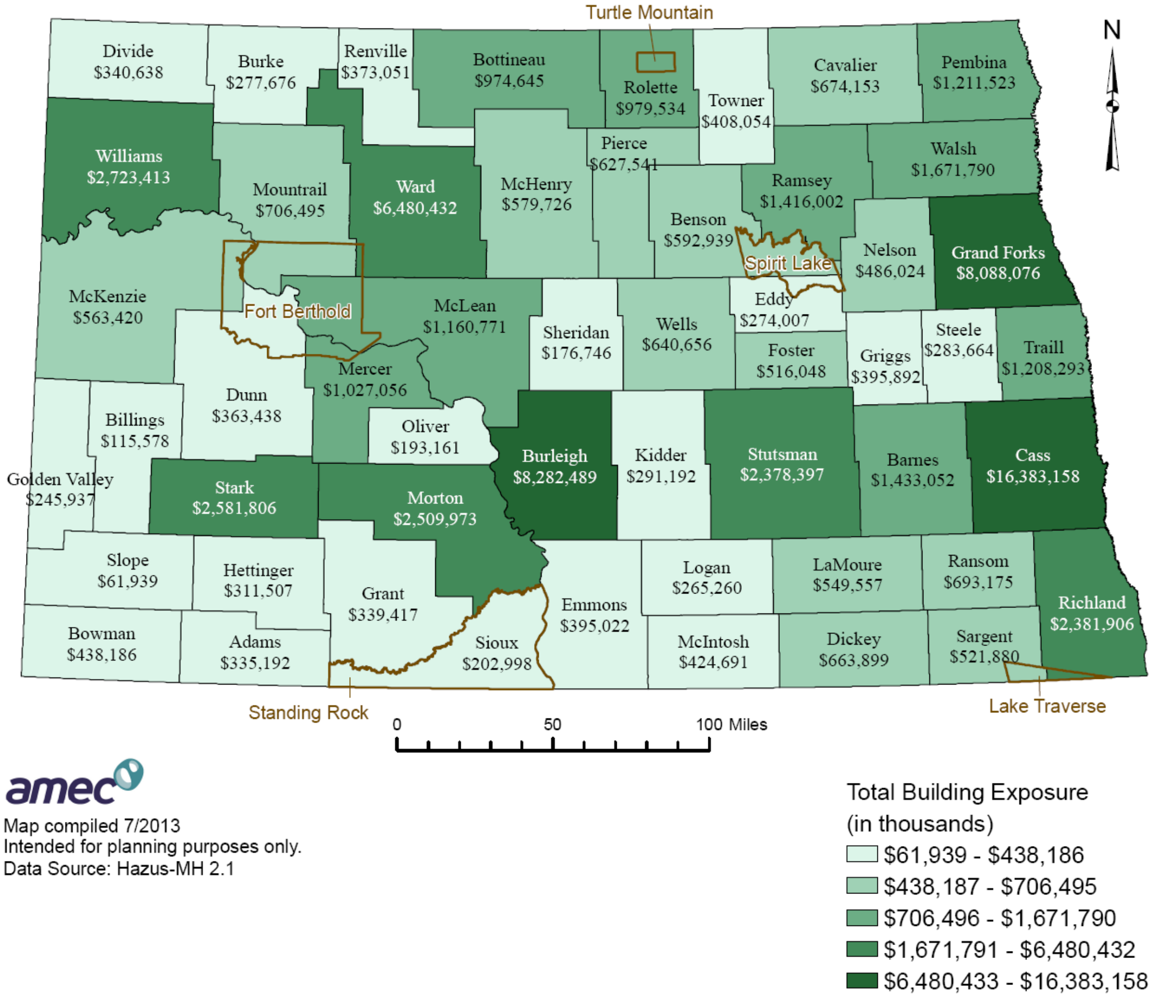


Table 4.21 shows the number of housing units, density, number of occupied housing units, and median value by county.

Table 4.21. North Dakota Housing Unit Statistics, 2010 Census and 2007-2011 5-Year American Community Survey

County	Total Housing Units-2010	Housing Unit Density # Per Square Mile, 2010	Occupied Housing Units	Median Value Of Owner-Occupied Housing Units
North Dakota	317,498	4.60	278,669	$118,200
Adams	1,377	1.39	1,097	$86,300
Barnes	5,704	3.82	4,758	$84,000
Benson	2,950	2.12	2,300	$52,800
Billings	484	0.42	364	$77,100
Bottineau	4,341	2.60	2,999	$70,000
Bowman	1,683	1.45	1,317	$89,600

County	Total Housing Units-2010	Housing Unit Density # Per Square Mile, 2010	Occupied Housing Units	Median Value Of Owner-Occupied Housing Units
Burke	1,340	1.21	989	$54,000
Burleigh	35,754	21.90	33,437	$159,000
Cass	67,938	38.49	63,901	$150,700
Cavalier	2,309	1.55	1,713	$70,800
Dickey	2,636	2.33	2,156	$65,200
Divide	1,324	1.05	1,023	$59,500
Dunn	2,132	1.06	1,359	$81,000
Eddy	1,323	2.10	997	$50,700
Emmons	2,085	1.38	1,618	$64,400
Foster	1,801	2.83	1,506	$77,100
Golden Valley	967	0.97	733	$59,600
Grand Forks	29,344	20.43	26,760	$143,700
Grant	1,690	1.02	1,175	$61,700
Griggs	1,461	2.06	1,086	$65,700
Hettinger	1,414	1.25	1,073	$61,600
Kidder	1,674	1.24	1,152	$61,000
LaMoure	2,238	1.95	1,923	$70,500
Logan	1,144	1.15	848	$55,300
McHenry	2,948	1.57	2,515	$68,800
McIntosh	1,858	1.91	1,301	$49,700
McKenzie	3,090	1.12	2,566	$88,400
McLean	5,590	2.65	3,904	$98,900
Mercer	4,450	4.27	3,662	$109,300
Morton	12,079	6.27	10,918	$120,400
Mountrail	4,119	2.26	2,885	$75,400
Nelson	1,927	1.96	1,443	$51,100
Oliver	905	1.25	773	$91,100
Pembina	3,859	3.45	3,304	$73,000
Pierce	2,199	2.16	1,951	$81,700
Ramsey	5,615	4.73	4,807	$85,400
Ransom	2,656	3.08	2,307	$88,800
Renville	1,386	1.58	1,098	$66,200
Richland	7,503	5.23	6,483	$99,000
Rolette	5,372	5.95	4,619	$61,200
Sargent	2,004	2.33	1,715	$72,400
Sheridan	894	0.92	608	$53,800
Sioux	1,311	1.20	1,067	$72,900
Slope	436	0.36	306	$54,800
Stark	10,735	8.04	9,793	$130,000
Steele	1,171	1.64	836	$65,500
Stutsman	9,862	4.44	8,574	$92,800
Towner	1,449	1.41	992	$53,000
Traill	3,780	4.39	3,375	$90,100
Walsh	5,498	4.29	4,825	$66,000
Ward	26,744	13.28	24,453	$124,300
Wells	2,481	1.95	2,032	$55,600
Williams	10,464	5.04	9,273	$110,000

Source: US Census Bureau, Total Housing Units and Housing Density from 2010 Decennial Census; Occupied Housing Units and Median Value of Owner-Occupied Housing Units from 2007-2011 5-Year American Community Survey

4.5. Economic, Ecologic, Historic, and Social Values

Agriculture is the primary industry in North Dakota. Agricultural production comprises about 90 percent of the state's total land area. 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. **Table 4.22** and **Figure 4.12** show the market value of agricultural products sold as calculated in the 2007 Census of Agriculture. At the time this plan update was under development, the 2012 Census of Agriculture had not yet been released.

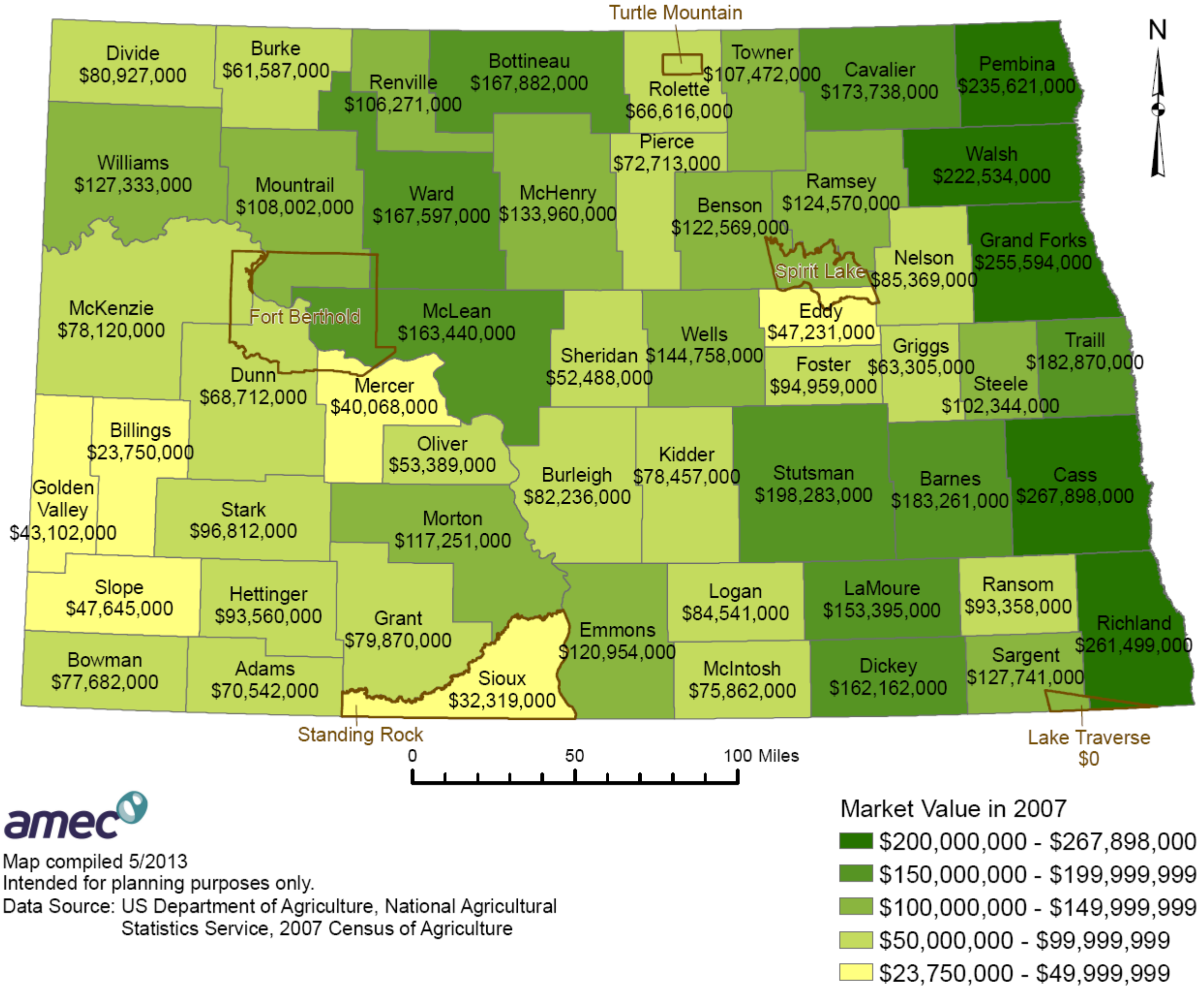
Table 4.22. North Dakota 2007 Market Value of Agricultural Products Sold

County	Value Of Crops	Market Value Of Livestock, Poultry & Their Products	Market Value Of Ag Products Sold
Adams	$39,246,000	$31,296,000	$70,542,000
Barnes	$172,501,000	$10,760,000	$183,261,000
Benson	$108,039,000	$14,530,000	$122,569,000
Billings	$7,264,000	$16,486,000	$23,750,000
Bottineau	$158,991,000	$8,891,000	$167,882,000
Bowman	$35,079,000	$42,603,000	$77,682,000
Burke	$55,256,000	$6,331,000	$61,587,000
Burleigh	$50,682,000	$31,554,000	$82,236,000
Cass	$252,192,000	$15,706,000	$267,898,000
Cavalier	$171,319,000	$2,419,000	$173,738,000
Dickey	$124,459,000	$37,703,000	$162,162,000
Divide	$73,992,000	$6,935,000	$80,927,000
Dunn	$31,384,000	$37,328,000	$68,712,000
Eddy	$38,658,000	$8,573,000	$47,231,000
Emmons	$86,729,000	$34,225,000	$120,954,000
Foster	$75,607,000	$19,352,000	$94,959,000
Golden Valley	$26,832,000	$16,270,000	$43,102,000
Grand Forks	$233,477,000	$22,117,000	$255,594,000
Grant	$47,085,000	$32,785,000	$79,870,000
Griggs	$56,624,000	$6,681,000	$63,305,000
Hettinger	$83,684,000	$9,876,000	$93,560,000
Kidder	$46,750,000	$31,707,000	$78,457,000
La Moure	$123,335,000	$30,060,000	$153,395,000
Logan	$39,574,000	$44,967,000	$84,541,000
Mchenry	$90,288,000	$43,672,000	$133,960,000
Mcintosh	$49,985,000	$25,877,000	$75,862,000
Mckenzie	$50,115,000	$28,005,000	$78,120,000
Mclean	$145,847,000	$17,593,000	$163,440,000
Mercer	$24,622,000	$15,446,000	$40,068,000
Morton	$60,803,000	$56,448,000	$117,251,000
Mountrail	$92,746,000	$15,256,000	$108,002,000
Nelson	$77,333,000	$8,036,000	$85,369,000
Oliver	$24,326,000	$29,063,000	$53,389,000

County	Value Of Crops	Market Value Of Livestock, Poultry & Their Products	Market Value Of Ag Products Sold
Pembina	$229,298,000	$6,323,000	$235,621,000
Pierce	$58,702,000	$14,011,000	$72,713,000
Ramsey	$122,100,000	$2,470,000	$124,570,000
Ransom	$72,103,000	$21,255,000	$93,358,000
Renville	$103,034,000	$3,237,000	$106,271,000
Richland	$228,812,000	$32,687,000	$261,499,000
Rolette	$52,837,000	$13,779,000	$66,616,000
Sargent	$104,365,000	$23,376,000	$127,741,000
Sheridan	$43,742,000	$8,746,000	$52,488,000
Sioux	$11,148,000	$21,171,000	$32,319,000
Slope	$31,423,000	$16,222,000	$47,645,000
Stark	$63,674,000	$33,138,000	$96,812,000
Steele	$99,946,000	$2,398,000	$102,344,000
Stutsman	$168,570,000	$29,713,000	$198,283,000
Towner	$96,333,000	$11,139,000	$107,472,000
Traill	$177,193,000	$5,677,000	$182,870,000
Walsh	$218,090,000	$4,444,000	$222,534,000
Ward	$153,487,000	$14,110,000	$167,597,000
Wells	$132,852,000	$11,906,000	$144,758,000
Williams	$115,992,000	$11,341,000	$127,333,000
Total	**$5,038,525,000**	**$1,045,694,000**	**$6,084,219,000**

Source: National Agricultural Statistics Service, 2007 Census of Agriculture

Figure 4.12. 2007 Market Value of Agricultural Products Sold



In 2011, approximately 17,812,260 acres in North Dakota were covered by crop insurance through the USDA Risk Management Agency, covering 89 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.

In 2012, the Gross Domestic Product (GDP) for North Dakota was $31,618,000,000. North Dakota ranked as the fastest-growing state, boosting its GDP by 13.4 percent. This growth is attributed to the oil and gas boom that started in 2005. The per capita personal income and percentage of the population in poverty by county is shown in **Table 4.23**

Table 4.23. North Dakota Per Capita Personal Income and Poverty Statistics

County	Per capita income in the past 12 months (in 2011 inflation-adjusted dollars), 2007-2011	Median household income, 2007-2011	People of all ages in poverty, percent, 2007-2011
Adams	$25,292	$40,236	8.6
Barnes	$28,178	$43,730	10.2
Benson	$16,159	$32,149	36.3
Billings	$35,427	$53,846	8.8
Bottineau	$28,573	$44,399	12.4
Bowman	$28,074	$50,487	7.1
Burke	$34,630	$54,402	8.2
Burleigh	$30,070	$56,231	9.3
Cass	$29,518	$49,429	13.2
Cavalier	$27,129	$49,293	7.7
Dickey	$24,105	$41,776	9
Divide	$29,512	$47,545	10.5
Dunn	$28,816	$52,861	8.7
Eddy	$21,865	$40,096	15.9
Emmons	$22,699	$36,903	14.1
Foster	$34,606	$47,500	7.9
Golden Valley	$26,109	$35,402	11.1
Grand Forks	$25,807	$46,050	16.7
Grant	$28,219	$41,821	12.4
Griggs	$24,838	$43,000	9.7
Hettinger	$24,717	$41,179	10.8
Kidder	$24,765	$37,105	16.1
LaMoure	$28,230	$49,922	8.9
Logan	$24,022	$42,069	11.5
McHenry	$24,398	$41,989	13.2
McIntosh	$23,068	$35,757	13.4
McKenzie	$29,890	$53,902	12
McLean	$27,945	$52,996	9.9
Mercer	$30,387	$62,578	8.7
Morton	$27,347	$55,196	7.4
Mountrail	$28,998	$56,593	14.7
Nelson	$25,757	$41,961	7.9
Oliver	$29,825	$61,131	11.6
Pembina	$27,555	$52,270	7.8
Pierce	$22,011	$40,139	11.9
Ramsey	$26,257	$44,452	11.4
Ransom	$23,546	$47,922	7.9
Renville	$28,704	$50,093	7
Richland	$25,835	$48,908	10.6
Rolette	$14,282	$27,662	36.7
Sargent	$26,258	$52,154	7.1
Sheridan	$25,217	$38,235	17.3

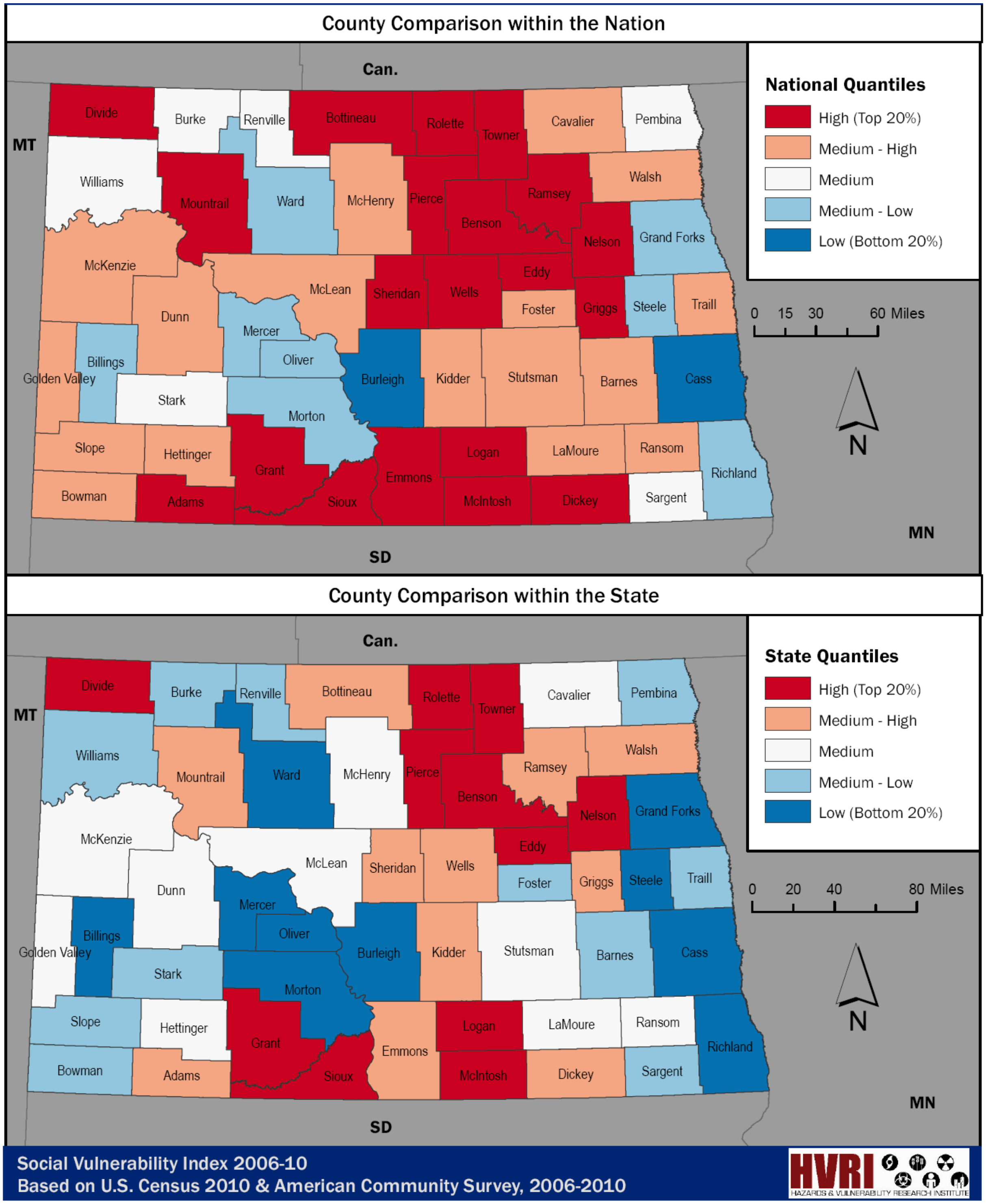
County	Per capita income in the past 12 months (in 2011 inflation-adjusted dollars), 2007-2011	Median household income, 2007-2011	People of all ages in poverty, percent, 2007-2011
Sioux	$13,983	$32,802	42.3
Slope	$28,079	$55,625	5.3
Stark	$26,678	$54,269	9.3
Steele	$30,038	$49,485	3.7
Stutsman	$24,653	$46,317	11.1
Towner	$26,385	$47,703	9.8
Traill	$24,725	$48,341	8.8
Walsh	$25,377	$46,453	10.3
Ward	$26,026	$51,081	10.1
Wells	$26,145	$42,035	10.9
Williams	$31,822	$62,082	8.4
North Dakota	**$27,305**	**$49,415**	**12.3**

Source: US Census Bureau, 2007-2011 5-Year American Community Survey

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 U.S. 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, it synthesizes 42 socioeconomic and built environment variables that research literature suggests contribute to reduction in a community's ability 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 2014 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 **Figure 4.13** 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.

Figure 4.13. Social Vulnerability to Environmental Hazards, North Dakota



Source: Source: Hazards and Vulnerability Research Institute, University of South Carolina, http://webra.cas.sc.edu/hvri/products/sovi2010_img/PDF/NorthDakota_0610.pdf accessed on 7/11/2013

The North Dakota Department of Human Services (NDDHS), Lake Region Human Services Center conducted a survey of individuals residing in their service area (Benson, Cavalier, Eddy, Ramsey, Rolette, and Towner Counties) that called the disaster registration hotline from May 6-19, 2013 to register for assistance as a result of spring flooding.

A summary of responses for Region III Recovery Center registrants follows:

1. How do you rate your degree of loss and grief you are experiencing as a result of your disaster situation?

   Summary: 70% responded in a range between 5 to 10 (moderate to severe)
2. How much disaster related stress or anxiety are you currently experiencing?

   Summary: 90% responded in a range between 5 to 10 (moderate to severe).
3. How much is your health being affected by the disaster stress?

   Summary: 67% responded in a range between 5 to 10 (moderate to severe).
4. To what extent is safe and secure housing a challenge for you now and over the next few months?

   Summary: 51% responded in a range between 5 to 10 (moderate to severe).
5. How much hope do you have that your disaster situation will improve at some point in 2011?

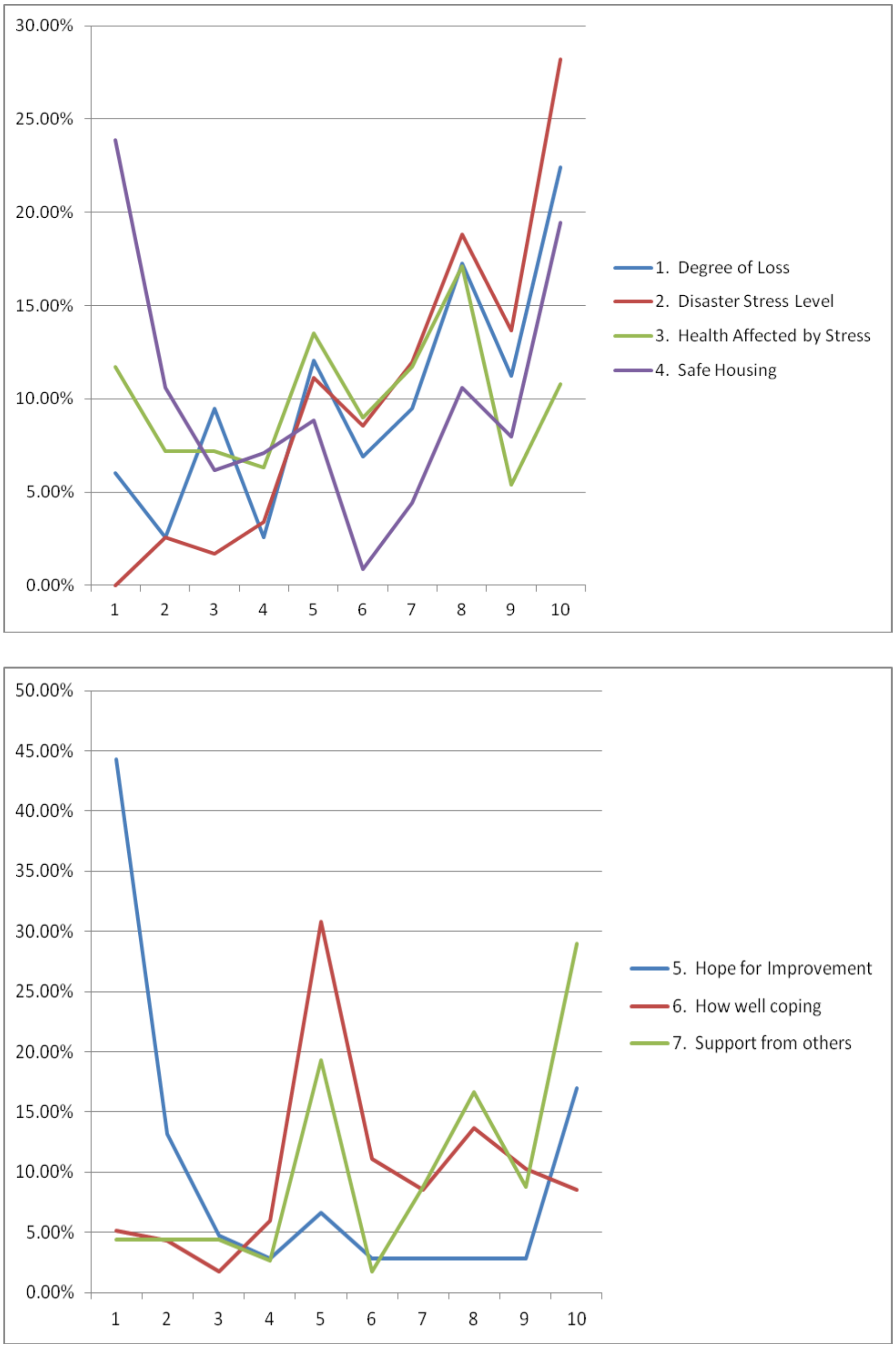
   Summary: 34% responded in a range between 5 to 10; meaning 66% are less hopeful.
6. How well are you presently coping with stress?

   Summary: 83% responded in a range between 5 to 10- a positive sign that so far, coping is intact, except for 17% of responders.
7. How much support do you presently have from family, friends, neighbors, pastors and others?

   Summary: 84% responded in a range between 5 to 10- Support is adequate to strong except for 16% of responders.

The results of select questions from this survey are provided in **Figure 4.14** to further demonstrate the impact that hazards have on society.

Figure 4.14. Lake Region Flood Coping Survey Results, May 2013



Source: North Dakota ND DHS, Lake Services Regions

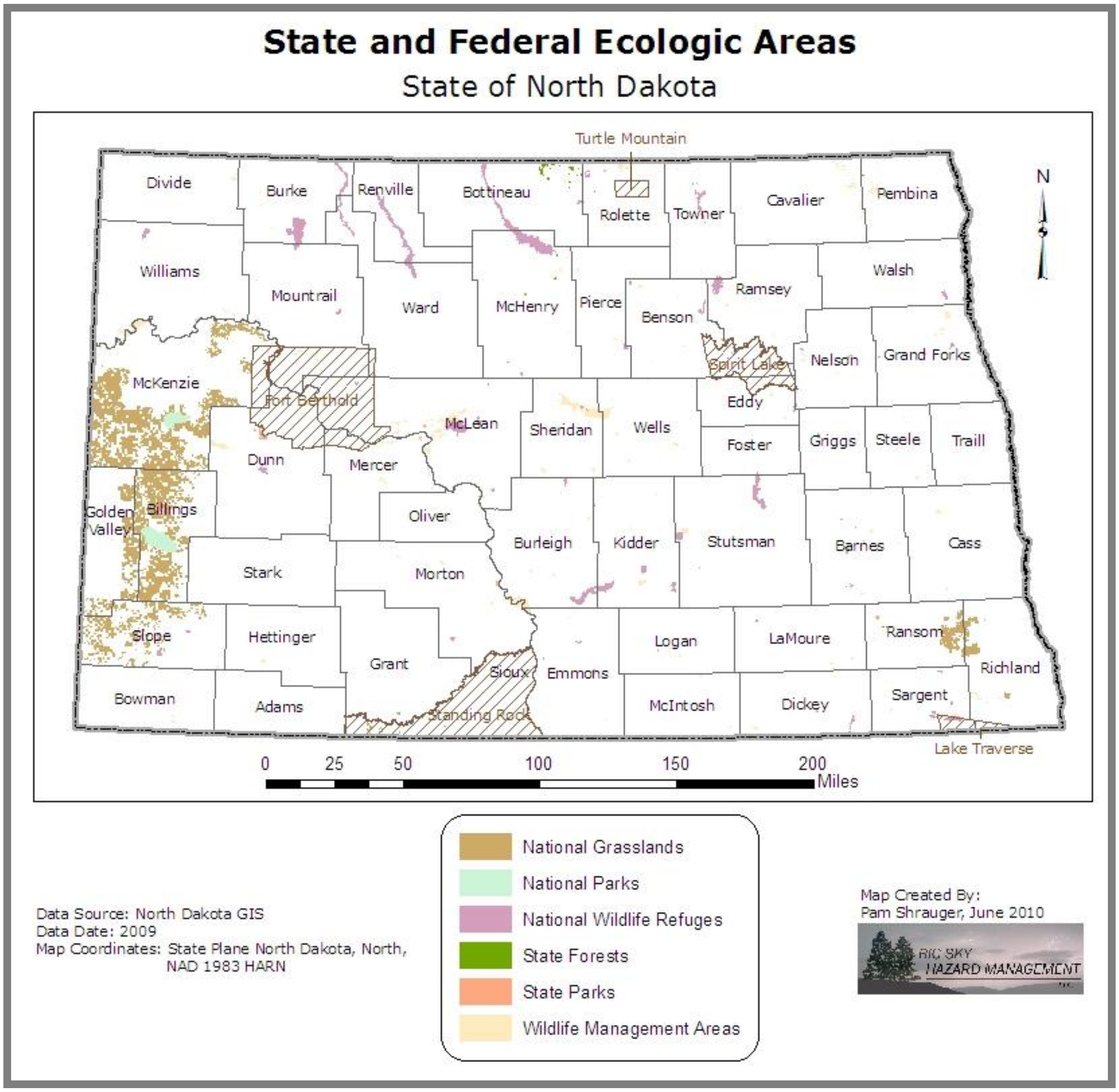
Related to social impacts of disasters is crisis counseling that is provided to those impacted. In the past 10 years, $3,358,384 in federal funds has been received by the State of North Dakota for crisis counseling after Presidential Disaster Declarations.

The ecological, historical, and social values of North Dakota each tie in to the quality of life for residents and visitors. Without these values, lives and property may not be threatened, but the way of life and connections to history and the environment could be disrupted. These values can have deep emotional meaning and investment.

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 February 2012, according to the US Fish and Wildlife, the following Endangered Species have been indentified in North Dakota: Interior Least Tern, Whooping Crane, Black-footed Ferret, Pallid Sturgeon, and the Gray Wolf. Threatened species include the Piping Plover and Western Prairie Fringed Orchid. Candidate species in North Dakota are the Dakota Skipper, Poweshiek Skipperling, Sprague's Pipit, and Greater Sage-Grouse. For a list of Threatened, Endangered, and Candidate species by county, go to http://www.fws.gov/northdakotafieldoffice/SEtable.pdf.

Areas of ecologic significance include Theodore Roosevelt National Park, the Dakota Prairie National Grasslands, 64 National Wildlife Refuges, 11 National Wetland Management Districts, one National Game Preserve, five State Nature Preserves, and five State Forests. **Figure 4.15** shows areas managed by selected federal and state agencies.

Figure 4.15. State and Federal Ecologic Areas in North Dakota



Historic values capture a piece of history and maintain a point in time. Historic values can include sites, buildings, documents, and other pieces that preserve times past and have value to people. **Table 4.24** details the number of federal register listings and landmarks as well as state register listings according to the North Dakota Historical Society as of June 2013.

Table 4.24. County Summaries of Historic Places (Federal and State Listed)

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

County	Federal Register Individual Listings	Federal Register Districts	Resources in the Federal Register Districts	Federal Register Formally Determined Eligible	State Register Listings
Ransom	9	0	N/A		3
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

Source: North Dakota Historical Society, June 2013

The National Register of Historic Places database can be accessed at http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome and provides more detail on specific locations.

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.

4.6. Land Use

Much of the land in North Dakota is devoted to agriculture. About 90 percent 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. Based on the gap analysis conducted by the US Geological Survey in 2004, North Dakota's land can be generally classified as shown in **Table 4.25**. **Figure 4.16** shows the state's land cover and **Figure 4.17** shows the federal and state government land ownership.

Table 4.25. North Dakota Land Cover Summary

General Category	Area
Cropland	34,041 square miles
Prairie	13,777 square miles
Planted Herbaceous Perennials	11,793 square miles
Wetland	6,293 square miles
Shrubland	2,039 square miles
Woodland	1,654 square miles
Barren/Sparse Vegetation	732 square miles
Developed	368 square miles

Source: US Geological Survey, 2004.

Figure 4.16. North Dakota Land Classification

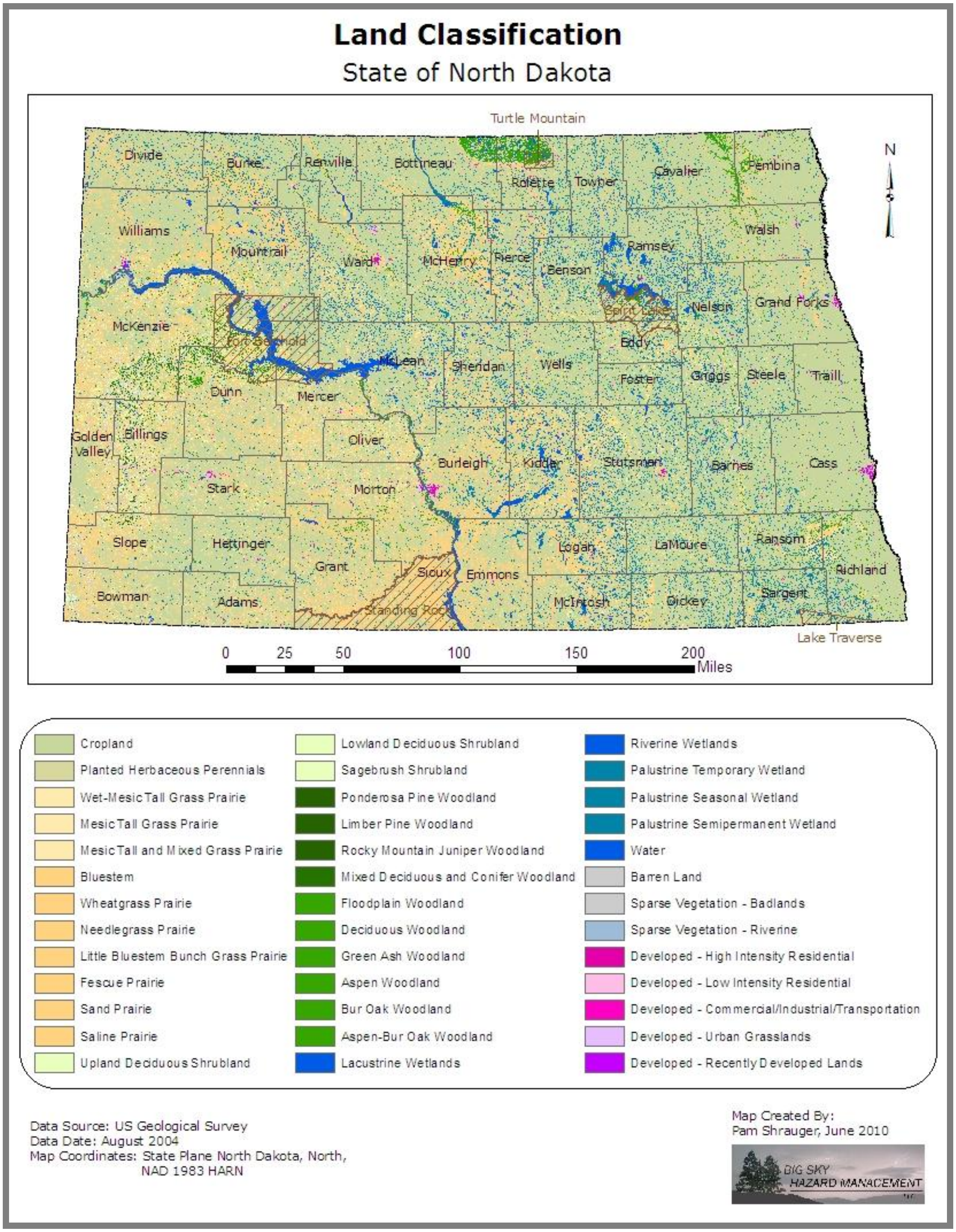
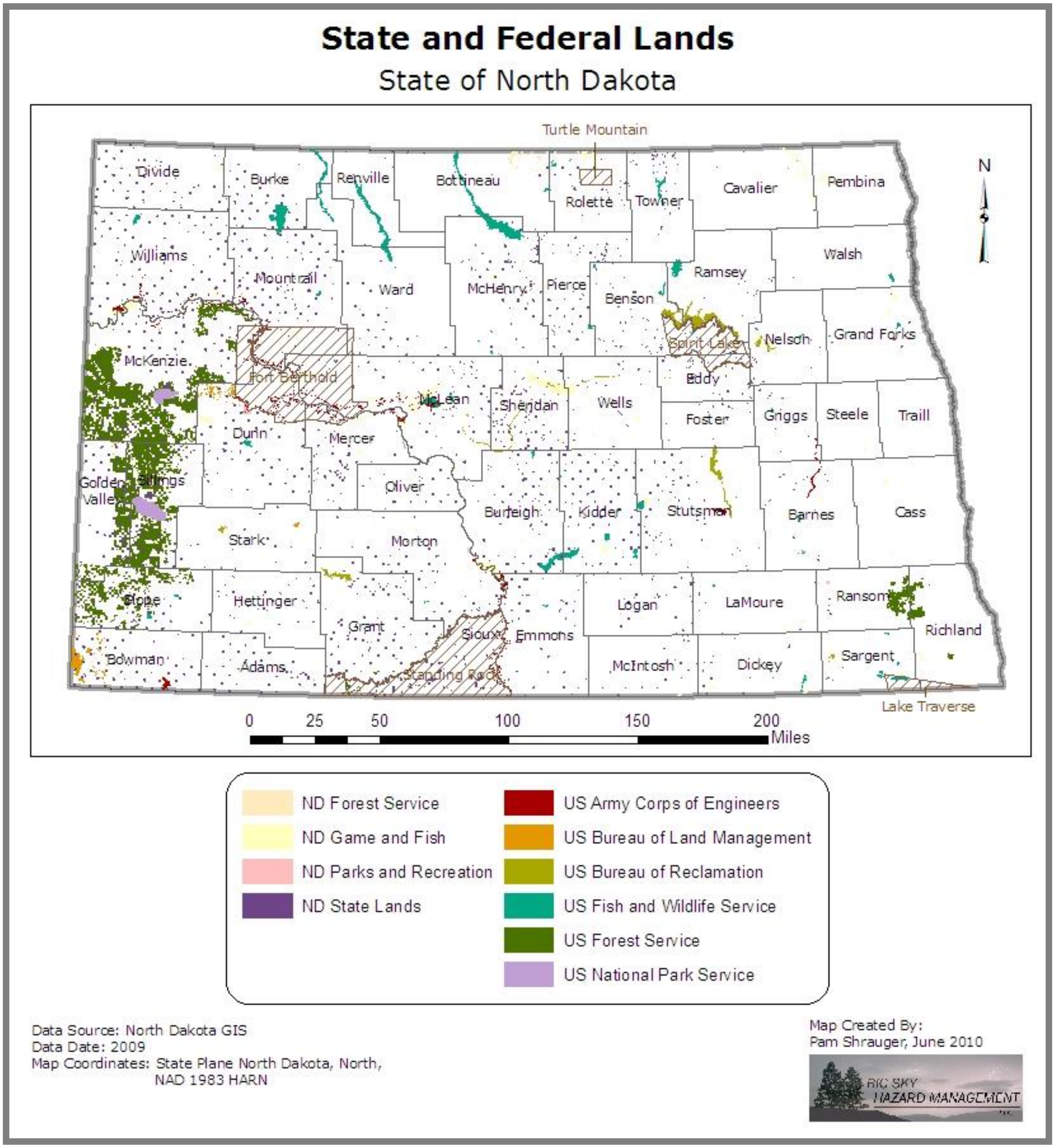


Figure 4.17. North Dakota State and Federal Lands



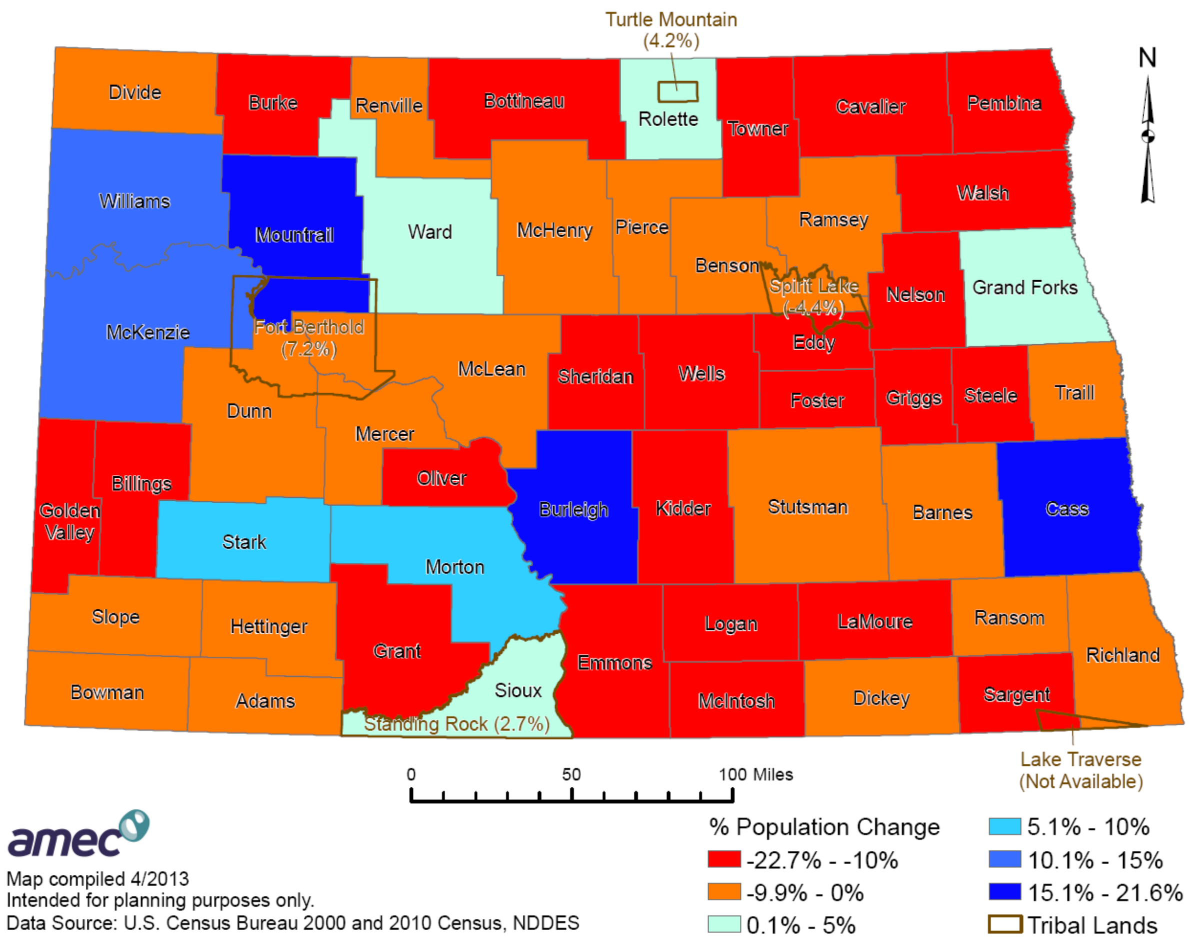
4.7. New Development

This section discusses new development that has occurred in North Dakota. Specific aspects of development discussed in this section include: population, housing units, and economic growth. The final section details specific impacts of the oil and gas industry on new development.

4.7.1. Population Change

Table 4.19 in the population section shows the population change by county from 2000 to 2010 as well as projections to 2025. **Figure 4.18** demonstrates this change geographically. As this demonstrates, the North Dakota population trend is people moving out of the rural areas and into the urban and new energy development areas.

Figure 4.18. Population Change 2000 to 2010



4.7.2. Housing Units

Table 4.26 provides the change in number of total housing units from 2000 to 2010 for counties, reservations, and select cities in North Dakota.

Table 4.26. Changes in Total Number of Housing Units, 2000 to 2010

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Adams County	1,353	1,416	-63	-4%
Barnes County	5,694	5,599	95	2%
Benson County	2,963	2,932	31	1%
Billings County	488	529	-41	-8%
Bottineau County	4,362	4,409	-47	-1%
Bowman County	1,636	1,596	40	3%
Burke County	1,251	1,412	-161	-11%
Burleigh County	34,557	29,003	5,554	19%
Cass County	65,986	53,790	12,196	23%
Cavalier County	2,392	2,725	-333	-12%
Dickey County	2,650	2,656	-6	0%
Divide County	1,408	1,469	-61	-4%
Dunn County	2,117	1,965	152	8%
Eddy County	1,300	1,418	-118	-8%
Emmons County	2,099	2,168	-69	-3%
Fort Berthold Reservation	3,322	2,624	698	27%
Foster County	1,837	1,793	44	2%
Golden Valley County	956	973	-17	-2%
Grand Forks County	29,048	27,373	1,675	6%
Grant County	1,721	1,722	-1	0%
Griggs County	1,463	1,521	-58	-4%
Hettinger County	1,460	1,419	41	3%
Kidder County	1,678	1,610	68	4%
LaMoure County	2,252	2,271	-19	-1%
Logan County	1,075	1,193	-118	-10%
McHenry County	2,963	2,983	-20	-1%
McIntosh County	1,931	1,853	78	4%
McKenzie County	3,019	2,719	300	11%
McLean County	5,528	5,264	264	5%
Mercer County	4,435	4,402	33	1%
Mountrail County	3,949	3,438	511	15%
Nelson County	1,952	2,014	-62	-3%
North Dakota	312,861	289,677	23,184	8%
Oliver County	887	903	-16	-2%
Pembina County	3,896	4,115	-219	-5%
Pierce County	2,177	2,269	-92	-4%
Ramsey County	5,641	5,729	-88	-2%
Ransom County	2,676	2,604	72	3%
Renville County	1,439	1,413	26	2%

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Richland County	7,525	7,575	-50	-1%
Rolette County	5,301	5,027	274	5%
Sargent County	2,017	2,016	1	0%
Sheridan County	919	924	-5	-1%
Sioux County	1,307	1,216	91	7%
Slope County	470	451	19	4%
Spirit Lake Reservation	1,300	1,532	-232	-15%
Standing Rock Reservation	1,307	1,216	91	7%
Stark County	10,528	9,722	806	8%
Steele County	1,196	1,231	-35	-3%
Stutsman County	9,827	9,817	10	0%
Towner County	1,461	1,558	-97	-6%
Traill County	3,759	3,708	51	1%
Turtle Mountain Reservation	2,802	2,636	166	6%
Wahpeton city	3,506	3,489	17	0%
Walsh County	5,540	5,757	-217	-4%
Ward County	26,294	25,097	1,197	5%
Wells County	2,465	2,643	-178	-7%
Williams County	10,184	9,680	504	5%

Source: U.S. Census Bureau and the Center for Social Research at NDSU

Another indicator of growth is the number of building permits issued for privately owned construction. **Table 4.27** shows the estimated number of new privately owned housing units authorized in North Dakota by county in 2012. This information is based on building permit data, so it is important to note that development in areas lacking a building permit system may not be included in these results. With nearly twice as many units as buildings, this data suggests that much of the new residential construction involves multi-family structures.

Table 4.27. New Privately Owned Housing Units and Costs, 2012 Building Permits

County	Buildings	Units	Construction Cost
Adams	0	0	$0
Barnes	21	21	$5,122,900
Benson	0	0	$0
Billings	8	8	$1,077,804
Bottineau	8	11	$1,340,000
Bowman	6	6	$1,026,000
Burke	14	17	$800,700
Burleigh	858	1,389	$208,342,410
Cass	908	1,990	$244,850,264
Cavalier	6	6	$1,385,000
Dickey	0	0	$0
Divide	20	51	$4,635,000
Dunn	46	77	$10,517,000
Eddy	0	0	$0
Emmons	3	3	$590,000
Foster	0	0	$0
Golden Valley	14	14	$2,740,000
Grand Forks	154	439	$55,975,709

County	Buildings	Units	Construction Cost
Grant	0	0	$0
Griggs	0	0	$0
Hettinger	8	8	$879,000
Kidder	0	0	$0
LaMoure	3	10	$1,070,000
Logan	2	4	$720,000
McHenry	17	20	$4,347,800
McIntosh	1	1	$130,000
McKenzie	71	232	$29,794,558
McLean	84	84	$16,772,780
Mercer	49	61	$11,906,849
Morton	373	565	$108,085,713
Mountrail	63	107	$17,246,716
Nelson	4	4	$1,390,000
Oliver	2	2	$425,000
Pembina	1	1	$150,000
Pierce	2	2	$250,000
Ramsey	23	39	$6,354,212
Ransom	4	4	$671,000
Renville	1	2	$250,000
Richland	9	9	$2,140,000
Rolette	2	2	$250,000
Sargent	13	16	$2,633,895
Sheridan	4	4	$324,250
Sioux	0	0	$0
Slope	0	0	$0
Stark	718	1,545	$171,990,616
Steele	3	3	$330,000
Stutsman	18	18	$4,363,530
Towner	0	0	$0
Trail	5	6	$1,350,000
Walsh	6	7	$1,425,000
Ward	717	1,498	$177,065,655
Wells	2	2	$550,000
Williams	541	1,907	$275,140,111
Total	**4,812**	**10,195**	**$1,376,409,472**

Source: US Census Bureau, Annual New Privately-owned Residential Building Permits, http://censtats.census.gov/bldg/bldgprmt.shtml

Table 4.28 shows the number of building permits approved from 2005-2012 by county. Note that development in areas lacking a building permit system may not be included in these results.

Table 4.28. New Privately Owned Residential Building Permits

County	2005	2006	2007	2008	2009	2010	2011	2012	2005-2012
Adams	3	8	6	5	1	2	1	0	26
Barnes	25	21	16	21	10	3	12	21	129
Benson	0	0	1	0	0	1	0	0	2
Billings	1	0	0	1	1	4	10	8	25
Bottineau	4	0	5	2	2	2	5	8	28
Bowman	1	3	6	5	5	4	11	6	41
Burke	3	0	1	2	3	0	8	14	31
Burleigh	516	553	514	450	362	475	401	858	4,129
Cass	1,026	840	809	616	592	558	501	908	5,850

County	2005	2006	2007	2008	2009	2010	2011	2012	2005-2012
Cavalier	1	1	7	3	2	2	2	6	24
Dickey	1	4	2	0	0	0	0	0	7
Divide	0	1	1	0	2	9	37	20	70
Dunn	4	8	5	4	3	0	11	46	81
Eddy	1	0	0	1	2	5	2	0	11
Emmons	1	2	2	2	2	6	5	3	23
Foster	5	1	3	1	6	0	2	0	18
Golden Valley	2	3	1	1	1	2	13	14	37
Grand Forks	226	217	148	108	128	95	102	154	1,178
Grant	0	0	0	1	1	0	0	0	2
Griggs	0	0	0	0	0	1	0	0	1
Hettinger	1	0	0	0	0	0	5	8	14
Kidder	4	3	2	1	0	0	0	0	10
LaMoure	3	2	3	1	4	1	0	3	17
Logan	0	0	1	2	2	1	1	2	9
McHenry	5	8	3	12	13	27	16	17	101
McIntosh	10	1	1	2	0	1	0	1	16
McKenzie	1	8	2	0	20	0	28	71	130
McLean	20	50	42	24	21	31	46	84	318
Mercer	8	7	12	22	22	7	19	49	146
Morton	149	184	219	126	75	90	120	373	1,336
Mountrail	19	13	27	25	47	40	78	63	312
Nelson	2	2	2	0	1	7	6	4	24
Oliver	0	0	1	0	1	1	1	2	6
Pembina	1	1	4	3	0	0	1	1	11
Pierce	3	4	1	1	2	0	3	2	16
Ramsey	4	3	6	6	6	11	23	23	82
Ransom	5	2	3	0	0	4	4	4	22
Renville	2	1	1	1	1	0	6	1	13
Richland	36	48	41	20	16	16	23	9	209
Rolette	0	0	0	0	3	2	1	2	8
Sargent	15	14	7	9	4	0	3	13	65
Sheridan	1	7	3	1	4	2	3	4	25
Sioux	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0
Stark	79	89	94	103	92	175	197	718	1,547
Steele	7	1	7	1	3	2	0	3	24
Stutsman	31	38	28	33	26	19	16	18	209
Towner	0	0	0	0	0	0	0	0	0
Traill	20	18	13	7	7	1	4	5	75
Walsh	6	8	9	5	4	10	4	6	52
Ward	188	165	142	195	208	245	571	717	2,431
Wells	1	1	3	0	2	2	2	2	13
Williams	53	78	69	137	81	239	571	541	1,769
Total	**2,494**	**2,418**	**2,273**	**1,960**	**1,788**	**2,103**	**2,875**	**4,812**	**20,723**

Source: US Census Bureau; Note: Only areas with building permit systems are included. Totals reflect reported permits only; Additional new construction may be occurring in areas lacking building permit regulations

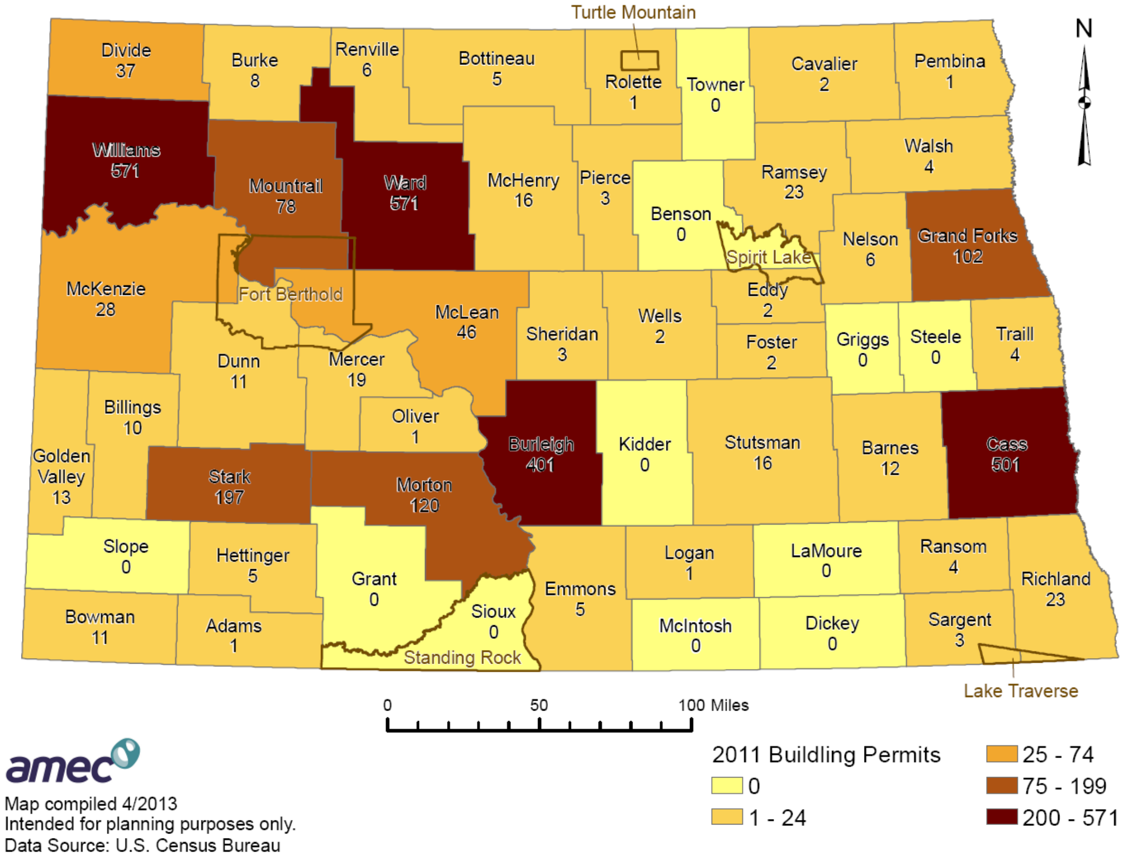
Table 4.29 shows those counties with a total of 50 or more building permits issued in this 8-year period.

Table 4.29. Counties With 50 or More Building Permits Issued 2005-2012

County	2005	2006	2007	2008	2009	2010	2011	2012	2005-2012
Cass	1,026	840	809	616	592	558	501	908	5,850
Burleigh	516	553	514	450	362	475	401	858	4,129
Ward	188	165	142	195	208	245	571	717	2,431
Williams	53	78	69	137	81	239	571	541	1,769
Stark	79	89	94	103	92	175	197	718	1,547
Morton	149	184	219	126	75	90	120	373	1,336
Grand Forks	226	217	148	108	128	95	102	154	1,178
McLean	20	50	42	24	21	31	46	84	318
Mountrail	19	13	27	25	47	40	78	63	312
Richland	36	48	41	20	16	16	23	9	209
Stutsman	31	38	28	33	26	19	16	18	209
Mercer	8	7	12	22	22	7	19	49	146
McKenzie	1	8	2	0	20	0	28	71	130
Barnes	25	21	16	21	10	3	12	21	129
McHenry	5	8	3	12	13	27	16	17	101
Ramsey	4	3	6	6	6	11	23	23	82
Dunn	4	8	5	4	3	0	11	46	81
Traill	20	18	13	7	7	1	4	5	75
Divide	0	1	1	0	2	9	37	20	70
Sargent	15	14	7	9	4	0	3	13	65
Walsh	6	8	9	5	4	10	4	6	52

Source: US Census Bureau; Note: Only areas with building permit systems are included. Totals reflect reported permits only; Additional new construction may be occurring in areas lacking building permit regulations

Figure 4.19. New Residential Construction Building Permits, 2011



4.7.3. Economic Growth

Despite the national economic slowdown in recent years, many North Dakota businesses and industries have been expanding. **Table 4.30** highlights a few of the larger startups and expansions in the state over the past 6.5 years. The data is sorted by county to show those counties with the most economic activity. The data for was primarily collected through reports generated by the North Dakota Department of Commerce.

Table 4.30. Examples of Business Growth Announcements 2007-July 2013

City	County	Year	Cost	Description
Hettinger	Adams	2007	$171 million	New ethanol plant
Oriska	Barnes	2009	$248 million	Wind farm expansion
Valley City	Barnes	2008	Not Reported	Wind farm start up
Valley City	Barnes	2012	$20 million	
Maddock	Benson	2012	$4 million	Farm Machinery and Equipment Manufacturing
Bottineau	Bottineau	2008	$2.7 million	Agriculture storage bin expansion
Gascoyne	Bowman	2008	Not Reported	Wind farm start up
Rhame	Bowman	2008	$48.75 million	Wind farm expansion
Scranton	Bowman	2008	Not Reported	Wind farm expansion
Bismarck	Burleigh	2012	$10 million	Construction Machinery Manufacturing
Bismarck	Burleigh	2013	$64 million	Basin Electric Power Cooperative Lonesome Creek Station
Bismarck	Burleigh	2013	$20 million	Facility addition transforming from warehouse to research-and-development site.
Regan	Burleigh	2009	Not Reported	Wind farm expansion
Wilton	Burleigh	2009	$88 million	Wind farm expansion
Casselton	Cass	2007	$240 million	New ethanol plant
Casselton	Cass	2011	$1 million	Construction Machinery Manufacturing
Fargo	Cass	2007	$3 million	New meat processing plant
Fargo	Cass	2007	$35 million	Software publisher expansion
Fargo	Cass	2008	$18 million	Farm and construction machinery manufacturing expansion
Fargo	Cass	2009	$1.7 million	Canvas and related product mills expansion
Fargo	Cass	2009	$10 million	Drug wholesaler expansion
Fargo	Cass	2009	$15 million	Metal services and steel manufacturing expansion
Fargo	Cass	2009	$3 million	New building for computer systems design services company
Fargo	Cass	2009	$1.7 million	Packaging and labeling services project expansion
Fargo	Cass	2009	$1.5 million	Packaging machinery manufacturing expansion
Fargo	Cass	2011	Not reported	Third party administration of insurance and pension funds
Fargo	Cass	2011	$200 thousand	custom computer programming services
Fargo	Cass	2011	$22 million	other electronic component manufacturing; engineering services
Fargo	Cass	2012	$3 million	Farm Machinery and Equipment Manufacturing; Construction Machinery Manufacturing
Fargo	Cass	2012	$22 million	Electronic component manufacturing; engineering services
Fargo	Cass	2013	$3.5 million	New facility to manufacture high-density plastic pipe products for use in water management
Kindred	Cass	2008	$200 million	Soybean crushing and biodiesel plant start up
Mapleton	Cass	2012	$12 million	Manufacturing plant

City	County	Year	Cost	Description
West Fargo	Cass	2008	$20 million	Metal manufacturing expansion
West Fargo	Cass	2011	$50 million	Other motor vehicle parts manufacturing
West Fargo	Cass	2011	$50 million	soybean and other oilseed processing
Nekoma	Cavalier	2008	$73 million	Wind farm expansion
Ellendale	Dickey	2008	$310 million	Wind farm expansion
Forbes	Dickey	2008	$381 million	Wind farm start up
Monango	Dickey	2008	$400 million	Wind farm start up
Oakes	Dickey	2011	Not Reported	Machine shops
Linton	Emmons	2011	Not R	Telemarketing
Grand Forks	Grand Forks	2008	$4 million	Concrete panel finishing facility expansion
Grand Forks	Grand Forks	2009	$1.5 million	Two new silos for dry pasta manufacturing
Grand Forks	Grand Forks	2011	$2.14 million	Electronic shopping
Grand Forks	Grand Forks	2012	$1.76 million	Machine assembly
Wishek	McIntosh	2007	$1 million	Farm machinery and equipment manufacturing expansion
Wishek	McIntosh	2008	Not Reported	Wind farm start up
Watford City	McKenzie	2010	$350 million	Natural gas processing plant expansion
Watford City	McKenzie	2012	$345 million	Natural gas processing
Underwood	McLean	2007	$20 million	New coal drying plant
Mandan	Morton	2009	$2 million	Computer services expansion
Mandan	Morton	2011	Not Reported	Brewery
Mandan	Morton	2011	$35 million	Expansion of exsitng petroleum refinery
Mandan	Morton	2012	$35 million	Petroleum refineries; crude petroleum and natural gas extraction
New Salem	Morton	2008	$2 billion	Wind farm expansion
Stanley	Mountrail	2008	Not Reported	Wind farm start up
Lakota	Nelson	2007	$171 million	New ethanol plant
Center	Oliver	2009	$180 million	Wind farm expansion
Hankinson	Richland	2011	Not reported	Lollilop manufacturing
Wahpeton	Richland	2008	$3 million	Rubber and plastics manufacturing expansion
Wahpeton	Richland	2009	$4.2 million	Roasted nuts and peanut butter manufacturing expansion
Wahpeton	Richland	2011	$2 million	Roasted nuts and peanut butter manufacturing expansion
Wahpeton	Richland	2011	$1 million	rubber and plastics hoses and belting manufacturing
Wahpeton	Richland	2011	$3 million	Farm machinery and equipment manufacturing
Wahpeton	Richland	2012	$5 million	Plastics product manufacturing; metal crown, closure, and other metal stamping (except automotive); miscellaneous fabricated metal product manufacturing
Wahpeton	Richland	2012	$70 million	Beet sugar manufacturing; miscellaneous food manufacturing
Dickinson	Stark	2012	$3.6 million	Heating Equipment (except Warm Air Furnaces) Manufacturing
Dickinson	Stark	2013	$300 million	New diesel refinery that is able to produce up to 20,000 barrels of diesel daily. Estimated completion date 2014.
Luverne	Steele	2009	$110 million	Wind farm expansion
Jamestown	Stutsman	2007	$1.8 million	Aircraft parts and equipment manufacturing expansion
Jamestown	Stutsman	2007	$1.785 million	Farm machinery and equipment manufacturing expansion
Jamestown	Stutsman	2007	$300 million	New power plant
Forest River	Walsh	2007	$12.5 million	New pig farrowing operation
Grafton	Walsh	2008	$10 million	Window and door manufacturing expansion

City	County	Year	Cost	Description
Berthold	Ward	2008	Not Reported	Wind farm start up
Donnybrook	Ward	2008	Not Reported	Wind farm expansion
Douglas	Ward	2008	$250 million	Wind farm expansion
Kenmare	Ward	2008	Not Reported	Wind farm start up
Makoti	Ward	2012	$450 million	New refinery that will refine 20,000 barrels a day of North Dakota crude oil into propane and diesel fuel.
Minot	Ward	2007	$14.55 million	Computer programming services expansion
Minot	Ward	2008	$5 million	Grain and bean storage facility expansion
Minot	Ward	2008	$240 million	Wind farm expansion
Minot	Ward	2009	$9.74 million	Wind farm expansion
Minot	Ward	2011	$12 million	Trading
Harvey	Wells	2008	Not Reported	Flour milling expansion
Harvey	Wells	2009	$11 million	Flour milling expansion
Williston	Williams	2009	$2.6 million	Pea and lentil processing warehouse expansion
Williston	Williams	2009	$7.5 million	Pea and lentil processing plant start up
N/A	Williams	2011	$282 million	Natural gas processing facility able to process 100 million cubic feet of NG per day
N/A		2008	Not Reported	New crude oil pipeline from Alberta, Canada to the Midwest through 218 miles of eastern North Dakota

Source: North Dakota Department of Commerce, 2013, http://www.business.nd.gov/searchcenter/expansion/ accessed on 7/12/2013

4.7.4. Specific Impacts of Oil and Gas Industry on New Development

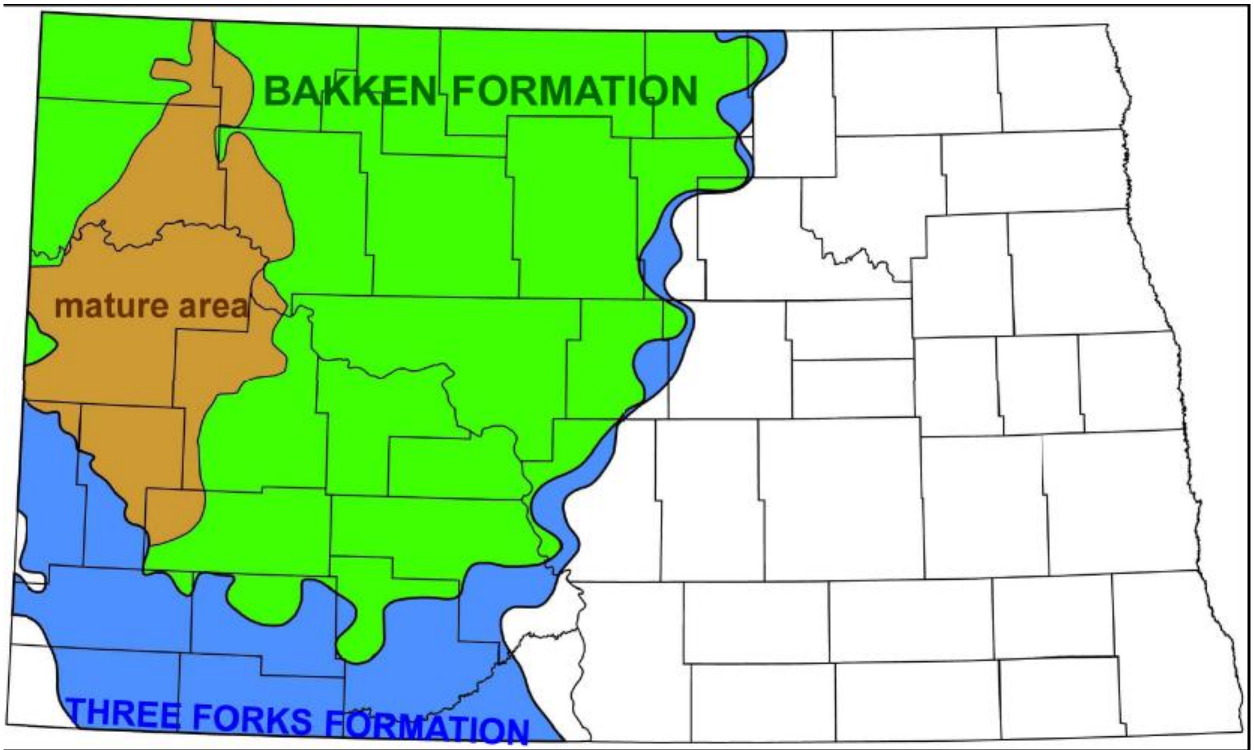
Note: Much of this information is also included in the Hazardous Materials Incident Hazard Profile.

The expansion of the oil and gas industry in North Dakota has been termed by some as the "North Dakota Miracle". While there are many positive impacts of this growth, concerns related to development have been amplified due to the rapid nature of the development. This section provides a discussion of some of the specific impacts of the expanding oil and gas industry on new development in North Dakota.

In North Dakota and 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. North Dakota is now the second largest producer of oil in America, second only to Texas.

Figure 4.20 shows the Bakken Formation and Three Forks Formation in North Dakota with the mature area of oil drilling.

Figure 4.20. Map of North Dakota with Estimated Mature Area of the Bakken Formation



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

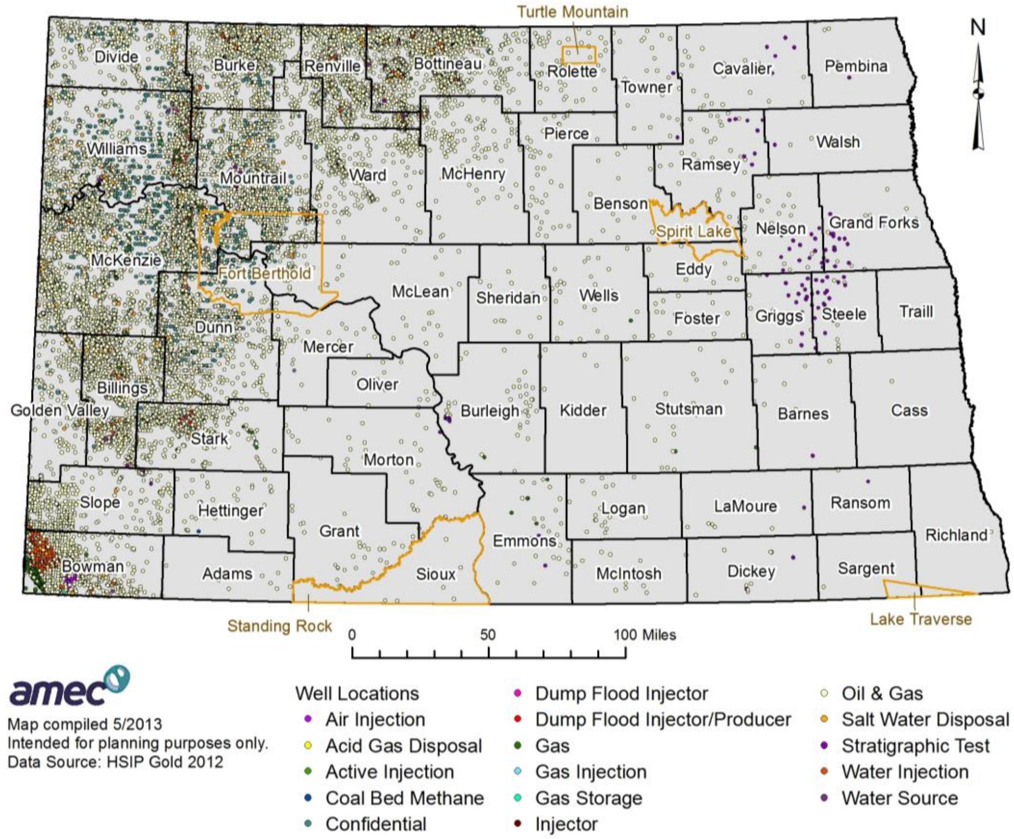
The industry began to take off when developers created the horizontal drilling and hydraulic fracturing process. Oil developers looked for known reserves that were difficult to reach and they decided to try North Dakota's Bakken. In 2005, the first major well was horizontally drilled and fracked in the State and the boom was on. The numbers of drill rigs and oil production continues to increase every year. As of 2012, North Dakota had 21,018 oil producing wells according to the Homeland Security Infrastructure Protection (HSIP) Gold data and 189 active drilling rigs.

2012 was a big year for North Dakota oil production. A record 749,000 barrels a day flowed in October from close to 7,800 wells. This is a fourfold increase in five years. In July, the State jumped ahead of California to become the second-largest oil producing state in the country behind Texas. Within the Bakken and Three Forks areas, U.S. Energy Information Administration (EIA) officials said they estimate 1.19 million barrels per day by December 2014.

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 now is being 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.

Figure 4.21 shows the locations of the oil and natural gas wells on a statewide map. Projections estimate an oil well on every section within the oil fields served by the Bakken and Three Forks Formations over the next six years.

Figure 4.21. Oil and Natural Gas Wells



In the Williston Basin as of March 2013, the North Dakota Pipeline Authority estimated the following percentages of oil by transport type being transported from the well heads:

- Rail – 71 percent
- Pipeline export – 20 percent
- Tesoro refinery – 8 percent
- Truck to Canadian Pipelines – 1 percent

Economic Growth

In 2012, the Gross Domestic Product (GDP) for North Dakota was $31,618,000,000. North Dakota ranked as the fastest-growing state, boosting its GDP by 13.4 percent. This growth is attributed to the oil and gas boom that started in 2005.

North Dakota also has the lowest unemployment in the United States, boasting a surplus of jobs due to the oil and gas industry. The North Dakota Department of Mineral Resources, Oil and Gas Division maintains a list of Bonded Operators in the State. As of March 2013, this list has about 330 operators in the State and the list is growing.

Tax revenues increased over $850 million in 2012 alone. The Office of State Tax Commissioner reports the following major tax increases that were a direct result of the increase in the gross value of oil production:

- Oil Extraction Tax, $419 million
- Gross Production Tax, $344 million
- Sales Tax, $75 million
- Individual Income Tax, $22 million

Two new refineries are being built in North Dakota, slated to come online in 2014. Currently there is only one refinery that simply cannot keep up with the need to refine the oil being extracted.

Housing Needs

The increase in population has resulted in housing shortages. The oil companies have constructed Main Camps to supply some housing for workers. Main Camps are located near frontage roads with high access and water supplies. There is currently a moratorium on expansion of these camps. There are also 'camper clusters' which consist of Recreational Vehicles parked very close together. New housing construction is occurring quickly. But, because of inflated prices, not all residents can afford to purchase homes. Property values have increased 40 percent since the oil and gas boom began in 2005. Rental housing has also become inflated due to the demand. Locals that are on fixed incomes are having difficulty affording the inflated prices.

The *2012 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 at: http://www.ndhfa.org/Web_Images/NDSHNA_HousingForecast_Final.pdf.

Impact on 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.

The North Dakota Department of Transportation has projects underway to expand capacity in oil boom jurisdictions. The following are some of the larger projects underway:

- US 85 – four lane between Watford City and Williston
- Truck bypasses/reliever routes – Williston, Alexander, Watford City, Dickinson, New Town
- US 2 west of Williston
- ND 23 east of ND 37
- ND 22 north of Killdeer
- US 85 near Belfield
- ND 8 south of Bowbells

Impact on Emergency Services

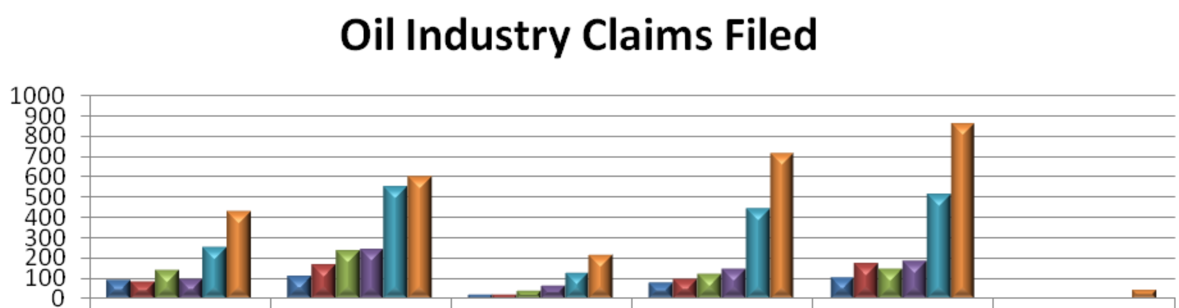
The rapid population growth and more dangerous work conditions have Emergency Medical Services and hospitals scrambling to keep up in the North Dakota oil patch. According to the North Dakota health Department, from 2006 to 2011, ambulance calls rose a staggering 59 percent. Compounding the strain, the bad debt for hospitals is rising as many patients are not insured or are underinsured. The 12 medical facilities in western North Dakota saw their combined debt rise by 46 percent over the course of the 2011 and 2012 fiscal years, according to the State's Rural Health Association (New York Times, January 27, 2013, http://www.nytimes.com/2013/01/28/us/boom-in-north-dakota-weighs-heavily-on-health-care.html?hp&_r=2&). Other first responders such as fire and police are also playing catch-up to match capabilities with the increasing needs.

Workforce Safety and Insurance Claims

Although many of the impacts of the oil and gas industry boom are positive, there are some negative aspects as well. The oil and natural gas drilling work is dangerous and fast-paced. Often, workers work long hours. The weather conditions are brutal in the winter with strong winds, snow and freezing temperatures. According to the North Dakota Workforce Insurance and Safety Department, over 80 percent of the injuries occur to employees who are in their first year on the job.

Figure 4.22 shows historical North Dakota Workforce Safety and Insurance Claims Filed from Oil Industry workers from fiscal year 2007-2012. It is separated by workforce area rate class and the drastic increases in insurance claims filed from fiscal year 2007 to 2012 in all oil workforce areas.

Figure 4.22. Oil Industry Workforce Safety and Insurance Claims Files, Fiscal Year 2007-2012



	1320	6203	6204	6205	6206	6208
FY07	91	111	23	75	104	6
FY08	81	164	23	94	170	7
FY09	140	235	42	123	145	5
FY10	97	243	63	149	185	10
FY11	251	548	127	445	515	12
FY12	431	601	216	713	858	47

Source: North Dakota Workforce Safety and Insurance

Note:

1320 *= Oil Or Gas Operations - Completed Well*

6203 *= Oil & Gas Development-Drilling*

6204 *= Oil & Gas Well Supply or Equipment Dealers*

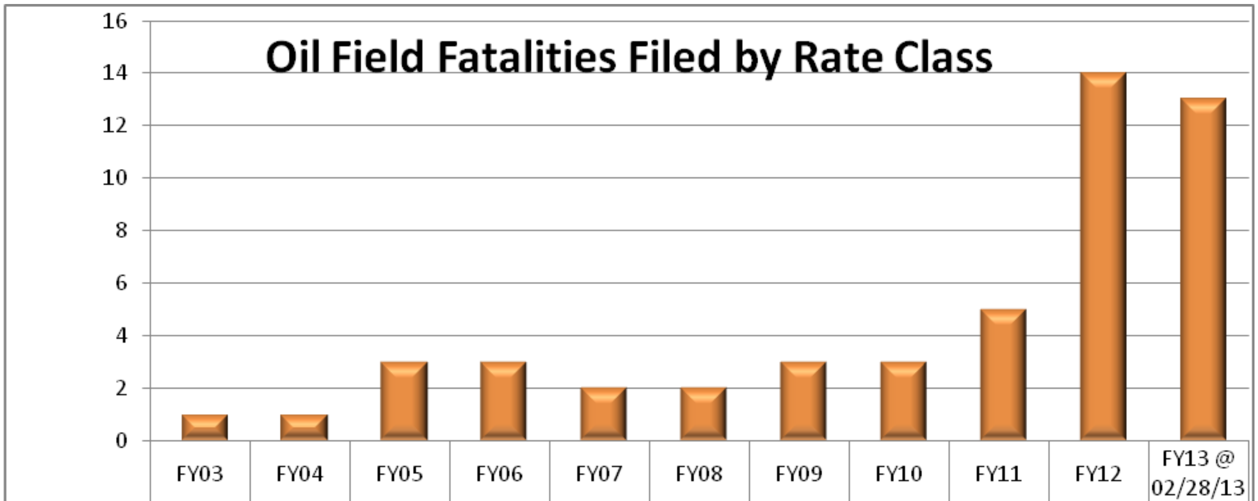
6205 *= Oil Well Trucking*

6206 *= Oil Well Servicing*

6208 *= Oil & Gas Instrument Logging*

Figure 4.23 shows the number of oil field fatalities files by Rate Class. A description of the rate classes are in the note section below. In fiscal year 2012, there were a record number of 14 fatalities. In fiscal year 2013, there are already 13 fatalities as of February 28, 2013.

Figure 4.23. Number of Oil Field Fatalities Filed by Rate Class, Fiscal Year 2003 - partial 2013.



	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13 @ 02/28/13
1320	0	0	1	0	0	1	1	0	0	2	3
6203	0	1	0	3	1	1	1	1	3	3	1
6204	0	0	0	0	0	0	0	0	0	2	1
6205	0	0	2	0	1	0	1	1	1	4	2
6206	1	0	0	0	0	0	0	1	1	3	6
Total Filed	1	1	3	3	2	2	3	3	5	14	13

Source: North Dakota Workforce Safety and Insurance

Note:

1320 = Oil Or Gas Operations - Completed Well

6203 = Oil & Gas Development-Drilling

6204 = Oil & Gas Well Supply or Equipment Dealers

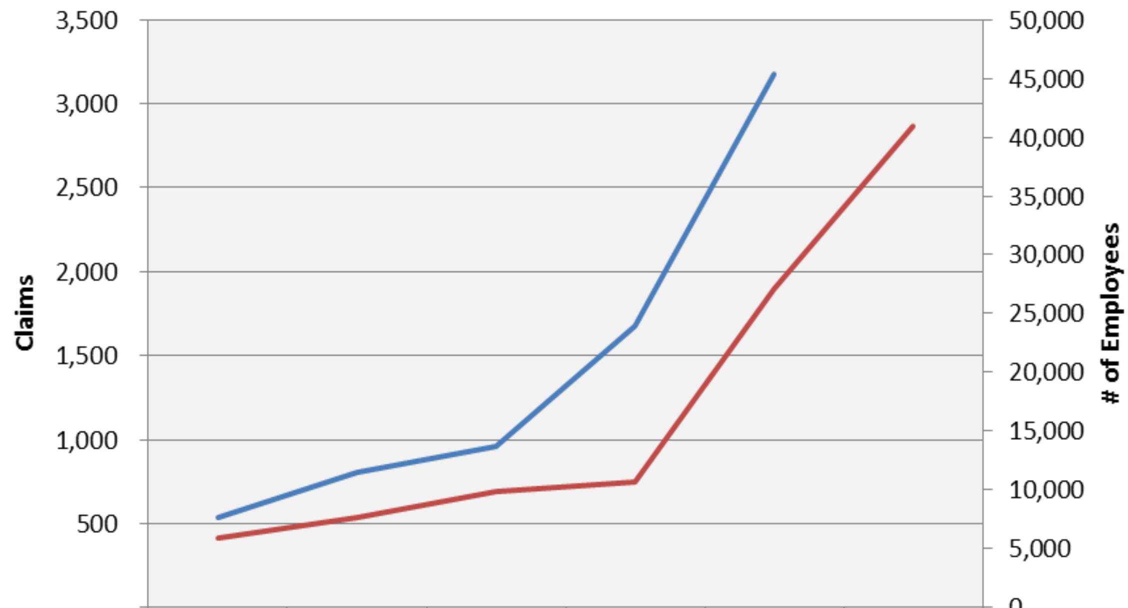
6205 = Oil Well Trucking

6206 = Oil Well Servicing

6208 = Oil & Gas Instrument Logging

Figure 4.24 shows historical North Dakota Workforce Safety and Insurance Claims Filed from Oil Industry workers from fiscal year 2006 – 2012. It shows the drastic increase of the insurance claims and the number of workers involved. By 2011/2012, there were over 2,866 claims from the oil industry.

Figure 4.24. Petroleum Reported Employees/Claims



	06/07	07/08	08/09	09/10	10/11	11/12
Claims	410	539	690	747	1,898	2,866
# of Emp	7,692	11,534	13,759	23,921	45,327	

Source: North Dakota Workforce Safety and Insurance
Note: Blue line represents the claims and the Red line represents the number of employees.

Mediation of Energy Disputes

The booming oil and gas industry has resulted in expanded roles and responsibilities within state government. The North Dakota Mediation Service (NDMS) is a division of the North Dakota Department of Agriculture working under the United States Department of Agriculture (USDA) mediation statutes, North Dakota Statutes, and administrative rules. In 1984 North Dakota began the mediation program in response to the farm credit crisis present at that time. In 2011, in response to the growing energy climate in North Dakota, the North Dakota legislature expanded the program to include mediation of energy disputes. NDMS now services a variety of disputes related to energy and agriculture.

Hazard Specific Impacts

The hazard profile chapter that follows provides specific existing or potential impacts related to the oil and gas industry expansion. A few of the more notable impacts are bulleted below. See, the detailed hazard profiles in Chapter 5 for a more detailed discussion.

- Increased need for fresh water supply—this can become a concern during drought conditions
- Development issues in dam inundation areas, floodplains, wildland fire risk areas, etc.

- Williston(Williams Co.) is in inundation area of Ft. Peck Dam
- Hazardous Materials incidents increased
- Infrastructure Failure is a heightened concern do to overloaded infrastructure such as wastewater systems
- Floodplains and landslide hazards exist in boom counties
- Transportation Accidents Increased—volume of traffic on roads
- Wildland Fire Risk is greatest in western ND
- Many communities in boom areas do not have building codes
- Some hazards impede oil production
  - Winter Storm
  - Windstorm

4.8. Future Development

The way in which new development across the state 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 generally continue to see a decrease but most 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. The North Dakota population projected for 2025 is 841,820 people, up 25.20 percent from the 2010 census. **Table 4.31** shows those counties expected to grow from 2010 to 2025.

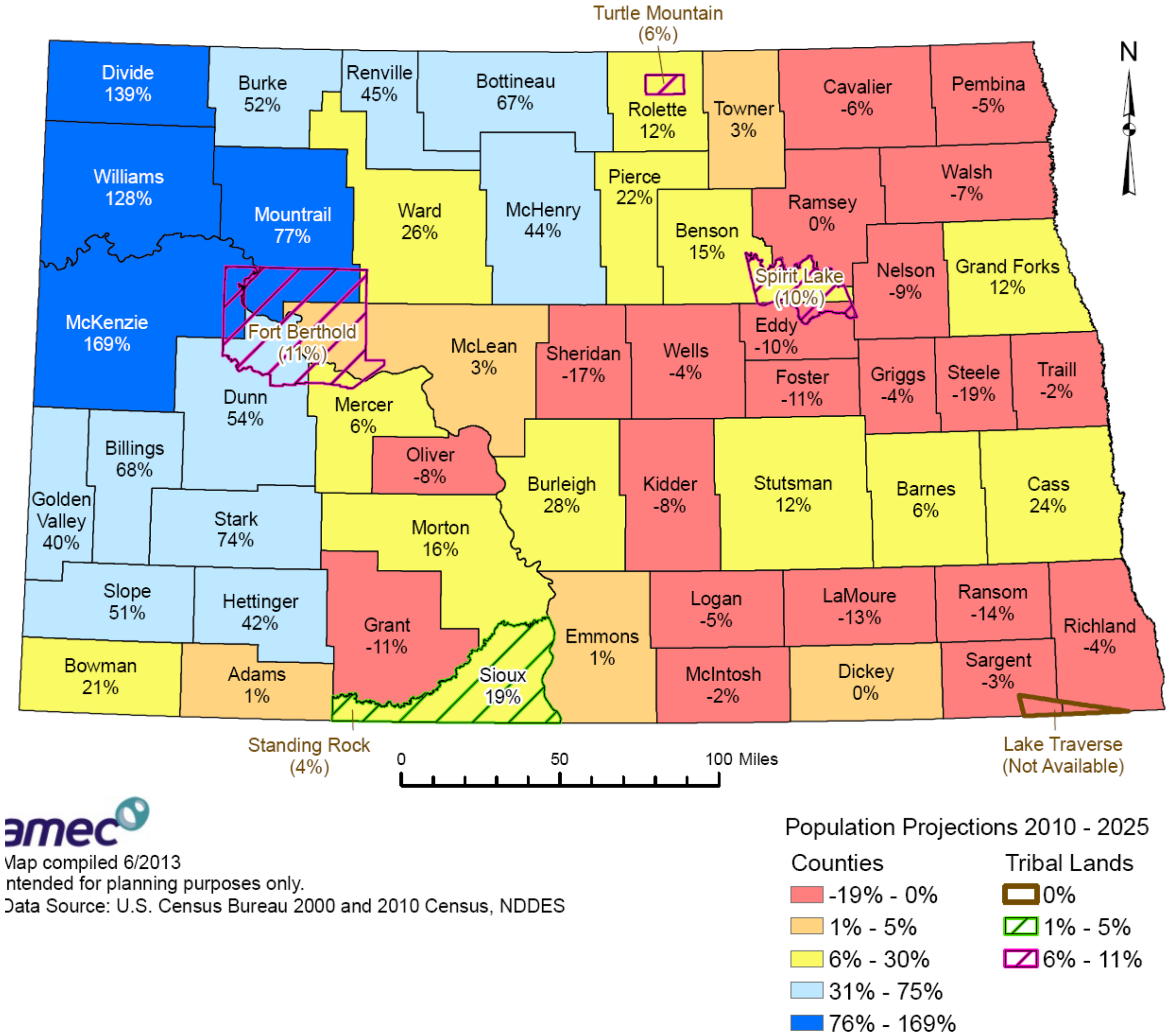
Table 4.31. North Dakota Counties and Reservations Expected to Experience Population Growth from 2010 to 2025

County/Reservation	2010	2025	% change: 2010 to 2025
McKenzie County	6,360	17,110	169.00%
Divide County	2,071	4,948	138.90%
Williams County	22,398	51,106	128.20%
Mountrail County	7,673	13,575	76.90%
Stark County	24,199	42,191	74.40%
Billings County	783	1,315	67.90%
Bottineau County	6,429	10,721	66.80%
Dunn County	3,536	5,433	53.60%
Burke County	1,968	2,989	51.90%
Slope County	727	1,095	50.60%
Renville County	2,470	3,589	45.30%
McHenry County	5,395	7,784	44.30%
Hettinger County	2,477	3,506	41.50%
Golden Valley County	1,680	2,354	40.10%
Burleigh County	81,308	104,154	28.10%
Ward County	61,675	77,490	25.60%
North Dakota	672,591	841,820	25.20%
Cass County	149,778	185,071	23.60%
Pierce County	4,357	5,295	21.50%
Bowman County	3,151	3,804	20.70%

County/Reservation	2010	2025	% change: 2010 to 2025
Sioux County	4,153	4,937	18.90%
Morton County	27,471	31,976	16.40%
Benson County	6,660	7,686	15.40%
Rolette County	13,937	15,651	12.30%
Grand Forks County	66,861	74,894	12.00%
Stutsman County	21,100	23,598	11.80%
Fort Berthold Reservation	6,341	7,026	10.80%
Spirit Lake Reservation	4,238	4,646	9.60%
Turtle Mountain Reservation	8,656	9,201	6.30%
Barnes County	11,066	11,743	6.10%
Mercer County	8,424	8,927	6.00%
Standing Rock Reservation	4,153	4,321	4.00%
McLean County	8,962	9,237	3.10%
Towner County	2,246	2,315	3.10%
Emmons County	3,550	3,593	1.20%
Adams County	2,343	2,360	0.70%
Dickey County	5,289	5,296	0.10%

Sources: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Figure 4.25. North Dakota Expected Population Growth 2010 to 2025



Mechanisms currently in place in North Dakota to manage growth and new development include building codes, zoning, floodplain ordinances, master plans, and subdivision regulations. All of these mechanisms are at the local and tribal government discretion to adopt and enforce. North Dakota has a state building code, but it is still up to the communities to choose to adopt and enforce the codes. As of August 2013, there were 111 cities and 9 counties in North Dakota that had adopted the state building code. **Table 4.32** shows the communities that have adopted the state building code and **Figure 4.26** that follows portrays this information on a statewide map. A significant limitation of this program is that communities may adopt the state building code but not enforce it. Therefore, simply adopting the code does not guarantee that new development and remodels meet current codes. **Table 4.33** shows those communities that have a recognized flood hazard but do not have floodplain ordinances.

Table 4.32. Cities and Counties that Have Adopted State Building Code

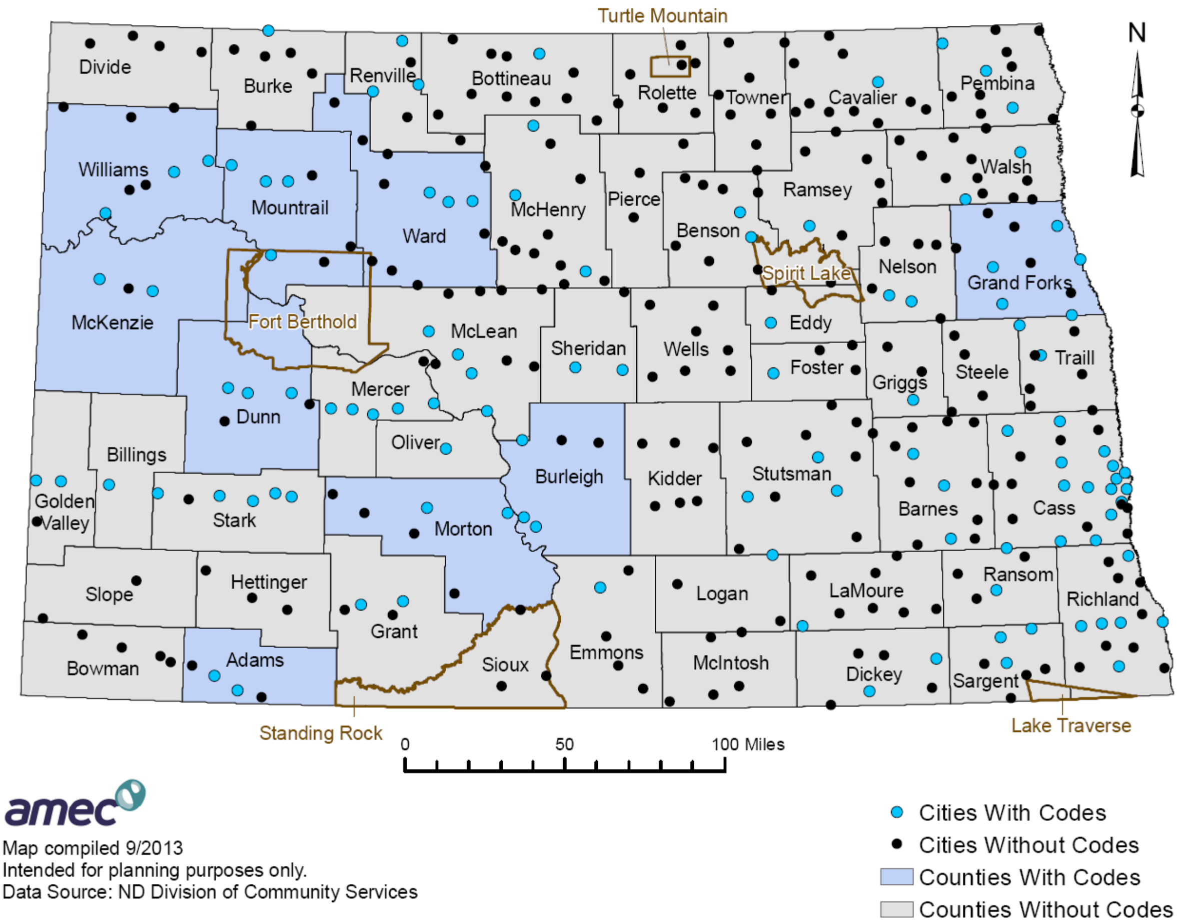
Cities with Building Codes	County Location
Bucyrus	Adams
Hettinger	Adams
Kathryn	Barnes
Rogers	Barnes
Valley City	Barnes
Brinsmade	Benson
Minnewaukan	Benson
Medora	Billings
Souris	Bottineau
Portal	Burke
Bismarck	Burleigh
Lincoln	Burleigh
Wilton	Burleigh
Amenia	Cass
Argusville	Cass
Casselton	Cass
Fargo	Cass
Harwood	Cass
Horace	Cass
Hunter	Cass
Kindred	Cass
Leonard	Cass
Mapleton	Cass
North River	Cass
Page	Cass
Prairie Rose	Cass
Reiles Acres	Cass
West Fargo	Cass
Langdon	Cavalier
Ellendale	Dickey
Oakes	Dickey
Dunn Center	Dunn
Halliday	Dunn
Killdeer	Dunn
New Rockford	Eddy
Hazelton	Emmons
Carrington	Foster
Beach	Golden Valley
Sentinel Butte	Golden Valley
Grand Forks	Grand Forks
Larimore	Grand Forks
Manvel	Grand Forks
Northwood	Grand Forks
Reynolds	Grand Forks

Cities with Building Codes	County Location
Carson	Grant
Elgin	Grant
Hannaford	Griggs
Kulm	LaMoure
Gackle/Logan	Logan
Drake	McHenry
Granville	McHenry
Upham	McHenry
Alexander	McKenzie
Watford City	McKenzie
Coleharbor	McLean
Garrison	McLean
Underwood	McLean
Washburn	McLean
Beulah	Mercer
Golden Valley	Mercer
Hazen	Mercer
Stanton	Mercer
Zap	Mercer
Mandan	Morton
New Salem	Morton
New Town	Mountrail
Ross	Mountrail
Stanley	Mountrail
White Earth	Mountrail
McVille	Nelson
Pekin	Nelson
Center	Oliver
Cavalier	Pembina
St Thomas	Pembina
Walhalla	Pembina
Devils Lake	Ramsey
Enderlin	Ransom
Lisbon	Ransom
Mohall	Renville
Sherwood	Renville
Tolley	Renville
Barney	Richland
Christine	Richland
Hankinson	Richland
Mooreton	Richland
Wahpeton	Richland
Wyndmere	Richland
Forman	Sargent
Gwinner	Sargent
Milnor	Sargent

Cities with Building Codes	County Location
Goodrich	Sheridan
McClusky	Sheridan
Belfield	Stark
Dickinson	Stark
Gladstone	Stark
Richardton	Stark
Taylor	Stark
Buchanan	Stutsman
Jamestown	Stutsman
Medina	Stutsman
Hatton	Traill
Mayville	Traill
Fordville	Walsh
Grafton	Walsh
Burlington	Ward
DesLacs	Ward
Minot	Ward
Surrey	Ward
Ray	Williams
Tioga	Williams
Williston	Williams
Counties with Building Codes	
Adams	
Burleigh	
Dunn	
Grand Forks	
McKenzie	
Morton	
Mountrail	
Ward	
Williams	

Source: North Dakota Department of Commerce, 2013

Figure 4.26. Building Code Enforcing Jurisdictions



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 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 have identified flood hazard areas but do not participate in the NFIP and lack floodplain management ordinances. As of January 2013, there were 327 communities participating in the NFIP (320 in the regular program and 7 in the emergency program) and 23 sanctioned communities with identified flood hazards that do not participate in the NFIP.

Table 4.33. NFIP Sanctioned Communities as of January 31, 2012

Community Name	County
Adams, City of	Walsh County
Anamoose, City of	McHenry County
Brinsmade, City of	Benson County

Community Name	County
Loretta, Township of	Grand Forks County
Neche, Township of	Pembina County
New England, City of	Hettinger County

Community Name	County
Fordville, City of	Walsh County
Gardar, Township of	Pembina County
Gladstone, City of	Stark County
Grafton, Township of	Walsh County
Hegton, Township of	Grand Forks County
Hoople, City of	Walsh County
Kenmare, City of	Ward County
Lansford, Township of	Bottineau County
Logan Center, Township of	Grand Forks County

Community Name	County
Oakwood, Township of	Walsh County
Oberon, City of	Benson County
Park, Township of	Pembina County
Portal, City of	Burke County
St. Thomas, Township of	Pembina County
Stafford, Township of	Renville County
Stanton, City of	Mercer County
Towner, City of	McHenry County

Source: FEMA Community Status Book, as of January 31, 2013

Table 4.34 lists the counties and tribes expected to experience growth from 2010 to 2025 and their building code status. None of the jurisdictions with projected growth were NFIP sanctioned communities.

Table 4.34. Counties, Cities, and Tribes with Projected Growth 2010-2025 and their Building Code Adoption and NFIP Participation Statuses

Area	% Projected change: 2010 to 2025	Adopted State Building Code (Y/N)	NFIP Sanctioned Community (Y/N)
McKenzie County	169.00%	Y	N
Divide County	138.90%	N	N
Williams County	128.20%	Y	N
Williston city	123.30%	Y	N
Mountrail County	76.90%	Y	N
Stark County	74.40%	N	N
Dickinson city	72.70%	N	N
Billings County	67.90%	N	N
Bottineau County	66.80%	N	N
Dunn County	53.60%	Y	N
Burke County	51.90%	N	N
Slope County	50.60%	N	N
Renville County	45.30%	N	N
McHenry County	44.30%	N	N
Hettinger County	41.50%	N	N
Golden Valley County	40.10%	N	N
Bismarck city	28.50%	Y	N
Burleigh County	28.10%	Y	N
Ward County	25.60%	Y	N
Minot city	24.50%	Y	N
Cass County	23.60%	N	N
West Fargo city	23.50%	N	N
Fargo city	23.20%	Y	N
Pierce County	21.50%	N	N
Bowman County	20.70%	N	N

Area	% Projected change: 2010 to 2025	Adopted State Building Code (Y/N)	NFIP Sanctioned Community (Y/N)
Sioux County	18.90%	N	N
Morton County	16.40%	Y	N
Mandan city	16.30%	Y	N
Benson County	15.40%	N	N
Rolette County	12.30%	N	N
Grand Forks County	12.00%	Y	N
Stutsman County	11.80%	N	N
Grand Forks city	11.60%	Y	N
Jamestown city	11.60%	Y	N
Fort Berthold Reservation	10.80%	N	N
Spirit Lake Reservation	9.60%	N	N
Turtle Mountain Reservation	6.30%	N	N
Valley City city	6.20%	Y	N
Barnes County	6.10%	N	N
Mercer County	6.00%	N	N
Standing Rock Reservation	4.00%	N	N
McLean County	3.10%	N	N
Towner County	3.10%	N	N
Emmons County	1.20%	N	N
Adams County	0.70%	Y	N
Dickey County	0.10%	N	N

Source: U.S. Census Bureau and the Center for Social Research at NDSU; North Dakota Department of Commerce, FEMA Community Status Book

5 Hazard Profiles and Risk Assessment

Hazard Identification

Many hazards 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, hazards were identified for inclusion in this plan based on their history of resulting in disaster declarations, their inclusion in previous versions of mitigation and response plans, their inclusion in local mitigation plans, and through input and discussion by stakeholders. Closely related-hazards were grouped together for simplicity.

Table 5.1 provides a summary of all Presidential Disaster and Emergency Declarations for the State of North Dakota.

Table 5.1. Presidentially Declared Disasters and Emergencies in North Dakota

Declaration	Date	Hazard(s)	Deaths	Injuries	Damages
DR 79	1957	Tornadoes	13	103	$25,000,000 estimated total
DR 195	1965	Flood	Unknown	Unknown	Unknown
DR 216	1966	Flood	Unknown	Unknown	Unknown
DR 220	1966	Flood, Severe Storms	1	2	$1,356,000^ estimated total
DR 256	1969	Flood	0	0	$27,000,000
DR 287	1970	Flood	0	9	$135,000^ estimated total
DR 335	1972	Flood, Severe Storms	0	1	$350,000^ estimated total
DR 434	1974	Flood	Unknown	Unknown	Unknown
DR 469	1975	Flood	Unknown	Unknown	$1,000,000,000
DR 475	1975	Flood	1	9	$2,830,000^ estimated total
EM 3012	1976	Flood	Unknown	Unknown	Unknown
DR 501	1976	Flood	Unknown	Unknown	Unknown
EM 3016	1976	Drought	0	0	Unknown
DR 554	1978	Flood, Severe Storms	Unknown	Unknown	Unknown
EM 3061	1978	Winter Storms	Unknown	Unknown	Unknown
EM 3065	1978	Severe Storms	5	35	$3,590,000 estimated total
DR 581	1979	Flood, Severe Storms	Unknown	Unknown	$64,800,000
DR 658	1982	Flood	Unknown	Unknown	Unknown
DR 825	March – April 1989	Flood	0	0	$2,719,000*
DR 1001	June – July 1993	Flood, Severe Storms	2		$48,446,044*, $600,000,000 estimated total
DR 1032	March – July 1994	Flood	1	4	$4,073,939*
		Severe Storms	Unknown	Unknown	$9,670,000^ estimated total
DR 1050	March – May 1995	Flood, Severe Storms	3	1	$15,637,415*, $102,000,000 estimated total
DR 1118	March 12 – June 21, 1996	Flood	2	0	$13,348,768*
DR 1157	January 2-31, 1997	Winter Storms	8	91	$14,801,246*, $317,000,000 estimated total
DR 1174	February 28 – May 24, 1997	Flood, severe storms	7	2	$557,503,842*,
DR 1220	March 2 – July 18, 1998	Flood	0	0	$18,054,727*

Declaration	Date	Hazard(s)	Deaths	Injuries	Damages
DR 1279	March 1 – July 19, 1999	Flood, Severe Storms, tornadoes, snow and ice	1	1	$124,391,622*, $117,864,000^ estimated total
DR 1334	April 5 – August 12, 2000	Flood, severe storms	2	25	$91,944,041*, $21,985,000^ estimated total
DR 1353	November 1-20, 2000	Winter Storms	0	7	$1,202,000 estimated total
DR 1376	March 1 – July 31, 2001	Flood	0	3	$27,858,168*
DR 1431	June 8 – August 11, 2002	Flood, severe storms, tornadoes	0	19	$1,266,549*, $283,797,000^ estimated total
DR 1483	June 24-June 25, 2003 (Declared August 1)	Severe Storms and High Winds			$868,596*
EM 3196	January 23-27, 2004	Winter Storms	0	0	Unknown
DR 1515	March 26 – June 14, 2004	Flood, severe storms	0	0	$7,459,705*
DR 1597	June 1 – July 7, 2005	Flood, severe storms	1	1	$20,350,276*, $16,305,000^ estimated total
EM 3247	Sep-05	Hurricane Katrina	0	0	Unknown
DR 1616	October 4-6, 2005 (Declared on November 21, 2005)	Winter Storm			$1,990,803*
DR 1621	November 27-30, 2005	Winter Storms	Unknown	Unknown	$2,728,807*, $3,000,000 estimated total
DR 1645	March 30 – April 30, 2006	Flood, severe storms	2	0	$10,388,198*
DR 1713	June 2 – June 18, 2007	Flood, severe storms	Unknown	Unknown	$4,375,932*
DR 1725	15-Jul-07	Severe Storms, tornadoes	Unknown	Unknown	$935,462*, $270,000,000 estimated total
DR 1726	August 26-27, 2007	Severe Storms, tornadoes	Unknown	Unknown	$12,775,075*, $50,000,000 estimated total
DR 1829	March 13 – August 10, 2009	Flood, severe storms	2	50	$184,696,371*, $623,000,000 estimated total
DR 1879	January 20-25, 2010	Severe Winter Storms	0	0	$17,820,975*~
EM 3309	February 26 – April 30, 2010	Flood	0	0	$4,312,500*~
DR 1901	April 1-3, 2010	Severe Winter Storms	0	0	$25,879,643*~
DR 1907	February 26 - July 15, 2010	Flood	0	0	$6,221,213*~
EM-3318	April 5-July 1, 2011	Flood	0	0	$893,946^
DR-1981	February 14-July 20, 2011	Flood	2	3	$1,066,608,966*^
DR-1986	April 29-May 2, 2011 (Declared on May 20)	Winter Storm	0	0	$4,873,419*
EM-3364	April 22-May 7, 2013 (Declared on April 26)	Flood	0	0	TBD
DR-4118	April 22-May 16, 2013 (Declared May 29)	Flood	0	0	TBD
DR-4123	Declared June 25, 2013	Flood	0	0	TBD

Source: FEMA, ^ Summer Storm portion, ~ preliminary numbers, subject to change, * Federal Share

Table 5.2 provides the Presidential Disaster and Emergency Declarations by county from 1989 to present. Data on counties included in each declaration was not available for the declarations prior to 1989. **Figure 5.1** that follows depicts the number of declarations by county on a statewide map.

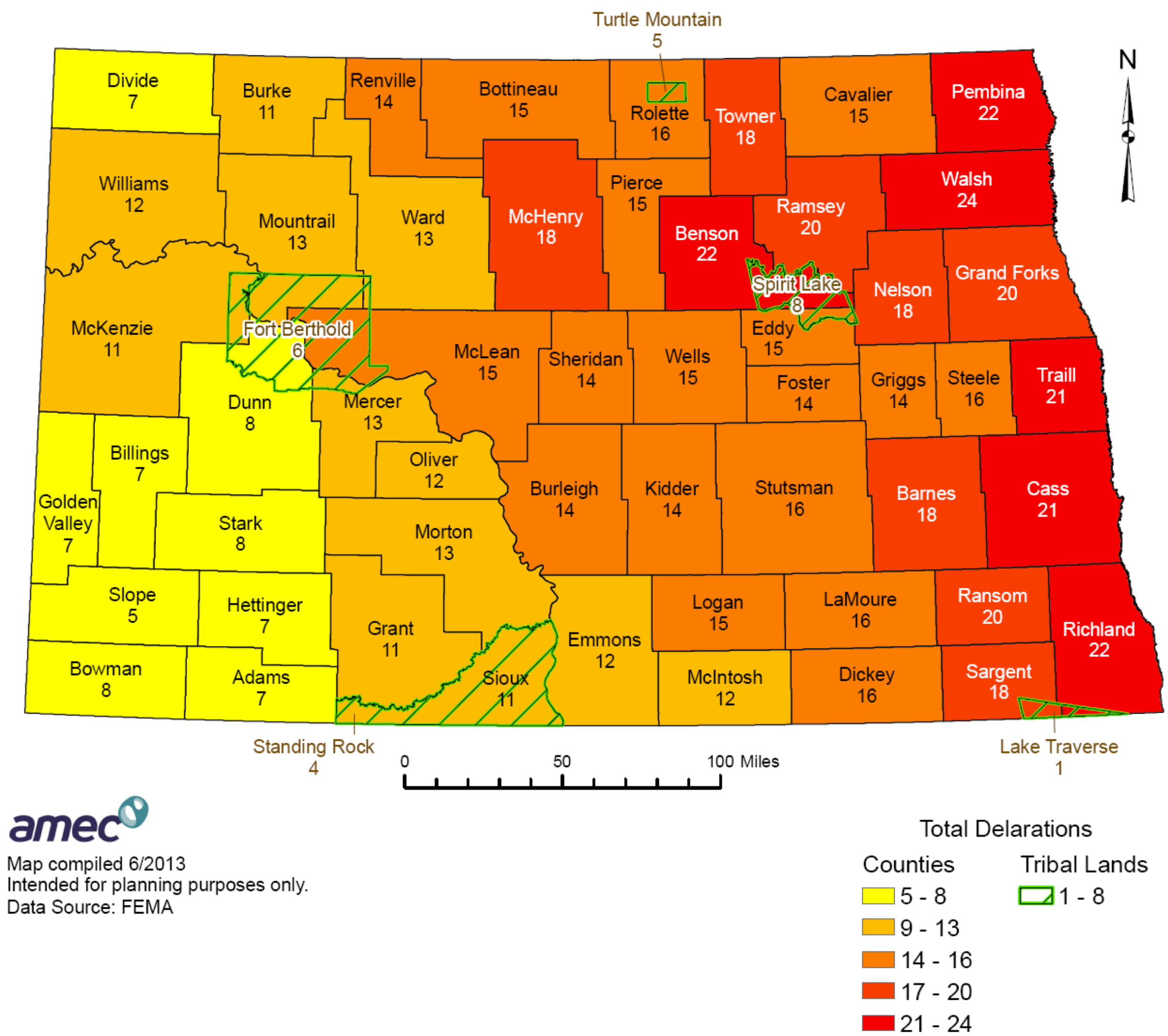
Table 5.2. Presidential Disaster and Emergency Declarations by County 1989-July 2013

	DR 825	DR 1001	DR 1032	DR 1050	DR 1118	DR 1157	DR 1174	DR 1220	DR 1279	DR 1334	DR 1353	DR 1376	DR 1431	DR 1483	EM 3196	DR 1515	DR 1597	EM 3247	DR 1616	DR 1621	DR 1645	DR 1713	DR 1725	DR 1726	DR 1829	DR 1879	EM 3309	DR 1901	DR 1907	EM-3318	DR-1981	DR-1986	EM-3364	DR-4118	DR-4123	DR-4128
Adams						X	X					X						X							X	X		X								
Barnes		X	X	X	X	X	X	X	X			X		X				X				X			X	X	X		X	X	X					
Benson		X	X	X	X	X	X	X	X	X	X	X				X	X	X	X						X		X	X	X	X	X			X		X
Billings						X	X											X	X						X	X					X					
Bottineau				X		X	X		X	X		X				X	X	X	X						X				X		X	X		X		X
Bowman						X	X				X							X	X			X			X	X										
Burke		X				X	X								X	X		X	X						X	X					X	X				
Burleigh		X		X	X	X	X		X	X		X						X							X		X	X		X	X					
Cass	X	X			X	X	X	X	X	X		X						X		X	X	X	X		X		X		X	X	X		X	X		
Cavalier		X		X	X	X	X				X	X				X	X	X			X	X			X						X			X		X
Dickey		X		X	X	X	X	X	X			X					X	X				X			X	X	X		X		X					
Divide		X				X	X				X							X													X	X				
Dunn						X	X								X			X	X						X	X						X				X
Eddy		X	X	X	X	X	X			X		X				X		X							X				X	X	X			X		
Emmons		X		X	X	X	X		X									X							X	X	X		X	X						
*Fort Berthold^*									X	X			X		X		X		X																	
Foster			X	X	X	X	X		X	X		X						X							X		X		X		X			X		
Golden Valley						X	X				X	X						X	X							X										
Grand Forks	X	X			X	X	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		X			X					
Griggs		X	X	X	X	X	X		X	X		X				X	X	X							X						X					
Hettinger		X	X			X	X											X							X	X										
Kidder		X	X	X	X	X	X		X	X		X					X	X							X				X		X					X
Lake Traverse^																									X											
LaMoure		X	X	X	X	X	X	X	X			X					X	X				X			X		X		X		X					
Logan		X	X	X	X	X	X		X	X		X						X				X			X	X			X		X					
McHenry				X	X	X	X		X	X		X			X	X	X	X	X			X			X			X	X		X			X		X
McIntosh		X	X	X	X	X	X		X									X							X	X			X		X					
McKenzie			X			X	X				X				X			X	X						X	X					X	X				X
McLean		X		X	X	X	X		X	X		X			X			X	X						X			X		X	X					X
Mercer		X				X	X								X			X	X						X	X	X	X	X	X	X					
Morton		X			X	X	X					X						X	X						X	X		X	X	X	X					
Mountrail						X	X		X			X			X	X	X	X	X						X	X					X	X				X

	DR 825	DR 1001	DR 1032	DR 1050	DR 1118	DR 1157	DR 1174	DR 1220	DR 1279	DR 1334	DR 1353	DR 1376	DR 1431	DR 1483	EM 3196	DR 1515	DR 1597	EM 3247	DR 1616	DR 1621	DR 1645	DR 1713	DR 1725	DR 1726	DR 1829	DR 1879	EM 3309	DR 1901	DR 1907	EM-3318	DR-1981	DR-1986	EM-3364	DR-4118	DR-4123	DR-4128
Nelson		X	X	X	X	X	X	X	X	X		X				X	X	X							X		X		X	X	X					X
Oliver		X	X		X	X	X			X								X	X						X	X		X		X						
Pembina	X	X		X	X	X	X	X	X	X		X	X			X	X	X			X				X		X		X	X	X		X	X		X
Pierce			X	X	X	X	X	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							X		X		X	X	X			X		X
Ransom		X		X	X	X	X	X	X	X		X					X	X		X	X	X			X	X	X		X	X	X					
Renville				X		X	X		X	X						X	X	X	X							X			X		X	X		X		
Richland	X	X	X		X	X	X	X	X	X		X					X	X		X	X	X			X		X		X	X	X		X	X		
Rolette		X	X	X		X	X	X	X	X		X					X	X	X		X				X						X			X		
Sargent		X	X	X	X	X	X	X	X	X		X					X	X		X	X	X			X				X		X					
Sheridan		X	X	X	X	X	X		X	X		X						X	X						X			X			X					X
Sioux		X		X		X	X										X	X							X	X		X		X	X					
Slope						X	X											X	X							X										
Spirit Lake								X	X	X						X									X		X		X					X		X
*Standing Rock^*																	X								X	X		X							X	
Stark		X				X	X										X	X	X						X	X										X
Steele		X	X	X	X	X	X		X			X				X	X	X					X		X	X			X		X					
Stutsman		X	X	X	X	X	X	X	X			X	X					X				X			X		X		X		X					
Towner		X	X	X		X	X	X	X		X	X				X	X	X	X		X				X					X	X			X		X
Traill	X	X		X	X	X	X		X	X		X	X			X	X	X			X				X		X		X	X	X		X	X		
*Turtle Mountain^*								X	X							X	X				X															X
Walsh	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X			X				X	X	X		X	X	X		X	X		X
Ward						X	X		X						X	X	X	X	X						X				X	X	X	X				X
Wells		X	X	X	X	X	X		X	X		X						X							X			X	X		X			X		X
Williams		X	X			X	X		X		X				X			X	X						X						X	X				

Source: FEMA

Figure 5.1. Presidential Disaster and Emergency Declarations 1989-2013



The 2013 hazard identification process produced a list of fourteen probable hazard groups to be profiled. **Table 5.3** shows the hazards and how and why they were identified. The level of detail for each hazard correlates to the relative risk of each hazard and is limited by the amount of data available. As new hazards are identified, they can be added to the hazard list, profiled, and mitigated. **Table 5.4** lists the hazards that were excluded from this plan and the reasons why. The process to identify new hazards in future plan updates should include:

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

Table 5.3. North Dakota Major Hazards

Hazard Profile	How Identified	Why Identified
Communicable Disease (including human, animal, and plant diseases)	Centers for Disease Control and Prevention ND Department of Health ND State Board of Animal Health Pandemic studies Risk Management Agency US Department of Agriculture US Census Bureau World Health Organization	Global disease threat History of pandemics Dependence on agricultural economy
Dam Failure	ND State Water Commission US Army Corps of Engineers	Numerous dams throughout the state, including 29 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 ND State Climate Office ND State Water Commission Risk Management Agency US Department of Agriculture	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
Flood (including riverine, levee failure, closed basin, ice jam, and flash floods)	Federal Emergency Management Agency National Climatic Data Center ND Department of Emergency Services ND State Fire and Tornado Fund ND State Water Commission US Army Corps of Engineers US Geological Survey	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 Levee Failure was added to this hazard analysis for the 2013 update
Geologic Hazards (including landslide, earthquake, and other geologic/mining hazards)	National Earthquake Hazards Reduction Program ND Geological Survey US Geological Survey	History of landslide losses Increase in mining activity and related geologic hazards Potential for minor earthquake losses
Hazardous Material Release	Environmental Protection Agency National Transportation Safety Board ND Department of Emergency Services ND State Fire and Tornado Fund US Department of Transportation	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 Additional emphasis on the impact of the oil and gas industry was added in the 2013 update.
Homeland Security Incident	Anti-Defamation League Federal Bureau of Investigations National Memorial for the Prevention of Terrorism ND Department of Emergency Services ND State Fire and Tornado Fund Southern Poverty Law Center	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 Additional emphasis on the potential for cyber-terrorism was added in the 2013 update
Shortage or Outage of Critical Materials or Infrastructure	ND Department of Emergency Services ND Public Service Commission Stakeholder input	Daily and operational dependence on utilities, fuel, and communications History of power, communication, and water

Hazard Profile	How Identified	Why Identified
		outages History of critical material shortages
Severe Summer Weather (including tornadoes, hail, downbursts, strong winds, and lightning)	National Climatic Data Center National Severe Storms Laboratory National Weather Service ND Atmospheric Resources Board ND Department of Emergency Services ND State Fire and Tornado Fund 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 The name of this hazard was revised for the 2013 update
Transportation Accident (including vehicular, railway, and aircraft accidents)	Federal Railroad Administration National Transportation Safety Board ND Department of Transportation	Potential for a serious accident involving multiple patients History of highway closures History of railroad accidents History of small plane crashes
Urban Fire or Structure Collapse	National Fire Protection Association ND Fire Marshal ND State Fire and Tornado Fund US Fire Administration	History of major downtown urban fires History of structure collapses under heavy snow loads Potential for structure collapses for a variety of reasons
Windstorms	National Climatic Data Center National Weather Services ND Department of Emergency Services Risk Management Agency	Due to the unique issues related to windstorm in North Dakota that may not be associated with thunderstorm activity, the state team determined this should be a separately profiled hazard in the 2013 plan update.
Wildland Fire	ND Department of Emergency Services ND Fire Marshal ND Forest Service	History of large and damaging wildland fires Scattered government lands and natural fuels throughout the state
Severe Winter Weather (including blizzards, heavy snow, ice storms, and extreme cold)	National Climatic Data Center National Weather Service ND Department of Emergency Services ND State Fire and Tornado Fund 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 The name of this hazard was revised for the 2013 update

Table 5.4. Hazards Excluded from 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 this 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.
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 capabilities. North Dakota does not have a history of any declared state or federal volcano disasters.

Risk Assessment Methodologies

A key step in preventing and reducing disaster losses is the development of a comprehensive understanding of the hazards that pose risks throughout North Dakota. A realistic all-hazard 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 can be found throughout this section.

Hazard:	a source of danger
Risk:	possibility of loss or injury
Vulnerability:	open to attack or damage

Source: Federal Emergency Management Agency, 2001.

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

The North Dakota risk assessment consists of hazard profiles that evaluate the risks from each hazard to the state. A statewide inventory describing 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, provides background and exposure data for the risk assessment. This inventory was collected from a variety of sources across the state.

Each hazard or group of related hazards has its own *hazard profile*. A stand-alone hazard profile allows for the comprehensive analysis of each hazard from many different aspects. Each hazard profile contains the *description* of the hazard containing information from specific hazard experts. *Geographic locations o*f the hazards, where spatial differences exist, allows for hazard analyses by geographic location. Some hazards, such as riverine flooding, can have varying levels of risk based on location (i.e. near the river versus far away from a river). Other hazards, such as winter storms or drought, cover larger geographic areas and the delineation of hazard areas is not typically available or useful. In many cases, values at risk are also mapped by county. The hazard profiles also each contain a section on *previous occurrences* of the hazard compiled from a wide variety of databases and sources.

Using the historical occurrence, or more specific documentation if available, a *probability and magnitude* 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 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 hazard frequency and impact ranges show the differentiation between high frequency, low impact events and low frequency, high impact events.

The *State Risk Assessment* for each hazard includes two sections: 1) vulnerability analysis and 2) loss estimate. Where applicable, a combination of historical data, risk data, and exposure data, at the county level, was used to develop an overall vulnerability rating for each county and reservation. Where this was possible, a rating of high, moderate-high, moderate, low-moderate, or low was assigned to each geographic area. The ratings are comparative within the hazard, and are not necessarily an indication of the hazard level when compared to other hazards. For example, a county may receive a “low” flood hazard rating when compared to other counties in the state and a “high” transportation accident hazard rating, but flood is still a greater hazard for that county than a transportation accident. These ratings are generally only useful when comparing geographic areas of the state. Inter-hazard differences are noted in the statewide hazard rankings and the individual local mitigation plans. To develop loss estimates, a combination of GIS-based analysis, statistical analysis, and scenario-based analysis was utilized to develop estimates of future losses.

In addition to the statewide assessment of the counties and reservations using statewide data for each hazard, the *local risk assessments* discussion in each hazard section summarizes data extracted from each of the local plans that counties and tribes completed. At the time this update was developed, fifty-two counties and three tribal nations were either developing or had approved mitigation plans. The fifty-third county has submitted a Notice of Interest for the Hazard Mitigation Grant Program to develop a plan. This is nearly double the amount at the onset of this initiative. The remaining tribal nation and county without a plan are being encouraged to apply for a mitigation grant to assist in the development of a local plan. In development of the local risk assessments, a similar approach was used for most areas; each hazard was assigned a “risk class.” In many cases, the classes were based on the following criteria shown in. Note that some jurisdictions may have used slightly different methodologies. **Table 5.5**and **Table 5.6** define the terms that were used in local plans to describe relative risk.

Table 5.5. 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 5.6. Risk Analysis Classifications

		IMPACT			
		Negligible	*Limited*	*Critical*	*Catastrophic*
FREQUENCY	*Highly Likely*	**C**	**B**	**A**	**A**
	Likely	**C**	**C**	**B**	**A**
	Possible	**D**	**C**	**B**	**B**
	Unlikely	**D**	**D**	**C**	**C**

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

Potential losses listed in the local plans were also incorporated into the vulnerabilities to jurisdictions section. Many counties, where potential losses were listed, used an assessment conducted by North Dakota State University in 2003 and adjusted the estimates for inflation. Other counties may have used their own methodologies for estimating potential losses. Local plan updates should include updated potential losses that reflect the changes in development for their county.

Vulnerability *to 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. In some cases, past claims were analyzed to show the historic losses from a particular hazard. In cases where such data was not available or useful, a descriptive analysis of the exposure of state-owned buildings and property and other critical facilities was conducted. North Dakota does not have a comprehensive GIS database of state-owned facilities.

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 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 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 given current regulations. Potential loss estimates have not changed significantly due to new development. In some cases, however, the potential losses have changed due to improvements to data used in the evaluation, improved and longer historical data, or inflation.

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 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* are listed since many other plans and studies exist that are important pieces of information regarding a particular hazard and often contain more data than is needed or useful in a multi-hazard plan.

At the end of the risk assessment, the *summary* brings together data from each of the hazards to show comparisons and ultimately rank the hazards statewide. The county ratings were brought together to show the areas of the state that are most vulnerable to all hazards. The prioritization of hazards into high, moderate, and low categories is based on the classification of hazards by the individual jurisdictions in their local plans which was then reviewed and adjusted by the state planning team.

Due to the inherent errors possible in any disaster risk assessment, the results of the risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

Integration of the States Threat and Hazard Identification and Risk Assessment (THIRA)

In 2012 NDDES completed a Threat and Hazard Identification and Risk Assessment (THIRA). This product will be updated annually. The THIRA meets the requirements issued to States and Urban Area Security Initiative (UASI) jurisdictions by:

- Detailing North Dakota's threats and hazards of concern
- Providing outcome statements for all 31 Core Capabilities described in the National Preparedness Goal outlined in Presidential Policy Directive 8
- Providing estimated impacts for the threats and hazards of concern in relation to all the 31 core capabilities, and
- Providing capability targets for all 31 capabilities

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 been integrated into this Risk Assessment. At the beginning of each hazard profile a table has been included to indicate the "Threat/Hazard Group" of each hazard. The State has identified the 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, but rather provides evaluation of 3 scenarios that represent the most likely events within the 3 threat/hazard groups of "Natural, Technological, and Adversarial". The THIRA does include a Hazard Identification Matrix. **Table 5.7** provides a comparison of the hazards identified by the State Hazard Mitigation Plan and the 2012 THIRA. As this comparison demonstrates, the focus of the 2012 THIRA is more on Homeland Security Threats and the State Hazard Mitigation Plan is focused more on natural hazards. The State intends to merge and align the THIRA process and the HMP and SEOP update cycles in the future. The THIRA's Desired Outcomes and Capability Targets that include hazard mitigation are integrated into the mitigation strategy discussed further in Chapter 6 of this plan.

The ND THIRA will be updated in 2013 to address all identified Threats and Hazards per the guidelines established in CPG 201. The state is also working with local authorities to initiate the THIRA process at the local level under a multi-year fielding plan.

Table 5.7. Hazard Comparison, State Hazard Mitigation Plan and THIRA

State Hazard Mitigation Plan	THIRA
Communicable Disease (Includes Human, Animal, and Plant Diseases)	Animal Disease Outbreak Human Pandemic Outbreak
Dam Failure	Dam Failure
Drought	Not Included
Flood (Including Riverine, Levee Failure, Closed Basin, Ice Jam, and Flash Floods)	Flood
Geologic Hazards (Including Landslide, Earthquake, and other Geologic/Mining Hazards)	Not Included
Hazardous Material Release (Including Oil and Gas Industry)	Chemical Substance Spill or Release Radiological Substance Release
Homeland Security Incident (Including Multiple Types of Terrorism and Cyber-Terrorism)	Cyber Infrastructure Attack Cyber Data Attack Chemical/biological Food or Food Production Attack Armed Assault Chemical Terrorism Attack (non-food) Explosives Terrorism Attack Aircraft as a Weapon Radiological Dispersal Device Terrorism Attack Biological Terrorism Attack (non-food) Nuclear Terrorism Attack
Severe Summer Weather (Including Tornadoes, Hail, Downbursts, Thunderstorm Winds, Lightning, and Extreme Heat)	Summer Storm
Severe Winter Weather (Including Blizzards, Heavy Snow, Ice Storms, and Extreme Cold)	Winter Storm
Shortage or Outage of Critical Materials or Infrastructure (Including Space Weather Impacts)	Not Included
Transportation Accident (Including Vehicular, Railway, and Aircraft Accidents)	Not Included
Urban Fire or Structure Collapse	Not included
Wildland Fire	Fire (meaning wildland fire in this context)
Windstorm	Not Included

5.1. Communicable Disease (Including Human, Animal, and Plant Diseases)

Hazard Rating	THIRA Threat/Hazard Group
Moderate	Natural/Adversarial

5.1.1. Description

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 significance in the emergency management realm are communicable diseases with the potential for high infection rates in humans or those which might necessitate the destruction of livestock or crops. Such diseases can devastate 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. Terrorism experts also theorize about the possibility of attacks using biological agents.

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 communicable diseases. The following biologic agents are considered the highest bioterrorism threats (Category A) due to their ease of dissemination or person-to-person transmission, high mortality rate with potential for major public health impacts, and potential for public panic and social disruption: Anthrax, Botulism, Plague, Smallpox, Tularemia, and Viral Hemorrhagic Fevers. (Centers for Disease Control and Prevention, 2010)

In addition to global disease and bioterrorism concerns, naturally occurring diseases can threaten communities. Natural illnesses of particular concern include Influenza, Meningitis, Pertussis (Whooping Cough), Measles, Norwalk Virus, Severe Acute Respiratory Syndrome (SARS), and food-borne illnesses such as E. coli and Salmonella outbreaks, among others. These diseases can infect populations rapidly, particularly through groups of people in close proximity such as schools, assisted living facilities, and workplaces.

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.

Animal and plant diseases, particularly those that infect livestock or crops, can distress the agricultural community. Such diseases could lead to food shortages and negative economic impacts, depending on the animals or plants infected and the geographic extent of the disease.

Of most concern are those diseases that spread rapidly and cause widespread economic losses. The North Dakota Department of Agriculture is charged with conducting regular and emergency inspections and licensure of animal and plant producers and shippers. The effects of these regulatory activities are to mitigate any effects from contaminated or suspect products entering the food chain. A summary of the types of regulatory activities for 2012 are shown in **Table 5.8.**

Table 5.8. North Dakota Department of Agriculture 2012 Regulatory Activities Summary

Program / Product Inspected / Licensure	Activity in 2012
Plant Industries Licensure:	
Nursery Growers	26 licensed and inspected
Nursery Dealers	184 licensed
Nursery Dealer Inspections	65 inspected
Beekeepers	201 licensed (484,398 registered colonies)
Plant Industries Export Certification:	
Federal phytosanitary certificates	2826 certificates issued
State phytosanitary certificates	352 certificates issued
European corn borer certificates	292 certificates issued
Animal Health Licensure:	
Dairy Samplers	89 licensed
Livestock Dealers	149 dealers and 243 agents licensed
Auction Markets	16 licensed
Satellite Video Auctions	10 licensed
Custom Exempt Slaughter Plants	84 licensed
State Meat and Poultry Plants	13 licensed (1500 inspections each year)

Source: North Dakota Department of Agriculture, 2013

5.1.2. Geographic Location

Communicable 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 communicable diseases. Chapter 4 provides additional details regarding those counties with highest populations as well as highest market values of crops and livestock. In addition, the State Risk Assessment later in this section provides additional details of areas of the state that are most vulnerable, based on factors such as age and presence of group quarters for human disease and exposure for crop/plant and animal disease.

5.1.3. 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. Transporting influenza patients by train was a crime. (US Department of Health and Human Services, 2006) Previous to that, in 1837, a smallpox epidemic virtually annihilated the village of Mandan Native Americans near Fort Clark. (State Historical Society of North Dakota, 2007)

In 1900 nearly all of the leading causes of death were infectious; now only pneumonia and influenza remain among the top 10 causes of death. The number of deaths due to pneumonia and influenza are tracked by the North Dakota Department of Health (NDDoH) by influenza year, which begins in September. The rate is age adjusted to the standard 2000 census. NDDoH's goal is less than 60 deaths per 100,000 people. **Table 5.9** provides the number of deaths due to influence and pneumonia per 100,000 people from 2005 to 2011.

Table 5.9. Deaths Due to Influenza and Pneumonia per 100,000 People, 2005-2011

	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Number of deaths due to influenza and pneumonia among all causes of death per 100,000 population	60	78	62	76	67	55

Source: North Dakota Department of Health, 2013

Foodborne illness is very frequent and infections can be very serious. For instance, some bacterial causing foodborne illness can cause permanent kidney failure or death. Recent data suggests that some of these infections can cause health effects long after the acute infection has been resolved. Foodborne infections commonly occur in outbreaks which can be local (family, restaurant) or national in scope. Not all outbreaks in the state are identified or reported to public health. Prevention involves controlling the entry of bacteria into food products, proper handling of food to prevent the growth of the bacteria and proper food preparation to ensure the organisms are killed before the food is consumed. **Table 5.10** provides the number of cases of salmonella, Shigella, Campylobacter, and Shiga-toxin positive E. coli per 100,000 people from 2005 to 2011.

Table 5.10. Deaths Due to Select Foodborne Illnesses per 100,000 People, 2005-2011

	2005	2006	2007	2008	2009	2010	2011
Number of cases of Salmonella, Shigella, Campylobacter, and Shiga-toxin positive E.coli per 100,000 population.	32.7	61.7	34.9	37.8	34.2	27.1	31.7

Source: North Dakota Department of Health; **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).

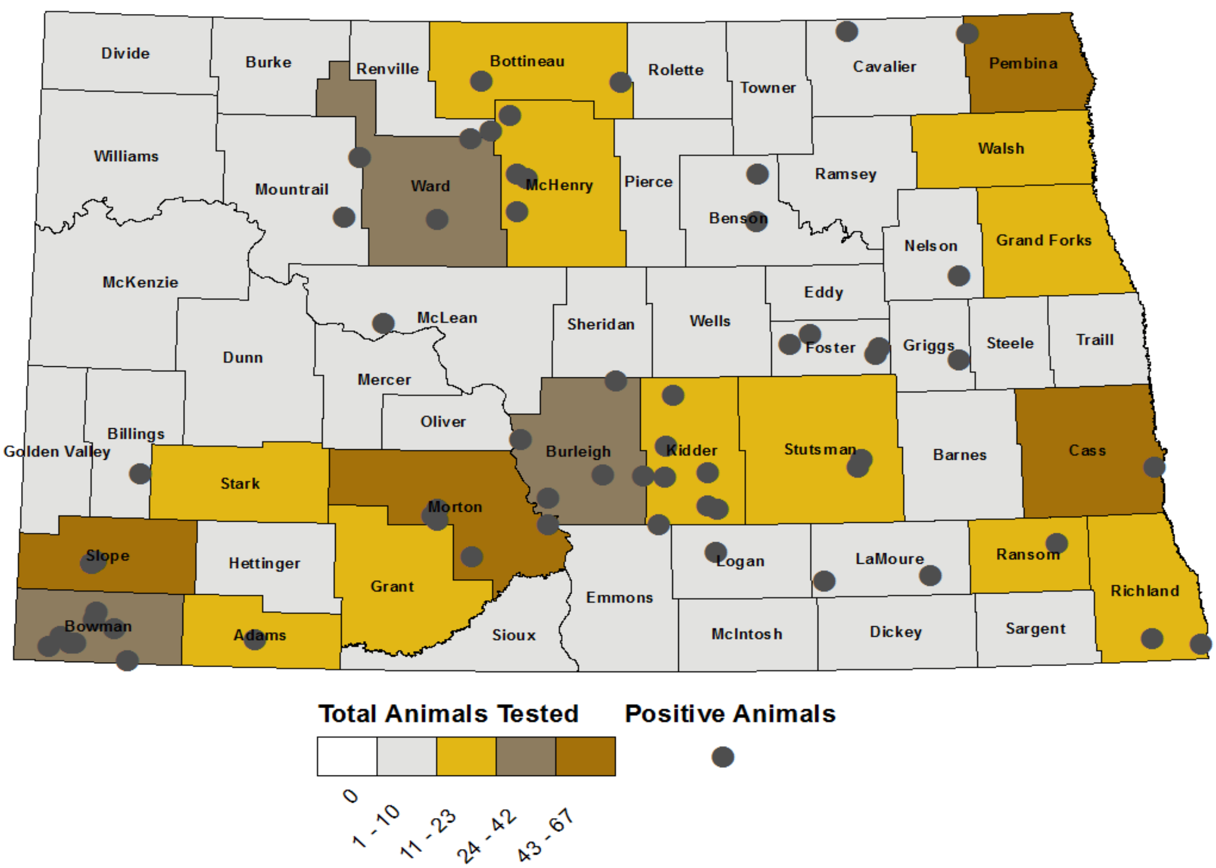
Rabies is an animal disease that is tracked very closely by NDDoH. **Table 5.11** provides details of rabies activity by species for 2012. **Figure 5.2** that follows provides details of locations of animals tested as well as animals that tested positive in 2012.

Table 5.11. Rabies Activity by Species, 2012

Species	Number Confirmed
Bat	2
Cat	6
Cow	12
Dog	4
Sheep	1
Skunk	50
Total	**75**

Source: North Dakota Department of Health, retrieved on 7/1/2013 from http://www.ndhealth.gov/disease/Rabies/Rabies2012.htm

Figure 5.2. North Dakota 2012 Rabies Activity



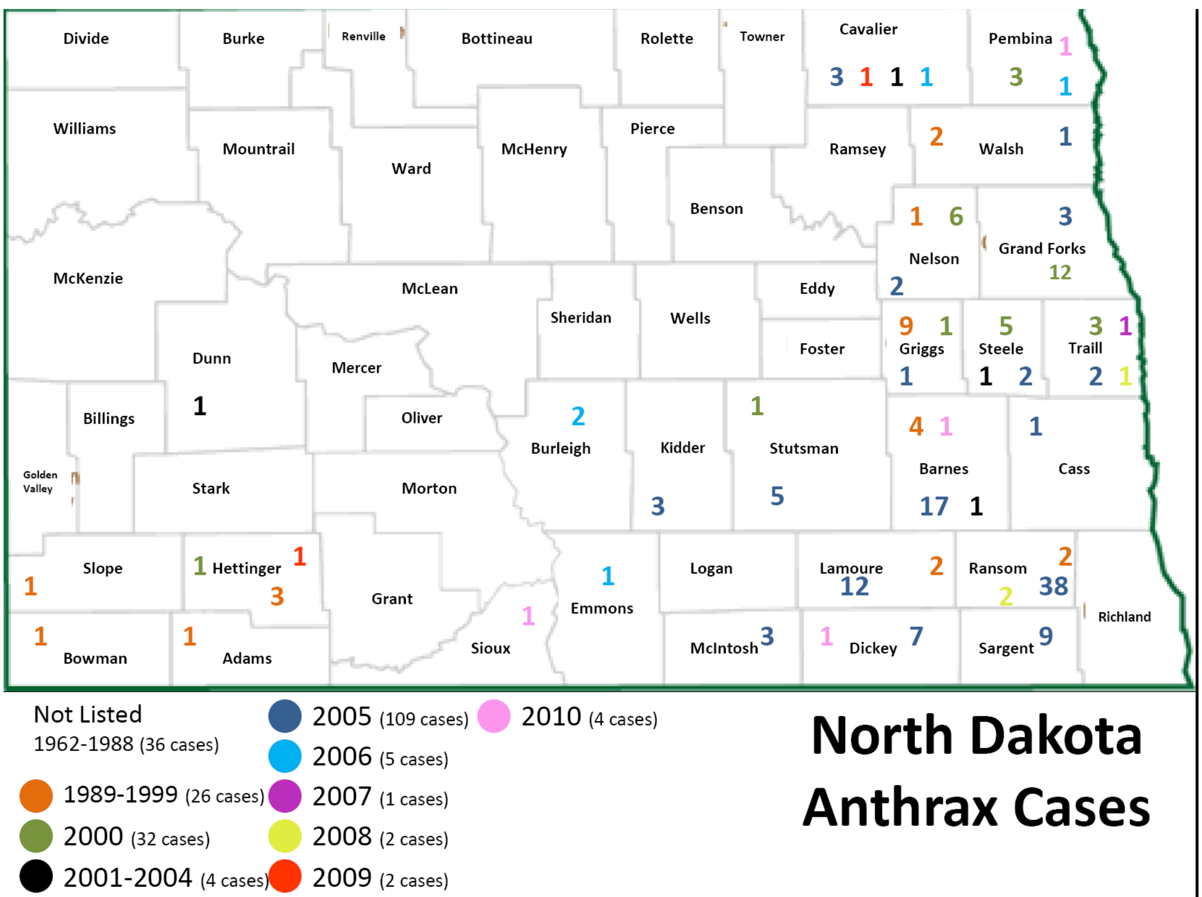
Source: North Dakota Department of Health, retrieved on 7/1/2013 from http://www.ndhealth.gov/disease/Rabies/Rabies2012.htm

Anthrax occurs worldwide and is associated with sudden death of cattle and sheep. Anthrax can infect all warm-blooded animals, including humans. The anthrax organism (*Bacillus anthracis*) has the ability to form spores and become resistant to adverse conditions. Pasteurization or ordinary disinfectants may destroy anthrax organisms in animals or their secretions. However, if the animal carcass is opened and the organisms are exposed to air, they will form spores.

Sporulated anthrax organisms are highly resistant to heat, cold, chemical disinfectants and drying. The anthrax spore may live indefinitely in the soil of a contaminated pasture or yard.

In 2012, the Veterinary Diagnostic Laboratory at North Dakota State University confirmed the diagnosis of anthrax in a beef cow. At that time, State Veterinarian Susan Keller warned “producers should contact their veterinarians to determine when and if their animals should be vaccinated and that their boosters are up to date.” “They should also monitor their herds for unexpected deaths and report them to their veterinarians.” Dry pastures and short grass in some parts of the state are ideal conditions for livestock to ingest anthrax spores and develop the disease. Anthrax has been most frequently reported in northeast, southeast and south central North Dakota, but it has been suspected in almost every part of the state. The state usually 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. **Figure 5.3** provides details on locations and numbers of anthrax cases from 1989 to 2010.

Figure 5.3. Historical North Dakota Anthrax Cases



Source: North Dakota Department of Agriculture, retrieved on 7/1/2013 from http://www.nd.gov/ndda/files/resource/NDAnthraxMap1989-2010_0.pdf

Plant Disease

Plant pests and diseases have the potential to cause major disruptions in agricultural production/exports or significant damage to native plant communities and their associated wildlife in North Dakota. The total losses covered by crop insurance from 2003-2013 from plant disease and mycotoxin in the state totaled $83,737,688 or about $8.4 million annually. (Risk Management Agency, 2013) 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**."

Significant pests or diseases which would trigger either emergency quarantines, or an emergency action response include:

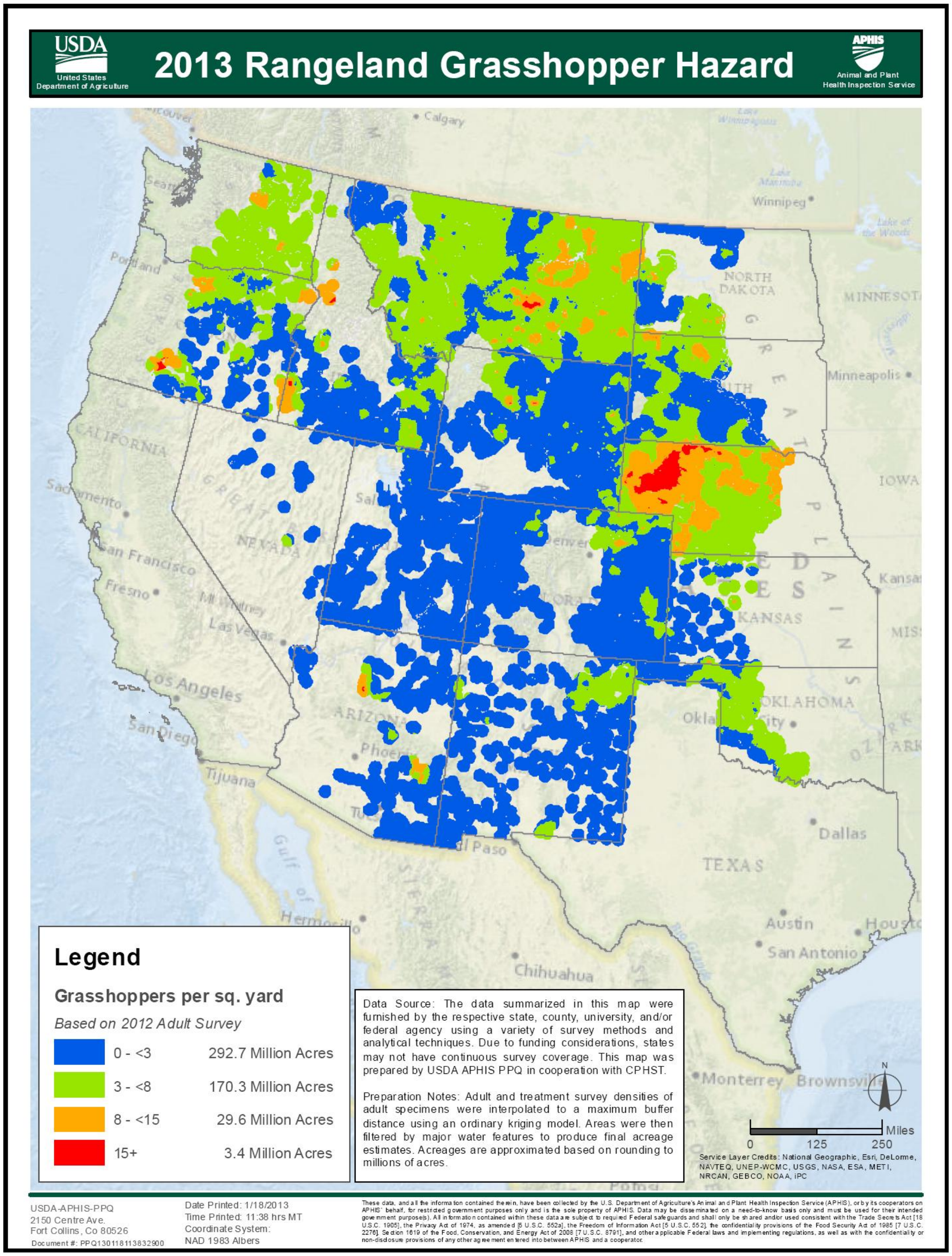
1. Karnal bunt disease of wheat: Karnal bunt (also known as partial bunt) is a fungal disease of wheat, durum wheat, and triticale which are crops extremely important to North Dakota. The fungus *Tilletia indica* invades the kernels, leaving behind waste products with a disagreeable odor and also that 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 for import to the United States. In North Dakota, Animal and Plant Health Inspection Service (APHIS) annually provides funds and cooperates with the North Dakota Department of Agriculture to operate a detection survey across the state. During the 2012 Survey, Karnal bunt was not detected. A total of 253 composite samples (226 HRSW and 27 durum) were collected from 63 elevators representing 50 of 53 North Dakota counties. Detection of Karnal bunt would have an immediate negative effect on exports if detected. North Dakota's trading partners (including states and countries) would establish immediate quarantines against the state prohibiting movement of grain and seed. Appearance of the disease in Arizona in early 1996 resulted in APHIS implementing an emergency quarantine, inspection, and certification program for wheat moving out of the infested areas, along with regulations on sanitizing machinery and storage facilities. Many foreign countries have a zero tolerance for Karnal bunt in import shipments and closed markets. Since that time, detection surveys, eradication programs, and establishment of regulated areas have been successful in restoring lost markets.

2. Black stem rust race Ug99: Black stem rust race Ug99 is another disease of wheat that warrants attention. Although black stem rust is endemic to the US, the race Ug99 does not occur and current wheat varieties available in the US are not resistant to this race. Introduction of this race to North America would cause large scale economic loss and quarantine restrictions. The links below include information about the native plant common barberry. 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.

3. Emerald ash borer: The Emerald ash borer 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. The closest known infestations are in areas of Minneapolis/St. Paul. The beetle has been responsible for killing millions of ash trees in Michigan alone. 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. Wildlife species that are dependent on healthy forests would also be indirectly impacted. The potential 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. In 2013 North Dakota participated in the National EAB survey. A total of 393 traps were deployed. Emerald Ash borer was not detected.

4. Large scale grasshopper outbreak: Large scale outbreaks have occurred in North Dakota and the American west many times in history. Rangeland in western North Dakota is an important agricultural resource because of the forage production used for livestock feed and wildlife habitat. Grasshoppers are natural components of the rangeland ecosystem. However, when several environmental factors occur, their populations can reach outbreak levels and cause serious economic losses, especially when accompanied by a drought. Federal, state and private land managers rely on Plant Protection & Quarantine (PPQ) 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 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. **Figure 5.4** provides details on the number of adult grasshoppers per square yard in the western U.S. based on a 2012 survey.

Figure 5.4. Number of Adult Grasshoppers per Square Yard, 2012



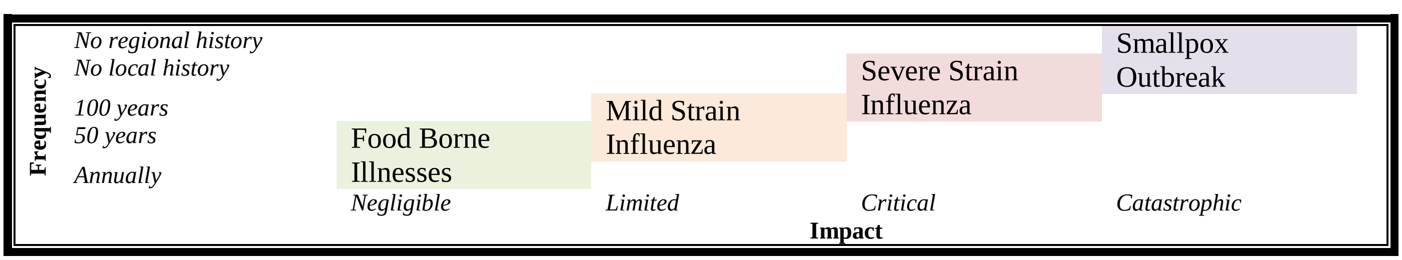
Source: USDA APHIS PPQ, 2013

5. Pale and/or Golden potato cyst nematodes (PCN): *Globodera pallidia* (pale cyst nematode) and *Globodera rostenciensis* (golden nematode) is a regulatory significant nematode pest of potato. A national survey was initiated after the 2006 discovery of cysts in Idaho. To date, it has 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 potato cyst nematodes (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 Canadafacilitating the movement of seed potatoes across the US border. North Dakota participated in the National PCN Survey. A total of 1,018 samples were collected in the spring and 2,627 samples were collected in the fall of 2012. No *Globodera* species detected.

5.1.4. Probability and Magnitude

Figure 5.5 is a graphical representation of the range of events that can occur within the disease hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the communicable disease hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.5. Hazard Frequency and Impact Ranges



Quantifying the probability of a human epidemic affecting North Dakota presents challenges due to a limited history of outbreaks. Medical 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.

Approximately three human influenza pandemics have occurred over the past 100 years with one, the 1918 pandemic, severely affecting the United States. Animal and plant disease outbreaks are even harder to predict. Most global livestock diseases have been confined to specific countries due to strict import regulations.

The magnitude of a communicable disease outbreak varies from every day disease occurrences to widespread infection. During the 1918 Influenza Pandemic, infection rates approached 28 percent in the United States. (Billings, 1997) Other pandemics produced infections rates as high as 35percent of the total population. (World Health Organization, 2010) Such a pandemic affecting North Dakota represents a severe magnitude event. Almost any highly contagious, incapacitating disease that enters the North Dakota population would quickly overwhelm local and state health resources. Similarly, any rapidly spreading bioterrorism event for which little vaccination or containment capability exists is a high magnitude event.

Many of the diseases such as diphtheria, tetanus, and polio that have the potential to result in serious outbreaks are preventable through routine vaccination. Vaccination is so effective that each vaccination actually saves substantially more money than it costs. In parts of the world where vaccination rates are low, these diseases continue to take a high toll in death and disability.

The North Dakota Department of Health monitors the rate of vaccination among children, specifically the percentage of children completing the 4:3:1:3:3:1:1 vaccination series at age 2 years. Vaccination rates have been rising slowly since 2007. Although better than US rates for this indicator, the coverage rate is below the target of 90 percent. In 2011, the rate of vaccination for North Dakota children was 82.8 percent and 72.7 percent nationally. Achieving high vaccination levels among two year olds is dependent on the cooperation of parents. Different parents have different reasons for not vaccinating their children. For instance, even though the risks associated with vaccination are far below the risk of serious illness if a child is not vaccinated, some parents remain reluctant to vaccinate their children due to anxiety about serious adverse effects. But serious reactions to childhood vaccination are very rare. Other parents don't perceive vaccination to be a high priority, partly because vaccine preventable diseases are relatively uncommon. Consequently, parents who don't vaccinate their children are in essence depending on the vaccination of other children to protect their child from getting vaccine preventable diseases.

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. Most disease outbreaks that cause catastrophic numbers of deaths are infectious in nature, meaning that they are spread from person to person. The key to reducing the catastrophic nature of the event is to stop the spread of disease. This is generally done in three ways: (1) identification and isolation of the ill, (2) quarantine of those exposed to the illness to prevent further spread, and (3) education of the public about methods to prevent transmission. The public health and health care providers in North Dakota routinely utilize all three methods to reduce morbidity and mortality from infectious disease. However, 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 in order 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. Because of these limitations in personnel, facilities, and equipment, the health care community is planning to utilize "social distancing" measures. These measures which could include closure of schools, day cares and other public events would have far-reaching economic impacts on communities and might shutdown facilities for 30 days or more. Closure of the day cares or schools would have a serious impact on the economy as parents might not be able to find child care elsewhere.

5.1.5. State Risk Assessment

Vulnerability Overview

The most significant impacts of communicable disease are to the population affected and the healthcare organizations involved. Disease can spread rapidly through schools, health facilities, and communities. The entire state population plus visitors are at risk to contracting a communicable disease that surfaces in North Dakota. Although infectious diseases are not subject to geographic boundaries, several populations in North Dakota are specifically at higher risk to infectious diseases. Communicable diseases are most likely to spread quickly in institutional settings such as dormitories, long-term care facilities, day care facilities, schools, correctional institutions, etc. The number of infections and fatalities in the state depends on the transmission and mortality rates. The statewide economy relies heavily on the agriculture, health care, travel, and utility industries, and therefore, human or livestock diseases would negatively affect the economy. With respect to human diseases, 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 that 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.

Human Disease

The entire state is vulnerable to a major disease outbreak. As evidenced by annual infectious disease reports and reports of investigations completed by the North Dakota Department of Health, many counties experience one or multiple disease outbreaks each year. Potential casualty losses are anticipated to be greatest in counties with higher populations, higher pediatric populations and higher elderly populations as well as larger populations living in group quarters. **Table 5.12** provides data from the 2010 census regarding total populations, populations under age 5, over age 65 and living in group quarters.

Table 5.12. 2010 Census Data for Population, Under Age 5, Over Age 65 and in Group Quarters.

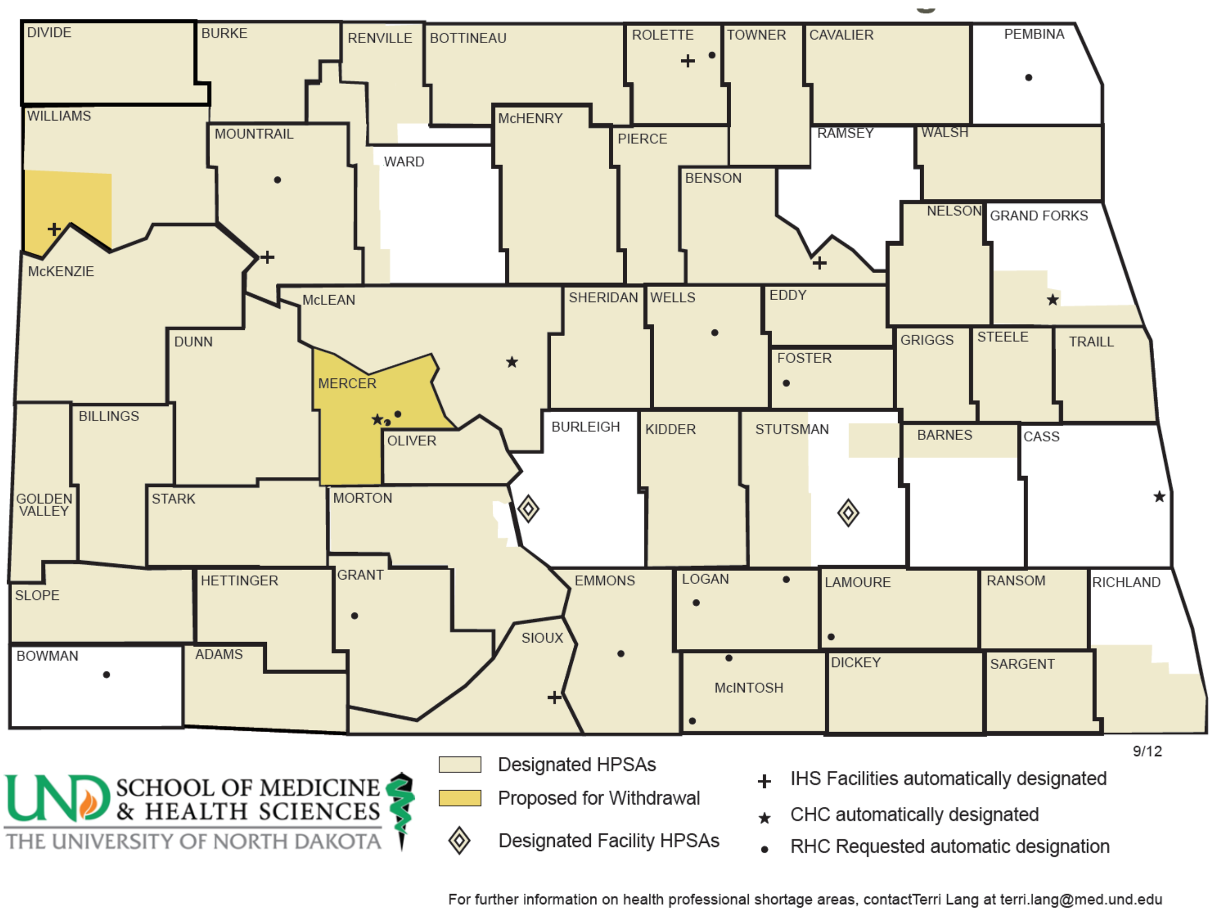
	Total Population 2010	Under Age 5 2010	% Under Age 5 2010	Over Age 65 2010	% Over 65 2010	Total population - In group quarters 2010	% Total population - In group quarters 2010
North Dakota	*672,591*	*44,595*	*6.6*	*97,477*	*14.5*	*25,056*	*3.7*
Adams County	2,343	118	5	568	24.2	52	2.2
Barnes County	11,066	582	5.3	2,170	19.6	492	4.4
Benson County	6,660	656	9.8	853	12.8	16	0.2
Billings County	783	41	5.2	151	19.3	9	1.1
Bottineau County	6,429	349	5.4	1,382	21.5	270	4.2
Bowman County	3,151	208	6.6	692	22	82	2.6
Burke County	1,968	116	5.9	412	20.9	2	0.1
Burleigh County	81,308	5,389	6.6	10,913	13.4	2,763	3.4
Cass County	149,778	10,415	7	14,550	9.7	5,010	3.3
Cavalier County	3,993	184	4.6	1,022	25.6	83	2.1
Dickey County	5,289	350	6.6	1,170	22.1	299	5.7
Divide County	2,071	98	4.7	551	26.6	66	3.2
Dunn County	3,536	211	6	616	17.4	127	3.6
Eddy County	2,385	126	5.3	586	24.6	84	3.5
Emmons County	3,550	169	4.8	971	27.4	53	1.5
Foster County	3,343	178	5.3	758	22.7	61	1.8
Golden Valley County	1,680	85	5.1	358	21.3	52	3.1
Grand Forks County	66,861	4,336	6.5	6,903	10.3	4,216	6.3
Grant County	2,394	110	4.6	645	26.9	25	1
Griggs County	2,420	122	5	637	26.3	47	1.9
Hettinger County	2,477	122	4.9	638	25.8	169	6.8
Kidder County	2,435	132	5.4	511	21	0	0
LaMoure County	4,139	218	5.3	1,022	24.7	65	1.6
Logan County	1,990	94	4.7	557	28	72	3.6
McHenry County	5,395	290	5.4	1,118	20.7	48	0.9
McIntosh County	2,809	150	5.3	954	34	103	3.7
McKenzie County	6,360	513	8.1	902	14.2	152	2.4
McLean County	8,962	449	5	1,941	21.7	196	2.2
Mercer County	8,424	472	5.6	1,328	15.8	126	1.5
Morton County	27,471	1,913	7	4,013	14.6	597	2.2
Mountrail County	7,673	510	6.6	1,050	13.7	564	7.4
Nelson County	3,126	134	4.3	858	27.4	80	2.6
Oliver County	1,846	106	5.7	308	16.7	2	0.1

	Total Population 2010	Under Age 5 2010	% Under Age 5 2010	Over Age 65 2010	% Over 65 2010	Total population - In group quarters 2010	% Total population - In group quarters 2010
Pembina County	7,413	416	5.6	1,489	20.1	149	2
Pierce County	4,357	238	5.5	1,029	23.6	261	6
Ramsey County	11,451	733	6.4	2,072	18.1	492	4.3
Ransom County	5,457	304	5.6	1,084	19.9	185	3.4
Renville County	2,470	132	5.3	502	20.3	54	2.2
Richland County	16,321	1,029	6.3	2,424	14.9	986	6
Rolette County	13,937	1,411	10.1	1,398	10	122	0.9
Sargent County	3,829	207	5.4	727	19	37	1
Sheridan County	1,321	44	3.3	396	30	0	0
Sioux County	4,153	475	11.4	294	7.1	44	1.1
Slope County	727	40	5.5	135	18.6	0	0
Stark County	24,199	1,496	6.2	3,875	16	909	3.8
Steele County	1,975	101	5.1	441	22.3	0	0
Stutsman County	21,100	1,179	5.6	3,618	17.1	1,733	8.2
Towner County	2,246	106	4.7	552	24.6	43	1.9
Traill County	8,121	510	6.3	1,521	18.7	362	4.5
Walsh County	11,119	681	6.1	2,237	20.1	332	3
Ward County	61,675	4,794	7.8	8,026	13	2,685	4.4
Wells County	4,207	207	4.9	1,221	29	119	2.8
Williams County	22,398	1,546	6.9	3,328	14.9	560	2.5

Source: U.S. Census Bureau, 2010 Decennial Census

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. **Figure 5.6** below shows the Health Professional Shortage Areas in North Dakota. The percentage of uninsured North Dakotans for 2009 was 11 percent compared to 17 percent nationally according to the North Dakota Department of Human Services.

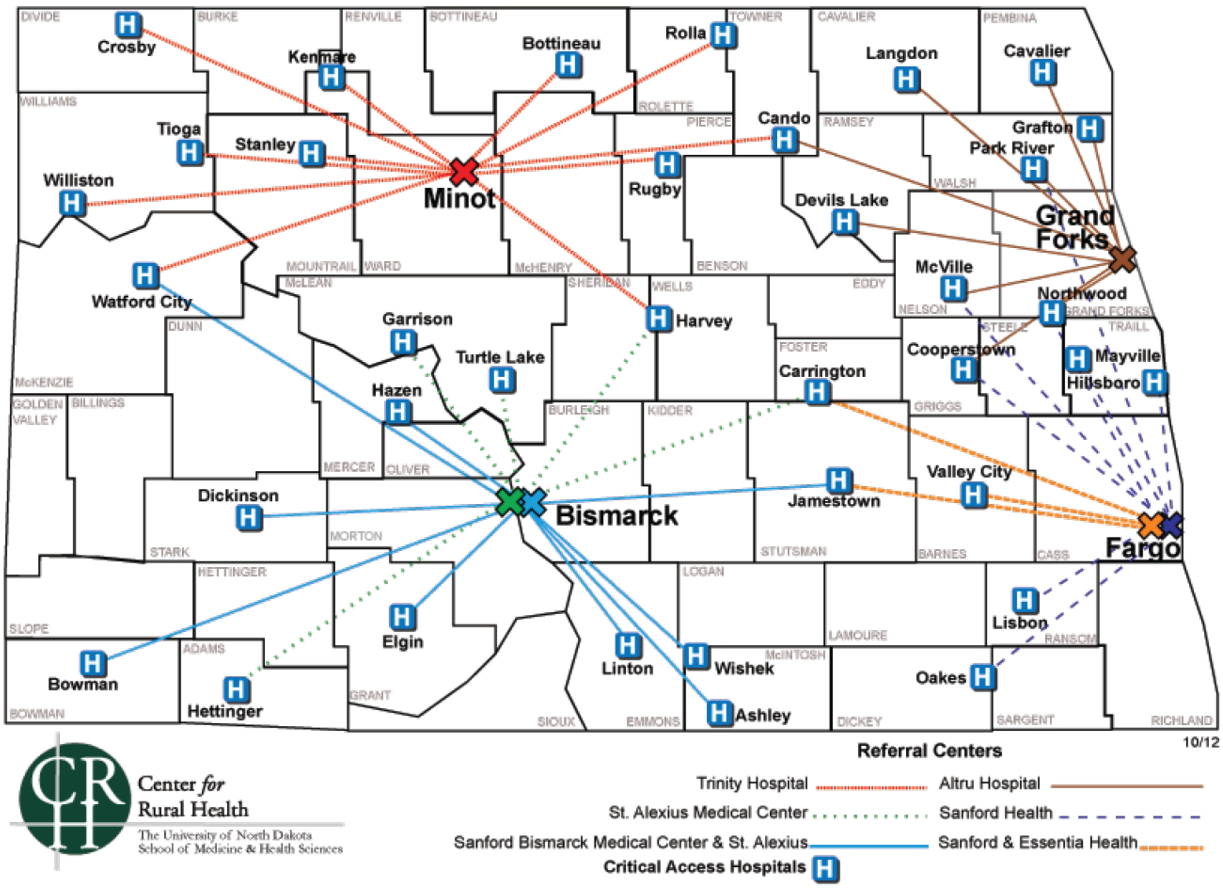
Figure 5.6. North Dakota Health Professional Shortage Areas



Source: University of North Dakota School of Medicine and Health Sciences, 2012a

Populations in outlying rural areas are often served by larger metropolitan areas with respect to medical care needs. **Figure 5.7** below shows the location of Critical Access Hospitals (25 beds of less) and their referring hospitals.

Figure 5.7. North Dakota Critical Access Hospitals and Referral Centers



Source: University of North Dakota School of Medicine and Health Sciences, 2012b

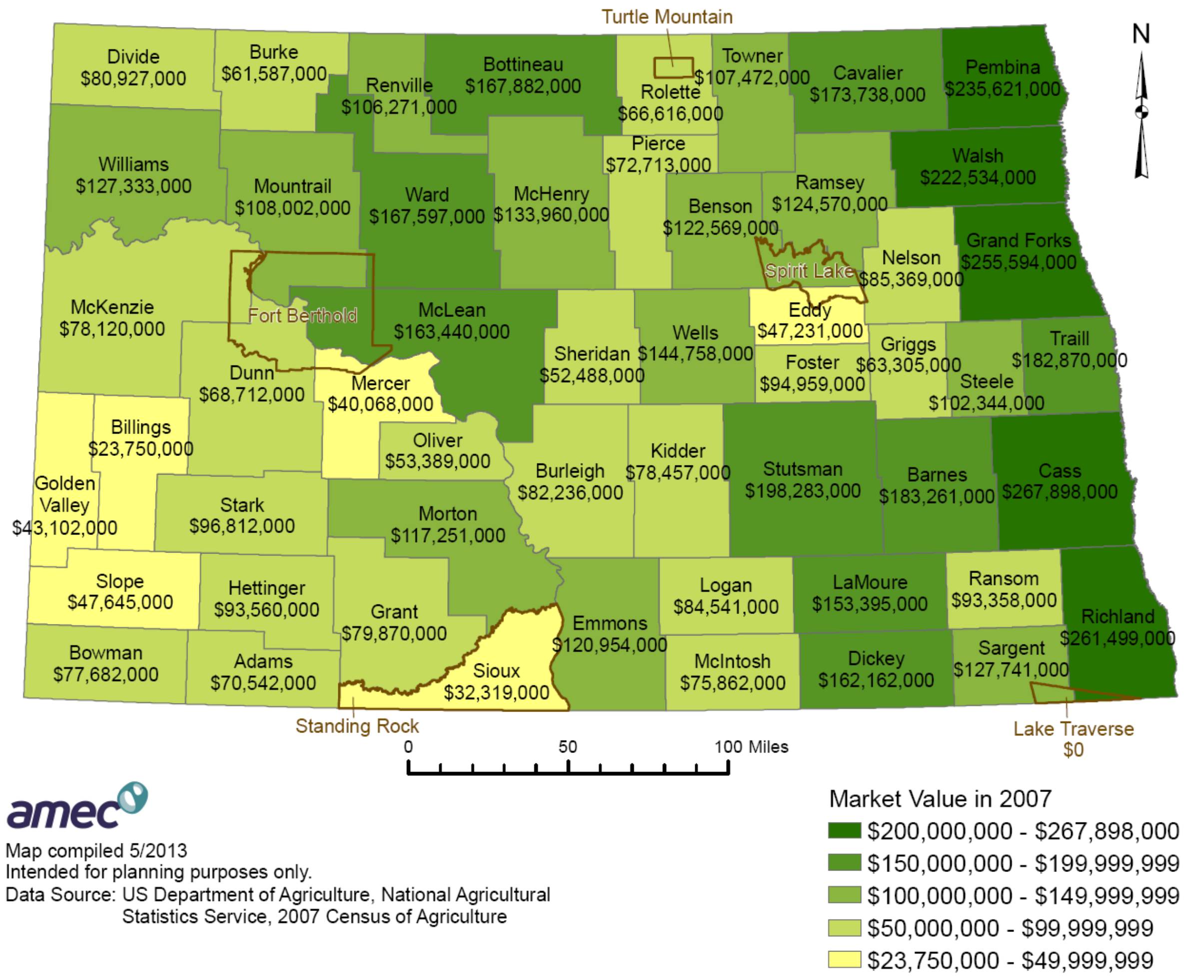
NDDoH and its medical partners have most of the anticipated materials needed for biological response. These materials are stored in a warehouse supported by an internal transportation which can be supplemented by contract or by assistance request to DES. Some materials are pre-deployed around the state. The list of items in the NDDoH is extensive and available to authorized viewers by request. NDDoH has well developed management systems at both the general procedural level and the technical IT level. The state health care system is of high quality but depends on a range of institutions from moderately large to quite small. The small rural system is highly dependent on the referral of patients to major medical centers for many types of problems. Not all small local hospitals have 24 hour emergency rooms and the level of staffing expertise of emergency rooms varies. The capacity for managing infectious diseases, that is, achieving optimal outcomes and protecting workers and patients from disease transmission, is highly developed and well exercised.

Although the private health care system works well with NDDoH, it is not under the direct authority of NDDoH except for licensure. Nonetheless, NDDoH has had exceptional success managing the health care system as a single statewide, inter-dependent system. The Emergency Medical System (EMS) in rural areas is very fragile. It is almost entirely volunteer in those areas and the capacity depth is shallow; that is, loss of a few persons could shut down the system. The health care system is highly dependent on EMS not only for field response, recovery and transport, but for movement of more severely ill persons to higher levels of care at regional medical centers. The overall capacity of the health care system is finite.

Animal Disease

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. A communicable livestock disease would negatively affect the agricultural economy and could also limit food supplies. The market value of crop sales in 2007 totaled over $5 billion and depending on the crop affected, severe crop losses could be seen, having a trickle-down effect on the agricultural feed supply(US Department of Agriculture, 2007). **Figure 5.8** provides a statewide map showing the market value of agricultural products sold (both livestock and crops) from the 2007 Census of Agriculture.

Figure 5.8. Market Value of Agricultural Products Sold, 2007



Plant Disease

According to the 2007 Census of Agriculture, North Dakota had 31,970 farms covering 39.7 million acres with annual cash receipts totaling over $6 billion in 2007. Additionally, should a disease be especially severe for a particular species, that species could be eradicated from the state resulting in ecologic imbalances.

Loss Estimates

Human Disease

According to *The annual impact of seasonal influenza in the US: Measuring disease burden and costs* by Molinari et al., nationally the economic burden of influenza medical costs, medical costs plus lost earnings, and the total economic burden were $10.4 billion, $26.8 billion and $87.1 billion respectively. The financial burden of healthcare-associated infections nationally has been estimated at $33 billion annually. 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 North Dakota Department of Health's Pandemic Influenza Planning includes the following vulnerability estimates. 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, in North Dakota:

- 192,660 persons would become ill and may require outpatient care
- 1,541 persons may require hospitalization
- 385 individuals may die

The majority of these deaths, hospitalizations, etc would occur in more highly populated counties. Using these CDC estimates, the statewide losses are described in **Table 5.13. Table 5.14** that follows provides potential losses by county.

Table 5.13. Medium-level Pandemic Potential Losses in North Dakota, Statewide

Statewide	Number	Dollar Loss per day/visit	Source of Data
Illness	192,660	$15,798,120 (one visit per ill person)	Estimate of $85 per visit for out of pocket expenses related to co-pays for physician visit, laboratory and prescription drugs
Hospitalization	1,541	$2,219,040 per DAY	Kaiser State Health facts Average cost per inpatient day in 2010. North Dakota private hospitals - $1440/day
Deaths	385	$ 3,272,500 per DEATH	Headstones.usa Average cost of a funeral in North Dakota is $8,500.

Source: North Dakota Department of Health, Pandemic Flu Loss Estimates

Table 5.14. Medium-level Pandemic Potential Losses in North Dakota, by County

	Population	Ill	Hospitalized	Deaths
North Dakota	642,200	192,660	1,541	385
Adams	2,593	908	25	7
Barnes	11,775	4,121	115	33
Benson	6,964	,2437	68	19
Billings	888	311	9	2
Bottineau	7,149	,2502	70	20
Bowman	3,242	1,135	32	9
Burke	2,242	785	22	6
Burleigh	69,416	24,296	680	194
Cass	123,138	43,098	1,207	345
Cavalier	4,831	1,691	47	14
Dickey	5,757	,2015	56	16

	Population	Ill	Hospitalized	Deaths
Divide	2,283	799	22	6
Dunn	3,600	1,260	35	10
Eddy	2,757	965	27	8
Emmons	4,331	1,516	42	12
Foster	3,759	1,316	37	11
Golden Valley	1,924	673	19	5
Grand Forks	66,109	23,138	648	185
Grant	2,841	994	28	8
Griggs	2,754	964	27	8
Hettinger	2,715	950	27	8
Kidder	2,753	964	27	8
LaMoure	4,701	,1645	46	13
Logan	2,308	808	23	6
McHenry	5,987	2,095	59	17
McIntosh	3,390	1,187	33	9
McKenzie	5,737	2,008	56	16
McLean	9,311	3,259	91	26
Mercer	8,644	3,025	85	24
Morton	25,303	8,856	248	71
Mountrail	6,631	2,321	65	19
Nelson	3,715	1,300	36	10
Oliver	2,065	723	20	6
Pembina	8,585	3,005	84	24
Pierce	4,675	1,636	46	13
Ramsey	12,066	,4223	118	34
Ransom	5,890	2,062	58	16
Renville	2,610	914	26	7
Richland	17,998	6299	176	50
Rolette	13,674	4,786	134	38
Sargent	4,366	1,528	43	12
Sheridan	1,710	599	17	5
Sioux	4,044	1,415	40	11
Slope	767	268	8	2
Stark	22,636	7,923	222	63
Steele	2,258	790	22	6
Stutsman	21,908	7,668	215	61
Towner	2,876	1,007	28	8
Traill	8,477	2,967	83	24
Walsh	12,389	4,336	121	35
Ward	58,795	20,578	576	165
Wells	5,102	1,786	50	14
Williams	19,761	6,916	194	55

Source: North Dakota Department of Health, Pandemic Flu Loss Estimates

Additionally, the U.S. Centers for Disease Control and Prevention (CDC) estimates 76 million people suffer foodborne illnesses each year in the United States, accounting for 325,000 hospitalizations and more than 5,000 deaths. Foodborne disease is extremely costly. Health experts estimate that the yearly cost of all foodborne diseases in this country is $5 to $6 billion in direct medical expenses and lost productivity. Infections with the bacteria *Salmonella* alone account for $1 billion yearly in direct and indirect medical costs.

Animal Disease & Plant Disease

It is difficult to estimate losses to Animal and Plant Disease due to the variables involved. **Table 5.15** provides potential loss estimates if disease resulted in 20 percent loss to crops and livestock.

Table 5.15. Loss Estimates for Crop and Livestock Disease

County	Value of Crops	20% crop loss	Mkt Value of Livestock, poultry & their products	20% livestock /product loss
Adams	$39,246,000	$7,849,200	$31,296,000	$6,259,200
Barnes	$172,501,000	$34,500,200	$10,760,000	$2,152,000
Benson	$108,039,000	$21,607,800	$14,530,000	$2,906,000
Billings	$7,264,000	$1,452,800	$16,486,000	$3,297,200
Bottineau	$158,991,000	$31,798,200	$8,891,000	$1,778,200
Bowman	$35,079,000	$7,015,800	$42,603,000	$8,520,600
Burke	$55,256,000	$11,051,200	$6,331,000	$1,266,200
Burleigh	$50,682,000	$10,136,400	$31,554,000	$6,310,800
Cass	$252,192,000	$50,438,400	$15,706,000	$3,141,200
Cavalier	$171,319,000	$34,263,800	$2,419,000	$483,800
Dickey	$124,459,000	$24,891,800	$37,703,000	$7,540,600
Divide	$73,992,000	$14,798,400	$6,935,000	$1,387,000
Dunn	$31,384,000	$6,276,800	$37,328,000	$7,465,600
Eddy	$38,658,000	$7,731,600	$8,573,000	$1,714,600
Emmons	$86,729,000	$17,345,800	$34,225,000	$6,845,000
Foster	$75,607,000	$15,121,400	$19,352,000	$3,870,400
Golden Valley	$26,832,000	$5,366,400	$16,270,000	$3,254,000
Grand Forks	$233,477,000	$46,695,400	$22,117,000	$4,423,400
Grant	$47,085,000	$9,417,000	$32,785,000	$6,557,000
Griggs	$56,624,000	$11,324,800	$6,681,000	$1,336,200
Hettinger	$83,684,000	$16,736,800	$9,876,000	$1,975,200
Kidder	$46,750,000	$9,350,000	$31,707,000	$6,341,400
La Moure	$123,335,000	$24,667,000	$30,060,000	$6,012,000
Logan	$39,574,000	$7,914,800	$44,967,000	$8,993,400
McHenry	$90,288,000	$18,057,600	$43,672,000	$8,734,400
McIntosh	$49,985,000	$9,997,000	$25,877,000	$5,175,400
McKenzie	$50,115,000	$10,023,000	$28,005,000	$5,601,000
McLean	$145,847,000	$29,169,400	$17,593,000	$3,518,600
Mercer	$24,622,000	$4,924,400	$15,446,000	$3,089,200
Morton	$60,803,000	$12,160,600	$56,448,000	$11,289,600
Mountrail	$92,746,000	$18,549,200	$15,256,000	$3,051,200
Nelson	$77,333,000	$15,466,600	$8,036,000	$1,607,200
Oliver	$24,326,000	$4,865,200	$29,063,000	$5,812,600
Pembina	$229,298,000	$45,859,600	$6,323,000	$1,264,600

County	Value of Crops	20% crop loss	Mkt Value of Livestock, poultry & their products	20% livestock /product loss
Pierce	$58,702,000	$11,740,400	$14,011,000	$2,802,200
Ramsey	$122,100,000	$24,420,000	$2,470,000	$494,000
Ransom	$72,103,000	$14,420,600	$21,255,000	$4,251,000
Renville	$103,034,000	$20,606,800	$3,237,000	$647,400
Richland	$228,812,000	$45,762,400	$32,687,000	$6,537,400
Rolette	$52,837,000	$10,567,400	$13,779,000	$2,755,800
Sargent	$104,365,000	$20,873,000	$23,376,000	$4,675,200
Sheridan	$43,742,000	$8,748,400	$8,746,000	$1,749,200
Sioux	$11,148,000	$2,229,600	$21,171,000	$4,234,200
Slope	$31,423,000	$6,284,600	$16,222,000	$3,244,400
Stark	$63,674,000	$12,734,800	$33,138,000	$6,627,600
Steele	$99,946,000	$19,989,200	$2,398,000	$479,600
Stutsman	$168,570,000	$33,714,000	$29,713,000	$5,942,600
Towner	$96,333,000	$19,266,600	$11,139,000	$2,227,800
Traill	$177,193,000	$35,438,600	$5,677,000	$1,135,400
Walsh	$218,090,000	$43,618,000	$4,444,000	$888,800
Ward	$153,487,000	$30,697,400	$14,110,000	$2,822,000
Wells	$132,852,000	$26,570,400	$11,906,000	$2,381,200
Williams	$115,992,000	$23,198,400	$11,341,000	$2,268,200
Total	$5,038,525,000	$1,007,705,000	$1,045,694,000	$209,138,800

5.1.6. Local Risk Assessments

Table 5.16 provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding communicable disease vulnerability and/or estimated losses. As indicated in the Communicable Disease Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. Another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.16. Communicable Disease Risk Summary from Local Plans

County	Communicable Disease Hazard Rating	Communicable Disease Additional Information
Adams	NI	
Barnes	C	
Benson	C	2,437 cases, 487 fatalities
Billings	NI	
Bottineau	B	
Bowman	B	
Burke	NI	

County	Communicable Disease Hazard Rating	Communicable Disease Additional Information
Burleigh	NI	
Cass	NI	
Cavalier	NL	
Dickey	NI	
Divide	NP	
Dunn	NI*	
Eddy	B	
Emmons	A	
*Fort Berthold^*	*CPRI 2.8 / 2.5***	
Foster	B	
Golden Valley	NI	
Grand Forks	B	4,689 fatalities; 23,444 infections
Grant	NI	
Griggs	NI	
Hettinger	A	
Kidder	NI	
*Lake Traverse^*	*NP*	
LaMoure	#4 of 12	
Logan	NL	
McHenry	D	
McIntosh	NI	
McKenzie	NP*	
McLean	NL*	
Mercer	A	
Morton	NI	
Mountrail	NI*	
Nelson	NL*	
Oliver	NI	
Pembina	NL	
Pierce	NI	
Ramsey	C*	783 fatalities; 3,916 infections
Ransom	Medium	
Renville	B	
Richland	NI*	
Rolette	C	
Sargent	NI*	
Sheridan	NP	
Sioux	*Somewhat Likely*	
Slope	B	
Spirit Lake	Moderate	
*Standing Rock^*	*Somewhat Likely*	
Stark	NP	
Steele	NP	
Stutsman	D	
Towner	C	
Traill	B	
Turtle Mountain^	NI	
Walsh	B	
Ward	NI*	
Wells	B	
Williams	NI	

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; * includes at least part of the reservation population; ** Pandemic Outbreak / Pestilence; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.1.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

Vulnerabilities from communicable disease are not to the structures themselves but rather to the occupants. In some instances, the accessibility and functionality of a facility can be compromised. Contamination of a state-owned building could render the facility unusable until it is decontaminated or the threat has passed. Should a building become contaminated by some disease agent, clean up costs and the loss of use of the building could result. Such costs could be significant. 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. (US General Accounting Office, 2003) For this reason, all state-owned buildings are assumed to be at some risk from communicable disease.

The structural integrities of critical facilities in North Dakota are not threatened by communicable disease. Similar to state-owned buildings, should a facility become contaminated, clean-up costs could be expensive. 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. Diseases can spread quickly in special needs facilities such as schools, colleges, universities, and assisted living. Often these facilities, as well as the hospitals and medical clinics, are the first places where diseases are identified and treated.

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.

5.1.8. Development in Identified Hazard Areas

Buildings, infrastructure, and critical facilities are not vulnerable to this hazard. It affects only persons susceptible to the illness. The impacts and potential losses are largely economic and are dependent on the type, extent, and duration of the illness. As the population of North Dakota ages, the vulnerability to this hazard is likely to increase, similarly, as additional people move to the state due to the growing oil and gas industry, exposure to this hazard is likely to increase.

5.1.9. Data Limitations and Other Key Documents

One of the keys to decreasing loss due to communicable disease is the stop of the spread of the disease. Disease 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 the Communicable Disease hazard include:

- North Dakota Department of Health, Pandemic Influenza Plan
- North Dakota Department of Health, Public Health & Medical All-Hazards Plan
- North Dakota Department of Health, Specific Disease Agent Plans
- North Dakota Department of Agriculture, Foreign Animal Disease Plan
- North Dakota Emergency Operations Plan, Animal Health Annex
- North Dakota Emergency Operations Plan, Infectious Diseases Annex
- North Dakota Emergency Operations Plan, Plant Health Annex

5.2. Dam Failure

Hazard Rating	THIRA Threat/Hazard Group
Low	Natural/Technological

5.2.1. 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, the Dam Safety Program is administered by the North Dakota State Water Commission.

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 the North Dakota Dam Design Handbook (North Dakota State Engineer, June 1985, page 3):

- 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 located 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.

According to the North Dakota State Water Commission, as of April 2013, there were 3,051 dams in North Dakota's dam inventory. Of these, 44 dams are classified as high hazard and 90 are classified as medium hazard. The remaining 2,917 are classified as low hazard or undetermined hazard. As this update to the State Hazard Mitigation Plan was being developed, the State Water Commission was in the midst of an effort to review and update the hazard classifications of those dams classified as medium hazard to see if downstream development warrants reclassification as high hazard dams, or if any of the dams should be reclassified as low hazard. This effort will be completed prior to the next update of the State Hazard Mitigation Plan. Any changes to dam classifications will be updated at that time.

Table 5.17 provides an inventory of the high hazard dams listed alphabetically by county. **Table 5.18** that follows provides the number of high and medium hazard dams by owner type.

Table 5.17. Inventory of High Hazard Dams in North Dakota by County

County	Dam Name	Owner Name	Owner Type
Barnes	Baldhill Dam	US Corps Of Engineers	Federal
Barnes	Clausen Springs Dam	Barnes Co WRD	Local
Benson	Spirit Lake Bia 4 North	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Bia 4 South	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Bia 5	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Jetty 1	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Jetty 2	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Kurtz Dam	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake Spring Lake	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake St. Michael 1	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake St. Michael 2	US Bureau Of Indian Affairs	Federal
Benson	Spirit Lake St. Michael 3	US Bureau Of Indian Affairs	Federal
Bowman	Bowman-Haley Lake	US Corps Of Engineers	Federal
Burleigh	Jackman Coulee Dam 2	City Of Bismarck	Local
Cass	Hunter Dam	City Of Hunter	Local
Cass	Maple River Dam	Cass County Joint WRD	Local
Cass	Maple River Dam (T-180)	Maple River WRD	Local
Cavalier	Senator Young Dam	Pembina Co WRD	Local
Dunn	Lake Ilo	US Fish & Wildlife	Federal
Golden Valley	Beach Dam	City Of Beach	Local
Grand Forks	English Coulee Dam	Grand Forks Co WRD	Local
Grand Forks	Upper Turtle R.Fld.Ret.#9	Grand Forks Co WRD	Local
Grant	Heart Butte Dam	US Bureau Of Reclamation	Federal
Hettinger	Mott Watershed Dam	Hettinger Co WRD	Local
McLean	Garrison Dam	Us Corps Of Engineers	Federal
Mercer	Beulah Flood Control Dam	City Of Beulah	Local
Morton	Sweetbriar Creek Dam	ND Game & Fish Dept, Morton Co Park Board	State
Oliver	Nelson Lake Dam	Minnkota Power Inc.	Public Utility
Oliver	Square Butte Creek Dam 5	Oliver & Morton Co WRD	Local
Pembina	Olson Dam	Pembina Co WRD	Local
Pembina	Renwick Dam	Pembina Co WRD	Local
Ramsey	Acorn Ridge	City Of Devils Lake	Local
Rolette	Belcourt Lake	US Bureau Of Indian Affairs	Federal
Rolette	Gordon Lake Dam	US Bureau Of Indian Affairs	Federal
Sioux	Prairie Dam #1	US Bureau Of Indian Affairs	Federal
Stark	Dickinson Dam	US Bureau Of Reclamation	Federal
Stutsman	Jamestown Dam	US Bureau Of Reclamation	Federal
Stutsman	Pipestem Dam	US Corps Of Engineers	Federal
Walsh	Bylin Dam	Walsh Co WRD	Local
Walsh	Homme Reservoir	US Corps Of Engineers	Federal
Walsh	Matejcek Dam	Walsh Co WRD	Local
Ward	Lake Darling (Up Souris Nwr)	US Fish & Wildlife	Federal
Williams	Mcgregor Dam	ND Game & Fish Dept	State
Williams	Tioga Dam	City Of Tioga	Local

Source: North Dakota State Water Commission, 2013

Table 5.18. Number of High and Medium (Significant) Hazard Dams by Owner Type

Owner Types	# of High Hazard Dams	# of Medium Hazard Dams	Total
Federal	23	1	24
Local	18	70	84
Public Utility	1	0	1
Private	0	9	9
State	2	10	12
Total	44	90	134

Source: North Dakota State Water Commission, 2013

There are many potential causes for dam failure including hydrologic inadequacy, seepage related issues, structural problems, mechanical problems, operational errors, earthquakes, and terrorism. The causes behind a dam failure can be interrelated and complex. 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 30 seismic monitoring stations throughout the state. Some have claimed that the microseismic events triggered by hydraulic fracturing are a concern. However, according to a Stanford University geophysicist, the amount of energy released by a microseismic event is roughly equivalent to the amount of energy released by a can of soda when it is dropped to the floor from about waist height (source: *World's Largest Buried Microseismic Array* by Fred J. Anderson, Geo News, July 2010).

The most common causes of dam failure are hydrologic inadequacy and seepage related issues.

Hydrologic Failures

Hydrologic failures are typically associated with flood events. A hydrologic failure may occur due to dam overtopping or excessive spillway erosion. A dam can be overtopped during a flood event due to insufficient reservoir storage and insufficient spillway capacity. Earthen dams are particularly susceptible to failure when overtopped since earthen material may erode relatively easily. Some dams have an earthen auxiliary spillway designed to carry excess flows during a flood event. Since these are earthen spillways, some erosion can be expected, but under the right conditions excessive erosion can occur. (North Dakota State Water Commission, 2007)

Seepage Failures

All dams have some seepage occurring through the structure and foundation. Seepage, if uncontrolled, can erode material from the embankment of an earthen dam and lead to complete failure of the dam. Piping is a special seepage problem where erosion starts at the point where seepage is exiting the downstream slope or foundation, then works backwards toward the upstream slope. Internal erosion, another type of seepage failure, occurs when water flowing through the dam causes erosion along a crack in the embankment or foundation, or along some other discontinuity or preferential flow path in the embankment, such as along a spillway conduit. Tree roots and animal burrows can also provide paths for seepage. Seepage failures can occur during the course of normal operations, but can also occur during flood conditions when reservoir levels are abnormally high. (North Dakota State Water Commission, 2007)

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. Any new dam should be designed to meet current dam safety standards, and should be designed in accordance with current best practices in dam design. 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. 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 4 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 in **Table 5.17** 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.

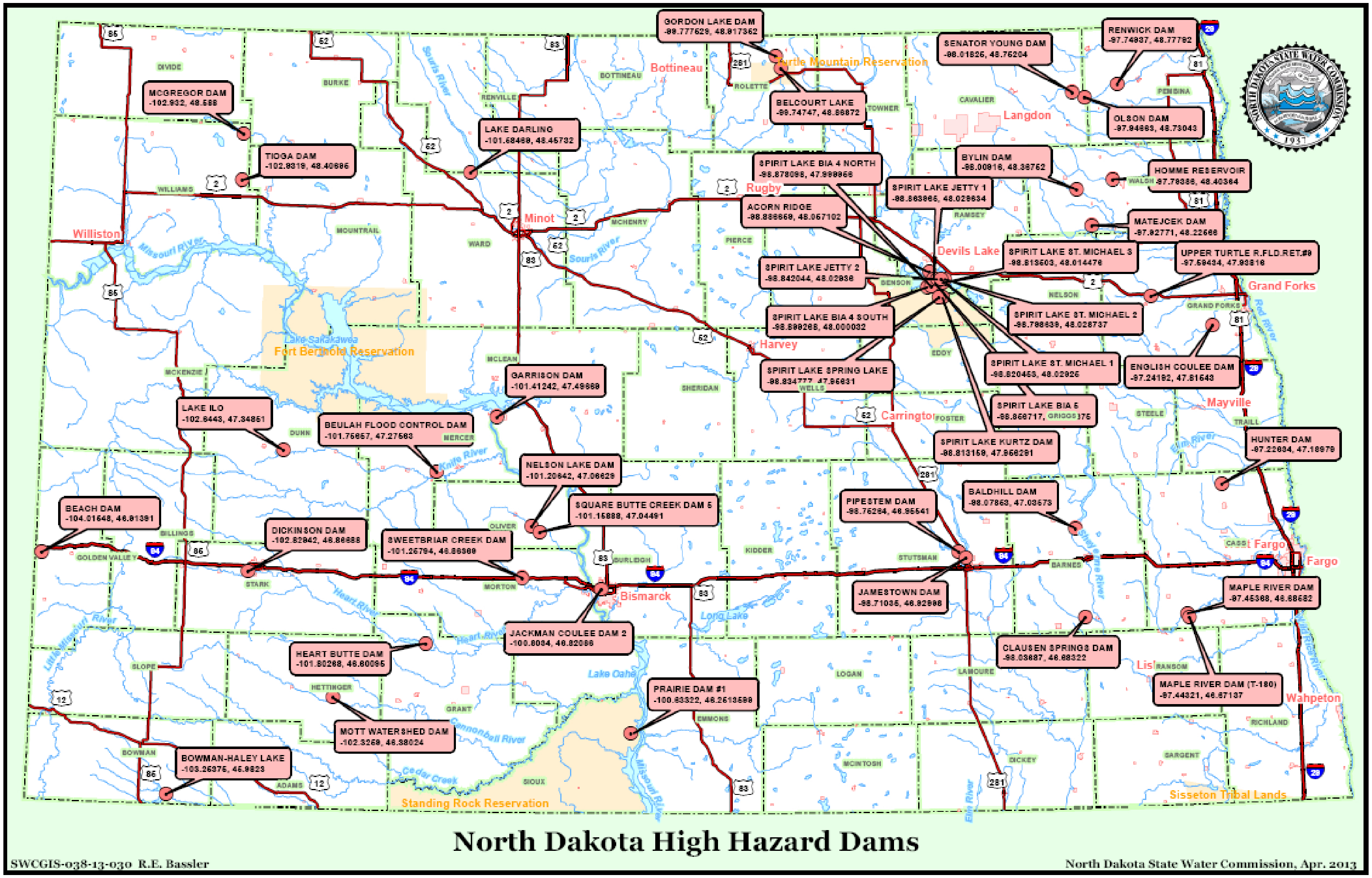
The Spirit Lake Nation has several perimeter dams and roads that were constructed as dams throughout the reservation. These dams are not built to their ultimate elevation. Additional money is needed to get those perimeter dams to their ultimate elevations.

Despite extensive dam safety laws and a regular inspection schedule, problems can still occur with dams in North Dakota.

5.2.2. Geographic Location

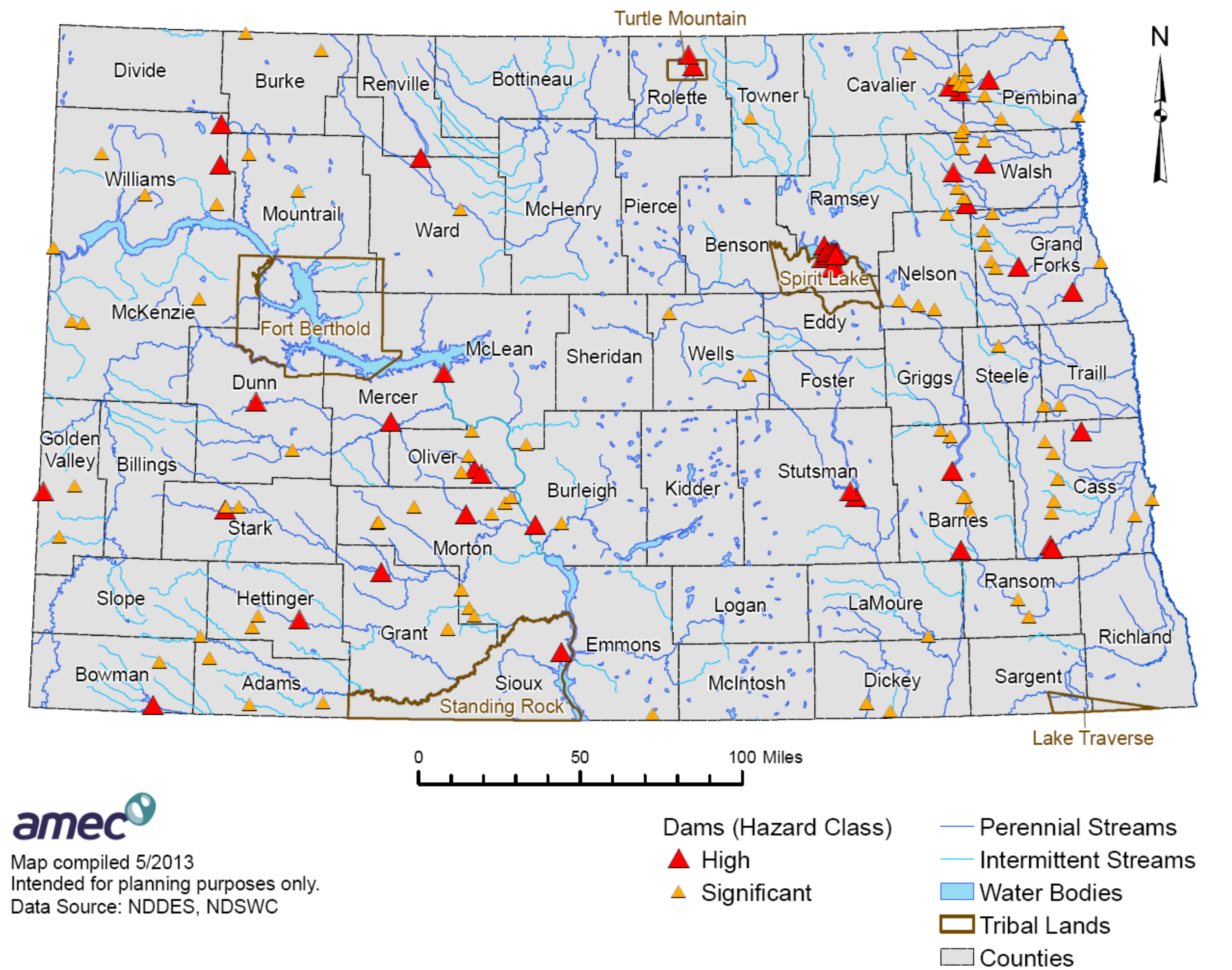
Figure 5.9 shows the locations of the high hazard dams in North Dakota and **Figure 5.10** provides the locations of both high and medium hazard dams. Note that the National Inventory of Dams refers to medium hazard dams as "significant" hazard dams.

Figure 5.9. High Hazard Dams in North Dakota



Source: North Dakota State Water Commission

Figure 5.10. North Dakota High and Medium (Significant) Hazard Dams



5.2.3. Previous Occurrences

There were no failures of high or medium hazard dams within the last five years. However, there was threat of failure of dams in 2009, 2011 and 2013 and some dams did sustain significant damage due to flooding in the springs of 2009, 2010, and 2013.

Additional details related to some of these incidents are provided below. Note that this list is not all-inclusive, and many other small dams were damaged by these flood events as well.

- **May 2013:** Due to concerns with the Renwick Dam in Cavalier County, the City of Cavalier and Pembina County issued a mandatory evacuation order for Cavalier as well as areas in the county between Renwick Dam and the city.
- **May 2013:** Several dams in Pembina and Cavalier Counties experienced record high reservoir levels an several experienced flow through their auxiliary spillways for the first time in their history. Olson Dam in Pembina County and Bourbanis Dam in Cavalier County each had damage to their auxiliary spillways caused by the flooding
- **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 US Army Corps of Engineers,
- **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.

Another source consulted from previous incidents was the Stanford University National Performance of Dams Program (NPDP). In recent years, the NPDP has been replaced by the Significant Incident Reporting Database (SIR), through the Department of Homeland Security. However, the SIR system is not available for search and retrieval of incident details. According to the NPDP, there were 22 dam incidents in North Dakota captured in the database between 1970 and April 2013 (43 years). However, the most recent incident reported to the NPDP occurred in 2005. This is presumably due to the transfer of reporting to SIR. Of the 22 events in the NPDP, 11 were classified as dam failures. The remaining 11 were either classified as dam incidents or unknown. See **Table 5.19.**

Table 5.19. North Dakota Dam Incidents

Dam Name	Hazard Class	River	Incident Date	Incident Type	Dam Failure
Sheep Creek Dam	Low	Cannonball-Tributary	1970	Not Known	Yes
Enderlin Park Dam	Low	Sheyenne-Maple	Apr-78	Inflow Flood - Hydrologic Event	Yes
Sarnia Dam	Low	Forest-Tributary	Apr-78	Piping	Yes
Simpson Dam; Alvin	Low	Yellowstone-Tributary	7/17/1986	Inflow Flood - Hydrologic Event; Seepage; Piping	Yes
Jund (Zeeland) Dam	N/A	N/A	7/16/1993	Inflow Flood - Hydrologic Event; Biological Attack (i.e., bush, tree growth);Embankment Erosion; Inadequate Spillway Capacity	Yes
Knodle (Hurdsfield) Dam	N/A	N/A	7/22/1993	Inflow Flood - Hydrologic Event; Seepage; Piping	Yes
Knodle (Hurdsfield) Dam	N/A	N/A	7/22/1994	Inflow Flood - Hydrologic Event	Unknown
Pipestem Dam	High	Pipestem Creek	7/25/1994	Slump/Heavy Rains	No
Appert	N/A	West Branch, Long Lake Creek	7/15/1995	Inflow Flood - Hydrologic Event	Yes
Appert	N/A	West Branch, Long Lake Creek	7/15/1995	Inflow Flood - Hydrologic Event; Seepage	Yes
Mount Carmel Dam	Medium	Pembina-Tributary	8/18/1995	Inflow Flood - Hydrologic Event	No
Iverson Dam	N/A	N/A	4/24/1997	Deterioration	No
Vanberkon Dam	N/A	N/A	11/9/1999	Inflow Flood - Hydrologic Event	No
Ut-6	Medium	Tributary of South Branch Turtle River	6/12/2000	Inflow Flood - Hydrologic Event	No
Grand Forks Co. Com. #1	Low	Turle-Tributary	6/12/2000	Inflow Flood - Hydrologic Event	Yes
Upper Turtle R.Fld.Ret.#9	High	Turtle-Tributary	6/12/2000	Inflow Flood - Hydrologic Event	No
Upper Turtle R.Fld.Ret.#5	Low	Turtle-Tributary	6/12/2000	Inflow Flood - Hydrologic Event	No
Ut-8	Medium	Tributary of South Branch Turtle River	6/12/2000	Inflow Flood - Hydrologic Event	No
Ut-7	Medium	Tributary of South Branch Turtle River	6/12/2000	Inflow Flood - Hydrologic Event	No
Greenview Dam	Low	Sheyenne-Tributary	2004	Inflow Flood - Hydrologic Event	Yes
Colt Dam	Low	Knife	7/1/2005	Inflow Flood - Hydrologic Event	Yes
Mount Carmel Dam	Medium	Pembina-Tributary	N/A	Seepage	No

Source: Stanford University's National Performance of Dams Program, http://ce-npdp-serv2.stanford.edu/DamDirectory/DamIncidentQuery/IncidentForm.jsp

5.2.4. Probability and Magnitude

Table 5.20 is a graphical representation of the range of events that can occur within the dam failure hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the dam failure hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Table 5.20. Hazard Frequency and Impact Ranges

Frequency	Negligible	Limited	Critical	Catastrophic
No regional history				High Hazard Dam Complete Failure
No local history			Dam Failure with Some Damages	
100 years				
50 years		Threatened Dam Failure		
Annually				

Impact

The dam failure probability is somewhat low based on a 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 loss of property, services, and even life could result. 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 particular dam. The design and condition of the dam also factors into the probability of failure.

5.2.5. State Risk Assessment

Vulnerability Overview

According to the North Dakota State Water Commission, dam safety related concerns for dams across North Dakota include lack of maintenance, aging dams, funding for repairs, and hazard creep downstream of existing dams.

Currently, dams with a storage capacity greater than 1,000 acre-feet are required to have an Emergency Action Plan, in accordance with the ND Century Code and ND Administrative Code. Of the 90 Medium Hazard Dams, 42 have Emergency Action Plans (EAPs). There is no EAP required for 36 of the Medium Hazard Dams due to their size, leaving 12 that are required to have an EAP, but do not have one. Since the 2011 update to the State Hazard Mitigation Plan, progress has been made relating to Emergency Action Plans (EAP) on file for High hazard dams. In 2011, of High Hazard Dams that required an EAP, seven did not have one. As of April 2013, five dams for which an EAP is required did not have a final version on file. However, of those, four are in progress. There are three dams currently classified as high hazard that by law are not required to have an EAP. The High Hazard dams without final EAPs are listed in **Table 5.21**.

Table 5.21. High Hazard Dams Without an EAP

County	Dam Name	Owner Name	Owner Type	EAP
Mercer	Beulah Flood Control Dam	City Of Beulah	Local	Draft In Progress
Ramsey	Acorn Ridge	City Of Devils Lake	Local	Draft In Progress
Walsh	Bylin Dam	Walsh Co WRD	Local	Draft In Progress
Walsh	Matejcek Dam	Walsh Co WRD	Local	Draft In Progress
Williams	Tioga Dam	City Of Tioga	Local	No
GOLDEN VALLEY	BEACH DAM	CITY OF BEACH	LOCAL	NO - NOT REQUIRED
CASS	HUNTER DAM	CITY OF HUNTER	LOCAL	NO - NOT REQUIRED
BURLEIGH	JACKMAN COULEE DAM 2	CITY OF BISMARCK	LOCAL	NO - NOT REQUIRED

Source: North Dakota State Water Commission, 2013

In total, there are 17 high and medium hazard dams that require an EAP and do not have one. In addition, there are three high hazard dams and 36 medium hazard dams that are not currently required to have an EAP. This is a concern because if a dam without an EAP were to fail, Emergency Management Officials would not have a formal action plan to guide notification and evacuation in the areas that would be inundated.

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, 2 points,
- High Hazard Dams, 3 points,
- High and Medium Hazard Dams without an EAP, an additional 2 points,

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 damages. Additionally, it is recognized that failure of dams can impact adjacent downstream counties. This is a recognized data limitation. Actual inundation areas in a statewide layer would be needed to fully resolve this limitation. **Table 5.22** provides the results of the dam failure vulnerability analysis and **Figure 5.11** displays these results in a statewide thematic map.

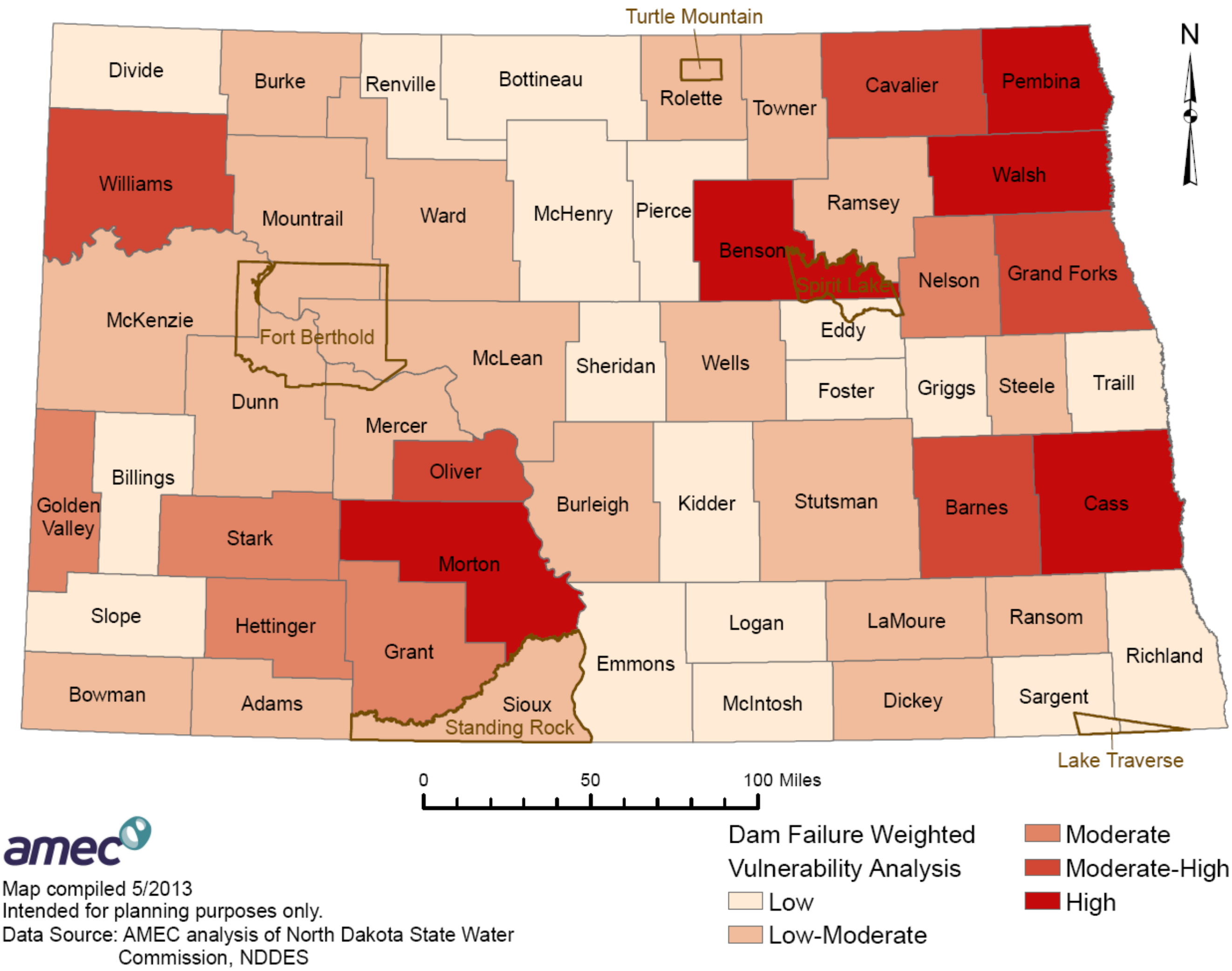
Table 5.22. Dam Failure Vulnerability Analysis Results Table

County	# of Medium Hazard Dams (X 2 pts.)	# of High Hazard Dams (X 3 pts.)	# of Medium and High Hazard Dams w/o EAP (X 2 pts.)	Weighted Vulnerability Analysis Score	Vulnerability
Adams	3	0	0	6	Low-Moderate
Barnes	5	2	0	16	Moderate-High
Benson	0	10	0	30	High
Billings	0	0	0	0	Low
Bottineau	0	0	0	0	Low
Bowman	1	1	0	5	Low-Moderate
Burke	2	0	1	6	Low-Moderate
Burleigh	1	1	0	5	Low-Moderate
Cass	7	3	0	23	High
Cavalier	5	1	0	13	Moderate-High
Dickey	2	0	1	6	Low-Moderate
Divide	0	0	0	0	Low
Dunn	1	1	0	5	Low-Moderate
Eddy	0	0	0	0	Low
Emmons	1	0	0	2	Low
Foster	0	0	0	0	Low
Golden Valley	2	1	1	9	Moderate
Grand Forks	6	2	0	18	Moderate-High

County	# of Medium Hazard Dams (X 2 pts.)	# of High Hazard Dams (X 3 pts.)	# of Medium and High Hazard Dams w/o EAP (X 2 pts.)	Weighted Vulnerability Analysis Score	Vulnerability
Grant	1	1	1	7	Moderate
Griggs	0	0	0	0	Low
Hettinger	2	1	0	7	Moderate
Kidder	0	0	0	0	Low
LaMoure	1	0	1	4	Low-Moderate
Logan	0	0	0	0	Low
McHenry	0	0	0	0	Low
McIntosh	0	0	0	0	Low
McKenzie	3	0	0	6	Low-Moderate
McLean	1	1	0	5	Low-Moderate
Mercer	0	1	1	5	Low-Moderate
Morton	9	1	1	23	High
Mountrail	2	0	1	6	Low-Moderate
Nelson	4	0	0	8	Moderate
Oliver	3	2	2	16	Moderate-High
Pembina	7	2	1	22	High
Pierce	0	0	0	0	Low
Ramsey	0	1	1	5	Low-Moderate
Ransom	2	0	0	4	Low-Moderate
Renville	0	0	0	0	Low
Richland	0	0	0	0	Low
Rolette	0	2	0	6	Low-Moderate
Sargent	0	0	0	0	Low
Sheridan	0	0	0	0	Low
Sioux	0	1	0	3	Low-Moderate
Slope	1	0	0	2	Low
Stark	2	1	0	7	Moderate
Steele	2	0	0	4	Low-Moderate
Stutsman	0	2	0	6	Low-Moderate
Towner	1	0	1	4	Low-Moderate
Traill	1	0	0	2	Low
Walsh	5	3	2	23	High
Ward	1	1	0	5	Low-Moderate
Wells	2	0	0	4	Low-Moderate
Williams	4	2	2	18	Moderate-High

Source: Analysis by AMEC utilizing data from the North Dakota State Water Commission

Figure 5.11. Dam Failure Vulnerability



According to this analysis, the counties with Moderate-High and High vulnerability to Dam Failure are: Barnes, Benson, Cass, Cavalier, Grand Forks, Morton, Oliver, Pembina, Walsh, and Williams. 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.

A primary function of North Dakota's dam safety program is to conduct dam inspections in order to identify deficient dams in need of maintenance or repair. Dam safety program staff currently inspect 108 high and medium hazard dams on a rotational basis. These dams include all non-federally owned high hazard dams and all non-federally owned medium hazard dams greater than 10 feet high. Every dam on the list is fully inspected at least once every ten years. High hazard dams are inspected at least once every four years. The findings and recommendations from these inspections are provided to the dam owners. In addition, each spring, 142 dams are given a partial inspection to check on the status of the dams after the spring runoff season. These dams include non-federally owned high and medium hazard dams, and selected low hazard dams. Additional inspections are conducted on request from dam owners or the public, or when there are concerns at a dam, such as during flood events.

Dams in Adjacent States/Provinces

Upstream dams in adjacent States/Provinces can 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 5.23** 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. In addition, 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 is not based on specific inundation studies which would provide more accurate results. This analysis revealed four high hazard dams in Montana with the potential to impact North Dakota in the event of Failure. The North Dakota border county downstream for all four is Williams County and the nearest downstream community for all four is the City of Williston. For Canada, the analysis revealed an additional six dams with the potential to impact North Dakota in the event of failure. The North Dakota border county for all six is Renville County and the nearest downstream community for all six is the City of Burlington. There were no additional upstream dams in other adjacent states/provinces that met the analysis criteria.

Table 5.23. 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)	ND Border County/ Distance to ND Border (approx river miles)	Downstream ND Community	Distance to Downstream Communities (approx 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	Alameda 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

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 hazard mitigation plans 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 damages 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.

5.2.6. Local Risk Assessments

Threats to the jurisdictions from dam failure include the destruction of homes, businesses, and property, road washouts, loss of critical services, loss of economic values, and loss of life. Emergency action plans for the high hazard dams contain provisions for warning the public and those in the path of the rushing flood waters, however, the rapid movement of huge volumes of water being held by the dam may not allow for enough time in all cases. **Table 5.24** provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding dam failure regarding vulnerability and/or estimated losses. As indicated in the Dam Failure Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. Another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.24. Dam Failure Risk Summary from Local Plans

County	Dam Failure Hazard Rating	Dam Failure Additional Information
Adams	D	
Barnes	C	
Benson	B	
Billings	D	
Bottineau	D	
Bowman	C	
Burke	C	
Burleigh	B	
Cass	C	
Cavalier	Medium	
Dickey	D	
Divide	NP	
Dunn	D	
Eddy	D	
Emmons	D	
*Fort Berthold^*	*NL*	
Foster	D	
Golden Valley	D	
Grand Forks	D	$602,007 building exposure to Larimore Dam, $170,844,800 building exposure to English Coulee Dam
Grant	D	
Griggs	D	
Hettinger	B	
Kidder	D	
*Lake Traverse^*	*NP*	
LaMoure	#11 of 12	
Logan	C	
McHenry	C	
McIntosh	D	
McKenzie	NP	
McLean	A	
Mercer	D	
Morton	B	
Mountrail	D	
Nelson	D	
Oliver	D	
Pembina	C	
Pierce	D	
Ramsey	B*	$8,064,500 in residential losses
Ransom	High*	
Renville	D	
Richland	C	
Rolette	C	
Sargent	D	
Sheridan	NP	
Sioux	*Unlikely*	
Slope	B	
Spirit Lake	High	
*Standing Rock^*	*Unlikely*	
Stark	NP	

County	Dam Failure Hazard Rating	Dam Failure Additional Information
Steele	NP	
Stutsman	D	
Towner	C	
Traill	D	
Turtle Mountain^	CPRI 2.5	
Walsh	C	
Ward	D	
Wells	D	
Williams	C	$187M in potential losses

Source: Local Hazard Mitigation Plans as of June 2013; ^ includes only North Dakota parts of the reservation; *includes dike and/or embankment failure; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.2.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

The high hazard dams, by definition, have the potential to destroy property downstream, including state-owned property. North Dakota Insurance Department's State Fire and Tornado Fund is the most comprehensive inventory of state-owned and operated facilities. This data is not available in a GIS-based format. Without specific point data depicting the locations of all state-owned buildings, 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 damages from flood waters. Other infrastructure, particularly the transportation network, is vulnerable to washouts.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.2.8. Development in Identified Hazard Areas

New and future development in North Dakota is generally at risk from dam failures. No known state, tribal, or local laws prohibit or mitigate new development from taking place in dam inundation areas. The primary exceptions 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; however, future development outside the floodplain may also be at risk should a large dam fail.

Table 5.25 indicates population change from 2000 to 2010 and projected population in 2025 for the ten counties the State determined to have High and Moderate High Vulnerability to dam failure. Of these, Cass, Grand Forks, Morton, and Williams Counties have experienced population growth from 2000 to

2010 and all but Cavalier, Oliver, Pembina, and Walsh are expected to have projected population increases for 2025.

Table 5.25. Development Indicators in Counties with Moderate-High and High Vulnerability to Dam Failure

County	Dam Vulnerability Rating	Population Increase 2000-2010	40% or More Projected Population Increase 2010-2025
Barnes	Medium-High	-6.00%	6.10%
Benson	High	-4.40%	15.40%
Cass	High	21.60%	23.60%
Cavalier	Medium-High	-17.30%	-5.50%
Grand Forks	Medium-High	1.10%	12.00%
Morton	High	8.60%	16.40%
Oliver	Medium-High	-10.60%	-8.00%
Pembina	High	-13.70%	-4.80%
Walsh	High	-10.30%	-7.20%
Williams	Medium-High	13.30%	128.20%

Sources: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.2.9. Data Limitations and Other Key Documents

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
- North Dakota Emergency Operations Plan, Dam Failure Annex

5.3. Drought

Hazard Rating	THIRA Threat/Hazard Group
Moderate	Natural

5.3.1. 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. Under these 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. Recreation, oil and gas development, and agricultural food processing economic sectors also rely heavily on the water supply and levels in the State. Prolonged droughts have caused severe economic hardships in North Dakota.

The following is an excerpt from the National Drought Mitigation Center:

Drought is an insidious hazard of nature. It is often referred to as a "creeping phenomenon" and its impacts vary from region to region. Drought can therefore be difficult for people to understand. It is equally difficult to define, because what may be considered a drought in, say, Bali (six days without rain) would certainly not be considered a drought in Libya (annual rainfall less than 180 mm). In the most general sense, drought originates from a deficiency of precipitation over an extended period of time--usually a season or more--resulting in a water shortage for some activity, group, or environmental sector. Its impacts result from the interplay between the natural event (less precipitation than expected) and the demand people place on water supply, and human activities can exacerbate the impacts of drought. Because drought cannot be viewed solely as a physical phenomenon, it is usually defined both conceptually and operationally.

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 following definitions were provided by the National Drought Mitigation Center:

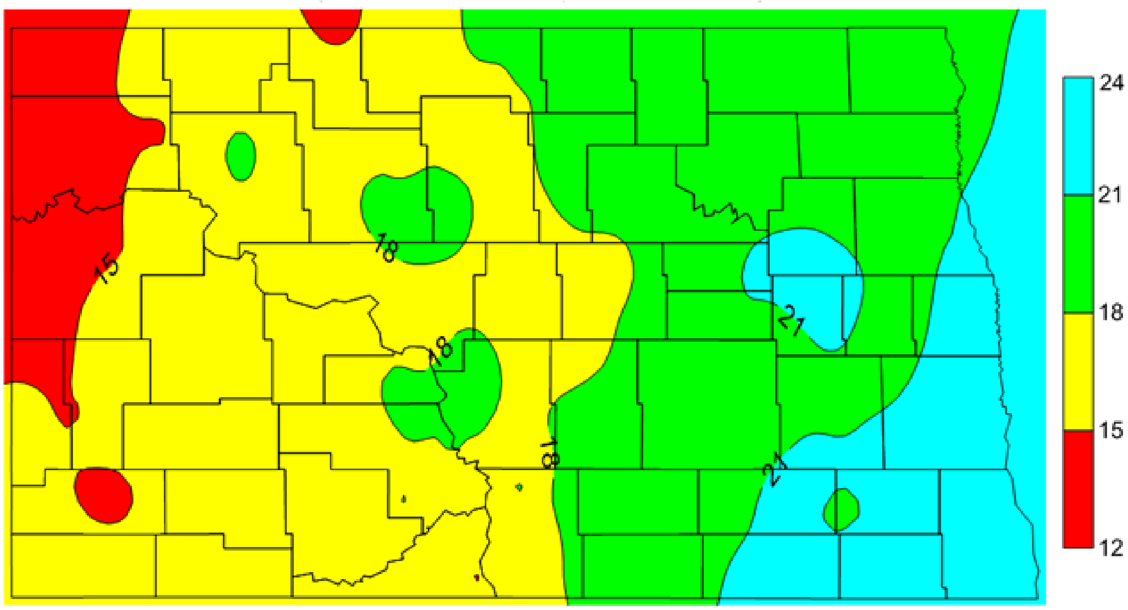
- *Meteorological drought* is usually an expression of precipitation's departure from normal over some period of time. These definitions are usually region-specific, and presumably based on a thorough understanding of regional climatology.
- *Agricultural drought* occurs when there isn't enough soil moisture to meet the needs of a particular crop at a particular 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 of time, 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.

Annual precipitation in North Dakota ranges from 12 inches in the west to 24 inches in the east and southeast. About 75 percent of the annual precipitation occurs during the crop season from April to September. **Figure 5.12** shows the annual precipitation in North Dakota from 1981 to 2010.

Figure 5.12. North Dakota Annual Precipitation (1981-2010) (inches)



Source: North Dakota State Climate Office, 2013

Drought effects regarding agriculture depend on time of year, timing of precipitation, amount of stored soil moisture, type of crop, stage of growth, and meteorological variables such as temperature, humidity, and wind. Precipitation deficits as little as four to six inches can cause severe agricultural drought conditions.

A wide range of social and economic consequences normally occurs during a prolonged agricultural drought. The effects of drought first strike individual farmers and ranchers, who suffer loss of income, increased indebtedness, possible bankruptcy, and dislocation. Regionally, drought can cause increased unemployment, economic disruption, migration intensity, and regional instability. A nation may be affected by increased government payments to the agricultural sector, foreign trade losses, rising prices, food shortages, and health problems. Worldwide effects include severe health problems, disruption of world social systems, international conflict, starvation, and famine.

Hydrological droughts affecting tourism/recreation, energy development, food processing, and other industries are usually related to surface water levels in area lakes and rivers that serve as water sources. Reduced water levels can lower production and threaten the ability to produce energy at an acceptable rate, thus, having significant economic ramifications. Water-related recreation can become less desirable or even impossible with the effects of such extending into the economic well-being of tourism and recreation businesses.

A number of 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 chemical 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.

Effects of drought accumulate slowly but tend to persist over long periods. Determining whether conditions warrant drought status versus an extended dry spell is difficult and experts often disagree. However, a typical drought in North Dakota would most likely begin with limited winter snowfall, deficient spring precipitation accompanied by warmer than normal temperatures and windy conditions. At this point, normal spring greening does not occur causing a shortage of natural livestock feed. Spring planting plans most likely change. Fire danger to grasslands begins to increase. Growth and production of cash crops and feed grains become questionable. Continued drought negatively affects farm income, ultimately affecting agriculture-related businesses. Besides crop loss, recreational opportunities are reduced and hydroelectric power production is affected. Water supplies for industries such as food processing may become limited and threaten the continuity of operations. Eventually, public drinking water supplies could be affected, resulting in a more direct threat to lives. Drought causes serious economic problems for the entire State of North Dakota.

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 5.26** 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 5.26. 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, 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

Index	Use
	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.

Source: National Drought Mitigation Center, 2013

5.3.2. Geographic Location

Drought is usually a regional hazard and any part of the state could be impacted in any given year. Mapping of the current drought status is published by the U.S. Drought Monitor each Thursday at http://drought.unl.edu/dm. North Dakota also has an extensive network of ground monitoring wells and surface water gauges. Ground water information, including hydrographs, recent water levels and chemistry conditions, can be found at http://mapservice.swc.state.nd.us/ . Daily streamflow conditions are maintained by the U.S. Geological Survey and can be found at http://waterdata.usgs.gov/nd/nwis/rt.

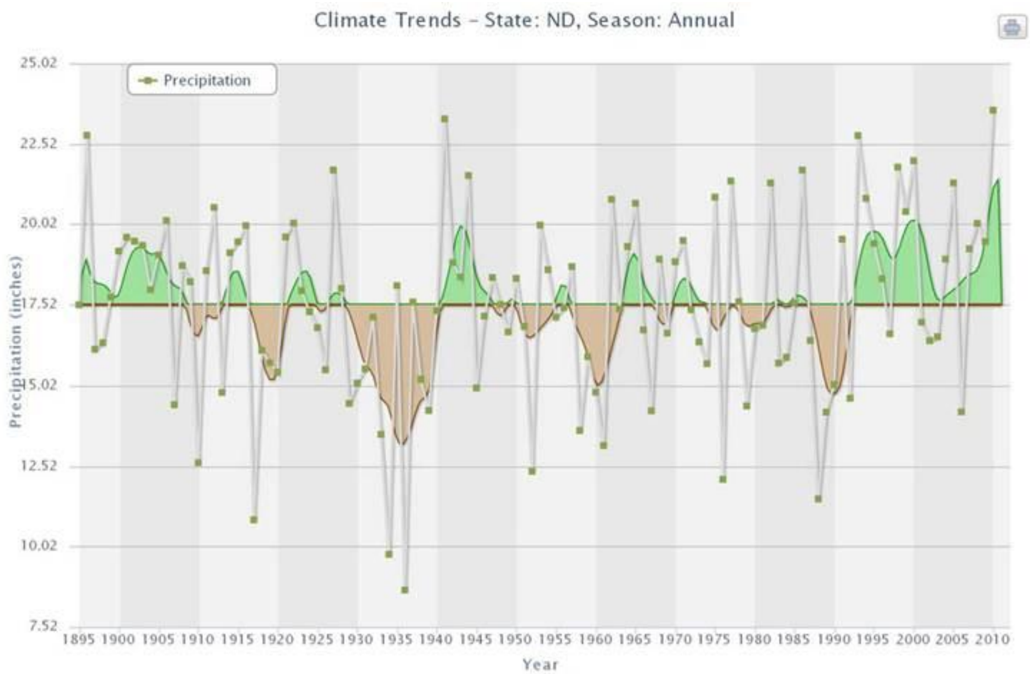
The remaining discussions of drought and the various impacts on North Dakota include several maps that indicate how this hazard varies across the state. Each map is introduced in more detail, including the factors represented in the sections including the maps.

- To show how exposure of agricultural areas varies across the state, **Figure 5.17** shows the market value of agricultural products (crops and livestock) in 2007.
- Based on crop exposure and crop insurance payments as a result of drought, an overall agricultural vulnerability to drought was calculated. **Figure 5.18** shows the counties with their associated drought vulnerability.
- **Figure 5.19** depicts losses as a result of drought based on federal crop insurance payments from 2003-2012. The losses over the 10-year period in the State are $854,628,145 or about $85 million annually.
- **Figure 5.20, Figure 5.21,** and **Figure 5.22** are all concerning active water permits. These water users can be significantly impacted by drought conditions due to their dependence on high volumes of water.

5.3.3. 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, and 2006. **Figure 5.13** shows the annual precipitation records for the state of North Dakota from 1895-2012. The green shaded areas show wet and the brown shaded areas shows dry periods in North Dakota. On average, wet and dry periods last about a decade; but the last wet period starting in early 1990s lasted more than 20 years.

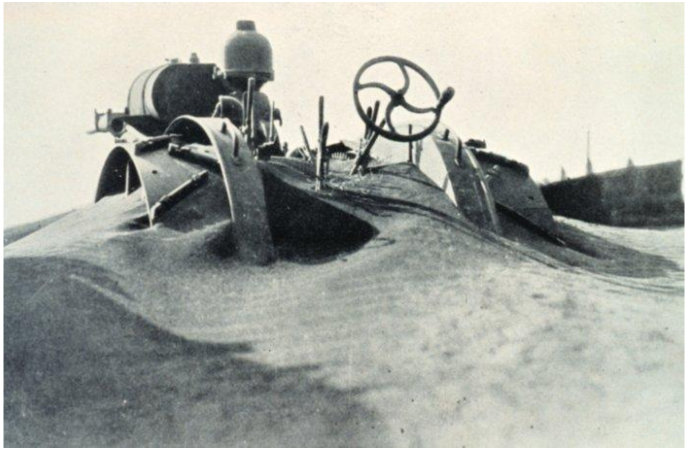
Figure 5.13. Statewide Annual Precipitation 1895-2012



Source: North Dakota State Climate Office, 2013

- 1930s Dust Bowl: 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, ND 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 United States Department of Agriculture (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 5.14** is a photo from 1935 when dust buried farm equipment in North Dakota.

Figure 5.14. 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. Damages were 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 and ruled for 78 consecutive months from December 2000 until mid-June 2007. The most severe drought occurred during July 2006 when 100 percent 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 percent 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 U.S. Bureau of Reclamation 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, Reclamation raised and exposed the existing backup intake 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.

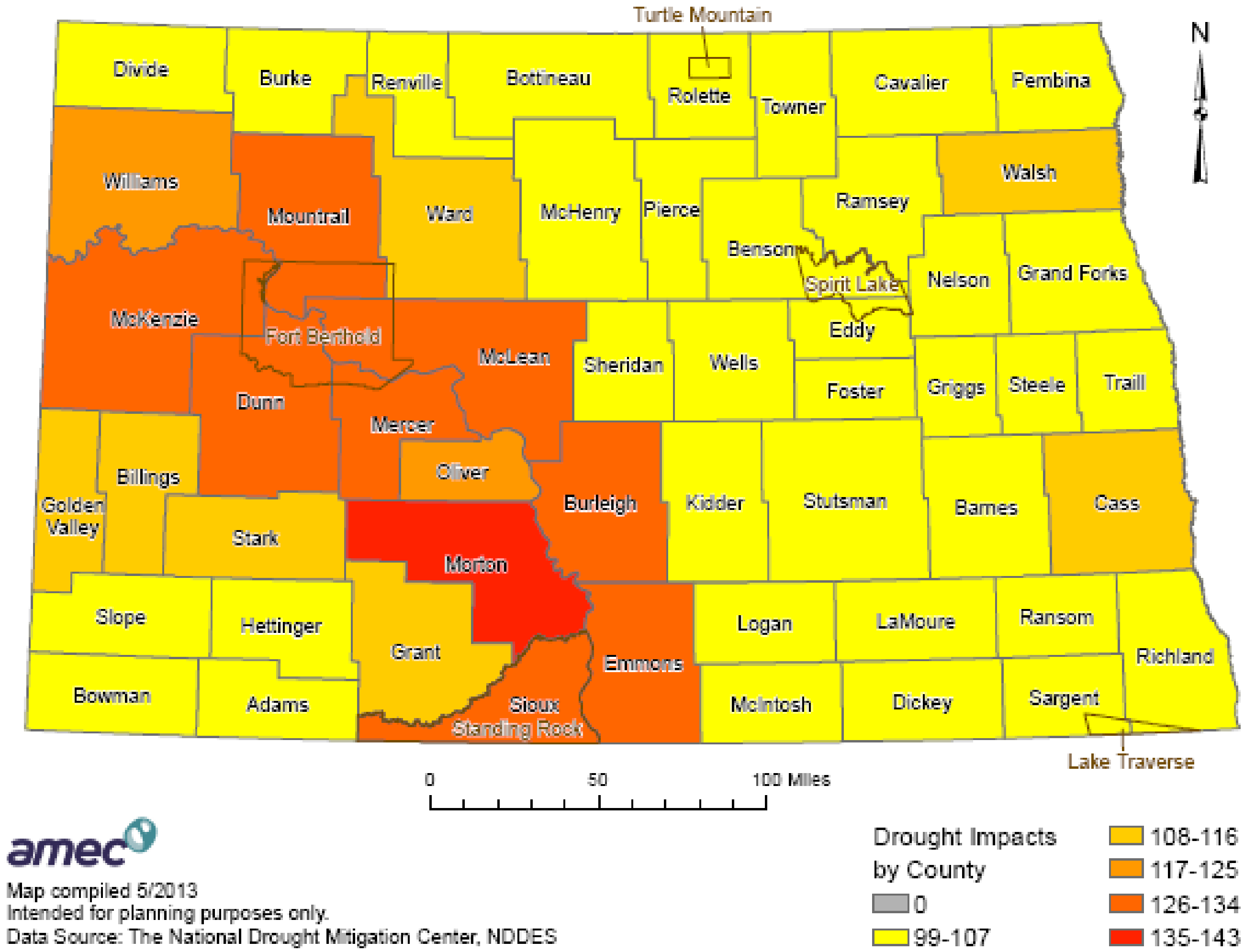
National Drought Mitigation Center Impacts

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 response to drought impacts. The main emphasis is for drought planning.

The Drought Impact Reporter contains information on 210 drought impacts from droughts that affected North Dakota between January 2003 and December 2012. Thirty-three percent of them are from media reports. Most of the impacts, 99, were classified as “agriculture.” Other impacts include “energy” (5), “plants and wildlife” (17), “society and public health” (27), “water supply and quality” (43), “business and industry” (15), “fire” (20), “relief, response, and restrictions” (45), and “tourism and recreation” (3). These categories of agriculture, energy, plants and wildlife, society and public health, water supply and quality, business and industry, fire, relief, response, and restrictions, and tourism and recreation are described on the National Drought Mitigation Center, Drought Impact Reporter website http://droughtreporter.unl.edu/.

Figure 5.15 is a statewide map showing the 210 drought-related impacts by county that have been reported from January 2003 through December 2012. As shown, the county of Morton has the highest reported with 143 drought impacts. Looking at the entire state, the western and west central counties have historically had the most drought-related impacts in North Dakota.

Figure 5.15. Drought Impacts Recorded from January 2003 – December 2012



Source: National Drought Mitigation Center, at the University of Nebraska, Lincoln http://droughtreporter.unl.edu/map.aspx

USDA Secretarial Disaster Declarations for Drought

The Federal Emergency Management Agency's ability to utilize the President's Disaster Fund for drought relief to state and local interests is very limited in scope, however the U.S. Department of Agriculture declares Secretarial Disaster Declarations for agricultural disasters including drought. Secretarial Disasters are designated from a natural disaster and have a minimum of 30 percent production loss of at least one crop in the county. **Table 5.27** lists the drought declared disasters and emergencies from 1976 through 2012.

Table 5.27. North Dakota Drought Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
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
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	6/28/2006	State declared agricultural drought emergency	Unknown	Unknown
State EO 2006-05.1	North Dakota	7/12/2006	State declared agricultural drought emergency	Unknown	Unknown
USDA	Entire State of North Dakota	January 1,	Also included impacts from frost, high	None	Unknown

Declaration	Location	Date	Magnitude	Casualties	Damages
Secretarial		2007 through December 31, 2007	temperatures, overland flooding, torrential rainfall, severe storms, hail, and high winds.		
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	3/26/2007	State declared water shortage emergency	Unknown	Unknown
State EO 2007-02	Upper Missouri River Basin	4/2/2007	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	5/9/2008	State declared early-phase agricultural drought emergency	Unknown	Unkonw
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
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

Declaration	Location	Date	Magnitude	Casualties	Damages
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
State EO 2012-08	North Dakota	8/14/2012	State declared early phase agricultural drought emergency		

Sources: Federal Emergency Management Agency, 2007; Farm Service Agency, 2007; North Dakota Department of Emergency Services, 2007; USDA Farm Service Agency, 2013.

Insured Crop Loss Data

According to the USDA Risk Management Agency, insured crop losses to farmers in the State of North Dakota from 2003 to 2012 as a result of drought conditions totaled $854,628,145. **Table 5.28** shows crop insurance paid as a result of drought conditions by year for this 10-year time frame. This shows 2007 as the year with the highest crop losses during this 10-year period, followed by 2009 and 2003. 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 percent of North Dakota's row crops were insured in 2011. Note that 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. As a result, additional non-quantifiable losses likely occurred.

Table 5.28. Insured Crop Insurance Paid by Year, 2003-2012

Year	Crop Insurance Paid
2012	$54,728,652
2011	$38,743,638
2010	$2,930,874
2009	$194,368,225
2008	$11,817,784
2007	$434,422,674
2006	$10,683,217
2005	$2,576,456
2004	$1,712,122
2003	$102,644,503
Total	**$854,628,145**

Source: USDA Risk Management Agency, 2013

5.3.4. Probability and Magnitude

Figure 5.16 is a graphical representation of the range of events that can occur within the drought hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the drought hazard. The impact categories are defined at the beginning of this chapter.

Figure 5.16. Hazard Frequency and Impact Ranges

Frequency	*Negligible*	*Limited*	*Critical*	*Catastrophic*
No regional history				Statewide Loss of
No local history				Potable Water
100 years			Loss of Public Water	
50 years		High Water Users	Supplies	
Annually		Impacted		

Impact

The National Oceanic and Atmospheric Administration 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 of what we should expect in terms of the magnitude and duration of future droughts. For example, paleoclimatic data suggest that droughts as severe at the 1950s drought have occurred in central North America several times a 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. These data indicate 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 a 20 percent 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 2 percent chance of occurring each decade.

Based on the Drought Impact Reporter reporting 210 drought impacts in North Dakota between January 2003 and December 2012, the State can expect drought conditions affecting certain counties and regions on a more reoccurring basis. With the possibility of climate change, this hazard may affect more regions of the State with more frequency.

5.3.5. State Risk Assessment

Vulnerability Overview

Typically, the most profound impact of drought is to the economy. Important sectors of the North Dakota economy that can experience impacts from drought include agriculture, energy development/production, food processing, and tourism/recreation. 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. With an agricultural market value of over $1 billion, drought can severely diminish profits for the roughly 32,000 farms and ranches in North Dakota. Over the past 10 years, insured crop losses in North Dakota due to drought have averaged $85 million annually.

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 3 million gallons of water which is mostly hauled by fleets of trucks. As of June 2013, fracking is most prevalent in the following 17 counties of:

- Billings
- Bottineau
- Bowman
- Burke
- Divide
- Dunn
- Golden Valley
- McHenry
- McKenzie
- McLean
- Mercer
- Mountrail
- Renville
- Slope
- Stark
- Ward
- Williams

Food processing similarly requires large amounts of water. 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.

To determine agricultural areas of the State that are most vulnerable to the impacts of drought, an analysis was completed based on crop and livestock exposure as well as the crop loss data based on crop insurance payments.. The drought-related crop insurance payments have been extrapolated to estimate damages 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 exposure value from the 2007 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 5.29** provides the results of this analysis. **Figure 5.17** shows the market value of agricultural products (crops and livestock) in 2007. The counties with higher values rely more heavily and directly on agriculture economically. Both livestock and crop producers can see increased damages and therefore significantly diminished profits from drought.

Figure 5.17. 2007 Market Value of Agricultural Products Sold by County

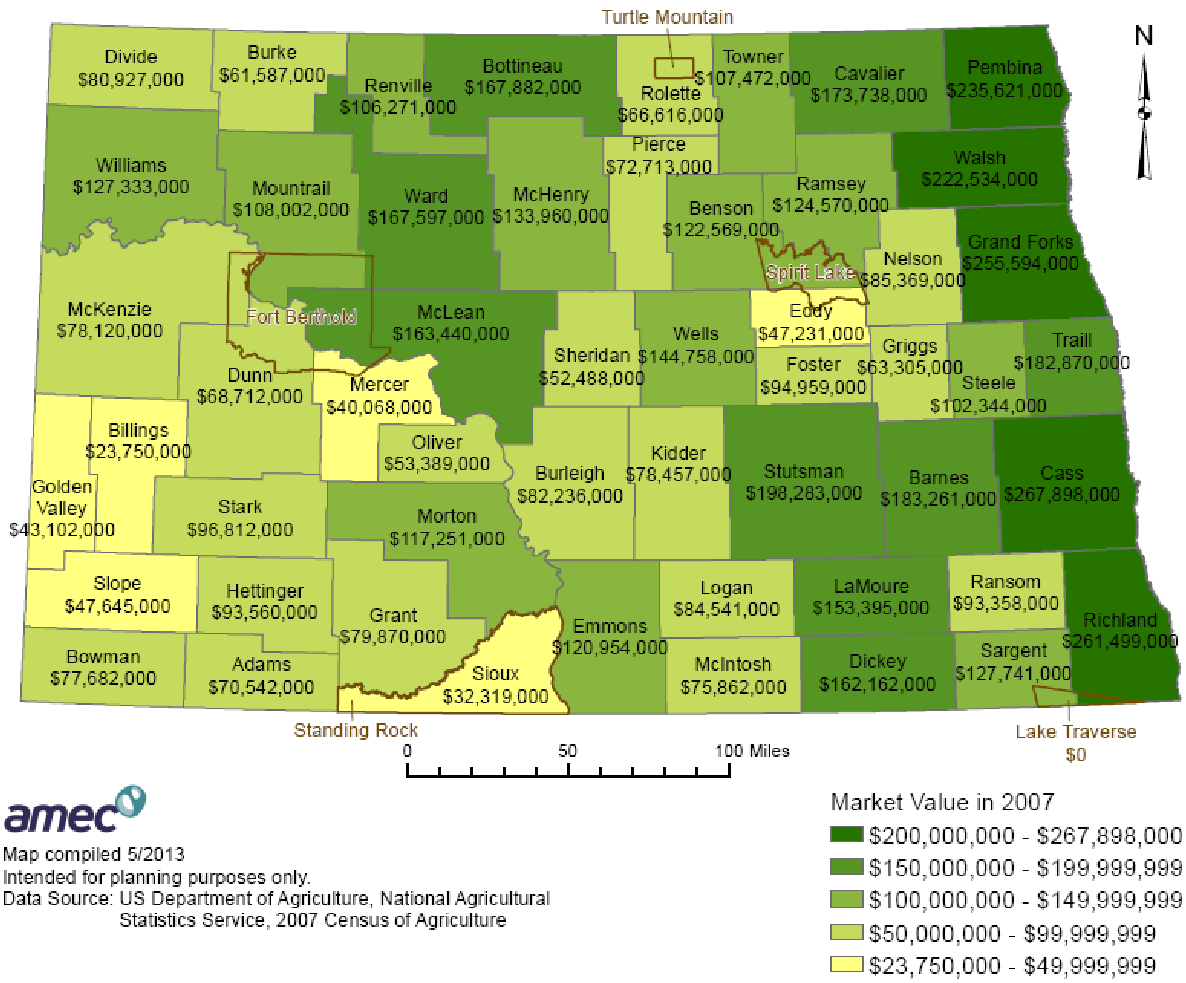


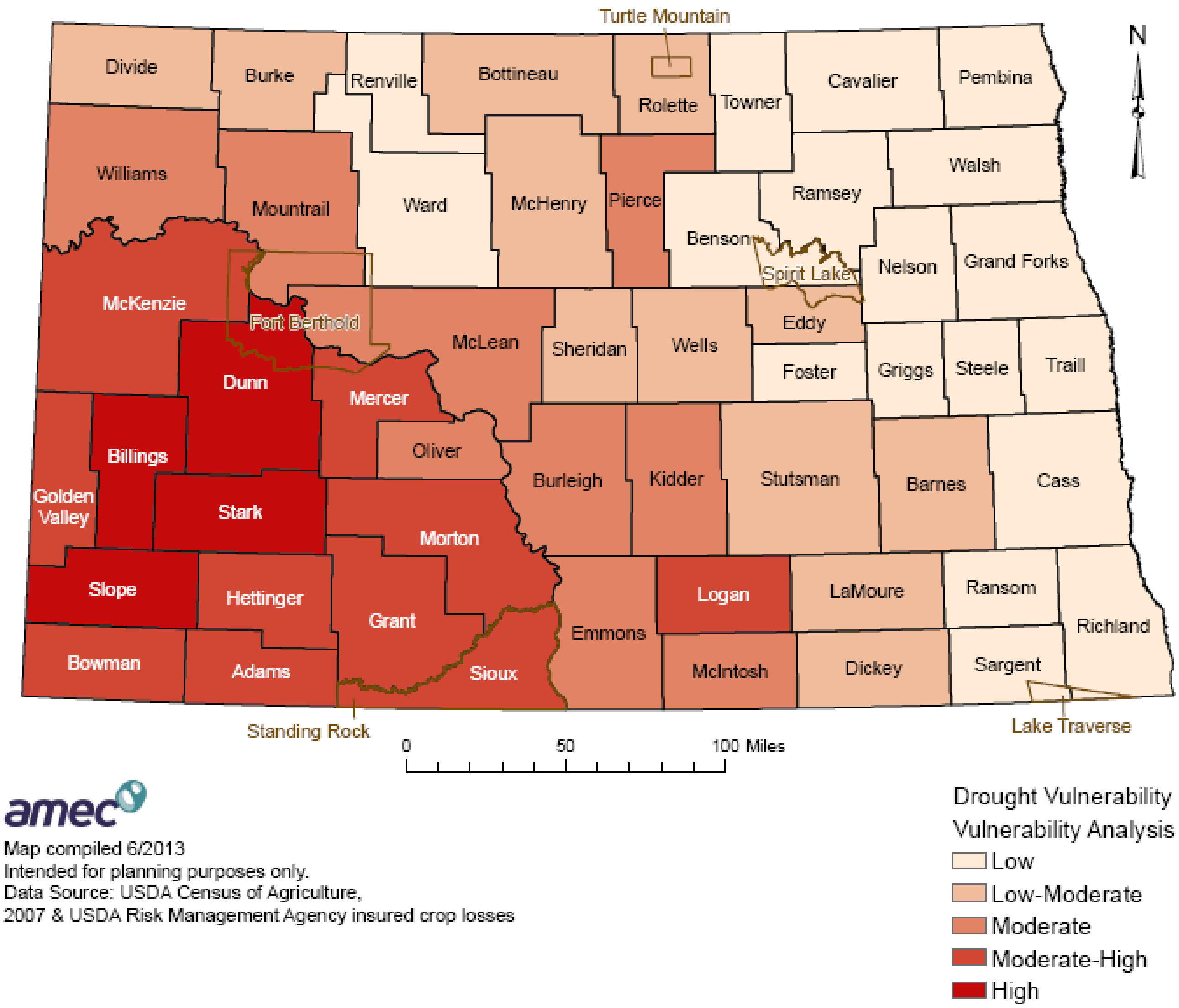
Table 5.29. Drought Agricultural Vulnerability Analysis

County Name	Crop Exposure Value (2007 Census of Agriculture)	Drought-Related Crop Insurance Paid (2003-2012)	Estimated Crop Damages (extrapolated based on 89 percent insured)	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio	Overall Vulnerability
Adams	$39,246,000	$19,976,648	$22,445,672	$2,244,567	0.0572	High
Barnes	$172,501,000	$16,063,182	$18,048,519	$1,804,852	0.0105	High
Benson	$108,039,000	$8,803,933	$9,892,060	$989,206	0.0092	High
Billings	$7,264,000	$8,735,224	$9,814,858	$981,486	0.1351	High
Bottineau	$158,991,000	$14,916,262	$16,759,845	$1,675,984	0.0105	Moderate-High
Bowman	$35,079,000	$20,265,066	$22,769,737	$2,276,974	0.0649	Moderate-High
Burke	$55,256,000	$8,758,251	$9,840,731	$984,073	0.0178	Moderate-High
Burleigh	$50,682,000	$17,351,839	$19,496,448	$1,949,645	0.0385	Moderate-High
Cass	$252,192,000	$12,447,958	$13,986,470	$1,398,647	0.0055	Moderate-High
Cavalier	$171,319,000	$6,002,911	$6,744,844	$674,484	0.0039	Moderate-High

County Name	Crop Exposure Value (2007 Census of Agriculture)	Drought-Related Crop Insurance Paid (2003-2012)	Estimated Crop Damages (extrapolated based on 89 percent insured)	Annualized Estimated Crop Damages	Estimated Crop Damage Ratio	Overall Vulnerability
Dickey	$124,459,000	$12,681,631	$14,249,024	$1,424,902	0.0114	Moderate-High
Divide	$73,992,000	$10,302,607	$11,575,963	$1,157,596	0.0156	Moderate-High
Dunn	$31,384,000	$32,190,108	$36,168,661	$3,616,866	0.1152	Moderate-High
Eddy	$38,658,000	$3,815,193	$4,286,734	$428,673	0.0111	Moderate-High
Emmons	$86,729,000	$37,994,628	$42,690,593	$4,269,059	0.0492	Moderate
Foster	$75,607,000	$6,227,274	$6,996,937	$699,694	0.0093	Moderate
Golden Valley	$26,832,000	$12,626,013	$14,186,531	$1,418,653	0.0529	Moderate
Grand Forks	$233,477,000	$9,850,265	$11,067,713	$1,106,771	0.0047	Moderate
Grant	$47,085,000	$29,928,447	$33,627,469	$3,362,747	0.0714	Moderate
Griggs	$56,624,000	$3,776,395	$4,243,140	$424,314	0.0075	Moderate
Hettinger	$83,684,000	$55,749,875	$62,640,309	$6,264,031	0.0749	Moderate
Kidder	$46,750,000	$13,721,624	$15,417,555	$1,541,756	0.0330	Moderate
La Moure	$123,335,000	$17,614,486	$19,791,557	$1,979,156	0.0160	Moderate
Logan	$39,574,000	$23,253,379	$26,127,392	$2,612,739	0.0660	Low-Moderate
McHenry	$90,288,000	$8,438,016	$9,480,917	$948,092	0.0105	Low-Moderate
McIntosh	$49,985,000	$18,024,573	$20,252,329	$2,025,233	0.0405	Low-Moderate
McKenzie	$50,115,000	$29,817,776	$33,503,119	$3,350,312	0.0669	Low-Moderate
McLean	$145,847,000	$38,091,196	$42,799,097	$4,279,910	0.0293	Low-Moderate
Mercer	$24,622,000	$13,401,037	$15,057,345	$1,505,734	0.0612	Low-Moderate
Morton	$60,803,000	$39,662,631	$44,564,754	$4,456,475	0.0733	Low-Moderate
Mountrail	$92,746,000	$26,253,361	$29,498,158	$2,949,816	0.0318	Low-Moderate
Nelson	$77,333,000	$4,698,657	$5,279,390	$527,939	0.0068	Low-Moderate
Oliver	$24,326,000	$10,278,006	$11,548,321	$1,154,832	0.0475	Low-Moderate
Pembina	$229,298,000	$6,634,711	$7,454,731	$745,473	0.0033	Low-Moderate
Pierce	$58,702,000	$10,520,181	$11,820,428	$1,182,043	0.0201	Low-Moderate
Ramsey	$122,100,000	$8,004,277	$8,993,570	$899,357	0.0074	Low
Ransom	$72,103,000	$4,133,953	$4,644,891	$464,489	0.0064	Low
Renville	$103,034,000	$6,436,379	$7,231,887	$723,189	0.0070	Low
Richland	$228,812,000	$7,078,563	$7,953,442	$795,344	0.0035	Low
Rolette	$52,837,000	$5,980,801	$6,720,001	$672,000	0.0127	Low
Sargent	$104,365,000	$6,812,987	$7,655,042	$765,504	0.0073	Low
Sheridan	$43,742,000	$5,342,130	$6,002,393	$600,239	0.0137	Low
Sioux	$11,148,000	$8,500,981	$9,551,664	$955,166	0.0857	Low
Slope	$31,423,000	$30,137,624	$33,862,499	$3,386,250	0.1078	Low
Stark	$63,674,000	$53,336,170	$59,928,281	$5,992,828	0.0941	Low
Steele	$99,946,000	$6,201,848	$6,968,369	$696,837	0.0070	Low
Stutsman	$168,570,000	$20,084,796	$22,567,187	$2,256,719	0.0134	Low
Towner	$96,333,000	$5,567,975	$6,256,152	$625,615	0.0065	Low
Traill	$177,193,000	$7,656,994	$8,603,364	$860,336	0.0049	Low
Walsh	$218,090,000	$13,822,781	$15,531,215	$1,553,121	0.0071	Low
Ward	$153,487,000	$12,079,072	$13,571,991	$1,357,199	0.0088	Low
Wells	$132,852,000	$12,581,191	$14,136,170	$1,413,617	0.0106	Low
Williams	$115,992,000	$31,996,279	$35,950,875	$3,595,088	0.0310	Low
Totals	**$5,038,525,000**	**$854,628,145**	**$960,256,343**	**$96,025,634**	**0.0191**	

Source: USDA Risk Management Agency; 2007 USDA Census of Agriculture

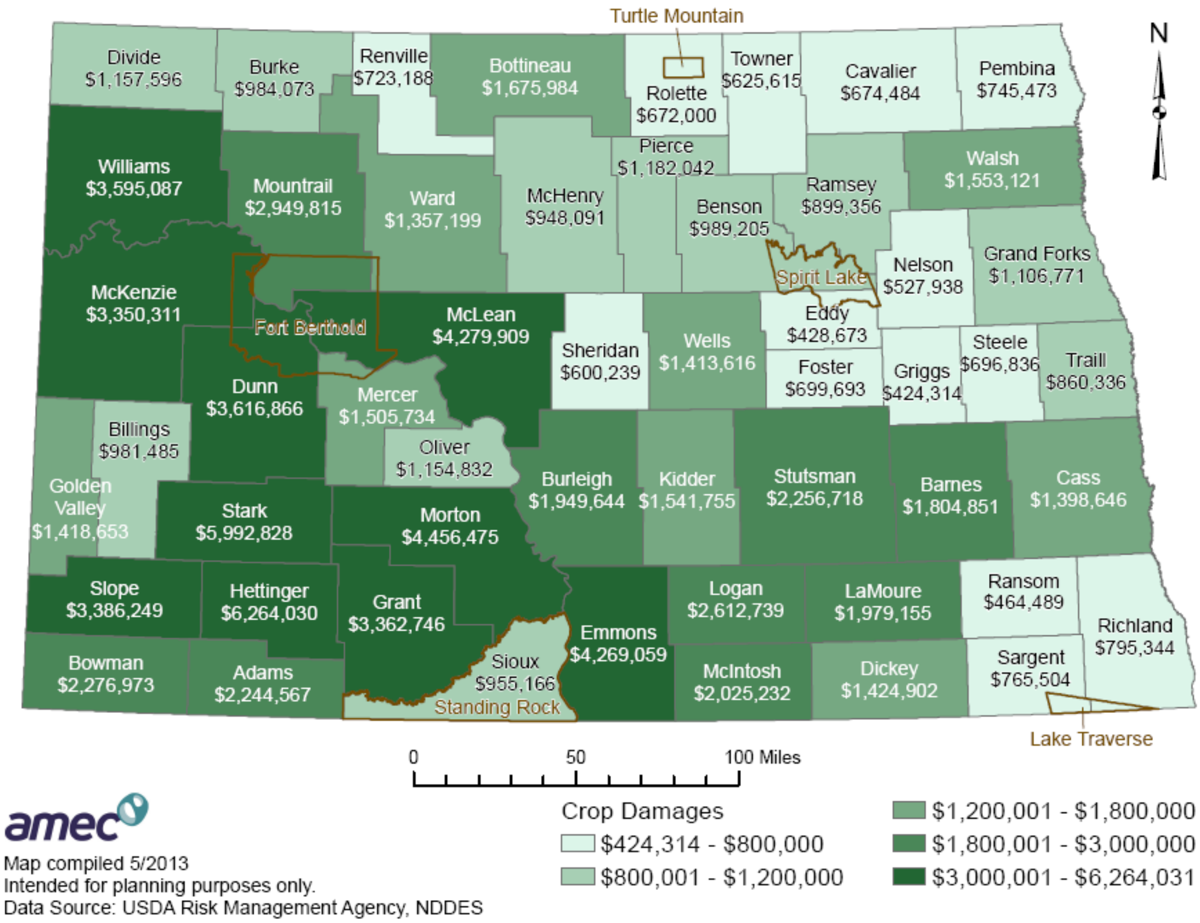
Figure 5.18. Overall Agricultural Drought Vulnerability by County



Loss Estimates

Table 5.29 in the preceding Vulnerability section provides the annualized estimated crop losses by county. **Figure 5.19** displays this data in a statewide thematic map. Similar annual losses can be expected if drought conditions are similar to the pattern in this 10-year time period. However, as discussed in the previous events section, 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.

Figure 5.19. Annualized Estimated Crop Losses from Drought, by County 2003-2012



Source: USDA Risk Management Agency

Nationally, drought losses average about $6-8 billion annually with impacts primarily to agriculture, transportation, recreation, tourism, forestry, and energy sectors. The impacts of drought are so diffuse and far-reaching that financial estimates of loss are often difficult to quantify. **Table 5.30** shows the types of losses that may occur with drought.

Table 5.30. 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)

Drought Type / Severity	Loss Type	Causes
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 - 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 (wells, dams, pipelines)
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

Drought Type / Severity	Loss Type	Causes
		areas
Socioeconomic	Health and values	- Mental and physical stress - Low-flow 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: National Drought Mitigation Center

5.3.6. Local Risk Assessments

Table 5.31 provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding drought vulnerability and/or estimated losses. As indicated in the Drought Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.31. Drought Risk Summary from Local Plans

County	Drought Hazard Rating	Drought Additional Information
Adams	B	$41,000,000 estimated losses
Barnes	B	$2,335,037 structure and contents losses
Benson	C	
Billings	C	
Bottineau	B	$405,097 estimated losses
Bowman	A	
Burke	B	$100,000 estimated losses
Burleigh	A	$3,461,731 critical facilities losses
Cass	A	$27,735,841 residential losses
Cavalier	High	
Dickey	B	$481,000 estimated losses
Divide	NP	
Dunn	B	
Eddy	B	$21,589,372.84 estimated losses
Emmons	A	$21,000,000 estimated losses
*Fort Berthold^*	*CPRI 2.05*	

County	Drought Hazard Rating	Drought Additional Information
Foster	B	$405,096.94 estimated losses
Golden Valley	B	$405,097 estimated losses
Grand Forks	C	
Grant	B	
Griggs	B	
Hettinger	A	
Kidder	B	
*Lake Traverse^*	*NP*	$87,000 estimated losses
LaMoure	#3 of 12	
Logan	B	
McHenry	B	$269,651.84 estimated losses
McIntosh	B	$269,652 estimated losses
McKenzie	NP	$642,913 estimated losses
McLean	B	
Mercer	B	
Morton	B	
Mountrail	A	$172,000 estimated losses
Nelson	B	$281,331 estimated losses
Oliver	B	
Pembina	B	$69,879,876 estimated losses
Pierce	B	
Ramsey	C	
Ransom	High	
Renville	B	$155,767.93 estimated loss
Richland	B	
Rolette	B	
Sargent	B	$272,676 estimated losses
Sheridan	NP	
Sioux	*Somewhat Likely*	
Slope	A	
Spirit Lake	Low	
*Standing Rock^*	*Somewhat Likely*	
Stark	NP	
Steele	NP	
Stutsman	B	$287,162.97 estimated losses
Towner	B	$117,363.51 estimated losses
Traill	B	$405,096.94 estimated losses
Turtle Mountain^	NI	
Walsh	B	
Ward	A	$2,429,041 estimated losses
Wells	B	$313,473.29 estimated losses
Williams	B	$638,879 estimated losses

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

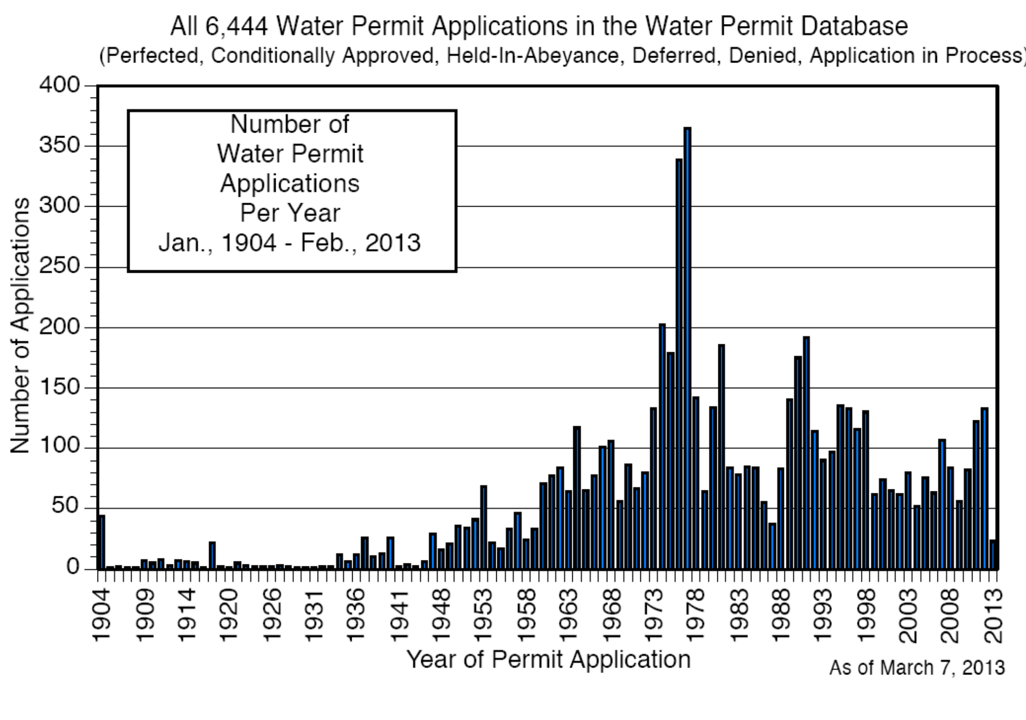
5.3.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

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. 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 damages to systems can occur. Such problems can have serious consequences for municipal water supplies, electric power generation, and other critical industries. **Figure 5.20** below shows the number of Water Permit Applications that have been received over the past 100+ years. Most of the applications were received in 1977 when the State Water Use program began. **Figure 5.21** shows the number of currently active water permits in the State and **Figure 5.22** is a statewide map of location and type of active water permits. As seen, irrigation is the top water user in the State followed by industrial users.

The U.S. Army Corps of Engineers maintains a database of water supply intakes along the Missouri River system, including information on what water elevations and flows begin to cause problems.

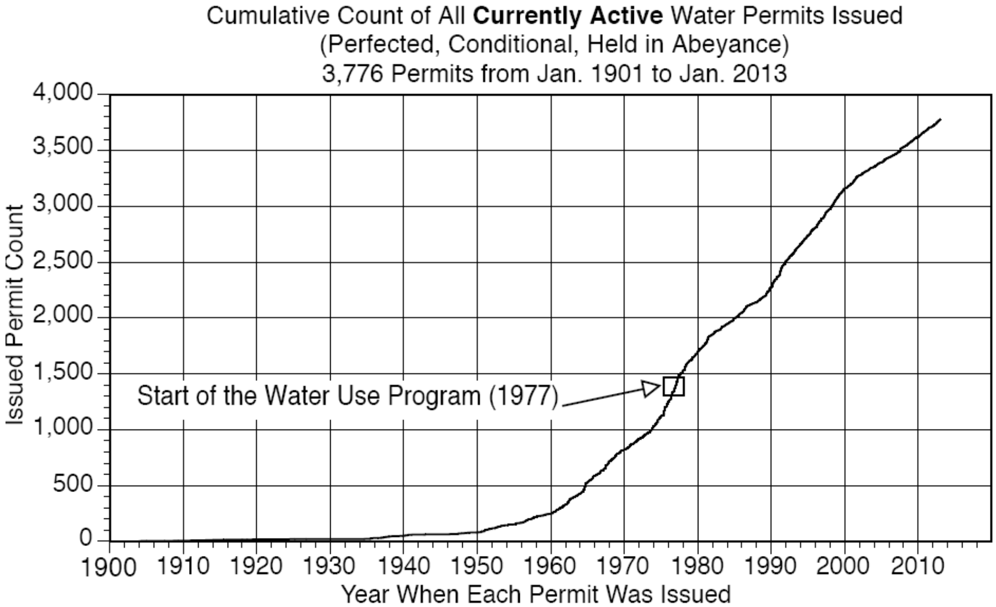
In addition to the importance of surface water supplies, ground water supplies can also be affected by drought, diminishing the water available from wells. Shallow wells may even dry up. Ninety percent of North Dakota community water systems depend on ground water for at least some of their drinking water. Sixty percent of all North Dakotans rely on ground water for their primary source of drinking water and that figure increases to ninety-seven percent 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. 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.

Figure 5.20. North Dakota State Water Commission's Water Permit Applications



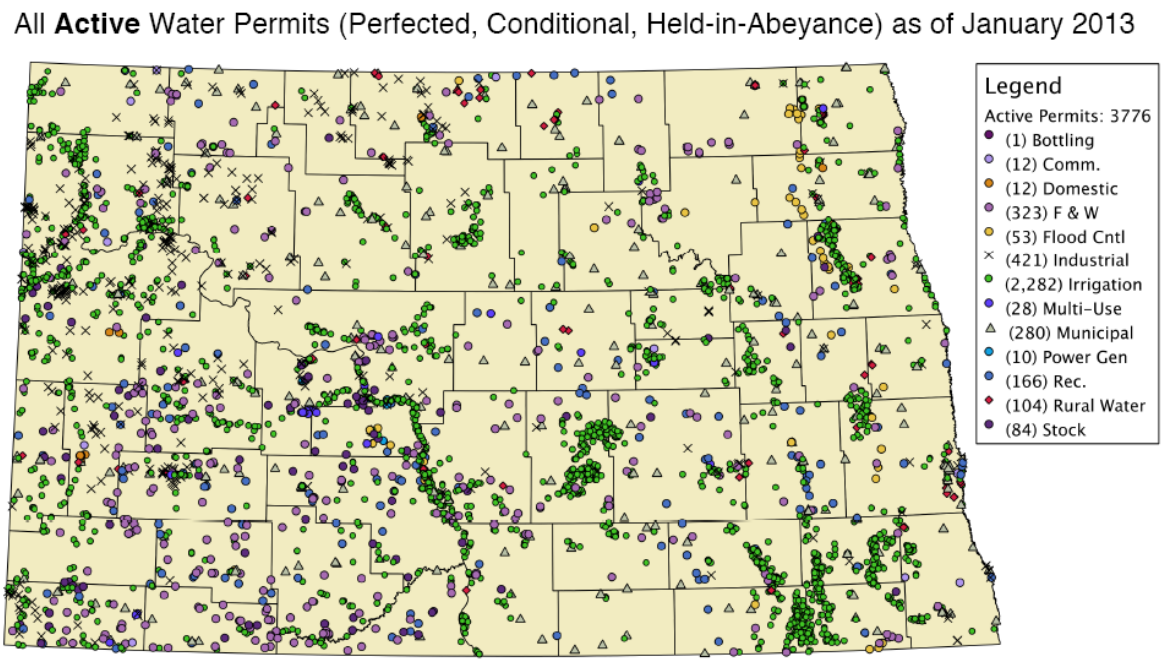
Source: North Dakota State Water Commission, 2013

Figure 5.21. North Dakota State Water Commission's Currently Active Water Permits Issued



Source: North Dakota State Water Commission, 2013

Figure 5.22. Map of North Dakota with the State Water Commission's Type and Location of Active Water Permits



Source: North Dakota State Water Commission, 2013

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.3.8. Development in Identified Hazard Areas

The greatest impact of drought to development would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up the water available or diminish water quality, particularly during periods of drought. Fortunately, public water systems are monitored by the North Dakota Department of Health; but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities. Population increases are being seen in Burleigh, Cass, Grand Forks, McKenzie, Morton, Mountrail, Rolette, Stark, Sioux, Ward, and Williams Counties. See Chapter 4, Future Development Section, for more information on these indications and projections.

Industrial development, particularly in energy development, may lead to additional large water users and vulnerability.

5.3.9. Data Limitations and Other Key Documents

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 active programs to provide assistance to 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.

Other key documents include:

- Climatic and Hydrologic Aspects of the 1988-1992 Drought and the Effect on People and Resources of North Dakota, North Dakota State Water Commission, 1994.
- North Dakota Drought Response Plan
- North Dakota Emergency Operations Plan, Drought Overview and Checklist

5.4. Flood (Including Riverine, Levee Failure, Closed Basin, Ice Jam, and Flash Floods)

Hazard Rating	THIRA Threat/Hazard Group
High	Natural

5.4.1. Description

Flooding is North Dakota's most costly and repetitive natural hazard. All 53 counties and four tribal nations have experienced severe damages 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 complicates and increases the extent of damage caused by flooding. Many of these improvements are in 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.

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 often occur along rivers and streams, along closed basin lakes, in poor drainage areas, or in oversaturated soils. Flooding of land adjoining the normal course of a stream or river or a closed basin lake is a natural occurrence. If these floodplain areas were left in a natural state, the floods would not cause major damage. The economic attractiveness of vacant land 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 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.

Surface water is that water found on the land surface and includes overland flow and flow in distinct channels. The three major sources of surface water include: 1) streams and rivers flowing into the state, 2) precipitation, and 3) groundwater discharge along streambeds. Surface water leaves the state in out-flowing streams and rivers, by evaporation, and by percolating downward into the subsurface groundwater flow system.

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.

Several different types of flooding will be covered in this discussion: Riverine Flooding, Levee Failure, Closed Basin Flooding, Ice Jam Flooding, and Flash Flooding. Ice Jam Flooding occurs in winter months. Riverine Flooding of major rivers and any associated Levee Failure, and Flash Flooding generally occur during the spring with Closed Basin Flooding occurring a few months later. The spring flood danger period is generally during March and April with Closed Basin Flooding usually peaking in June, July, and August. The magnitude of the flooding varies from year to year depending on such factors as characteristics of the snow cover, soil moisture conditions, frost depth, winter temperatures, temperatures during spring melting, spring precipitation, and the extent of ice jams. A wet fall, early freeze up with saturated ground at the time of freezing, heavy winter precipitation, and warm rains during and after spring thaw add to the seriousness of the spring flooding situation. Smaller streams are more susceptible to flooding in the summer with peak flows resulting from thunderstorms. North Dakota's major rivers are characterized by large, average annual discharges; however, variations in flow during the year can be great with periods of no flow possible on most of the larger streams and rivers.

Riverine Flooding

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. The riverine hazard areas may be mapped as part of the National Flood Insurance Program (NFIP). Under this program, an area is broken into zones to depict the level of flood hazard. Most commonly, the areas within the 100-year floodplain are considered the greatest risk. The 100-year floodplain is that area of the floodplain that has a 1 percent chance of flooding in any given year. Over a 100-year period, a flood of this magnitude or greater has a 63.5 percent chance of occurring. According to the Federal Emergency Management Agency, structures in the 100-year floodplain are nearly three times more likely to be damaged by flood than a major fire. Locations outside the 100-year floodplain may also experience flood conditions during greater magnitude floods, localized events, flash flooding, or along unmapped creeks, streams, and ditches.

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 State Emergency Operations Center (SEOC) works with the local and tribal jurisdictions to conduct advance planning; staff also issues an Event Specific Operations Plan that outlines areas of responsibility and protocols for coordination as well as guides efforts to preposition resources.

Levee 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 damages to property, the environment, and the economy. 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, such as the 100-year and 500-year flood events. 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" (http://content.asce.org/ASCELeveeGuide.html)

- 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.

Levees are usually engineered to withstand a flood with a computed risk of occurrence. Many flood control dikes and levees in North Dakota have been constructed over the years in attempts to contain floodwaters within the channel and protect development. Some of these structures have not been built to current standards. A majority of these structures have been built under emergency conditions, with changing cross sections or elevations; some lack the necessary free board, many are not strong enough, have not been maintained properly, or other problems may exist. The presence of levees that are not built in accordance with current standards and/or are not intended to protect against larger floods such as the 100-year or 500-year flood can, in some cases, generate a false sense of security.

Closed Basin

Flooding in a closed basin occurs when surface water cannot flow naturally out of the basin as a river does (until a certain elevation is reached), and therefore, during wet periods, normally dry locations can fill in with water. The Devils Lake Basin in North Dakota is a closed basin.

Ice Jams

Flooding can also result from ice jamming or blockage along streams. Ice breaking up into pieces, called floes, moves 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 US Army Corps of Engineers, the types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood levee failure, or dam failure.

Flash Flood

Another source of flooding, called flash flooding, occurs when heavy rain falls in such a short time that the soil cannot absorb it and/or drainage systems (natural or mad made) cannot carry the volume of water away as quickly as it accumulates. Flash flooding also occurs when heavy rain falls over a prolonged period of time and the ground becomes saturated and cannot absorb the additional moisture fast enough.

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. These types of floods often occur rapidly with significant impacts. Rapidly moving water, only a few inches deep, can lift people off their feet, and only a depth of a foot or two, is needed to sweep cars away. Most flood deaths result from flash floods.

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 National Oceanic and Atmospheric Administration, 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.

Groundwater levels fluctuate from season to season and from year to year. Excessive groundwater may flood basements and crawlspaces but never reach the Earth's surface. Often this type of flooding occurs during or following periods of heavy rainfall or snowmelt.

Hundreds of significant floods occur in the United States each year and kill an average of 93 people annually. Flooding is one of the most deadly hazards nationwide and in North Dakota. Most injuries and deaths occur when people are swept away by flood currents, and most property damage results from inundation by sediment-laden water. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can also cause extensive damage.

A tremendous amount of soil erosion takes place by water movement and its pressures on land surfaces. Runoff from the eroded areas is swift, thus contributing to flood magnitude. Additionally, when the flood-flow slackens, the suspended materials will settle to the bottom of the channel, reducing the space that was previously available to keep the river within its banks. This sedimentation increases flood potential.

Excessive rainfall and heavy snows associated with riverine, closed basin, flash, ice jam, and groundwater flooding can be related to other hazards. Landslides and mudslides are often attributed to saturated soils and flooding. During the summer, severe thunderstorms can bring heavy rain along with the wind, hail, and tornadoes.

5.4.2. Geographic Location

Several areas of North Dakota are subject to periodic flooding conditions. They include the Red River Valley, the Devils Lake Basin, the Souris River Basin, and extensive areas in central and southwest portions of the state.

Major Drainage Basins

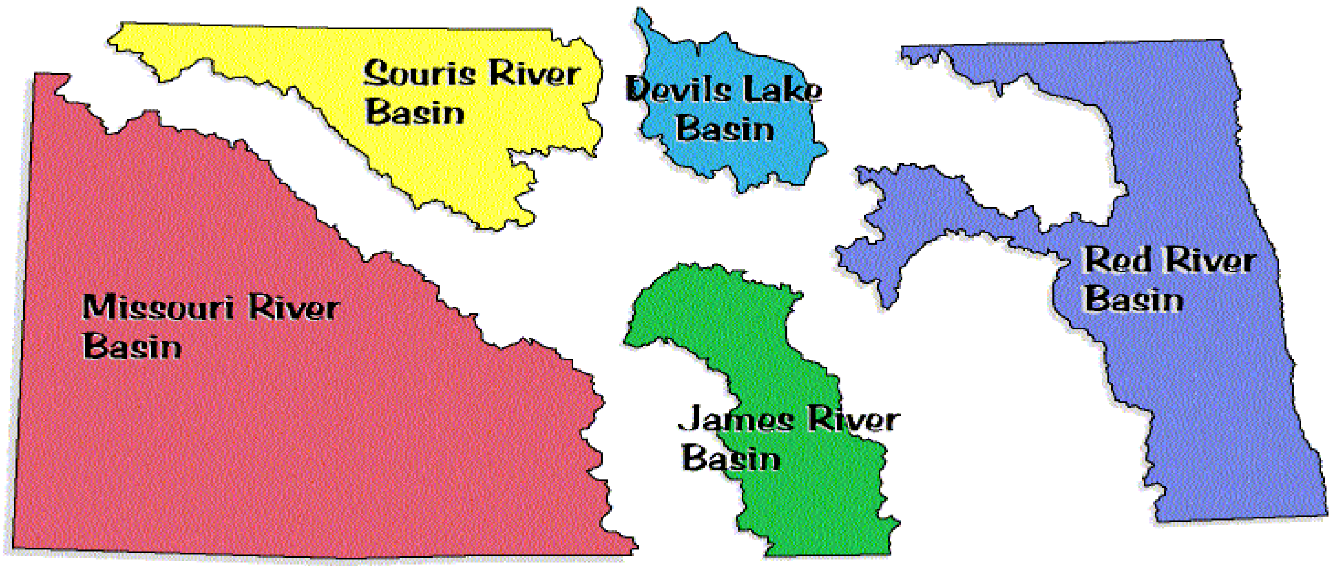
North Dakota is separated into two major drainage basins by a divide running from the northwest through the central and southeastern part of the state. The northeast portion of the divide falls generally within the Hudson Bay drainage, while the southwest part of the divide is drained by the Missouri River 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 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 landscape features that are internally drained but can provide ample wetland 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 dynamic linkages among them, and also potential linkages with tributaries that may contribute flow to larger river systems.

There are five major hydrologic subdivisions in North Dakota. These subdivisions are the Missouri River Basin, the James River Basin, the Red River Basin, the Devils Lake Basin, and the Souris River Basin. **Figure 5.23** shows these basins.

Figure 5.23. North Dakota Basins



Source: North Dakota State Water Commission.

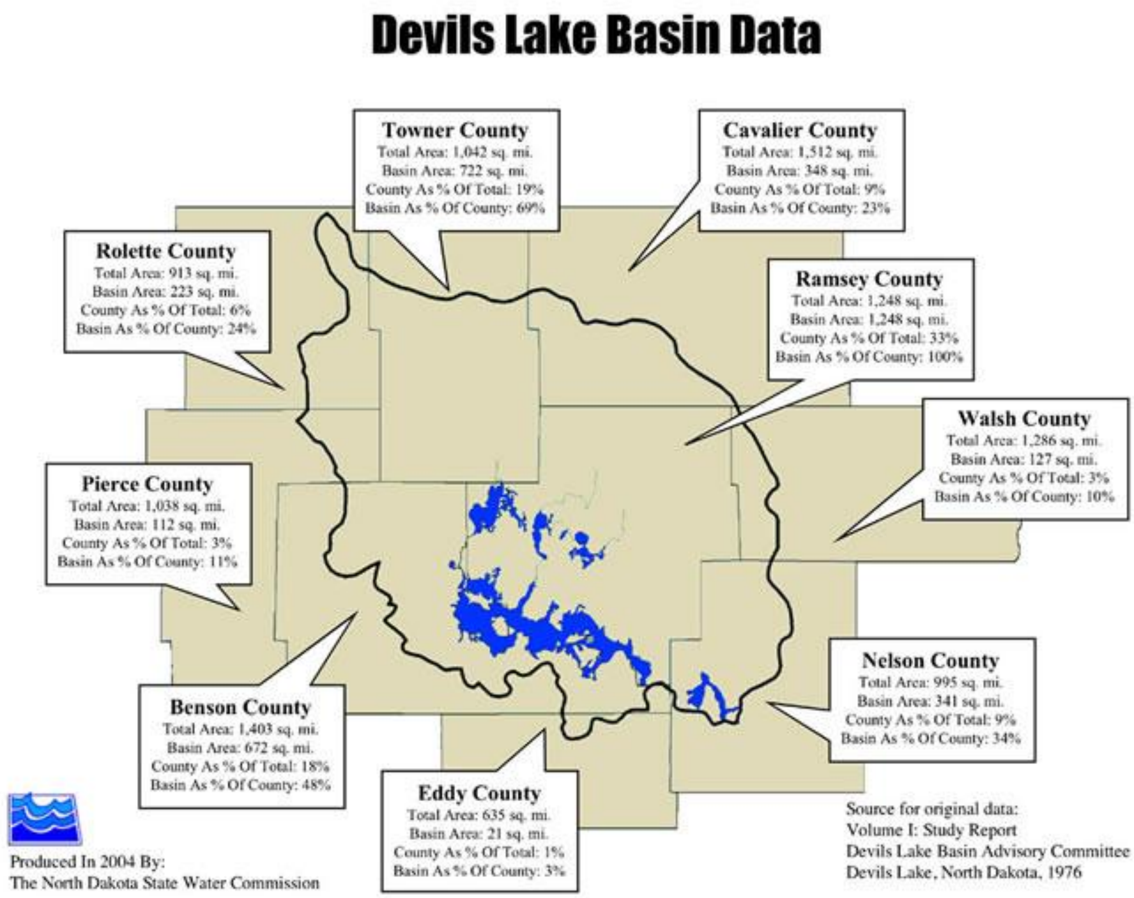
Devils Lake Basin

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:

- Benson County
- Cavalier County
- Eddy County
- Nelson County
- Pierce County
- Ramsey County
- Rolette County
- Towner County
- Walsh County

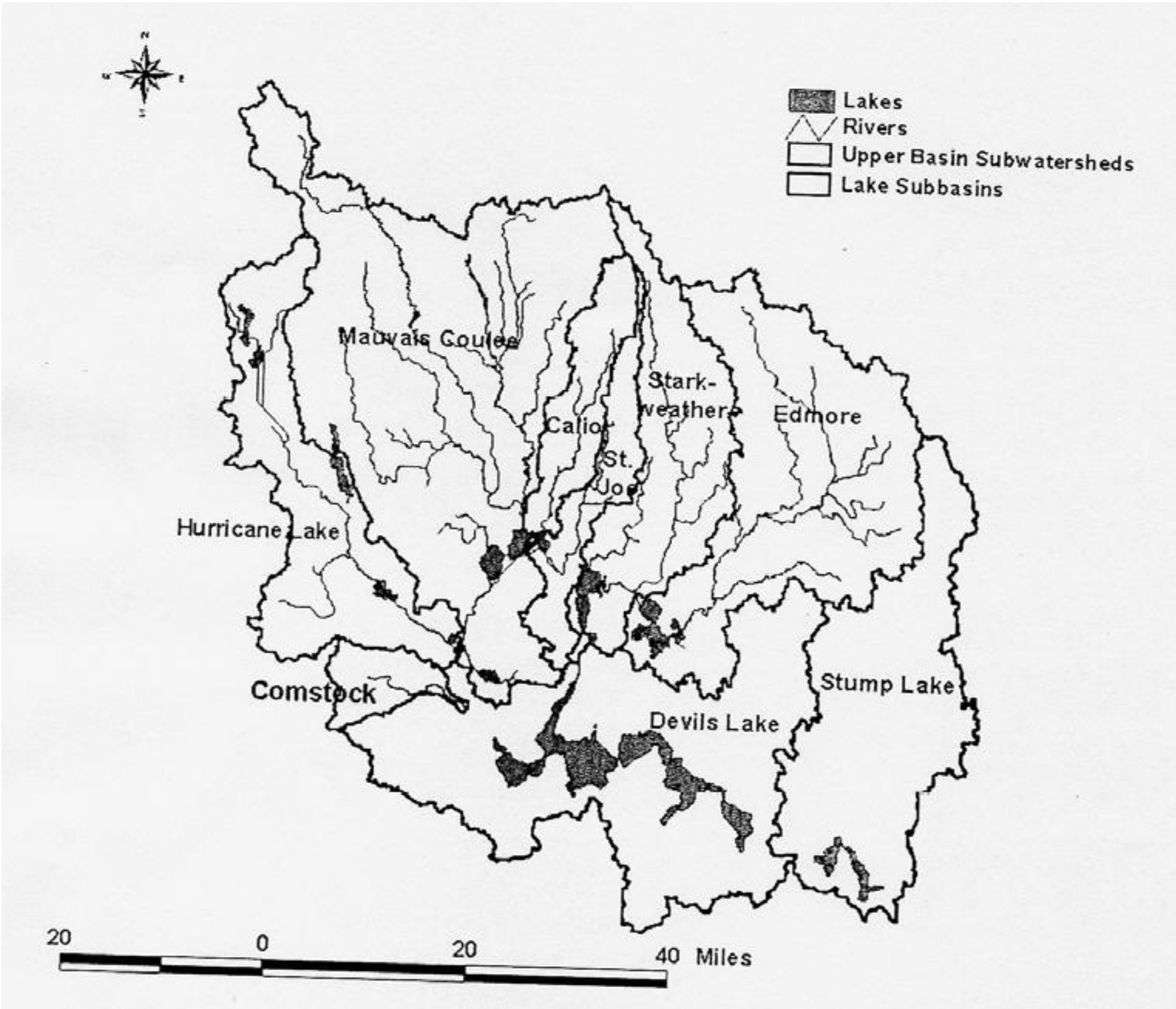
Figure 5.24 shows the counties included in the Devils Lake Basin. **Figure 5.25** shows the sub-basins within the Devils Lake Basin.

Figure 5.24. Counties Included in the Devils Lake Basin



Source: North Dakota State Water Commission, 2004, retrieved on 5/22 from http://www.dlbasin.com/

Figure 5.25. Devils Lake Sub-Basins



Source: U.S. Fish and Wildlife Service, Final Fish and Wildlife Coordination Act Report for the Devils Lake Emergency Outlet Devils Lake, North Dakota, June 2002, retrieved on 7/1/2013 from http://www.swc.nd.gov/4dlink9/4dcgi/GetSubContentPDF/PB-2082/Volume_1_FileAppendix_2.pdf

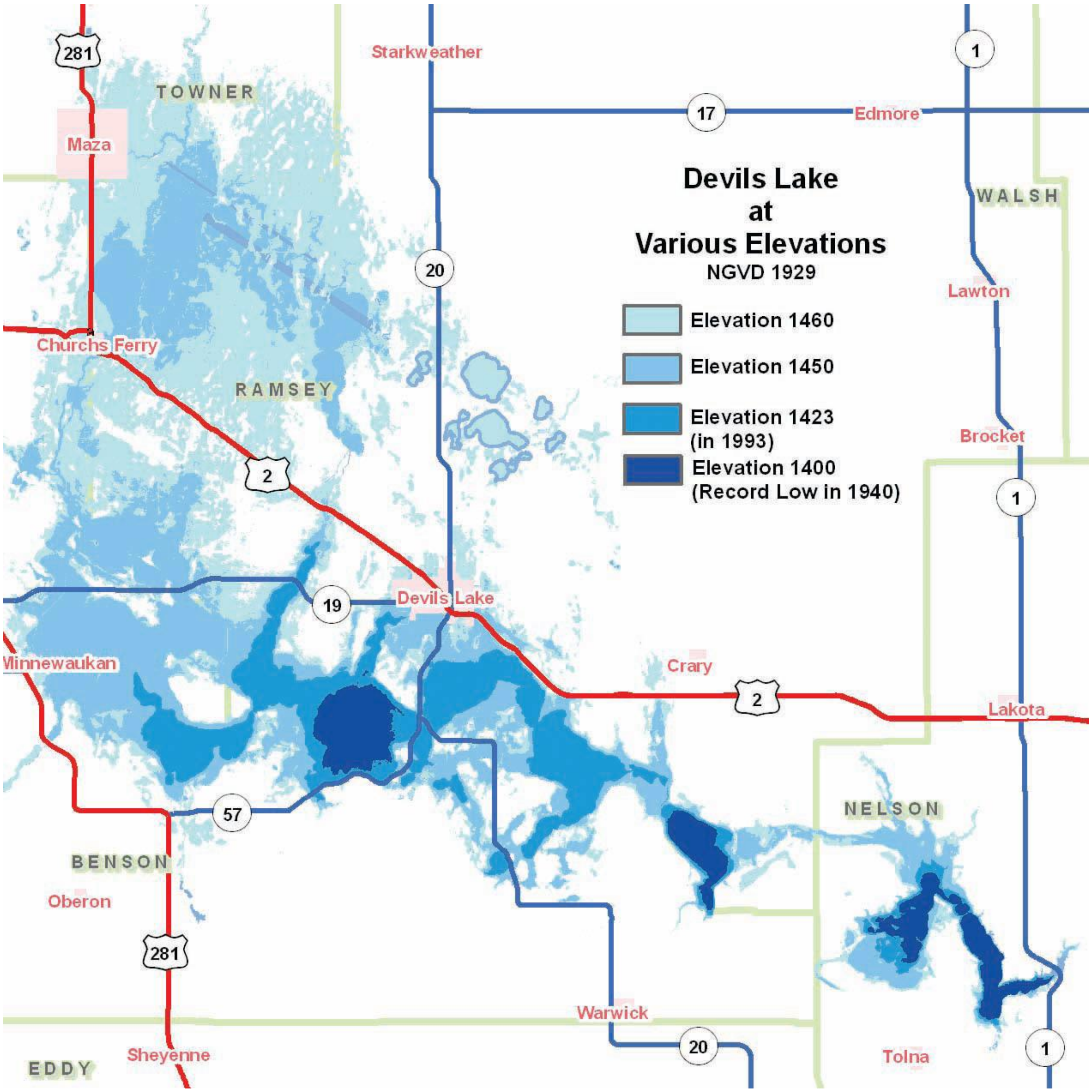
The water levels of Devils Lake fell 37.5 feet between 1867 and 1940. Since 1940, the trend has reversed. Between February 1993 and June 1999, the lake rose approximately 22 feet, thereby tripling the volume of water in the lake. The lake area expanded from 42,000 acres in 1993 to 82,200 acres in 1996. 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 5.26** shows the coverage of Devils Lake at various elevations.

Figure 5.26. Coverage of Devil's Lake at Various Elevations



Source: North Dakota State Water Commission, Devils Lake Flood Facts, March 2013, retrieved on 7/1/2013 from http://www.swc.state.nd.us/4dlink9/4dcgi/GetContentPDF/PB-206/DL_Quick_Facts.pdf

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, a warranty deed and restricted covenant is placed on the property. In rural areas, an easement is generally used for the restriction on each 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 5.27** shows water surface elevations of five major Red River floods.

Figure 5.27. 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 Section 7.5.8, Project Monitoring and Evaluation.

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% 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.

Riverine Flooding Additional Location Details

Typically, as part of the National Flood Insurance Program assessment, the Federal Emergency Management Agency (FEMA) conducts a Flood Insurance Study (FIS) to identify the community's risk levels. The Flood Insurance Study includes statistical data for river flows, rainfall, topographic surveys, and hydrologic and hydraulic analyses. After examining the FIS data, FEMA creates Flood Insurance Rate Maps (FIRMs) delineating the different areas of flood risk. Land areas that are at high risk for flooding are called Special Flood Hazard Areas (SFHAs), or floodplains. Some communities in the state have digital FIRMs (DFIRMs) that have incorporated improved analysis methods and technologies into the digitized floodplain map. Upon the full conversion of FIRMs to DFIRMs, the digital data can be used for improved statewide flood analyses; however, remember that some areas of the state that are not mapped or are mapped as outside the 100-year floodplain may still be at risk from flooding. Paper copies and digital files (where available) of the maps for communities in North Dakota can be ordered from the

Federal Emergency Management Agency. These maps generally have much more detail than can be depicted or analyzed on the statewide scale.

For additional information regarding available FIRMs and DFIRMs for North Dakota counties, go to, https://hazards.fema.gov/wps/portal/mapviewer. **Section 5.4.5** provides additional details regarding the population and assets at risk to riverine flooding in each county in North Dakota.

Levee Failure Additional Location Details

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.

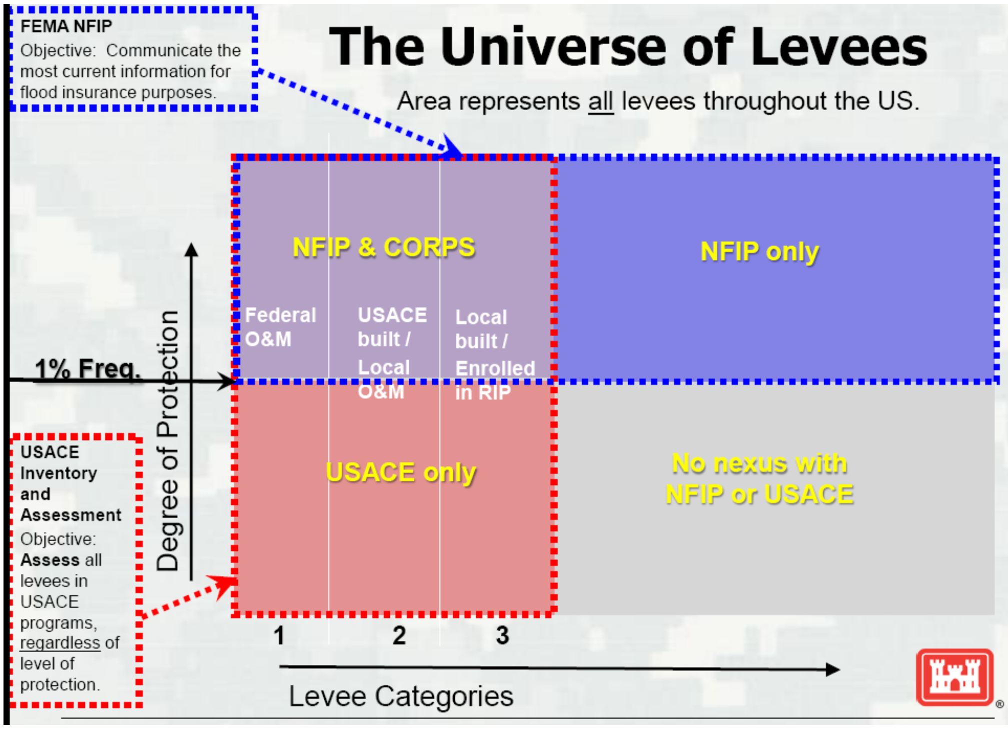
- The U.S. Army Corps of Engineers (USACE) has developed the National Levee Database (NLD). At this time, the NLD contains only levees that are currently enrolled in the USACE National Levee Safety Program (LSP).
- FEMA has developed the Mid-Term Levee Inventory (MLI) which contains levee data gathered primarily for structures that were designed to provide protection from at least the base (1-percent-annual-chance) flood, as this standard is the minimum level of protection recognized by the national Flood Insurance Program (NFIP) for accreditation. Some levees that are not designed to meet, or have not been engineer-certified to meet, the minimum NFIP criteria for accreditation are also included in the MLI. Although not completely comprehensive, the FEMA MLI also includes levees in the USACE LSP a well as other levees.

For purposes of the levee failure hazard profile and risk assessment in this hazard mitigation plan, levees in North Dakotas will be discussed in four categories:

1. Levees in the USACE Levee Safety Program
2. FEMA Accredited Levees
3. Levees that are both in the USACE Levee Safety Program and Accredited by FEMA
4. All other levees

The graphic in **Figure 5.28** displays the four levee categories described above. In terms of assessing risk, levees in categories 1, 2, and 3 all undergo or have undergone some sort of inspection, certification, or accreditation that indicates the level of protection and/or structural integrity of the levee system. However, the levees in the category 4 may not be regularly monitored or inspected.

Figure 5.28. Four Categories of Levees



Source: U.S. Army Corps of Engineers, 2012

<u>Levees in the USACE Levee Safety Program</u>

USACE created the Levee Safety Program (LSP) in 2006 to assess the integrity and viability of levees and to make sure that levee systems do not present unacceptable risks to the public, property, and environment. Under the Levee Safety Program, USACE conducts levee inspections (routine, periodic and special event). During these inspections, deficiencies may be identified such as unsatisfactory culverts, non-compliant vegetation, encroachments, and animal burrows. USACE uses inspection findings to "rate" levee systems to determine compliance with operation and maintenance requirements, understand the overall levee condition, and determine eligibility for federal rehabilitation assistance under P.L. 84-99

According to the **National Levee Database** managed by USACE, there are currently 28 levees in North Dakota in the USACE Levee Safety Program. The St. Paul District Office manages 22 of LSP levees and the Omaha District Office manages the remaining 6 LSP levees in North Dakota. The USACE Levee Safety Program Levees are in the following North Dakota counties:

- Bowman
- Cass
- Grand Forks
- McHenry
- Morton
- Pembina
- Renville
- Slope
- Ward

See **Table 5.32** for additional information on the North Dakota levees in the USACE Levee Safety Program.

Table 5.32. North Dakota Levees in the USACE Levee Safety Program

County(ies)	System Name	USACE District Office	Length (miles)	Inspection Rating	Inspection Date	Sponsor(s)	Authorization Category
Bowman County	Scranton - Buffalo Creek RB	Omaha	0.44	MINIMALLY ACCEPTABLE	3-May-11	Bowman County Water Conservation And Flood Control	USACE Federally constructed, turned over to public sponsor operations and maintenance
Bowman County	Scranton - Buffalo Creek LB	Omaha	0.5	MINIMALLY ACCEPTABLE	3-May-11	Bowman County Water Conservation And Flood Control	USACE Federally constructed, turned over to public sponsor operations and maintenance
Cass County	Sheyenne River - West Fargo	St. Paul	12.66	Not Available	Not Available	South East Cass Water Resource District	USACE Federally Constructed and USACE Federally Operated
Cass County	Sheyenne River - Horace to West Fargo	St. Paul	8.52	Not Available	Not Available	South East Cass Water Resource District	USACE Federally Constructed and USACE Federally Operated
Cass County	Red River of the North - Fargo	St. Paul	0.84	Not Available	Not Available	City Of Fargo	USACE Federally constructed, turned over to public sponsor operations and maintenance
Cass County	Red River of the North - Argusville	St. Paul	1.92	MINIMALLY ACCEPTABLE	8-Aug-12	City Of Argusville	USACE Federally constructed, turned over to public sponsor operations and maintenance
Cass County	Mapleton	St. Paul	5.47	MINIMALLY ACCEPTABLE	7-Aug-12	City Of Mapleton	Locally Constructed, Locally Operated and Maintained
Cass County	Harwood	St. Paul	1.64	MINIMALLY ACCEPTABLE	4-Aug-11	City Of Harwood	Locally Constructed, Locally Operated and Maintained
Cass County	Casselton	St. Paul	2.95	MINIMALLY ACCEPTABLE	7-Aug-12	City Of Casselton	Locally Constructed, Locally Operated and Maintained
Cass County, Ransom County	Maple River - Enderlin	St. Paul	1.57	MINIMALLY ACCEPTABLE	6-Aug-12	City Of Enderlin	USACE Federally constructed, turned over to public sponsor operations and maintenance
Grand Forks County	Red River of the North - Grand Forks	St. Paul	22.49	MINIMALLY ACCEPTABLE	19-Sep-11	City Of Grand Forks	USACE Federally constructed, turned over to public sponsor operations and maintenance

County(ies)	System Name	USACE District Office	Length (miles)	Inspection Rating	Inspection Date	Sponsor(s)	Authorization Category
McHenry County	Souris River - Velva	St. Paul	2.28	MINIMALLY ACCEPTABLE	26-Apr-12	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Morton County	Mandan - Lower Heart River RB Sunny Unit	Omaha	3.96	MINIMALLY ACCEPTABLE	23-Sep-10	Lower Heart River Water Resource District	USACE Federally constructed, turned over to public sponsor operations and maintenance
Morton County	Mandan - Lower Heart River LB North	Omaha	4.32	MINIMALLY ACCEPTABLE	24-Sep-10	Lower Heart River Water Resource District	USACE Federally constructed, turned over to public sponsor operations and maintenance
Morton County	Mandan - Lower Heart River LB Lower Unit	Omaha	3.49	MINIMALLY ACCEPTABLE	24-Sep-10	Lower Heart River Water Resource District	USACE Federally constructed, turned over to public sponsor operations and maintenance
Pembina County	Red River of the North - Pembina	St. Paul	2.97	Not Available	Not Available	City Of Pembina	USACE Federally constructed, turned over to public sponsor operations and maintenance
Renville County	Souris River - Renville County Park	St. Paul	1.05	MINIMALLY ACCEPTABLE	26-Apr-12	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Slope County	Marmarth - Little Beaver Creek LB & Little Missouri River LB	Omaha	2.44	Not Available	Not Available	Marmarth Water Conservation & Flood Control District, Slope Co, ND	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River-Burlington to Minot-TerricitaVallejo	St. Paul	0.31	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River-Burlington to Minot-Talbotts Nursery	St. Paul	0.53	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River-Burlington to Minot-Country Club	St. Paul	1.69	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River-Burlington to Minot - Kings Court	St. Paul	0.83	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance

County(ies)	System Name	USACE District Office	Length (miles)	Inspection Rating	Inspection Date	Sponsor(s)	Authorization Category
Ward County	Souris River-Burlington to Minot - Johnson	St. Paul	0.96	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River-Burlington to Minot - Brooks	St. Paul	0.94	Not Available	Not Available	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River - Sawyer - West	St. Paul	0.22	UNACCEPTABLE	26-Apr-12	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River - Sawyer - East	St. Paul	0.82	MINIMALLY ACCEPTABLE	26-Apr-12	Souris River Joint Water Resource Board	USACE Federally constructed, turned over to public sponsor operations and maintenance
Ward County	Souris River - Minot - Right Bank	St. Paul	3.21	Not Available	Not Available	Ward Co. Water Management District/City Of Minot	Locally Constructed, Locally Operated and Maintained
Ward County	Souris River - Minot - Left Bank	St. Paul	5.15	Not Available	Not Available	Ward Co. Water Management District/City Of Minot	Locally Constructed, Locally Operated and Maintained

Source: National Levee Database, http://nld.usace.army.mil

FEMA Accredited Levees

Many levees shown on effective Flood Insurance Rate Maps (FIRM) were mapped in the 1970s and 1980s and have never been remapped by FEMA. Prior to 1986, levees were shown on FIRMs as providing protection from the base flood when they were designed and constructed in accordance with sound engineering practices. Since 1986, levees have been shown as accredited on FIRMs only when they meet the requirements of 44 CFR 65.10 "Mapping Areas Protected by Levee Systems", including certification by a registered professional engineer or a Federal agency with responsibility for levee design.

Levees that do not meet the requirements of 44 CFR 65.10 cannot be shown as accredited on a FIRM. Furthermore, floodplain areas behind the levee are at risk to base flood inundation and are mapped as high risk areas subject to FEMA's minimum floodplain management regulations and mandatory flood insurance purchase requirement.

In 2004, as it initiated work under the Flood Map Modernization Initiative (Map Mod), FEMA determined that analysis of the role of levees in flood risk reduction would be an important part of the mapping efforts. A report issued in 2005 noted that the status of the Nation's levees was not well understood and the condition of many levees and floodwalls had not been assessed since their original inclusion in the NFIP. As a result, FEMA established policies to address existing levees. As levees are assessed according to these policies, they fall under one of the three following categories:

1) Accredited Levee - With the except of areas of residual flooding (interior drainage), if the data and documentation specified in 44 CFR 65.10 is readily available and provided to FEMA, the area behind the levee will be mapped as a moderate-risk area. There is no mandatory flood insurance purchase requirement in a moderate-risk area, but flood insurance is strongly recommended.
2) Provisionally Accredited Levee (PAL) - If data and documentation is not readily available, and no known deficiency precludes meeting requirements of 44 CFR 65.10, FEMA can allow the party seeking recognition up to two years to compile and submit full documentation to show compliance with 44 CFR 65.10. During this two-year period of provisional accreditation, the area behind the levee will be mapped as moderate-risk with no mandatory flood insurance purchase requirement.
3) De-Accredited Levees – If the information established under 44 CFR 65.10 is not readily available and provided to FEMA, and the levee is not eligible for the PAL designation, the levee will be de-accredited by FEMA. If a levee is de-accredited, FEMA will evaluate the level of risk associated with each non-accredited levee through their Levee Analysis Mapping Procedures (LAMP) criteria to consider how to map the floodplain and which areas on the dry side of the levee will be shown as high risk. The mapping will then be updated to reflect this risk.
   According to FEMA's Mid-term Levee Inventory Project Summary Report dated November 30, 2012, there are 23 North Dakota Counties with levees, with 286 total miles of levees. These counties are listed below. The counties in bold are those counties that also have levees in the USACE LSP:

- **Barnes**
- Bowman
- Burleigh
- **Cass**
- Dunn
- **Grand Forks**
- Hettinger
- **McHenry**
- Mercer
- **Morton**
- Mountrail
- Oliver
- **Pembina**
- Ramsey
- Ransom
- **Renville**
- Richland
- Sargent
- Sioux
- **Slope**
- Walsh
- **Ward**
- Williams

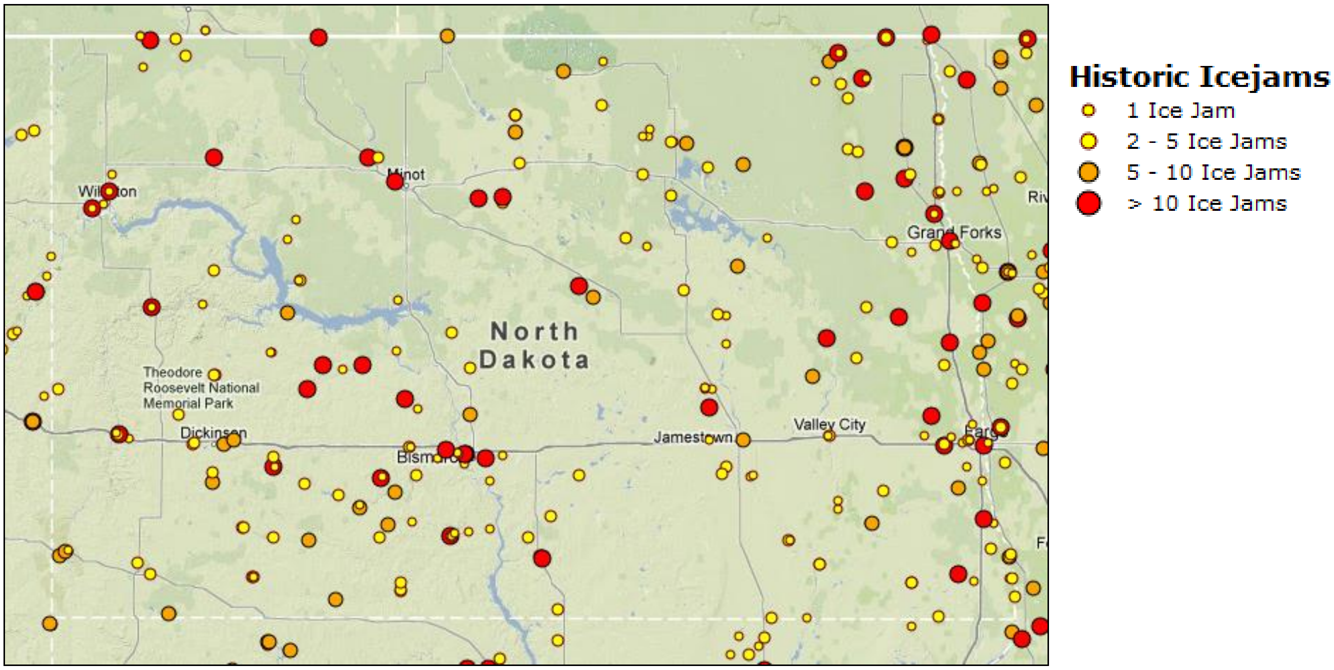
Closed Basin Flooding Additional Location Details

The Closed Basin Flooding associated with Devils Lake in North Dakota primarily impacts the following counties: Benson, Nelson, Ramsey, and Towner counties.

Ice Jam Flooding Additional Location Details

The US Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) website has a database and maps of current and historic ice jam events. The Ice Jam Database is maintained by the Ice Engineering Group at CRREL and currently consists of over 18,000 records from across the US. According to this data as of May 2013, since 1881, there have been 1,194 ice jams in North Dakota (see **Figure 5.29**). From 2000 to May 2013, there were 164 recorded ice jams.

Figure 5.29. Ice Jams in North Dakota 1881-May 2013



Source: U.S. Army Corps of Engineers Cold Regions Research and Engineering laboratory, http://www.crrel.usace.army.mil/

5.4.3. Previous Occurrences

From 1965 to 2013, North Dakota has received 33 Presidential Disaster Declarations, four (4) Emergency Declarations, and one (1) State level declaration that did not result in a presidential disaster or emergency declaration for events including flood. These events are detailed in **Table 5.33**. **Figure 5.30** that follows provides a statewide map indicating the number of flood-related declarations for each county and tribe in North Dakota. Note: specific information on tribal declarations is not available prior to 1998.

Table 5.33. 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
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

Declaration	Location	Date	Other Information	Casualties	Damages
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*
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
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

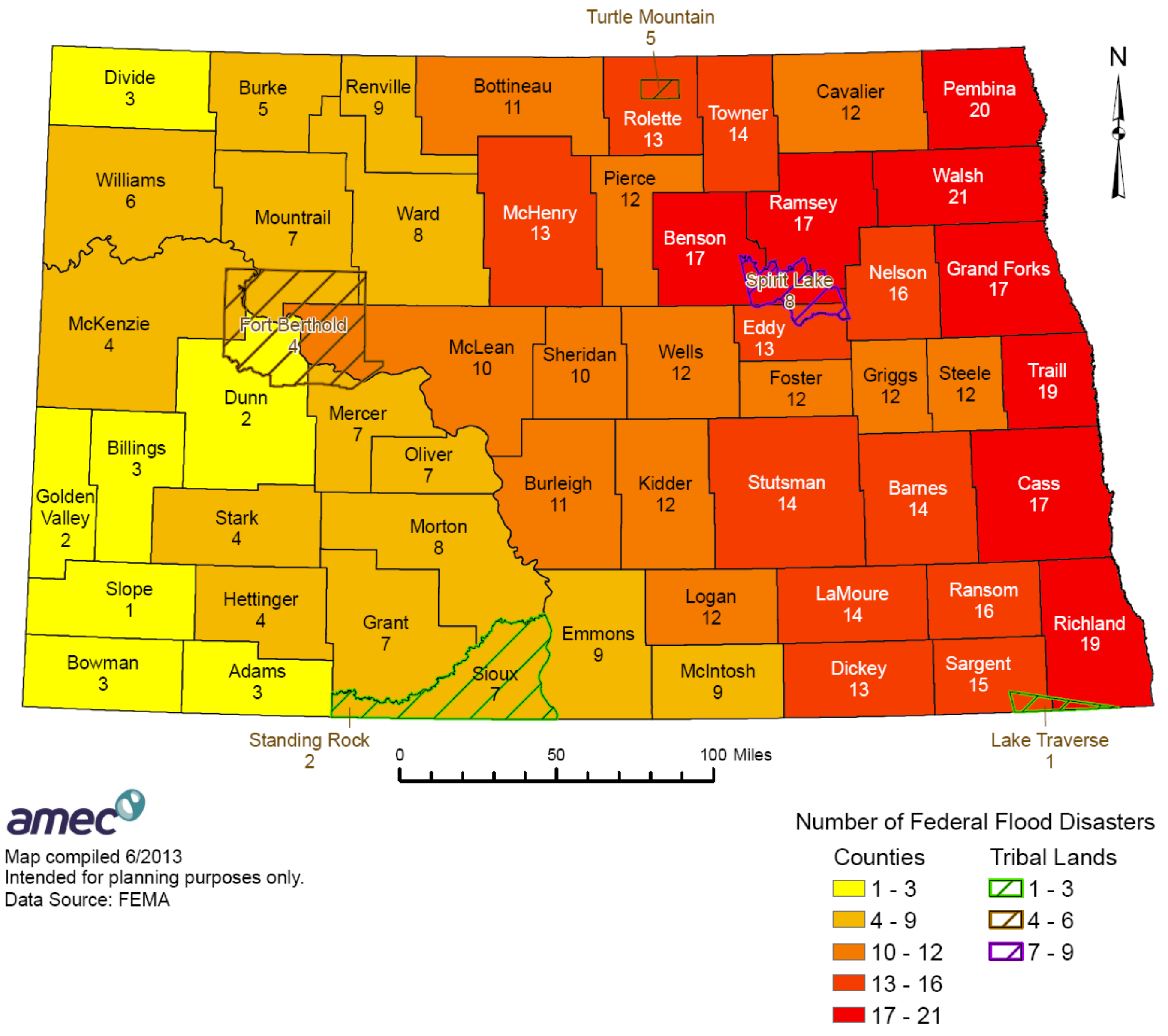
Declaration	Location	Date	Other Information	Casualties	Damages
State EO 2013-03	Mouse (Souris), Devils Lake, Sheyenne, James, Pembina, and Red River of the North Basins	3/29/2013	State declared flood emergency	Unknown	Unknown
EM-3364	6 counties along eastern ND border	April 22-May 7, 2013 (Declared on 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
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

* 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

Figure 5.30. North Dakota Presidential Disaster and Emergency Declarations Including Flooding,1989-2013



North Dakota's history is colored with many significant flood events. The summaries that follow are for the more significant flood events that have been recorded in the state. Sources consulted for this information include: State Historical Society of North Dakota; North Dakota Department of Emergency Services; US Geological Survey; Minot Daily News, 1969; Interagency Hazard Mitigation Team Reports, varied dates; National Climatic Data Center; US Army Corps of Engineers; and the Bismarck Tribune.

- 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 5.31. First Avenue South from 8th 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 5.32** shows the Officers Club at Camp Grafton being battered by floodwaters during this event.

Figure 5.32. 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 all 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 that 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

"Over the last several years excessive moisture conditions have caused great financial losses to the infrastructure in most of the townships in North Dakota. Severe damage to road surfaces, bridges and culverts throughout North Dakota combined with pooling in ditches and adjacent farm land have contributed to road bed deterioration far above normal conditions. Funding sources for road maintenance just cannot cover any more than some of the most hazardous conditions that the last few years of excessive flooding have brought to us. Roads being closed and abandoned due to inundation have put excessive use on the roads that are open for travel."

~Ken Yantes
Executive Secretary
North Dakota Township Officers Association

moisture led to riverine and flash flooding during the spring of 1999. Roads, utilities, homes, and public facilities all suffered damages. Delayed crop planting hurt farmers.

- 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, Manvel, 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 Fargodome filled with 8-12 feet of water, and North Dakota State University had water in nearly all of 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 Fargo 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 5.33. 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 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. A few homes were threatened by high creek and coulee levels 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, several homes were surrounded by water. 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 40.82 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.
- 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, US Geological Survey, and North Dakota State Water Commission. On February 14, 2011, the State Emergency Operations Center received their 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. 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 NDNG, 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 29th. Due to a rather wet summer, Fargo experienced 150 days above flood stage this spring and finally dropped below flood stage on the 27th of August.

- 2011 Devils 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 average level of 1454.40 feet on the 27th of July. 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
- 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 on the roof 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, DR-4128 - The event was a result of severe storms, and overland and riverine flooding resulting from a record-breaking, four-week wet cycle that began on May 17, 2013 and ended June 16, 2013. Declared jurisdictions included: 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, main stem rivers and tributaries, already full from 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.

Figure 5.34. Aerial Photo of Flood Impacts in Pembina County, May 2013

Source: Photos Courtesy of Cavalier Municipal Airport Authority

Riverine Flood Additional Previous Events Details

Table 5.34 shows the flood events from 2000 through February 2013 by county from the National Climatic Data Center (NCDC). Note that the NCDC database often lists damages from riverine floods for a zone rather than by county, and therefore, the listing of losses by county may include losses in other locations. Also, note that additional events may have occurred but may not have been reported to the National Weather Service and listed in the database. Some events may be lacking a damage estimate.

Table 5.34. Flood Events by County/Zone, 2000 to February 2013

County/Zone	# of Events	Property Damages
Adams	3	$179,000
Barnes (Zone)	3	$500,000
Barnes	8	$525,000
Benson (Zone)	15	$20,250,000
Benson	24	$4,720,000
Billings (Zone)	1	$0
Billings	2	$100,000
Bottineau (Zone)	1	$0
Bottineau	5	$476,000
Bowman	3	$437,000
Burleigh (Zone)	1	$0
Burleigh	8	$1,138,000
Cass (Zone)	7	$4,000,000
Cass	11	$1,369,000
Cavalier (Zone)	4	$340,000
Cavalier	5	$642,000
Dickey	3	$849,000

County/Zone	# of Events	Property Damages
Dunn (Zone)	2	$0
Dunn	4	$120,000
Eastern Walsh (Zone)	6	$2,400,000
Eddy (Zone)	5	$0
Eddy	5	$15,000
Emmons	2	$1,048,000
Foster	2	$605,000
Golden Valley (Zone)	1	$0
Grand Forks (Zone)	5	$5,200,000
Grand Forks	7	$897,000
Grant	4	$467,000
Griggs (Zone)	5	$250,000
Griggs	5	$20,000
Hettinger	2	$218,000
Kidder	2	$1,345,000
La Moure	2	$1,893,000
Logan	2	$171,000
McHenry (Zone)	1	$0
McHenry	4	$5,212,000
McIntosh	2	$127,000
McKenzie (Zone)	1	$0
McKenzie	4	$144,000
McLean	4	$555,000
Mercer	4	$808,000
Morton	7	$1,243,000
Mountrail (Zone)	1	$0
Mountrail	5	$452,000
Nelson (Zone)	10	$5,000,000
Nelson	27	$4,165,000
Oliver	4	$187,000
Pembina (Zone)	9	$1,600,000
Pembina	13	$512,000
Pierce	2	$296,000
Ramsey (Zone)	16	$25,250,000
Ramsey	24	$4,715,000
Ransom (Zone)	7	$250,000
Ransom	11	$128,000
Renville	2	$5,000,000
Richland (Zone)	14	$3,000,000
Richland	13	$1,155,000
Rolette	3	$450,000
Sargent (Zone)	6	$0
Sargent	11	$260,000
Sioux	4	$430,000
Slope	1	$50,000
Stark (Zone)	1	$0
Stark	1	$30,000
Steele (Zone)	3	$300,000
Steele	9	$40,000
Stutsman	3	$1,020,000
Towner (Zone)	5	$0
Towner	5	$304,000
Traill (Zone)	7	$500,000
Traill	6	$187,000
Walsh	11	$990,000
Ward	4	$100,538,000
Wells (Zone)	2	$0
Wells	2	$2,450,000

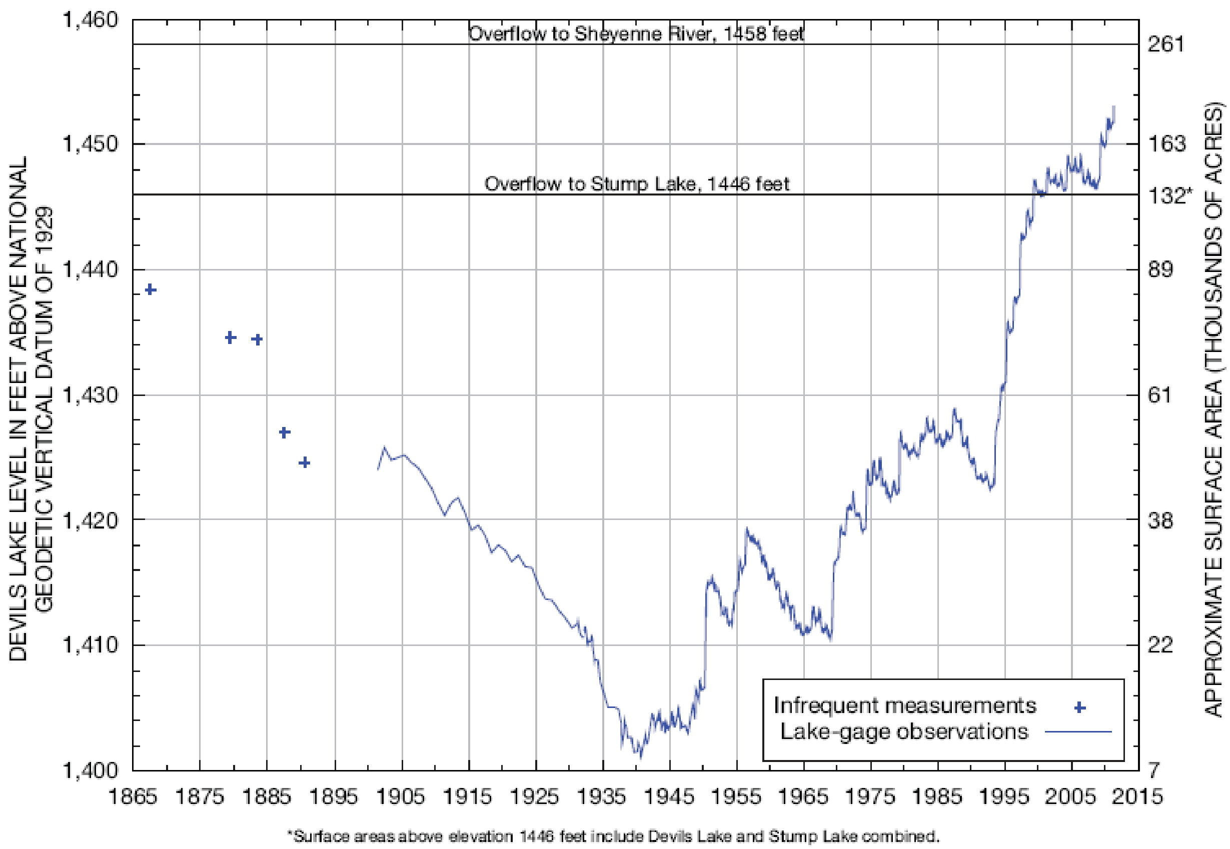
County/Zone	# of Events	Property Damages
Western Walsh (Zone)	2	$500,000
Williams (Zone)	1	$300,000
Williams	3	$250,000
Total	440	$218,572,000

Source: National Climatic Data Center, data downloaded on 5/22/2013, http://www.ncdc.noaa.gov/stormevents/

Closed Basin Flooding Additional Previous Events Details

Figure 5.35 shows the water surface elevation for Devils Lake from 1865 to 2013 and **Table 5.35** that follows provides the square miles of water, percent change, and percent of the basin.

Figure 5.35. Water Surface Elevation for Devils Lake, 1865-2013



Source: North Dakota State Water Commission, Devils Lake Flood Facts, March 2013, retrieved on 7/1/2013 from http://www.swc.state.nd.us/4dlink9/4dcgi/GetContentPDF/PB-206/DL_Quick_Facts.pdf

Table 5.35. Devils Lake Surface Water, 1991-2011

Year	H20 (sq. Miles)	% Change	% Basin
1991	120		3%
1995	317	264.2%	9%
1998	348	109.8%	10%
2003	324	93.1%	9%

Year	H20 (sq. Miles)	% Change	% Basin
2010	470	145.1%	13%
2011	819	174.3%	23%

Source: North Dakota State Water Commission, 2011, retrieved from http://www.dlbasin.com/ on 5/22/2013

Ice Jam Flooding Additional Previous Events Details

The US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL) maintains a database of historic ice jams. **Table 5.36** lists the number of ice jams by water year (October – September with the water year being that of the end of the period). During the 24-year period from 1990 to May 2013, there were a total of 164 events. Note that additional ice jams may have occurred but were not observed or recorded in the ice jam database.

Table 5.36. North Dakota Ice Jams by Water Year, 1990-May 2013

Water Year	Reports
1990	0
1991	0
1992	0
1993	0
1994	6
1995	7
1996	16
1997	39

Water Year	Reports
1998	3
1999	6
2000	3
2001	5
2002	1
2003	3
2004	35
2005	13

Water Year	Reports
2006	6
2007	2
2008	20
2009	25
2010	26
2011	15
2012	4
2013*	6

U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory, http://www.crrel.usace.army.mil/; *as of 5/10/2013

Flash Flood Additional Previous Events Details

Table 5.37 provides flash flood events from 2000 through February 2013 by county from the National Climatic Data Center (NCDC). During this 14-year period, there have been 405 reported flash flood events. **Figure 5.36** that follows displays this data on a statewide map.

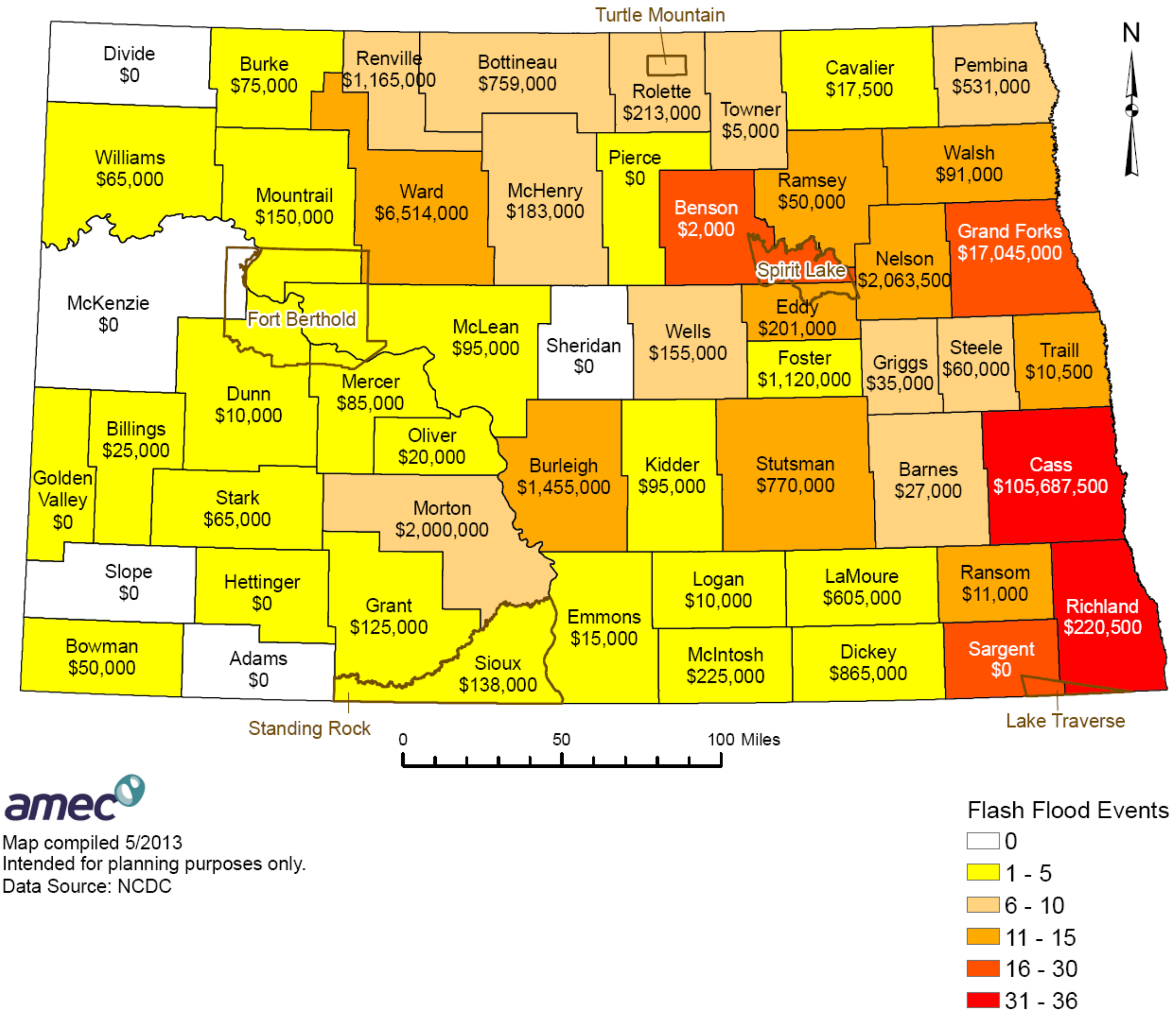
Table 5.37. Flash Flood Events by County 2000 to February 2013

County	# of Events	Property Damages
Barnes	10	$27,000
Benson	16	$2,000
Billings	2	$25,000
Bottineau	6	$759,000
Bowman	1	$50,000
Burke	1	$75,000
Burleigh	11	$1,455,000
Cass	33	$105,687,500
Cavalier	5	$17,500
Dickey	5	$865,000
Dunn	3	$10,000
Eddy	14	$201,000
Emmons	2	$15,000
Foster	4	$1,120,000
Golden Valley	4	$0
Grand Forks	30	$17,045,000
Grant	4	$125,000
Griggs	7	$35,000
Hettinger	2	$0

County	# of Events	Property Damages
Kidder	3	$95,000
La Moure	4	$605,000
Logan	1	$10,000
McHenry	7	$183,000
McIntosh	1	$225,000
McLean	4	$95,000
Mercer	3	$85,000
Morton	7	$2,000,000
Mountrail	5	$150,000
Nelson	13	$2,063,500
Oliver	4	$20,000
Pembina	10	$531,000
Pierce	1	$0
Ramsey	12	$50,000
Ransom	13	$11,000
Renville	7	$1,165,000
Richland	36	$220,500
Rolette	7	$213,000
Sargent	20	$0
Sioux	5	$138,000
Stark	3	$65,000
Steele	10	$60,000
Stutsman	14	$770,000
Towner	7	$5,000
Traill	12	$10,500
Walsh	13	$91,000
Ward	15	$6,514,000
Wells	6	$155,000
Williams	2	$65,000
Total	**405**	**$143,109,500**

Source: National Climatic Data Center, data downloaded on 5/22/2013, http://www.ncdc.noaa.gov/stormevents/

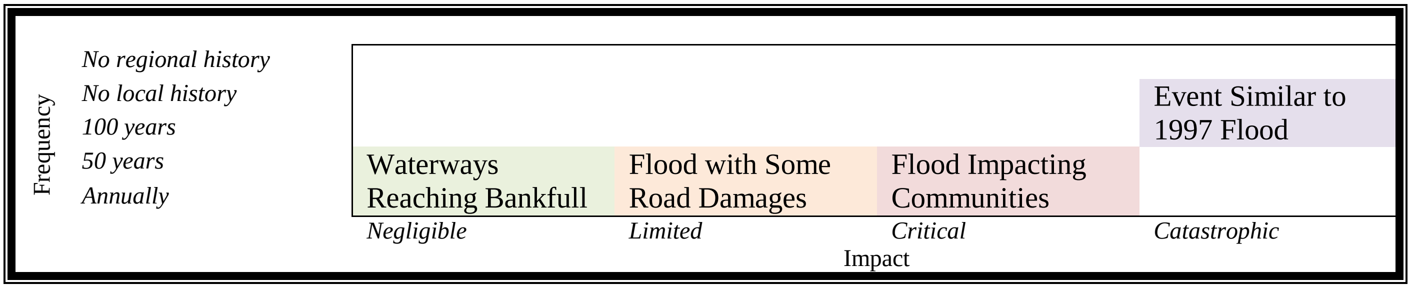
Figure 5.36. Flash Flood Events 2000-May 2013



5.4.4. Probability and Magnitude

Figure 5.37 is a graphical representation of the range of events that can occur within the flood hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the flood hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.37. Hazard Frequency and Impact Ranges



Considering the extensive history of flooding in North Dakota, this history will be used to express the probability and magnitude of floods in the state. **Table 5.38** provides this data for Riverine, Flash and Ice Jam Flooding. Detailed statistical data was not available for all events involving levee failure. 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.

Table 5.38. North Dakota Flood Occurrences

Flood Type	History	Recurrence	Typical Impacts
Riverine	33 declared events in 48 years (1965 to 2013)	Averages at least one event per year. (67 percent likelihood)	Roads Bridges Sewer Systems Homes Businesses Public Facilities Electricity Agriculture
Flash	405 events reported to NCDC in 14 years.	Nearly 29 events per year	Roads Homes Businesses Agriculture
Ice Jam	164 events in 24 years	Nearly 7 events per year	Roads Homes Businesses Agriculture

The 100-year floodplain has a 1 percent probability of being exceeded in any given year. For flooding, the 500-year events represent the worst-case scenarios. Detailed mapping of the 500-year hazard areas do not exist for all parts of North Dakota, however, such an event would likely cause significant problems. Damages to structures, infrastructure, and the economy could be expected in areas that have never flooded in recorded history.

5.4.5. State Risk Assessment

Vulnerability Overview

As history has shown, essentially all jurisdictions in North Dakota are at risk from flood damages. The damages 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.

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. All jurisdictions in North Dakota are at risk from flood deaths. According to the National Weather Service, an average of 93 people died each year from floods, based on the 30-year history from 1980-2009. According to state disaster reports, a total of 31 people have died from floods in North Dakota from 1993 to May 2013 leading to an average of nearly two deaths per year in the state from flood.

Flooding regularly affects the agricultural areas of North Dakota. Much of the most productive croplands are along rivers and creeks in the more lush 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 affected. 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 **Section 5.11** for additional details) may additionally have an impact on commerce.

Dirty floodwaters often contaminate or destroy everything they touch. Historic resources have been lost during flood events. In fact, the North Dakota State Fire and Tornado Fund paid $18,519 to the Grand Forks County Historical Society for flood losses. (North Dakota State Fire and Tornado Fund, 2010) Road washouts could disrupt social values as activities are cancelled and travel is limited. 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.

The sections that follow provide additional details regarding populations and values 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 values vulnerable to damage from these types of flooding events.

Riverine Flooding Additional Vulnerability Details

To provide additional details on the populations and assets vulnerable to riverine flooding, a GIS-based analysis was completed utilizing a combination of DFIRM, preliminary DFIRM, and Q3 data. As discussed previously, a DFIRM is a digital version f the FIRM that is designed for use with digital mapping and analysis software. A preliminary DFIRM is the DFIRM product that is not yet effective and in force. Prior to becoming effective some modifications could be made to a preliminary DFIRM. Digital Q3 flood data are developed by scanning the existing FIRM hardcopy, vectoring a thematic overlay of flood risks. Vector Q3 flood files contain only certain features from the existing FIRM hard copy and are not as accurate as DFIRM data. However, in the absence of a DFIRM, the Q3 data is the best available data for GIS-based analysis. **Table 5.39** provides details on which type of data was utilized for each county in North Dakota. Please note that only portions of the county had available DFIRM or preliminary DFIRM data for many counties. Therefore, for the remaining portions of the county, Q3 data was used. These counties are indicated as "partial"

Table 5.39. GIS-Based Data Utilized for Riverine Flood Vulnerability Analysis by County

Counties with DFIRM Data	Preliminary DFIRM	Q3	Not Mapped
Barnes	Cass (partial)	Adams	Dickey
Benson (partial)		Benson	Divide
Bottineau (partial)		Billings	Foster
Burleigh (partial)		Bottineau	Grant
Cavalier (partial)		Bowman	Sargent
Grand Forks (partial)		Burke	Sheridan
Hettinger (partial		Burleigh	Steele
McHenry (partial)		Cass	Towner
McLean (partial)		Cavalier	
Morton (partial)		Divide	
Nelson (partial)		Dunn	
Pembina (partial)		Eddy	
Ransom (partial)		Emmons	
Renville (partial)		Golden Valley	
Richland (partial)		Grand Forks	
Rolette		Griggs	
Sioux(partial)		Hettinger	
Stark (partial)		Kidder	
Stutsman (partial)		LaMoure	
Traill (partial)		Logan	
Walsh (partial)		McHenry	
Williams (partial)		McIntosh	
		McKenzie	
		McLean	
		Mercer	
		Morton	
		Mountrail	
		Nelson	
		Oliver	
		Pembina	
		Pierce	
		Ramsey	
		Ransom	
		Renville	
		Richland	
		Sioux	

Counties with DFIRM Data	Preliminary DFIRM	Q3	Not Mapped
		Slope	
		Stark	
		Stutsman	
		Traill	
		Walsh	
		Ward	
		Wells	
		Williams	

After assembling the various GIS-based layers described above to depict the areas in North Dakota vulnerable to riverine flooding, a vulnerability analysis was completed to determine populations and assets at risk utilizing the census block data available as part of FEMAS HAZUS MH 2.1. **Table 5.40** provides the population, building count, building value, estimated content value, and total values vulnerable to the 1-percent annual chance riverine flood by county. **Figure 5.38** that follows depicts flood loss estimate in these areas based on 20 percent damage.

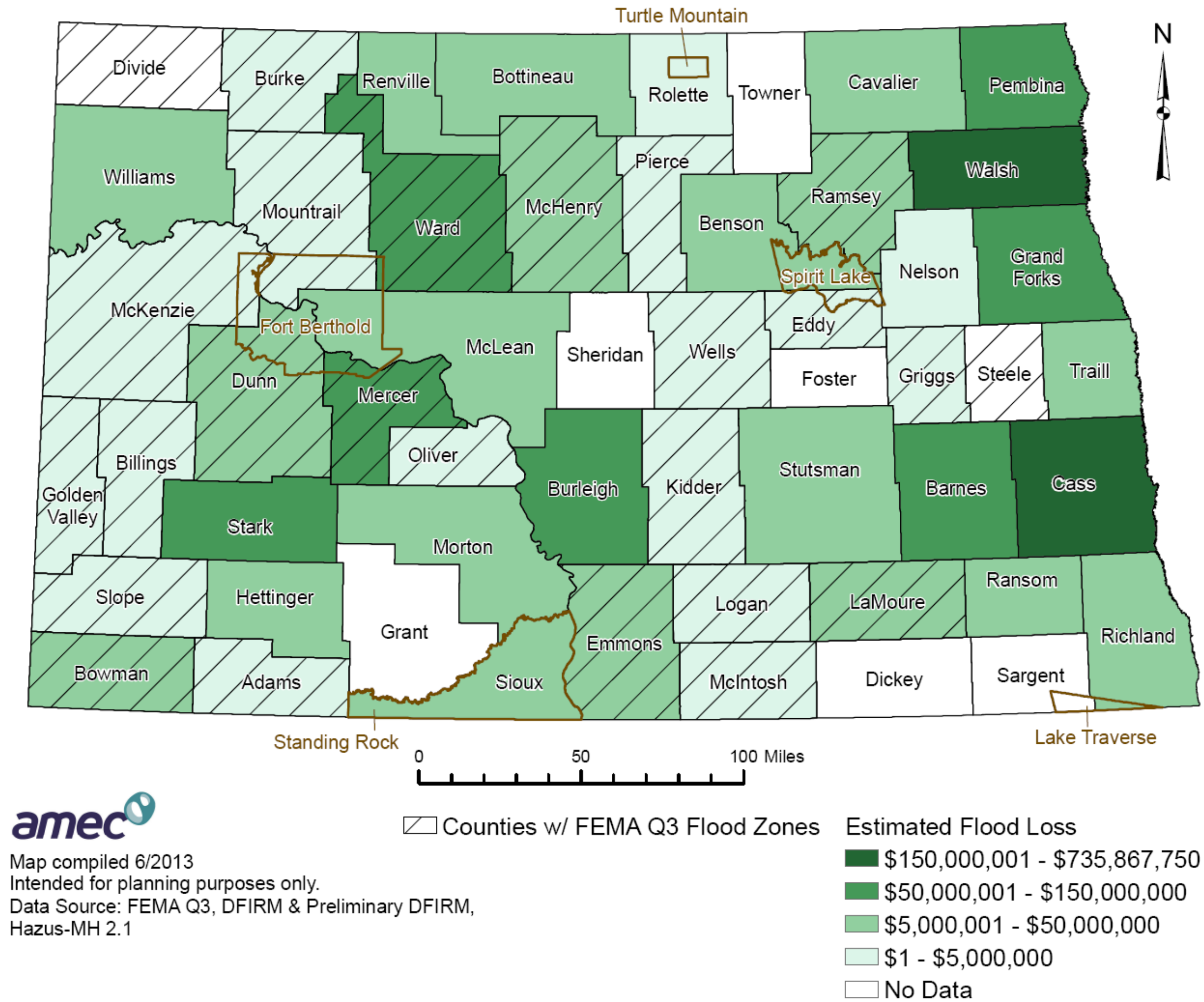
Table 5.40. Population and Values Vulnerable to 1-Percent Annual Chance Riverine Flood by County

County	Population	Building Count	Building Value ($)	Estimated Content Value ($)	Total Value ($)	Vulnerability Rating
Adams	0	<1	74,000	37,000	111,000	Low
Barnes	2,217	1,118	286,373,000	143,186,500	429,559,500	Moderate-High
Benson	650	221	41,047,000	20,523,500	61,570,500	Moderate
Billings	49	60	9,437,000	4,718,500	14,155,500	Low-Moderate
Bottineau	198	135	21,929,000	10,964,500	32,893,500	Moderate
Bowman	178	114	21,994,000	10,997,000	32,991,000	Moderate
Burke	30	30	4,102,000	2,051,000	6,153,000	Low-Moderate
Burleigh	3,286	1,379	362,470,000	181,235,000	543,705,000	Moderate-High
Cass	15,653	5,680	1,962,314,000	981,157,000	2,943,471,000	High
Cavalier	69	73	14,336,000	7,168,000	21,504,000	Moderate
Dickey	0	0	0	0	0	Low
Divide	0	0	0	0	0	Low
Dunn	154	200	17,226,000	8,613,000	25,839,000	Moderate
Eddy	0	<1	15,000	7,500	22,500	Low
Emmons	287	212	23,232,000	11,616,000	34,848,000	Moderate
Foster	0	0	0	0	0	Low
Golden Valley	27	18	3,853,000	1,926,500	5,779,500	Low-Moderate
Grand Forks	2,596	1,205	308,554,000	154,277,000	462,831,000	Moderate-High
Grant	0	0	0	0	0	Low
Griggs	3	3	270,000	135,000	405,000	Low
Hettinger	95	144	14,726,000	7,363,000	22,089,000	Moderate
Kidder	10	8	590,000	295,000	885,000	Low
LaMoure	110	65	25,496,000	12,748,000	38,244,000	Moderate
Logan	5	6	738,000	369,000	1,107,000	Low
McHenry	264	197	22,627,000	11,313,500	33,940,500	Moderate
McIntosh	0	<1	13,000	6,500	19,500	Low
McKenzie	110	82	12,968,000	6,484,000	19,452,000	Low-Moderate
McLean	107	130	20,664,000	10,332,000	30,996,000	Moderate
Mercer	1,200	687	140,321,000	70,160,500	210,481,500	Moderate-High
Morton	868	518	106,488,000	53,244,000	159,732,000	Moderate
Mountrail	54	30	7,127,000	3,563,500	10,690,500	Low-Moderate
Nelson	34	34	4,104,000	2,052,000	6,156,000	Low-Moderate

County	Population	Building Count	Building Value ($)	Estimated Content Value ($)	Total Value ($)	Vulnerability Rating
Oliver	94	72	8,534,000	4,267,000	12,801,000	Low-Moderate
Pembina	1,807	1,409	251,939,000	125,969,500	377,908,500	Moderate-High
Pierce	43	22	3,967,000	1,983,500	5,950,500	Low-Moderate
Ramsey	146	100	46,056,000	23,028,000	69,084,000	Moderate
Ransom	862	501	103,449,000	51,724,500	155,173,500	Moderate
Renville	14	128	21,442,000	10,721,000	32,163,000	Moderate
Richland	1,057	710	123,991,000	61,995,500	185,986,500	Moderate
Rolette	113	42	5,123,000	2,561,500	7,684,500	Low-Moderate
Sargent	0	0	0	0	0	Low
Sheridan	0	0	0	0	0	Low
Sioux	642	164	32,617,000	16,308,500	48,925,500	Moderate
Slope	3	2	283,000	141,500	424,500	Low
Stark	1,467	837	159,347,000	79,673,500	239,020,500	Moderate-High
Steele	0	0	0	0	0	Low
Stutsman	615	291	56,211,000	28,105,500	84,316,500	Moderate
Towner	0	0	0	0	0	Low
Traill	563	410	110,843,000	55,421,500	166,264,500	Moderate
Walsh	5,376	3,086	706,918,000	353,459,000	1,060,377,000	High
Ward	2,516	1,332	257,770,000	128,885,000	386,655,000	Moderate-High
Wells	53	13	6,032,000	3,016,000	9,048,000	Low-Moderate
Williams	331	329	52,810,000	26,405,000	79,215,000	Moderate
Total	**43,958**	**21,796**	**5,380,420,000**	**2,690,210,000**	**8,070,630,000**	

Source: FEMA DFIRM, Preliminary DFIRM, and Q3 Data; HAZUS MH 2.1

Figure 5.38. 1 Percent Annual Chance Flood Loss Based on DFIRM and Q3 Data



Levee Failure Additional Vulnerability Details

To determine vulnerability to levee failure, data was obtained from the USACE National Levee Database regarding areas protected by levees that are in the USACE Levee Safety Program. While this is not a comprehensive inventory of all levees in North Dakota, it is the best data available to perform GIS-based vulnerability analysis. Currently FEMA and USACE are in the process of integrating data collected in the FEMA Mid-term Levee Inventory with the National Levee Database. When this integration is complete it will provide a more comprehensive GIS-based data set for levee protected areas. If this data is available, it will be utilized in the next update of this plan.

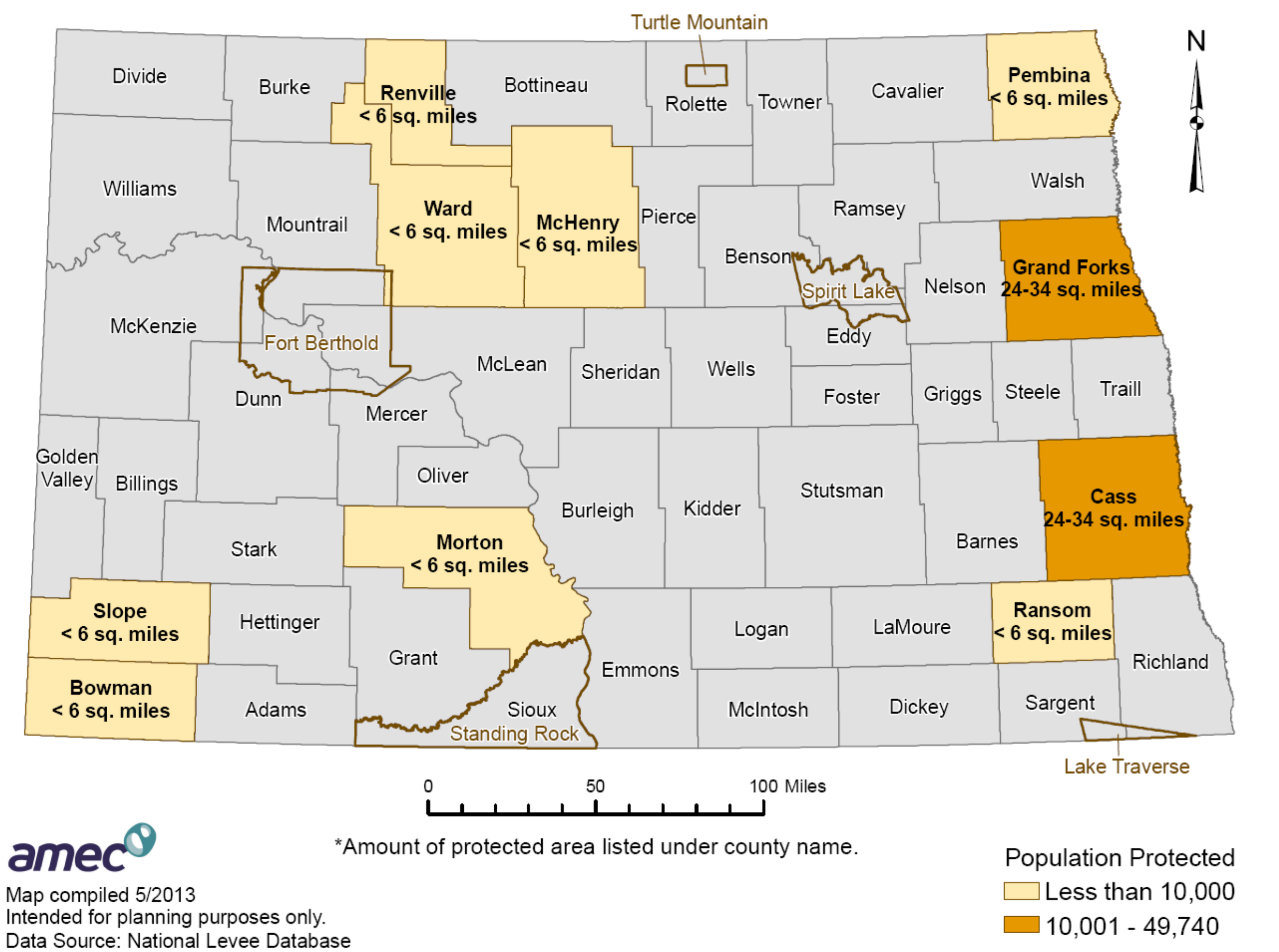
Table 5.41 provides details regarding acreage, populations, and values of assets vulnerable to damage in the event of failure of levees in the USACE NLD. **Figure 5.39** that follows shows these levee protected areas in a statewide map.

Table 5.41. Population and Values in USACE LSP Levee Protected Areas

County	Leveed Area (sq mi)	Acres	Population	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total Exposure
Bowman	0.1	43	212	$16,403	$3,564	$1,032	$516	$0	$192	$0	$21,707
Cass	24	15,044	20,412	$1,539,116	$604,085	$244,147	$16,580	$39,658	$10,677	$28,914	$2,483,177
Grand Forks	34	21,813	49,521	$3,964,715	$1,630,090	$267,514	$45,548	$114,596	$43,627	$204,589	$6,270,679
McHenry	0.6	404	931	$74,255	$14,813	$1,361	$742	$6,650	$1,252	$2,554	$101,627
Morton	6	3,893	6,084	$323,485	$242,685	$31,030	$4,262	$19,150	$25,868	$15,434	$661,914
Pembina	0.5	338	645	$57,504	$13,350	$41,677	$1,410	$2,874	$4,673	$2,270	$123,758
Ransom	0.3	163	573	$53,548	$25,324	$1,383	$912	$3,958	$686	$4,408	$90,219
Renville	0.1	86	7	$15,306	$1,530	$935	$0	$210	$0	$0	$17,981
Slope	0.6	375	140	$11,814	$654	$0	$0	$0	$0	$0	$12,468
Ward	0.7	446	1,184	$76,063	$10,118	$624	$740	$1,336	$283	$0	$89,164
Total	**67**	**42,605**	**79,709**	**$6,132,209**	**$2,546,213**	**$589,703**	**$70,710**	**$188,432**	**$87,258**	**$258,169**	**$9,872,694**

Source: USACE National Levee Safety Program

Figure 5.39. Areas Protected by USACE Levee Safety Program Levees



Closed Basin Flooding Additional Vulnerability Details

In 2010, the State Water Commission began a process to identify structures that will be inundated as Devils Lake continues to expand and rise. It was estimated that over 100 landowners will have over 700 structures affected between an elevation of 1,451' amsl (above mean sea level) and 1,454' amsl in Benson, Nelson, Ramsey, and Towner counties. The SWC is currently cataloguing structures up to an elevation of 1,458' amsl because of forecasted record raises in Devils Lake, with preliminary estimates of nearly 2,000 total structures (2013 Draft Devils Lake Basin Water Management Plan).

National Flood Insurance Program

The National Flood Insurance Program offers flood insurance to homeowners and businesses within a jurisdiction. This flood insurance is only available if either the community does not have an identified flood hazard, or if the community adopts and enforces standards for construction in the identified flood hazard areas. As of January 31, 2013, North Dakota had 13,859 policies in force insuring a value of $3,350,357,300. The comparison of flood risk and insurance coverage indicates which areas are most at risk for substantial, uninsured flood losses in the future. Since 1978, the National Flood Insurance Program has paid nearly $256 million in flood insurance claims.

Table 5.42, **Figure 5.40** and **Figure 5.41** that follow show the flood insurance claim history by county. Comparing the historical occurrence and estimated losses to the insurance coverage clearly shows that some of the most hazardous areas have very little insurance coverage.

Table 5.42. National Flood Insurance Policy and Loss Statistics, as of 1/31/2013

County	# Policies	Coverage	No. of Claims since 1978	Total Paid Since 1978
Adams	1	$140,000	0	$0
Barnes	422	$63,132,100	337	$2,297,190
Benson	129	$27,663,200	542	$12,306,040
Billings	17	$3,888,200	12	$81,047
Bottineau	6	$712,200	2	$0
Bowman	13	$1,981,000	13	$15,702
Burke	4	$500,000	1	$4,219
Burleigh	1,205	$326,111,400	662	$14,915,485
Cass	5,311	$1,408,878,000	3,272	$24,943,952
Cavalier	1	$29,400	6	$5,821
Dickey	5	$433,000	6	$20,331
Dunn	2	$220,000	7	$48,098
Eddy	2	$385,000	6	$19,677
Emmons	23	$1,820,600	72	$1,047,095
Foster	8	$1,064,000	9	$97,992
Golden Valley	1	$245,000	2	$0
Grand Forks	1,103	$267,799,600	2,974	$75,410,035
Grant	11	$241,400	7	$45,095
Griggs	7	$1,610,000	6	$27,159
Hettinger	4	$276,400	106	$320,013
LaMoure	17	$1,676,200	9	$78,230
Logan	3	$980,000	1	$252,920
McHenry	128	$31,279,800	66	$671,971
McIntosh	3	$730,300	2	$7,285
McKenzie	11	$2,486,400	1	$0
McClean	8	$2,210,000	9	$66,661
Mercer	123	$12,917,000	84	$886,226
Morton	341	$90,366,500	210	$2,715,444
Nelson	10	$1,228,700	40	$862,857
Oliver	4	$330,100	3	$4,603
Pembina	192	$36,488,600	535	$3,076,199
Pierce	1	$140,000	6	$45,786
Ramsey	463	$117,643,400	1,019	$37,038,238
Ransom	159	$25,030,800	150	$678,837
Renville	10	$1,086,000	57	$156,633
Richland	156	$34,185,500	215	$2,189,787
Rolette	7	$1,910,000	3	$23,024
Sargent	6	$952,000	6	$89,160
Sioux	3	$538,000	5	$872
Slope	0	$0	1	$0
Stark	118	$16,514,300	23	$62,800
Stutsman	150	$33,417,800	114	$619,868
Towner	8	$1,752,900	28	$340,500
Traill	73	$12,560,800	151	$1,592,339
Walsh	618	$59,069,300	1,152	$4,498,567

County	# Policies	Coverage	No. of Claims since 1978	Total Paid Since 1978
Ward	2,915	$746,308,000	1,022	$68,250,781
Wells	1	$350,000	0	$0
Williams	56	$11,074,400	16	$99,925
Total	**13,859**	**$3,350,357,300**	**12,970**	**$255,914,464**

Source: North Dakota State Water Commission, current a of January 31, 2013

Figure 5.40. NFIP Total Paid, as of 1/31/2013

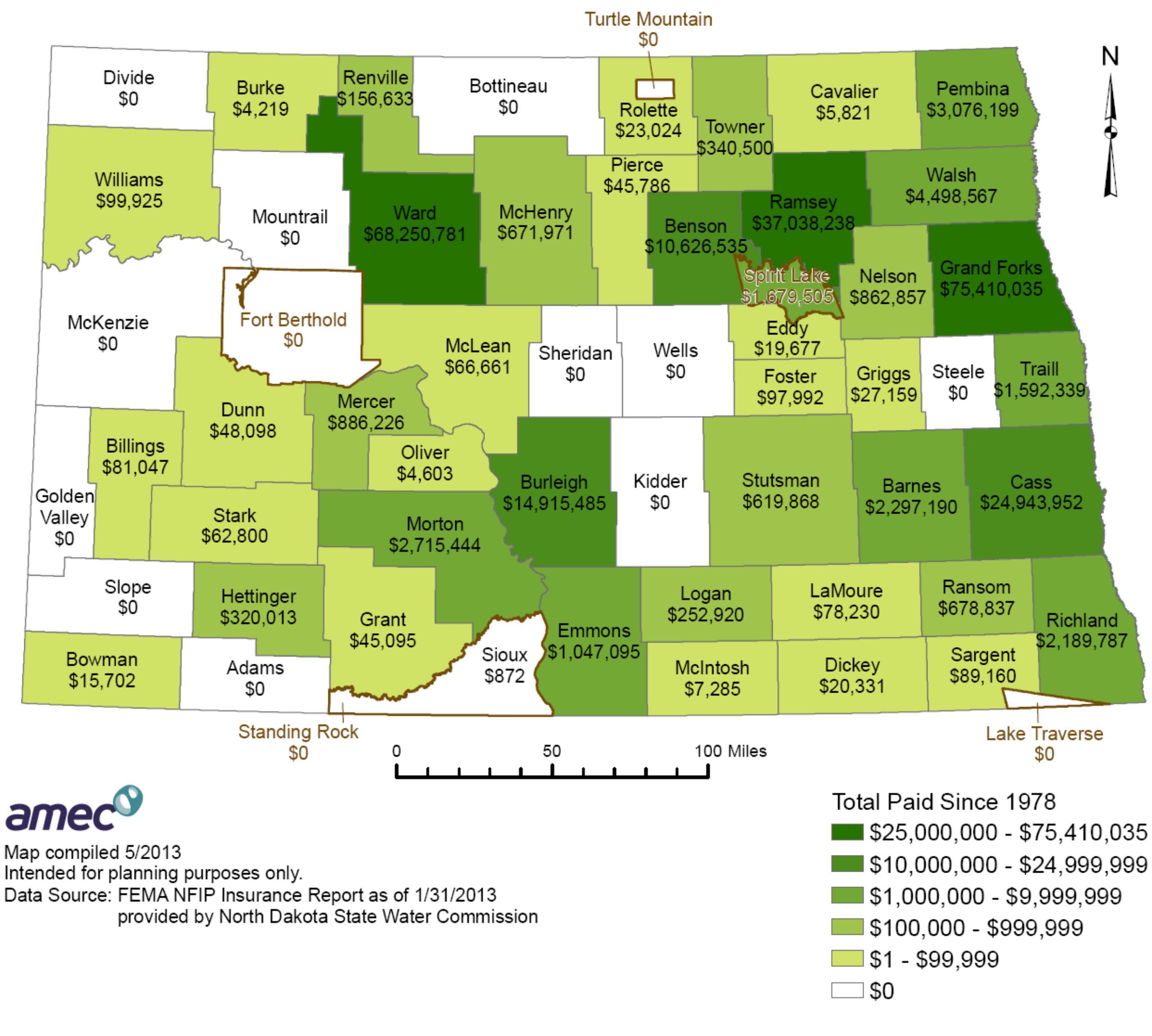
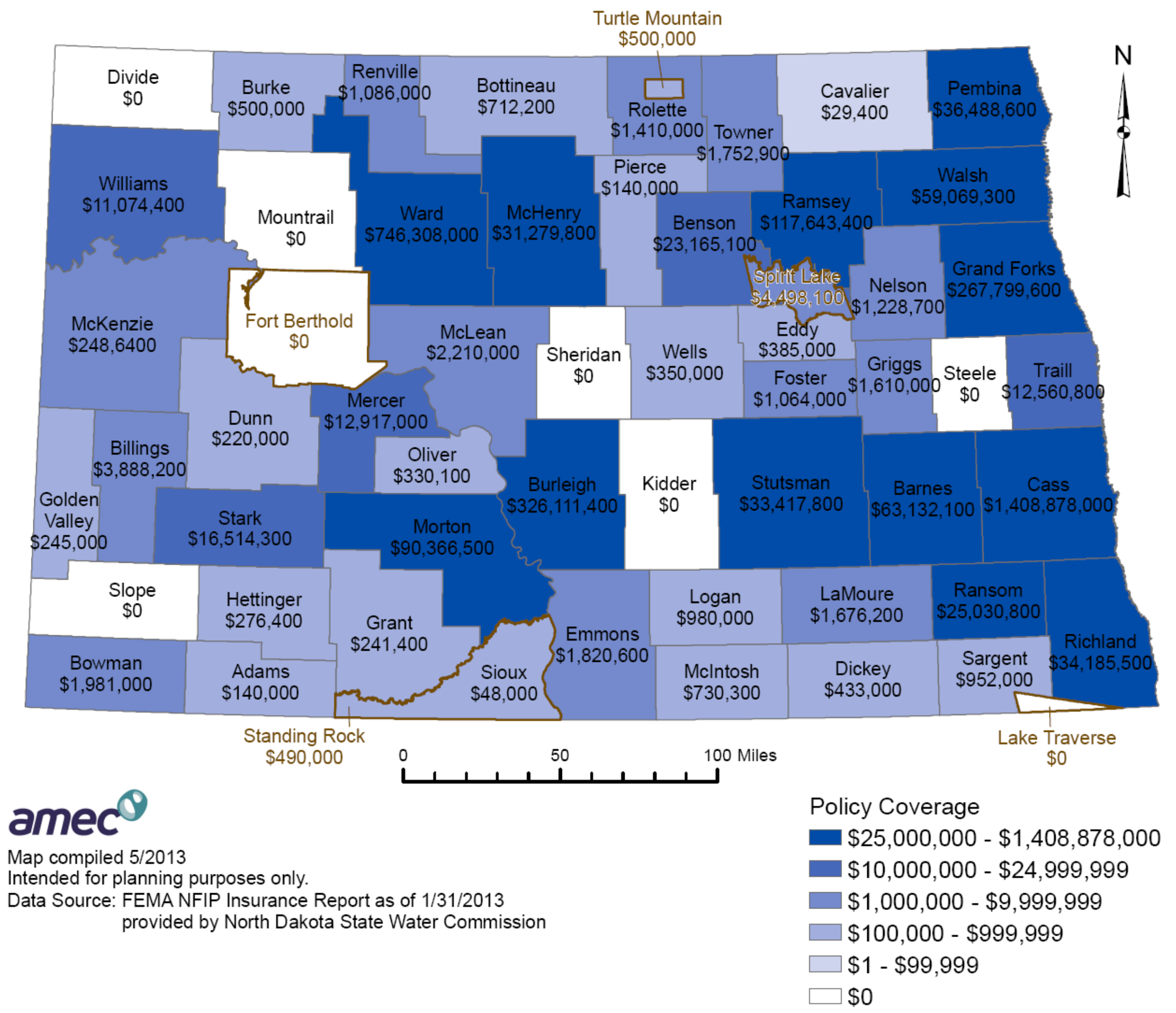


Figure 5.41. Flood Insurance Policies and Coverage, as of 1/31/2013



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 National Flood Insurance Program (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 April 30, 2013 includes a total of 390 repetitive loss properties. Of those properties, 55 are indicated as no longer repetitive because the property address associated with it was not specific enough to be located. In addition, 75 properties are indicated as no longer repetitive because there is no building located on the property and another 23 are indicated as no longer repetitive because flood protection has been provided to the property. This leaves a current total of 237 remaining repetitive loss properties.

For the 75 properties indicated as no longer repetitive because there is no building remaining, 20 were demolished but not acquired through any program, 43 were acquired and demolished as part of a program, and 12 were relocated out of the floodplain. Of the 43 acquired and demolished 37 were through the Hazard Mitigation Grant Program, 2 were through the Flood Mitigation Assistance Program, 4 were through non-FEMA funding sources.

For the 23 properties indicated as no longer repetitive because flood protection has been provided, 1 was elevated utilizing Increased Cost of Compliance (ICC) coverage and 22 were protected by a flood control/stormwater management project. All of the flood control/ stormwater management projects were either funded by USACE (7) or local programs (15).

Table 5.43 provides a summary by county of the remaining 237 repetitive loss properties as of April 30, 2013.

Table 5.43. North Dakota Repetitive Loss Properties as of April 30, 2013

County	# Of Repetitive Loss Properties	# Of Losses	Total Paid	Average Payment Per Loss
Barnes	15	32	$782,532	$323,795
Benson	2	4	$287,547	$143,774
Burleigh	31	63	$2,479,065	$1,228,324
Cass	64	159	$3,646,614	$1,464,351
Emmons	5	12	$223,021	$95,704
Grand Forks	12	30	$797,664	$305,970
Hettinger	1	3	$7,922	$2,641
McHenry	5	11	$457,512	$223,357
McLean	1	2	$7,784	$3,892
Morton	3	12	$158,835	$29,621
Nelson	2	4	$335,496	$167,748
Pembina	6	14	$212,150	$94,940
Ramsey	13	30	$2,360,751	$1,038,303
Ransom	6	14	$144,683	$66,745
Renville	1	2	$10,726	$5,363
Richland	5	12	$162,489	$64,214
Stutsman	3	6	$23,750	$11,875
Towner	1	3	$180,000	$60,000
Traill	6	13	$164,317	$77,120
Walsh	13	33	$930,235	$312,942
Ward	42	90	$5,569,750	$2,694,395
Total	**237**	**549**	**$18,942,841**	**$8,415,073**

Source: FEMA

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. There are 2 validated Severe Repetitive Loss Properties in North Dakota. One is 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.

Mitigation activities across the state, particularly acquisitions in the Red River Valley and the Devils Lake Basin have reduced the vulnerabilities to structures. 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 7.5.8, Project Monitoring and Evaluation.

Loss Estimates

Flood Property Losses

In 2009-2010 FEMA conducted a HAZUS Flood Average Annualized Loss (AAL) study which was performed for the entire continental United States using the MR4 release of HAZUS-MH. The inputs for the AAL included 30 meter Digital Elevation Model (DEM) and the default census block data in HAZUS MR4, which utilized the 2000 Decennial Census data.

The analysis was performed at the county level using Level 1 methodology with national datasets. The purpose of the AAL study was to identify flood-prone areas and communicate relative flood risk in terms of people and property vulnerable to damage. The AAL study data provides potential dollar losses for four flood frequencies as follows: 10-percent (10-year), 2-percent (50-year), 1-percent (100-year), and 0.2 percent (500-year). The average annualized loss estimates are then calculated based on the aggregated dollar losses from the various flood frequencies (averaged and annualized).

AAL total losses for the state of North Dakota are estimated to be $64,560,000 based on this study. **Table 5.44** provides the detailed estimated AAL results for each county in North Dakota for the following loss types: Residential Building and Contents Losses, Commercial Building and Contents Losses, Other Building and Contents Losses, Total Building and Contents Losses, Business Disruption Losses, and Total Losses**.** **Figure 5.42** and **Figure 5.42** that follow provide a statewide map depicting the AAL results by county and the per capita AAL by county respectively. The per capita analysis divides the total AAL by the 2010 population of the county to show the loss normalized by total population. The results of this analysis indicate counties that may have face a more difficult time recovering from floods.

Table 5.44. North Dakota AAL Losses by County and Loss Type

County	Business Disruption	Residential Building Loss	Residential Contents Loss	Commercial Building Loss	Commercial Contents Loss	Other Building Loss	Other Contents Loss	Total Building Loss	Total Contents Loss	Total Losses	Loss Rating
Adams	$1,000	$17,000	$5,000	$2,000	$7,000	$4,000	$8,000	$23,000	$20,000	$44,000	Low
Barnes	$130,000	$1,215,000	$750,000	$517,000	$1,340,000	$89,000	$387,000	$1,821,000	$2,477,000	$4,428,000	High
Benson	$4,000	$34,000	$19,000	$3,000	$9,000	$3,000	$11,000	$40,000	$39,000	$83,000	Low
Billings	$15,000	$104,000	$58,000	$7,000	$36,000	$3,000	$16,000	$114,000	$110,000	$239,000	Low
Bottineau	$8,000	$174,000	$87,000	$22,000	$70,000	$10,000	$43,000	$206,000	$200,000	$414,000	Low-Moderate
Bowman	$5,000	$56,000	$28,000	$11,000	$32,000	$7,000	$35,000	$74,000	$95,000	$174,000	Low
Burke	$2,000	$5,000	$3,000	$3,000	$15,000	$4,000	$34,000	$12,000	$52,000	$66,000	Low
Burleigh	$121,000	$729,000	$587,000	$173,000	$481,000	$200,000	$722,000	$1,102,000	$1,790,000	$3,013,000	Moderate-High
Cass	$128,000	$2,565,000	$1,356,000	$760,000	$1,878,000	$260,000	$754,000	$3,585,000	$3,988,000	$7,701,000	High
Cavalier	$22,000	$79,000	$82,000	$35,000	$109,000	$14,000	$47,000	$128,000	$238,000	$388,000	Low-Moderate
Dickey	$4,000	$15,000	$8,000	$8,000	$17,000	$9,000	$30,000	$32,000	$55,000	$91,000	Low
Divide	$0	$6,000	$1,000	$0	$2,000	$2,000	$5,000	$8,000	$8,000	$16,000	Low
Dunn	$4,000	$82,000	$36,000	$15,000	$50,000	$4,000	$22,000	$101,000	$108,000	$213,000	Low
Eddy	$3,000	$21,000	$8,000	$0	$2,000	$5,000	$19,000	$26,000	$29,000	$58,000	Low
Emmons	$9,000	$73,000	$34,000	$7,000	$28,000	$28,000	$80,000	$108,000	$142,000	$259,000	Low-Moderate
Foster	$1,000	$1,000	$0	$2,000	$5,000	$2,000	$10,000	$5,000	$15,000	$21,000	Low
Golden Valley	$0	$8,000	$3,000	$2,000	$9,000	$1,000	$2,000	$11,000	$14,000	$25,000	Low
Grand Forks	$305,000	$1,241,000	$1,059,000	$360,000	$1,130,000	$529,000	$1,720,000	$2,130,000	$3,909,000	$6,344,000	High
Grant	$2,000	$53,000	$17,000	$6,000	$12,000	$8,000	$25,000	$67,000	$54,000	$123,000	Low
Griggs	$15,000	$19,000	$6,000	$11,000	$35,000	$21,000	$86,000	$51,000	$127,000	$193,000	Low
Hettinger	$12,000	$67,000	$31,000	$40,000	$115,000	$8,000	$29,000	$115,000	$175,000	$302,000	Low-Moderate
Kidder	$3,000	$12,000	$5,000	$4,000	$18,000	$4,000	$20,000	$20,000	$43,000	$66,000	Low
LaMoure	$11,000	$38,000	$31,000	$11,000	$38,000	$9,000	$57,000	$58,000	$126,000	$195,000	Low
Logan	$7,000	$12,000	$4,000	$7,000	$30,000	$4,000	$18,000	$23,000	$52,000	$82,000	Low
McHenry	$14,000	$249,000	$121,000	$7,000	$36,000	$33,000	$169,000	$289,000	$326,000	$629,000	Low-Moderate
McIntosh	$4,000	$27,000	$63,000	$0	$2,000	$4,000	$20,000	$31,000	$85,000	$120,000	Low
McKenzie	$15,000	$63,000	$25,000	$3,000	$14,000	$9,000	$53,000	$75,000	$92,000	$182,000	Low
McLean	$12,000	$46,000	$19,000	$6,000	$29,000	$12,000	$67,000	$64,000	$115,000	$191,000	Low
Mercer	$83,000	$608,000	$334,000	$148,000	$432,000	$77,000	$389,000	$833,000	$1,155,000	$2,071,000	Moderate
Morton	$363,000	$2,298,000	$1,145,000	$817,000	$3,134,000	$193,000	$665,000	$3,308,000	$4,944,000	$8,615,000	High
Mountrail	$22,000	$52,000	$33,000	$36,000	$138,000	$16,000	$68,000	$104,000	$239,000	$365,000	Low-Moderate
Nelson	$2,000	$1,000	$0	$0	$3,000	$2,000	$12,000	$3,000	$15,000	$20,000	Low
Oliver	$7,000	$35,000	$14,000	$9,000	$46,000	$4,000	$20,000	$48,000	$80,000	$135,000	Low
Pembina	$50,000	$432,000	$291,000	$66,000	$179,000	$66,000	$276,000	$564,000	$746,000	$1,360,000	Moderate
Pierce	$26,000	$107,000	$114,000	$121,000	$187,000	$5,000	$26,000	$233,000	$327,000	$586,000	Low-Moderate

County	Business Disruption	Residential Building Loss	Residential Contents Loss	Commercial Building Loss	Commercial Contents Loss	Other Building Loss	Other Contents Loss	Total Building Loss	Total Contents Loss	Total Losses	Loss Rating
Ramsey	$41,000	$40,000	$21,000	$20,000	$79,000	$40,000	$172,000	$100,000	$272,000	$413,000	Low-Moderate
Ransom	$96,000	$401,000	$255,000	$139,000	$393,000	$65,000	$266,000	$605,000	$914,000	$1,615,000	Moderate
Renville	$5,000	$25,000	$12,000	$8,000	$37,000	$7,000	$33,000	$40,000	$82,000	$127,000	Low
Richland	$80,000	$534,000	$291,000	$91,000	$285,000	$126,000	$354,000	$751,000	$930,000	$1,761,000	Moderate
Rolette	$8,000	$91,000	$45,000	$18,000	$59,000	$14,000	$59,000	$123,000	$163,000	$294,000	Low-Moderate
Sargent	$35,000	$87,000	$43,000	$13,000	$50,000	$21,000	$73,000	$121,000	$166,000	$322,000	Low-Moderate
Sheridan	$0	$0	$0	$3,000	$12,000	$1,000	$7,000	$4,000	$19,000	$23,000	Low
Sioux	$2,000	$97,000	$49,000	$3,000	$12,000	$3,000	$10,000	$103,000	$71,000	$176,000	Low
Slope	$0	$36,000	$11,000	$0	$1,000	$0	$0	$36,000	$12,000	$48,000	Low
Stark	$42,000	$682,000	$331,000	$79,000	$200,000	$105,000	$218,000	$866,000	$749,000	$1,657,000	Moderate
Steele	$0	$24,000	$9,000	$0	$0	$0	$0	$24,000	$9,000	$33,000	Low
Stutsman	$148,000	$1,238,000	$804,000	$215,000	$752,000	$127,000	$581,000	$1,580,000	$2,137,000	$3,865,000	Moderate-High
Towner	$5,000	$6,000	$1,000	$10,000	$22,000	$8,000	$41,000	$24,000	$64,000	$93,000	Low
Traill	$229,000	$389,000	$239,000	$178,000	$575,000	$150,000	$710,000	$717,000	$1,524,000	$2,470,000	Moderate
Walsh	$152,000	$655,000	$375,000	$109,000	$350,000	$136,000	$519,000	$900,000	$1,244,000	$2,296,000	Moderate
Ward	$324,000	$3,034,000	$1,669,000	$889,000	$2,415,000	$338,000	$1,104,000	$4,261,000	$5,188,000	$9,773,000	High
Wells	$11,000	$84,000	$130,000	$17,000	$50,000	$29,000	$75,000	$130,000	$255,000	$396,000	Low-Moderate
Williams	$27,000	$78,000	$33,000	$30,000	$138,000	$13,000	$67,000	$121,000	$238,000	$386,000	Low-Moderate
Statewide Totals	**$2,615,000**	**$18,045,000**	**$10,695,000**	**$5,041,000**	**$15,098,000**	**$2,832,000**	**$10,234,000**	**$25,918,000**	**$36,027,000**	**$64,560,000**	

Source: FEMA Average Annualized Loss Summary

Figure 5.42. North Dakota Average Annualized Loss by County

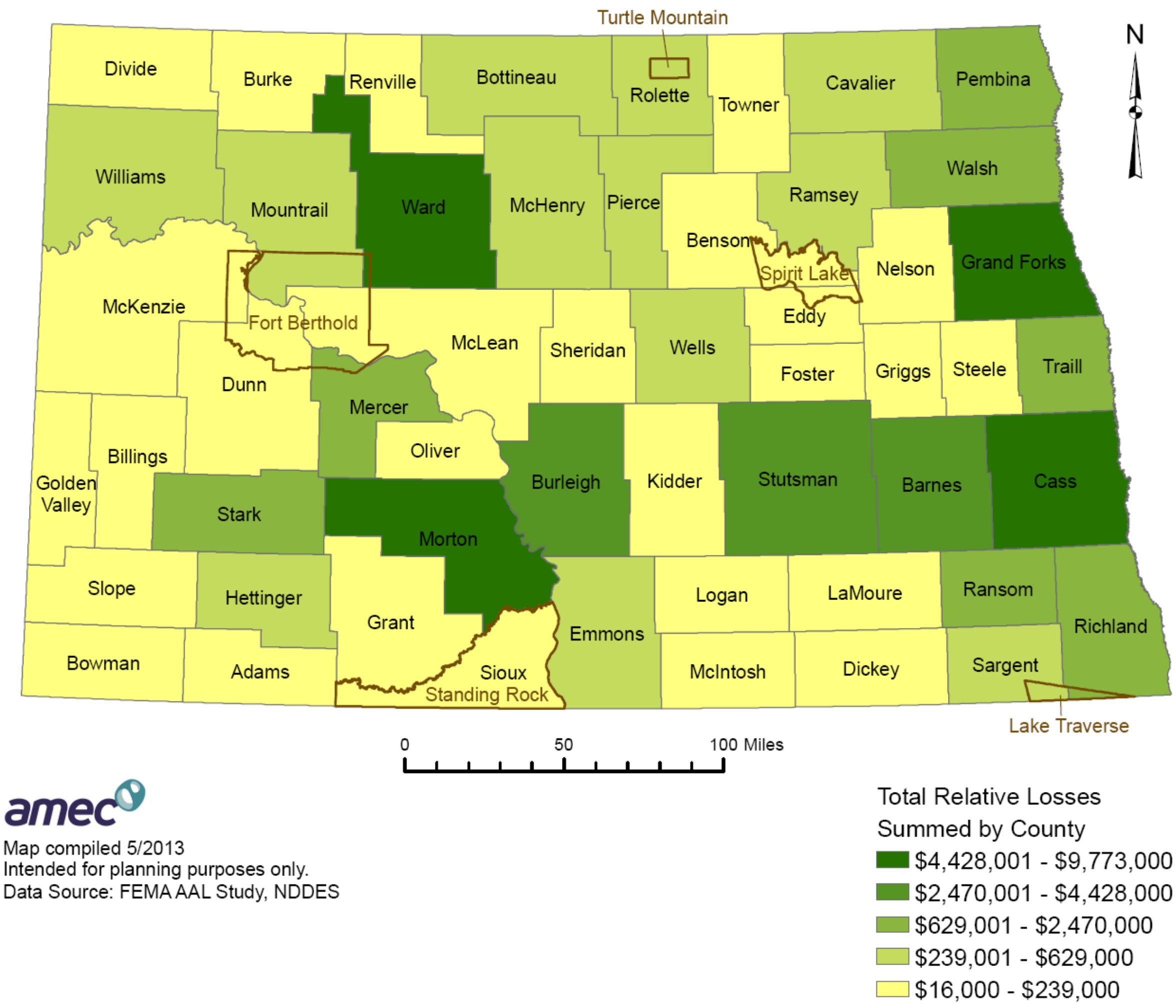
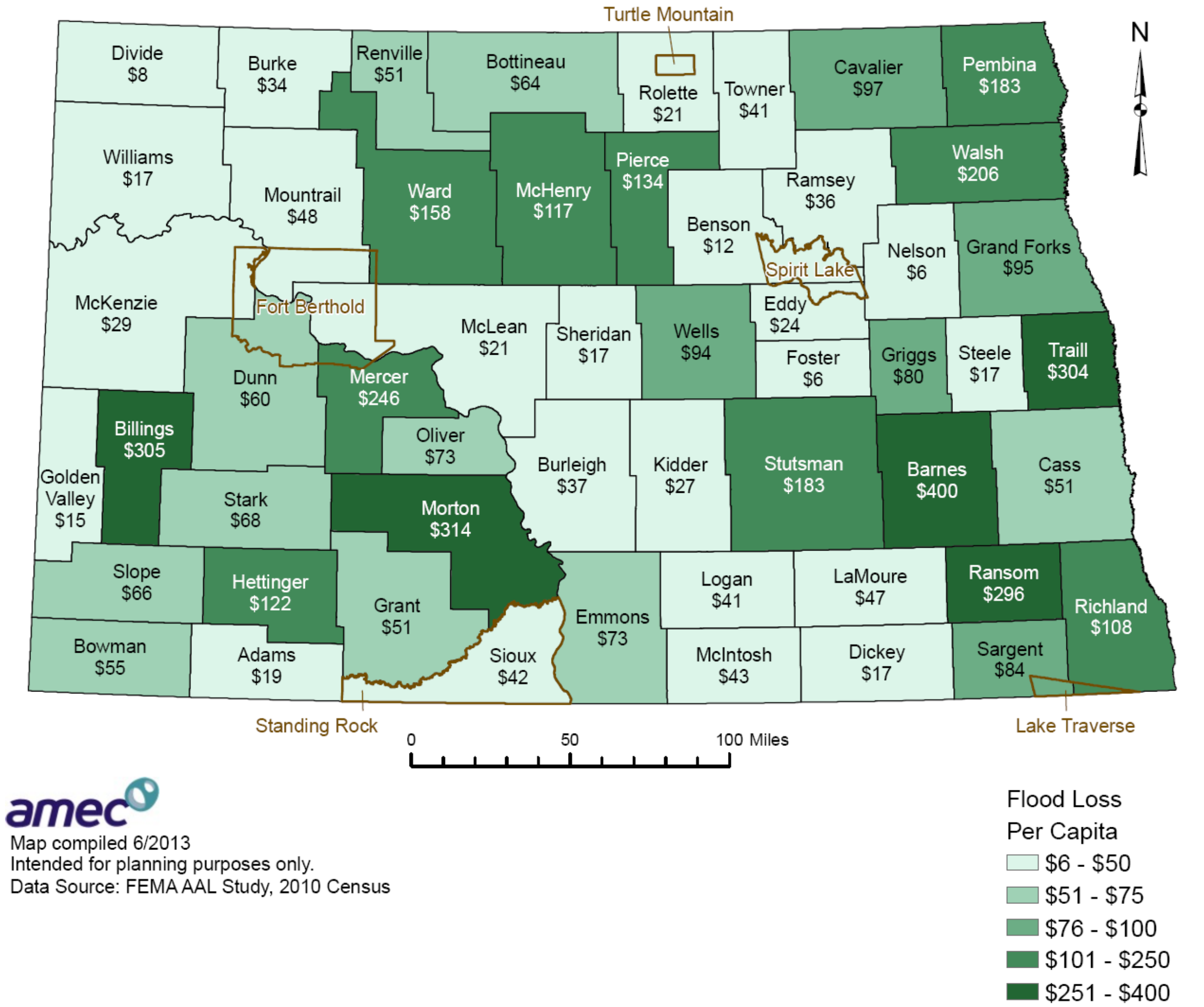


Figure 5.43. North Dakota Per Capita Average Annualized Loss by County



Flood Crop Losses

Table 5.45 provides an analysis based on crop insurance payments to insured crops for flood damages in each county over the 10-year period from 2003 to 2012. The USDA does not differentiate damages resulting from various types of flood. So, these losses include combined losses for all types of flooding. According to the 2011 North Dakota Crop Insurance Profile Report issued by the USDA Risk management Agency, 89 percent of North Dakota insurable crops were insured in 2011. Therefore, the crop insurance payments have been extrapolated to estimate losses to all insurable crops. The crop exposure value from the 2007 Census of Agriculture is provided to provide the basis for an annualized ratio of estimated losses to total value.

Table 5.45. Flood-Related Crop Insurance Payments Analysis (2003-2012)

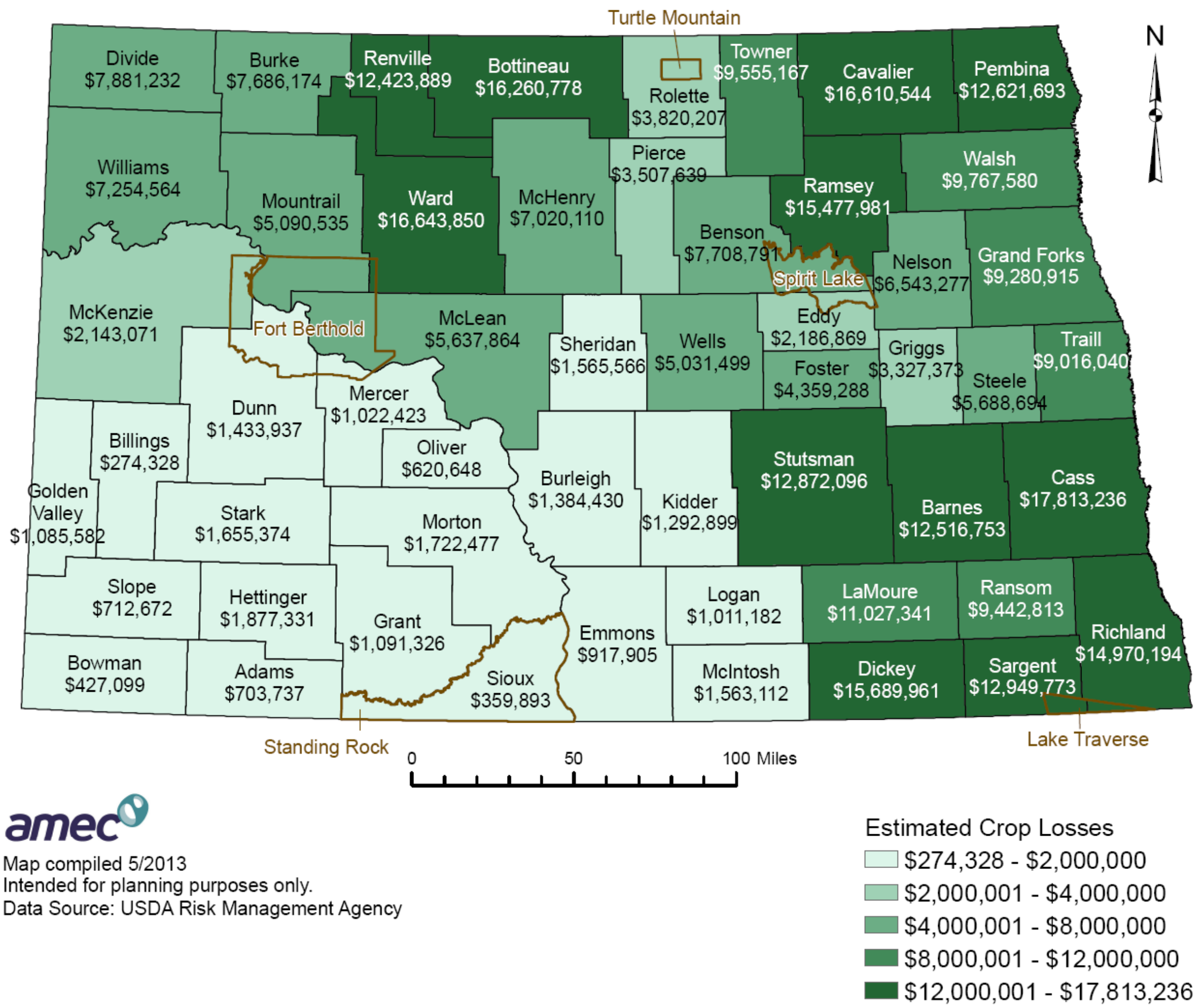
County	Value of Crops- 2007 Census of Agriculture	Crop Insurance Paid 2003-2012	Annualized Crop Insurance paid	Annualized Estimated Crop Losses by County	Crop Loss Ratio (Annualized Estimated Crop Losses/Value of Crops
Adams	$39,246,000	$6,263,263	$626,326.30	$703,737.42	1.8%
Barnes	$172,501,000	$111,399,098	$11,139,909.80	$12,516,752.58	7.3%
Benson	$108,039,000	$68,608,236	$6,860,823.60	$7,708,790.56	7.1%
Billings	$7,264,000	$2,441,518	$244,151.80	$274,327.87	3.8%
Bottineau	$158,991,000	$144,720,926	$14,472,092.60	$16,260,778.20	10.2%
Bowman	$35,079,000	$3,801,179	$380,117.90	$427,098.76	1.2%
Burke	$55,256,000	$68,406,946	$6,840,694.60	$7,686,173.71	13.9%
Burleigh	$50,682,000	$12,321,431	$1,232,143.10	$1,384,430.45	2.7%
Cass	$252,192,000	$158,537,801	$15,853,780.10	$17,813,236.07	7.1%
Cavalier	$171,319,000	$147,833,843	$14,783,384.30	$16,610,544.16	9.7%
Dickey	$124,459,000	$139,640,649	$13,964,064.90	$15,689,960.56	12.6%
Divide	$73,992,000	$70,142,962	$7,014,296.20	$7,881,231.69	10.7%
Dunn	$31,384,000	$12,762,041	$1,276,204.10	$1,433,937.19	4.6%
Eddy	$38,658,000	$19,463,138	$1,946,313.80	$2,186,869.44	5.7%
Emmons	$86,729,000	$8,169,357	$816,935.70	$917,905.28	1.1%
Foster	$75,607,000	$38,797,661	$3,879,766.10	$4,359,287.75	5.8%
Golden Valley	$26,832,000	$9,661,677	$966,167.70	$1,085,581.69	4.0%
Grand Forks	$233,477,000	$82,600,144	$8,260,014.40	$9,280,915.06	4.0%
Grant	$47,085,000	$9,712,799	$971,279.90	$1,091,325.73	2.3%
Griggs	$56,624,000	$29,613,624	$2,961,362.40	$3,327,373.48	5.9%
Hettinger	$83,684,000	$16,708,243	$1,670,824.30	$1,877,330.67	2.2%
Kidder	$46,750,000	$11,506,803	$1,150,680.30	$1,292,899.21	2.8%
LaMoure	$123,335,000	$98,143,336	$9,814,333.60	$11,027,341.12	8.9%
Logan	$39,574,000	$8,999,518	$899,951.80	$1,011,181.80	2.6%
McHenry	$90,288,000	$62,478,983	$6,247,898.30	$7,020,110.45	7.8%
McIntosh	$49,985,000	$13,911,699	$1,391,169.90	$1,563,112.25	3.1%
McKenzie	$50,115,000	$19,073,333	$1,907,333.30	$2,143,071.12	4.3%
McLean	$145,847,000	$50,176,991	$5,017,699.10	$5,637,864.16	3.9%
Mercer	$24,622,000	$9,099,563	$909,956.30	$1,022,422.81	4.2%
Morton	$60,803,000	$15,330,044	$1,533,004.40	$1,722,476.85	2.8%
Mountrail	$92,746,000	$45,305,763	$4,530,576.30	$5,090,535.17	5.5%
Nelson	$77,333,000	$58,235,167	$5,823,516.70	$6,543,277.19	8.5%
Oliver	$24,326,000	$5,523,766	$552,376.60	$620,647.87	2.6%
Pembina	$229,298,000	$112,333,072	$11,233,307.20	$12,621,693.48	5.5%
Pierce	$58,702,000	$31,217,990	$3,121,799.00	$3,507,639.33	6.0%
Ramsey	$122,100,000	$137,754,027	$13,775,402.70	$15,477,980.56	12.7%
Ransom	$72,103,000	$84,041,037	$8,404,103.70	$9,442,813.15	13.1%
Renville	$103,034,000	$110,572,610	$11,057,261.00	$12,423,888.76	12.1%
Richland	$228,812,000	$133,234,730	$13,323,473.00	$14,970,194.38	6.5%
Rolette	$52,837,000	$33,999,846	$3,399,984.60	$3,820,207.42	7.2%
Sargent	$104,365,000	$115,252,979	$11,525,297.90	$12,949,772.92	12.4%
Sheridan	$43,742,000	$13,933,535	$1,393,353.50	$1,565,565.73	3.6%

County	Value of Crops-2007 Census of Agriculture	Crop Insurance Paid 2003-2012	Annualized Crop Insurance paid	Annualized Estimated Crop Losses by County	Crop Loss Ratio (Annualized Estimated Crop Losses/Value of Crops
Sioux	$11,148,000	$3,203,052	$320,305.20	$359,893.48	3.2%
Slope	$31,423,000	$6,342,781	$634,278.10	$712,672.02	2.3%
Stark	$63,674,000	$14,732,831	$1,473,283.10	$1,655,374.27	2.6%
Steele	$99,946,000	$50,629,380	$5,062,938.00	$5,688,694.38	5.7%
Stutsman	$168,570,000	$114,561,651	$11,456,165.10	$12,872,095.62	7.6%
Towner	$96,333,000	$85,040,983	$8,504,098.30	$9,555,166.63	9.9%
Traill	$177,193,000	$80,242,759	$8,024,275.90	$9,016,040.34	5.1%
Walsh	$218,090,000	$86,931,459	$8,693,145.90	$9,767,579.66	4.5%
Ward	$153,487,000	$148,130,262	$14,813,026.20	$16,643,849.66	10.8%
Wells	$132,852,000	$44,780,341	$4,478,034.10	$5,031,498.99	3.8%
Williams	$115,992,000	$64,565,624	$6,456,562.40	$7,254,564.49	6.3%
Statewide Totals	**$5,038,525,000**	**$3,030,892,451**	**$303,089,245**	**$340,549,714**	**6.8%**

Source: USDA Risk Management Agency, 2012

According to this analysis, North Dakota insurable crops sustain an estimated annual average loss of $340,549,714 as a result of flooding. The counties with over $15 Million in estimated annual average crop loss as a result of flooding include Cass, Ward, Cavalier, Bottineau, Dickey, and Ramsey. The highest crop loss ratios occurred in Burke, Ransom, Ramsey, Dickey, Sargent, and Renville Counties.

Figure 5.44. Flood-related Annualized Estimated Crop Losses



5.4.6. Local Risk Assessments

Table 5.46 provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding flooding vulnerability and/or estimated losses. As indicated in the Flood Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.46. Flood Risk Summary from Local Plans

County	Flood Hazard Rating	Flood Additional Information
Adams	C	$42,9000,000 estimated losses
Barnes	A	$49,205,901 estimated structure and contents losses
Benson	A	
Billings	C	
Bottineau	B	$24,873,236 estimated losses
Bowman	C	
Burke	B	$6,100,000 estimated losses
Burleigh	B	$82,956,512 critical facilities losses, $305,094,252 residential losses
Cass	B/C	$2,913,406,986 estimated losses
Cavalier	High	
Dickey	C	
Divide	NP	
Dunn	C	
Eddy	B	$38,856,685.72 estimated losses
Emmons	B	
*Fort Berthold^*	*CPRI 3.55*	
Foster	B	$24,873,236.19 estimated losses
Golden Valley	D	
Grand Forks	A	$67,558,400 building exposure to 100-year flood
Grant	C	
Griggs	B	$7,000,000 estimated losses
Hettinger	A	$1,937,280 potential losses
Kidder	C	$12,000,000 estimated losses
*Lake Traverse^*	*NP*	
LaMoure	#6 of 12	
Logan	A	$5,171,688 estimated losses
McHenry	A	$15,500,723.04 estimated losses
McIntosh	B	$17,179,219 estimated losses
McKenzie	NP	
McLean	A	
Mercer	B	
Morton	A	
Mountrail	B	$8,500,000 estimated losses
Nelson	B	$16,631,787 estimated losses
Oliver	B	
Pembina	A	$93,491,440 estimated losses
Pierce	B	
Ramsey	A	Hundreds of millions of dollars in property losses
Ransom	Medium	
Renville	B	$56,298,231.31 estimated loss
Richland	B	
Rolette	A	
Sargent	C	$18,805,133 estimated losses
Sheridan	NP	
Sioux	*Highly Likely*	
Slope	C	
Spirit Lake	High	$178,034 estimated rental income losses, $2,722,700 estimated land value losses
*Standing Rock^*	*Highly Likely*	
Stark	NP	
Steele	NP	
Stutsman	B	$146,611,612.13 estimated losses
Towner	A	$11,998,259.00 estimated losses
Traill	B	$24,873,236.19 estimated losses

County	Flood Hazard Rating	Flood Additional Information
Turtle Mountain^	CPRI 2.65	
Walsh	A	
Ward	B	$376,814,181 estimated losses
Wells	B	$22,475,932.82 estimated losses
Williams	A	$26,585,512 estimated losses

Source: Local Hazard Mitigation Plans; NI = not identified in the local plan; ^includes only North Dakota portions of the reservation; NP = no local plan; NL = included in the local plan, but no classification listed

5.4.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

Like most structures, state-owned buildings and property are certainly vulnerable to floods. 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 as a result of the devastating flooding in 1997. **Table 5.47** summarizes the claims paid by the fund to state agency facilities and **Table 5.48** that follows summarizes claims paid by the fund to local government critical facilities, National Guard facilities, state-owned universities and school districts due to flood.

Table 5.47. Flood Claims on Buildings and Property Owned by State Agencies Since 1989

County	Amount Paid
Bottineau	$4,722
Burleigh	$123,428
Cass	$3,200
Grand Forks	$5,029
Morton	$4,193
Stutsman	$10,000
Total	**$150,572**

Source: North Dakota State Fire and Tornado Fund, 2013.

Table 5.48. Flood Claims Paid on Critical Facilities Insured by the State since 1989

County	Adjutant General	State University System	Local Government	School Districts	Total
North Dakota	$20,232	$2,914,292	$4,005,636	$124,233	$7,064,393
Barnes	$0	$8,095	$5,064	$0	$13,159
Benson	$0	$0	$0	$666	$ 666
Bottineau	$0	$0	$1,193	$0	$1,193
Burleigh	$5,494	$0	$7,750	$2,032	$15,276
Cass	$0	$14,811	$25,514	$0	$40,325
Grand Forks	$0	$1,399,408	$1,154,483	$1,735	$2,555,626
Kidder	$0	$0	$11,140	$0	$11,140
LaMoure	$0	$0	$10,000	$0	$10,000
McHenry	$0	$0	$0	$8,335	$8,335
Mountrail	$0	$0	$0	$8,268	$8,268
Nelson	$0	$0	$1,191	$0	$1,191
Pembina	$0	$0	$87,238	$617	$87,855
Ramsey	$1,250	$9,178	$13,750	$0	$24,178
Ransom	$0	$0	$0	$10,000	$10,000

County	Adjutant General	State University System	Local Government	School Districts	Total
Renville	$0	$0	$0	$1,110	$1,110
Richland	$0	$23,062	$1,445	$6,678	$31,185
Rolette	$0	$0	$0	$1,970	$1,970
Stutsman	$0	$0	$16,444	$0	$16,444
Traill	$0	$5,950	$0	$0	$5,950
Total	**$13,488**	**$1,453,788**	**$2,670,424**	**$82,822**	**$4,220,522**

Source: North Dakota State Fire and Tornado Fund, 2013

North Dakota State Parks have suffered damages from previous flood events. Details of some of the more damaging events are provided below:

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 area, 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 S P**: Sprint melt water along with heavy rains flooded campground. Numerous electrical pedestals had to be replaced, silt and debris cleanup
- **Fort Ransom S.P:** 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 snow melt run off. Snowmobile trails had to be re built, culverts replaced.
- **Graham's Island S.P**: 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 S.P**: 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 S.P**: 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, 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 S.P**: 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 drown out or fell over due to over saturation of the ground. Cleaning and repair of campground support buildings was required.
- **Sully Creek S.P:** 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 S.P**: Spring snow melt and rain caused severe hillslides at the park. Major portions of the non motorized trail were damaged. Repairs completed in 2012. Park sewer systems were inundated for the 1st 2 months of park operations in 2011.
- **Cross Ranch S.P:** 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.

The majority of disaster related problems in ND State Parks are due to floods – either from excessive snow melt, ice jams or rain events. The North Dakota Parks and Recreation Department (NDPRD) has begun to implement measures to reduce future disaster issues. While floods would still cause problems, NDPRD is working from experience to reduce those impacts.

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 damages.

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. Scour critical bridges are especially vulnerable during periods of flooding. Section 4.2, Critical Facilities and Infrastructure, contains the number of scour critical bridges by county in more detail. Bridges can also be obstructions in watercourses, inhibiting the flow of water during flood events.

Additional Riverine Flooding Critical Facility Analysis

Other critical facilities that support government services and private utilities may also be located in flood hazard areas. Damages to such facilities may seriously disrupt emergency and essential services. To provide additional information on critical facilities vulnerable to damage from riverine flood, GIS-based analysis was performed utilizing data from the Homeland Security Infrastructure Program and the data compiled from DFIRM, Preliminary DFIRM and Q3 data to depict those areas vulnerable to the 1-percent annual chance flood. Critical Facilities in the following facility classes were included in this analysis: communications, emergency services, energy, public health and transportation. **Table 5.49** provides the results of this analysis.

Table 5.49. Critical Facilities in Areas Vulnerable to 1-Percent Annual Chance Flood

Facility Class	Facility Type	Count
Communications	Cell Tower	5
	Microwave	79
	Total	**84**
Emergency Services	Air Care	1
	EMS	15
	Fire Stations	15
	Law Enforcement	10
	Local EOCs	1
	Shelters	12
	Total	**54**
Energy	Power Plants	6
	Substations	52
	Wells	124
	Total	**182**
Public Health	Blood & Organ Banks	2
	Hospitals	3
	Nursing Homes	9
	Public Health Depts	1
	Urgent Care	2
	VA Centers	2
	Total	**19**
Transportation	Bridge	310
	Scour Critical Bridge	4
	Total	**314**
	Grand Total	**653**

Source: Homeland Security Infrastructure Program Gold Dataset; FEMA DFIRM, Preliminary DFIRM, and Q3 data

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

Additional Levee Failure Critical Facility Analysis

To provide additional information on critical facilities vulnerable to damage from levee failure, GIS-based analysis was performed utilizing data from the Homeland Security Infrastructure Program and the data available from the USACE NLD for areas protected by levees in the LSP. Again, critical Facilities in the following facility classes were included in this analysis: communications, emergency services, energy, public health and transportation. **Table 5.50** provides the results of this analysis.

Table 5.50. Critical Facilities in USACE Levee Safety Program Levee Protected Areas

Facility Class	Facility Type	Count
Communications	Microwave	126
	Total	**126**
Emergency Services	Fire Stations	14
	EMS	10
	Law Enforcement	9
	Local EOCs	2
	Shelters	20
	Total	**55**
Energy	Power Plants	2
	Substations	9
	Total	**11**
Public Health	Blood & Organ Banks	2
	Hospitals	4
	Nursing Homes	7
	Public Health Depts	2
	Urgent Care	6
	Total	**21**
Transportation	Bridge	53
	Total	**53**
Water Treatment Plants	Sewerage Systems	1
	Total	**1**
	Grand Total	**267**

Source: Homeland Security Infrastructure Program Gold Dataset; USACE National Levee Database

5.4.8. Development in Identified Hazard Areas

Table 5.144 and **Table 5.145** show the areas with Moderate-High and High Riverine Flood Vulnerability with housing unit and population increases from 2000 to 2010 respectively. If additional development occurs in flood prone areas within these counties in accordance to their local floodplain management ordinances future damages should be minimized up to the 1% annual chance flood. Vulnerability to flood damage will increase for larger magnitude floods, or if development occurs in areas that are not currently mapped as a SFHA or violates local floodplain management regulations.

Table 5.51. Areas with Moderate-High and High Riverine Flood Vulnerability and Housing Unit Increases 2000 to 2010

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Cass County	65,986	53,790	12,196	23%
Burleigh County	34,557	29,003	5,554	19%
Stark County	10,528	9,722	806	8%
Grand Forks County	29,048	27,373	1,675	6%
Ward County	26,294	25,097	1,197	5%
Barnes County	5,694	5,599	95	2%
Mercer County	4,435	4,402	33	1%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf and FEMA AAL

Table 5.52. Areas with Areas with Moderate-High and High Riverine Flood Vulnerability and Population Increases 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	**123,138**	**149,778**	**26,640**	**21.60%**
Burleigh County	**69,416**	**81,308**	**11,892**	**17.10%**
Stark County	**22,636**	**24,199**	**1,563**	**6.90%**
Ward County	**58,795**	**61,675**	**2,880**	**4.90%**
Grand Forks County	**66,109**	**66,861**	**752**	**1.10%**

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.53. Areas with Moderate-High and High Riverine Flood Vulnerability and Projected Population Increases of 40% or More by 2025

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
Stark County	**24,199**	**42,191**	**17,992**	**74.40%**

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

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 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 have identified flood hazard areas but do not participate in the NFIP and lack floodplain management ordinances. As of January 2013, there were 23 sanctioned communities with identified flood hazards that do not participate in the NFIP. Of those, 10 communities (in bold) are in also counties that have a Moderate-High and High Riverine Flood Vulnerability.

Table 5.54. Sanctioned Communities with Moderate-High and High Riverine Flood Vulnerability

Community Name	County
Adams, City of	Walsh County
Anamoose, City of	McHenry County
Brinsmade, City of	Benson County
Fordville, City of	Walsh County
Gardar, Township of	**Pembina County**
Gladstone, City of	**Stark County**
Grafton, Township of	Walsh County
Hegton, Township of	**Grand Forks County**
Hoople, City of	Walsh County
Kenmare, City of	**Ward County**
Lansford, Township of	Bottineau County
Logan Center, Township of	**Grand Forks County**

Community Name	County
Loretta, Township of	**Grand Forks County**
Neche, Township of	**Pembina County**
New England, City of	Hettinger County
Oakwood, Township of	Walsh County
Oberon, City of	Benson County
Park, Township of	**Pembina County**
Portal, City of	Burke County
St. Thomas, Township of	**Pembina County**
Stafford, Township of	Renville County
Stanton, City of	**Mercer County**
Towner, City of	McHenry County

Source: FEMA Community Status Book, as of January 31, 2013

North Dakota has two communities, the City of Fargo and the City of Grand Forks, that participate in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP). 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. Fargo is a Class 7 (15% discount for SFHA) and Grand Forks is a Class 5 (25% discount for SFHA). According to data from FEMA, the total premium savings to the community is $28,190 in Fargo and $32,211 in Grand Forks.

Analysis of counties with areas protected by USACE levee Safety Program levees revealed that the following counties have also experienced housing unit increases: Cass, Grand Forks, Ward, Slope, Ransom, Bowman, and Mercer Counties. If development is occurring in the levee protected areas, vulnerability to damage from levee failure also increases.

Additionally, through the tacit approval of local government, redevelopment is occurring on the north shore of Devils Lake at elevations which could be inundated by an impending revised 1% chance flood event for the Devils Lake/Stump Lake system. (North Dakota State Water Commission, 2008)

5.4.9. Data Limitations and Other Key Documents

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 probable risk will allow for smarter development and protection of the people in the state. Hydrologists can provide more information and outlooks on the flood hazard. 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.

Other key documents related to the flood hazard include:

- 2011 Flood Report: Response and Recovery
- State Of North Dakota Department of Emergency Services Legislative Flood Mitigation and Response Study, April 24, 2013
- Devils Lake Risk Assessment
- North Dakota Emergency Operations Plan, Flood Annex
- North Dakota Water Development Reports
- North Dakota NFIP Map Modernization Plan
- The Floods of 1997: A Special Report
- The Red River of the North Flood Disaster, 10 Years Later
- Interagency Hazard Mitigation Team Reports

5.5. Geologic Hazards (Including Landslide, Earthquake, and other Geologic/Mining Hazards)

Hazard Rating	THIRA Threat/Hazard Group
Low	Natural

5.5.1. Description

Geologic hazards in North Dakota usually do not cause severe damage, as other hazards may, but the potential exists for the occasional landslide, earthquake, or mine collapse that causes some loss.

Landslide

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 (US Geological Survey). Other causative factors include steepening of slopes by erosion or construction, alternate freezing or thawing, earthquake shaking, 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 (US Geological Survey).

Landslides are typically associated with mountainous regions, but they can also occur in areas of low relief. In these areas, the landslides are often the result of cut-and-fill failures (from roadway and building excavations), river bluff failures, lateral spreading, or mine collapse (US Geological Survey).

Landslides occur in natural and anthropogenic settings in North Dakota and are most commonly found within major river valleys and on engineered slopes along major transportation corridors.

Landslides are dominantly found in two settings, controlled by the surface geology of the Great Plains in western and southwestern North Dakota and along major river valleys of the Missouri, Sheyenne, James, Souris, and Red Rivers (North Dakota Geological Survey).

Riverbank slumping can be considered a form of landslide and is often found along the rivers in North Dakota. The riverbank soils are inherently weak, and natural forces are always moving river channels. Urbanization has artificially accelerated riverbank slumping and instability through activities such as placing homes and structures too close to the riverbank in a way that adds pressure to the bank and increases soil hydration through increased storm water runoff, using irrigation systems that saturate the soil and decrease its strength, adding weight to the riverbank with structures, retaining walls, and riprap, and planting shallow-rooted vegetation. Minimizing these types of activities and placing structures away from riverbanks can mitigate some, but not all, riverbank slumping (Cass County, 2010).

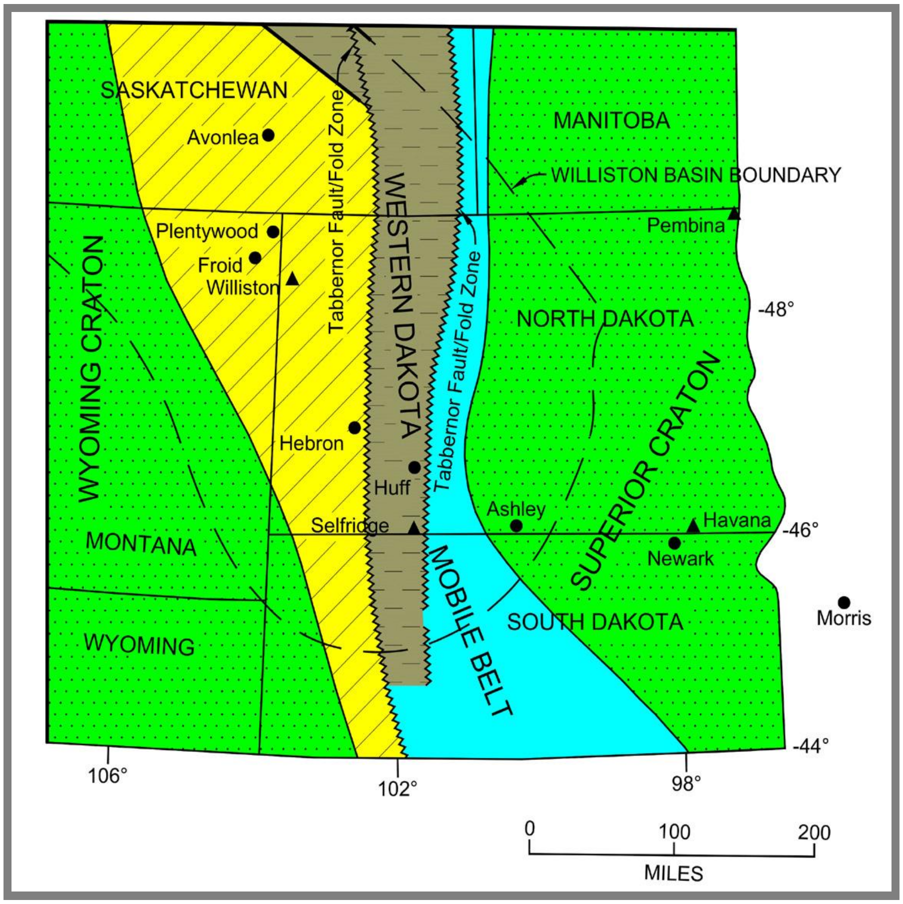
Earthquake

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 (US Geological Survey).

North Dakota is not an area known for its earthquake activity, however, hundreds of miles to the west in the Rocky Mountains 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 damages 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 are postulated and may be capable of producing small to moderate earthquakes. The area is shown in **Figure 5.45** (North Dakota Geological Survey).

Geologists primarily measure earthquake severity 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

Figure 5.45. Western Dakota Mobile Belt



Map showing the main basement geologic structures in North Dakota and the surrounding area. The map shows the major Precambrian Structural provinces (Superior Craton, Western Dakota Mobile Belt, and Wyoming Craton). Two deep faults, the Thompson Boundary Fault and the Tabbernor Fault/Fold Zone, extend north-south through the Western Dakota Mobile Belt in western North Dakota. All of these features are deeply buried beneath younger materials throughout the area.

Localities where earthquakes have occurred are noted on the map (round dots). Additionally, earthquakes have been reported felt at the locations shown by triangles.

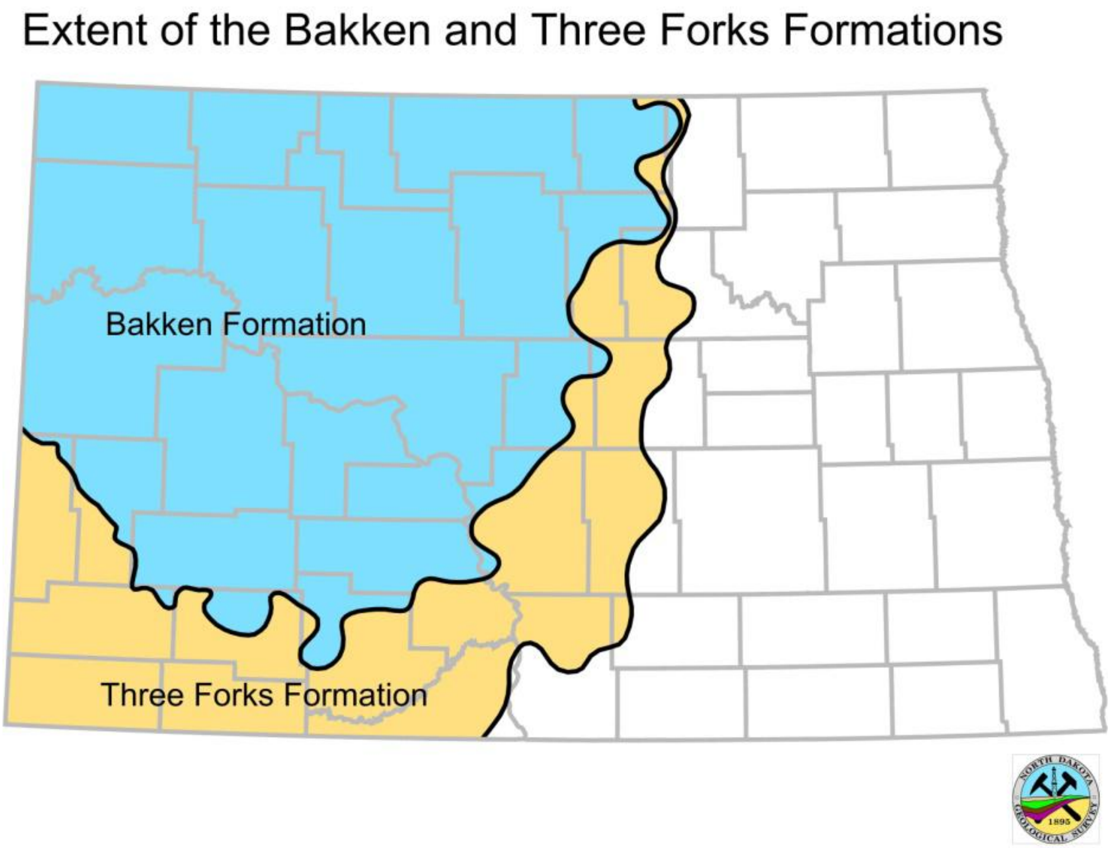
All of the features shown on the map are buried beneath younger materials throughout the area and, because they are hidden and cannot be studied directly, the map is speculative. Other structural maps of the area, compiled by other geologists, differ from this one in various ways.

Source: North Dakota Geological Survey, 2007.

Other Geologic / Mining Hazards

North Dakota does have expansive soils, including clay with swelling potential, but the impacts of such are generally limited to a small scale; good building practices generally mitigate damages from expansive soils. North Dakota has a minimal land subsidence hazard, usually only related to mining activities, which is typically recognized and mitigated. Most mine, drilling, and energy production disasters do not cause significant losses to area communities and are limited to occupational hazards but collapses, fires, and explosions are all possible. Given the abundance of mining activity in North Dakota, the potential for a disaster related to mining hazards exists. **Figure 5.46** shows the Bakken and Three Forks Formations, areas favored for continued oil development. Projections estimate an oil well on every section within the oil fields served by the Bakken, Three Forks, and Sanish Formations over the next six years.

Figure 5.46. Extent of the Bakken and Three Forks Formations

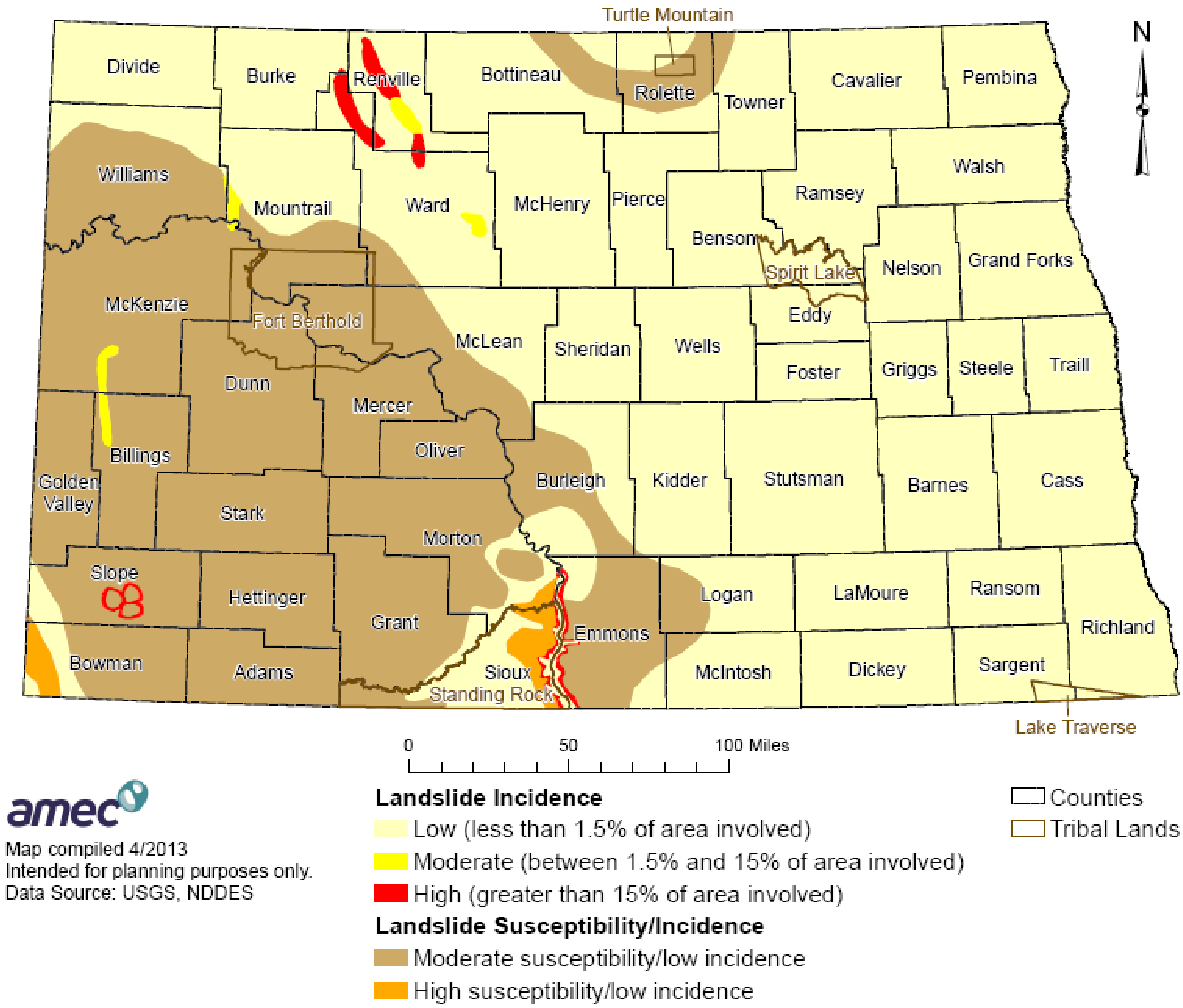


Source: North Dakota Department of Mineral Resources, 2010.

5.5.2. Geographic Location

An ongoing project at the North Dakota Geological Survey is the identification and mapping of landslide areas of the state, called the Landslide Inventory Mapping Program. As of 2010, 8,856 individual landslides and roughly 20% of the state were mapped in North Dakota. **Figure 5.47** shows the areas of landslide incidence and susceptibility that have been mapped to date. According to the map, high and moderate landslide areas are located along the Missouri River in Sioux and Emmon counties, as well as in Bowman, Slope, Billings, McKenzie, Mountrail, Ward, and Renville counties.

Figure 5.47. Landslide Incidence and Susceptibility



In general, landslides in North Dakota occur along natural slopes along major river corridors, including the Missouri, Sheyenne, James, and Red rivers. They may also occur on engineered slopes along major transportation routes. Slide areas are found within the Paleocene Fort Union Group in the southwestern part of the state, the late Cretaceous Pierre Formation in eastern North Dakota, and Pleistocene glaciolacustrine sediments of the Sherack and Brenna Formations in the Red River Valley. **Figure 5.48** shows some areas within the state with strata and deposits that have slid or slumped to the base of steep slopes.

Figure 5.48. Landslide Deposits

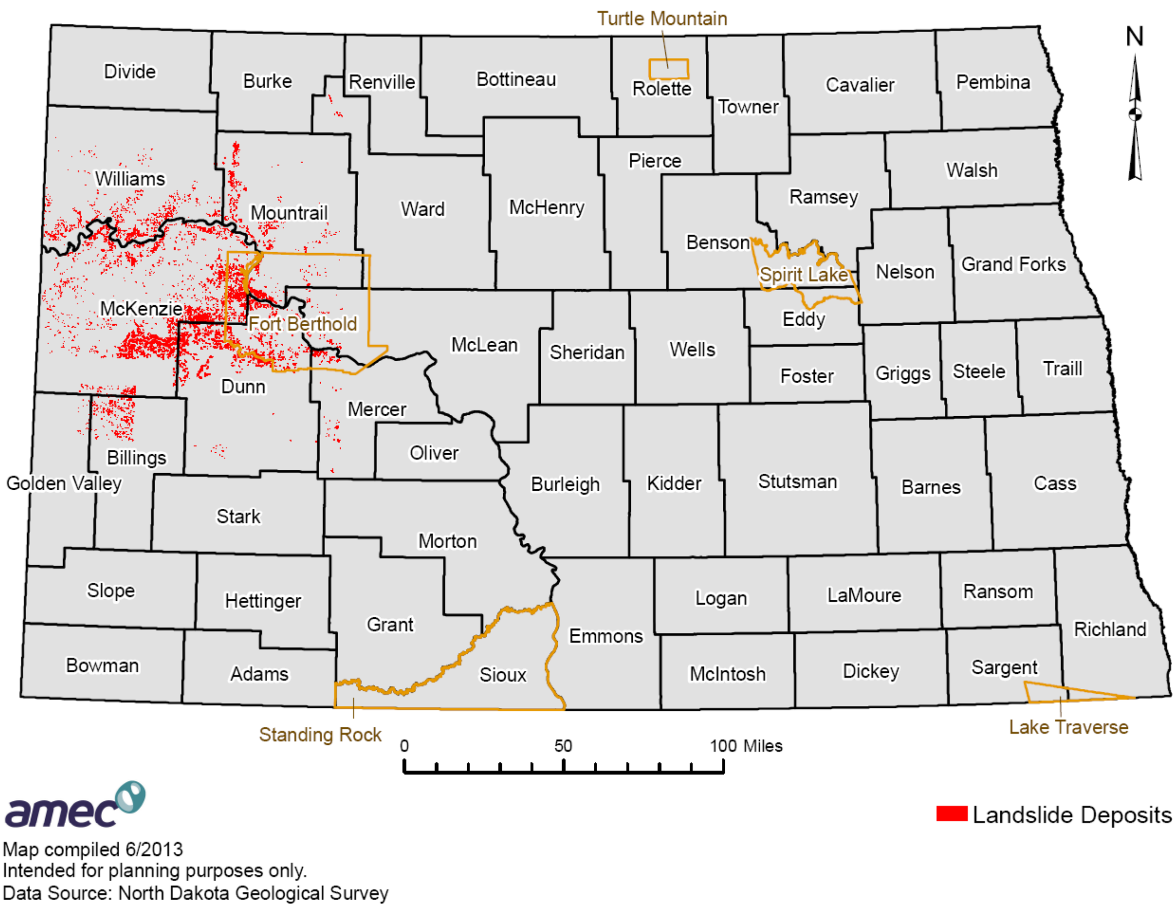


Figure 5.49 depicts the location, magnitude, and intensities of historical earthquakes in North Dakota. These earthquakes are summarized in **Table 5.56**. **Figure 5.50** shows the peak horizontal acceleration (as a percentage of gravity) that has a 2% probability of exceedance in 50 years. As a measure of how hard the ground shakes, the higher the value, the greater the hazard; however, when viewed on the national scale, the North Dakota values are very low. **Table 5.55** summarizes the expected impacts under these accelerations.

Figure 5.49. Location of Historical Earthquakes in North Dakota

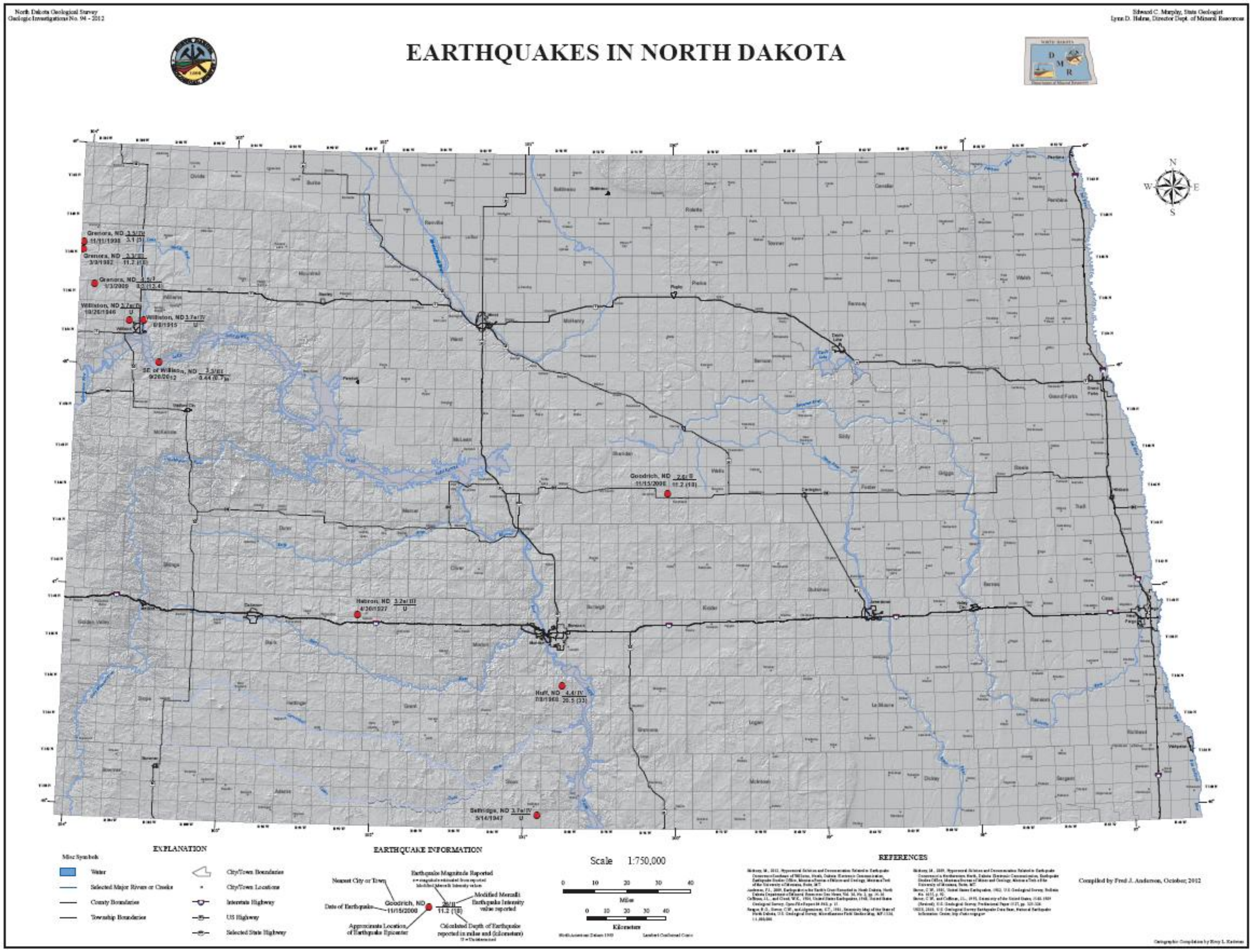


Figure 5.50. Peak Horizontal Acceleration

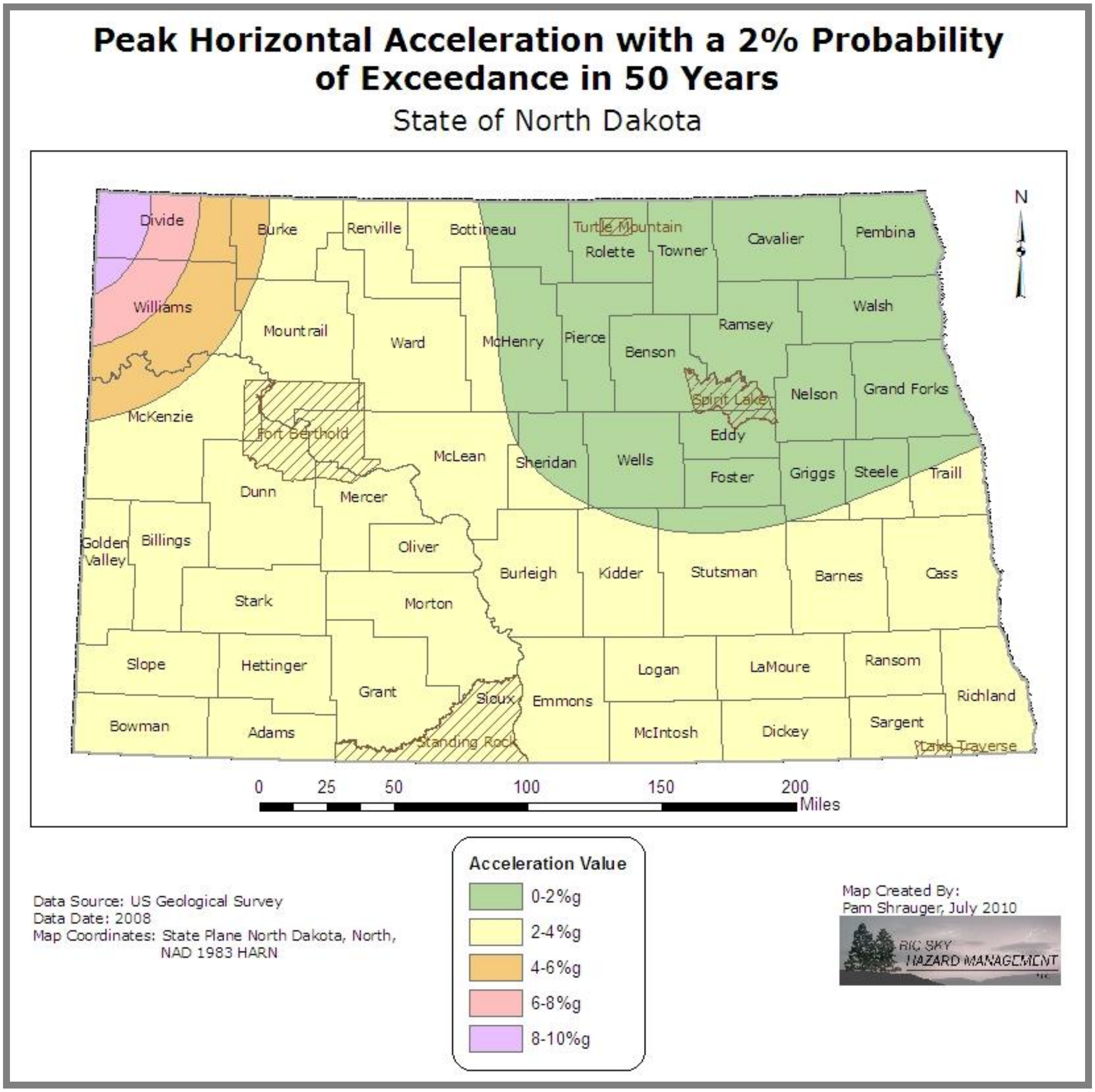


Table 5.55. Expected Impacts from Peak Horizontal Accelerations

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, 2010.

5.5.3. Previous Occurrences

Most geologic events in North Dakota go unnoticed or result in very little physical damage. Most landslide damages that do occur are to transportation infrastructure and lead to impacts such as road closures, detours, and road repairs. Occasionally, structures are involved. Some of the more notable landslide events in North Dakota are summarized below from the Bismarck Tribune, North Dakota Geological Survey, and Barnes County:

- Slope failures along North Dakota Highway 22 in western North Dakota.
- Slope failures on Riverview Drive in Valley City.
- Slope failures along the Red River near Drayton.
- Closure of Highway 85 in west-central North Dakota.
- 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.

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. These events were largely caused by spring rains and snowmelt. 2011 slope failure locations 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, 24 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.

A NDDOT report stated that some climatologists believe that the state is entering a wet cycle that could potentially last up to 30 years. North Dakota landslides are in part caused by excessive ground moisture from the record snowfalls and rainfalls in this wet cycle. (Source: TransAction III Topic Summaries, North Dakota's Statewide Strategic Transportation Plan)

Earthquakes have been felt in North Dakota but usually do not result in damages. **Table 5.56** lists the earthquakes recorded in the state and nearby. **Table 5.57** lists North Dakota disaster declarations resulting from geologic hazards.

Table 5.56. North Dakota and Area Earthquakes

Location	Date	Magnitude / Impacts
Southeastern North Dakota	1872	
Pembina	1900	
Avonlea, Saskatchewan	05/16/1909	5.5 magnitude Broke 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	
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	
Grenora	03/09/1982	3.3 magnitude, III intensity
Morris, MN	1993	
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: North Dakota Geological Survey, 2007; North Dakota Geological Survey, 2010c.; North Dakota Department of Mineral Resources and North Dakota Geological Survey 2012

Table 5.57. North Dakota Geologic Hazards Declared Disasters

Declaration	Location	Date	Magnitude	Casualties	Damages
DR-1279 (for Severe Storms, Tornadoes, Snow and Ice, Flooding, Ground Saturation, Landslides, and Mudslides)	42 counties and 4 reservations	6/8/1999 (incident period 3/1/1999 through 7/19/1999)	Not Reported	Not Reported	Disaster assistance over $100 million

5.5.4. Probability and Magnitude

Figure 5.51 is a graphical representation of the range of events that can occur within the geologic hazards. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the geologic hazards. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.51. Hazard Frequency and Impact Ranges

Frequency	*Negligible* Impact	*Limited*	*Critical*	*Catastrophic*
No regional history				
No local history				
100 years		Landslide Damaging Roads		
50 years	Earthquake Shaking Felt			
Annually				

Earthquake experts use probabilities when determining the seismicity of an area. Peak horizontal acceleration is the maximum horizontal acceleration experienced by a particle during the course of the earthquake motion. When acceleration acts on a physical body, the body experiences the acceleration as a force. Gravity is a commonly known force of nature, and therefore, the units of acceleration are measured in terms of g, the acceleration due to gravity. The peak ground acceleration with a 2% probability of exceedance in 50 years in North Dakota is less than 10%g (US Geological Survey). 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).

5.5.5. State Risk Assessment

Vulnerability Overview

The primary threats to jurisdictions from the geologic hazards are to county, city, and township road systems and potentially structures. Landslide poses the greatest threat of the geologic hazards. Roadways may crumble or be buried following a landslide. Should buildings be located in such areas, losses could occur. The potential for significant earthquake losses in North Dakota is marginal.

Table 5.58 demonstrates the geologic hazard by jurisdiction. Note that even though an area may be designated as high hazard, given the low frequency and low impact generally seen with these events, geologic hazards may not be a primary concern for the area.

Given the incompleteness of the landslide data, the hazard ratings are only broken into three levels:

- High – several areas of the county have identified landslide hazard areas
- Moderate – isolated areas of the county have identified landslide hazard areas
- Low – none of the county has identified landslide hazard areas

The earthquake rating was based on the potential peak horizontal acceleration with a 2% probability of exceedance in 50 years as follows:

- High – 8-10%g
- Moderate-High – 6-8%g
- Moderate – 4-6%g
- Low-Moderate – 2-4%g
- Low – 0-2%g

The overall geologic hazards rating is based on the combination of the landslide and earthquake hazards, with more weight given to the landslide hazard.

Table 5.58. Geologic Hazards Risk to Jurisdictions

County	Landslide Rating	Earthquake Rating	Overall Rating
Adams	L	LM	Low
Barnes	M	LM	Moderate
Benson	L	L	Low
Billings	H	LM	Moderate-High
Bottineau	M	LM	Moderate
Bowman	M	LM	Moderate
Burke	L	M	Low-Moderate
Burleigh	M	LM	Moderate
Cass	L	LM	Low
Cavalier	L	L	Low
Dickey	L	LM	Low
Divide	L	H	Moderate
Dunn	H	LM	Moderate-High
Eddy	L	L	Low
Emmons	M	LM	Moderate
*Fort Berthold^*	*H*	*LM*	*Moderate-High*
Foster	L	L	Low
Golden Valley	M	LM	Moderate
Grand Forks	L	L	Low
Grant	L	LM	Low
Griggs	L	LM	Low
Hettinger	L	LM	Low
Kidder	L	LM	Low
*Lake Traverse^*	*L*	*LM*	*Low*
LaMoure	L	LM	Low
Logan	L	LM	Low
McHenry	M	LM	Moderate
McIntosh	L	LM	Low
McKenzie	H	M	Moderate-High
McLean	M	LM	Moderate
Mercer	M	LM	Moderate
Morton	M	LM	Moderate
Mountrail	H	M	Moderate-High
Nelson	L	L	Low
Oliver	L	LM	Low
Pembina	L	L	Low
Pierce	L	L	Low
Ramsey	L	L	Low
Ransom	L	LM	Low
Renville	M	LM	Moderate
Richland	L	LM	Low
Rolette	M	L	Moderate
Sargent	L	LM	Low
Sheridan	L	LM	Low
Sioux	M	LM	Moderate
Slope	M	LM	Moderate
Spirit Lake	*L*	*L*	*Low*
*Standing Rock^*	*M*	*LM*	*Moderate*
Stark	M	LM	Moderate

County	Landslide Rating	Earthquake Rating	Overall Rating
Steele	L	LM	Low
Stutsman	M	LM	Moderate
Towner	L	L	Low
Traill	L	LM	Low
*Turtle Mountain^*	*L*	*L*	*Low*
Walsh	L	L	Low
Ward	M	LM	Moderate
Wells	L	L	Low
Williams	H	H	High

H = high; MH = moderate-high; M = moderate; LM = low-moderate; L = low

Loss Estimates

The 2011 landslides cost $5.6 in emergency repairs and an estimated $14 million in permanent repairs for a total of nearly $20 million. Although these types of losses do not occur every year, similar losses are possible in any year when similar flood conditions are present.

A HAZUS-MH 2,500 probabilistic earthquake loss scenario was run for the entire state. 1,721 buildings would be at least moderately damaged, with 9 buildings damaged beyond repair. 38 households could be displaced by earthquakes according to this scenario, with 24 people seeking temporary shelter in public shelters. Total economic impacts could exceed $73.88 million, which includes building and lifeline related losses based on the region's available inventory. Casualty losses are relatively small. **Table 5.59** summarizes the results of the scenario.

Table 5.59. HAZUS-MH Earthquake Loss Estimation 2.500-Year Scenario Results

Type of Impact	Impacts to State
Total Buildings Damaged	Slight: 7,024 Moderate: 1,578 Extensive: 133 Complete: 9
Building and Income Related Losses	$55.80 million 44% of damage related to residential structures 42% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	$73.88 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: 3 Life threatening: 0 Fatalities: 0

Type of Impact	Impacts to State
Casualties (based on 5 p.m. time of occurrence)	Not requiring hospitalization: 18 Requiring hospitalization: 2 Life threatening: 0 Fatalities: 0
Displaced Households	38
Shelter Requirements	24

5.5.6. Local Risk Assessments

Table 5.60 provides information from local and tribal mitigation plans regarding the local hazard rating. Local plans did not provide additional information provided regarding estimated losses for geologic hazards. As indicated in the Communicable Disease Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. Another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.60. Geologic Hazards Risk Summary from Local Plans

County	Geological Hazards Hazard Rating	Geological Hazards Additional Information
Adams	NI	
Barnes	D**	
Benson	NI	
Billings	NI	
Bottineau	NI	
Bowman	NI	
Burke	NI	
Burleigh	NI	
Cass	NI	
Cavalier	Low	
Dickey	NI	
Divide	NP	
Dunn	NI	
Eddy	NI	
Emmons	NI	
*Fort Berthold^*	*CPRI 2.5 / 2.05**	
Foster	NI	
Golden Valley	NP	
Grand Forks	NI	
Grant	NI	
Griggs	NI	
Hettinger	NI	
Kidder	NI	
*Lake Traverse^*	*NP*	
LaMoure	NI	

County	Geological Hazards Hazard Rating	Geological Hazards Additional Information
Logan	NI	
McHenry	NI	
McIntosh	NI	
McKenzie	NP	
McLean	NI	
Mercer	NI	
Morton	NI	
Mountrail	NI	
Nelson	NI	
Oliver	NI	
Pembina	NI	
Pierce	NI	
Ramsey	NI	
Ransom	Medium***	
Renville	NI	
Richland	NI	
Rolette	NI	
Sargent	NI	
Sheridan	NP	
Sioux	*Unlikely*	
Slope	NI	
Spirit Lake	NI	
*Standing Rock^*	*Unlikely*	
Stark	NP	
Steele	NP	
Stutsman	NI	
Towner	NI	
Traill	NI	
Turtle Mountain^	NI	
Walsh	NI	
Ward	NI	
Wells	NI	
Williams	NI	

Source: Local Hazard Mitigation Plans; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed^ includes only North Dakota parts of the reservation; *Mudslides or Landslide / Earthquakes; **Landslides only; ***Riverbank erosion only

5.5.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

State-owned buildings and property are generally not at risk from the geologic hazards. Hazards such as landslide are considered when such facilities are constructed, and none of the existing facilities are known to be at risk.

Most critical facilities and infrastructure in North Dakota are likely located outside of geologic hazard areas, such as landslide. The primary exception may be transportation infrastructure. **Table 5.160** in **Section 5.15**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.5.8. Development in Identified Hazard Areas

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. 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. **Table 5.61** demonstrates the new and future development activities in the high and moderate-high geologic hazard jurisdictions. See Section 4.9, New Development, for additional information regarding the limitations of the building permit data.

Table 5.61. New and Future Development in High and Moderate-High Geologic Hazard Jurisdictions

County	Residential Building Permits 2012	Population Growth Expected?	Building Codes?
Billings	8	Yes	1 city
Dunn	46	Yes	4 cities
McKenzie	71	Yes	2 cities
Mountrail	63	Yes	4 cities
Williams	541	Yes	3 cities

Source: Building Permits, US Census Bureau, Annual New Privately-owned Residential Building Permits, http://censtats.census.gov/bldg/bldgprmt.shtml; Population Growth, U.S. Census Bureau and the Center for Social Research at NDSU ; Building Codes, North Dakota Department of Commerce, Building Code Enforcing Jurisdictions, 2013

North Dakota's growing oil and gas industry is also at risk to geologic hazards. GIS analysis identified a total of 67 wells in known landslide deposit areas. This includes 8 confidential wells, 57 oil and gas wells, 1 salt water disposal, and 1 water source. **Figure 5.53** depicts the location of the wells across the state.

Increased populations add to the challenges of managing development in geologic hazard areas, especially in locations where landslide mapping has not been completed. **Table 5.62** shows the areas with population increases from 2000 to 2010 and **Table 5.63** lists the areas with projected 40 percent and greater population increases from 2010 to 2025. Development pressures may also increase in these areas. The counties' land use and development plans will be important tools for protecting people and preventing development in unmitigated geologic hazard areas. Nearly all of the counties listed in **Table 5.63** have identified landslide incidence or susceptibility (see **Figure 5.47**). Divide and McHenry counties are the only ones with at least 40% projected growth that do not have identified landslide hazard areas.

Table 5.62. Area Population Increases from 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	123,138	149,778	26,640	21.60%
Burleigh County	69,416	81,308	11,892	17.10%
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	19,761	22,398	2,637	13.30%
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	22,636	24,199	1,563	6.90%
Ward County	58,795	61,675	2,880	4.90%
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	66,109	66,861	752	1.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.63. Area Projected 40 Percent and Greater Population Increases from 2010 to 2025.

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	22,398	51,106	28,708	128.20%
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.5.9. Data Limitations and Other Key Documents

Geologic hazards, particularly landslide hazard areas, are commonly influenced by local factors and are difficult to analyze at the statewide level. Continued study by the North Dakota

Geological Survey should aid in identifying those areas at greatest risk and potentially in need of mitigation action.

Other key documents related to the geologic hazards include:

- North Dakota Emergency Operations Plan

5.6. Hazardous Material Release (Including Oil and Gas Industry)

Hazard Rating	THIRA Threat/Hazard Group
Moderate	Technological

5.6.1. Description

Hazardous materials are any substances posing an unreasonable risk to safety and health, the environment, and the property of North Dakota citizens. The term "hazardous materials" envelops a vast array of products, from the relatively innocuous types, such as creosote, to highly toxic or poisonous types, such as anhydrous ammonia and phosgene gas. The severity of potential hazards caused by these materials is varied, but the primary reason for the designation is their risk to public safety.

The Federal Motor Carrier Safety Administration has nine categories of hazardous materials that are:

- 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 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 man-made hazard event. Although the listed hazardous materials are classified essentially the same in both transportation and fixed facility incidents, the U.S. Department of Transportation is responsible for determining hazardous materials associated with transportation, including pipelines, and the U.S. Environmental Protection Agency (EPA) determines which materials are considered hazardous in fixed facility releases.

Generally, with a fixed facility, the hazards are pre-identified, and the facility is required by law to prepare a risk management plan and provide a copy to the local emergency planning committee (LEPC) and local fire departments.

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. Traffic accidents pose the greatest threat of incidents involving explosives. Flammable liquids, solids, and gases are produced and transported intrastate and interstate via the highway, railroad, and pipeline systems, constituting a danger to public safety. One jurisdiction in west central North Dakota has one of the largest coal gasification plants in the world. This plant alone has forty-two hazardous materials that are used, stored, or produced. One product produced is anhydrous ammonia (fertilizer), a hazardous material used by most farmers in North Dakota. Facilities that store or use chemicals considered unusually dangerous to human safety are required by Section 112R of the Clear 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 through the EPA at http://data.rtknet.org/rmp/rmp.php?reptype=f&state=ND. Nuclear fuels are not produced or used but may be transported in North Dakota. Radioactive isotopes are used in the medical profession and are classified as a hazardous material and a hazardous waste. According the Environmental Protection Agency's (EPA) Envirofacts database, North Dakota has 56 facilities regulated by the EPA.

Hazardous materials releases often are viewed in a worst case scenario. Some have resulted in the loss of several lives and contamination of soils, rivers, lakes, streams, underground water supplies, and fish and wildlife habitat; however, the majority of incidents involve small spills and releases requiring little response or recovery action. The problem for decision-makers at all levels of government is to create a safe system for the use, storage, and transportation of hazardous materials while expanding the economic viability.

Other significant hazardous material concerns are the hazardous by-products from the production of the drug methamphetamine. This drug is easily "cooked" up using readily available hazardous materials in clandestine labs. These labs may then be contaminated with a variety of toxic chemicals such as methanol, ether, benzene, methylene chloride, trichloroethane, toluene, muriatic acid, sodium hydroxide, anhydrous ammonia, and red phosphorus.

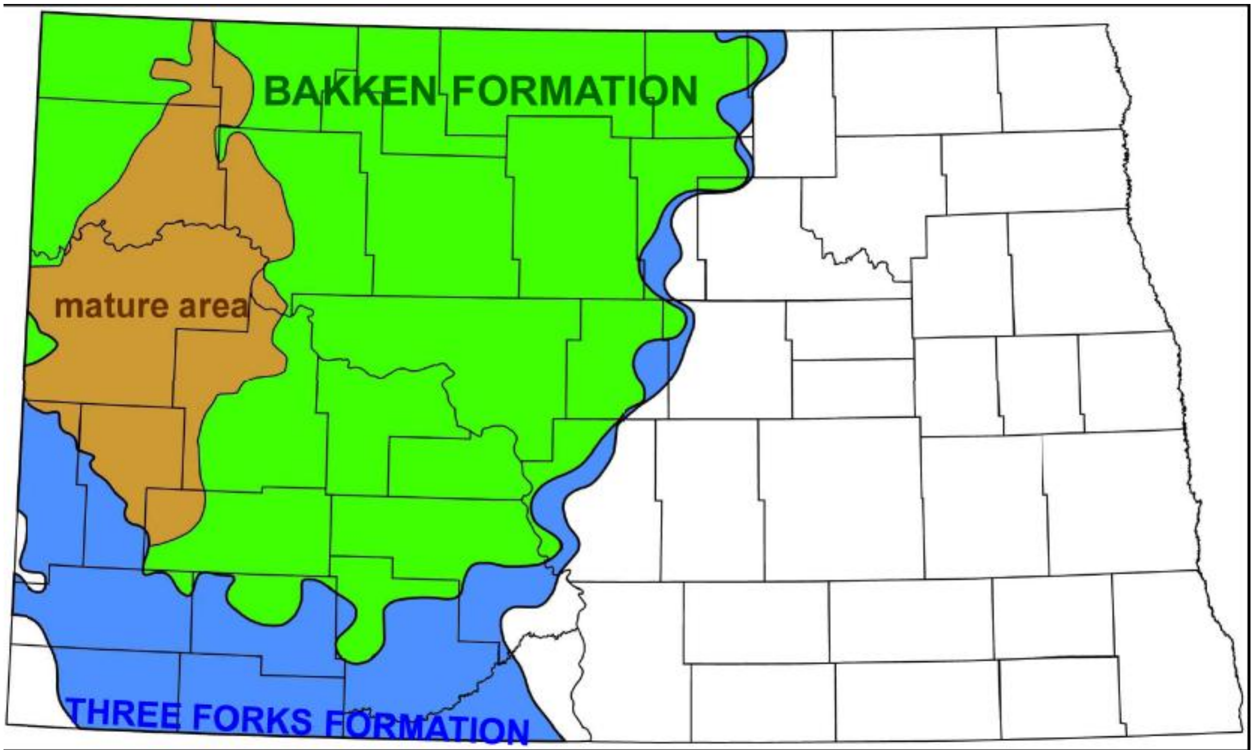
Hazardous material releases occur as a result of multiple causes but are often initiated by a transportation accident. Almost any hazard that destroys infrastructure can lead to a hazardous material release. For example, floods can wash out bridges or roadways causing transportation accidents as well as infiltrate storage facilities causing a hazardous material release at a fixed facility. Strong winds, poor visibilities, or slippery roadways may also instigate a transportation accident. Hazardous material releases can also be intentional as is the case with a terrorist act. A release could also be caused through an accidental domestic incident such as a methamphetamine lab. Hazardous material releases during any hazard event will most certainly compound the complexity of the event.

Oil and Natural Gas Industry

In North Dakota and 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. **Figure 5.52** shows the

Bakken Formation and Three Forks Formation in North Dakota with the mature area of oil drilling.

Figure 5.52. Map of North Dakota with Estimated Mature Area of the Bakken Formation



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

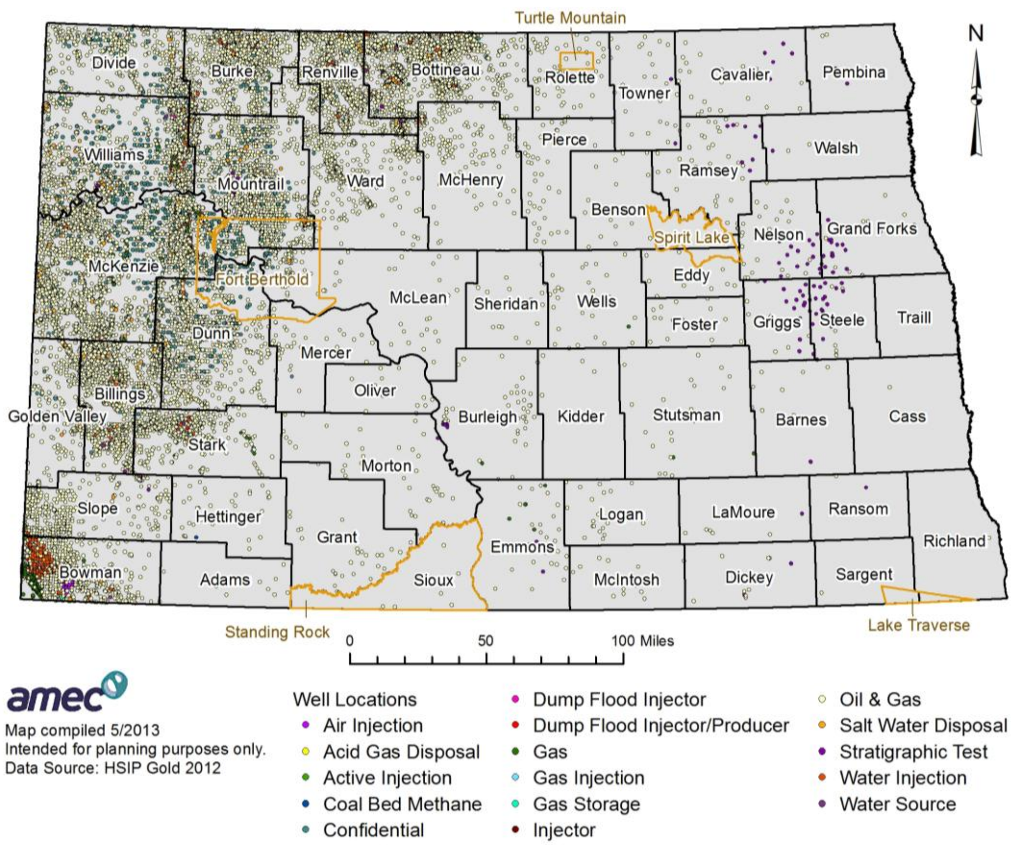
The industry began to take off when developers created the horizontal drilling and hydraulic fracturing process. Oil developers looked for known reserves that were difficult to reach and they decided to try North Dakota's Bakken. In 2005, the first major well was horizontally drilled and fracked in the State and the boom was on. The numbers of drill rigs and oil production continues to increase every year. As of 2012, North Dakota had 21,018 oil producing wells according to the Homeland Security Infrastructure Protection (HSIP) Gold data and 189 active drilling rigs according to North Dakota, Department of Mineral Resources, Oil and Gas Division, in June 2013. The major increase in wells can be seen in comparing the numbers from March 2010, there were just 4,744 oil wells producing, and in July 2010, about 137 active drilling rigs.

2012 was a big year for North Dakota oil production. A record 749,000 barrels a day flowed in October from close to 7,800 wells. This is a fourfold increase in five years. In July, the State jumped ahead of California to become the second-largest oil producing state in the country behind Texas. Within the Bakken and Three Forks areas, U.S. Energy Information Administration (EIA) officials said they estimate 1.19 million barrels per day by December 2014.

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 now is being 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.

Figure 5.53 shows the locations of the oil and natural gas wells on a statewide map. Projections estimate an oil well on every section within the oil fields served by the Bakken and Three Forks Formations over the next six years.

Figure 5.53. Oil and Natural Gas Wells



In the Williston Basin as of March 2013, the North Dakota Pipeline Authority estimated the following percentages of oil by transport type being transported from the well heads:

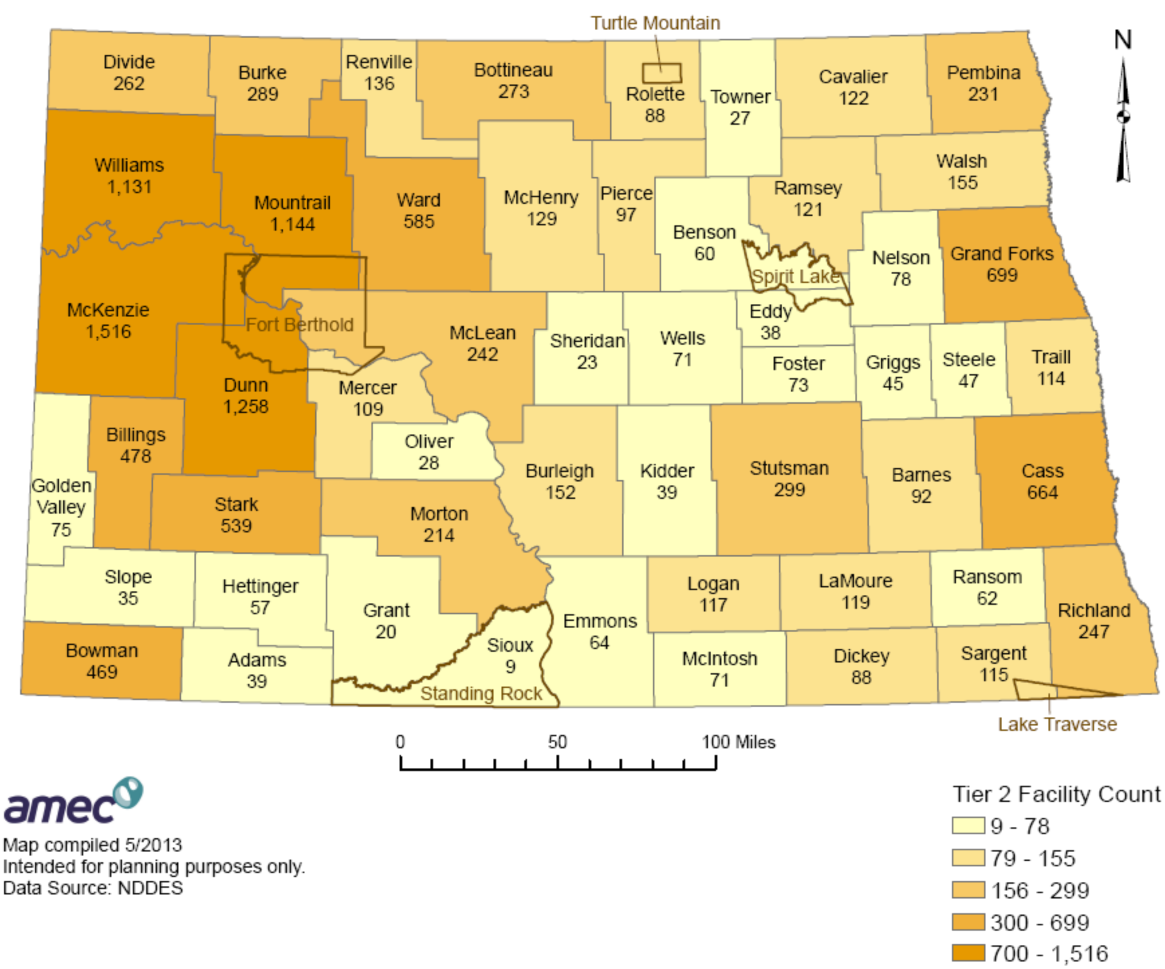
- Rail – 71 percent
- Pipeline export – 20 percent
- Tesoro refinery – 8 percent
- Truck to Canadian Pipelines – 1 percent

The mode of transport of the crude oil is changing as production, transportation dynamics and potential transportation constraints are understood.

Fixed Facility Locations

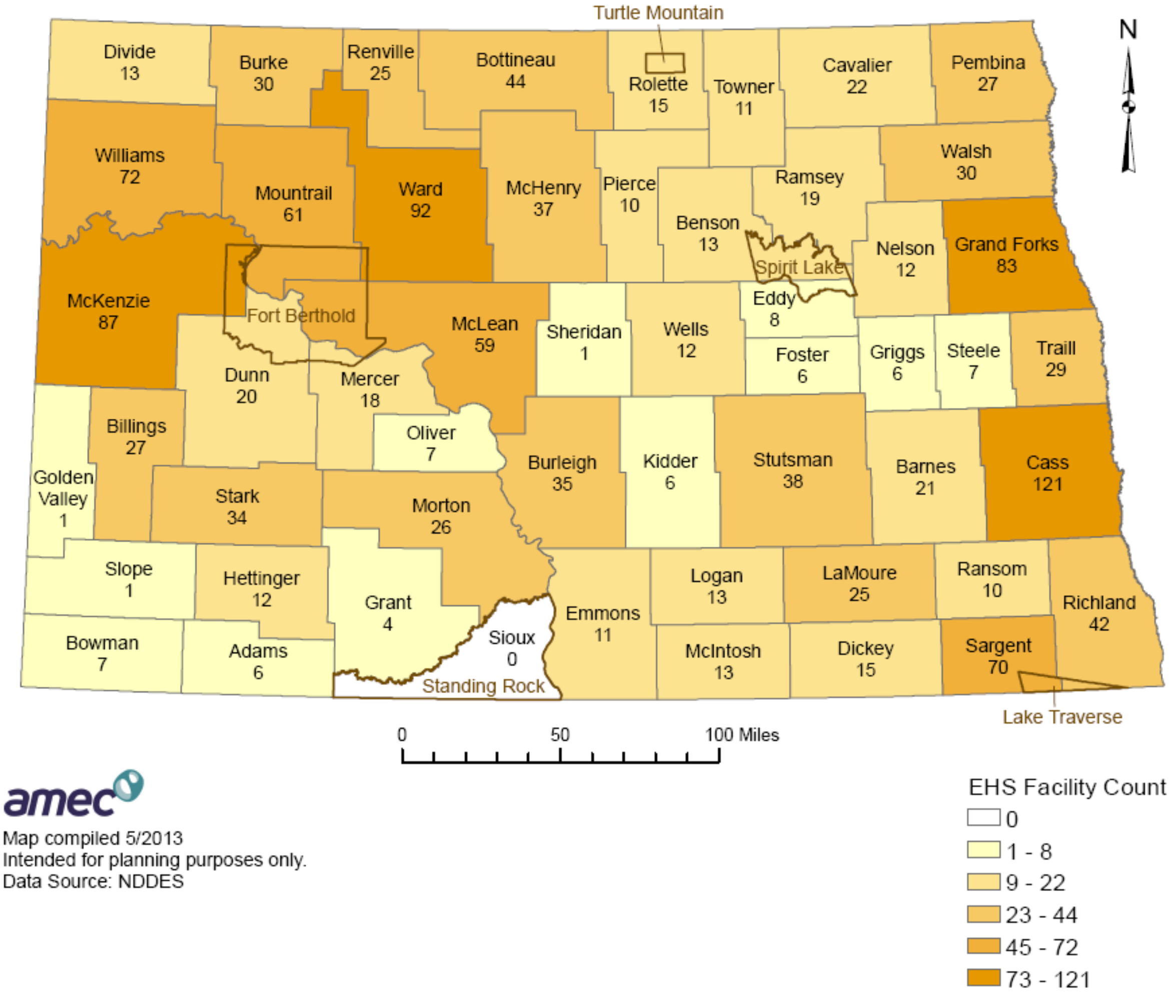
In 2011, there were 13,255 Tier II reporting facilities housing or using hazardous chemicals in North Dakota identified by the Community Right to Know Act. The facilities must maintain a material safety data sheet and submit the list of chemicals to the North Dakota Department of Emergency Services, Hazardous Chemicals Preparedness and Response Program, the Local Emergency Planning Committee (LEPC) and local fire department. The typical facilities reporting are: bulk fuel plants, anhydrous ammonia plants, propane plants, agricultural processing plants, energy producing sites, and oil producing sites. The number of facilities in 2011 is illustrated by county in **Figure 5.54.** As can been seen, the oil producing counties have the highest number of hazardous chemical facilities.

Figure 5.54. Number of North Dakota Tier II Reported Hazardous Chemical Facilities Per County, 2011



In 2011, there were also 1,414 facilities housing extremely hazardous chemicals in North Dakota. These facilities are required under Occupational Safety and Health Administration regulations to maintain the material safety data sheets and report the chemical quantities that equal or exceed either 500 pounds or the threshold planning quantity. The number of facilities is illustrated by county in **Figure 5.55**.

Figure 5.55. Number of North Dakota Extremely Hazardous Substance Facilities Per County, 2011



In particular, there are many licensed dealers selling hazardous fertilizers and pesticides to accommodate the agriculture industry. **Table 5.64** provides the program statistics from the Pesticide and Fertilizer Division as of April 2013.

Table 5.64. Fertilizer and Pesticide Program Statistics

Fertilizer Program	Number
Licensed Fertilizer Distributors: (Note: 128 of these companies are out of state)	546
Registered Fertilizer Products:	3,405
Tons of Fertilizer Sold to End Users in 2012:	2,142,405
Anhydrous Ammonia Program	**Number**
Number of Active Anhydrous Facilities in ND:	347
Number of Licensed Bulk Anhydrous Tanks:	526
Pesticide Program	**Number**
Registered Pesticide Products:	12,104
Number of Pesticide Registrants:	1,223

Source: North Dakota Pesticide and Fertilizer Division, April 2013

Pipelines

According to the U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration's Pipeline Safety Stakeholder Communications, in 2011, North Dakota had a total of 8,080 miles of pipelines. **Table 5.65** Provides additional details on pipeline mileage in the State. The mileage of pipelines associated with oil and gas development will continue to rise as there is a huge demand for additional pipelines.

Table 5.65. North Dakota Pipeline Mileage, 2011

Pipeline System	Mileage
Hazardous Liquid Lines	2,883
Gas Transmission Lines	2,180
Gas Gathering Lines	2
Gas Distribution (148,249 services)*	3,015
Pipeline Mileage	8,080

Source: U.S. Department of Transportation, Pipeline Safety Stakeholder Communications, http://primis.phmsa.dot.gov/comm/reports/safety/ND_detail1.html?nocache=6557

* Gas distribution service lines (the connection between the distribution line and the end user) are not included in the gas distribution mileage.

All mileages are for 2011 and are approximate as some data sources may not have contained a complete record of state pipeline mileage as new pipelines are being laid daily to try to manage the oil and natural gas in the State. According to the North Dakota Pipeline Authority in 2012, 64 percent of the crude oil is being transported by trucks and 36 percent is transported by pipeline until more pipelines are laid and available for use.

Table 5.66 shows the breakdown of gas transmission line and hazardous liquid line mileage by county in 2011 and **Figure 5.56** is a statewide map of the pipelines in North Dakota. Again, these numbers of miles are increasing on a daily basis.

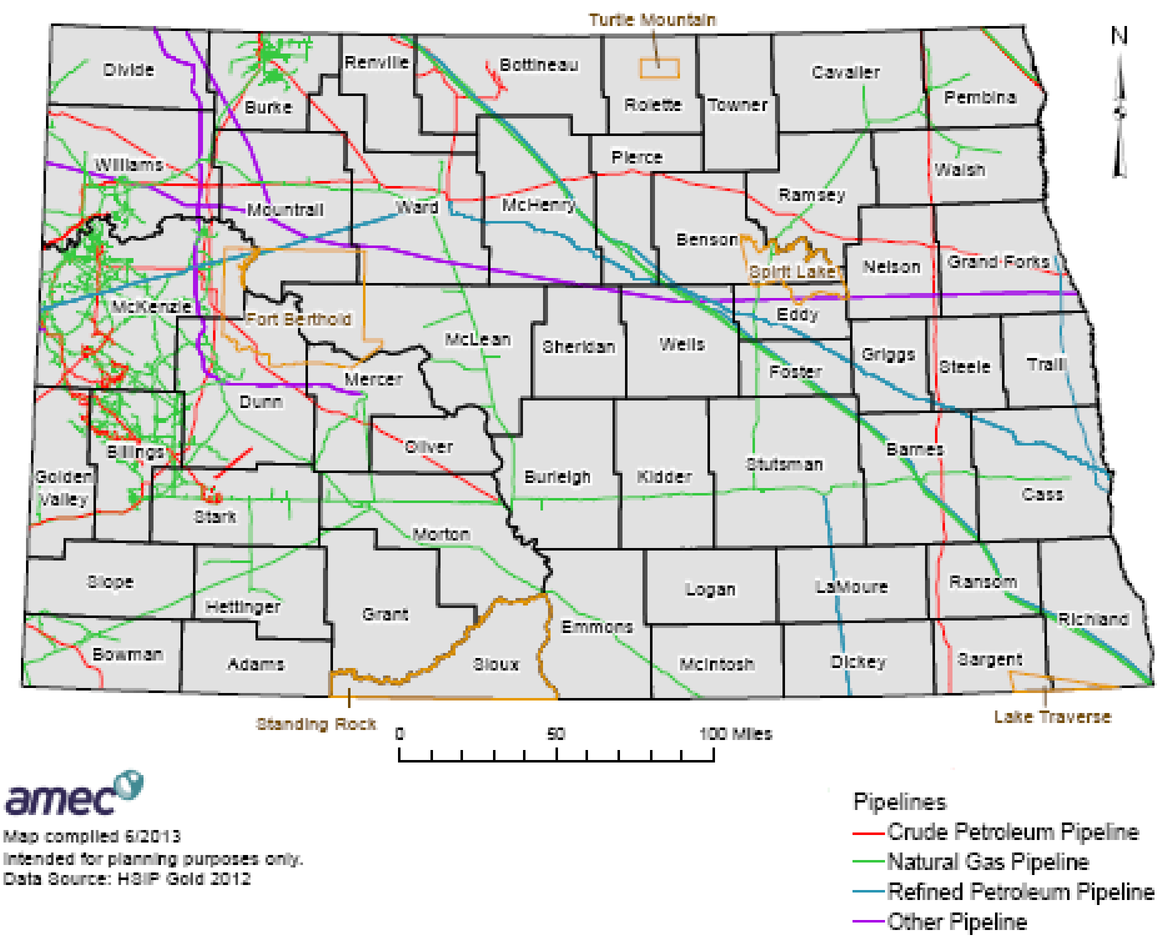
Table 5.66. Gas Transmission Line and Hazardous Liquid Line Mileage by County, 2011

County Name	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Percent
Adams	0	0	0
Barnes	93	146	4.70%
Benson	20	33	1.00%
Billings	93	85	3.50%
Bottineau	33	82	2.20%
Bowman	43	24	1.30%
Burke	50	72	2.40%
Burleigh	67	36	2.00%
Cass	54	140	3.80%
Cavalier	42	7	0.90%
Dickey	0	26	0.50%
Divide	6	42	0.90%
Dunn	109	94	4.00%
Eddy	24	26	1.00%
Emmons	43	0	0.80%
Foster	49	53	2.00%
Golden Valley	65	39	2.00%
Grand Forks	0	62	1.20%
Grant	0	0	0.00%
Griggs	0	28	0.50%
Hettinger	40	0	0.80%
Kidder	30	29	1.10%
La Moure	0	26	0.50%
Logan	0	0	0.00%
McHenry	54	130	3.60%
McIntosh	19	0	0.30%
McKenzie	190	312	9.80%
McLean	102	1	2.00%
Mercer	37	37	1.40%
Morton	156	22	3.50%
Mountrail	86	121	4.00%
Nelson	0	63	1.20%
Oliver	0	30	0.50%
Pembina	33	224	5.00%
Pierce	25	62	1.70%
Ramsey	47	39	1.70%
Ransom	33	58	1.70%
Renville	5	21	0.50%
Richland	66	42	2.10%
Rolette	0	0	0.00%
Sargent	0	27	0.50%
Sheridan	0	0	0.00%
Sioux	0	0	0.00%
Slope	5	0	0.10%
Stark	123	42	3.20%
Steele	0	35	0.60%

County Name	Gas Transmission Pipeline Miles	Haz-Mat Liquid Pipeline Miles	Percent
Stutsman	94	79	3.40%
Towner	0	0	0.00%
Traill	0	32	0.60%
Walsh	26	26	1.00%
Ward	87	140	4.40%
Wells	26	55	1.60%
Williams	84	254	6.60%
Statewide	2,180	2,902	100%

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration

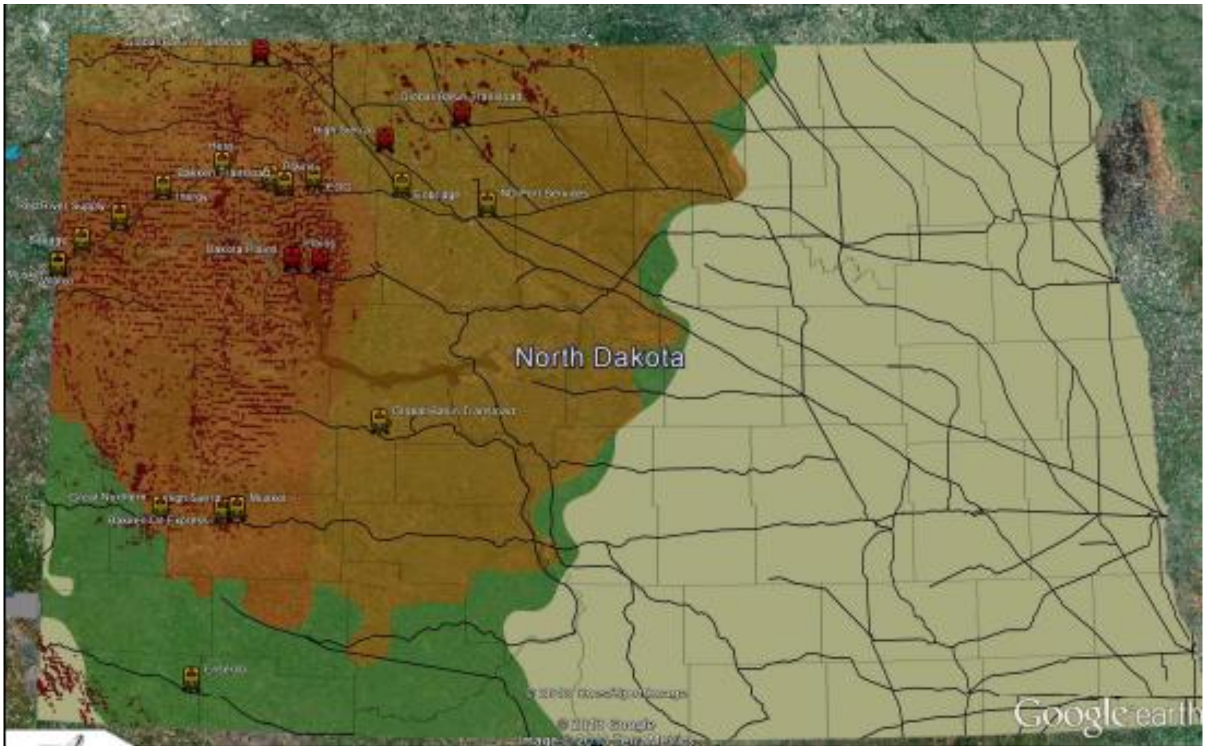
Figure 5.56. North Dakota Pipelines



Transportation

Figure 5.57 shows the railroad loading facilities being used to transport the crude oil.

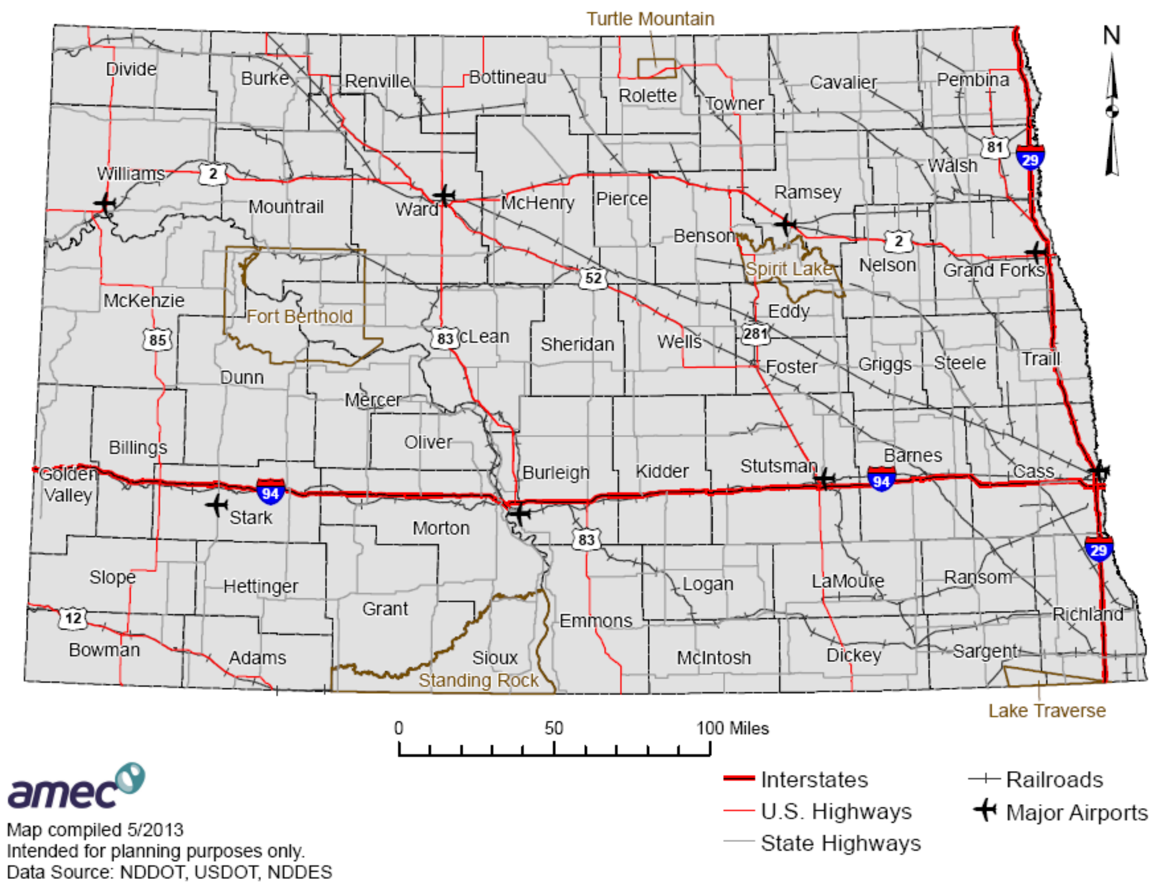
Figure 5.57. Oil Loading Rail Facilities



Source: map by Google Earth and presented by North Dakota Pipeline Authority, May 2013 presentation by Justin Kringstad

Figure 5.58 illustrates the size and location of North Dakota's transportation infrastructure.

Figure 5.58. North Dakota Transportation Routes



5.6.2. Geographic Location

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. **Figure 5.53** shows the oil and gas well development, **Figure 5.54** and **Figure 5.55** shows the number of Tier II and Extremely Hazardous Substance Facilities by county. **Figure 5.56** shows the pipelines in the State and **Figure 5.58** is the transportation infrastructure in the State.

5.6.3. Previous Occurrences

The history of hazardous material releases in North Dakota range from farming incidents to large releases from train derailments. In accordance with state and federal law, the intentional or unintentional release of hazardous materials beyond the reportable quantities must be reported. Notification is made to N.D. Department of Emergency Services (NDDES) through the Division of State Radio. **Table 5.69** in the State Risk Assessment Vulnerability section provides the number of incidents reported to North Dakota Department of Emergency Services in 2012 by county. The statewide total for this year was 1,400 incidents. This total includes all Oil Spill Reports (OSR's), Environmental Incident Report (EIR's) and National Response Center (NRC) Flash Faxes.

The North Dakota National Guard maintains a hazardous materials spill logbook that documents the spill date, time, substance and amount spilled, location, and who reported. The majorities of the spills are diesel fuel and occurred at locations throughout the State.

Details of notable previous events are provided below:

- August 28, 1985: A truck hauling drums of uranium oxide collided with a freight train near Bowdon. 30 to 40 first responders were exposed to the chemical but none were hospitalized.
- April 5, 1987: An agricultural chemical warehouse fire in Minot forced the evacuation of 10,000 people and sickened 37 people.
  September 2008: A natural gas explosion demolished a duplex and injured 13 people in the city of Fargo.
- January 18, 2002: Perhaps the most significant hazardous material release in North Dakota's history was the anhydrous ammonia release near Minot. An excerpt from the associated National Transportation Safety Board report follows.

  "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 2 train crewmembers, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation."

- 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.

- Rail Incidents

Table 5.67 shows the numbers of rail cars carrying hazmat compared to the number of hazmat cars damaged or derailed from rail incidents. The State averages about 3 hazmat rail incidents per year.

Table 5.67. Number of Rail Cars Carrying HAZMAT Compared to the Number of HAZMAT Rail Car Incident, 2004-2012

Rail	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	9-yr average
Cars carrying hazmat	0	10	8	1	26	16	101	33	12	207	23
Hazmat cars damaged/derailed	0	5	1	1	2	5	15	5	1	35	3

Source: North Dakota Department of Transportation, 2013

U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration

Reports from the U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration's provides detail and incident history for the pipeline systems in the State of North Dakota between 2003 and February 2013. 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; 4) liquid releases resulting in an unintentional fire or explosion. According to these reports, there were 35 pipeline incidents that caused two fatalities, 10 injuries and $14 million in damages over the period of 2003 - February 2013). **Table 5.68** gives the incident details by counties. On average, North Dakota experienced 3 incidents, less than one fatality, one injury and $1.4 million in damages each year.

Table 5.68. Details of North Dakota Pipeline Incidents by County, 2003 - February 2013

Date	County	Natural Gas Transmission Incidents	Natural Gas Distribution Incidents	Hazardous Liquid Incidents	Fatalities	Injuries	Damages	Gross Barrels Lost	Barrels Recovered
07/16/2003	Barnes	0	0	1	0	0	$1,481,000	7,324	7,324
07/17/2007	Barnes	0	0	1	0	0	$112,931	0	0
08/04/2003	Barnes	0	0	1	0	0	$114,193	3,283	3,283
05/15/2012	Billings	0	0	1	0	0	$71,290	150	35
11/24/2007	Bottineau	0	0	1	0	0	$11,369	84	0
09/02/2008	Cass	0	1	0	0	4	$161,546	0	0
09/02/2008	Cass	0	0	1	0	4	$161,546	N/A	N/A
05/01/2011	Dunn	1	0	0	0	0	$103,016	0	0
05/01/2011	Dunn	0	0	1	0	0	$103,016	N/A	N/A

Date	County	Natural Gas Transmission Incidents	Natural Gas Distribution Incidents	Hazardous Liquid Incidents	Fatalities	Injuries	Damages	Gross Barrels Lost	Barrels Recovered
04/10/2008	Grand Forks	1	0	0	0	0	$320,068	0	0
04/10/2008	Grand Forks	0	0	1	0	0	$320,068	N/A	N/A
01/11/2008	McKenzie	0	0	1	0	0	$6,258	265	5
01/26/2013	McKenzie	1	0	0	0	0	$194,993	0	0
01/26/2013	McKenzie	0	0	1	0	0	$194,993	N/A	N/A
12/06/2011	McKenzie	0	0	1	0	0	$21,481	800	150
12/09/2011	McKenzie	0	0	1	0	0	$60,437	1,000	530
01/27/2008	Morton	0	1	0	0	0	$376,254	0	
01/27/2008	Morton	0	0	1	0	0	$376,254	N/A	N/A
07/31/2012	Morton	1	0	0	0	0	$80,960	0	0
07/31/2012	Morton	0	0	1	0	0	$80,960	N/A	N/A
01/25/2007	Mountrail	0	0	1	0	0	$83,617	215	15
06/08/2004	Oliver	0	0	1	0	0	$971,719	400	400
01/08/2010	Pembina	0	0	1	0	0	$4,280,772	3,784	2,237
12/15/2004	Richland	0	0	1	0	0	$202,793	2,500	2,500
05/07/2011	Sargent	0	0	1	0	0	$1,337,494	400	0
11/13/2011	Stark	0	0	1	0	0	$40,523	200	80
12/10/2010	Stark	1	0	0	0	0	$482,082	0	0
12/10/2010	Stark	0	0	1	0	0	$482,082	N/A	N/A
09/25/2011	Ward	0	0	1	0	0	$232,914	20	0
11/13/2012	Ward	0	0	1	0	0	$760,240	130	0
12/08/2012	Ward	0	1	0	0	1	$120,390	0	0
12/08/2012	Ward	0	0	1	0	1	$120,390	N/A	N/A
09/21/2006	Williams	0	0	1	0	0	$580,866	100	100
11/08/2010	Williams	1	0	0	1	0	$41,343	0	0
11/08/2010	Williams	0	0	1	1	0	$41,343	N/A	N/A
	Statewide Totals	**6**	**3**	**26**	**2**	**10**	**$14,131,201**	**20,655**	**16,659**

Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration, http://primis.phmsa.dot.gov/comm/reports/safety/IncDetSt_st_KS_flt_sig.html?nocache=999#_all

Notes: The costs shown are in 2012 dollars. For years 2002 and later, property damage is estimated as the sum of all public and private costs reported in the 30-day incident report. N/A= not available

There have not been any Presidential or State-level disaster declarations in North Dakota for hazardous material releases.

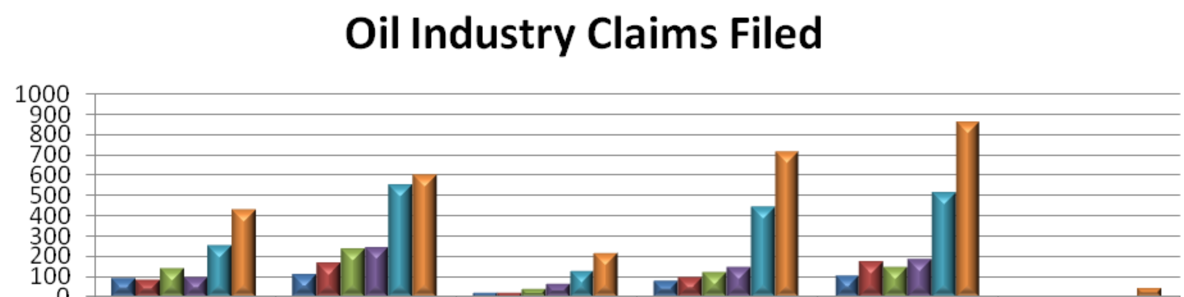
Oil and Natural Gas Industry

The North Dakota Department of Mineral Resources, Oil and Gas Division maintains a list of Bonded Operators in the State. As of March 2013, this list has about 330 operators in the State and the list is growing.

The oil and natural gas drilling work is dangerous and fast-paced. Often, workers work long hours. The weather conditions are brutal in the winter with strong winds, snow and freezing temperatures. According to the North Dakota Workforce Insurance and Safety Department, over 80 percent of the injuries occur to employees who are in their first year on the job.

Figure 5.59 shows historical North Dakota Workforce Safety and Insurance Claims Filed from Oil Industry workers from fiscal year 2007-2012. It is separated by workforce area rate class and the drastic increases in insurance claims filed from fiscal year 2007 to 2012 in all oil workforce areas.

Figure 5.59. Oil Industry Workforce Safety and Insurance Claims Files, Fiscal Year 2007-2012



	1320	6203	6204	6205	6206	6208
FY07	91	111	23	75	104	6
FY08	81	164	23	94	170	7
FY09	140	235	42	123	145	5
FY10	97	243	63	149	185	10
FY11	251	548	127	445	515	12
FY12	431	601	216	713	858	47

Source: North Dakota Workforce Safety and Insurance

Note:

1320 *= Oil Or Gas Operations - Completed Well*

6203 *= Oil & Gas Development-Drilling*

6204 *= Oil & Gas Well Supply or Equipment Dealers*

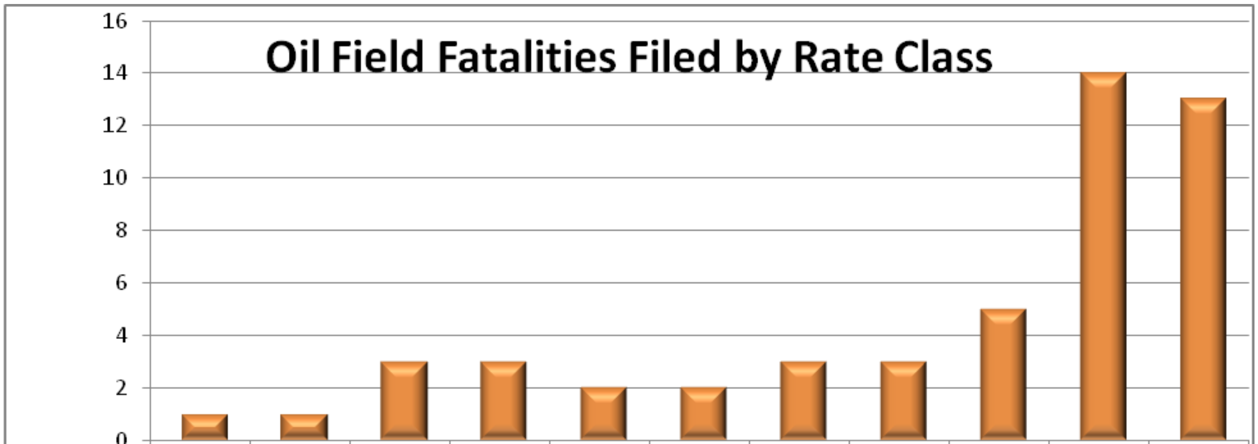
6205 *= Oil Well Trucking*

6206 *= Oil Well Servicing*

6208 *= Oil & Gas Instrument Logging*

Figure 5.60 shows the number of oil field fatalities files by Rate Class. A description of the rate classes are in the note section below. In fiscal year 2012, there were a record number of 14 fatalities. In fiscal year 2013, there are already 13 fatalities as of February 28, 2013.

Figure 5.60. Number of Oil Field Fatalities Filed by Rate Class, Fiscal Year 2003 - partial 2013.



	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13 @ 02/28/13
1320	0	0	1	0	0	1	1	0	0	2	3
6203	0	1	0	3	1	1	1	1	3	3	1
6204	0	0	0	0	0	0	0	0	0	2	1
6205	0	0	2	0	1	0	1	1	1	4	2
6206	1	0	0	0	0	0	0	1	1	3	6
Total Filed	1	1	3	3	2	2	3	3	5	14	13

Source: North Dakota Workforce Safety and Insurance

Note:

1320 = Oil Or Gas Operations - Completed Well

6203 = Oil & Gas Development-Drilling

6204 = Oil & Gas Well Supply or Equipment Dealers

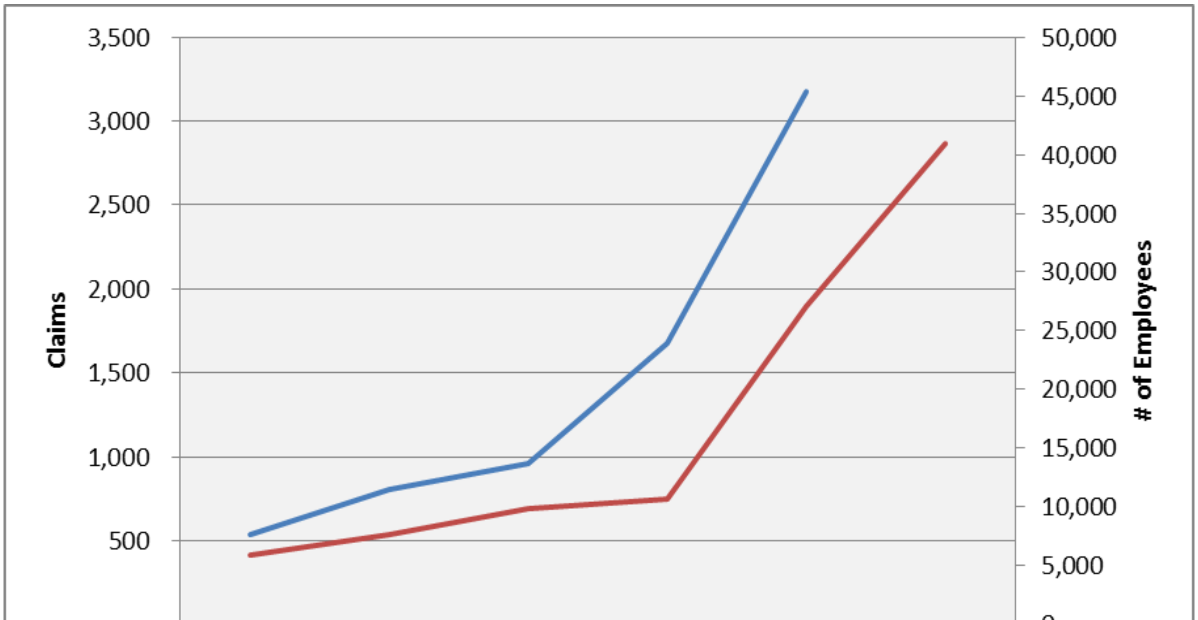
6205 = Oil Well Trucking

6206 = Oil Well Servicing

6208 = Oil & Gas Instrument Logging

Figure 5.61 shows historical North Dakota Workforce Safety and Insurance Claims Filed from Oil Industry workers from fiscal year 2006 – 2012. It shows the drastic increase of the insurance claims and the number of workers involved. By 2011/2012, there were over 2,866 claims from the oil industry.

Figure 5.61. Petroleum Reported Employees/Claims



	06/07	07/08	08/09	09/10	10/11	11/12
Claims	410	539	690	747	1,898	2,866
# of Emp	7,692	11,534	13,759	23,921	45,327	

Source: North Dakota Workforce Safety and Insurance
Note: Blue line represents the claims and the Red line represents the number of employees.

5.6.4. Probability and Magnitude

Workers in the oil and gas industry are the most at risk to a HAZMAT event. As seen by the high number of employees filing injury claims to the North Dakota Workforce Safety & Insurance and the number of fatalities in the industry in 2012 and 2013. Unfortunately, the injuries and fatalities will probably only continue to rise.

Also, the Loss Control Department of Workforce Safety & Insurance believe that every North Dakota employee deserves a safe work environment. The Department provides several Safety Incentive Programs to North Dakota Employers and encourages employers to participate.

Figure 5.62 is a graphical representation of the range of events that can occur within the hazardous material release hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the hazardous material release hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.62. Hazard Frequency and Impact Ranges

Frequency	Negligible	Limited	Critical	Catastrophic
No regional history No local history 100 years		Release Requiring Large Evacuation	Hazardous Plume in an Urban Area	Nuclear Release in an Urban Area
50 years Annually	Spill Requiring Response			
		Impact		

As reported in the 2011 State Hazard Mitigation Plan, during the 7.5 year period from March 2003 – August 2010, 486 hazardous material releases were reported to the North Dakota Department of Emergency Services. Now, with even more growth in the oil and natural gas industry 1,400 incidents occurred in 2012 alone. This indicates that the rate of incidents has increased 347 percent North Dakota had an average of 3-4 pipeline incidents per year from 2003 – February 2013. Major incidents requiring large scale evacuations and causing mass fatalities or injuries are possible as the historical record indicates.

5.6.5. State Risk Assessment

Vulnerability Overview

The impacts to people are often greater than the structural impacts as a result of a hazardous material incident. 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, than more rural areas. 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 some time to evacuate, depending on the weather conditions, material released, and public notification.

Vulnerabilities to public water supplies also threaten jurisdictions, and contamination could come from sources outside of North Dakota. 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, such as Lake Sakakawea could have an impact on many counties and cities.

Significant losses can also 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.

The statistical analysis method was used to refine and assess the relative vulnerability to each North Dakota county to Hazardous Materials. The State assigned ratings to five pertinent factors that were examined at the county level. These factors are: number of Tier II facilities, and number of incidents reported to NDDES in 2012, the miles of gas transmission and haz-mat liquid pipelines and the number of pipeline incidents from the U.S. Department of Transportation, Pipeline Safety Stakeholder Communications. A rating value of 1-5 was assigned to the data obtained for each factor to obtain vulnerability scores for comparison and to determine the most vulnerable counties. **Table 5.69** and **Figure 5.63** shows the overall hazardous material vulnerability by county.

Table 5.69. Hazardous Materials Vulnerability Analysis by County

County	# of Tier II Facilities	Tier II Facility Rating	# of Reported Incidents to NDDES in 2012	Incident Rating	Gas Transmission Pipeline Miles	Gas Pipeline Rating	Haz-Mat Liquid Pipeline Miles	Liquid Pipeline Rating	Pipeline Incidents 2012	Pipeline Incident Rating	Total Ratings	HAZMAT Analysis by County
Adams	39	1	1	1	0	0	0	0	0	0	2	Low
Barnes	92	1	5	1	93	3	146	3	0	0	8	Low-Moderate
Benson	60	1	1	1	20	1	33	1	0	0	4	Low
Billings	478	3	86	2	93	3	85	2	1	1	11	Moderate
Bottineau	273	2	40	1	33	1	82	2	0	0	6	Low-Moderate
Bowman	469	3	46	1	43	2	24	1	0	0	7	Low-Moderate
Burke	289	2	55	1	50	2	72	2	0	0	7	Low-Moderate
Burleigh	152	2	3	1	67	2	36	1	0	0	6	Low-Moderate
Cass	664	4	18	1	54	2	140	3	0	0	10	Moderate
Cavalier	122	2	2	1	42	2	7	1	0	0	6	Low-Moderate
Dickey	88	1	0	0	0	0	26	1	0	0	2	Low
Divide	262	2	40	1	6	1	42	1	0	0	5	Low-Moderate
Dunn	1258	5	197	3	109	3	94	2	0	0	13	Moderate-High
Eddy	38	1	0	0	24	1	26	1	0	0	3	Low
Emmons	64	1	0	0	43	2	0	0	0	0	3	Low
Foster	73	1	2	1	49	2	53	1	0	0	5	Low-Moderate
Golden Valley	75	1	9	1	65	2	39	1	0	0	5	Low-Moderate
Grand Forks	699	4	20	1	0	0	62	1	0	0	6	Low-Moderate
Grant	20	1	0	0	0	0	0	0	0	0	1	Low
Griggs	45	1	2	1	0	0	28	1	0	0	3	Low
Hettinger	57	1	1	1	40	2	0	0	0	0	4	Low
Kidder	39	1	3	1	30	1	29	1	0	0	4	Low
LaMoure	119	2	1	1	0	0	26	1	0	0	4	Low
Logan	117	2	0	0	0	0	0	0	0	0	2	Low

County	# of Tier II Facilities	Tier II Facility Rating	# of Reported Incidents to NDDES in 2012	Incident Rating	Gas Transmission Pipeline Miles	Gas Pipeline Rating	Haz-Mat Liquid Pipeline Miles	Liquid Pipeline Rating	Pipeline Incidents 2012	Pipeline Incident Rating	Total Ratings	HAZMAT Analysis by County
McHenry	129	2	9	1	54	2	130	3	0	0	8	Low-Moderate
McIntosh	71	1	3	1	19	1	0	0	0	0	3	Low
McKenzie	1516	5	297	5	190	5	312	5	0	0	20	High
McLean	242	2	4	1	102	3	1	1	0	0	7	Low-Moderate
Mercer	109	2	4	1	37	1	37	1	0	0	5	Low-Moderate
Morton	214	2	3	1	156	4	22	1	2	2	10	Moderate
Mountrail	1144	5	170	3	86	3	121	2	0	0	13	Moderate-High
Nelson	78	1	0	0	0	0	63	2	0	0	3	Low
Oliver	28	1	2	1	0	0	30	1	0	0	3	Low
Pembina	231	2	6	1	33	1	224	4	0	0	8	Low-Moderate
Pierce	97	1	0	0	25	1	62	1	0	0	3	Low
Ramsey	121	2	3	1	47	2	39	1	0	0	6	Low-Moderate
Ransom	62	1	2	1	33	1	58	1	0	0	4	Low
Renville	136	2	2	1	5	1	21	1	0	0	5	Low-Moderate
Richland	247	2	13	1	66	2	42	1	0	0	6	Low-Moderate
Rolette	88	1	0	0	0	0	0	0	0	0	1	Low
Sargent	115	2	0	0	0	0	27	1	0	0	3	Low
Sheridan	23	1	0	0	0	0	0	0	0	0	1	Low
Sioux	4	1	0	0	0	0	0	0	0	0	1	Low
Slope	35	1	1	1	5	1	0	0	0	0	3	Low
Stark	5	1	40	1	123	4	42	1	0	0	7	Low-Moderate
Steele	539	3	31	1	0	0	35	1	0	0	5	Low-Moderate
Stutsman	47	1	4	1	94	3	79	2	0	0	7	Low-Moderate
Towner	299	2	1	1	0	0	0	0	0	0	3	Low
Traill	27	1	2	1	0	0	32	1	0	0	3	Low
Walsh	114	2	1	1	26	1	26	1	0	0	5	Low-Moderate
Ward	155	2	28	1	87	3	140	3	3	3	12	Moderate
Wells	585	3	2	1	26	1	55	1	0	0	6	Low-Moderate
Williams	71	1	240	4	84	3	254	5	0	0	13	Moderate-High

Figure 5.63. Hazard Materials Overall Vulnerability

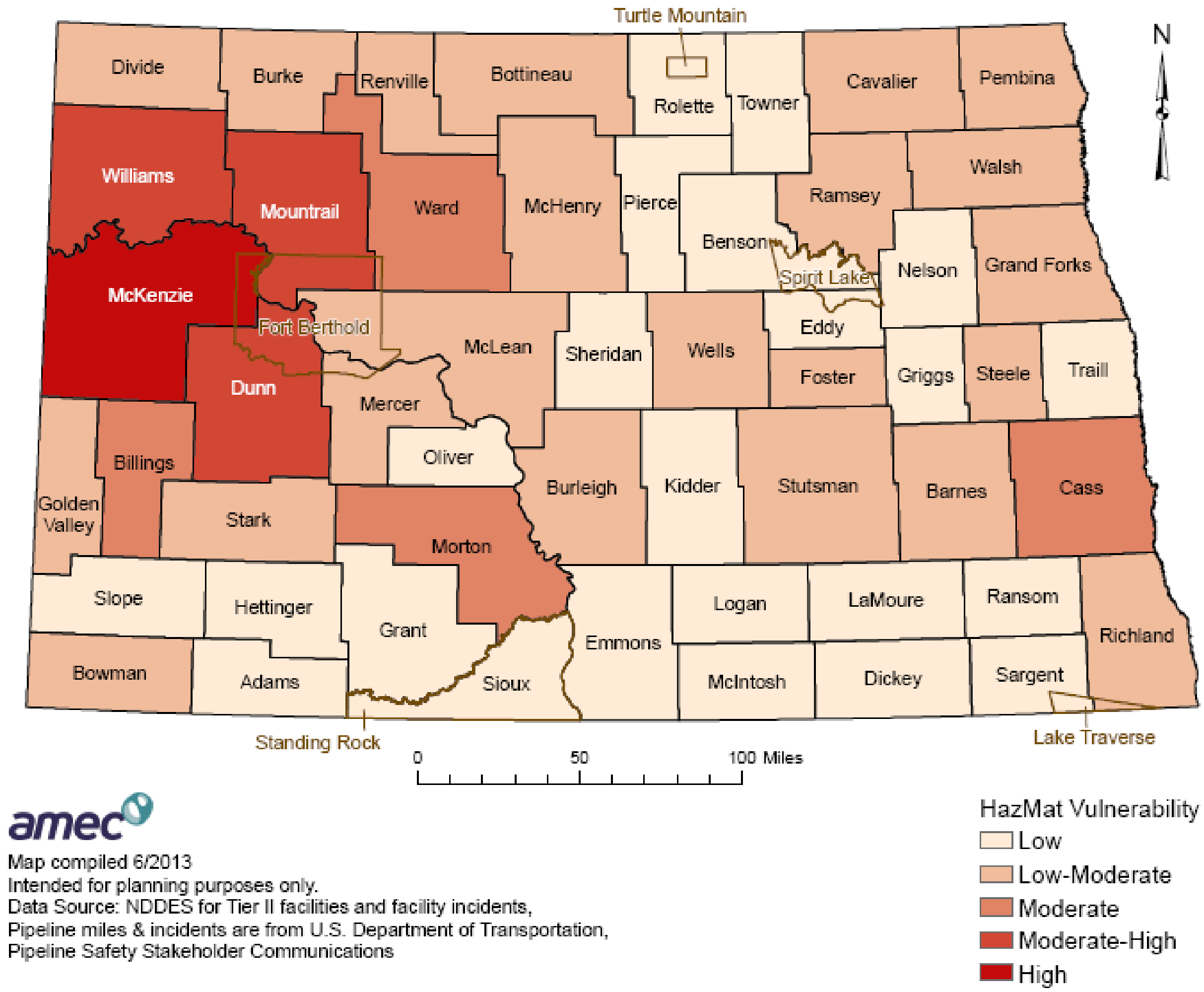


Table 5.70. Top Counties Vulnerable to Hazardous Materials

County	HAZMAT Analysis by County
McKenzie	High
Williams	Moderate-High
Mountrail	Moderate-High
Dunn	Moderate-High
Ward	Moderate
Billings	Moderate
Morton	Moderate
Cass	Moderate

Loss Estimates

Sufficient data is not available at this time to make estimates of potential losses by jurisdiction for all types of HAZMAT 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.

THE FOLLOWING HYPOTHETICAL SCENARIO IS FOR INSTRUCTIONAL AND ILUSTRATIVE PURPOSES ONLY*

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people and then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work close with local responders, NDDHE, NDCC, NDDES, and EPA to ensure that cleanup is done safely and in accordance with federal and state laws.

As mentioned, it is difficult to determine the potential losses to existing development because of the variable nature of a hazardous materials spill. For example, a spill of a toxic airborne chemical in a populated area could have great potential for loss of life and by contrast, the spill of a very small amount of a chemical in a rural agricultural area would be much less costly and possible limited to remediation of soil.

For discussion purposes, the personnel and materials needed for a spill at a fixed facility at an easily remediated area are listed below in **Table 5.71**. The costs for the cleanup are estimates only.

Table 5.71. Potential Cost Estimate for HAZMAT Spill Remediation

Classification	Rates Per Hour/Unit	Number of Hours/Units	Cost
Project Manager	$90.00	24	$2,160
Health & Safety Supervisor	$86.00	24	$2,064
Environmental Tech	$50.00	12	$600
Foreman	$55.00	24	$1,320
Equipment Operator	$56.50	24	$1,356
Laborer	$45.00	24	$1,080
Truck, 4 wheel drive	$680/wk	1	$680
Backhoe, Case 416B	$320.00/day	2	$640
Forklift, 3 ton all terrain	$160.00/day	2	$320
Skimmer	$250.00/day	2	$500
Pump, 4”	$80.00/day	3	$240
Drums, chemical, 17H or 17E	$90.00	25	$2,250
Drums, 95 gallon	$295.00	25	$7,375
Vermiculite per bag	$15.00	6	$90
Acid Suits	$70.00/each	6	$420
Gloves	$4.00/pair	30	$120
Total			**$21,215**

5.6.6. Local Risk Assessments

Table 5.72 provides information from local and tribal mitigation plans regarding the local hazard rating and any additional information. As indicated in the rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.72. Hazardous Materials Release Risk Summary From Local Plans

County	Hazardous Materials Hazards Rating	Hazardous Materials Additional Information
Adams	C	
Barnes	B	
Benson	B	
Billings	C	
Bottineau	B	
Bowman	B	
Burke	D	
Burleigh	B	
Cass	B	
Cavalier	High	
Dickey	C	
Divide	NP	
Dunn	C	
Eddy	B	
Emmons	C	
*Fort Berthold^*	*CPRI 3.7*	
Foster	B	
Golden Valley	C	

County	Hazardous Materials Hazards Rating	Hazardous Materials Additional Information
Grand Forks	B	Billions of dollars in building exposure and tens of thousands of residents within 5 miles of the railroad main lines
Grant	D	
Griggs	C	
Hettinger	C	
Kidder	B	
*Lake Traverse^*	*NP*	
LaMoure	#10 of 12	
Logan	B	
McHenry	B	
McIntosh	B	
McKenzie	NP	
McLean	B	
Mercer	B	
Morton	B	
Mountrail	C	
Nelson	B	
Oliver	B	
Pembina	B	
Pierce	C	
Ramsey	B	8,606 people within 5 miles of railroad main line; Up to millions of dollars in structure losses
Ransom	Medium	
Renville	B	
Richland	B	
Rolette	B	
Sargent	C	
Sheridan	NP	
Sioux	*Somewhat Likely*	
Slope	C	
Spirit Lake	Moderate High	
*Standing Rock^*	*Somewhat Likely*	
Stark	NP	
Steele	NP	
Stutsman	B	
Towner	B	
Traill	B	
Turtle Mountain^	CPRI 2.2	
Walsh	B	
Ward	B	
Wells	B	
Williams	B	

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.6.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

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 are typically not damaged in a hazardous materials release. 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.

Similar to state-owned buildings and property, critical facilities and infrastructure are at risk from hazardous material releases. Those in close proximity to hazardous fixed facilities and transportation, pipeline, or utility infrastructure are at greatest 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 could be reduced. A release near a special needs facility may present unique evacuation challenges.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.6.8. Development in Identified Hazard Areas

The oil and natural gas industry is already huge and will only continue to develop and grow in North Dakota. As stated North Dakota is the second-largest oil producing state in the U.S. The U.S. Energy Information Administration (EIA) officials said they estimate 1.19 million barrels per day by December 2014 within the Bakken and Three Forks areas.

The industry is making progress in developing infrastructure to transport the oil and gas pumped from the ground. Several pipeline expansion projects are underway or waiting for approval and a system of pipelines to gather the oil is being developed.

Figure 5.64. Pipelines Being Laid in North Dakota

Source: Peaks and Plains Magazine, Spring 2013, photo by Travis Dewitz

Currently, about 30 percent of the natural gas is being flared off and not being captured. The State is working to change this in the future by installing new gas gathering pipelines, processing capacity, and providing adequate interstate pipeline capacity.

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 entire State and in particular the western part of the State, is experiencing drastic new infrastructure development to accommodate the gas and natural 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. Population increases are being seen in Burleigh, Cass, Grand Forks, McKenzie, Morton, Mountrail, Rolette, Stark, Sioux, Ward, and Williams Counties which correspond with McKenzie, Williams, Mountrail, Morton and Cass as having the highest vulnerability to hazardous material incidents.

5.6.9. Data Limitations and Other Key Documents

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. 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.

Other key documents related to the Hazardous Material Release hazard include:

- North Dakota Emergency Operations Plan, Hazardous Materials Annex

5.7. Homeland Security Incident (Including Multiple Types of Terrorism and Cyber- Terrorism)

Hazard Rating	THIRA Threat/Hazard Group
Low	Adversarial

5.7.1. Description

A homeland security incident is any intentional adversarial human-caused incident, domestic or international, that causes mass casualties, large economic losses, or widespread panic in the country. Terrorism and civil unrest are examples of human-caused hazards that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try and influence government or the population of some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using untraditional methods. The primary recognized forms of terrorism are chemical, explosive, biological, radiological/nuclear, and cyber; however, terrorism's only limitation is the human imagination.

Chemical Terrorism

Chemical terrorism 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 broken into five different categories: nerve agents, vesicants, cyanide, pulmonary agents, and incapacitating agents. Known nerve agents include tabun, sarin, soman, 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 produce reversible disturbances within the central nervous system and cognitive abilities and include the agent BZ. (Sidell, 1996)

Explosive Terrorism

Terrorism using explosive and incendiary devices includes 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 in the case of a suicide bomb.

Biological Terrorism

Biological Terrorism, 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 could be similar to those discussed in the Communicable Disease Hazard Profile, **Section 5.1**, with the primary exception that the infection of the population was intentionally caused.

Radiological/Nuclear Terrorism

Radiological/nuclear terrorism involves the use of radiological dispersal devices, nuclear weapons, or nuclear facilities to attack the population. Exposure to radiation can cause radiation sickness, long-term illness, and even death. Terrorism experts fear the use of explosive and radiological devices in the form of a “dirty bomb” to attack the population. A “dirty bomb” is a low-tech, easily assembled and transported device made up of simple explosives combined with a suitable radioactive agent. As with chemical and biological events, radiological incidents present contamination challenges for first responders. North Dakota is also home to United States intercontinental ballistic missiles located in silos around Minot Air Force Base. 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 US Air Force.

Cyber Terrorism

Cyber terrorism is the attack or hijack of the information technology infrastructure that is critical to the functions controlled by computer networks such as: operating, financial, communications, and trade systems. Any cyber-attack 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 in order to mitigate any potential disruption to critical infrastructure. In order to ensure a quick and proper response to cyber-attacks, systems vulnerable to cyber terrorism should have an incident response plan to minimize negative impacts.

Civil Unrest

Civil unrest and violence typically occur on a smaller scale than other types of terrorism. Civil unrest can occur when large groups, organizations, or distraught individuals take action with potentially disastrous or disruptive results. Civil unrest can result following a disaster that creates panic in the community. Forms of civil unrest can range from groups blocking sidewalks, roadways, and buildings to mobs rioting and looting to gang activity. Civil unrest 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. Other forms of violence that threaten communities across the country include irrational individuals killing others in schools, workplaces, and essentially anywhere. 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.

Most times, homeland security incidents, both domestic and international, are driven by a terrorist group or hate organization. Occasionally, individuals perform independent acts. Usually, the perpetrators have an underlying belief that drives the act. Definitions of several types of Hate and Terrorist Organizations are listed below as provided by the North Dakota State & Local Intelligence Center (SLIC).

- Anarchist Extremists: Groups or individuals who facilitate or engage in acts of violence as a means of changing the government and society in support of the belief that all forms of capitalism and corporate globalization should be opposed and that governing institutions are unnecessary and harmful to society.
- Animal Rights Extremists: Groups or individuals who facilitate or engage in acts of violence directed against people, businesses, or governmental entities perceived to be exploiting or abusing animals.
- Anti-Abortion Extremists: Groups or individuals who facilitate or engage in acts of violence directed against the providers of abortion-related services, their employees, and their facilities in support of the belief that the practice of abortion should end.
- Black Supremacist Extremists: Groups or individuals who facilitate or engage in acts of violence as a means to oppose racial integration and/or to eliminate non-black people and Jewish people.
- Domestic Terrorists: Groups or individuals who commit an act of violence that is dangerous to human life or potentially destructive of critical infrastructure or key resources. These groups or individuals are based and operating entirely within the United States or its territories without direction or inspiration from a foreign terrorist group. The act of domestic terrorism is a violation of the criminal laws of the United States or of any state or other subdivision of the United States and appears to be intended to intimidate or coerce a civilian populations, to influence the policy of a government by intimidation or coercions, or to affect the conduct of a government by mass destruction, assassination, or kidnapping. A domestic terrorist differs from a homegrown violent extremist in that the former is not inspired by and does not take direction from a foreign terrorist group or other foreign power.
- Environmental Rights Extremists: Groups or individuals who facilitate or engage in acts of violence against people, businesses, or government entities perceived to be destroying, degrading, or exploiting the natural environment.
- Homegrown Violent Extremist (HVE): A homegrown violent extremist (HVE) is a person of any citizenship who has lived and/or operated primarily in the United States or its territories who advocates, is engaged in, or is preparing to engage in ideologically-motivated terrorist activities (including providing support to terrorism) in furtherance of political or social objectives promoted by a foreign terrorist organization, but is acting independently of direction by a foreign terrorist organization. HVEs are distinct from traditional domestic terrorists who engage in unlawful acts of violence to intimidate civilian populations or attempt to influence domestic policy without direction from or influence from a foreign actor.
- Lone Offender: An individual motivated by one or more violent extremist ideologies who, operating alone, supports or engages in acts of violence in furtherance of that ideology or ideologies that may involve influence from a larger terrorist organization or a foreign actor.
- Militia Extremists: Groups or individuals who facilitate or engage is acts of violence directed at federal, state, or local government officials or infrastructure in response to their belief that the government deliberately is stripping Americans of their freedoms and is attempting to established a totalitarian regime. These individuals consequently oppose many federal and state authorities' laws and regulations, (particularly those related to firearms

ownership), and often belong to armed paramilitary groups. They often conduct paramilitary training designed to violently resist perceived government oppression or to violently overthrow the US Government.

- Racist Skinhead Extremists: Groups or individuals who are a subcategory of white supremacist extremists that facilitate, support or engage in acts of violence directed towards the federal government, ethnic minorities, or Jewish persons in support of their belief that Caucasians are intellectually and morally superior to other races and their perception that the government is controlled by Jewish persons. Racist skinheads consider themselves to be the frontline soldiers of white supremacist extremist and frequently distinguish themselves from other violent white supremacist extremists by a distinctive style of dress.
- Sovereign Citizen Extremists: Groups or individuals who facilitate or engage in acts of violence directed at public officials, financial institutions, and government facilities in support of their belief that the legitimacy of US citizenship should be rejected; who believe that all forms of established government, authority, and institutions are illegitimate and that they are immune from federal, state and local laws.
- Terrorism: Any activity that involves an act that is dangerous to human life or potentially destructive to critical infrastructure or key resources, and is a violation of the criminal laws of the United States or of any state or other subdivision of the United States and appears to be intended to intimidate or coerce a civilian population to influence the policy of a government by intimidation or coercion, or to affect the conduct of a government by mass destruction, assassination, or kidnapping.
- White Supremacist Extremists: Groups or individuals who facilitate or engage in acts of violence directed at the federal government, ethnic minorities, or Jewish persons in support of their belief that Caucasians are intellectually and morally superior to other races and their perception that the government is controlled by Jewish persons.

Specific to North Dakota is the Little Shell Pembina Band. Law enforcement officers and public officials around the country are encountering members of a new and active anti-government extremist group that calls itself the "Little Shell Pembina Band of North America." Members of the group claim that they belong to a "sovereign" Native American tribe and therefore are not subject to laws and regulations; in reality, the "Little Shell Pembina Band" is part of the anti-government “sovereign citizen” movement. Its members' activities range from driving with unlawful license plates to perpetrating insurance fraud schemes to tax evasion. The group is primarily based in North Dakota and Washington, but members can be found across the nation. The group has split into two competing factions, but each use the same name. According to the Southern Poverty Law Center Intelligence Project, a White Nationalist group, the Frontline Aryans, have an active cell in Minot.

North Dakota State and Local Intelligence Center (SLIC)

The mission of the North Dakota SLIC is to collect, store, analyze and disseminate information 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.

According to the SLIC, information and communication technology (ICT) has played an essential role disseminating terrorist group's radical ideology and also 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. YouTube, Skype, email interfaces, blogs, message boards, and other social networking Web sites 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.

Whereas would-be extremists once had to physically attend an extremist mosque or meeting to be exposed to radical rhetoric, Al Qaida and otherwise inspired sermons and propaganda are now widely available on the Internet, including on hundreds of English-language Web sites.

Directions on how to make a pressure cooker bomb, similar to the bomb constructed by the April 2013 Boston Marathon bombers were readily available on the internet and in an Al Qaida English Language on-line magazine.

The only limitations of homeland security incidents are the human imagination and motivations, therefore, any hazard that can be "created" can be the result of terrorism or civil unrest. For example, terrorists can compromise a dam, leading to catastrophic dam failure. Other hazards that people can initiate given the appropriate materials and motivation include communicable disease, transportation accidents, hazardous material releases, utility or communications failures, and wildland fires; all can be intentionally triggered.

5.7.2. Geographic Location

In general, jurisdictions with large, dense population areas are more vulnerable to Homeland Security Incidents as well as special events with large populations gathered at a specific site. **Table 5.73** below provides population density by county and is sorted in order of density. Cass County has the highest population density by far, followed by Burleigh and Grand Forks Counties.

Table 5.73. North Dakota, Population Density by County

County	Population Density # per square mile, 2010

County	Population Density # per square mile, 2010
Cass County	84.9
Burleigh County	49.8
Grand Forks County	46.5
Ward County	30.6
Stark County	18.1
Rolette County	15.4
Morton County	14.3
Richland County	11.4
Williams County	10.8
Ramsey County	9.6
Stutsman County	9.5
Traill County	9.4
Walsh County	8.7
Mercer County	8.1
Barnes County	7.4
Pembina County	6.6
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	4.2
Mountrail County	4.2
Bottineau County	3.9
Eddy County	3.8
Sioux County	3.8
LaMoure County	3.6
Griggs County	3.4
Wells County	3.3
Nelson County	3.2
McHenry County	2.9
McIntosh County	2.9
Renville County	2.8
Steele County	2.8
Bowman County	2.7
Cavalier County	2.7
Oliver County	2.6
Adams County	2.4
Emmons County	2.4
McKenzie County	2.3
Hettinger County	2.2
Towner County	2.2
Logan County	2.0
Burke County	1.8
Dunn County	1.8

County	Population Density # per square mile, 2010
Kidder County	1.8
Golden Valley County	1.7
Divide County	1.6
Grant County	1.4
Sheridan County	1.4
Billings County	0.7
Slope County	0.6

Source: U.S. Census Bureau

While it is not possible to predict the location of civil disorders, large venue locations such as stadiums 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:

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

Another important factor in the consideration of homeland security incidents both locally and nationally is the sparsely populated international border with Canada along North Dakota's northern boundary. Individuals linked to terrorist organizations have been known to attempt entry into the country through such areas, and North Dakota is not immune to these risks and threats.

5.7.3. 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. The North Dakota SLIC provided the following information on previous occurrences of Homeland Security Incidents in 2011 and 2012:

2011 – In 2011, the ND SLIC provided information to the intelligence community on six subjects encountered in North Dakota who are on the FBI Terrorist Watch List. There were three instances of rail tampering in 2011 and solicitation of information concerning rail, two incidents of suspicious photography concerning rail and two incidents of suspicious surveillance of railroad property. There were five reports of suspicious aircraft or persons at airports in North Dakota in 2011. There were suspicious packages, a threat made to North Dakota bridges and dams, a threat made to the President of the United States from North Dakota, solicitation of information on gun ranges, as well as suspicious photography at military installations and suspicious persons at military installations reported to the ND SLIC. The ND SLIC assisted authorities on a report of a subject attempting to obtain chemicals that could be used for bomb making purposes, arms trafficking investigations and cross border drug trafficking cases.

- 2012 – In 2012, the ND SLIC analysts handled 259 requests for information or case support with a crime or Homeland Security nexus from Federal entities such as the Department of Homeland Security (DHS), Federal Bureau of Investigation (FBI), Department of Energy (DOE), OSI Systems, Inc., National Nuclear Security Administration (NNSA), and Department of Domestic Security (DDS). Fusion Centers from around the country made 168 requests for information or shared information with the ND SLIC. There were 380 requests for assistance from North Dakota Police Departments, 184 requests from North Dakota Sheriff's Offices, 526 requests from State Agencies such as the North Dakota Highway Patrol (NDHP) and North Dakota Bureau of Criminal Investigation (NDBCI), 80 requests for information from local law enforcement outside of North Dakota, 405 requests from the various task forces in North Dakota, three requests from tribal authorities, 65 from military police in North Dakota and 19 requests for assistance from the private sector, not including critical infrastructure.

  Although the ND SLIC does not normally get follow-up information from law enforcement agencies that it has aided, the ND SLIC is aware of being instrumental in the capture of over 30 criminals from all over the United States in 2012.

  In 2012, The ND SLIC provided information to Homeland Security agencies on six subjects encountered in North Dakota who are on the FBI Terrorist Watch list. There were five bomb threats and one actual bomb in North Dakota that the ND SLIC assisted authorities with in 2012 as well as threats originating from North Dakota to the President of the United States. Suspicious Activities were recorded by the ND SLIC in 2012 such as a threat to a dam by an individual, suspicious photography at a major refinery, solicitation of information at Military installations, numerous suspicious packages, information on a subject on the "no fly" list who attended a flight school in North Dakota, possible chemical tampering of soap in a public restroom and suspicious aircraft landing or flying low.

The Historical Society of North Dakota and North Dakota Department of Emergency Services provided the following specific examples of relatively minor incidents that have occurred in North Dakota:

- 1933 – A violent strike erupted at the new North Dakota Capitol construction site and required help from the North Dakota National Guard.
- February 13, 1983 - Federal law enforcement officers went to Medina, to arrest Gordon Kahl on a Texas warrant. Kahl farmed in Heaton, north of Medina. He 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.

- January 22, 1995 - A lone vandal cut 19 underground telephone cables at five Fargo locations. The sabotage disrupted service to more than 20,000 US West customers in Fargo and northwestern Minnesota for several days. Damage was estimated at $1 million. Fargo police traced the vandalism to Michael Damron, then a 31-year-old North Dakota State University electrical engineering student. On January 24, Damron fled Fargo after refusing to let police search his apartment. A search later turned up the gas-powered saw Damron used to cut the lines, a notebook listing plans for the sabotage, a map marked with the sites of the cut lines, and a list of possible getaways, including "motorized hang glider, dirt bike, golf cart, scuba-diving equipment." Damron remained at large for nearly two years before FBI agents caught him in Iowa. His bail was set at $1 million when he returned to Fargo. Damron was sentenced to 10 years in prison in 1997 after he plead guilty to cutting the phone lines and to possessing stolen electronic equipment.
- January 2005 - Twenty-nine-year-old Chad Reinhardt was hired by Farstad Oil Company in Minot in 2004 as a warehouse worker. Reinhardt is believed to have set fire to the warehouse to try to destroy evidence in an investigation into whether he made improper charges on a corporate credit card. Reinhardt pleaded guilty to arson and burglary in May of 2005. The Farstad Oil Company had to move its staff and warehouse. Reinhardt was sentenced to nine years in prison for starting the fire that caused millions of dollars in damages.
- August 19, 2005 – A police officer was shot and two public buildings were set on fire in Cavalier when police officers attempted to serve a restraining order to a North Dakota farmer. James Thorlakson, a Hensel farmer fled after shooting Cavalier Police Chief Ken Wolf and setting the Pembina County courthouse and law enforcement center on fire. The drama started at approximately 4 p.m. when county officers attempted to serve Thorlakson with a protection order. He reportedly was armed and refused to be served. He then fired on officers and escaped. The firefighters said the blazes were started with cans of gasoline thrown through glass doors into the entryways of the two buildings. The law enforcement center suffered minor damage and the prisoners had to be relocated. A standoff lasted for several hours before he was captured. The Grand Forks SWAT team and at least one helicopter assisted during the operation. Cavalier residents and businesses were told to lock their doors and stay inside. Road blocks were set up around the courthouse and in two rural areas, including Thorlakson's home. Thorlakson was captured at about 10:45 p.m.

Within North Dakota, recent hate incident as reported by the Southern Poverty Law Center include:

- October 2004 – A mosque was vandalized in Fargo.
- April-May 2008 - A Jewish student at the University of North Dakota was harassed by a group of student using racial slurs and obscenities. Five swastikas in four months were drawn on a building on campus.
- October 2011 – In Harwood, racist sayings, swastikas and anarchy symbols were written on the city hall, a residence, several street signs, and numerous vehicles, including school buses.
- September 2011 – In Grand Forks, replacement workers and security workers were allegedly called racial slurs by union supporters outside a sugar plant. A monkey-like figure hanging from a noose attached to a large inflatable rat was also hung outside the plant.
- June 2012 – In Grand Forks, a threatening anti-gay epithet was written on the back window of a car that had rainbow bumper stickers, which sometimes symbolize gay pride

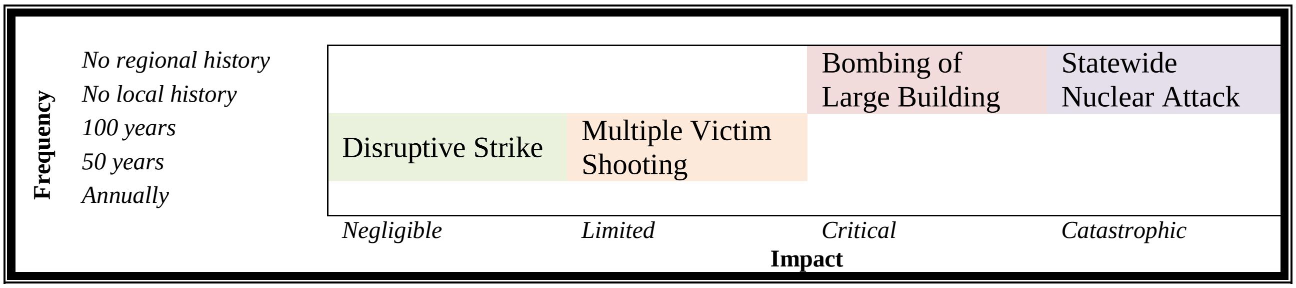
According to National Memorial Institute for the Prevention of Terrorism and internet research, on a broader scale, significant terrorist acts occurring in the United States since 1950 include:

- January 27-29, 1975 – In New York City, a bomb at a Wall Street bar killed 4 and injured 60. Two days later, a bomb exploded in a US Department of State bathroom. A domestic terrorist organization claimed responsibility.
- August 3, 1977 – Two bombs were left at offices in New York City, killing one person and injuring eight; one building housed US Department of Defense personnel. The bombs were planted by members of the Armed Forces of National Liberation (FALN), a Puerto Rican pro-independence organization.
- February 26, 1993 – A bombing in the parking area of the World Trade Center killed 6 and wounded about 1,000. The bombing was organized by the foreign terrorist organization, Al Qaeda.
- April 19, 1995 – Domestic terrorist Timothy McVeigh blew up the Alfred P. Murrah Federal Building in Oklahoma City, killing 168 people and injuring hundreds more.
- September 11, 2001 – Four commercial planes hijacked by 19 members of the Al Qaeda terrorist organization were intentionally crashed into buildings; two planes hit the World Trade Center buildings in New York City, one into the Pentagon outside Washington, DC, and one into a field in Pennsylvania after passengers stormed the cockpit. Nearly 3,000 people were killed.
- October 2001 – Letters containing the deadly anthrax bacterium were mailed to members of Congress and television networks. One person died. The perpetrator was believed to be a United States Army Medical Research Institute of Infectious Diseases researcher.
- April 2013 – Boston Marathon Bombing. Two bombs near the finish line of the Boston Marathon killed 3 people and injured more than 200 additional people. Two suspects were identified as brothers, Tamerian and Dzohkhar Tsarnaev. Tamerian Tsarnaev was killed in a confrontation with police,

5.7.4. Probability and Magnitude

Figure 5.65 is a graphical representation of the range of events that can occur within the homeland security incident hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the homeland security incident hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.65. Hazard Frequency and Impact Ranges



The probability of a homeland security incident affecting North Dakota directly is difficult to determine. There are no specific terrorist targets that have been identified in the State and North Dakota is not an area at high risk for civil unrest; however, the 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.

An attack on the United States that collapses 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.

5.7.5. State Risk Assessment

Vulnerability Overview

The effects of homeland security incidents are usually felt by the general population. 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.

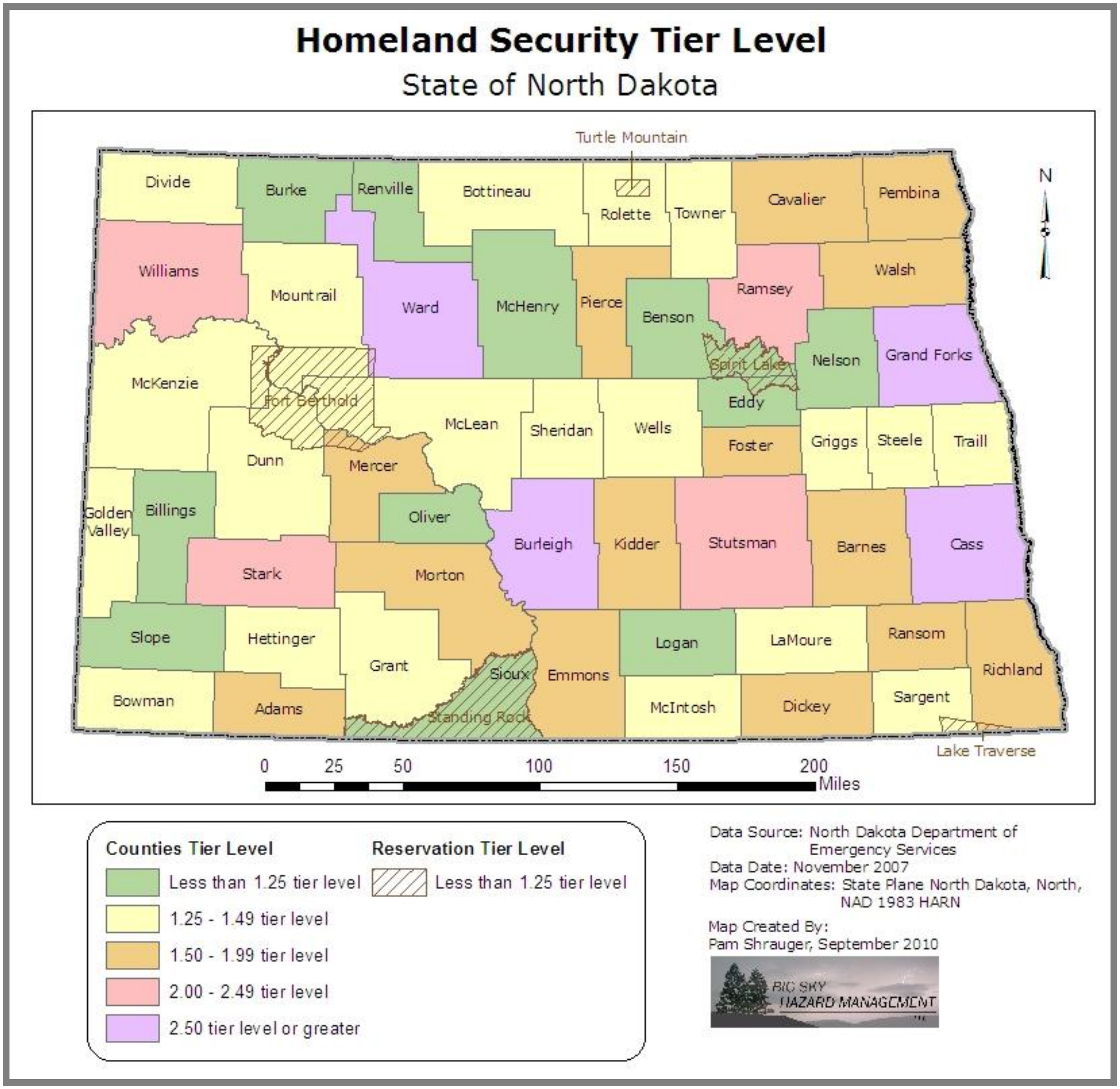
Terrorist attacks generally have a damaging effect on the economy as well. Any time the public's safety is compromised, more people stay home until they are more confident in their safety. Therefore, depending on the type of attack and remaining threat, the tourism and travel industries may be affected. Additionally, attacks on the national informational or financial infrastructure could lead to significant declines in the national economy. Specific to North Dakota, attacks on agriculture could lead to substantial direct losses in the state.

Ecological values could be harmed if a damaging chemical, biological, or radioactive agent is used. Additionally, 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.

In 2002, each county and tribe conducted a homeland security risk assessment, including the threat, vulnerability, and an optional agricultural vulnerability assessment for their jurisdiction. The jurisdictional working groups were able to use planning factors to provide a numerical focus for homeland security scenarios. Shortfalls or gaps discovered during the assessment process target specific resources required to respond to homeland security incidents. These "tiers" measure the ability of the county or tribe to respond to a homeland security incident. The assumption is that those jurisdictions with a higher ability to respond are also at higher risk due to a larger population base and more commercial and industrial values at risk. This assumption may not be entirely accurate, but is the best basis available for the jurisdictional ratings. Following a review of the information in 2013, the determination was that the information for the purposes of this plan needs to be updated for the western half of the state that has seen growth as a result of oil-related industry.

Figure 5.66 shows the tier levels for each jurisdiction.

Figure 5.66. Homeland Security Tier levels, 2002 Assessment



Loss Estimates

Potential losses from Homeland Security Incidents 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.

As discussed previously, it is difficult to quantify potential losses in terms of the jurisdictions most threatened by homeland security events due to the many variables and human element. Therefore, for the purposes of this plan, the loss estimates will take into account 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) http://www.hopkins-cepar.org/EMCAPS/EMCAPS.html which utilizes scenarios developed by the Department of Homeland Security.

****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 the stadium during a home football game using a carbon dioxide powered sprayer. 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:

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 @ $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 weapon of mass destruction (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:

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
Total "Worried Well" Cases (9 times the number of infected cases)	44,649 persons

Improvised Explosive Device Attack – ANFO

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (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 Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

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 Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (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, 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 Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) Standards. (4) The Falling Glass Hazard distance is 2,750 feet according to BATF Explosive Standards.

Described Losses:

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
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

5.7.6. Local Risk Assessments

Table 5.74 provides information from local and tribal mitigation plans regarding the local hazard rating. None of the local plans provided additional information regarding estimated losses. As indicated in the rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.74. Homeland Security Incident Risk Summary From Local Plans

County	Homeland Security Hazards Rating*
Adams	D/D
Barnes	C
Benson	C
Billings	D/D
Bottineau	C
Bowman	D
Burke	C/C
Burleigh	B/B
Cass	B/C/D
Cavalier	Low
Dickey	D/C
Divide	NP
Dunn	D/C
Eddy	C
Emmons	D/C
*Fort Berthold^*	*NI*
Foster	C
Golden Valley	C/D
Grand Forks	D
Grant	C/D
Griggs	D/C
Hettinger	C
Kidder	D/B
*Lake Traverse^*	*NP*
LaMoure	#12 of 12
Logan	C
McHenry	C
McIntosh	C/C
McKenzie	NP
McLean	B
Mercer	D
Morton	C/D
Mountrail	C/B
Nelson	C
Oliver	C/D
Pembina	C
Pierce	D/C
Ramsey	D
Ransom	Medium

County	Homeland Security Hazards Rating*
Renville	C
Richland	C/B
Rolette	C
Sargent	C/D
Sheridan	NP
Sioux	*NI*
Slope	D
Spirit Lake	Low
*Standing Rock^*	*NI*
Stark	NP
Steele	NP
Stutsman	C
Towner	C
Traill	C
Turtle Mountain^	NI
Walsh	C
Ward	B/C
Wells	B
Williams	D/D

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; * Many of the local plans have both a civil disorder/terrorism hazard and a national security hazard. Both classifications are listed respectively; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.7.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

State-owned buildings and property are at risk from homeland security incidents. 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 Critical Infrastructure Program (CIP) at NDDES has collected data on Critical Infrastructure and Key Resources (CIKR) that exist in the State of North Dakota. Out of the statewide CIKR inventory, the CIP has identified specific facilities that are critical to homeland security in seven different sectors as follows:

- Food / Agriculture: major food distribution centers
- Energy: power generation and chemical facilities
- Public Health: hospitals and public health offices
- Transportation: bridges and major highways
- Emergency Services: police, fire and dispatch centers
- Communications: major communications towers
- Water: treatment facilities

The criteria used in identification of specific facilities and facility names and specific locations are protected for security reasons and cannot be directly published in a public plan such as this. However, a summary of the number of CIKR facilities critical to homeland security from the

State's perspective has been provided and is shown in **Table 5.75** and **Figure 5.67**. For the 2013 plan update, the CIP verified that this summary level data did not change since the previous update. As a result, the figure is a duplicate of the one provided in the previous plan.

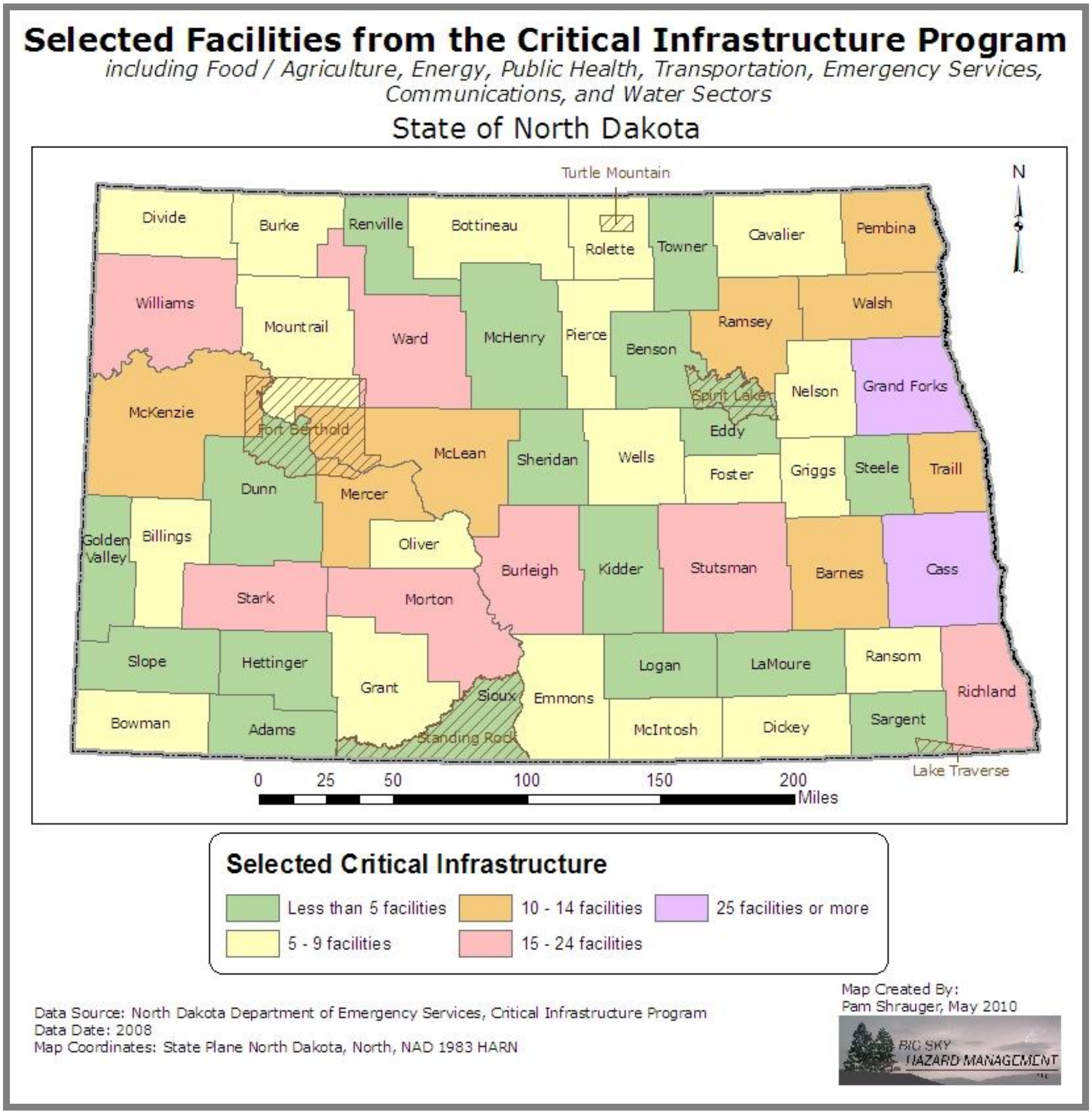
Table 5.75. Summary of Selected CIKR Facilities Critical to Homeland Security by County

County	Food / Agriculture	Energy	Public Health	Transportation	Emergency Services	Communications	Water	Total
Adams	0	0	2	1	1	0	0	4
Barnes	0	1	2	2	3	1	2	11
Benson	0	0	1	2	1	0	0	4
Billings	0	0	1	7	1	0	0	9
Bottineau	0	1	1	1	2	1	0	6
Bowman	0	0	2	2	2	1	0	7
Burke	0	1	1	1	1	1	0	5
Burleigh	1	2	3	8	4	3	2	23
Cass	3	0	3	21	5	3	4	39
Cavalier	0	0	2	0	2	1	1	6
Dickey	0	0	2	1	2	1	0	6
Divide	0	0	2	1	2	1	0	6
Dunn	0	0	1	1	1	1	0	4
Eddy	0	0	1	1	1	0	0	3
Emmons	0	0	2	1	2	1	0	6
Foster	0	0	2	0	2	1	0	5
Golden Valley	0	0	1	1	1	1	0	4
Grand Forks	2	2	3	9	6	2	3	27
Grant	0	0	2	0	2	1	0	5
Griggs	0	0	2	0	2	1	0	5
Hettinger	0	0	1	1	1	1	0	4
Kidder	0	0	1	1	1	1	0	4
LaMoure	0	0	1	1	2	0	0	4
Logan	1	0	1	0	2	0	0	4
McHenry	0	0	1	1	1	0	0	3
McIntosh	0	0	3	0	2	1	0	6
McKenzie	0	1	2	7	2	1	0	13
McLean	0	2	3	2	2	2	1	12
Mercer	0	4	2	0	4	0	1	11
Morton	2	4	2	7	3	1	2	21
Mountrail	0	0	3	1	5	0	0	9
Nelson	0	0	2	1	1	1	0	5
Oliver	0	2	1	2	1	1	0	7
Pembina	0	0	2	5	3	0	1	11
Pierce	0	0	2	1	3	0	1	7
Ramsey	0	0	2	4	3	1	1	11
Ransom	0	0	2	0	2	0	1	5
Renville	0	0	2	1	1	0	0	4
Richland	0	0	1	8	3	1	3	16
Rolette	0	0	3	1	3	1	0	8
Sargent	0	0	1	0	2	1	0	4
Sheridan	0	0	1	0	1	1	0	3
Sioux	0	0	1	0	1	0	0	2

County	Food / Agriculture	Energy	Public Health	Transportation	Emergency Services	Communications	Water	Total
Slope	0	1	0	1	1	0	0	3
Stark	1	1	3	6	4	1	2	18
Steele	0	0	1	0	1	1	0	3
Stutsman	1	2	2	7	3	1	3	19
Towner	0	0	1	1	2	0	0	4
Traill	1	0	3	2	4	1	0	11
Walsh	0	0	3	2	3	0	2	10
Ward	1	0	3	8	5	3	2	22
Wells	0	0	2	1	2	0	1	6
Williams	0	3	1	4	4	2	2	16
North Dakota	**13**	**27**	**95**	**136**	**121**	**44**	**35**	**471**

Source: North Dakota Critical Infrastructure Program, 2013

Figure 5.67. Statewide Summary Map of Selected CIKR Facilities Critical to Homeland Security by County



Critical facilities and infrastructure play prominent roles in North Dakota. Often, terrorists target facilities that are highly important for government services and community stability.

Table 5.76 Summarizes the losses paid out of the North Dakota Tornado and Fire Fund for vandalism and theft at state agency facilities, local government critical facilities (including: counties, cities, townships, airport authorities, fire districts, water districts, and other categories), National Guard facilities, state-owned universities and school districts; all of which can be considered critical or essential facilities.

Table 5.76. 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
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

County Name	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
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 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.7.8. Development in Identified Hazard Areas

In general, development should have little to no impact on the homeland security incident hazard. However increase in population 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. Some industries, such as nuclear technologies, are carefully regulated to protect the infrastructure, however, others are not, and losses are possible if the privately or publicly owned facilities and infrastructure are not adequately protected.

Table 5.77 shows the areas with population increases from 2000 to 2010 and **Table 5.78** shows the areas with projected 40 percent and greater population increases from 2010 to 2025. The counties that were in the top two tiers in terms of vulnerability assessments conducted by local jurisdictions in 2002 are bolded.

Table 5.77. Areas with Population Increases 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	**123,138**	**149,778**	**26,640**	**21.60%**
Burleigh County	**69,416**	**81,308**	**11,892**	**17.10%**
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	**19,761**	**22,398**	**2,637**	**13.30%**
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	**22,636**	**24,199**	**1,563**	**6.90%**
Ward County	**58,795**	**61,675**	**2,880**	**4.90%**

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	**66,109**	**66,861**	**752**	**1.10%**

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.78. Areas with Projected Population Increases of 40% or More by 2025

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	**22,398**	**51,106**	**28,708**	**128.20%**
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	**24,199**	**42,191**	**17,992**	**74.40%**
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.7.9. Data Limitations and Other Key Documents

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 Emergency Operations Plan, Terrorism Annex
- North Dakota Threat and Hazard Identification and Risk Assessment (THIRA)

5.8. Severe Summer Weather (Including Tornadoes, hail, downbursts, thunderstorm winds, Lightning, and Extreme Heat)

Hazard Rating	THIRA Threat/Hazard Group
High	Natural

5.8.1. Description

Severe summer storms can result in loss of life, injuries, and damage to property and crops. Although thunderstorms affect relatively small areas when compared to other hazards such as winter storms, all thunderstorms are dangerous. Every thunderstorm produces lightning, which kills more people each year than tornadoes. Heavy rain from thunderstorms can lead to flash flooding (see **Section 5.4** for more information on this hazard). Strong winds, hail, and tornadoes are also dangers associated with some thunderstorms.

Of the estimated 100,000 thunderstorms that occur each year in the United States, only about 10 percent are classified as severe. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. The National Weather Service considers a thunderstorm severe if it produces hail at least 1 inch in diameter, winds of 58 mph or stronger, or a tornado. Thunderstorms are most likely to happen in the spring and summer months during the afternoon and evening hours, but they can occur year round and at all hours. Annually, the central and northern parts of North Dakota may have an average of 10 to 30 days with thunderstorm activity, while the southern part of the state averages between 30 to 50 days.

Thunderstorms form when moisture, unstable air, and lift are present in the atmosphere. Thermal instability, fronts, and the sun's heat are capable of lifting the air to help form thunderstorms. All thunderstorms proceed through a three-stage life cycle.

The Cumulus Stage

The cumulus stage occurs when thunderstorm development begins. At this stage, the storm consists only of upward-moving air currents called updrafts. These updrafts reach heights of around 20,000 feet above the ground, but the base of the storm may lower, as moisture becomes more plentiful. As a thunderstorm develops, towering cumulus clouds indicate rising air. There is usually little rain during this stage and only occasional lightning.

The Mature Stage

The mature stage is the strongest and most dangerous stage of a storm's life cycle. As the storm matures, the clouds have a black or dark green appearance. Hail, heavy rain, frequent lightning, strong winds, and tornadoes are most likely to occur during this phase, lasting an average of 10 to 20 minutes. At this stage, the storm contains both upward and downward moving air currents (updrafts and downdrafts) with precipitation in the downdraft areas. These updrafts and downdrafts can reach velocities of 170 mph. When the cool downdraft hits the ground, it spreads out and forms a gust front, which may include damaging wind called a downburst. The updraft also causes the top of the storm to spread out.

The Dissipating Stage

In the dissipating stage, the precipitation and downdraft dominate the storm and weaken the updraft. As the gust front moves away from the storm, the inflow of energy into the storm is cut off. As the thunderstorm dissipates, rainfall may decrease in intensity, but lightning and strong winds remain a danger.

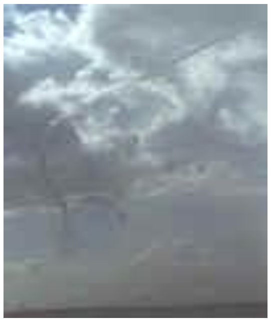
Tornado

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The term "tornado" was derived from the Latin word, "tornare" which means "to make round by turning." A tornado is initially a cloud within the thunderstorm, composed of condensed water vapor. A tornado forms when a change in wind direction and increase in wind speed with increasing height creates a horizontal spinning effect in the lower atmosphere. This area of rotation may be two to six miles wide, extending through much of the storm. Most tornadoes form within this area of strong rotation when the rising air within the thunderstorm updraft tilts the rotating air from horizontal to vertical. Tornadoes may appear nearly transparent until the circulating wind in the funnel reaches the ground and picks up debris that eventually darkens the whole funnel.

Tornadoes are nature's most violent windstorm. In an average year, the United States experiences an average of 1,200 tornadoes that result in an average of 70 to 80 deaths and 1,500 injuries. Most fatalities occur when people are struck by flying debris or do not leave mobile homes and automobiles.

Tornadoes can vary greatly in shape, size, and wind speed. Most tornadoes, 88 percent, have wind speeds of less than 110 mph and a lifetime of less than ten minutes. These weak tornadoes result in less than five percent of tornado deaths. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. The average forward speed is 30 mph, but may vary from nearly stationary to 70 mph. Approximately 11 percent of all tornadoes have wind speeds between 110 and 205 mph and result in nearly 30 percent of all tornado deaths. These strong tornadoes may last 20 minutes or longer. Less than one percent of all tornadoes have resulted in 70 percent of all tornado deaths. These violent tornadoes can be over a mile wide with documented rotating winds of more than 250 mph, and they can have lifetimes exceeding one hour and stay on the ground for over 50 miles. **Figure 5.68** shows various stages of a tornado that occurred at Turtle Lake on July 28, 1996.

Figure 5.68. Turtle Lake Tornado on July 28, 1996

Development Stage Mature State (F1) Dissipation Stage

Source: National Weather Service, 2007

A funnel cloud is the rotating column of air extending out of a cloud base, but not yet touching the ground. The funnel cloud does not become a tornado until it touches the ground. Once in contact with the surface, it can create great damage over a small area. 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 5.79**.

Table 5.79. Tornado 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.

Hail

Hail is precipitation in the form of a lump of ice. 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 in size, finally becoming too heavy to be supported by the updraft and fall to the ground. Hailstones are usually round but can be conical or irregular in shape. They can range from pea size to the size of grapefruit, and large hailstones can fall at speeds faster than 100 mph. Hail tends to 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) Most hail events, however, affect only relatively small areas.

Hail causes considerable damage to crops and property in the United States, occasionally causing death to farm animals, but seldom causing loss of human life. The damaging aspects of hailfalls include the hailstone sizes (average and maximum), number of hailstones per unit area, hail hardness, and associated winds; hail risk is a combination of these factors plus the frequency of hail at a point or over an area. Crop hail losses nationally are estimated at $1.3 billion annually nationwide, representing between 1 and 2 percent of the annual crop value. Hail losses vary considerably regionally, representing, for example, 1 to 2 percent of the crop value in the Midwest, 5 to 6 percent of the crops produced in the High Plains, and much less elsewhere in the nation. Property hail losses have been increasing with time, now appearing to approximate crop-hail losses recently with crudely estimated annual losses of $1 billion. (Changnon, 1997)

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. In a normal year, about 175 Americans succumb to the demands of summer heat. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

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, 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 5.69 and **Figure 5.70** show the Heat Index (HI) as a function of heat and relative humidity. The Heat Index describes how hot the heat-humidity combination makes it feel. As relative humidity increases, the air seems warmer than it actually is because the body is less able to cool itself via evaporation of perspiration. As the HI rises, so do health risks.

- When the HI is 90°F, heat exhaustion is possible with prolonged exposure and/or physical activity.
- When it is 90°-105°F, heat exhaustion is probable with the possibility of sunstroke or heat cramps with prolonged exposure and/or physical activity.
- When it is 105°-129°F, sunstroke, heat cramps or heat exhaustion is likely, and heatstroke is possible with prolonged exposure and/or physical activity.
- When it is 130°F and higher, heatstroke and sunstroke are extremely likely with continued exposure. Physical activity and prolonged exposure to the heat increase the risks.

Figure 5.69. Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	118	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	126	130					
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 Streuous Activity

Caution   Extreme Caution   Danger   Extreme Danger

Source: National Weather Service

Note: Since 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.

Figure 5.70. 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

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 office in Sacramento can issue the following heat-related advisory as conditions warrant.

- **Excessive Heat Outlook**: are issued when the potential exists for an excessive heat 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. 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.

Downbursts and Strong Winds

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. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported up by the storm's updraft, or an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. 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 in excess of 100 mph.

Straight-line winds 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. Downbursts can be extremely dangerous to aviation. Damage attributed to tornadoes is frequently caused by straight-line winds from a downburst. Downbursts can produce a "roaring" sound and damage similar to a tornado. These strong winds can damage trees, blow vehicles off the road, break windows, down power lines, damage roofs and fences, and cause other structural damages. Individuals caught outside are also at risk of injury from blowing dust and debris.

Strong winds can also occur outside of tornadoes and severe thunderstorms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are. Strong winds can occur at any time of year.

These events are not included in this section. Instead, they are profiled in Section **5.14** Windstorms.

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 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder. (National Weather Service, 2007)

Lightning occurs with all thunderstorms, and averages 80 to 93 deaths and 300 injuries in the United States each year. Lightning also causes several hundred million dollars in damage to property and forests annually. Most lightning deaths and injuries occur when people are caught outdoors, especially under or near tall trees, in or on water, or on or near hilltops. Between 1984 and 1994, over 15,000 lightning induced fires nationwide resulted in several hundred million dollars in damages and the loss of two million acres of forest.

Lightning can cause fatalities, injuries, and property damage directly and indirectly. Lightning can strike humans, animals, aircraft, buildings, equipment, and the surface of the earth causing death and destruction. Lightning can trigger other hazards including fires, power surges, interruption of communications, downed power lines, and exposure to noxious gas due to vaporization of materials. Computer equipment is especially vulnerable to damage from power surges.

Most summer storms occur during the hot summer months and may be associated with other summer 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.

5.8.2. Geographic Location

Many summer storm records maintained by the National Climatic Data Center contain location estimates for the reported events. The locations are based on where the reporting party estimates they are in relation to a town center. This data is then converted to an approximate latitude and longitude. These locations are not extremely accurate.

Figure 5.71 shows the number of tornadoes reported over the past 63 years (1950-2013) by county. Generally, this map shows that tornadoes are possible in all parts of the state. The highest concentrations of tornadoes are in the eastern and central sections of the state. **Figure 5.72** similarly shows the severe hail events. The highest concentrations of severe hail are primarily in the eastern part of the state. **Figure 5.73** shows the severe thunderstorm wind events. Maps were not created for lightning or extreme heat due to the low number of events in each county. Generally, the highest concentration of these types of events is in the eastern and central parts of North Dakota. Note that these findings may be more indicative of the spotter networks in the state rather than the actual occurrence. The state also conducts cloud seeding operations in the western part of the state for hail suppression.

Figure 5.71. Tornado Events: 1950-2013

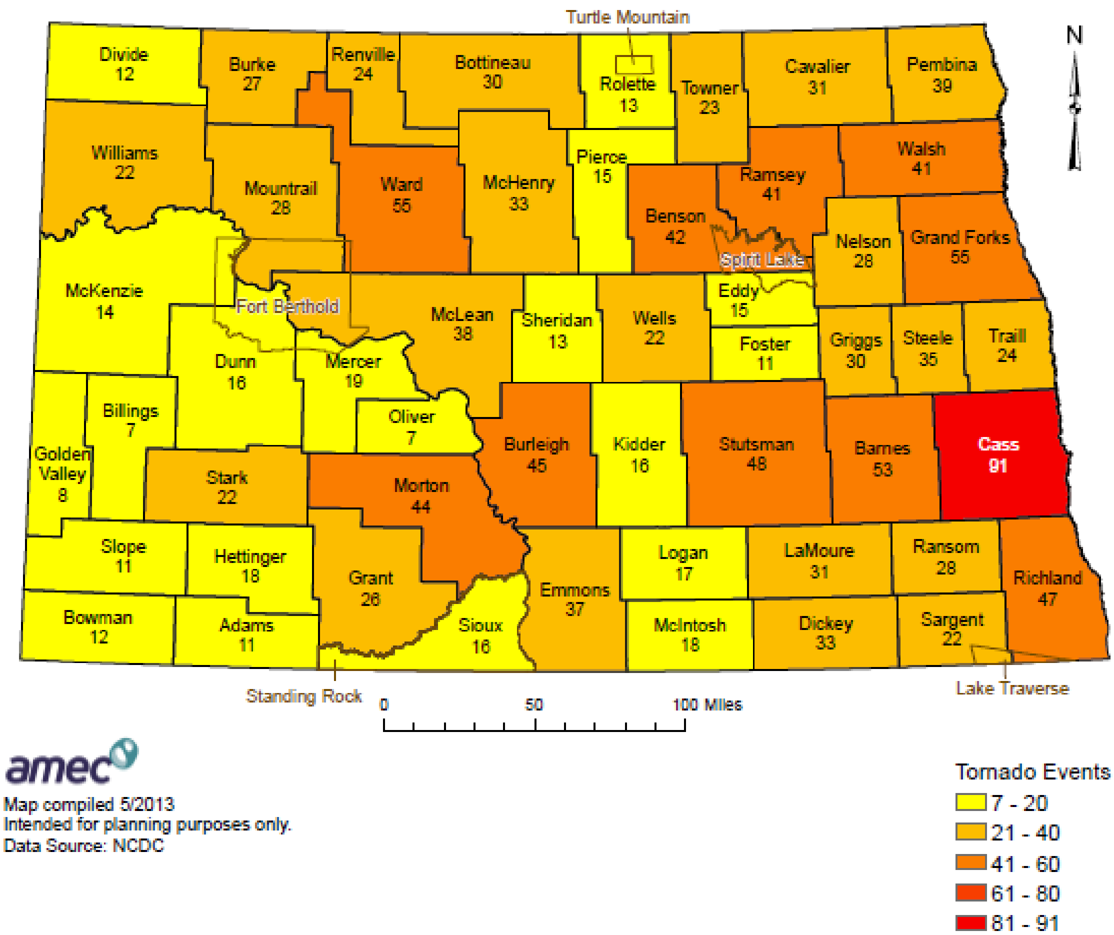


Figure 5.72. Hail Events: 2000-2013

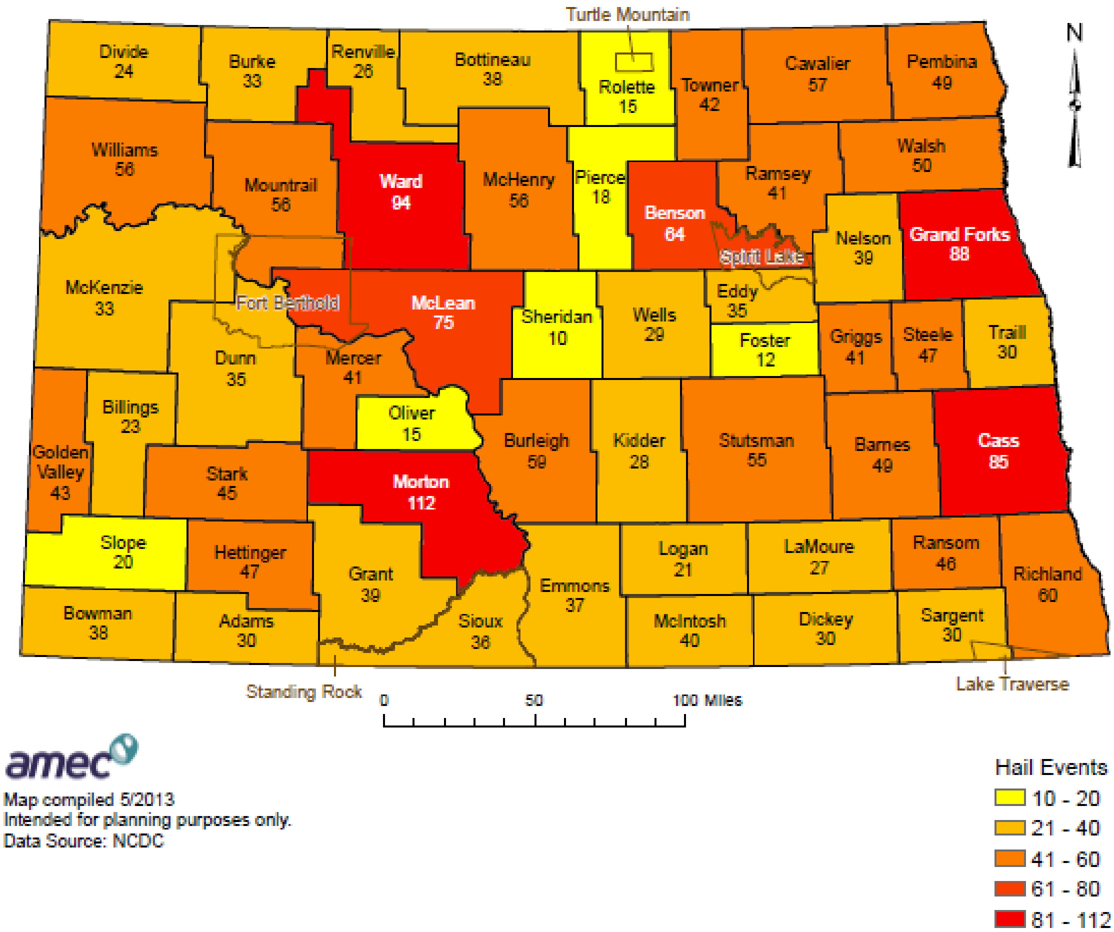
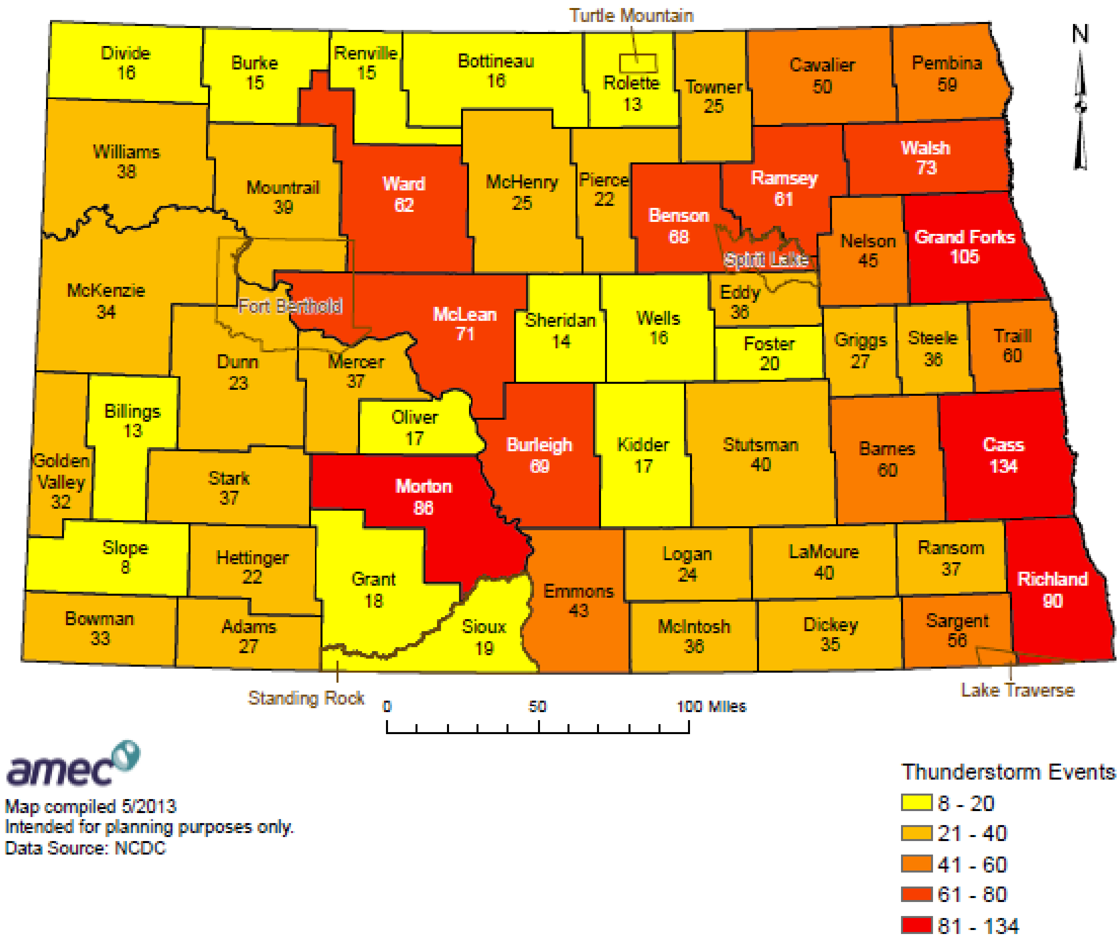


Figure 5.73. Thunderstorm Events: 2000-2013



5.8.3. Previous Occurrences

Between various start dates (1950 for tornadoes, 2000 for hail, 1950 for extreme heat, 2000 for thunderstorm winds, and 1994 for lightning strikes) and March 2013, North Dakota experienced 6,029 reported severe summer weather events. These storms resulted in a crudely estimated $569 million in property damage, 27 deaths, and 375 injuries. (National Climatic Data Center, 2013)

Reports of severe thunderstorms and tornadoes are collected from trained spotters by the local National Weather Service (NWS) offices in Bismarck and Grand Forks. These records are archived by the National Climatic Data Center. 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 also collects hail data, both severe and non-severe, from an established spotter network.

Tornado

In June 2000 (and supplemented by information provided in 2010 and 2013), the Bismarck office of the National Weather Service published a statistical report on tornadoes in North Dakota. These statistics indicated that during the period of 1950 to 2012, North Dakota received an average of 23 reported tornadoes annually, and has ranged from only two reported tornadoes in some years to an annual high of 61 reported tornadoes in 1999. (National Weather Service, 2013) 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. **Figure 5.74**and **Figure 5.75** provide 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. The county with the largest number of reported tornadoes (Cass with 87 tornadoes) also had the largest population.

Figure 5.74. Tornado near Bismarck, November 1, 2000

Source: Pat Whitlock, KOTVS

Figure 5.75. Tornadoes in Bismarck on November 1, 2000

Source: 2010 State Hazard Mitigation Plan

Table 5.80 lists the North Dakota tornadoes that were classified using the Fujita or Enhanced Fujita scale during the period 1950 to 2013. Notice that about 9 out of 10 tornadoes in the state were either an F0/EF0 or F1/EF1, however, an F3/EF3 or higher tornado occurs roughly annually. **Table 5.81** shows the tornadoes in North Dakota that have caused fatalities.

Table 5.80. Fujita Scale Statistics for North Dakota Tornadoes 1950-2013

Magnitude	Number of Recorded Tornadoes	Average Frequency
F0/EF0	855	14 per year
F1/EF1	336	5 per year
F2/EF2	128	2 per year
F3/EF3	41	1 every 1.5 years
F4/EF4	14	1 every 4.5 years
F5/EF5	3	1 every 21 years

Source: National Climatic Data Center, 2013.

Table 5.81. Deadly Tornadoes in North Dakota 1950-2013

Location	Date	Magnitude	Fatalities	Injuries
Burleigh and Kidder Counties	July 1, 1952	F4	1 fatality	25 injuries
Morton County	May 29, 1953	F5	2 fatalities	20 injuries
Richland County	July 2, 1955	F4	2 fatalities	19 injuries
Cass County	June 20, 1957	F5	13 fatalities	103 injuries
Cavalier County	June 24, 1966	F1	1 fatality	1 injury
Hettinger County	June 29, 1975	F4	1 fatality	4 injuries
Elgin, Grant County	July 4, 1978	F4	5 fatalities	35 injuries
12 miles South of Greene Renville County	July 23, 1997	F2	1 fatality	2 injuries
Northwood, Grand Forks County	August 26, 2007	EF4	1 fatality	18 injuries
10 miles north-northeast of Niobe, Ward County	August 12, 2010	EF3	1 fatality	1 injury

Source: National Climatic Data Center, 2013.

Figure 5.76 shows the number of reported tornadoes and **Figure 5.77** shows the strongest tornadoes reported by county from 1950-2012. During the 63-year period from January 1950 to March 2013, 1,477 tornadoes were reported in North Dakota with an estimated $170,126,270 in property damage, $2,700,417 in average annualized property damage, 25 deaths, and 326 injuries. Most of the injuries occurred to those inside their homes, outside, or driving a vehicle. (National Climatic Data Center, 2013) According to data from the Risk Management Agency, crop insurance payments for tornado and cyclone damage to North Dakota insured crops totaled $375,250 between 2003 and 2012. (Risk Management Agency 2003-2012)

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 (see **Figure 5.78**).

The earliest occurring tornado in a calendar year occurred on March 26th, 2003. The tornado touched down about 2 miles southwest of Edmunds in Stutsman County. The tornado caused minor damage.

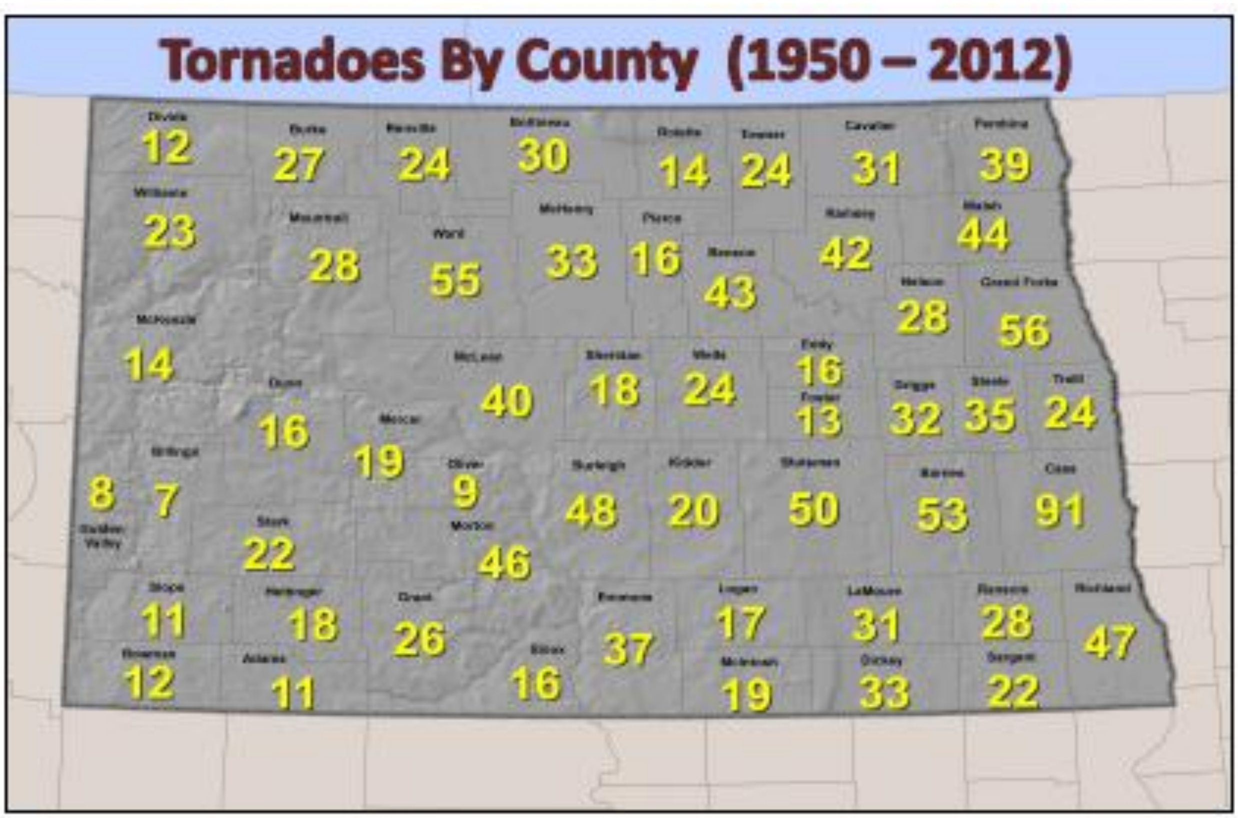
On August 26, 2007, a tornado impacted the community of Northwood in Grand Forks County. Two mobile home parks were destroyed, one person was killed, and 18 were injured. Approximately 90 percent of the 500 homes in Northwood were damaged with about 100 uninhabitable. Businesses and municipal buildings also suffered heavy losses. Damages were estimated at about $50 million (Grand Forks County, 2009).

In the mid-afternoon hours of Wednesday, July 8th, 2009 Tornado Watch 563 was issued for all of 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.

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 4 miles ESE 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.

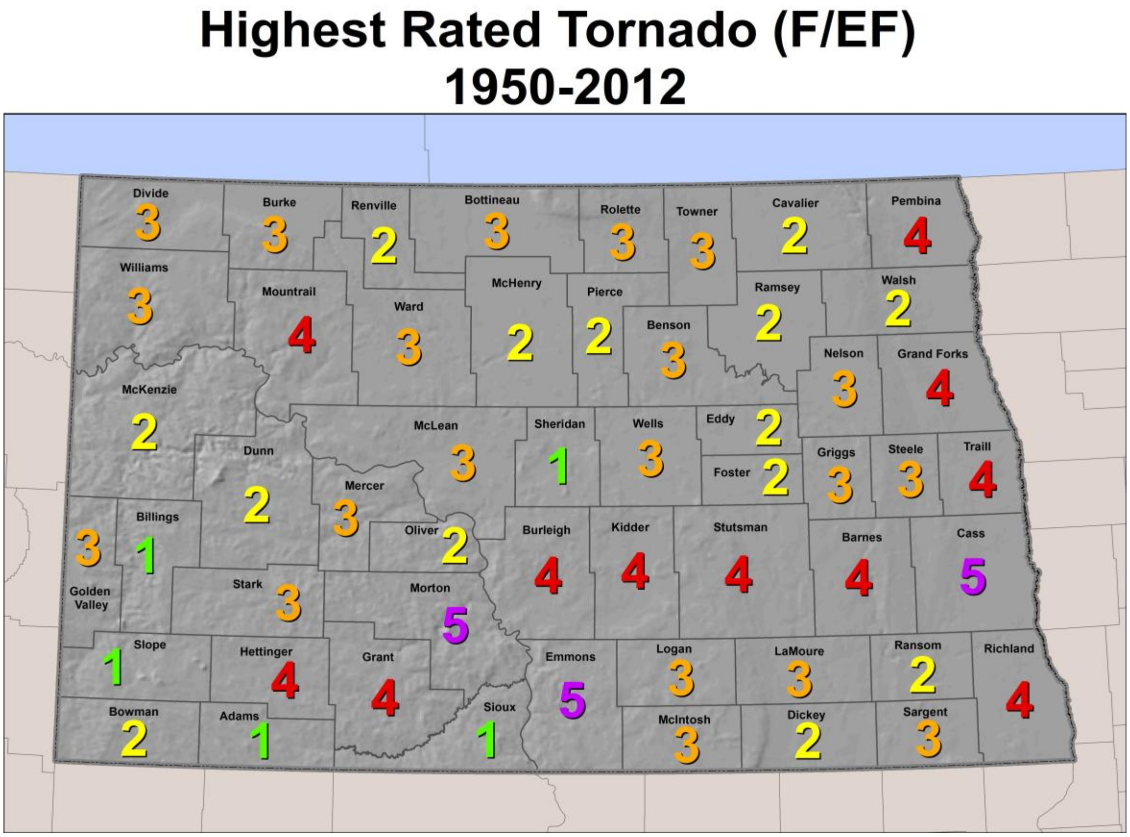
A prolonged severe weather event materialized on July 17, 2011 in LaMoure County. An EF3 tornado touched down around seven miles southeast of Nortonville, then moved southeast before lifting six miles south-southeast of Berlin. This was a long tracked tornado across parts of Russell, Wano, Henrietta, 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 completely destroyed, outbuildings completely 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 damages, it was determined that windspeeds were on the order of 165 miles per hour.

Figure 5.76. Tornadoes by County: 1950-2012



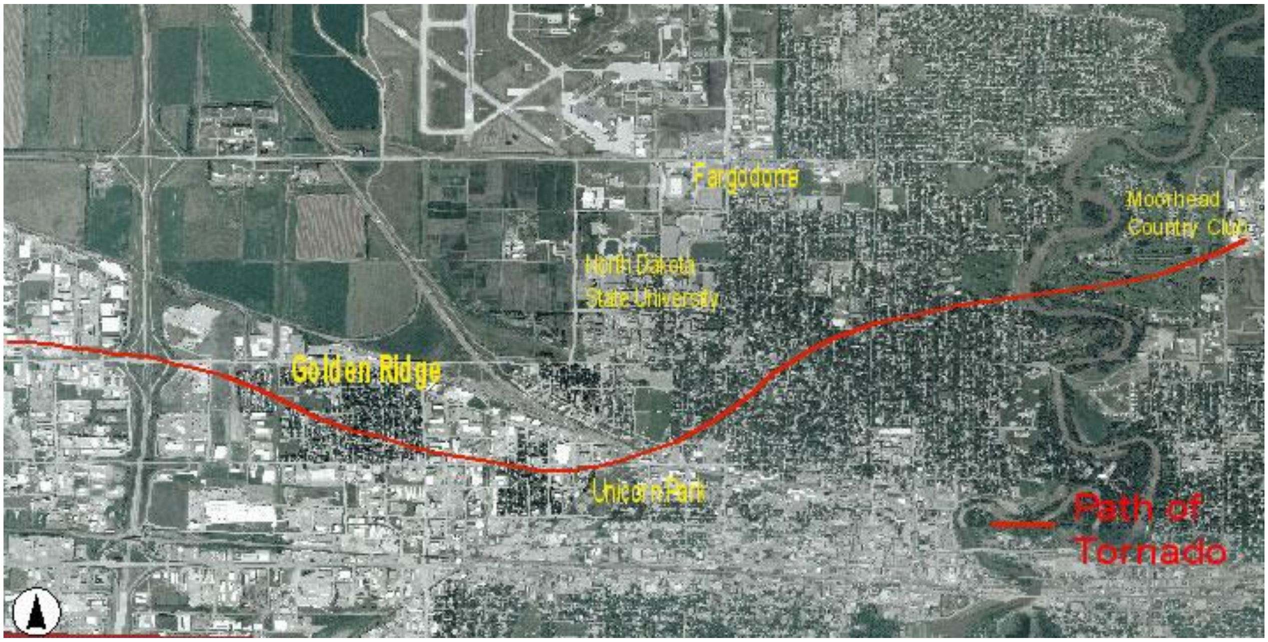
Source: National Weather Service, 2013

Figure 5.77. Highest Rate Tornado (F/EF): 1950-2013



Source: National Weather Service, 2013

Figure 5.78. Fargo 1957 Tornado Path



Source: National Weather Service, 2007b.

Hail

Hail damage has been reported in every county in North Dakota. **Figure 5.79** shows the maximum hail size reported by county from 1950-2012. During the 13-year period from 2000 to 2013, 2,249 severe hail events were reported in North Dakota with an estimated $383,804,600 in property damage, $29,523,431 in average annualized property damage, 0 fatalities, and 10 injuries. Note that the number of severe hail events over the period does take into account the 2010 switch from 0.75 inch diameter to 1 inch diameter severe criteria. Most of the injuries occurred to those outdoors such as golfers and hikers and those driving through storms that received broken windshields (National Climatic Data Center, 2013). Crop insurance payments for hail losses to North Dakota insured crops totaled $460,334,751 between 2003 and 2012. (Risk Management Agency 2003-2012)

The North Dakota Atmospheric Resource Board has a volunteer observer network that has been recording rain and hail since 1977. On average, about 800 observers statewide record rain and hail reports during the months of April –September. During the 34-year timeframe from 1977-2010, nearly 12,000 hail reports (not all severe) weren't recorded and entered into their database. The high-density network increases the chances of observing a hail event; even still, their network may have missed thousands of hail occurrences when hail fell and no one was there to observe it. (North Dakota State Water Commission, 2010).

Note that cloud modifications over the past ten years may have reduced hail damage to crops in the western part of the state. 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, McKenzie, Mountrail, Ward, Williams, and part of Slope.

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, and 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).

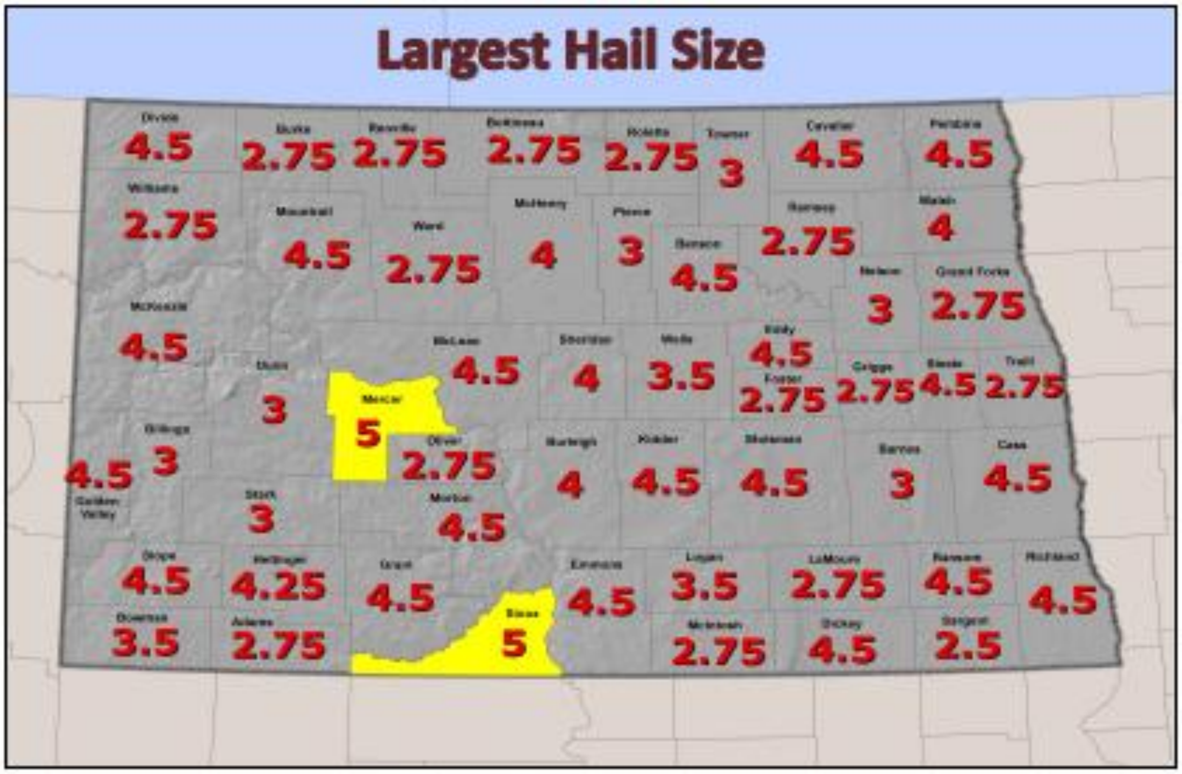
In July 2005, nickel size to tennis ball size hail combined with 70 mph winds and caused extensive and widespread damage in Bismarck. The larger hail fell on the north side of the city where most of the damage occurred. Numerous homes and vehicles were damaged. There was damage to siding and roofs, and 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 13th, 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.

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 damages were estimated at $400,000.

Figure 5.79. Largest Hail Size



Source: National Weather Service, 2013

Extreme Heat

NCDC recorded 73 extreme heat events in North Dakota between 1950 and 2013. However, the database showed only five unique events in that time period. Dates included August 3, 2001; August 4, 2001; August 5, 2001; August 7, 2001; and July 16, 2011. These events did not result in any human fatalities or injuries. The only recorded damages occurred during the July 16, 2011 event. These damages were related to livestock losses. It is estimated that up to 700 head of cattle died from the heat wave. Estimated at near $1,000 per head, monetary damages are estimated near $700,000. A detailed breakdown by county was not available. (NCDC 2013) Crop insurance payments for extreme heat losses to North Dakota insured crops totaled $110,334,830 from 2003 through 2012. (Risk Management Agency 2003-2012)

Thunderstorm Winds and Downbursts

Severe winds associated with thunderstorms are not uncommon during the summer months in North Dakota. Between 2000 and 2013, NCDC recorded 2,114 thunderstorm wind events. The highest windspeed recorded among these events was 110 knots, or 126.7 mph. This event occurred on July 10, 2011 in Sargent County. (National Climatic Data Center, 2013) **Figure 5.80** shows the maximum recorded non-tornadic wind speeds by county from 1950-2012. The 2,114 thunderstorm wind events resulted in an estimated $11,932,700 in property damage, $917,900 in average annualized property damages, 1 death, and 31 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, crop insurance payments for thunderstorm wind losses to North Dakota insured crops totaled $5,482,826 between 2003 and 2012. (Risk Management Agency 2003-2012)

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)

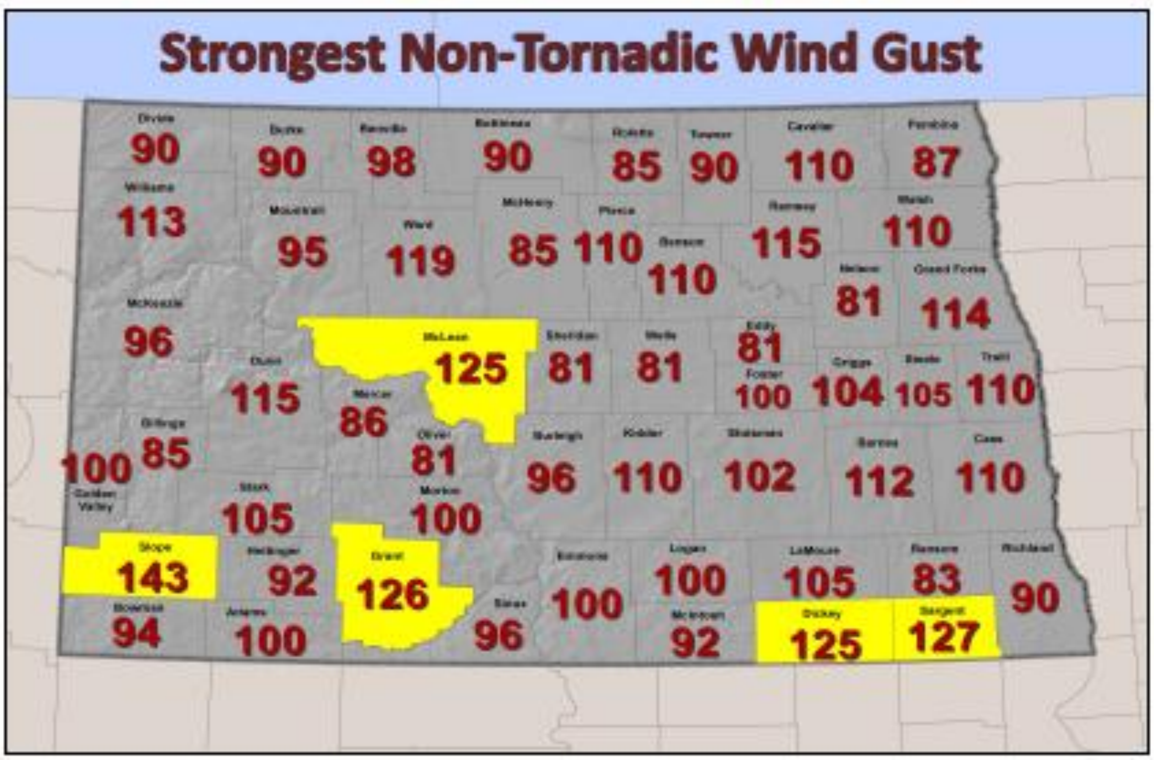
On July 15, 2007, Cass and Steele Counties were significantly impacted by downburst winds of 80 mph and some localized areas over 100 mph. Roofs, windows, siding, and crops through the area suffered damages with property losses estimated at $15-$20 million and crop losses of $250 million. (National Climatic Data Center, 2010)

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.

Figure 5.80. Strongest Non-Tornadic Wind Gust



Source: National Weather Service, 2013

Lightning

In North Dakota, between 1994 and 2013, there were 116 damaging lightning events reported, resulting in about $2,659,500 in property damage, $139,974 in average annualized property losses, 1 death, and 8 injuries. Specific crop losses due to lightning were not available from Risk Management Agency data. 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) 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. (National Climatic Data Center, 2012)

Table 5.82. Summer Storm Events Summary

Event Type	North Dakota
Reported Tornadoes (1950-2013)	1,477 events Highest Magnitude: 3 F5/EF5 tornadoes since 1950 $170,126,270 property damage $375,250 crop insurance payments 25 fatalities 326 injuries
Reported Severe Hail (2000-2013)	2,249 events Highest Magnitude: 5.00” $383,804,600 property damage $460,334,751 crop insurance payments 10 injuries
Reported Extreme Heat Events (1950-2013)	73 events $700,000 property damage $110,334,830 crop insurance payments
Reported Severe Thunderstorm Winds (2000-2013)	2,114 events Highest Magnitude: 126.7 mph $11,932,700 property damage $5,482,826 crop insurance payments 1 fatality 31 injuries
Reported Damaging Lightning Strikes (1994-2013)	116 events $2,659,500 property damage 1 fatality 8 injuries

Source: National Climatic Data Center, 2013; Note: Flash flood events related to summer storms are addressed in Section 5.4.

Table 5.83. 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.	1 death^ 2 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 total
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
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	April 5 – August 12, 2000	Severe Storms Public Assistance and Individual Assistance	1 death^ 25 injuries^	$91,944,041*~ $21,985,000^

Declaration	Location	Date	Other Information	Casualties	Damages
	Dakota		Also included impacts from flooding.		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*~
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,	4/11/2010	State declared spring storm emergency	Unknown	Unknown

Declaration	Location	Date	Other Information	Casualties	Damages
	McHenry, Mercer, Morton, Oliver, Sheridan, Sioux, Ward, Wells, Standing Rock Sioux reservation				
State EO 2011-23	Dickey and LaMoure Counties	7/21/2011	State declared severe summer weather emergency	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; ^ 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).

5.8.4. Probability and Magnitude

Figure 5.81 is a graphical representation of the range of events that can occur within the summer storm hazard. Generally, the more frequent events have a low impact, and the high impact event occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the summer storm hazard. The Introduction to this risk assessment chapter defines the impact categories and provides additional information.

Figure 5.81. Hazard Frequency and Impact Ranges

Frequency	Negligible	Limited	Critical	Catastrophic
No regional history				
No local history				EF5 Tornado in Urban Area
100 years				
50 years	Damaging Lightning Strike	Widespread Hail and Wind Damage	Strong Tornado in a Community	
Annually				

Impact

Based on the historical record, the following can be expected on average in North Dakota:

- In an average year, 23 reported tornadoes resulting in about $2.7 million in combined property and crop damage and 5 injuries. Fatalities are possible, averaging one every other year over the past 63 years.
- In an average year, 173 severe hail events resulting in about $69 million in property and crop damage and 1-2 injuries. Fatalities are possible, but have not been noted in the past 13 years.
- In an average year, 1-2 extreme hail events resulting in about $1.9 million in property and crop damage, and no human fatalities or injuries. Fatalities and heat-related injuries are possible, but have not been noted in the historic data.
- In an average year, 163 severe thunderstorm wind events resulting in about $1.4 million in property and crop damage and 1-2 injuries. Fatalities are possible, averaging one every 10 years or more over the past 13 years.
- In an average year, 6-7 damaging lightning events resulting in $139,974 in property damage. Fatalities and injuries are possible, averaging one every two years over the past 19 years.

Reported tornado and severe thunderstorm events over the past several decades provide an acceptable framework for determining the magnitude of summer storms that can be expected and should be planned for. For tornadoes, even though only a few counties have experienced F5/EF5 tornadoes, all counties could experience tornadoes of this magnitude. The Federal Emergency Management Agency 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). (Federal Emergency Management Agency, 2004) Hail sizes up to 5.00 inches, or even larger, can be expected throughout the state based on historical reports. This size hail and even smaller sizes can damage structures, break windows, dent vehicles, ruin crops, and kill or injure people and livestock. Non-tornadic winds over 100 mph should also be planned for. As history demonstrates, these types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures.

5.8.5. State Risk Assessment

Vulnerability Overview

Table 5.84 through **Table 5.87** show the damage indicators for various types of residential, farm, and business structures.

Table 5.84. One and Two Family Residences

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	53-80 mph (65 mph)
Loss of roof covering material (<20%), gutters, and/or awning; loss of vinyl or metal siding	63-97 mph (79 mph)
Broken glass in doors and windows	79-114 mph (96 mph)
Uplift of roof deck and loss of significant roof covering material (>20%); collapse of chimney; garage doors collapse inward; failure of porch or carport	81-116 mph (97 mph)
Entire house shifts off foundation	103-141 mph (121 mph)
Large sections of roof structure removed, most walls remain standing	104-142 mph (122 mph)
Top floor exterior walls collapsed	113-153 mph (132 mph)
Most interior walls of top story collapsed	128-173 mph (148 mph)
Most walls collapsed in bottom floor, except small interior rooms	127-178 mph (152 mph)
Total destruction of entire building	142-198 mph (170 mph)

Source: Storm Prediction Center, 2007

Table 5.85. Single Wide Manufactured Homes

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	51-76 mph (61 mph)
Loss of shingles or partial uplift of one-piece metal roof covering	61-92 mph (74 mph)
Unit slides off block piers but remains upright	72-103 mph (87 mph)
Complete uplift of roof, most walls remain standing	73-112 mph (89 mph)
Unit rolls on its side or upside down, remains essentially intact	84-114 mph (98 mph)
Destruction of roof and walls leaving floor and undercarriage in place	87-123 mph (105 mph)
Unit rolls or vaults, roof and walls separate from floor and undercarriage	96-128 mph (109 mph)
Undercarriage separates from unit, rolls, tumbles, and is badly bent	101-136 mph (118 mph)
Complete destruction of unit, debris blown away	110-148 mph (127 mph)

Source: Storm Prediction Center, 2007

Table 5.86. Small Barns and Farm Outbuildings

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	53-78 mph (62 mph)
Loss of wood or metal roof panels	61-91 mph (74 mph)
Collapse of doors	68-102 mph (83 mph)
Major loss of roof panels	78-110 mph (90 mph)
Uplift or collapse of roof structure	77-114 mph (93 mph)

Damage Description	Wind Speed Range (expected in parentheses)
Collapse of walls	81-119 mph (97 mph)
Overturning or sliding of entire structure	83-118 mph (99 mph)
Total destruction of building	94-131 mph (112 mph)

Source: Storm Prediction Center, 2007

Table 5.87. Small Retail Building

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	54-81 mph (65 mph)
Loss of roof covering (<20%)	65-98 mph (78 mph)
Broken glass in windows and doors	72-103 mph (86 mph)
Uplift of roof decking; significant loss of roof covering (>20%)	81-119 mph (98 mph)
Canopies or covered walkways destroyed	83-114 mph (98 mph)
Uplift or collapse of entire roof structure	101-140 mph (119 mph)
Collapse of exterior walls; closely spaced interior walls remain standing	120-159 mph (138 mph)
Total destruction of entire building	143-193 mph (167 mph)

Source: Storm Prediction Center, 2007

Since structures are vulnerable to tornadoes and strong winds, those inside them are also at risk. 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. Generally, these warnings recommend that people move to a pre-designated shelter or a basement. If not available, interior rooms or hallways on the lowest floor away from windows or under a sturdy piece of furniture is recommended. Mobile homes, even if tied down, and automobiles are not safe places. North Dakota has approximately 23,471 mobile homes across the state. Given approximately 2.3 people per housing unit in the state, roughly 53,983 people are at enhanced risk from tornadoes and strong winds. Besides structure failure, wind-driven projectiles and shattered glass can injure or kill occupants.

Large hail is always a threat to the agricultural community. Hail can damage crops and injure or kill livestock. A severe hail event that substantially damages an agricultural area could have significant economic impacts. Similarly, structures can be damaged by hail, so losses can easily total in the millions of dollars in urban areas. Strong winds and tornadoes could have similar impacts. Extreme heat events can wither crops and kill livestock.

To refine and access the relative vulnerability of each North Dakota county to severe summer storm events, ratings were assigned to pertinent factors that were examined at the county level. These factors include: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, livestock exposure, crop exposure, and annualized crop loss. Tornado also included mobile home density, and lightning did not include annualized crop loss. A rating value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for each comparison and to determine the most vulnerable counties. The Social Vulnerability Index normally ranges from 1-5. To give the Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two. Overall vulnerability scores were sorted into rankings from low, low-moderate, moderate, moderate-high, and high. **Table 5.88** summarizes the calculated ranges applied to determine the overall vulnerability ranking based on the scores which varied among individual hazards.

Table 5.88. Rankings for Overall Severe Summer Weather Vulnerability

Hazard	Low	Low-Moderate	Moderate	Moderate-High	High
Tornado	14-22	23-31	32-40	41-49	50-59
Hail	15-22	23-30	31-38	39-46	47-55
Extreme Heat	14-19	20-25	26-31	32-37	38-42
Thunderstorm Winds	10-17	18-25	26-33	34-41	42-50
Lightning	12-17	18-23	24-29	30-36	37-43

The following are the data sources for the rating factors: Social Vulnerability Index for North Dakota counties from the Hazards and Vulnerability Research Institute at the University of South Carolina, National Climatic Data Center (NCDC) storm events (2000-2012), U.S. Census Bureau (2010), USDA's Census of Agriculture (2007), and the USDA Risk Management Agency (2003-2012). **Table 5.89** below lists the counties in North Dakota and their vulnerability ranking for each hazard. These rankings were given a score (low = 1, low-moderate = 2, moderate = 3, moderate-high = 4, and high = 5). Each county's individual hazard scores were added together and then divided by five to obtain an overall summer storm vulnerability ranking. The full vulnerability tables for each of these hazards are included in Appendix J. **Figure 5.82** through **Figure 5.87** illustrate vulnerability by county for individual summer storm hazards and summer storms overall.

Table 5.89. Severe Summer Weather Vulnerability

County	Tornado	Hail	Extreme Heat	Thunderstorm Winds	Lightning	Overall Vulnerability Ranking
Adams	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Barnes	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Moderate	Low-Moderate
Benson	Low-Moderate	Low-Moderate	Moderate	Moderate	Low-Moderate	Low-Moderate
Billings	Low	Low	Low	Low	Low	Low
Bottineau	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Bowman	Low-Moderate	Low-Moderate	Low	Low-Moderate	Moderate	Low-Moderate
Burke	Low	Low	Low	Low	Moderate	Low
Burleigh	Moderate	Moderate-High	Low-Moderate	Moderate	High	Moderate
Cass	High	High	High	High	High	High
Cavalier	Low-Moderate	Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Dickey	Low-Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Divide	Low	Low	Low-Moderate	Low	Low	Low
Dunn	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate

County	Tornado	Hail	Extreme Heat	Thunderstorm Winds	Lightning	Overall Vulnerability Ranking
Eddy	Low	Low	Low-Moderate	Low-Moderate	Low	Low
Emmons	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Foster	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Golden Valley	Low	Low	Low-Moderate	Low	Low-Moderate	Low
Grand Forks	High	Moderate-High	High	High	High	High
Grant	Low-Moderate	Low-Moderate	Moderate-High	Low-Moderate	Moderate	Moderate
Griggs	Low	Low	Low-Moderate	Low-Moderate	Low	Low
Hettinger	Low	Low-Moderate	Low-Moderate	Low	Low-Moderate	Low-Moderate
Kidder	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
LaMoure	Moderate	Moderate	Low-Moderate	Low-Moderate	Moderate	Moderate
Logan	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Moderate	Low-Moderate
McHenry	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Moderate	Low-Moderate
McIntosh	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
McKenzie	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
McLean	Low-Moderate	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate
Mercer	Low	Low	Low	Low	Low	Low
Morton	Moderate	Moderate-High	Moderate	Moderate	Moderate	Moderate
Mountrail	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Nelson	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Oliver	Low	Low	Low	Low	Low	Low
Pembina	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Pierce	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Ramsey	Low-Moderate	Low-Moderate	Moderate-High	Moderate	Low-Moderate	Moderate
Ransom	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Renville	Low	Low	Low-Moderate	Low	Low	Low
Richland	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Rolette	Low-Moderate	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Sargent	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Sheridan	Low	Low	Low-Moderate	Low	Low	Low
Sioux	Low	Low-Moderate	Moderate	Low	Low-Moderate	Low-Moderate
Slope	Low	Low	Low	Low	Low	Low
Stark	Moderate	Low-Moderate	Moderate	Low-Moderate	High	Moderate
Steele	Low	Low	Low-Moderate	Low	Low	Low
Stutsman	Moderate	Moderate-High	Moderate	Moderate-High	Moderate-High	Moderate-High
Towner	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Traill	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Walsh	Low-Moderate	Low-Moderate	Moderate-High	Low-Moderate	Low-Moderate	Low-Moderate
Ward	Moderate	Moderate	Moderate	Low-Moderate	Moderate-High	Moderate
Wells	Low-Moderate	Low-Moderate	Moderate	Low-Moderate	Low-Moderate	Low-Moderate
Williams	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate

Figure 5.82. Vulnerability to Tornadoes by County

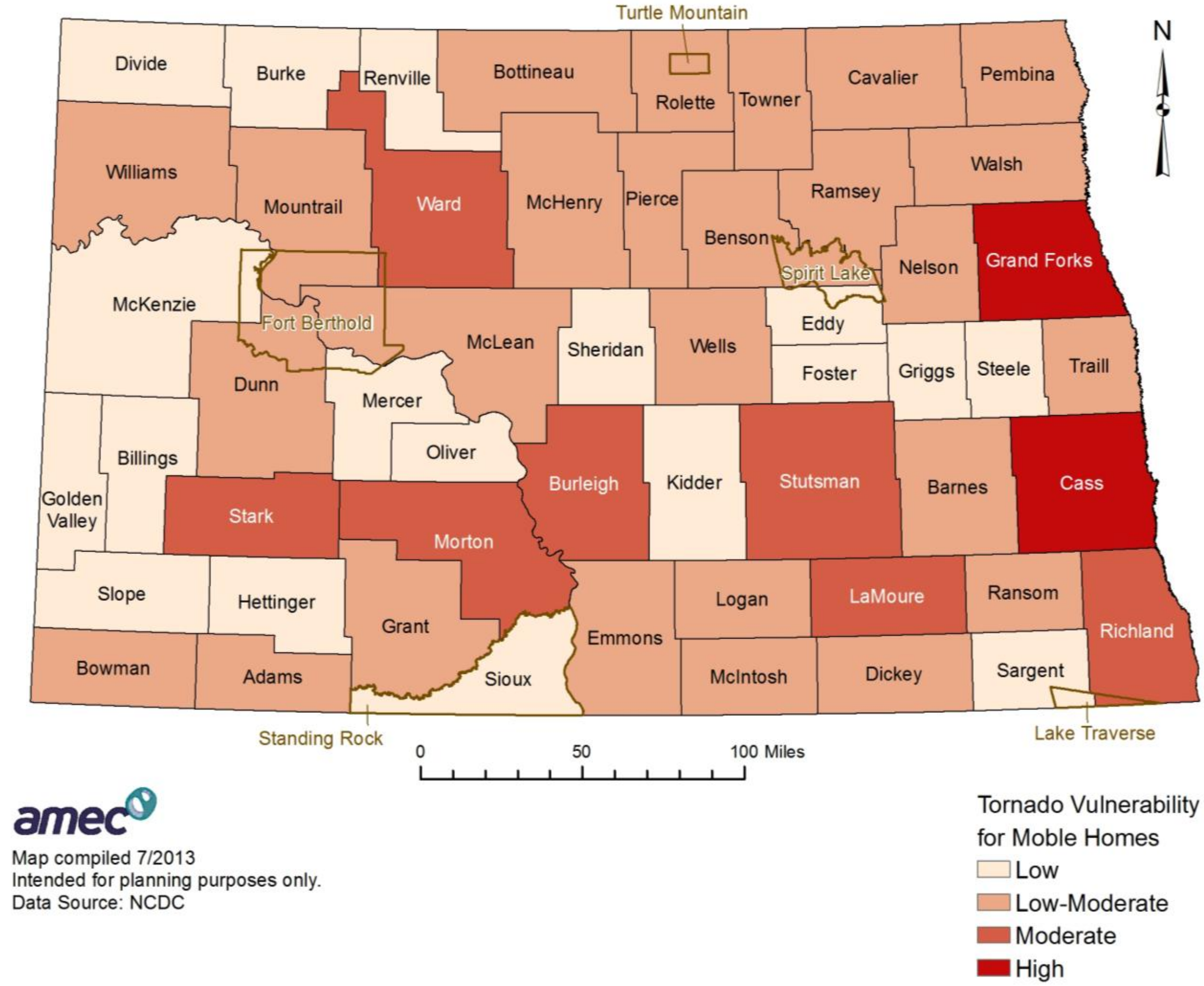


Figure 5.83. Hail Vulnerability

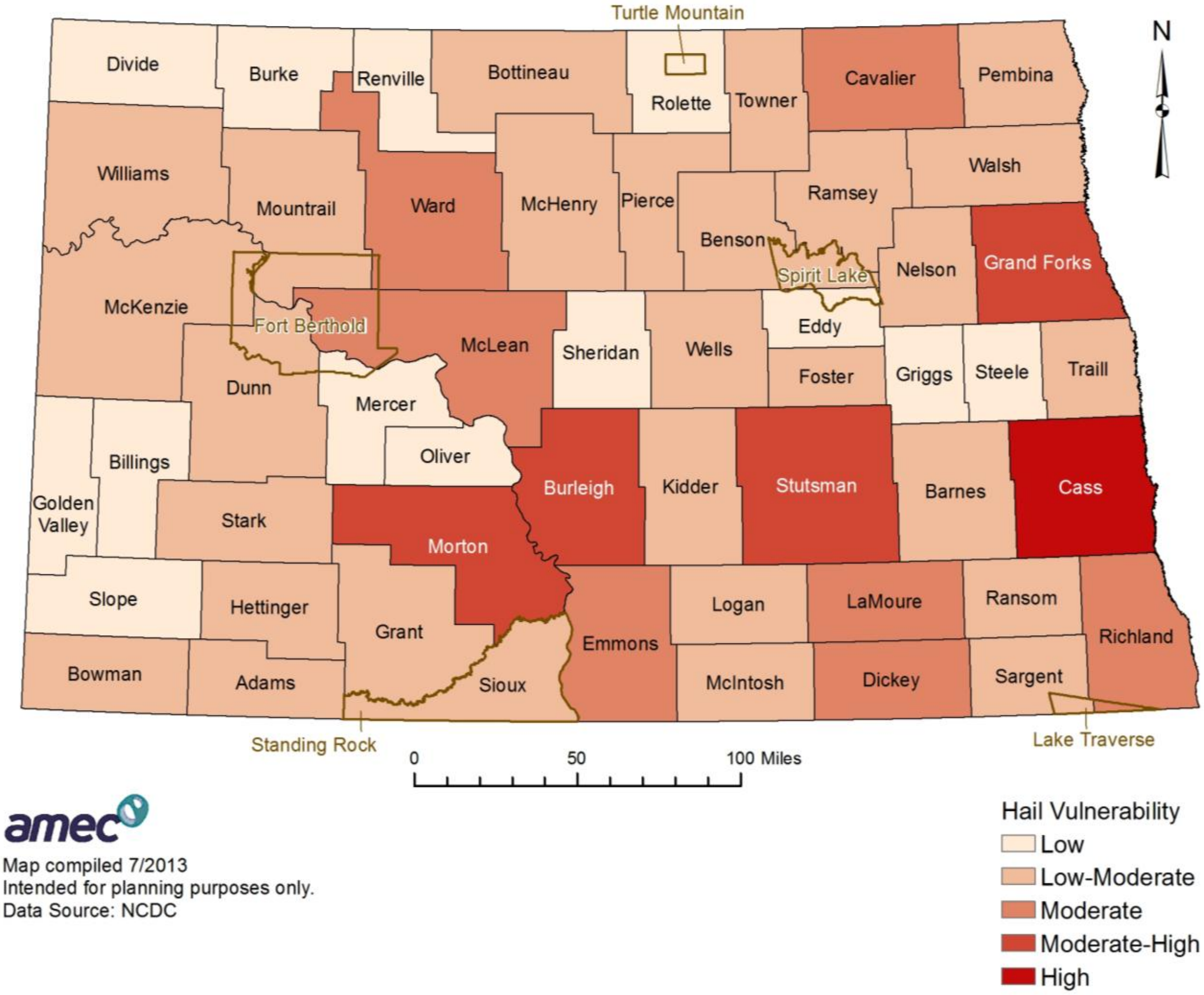


Figure 5.84. Extreme Heat Vulnerability

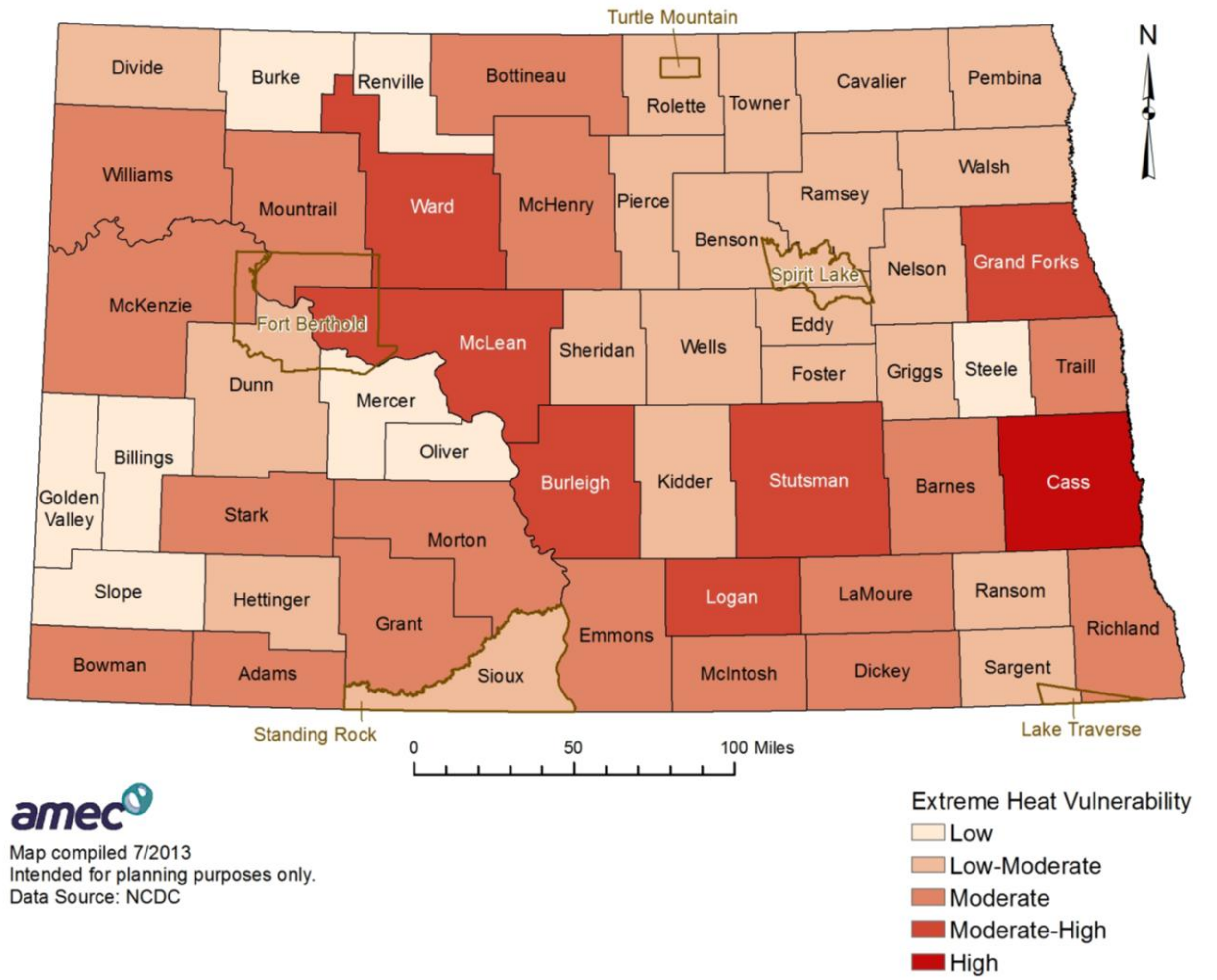


Figure 5.85. Thunderstorm Winds Vulnerability

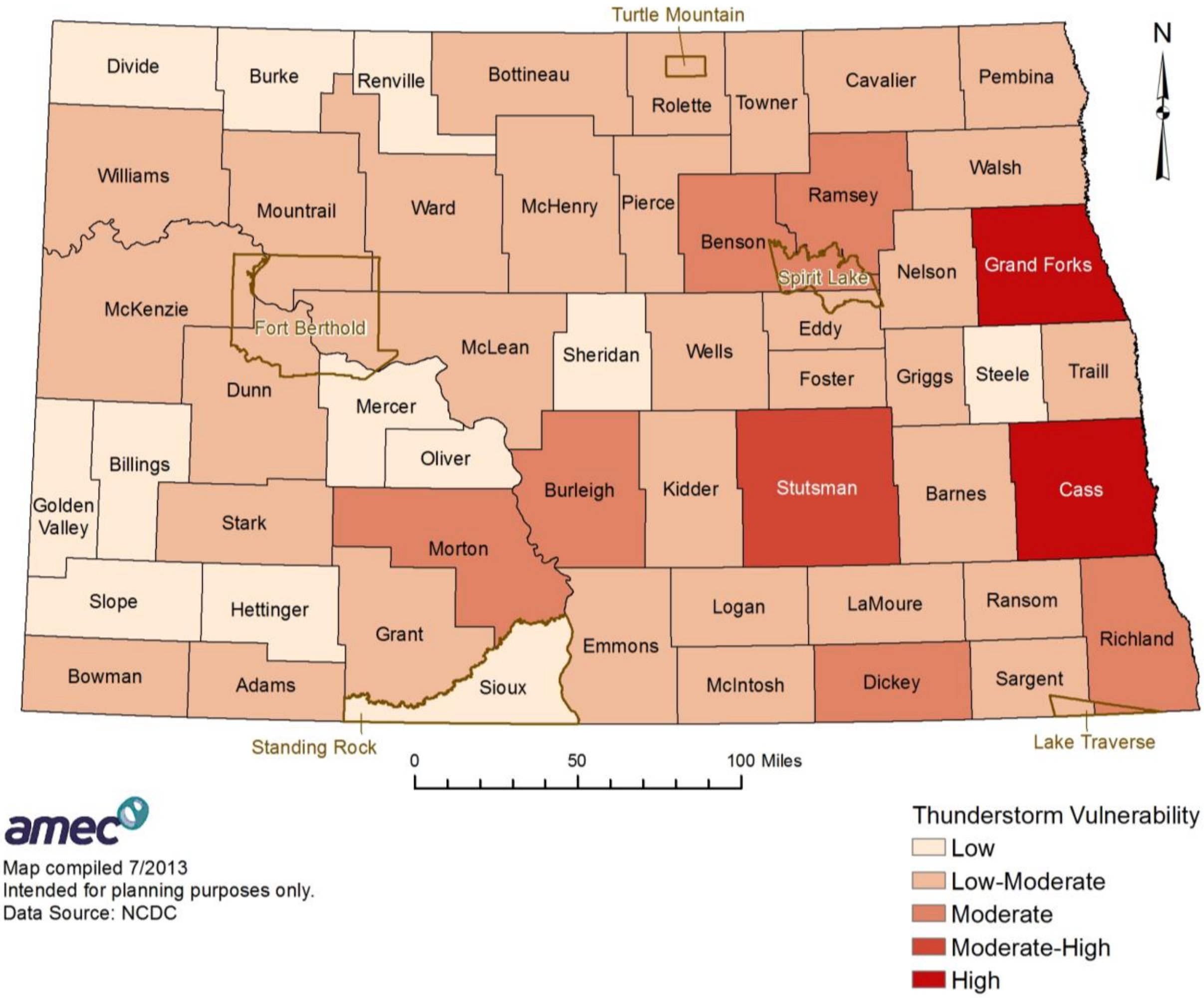


Figure 5.86. Lightning Vulnerability

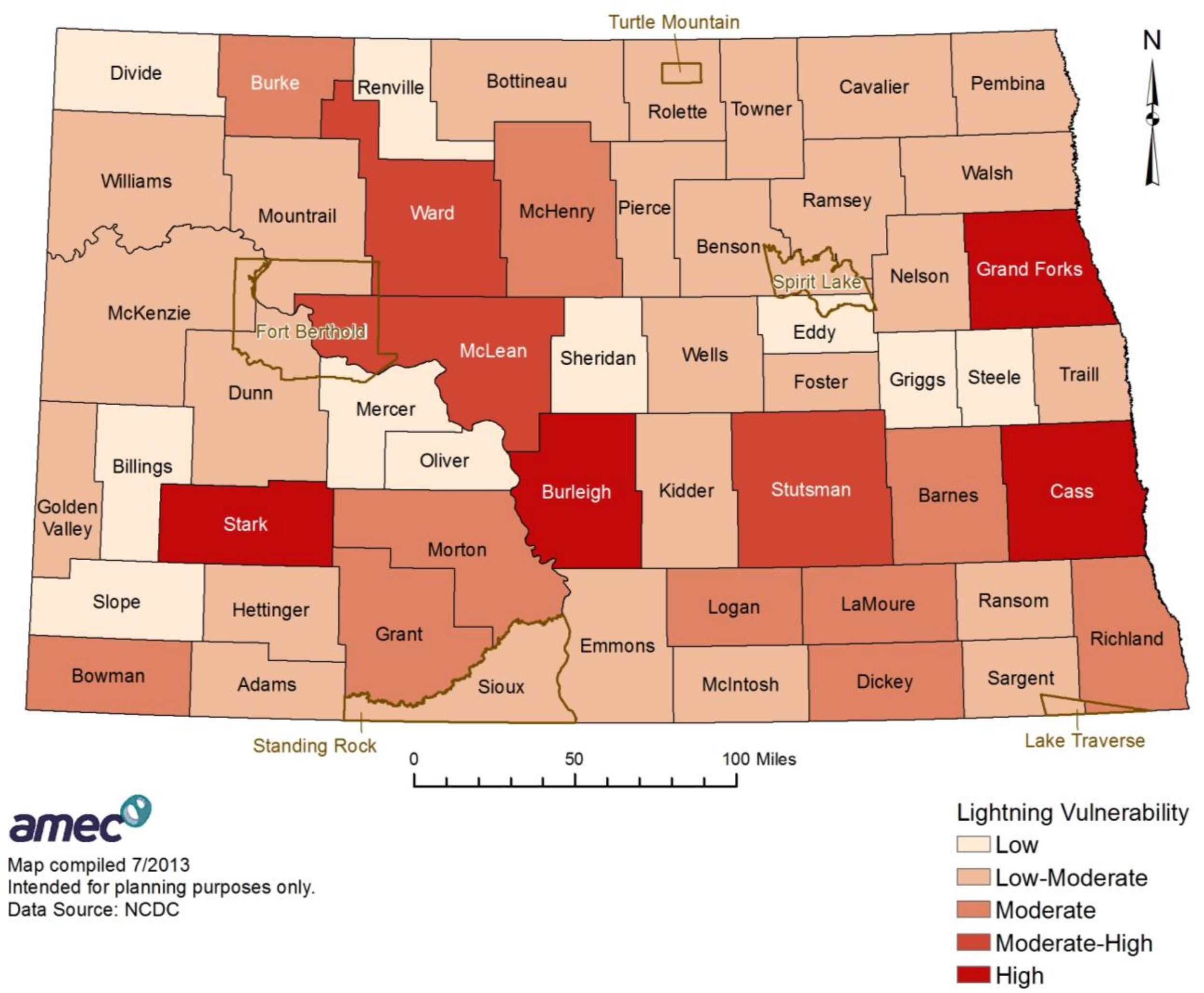
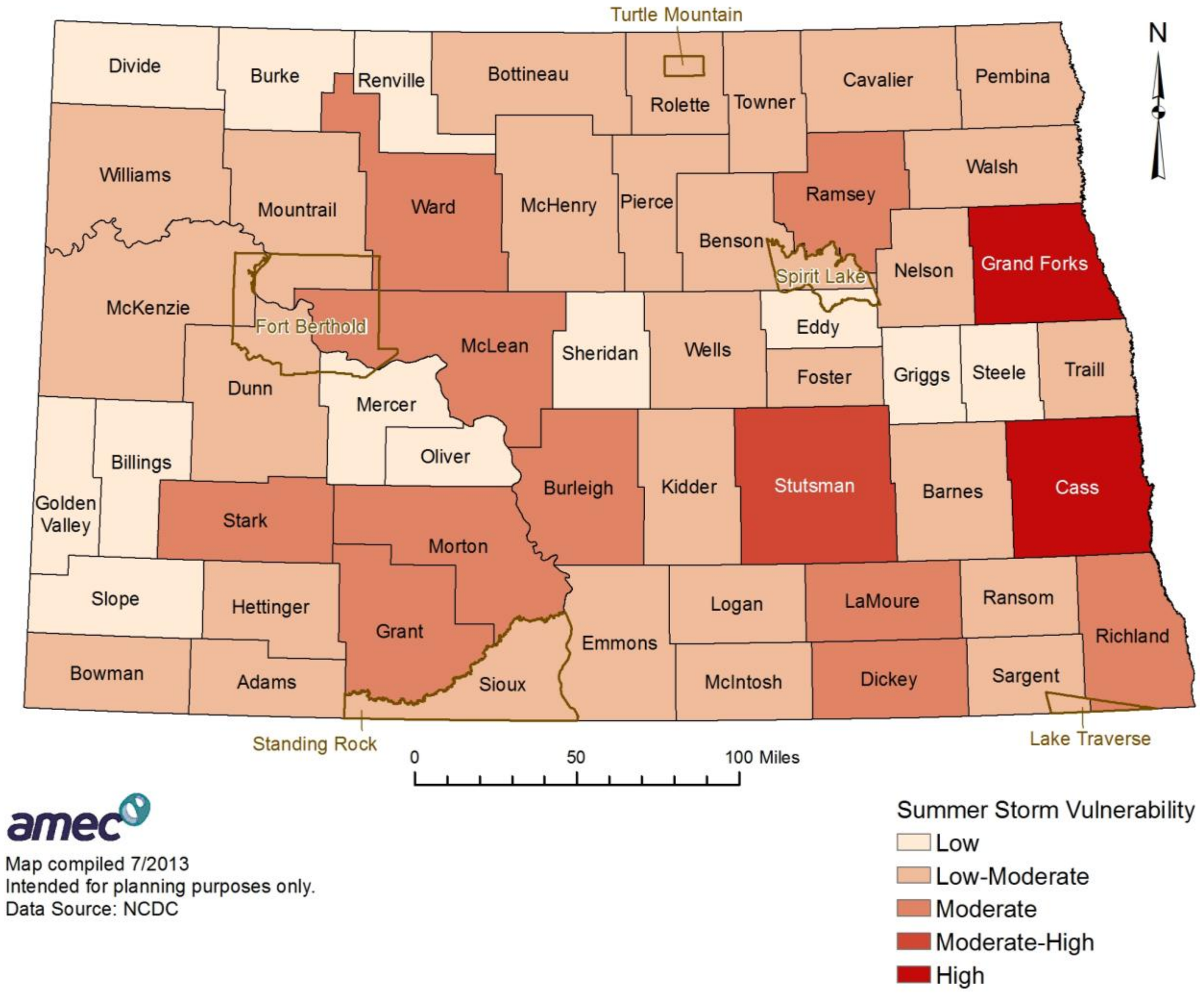


Figure 5.87. Summer Storm Vulnerability



Loss Estimates

Loss estimates are based on data from NCDC and the Risk Management Agency. Based on NCDC event narratives, typical damages 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 damages from all five summer storm hazards in NCDC records included an estimated \$569 million in property damage, 27 deaths, and 375 injuries.

Crop loss figures were extrapolated from the Risk Management Agency crop insurance payment data. According to the 2011 North Dakota Crop Insurance Profile Report issued by the USDA Risk Management Agency, 89 percent 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

$647,783,884 between 2003 and 2012. (Risk Management Agency 2003 – 2012) Loss estimates are broken out by individual hazard in **Table 5.90**.

Table 5.90. Severe Summer Storm Loss Estimates by Hazard

Event Type	North Dakota
Reported Tornadoes (1950-2013)	$170,126,270 property damage $421,629 crop damage 25 fatalities 326 injuries
Reported Severe Hail (2000-2013)	$383,804,600 property damage $517,230,057 crop damage 10 injuries
Reported Extreme Heat Events (1950-2013)	$700,000 property damage $123,971,719 crop damage
Reported Severe Thunderstorm Winds (2000-2013)	$11,932,700 property damage $6,160,479 crop damage 1 fatality 31 injuries
Reported Damaging Lightning Strikes (1994-2013)	$2,659,500 property damage 1 fatality 8 injuries

5.8.6. Local Risk Assessments

Table 5.91 provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding severe summer weather vulnerability and/or estimated losses. As indicated in the Severe Summer Weather Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. Another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.91. Severe Summer Weather Risk Summary from Local Plans

County	Severe Summer Weather Hazards Rating	Summer Storm Additional Information
Adams	B	$44,000,000 estimated tornado losses, $43,000,000 estimated hail losses
Barnes	A	$70,921,572.32 estimated tornado losses, $32,713,496.57 estimated hail losses
Benson	A	
Billings	B	
Bottineau	A	$81,259,566 estimated tornado losses, $28,372,927 estimated hail losses

County	Severe Summer Weather Hazards Rating	Summer Storm Additional Information
Bowman	A	$31,632,854 estimated tornado losses, $5,272,143 estimated hail losses
Burke	B	$15,000,000 estimated tornado losses, $4,400,000 estimated hail losses
Burleigh	B	$53,530,492 critical facilities hail losses, $138,679,206 residential hail losses, $205,495,094 critical facilities tornado losses, $832,075,233 residential tornado losses
Cass	B	$3,178,314,351 estimated tornado losses, $26,135,387,309 estimated hail losses
Cavalier	High	
Dickey	C	
Divide	NP	
Dunn	A	
Eddy	A	$81,317,951.53 estimated tornado losses, $30,879,346.19 estimated hail losses
Emmons	A	
*Fort Berthold^*	*CPRI 2.65 / 2.95**	
Foster	A	$81,259,566.49 estimated tornado losses, $28,372,926.93 estimated hail losses
Golden Valley	A	
Grand Forks	A	$50,000,000 estimated losses
Grant	A	
Griggs	A	$22,000,000 estimated tornado losses, $4,700,000 estimated hail losses
Hettinger	A	
Kidder	A	$36,000,000 estimated tornado losses, $11,000,000 estimated hail losses
*Lake Traverse^*	*NP*	
LaMoure	#5 of 12	
Logan	A	$14,2169,283 estimated tornado losses, $2,626,974 estimated hail losses
McHenry	A	$36,839,897.61 estimated tornado losses, $10,929,376.33 estimated hail losses
McIntosh	B	$33,298,998 estimated tornado losses, $12,544,819 estimated hail losses
McKenzie	NP	
McLean	A	
Mercer	A	
Morton	A	
Mountrail	B	$18,000,000 estimated tornado losses, $5,700,000 estimated hail losses
Nelson	A	$34,604,999 estimated tornado losses, $11,543,038 estimated hail losses
Oliver	A	
Pembina	A	$146,614,008 estimated tornado losses, $83,433,626 estimated hail losses
Pierce	A	
Ramsey	A	Millions of dollars in structure losses
Ransom	Medium	
Renville	A	$72,083,991.74 estimated tornado losses, $51,953.872.59 estimated hail losses
Richland	A	
Rolette	A	$42,849,510.98 estimated tornado losses, $13,505,862.87 estimated hail losses
Sargent	A	$39,490,284 estimated tornado losses, $12,978,646 estimated hail losses
Sheridan	NP	

County	Severe Summer Weather Hazards Rating	Summer Storm Additional Information
Sioux	*Very Likely*	
Slope	A	$597,562 estimated tornado losses, $99,594 estimated hail losses
Spirit Lake	High	
*Standing Rock^*	*Very Likely*	
Stark	NP	
Steele	NP	
Stutsman	A	$307,859,190.54 estimated tornado losses, $98,309,309.96 estimated hail losses
Towner	A	$31,961,278.42 estimated tornado losses, $5,759,479.74 estimated hail losses
Traill	A	$81,259,566.49 estimated tornado losses, $28,372,926.93 estimated hail losses
Turtle Mountain^	CPRI 2.9 / 2.95*	
Walsh	A	
Ward	A	$762,653,845 estimated tornado losses, $259,603,707 estimated hail losses
Wells	A	$47,050,458.71 estimated tornado losses, $15,570,523.39 estimated hail losses
Williams	A	$147,818,391 estimated tornado losses, $26,585,512 estimated hail losses

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; *Thunderstorm / Tornado; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.8.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings. Building types that many state-owned buildings and critical facilities fall under are shown in **Table 5.92** and **Table 5.93.**

Table 5.92. Institutional Buildings

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	59-88 mph (72 mph)
Loss of roof covering (<20%)	72-109 mph (86 mph)
Damage to upper walls and roof, loss of rooftop HVAC equipment	75-111 mph (92 mph)
Broken glass in windows or doors	78-115 mph (95 mph)
Uplift of lightweight roof deck and insulation, significant loss of roofing material (>20%)	95-136 mph (114 mph)
Façade components torn from structure	97-140 mph (118 mph)
Damage to curtain walls or other wall cladding	110-152 mph (131 mph)
Uplift of pre-cast concrete roof slabs	119-163 mph (142 mph)
Uplift of metal deck with concrete fill slab	118-170 mph (146 mph)
Collapse of some top story exterior walls	127-172 mph (148 mph)
Significant damage to building envelope	178-268 mph (210 mph)

Source: Storm Prediction Center, 2007

Table 5.93. Metal Building Systems

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	54-83 mph (67 mph)
Inward or outward collapsed of overhead doors	75-108 mph (89 mph)
Metal roof or wall panels pulled from the building	78-120 mph (95 mph)
Column anchorage failed	96-135 mph (117 mph)
Buckling of roof purlins	95-138 mph (118 mph)
Failure of X-braces in the lateral load resisting system	118-158 mph (138 mph)
Progressive collapse of rigid frames	120-168 mph (143 mph)
Total destruction of building	132-178 mph (155 mph)

Source: Storm Prediction Center, 2007

Many of the critical and special needs facilities, although adequate for most events, may not be able to withstand 160-200 mph tornadic or severe thunderstorm winds, as recommended by the Federal Emergency Management Agency. (Federal Emergency Management Agency, 2004) Most structures should be able to provide adequate protection from hail, but the structures could suffer broken windows and dented exteriors. Even if a structure performs well in the high winds, flying debris and falling trees may damage the building. **Table 5.94** shows the damage indicators for a typical school building.

Table 5.94. School Building (Junior or Senior High School)

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	55-83 mph (68 mph)
Loss of roof covering (<20%)	66-99 mph (79 mph)
Broken windows	71-106 mph (87 mph)
Exterior door failures	83-121 mph (101 mph)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 mph (101 mph)
Damage to or loss of wall cladding	92-127 mph (108 mph)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 mph (114 mph)
Uplift or collapse of light steel roof structure	108-148 mph (125 mph)
Collapse of exterior walls in top floor	121-153 mph (139 mph)
Most interior walls of top floor collapsed	133-186 mph (158 mph)
Total destruction of a large section of building envelope	163-224 mph (192 mph)

Source: Storm Prediction Center, 2007

Above ground infrastructure, namely overhead power lines, communications towers and lines, and structures, are very susceptible to tornadoes, severe thunderstorms, and lightning. High winds and falling trees can damage this type of infrastructure and disrupt services. Therefore, even an indirect hit by a tornado or thunderstorm winds could disrupt regional electricity and possibly telephone services. **Table 5.95** shows the Enhanced Fujita Scale Damage Indicators for electric transmission lines.

Table 5.95. Electrical Transmission Lines

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	70-98 mph (83 mph)
Broken wood cross member	80-114 mph (99 mph)
Wood poles leaning	85-130 mph (108 mph)
Broken wood poles	98-142 mph (118 mph)
Broken or bent steel or concrete poles	115-149 mph (138 mph)
Collapsed metal truss towers	116-165 mph (141 mph)

Source: Storm Prediction Center, 2007

Should above ground facilities such as water treatment facilities or a sewer lagoon be damaged, water and sewer services could also be disrupted. Debris may also block roadways making transportation and commerce difficult if not impossible.

Considering tornadoes and severe thunderstorm winds in North Dakota can exceed 160 mph and even 200 mph, state-owned buildings and property and critical facilities are vulnerable from summer storms. **Table 5.96** shows the losses to state government facilities insured by the North Dakota Fire and Tornado Fund since 1989. The remaining tables in this section show losses to Adjutant General facilities and property, State University facilities and property, local government critical facilities and property, and public school district facilities and property

Table 5.96. Hail, Wind, Lightning Claims Paid on State Government Facilities and Property Insured by the State, 1989-2013

County	Claim Payment
Hail	
Bottineau	$33,606
Burleigh	$580,999
Morton	$346,481
Rolette	$5,482
Stark	$4,737
Stutsman	$230,795
Walsh	$1,926
Ward	$181,946
Lightning	
Barnes	$5,800
Bottineau	$1,671
Burleigh	$164,838
Ransom	$1,401
Stutsman	$8,663
Ward	$1,852
Wind	
Barnes	$20,750
Burleigh	$168,735
Morton	$4,363
Rolette	$1,534
Stark	$187,400
Stutsman	$2,401
Ward	$130,919
Total	**$2,086,299**

Source: North Dakota State Fire and Tornado Fund, 2013

Table 5.97. Hail, Wind, Lightning Claims Paid on Adjutant General Facilities and Property Insured by the State, 1989-2013

County	Claim Payment
Hail	
Burleigh	$385,777
Lightning	
Burleigh	$25,591
Ramsey	$10,303
Wind	
Burleigh	$21,922
Ramsey	$72,174
Total	**$515,767**

Source: North Dakota State Fire and Tornado Fund, 2013

Table 5.98. Hail, Wind, Lightning Claims Paid on State University Facilities and Property Insured by the State, 1989-2013

County	Claim Payment
Hail	
Adams	$75,743
Barnes	$1,325
Bottineau	$56,070
Burleigh	$440,825
Cass	$74,630
Foster	$7,057
Grand Forks	$93,835
Stark	$314,010
Ward	$45,424
Lightning	
Barnes	$5,955
Cass	$17,009
Foster	$7,560
Grand Forks	$172,691
Ramsey	$6,002
Richland	$27,230
Stark	$12,297
Traill	$20,191
Ward	$46,394
Williams	$3,773
Wind	
Adams	$9,289
Barnes	$260
Burleigh	$11,518
Cass	$324,420
Cavalier	$547
Grand Forks	$168,111
Ramsey	$3,602
Stark	$58,901
Traill	$1,568
Williams	$1,852
Total	**$2,008,088**

Source: North Dakota State Fire and Tornado Fund, 2013

Table 5.99. Hail, Wind, Lightning Claims Paid on Local Government Critical Facilities and Property Insured by the State, 1989-2013

County	Claim Payment
Hail	
Adams	$220,655
Barnes	$25,493
Benson	$21,903
Billings	$216,217
Bottineau	$546
Bowman	$20,242
Burke	$7,783
Burleigh	$329,008
Cass	$78,370
Cavalier	$15,047
Dickey	$5,021
Dunn	$18,257
Eddy	$49,281
Emmons	$78,829
Foster	$23,086
Golden Valley	$16,076
Grand Forks	$11,749
Grant	$15,595
Griggs	$189,930
Hettinger	$8,840
Kidder	$44,849
LaMoure	$42,604
Logan	$40,278
McIntosh	$54,193
McKenzie	$9,027
McLean	$95,720
Mercer	$129,722
Morton	$478,544
Mountrail	$23,602
Nelson	$12,094
Pembina	$58,504
Pierce	$7,904
Ramsey	$4,924
Ransom	$72,804
Renville	$7,948
Richland	$19,137
Sargent	$12,080
Sheridan	$10,092
Sioux	$5,495
Slope	$9,550
Stark	$77,097
Steele	$1,751
Stutsman	$45,055
Towner	$35,889
Walsh	$9,088
Ward	$82,834
Wells	$51,404
Williams	$13,757
Lightning	
Adams	$22,409
Barnes	$9,066
Benson	$1,859
Billings	$53

County	Claim Payment
Bottineau	$33,276
Bowman	$1,010
Burke	$2,545
Burleigh	$27,961
Cass	$158,099
Cavalier	$19,498
Dickey	$18,664
Divide	$12,212
Dunn	$6,266
Eddy	$1,369
Emmons	$1,127
Foster	$19,513
Golden Valley	$16,337
Grand Forks	$95,266
Grant	$6,220
Griggs	$6,829
LaMoure	$7,797
Logan	$2,519
McHenry	$30,649
McIntosh	$8,792
McKenzie	$9,547
McLean	$84,086
Mercer	$47,653
Morton	$7,974
Mountrail	$131,633
Nelson	$10,326
Oliver	$4,079
Pembina	$706
Pierce	$15,006
Ramsey	$16,446
Ransom	$2,014
Renville	$2,543
Richland	$5,927
Rolette	$534
Sargent	$13,968
Sheridan	$5,608
Sioux	$430
Stark	$14,994
Steele	$4,212
Stutsman	$15,998
Towner	$2,573
Traill	$49,059
Walsh	$25,103
Ward	$157,455
Wells	$37,308
Williams	$13,022
Wind	
Adams	$1,324
Barnes	$48,086
Benson	$48,723
Billings	$10,867
Bottineau	$5,759
Burke	$2,907
Burleigh	$673,910
Cass	$2,307,461
Cavalier	$51,035
Dickey	$74,694
Divide	$13,811

County	Claim Payment
Dunn	$15,662
Eddy	$5,598
Emmons	$41,608
Foster	$5,958
Golden Valley	$67,288
Grand Forks	$933,368
Grant	$2,764
Griggs	$22,492
Hettinger	$104,792
Kidder	$63,312
LaMoure	$34,140
Logan	$8,196
McHenry	$4,070
McIntosh	$4,468
McKenzie	$655
McLean	$70,166
Mercer	$8,838
Morton	$174,995
Mountrail	$31,497
Nelson	$60,706
Oliver	$310
Pembina	$18,021
Ramsey	$54,162
Ransom	$46,776
Renville	$17,197
Richland	$97,808
Rolette	$34,174
Sargent	$42,906
Stark	$145,720
Steele	$711
Stutsman	$19,771
Towner	$140,490
Traill	$51,562
Walsh	$181,018
Ward	$25,015
Wells	$17,297
Williams	$75,730
Total	**$9,863,232**

Source: North Dakota State Fire and Tornado Fund, 2013

Table 5.100. Hail, Wind, Lightning Claims Paid on Public School District Facilities and Property Insured by the State, 1989-2013

County	Claim Payment
Hail	
Adams	$112,633
Barnes	$20,921
Benson	$9,196
Billings	$50,881
Bowman	$878
Burleigh	$269,225
Cass	$35,746
Cavalier	$12,112
Dunn	$13,704
Eddy	$20,947
Emmons	$64,919
Foster	$82,068

County	Claim Payment
Golden Valley	$356,075
Grant	$45,206
Griggs	$83,160
Hettinger	$109,500
Kidder	$135,588
LaMoure	$55,716
Logan	$103,937
McHenry	$29,941
McIntosh	$1,838
McKenzie	$12,527
McLean	$65,186
Mercer	$6,163
Morton	$294,866
Mountrail	$51,837
Nelson	$39,607
Oliver	$16,864
Pembina	$26,771
Ramsey	$4,486
Ransom	$14,573
Renville	$109,371
Richland	$26,943
Rolette	$8,105
Sioux	$66,265
Stark	$291,005
Stutsman	$29,546
Towner	$14,707
Walsh	$65,627
Ward	$41,586
Wells	$105,864
Williams	$24,936
Lightning	
Barnes	$13,060
Benson	$7,264
Billings	$159
Bottineau	$5,499
Bowman	$5,548
Burke	$12,736
Burleigh	$3,423
Cass	$50,897
Cavalier	$22,312
Dickey	$320
Dunn	$13,620
Emmons	$20,318
Grand Forks	$117,011
Hettinger	$3,150
Kidder	$1,497
LaMoure	$16,940
Logan	$8,635
McHenry	$4,471
McIntosh	$549
McKenzie	$1,451
McLean	$6,200
Mercer	$23,294
Morton	$17,463
Nelson	$2,568
Oliver	$6,560
Pembina	$15,065
Ramsey	$2,360

County	Claim Payment
Richland	$13,725
Rolette	$4,355
Sargent	$6,334
Sheridan	$8,934
Sioux	$4,533
Stark	$49,205
Stutsman	$4,510
Towner	$3,395
Traill	$12,050
Walsh	$8,042
Ward	$900
Wells	$6,494
Williams	$9,100
Wind	
Adams	$240
Barnes	$32,586
Benson	$43,124
Billings	$1,258
Bottineau	$35,598
Bowman	$14,940
Burke	$1,099
Burleigh	$47,284
Cass	$166,136
Cavalier	$2,156
Dickey	$2,187
Divide	$5,385
Dunn	$19,400
Eddy	$241
Emmons	$1,081,198
Foster	$7,126
Golden Valley	$6,324
Grand Forks	$8,079,492
Grant	$19,104
Griggs	$4,864
Hettinger	$3,050
Kidder	$52,543
LaMoure	$34,572
Logan	$719
McHenry	$11,512
McIntosh	$31,293
McKenzie	$38,631
McLean	$10,459
Mercer	$4,426
Morton	$60,951
Mountrail	$8,888
Nelson	$7,158
Oliver	$3,346
Pembina	$76,953
Pierce	$2,650
Ramsey	$32,348
Ransom	$450
Renville	$107,366
Richland	$6,798
Rolette	$396
Sargent	$3,214
Sheridan	$1,350
Sioux	$9,625
Stark	$96,154

County	Claim Payment
Steele	$14,517
Stutsman	$10,164
Towner	$200
Traill	$25,551
Walsh	$9,001
Ward	$53,646
Wells	$950
Williams	$42,799
Total	**$13,776,388**

Source: North Dakota State Fire and Tornado Fund, 2013

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.8.8. Development in Identified Hazard Areas

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 are 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 Chapter 4. New and future development in these jurisdictions is generally at greater risk from summer storms.

Increases in structures and populations add to the challenges of managing development in areas vulnerable to severe summer storms. **Table 5.101** shows the areas with housing unit increases from 2000 to 2010. **Table 5.102** shows the areas with population increases during this time period. And **Table 5.103** the areas with projected 40 percent and greater population increases from 2010 to 2025. Cass, Grand Forks, and Stutsman counties were found to have moderate-high to high vulnerability to summer storms based on data from NCDC and the Risk Management Agency. Cass and Grand Forks counties both show increases in total housing units and in population between 2000 and 2010. Grand Forks County is projected to see population increases of at least 40 percent through 2025.

Table 5.101. Areas with Housing Unit Increases 2000 to 2010

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Fort Berthold Reservation	3,322	2,624	698	27%
Cass County	65,986	53,790	12,196	23%
Burleigh County	34,557	29,003	5,554	19%
Mountrail County	3,949	3,438	511	15%
McKenzie County	3,019	2,719	300	11%
Stark County	10,528	9,722	806	8%
Dunn County	2,117	1,965	152	8%
Sioux County	1,307	1,216	91	7%

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Standing Rock Reservation	1,307	1,216	91	7%
Turtle Mountain Reservation	2,802	2,636	166	6%
Grand Forks County	29,048	27,373	1,675	6%
Rolette County	5,301	5,027	274	5%
Williams County	10,184	9,680	504	5%
McLean County	5,528	5,264	264	5%
Ward County	26,294	25,097	1,197	5%
Kidder County	1,678	1,610	68	4%
Slope County	470	451	19	4%
McIntosh County	1,931	1,853	78	4%
Hettinger County	1,460	1,419	41	3%
Ransom County	2,676	2,604	72	3%
Bowman County	1,636	1,596	40	3%
Foster County	1,837	1,793	44	2%
Renville County	1,439	1,413	26	2%
Barnes County	5,694	5,599	95	2%
Traill County	3,759	3,708	51	1%
Benson County	2,963	2,932	31	1%
Mercer County	4,435	4,402	33	1%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.102. Area Population Increases from 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	123,138	149,778	26,640	21.60%
Burleigh County	69,416	81,308	11,892	17.10%
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	19,761	22,398	2,637	13.30%
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	22,636	24,199	1,563	6.90%
Ward County	58,795	61,675	2,880	4.90%
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	66,109	66,861	752	1.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.103. Area Projected 40 Percent and Greater Population Increases from 2010 to 2025.

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	22,398	51,106	28,708	128.20%

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.8.9. Data Limitations and Other Key Documents

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 Climatic Data Center database are only recorded if reported to the National Weather Service. The addition of trained spotters to the area may improve data collection.

Other key documents related to the Summer Storm hazard include:

- North Dakota Emergency Operations Plan, Severe Storms Annex

5.9. Severe Winter Weather (Including Blizzards, Heavy Snow, Ice Storms, and Extreme Cold)

Hazard Rating	THIRA Threat/Hazard Group
High	Natural

5.9.1. Description

Winter storms take many forms and vary 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. On average, there are around ten 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. As a result, North Dakota typically leads the nation in blizzard frequency. (National Climatic Data Center, 2010; National Weather Service, 2007)

Another hazard associated with Severe Winter Weather is prolonged periods of cold often associated with high winds, which produce life-threatening situations. This type of winter weather sometimes catches people unprepared, resulting in tragedy. Researchers have said that 70 percent of the fatalities related to ice and snow occur in automobiles and about 25 percent are related to people who have been caught off guard out in the storm. Ice storms with wind, or heavy snow without wind, have been extremely dangerous and costly to businesses, industries, state, tribal, and local governments, and citizens. Blizzards can last from less than 24 hours (in the fast moving storms) to more than four days (in the slower moving ones).

There are two major winter storm tracks that occur in the United States. The northern track produces the Alberta Low Pressure System, commonly called the "Alberta Clipper." This usually is a fast moving storm producing blizzard conditions for a relatively short period of time. Extremely low temperatures usually follow storms of this nature. Alberta Lows have traveled as fast as 90 mph and have not been known to become stationary systems. The southern track produces the Colorado Low Pressure System. These types of storms move more slowly and more erratically. The Colorado Low has traveled as fast as 60 mph, but has also been known to stop and become stationary for as long as 18 hours. Both of these types of storm systems can become very deadly.

Blizzards

Blizzards, as defined by the National Weather Service, 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 3 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, making them as potentially deadly as a conventional blizzard.

The impact of a severe blizzard with low visibility, heavy snow, and cold temperatures can bring the entire region to a standstill. Utility and communication systems are often interrupted. Road systems are rendered impassable which causes school, workplace, and commercial shutdowns. This in turn magnifies the emergency and medical management needs of the community. Rural residents are especially hard hit if they are not adequately stocked with food and fuel. The livestock industry 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.

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 eight 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. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. 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.

Ice Storms

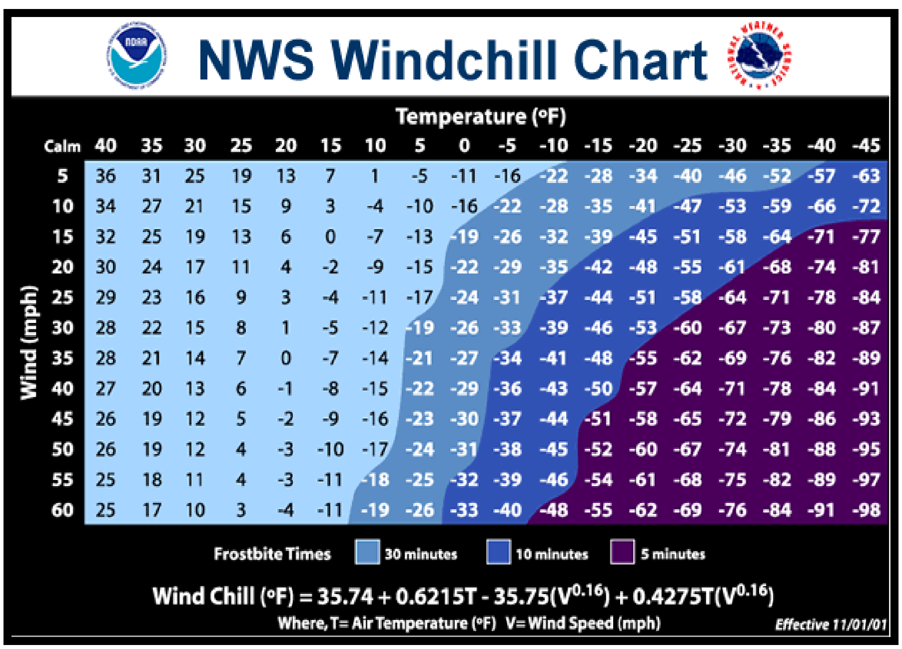
Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into a warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating 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.

Extreme Cold

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 5.88** shows the windchill chart.

Figure 5.88. NWS Windchill Chart



NWS Windchill 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

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.

The lack of adherence to simple but important and necessary precautions or even apathy can result in loss of property, injury, and even death. Wind chill conditions become very relevant when human tissue is exposed to the outside air. This can occur when people become stranded in a blizzard and attempt to walk to safety and become lost. Lowering of the body core temperature leads to the condition known as "hypothermia." Hypothermia has often been called "the killer of the unprepared." It also claims the lives of many outdoor sports enthusiasts. This condition occurs when the body or "core temperature" is lowered. The blood is cooled, thereby reducing the amount of oxygen which is carried to the brain, thus dulling the senses. The victim becomes fatigued, delirious, and loses dexterity and control of arms and legs. If the body core temperature continues to drop and nears 85°F, the victim eventually slips into unconsciousness. If treatment is not started immediately, the result is arrest of the circulatory and respiratory systems and death.

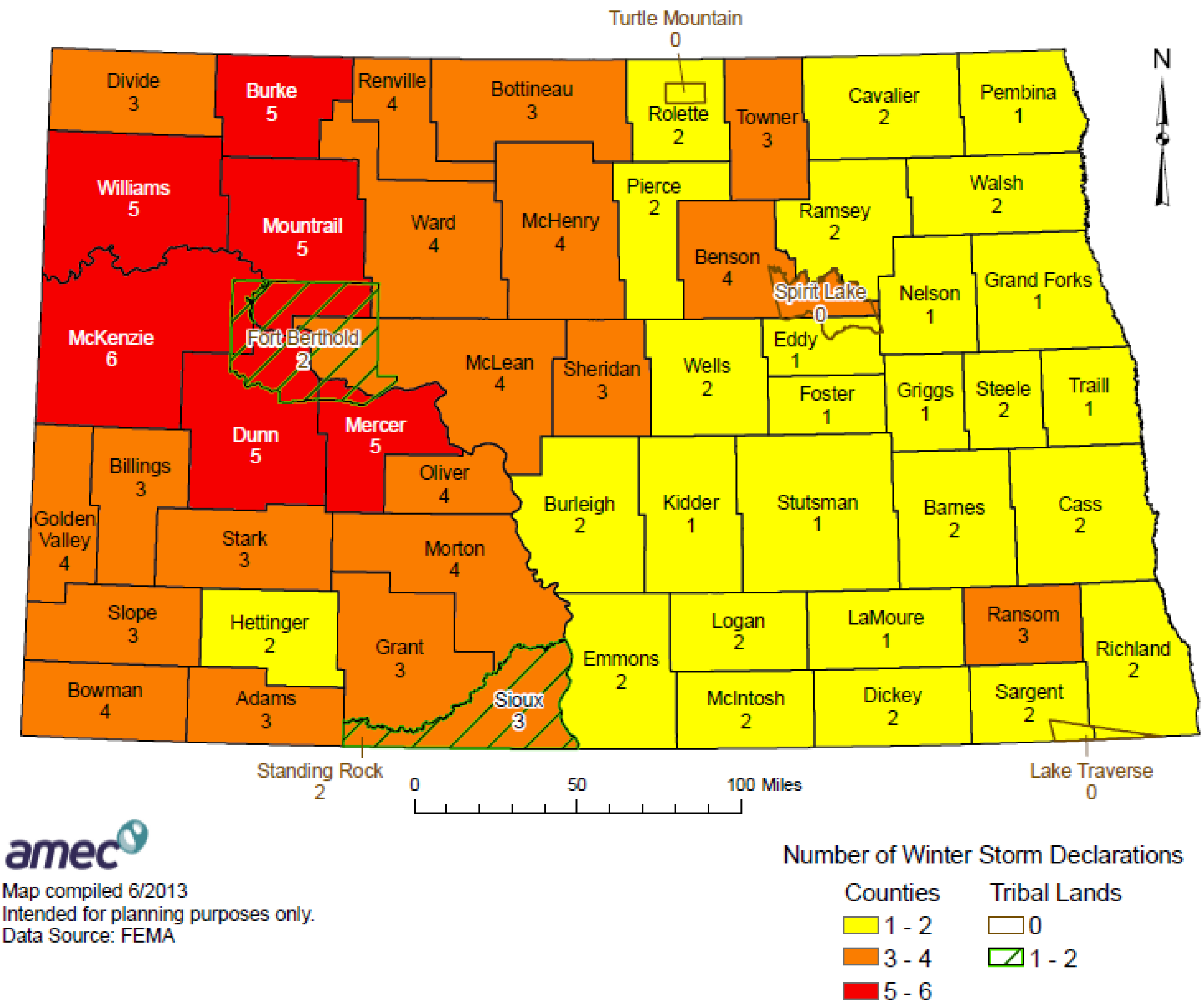
Winter storms can often be associated with other hazards. The most common hazards thought of during winter weather events are transportation accidents. Roadways become hazardous quickly during snow, blowing snow, and ice events. Most accidents involve passenger vehicles; however, an accident involving a commercial vehicle transporting hazardous materials is also possible. Transportation accidents are discussed in further detail in **Section 5.11.**

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. Utility Outage is discussed in further detail in **Section 5.10.** In North Dakota, severe winter seasons often translate to severe flooding potential in the spring.

5.9.2. Geographic Location

The winter storm hazards, such as blizzards, ice storms, heavy snow, and extreme cold, usually occur on a regional or even statewide scale. As the historical record indicates, winter storms are a formidable hazard for all parts of the state. **Figure 5.89** shows the number of winter storm Presidential disaster and emergency declarations since 1989 by county.

Figure 5.89. Winter Storm Declarations: 1989-2013



5.9.3. Previous Occurrences

North Dakota has winter storms several times per year. Records show that only three to four severe, widespread blizzards occur each decade. The winter of 1996 with 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. A summary of some of the more significant winter weather events across the state follow from the following sources: State Historical Society of North Dakota, South Dakota Office of Emergency Management, National Climatic Data Center:

- 1886-1887 Winter – A severe winter in the western part of the Dakota Territory put an end to open range ranching.
- 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 (see **Figure 5.90**). 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 5.90. 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 4th and 5th, 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.

- <u>April 1999 Ice Storm</u> – 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.
- <u>November 2000 Winter Storm and Ice Storm</u> – Early season heavy snowfall in north-central and western North Dakota, up to 18 inches, closed roads and caused numerous accidents, injuring 7 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.
- <u>January 2004 Winter Storm</u> – 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.
- <u>October 2005 Blizzard</u> – 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 $2.2 million.
- <u>November 2005 Ice Storm</u> – 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. Power line repairs in the Fargo area exceeded $3,000,000.
- <u>April 2006 Blizzard</u> – 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 $20 million in damages, primarily to electric systems, were reported in western and central North Dakota.
- April 2010 Winter Storm – Heavy wet snow and sleet combined with strong winds to cause widespread damages 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. Damages were estimated at over $35 million.
- April-May 2011 Winter Storm – A powerful late spring storm system swept across the Northern Plains region April 29th into May 1st. 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 damages, 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 20th, 2011.

The National Climatic Data Center has 3,353 winter weather events listed for North Dakota from January 1, 2000 through February 2013. This event count includes blizzards, extreme cold/wind chill events, heavy snow, ice storms, winter storms, and winter weather. Damages from these events included $68,875,000 in property damages, 6 direct deaths, and 16 direct injuries. Based on these numbers, North Dakota could expect roughly $5,298,077 in average annual property damages. Note that some winter weather events in the database may be listed more than once if they occurred over several regions. The total number of distinct winter weather events in North Dakota from January 2000-February 2013 is about 222, which equates to about 17 events per year. (NCDC, 2013) According to data from the Risk Management Agency, cold winter crop insurance payments for North Dakota insured crops totaled $1,964,031 between 2003 and 2012. (Risk Management Agency 2003-2012)

Table 5.104. 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 2005-11	North Dakota	10/31/2005	State declared snow disaster	Unknown	Unknown
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	April 1-3, 2010	Public Assistance.	None	$25,879,643*^

Declaration	Location	Date	Other Information	Casualties	Damages
	tribe in central North Dakota		For severe winter storms.		
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

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.

* 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.

5.9.4. Probability and Magnitude

Figure 5.91 is a graphical representation of the range of events that can occur within the winter weather hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from winter weather hazard. The impact categories and additional information is discussed in additional detail at the beginning of this Risk Assessment Chapter.

Figure 5.91. Hazard Frequency and Impact Ranges

Frequency				
No regional history				Extreme Isolation and Power Outages Statewide
No local history				
100 years			Long Duration Blizzard	
50 years	Heavy Snow	Winter Road Closures / Outages		
Annually				
	Negligible	*Limited*	*Critical*	*Catastrophic*
		Impact		

Based on blizzard studies, a typical North Dakota county may experience an average of two blizzards annually, while statewide, about three to four of these extremely dangerous storms occur. (Schwartz, 2000; National Weather Service, 2007e) The National Climatic Data Center has 3,353 winter weather events listed for North Dakota from January 1, 2000 through February 2013. Damages from these events included $68,875,000 in property damages, 6 direct deaths, and 16 direct injuries. Based on these numbers, North Dakota could expect roughly $5,298,077 in average annual property damages. Note that some winter weather events in the database may be listed more than once if they occurred over several regions. The total number of distinct winter weather events in North Dakota from January 2000-February 2013 is about 222, which equates to about 17 events per year. (NCDC, 2013) 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 2 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.

North Dakota's Living Snow Fence Initiative may help 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.

5.9.5. State Risk Assessment

Vulnerability Overview

The population of North Dakota is most threatened by winter storms while driving or when electric service is lost. Transportation accidents are more common during poor road and visibility conditions and may result in injuries or deaths. Property losses are usually covered by insurance. Approximately 29 percent of North Dakota's population relies on electricity for heat. Many of the counties in eastern and northern North Dakota have electricity as their primary heat source. In addition, those homes and businesses that use natural gas, propane, and fuel oil still often require electricity to run the blowers and heating systems. Therefore, an extended power outage during winter may make many homes and offices unbearably cold. Additionally, during extended winter-time power outages, people often make the mistake of bringing portable generators inside or not venting them properly, leading to carbon monoxide poisoning. With poor road conditions, sheltering residents may present significant logistical challenges with getting people to heated facilities, feeding, and providing medical care. These situations, accompanied by stranded motorists that need to be rescued, represent significant threats to the population. As history has demonstrated, poorly built structures may also experience structural collapses resulting in property losses.

With respect to the economy, agriculture, transportation, and businesses in general may be affected. Winter is not a peak growing season, so agriculture may not be severely affected unless the storms arrive early or late in the growing season. The primary exceptions for agriculture are extreme cold temperatures during calving operations and keeping animals hydrated during blizzards. Ranchers must take precautions not to lose large numbers of calves and livestock during cold and snowy weather. This could have an impact on agricultural profits. Winter storms may slow transportation resulting in business closures and delivery delays. Schools often close temporarily if conditions warrant.

Perhaps the greatest threat to historical values from winter weather is the potential for pipes to freeze and burst during cold weather. Water can easily damage the interiors of structures and their contents, including items of historic value. When roads are impassable, social events may also be postponed or cancelled.

To refine and assess the relative vulnerability of each North Dakota county to winter storm events, ratings were assigned to pertinent factors that were examined at the county level. These factors include: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, livestock exposure, crop exposure, and annualized crop loss. A rating value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for each comparison and to determine the most vulnerable counties. The Social Vulnerability Index normally ranges from 1-5. To give the Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two. Overall vulnerability scores were sorted into rankings from low, low-moderate, moderate, moderate-high, and high. **Table 5.105** summarizes the calculated ranges applied to determine the overall vulnerability ranking based on the scores which ranged from 10 through 39.

Table 5.105. Rankings for Overall Severe Winter Storm Vulnerability

Low	Low-Moderate	Moderate	Moderate-High	High
10-15	16-21	22-27	28-33	34-39

The following are the data sources for the rating factors: Social Vulnerability Index for North Dakota counties from the Hazards and Vulnerability Research Institute at the University of South Carolina, National Climatic Data Center (NCDC) storm events (2000-2012), U.S. Census Bureau (2010), USDA's Census of Agriculture (2007), and the USDA Risk Management Agency (2003-2012). **Table 5.106** shows the vulnerability rankings derived from the analysis of data from these sources. **Figure 5.92** illustrates severe winter weather vulnerability by county.

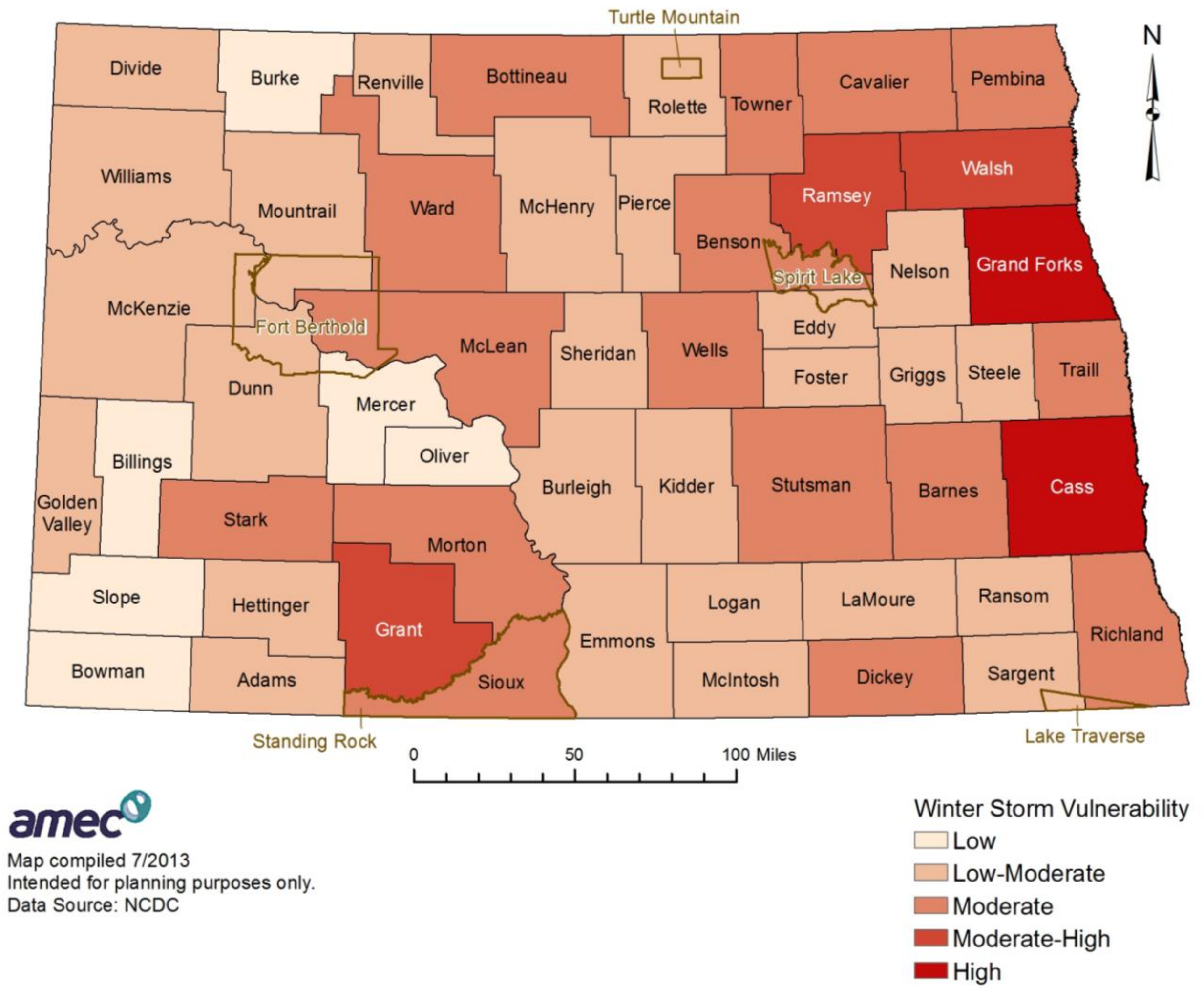
Table 5.106. Severe Winter Weather Vulnerability Analysis

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Adams	10	42	$2,080,000	$160,000	$335,192	2.4	$31,296,000	$39,246,000	$27,154	$30,510	$3,051	19	Low-Moderate
Barnes	8	82	$272,000	$20,923	$1,433,052	7.4	$10,760,000	$172,501,000	$9,647	$10,839	$1,084	23	Moderate
Benson	10	80	$14,000	$1,077	$592,939	4.8	$14,530,000	$108,039,000	$25,313	$28,442	$2,844	24	Moderate
Billings	4	49	$1,044,000	$80,308	$115,578	0.7	$16,486,000	$7,264,000		$0	$0	10	Low
Bottineau	10	72	$130,000	$10,000	$974,645	3.9	$8,891,000	$158,991,000	$24,969	$28,055	$2,806	25	Moderate
Bowman	8	45	$1,775,000	$136,538	$438,186	2.7	$42,603,000	$35,079,000	$18,514	$20,802	$2,080	15	Low
Burke	6	57	$610,000	$46,923	$277,676	1.8	$6,331,000	$55,256,000	$1,623	$1,824	$182	14	Low
Burleigh	2	48	$2,025,000	$155,769	$8,282,489	49.8	$31,554,000	$50,682,000	$40,019	$44,965	$4,497	21	Low-Moderate
Cass	2	86	$300,000	$23,077	$16,383,158	84.9	$15,706,000	$252,192,000	$15,099	$16,965	$1,697	39	High
Cavalier	8	77	$414,000	$31,846	$674,153	2.7	$2,419,000	$171,319,000	$39,497	$44,379	$4,438	24	Moderate
Dickey	10	55	$71,000	$5,462	$663,899	4.7	$37,703,000	$124,459,000	$63,356	$71,187	$7,119	23	Moderate
Divide	10	52	$623,000	$47,923	$340,638	1.6	$6,935,000	$73,992,000	$10,826	$12,164	$1,216	19	Low-Moderate
Dunn	8	59	$1,662,000	$127,846	$363,438	1.8	$37,328,000	$31,384,000	$29,064	$32,656	$3,266	16	Low-Moderate
Eddy	10	75	$14,000	$1,077	$274,007	3.8	$8,573,000	$38,658,000	$39,382	$44,249	$4,425	21	Low-Moderate
Emmons	10	47	$1,100,000	$84,615	$395,022	2.4	$34,225,000	$86,729,000	$54,487	$61,221	$6,122	21	Low-Moderate
Foster	8	66	$0	$0	$516,048	5.3	$19,352,000	$75,607,000	$10,609	$11,920	$1,192	18	Low-Moderate
Golden Valley	8	44	$161,000	$12,385	$245,937	1.7	$16,270,000	$26,832,000	$157,660	$177,146	$17,715	21	Low-Moderate
Grand Forks	4	70	$5,000	$385	$8,088,076	46.5	$22,117,000	$233,477,000	$150,665	$169,287	$16,929	36	High
Grant	10	47	$12,345,000	$949,615	$339,417	1.4	$32,785,000	$47,085,000	$216,311	$243,046	$24,305	32	Moderate-High
Griggs	10	75	$2,000	$154	$395,892	3.4	$6,681,000	$56,624,000	$2,993	$3,363	$336	21	Low-Moderate

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Hettinger	8	44	$2,085,000	$160,385	$311,507	2.2	$9,876,000	$83,684,000	$229	$257	$26	18	Low-Moderate
Kidder	8	53	$0	$0	$291,192	1.8	$31,707,000	$46,750,000	$94,154	$105,791	$10,579	20	Low-Moderate
LaMoure	8	59	$0	$0	$549,557	3.6	$30,060,000	$123,335,000	$14,522	$16,317	$1,632	19	Low-Moderate
Logan	10	49	$123,000	$9,462	$265,260	2	$44,967,000	$39,574,000	$25,130	$28,236	$2,824	18	Low-Moderate
McHenry	8	73	$100,000	$7,692	$579,726	2.9	$43,672,000	$90,288,000	$16,163	$18,161	$1,816	19	Low-Moderate
McIntosh	10	47	$2,300,000	$176,923	$424,691	2.9	$25,877,000	$49,985,000	$9,707	$10,907	$1,091	18	Low-Moderate
McKenzie	8	59	$859,000	$66,077	$563,420	2.3	$28,005,000	$50,115,000	$7,294	$8,196	$820	16	Low-Moderate
McLean	8	62	$450,000	$34,615	$1,160,771	4.2	$17,593,000	$145,847,000	$73,668	$82,773	$8,277	23	Moderate
Mercer	4	55	$203,000	$15,615	$1,027,056	8.1	$15,446,000	$24,622,000	$15,063	$16,925	$1,692	11	Low
Morton	4	57	$18,816,000	$1,447,385	$2,509,973	14.3	$56,448,000	$60,803,000	$58,873	$66,149	$6,615	26	Moderate
Mountrail	10	62	$729,000	$56,077	$706,495	4.2	$15,256,000	$92,746,000	$13,186	$14,816	$1,482	20	Low-Moderate
Nelson	10	72	$2,000	$154	$486,024	3.2	$8,036,000	$77,333,000	$1,093	$1,228	$123	20	Low-Moderate
Oliver	4	49	$1,271,000	$97,769	$193,161	2.6	$29,063,000	$24,326,000		$0	$0	10	Low
Pembina	6	75	$402,000	$30,923	$1,211,523	6.6	$6,323,000	$229,298,000	$52,918	$59,458	$5,946	26	Moderate
Pierce	10	65	$110,000	$8,462	$627,541	4.3	$14,011,000	$58,702,000	$5,707	$6,412	$641	20	Low-Moderate
Ramsey	10	79	$414,000	$31,846	$1,416,002	9.6	$2,470,000	$122,100,000	$104,404	$117,308	$11,731	28	Moderate-High
Ransom	8	79	$272,000	$20,923	$693,175	6.3	$21,255,000	$72,103,000	$21,324	$23,960	$2,396	19	Low-Moderate
Renville	6	67	$108,000	$8,308	$373,051	2.8	$3,237,000	$103,034,000	$3,523	$3,958	$396	17	Low-Moderate
Richland	4	81	$2,023,000	$155,615	$2,381,906	11.4	$32,687,000	$228,812,000	$48,629	$54,639	$5,464	27	Moderate
Rolette	10	67	$100,000	$7,692	$979,534	15.4	$13,779,000	$52,837,000		$0	$0	20	Low-Moderate

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Sargent	6	73	$272,000	$20,923	$521,880	4.5	$23,376,000	$104,365,000	$59,482	$66,834	$6,683	19	Low-Moderate
Sheridan	10	58	$700,000	$53,846	$176,746	1.4	$8,746,000	$43,742,000	$6,448	$7,245	$724	18	Low-Moderate
Sioux	10	46	$8,850,000	$680,769	$202,998	3.8	$21,171,000	$11,148,000	$43,534	$48,915	$4,891	22	Moderate
Slope	8	41	$998,000	$76,769	$61,939	0.6	$16,222,000	$31,423,000	$5,362	$6,025	$602	14	Low
Stark	6	45	$685,000	$52,692	$2,581,806	18.1	$33,138,000	$63,674,000	$187,787	$210,997	$21,100	25	Moderate
Steele	4	70	$2,000	$154	$283,664	2.8	$2,398,000	$99,946,000	$38,562	$43,328	$4,333	16	Low-Moderate
Stutsman	8	59	$0	$0	$2,378,397	9.5	$29,713,000	$168,570,000	$15,140	$17,011	$1,701	23	Moderate
Towner	10	74	$414,000	$31,846	$408,054	2.2	$11,139,000	$96,333,000	$1,673	$1,880	$188	22	Moderate
Traill	8	70	$3,000	$231	$1,208,293	9.4	$5,677,000	$177,193,000	$1,189	$1,336	$134	23	Moderate
Walsh	8	147	402000	$30,923	$1,671,790	8.7	$4,444,000	$218,090,000	$19,823	$22,273	$2,227	31	Moderate-High
Ward	4	70	$300,000	$23,077	$6,480,432	30.6	$14,110,000	$153,487,000	$51,762	$58,160	$5,816	25	Moderate
Wells	10	64	$0	$0	$640,656	3.3	$11,906,000	$132,852,000		$0	$0	23	Moderate
Williams	6	54	$1,235,000	$95,000	$2,723,413	10.8	$11,341,000	$115,992,000	$30,494	$34,263	$3,426	20	Low-Moderate

Figure 5.92. Vulnerability to Severe Winter Weather by County



Loss Estimates

Based on NCDC 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. Damages from severe winter storm events between 2000 and 2013 in NCDC included $68,875,000 in property damages, 6 direct deaths, and 16 direct injuries. Based on these numbers, North Dakota could expect roughly $5,298,077 in average annual property damages from severe winter storms.

As mentioned previously, total crop insurance payments for insurable crops due to cold winter in North Dakota totaled $1,964,031 between 2003 and 2012. According to the 2011 North Dakota Crop Insurance Profile Report issued by the USDA Risk Management Agency, 89 percent 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 winter from 2003-2012 totaled $2,206,776, or about $220,678 annually. (Risk Management Agency, 2003-2012)

5.9.6. Local Risk Assessments

Table 5.107 provides information from local and tribal mitigation plans regarding the local hazard rating as well as additional information provided regarding severe winter weather vulnerability and/or estimated losses. As indicated in the Severe Winter Weather Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. Another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.107. Severe Winter Weather Risk Summary from Local Plans

County	Winter Storm Hazard Rating	Winter Storm Additional Information
Adams	A	$42,600,000 estimated losses
Barnes	A	$32,713,497 estimated structure and contents loss
Benson	A	
Billings	C	
Bottineau	A	$28,372,927 estimated losses
Bowman	A	$5,272,143 estimated losses
Burke	A	$4,400,000 estimated losses
Burleigh	B	$53,530,492 critical facilities losses, $138,679,206 residential losses
Cass	B	$26,135,387,309 estimated losses
Cavalier	High	
Dickey	B	
Divide	NP	
Dunn	A	
Eddy	A	$30,879,346.19 estimated losses
Emmons	A	
*Fort Berthold^*	*CPRI 3.55*	
Foster	A	$28,372,926.93 estimated losses
Golden Valley	A	
Grand Forks	A	
Grant	A	
Griggs	A	$4,700,000 estimated losses
Hettinger	A	
Kidder	A	$8,100,000 estimated losses
*Lake Traverse^*	*NP*	
LaMoure	#1 of 12	
Logan	A	$2,626,974 estimated losses
McHenry	A	$10,929,376.33 estimated losses
McIntosh	B	$12,544,819 estimated losses
McKenzie	NP	
McLean	A	
Mercer	A	
Morton	A	
Mountrail	A	$5,700,000 estimated losses

County	Winter Storm Hazard Rating	Winter Storm Additional Information
Nelson	A	$11,543,038 estimated losses
Oliver	A	
Pembina	A	$83,433,626 estimated losses
Pierce	A	
Ramsey	A	
Ransom	High	
Renville	A	$51,953,872.59 estimated losses
Richland	A	
Rolette	A	$13,505,862.87 estimated losses
Sargent	A	$12,978,646 estimated losses
Sheridan	NP	
Sioux	*Very Likely*	
Slope	A	$99,594 estimated losses
Spirit Lake	Moderate High	
*Standing Rock^*	*Very Likely*	
Stark	NP	
Steele	NP	
Stutsman	C	$98,309,309.96 estimated losses
Towner	A	$5,326,879.74 estimated losses
Traill	A	$28,372,926.93 estimated losses
Turtle Mountain^	CPRI 3.25	
Walsh	A	
Ward	A	$259,603,707 estimated losses
Wells	A	$15,570,523.39 estimated losses
Williams	A	$26,585,512 estimated losses

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.9.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

Most structures usually remain unaffected by winter weather with the primary exceptions being heavy snow loads, frozen pipes, or other utility failure. 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 5.132** in the Urban Fire or Structure Collapse Hazard Profile 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.

Extremely cold temperatures may cause pipes to freeze and subsequently burst, causing water damage. Probably the greatest issue 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 electric 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.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.9.8. Development in Identified Hazard Areas

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 be placed in those areas. Chapter 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.

In some ways increased populations add to the challenges of dealing with severe winter weather. A higher number of people may be susceptible to vehicle accidents on snowy or icy roads. 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 5.108** shows the areas with population increases from 2000 to 2010 and **Table 5.109** the areas with projected 40 percent and greater population increases from 2010 to 2025 that create a higher demand for electricity and essential services that can be knocked out during a power outage from severe winter weather.

Table 5.108. Area Population Increases from 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	123,138	149,778	26,640	21.60%
Burleigh County	69,416	81,308	11,892	17.10%
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	19,761	22,398	2,637	13.30%
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Stark County	22,636	24,199	1,563	6.90%
Ward County	58,795	61,675	2,880	4.90%
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	66,109	66,861	752	1.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.109. Area Projected 40 Percent and Greater Population Increases from 2010 to 2025.

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	22,398	51,106	28,708	128.20%
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.9.9. Data Limitations and Other Key Documents

Since major winter storms occur frequently in North Dakota, but do not always cause significant damages, 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 damages, 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 Emergency Operations Plan

5.10. Shortage or Outage of Critical Materials or Infrastructure

Hazard Rating	THIRA Threat/Hazard Group
Moderate	Technological/Adversarial

5.10.1. Description

A shortage or outage of critical materials or infrastructure occurs when the demand for a life sustaining product exceeds the supply. These shortages and outages may include a wide variety of resources including energy-related products, power transmission, medical products, food, and water.

The disruption of the critical material supply system may be caused by weather conditions (severe low temperatures, ice/winter storm high winds, space weather such as solar flares), other natural disasters such as flooding and tornadoes, lack of infrastructure maintenance, human error, global conflict, oil embargo, major work stoppage, cyber security or a national security emergency. Any disruption, regardless of the cause could have immediate adverse impacts as well as severely diminish existing supplies, thereby threatening the long term health, safety, and well-being of North Dakota citizens.

Examples of shortages or outages of critical material or infrastructure include:

- Widespread and prolonged electric power failure that impacts both day-to-day and emergency capabilities.
- A lack of transportation fuels causing surface movement gridlock and disruption of commerce.
- Diminished supplies of heating fuels during the winter causing severe economic and health impacts.
- A lack of medical supplies especially vaccines, antibiotics, and anti-viral medications posing a public health and safety threat.
- Private hoarding, compounding a shortage problem.
- A lack of adequate food, water, and shelter.

The public has come to rely upon utility, communication, and fuel services for everyday life and basic survival. Many in North Dakota depend on the typical utility and communication infrastructure such as water, sewer, electricity, propane, natural gas, telephone, internet, and gasoline. Water and sewer services are either provided through a public system or through individual wells and septic systems. Electricity is primarily provided by regional electric companies through overhead or buried lines. Homes and businesses are heated with fuels such as natural gas, propane, oil, and electricity. Those buildings heated with propane or oil typically have a nearby tank that is refilled regularly by a local vendor but still rely on electricity to power their heating systems. Natural gas is provided through underground piping. Telephone, cellular telephone, and internet services are provided by several local and national companies. Privately-owned gas stations are located throughout the State.

Almost any hazard can cause a shortage or outage of critical materials or infrastructure, but disruptions can also occur due to human error, equipment failures, or low supplies. The ability to restore services may also depend on the ability of repair crews to access the affected areas. In the case of a quarantine or pandemic, repair crews may not be available to quickly restore services. The most common hazards that interrupt electric services are heavy snow, ice, and wind. Water supplies may be threatened by drought. Sewer services can be disrupted by flood. Often these types of outages are short lived. Crews quickly respond and resolve the problem causing the outage. During a widespread or complicated outage, services may be down for days or even weeks. Most problems arise during these longer term outages. For example, electricity is needed to maintain water supplies and sewer systems, but also to run blowers for heating systems. Essentially, without electricity, most facilities are without heat, water, fuel, or other appliances during a long term outage. This problem becomes particularly significant in North Dakota during the cold winter months. Telephone services are important for day-to-day business, but are most important for 911 communications in an emergency. Without telephone service, emergency services can be severely delayed. In most cases, a long term utility outage would force many businesses to close until the services were restored. Gasoline shortages are also common during times of disaster.

Space Weather

According to the NOAA Space Weather Prediction Center, Space Weather is 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 severe space weather. These are storms that originate from the sun and occur in space near Earth or in the Earth's atmosphere. Most of the disruptions can be categorized into three types of events that can have environmental effects on Earth. They are: geomagnetic storms, solar radiation storms, and radio blackouts. The effects of these storms are discussed in the State Vulnerability Section.

5.10.2. Geographic Location

Essentially all jurisdictions rely on critical materials and infrastructure in some fashion. **Table 5.111** in the State Risk Assessment Section show the dependence of the counties on the various home heating fuels and **Table 5.112** shows the population at risk. 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.

5.10.3. Previous Occurrences

North Dakota has experienced three separate major statewide incidents involving shortages of critical materials:

- 1970s Oil Embargo – International events caused the price of gasoline to rise significantly, and many Americans experienced long lines at gas stations and were rationed in the amount of gasoline they were able to buy. During the oil embargo, a "state of disaster emergency" was declared to meet the dangers inherent from a critical fuel shortage to the citizens of North Dakota. As a result, the following steps were immediately implemented by all state agencies to conserve energy resources:
    - Provisions to eliminate duplication of travel were implemented.
    - Fuel-efficient policies regarding the use of and purchase of state vehicles were implemented.
    - Temperature control limits and regulations were set for all state buildings.
    - Lighting controls and regulations were set for all state buildings.
    - Energy conservation public information was coordinated among state agencies and targeted to all residents of North Dakota.

  A fuel allocation program was established under federal authority whereby 3 percent of motor gasoline and 4 percent of middle distillate fuels brought into the State were "set aside" to be reallocated to retailers who were experiencing temporary shortages.

- 1970s Anti-Freeze Shortage – The anti-freeze shortage occurred prior to and during the winter months when it is critical to protect cooling system liquids from freezing in automobile engines. Distributors were able to receive ample stocks, but state officials monitored the situation and prepared to activate the State Emergency Operations Plan, which would have allowed them to exercise control over existing supplies, making sure the needs of all citizens were addressed. Because of this situation, state officials monitor distribution of this product annually to ensure proper supply.
- 1980s Farm Fertilizer Shortage – During the fertilizer shortage, phosphate, one of three primary ingredients used in farm fertilizers, was in short supply. Fertilizer has become an absolute necessity to maintain agricultural production levels, which aid in stabilizing the State's economy. State officials monitored the situation and were prepared to activate the State Emergency Operations Plan to exercise controls over phosphate supplies. Much the same as during the anti-freeze shortage, specific actions were not required, but State Agriculture Department officials monitored distribution of farm fertilizers to ensure adequate supplies. Agriculture officials monitor fertilizer supplies on a yearly basis to ensure that timely actions are implemented to avert a shortage.
- Yearly power outages – occur that the utility companies classify as major events. These events will vary in magnitude and duration, most of them have been weather related, ice, wind, tornado are the common causes, most occur between October 1 and June 1 however

summer wind storms and tornados are also relatively common. Other causes for these events include accidents, vandalism, and terrorism.

Winter storms (and early spring) are often the most difficult to manage and cause the most hardship for residents. Some of these storms in the past have been relatively minor and may only cause outages for 100 accounts or less that last less than 48 hours and the cost of restoration may be less than $100,000. Other major winter storms may affect thousands of residents with outages lasting several weeks for some. The cost of system restoration following major storms has often been in the millions of dollars. The magnitude of these storms and the damage they cause varies widely and is extremely difficult to predict. Utility companies monitor when a storm is on the way but have difficulty predicting the extent of the damage.

- 2009-2010 Winter Electric Outages – Two devastating storms caused severe and prolonged electric outages in rural areas. One cooperative, Mor-Gran-Sou Electric, headquartered in Flasher, lost over 500 miles of line with over 10,000 downed poles. Some customers were out of power for nearly one month according to the North Dakota Association of Rural Electric Cooperatives.

Table 5.110 lists the State Executive Order declarations dealing with a shortage or outage of critical materials or infrastructure.

Table 5.110. North Dakota Shortage or Outage of Critical Materials or Infrastructure Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
State EO	North Dakota	1998	State Declared Critical Shortage of Livestock Feed	Unknown	Unknown

Space Weather

There are no recorded space weather effects in North Dakota. The nearest storm affected Montreal, Canada on March 13, 1989 when a geomagnetic storm took out their commercial electric power for 9 hours.

5.10.4. Probability and Magnitude

Figure 5.93 is a graphical representation of the range of events that can occur within the shortage or outage of critical materials or infrastructure hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the shortage or outage of critical materials or infrastructure hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.93. Hazard Frequency and Impact Ranges

Frequency				
No regional history				Statewide Loss of Food or Water
No local history				
100 years		Fuel Rationing	Extended Winter Power Outage	
50 years	Short-lived Power Outage			
Annually				
	Negligible	Limited	Critical	Catastrophic
		Impact		

Power outages of some magnitude are an annual event in most all areas. The probability of a more widespread, prolonged event is less certain but is more frequent during other hazard events. The probability can also be broken down by service type. Electric power outages are the most common, but significant water, sewer, communications, heat, propane, internet, or fuel outages can also occur, with somewhat lower probability. Since 1970, three major material shortages and several extended power outages have occurred in the State.

Possibly the most significant outage scenario for North Dakota is the loss of electricity for a week or more during a particularly cold winter spell. Without generators, an extended power outage could additionally lead to the loss of running water, sewer services, and the ability to heat buildings. Any equipment such as medical equipment, computers, and cell phones requiring power to run would eventually be incapacitated. Those facilities with generators would still be able to use appliances, equipment, and heating 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. Fuel and other material shortages would primarily affect the economy.

Space Weather

According to the NERC's Geomagnetic Disturbance Reference Document, "there are 200 days over the 11-year solar cycle with strong-severe geomagnetic storms, and approximately 4 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. We usually see most of the solar storms during a 4-6 year period that we refer to as a solar maximum. The next solar cycle – Solar Cycle 24 – is expected to reach its maximum phase in 2013." 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, geomagnetic storms are considered to be High Impact, Low Frequency (HILF) events, meaning that they occur relatively rarely but can have serious impacts when they do happen.

5.10.5. State Risk Assessment

Vulnerability Overview

Major storms that take bulk transmission lines down can affect the grid and cause outages covering a wide area. When this happens, outages often become lengthy and restoration becomes much more difficult. Most storms will cause damage to sub-transmission line and overhead distribution lines. The failure of sub-transmission lines causes the loss of substations which will extend outages because alternate sources are often not available and distribution feeders are also down. If the distribution feeders are underground they usually remain on-line as long as the substation has power.

The length of outages is often increased because of blocked roads, the need for snow removal or mud. It is often necessary to arrange for non utility equipment to be available to pull utility trucks from pole to pole. Lodging and hot food can become a serious issue during these events. If the area has no power, restaurants and motels are forced to close and crews have to travel significant distances to find food and lodging. Some residents, both farm and business, will have stand-by generators but the majority of residents do not. Local utilities do not have generators available for use during these events.

Communications towers often have stand-by generators. However these towers are often located on a high point which is not necessarily near a well traveled road. If the outage becomes extended the generator will often run out of fuel and it can be extremely difficult to gain access to the site.

Utilities use their own crews, contractors, mutual aid from other utilities in the State and occasionally crews from neighboring states to restore the system during the emergency period. After power is restored to all customers, the remaining system restoration is completed by the Utilities crews and contractors. **Figure 5.94** shows a Northern Plains Rural Electric Cooperative crew making repairs to electrical poles and lines.

Figure 5.94. Northern Plains Rural Electric Cooperative Utility Crew Making Repairs from Winter Storm

Source: NDDES, Photo Credit to Gary Allen, Northern Plains Rural Electric Cooperative

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.

Propane, natural gas, fuel oil, and electricity are critical for heat, especially during the cold winter months. Approximately, 115,000 housing units in North Dakota rely on natural gas for heat, 27,000 rely on propane, 101,000 rely on electric heat, and 14,000 rely on fuel oil/kerosene. 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 it also essential in drill a well with the hydraulic fracturing. Food processing similarly requires large amounts of water. Sewer is needed for sanitation. Grocery stores are the most common means of distributing the nation's food supply and pharmacies deliver medications. Each is important for health and safety. 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.

The economy depends heavily on utility and communication services. Electricity alone powers many systems used in day-to-day business. Businesses, such as restaurants, require electricity and water to operate. Without these services, many businesses could be shut down. Closed businesses and government offices essentially put the economy at a standstill until services are restored. Fuel shortages due to a power outage, low supplies, high prices, or transportation closures, could have lasting effects on everyone from the individual commuter to any business that ships inventory. Ultimately, the economy has a high dependence on utility or communications services.

Social values such as going from one place to another could be disrupted by a fuel shortage or transportation closure. Other social events may be cancelled due to the reliance on the utility services. Otherwise, ecological and historical values would remain unaffected.

Table 5.111 shows the dependence of the counties on the various home heating fuels

Table 5.111. North Dakota Number of Housing Units by Home Heating Fuel by County

County	Utility Gas	Bottled, tank, or LP gas	Electricity	Fuel oil, kerosene, etc.	Coal or coke	Wood	Solar Energy	Other Fuel	No Fuel Use	Housing Units Per County
Adams	208	421	361	54	8	19	0	26	0	1,097
Barnes	1,424	626	2,328	270	3	32	0	43	32	4,758
Benson	88	1,024	910	221	4	32	0	21	0	2,300
Billings	10	152	142	34	3	17	0	6	0	364
Bottineau	43	903	1,581	389	16	25	0	32	10	2,999
Bowman	720	263	228	70	10	0	5	21	0	1,317
Burke	102	497	325	34	16	2	0	10	3	989
Burleigh	22,349	2,551	7,276	215	114	58	0	566	308	33,437
Cass	25,217	2,142	33,354	1,995	13	97	0	485	598	63,901
Cavalier	562	302	674	151	7	13	0	0	4	1,713
Dickey	44	917	838	286	0	34	0	37	0	2,156
Divide	43	403	326	189	36	0	0	10	16	1,023
Dunn	226	510	446	122	24	18	0	13	0	1,359
Eddy	549	109	232	56	10	0	0	41	0	997
Emmons	249	324	538	376	0	13	0	104	14	1,618
Foster	651	248	519	62	0	0	0	10	16	1,506
Golden Valley	463	105	127	18	6	5	0	9	0	733
Grand Forks	11,792	1,847	11,374	718	86	114	39	459	331	26,760
Grant	12	662	251	154	45	24	0	25	2	1,175
Griggs	10	223	560	239	0	24	0	30	0	1,086
Hettinger	589	187	240	24	15	7	0	9	2	1,073
Kidder	350	295	266	116	7	17	0	90	11	1,152
LaMoure	32	475	931	431	2	25	0	18	9	1,923
Logan	6	159	375	250	7	2	4	45	0	848
McHenry	151	1,005	849	407	22	47	0	30	4	2,515
McIntosh	12	313	408	521	3	16	0	25	3	1,301
McKenzie	838	860	784	16	13	39	0	0	16	2,566
McLean	1,699	821	1,098	97	40	53	0	87	9	3,904
Mercer	116	1,479	1,718	90	170	23	0	39	27	3,662
Morton	7,263	1,506	1,569	129	110	36	0	249	56	10,918
Mountrail	669	1,126	952	76	13	19	0	20	10	2,885
Nelson	29	284	724	372	0	3	0	4	27	1,443
Oliver	6	437	232	6	53	11	0	13	15	773
Pembina	950	733	1,026	497	0	45	0	42	11	3,304
Pierce	21	515	922	428	12	47	0	6	0	1,951

County	Utility Gas	Bottled, tank, or LP gas	Electricity	Fuel oil, kerosene, etc.	Coal or coke	Wood	Solar Energy	Other Fuel	No Fuel Use	Housing Units Per County
Ramsey	2,250	639	1,558	237	0	8	0	30	85	4,807
Ransom	42	519	1,102	502	0	100	0	38	4	2,307
Renville	40	646	323	39	7	32	0	8	3	1,098
Richland	1,456	1,351	2,638	838	2	61	0	89	48	6,483
Rolette	79	1,563	2,469	292	6	180	0	11	19	4,619
Sargent	11	622	626	416	0	16	0	15	9	1,715
Sheridan	4	257	225	54	10	2	0	56	0	608
Sioux	53	866	82	45	5	5	0	11	0	1,067
Slope	72	143	55	17	4	6	0	2	7	306
Stark	5,624	664	3,053	103	96	55	0	71	127	9,793
Steele	13	235	373	190	0	14	3	8	0	836
Stutsman	4,840	1,090	2,056	321	19	54	0	64	130	8,574
Towner	18	198	574	158	17	17	0	10	0	992
Traill	100	1,052	1,578	507	0	50	4	70	14	3,375
Walsh	1,669	569	1,821	565	0	67	0	102	32	4,825
Ward	16,354	1,793	5,534	260	119	59	0	156	178	24,453
Wells	56	1,000	644	293	12	5	0	21	1	2,032
Williams	5,421	1,122	2,467	52	33	51	0	108	19	9,273
Statewide Per Fuel Type	**115,595**	**27,225**	**101,662**	**14,002**	**1,198**	**1,699**	**55**	**3,495**	**2,210**	**278,669**

Source: American Community Survey, 2007-2011, House Heating Fuel

The ratings provided in **Table 5.112** reflect the population by county at risk, and therefore, the number of people that would be affected should a shortage or outage occur. The ratings are "low" for populations less than 4,000, "low-moderate" for populations of 4,001 to 9,000, "moderate" for populations of 9,001 to 16,000, "moderate-high" for populations of 16,001 to 27,000, and "high" for populations of greater than 27,001 based on the 2010 U.S. Census information. Determining the probability that a shortage or outage will occur in a given area is not practical or feasible.

Table 5.112. Shortage or Outage of Critical Materials or Infrastructure Risk to Jurisdictions

County	Shortage or Outage of Critical Materials or Infrastructure Hazard
Adams	Low
Barnes	Moderate
Benson	Low-Moderate
Billings	Low
Bottineau	Low-Moderate
Bowman	Low
Burke	Low
Burleigh	High
Cass	High
Cavalier	Low
Dickey	Low-Moderate
Divide	Low
Dunn	Low
Eddy	Low

County	Shortage or Outage of Critical Materials or Infrastructure Hazard
Emmons	Low
Fort Berthold^	Low-Moderate
Foster	Low
Golden Valley	Low
Grand Forks	High
Grant	Low
Griggs	Low
Hettinger	Low
Kidder	Low
Lake Traverse^	Low
LaMoure	Low-Moderate
Logan	Low
McHenry	Low-Moderate
McIntosh	Low
McKenzie	Low-Moderate
McLean	Low-Moderate
Mercer	Low-Moderate
Morton	High
Mountrail	Low-Moderate
Nelson	Low
Oliver	Low
Pembina	Low-Moderate
Pierce	Low-Moderate
Ramsey	Moderate
Ransom	Low-Moderate
Renville	Low
Richland	Moderate-High
Rolette	Moderate
Sargent	Low
Sheridan	Low
Sioux	Low-Moderate
Slope	Low
Spirit Lake	Low-Moderate
Standing Rock^	Low-Moderate
Stark	Moderate-High
Steele	Low
Stutsman	Moderate-High
Towner	Low
Traill	Low-Moderate
Turtle Mountain^	Low-Moderate
Walsh	Moderate
Ward	High
Wells	Low-Moderate
Williams	Moderate-High

Note: ^ includes only North Dakota parts of the reservation

The counties of Burleigh, Cass, Grand Forks, Morton and Ward are ranked “High” for vulnerability based on their population being over 27,001.

Space Weather

Space weather storms mainly disrupt technology. As our society becomes more dependent and sophisticated with our technologies, our vulnerability to space weather storms increases as well. 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 5.113 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 5.113. NOAA Space Weather Scale for Geomagnetic Storms

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values*	Number of storm events when Kp level was met; (number of storm days)
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)

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values*	Number of storm events when Kp level was met; (number of storm days)
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)
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 GeoForschungsZentrum (GFZ) (Research Center for Geosciences).
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings

Table 5.114 describes the S1-S5 severity scale as elevated levels of radiation occurs as the numbers of energetic particles increases. The possible biological effects on are people, satellite operations, and other operation systems from the Solar Radiation Storm.

Table 5.114. NOAA Space Weather Scale for Solar Radiation Storms

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Solar Radiation Storms			Flux level of >= 10 MeV particles (ions)*	Number of events when flux level was met (number of storm days**)
S 5	**Extreme**	**Biological:** unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); 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 the polar regions and navigation at polar cap locations possibly affected.	10^2	25 per cycle

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Solar Radiation Storms			Flux level of >= 10 MeV particles (ions)*	Number of events when flux level was met (number of storm days**)
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.

Table 5.115 describes the R1-R5 severity scale disturbances of the ionosphere caused by X-ray emissions from the Sun. The possible effects can be on high frequency radios and navigation.

Table 5.115. NOAA Space Weather Scale for Radio Blackouts

Category		Effect	Physical measure	Average Frequency (1 cycle=11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Radio Blackouts			GOES X-ray peak brightness by class and by flux*	Number of events when flux level was met; (number of storm days)
R 5	**Extreme**	**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 en route 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 x 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 navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)

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·m^{-2}. Based on this measure, but other physical measures are also considered.
** Other frequencies may also be affected by these conditions.

Loss Estimates

Since infrastructure outage is generally a secondary or cascading impact of other hazards, it is not possible to quantify estimated potential losses specific to this hazard due to the variables associated with affected population, duration of outages, etc.

Although the limitless variables make it difficult to estimate future losses on a statewide basis, FEMA has developed standard loss of use estimates in conjunction with their Benefit-Cost Analysis methodologies to estimate the cost of lost utilities on a per-person, per-use basis (See **Table 5.116**).

Table 5.116. FEMA Standard Values for Loss of Service for Utilities and Roads/Bridges

Loss of Electric Power	Cost of Complete Loss of Service
Economic Impact	$126 per person per day
Loss of Potable Water Service	Cost of Complete Loss of Service
Economic Impact	$93 per person per day
Loss of Wastewater Service	Cost of Complete Loss of Service
Economic Impact	$41 per person per day
Loss of Road/Bridge Service	Cost of Complete Loss of Service
Vehicle Delay Detour Time	$38.15 per vehicle per hour
Vehicle Delay Mileage	$0.55 per mile (or current federal mileage rate)

Source: FEMA BCA Reference Guide, June 2009, Appendix C

5.10.6. Local Risk Assessments

Table 5.117 provides information from local and tribal mitigation plans regarding the local hazard rating. Local plans did not provide additional information provided regarding shortage or outage of critical materials or infrastructure estimated losses. As indicated in the Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.117. Shortage or Outage of Critical Materials or Infrastructure Risk Summary from Local Plans

County	Shortage or Outage of Critical Material or Infrastructure Hazard Rating
Adams	C
Barnes	B
Benson	B
Billings	D
Bottineau	D
Bowman	B
Burke	C
Burleigh	B
Cass	C
Cavalier	NL
Dickey	B
Divide	NP
Dunn	D
Eddy	D
Emmons	B
*Fort Berthold^*	*NI*
Foster	D
Golden Valley	C
Grand Forks	B
Grant	C
Griggs	D
Hettinger	NL
Kidder	D
*Lake Traverse^*	*NP*
LaMoure	#2 of 12
Logan	B
McHenry	B
McIntosh	B
McKenzie	NP
McLean	D
Mercer	D
Morton	B
Mountrail	B
Nelson	D
Oliver	D
Pembina	B
Pierce	C
Ramsey	B
Ransom	Low
Renville	D
Richland	B
Rolette	B
Sargent	C
Sheridan	NP
Sioux	*Unlikely*
Slope	B
Spirit Lake	Moderate

County	Shortage or Outage of Critical Material or Infrastructure Hazard Rating
*Standing Rock^*	*Unlikely*
Stark	NP
Steele	NP
Stutsman	D
Towner	B
Traill	D
Turtle Mountain^	NI
Walsh	B
Ward	C
Wells	D
Williams	D

Source: Local Hazard Mitigation Plans as of June 2013; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.10.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

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. Generally, structures are not directly affected by critical material or infrastructure shortages or outages, but in some cases, direct damages may result.

Critical material or infrastructure outages do not often affect structures; however, an electric outage during winter could result in frozen and burst water pipes, causing water damage within the interiors of critical facilities. A propane, natural gas, or fuel oil outage could produce similar results. The failure of a sewer lift station could lead to a system back-up, and structures without sewer backflow valves could experience damages from sewer backwater; other structures could be flooded by overflowing sewage.

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. Special needs facilities may need to move occupants to alternate locations due their dependence on local utilities.

Infrastructure supports utility and communication services. Therefore, outages or failures are often related to problems with the infrastructure. Minor damages or problems may indicate a short-term outage whereas large-scale damages may suggest a long term outage. 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 electric 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 a geomagnetic-related energy disruption on the critical facilities and infrastructure in North Dakota is difficult to determine. The impact would largely depend on the number of people served by a particular electric grid, as well as the electric provider's ability to repair the grid in a timely manner.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.10.8. Development in Identified Hazard Areas

New and future development may have significant impacts on the shortage or outage of critical materials or infrastructure hazard. In particular, with the large population growth in western North Dakota has created an unusually high demand for electricity. As the projected demand for electricity increases, the electrical providers are in the process of adding capacity and upgrading transmission lines.

Increased populations add to the challenges of managing a utility outage and a shortage or outage of critical materials. **Table 5.118** shows the areas with population increases from 2000 to 2010 and **Table 5.119** the areas with projected 40 percent and greater population increases from 2010 to 2025 that create a higher demand for electricity and essential services.

Table 5.118. Area Population Increases from 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	123,138	149,778	26,640	21.60%
Burleigh County	69,416	81,308	11,892	17.10%
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	19,761	22,398	2,637	13.30%
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	22,636	24,199	1,563	6.90%
Ward County	58,795	61,675	2,880	4.90%
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	66,109	66,861	752	1.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.119. Area Projected 40 Percent and Greater Population Increases from 2010 to 2025.

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	22,398	51,106	28,708	128.20%
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

All the counties with project population increases from 2010 to 2025 are all in the oil producing counties except Hettinger County. Though Hettinger County is adjacent to oil production and oil drilling is anticipated in the near future. The following is the list of the 17 oil producing counties as of June 2013:

- Billings
- Bottineau
- Bowman
- Burke
- Divide
- Dunn
- Golden Valley
- McHenry
- McKenzie
- McLean
- Mercer
- Mountrail
- Renville
- Slope
- Stark
- Ward
- Williams

Utility services are being stressed beyond capacity in these oil producing counties and have a higher probability of a shortage occurring in the short term as utilities are trying to construct larger capability facilities and the infrastructure to support it.

5.10.9. Data Limitations and Other Key Documents

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 hazard include:

- North Dakota Emergency Operations Plan, Shortage of Critical Materials Annex
- North Dakota Energy Emergency Response Plan Update, N.D. 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

5.11. Transportation Accident (Including Vehicular, Railway, and Aircraft Accidents)

Hazard Rank	THIRA Threat/Hazard Group
Low	Technological

5.11.1. Description

A transportation accident, for the purposes of this plan, is any large-scale vehicular, railroad, or aircraft 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.

Transportation incidents in North Dakota are the same as most states. Passenger and cargo trains, bus and other highway vehicles, and passenger and cargo airplanes pose the highest risks. 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.

Federal and state highways, tribal, county, city, and township roadways, active railways, airports, and air traffic routes pass through North Dakota. **Figure 5.95** 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 105,000 miles of road and 5,026 bridges, including 18 international highway ports of entry along the Canadian border.

Railroads in North Dakota include Amtrak for passenger service and 3,346 freight railroad miles operated by BNSF Railway, Canadian Pacific 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 with 72 paved and 17 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 single engine incidents to large commercial crashes. The location of the accident, such as a remote area versus a populated location, also plays an important role in the amount of destruction.

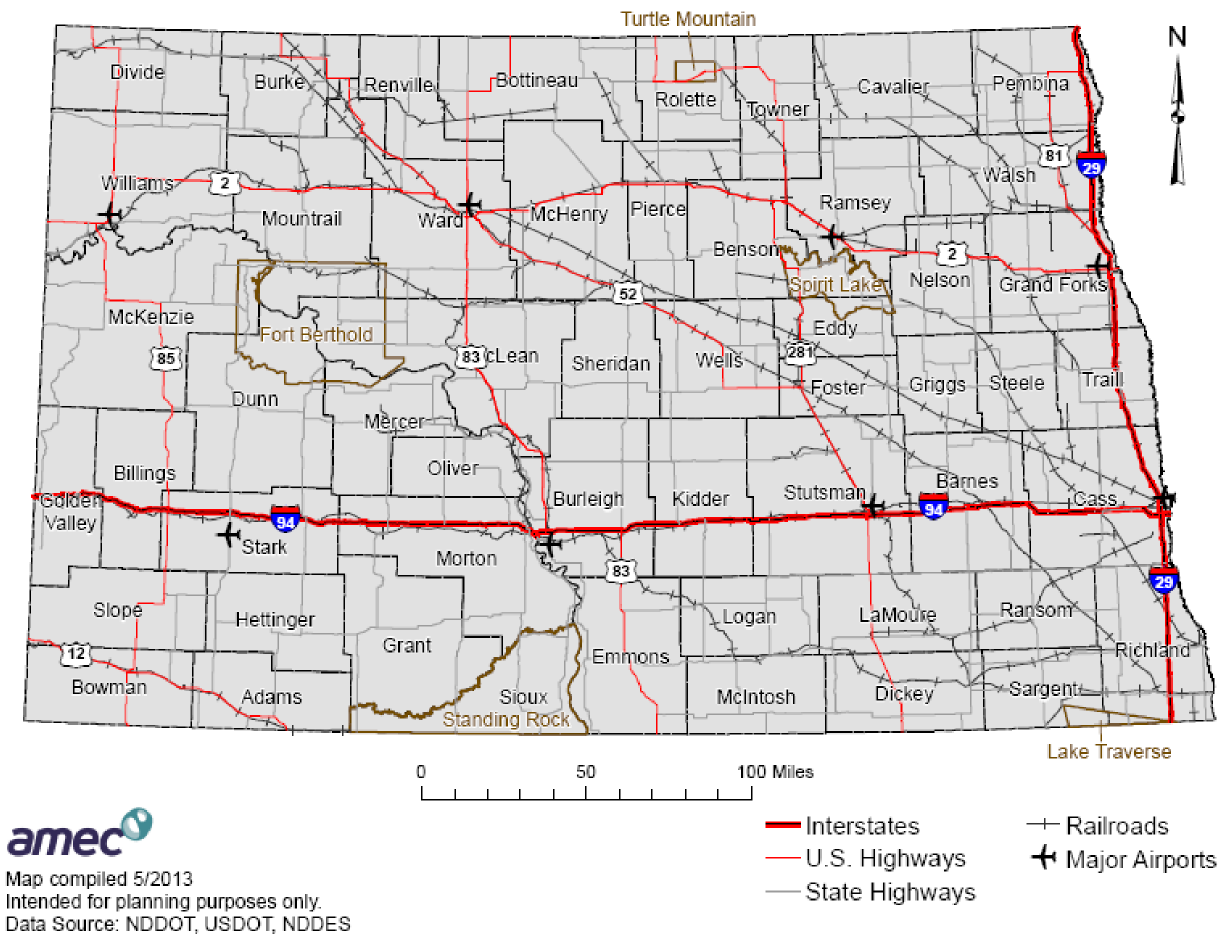
Probably the most significant and common hazard associated with transportation accidents is the release of hazardous materials. Many hazardous material releases occur as an element of a transportation accident. Any transportation accident involving the release of hazardous materials significantly increases the complexity and potential damages from such an accident. Transportation accidents can also occur independently due to poor operator judgment or equipment problems.

Many times, weather hazards lead to transportation accidents. Examples include winter weather when snow and ice make roadways slick. Blizzards, smoke, and dust storms can lead to reduced visibilities and increase the probability of an accident. Floods may damage the infrastructure of transportation networks. Summer storms can cause confusion, reduce visibilities, damage infrastructure, and knock down trees and poles, blocking roadways. Terrorists have used transportation, particularly mass transportation, as a method of delivering their attacks throughout the world. Should above-ground electric or telephone infrastructure be damaged in a transportation accident, it could lead to a long-term utility or communication outage. Almost any hazard can cause or aggravate a mass casualty transportation incident.

5.11.2. Geographic Location

Figure 5.95 shows the major road, rail, and airport networks in the State. Theoretically, the more highly used transportation infrastructure that exists in a given area, the more likely a significant transportation accident will occur.

Figure 5.95. Transportation in North Dakota



The Canadian Pacific train operations are regularly interrupted from flooded conditions along several areas in the State. Those areas are:

- 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 Enderline (Ransom & Cass Counties) along the Maple River,
- City of Kensal (Stutsman County) along the James River.

5.11.3. Previous Occurrences

Transportation accidents involving mass casualties have had no significant record of occurrence in North Dakota. Listed below are some of the transportation events of greater significance that have occurred in the State from the State Historical Society.

- 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.

A recent mass casualty train event occurred in Canada. The train was transporting oil from North Dakota's Bakken oil region to a refinery in New Brunswick. The train was parked in an overnight spot, but rolled downhill for seven miles before derailing and exploding in the Quebec town of Lac-Megantic. Casualty estimates as of July 8, 2013 included 13 dead and 40 missing. 27,000 gallons of light crude spilled from the derailed tankers. (MSN News, "Dozens missing in Canada rail crash, fire; 13 dead," http://news.msn.com/world/dozens-missing-in-canada-rail-crash-fire-13-dead?ocid=ansnews11, accessed July 8, 2013)

North Dakota's state highways and interstates are impacted by weather conditions. Flooding impacts across the State have caused traveler delays due to temporary traffic control or detour routes. Winter weather causes roads to be temporarily closed due to hazardous driving conditions or poor visibility. Wildland fires can also cause closures related to reduced visibility resulting from smoke on grass fires.

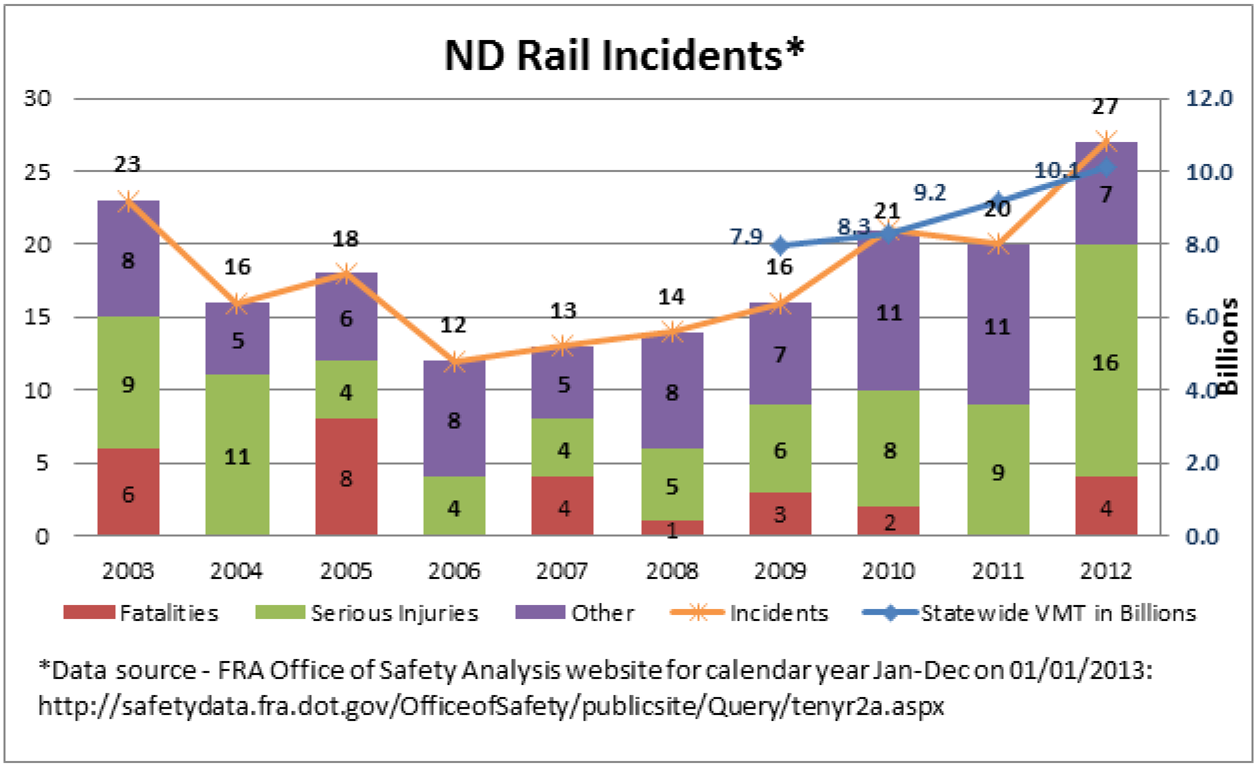
The history of transportation accidents in North Dakota consists primarily of small magnitude incidents, some with fatalities, but most with very little effect on the entire community. Traffic accidents along the roadways occur regularly, usually inconveniencing travelers, requiring local emergency resources, and occasionally causing delays. **Table 5.120** shows the motor vehicle fatalities and crash data in North Dakota since 2001. **Figure 5.96** shows railroad incident statistics and **Table 5.121** shows the number of incidents at highway- railroad interchanges. **Table 5.122** shows the aircraft incident statistics.

Table 5.120. 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

Source: North Dakota Department of Transportation, 2011.

Figure 5.96. North Dakota Rail Incidents, 2003-2012



The number of highway-rail incidents has been increasing since 2009 as seen in **Table 5.121**.

Table 5.121. Highway-Rail Incidents, 2004-March 2013

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total From 2004-March 2013 Period
Highway-Rail Incidents	5	4	4	1	4	2	5	6	8	3	42
Highway-Rail Incident Deaths	0	1	0	0	0	0	0	0	0	0	1
Highway-Rail Incident Injuries	2	1	0	0	1	0	3	0	7	1	15

Source: North Dakota Department of Transportation

Table 5.122. North Dakota Aircraft Incident Data, 2000-2012

Year	Accidents/ 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

Year	Accidents/ Incidents	Fatalities
2011	14	1
2012	15	2

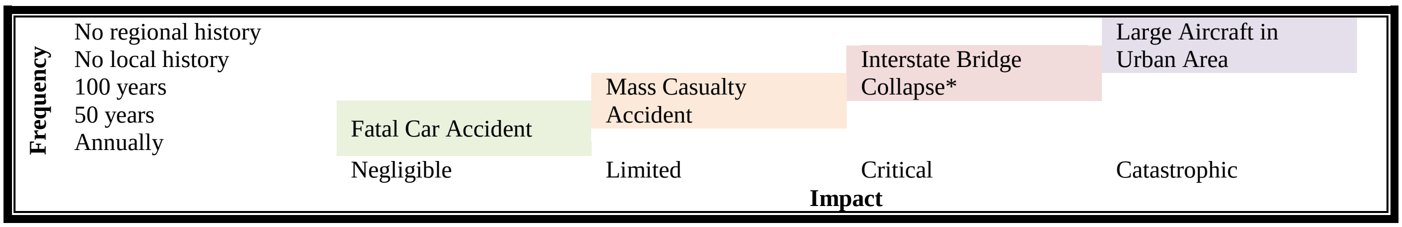
Source: National Transportation Safety Board, 2013.

There have been no State Executive Order or federal declarations dealing with a transportation accident in North Dakota.

5.11.4. Probability and Magnitude

Figure 5.97 is a graphical representation of the range of events that can occur within the transportation accident hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the transportation accident hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.97. Hazard Frequency and Impact Ranges



*mainly those over the Missouri and Red Rivers

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. On average from 2001-2011, North Dakota has about 16,492 accidents annually. Serious, fatal accidents are less frequent but still occur. On average, North Dakota has 113 traffic fatalities and 4,546 injuries annually.

Railroad accidents in North Dakota have historically had very little impact on the communities. The only exception is the January 2002 railroad accident near Minot where those impacted were affected by the hazardous material release rather than the accident itself. Based on records from the past ten years, approximately 18 railroad incidents occur annually resulting in about two fatalities annually.

Aircraft accidents are documented carefully. Since 2000, there have been 145 aircraft incidents which averages to 11 incidents per year and resulting in about 1-2 fatalities annually in North

Dakota. Although an incident involving a commercial passenger flight and mass casualties cannot be ruled out, the probability is considered lower.

Mass casualty incidents that overwhelm the emergency response resources, such as a bus, large multi-vehicle, passenger rail, or plane crash, represent high magnitude events.

5.11.5. State Risk Assessment

Vulnerability Overview

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 anytime, 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.

Table 5.123 and **Figure 5.98** provide a transportation analysis by county and reservation. The hazard rating was determined based on presence of the following infrastructure in each county and reservation as 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 U.S. highways.
- Low-Moderate: Jurisdiction has railroad infrastructure or U.S. highways.
- Low: Jurisdiction has only state highways.

Table 5.123. Transportation Infrastructure Analysis to Jurisdictions

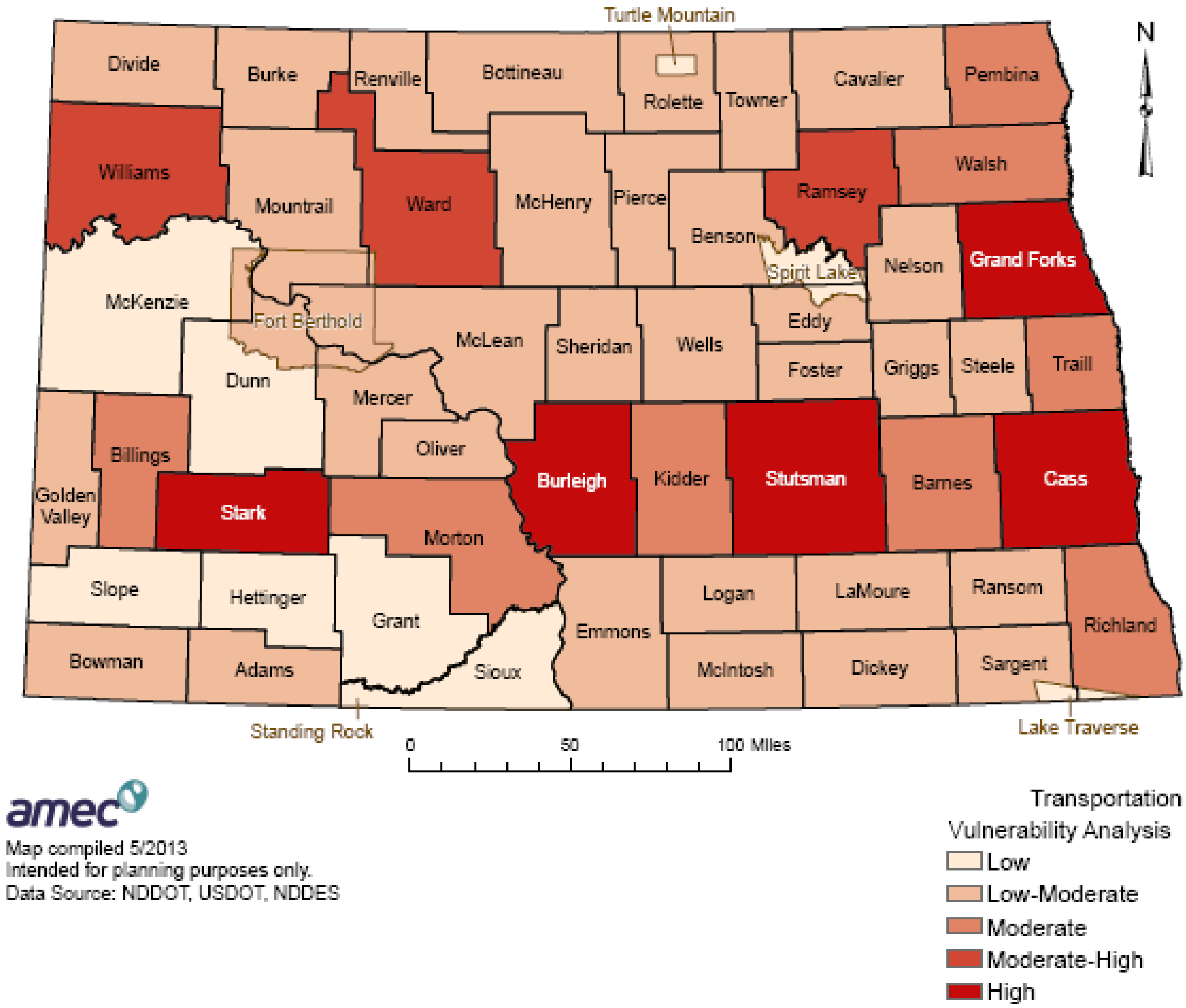
County	Transportation Infrastructure
Adams	Low-Moderate
Barnes	Moderate
Benson	Low-Moderate
Billings	Moderate
Bottineau	Low-Moderate
Bowman	Low-Moderate
Burke	Low-Moderate
Burleigh	High
Cass	High
Cavalier	Low-Moderate
Dickey	Low-Moderate
Divide	Low-Moderate
Dunn	Low
Eddy	Low-Moderate
Emmons	Low-Moderate
Fort Berthold^	Low-Moderate
Foster	Low-Moderate
Golden Valley	Low-Moderate
Grand Forks	High

County	Transportation Infrastructure
Grant	Low
Griggs	Low-Moderate
Hettinger	Low
Kidder	Moderate
Lake Traverse^	Low-Moderate
LaMoure	Low
Logan	Low-Moderate
McHenry	Low-Moderate
McIntosh	Low-Moderate
McKenzie	Low
McLean	Low-Moderate
Mercer	Low-Moderate
Morton	Moderate
Mountrail	Low-Moderate
Nelson	Low-Moderate
Oliver	Low-Moderate
Pembina	Moderate
Pierce	Low-Moderate
Ramsey	Moderate-High
Ransom	Low-Moderate
Renville	Low-Moderate
Richland	Moderate
Rolette	Low-Moderate
Sargent	Low-Moderate
Sheridan	Low-Moderate
Sioux	Low
Slope	Low
Spirit Lake	Low
Standing Rock^	Low
Stark	High
Steele	Low-Moderate
Stutsman	High
Towner	Low-Moderate
Traill	Moderate
Turtle Mountain^	Low
Walsh	Moderate
Ward	Moderate-High
Wells	Low-Moderate
Williams	Moderate-High

Note: ^ includes only North Dakota parts of the reservation

The counties of Burleigh, Cass, Grand Forks, Stark, and Stutsman are ranked “High” for the transportation infrastructure analysis. These counties all have major airports, U.S. highways, and railroads in their county. **Figure 5.98** shows the variance across the State.

Figure 5.98. 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 volume of traffic utilizing the transportation infrastructure. **Figure 5.99** shows the significant increases in all vehicles, and specifically trucks, in the vehicle miles of travel in oil producing counties and statewide on North Dakota state highways from 2011 to 2012.

Figure 5.99. Increases in Vehicle Miles of Travel in Oil Producing Counties and Statewide in North Dakota from 2011 to 2012.

	All State Highways					
	All Vehicles VMT			Truck Only VMT		
County	2011	2012	% Change	2011	2012	% Change
Billings	57,803,615	72,721,397	26%	18,642,324	21,519,655	15%
Bowman	33,087,711	37,757,350	14%	7,353,312	9,854,139	34%
Burke	38,353,749	49,202,614	28%	13,660,610	19,984,681	46%
Divide	29,935,853	42,852,328	43%	10,724,131	18,562,232	73%
Dunn	117,135,610	152,319,395	30%	36,609,912	51,317,927	40%
Golden Valley	34,049,462	41,545,039	22%	10,583,675	12,796,440	21%
Hettinger	21,182,816	21,697,394	2%	3,603,649	3,451,929	-4%
McHenry	91,136,106	96,580,106	6%	21,309,832	25,313,462	19%
McKenzie	273,341,185	442,378,471	62%	102,819,869	165,393,950	61%
McLean	163,129,680	167,843,902	3%	28,000,438	34,324,480	23%
Mercer	56,842,129	61,868,527	9%	6,439,775	7,877,861	22%
Mountrail	225,971,742	297,174,013	32%	71,117,294	95,594,726	34%
Renville	24,287,304	25,592,356	5%	4,135,954	3,749,981	-9%
Slope	24,162,356	29,418,947	22%	6,281,201	8,690,818	38%
Stark	243,518,984	297,922,816	22%	49,549,757	70,190,675	42%
Ward	399,538,842	469,413,153	17%	80,066,918	91,601,316	14%
Williams	348,937,138	485,789,778	39%	116,156,834	164,114,005	41%
17 Oil Producing Counties Total	**2,182,414,284**	**2,792,077,589**	**28%**	**587,055,484**	**804,338,276**	**37%**
All vehicles percent change on State Highways 2011 to 2012 in the remainder of the state						
Central Region	5%					
East Region	2%					

	All Vehicles VMT			Truck Only VMT		
	2011	**2012**	**% Change**	**2011**	**2012**	**% Change**
Statewide Total VMT	9,166,285,707	10,092,942,252	10%			
Statewide All State Highways	5,928,836,602	6,669,238,135	12%	1,251,068,708	1,495,238,683	20%
All Interstate Highways VMT	2,045,940,947	2,138,153,772	5%	416,804,882	455,911,317	9%
Non-Interstate Highways VMT	3,882,895,655	4,531,084,363	17%	834,263,825	1,039,327,365	25%
US 85 VMT	247,426,417	390,421,600	58%	85,746,096	142,392,942	66%

All figures are Annual Vehicle Miles of Travel

Truck VMT numbers had to be obtained from Mainframe whereas the All Vehicles VMT numbers were obtained from the HPMS database. Therefore, there might be very minor inconsistencies between the 2 systems.

Data on cost estimates of previous vehicle events by county also provides some basis to draw conclusions on patters of traffic volumes. **Table 5.124** is the NDDOT motor vehicle crash data and the associated costs per county for 2011. This information is not available specific to tribal land. According to NDDOT Crash Summary for 2011, 55 percent of the crashes in the State occurred in urban locations and 77 percent of the fatal crashes occurred on rural roads.

Table 5.124. NDDOT Motor Vehicle Crash Data and Associated Costs Per County, 2011

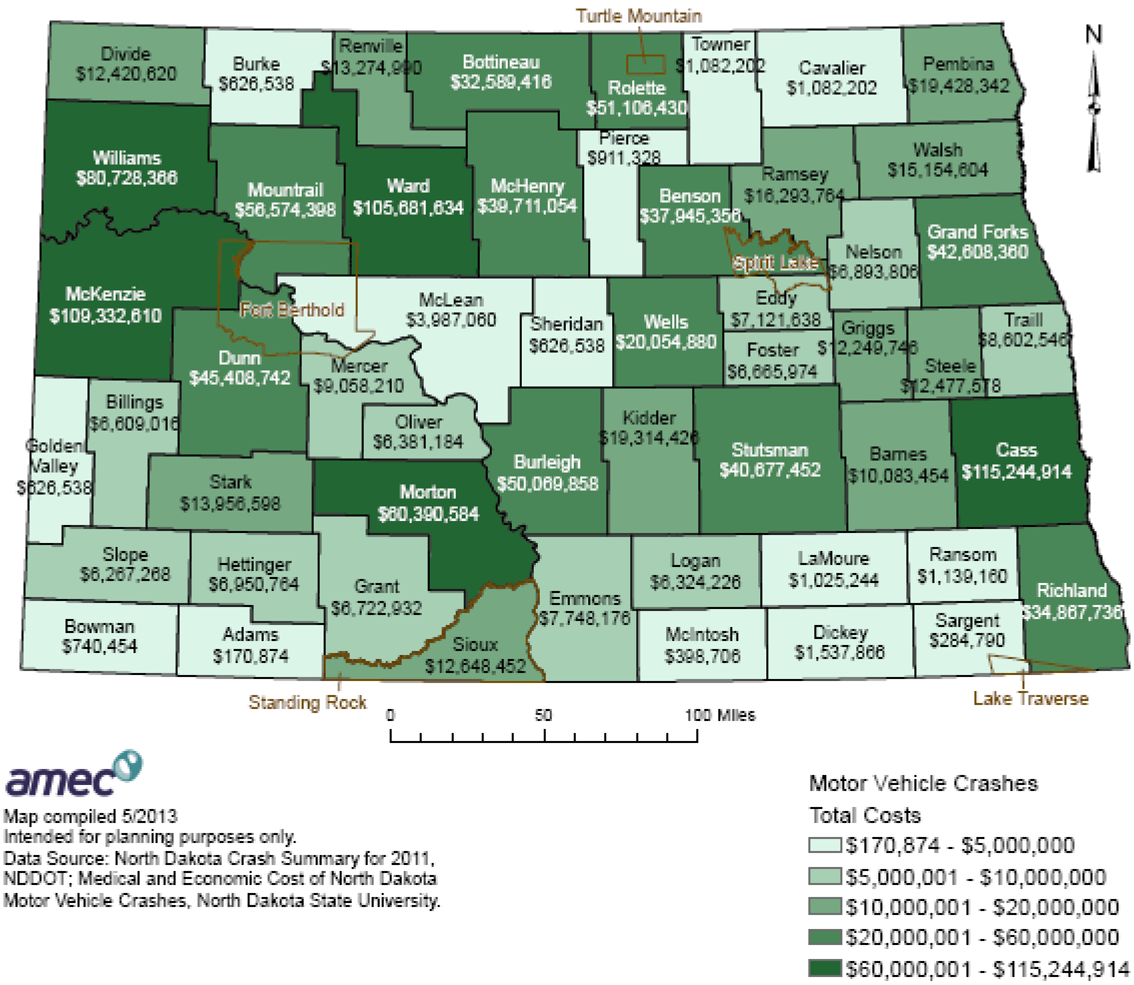
County Name	Injuries	Fatalities	Crashes	Injury Costs	Fatal Costs	Costs
Adams	3	0	38	$170,874	$0	$170,874
Barnes	71	1	309	$4,044,018	$6,039,436	$10,083,454
Benson	30	6	151	$1,708,740	$36,236,616	$37,945,356
Billings	10	1	53	$569,580	$6,039,436	$6,609,016
Bottineau	42	5	168	$2,392,236	$30,197,180	$32,589,416
Bowman	13	0	68	$740,454	$0	$740,454
Burke	11	0	84	$626,538	$0	$626,538
Burleigh	667	2	2,736	$37,990,986	$12,078,872	$50,069,858
Cass	963	10	3,012	$54,850,554	$60,394,360	$115,244,914
Cavalier	19	0	75	$1,082,202	$0	$1,082,202
Dickey	27	0	159	$1,537,866	$0	$1,537,866
Divide	6	2	38	$341,748	$12,078,872	$12,420,620
Dunn	55	7	197	$3,132,690	$42,276,052	$45,408,742
Eddy	19	1	91	$1,082,202	$6,039,436	$7,121,638
Emmons	30	1	136	$1,708,740	$6,039,436	$7,748,176
Foster	11	1	120	$626,538	$6,039,436	$6,665,974
Golden Valley	11	0	53	$626,538	$0	$626,538
Grand Forks	536	2	1,482	$30,529,488	$12,078,872	$42,608,360
Grant	12	1	28	$683,496	$6,039,436	$6,722,932
Griggs	3	2	38	$170,874	$12,078,872	$12,249,746
Hettinger	16	1	65	$911,328	$6,039,436	$6,950,764
Kidder	21	3	123	$1,196,118	$18,118,308	$19,314,426
La Moure	18	0	117	$1,025,244	$0	$1,025,244
Logan	5	1	64	$284,790	$6,039,436	$6,324,226
McHenry	61	6	206	$3,474,438	$36,236,616	$39,711,054
McIntosh	7	0	41	$398,706	$0	$398,706
McKenzie	223	16	445	$12,701,634	$96,630,976	$109,332,610
McLean	70	0	271	$3,987,060	$0	$3,987,060
Mercer	53	1	197	$3,018,774	$6,039,436	$9,058,210
Morton	212	8	745	$12,075,096	$48,315,488	$60,390,584
Mountrail	145	8	394	$8,258,910	$48,315,488	$56,574,398
Nelson	15	1	92	$854,370	$6,039,436	$6,893,806
Oliver	6	1	40	$341,748	$6,039,436	$6,381,184
Pembina	23	3	142	$1,310,034	$18,118,308	$19,428,342
Pierce	16	0	104	$911,328	$0	$911,328
Ramsey	74	2	348	$4,214,892	$12,078,872	$16,293,764
Ransom	20	0	92	$1,139,160	$0	$1,139,160
Renville	21	2	83	$1,196,118	$12,078,872	$13,274,990
Richland	82	5	328	$4,670,556	$30,197,180	$34,867,736
Rolette	49	8	74	$2,790,942	$48,315,488	$51,106,430

County Name	Injuries	Fatalities	Crashes	Injury Costs	Fatal Costs	Costs
Sargent	5	0	46	$284,790	$0	$284,790
Sheridan	11	0	37	$626,538	$0	$626,538
Sioux	10	2	9	$569,580	$12,078,872	$12,648,452
Slope	4	1	27	$227,832	$6,039,436	$6,267,268
Stark	139	1	856	$7,917,162	$6,039,436	$13,956,598
Steele	7	2	30	$398,706	$12,078,872	$12,477,578
Stutsman	184	5	711	$10,480,272	$30,197,180	$40,677,452
Towner	19	0	32	$1,082,202	$0	$1,082,202
Traill	45	1	132	$2,563,110	$6,039,436	$8,602,546
Walsh	54	2	266	$3,075,732	$12,078,872	$15,154,604
Ward	477	13	2,156	$27,168,966	$78,512,668	$105,681,634
Wells	34	3	157	$1,936,572	$18,118,308	$20,054,880
Williams	357	10	1,357	$20,334,006	$60,394,360	$80,728,366
Statewide s	5,022	148	18,823	$286,043,076	$893,836,528	$1,179,879,604

Source: *North Dakota Crash Summary for 2011*, 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.

Figure 5.100 shows the motor vehicle crashes costs per county. This map 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 theses counties associated with the oil and gas production.

Figure 5.100. Motor Vehicle Crashes Costs per County, 2011



Loss Estimates

According to *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, a serious motor vehicle crash can have medical costs and substantial economic losses associated with death and injury. The costs of fatalities are based on the Value of a Statistical Life as reported by the U.S. Department of Transportation and does not include costs for medical expenses, property damages or other costs. The costs for non-incapacitating injury include wage and productivity losses, medical expenses, administrative expenses, motor vehicle damage, and employer's uninsured costs from the Nation Safety Council. These figures were converted from 2008 dollars to 2011 dollars using an annual inflation rate of 1.04 percent.

Table 5.125. Per Crash Cost Estimates by Crash Severity

Year	Non-incapacitating Injury	Fatal
2011	$56,958	$6,039,436

Source: *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, costs have been converted to 2011 inflation costs.

This per crash cost estimate by crash severity can be used with the North Dakota Department of Transportation (NDDOT) Crash Summary for 2011 which includes the number of motor vehicle crashes with injuries and fatalities per county to calculate a potential loss estimate per county. This is making an assumption that all crashes were non-incapacitating for planning purposes only.

Table 5.126. Top 10 Counties with Estimated Injury and Fatality Costs for Motor Vehicle Crashes, 2011

County Name	Costs
Cass	$115,244,914
McKenzie	$109,332,610
Ward	$105,681,634
Williams	$80,728,366
Morton	$60,390,584
Mountrail	$56,574,398
Rolette	$51,106,430
Burleigh	$50,069,858
Dunn	$45,408,742
Grand Forks	$42,608,360

Source: *North Dakota Crash Summary for 2011*, 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.

5.11.6. Local Risk Assessments

Table 5.127 provides information from local and tribal mitigation plans regarding the transportation accident local hazard rating as well as additional information provided regarding transportation accident vulnerability and/or estimated losses. As indicated in the Transportation Accident Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.127. Transportation Accident Risk Summary from Local Plans

County	Transportation Accident Hazard Rating*	Transportation Accident Additional Information
Adams	C	
Barnes	D	
Benson	C	
Billings	C	
Bottineau	D	
Bowman	C	
Burke	B	
Burleigh	B	
Cass	D	
Cavalier	NL	
Dickey	D	
Divide	NP	
Dunn	D	
Eddy	D	
Emmons	D	
*Fort Berthold^*	*NI*	
Foster	D	
Golden Valley	D	
Grand Forks	D	Up to $928,000 structural losses, Up to 200 fatalities
Grant	NI	
Griggs	D	
Hettinger	D	
Kidder	C	
*Lake Traverse^*	*NP*	
LaMoure	#7 of 12	
Logan	D	
McHenry	D	
McIntosh	C	
McKenzie	NP	
McLean	C	
Mercer	C	
Morton	D	
Mountrail	D	
Nelson	D	
Oliver	C	
Pembina	D	
Pierce	D	
Ramsey	C	
Ransom	NI	
Renville	D	
Richland	C	
Rolette	D	
Sargent	C	
Sheridan	NP	
Sioux	*Somewhat Likely*	
Slope	C	
Spirit Lake	High	
*Standing Rock^*	*Somewhat Likely*	
Stark	NP	
Steele	NP	

County	Transportation Accident Hazard Rating*	Transportation Accident Additional Information
Stutsman	D	
Towner	D	
Traill	D	
Turtle Mountain^		
Walsh	B	
Ward	D	
Wells	D	
Williams	C	

Source: Local Hazard Mitigation Plans; *Many of the local plans have a mass casualty hazard listed rather than a transportation accident hazard. For analysis purposes, mass casualty is listed under the transportation accident category here. ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.11.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

Except in the very rare case of an aircraft, train, or vehicle crashing into a structure, state-owned buildings and property should be unaffected by a transportation accident. 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 for a greater loss to buildings and property. Like state-owned buildings and property, except in the very rare case of an aircraft, train, or vehicle crashing into a critical facility, the facilities should remain unaffected by a transportation accident. An accident involving a first response agency or blocking a primary transportation route could delay emergency services.

In most cases, infrastructure also remains unaffected during transportation accidents. 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 can take out power lines, telephone lines, or other important pieces of infrastructure, resulting in service disruptions. **Table 5.160** in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.11.8. Development in Identified Hazard Areas

New and future development, particularly the associated increase in traffic, may increase the probability of a major transportation accident. 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. Population increases are being seen in Burleigh, Cass, Grand Forks, McKenzie, Morton, Mountrail, Rolette, Stark, Sioux, Ward, and Williams Counties.

The North Dakota Department of Transportation is currently expanding state and federal highway capability to support the oil and gas industry expansion. The following areas have construction projects underway:

- U.S. Highway 85 – expanded to four lanes between Watford City and Williston (McKenzie and Williams Counties)
- Truck bypasses/reliever routes – Williston (Williams County), Alexander (McKenzie County), Watford City (McKenzie County), Dickinson (Stark County), and New Town (Mountrail County)
- U.S. Highway 2 west of Williston (Williams County)
- N.D. Highway 23 east of N.D. 37 (Ward County)
- N.D. 22 north of Killdeer (Burleigh County)
- U.S. Highway 85 near Belfield (Burleigh County)
- N.D. 8 south of Bowbells (Burke County)

5.11.9. Data Limitations and Other Key Documents

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 necessary be placed in a public plan for security reasons.

Other key documents related to the Transportation Accident hazard include:

- North Dakota Emergency Operations Plan, Transportation Annex
- TransAction II, North Dakota's Statewide Strategic Transportation Plan
- North Dakota Highway Safety Plan

5.12. Urban Fire or Structure Collapse

Hazard Rank	THIRA Threat/Hazard Group
Low	Technological

5.12.1. Description

Alone a fire or collapse can have devastating effects, but they can also be secondary to another hazard. For example, a heavy snow event could lead to structure failure due to overwhelming snow loads. Strong winds and tornadoes can also lift roofs and render structures uninhabitable. Urban fires can be caused by hazardous material releases, lightning, and wildfires. Acts of terrorism and civil unrest may also lead to structure fires or structure collapse. Despite the cause, urban fires and structure collapse can lead to complete building losses in addition to other losses from the causative hazard.

Urban Fire

Fire is the result of three components: a heat source, a fuel source, and an oxygen source according to the U.S. Fire Administration. When combined, these three sustaining factors will allow a fire to ignite and spread. Within a structure, 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. The heat from a fire can be 100 degrees Fahrenheit at floor level and rise to 600 degrees at eye level. In five minutes, a room can get so hot that everything in it ignites at once; this is called flashover.

The urban fire department is one of the oldest continuing institutions in the United States. Professional firefighters are well trained in the latest skills for preserving life and applying their abilities to limit property damages. They attempt to arrive at the fire as soon as possible, get all human life to safety, and suppress the fire as quickly as possible. The amount of lives and property saved from fire by fire departments tremendously exceeds losses which are reported in statistics.

North Dakota has 374 fire departments and the fire district boundary maps can be found on the North Dakota Insurance Department's website, http://www.nd.gov/ndins/special/fire-district-payment/fire-district-boundary-maps/. There are only four fully funded departments. These include Bismarck, Fargo, Grand Forks and Minot. There are nine partially funded departments, which include Bismarck Rural, Devils Lake, Dickinson, Jamestown, Mandan, Minot Rural, Valley City, West Fargo, and Williston. The remaining fire departments are volunteer departments. These firefighters are sometimes paid for a response call, or not at all.

The overall picture of fire safety information reveals that, per capita, the United States has one of the highest fire death rates in the industrialized world, however its standing has greatly improved according to the U.S. Fire Administration, approximately 2,000-3,000 people die in residential building fires in this country annually, and about 12,000-14,000 are injured. Children under the age of 5 and the population over the age of 54 are at the highest risk of death in fires. On average, fire kills more Americans annually than all natural disasters combined. In 2011, 83 firefighters died in duty-related incidents. Statistics show approximately 1.5 million fires are reported annually; many others go unreported, causing additional injuries and property loss. About $6-$9 billion in direct property losses occur annually from residential building fires.

In North Dakota there are approximately 2,500 urban fire events reported each year by fire departments statewide through the National Fire Incident Reporting system (NFIRS). Unfortunately, not all fires are reported through NFIRS. Urban fires consist of uncontrolled burning in developed areas to include structure fires, vehicle fires, and others. In 2010, the leading cause of structure fires was “unknown”, followed by “other equipment” and “natural” cause categories.

Winter weather can have a major effect on the number of fires that occur. Increasing costs of electricity, natural gas, propane, and fuel oil has led many people to look for alternative heating methods for their homes. Consequently, the use of space heaters, fireplaces, wood-burning stoves, and even continued use of coal stoves has created an increased fire hazard. Most people have limited experience with wood burners. Wood burning for heating has a poor safety record. Codes for the installation of stoves and chimneys may not be followed strictly, leading to an increased fire risk. Many communities in North Dakota have not adopted building codes. Other energy sources include portable LP (propane) gas or kerosene heaters with self contained fuel supplies; these are hazardous appliances, even when used according to manufacturer's instructions. Open flames and the leakage of fuel from containers are fire hazards and could cause explosions.

Although structure fires are usually individual disasters and not community-wide, the potential exists for widespread urban fires that displace several businesses or families and exceed local and even state resources. The “downtown” urban areas of North Dakota are particularly vulnerable to this hazard. An urban fire that rages uncontrollably despite firefighting efforts and burns a large portion of a downtown area or an important structure could have significant economic impacts. Large fires of this nature have also been known to require significant community resources if lives are lost. North Dakota has the potential for large scale residential fires, commercial fires, and fires in public venues. In industrial areas, there is the potential of chemical plant fires producing hazardous smoke and fumes.

Smoke detectors, automatic fire alarm systems, automatic sprinkler systems, fire doors, and fire extinguishers can all prevent deaths, injuries, and damages from fire. Automatic sprinkler systems are especially important in preventing a small fire from becoming a conflagration.

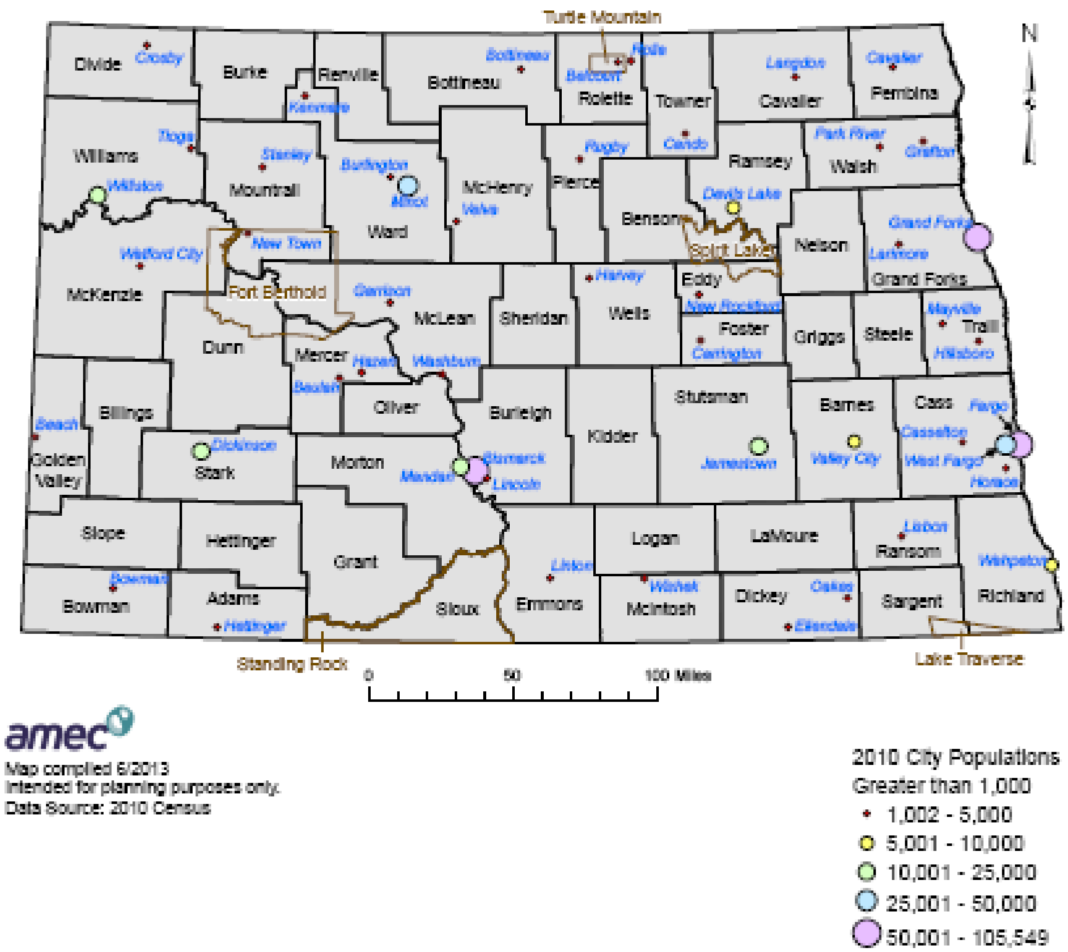
Structure Collapse

Structure collapse occurs when the forces of gravity or other external forces overcome the structural integrity of a building. The reasons for structure collapse can vary from poor construction to explosions to extreme winds to heavy snow loads. Structure collapse can trap occupants and damage valuable property. Urban fires and structure collapse can happen independently from other types of incidents.

5.12.2. Geographic Location

Urban fires can occur anywhere, but are generally most significant in downtown areas. **Figure 5.101** shows the communities in North Dakota with 1,000 or more people based on 2010 census. Cities with 1,000 or more people were chosen since cities of that size generally have a downtown area or other public venues that might be at increased risk of larger scale urban fires.

Figure 5.101. North Dakota Cities with Populations over 1,000



5.12.3. Previous Occurrences

Urban fires occur regularly in North Dakota, but some of the more significant events are listed below from the State Historical Society of North Dakota, City of Fargo Fire Department, and The Forum if Fargo-Moorhead. Reported structure collapse occurs with much less frequency.

- 1882 – Fire destroyed a large portion of Grand Forks.
- 1884 – Half of the City of Devils Lake was destroyed by fire.
- 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.
- October 1994 – The highest fatality fire in North Dakota occurred in Devils Lake when nine people died in a house fire.
- 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.

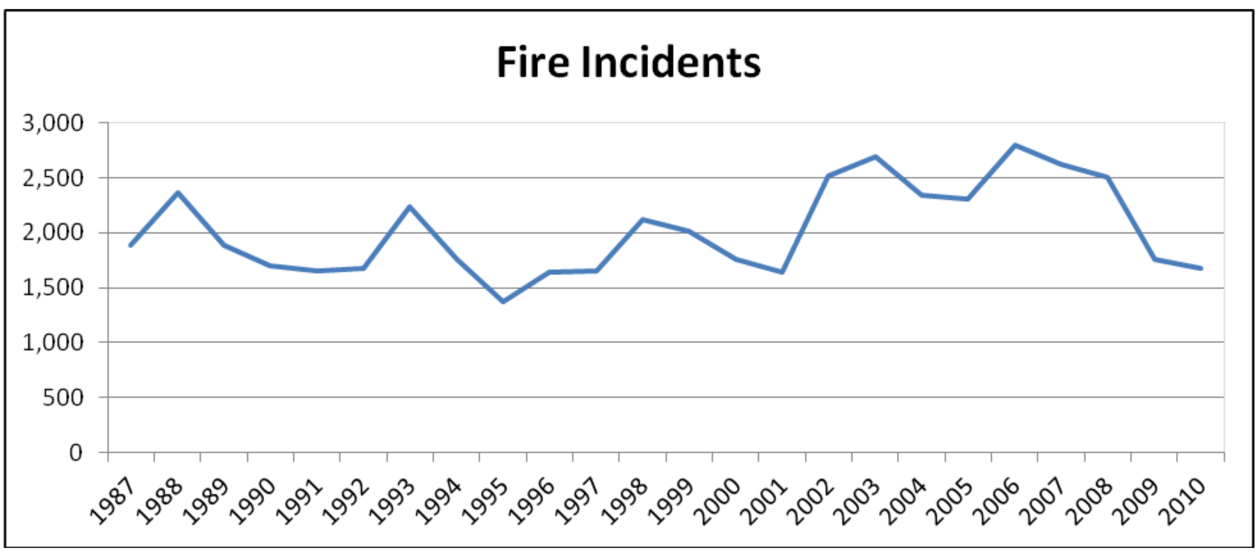
Table 5.128 and **Figure 5.102**, **Figure 5.103**, and **Figure 5.104** below show details of North Dakota fire statistics from1987 through 2010. Note the State Fire Marshal's Office indicates that the percentage of North Dakota population covered by reporting fire departments varies from year to year. Fire departments are asked to participate in the National Fire Incident Reporting System (NFIRS) and report their incidents but that is not always the case. The incident reports submitted for 2009 and 2010 cover an estimated 70-75 percent of the North Dakota population.

Table 5.128. North Dakota Fire Statistics from 1987-2010

Year	Number of Fire Incidents	Estimated Losses	Structure Fires	Vehicle Fires	Wildland Fires	Fatalities
1987	1,882 fires	$16,800,000	703	422	472	12
1988	2,363 fires	$13,000,000	764	421	1,003	12
1989	1,889 fires	$12,800,000	719	427	652	10
1990	1,697 fires	$11,300,000	614	385	563	4
1991	1,654 fires	$12,500,000	534	410	479	14
1992	1,674 fires	$9,900,000	531	391	447	11
1993	2,240 fires	$8,000,000	567	355	424	12
1994	1,754 fires	$12,800,000	688	428	518	11
1995	1,367 fires	$15,500,000	610	383	359	16
1996	1,637 fires	$20,000,000	660	441	518	10
1997	1,654 fires	$68,900,000*	693	489	472	5
1998	2,116 fires	$22,000,000	886	585	541	7
1999	2,016 fires	$22,496,819	645	537	508	8
2000	1,754 fires	$17,448,004	572	433	492	9
2001	1,636 fires	$7,935,149	674	448	674	10
2002	2,513 fires	$8,417,885	647	448	1,017	11
2003	2,689 fires	$8,756,663	675	480	1,009	4
2004	2,336 fires	$11,772,206	648	477	706	7
2005	2,310 fires	$22,265,117	643	445	717	11
2006	2,794 fires	$11,533,834	592	429	1,216	8
2007	2,624 fires	$21,096,127	710	443	906	4
2008	2,506 fires	$28,451,096	651	409	976	10
2009	1,762 fires	$21,658,867	581	428	397	7
2010	1,677 fires	$23,335,519	631	387	815	5

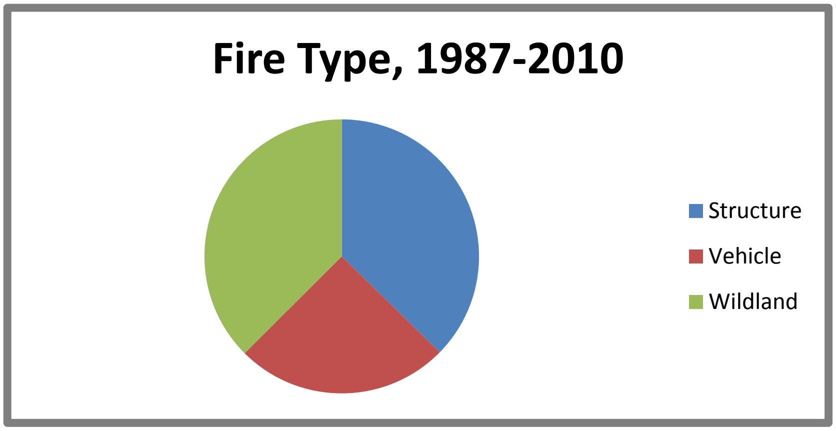
* Includes the devastating flood/fire in Grand Forks
Sources: North Dakota Fire Marshal, 2013.

Figure 5.102. North Dakota Fire Incidents, 1987-2010



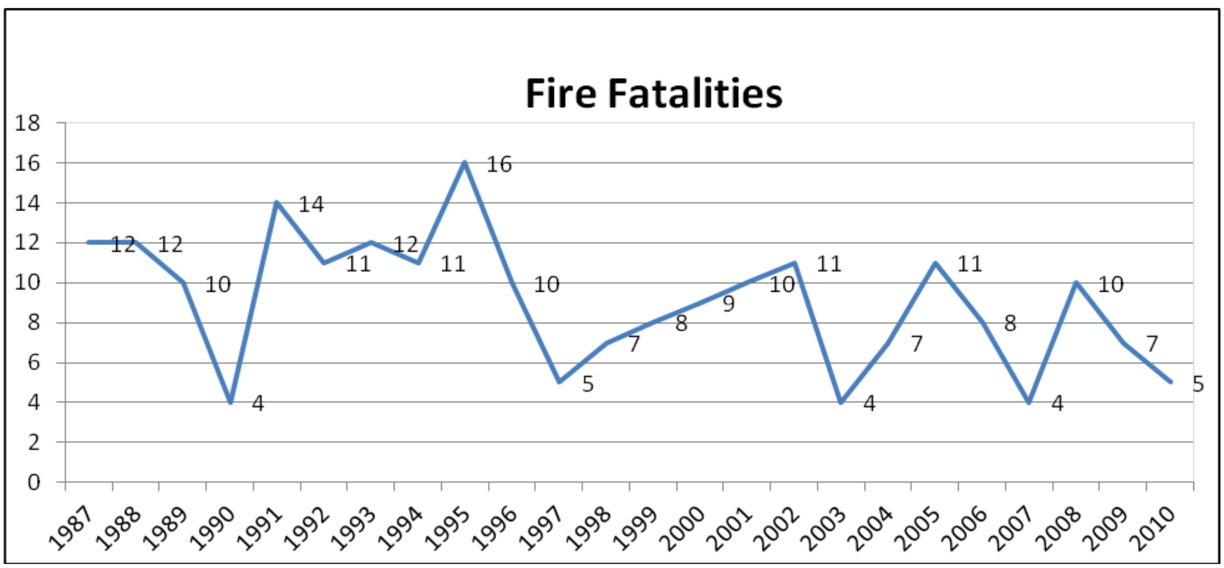
Sources: North Dakota Fire Marshal, 2013

Figure 5.103. North Dakota Fire Types, 1987-2010



Sources: North Dakota Fire Marshal, 2013

Figure 5.104. North Dakota Fire Fatalities, 1987-2010



Sources: North Dakota Fire Marshal, 2013

There have been no state executive order declarations or federal declarations for urban fire or structure collapse in North Dakota.

5.12.4. Probability and Magnitude

Figure 5.105 is a graphical representation of the range of events that can occur within the urban fire and structure collapse hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the urban fire and structure collapse hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.105. Hazard Frequency and Impact Ranges

Frequency	Negligible	Limited	Critical	Catastrophic
No regional history			Large Occupied Building Collapse	
No local history			Large Occupied Building Collapse	
100 years		Downtown Explosion and Fire		
50 years	Fatal Fire	Downtown Explosion and Fire		
Annually	Fatal Fire			

Impact

North Dakota has experienced 2,023 fire incidents annually from 1987 to 2010, of which 651 were structure fires, causing $14,990,303 in losses and 9 deaths in an average year. These statistics generally encompass smaller incidents and fires. The probability of a major urban fire is much more difficult to define. With the exception of 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.

5.12.5. State Risk Assessment

Vulnerability Overview

Property and the population are at risk from urban fires and structure collapses. Property losses are usually covered by insurance, but can be devastating to the building occupants, particularly for primary residences. 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.

Depending on the time and location, a major structure fire could result in the loss of life either to firefighters or building occupants. The potential for this type of loss is difficult to determine due to advances in firefighter safety and 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.

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 could lead to significant community losses. Most historic buildings lack sprinkler systems and would lose much of their historical value in a fire or collapse.

Table 5.129 shows the urban fire or structure collapse hazard ratings. The county ratings were determined based on the 2010 housing density, which is an indicator of urban areas. The rating was increased if there are no building code-enforcing jurisdictions in the county as building codes provide additional capability to prevent or minimize damages from structural fire or collapse. Chapter 4 provides additional information on building code enforcing jurisdictions in North Dakota. The age of structures in the county and fire department capabilities can also be important factors with respect to fire and collapse vulnerability.

Table 5.129. Urban Fire or Structure Collapse Hazard Ratings per County

County	Housing Density per Square Mile	Vulnerability Rating	Building Codes? (County/# Cities)	Adjusted Vulnerability Rating
Adams County	1.39	Low	Yes/2	Low
Barnes County	3.82	Moderate	No/3	Moderate
Benson County	2.12	Low-Moderate	No/0	Moderate
Billings County	0.42	Low	No/1	Low
Bottineau County	2.6	Low-Moderate	No/1	Low-Moderate
Bowman County	1.45	Low	No/0	Low-Moderate
Burke County	1.21	Low	No/1	Low
Burleigh County	21.9	High	Yes/3	High
Cass County	38.49	High	No/15	High
Cavalier County	1.55	Low	No/1	Low
Dickey County	2.33	Low-Moderate	No/2	Low-Moderate
Divide County	1.05	Low	No/0	Low-Moderate
Dunn County	1.06	Low	Yes/3	Low
Eddy County	2.1	Low-Moderate	No/1	Low-Moderate
Emmons County	1.38	Low	No/1	Low
Foster County	2.83	Low-Moderate	No/1	Low-Moderate
Golden Valley County	0.97	Low	No/2	Low
Grand Forks County	20.43	High	Yes/5	High
Grant County	1.02	Low	No/2	Low
Griggs County	2.06	Low-Moderate	No/1	Low-Moderate
Hettinger County	1.25	Low	No/0	Low-Moderate
Kidder County	1.24	Low	No/0	Low-Moderate
LaMoure County	1.95	Low	No/1	Low
Logan County	1.15	Low	No/1	Low

County	Housing Density per Square Mile	Vulnerability Rating	Building Codes? (County/# Cities)	Adjusted Vulnerability Rating
McHenry County	1.57	Low	No/3	Low
McIntosh County	1.91	Low	No/0	Low-Moderate
McKenzie County	1.12	Low	Yes/2	Low
McLean County	2.65	Low-Moderate	No/4	Low-Moderate
Mercer County	4.27	Moderate	No/5	Moderate
Morton County	6.27	Moderate-High	Yes/2	Moderate-High
Mountrail County	2.26	Low-Moderate	Yes/4	Low-Moderate
Nelson County	1.96	Low	No/2	Low
Oliver County	1.25	Low	No/1	Low
Pembina County	3.45	Moderate	No/3	Moderate
Pierce County	2.16	Low-Moderate	No/0	Moderate
Ramsey County	4.73	Moderate	No/1	Moderate
Ransom County	3.08	Moderate	No/2	Moderate
Renville County	1.58	Low	No/3	Low
Richland County	5.23	Moderate-High	No/6	Moderate-High
Rolette County	5.95	Moderate-High	No/0	High
Sargent County	2.33	Low-Moderate	No/3	Low-Moderate
Sheridan County	0.92	Low	No/2	Low
Sioux County	1.2	Low	No/0	Low-Moderate
Slope County	0.36	Low	No/0	Low-Moderate
Stark County	8.04	High	No/5	High
Steele County	1.64	Low	No/0	Low-Moderate
Stutsman County	4.44	Moderate	No/3	Moderate
Towner County	1.41	Low	No/0	Low-Moderate
Traill County	4.39	Moderate	No/2	Moderate
Walsh County	4.29	Moderate	No/2	Moderate
Ward County	13.28	High	Yes/4	High
Wells County	1.95	Low	No/0	Low-Moderate
Williams County	5.04	Moderate-High	Yes/3	Moderate-High

Source: Housing Density from U.S. Census Bureau, Decennial Census; Building Code Enforcing Jurisdiction data from North Dakota Department of Commerce, 2013.

Loss Estimates

Urban fires caused 2,023 fire incidents annually from 1987 to 2010, of which 651 were structure fires, causing $14,990,303 in losses and 9 deaths in an average year statewide. This translates to a $7,410 average fire incident cost. With so many types of fire incidents and death and injury occurrences, it is difficult to predict future fire loss estimates.

5.12.6. Local Risk Assessments

Table 5.130 provides information from local and tribal mitigation plans regarding the local hazard rating for urban fire and structure collapse. None of the local plans provided information regarding loss estimates for this hazard. In addition, some of the plans considered only urban fire, but not structure collapse. As indicated in the Hazard Rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.130. Urban Fire or Structure Collapse Risk Summary from Local Plans

County	Urban Fire or Structure Collapse Hazard Rating*
Adams	C
Barnes	D
Benson	C
Billings	C
Bottineau	D
Bowman	D
Burke	C
Burleigh	D
Cass	D
Cavalier	Medium
Dickey	C
Divide	NP
Dunn	C
Eddy	D
Emmons	C
*Fort Berthold^*	*NL*
Foster	D
Golden Valley	C
Grand Forks	D
Grant	C
Griggs	C
Hettinger	D
Kidder	C
*Lake Traverse^*	*NP*
LaMoure	#8 of 12
Logan	D
McHenry	D
McIntosh	C
McKenzie	NP
McLean	B
Mercer	C
Morton	D
Mountrail	C
Nelson	D
Oliver	C
Pembina	D
Pierce	C
Ramsey	C
Ransom	Medium
Renville	D
Richland	C
Rolette	D

County	Urban Fire or Structure Collapse Hazard Rating*
Sargent	D
Sheridan	NP
Sioux	*Unlikely*
Slope	D
Spirit Lake	Low
*Standing Rock^*	*Unlikely*
Stark	NP
Steele	NP
Stutsman	D
Towner	D
Traill	D
Turtle Mountain^	
Walsh	B
Ward	C
Wells	D
Williams	B

Source: Local Hazard Mitigation Plans; * Many of the local plans include only urban fire; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.12.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

Any building is vulnerable to structure fire and collapse. However, sprinkler systems can minimize fire losses. Those state-owned buildings that do not have a sprinkler system are at greater risk for fire losses. Like structure fire, structure collapses will likely result in or near structural losses. Using a general assumption, given improvements on construction methodologies over the years, the older the building or property, the more likely it is to succumb to a structural collapse. Flat roofs are also more susceptible to heavy snow loading and collapse.

Urban fires or structure collapse in a critical facility could result in temporary delays in emergency and critical services. Depending on the type of infrastructure, a fire or structure failure could result in short-term disruptions while services are rerouted. In the case of a supporting facility, such as the water treatment plant or a lift station, long-term disruptions could be seen. For example, a fire at an electric substation may leave residents without power for several hours or days or a fire at or collapse of a water treatment plant may leave communities without water for days or weeks.

Table 5.131 summarizes the losses paid out of the North Dakota Tornado and Fire Fund for fire and smoke and **Table 5.132** summarizes the losses paid for collapse. Claims data is provided for state agency facilities, local government critical facilities (including: counties, cities, townships, airport authorities, fire districts, water districts, and other categories), National Guard facilities, state-owned universities and school districts; all of which can be considered critical or essential facilities.

Table 5.131. Fire and Smoke Claims Paid on State Facilities and Other Critical Facilities Insured by the State. 1989-2013

County	State Agencies	Adjutant General	State Universities	Local Governments	School Districts
Adams	$0	$0	$3,432	$0	$0
Barnes	$0	$0	$6,345	$554,121	$2,273
Benson	$0	$0	$0	$16,430	$212,761
Bottineau	$0	$0	$0	$5,600	$210
Bowman	$0	$0	$0	$607	$0
Burke	$0	$0	$0	$59,846	$5,352
Burleigh	$256,777	$14,666.10	$176,616	$130,146	$1,252,164
Cass	$0	$0	$1,053,906	$60,129	$18,667
Cavalier	$0	$0	$0	$825	$37,902
Dickey	$0	$0	$0	$66,362	$4,747
Divide	$0	$0	$0	$64,750	
Dunn	$0	$0	$0	$73	$84,706
Emmons	$0	$0	$0	$28,171	
Foster	$0	$0	$0	$97,476	$1,676
Golden Valley	$0	$0	$0	$950	
Grand Forks	$0	$0	$212,430	$271,931	$23,817
Grant	$0	$0	$0	$5,948	$37,140
Griggs	$0	$0	$0	$6,422	
Kidder	$0	$0	$0	$93,067	$4,106
LaMoure	$0	$0	$0	$14,932	$1,444,834
McHenry	$0	$0	$0	$2,896	$17,970
McIntosh	$0	$0	$0	$11,157	$35,685
McKenzie	$0	$0	$0	$1,054	$2,375
Mercer	$0	$0	$0	$0	$1,890
Morton	$0	$0	$0	$290	$109,795
Mountrail	$0	$0	$0	$0	$9,166
Nelson	$0	$0	$0	$21,397	$0
Oliver	$0	$0	$0		$2,753,809
Pembina	$0	$0	$0	$72,648	$1,552
Ramsey	$0	$14,412.66	$10,011		$2,145
Ransom	$0	$0	$0	$275	$4,269
Renville	$0	$0	$0	$10,337	$5,089
Richland	$0	$0	$129,430	$179,395	$40,421
Rolette	$0	$0	$0	$15,944	$8,873
Sargent	$0	$0	$0	$17,199	$0
Sioux	$0	$0	$0	$0	$24
Stark	$0	$0	$268,531	$352,413	$11,078
Stutsman	$15,854	$0	$0	$135,484	$2,124
Towner	$0	$0	$0	$33,797	$6,089
Traill	$0	$0	$19,854	$1,827	$13,438
Walsh	$19,405	$0	$0	$76,581	$32,868
Ward	$0	$0	$1,075,539	$37,586	$16,993
Wells	$0	$0	$0	$9,868	$12,818
Williams	$0	$0	$0	$4,604	$94,265
Total	**$292,036**	**$29,078.76**	**$2,956,092**	**$2,462,539**	**$6,313,090**

Source: North Dakota Tornado and Fire Fund, 2013

Table 5.132. 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
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 5.160 in Section **5.15,** Risk Assessment Summary provides 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 by county, see Chapter 4.

5.12.8. Development in Identified Hazard Areas

Nationally, fire officials are working toward improved and stricter fire codes in all buildings. Fire codes usually cover the bare minimum of protection when buildings are constructed or remodeled. Future development in communities lacking fire and building codes will be more vulnerable than development that has the appropriate fire suppression systems and building codes for snow loads and structural stability in place. The development of industrial facilities housing hazardous materials could enhance the fire hazard. Population increases are being seen in Burleigh, Cass, Grand Forks, McKenzie, Morton, Mountrail, Rolette, Stark, Sioux, Ward, and Williams Counties. Of these, Rolette, and Sioux Counties do not have any jurisdictions that have adopted the state building code. New and future development in jurisdictions lacking building codes and not constructed to building code standards are at greater risk from urban fire and structure collapse.

5.12.9. Data Limitations and Other Key Documents

Fire data provides an estimation of future problems, but does not specifically address the potential for a large urban fire or structure collapse. Further evaluation of downtown areas and local building code enforcement would provide additional information in assessing the risk to the communities.

Other key documents related to the Urban Fire or Structure Collapse hazard include:

- North Dakota Emergency Operations Plan, Fire Annex

5.13. Wildland Fire

Hazard Rank	THIRA Threat/Hazard Group
High	Natural

5.13.1. Description

A wildland fire is an uncontrolled fire in a vegetated area. Wildland fires are a natural part of the ecosystem. They have a purpose in nature and following years of fire suppression, many areas have built up fuels that can lead to larger, more intense fires.

Any flame source can trigger a wildland fire. Once ignited, ambient conditions dictate whether the fire will spread or not. Moist, cool, and calm conditions or a lack of fuels will suppress the fire, whereas, dry, warm, and windy conditions and dry fuels will contribute to fire spread. The terrain, accessibility, and capabilities of the fire agencies are also factors in the fire's growth potential. Problems with wildfire occur when combined with the human environment. People and structures near wildfires can be threatened unless adequately protected through evacuation, mitigation, or suppression.

Wildland fires have always been common and widespread in North Dakota. Travelers, settlers, and explorers, including Lewis and Clark, documented huge fires on the horizon, the constant smell and pall of smoke in the air, and miles of blackened prairie. Studies indicate that wildfires occurred in the same locales every three to four years, with larger conflagrations taking place on a 10 to 30 year sequence. Today's wildfires follow similar cycles, with larger fires frequently coinciding with drought years.

According to the North Dakota Forest Service, The state experiences over 700 wildfires that burn in excess of 35,000 acres annually on average. The primary factors influencing these wildland fires include type, amounts, and conditions of fuel supply (vegetation), temperature, wind, precipitation patterns, humidity levels, topography, and the levels of human activity on the land.

Fires in areas of heavy vegetation, if not quickly detected and suppressed, can rapidly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property. An example of this was the McKenzie County fire of October 1999 when approximately 70,000 acres burned in two states (including more than 50,000 in North Dakota) in just a matter of hours. Wildfire is definitely weather dependent and wind-driven.

The general wildfire season runs from April 1st through October 31st. There are three critical periods during wildfire season: early spring prior to green-up, late summer due to higher temperatures, and fall following heavy frosts until snowfall. The first peak occurs during the spring before vegetation turns green. This tends to be a very critical time due to the fuel buildup from the previous growing season, drying winds, decreasing humidity, warmer temperatures, and increased human activity outdoors. In general, the month of April accounts for about 20% of the wildfire starts and over a third of the total acreage burned. The second peak in the fire season coincides with the increase in harvesting activities during mid to late summer. Temperatures remain hot, humidity is at its lowest, and precipitation has declined significantly. The third and final peak in fire season occurs between September 1st and October 31st when wildland fuels are fully cured out due to hard frosts, winds are frequent and high, humidity is low, and human activity remains high. Forty percent of the annual fire starts occur in this third peak, accounting for 50% of the annual burned acreage. This third fire season typically extends until a season-ending snowfall.

These seasons are always weather dependent and wind-driven. 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 greatest potential for major fire occurrence is in the western half of the state where grasslands are 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. This comprises nearly 90% of available fuels for wildland fires. Fires in these areas are characterized by high rates of spread and moderate intensity.

The charred ground and thick smoke plumes that can be produced by wildland fires can create other, cascading hazards. The heavy smoke may lead to unhealthy air conditions affecting those with respiratory problems and otherwise healthy people. Smoky conditions can also lead to poor visibility and an increased probability of transportation accidents. With vegetation removed and the ground seared from a wildfire, the area also becomes more prone to flash floods and landslides because of the ground's reduced ability to hold water. This can be especially problematic when wildland fires occur in the spring at the same time that flood risk is high in North Dakota.

Humans and human activity cause most of the wildland fires in North Dakota based on historical data. Many human acts of carelessness are demonstrated by loss of fire containment while attempting controlled burns of fields, ditches, and sloughs. Other sources of fire are related to recreational activities such as hunting, camping, off-road vehicle travel, when conditions are right, occasionally along railroad right-of-ways, and through the annual use of fireworks around the 4th of July. There are also natural causes of wildland fires such as lightning.

Timber lands in North Dakota only account for about 2% of the available fuel for fires. There are basically 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.

Natural fuels, in contrast with irrigated, developed, or agricultural lands, can burn more readily, particularly on large tracts of natural fuels. **Figure 4.16** in the Land Use section shows the land cover type across the state. Many of these tracts coincide with government lands. **Figure 4.17** in the Land Use section shows the state and federal government land ownership in the state. Additionally, many parts of the state have Conservation Reserve Program (CRP) acres. The US

Department of Agriculture (USDA) Farm Service Agency's Conservation Reserve Program is a voluntary program available to agricultural producers to safeguard environmentally sensitive lands. Producers enrolled in CRP establish long-term, resource-conserving covers to improve the quality of water, control soil erosion, and enhance wildlife habitat. In return, the Farm Service Agency provides participants with rental payments and cost-share assistance. Although the CRP benefits the environment in many respects, CRP lands may increase the fuels available and therefore the wildfire risk to nearby communities. According to the USDA Farm Service Agency, as of April 2013, North Dakota had 1,796,138 acres participating in the CRP.

Wildland fires can have devastating effects, such as the loss of livestock and wildlife, the destruction of habitat, agricultural crops, forage, and watersheds, the loss of personal and real property, valuable timber, and shelter belts, and the degradation of scenic and recreational areas. Secondary damage can occur with soil erosion, silting of streams and reservoirs, contamination of wells, flooding, and damage to utilities.

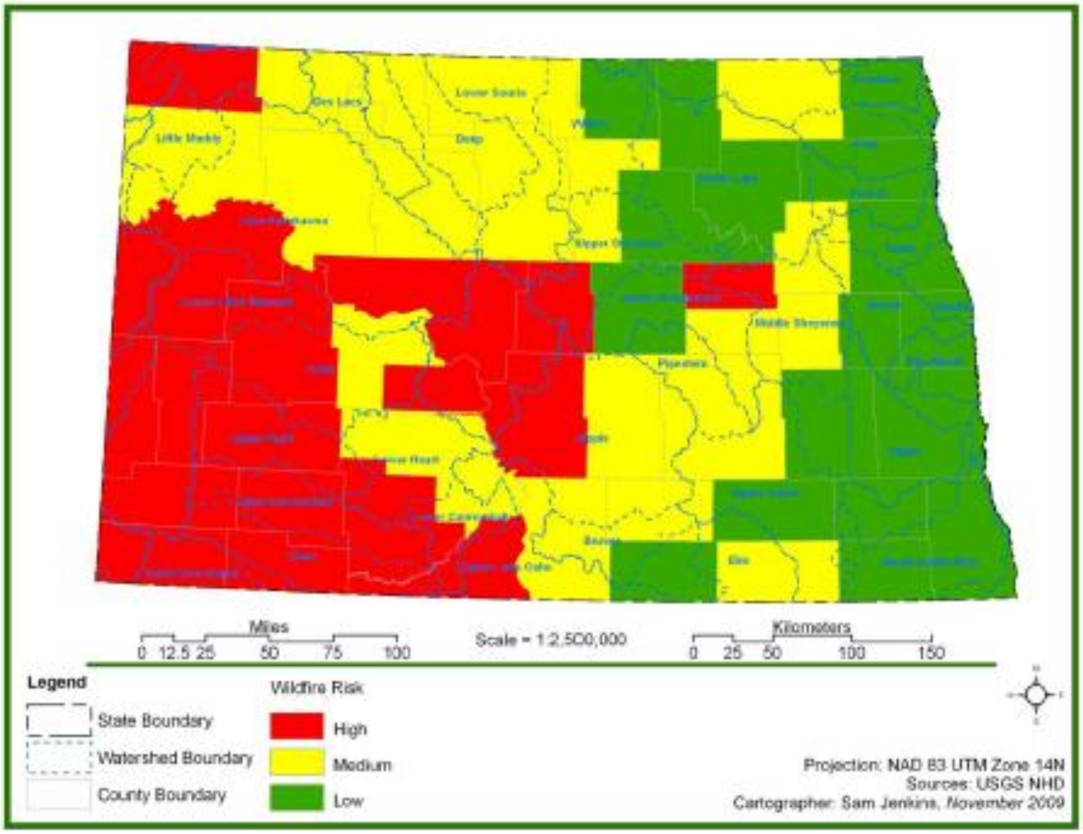
Limited resources in North Dakota necessitate the cooperation of various agencies to help share the responsibility for wildland fire mitigation and response operations. The North Dakota population is increasingly using more land for recreational activities, thereby creating a need for stronger mitigation activities to ensure minimal property loss and threat to both wildlife and human populations.

5.13.2. Geographic Location

Wildfire potential is mapped in a variety of ways. Since many factors play into wildfire risk, components are often mapped individually. **Figure 4.16** in the Land Use section shows the general land cover for North Dakota. Land cover demonstrates the type of fuels available for wildfires. In the case of agriculture, the flammability depends on the crop and its condition at that point in the growing season. Grasslands and shrub lands are not usually managed significantly and may contain a build-up of flashy fuels year round. Timber areas in the Turtle Mountains, the Pembina Hills, the area around Devils Lake, and the limited river bottom areas of the Missouri, Red, and Sheyenne Rivers can be seen in this map. The widespread prairie grasslands in the western part of the state and scattered in other parts of the state can also be visually depicted.

Figure 5.106 shows the wildfire risk by county as developed by the North Dakota Forest Service in 2009 based on wildfire occurrence, fire department response capabilities, and weather.

Figure 5.106. Wildfire Risk by County



Source: North Dakota Forest Service, 2010.

5.13.3. Previous Occurrences

North Dakota has a long history of wildland fires ranging from small to large. Some have caused damages and others have not. The extent of damages often depends on the fire spread rate and the effectiveness of suppression and mitigation measures. Data on wildfire occurrences was obtained from two sources: the North Dakota Forest Service and the Federal Wildland Fire Occurrence website (http://wildfire.cr.usgs.gov/firehistory/data.html). There is currently not one comprehensive source for data on historic wildland fires in North Dakota. These two sources were used to provide as detailed a picture of wildland fire history as possible. However, it should be noted that not all wildland fires are reported to either source and some wildfires are captured in both, depending on response agencies involved.

The Federal Wildland Fire Occurrence data had records for 16,084 North Dakota fires between 1980 and 2012. These fires were of varying sizes between 0 and 82,948 acres. In total, during this time frame, these fires burned an estimated total of 476,616 acres. The largest of these was the McKenzie County Gap/Rough Creek Fire in 1999 that burned over 50,000 acres in North Dakota.

Wildland fire causes can be natural or as a result of human activity. According to the Federal Wildland Fire Occurrence website, 96 percent of the fires resulted from human activity; 3.5 percent were from natural causes; and the causes of the remaining 0.5 percent were unknown. Between 1980 and 2012, 71 fires burned 1,000 acres or more. Of the 71 fires that burned 1,000 acres or more, 62 (88 percent) occurred as a result of human causes, and the remaining 9 (12 percent) occurred due to natural causes. The location and cause distribution of the 71 events that were 1,000 acres or more are depicted in **Figure 5.107** and **Figure 5.108** respectively.

Table 5.133. North Dakota Wildland Fire Statistics, 1980-2012

Year	# Of Fires	Total Acres Burned
1980	8	1,300
1981	5	142
1982	1	1
1983	91	1,399
1984	99	1,283
1985	354	5,492
1986	197	2,986
1987	414	6,968
1988	756	75,935
1989	380	8,668
1990	345	5,189
1991	284	4,940
1992	393	6,726
1993	366	3,737
1994	506	11,695
1995	296	2,068
1996	554	4,921
1997	470	7,746
1998	534	7,780
1999	574	82,948
2000	658	18,516
2001	576	7,893
2002	934	54,675
2003	880	20,502
2004	842	16,326
2005	769	15,997
2006	1077	24,336
2007	799	17,585
2008	707	17,383
2009	432	5,085
2010	460	6,894
2011	373	8,793
2012	950	18,506
Total	**16,084**	**474,616**

Source: Federal Wildland Fire Occurrence Website, http://wildfire.cr.usgs.gov/firehistory/data.html

Figure 5.107. Locations of North Dakota Wildland Fires 1,000 Acres or More, 1980-2012

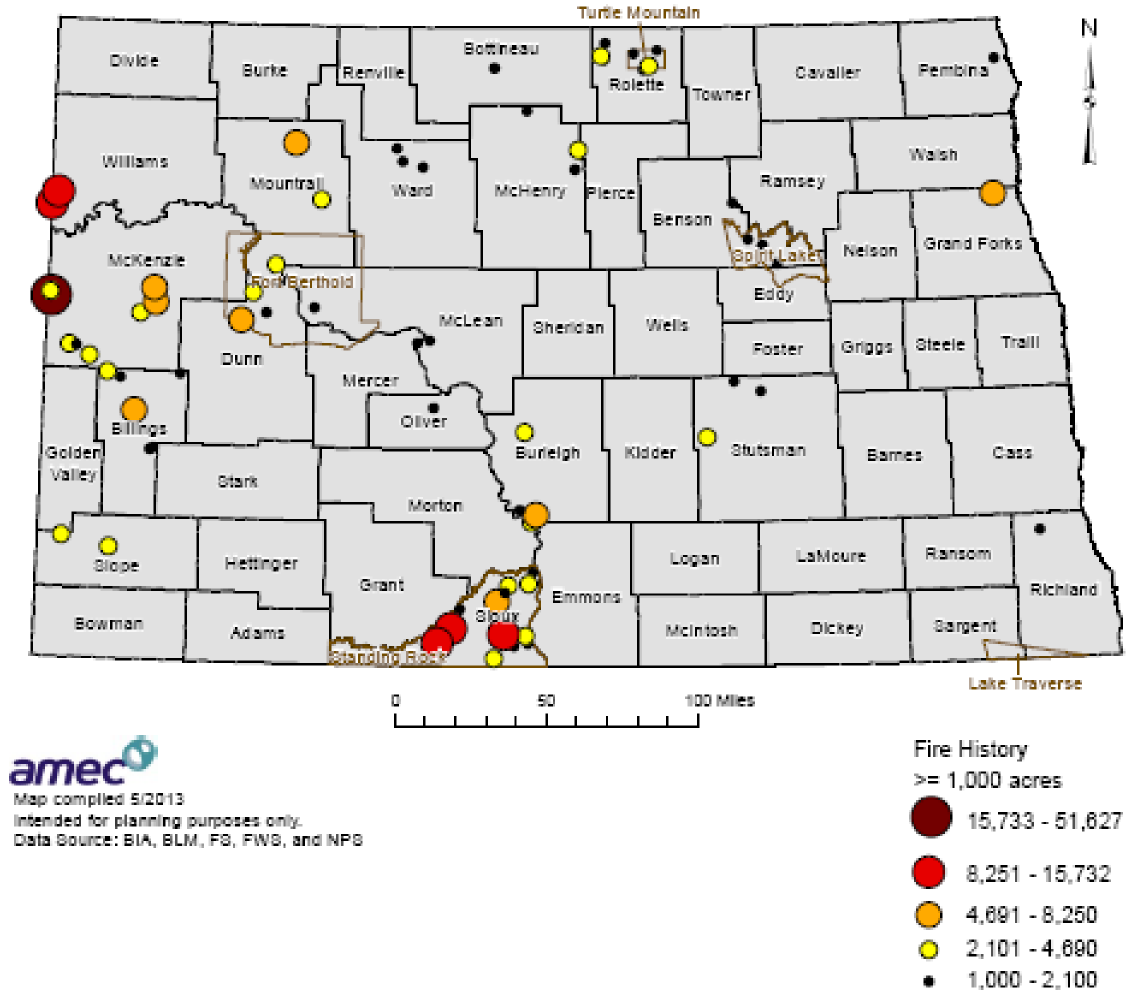
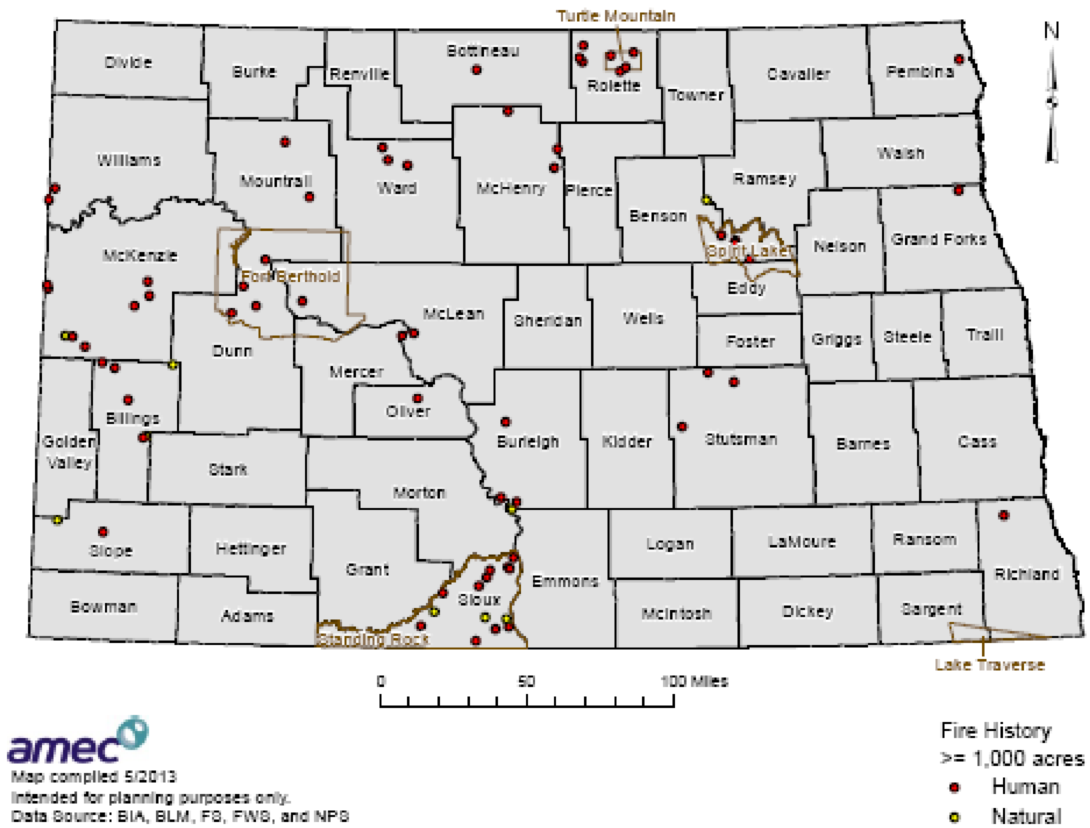


Figure 5.108. North Dakota Causes of Wildland Fires 1,000 Acres or More, 1980-2012



In addition to the Federal Wildland Fire Occurrence Website, previous North Dakota wildland fire statistics were also obtained from the North Dakota Forest Service for the period from 2009 to 2012. While fires reported to the North Dakota Forest Service can provide useful information in terms of statistical analysis, it should be noted that not all fire department report wildland fires. Additionally, of the fire departments that do generally report wildland fires, they may not report 100% of the time. Based on the available data, during the four-year period from 2009 to 2012, there were 931 total wildland fires reported that burned a total of 29,883 acres. **Table 5.134** provides additional details for each county for which wildland fire occurrences were reported during this time period.

Table 5.134. North Dakota Wildland Fires, 2009-2012

County	# of Fires	Acres Burned
Barnes	17	101
Benson	6	2
Barnes	1	0
Bottineau	11	636
Burke	3	1,201

County	# of Fires	Acres Burned
Burleigh	29	1,609
Cass	30	269
Cavalier	10	382
Dickey	9	3
Divide	4	30
Dunn	19	527
Adams	11	69
Eastman	1	11
Eddy	13	288
Emmons	7	224
Foster	4	38
Genesee	1	10
Golden Valley	6	66
Grand Forks	81	457
Grant	20	547
Griggs	12	1,270
Hettinger	4	4,017
Kidder	7	3,025
La Moure	3	0
Logan	43	255
McHenry	6	23
McIntosh	12	333
McKenzie	40	522
McLean	42	827
Mercer	44	2,632
Mountrail	2	0
Morton	60	2,148
Mountrail	10	160
Not Reported	1	1
Nelson	4	177
Oliver	5	21
Pembina	5	31
Pierce	1	2
Ramsey	1	10
Ransom	13	961
Renville	5	371
Richland	14	358
Rolette	1	20
Sargent	15	247
Sheridan	9	85
Sioux	17	3,452
Slope	9	0
Stark	56	869
Steele	2	0
Stout	1	0
Stutsman	82	1,175
Towner	4	29
Traill	6	55
Not Reported	3	3
Walsh	8	55
Ward	47	173
Wells	3	15
Williams	5	28
Location Not Reported	3	3
Total	**931**	**29,883**

Source: North Dakota Forest Service, 2013

According to this data, Hettinger County had the most acres burned, with 4,102, followed by Sioux, then Kidder, Mercer, and Morton Counties. In terms of the number of wildland fire events, Stutsman County had the most, with 82, followed by Grand Forks, Morton, Stark, Ward, and Mercer Counties.

Of the 931 fires reported to the ND Forest Service from 2009 to 2012, 382 (41 percent) burned an acre or less. Although these fires did not result in the burning of large acreage, some of these fires indicated damages to stored harvested crops such as baled hay or farm implements, such as tractors parked in a field. Additionally, it is these small fires that can result in large, more catastrophic fires if response capabilities are hindered or non-existent.

Another source of information on historical occurrences and associated losses due to wildland fires is the SDA Risk Management Agency crop insurance claims as a result of fire. From the period from 2003 to 2012 (10 years), $251,770 in crop insurance was paid as a result of wildland fire. In 2011, 89 percent of insurable crops were insured. By taking into account the uninsured, insurable crops, it is estimated that during this time frame, there may have been as much as $282,887 in wildland fire damages. This translates to an annual average of $28,288.

Table 5.135. Crop Indemnity Amounts from Fires, 2003-2012

Crop Year ID	County Name	Crop Name	Cause of Loss Description	Indemnity Amount
2008	Barnes	SOYBEANS	Fire	$14,057
2011	Benson	WHEAT	Fire	$3,732
2006	Burleigh	WHEAT	Fire	$12,278
2008	Cass	CORN	Fire	$5,640
2004	Cavalier	CANOLA	Fire	$9,221
2007	Cavalier	CANOLA	Fire	$1,171
2003	Divide	WHEAT	Fire	$1,020
2007	Eddy	SUNFLOWERS	Fire	$6,528
2006	Emmons	SUNFLOWERS	Fire	$1,951
2008	Golden Valley	WHEAT	Fire	$12,516
2008	Golden Valley	WHEAT	Fire	$4,013
2005	Grant	WHEAT	Fire	$700
2008	Hettinger	SUNFLOWERS	Fire	$806
2006	Logan	WHEAT	Fire	$2,997
2003	McHenry	SUNFLOWERS	Fire	$1,464
2009	McLean	DRY PEAS	Fire	$4,814
2007	Mountrail	DRY PEAS	Fire	$1,110
2005	Pierce	WHEAT	Fire	$1,323
2006	Sheridan	SUNFLOWERS	Fire	$190
2006	Sheridan	SUNFLOWERS	Fire	$1,904
2008	Stutsman	CORN	Fire	$3,518
2007	Traill	SUGAR BEETS	Fire	$149,694
2005	Wells	SUNFLOWERS	Fire	$2,468
2003	Williams	WHEAT	Fire	$8,655
Total				**$251,770**

Source: USDA Risk Management Agency, 2013

Some of the more significant wildland fire events that have occurred in North Dakota are described below. These events and descriptions were obtained from the North Dakota

Department of Emergency Services, North Dakota Forest Service, Federal Wildland Fire Occurrence website, 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 pockets" 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.
- 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 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.
- 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.
- 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 outbuildings on October 17-18, 2012 in the town of Bucyrus in Adams County displacing 20 residents. The fire that burned approximately 4,000 acres and measured eight miles long and 1.5 miles wide also destroyed about 70 electrical utility poles.

Table 5.136. North Dakota Wildland Fire Declared Disasters and Emergencies

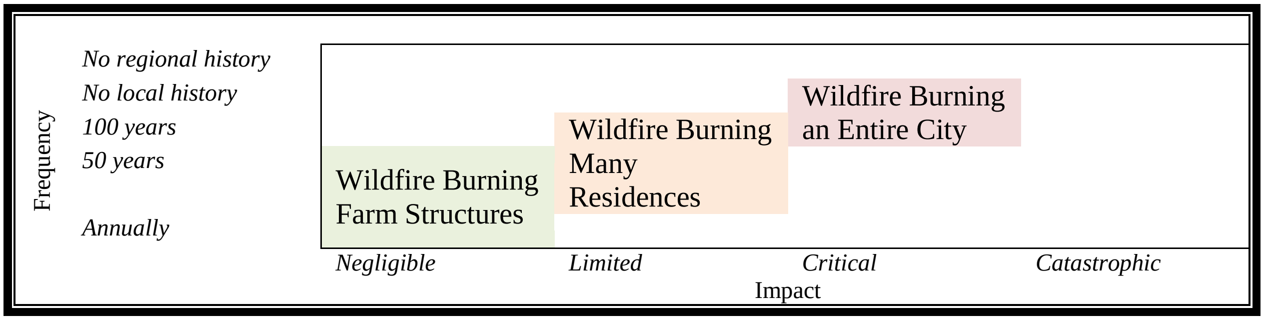
Declaration	Location	Date	Magnitude	Casualties	Damages
State EO	North Dakota	1980	State Declared Fire Disaster	Unknown	Unknown
State EO	North Dakota	1981	State Declared Fire Disaster	Unknown	Unknown
State EO	North Dakota	1988	State Declared Fire Disaster	Unknown	Unknown
State EO	North Dakota	1990	State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

Source: North Dakota Department of Emergency Services.

5.13.4. Probability and Magnitude

Figure 5.109 is a graphical representation of the range of events that can occur within the wildland fire hazard. Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear in the figure, but the information presented can assist when comparing hazards (high frequency, low impact events versus low frequency, high impact events) or when assessing the range of magnitudes possible from the wildland fire hazard. The beginning of this risk assessment chapter provides additional information on frequency and impact ratings.

Figure 5.109. Hazard Frequency and Impact Ranges



Multiple wildland fires occur on an annual basis in North Dakota. As a result, the probability of future occurrence in any given year is a 100 percent probability. The frequency and size of the wildfires depends on the ambient conditions and other factors. As history shows, the larger fires can burn tens of thousands of acres, and wildfires in the hundreds of thousands of acres are even possible.

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.

5.13.5. State Risk Assessment

Vulnerability Overview

Homes, ranches, farms, and businesses can all be threatened by North Dakota wildland fires, particularly those in rural areas surrounded by dry, natural fuels. Much of western North Dakota has these conditions for a better part of the year, and large wildfires can develop. Estimating damages can be rather difficult because future losses will be highly dependent on future fire characteristics and locations. History has shown that personal property losses can be much greater than just that of residences. Outbuildings, fences, equipment, livestock, pastures, hay bales, and crops are often additional losses. Generally, the land use is not expected to change much in the next ten years, so those areas that have historically been affected by wildland fires will probably continue to be at risk.

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. In these types of situations, firefighters can also be at risk from rapidly moving wildfires. Many times, wildfire fatalities of the evacuating population occur when frantic drivers or poor visibilities due to smoke cause a traffic accident. According to the North Dakota Department of Transportation various lane/road closures have been necessary in the past due to reduced visibility resulting from smoke from grass fires. In recent incidents, wildfire deaths have been attributed to landowners trying to protect their own property without adequate firefighting protective equipment.

Wildfires can certainly have an effect on 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. Natural resources are often lost during wildfires, but since wildfires are an important part of the ecosystem, such losses are usually only financial. Depending on the location, historic losses could also occur. Impacts to social values could occur for those under evacuation orders and others supporting the firefighting effort. Fire restrictions may prevent campfires, hunting, and other recreational activities people often enjoy.

The wildland fire risk to jurisdictions shown in **Table 5.137** is based on wildfire occurrence, fire department response capabilities, and weather, as determined by the North Dakota Forest Service in 2009.

Table 5.137. Wildland Fire Risk to Jurisdictions

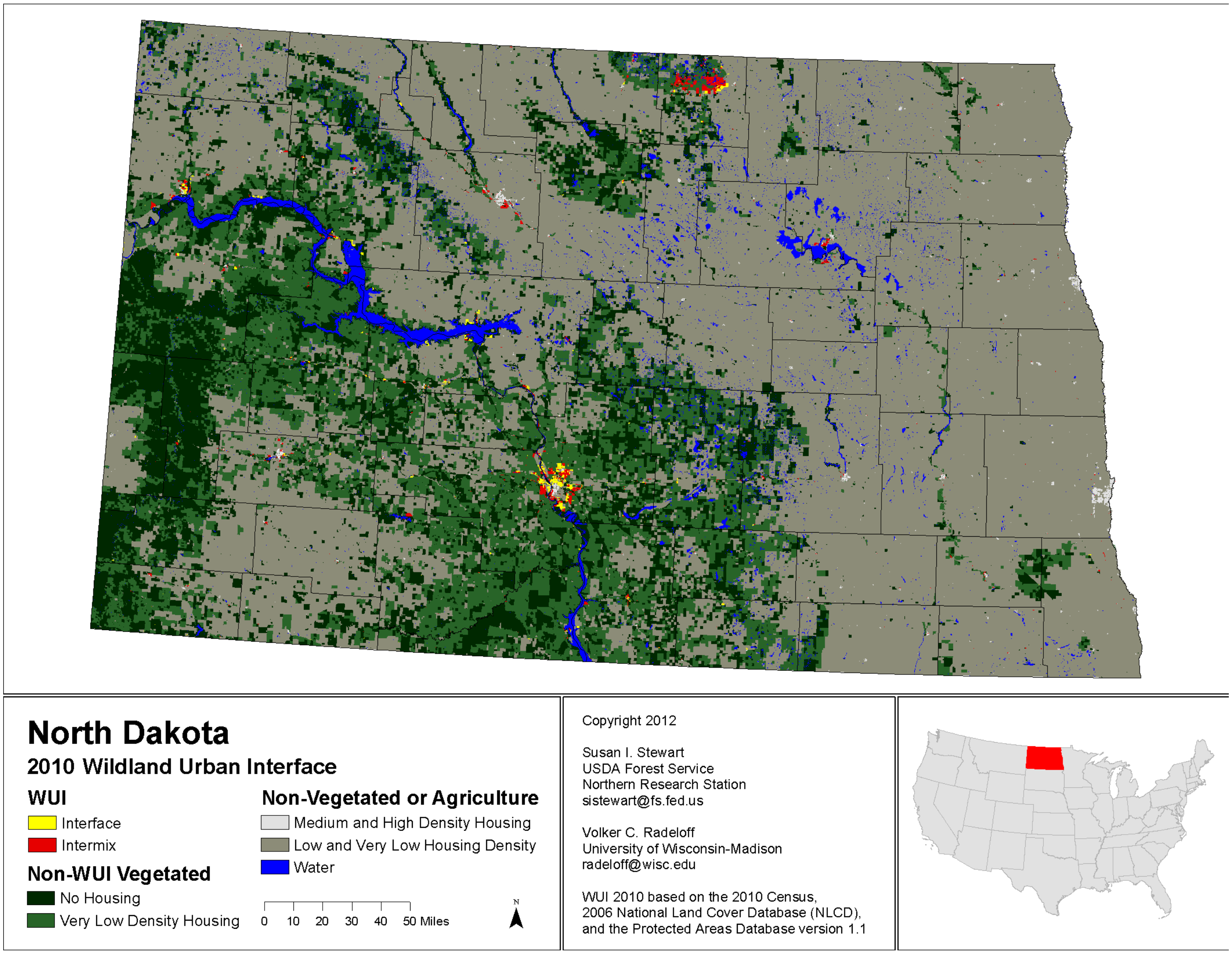
County	Wildland Fire Hazard
Adams	High
Barnes	Low
Benson	Low
Billings	High
Bottineau	Moderate
Bowman	High
Burke	Moderate
Burleigh	High
Cass	Low
Cavalier	Moderate
Dickey	Moderate
Divide	High
Dunn	High
Eddy	High
Emmons	Moderate
Fort Berthold^	Moderate-High
Foster	Moderate
Golden Valley	High
Grand Forks	Low
Grant	High
Griggs	Moderate
Hettinger	High
Kidder	Moderate
Lake Traverse^	Low
LaMoure	Low
Logan	Moderate
McHenry	Moderate
McIntosh	Low
McKenzie	High
McLean	High
Mercer	Moderate
Morton	Moderate
Mountrail	Moderate

County	Wildland Fire Hazard
Nelson	Moderate
Oliver	High
Pembina	Low
Pierce	Moderate
Ramsey	Low
Ransom	Low
Renville	Moderate
Richland	Low
Rolette	Low
Sargent	Low
Sheridan	High
Sioux	High
Slope	High
Spirit Lake	Moderate
Standing Rock^	High
Stark	High
Steele	Low
Stutsman	Moderate
Towner	Low
Traill	Low
Turtle Mountain^	Low
Walsh	Low
Ward	Moderate
Wells	Low
Williams	Moderate

^ includes only North Dakota parts of the reservation

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 or Intermix areas.

Figure 5.110. North Dakota Wildland-Urban Interface/Intermix



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

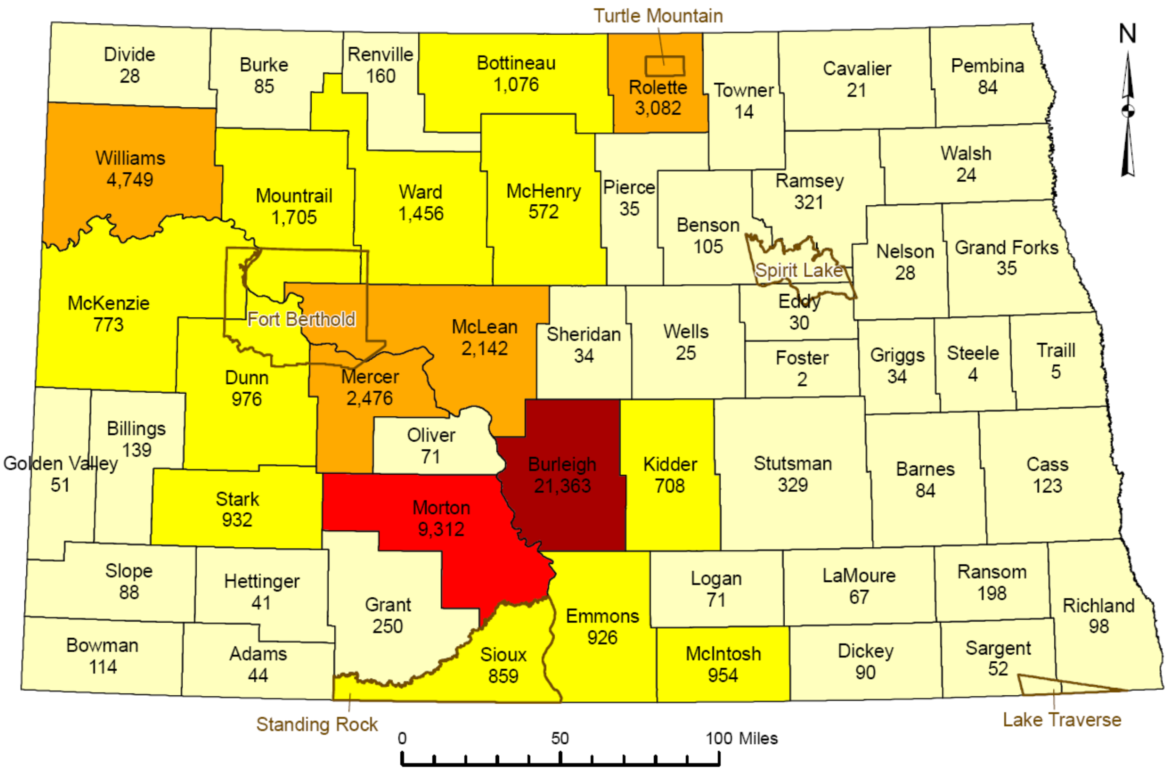
- Medium Density Interface
- Low Density Intermix

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 5.111** 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. The results are shown in **Table 5.138.** Burleigh County has the highest building and population exposure by far compared to the other counties, followed by Morton and then Williams Counties.

Figure 5.111. Housing Units in WUI High and Moderate Risk Threat Zones



Map compiled 5/2013
Intended for planning purposes only.
Data Source: SILVIS, NDDES

Total Housing Units
- 10,001 - 21,363
- 5,001 - 10,000
- 2,001 - 5,000
- 501 - 2,000
- 2 - 500

Table 5.138. Population and Housing Units in SILVIS High and Moderate Risk Threat Zones

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
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 Valley	22	15	60	36	82	51
Grand Forks	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

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
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
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.

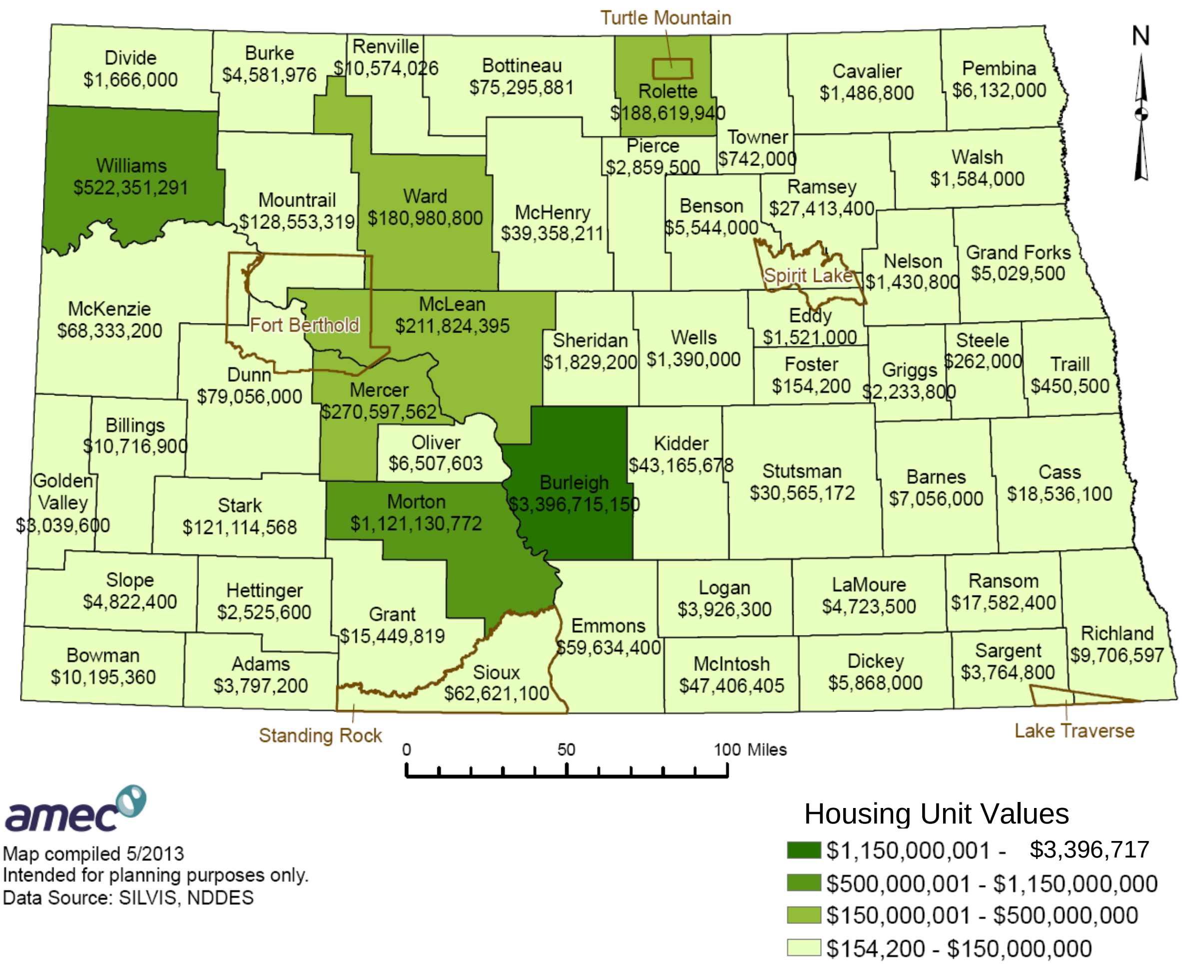
Table 5.139. Housing Unit Values in High and Moderate Wildfire Risk Areas

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

County Name	Total Housing Units in High and Moderate Risk Categories	Median Housing Value	Housing Unit Values in High and Moderate Wildfire Risk Areas
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
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

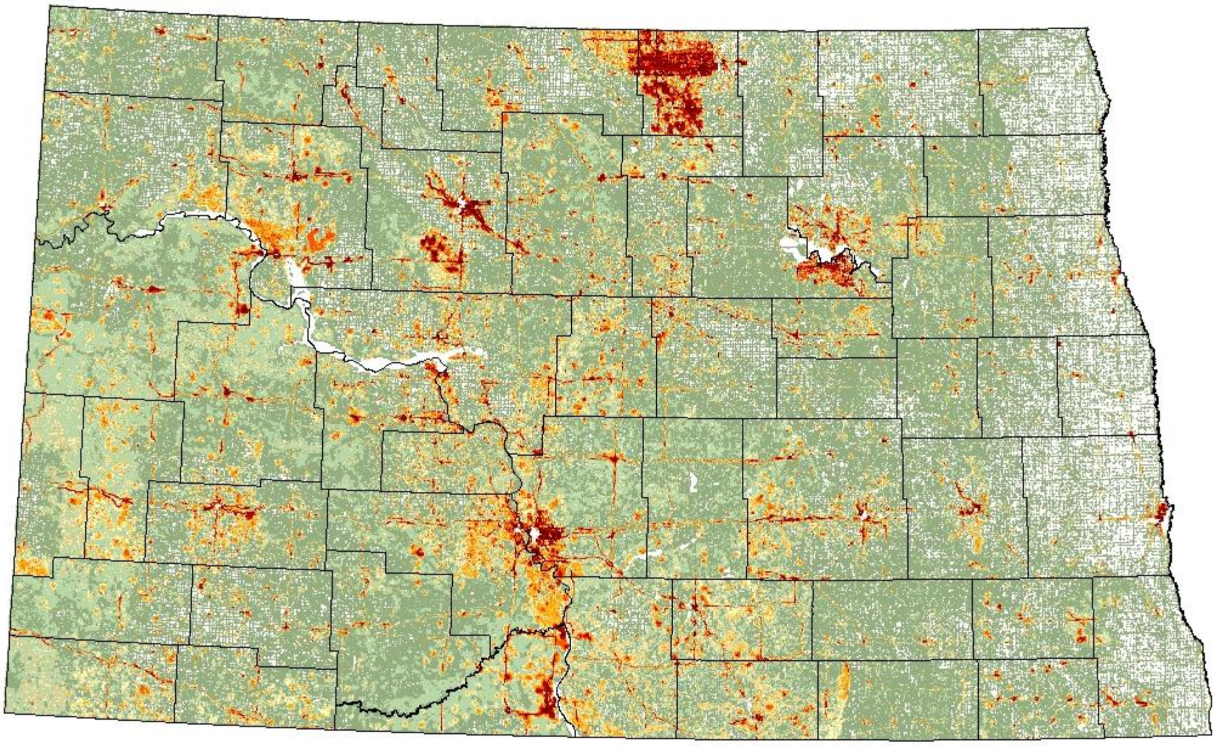
Figure 5.112. Housing Unit Values in High and Moderate Wildfire Risk Areas



The 2013 West Wide Wildfire Risk Assessment (WWA) was also reviewed during the 2013-2014 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 5.113**. 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 4 to 9)
- 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 5.113. North Dakota Fire Risk Index Based on West Wide Wildfire Risk Assessment



Source: 2013 West Wide Wildfire Risk Assessment

5.13.6. Local Risk Assessments

Table 5.140 provides information from local and tribal mitigation plans regarding the local hazard rating for wildland fire as well as estimated losses, where available. As indicated in the rating column, the local plans utilized various methods to rate or rank the hazards. The most widely used ranking system was an A through D ranking, with "A" being highest risk hazards and "D" being lowest risk hazards. One county plan utilized a Calculated Priority Risk Index (CPRI) method which uses several factors to rank hazards on a scale from 0 to 4. And another numbered the hazards according to rank (see LaMoure County). Still other local plans used a high, medium, low ranking approach.

Table 5.140. Wildland Fire Risk Summary From Local Plans

County	Wildland Fire Hazard Rating	Wildland Fire Additional Information
Adams	B	$8,600,000 estimated losses
Barnes	D	$17,222,644 estimated structure and contents loss
Benson	B	
Billings	B	
Bottineau	C	$22,842,716 estimated losses
Bowman	C	$2,530,629 estimated loss
Burke	C	$3,600,000 estimated losses
Burleigh	B	$143,861,236 critical facilities losses, $85,703,749 residential losses
Cass	C	$16,182,636,574 estimated losses
Cavalier	Medium	
Dickey	C	
Divide	NP	
Dunn	C	
Eddy	C	$160,356,789.10 estimated losses
Emmons	B	
*Fort Berthold^*	*CPRI 3.5*	
Foster	C	$22,872,715.60 estimated losses
Golden Valley	C	
Grand Forks	D	Up to $215,000,000 enhanced risk building exposure
Grant	C	
Griggs	C	$17,000,000 estimated losses
Hettinger	D	
Kidder	C	$6,300,000 estimated losses
*Lake Traverse^*	*NP*	
LaMoure	#9 of 12	
Logan	D	$1,463,529 estimated losses
McHenry	D	$53,659,718.84 estimated losses
McIntosh	B	$15,132,295 estimated losses
McKenzie	NP	
McLean	A	
Mercer	C	
Morton	D	
Mountrail	C	$41,000,000 estimated losses
Nelson	C	$9,144,594 estimated losses
Oliver	B	
Pembina	D	$99,260,441 estimated losses
Pierce	C	
Ramsey	B	Hundreds of thousands of dollars in structure losses
Ransom	Medium	
Renville	C	$46,860,340.94 estimated losses
Richland	B	
Rolette	D	$70,646,382.03 estimated losses
Sargent	B	$10,221,436 estimated losses

County	Wildland Fire Hazard Rating	Wildland Fire Additional Information
Sheridan	NP	
Sioux	*Very Likely*	
Slope	B	$47,805 estimated losses
Spirit Lake	High	
*Standing Rock^*	*Very Likely*	
Stark	NP	
Steele	NP	
Stutsman	C	$76,516,122.94 estimated losses
Towner	D	$85,230,075.79 estimated losses
Traill	C	$22,872,715.60 estimated losses
Turtle Mountain^	CPRI 3.2	
Walsh	C	
Ward	C	$207,286,493 estimated losses
Wells	C	$4,154,872.71 estimated losses
Williams	A	$2,094,512 estimated losses

Source: Local Hazard Mitigation Plans; ^ includes only North Dakota parts of the reservation; NI = not identified in the local plan; NP = no local plan; NL = included in the local plan, but no classification listed

5.13.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

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. Site evaluations would be needed to specifically state which buildings are at highest risk.

With many acres of land under its jurisdiction, the North Dakota Game and Fish Department (NGFD) is one state agency that is impacted annually by wildland fires. From 2005-2012, the NGFD lost 6,316 acres to wildland fires. Specifics of these losses are provided in **Table 5.141.**

Table 5.141. North Dakota Game and Fish Department Wildland Fire Burn Summary, 2005-2012

Date	Acres	WMA/County	Habitat
2/13/2005	0.5	Oahe/Burleigh	Native prairie (MacLean 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

Date	Acres	WMA/County	Habitat
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
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

Source: North Dakota Game and Fish Department, 2013; WMA=Wildlife Management Area

Wildfires have the greatest potential to threaten facilities and infrastructure lacking defensible space. Defensible space is a buffer zone between a structure and flammable fuels. Irrigation, mowed areas, tree thinning, roads, and waterways can serve as buffers to wildfires in some cases. The threat to a structure can truly only be assessed on a case-by-case basis. In many cases, critical facilities are located in developed communities, and therefore, are provided some measure of protection from the surrounding development and irrigated agricultural lands.

Often regional electric infrastructure passes through wildland and non-irrigated agricultural areas. In particular, electric substations and 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.

Additional Wildland Fire Critical Facility Analysis

Other critical facilities that support government services and private utilities may also be located in areas vulnerable to wildland fire. Damages to such facilities may seriously disrupt emergency and essential services. To provide additional information on critical facilities vulnerable to damage from riverine flood, GIS-based analysis was performed utilizing data from the Homeland Security Infrastructure Program and the Wildland Urban Interface Wildfire Risk layers from SILVIS. Critical Facilities in the following facility classes were included in this analysis: communications, emergency services, energy, public health and transportation. **Table 5.142** provides the results of critical facilities in these classes in High Wildfire Risk areas and **Table 5.143** provides the results of critical facilities in these classes in Moderate Wildfire Risk areas.

Table 5.142. Critical Facilities in SILVIS High Wildfire Risk Areas

Facility Class	Facility Type	Count
Communications	Microwave	34
	Total	**34**
Emergency Services	Air Care	1
	EMS	6
	Fire Stations	4
	Law Enforcement	4
	Local EOCs	1
	Shelters	3
	Total	**19**
Energy	Substations	3
	Wells	1
	Total	**4**
Public Health	Hospitals	3
	Nursing Homes	8
	Public Health Depts	3
	Urgent Care	2
	VA Centers	1
	Total	**17**
Transportation	Bridge	8
	Scour Critical Bridge	1
	Total	**9**
	Grand Total	**83**

Source: Homeland Security Infrastructure Gold Data, SILVIS Wildland Urban Interface Risk layers.

Table 5.143. Critical Facilities in SILVIS Moderate Wildfire Risk Areas

Facility Class	Facility Type	Count
Communications	Cell Tower	4
	Microwave	37
	Total	**41**
Emergency Services	EMS	20
	Fire Stations	25
	Law Enforcement	9
	Local EOCs	4
	Shelters	13
	State EOC	1
	Total	**72**
Energy	Power Plants	1
	Substations	29
	Wells	36
	Total	**66**
Public Health	Hospitals	3
	Nursing Homes	11
	Public Health Depts	5
	Urgent Care	2
	Total	**21**
Transportation	Bridge	15
	Scour Critical Bridge	1
	Total	**16**
Water Treatment Plants	Water Supply	1
	Total	**1**
	Grand Total	**217**

Source: Homeland Security Infrastructure Gold Data, SILVIS Wildland Urban Interface Risk layers.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.13.8. Development in Identified Hazard Areas

Remote, isolated, forested areas are becoming more popular places to live or to have a second home, as national trends show. Growth in these parts of North Dakota is possible. Regulating growth in these areas is a delicate balance between protecting private property rights, promoting economic development, and promoting public safety. Future development could have a negative impact on the wildland fire vulnerabilities, 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.

Table 5.144 and **Table 5.145** show the areas with housing unit and population increases from 2000 to 2010 respectively that were determined to be Moderate-High and High Risk to Wildland Fire by the State's 2009 assessment. **Table 5.146** shows the areas with projected 40 percent and greater population increases from 2010 to 2025 that were determined to be Moderate-High and High Risk to Wildland Fire by the State's 2009 assessment. In addition, both Morton and Burleigh Counties were determined to have over 5,000 housing units in SILVIS High and Moderate Risk Zones. Both of these counties have also experienced growth and are expected to continue to do so.

Table 5.144. Areas with Housing Unit Increases 2000 to 2010 and Moderate-High and High Risk to Wildland Fire by the State's 2009 Assessment

Area	2010 Total Housing Units	2000 Total Housing Units	# change	% change
Fort Berthold Reservation	3,322	2,624	698	27%
Burleigh County	34,557	29,003	5,554	19%
McKenzie County	3,019	2,719	300	11%
Stark County	10,528	9,722	806	8%
Dunn County	2,117	1,965	152	8%
Sioux County	1,307	1,216	91	7%
Standing Rock Reservation	1,307	1,216	91	7%
McLean County	5,528	5,264	264	5%
Slope County	470	451	19	4%
Hettinger County	1,460	1,419	41	3%
Bowman County	1,636	1,596	40	3%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.145. Areas with Population Increases 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Burleigh County	69,416	81,308	11,892	17.10%
McKenzie County	5,737	6,360	623	10.90%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	22,636	24,199	1,563	6.90%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.146. Areas with Projected Population Increases of 40% or More by 2025

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Dunn County	3,536	5,433	1,897	53.60%
Slope County	727	1,095	368	50.60%

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.13.9. Data Limitations and Other Key Documents

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 Emergency Operations Plan, Fire Annex
- 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

5.14. <u>Windstorm</u>

Hazard Rank	THIRA Threat/Hazard Group
Moderate	Natural

5.14.1. Description

Strong winds can occur year-round in North Dakota. This section focuses on high wind events that 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. 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.

FEMA recognizes four wind zones in the U.S., depicted in **Figure 5.114**. North Dakota falls into Zones II and III. Winds speeds 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.

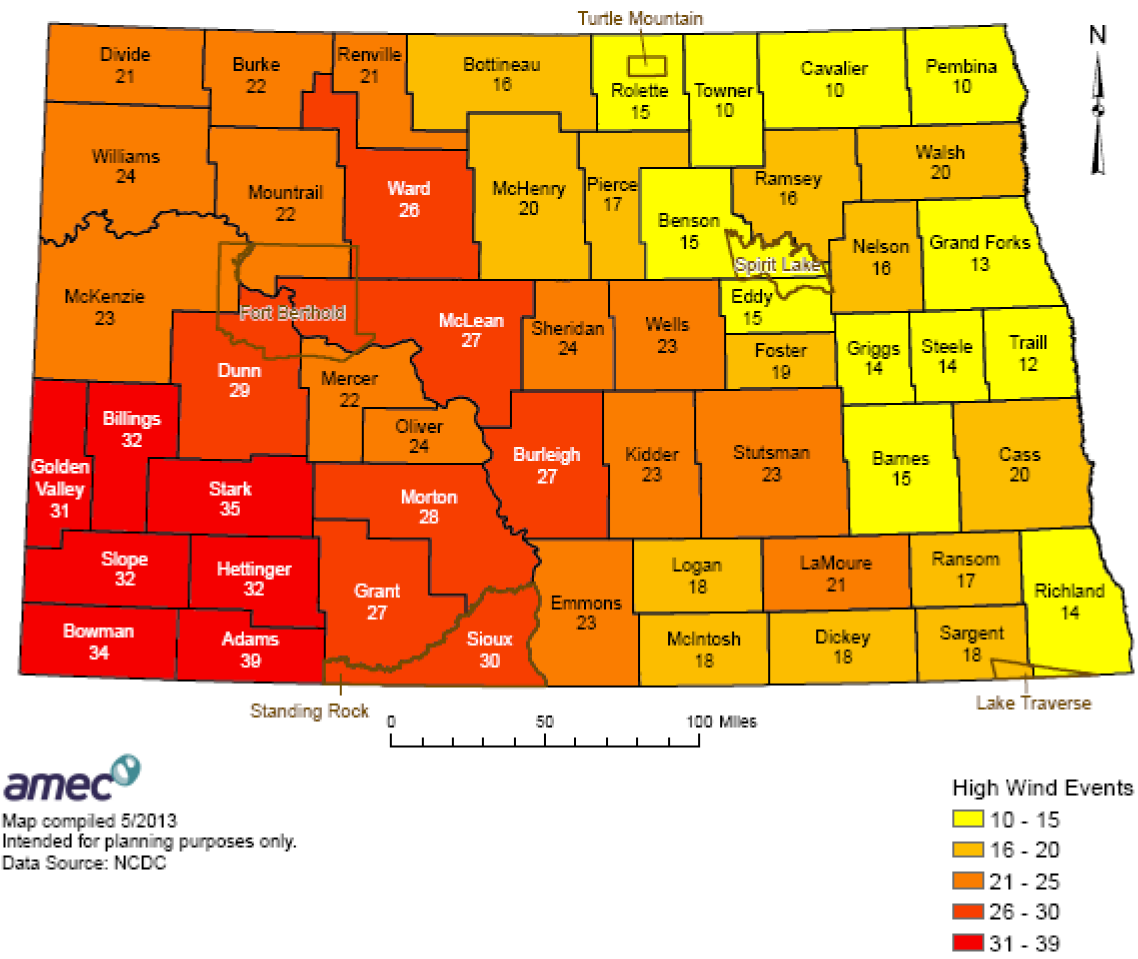
Figure 5.114. Wind Zones in the United States

Source: FEMA

5.14.2. Geographic Location

Figure 5.115 shows the number of high wind events reported to NCDC over the past 13 years in each county. Generally this map shows that high winds are possible in all parts of the state. The highest concentrations of high wind events are in the western and central sections of North Dakota, with particular focus on the southwest corner of the state. It is important to note that high wind events may occur across several counties at once, so the previously referenced number of 1,135 high wind events between 2000 and 2013 does not necessarily mean that there were 1,135 unique high wind events.

Figure 5.115. High Wind Events: 2000-2013



5.14.3. Previous Occurrences

NCDC recorded 1,135 high wind events in North Dakota between 2000 and 2013. These events resulted in 1 fatality, 31 injuries, $5,396,500 in total property damages, and $415,115 in average annualized property damage. (National Climatic Data Center, 2013) Crop insurance payments for wind-related crop losses for North Dakota insurable crops totaled $32,913,468 between 2003 and 2012. (Risk Management Agency, 2003 - 2012)

- <u>July 31, 2000</u> -- 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)
- <u>June 11, 2008</u> -- 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)
- March 11, 2011 – A storm mainly produced prolonged and intense winds. Sustained winds in excess of 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 miles per hour occurred across Sioux County. An accident between a school bus and a pickup truck, which was caused by strong wings, resulted in seven injuries. (National Climatic Data Center, 2013)

North Dakota has had only one major federal disaster declaration related to high winds, DR 1483, summarized in **Table 5.147**.

Table 5.147. North Dakota Summer Storm Declared Disasters and Emergencies

Declaration	Location	Date	Other Information	Casualties	Damages
State Request	North Dakota	1981	Governor’s Request for USDA assistance for heat, hail, wind, heavy rain, and insects.	Unknown	Unknown
State Request	North Dakota	1982	Governor’s Request for USDA assistance for high wind, hail, and heavy rain.	Unknown	Unknown
DR 1483	Barnes County	June 24-25, 2003	Severe Storms and High Winds Public Assistance	None	$924,742* $1,900,000 estimated total

* 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).

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; North Dakota Department of Emergency Services, 2010b.

5.14.4. Probability and Magnitude

Based on the historical record, North Dakota can expect over 87 high wind events, not related to tornadoes or thunderstorm winds, in any given year. The state can also expect a fatality once every ten years or more, and 1-2 injuries each year. The Federal Emergency Management Agency 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). (Federal Emergency Management Agency, 2004) As history demonstrates, these types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures. Building codes can help reduce the likelihood or magnitude of structures failing due to high winds.

5.14.5. State Risk Assessment

Vulnerability Overview

Table 5.148 through **Table 5.151** show the damage indicators based on wind speed for various types of residential, farm, and business structures.

Table 5.148. One and Two Family Residences

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	53-80 mph (65 mph)
Loss of roof covering material (<20%), gutters, and/or awning; loss of vinyl or metal siding	63-97 mph (79 mph)
Broken glass in doors and windows	79-114 mph (96 mph)
Uplift of roof deck and loss of significant roof covering material (>20%); collapse of chimney; garage doors collapse inward; failure of porch or carport	81-116 mph (97 mph)
Entire house shifts off foundation	103-141 mph (121 mph)
Large sections of roof structure removed, most walls remain standing	104-142 mph (122 mph)
Top floor exterior walls collapsed	113-153 mph (132 mph)
Most interior walls of top story collapsed	128-173 mph (148 mph)
Most walls collapsed in bottom floor, except small interior rooms	127-178 mph (152 mph)
Total destruction of entire building	142-198 mph (170 mph)

Source: Storm Prediction Center, 2007.

Table 5.149. Single Wide Manufactured Homes

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	51-76 mph (61 mph)
Loss of shingles or partial uplift of one-piece metal roof covering	61-92 mph (74 mph)
Unit slides off block piers but remains upright	72-103 mph (87 mph)
Complete uplift of roof, most walls remain standing	73-112 mph (89 mph)
Unit rolls on its side or upside down, remains essentially intact	84-114 mph (98 mph)
Destruction of roof and walls leaving floor and undercarriage in place	87-123 mph (105 mph)
Unit rolls or vaults, roof and walls separate from floor and undercarriage	96-128 mph (109 mph)

Damage Description	Wind Speed Range (expected in parentheses)
Undercarriage separates from unit, rolls, tumbles, and is badly bent	101-136 mph (118 mph)
Complete destruction of unit, debris blown away	110-148 mph (127 mph)

Source: Storm Prediction Center, 2007.

Table 5.150. Small Barns and Farm Outbuildings

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	53-78 mph (62 mph)
Loss of wood or metal roof panels	61-91 mph (74 mph)
Collapse of doors	68-102 mph (83 mph)
Major loss of roof panels	78-110 mph (90 mph)
Uplift or collapse of roof structure	77-114 mph (93 mph)
Collapse of walls	81-119 mph (97 mph)
Overturning or sliding of entire structure	83-118 mph (99 mph)
Total destruction of building	94-131 mph (112 mph)

Source: Storm Prediction Center, 2007.

Table 5.151. Small Retail Building

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	54-81 mph (65 mph)
Loss of roof covering (<20%)	65-98 mph (78 mph)
Broken glass in windows and doors	72-103 mph (86 mph)
Uplift of roof decking; significant loss of roof covering (>20%)	81-119 mph (98 mph)
Canopies or covered walkways destroyed	83-114 mph (98 mph)
Uplift or collapse of entire roof structure	101-140 mph (119 mph)
Collapse of exterior walls; closely spaced interior walls remain standing	120-159 mph (138 mph)
Total destruction of entire building	143-193 mph (167 mph)

Source: Storm Prediction Center, 2007.

Since structures are vulnerable to strong winds, those inside them are also at risk. The National Weather Service offices in Bismarck and Grand Forks warn for high winds events in North Dakota. Meteorologists use a variety of tools such as Doppler radar and weather spotters to predict high wind events and issue warnings that are broadcast over NOAA Weather Radio and other media. Mobile homes, even if tied down, and automobiles are not safe places to take shelter during high wind events. North Dakota has approximately 23,471 mobile homes across the state. Given approximately 2.3 people per housing unit in the state, roughly 53,983 people are at enhanced risk from strong winds. Besides structure failure, wind-driven projectiles and shattered glass can injure or kill occupants. Note that potential wind speeds based on FEMA's wind zones can exceed the estimates listed in the above tables.

Based on the history of summer storms over the past 63 years, the counties have been relatively rated high, moderate-high, moderate, low-moderate, and low as shown in **Table 5.152**. All counties in North Dakota are certainly at risk from windstorms and a low rating does not mean that the vulnerability is small or non-existent. The history is highly dependent on the population observing and reporting an event, so therefore, the more rural counties may have fewer reports; however, those counties also have less population and property vulnerable to the hazard.

To refine and assess the relative vulnerability of each North Dakota county to windstorm events, ratings were assigned to pertinent factors that were examined at the county level. These factors include: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, livestock exposure, crop exposure, and annualized crop loss. A rating value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for each comparison and to determine the most vulnerable counties. The Social Vulnerability Index normally ranges from 1-5. To give the Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two. Overall vulnerability scores were sorted into rankings from low, low-moderate, moderate, moderate-high, and high. **Table 5.152** summarizes the calculated ranges applied to determine the overall vulnerability ranking.

Table 5.152. Rankings for Overall Windstorm Vulnerability

Hazard	Low	Low-Moderate	Moderate	Moderate-High	High
Windstorm	14-20	21-27	28-34	35-41	42-48

The following are the data sources for the rating factors: Social Vulnerability Index for North Dakota counties from the Hazards and Vulnerability Research Institute at the University of South Carolina, National Climatic Data Center (NCDC) storm events (2000-2012), U.S. Census Bureau (2010), USDA's Census of Agriculture (2007), and the USDA Risk Management Agency (2003-2012). **Table 5.153** shows the vulnerability ranking derived from the analysis of data from these sources. **Figure 5.116** illustrates windstorm vulnerability by county.

Table 5.153. Windstorm Vulnerability Ranking by County

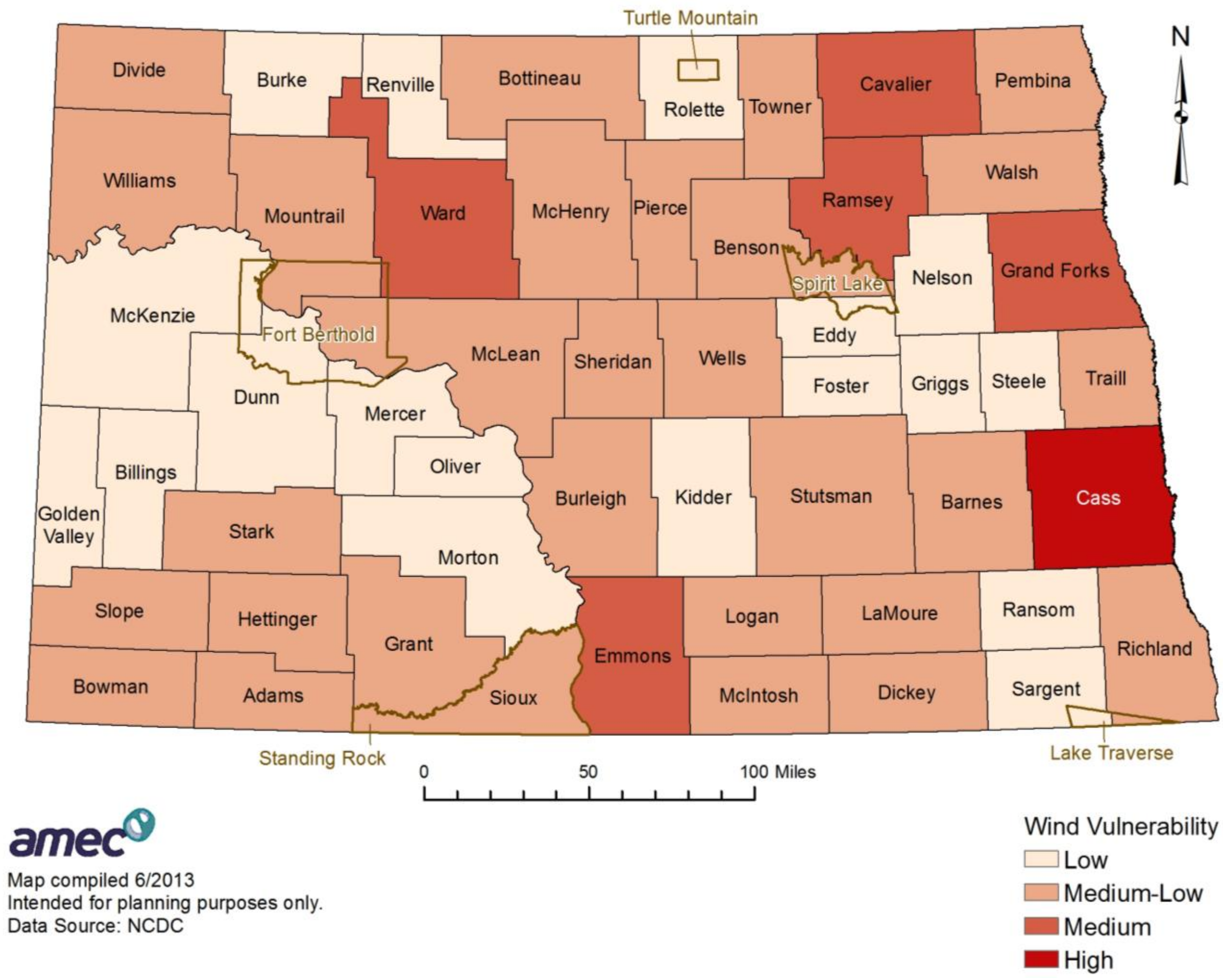
County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Adams	10	39	$0	$0	$335,192	2.4	$31,296,000	$39,246,000	$419,735	$471,612	$47,161	27	Low-Moderate
Barnes	8	15	$300,000	$23,077	$1,433,052	7.4	$10,760,000	$172,501,000	$281,082	$315,822	$31,582	21	Low-Moderate
Benson	10	15	$25,000	$1,923	$592,939	4.8	$14,530,000	$108,039,000	$1,035,281	$1,163,237	$116,324	23	Low-Moderate
Billings	4	32	$20,000	$1,538	$115,578	0.7	$16,486,000	$7,264,000	$974	$1,094	$109	17	Low
Bottineau	10	16	$50,000	$3,846	$974,645	3.9	$8,891,000	$158,991,000	$790,145	$887,803	$88,780	25	Low-Moderate
Bowman	8	34	$20,000	$1,538	$438,186	2.7	$42,603,000	$35,079,000	$62,246	$69,939	$6,994	22	Low-Moderate
Burke	6	22	$20,000	$1,538	$277,676	1.8	$6,331,000	$55,256,000	$234,154	$263,094	$26,309	17	Low
Burleigh	2	27	$115,000	$8,846	$8,282,489	49.8	$31,554,000	$50,682,000	$1,028,647	$1,155,783	$115,578	26	Low-Moderate
Cass	2	20	$3,035,000	$233,462	$16,383,158	84.9	$15,706,000	$252,192,000	$675,023	$758,453	$75,845	48	High
Cavalier	8	10	$0	$0	$674,153	2.7	$2,419,000	$171,319,000	$4,079,486	$4,583,692	$458,369	29	Moderate
Dickey	10	18	$25,000	$1,923	$663,899	4.7	$37,703,000	$124,459,000	$541,386	$608,299	$60,830	23	Low-Moderate
Divide	10	21	$20,000	$1,538	$340,638	1.6	$6,935,000	$73,992,000	$241,211	$271,024	$27,102	21	Low-Moderate

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Dunn	8	29	$60,000	$4,615	$363,438	1.8	$37,328,000	$31,384,000	$127,077	$142,783	$14,278	20	Low
Eddy	10	15	$0	$0	$274,007	3.8	$8,573,000	$38,658,000	$92,018	$103,391	$10,339	18	Low
Emmons	10	23	$25,000	$1,923	$395,022	2.4	$34,225,000	$86,729,000	$2,105,337	$2,365,547	$236,555	28	Moderate
Foster	8	19	$20,000	$1,538	$516,048	5.3	$19,352,000	$75,607,000	$191,949	$215,673	$21,567	19	Low
Golden Valley	8	31	$20,000	$1,538	$245,937	1.7	$16,270,000	$26,832,000	$18,643	$20,947	$2,095	20	Low
Grand Forks	4	13	$5,000	$385	$8,088,076	46.5	$22,117,000	$233,477,000	$735,797	$826,738	$82,674	30	Moderate
Grant	10	27	$80,000	$6,154	$339,417	1.4	$32,785,000	$47,085,000	$346,358	$389,166	$38,917	22	Low-Moderate
Griggs	10	14	$0	$0	$395,892	3.4	$6,681,000	$56,624,000	$27,311	$30,687	$3,069	19	Low
Hettinger	8	32	$200,000	$15,385	$311,507	2.2	$9,876,000	$83,684,000	$489,462	$549,957	$54,996	25	Low-Moderate
Kidder	8	23	$20,000	$1,538	$291,192	1.8	$31,707,000	$46,750,000	$668,799	$751,460	$75,146	20	Low
LaMoure	8	21	$135,000	$10,385	$549,557	3.6	$30,060,000	$123,335,000	$484,644	$544,544	$54,454	22	Low-Moderate
Logan	10	18	$20,000	$1,538	$265,260	2	$44,967,000	$39,574,000	$963,121	$1,082,158	$108,216	21	Low-Moderate
McHenry	8	20	$51,500	$3,962	$579,726	2.9	$43,672,000	$90,288,000	$417,040	$468,584	$46,858	21	Low-Moderate
McIntosh	10	18	$20,000	$1,538	$424,691	2.9	$25,877,000	$49,985,000	$1,343,424	$1,509,465	$150,947	22	Low-Moderate
McKenzie	8	23	$20,000	$1,538	$563,420	2.3	$28,005,000	$50,115,000	$127,996	$143,816	$14,382	19	Low
McLean	8	27	$60,000	$4,615	$1,160,771	4.2	$17,593,000	$145,847,000	$341,128	$383,290	$38,329	24	Low-Moderate
Mercer	4	22	$52,000	$4,000	$1,027,056	8.1	$15,446,000	$24,622,000	$305,734	$343,521	$34,352	14	Low

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Morton	4	28	$70,000	$5,385	$2,509,973	14.3	$56,448,000	$60,803,000	$522,429	$586,999	$58,700	20	Low
Mountrail	10	22	$50,000	$3,846	$706,495	4.2	$15,256,000	$92,746,000	$405,636	$455,771	$45,577	23	Low-Moderate
Nelson	10	16	$0	$0	$486,024	3.2	$8,036,000	$77,333,000	$177,852	$199,834	$19,983	20	Low
Oliver	4	24	$50,000	$3,846	$193,161	2.6	$29,063,000	$24,326,000	$139,480	$156,719	$15,672	14	Low
Pembina	6	10	$20,000	$1,538	$1,211,523	6.6	$6,323,000	$229,298,000	$242,215	$272,152	$27,215	21	Low-Moderate
Pierce	10	17	$55,000	$4,231	$627,541	4.3	$14,011,000	$58,702,000	$1,145,126	$1,286,658	$128,666	22	Low-Moderate
Ramsey	10	16	$25,000	$1,923	$1,416,002	9.6	$2,470,000	$122,100,000	$2,131,885	$2,395,376	$239,538	28	Moderate
Ransom	8	17	$100,000	$7,692	$693,175	6.3	$21,255,000	$72,103,000	$54,949	$61,740	$6,174	18	Low
Renville	6	21	$50,000	$3,846	$373,051	2.8	$3,237,000	$103,034,000	$325,322	$365,530	$36,553	18	Low
Richland	4	14	$100,000	$7,692	$2,381,906	11.4	$32,687,000	$228,812,000	$1,370,153	$1,539,498	$153,950	25	Low-Moderate
Rolette	10	15	$50,000	$3,846	$979,534	15.4	$13,779,000	$52,837,000	$769,498	$864,604	$86,460	20	Low
Sargent	6	18	$0	$0	$521,880	4.5	$23,376,000	$104,365,000	$1,012,716	$1,137,883	$113,788	19	Low
Sheridan	10	24	$50,000	$3,846	$176,746	1.4	$8,746,000	$43,742,000	$265,387	$298,188	$29,819	21	Low-Moderate
Sioux	10	30	$65,000	$5,000	$202,998	3.8	$21,171,000	$11,148,000	$282,919	$317,887	$31,789	22	Low-Moderate
Slope	8	32	$20,000	$1,538	$61,939	0.6	$16,222,000	$31,423,000	$174,244	$195,780	$19,578	21	Low-Moderate
Stark	6	35	$25,000	$1,923	$2,581,806	18.1	$33,138,000	$63,674,000	$47,708	$53,604	$5,360	25	Low-Moderate
Steele	4	14	$0	$0	$283,664	2.8	$2,398,000	$99,946,000	$82,982	$93,238	$9,324	14	Low

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Stutsman	8	23	$23,000	$1,769	$2,378,397	9.5	$29,713,000	$168,570,000	$349,013	$392,149	$39,215	26	Low-Moderate
Towner	10	10	$0	$0	$408,054	2.2	$11,139,000	$96,333,000	$2,055,509	$2,309,561	$230,956	24	Low-Moderate
Traill	8	12	$25,000	$1,923	$1,208,293	9.4	$5,677,000	$177,193,000	$517,671	$581,653	$58,165	22	Low-Moderate
Walsh	8	20	0	$0	$1,671,790	8.7	$4,444,000	$218,090,000	$1,165,555	$1,309,612	$130,961	27	Low-Moderate
Ward	4	26	$50,000	$3,846	$6,480,432	30.6	$14,110,000	$153,487,000	$926,720	$1,041,258	$104,126	28	Moderate
Wells	10	23	$110,000	$8,462	$640,656	3.3	$11,906,000	$132,852,000	$391,654	$440,061	$44,006	25	Low-Moderate
Williams	6	24	$40,000	$3,077	$2,723,413	10.8	$11,341,000	$115,992,000	$181,637	$204,087	$20,409	22	Low-Moderate

Figure 5.116. Vulnerability to Windstorms by County



Loss Estimates

Based on NCDC event narratives, typical losses due to windstorms include crop loss, vehicle accidents, downed power lines and utility poles, power outages, damaged structures, and human fatalities or injuries, sometimes due to vehicle accidents. Damages from windstorm events between 2000 and 2013 in NCDC included 1 fatality, 31 injuries, $5,396,500 in total property damages, and $415,115 in average annualized property damage.

As mentioned previously, total crop insurance payments for insurable crops due to wind events in North Dakota totaled $32,913,468 between 2003 and 2012. According to the 2011 North Dakota Crop Insurance Profile Report issued by the USDA Risk Management Agency, 89 percent 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 windstorms from 2003-2012 totaled $36,981,425, or about $3,698,142 annually. (Risk Management Agency, 2003-2012)

5.14.6. Local Risk Assessments

Prior to this plan update, Windstorm has not been a separately profiled hazard. Local risk assessments have also not profiled windstorm separate from Severe Summer Weather-related thunderstorms. As a result a local risk assessment is not available for this hazard.

5.14.7. State Owned and Operated Facilities and Critical Facilities in Hazard Prone Areas

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings. While windstorms can occur separate from tornadoes, the damage they cause can be very similar. Building types that many state-owned buildings fall under are shown in **Table 5.154** and **Table 5.155**.

Table 5.154. Institutional Buildings

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	59-88 mph (72 mph)
Loss of roof covering (<20%)	72-109 mph (86 mph)
Damage to upper walls and roof, loss of rooftop HVAC equipment	75-111 mph (92 mph)
Broken glass in windows or doors	78-115 mph (95 mph)
Uplift of lightweight roof deck and insulation, significant loss of roofing material (>20%)	95-136 mph (114 mph)
Façade components torn from structure	97-140 mph (118 mph)
Damage to curtain walls or other wall cladding	110-152 mph (131 mph)
Uplift of pre-cast concrete roof slabs	119-163 mph (142 mph)
Uplift of metal deck with concrete fill slab	118-170 mph (146 mph)
Collapse of some top story exterior walls	127-172 mph (148 mph)
Significant damage to building envelope	178-268 mph (210 mph)

Source: Storm Prediction Center, 2007.

Table 5.155. Metal Building Systems

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	54-83 mph (67 mph)
Inward or outward collapsed of overhead doors	75-108 mph (89 mph)
Metal roof or wall panels pulled from the building	78-120 mph (95 mph)
Column anchorage failed	96-135 mph (117 mph)
Buckling of roof purlins	95-138 mph (118 mph)
Failure of X-braces in the lateral load resisting system	118-158 mph (138 mph)
Progressive collapse of rigid frames	120-168 mph (143 mph)
Total destruction of building	132-178 mph (155 mph)

Source: Storm Prediction Center, 2007

The State Fire and Tornado Fund does not differentiate claims paid as a result of thunderstorm winds from other straight-line-type winds. For details on claims paid to state owned and operated facilities and critical facilities, see **Section 5.8.7** in the Severe Summer Weather hazard section.

Many of the critical and special needs facilities, although adequate for most events, may not be able to withstand 160-200 mph windstorms, as recommended by the Federal Emergency Management Agency. (Federal Emergency Management Agency, 2004) The structures could suffer broken windows and dented exteriors, or even collapse. Even if a structure performs well in the high winds, flying debris and falling trees may damage the building. **Table 5.156** shows the damage indicators for a typical school building.

Table 5.156. School Building (Junior or Senior High School)

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	55-83 mph (68 mph)
Loss of roof covering (<20%)	66-99 mph (79 mph)
Broken windows	71-106 mph (87 mph)
Exterior door failures	83-121 mph (101 mph)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 mph (101 mph)
Damage to or loss of wall cladding	92-127 mph (108 mph)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 mph (114 mph)
Uplift or collapse of light steel roof structure	108-148 mph (125 mph)
Collapse of exterior walls in top floor	121-153 mph (139 mph)
Most interior walls of top floor collapsed	133-186 mph (158 mph)
Total destruction of a large section of building envelope	163-224 mph (192 mph)

Source: Storm Prediction Center, 2007.

Above ground infrastructure, namely overhead power lines, communications towers and lines, and structures, are very susceptible to strong winds. High winds and falling trees can damage this type of infrastructure and disrupt services. Therefore, even an indirect hit by strong winds could disrupt regional electricity and possibly telephone services. **Table 5.157** shows the Enhanced Fujita Scale Damage Indicators for electric transmission lines.

Table 5.157. Electrical Transmission Lines

Damage Description	Wind Speed Range (expected in parentheses)
Threshold of visible damage	70-98 mph (83 mph)
Broken wood cross member	80-114 mph (99 mph)
Wood poles leaning	85-130 mph (108 mph)
Broken wood poles	98-142 mph (118 mph)
Broken or bent steel or concrete poles	115-149 mph (138 mph)
Collapsed metal truss towers	116-165 mph (141 mph)

Source: Storm Prediction Center, 2007.

Should above ground facilities such as water treatment facilities or a sewer lagoon be damaged, water and sewer services could also be disrupted. Debris may also block roadways making transportation and commerce difficult if not impossible.

Table 5.160 in Section **5.15.1**, Risk Assessment Summary provides 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 by county, see Chapter 4.

5.14.8. Development in Identified Hazard Areas

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 are more vulnerable to windstorms. Newer structures are generally built to withstand strong winds. Mobile homes, however, continue to be the exception. For additional details on which counties and cities have adopted a building code, see Chapter 4.

Increased populations add to the challenges of managing development in areas vulnerable to windstorms. The incident of the building under construction collapsing due to high winds shows that new development is at risk to windstorm events. **Table 5.158** shows the areas with population increases from 2000 to 2010 and **Table 5.159** the areas with projected 40 percent and greater population increases from 2010 to 2025 that create a higher demand for electricity and essential services that can be knocked out in a power outage from a windstorm.

Table 5.158. Area Population Increases from 2000 to 2010

Area with Census Population Increases	2000	2010	# change	% change: 2000 to 2010
Cass County	123,138	149,778	26,640	21.60%
Burleigh County	69,416	81,308	11,892	17.10%
Mountrail County	6,631	7,673	1,042	15.70%
Williams County	19,761	22,398	2,637	13.30%
McKenzie County	5,737	6,360	623	10.90%
Morton County	25,303	27,471	2,168	8.60%
Fort Berthold Reservation	5,915	6,341	426	7.20%
Stark County	22,636	24,199	1,563	6.90%
Ward County	58,795	61,675	2,880	4.90%
Turtle Mountain Reservation	8,307	8,656	349	4.20%
Sioux County	4,044	4,153	109	2.70%
Standing Rock Reservation	4,044	4,153	109	2.70%
Rolette County	13,674	13,937	263	1.90%
Grand Forks County	66,109	66,861	752	1.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

Table 5.159. Area Projected 40 Percent and Greater Population Increases from 2010 to 2025.

Area with Projected Population Increases	2010	2025	# change	% change: 2010 to 2025
McKenzie County	6,360	17,110	10,750	169.00%
Divide County	2,071	4,948	2,877	138.90%
Williams County	22,398	51,106	28,708	128.20%
Mountrail County	7,673	13,575	5,902	76.90%
Stark County	24,199	42,191	17,992	74.40%
Billings County	783	1,315	532	67.90%
Bottineau County	6,429	10,721	4,292	66.80%
Dunn County	3,536	5,433	1,897	53.60%
Burke County	1,968	2,989	1,021	51.90%
Slope County	727	1,095	368	50.60%
Renville County	2,470	3,589	1,119	45.30%
McHenry County	5,395	7,784	2,389	44.30%
Hettinger County	2,477	3,506	1,029	41.50%
Golden Valley County	1,680	2,354	674	40.10%

Source: U.S. Census Bureau and the Center for Social Research at NDSU, http://www.ndhfa.org/Web_Images/NDSHNA_DetailedTables_FINAL.pdf

5.14.9. Data Limitations and Other Key Documents

Windstorms can sometimes be isolated events, making vulnerability to a particular area hard to determine. Weather data is often limited by the observations taken, and events in the National Climatic Data Center database are only recorded if reported to the National Weather Service. The addition of trained spotters to the area may improve data collection.

Other key documents related to the Windstorm hazard include:

- North Dakota Emergency Operations Plan, Severe Storms Annex

5.15. Risk Assessment Summary

This risk assessment represents an approximate history and estimated vulnerabilities to the State of North Dakota from the hazards identified. As with any assessment involving natural or human-caused hazards, 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.

Every type of event is different, ranging from population to property to economic impacts. Incidents also have different probabilities and magnitudes even within hazards. For example, a light snowstorm will be different than a blizzard and a moderate flood will be different from both of those. Some hazards have estimates of dollar losses and population impacts whereas others are more qualitatively assessed based on the information available during the risk assessment process. In an attempt to rate hazards and prioritize mitigation activities, the hazards are summarized based on their historical occurrence, potential losses, and local hazard assessments. For more information on these determinations, see the individual hazard profiles and local mitigation plans.

5.15.1. State Owned and Operated Facilities and Other Critical Facilities

The preceding hazard profiles each included a discussion of the impact that the hazard event might have on state owned facilities and other critical facilities in the state. **Table 5.160** below provides a summary of the state owned facilities and other critical facilities in each county along with the overall vulnerability determination for each hazard by county.

Additional details and discussion of the state owned facilities and critical facilities can be found in Chapter 4. The categories of facilities included in this summary include the following:

<u>State Owned and Operated Facilities</u>

- Facilities Operated by State Agencies (including number of building properties and total insured value)
- National Guard Facilities
- State Owned Universities

<u>Other Critical Facilities and Infrastructure</u>

- Critical Facilities from Homeland Security Infrastructure Program (Energy, Public Health Transportation, Emergency Services, Communication, and Water sectors)
- Local Government Critical Facility Insured Values
- Major Airports
- Hospital Trauma Centers
- Private and Tribal Community Colleges
- Public School Enrollment

Table 5.160. Summary of Vulnerability Analysis Ratings and State Owned Facilities and Critical Facilities by County

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Adams	N/A	LM	H	L	L	L	M	LM	LM	L	LM	L	H	LM	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $1,446,872 in State Agency Assets $82,024 in National Guard Assets $3,239,856 in State University Assets	HSIP Facilities: 54 $13,440,551 in Local Government Critical Facilities 280 in public school enrollment
Barnes	N/A	MH	H	MH	M	LM	M	LM	M	M	M	M	L	LM	State Agency Building Properties :9 State Agency Critical Facilities: 0 $15,537,673 in State Agency Assets $1,551,211 in National Guard Assets Valley City State University $90,120,718 in State University Assets	HSIP Facilities: 176 $64,981,065 in Local Government Critical Facilities 1,492 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Benson*	N/A	H	H	M	L	L	L	LM	M	LM	LM	M	L	LM	State Agency Building Properties :15 State Agency Critical Facilities: 0 $11,983,132 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 107 $20,440,755 in Local Government Critical Facilities 1,022 in public school enrollment Cankdeska Cikana Community College
Billings	N/A	L	H	LM	MH	M	L	L	L	L	M	L	H	L	State Agency Building Properties :10 State Agency Critical Facilities: 0 $4,075,548 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,751 $19,149,849 in Local Government Critical Facilities 67 in public school enrollment Interstate and Railroad Transportation Infrastructure
Bottineau	N/A	L	MH	M	M	LM	LM	LM	M	LM	LM	LM	M	LM	State Agency Building Properties :43 State Agency Critical Facilities: 0 $4,829,185 in State Agency Assets $0 in National Guard Assets $26,580,147 in State University Asset	HSIP Facilities: 2,365 $26,517,670 in Local Government Critical Facilities 795 in public school enrollment Dakota College at Bottineau

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Bowman	N/A	LM	MH	M	M	LM	LM	LM	L	L	LM	LM	H	LM	State Agency Building Properties :4 State Agency Critical Facilities: 0 $2,374,200 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,580 $18,033,184 in Local Government Critical Facilities 595 in public school enrollment
Burke	N/A	LM	MH	LM	LM	LM	L	L	L	L	LM	L	M	L	State Agency Building Properties :3 State Agency Critical Facilities: 0 $707,860 in State Agency Assets $0 in National Guard Assets $0 in State University Asset	HSIP Facilities: 1,629 $13,918,590 in Local Government Critical Facilities 319 in public school enrollment Portal Oil Import Site

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Burleigh	N/A	LM	MH	MH	M	LM	H	M	LM	H	H	H	H	LM	State Agency Building Properties :99 State Agency Critical Facilities: 5 -Fraine Barracks -State Capital Complex and State Office -State Emergency Operations Center/Fusion Center -State Bureau of Criminal Investigation Lab -Bank of North Dakota -State Department of Health Lab and Morgue $545,776,526 in State Agency Assets Missouri River Correctional Center North Dakota State Penitentiary $69,387,486 in National Guard Assets $107,473,135 in State University Assets -Bismarck State College	HSIP Facilities: 365 $318,561,691 in Local Government Critical Facilities Bismarck Airport Sanford Medical Center St. Alexius Medical Center Medcenter One College of Nursing Rasmussen College – Bismarck United Tribes Technical College University of Mary 11,675 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Cass	N/A	H	MH	H	L	M	H	H	H	H	H	H	L	H	State Agency Building Properties: 11 State Agency Critical Facilities: 0 $29,744,896 in State Agency Assets $17,792,094 in National Guard Assets $954,896,755 in State University Asset -North Dakota State University	HSIP Facilities: 618 $618,469,882 in Local Government Critical Facilities Fargo Airport Essential Health Sanford Medical Center Rasmussen College - Fargo 21,295 in public school enrollment Interstate and Railroad Transportation Infrastructure
Cavalier	N/A	MH	MH	M	L	LM	M	LM	M	L	LM	L	M	M	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $1,243,307 in State Agency Assets $0 in National Guard Assets $2,219,699 in State University Assets	HSIP Facilities: 98 $24,606,690 in Local Government Critical Facilities 428 in public school enrollment Langdon Wind Power Plant

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Dickey	N/A	LM	MH	L	L	L	M	M	M	LM	LM	LM	M	LM	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,091,951 in State Agency Assets $0 in National Guard Assets $83,204 in State University Assets	HSIP Facilities: 62 $27,933,498 in Local Government Critical Facilities Trinity Bible College 826 in public school enrollment
Divide	N/A	L	MH	L	M	LM	LM	L	LM	L	LM	LM	H	LM	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $804,898 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 757 $15,912,031in Local Government Critical Facilities 340 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Dunn*	N/A	LM	MH	M	MH	MH	LM	LM	LM	L	L	L	H	L	State Agency Building Properties: 12 State Agency Critical Facilities: 0 $6,580,591in State Agency Assets $0 in National Guard Assets $1,574,357 in State University Assets	HSIP Facilities: 1,441 $13,370,058 in Local Government Critical Facilities 476 in public school enrollment
Eddy*	N/A	L	MH	L	L	L	L	L	LM	L	LM	LM	H	L	State Agency Building Properties: 0 State Agency Critical Facilities: 0 $50,329 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 44 $12,805,336 in Local Government Critical Facilities 340 in public school enrollment
Emmons	N/A	L	M	M	M	L	M	LM	LM	L	LM	L	M	M	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $913,299 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 100 $16,322,528 in Local Government Critical Facilities 544 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Foster	N/A	L	M	L	L	LM	M	LM	LM	L	LM	LM	M	L	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $1,084,431in State Agency Assets $3,425,042 in National Guard Assets $5,763,739 in State University Assets	HSIP Facilities: 47 $30,147,351 in Local Government Critical Facilities 543 in public school enrollment
Golden Valley	N/A	M	M	LM	M	LM	LM	L	LM	L	LM	L	H	L	State Agency Building Properties: 6 State Agency Critical Facilities: 0 $3,599,895 in State Agency Assets $0 in National Guard Assets $37,680 in State University Assets	HSIP Facilities: 348 $13,636,637 in Local Government Critical Facilities 313 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Grand Forks	N/A	MH	M	MH	L	LM	H	H	H	H	LM	H	L	M	State Agency Building Properties: 36 State Agency Critical Facilities: 0 $31,115,504 in State Agency Assets $17,341,882 in National Guard Assets $1,112,423,856 in State University Assets - University of North Dakota	HSIP Facilities: 390 $460,794,853 in Local Government Critical Facilities 8,506 in public school enrollment Grand Forks Air Force Base Altru Health System Grand Forks Airport Interstate and Railroad Transportation Infrastructure
Grant	N/A	M	M	L	L	L	LM	M	MH	L	H	L	H	LM	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $737,485 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 72 $10,996,325 in Local Government Critical Facilities 237 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Griggs	N/A	L	M	L	L	L	LM	L	LM	L	L	LM	M	L	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,200,840 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 55 $12,841,162 in Local Government Critical Facilities 370 in public school enrollment
Hettinger	N/A	M	M	M	L	L	LM	LM	LM	L	LM	LM	H	LM	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $7,235,807 in State Agency Assets $580,317 in National Guard Assets $0 in State University Assets	HSIP Facilities: 81 $26,352,782 in Local Government Critical Facilities 421in public school enrollment
Kidder	N/A	L	M	L	L	L	M	LM	LM	L	L	LM	M	L	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $860,625in State Agency Assets $0 in National Guard Assets $37,680 in State University Assets	HSIP Facilities: 82 $13,409,458 in Local Government Critical Facilities 370 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
LaMoure	N/A	LM	M	M	L	L	LM	M	LM	LM	M	L	L	LM	State Agency Building Properties: 11 State Agency Critical Facilities: 0 $797,084 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 72 $17,599,603 in Local Government Critical Facilities 650 in public school enrollment
Logan	N/A	L	LM	L	L	L	L	LM	LM	L	LM	L	M	LM	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $807,379 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 52 $8,947,626 in Local Government Critical Facilities 355 in public school enrollment
McHenry	N/A	L	LM	M	M	LM	L	LM	LM	LM	L	L	M	LM	State Agency Building Properties: 13 State Agency Critical Facilities: 0 $2,326,617 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 262 $26,353,106 in Local Government Critical Facilities 909 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
McIntosh	N/A	L	LM	L	L	L	LM	LM	LM	L	LM	LM	L	LM	State Agency Building Properties: 12 State Agency Critical Facilities: 0 $1,692,354 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 61 $14,670,582 in Local Government Critical Facilities 377 in public school enrollment
McKenzie*	N/A	LM	LM	LM	MH	H	LM	LM	LM	LM	LM	L	H	L	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $767,477 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 3,718 $36,013,921 in Local Government Critical Facilities 1,275 in public school enrollment
McLean*	N/A	LM	LM	M	M	LM	LM	M	M	LM	LM	LM	H	LM	State Agency Building Properties: 40 State Agency Critical Facilities: 0 $13,133,816 in State Agency Assets $180,393 in National Guard Assets $0 in State University Assets	HSIP Facilities: 277 $56,644,234 in Local Government Critical Facilities 1,582 in public school enrollment Coal Creek Power Plant Garrison Hydroelectric Power Plant

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Mercer*	N/A	LM	LM	MH	M	LM	M	L	L	LM	L	M	M	L	State Agency Building Properties: 7 State Agency Critical Facilities: 0 $22,182,719 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 127 $51,137,158 in Local Government Critical Facilities 1,276 in public school enrollment Great Plains Synfuels Plant Antelope Valley Power Plant Coyote Power Plant Garrison Hydroelectric Power Plant Leland Olds Power Plant Stanton Power Plant
Morton	N/A	H	LM	M	M	M	M	M	M	H	LM	MH	M	L	State Agency Building Properties: 55 State Agency Critical Facilities: 0 $42,434,897 in State Agency Assets $2,485,095 in National Guard Assets $1,584,235 in State University Assets	HSIP Facilities: 330 $108,713,211 in Local Government Critical Facilities 4,223 in public school enrollment R.M. Heskett Power Plant Tesoro West Coast Refinery North Dakota Youth Correctional Center Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Mountrail*	N/A	LM	LM	LM	MH	MH	LM	LM	LM	LM	LM	LM	M	LM	State Agency Building Properties: 9 State Agency Critical Facilities: 0 $2,841,231in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 1,842 $57,701,190 in Local Government Critical Facilities 1,616 in public school enrollment Fort Berthold Community College
Nelson*	N/A	M	LM	LM	L	L	L	LM	LM	L	M	L	M	L	State Agency Building Properties: 5 State Agency Critical Facilities: 0 $1,319,948 in State Agency Assets $0 in National Guard Assets $13,927 in State University Assets	HSIP Facilities: 115 $31,986,428 in Local Government Critical Facilities 443 in public school enrollment
Oliver	N/A	MH	LM	LM	L	L	L	L	L	L	LM	L	H	L	State Agency Building Properties: 13 State Agency Critical Facilities: 0 $4,188,423in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 68 $7,923,684 in Local Government Critical Facilities 200 in public school enrollment Milton R. Young Power Plant

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Pembina	N/A	H	LM	MH	L	LM	M	LM	M	LM	LM	M	L	LM	State Agency Building Properties: 30 State Agency Critical Facilities: 0 $7,313,456 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 179 $38,991,221 in Local Government Critical Facilities 1,231 in public school enrollment Neche Oil Import Site Interstate and Railroad Transportation Infrastructure
Pierce	N/A	L	LM	LM	L	L	M	LM	LM	LM	LM	M	M	LM	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $328,331 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 93 $30,203,383 in Local Government Critical Facilities 583 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	**State Owned Facilities (State Agencies, National Guard, and Universities)**	**Other Critical Facilities and Infrastructure**
Ramsey*	N/A	LM	L	M	L	LM	MH	M	MH	M	M	M	L	M	State Agency Building Properties: 47 State Agency Critical Facilities: 0 $32,179,293 in State Agency Assets $109,439,756 in National Guard Assets - Camp Grafton $33,554,184 in State University Assets -Lake Region State College	HSIP Facilities: 130 $71,398,236 in Local Government Critical Facilities 1,759 in public school enrollment Devils Lake Airport
Ransom	N/A	LM	L	M	L	L	M	LM	LM	LM	LM	M	L	L	State Agency Building Properties: 25 State Agency Critical Facilities: 0 $43,682,690 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 39 $35,482,796 in Local Government Critical Facilities 929 public school enrollment North Dakota Veterans Home

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Renville	N/A	L	L	M	M	LM	L	L	LM	L	MH	L	M	L	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $379,263 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 1,462 $14,787,121 in Local Government Critical Facilities 596 in public school enrollment
Richland*	N/A	L	L	M	L	LM	M	M	M	MH	LM	MH	L	LM	State Agency Building Properties: 8 State Agency Critical Facilities: 0 $3,379,532 in State Agency Assets $10,833,246 in National Guard Assets $228,915,734 in State University Assets -- North Dakota State College of Science	HSIP Facilities: 194 $59,198,422 in Local Government Critical Facilities 2,250 public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Rolette*	N/A	LM	L	LM	M	L	LM	LM	LM	M	LM	H	L	L	State Agency Building Properties: 57 State Agency Critical Facilities: 0 $13,288,063 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 114 $20,568,472 in Local Government Critical Facilities 2,904 in public school enrollment Turtle Mountain Community College
Sargent*	N/A	L	L	L	L	L	LM	LM	LM	L	M	LM	L	L	State Agency Building Properties: 3 State Agency Critical Facilities: 0 $598,063 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 43 $24,103,086 in Local Government Critical Facilities 649 in public school enrollment
Sheridan	N/A	L	L	L	L	L	LM	L	LM	L	LM	L	H	LM	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $836,501in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 58 $8,633,999 in Local Government Critical Facilities 106 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Sioux*	N/A	LM	L	M	M	L	L	LM	M	LM	LM	LM	H	LM	State Agency Building Properties: 1 State Agency Critical Facilities: 0 $293,512 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 39 $2,901,434 in Local Government Critical Facilities 421 in public school enrollment Sitting Bull College
Slope	N/A	L	L	L	M	L	L	L	L	L	LM	LM	H	LM	State Agency Building Properties: 0 State Agency Critical Facilities: 0 $6,502 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 381 $2,527,217 in Local Government Critical Facilities 16 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Stark	N/A	M	L	MH	M	LM	MH	M	M	MH	L	H	H	LM	State Agency Building Properties: 19 State Agency Critical Facilities: 0 $22,625,358 in State Agency Assets $0 in National Guard Assets $131,442,390 in State University Assets - Dickinson State University	HSIP Facilities: 834 $95,984,238 in Local Government Critical Facilities 3,562 in public school enrollment Dickinson Airport Interstate and Railroad Transportation Infrastructure
Steele	N/A	LM	L	L	L	LM	LM	L	LM	L	L	LM	L	L	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $612,361 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 62 $13,749,623 in Local Government Critical Facilities 221 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Stutsman	N/A	LM	L	M	M	LM	MH	MH	M	MH	L	M	M	LM	State Agency Building Properties: 63 State Agency Critical Facilities: 0 North Dakota State Hospital $159,408,922 in State Agency Assets $974,372 in National Guard Assets $2,103,544 in State University Assets	HSIP Facilities: 236 $129,490,835 in Local Government Critical Facilities 2,558 in public school enrollment - Jamestown College Jamestown Airport Interstate and Railroad Transportation Infrastructure
Towner	N/A	LM	L	L	L	L	LM	LM	M	L	L	LM	L	LM	State Agency Building Properties: 2 State Agency Critical Facilities: 0 $402,324 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 77 $20,270,346 in Local Government Critical Facilities 261 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Traill	N/A	L	L	M	L	L	LM	LM	M	LM	H	M	L	LM	State Agency Building Properties:4 North Dakota State Developmental Center State Agency Critical Facilities: 0 $766,048 in State Agency Assets $0 in National Guard Assets $81,373,330 in State University Assets - Mayville State University	HSIP Facilities: 156 $38,746,422 in Local Government Critical Facilities 1,329 in public school enrollment Interstate and Railroad Transportation Infrastructure
Walsh	N/A	H	L	H	L	LM	M	LM	MH	M	LM	M	L	LM	State Agency Building Properties: 34 State Agency Critical Facilities: 0 $72,428,748 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 180 $67,865,219 in Local Government Critical Facilities 1,575 in public school enrollment Interstate and Railroad Transportation Infrastructure

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Ward*	N/A	LM	L	MH	M	M	H	M	M	H	H	H	M	M	State Agency Building Properties: 42 State Agency Critical Facilities: 0 $93,182,321 in State Agency Assets $23,876,523 in National Guard Assets $226,690,857 in State University Assets - Minot State University	HSIP Facilities: 751 $164,064,125 in Local Government Critical Facilities 9,428 in public school enrollment Minot Air Force Base Trinity Hospital Minot Airport
Wells	N/A	LM	L	LM	L	LM	LM	LM	M	LM	LM	LM	L	LM	State Agency Building Properties: 10 State Agency Critical Facilities: 0 $3,444,028 in State Agency Assets $0 in National Guard Assets $0 in State University Assets	HSIP Facilities: 94 $23,995,335 in Local Government Critical Facilities 548 in public school enrollment

County	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm	State Owned Facilities (State Agencies, National Guard, and Universities)	Other Critical Facilities and Infrastructure
Williams	N/A	MH	L	M	H	MH	MH	LM	LM	MH	M	MH	M	LM	State Agency Building Properties: 26 State Agency Critical Facilities: 0 $12,962,474 in State Agency Assets $0 in National Guard Assets $61,761,798 in State University Assets - Williston State College	HSIP Facilities: 2,382 $188,364,345 in Local Government Critical Facilities 4,106 in public school enrollment Williston Airport

Sources: North Dakota Tornado and Fire Fund,2013; Homeland Security Infrastructure Program (HSIP) Gold Data, 2013; Association of American Railroads, 2013; Federal Aviation Administration, 2013; Wikipedia, 2013; North Dakota Department of Public Education, 2012; L=Low, LM=Low-Moderate, M=Moderate, MH=Moderate-High, H=High; N/A=overall vulnerability rating not available; * includes at least part of the reservation. See Hazard Profile sections for tribal vulnerability rating where available; **flood vulnerability rating is for riverine flooding only; ***transportation accident vulnerability rating is based on presence of infrastructure only and does not include analysis of volume. See Transportation Accident Hazard Profile for additional details on volume

The following section is a DRAFT of what will become Chapter 6 in the updated North Dakota Multi-Hazard Mitigation Plan. Please review for content and accuracy. Items highlighted in yellow are areas that need verification or where more information or clarification would be helpful or is pending.

6. Mitigation Strategy

6.1. Mitigation Purpose, 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. Studies on hazard mitigation show that for each dollar spent on mitigation, society saves an average of four dollars in avoided future losses. Mitigation can take many different forms from acquisition of flood-prone properties, minor flood control projects, tornado safe room construction and public education.

The development of a mitigation strategy allows the State of North Dakota to create a vision for preventing future disasters, establish a purpose, common set of mitigation goals across state, tribal, and local agencies, objectives, prioritize actions, and evaluate the success of such actions. The North Dakota Mitigation Strategy is based on the results of the statewide risk assessment, local risk assessments and mitigation strategies, and additional recommendations by mitigation stakeholders. The framework of the State's mitigation strategy has the following parts: purpose, goals, goal sponsor, objectives, and objective owner which are defined as follows:

- 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 usually not measurable or fully attainable but rather ideals to which the State and jurisdictions should strive for as they develop and implement mitigation projects.
    - The **Goal Sponsor** is the state agency that sponsors that goal.
- The **Objectives** link the goals and actions and help organize the plan for efficient implementation and evaluation.
    - The **Objective Owner** is the agency that will encourage and support that objective's ideals.

6.1.1. 2014 Updated Purpose, Goals, and Objectives

The following is the overall hazard mitigation strategy for the State of North Dakota that includes a purpose statement, eight goals and multiple objectives and actions. Goals and objectives are listed here.

Purpose: Minimize the vulnerability of the life and health of people, property, environment, and economy of North Dakota and its communities from the impacts of natural and technological hazards as well as adversarial threats.

Goal 1: Encourage and enhance sound state and local planning related to hazard understanding and mitigation.

Goal Sponsor: N.D. Department of Emergency Services (NDDES)

Objective 1.1: Increase and improve mitigation planning efforts at the state, tribal, and local levels through technical assistance, plan development, and plan updates.

Objective 1.1 Owner: NDDES

Objective 1.2: Improve hazard understanding and risk assessments through individual hazard studies and analyses using digital data.

Objective 1.2 Owner: NDDES

Goal 2: Enhance the public's awareness of hazards.

Goal Sponsor: NDDES

Objective 2.1: Provide the public with information that allows individuals to make sound personal and financial decisions before a disaster threatens.

Objective 2.1 Owner: NDDES

Goal 3: Reduce impacts to future development through the encouragement of wise land use planning.

Goal Sponsor: N.D. Department of Commerce (NDDoC)

Objective 3.1: Use land management tools to mitigate disasters before construction occurs.

Objective 3.1 Owner: NDDoC

Goal 4: Reduce impacts of flooding to people and property in North Dakota.

Goal Sponsor: N.D. State Water Commission (SWC)

Objective 4.1: Reduce property and infrastructure losses to developed areas during periods of flood.

Objective Owner: SWC

Objective 4.2: Prevent flood losses due to dam failures.

Objective 4.2 Owner: SWC

Goal 5: Reduce impacts of severe summer and winter weather to people and property.

Goal Sponsor: National Weather Service (NWS)

Objective 5.1: Improve severe weather warnings and public notifications to increase personal protective actions during severe summer and winter weather.

Objective 5.1 Owner: NDDES

Objective 5.2: Provide safe places for the public to take protective actions during extreme weather events.

Objective 5.2 Owner: NDDES

Objective 5.3: Improve resiliency of critical facilities and infrastructure from strong wind, heavy snow, hail and flood events.

Objective 5.3 Owner: NDDES

Goal 6: Reduce impacts of drought and wildland fires to people and property.

Goal Sponsor: SWC

Objective 6.1: Support practices that reduce drought losses and impacts.

Objective 6.1 Owner: SWC

Objective 6.2: Reduce the vulnerability of homes and businesses from approaching wildland fires.

Objective 6.2 Owner: N.D. Forest Service

Goal 7: Reduce impacts of human-caused threats to people and property.

Goal Sponsor: NDDES

Objective 7.1: Prevent intentional acts of terrorism or crime and accidental acts through observations, regulations, and enforcement.

Objective 7.1 Owner: N.D. State and Local Intelligence Center

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.

Goal Sponsor: NDDES

Objective 8.1: Reduce the human impact of all accidents, incidents and disasters by promoting readiness and resilience.

Objective 8.1 Owner: NDDES

6.1.2. Process for Updating Purpose, Goals, Objectives, and Actions

As part of the 2013-2014 plan update, the goals, objectives, and initiatives (actions) from the previous plan were assessed to determine if they addressed current and anticipated future conditions. During the North Dakota Multi-Hazard Mitigation Plan (NDMHMP) update meeting on June 5, 2013, there was a facilitated discussion of the 2011 plan's Mitigation Strategy that included seven plan goals. There was some discussion recommending re-wording some of the goals as well as to consolidate the hazard-specific goals into one or two broader goals. The consensus was for AMEC to develop some suggested changes to the goals for further discussion at the next planning meeting. At the third planning meeting on July 16, 2013, the State Hazard Mitigation Team (SHMT) members had an extensive discussion of the purpose and goals for this plan update and consensus was determined. The 2014 plan update has a purpose statement and eight plan goals with objectives. The revised goals include four hazard-specific goals which encompass all the hazards in the plan.

The intention of the SHMT was to establish mitigation goals that had applicability over the long term. These goals would continue to provide direction to state and local mitigation efforts for many years through future updates and revisions. The team believed that this approach of hazard-specific goals was more feasible rather than capability-based goals, and also aligned with the hazard specific work groups within the SHMT. The SHMT intended the objectives to be more specific, providing direction and detailed guidance for each goal and to be more short term in nature and be evaluated and revised during plan updates. The SHMT also recognized the importance of ensuring that the objectives address vulnerabilities to the high priority hazards identified through the statewide risk assessment. Goal sponsors and objective owners were identified in 2013 to further define and illustrate State agency roles and partnerships in achieving the goals. The overarching purpose statement was also a product of the discussion at the planning meetings.

Also at the third planning meeting on July 16, 2013, the SHMT reviewed the 2011 Mitigation Initiatives (actions) given to them with the description, lead agencies, and the 2013 status. A list of new mitigation initiative (action) ideas, based on the risk assessment, was presented for the SHMT members to consider as they develop their new actions.

The SHMT members were given time at this meeting to discuss new and ongoing mitigation actions in their topic/hazard specific working groups (see Appendix A for the list of working group members). Some of the ideas for new mitigation actions included mitigating loss of critical communication, mitigation of cyber threats, identification and analysis of hazardous materials truck routes and expanding regional hazmat teams.

These new mitigation actions were prioritized and submitted by SHMT members for the 2013-2014 plan update. The 2014 plan has changed the word choice of "initiatives" to "actions" to better align with FEMA terminology.

6.1.3. Review of Local Goals

The SHMT analyzed the goals of the FEMA-approved local hazard mitigation plans to assess their consistency with state goals. The analysis involved rolling up and comparing the goals from approved local hazard mitigation plans with the categories of the state goals. The results are shown in **Table 6.1**. The analysis indicates that the highest percentage of goals is oriented towards reducing risk. The majority of local goals are broader based rather than hazard specific, but in general there is alignment between the State Plan Goals and local plans.

Table 6.1. Local Plan Goals Summary and Comparison to State Goals

Local Goal Type	Number in Local Plans	Percent of Total	Corresponding State Goal
Policy Development and COOP	21	7 %	Goal 1Planning
Public Education	44	15 %	Goal 2 Public Awareness
Minimize Losses	61	20 %	Goal 3 Reduce Impacts; Purpose Statement
Risk Reduction	67	23 %; only 5 % of these are hazard specific.	Goals 4-8: Hazard Specific Goals and Purpose Statement
Protect the Environment	24	8%	Purpose Statement
Capability Development	24	8%	None
Communications	39	14%	None
Protect Critical Facilities	3	2%	None

Vulnerable Populations	9	3%	None
Total	292		

Source: Local approved hazard mitigation plans in North Dakota

6.2. Mitigation Actions

This section describes the intentions of the SHMT to address state 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 supports the mitigation activities. Mitigation actions are specific activities that provide the detail on how the State will accomplish identified objectives, and ultimately meet the mission and goals outlined in this plan. This section also reports on the status of previously identified mitigation actions as a measure of the progress that North Dakota is making toward its mitigation goals.

6.2.1. Evaluating 2011 Mitigation Actions

The updated Plan must identify the ongoing, completed, deleted, or deferred actions or activities from the previously approved Plan. It must also include any new actions identified since the previous Plan. The mitigation actions take into consideration the vulnerability and capability assessment, and are intended to address areas of high vulnerability or where capabilities should be strengthened. The SHMT revisited the 2011 mitigation actions during the planning process in 2013. The SHMT was provided a summary table 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. At the third planning meeting in July 2013, an action status tool was provided as an attachment in the handout booklet. The SHMT members validated or revised the 2011 actions and worked in a breakout session by hazard subcommittee in identifying new mitigation actions for the plan.

A result of the action strategy update is a measure of progress towards meeting the Plan’s goals. Seven of the 18 mitigation actions listed in the previous plan were deleted as they are not a statewide mitigation activity or the action is already identified within other programs at the State. The remaining 11 actions are ongoing actions that have been merged and revised for the 2014 plan to reflect the updated strategies and priorities of the State of North Dakota. For example as part of the 2013 update the dam safety actions changed from to a low priority to a moderate priority. **Table 6.2** below identifies the statewide mitigation action title, action description, the lead agency, support agencies, the 2013 status, priority level and status update. The status update notes demonstrate that many of these actions are being implemented and helping to reduce future losses.

Table 6.2. 2014 Status of Mitigation Actions from 2011 Plan

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-1	Mitigation Planning	Mitigation Planning: Mitigation plans can be developed at all levels of government, private companies, and non-profit organizations. All tribal and local jurisdictions are encouraged to develop and adopt a mitigation plan that meets the requirements of the Disaster Mitigation Act of 2000 and meets the needs of the jurisdictions. In some cases, grant funding is contingent on a mitigation plan approved by the Federal Emergency Management Agency. North Dakota Department of Emergency Services provides technical and financial assistance to those jurisdictions developing or updating their mitigation plans. Improvements can additionally be made to existing plans. Similarly, Community Wildfire Protection Plans that specifically address mitigation for wildland fires may be required for jurisdictions to receive wildfire mitigation funding. The North Dakota Forest Service can provide technical assistance regarding Community Wildfire Protection Plans. Additional drought mitigation needs to be developed particularly in large population areas.	DES	Forest Service, SWC, Dept of Agriculture, Fire Marshal	Ongoing & Reworded for 2014 Priorities	High	- Fifty-two (52) counties and three tribal nations either are developing or have approved mitigation plans. This is nearly double the amount at the onset of this initiative. The remaining tribal nation and county without a plan are being encouraged to apply for mitigation grants for planning.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-2	Data Digitization	Data Digitization: Digital data is especially important for Geographic Information System (GIS) analyses. Current technology allows for the comparison of assets with hazard areas and a variety of other analyses. HAZUS-MH is one example of a loss estimation model that can quantify potential losses from a variety of hazards when provided with the appropriate digital data. Digitization of data such as state-owned buildings, critical facilities and infrastructure, dam inundation areas, and floodplains would allow for a better understanding of hazard vulnerabilities and improve mitigation planning in North Dakota.	DES	ITD, SWC, DOT, Fire Marshal, Forest Service, Dept of Health, Dept of Agriculture	Ongoing & Reworded for 2014 Priorities	High	At DES this has been delayed based on lack of funding but it is now on track with projected completion in 2016. Approximately, 1/3 of State has been completed as part of the Base Map development. DOH-EHS is ongoing to provide digital data for Public Water System including Surface Water Intake, Treatment Facilities, and Wells for Community Systems. Information is also provided on landfills and waste water discharge points and treatment structures for municipal and industrial waste water systems. DOT is working with DES on digitization of county maps.
2011-3	Impacts Database	Impacts Database: (Statewide Seamless Basemap Initiative) An all-hazard database that outlines the impacts of disasters such as physical and economic losses for the State of North Dakota would significantly increase the understanding of the hazards that threaten the State. A large number of agencies, such as the Federal Emergency Management Agency, the US Department of Agriculture, the US Department of Health and Human Services, firefighting agencies, the insurance industry, and each of their state counterparts, play important roles in disaster response and recovery. Unfortunately, because so many agencies are involved, capturing information regarding disaster losses and impacts is very challenging. A centralized, accessible source of disaster impact information that provides loss estimates for historical disasters of all types would allow for a more comprehensive risk assessment.	DES	SWC, DOT, Fire Marshal, Dept of Health, Dept of Agriculture	Deferred	High	This action will begin once the Base Map has been completed.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-4	Public Education	Public Education: The individual is a powerful element of disaster mitigation. The more people that understand the hazards that threaten them and what can be done to mitigate the effects, the more likely such measures will be undertaken and future losses averted. For example, the public can be educated to recognize unusual behavior and seek help for those that may be preparing for a violent act or terrorist attack. As technology improves and new studies are conducted, the new hazard information and best practices need to be distributed to local leaders and the public. One example is a publication that demonstrates the losses avoided or that could be avoided through various land use regulations for distribution to local officials. Public education can be used as a mitigation measure for essentially any hazard, even those that are difficult to otherwise mitigate.	DES	SWC, DOT, Fire Marshal, Forest Service, Dept of Health, Dept of Agriculture	Ongoing & Reworded for 2014 Priorities	High	DES conducts periodic public information campaigns to help residents prepare for hazards and to look at ways to mitigate the impact. Campaign themes include severe winter weather, flooding and severe summer storms. NDDES also has issued information on burn bans and ways to mitigate fires. Ongoing for DOH-EHS which continues to provide information on debris clean up and environmental issues related to flooding. Forest Service provided education to school age students and teachers including teacher workshops each summer. Fire Marshal has ongoing education but reduced to Fire Safety talks for special interest groups. DOT traveler information continues to improve and a cell phone application has been added.
2011-5	Insurance Education	Insurance Education: Informing the public of their insurance options and the associated hazards may increase their financial protection from disaster. For example, many standard homeowners' insurance policies do not cover flood losses. Earthquake and terrorism are not generally covered in many insurance policies either. Educating those in flood hazard areas regarding their financial vulnerabilities may increase their participation in the National Flood Insurance Program. Similarly, educating agricultural producers regarding crop insurance may decrease their financial losses from drought, hail, and other severe weather events.	SWC	DES, Insurance Dept, Dept of Agriculture	Ongoing & Reworded for 2014 Priorities	High	Completed and ongoing – DES has been working in partnership with FEMA and State Water Commission to promote insurance education initiatives. Insurance Dept has programs that send materials (usually policy holders, but others also) reminding folks to check their policies for coverage related to the type of loss – fire, flood, sewer back up, etc and the limits of their coverage and hiring of only licensed contractors for

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
							repairs and not paying up front for work not done. Also they have a program specifically for commercial accounts that relates to reminding them to have emergency plans for fire and water companies to do emergency response and restoration.
2011-6	Building Codes	Building Codes: North Dakota has a state building code. The North Dakota State Building Code consists of the 2009 International Building Code, International Residential Code, International Mechanical Code, and International Fuel Gas Code, with some state amendments. The adoption and enforcement of the State Building Code is the responsibility of the individual jurisdictions within the state. Through the State Building Code Advisory Committee, the State Building Code can be modified and strengthened. Local jurisdictions can also make their own improvements to suit their needs. Those jurisdictions that have not adopted the State Building Code can do so and improve their future development's disaster resistance. An emphasis on enforcement is encouraged for those communities that have adopted the codes. Additional improvements to the State Life Safety and Fire Codes could further reduce losses.	DCS	DES	Deleted	High	This SHMT recognizes the importance of building codes in hazard mitigation but recommended this be deleted as it is mainly a local responsibility to adopt and enforce the codes. Some improvement has been made in the adoption of building codes at the local level (see related discussion in Chapter 7).

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-7	NFIP	National Flood Insurance Program: The National Flood Insurance Program (NFIP) is a mechanism to reduce the vulnerabilities to flood through local regulation and the opportunity and/or requirement for individuals to purchase flood insurance. The NFIP is firmly in place in many North Dakota jurisdictions and the purpose of this strategy is to encourage additional communities to join the program, identify and map additional communities at risk, update old mapping, promote participation in the Community Rating System (an incentive program that can reduce insurance rates), and support the state's additional requirement for construction of one foot above the base flood elevation. Communities are encouraged to adopt standards higher than the state and federal National Flood Insurance Program minimums.	SWC	DES, Insurance Dept, Dept of Agriculture	Ongoing & Reworded for 2014 Priorities	High	Completed and ongoing – DES has been working in partnership with FEMA and State Water Commission to promote insurance initiatives. Insurance Dept has programs that send materials (usually policy holders, but others also) reminding residents to check their policies for coverage related to the type of loss, fire, flood, sewer back-up, etc and the limits of their coverage and hiring of only licensed contractors for repairs and not paying up front for work not done. Also they have a program specifically for commercial accounts that relates to reminding them to have emergency plans for fire and water companies to do emergency response and restoration.
2011-8	Basin-Wide Water Management Planning	Basin-Wide Water Management Planning: Comprehensive basin-wide planning in the five major basins in North Dakota – the Missouri River Basin, the James River Basin, the Souris River Basin, the Red River Basin, and the Devils Lake Basin – allows for a consistent and collaborative approach to flood and drought mitigation plans and projects. 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.	SWC	DES	Ongoing & Reworded for 2014 Priorities	Moderate	Ongoing – the Base Map development that is underway will enhance this effort.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-9	Utility and Critical Materials	Utility and Critical Material Studies: Individual studies of the utilities and critical materials such as fuel, food, water, and agricultural supplies would promote a better understanding of the circumstances that may cause shortages or outages. Such studies could then be used to mitigate and prepare for future outages and shortages.	DES	Dept. of Commerce, Utility Companies	Deleted	Moderate	Partially completed and documented in response plans. Based on an analysis of anticipated needs, the DES Warehouse supplies have been expanded to include such needed items as ready-to-eat meals and water. State has an Energy Assurance Plan.
2011-10	Wildland Fire Database	Wildland Fire Database: 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.	Forest Service, Fire Marshal ,	DES	Deleted	Moderate	The initial phase has been completed. The second phase includes mapping over Base Map and critical infrastructure analysis. Delete Forest Service as a lead agency. This is deleted because it is not mitigation action.
2011-11	Floodplain Map Modernization	Floodplain Map Modernization: Flood insurance rate maps (FIRMs) produced through the National Flood Insurance Program (NFIP) are widely used for insurance and risk assessment purposes. Many maps throughout the state are becoming dated as new technology has improved mapping methodologies. Updating and digitizing the maps allows for a more accurate understanding of the flood hazard and improves the basis for the NFIP.	SWC		Ongoing	Moderate	Merged with Initiative #2011-7.
2011-12	Weather Modification	Weather Modification: Years of application and research by the North Dakota Atmospheric Resources Board has found that cloud seeding operations reduce hail impacts and increase rainfall. Continued research and application of weather modification techniques may lead to the reduction of future losses from hail, drought, and other weather-related hazards.	SWC		Deleted	Moderate	Program operates from June 1-August 31 each year. Bowman, McKenzie, Mountrail, Ward, Williams, and part of Slope counties participate. Project goals are hail suppression and rain enhancement. Action deleted since it is not a statewide program and only includes a couple counties.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-13	Household Hazardous Waste Regulations	Household Hazardous Waste Regulations: The development of a statewide hazardous waste collection program and disposal regulations may reduce the amount of hazardous chemicals that can contaminate drinking water supplies. Similarly, stricter regulations on storage tanks containing hazardous materials may reduce the chances of a spill.	Dept. of Health		Ongoing	Moderate	The cities of Bismarck, Fargo, Minot, Grand Forks and Jamestown have some provisions in place for household hazardous waste (HHW). Project Safe Send through the Ag Department does targeted statewide collection of unusable or banned pesticides. No additional HHW initiatives are ongoing at this time.
2011-14	Hazardous Materials Studies	Hazardous Materials Studies: Hazardous materials are transported throughout the state in vehicles, trains, and planes. Generally, the types and quantities of hazardous materials at fixed facilities are known through reporting requirements. Much less is known about mobile hazardous materials. A study that estimates the types, quantities, and possible worst case scenarios of hazardous materials transported on the roadways, railways, and airports using field, company, and/or agency data would allow for a more accurate portrayal of the hazard. Additionally, a working group consisting of the oil industry and local and state officials could identify the long-term hazards caused by the oil boom in the state, such as the degradation of road networks and related safety issues, increased health hazards, and quality of life threats and identify additional strategies for mitigating the threats.	DES	DOT	Completed	Low	This project has been initiated and is in the second year of data collection. As this program is in place thus not continued as a mitigation action in this plan.
2011-15	Transportation Database	Transportation Database: A GIS database that outlines the location, number, and severity of accidents on North Dakota roadways, railways, and airports would allow for focused mitigation to reduce future losses. Similarly, compiling data on roadway, railway, air traffic, and airport use would pinpoint the areas that could most benefit from	DOT	Highway Patrol, Aeronautics Commission	Deleted	Low	GIS portion merged with Data Digitization action.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
		improvements.					
2011-16	Dam Safety	Dam Safety: Continued improvements to North Dakota's state dam safety program would reduce the risk of dam failure and reduce the potential consequences if a failure were to occur. The risk of dam failure is reduced by design review and permitting of new dam construction, by inspection of existing dams, and by encouraging dam owners to properly maintain and repair their dams. Additional financial support and education for dam owners would help ensure that dams are properly maintained and that necessary repairs are made. Emergency Action Plans (EAPs) are intended to reduce the potential consequences of dam failure. EAPs for all high hazard dams should be required, and regular EAP updates should be encourages. A comprehensive program could be achieved through legislation and the associated funding to improve the existing state program.	SWC		Ongoing & Reworded for 2014 Priorities	Low	The priority level changed from a low priority to a moderate priority.
2011-17	Transportation Inspection Programs	Transportation Inspection Programs: The creation, support, management, and improvement of inspection programs on vehicles, trucks, trains, and planes may mitigate hazardous material releases and intentional attacks.	Highway Patrol	DOT	Deleted *Show as Completed?*	Low	Inspection programs are in place thus not continued as a mitigation action in this plan.

Action ID #	Action Title	Action Description	Lead Agency	Support Agencies	2013 Status	Priority	Status Update
2011-18	Transportation Engineering and Systems	Transportation Engineering and Systems: Improvements made to transportation infrastructure through engineering and the subsequent road, railway, and barrier designs could reduce transportation accidents and prevent mass casualty and hazardous material release incidents. 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.	DOT		Ongoing	Low	No changes.

6.2.2. 2014 Mitigation Actions

A number of new actions and revisions to ongoing actions were identified during the 2013 planning process and are identified in the **Table 6.3** below with the action title, action description, the goal & objective ID, the lead agency, support agencies, potential funding, implementation timeframe, the 2013 status, and priority level. The actions were 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 that many of the recommended mitigation actions can be implemented in the short term while others must be viewed as long-term measure.

Table 6.3. North Dakota 2014 Mitigation Actions

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
2014-1	Mitigation Planning	Provide technical and financial assistance to local and tribal jurisdictions developing or updating their mitigation plan. All local and tribal jurisdictions are encouraged to develop and adopt a mitigation plan that meets the requirements of the Disaster Mitigation Act of 2000, enhances Community Resiliency, and meets the needs of the jurisdictions.	1.1	NDDES	Forest Service, SWC, Dept of Agriculture, Fire Marshall	FEMA PDM, HMGP, USFS, BLM	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011	High
2014-2	Mitigation Planning with Cultural & Historical Preservation Component	Promote the participation of cultural and historical preservation organizations and businesses in the planning process to ensure decisions made today on land use will not impact future needs to expand.	1.2	NDDES	State Historical Society, N.D. State University Extension Service	Existing Budgets/Programs	1 to 3 months	New in 2014	Moderate
2014-3	Data Digitization	Provide a sound foundation for objective, scientific analyses of hazard vulnerabilities through the use of data digitization. Digital data is especially important for Geographic Information System (GIS) analyses. Current technology allows for the comparison of assets with hazard areas and a variety of other analyses. HAZUS-MH is one example of a loss estimation model that can quantify potential losses from a variety of hazards when provided with the appropriate digital data. Digitization of data such as state-owned buildings, critical facilities and infrastructure, dam inundation areas, and floodplains would allow for a better understanding of hazard vulnerabilities and improve mitigation planning in North Dakota.	1.2	NDDES	Information Technology Department, State Water Commission, N.D. Department of Transportation (NDDOT), Fire Marshal, Forest Service, N.D. Department of Health, Dept of Agriculture	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011	High

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
2014-4	Debris Management Plans	Support the development of Debris Management Plans at the local level. There is a need for coordinated educational effort, for county and regional planning and for development of staff, infrastructure and tools to properly address debris management to mitigate potential health impacts.	1.2	N.D. Department of Health	NDDES	USDA grant	6 months to 1 year	New 2014	High
2014-5	Public Education	Support educating the public on a regular basis by engaging media during hazardous awareness months, prior to spring flooding and other seasonal weather hazards.	2.1	NDDES	NWS, All Partner Agencies	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011	High
2014-6	Support Local Zoning	Encourage and support jurisdictions adopting a hazard mitigation and future risk assessment process when making decisions regarding facility placement, building permits and zoning.	3.1	NDDoC	NDDES, SWC	Existing Budgets/Programs	1 to 3 months	New 2014	Moderate
2014-7	Local Master/ Compre-hensive Plans	Encourage local zoning and planning boards and commissions to develop and maintain master plans and/or comprehensive plans for their community. The building codes, zoning, and ordinances outlined in these plans can be used to regulate development in hazardous areas and to improve the disaster resistance of their future development. Hazard mitigation becomes much more cost effective when handled before structures and infrastructure are placed in hazardous areas.	3.1	NDDoC	State Fire Marshal, NDDES	Existing Budgets/Programs	Ongoing	Ongoing	Moderate
2014-8	Local Mitigation Effectiveness	Establish a state hazard mitigation planning requirement for local jurisdictions to evaluate local building codes and zoning ordinances to determine effectiveness to mitigate hazards.	3.1	NDDES		Existing Budgets/Programs	Initiate in 1 to 3 months	New 2014	Low

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
2014-9	North Dakota Silver Jackets	Support North Dakota Silver Jackets actions towards basin wide hydrological studies to determine potential flood control projects, measures, and mitigation activities that could be supported.	4.1	SWC	U.S. Army Corps of Engineers	Existing Budgets/Programs	Ongoing: Already initiated and continuing	New 2014	High
2014-10	Basin-wide Water Management Planning	Conduct comprehensive basin-wide planning in the five major basins in North Dakota – the Missouri River Basin, the James River Basin, the Souris 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 particular 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.	4.1	SWC	U.S. Army Corps of Engineers	Unknown	Initiated in 6 months to 3 years	New 2014	High
2014-11	NFIP, RiskMap & CRS Program	Increase support for and participation in the National Flood Insurance Program (NFIP) through public education. Also support the RiskMap action. NFIP is a mechanism to reduce the vulnerabilities to flood through local regulation and the opportunity and/or requirement for individuals to purchase flood insurance. The NFIP is firmly in place in many North Dakota jurisdictions and the purpose of this strategy is to encourage additional communities to join the program, identify and map additional communities at risk, develop RiskMaps, promote participation in the Community Rating System, and support the State's additional	4.1	SWC	NDDES, N.D. Insurance Department	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011 Insurance Education & NFIP actions	High

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
		requirement for construction of one foot above the base flood elevation. Communities are encouraged to adopt standards higher than the state and federal NFIP minimums.							
2014-12	Property Acquisition, Relocation, Elevation and Floodproofing	Support the implementation of property acquisition, relocation, elevation and floodproofing at the local level through technical and financial assistance and public education. The acquisition priority is with repetitive flood loss and severe repetitive flood loss properties	4.1	SWC	NDDES	SWC, PDM, HMGP,	Ongoing: Already initiated and continuing	Ongoing	High
2014-13	Dam Safety	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.	4.2	SWC		Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	Moderate
2014-14	Dam Status Review	Periodically review dam status, conditions, designs, permitting of new dams and work with owners to encourage proper maintenance and repair their dams.	4.2	SWC	U.S. Bureau of Reclamation, N.D. Department of Mineral Resources, Natural Resources Conservation Service, Bureau of Indian Affairs, N.D. Parks and Recreation Department, N.D. Game and Fish Department, U.S. Army Corps of Engineers	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	Moderate
2014-15	Dam Owner Education	Work with local state and federal agencies to secure additional financial support to improve dams and educate for dam owners. This would help ensure that dams are properly maintained and that necessary repairs are made.	4.2	SWC	U.S. Bureau of Reclamation, Natural Resource Conservation Service, Bureau of Indian Affairs, U.S. Army Corps of Engineers		Ongoing: Already initiated and continuing	Ongoing	Moderate

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
2014-16	Review Dam EAPs	Review Emergency Action Plans (EAPs) to ensure that these plans address actions to reduce the potential consequences of dam failure. EAPs for all high hazard dams should be required, and regular EAP updates should be encourages. A comprehensive program could be achieved through legislation and the associated funding to improve the existing state program.	4.2	SWC	U.S. Bureau of Reclamation, N.D. Department of Mineral Resources, Natural Resources Conservation Service, Bureau of Indian Affairs, N.D. Parks and Recreation Department, N.D. Game and Fish Department, U.S. Army Corps of Engineers	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	Moderate
2014-17	Outdoor Warning Systems	Support the updating of outdoor warning systems in local communities through technical and financial assistance and public education.	5.1	NDDES	NWS	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	Moderate
2014-18	Emergency Notification Systems	Work with state, federal and local agencies to procure and implement emergency notification systems that cover as many modes and methods with new technology devices supporting next generation interaction 911, phones, smart TVs, and smart message boards.	5.1	NDDES		Existing Budgets/Programs	Initiated in 6 months to 3 years	New 2014	Moderate
2014-19	Retrofit Communication Sites	Retrofit communication sites by installing guy wires, and ensuring system redundancies through satellites, portable towers and new technology devices.	5.1	NDDES	NWS, ITD, NDDOT	Existing Budgets/Programs	Initiated in 6 months to 3 years	New 2014	High
2014-20	Tornado Safe Rooms & Shelters	Support the implementation of tornado safe rooms and shelters in buildings through technical and financial assistance and public education.	5.2	NDDES		Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	High
2014-21	Snow Fences	Support the development of snow fences at the local level through technical and financial assistance and	5.3	N.D. Forest Service	DOT,	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	High

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
		public education.							
2014-22	Electric Infrastructure Protection	Promote the burial of electrical power lines and other electrical mitigation activities.	5.3	NDDES	N.D. Association of Rural Electric Cooperatives	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	High
2014-23	Emergency Power at Critical Facilities	Encourage back-up generators or alternative solutions such as solar panels for emergency power until the service is restored for critical facilities, special needs facilities, utility infrastructure, and emergency shelters.	5.3	NDDES	N.D. Association of Rural Electric Cooperatives	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	Moderate
2014-24	Floodproofing Critical Facilities	Promote flood proofing activities to protect critical facilities, utility infrastructure, government buildings, and residential structures. Examples of floodproofing 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. Creative floodproofing measures can be used to protect ecologic and other values. For example, fisheries could be protected through measures that prevent the crossover of species during floods.	5.3	NDDES	SWC	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing	High
2014-25	Drought Task Force	Work with the ND Drought Task Force to implement mitigation strategies and initiate programs set up to relieve rural and municipal water shortages, share and relocate feed	6.1	SWC	NDDES, N.D. Department of Agriculture, NWS, DCS	Existing Budgets/Programs	1 to 3 months	New 2014	Moderate

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
		stocks, and assist vulnerable populations with heat induced health risks.							
2014-26	Firewise & Community Wildfire Protection Plan	Promote the Firewise and Community Wildfire Protection Plan (CWPP) program and public education. The North Dakota Forest Service can provide financial and technical assistance regarding Community Wildfire Protection Plans. These plans specifically address mitigation for wildland fires and may be required for jurisdictions to receive wildfire mitigation funding.	6.2	N.D. Forest Service		Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011	High
2014-27	Cyber Security Threats	Work to educate industry and public on ways to mitigate cyber threats affecting personal, private, and state security and other sensitive information.	7.1	N.D. Information Technology Department (ITD)	SHSP, State funds	Existing Budgets/Programs	1 to 3 years	New 2014	High
2014-28	Secure Electronic Systems	Procure and install systems as well as adopt processes that promote secure electronic systems.	7.1	N.D. State and Local Intelligence Center	NDDES, ITD	Existing Budgets/Programs	1 to 3 years	New 2014	High
2014-29	Protection of Critical Communication	Mitigate potential loss of critical communications by retrofitting sites with protective security measure.	7.1	NDDES	U.S. Department of Homeland Security, ITD, NDDOT	Existing Budgets/Programs	1 to 3 years	New 2014	High
2014-30	Hazardous Waste Collection Program	Promote and maintain a statewide hazardous waste collection program and disposal regulations may reduce the amount of hazardous chemicals that can contaminate drinking water supplies. Similarly, stricter regulations on storage tanks	7.1	N.D. Dept of Agriculture	N.D. Department of Health	Existing Budgets/Programs	Ongoing: Already initiated and continuing	Ongoing & reworded from 2011	Moderate

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
		containing hazardous materials may reduce the chances of a spill.							
2014-31	Transportation Engineering & Systems	Improve transportation infrastructure through engineering and the subsequent road, railway, and barrier designs could reduce transportation accidents and prevent mass casualty and hazardous material release incidents. 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.	7.1	NDDOT	N.D. Aeronautics Commission, N.D. Department of Health, N.D. Department of Mineral Resources	Existing Budgets/Programs & new Legislative funds	Ongoing: Already initiated and continuing	Ongoing from 2011	High
2014-32	Communicable Disease	Support the monitoring, preventive measures, and public education of communicable diseases to mitigate the impact of pests and pathogens.	8.1	NDDoH	N.D. Department of Agriculture, U.S. Animal Plant and Health Inspection Services (APHIS), N.D. Stockmen's Association	Existing Budgets/Programs	1 to 6 months	New 2014	Moderate
2014-33	Community Resiliency	Increase community resiliency through planning that emphasizes worker and first responder safety; and promotes preventive health for new populations.	8.1	NDDoH	NDDES, NDDOT, N.D. Department of Human Services, N.D. Workforce Safety and Insurance	Existing Budgets/Programs	1 to 6 months	New 2014	Moderate

Action ID #	Action Title	Action Description	Goal & Obj ID	Lead Agency	Support Agencies	Potential Funding	Implementation Timeframe	2013 Status	Priority
2014-34	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 community leaders and emergency managers strengthen local safety programs.	8.1	NWS	Des, City, County, & Tribal Emergency Management	Existing funds/programs	1 to 3 months	Ongoing but it was a local action in 2011 plan	High
2014-35	Public Education Programs	Promote educational activities designed to protect the public to include such programs as Weather Spotter Training, Community Emergency Response Teams, and Disaster-Resistant University programs.	8.1	NDDES	NDDoH, NWS	Existing funds/programs	Ongoing: Already initiated and continuing	Ongoing	High

6.2.3. Prioritizing Mitigation Actions

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, some actions may be best achieved outside the priorities established here.

Table 6.4 shows the types of hazards each action may mitigate 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 6.4. Hazards Mitigation by Each Proposed Action

	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Shortage or Outage of Critical Materials or Infrastructure	Severe Summer Weather	Transportation Accident	Urban Fire or Structure Collapse	Windstorms	Wildland Fire	Severe Winter Weather
Mitigation Planning	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cultural and Historical Preservation			X	X	X	X			X		X	X	X	X
Data Digitization	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Debris Management Plans	X	X		X	X	X		X	X	X	X	X	X	X
Public Education	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Support Local Zoning		X		X	X	X		X	X	X	X	X	X	X
Local Master / Comprehensive Plans	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Local Mitigation		X	X	X	X			X	X	X	X	X	X	X

	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Shortage or Outage of Critical Materials or Infrastructure	Severe Summer Weather	Transportation Accident	Urban Fire or Structure Collapse	Windstorms	Wildland Fire	Severe Winter Weather
Effectiveness														
North Dakota Silver Jackets		X	X	X				X						
Basin-wide Water Management Planning		X	X	X				X						
NFIP, RiskMap & CRS Program				X										
Property Acquisition, Relocation, Elevation & Floodproofing		X		X										
Dam Safety		X												
Dam Status Review		X												
Dams Owner Education		X												
Review Dam Emergency Action Plans		X												
Outdoor Warning Systems		X		X	X	X	X	X	X			X	X	X
Emergency Notification Systems	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Retrofit Communication Sites	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tornado Safe Rooms and Shelters									X			X		

	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Shortage or Outage of Critical Materials or Infrastructure	Severe Summer Weather	Transportation Accident	Urban Fire or Structure Collapse	Windstorms	Wildland Fire	Severe Winter Weather
Snow Fences												X		X
Electric Infrastructure Protection		X		X	X		X	X	X			X	X	X
Emergency Power at Critical Facilities		X		X	X		X	X	X		X	X	X	X
Floodproofing Critical Facilities				X										
Drought Task Force			X											
Firewise & Community Wildfire Protection Plan													X	
Cyber Security Threats							X	X						
Secure Electronic Systems							X	X						
Protection of Critical Communications							X	X						
Hazardous Waste Collection Program						X								
Transportation Engineering & Systems					X					X				
Communicable Disease	X													
Community Resiliency	X													
StormReady			X	X	X				X			X	X	X

	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous Material Release	Homeland Security Incident	Shortage or Outage of Critical Materials or Infrastructure	Severe Summer Weather	Transportation Accident	Urban Fire or Structure Collapse	Windstorms	Wildland Fire	Severe Winter Weather
Program														
Public Education Programs	X	X	X	X	X	X	X	X	X	X	X	X	X	X

To ensure that statewide goals, benefit/cost, and other factors are taken into account 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. *Cost* considers the annual direct expenses associated with the initiative. *Project management* evaluates the amount of time needed by state government employees to complete or coordinate the project. *Feasibility* assesses 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. The feasibility factor is essentially a summarization of FEMA's Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria as shown in **Table 6.5**. *Population benefit* considers the possible prevention of deaths and injuries through the action's implementation. *Property benefit* estimates the reduction of property losses, including structures, infrastructure, and values, from the hazard being mitigated. *Effectiveness* evaluates 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. The *hazard rating* is based on the results of the risk assessment and is a measure of the history, probability, severity, and vulnerabilities of the hazard.

Table 6.5. STAPLEE 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

Criteria	Considerations
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

Source: Federal Emergency Management Agency

Each of the factors was ranked qualitatively for each of the projects. The methods used to assign a category and the associated score can be generally defined as shown in **Table 6.6**. 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; see Risk Assessment Summary Section 5.15), and 4 of 22 points account for feasibility and effectiveness.

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. The prioritization of actions reflects this.

Table 6.6. Prioritization Criteria

Factor	Threshold	Rating	Score
Cost Range: 0-4	Little to no direct expenses	Low (L)	4
	Less than $100,000	Low-Moderate (LM)	3
	$100,000-$499,999	Moderate (M)	2
	$500,000-$999,999	Moderate-High (MH)	1
	$1,000,000 or greater	High (H)	0
Project Management Range: 0-2	Less than 40 hours of staff time	Low (L)	2
	40-80 hours of staff time	Moderate (M)	1
	Greater than 80 hours of staff time	High (H)	0
Feasibility Range: 0-2	Positive support for the project	High (H)	2
	Neutral support for the project	Moderate (M)	1
	Negative support for the project	Low (L)	0
Population Benefit Range: 0-4	Potential to reduce more than 20 casualties	High (H)	4
	Potential to reduce 10-20 casualties	Moderate-High (MH)	3
	Potential to reduce 5-10 casualties	Moderate (M)	2
	Potential to reduce 1-5 casualties	Low-Moderate (LM)	1
	No potential to reduce casualties	Low (L)	0
Property Benefit Range: 0-4	Potential to reduce losses to 100 or more buildings or severe damages to infrastructure or values	High (H)	4
	Potential to reduce losses to 25-99 buildings or substantial damages to infrastructure or values	Moderate-High (MH)	3

Factor	Threshold	Rating	Score
	Potential to reduce losses to 10-24 buildings or moderate damages to infrastructure or values	Moderate (M)	2
	Potential to reduce losses to 1-9 buildings or slight damages to infrastructure or values	Low-Moderate (LM)	1
	No potential to reduce property losses	Low (L)	0
Effectiveness Range: 0-2	Proven to be very effective	High (H)	2
	Expected to be moderately effective	Moderate (M)	1
	Effectiveness unknown or high maintenance	Low (L)	0
Hazard Rating Range: 0-4	see Risk Assessment Summary Section 5.15	High (H)	4
	see Risk Assessment Summary Section 5.15	Moderate (M)	2
	see Risk Assessment Summary Section 5.15	Low (L)	0

Table 6.7 shows the evaluation of each statewide mitigation action and their associated scores. Please note that all actions listed in this strategy are considered worthwhile, otherwise they would be not listed. Therefore, even though a project may be listed as a low priority, the project is still an important piece of the mitigation strategy in the State.

Table 6.7. Mitigation Action Priorities

Action ID #	Action Title	Cost	Project Management	Feasibility	Population Benefit	Property Benefit	Effectiveness	Hazard Rating	Total Score	Priority
2014-1	Mitigation Planning	2	0	2	0	4	2	4	14	High
2014-2	Mitigation Planning with Cultural & Historical Preservation Component	4	1	2	0	0	2	2	11	Moderate
2014-3	Data Digitization	1	0	2	3	4	2	4	16	High
2014-4	Debris Management Plans	4	2	1	0	0	2	4	13	High
2014-5	Public Education	3	1	2	0	0	2	4	12	High
2014-6	Support Local Zoning	3	1	1	0	0	2	2	9	Moderate
2014-7	Local Master /Comprehensive Plans	2	0	1	0	0	2	2	7	Moderate
2014-8	Local Mitigation Effectiveness	3	1	2	0	0	0	0	6	Low
2014-9	North Dakota Silver Jackets	3	2	2	0	0	2	4	13	High
2014-10	Basin-wide Water Management Planning	2	0	2	0	4	2	4	14	High
2014-11	NFIP, RiskMap & CRS Program	2	0	2	0	4	1	4	13	High
2014-12	Property Acquisition, Relocation, Elevation and Floodproofing	2	1	2	0	4	2	4	15	High
2014-13	Dam Safety	3	1	2	0	0	1	2	9	Moderate

Action ID #	Action Title	Cost	Project Management	Feasibility	Population Benefit	Property Benefit	Effectiveness	Hazard Rating	Total Score	Priority
2014-14	Dam Status Review	2	0	2	0	0	2	2	8	Moderate
2014-15	Dam Owner Education	3	0	2	0	0	2	2	9	Moderate
2014-16	Review Dam EAPs	2	0	2	0	0	2	2	8	Moderate
2014-17	Outdoor Warning Systems	2	2	2	1	0	2	2	11	Moderate
2014-18	Emergency Notification Systems	2	2	2	1	0	2	2	11	Moderate
2014-19	Retrofit Communication Sites	2	2	2	0	0	2	4	12	High
2014-20	Tornado Safe Rooms & Shelters	3	1	1	4	0	2	2	13	High
2014-21	Snow Fences	3	1	2	3	0	1	2	12	High
2014-22	Electric Infrastructure Protection	3	2	2	4	0	2	4	17	High
2014-23	Emergency Power at Critical Facilities	2	2	1	3	0	1	2	11	Moderate
2014-24	Floodproofing Critical Facilities	3	1	2	0	3	2	4	15	High
2014-25	Drought Task Force	3	1	2	2	0	1	2	11	Moderate
2014-26	Firewise & Community Wildfire Protection Plan	3	1	2	4	4	2	2	18	High
2014-27	Cyber Security Threats	3	1	2	3	0	2	2	13	High
2014-28	Secure Electronic Systems	1	0	2	3	3	2	2	13	High
2014-29	Protection of Critical Communication	1	0	2	2	4	2	2	13	High
2014-30	Hazardous Waste Collection Program	2	0	2	0	0	2	2	8	Moderate
2014-31	Transportation Engineering & Systems	0	0	2	4	2	2	2	12	High
2014-32	Communicable Disease	2	0	2	4	0	1	2	11	Moderate
2014-33	Community Resiliency	3	1	2	0	0	1	4	11	Moderate
2014-34	StormReady Program	4	2	2	4	4	2	4	22	High
2014-35	Public Education Programs	4	2	2	0	0	1	4	13	High

6.3. Local Mitigation Actions

North Dakota is diverse in its population and characteristics. Parts of the State can be considered urban, other areas are rural, and many locations have a mix of both. The needs and capabilities vary widely from one community to the next. Some communities are more concerned with flood whereas others are more concerned with wildland fire. Hazard mitigation is truly a local phenomenon. Federal and state government can provide support, funding, and technical assistance and integrate aspects of mitigation into state laws and programs, but the majority of successful mitigation activities are developed and implemented at the local level. Many activities that can be achieved at the state level can also be conducted at the local level given the appropriate resources. The following is a list of typical local mitigation actions:

- 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 and Roadway Protection
- Floodproofing
- National Flood Insurance Program
- Warning Systems
- Weather Spotter Training
- Tornado Safe Rooms and Shelters
- Electric Infrastructure Protection
- Snow Fences
- Drought Water Management
- Drought Land and Crop Practices
- Water Supply Intakes
- Firewise Programs
- Firebreaks
- Emergency Haying and Grazing
- Household Hazardous Waste Regulations
- Facility Hardening and Security
- Back-up Power
- Smoke Detectors and Sprinkler Systems

A roll-up and analysis of the mitigation actions contained in local hazard mitigation plans was conducted to summarize the types of mitigation actions most commonly implemented, or desired to be implemented. **Table 6.8** and **Table 6.9** summarize the mitigation actions listed in the local mitigation plans by type of actions.

Table 6.8. Mitigation Actions Listed in the Local Plans-Part 1

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
Adams								x	x				x		
Barnes						x		x		x	x	x	x	x	x
Benson	x			x		x	x	x	x			x	x		x
Bottineau						x	x			x	x		x		
Bowman	x					x			x		x		x	x	
Burke								x	x				x		
Burleigh	x		x			x							x		x
Cass			x			x				x	x	x	x	x	
Cavalier	x	x				x	x		x		x		x		
Dickey						x	x			x	x		x		
Divide															
Dunn						x	x	x					x		
Eddy	x					x	x				x		x		x
Emmons	x														
Fort Berthold	x				x										
Foster	x		x												
Golden Valley			x												
Grand Forks	x	x	x	x											
Grant	x														
Griggs															
Hettinger	x			x											
Kidder															
Lake Traverse															
LaMoure	x		x												
Logan															
McHenry	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
McIntosh															
McKenzie															
McLean	x		x												
Mercer	x	x													
Morton	x														
Mountrail															
Nelson		x													
Oliver															
Pembina	x														
Pierce			x												
Ramsey	x			x											
Ransom	x														
Renville	x		x												
Richland															
Rolette			x												
Sargent			x												
Sheridan															
Sioux			x		x										
Slope	x														
Spirit Lake	x		x												
Standing Rock			x	x	x										
Stark															
Steele															
Stutsman	x		x												
Towner															
Traill	x			x											
Turtle Mountain			x												
Walsh			x												
Ward															
Wells						x	x			x	x		x		x
Williams			x			x							x		

Table 6.9. Mitigation Actions Listed in the Local Plans-Part 2

County	Warning Systems	Weather Spotter Training	Tornado Safe Rooms and Shelters	Electric Infrastructure Protection	Snow Fences	Drought Water Management	Drought Land and Crop Practices	Water Supply Intakes	Firewise Programs	Firebreaks	Emergency Haying and Grazing	Household Hazardous Waste Regulations	Facility Hardening and Security	Back-up Power	Smoke Detectors and Sprinkler Systems
Adams	x				x								x		
Barnes	x								x				x	x	
Benson	x			x		x	x	x		x				x	
Bottineau	x	x				x			x	x			x	x	
Bowman	x						x		x					x	
Burke	x													x	
Burleigh	x								x	x				x	
Cass	x												x	x	
Cavalier	x		x			x		x						x	x
Dickey	x														
Divide															
Dunn		x	x		x	x	x								
Eddy	x	x	x	x									x	x	x
Emmons													x		x
Fort Berthold													x		x
Foster													x		x
Golden Valley													x		x
Grand Forks													x		x
Grant													x		x
Griggs													x		x
Hettinger													x		x
Kidder													x		x
Lake Traverse													x		x
LaMoure													x		x
Logan													x		x
McHenry													x		x
McIntosh													x		x
McKenzie													x		x

County	Warning Systems	Weather Spotter Training	Tornado Safe Rooms and Shelters	Electric Infrastructure Protection	Snow Fences	Drought Water Management	Drought Land and Crop Practices	Water Supply Intakes	Firewise Programs	Firebreaks	Emergency Haying and Grazing	Household Hazardous Waste Regulations	Facility Hardening and Security	Back-up Power	Smoke Detectors and Sprinkler Systems
McLean													x		x
Mercer													x		x
Morton													x		x
Mountrail													x		x
Nelson													x		x
Oliver													x		x
Pembina													x		x
Pierce													x		x
Ramsey													x		x
Ransom													x		x
Renville													x		x
Richland													x		x
Rolette													x		x
Sargent													x		x
Sheridan													x		x
Sioux													x		x
Slope													x		x
Spirit Lake													x		x
Standing Rock													x		x
Stark													x		x
Steele													x		x
Stutsman													x		x
Towner													x		x
Traill													x		x
Turtle Mountain													x		x
Walsh													x		x
Ward													x		x
Wells	x	x	x			x		x					x	x	x
Williams	x	x							x					x	

Additional strategies are listed in local mitigation plans and are primarily focused on response and preparedness activities, and thus, are not listed in this plan. However, additional strategies that could be considered mitigation include:

- Truck/Hazardous Materials Routes (Barnes County, LaMoure County, McIntosh County)
- Sanitation/Disease Prevention Activities (Barnes County)
- Fire Hazard Building Demolitions (Bottineau County, Ramsey County)
- Highway Closure Gates (McLean County)
- Emergency Energy Conservation (McIntosh County, McLean County)
- Lake Stabilization / Outlet Projects (Ramsey County)

The State and local programs and capabilities that contribute to hazard mitigation are discussed in more detail in Chapter 7, including an analysis of the effectiveness of these programs.

The following section is a DRAFT of what will become Chapter 7 in the updated North Dakota Multi-Hazard Mitigation Plan. Please review for content and accuracy. Items highlighted in yellow are areas that need verification or where more information or clarification would be helpful or is pending.

7. Mitigation Implementation System

Mitigation is implemented through all levels of government and includes many activities conducted in the private and non-profit sectors and by individuals. Mitigation in North Dakota, like many other states, does not "fit in a little box." Mitigation goals and objectives are far reaching and some organizations conduct mitigation activities on the periphery while others make it a primary mission within their organization. This North Dakota Mitigation Implementation System section was developed with the intent to capture the mitigation programs and systems used to implement mitigation actions in the State. Many agencies and organizations play a central role in implementing mitigation in North Dakota and will be highlighted here.

7.1. State Capability Assessment

Within state government, several agencies and programs are central to mitigation actions and programs. In a traditional sense, North Dakota Department of Emergency Services is the lead state agency; however, others such as the North Dakota State Water Commission, North Dakota Division of Community Services, North Dakota Forest Service, and several others implement important mitigation programs. Given the importance of multi-agency involvement, interagency teams are often used to establish priorities and assist communities.

Department of Emergency Services (DES)

North Dakota Department of Emergency Services is the state office housing the State Hazard Mitigation Officer (SHMO) and mitigation specialists. Depending on the funding available in a given year, DES typically has three full-time mitigation specialists and the SHMO. Additional details on the N.D. mitigation program can be found in Section **7.5.7** Grant Management and Section **7.5.8** Project Monitoring and Evaluation.

State Hazard Mitigation Team (SHMT)

The North Dakota State Hazard Mitigation Team is a group of state agencies that are convened as needed and coordinated by North Dakota DES to update the State Multi-hazard Mitigation Plan, provide mitigation support to local and tribal jurisdictions, and to review and rank mitigation grant applications. Specifically, the SHMT regularly reviews and prioritizes Hazard Mitigation Grant Program and Pre-Disaster Mitigation grant applications. North Dakota has a dedicated SHMT that strongly promotes a policy of progressive mitigation tactics throughout the State. Members of the SHMT also provide technical assistance to the State Hazard Mitigation Officer (SHMO) on engineering, environmental reviews, archaeological surveys, historic preservation, and other relevant issues. The SHMT receives formal training and maintains informal dialogue several times per year concerning topics involving floodplain management, disaster programs, state construction code changes, and new legislative changes. The team composition varies as needed, depending on the hazard, task, or issue at hand. Members of the SHMT regularly include representatives from the following agencies:

- Department of Emergency Services
- Bureau of Criminal Investigation
- Department of Agriculture
- Department of Commerce
- Department of Health
- Department of Human Services
- Department of Transportation
- Division of Community Services
- Forest Service
- Game and Fish Department
- Governor's Office
- Indian Affairs Commission
- Insurance Department
- National Guard
- Parks and Recreation Department
- Risk Management Division
- State Fire Marshal
- State Historical Society
- State Water Commission
- Workforce Safety and Insurance

Agencies as well as local emergency mangers, regional councils, associations, non-profits organizations, and businesses are added or removed, as needed, depending on the type of disaster, project reviews, or technical assistance.

Interagency Hazard Mitigation Team (IHMT)

The Interagency Hazard Mitigation Team, consisting of both federal and state agencies, usually convenes following a Presidentially declared disaster to recommend mitigation strategies, conduct applicant briefings, and leverage project funding. Representatives from the following agencies are typically on the IHMT, depending on the type, extent, and nature of the disaster:

- SHMT Members (listed above)

- Federal Emergency Management Agency
- Bureau of Indian Affairs
- Congressional Offices
- Environmental Protection Agency
- Federal Highway Administration
- Housing and Urban Development
- National Weather Service
- Natural Resources Conservation Service
- Small Business Administration
- US Army Corps of Engineers
- US Bureau of Reclamation
- US Department of Agriculture, Rural Development
- US Department of Homeland Security
- US Economic Development Administration
- US Fish and Wildlife Service
- US Geological Survey

Agencies are added or removed, as needed, depending on the type of disaster.

7.1.1. State Mitigation Programs

Several mitigation programs are active in North Dakota. This section provides a brief overview of each. During each plan update, the programs are evaluated by the appropriate agency regarding their strengths, weaknesses, changes, and potential improvements.

Hazard Mitigation Assistance

FEMA's Hazard Mitigation Assistance (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 the Hazard Mitigation Grant Program, the Pre-Disaster Mitigation, and Flood Mitigation Assistance in North Dakota which fall under the umbrella of HMA.

Hazard Mitigation Grant Program (HMGP)

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 percent of funds necessary for a hazard mitigation project through the Federal Emergency Management Agency (FEMA). Mitigation funds that are available as a result of a Presidentially declared disaster are based on a percentage of the overall Public Assistance, Individual Assistance, Small Business Administration Loans, and Federal Mission Assignment funds spent. Mitigation funds can be used anywhere in the State and on any natural hazard. The SHMT scores and rates hazard mitigation project applications for funding. The HMGP project priorities are set by the Governor. The State has an administrative plan for the 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 percent match for the Hazard Mitigation Grant Program (HMGP). North Dakota Department of Emergency Services provides technical assistance and administers this grant program for the State. Details on the HMGP grant management can be found in Section 7.5 Project Management. North Dakota has had HMGP funding available 23 times from 1998-July 2013 which has provided continuity to the program. **Table 7.1** shows the funding available by disaster through the HMGP. Additional program information can be found at: http://www.fema.gov/plan-prepare-mitigate or http://www.nd.gov/des/disaster/hazard-mitigation/ .

Table 7.1. HMGP Funding in North Dakota 1998-July 2013

Disaster Number	Disaster Year	Federal Share
1220	1998	$2,498,825
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	$26,298,477
1986	2011	$593,350
4118	2013	TBD
4123	2013	TBD
TOTAL		**$100,589,908**

Sources: North Dakota Department of Emergency Services, 2013.

Strengths:

- Many large disasters in the past 15 years have allowed for regular and significant funding from this program.
- As a well established program, policies and procedures have been refined to meet state, tribal, and local needs.
- Funding opportunities are not exclusively limited to disaster areas; all entities statewide can apply.
- The state legislature provides a 10 percent match on all HMGP projects.

Weaknesses:

- The continuity of this program depends on future disasters.

Changes since 2011:

- Training opportunities were provided for Benefit Cost Analysis, Local Multi-Hazard Mitigation Planning, and Mitigation Application Development. HAZUS training is also planned.

Ideas for Improvement:

- Develop comprehensive outreach materials for statewide dissemination.
- Develop a guide of best practices and successes.
- Provide additional training for application development and project management.

Figure 7.1. 2011 Flooded Homes in Minot Offered HMGP Voluntary Buyout Program

Source: http://www.valleynewslive.com/story/16225643/minot-buyout-plan-heads-to-water-commission

Pre-Disaster Mitigation (PDM) Program

The PDM program provides nationally competitive federal funding through the Federal Emergency Management Agency to states, tribal nations, communities, and universities for natural hazards mitigation planning, mapping, and projects. The intent of this program is to provide a consistent source of funding to state, tribal, and local 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 percent funding of project costs, except small and impoverished communities can get up to 90 percent. North Dakota Department of Emergency Services provides technical assistance and administers this grant program for the State. The State has an administrative plan for the PDM program. Additional program information can be found at: http://www.fema.gov/government/grant/pdm/index.shtm or http://www.nd.gov/des/disaster/hazard-mitigation/ .

Strengths:

- Requires a comprehensive multi-hazard mitigation plan to guide future projects.
- Encourages county-level mitigation planning and public participation.
- Provides mitigation opportunities even if federal post-disaster funding is not available.
- Nationally competitive process strives for consistency across the country.
- Most counties in the State are participating in this program at some level.
- Provides a source of funding for preparing or updating mitigation plans.

Weaknesses:

- The grant application process is lengthy and discourages some communities from applying.
- The time frame between the grant application submission and award occasionally delays implementation of timely projects.
- Guidance is not consistent year to year and funding levels have varied widely since it was implemented and is currently underfunded as of Fiscal Year 2013 at $25M nationally
- The program is limited to only certain types of mitigation, leaving funding gaps for related activities such as warning have adequate resources to pull together an application and/or implement a project.

Changes since 2011:

- PDM fund has not been used in North Dakota since 2009.

Ideas for Improvement:

- Provide additional training for application development and project management.

Flood Mitigation Assistance (FMA)

The FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured un the National Flood Insurance Program. This program exists for fiscal year 2013 be merged into the new National Flood Mitigation Fund.

National Flood Mitigation Fund

The Act (called the Biggert-Waters Flood Insurance Reform Act of 2012, found in H.R. 4348) consolidates three previous NFIP funded mitigation programs described below into a single program. The combined **National Flood Mitigation Fund (NFMF)** is to be funded at $90 million per year. While the old Flood Mitigation Assistance (FMA) and Severe Repetitive Loss (SRL) program were funded annually at up to $40 million per year each and the Repetitive Flood

Claims (RFC) program at up to $10 million annually, the SRL program was never fully utilized in part due to its complexity. More information can be found at: http://www.fema.gov/flood-insurance-reform-act-2012. The new program simplifies and combines the three previous programs and includes the following elements:

- Encourages flood mitigation planning to be integrated into a community's multi-hazard mitigation plan,
- Adds demolition/ rebuild (mitigation reconstruction) as an allowed mitigation activity under all programs,
- Caps the use of mitigation grant funds for mitigation planning activities at $50,000 (states) and $25,000 (communities),
- Provides for denial of grant funds if not fully obligated in 5 years, and
- Restructures federal share requirement:
  - Up to 100 percent for severe repetitive loss structures (4+ Claims of over $5000 or 2+ claims exceeding value of structure)
  - Up to 90 percent for repetitive loss structures (2 claims over 10 years averaging at least 25% of value of structure)
  - Up to 75 percent for other approved mitigation activities.

Strengths:

- Targets properties suffering regular and repetitive losses through the NFIP, thus, focusing on those properties that cause the most losses.
- The program is available for all NFIP insured properties that may have experienced loss due to flooding.

Weaknesses:

- Since many homeowners are not interested in acquisition opportunities, often the funds go unused.

Changes since 2011:

- The 2012 Biggert-Waters Reform Act that combined these three funding grants.

Ideas for Improvement:

- 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) Section 406 Program

The PA Section 406 program is federal funding through the Federal Emergency Management Agency and applies on the parts of the facility that were actually damaged by the disaster and the mitigation measure provides protection from subsequent events. The mitigation work must be cost effective and be reasonably performed as part of the work or measure that will reduce the potential for damage to a facility from a disaster event. Sometimes, a combination of Section 406 and 404 funding may be appropriate, where Section 406 hazard mitigation funding is used to provide protection to the parts of the facility that were damaged and Section 404 hazard mitigation funding is used to provide protection to the undamaged parts of the facility. In these instances, the application for Section 404 hazard mitigation funding must be submitted in a timely manner, consistent with state and local hazard mitigation plans, and approved by the State Hazard Mitigation Officer.

Typically, the federal share on PA projects is 75 percent. The North Dakota State Legislature provides up to a 10 percent match for the PA Program. North Dakota Department of Emergency Services provides technical assistance and administers this grant program for the State. Additional program information can be found at: http://www.fema.gov/government/grant/pa/index.shtm.

Strengths:

- Funds mitigation work during public infrastructure repairs, thus reducing future losses.
- The public, including local officials, may be more open to mitigation immediately following a major disaster, during the recovery period.

Weaknesses:

- Recovery, not mitigation, is typically the primary objective of communities immediately following a disaster; mitigation opportunities may be missed due to the focus on recovery.
- Identifying mitigation costs versus repair costs can be difficult to document and time consuming for a damaged facility.

Changes since 2011:

- None

Ideas for Improvement:

- Develop a guide of best practices and successes.
- Provide additional training for application development and project management.

Community Development Block Grant (CDBG)

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. The North Dakota Division of Community Services administers the CDBG program. Additional program information can be found at: http://www.hud.gov/offices/cpd/communitydevelopment/programs/ and http://www.communityservices.nd.gov/community/block-grant/.

Strengths:

- Many mitigation activities, such as acquisitions, qualify for CDBG funding.
- CDBG funds may be used as match on other grants.

Weaknesses:

- CDBG funding is used for other priorities besides hazard mitigation.
- Funding is generally limited to low or moderate income communities.

Changes since 2011:

- None

Ideas for Improvement:

- None

Community Development Block Grant (CDBG) Supplemental Disaster Recovery

The North Dakota Department of Commerce received one Supplemental Disaster Recovery appropriations from US Housing and Urban Development and is scheduled to receive another in 2013. The CDBG Disaster Recovery funds are to be used toward meeting unmet housing, infrastructure, public service, public facility, and other needs in counties designated as Presidential Disaster areas in 2011.

Strengths:

- State received $11.7 million in 2012 and $6.5 million is scheduled in 2013

Weaknesses

- None

Changes since 2011:

- The Supplemental Disaster Recovery allocations were from the 2011 flooding.

Ideas for Improvement:

- None

Building Code Program

North Dakota has a voluntary building code program in the State. The North Dakota State Building Code consists of the 2009 International Building Code, International Residential Code, International Mechanical Code, and International Fuel Gas Code, with some state amendments. Communities can join by adopting and enforcing the state building code. As of 2013, there are 9 counties and 111 cities that have adopted building codes. **Figure 7.2** shows the communities with building codes in 2008 compared to **Figure 7.3** showing the increased number of community participants in 2013. A significant limitation of this program is that communities may adopt the state building code but not enforce it. Therefore, simply adopting the code does not guarantee that new development and remodels meet current codes. The Manufactured Home Installation Program within DCS requires that all new manufactured/mobile homes installed anywhere in the State be inspected to ensure the unit is properly installed. Maintenance of the code and technical assistance is provided by the North Dakota Division of Community Services (DCS). Additional program information can be found at: http://www.communityservices.nd.gov/government/state-building-code/ .

The Manufactured Home Installation Program within DCS requires that all new manufactured/mobile homes installed anywhere in the State be inspected to ensure the unit is properly installed.

Strengths:

- Enables communities to adopt and enforce building code standards.
- Provides technical assistance to communities that do adopt building codes.
- Requires at least minimal inspection of all new manufactured/mobile homes.

Weaknesses:

- Requires local adoption and enforcement which can be a drain on resources or cost-prohibitive in some areas.
- Enforcement may not be consistent across the State.

Changes since 2011:

* Effective January 1, 2011 the North Dakota State Building Code consists of the 2009 International Building Code, International Residential Code, International Mechanical Code, and International Fuel Gas Code, along with state amendments to these four codes.

Ideas for Improvement:

* Develop comprehensive outreach materials for statewide dissemination.

Figure 7.2. Building Code Enforcing Jurisdiction Map, 2008

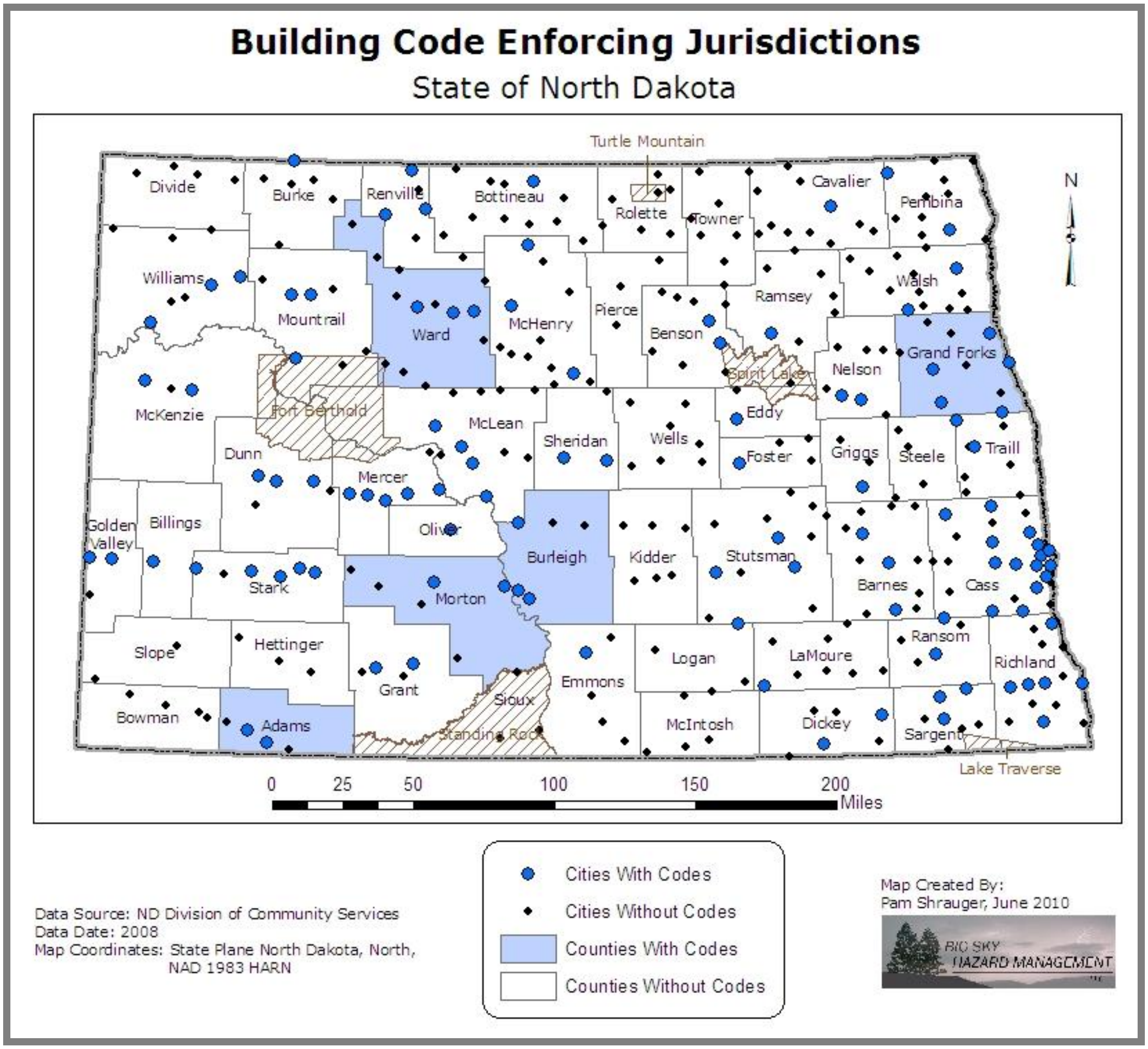
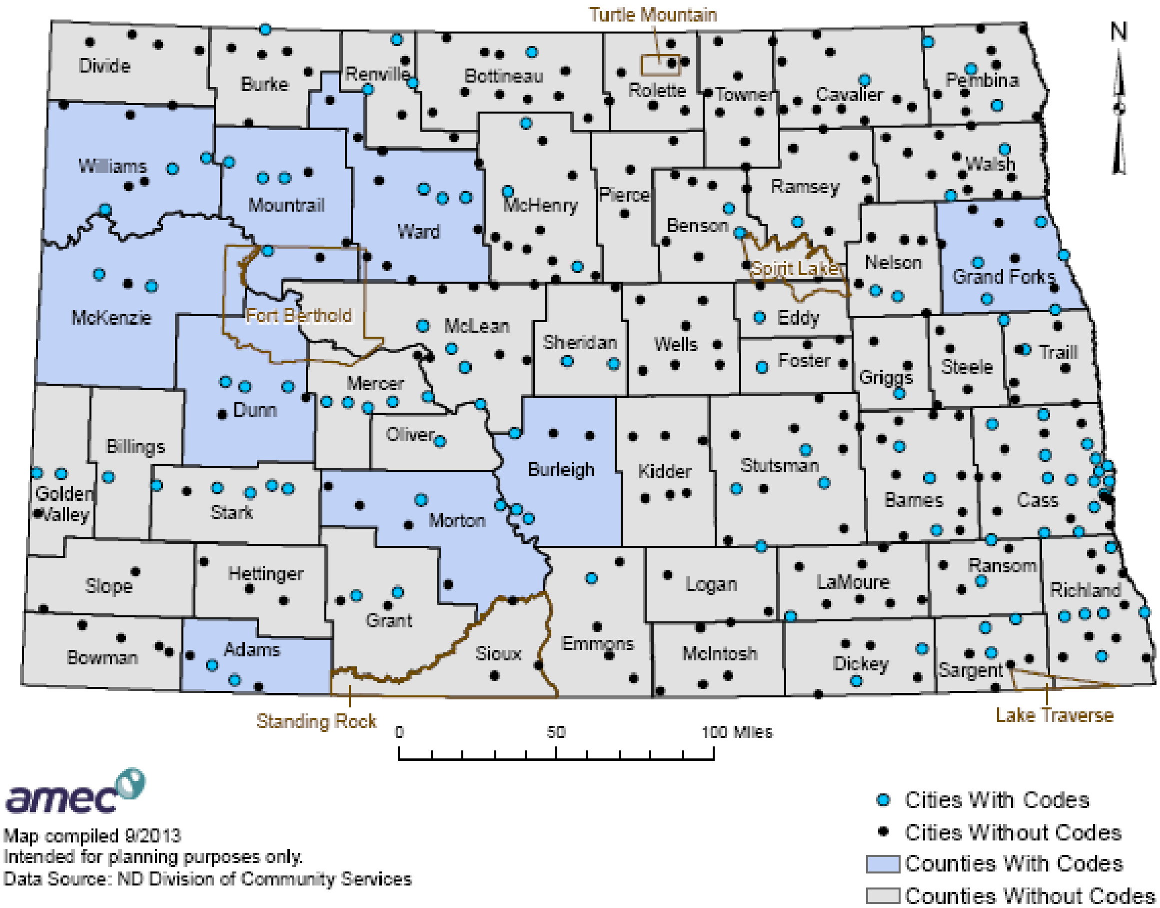


Figure 7.3. Building Code Enforcing Jurisdiction Map, 2013



Flood-Specific Programs

Silver Jackets Program

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 the Federal Emergency Management Agency Region VIII, North Dakota Department of Emergency Services, North Dakota State Water Commission, and US Army Corps of Engineers in St Paul and Omaha. 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 State Water Commission.

Strengths:

- Provides a mechanism for improvements to the flood mitigation system.

- Fosters collaboration and communication across agencies.
- Provides an avenue for local and tribal agencies to receive guidance and information regarding flood-related problems.

Weaknesses:

- Does not have a definitive source of funding.
- As a new program, the concept is being integrated into mitigation programs in North Dakota.

Changes since 2011:

- North Dakota has been awarded two Silver Jacket Pilot Projects in 2012 with assistance from the St Paul USACE District. One is for the Souris River Hydro-met Study and the other is Levee Safety Project for the Souris River Basin.

Ideas for Improvement:

- Encourage additional agencies to join such as USGS, USFWS, NWS, NRCS, and NDGS.

National Flood Insurance Program (NFIP)

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 flood prone areas. Participation in the NFIP requires communities to adopt floodplain regulations that meet NFIP objectives. The first objective is that new buildings must be protected at a 100-year flood level. The second objective is that new development must not cause an increase in flood damage to other property. In 2012, the Biggert-Waters Reform Act was signed and contains many reforms that will impact the NFIP moving forward. These changes include the phasing out of subsidies, new insurance policies to be issued at full-risk rates, and grandfathered rates being phased out over five years.

Communities have been provided 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. The state legislature provided the state engineer with an appropriation to be used in assisting communities to obtain base flood (100-year) elevation data.

As of 2013, 327 communities participate in the NFIP which 320 are in the regular program and seven are in the emergency program. Eighty-seven NFIP participating communities have no special flood hazard areas and 75 communities have only minimal flood hazard areas in their community. As of January 2013, there were 23 sanctioned communities with identified flood hazards but do not participate in the program. Of those, 10 communities (in bold) are also in counties that have a Moderate-High and High Riverine Flood Vulnerability as in **Table 7.2**.

Table 7.2. Sanctioned Communities with Moderate-High and High Riverine Flood Vulnerability

Community Name	County
Adams, City of	Walsh County
Anamoose, City of	McHenry County
Brinsmade, City of	Benson County
Fordville, City of	Walsh County
Gardar, Township of	**Pembina County**
Gladstone, City of	**Stark County**
Grafton, Township of	Walsh County
Hegton, Township of	**Grand Forks County**
Hoople, City of	Walsh County
Kenmare, City of	**Ward County**
Lansford, Township of	Bottineau County
Logan Center, Township of	**Grand Forks County**
Loretta, Township of	**Grand Forks County**
Neche, Township of	**Pembina County**
New England, City of	Hettinger County
Oakwood, Township of	Walsh County
Oberon, City of	Benson County
Park, Township of	**Pembina County**
Portal, City of	Burke County
St. Thomas, Township of	**Pembina County**
Stafford, Township of	Renville County
Stanton, City of	**Mercer County**
Towner, City of	McHenry County

Source: FEMA Community Status Book, as of January 31, 2013

Historically, after North Dakota's most significant flood events in 1979, 1997, 2009, and 2011 flood insurance claims spiked upward. Over $255 million dollars in flood insurance claims has been paid within North Dakota over the period of 1978-January 2013. 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 an additional one foot above the base flood elevation as the standard in flood ordinances. This improvement provides additional protection for structures during floods greater than the 1 percent annual chance flood and is an important and effective flood mitigation strategy across the State for future development.

The North Dakota State Water Commission is responsible for managing the National Flood Insurance Program in the State. Additional program information can be found at: http://www.swc.state.nd.us/4dlink9/4dcgi/GetCategoryRecord/Floodplain%20Management

Strengths:

- Individuals can purchase insurance for flood.
- Much of North Dakota participates 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.
- Model ordinances used in North Dakota exceed minimum NFIP requirements.
- The companion Map Modernization Program (now RiskMAP) works to improve community flood maps which help strengthen communities' abilities to practice floodplain management.

Weaknesses:

- Requires local adoption and enforcement of floodplain ordinances.
- Floodplain management not always working at local level as intended due to local developer influence and politics.
- 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 and nationally there has been a trend toward less funding for mapping than in previous years.
- 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.
- The 2012 Biggert-Waters Reform Act will affect homeowner's insurance premium rates, with affordability potentially becoming an issue in high-risk areas unless properties are mitigated.
- Community floodplain administrator turnover causes floodplain management inconsistencies, often there is no transition of information.

Changes since 2011:

- The 2012 Biggert-Waters Reform Act changes include the phasing out of subsidies, new insurance policies to be issued at full-risk rates, and grandfathered rates being phased out over five years.

Ideas for Improvement:

- Develop a better partnership with FEMA to identify and map communities at risk and promote NFIP participation and implementation.

Community Assistance Program (CAP)

The North Dakota State Water Commission conducts outreach and provides technical assistance to local and tribal governments through the NFIP Community Assistance Program – State Support Services Element (CAP-SSSE); two full-time employees provide this support. The policy of the State through the CAP 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, mapping assistance, and disaster assistance. The State Water

Commission maintains a five-year plan for CAP activities. Additional program information can be found at: http://www.fema.gov/floodplain-management/community-assistance-program-state-support-services-element.

Strengths:

- Allows the State to provide technical assistance to local communities with flood problems.
- The State has experienced staff in the flood management section.
- Limited areas of the State are experiencing floodplain development pressure which allows a concentrated targeting of assistance.
- North Dakota State Water Commission staff has developed familiarity with communities enrolled in the NFIP.

Weaknesses:

- Sustaining a floodplain management understanding in all NFIP participating communities.
- Community floodplain administrator turnover causes lack of continuity.
- Only two communities participating in the Community Rating System (CRS) program

Changes since 2011:

None

Ideas for Improvement:

- Develop a better partnership with FEMA to identify and map communities at risk and promote NFIP participation and implementation.

Map Modernization Program / Risk Mapping, Assessment, and Planning (RiskMAP)

The Map Modernization Program of the National Flood Insurance Program provides funding for the purpose of updating and modernizing Flood Insurance Rate Maps (FIRMs). As of 2013, there are 23 counties with complete or partial Digital Flood Insurance Rate Maps (DFIRMs). RiskMAP is the next phase of the Map Modernization Program and combines flood hazard mapping, risk assessment tools and hazard mitigation planning into one seamless program. The RiskMAP program's purpose is "to deliver quality data that increases public awareness and leads to mitigation actions that reduce risk to life and property." RiskMAP projects are done on a watershed basis. As of 2013 there is one funded watershed which covers part of Mckenzie and Dunn Counties in western North Dakota. *SHMT: Other RiskMAP details to add?*

The North Dakota State Water Commission is a Cooperating Technical Partner (CTP) with the Federal Emergency Management Agency (FEMA); one full-time employee is dedicated to this program. Unfortunately, sufficient funding is not available to map all risk areas of North Dakota. Additional program information can be found at: http://www.fema.gov/plan/prevent/fhm/mm_main.shtm.

Strengths:

- Provides a direct solution for areas with problematic flood mapping.
- Updates paper mapping to more modern digital formats.

Weaknesses:

- One third of all communities in the NFIP do not have a flood map.
- More mapping updates are needed than funding allows.
- Floodplain mapping processes and updates are time consuming and expensive.
- Potential for duplicative efforts or disconnects between RiskMAP and local hazard mitigation planning

Changes since 2011:

- DFIRMs are being integrated into the RiskMAP program.

Ideas for Improvement:

- Develop a better partnership with FEMA to identify and map communities at risk and promote NFIP participation and implementation.

Community Rating System (CRS)

The Community Rating System is a voluntary incentive program within the National Flood Insurance Program (NFIP). Through participation in this program, communities can receive discounts on flood insurance premiums by conducting flood mitigation activities that reduce their long term risk and exceed NFIP minimum requirements. Technical assistance for this program is provided by the North Dakota State Water Commission. As of 2013, two North Dakota communities are part of the program: the City of Fargo (Class 7) and the City of Grand Forks (Class 5). Additional program information can be found at: http://www.fema.gov/business/nfip/crs.shtm.

Strengths:

- Provides discounts on flood insurance for those communities that participate.

Weaknesses:

- As a voluntary program that requires efforts at the local level; limited local resources may discourage a community from participating.

- Communities with few flood insurance policies have little incentive to participate.

Some communities may be retrograded with compliance is measured against 2013 CRS Coordinator's Manual

Changes since 2011:

- New 2013 CRS Coordinator's Manual and changes to CRS credits

Ideas for Improvement:

- Encourage more communities with significant flood insurance policy numbers to participate in the CRS program; Flood insurance premium increases as a result of the 2012 Biggert-Waters Reform Act may provide an incentive for more communities to participate.

North Dakota State University Extension Services, Flood Information

The North Dakota State University Extension Services provide services to the residents of North Dakota on various topics. Since the flood of 2011, they have provided educational pamphlets and videos on flooded homes, family & children, farm & ranch, and resource materials in multiple languages. Additional flood information can be found at http://www.ag.ndsu.edu/flood.

Other Hazard-Specific Programs

Transportation Improvements

The North Dakota Department of Transportation (DOT) regularly conducts mitigation through road improvements. DOT 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. DOT 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. DOT also works through transportation improvements to reduce traffic accidents and mitigate losses and casualties due to hazardous material releases and other transportation incidents.

Strengths:

- 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.

Weaknesses:

- Hazard mitigation is not the primary focus, so it may at times be overlooked.

Changes since 2011:

- Program priorities have shifted to focus on transportation infrastructure in areas experiencing rapid energy development.

Ideas for Improvement:

- None

National Fire Plan/Firewise North Dakota/State Fire Assistance (SFA) Program

The Firewise North Dakota/SFA program promotes wildfire awareness, prevention, and mitigation, particularly in fire prone areas. Activities typically involve equipment purchases, outreach, hazardous fuels reductions, planning, and defensible space projects. This program is managed by the North Dakota Forest Service. Additional program information can be found at: http://www.ndsu.edu/ndfs/wildland_fire_resources/ .

Strengths:

- Funding priorities 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.

Weaknesses:

- The focus can easily shift to preparedness activities rather than mitigation. (Note: This can be seen as a strength from the preparedness perspective.)
- 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 2011:

- None

Ideas for Improvement:

- Develop a guide of best practices and successes.

Living Snow Fence Program

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 Hazard Mitigation Grant Program. The program is now funded 80 percent with federal Transportation Enhancement funds and 20 percent with state DOT funds. Since 1997, 594 living snow projects have been completed protecting 270 miles of roads and **Figure 7.4** shows a living snow fence. The Living Snow Fence program is managed by the Natural Resource Conservation Service, North Dakota Forest Service, and North Dakota Department of Transportation.

Figure 7.4. Snow Collected with the Living Snow Fence

Source: North Dakota Department of Transportation, Materials and Research Division, May 2006

Strengths:

- Provides a specific emphasis on living snow fence projects related to the winter storm hazard.
- No local match requirements due to match requirement being met with state DOT funds.
- High participation rates.
- Is a great example of interagency participation to achieve a specific mitigation goal.

Weaknesses:

- Funding for this program is dependent on grants.
- Snow fences could be vulnerable during periods of drought
- Many more “snow drifting” problems exist across the State than funding can mitigate.

Changes since 2011:

- None

Ideas for Improvement:

- None

Dam Safety Program

The primary function of the Dam Safety program is to inspect dams, provide reports on the conditions of those dams, and make recommendations to dam owners on necessary maintenance and repairs. The Dam Safety program also maintains an electronic database of dams in North Dakota. As of 2013, full periodic inspections of 134 high and medium hazard dams are conducted by program staff on a rotational basis. All non-federally owned high hazard dams are inspected at least once every four years. All non-federally owned medium hazard dams greater than ten feet high are inspected at least once every ten years. The Dam Safety program is managed by the North Dakota State Water Commission. The program is primarily state funded, however, some federal funding is provided by FEMA through National Dam Safety Program grants. Federal funding provides enough resources to fund one part-time position, provide training opportunities for dam safety employees, purchase equipment necessary for inspections, and provide some limited assistance to dam owners to develop Emergency Action Plans. The North Dakota Dam Safety program is staffed by two full time employees and one part time employee. Permitting of the construction of dams is handled through the North Dakota State Water Commission's Regulatory Section and is not included in this discussion of the Dam Safety program. Additional program information can be found at: http://www.swc.state.nd.us/4dlink9/4dcgi/GetSubCategoryRecord/Special%20Projects/Dam%20Safety#

Strengths:

- Allows for regular inspection of selected dams.
- Provides for a comprehensive dam identification and inventory process.
- Funding is available to dam owners to assist with the development of Emergency Action Plans.

Weaknesses:

- Lack of resources to ensure that problems identified by inspections are corrected.
- Emergency Action Plan (EAPs) should be required and regular updates encouraged.
- Funding through federal grants is uncertain from year to year.

Changes since 2011:

- None

Ideas for Improvement:

- Update the North Dakota Dam Design Handbook.

Hazardous Materials Emergency Preparedness Program

Despite the word "preparedness" in the program name, the Hazardous Materials Emergency Preparedness (HMEP) program through the US Department of Transportation, Pipeline and Hazardous materials Safety Administration (PHMSA) provides grants for planning and training. Within the planning program, risk assessments and hazard studies are eligible. North Dakota Department of Emergency Services provides technical assistance and administers this grant program for the State. Additional program information can be found at: http://www.phmsa.dot.gov/hazmat/grants.

Strengths:

- Promotes hazardous material risk assessments and studies.

Weaknesses:

- The focus is more on preparedness rather than mitigation.

Changes since 2011:

- None

Ideas for Improvement:

- None

Cloud Modification Program

The North Dakota Cloud Modification Project (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, McKenzie, Mountrail, Ward, Williams, and part of Slope. Studies have shown a 45 percent reduction in hail crop losses through this program.

Strengths:

- Has a proven history of reducing hail losses.
- Exhibits an excellent benefit to cost ratio of 16-26:1 for agricultural production, and 48-72:1 for gross economic impact.

Weaknesses:

- The overall program is somewhat expensive.
- Only six counties in the State participate.

Changes since 2011:

None

Ideas for Improvement:

- An ongoing research program is focusing on alternative seeding methods to improve efficacy.

Cultural Heritage Grant Program

The program is administered by the State Historical Society of North Dakota since 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**. Figure 7.5** shows the 2011 flooding effects on a historical property.

Strengths:

- Additional cost-share funding source to assist historical properties affected by natural disaster i.e. recent flooding.

Weaknesses:

- It is a dollar-for-dollar match requirement.
- Not a large funding source.

Changes 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.

Figure 7.5. Ward County Historical Society Minot, North Dakota Flood Damage Summer 2011

Source: The Local Network, State Historical Society of North Dakota, Volume 21, Number 3

7.1.2. Mitigation 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 North Dakota Century Code (NDCC) and other documents with respect to hazard mitigation was originally conducted in 2005. Most of the laws and regulation have not changed and only minor additions occurred for the 2013-2014 update. A summary of the relevant sections follows in **Table 7.3**. *Note: SHMT please review closely for additional laws.*

Table 7.3. North Dakota Laws and Regulations Related to Hazard Mitigation

Law Title ***Reference***	**Summary**	**Strengths/Limitations**
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. *Updated in 2009 to create the state disaster relief fund, allow for regional coordination of emergency management activities, and increase burn ban penalties.* *Updated in 2007 with homeland security and National Incident Management System language.* *Updated in 2005 to change the Division of Emergency Management to the Department of Emergency Services, to allow for burn ban violation penalties, and to add intrastate mutual aid provisions.*	- 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.
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 inspected by a third party.
Capitol Grounds Planning	Establishes a planning commission and capitol	- The commission advises the director of the office of management and budget and the

Law Title *Reference*	**Summary**	**Strengths/Limitations**
Commission *NDCC 48-10*	building fund for the capitol grounds.	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.
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.
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.
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*	- The adoption and enforcement of zoning is the responsibility of the township.

Law Title ***Reference***	**Summary**	**Strengths/Limitations**
	penalties. *Updated in 2005 to address institutional controls for environmental concerns.*	
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.
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 outlet, water rights, and the emergency municipal, tribal, and rural water system drinking water grant program. *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 flood control and reduction projects to be "necessary for the protection of health, property, and enterprises" and includes the Devils Lake outlet, southwest pipeline, and Grand Forks flood control projects. *Updated in 2009 to require the Commission to develop policies, including cost-sharing guidelines, for flood control water retention projects.*	- 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.
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). *Updated in 2007 to clarify responsibilities for*	- Allows for dam safety activities. - Provides the authority to enforce dam safety regulations.

Law Title *Reference*	**Summary**	**Strengths/Limitations**
	submerged property.	
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 US 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.
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.

Law Title ***Reference***	**Summary**	**Strengths/Limitations**
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 2005 to add a member of the upper Sheyenne River joint water resource board.*	- Requires the Devils Lake outlet advisory committee to recommend a plan of operation within two weeks following the first numerical NWS spring flood outlook.
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.
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.

Law Title *Reference*	**Summary**	**Strengths/Limitations**
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.
Air Pollution Control *NDCC 23-25*	Establishes air quality standards	- Protects air quality through standards and permit system for controlled releases.
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.
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.
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.
Safe Water Drinking Act *NDCC 61-28.1*	Authorizes the state department of health 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.
Water Pollution Control Revolving Loan Fund* *NDCC 61-28.2*	Authorizes the state department of health 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.
Communicable Disease Control		

Law Title ***Reference***	**Summary**	**Strengths/Limitations**
Reportable Diseases *NDCC 23-07*	Requires the state department of health 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.
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".
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.
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 the authority to inspect and order the destruction of infected livestock to prevent the disease spread.
Weapons Control and Population Protection		
Machine Guns, Automatic Rifles, Silencers, Bombs *NDCC 62.1-05*	Prohibits 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.
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.
Construction and Maintenance of State Highway System	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.

Law Title *Reference*	Summary	Strengths/Limitations
NDCC 24-03		
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 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.

* Added to the table list in 2013.

Table 7.4. Important North Dakota Mitigation Policies

Policy	Agency
NFIP standards are one foot above the base flood elevation.	North Dakota State Water Commission
Property acquisition is the top priority for flood mitigation.	North Dakota Department of Emergency Services
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.	North Dakota Department of Emergency Services

Table 7.5 lists the ideas for legislative and policy changes. Areas considered included laws, regulations, and policies that hinder mitigation efforts and opportunities for the integration of mitigation into new areas. *Note: SHMT please review and note any modifications.*

Table 7.5. North Dakota Recommended Legislative and Policy Changes

Section	Recommended Changes
Title 11 – Counties and/or Title 58 –	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

Section	Recommended Changes
Townships	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.
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.
DES policy	Develop improved performance objectives and mitigation projects through the Public Assistance (PA) program.

7.1.3. Integration into Other State Plans and Programs

Just as data from other state plans and programs was integrated into this mitigation plan, information from this plan can be 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. This mitigation plan will only strengthen and improve that integration. Information from this plan can be and has been integrated into agency strategic plans, emergency operations plans, local mitigation plans, comprehensive plans, threat and hazard identification and risk assessments (THIRA) efforts, and many other types of planning efforts.

Integration is a process. Ultimately, for mitigation to be successful and further integrated into state government, the "usual way of doing things" and mindsets have to change. Changing attitudes towards hazard mitigation and taking action before disaster strikes can be difficult at times, but a very wide variety of stakeholders from across the State participated in the 2011 and 2013-2014 plan updates and previous versions.

Specifically, 79 different local, tribal, state, and federal agencies, non-profit organizations, associations, and businesses participated in the 2013-2014 State Multi-Hazard Mitigation Plan update meetings.

Continuously educating and raising the awareness of hazard mitigation with state officials is how this plan will be further integrated with other state plans and programs. The State Hazard Mitigation Team plays a critical role in this process and will continue to integrate hazard and mitigation information into their agency plans and programs and those of their partner agencies. Many of the mitigation actions listed in this plan, such as building code improvements, the living snow fence program, and floodplain map modernization, are already being implemented by agencies besides DES and demonstrate the integration of mitigation concepts into other state missions and programs.

7.1.4. Current and Emerging State Capabilities

The State of North Dakota mitigation programs are capable of implementing a wide variety of mitigation activities, however, improvements can always be made to enhance the strengths of the programs and address the weaknesses. The State strengths, weaknesses, emerging capabilities, and needs were discussed and updated at the third planning meeting. The highlights that follow build off items identified in the 2011 plan and reflect the 2013-14 current and emerging capabilities.

State Capabilities' Strengths

- Strong relationships with other organizations and integrated processes due to a high number of recent disasters.
- Breadth of hazard mitigation experience, institutional knowledge, and ongoing training and awareness at the state level.
- 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.
- DES Advisory Committee and membership on other advisory committees.
- All of the FEMA's Hazard Mitigation Assistance (HMA) programs are managed by one agency.
- Continued outreach and education on the mitigation programs.
- The State managed Public Assistance (PA) program allows for closer linkages to local damages and potential mitigation projects in the Hazard Mitigation Assistance Grant Programs.
- The Department of Emergency Services has developed and continues to develop a Geographic Information System (GIS) program that can be used for mitigation planning and project development.
- Focused teams, such as the Devils Lake Basin Technical Review Team, that provide technical assistance on specific problems.
- State Water Commission also has mitigation funding assistance.
- Silver Jackets Program in North Dakota.
- N.D. DOT has in 2013 the Local Road Safety Program with $1 million in funds for counties and cities to improve safety of roads.
- Proactive regional councils and associated outreach to local jurisdictions.
- 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.
- Legislature is more aware mitigation projects in the State because of the State's financial commitment of providing 10 percent match for HMA grants.

State Capabilities' Weaknesses

- The time-consuming nature of recent disasters has made it difficult for state agencies to devote as much time to mitigation.
- The three-year state mitigation planning cycle has left less time for implementation and makes it difficult to synchronize with local plans on a five-year planning cycle.
- Complexities with the major flood areas (Red River and Devils Lake Basins) and the associated complexities with the possible solutions, including possible impacts downstream, can make mitigation strategies difficult to pursue, fund, and implement.
- The State has very little control or influence over development in hazard prone areas.
- Relationships with local emergency managers can be inconsistent due to high turnover rates.
- Difficulties with promoting and using the National Flood Insurance Program (NFIP) due to its solvency problems and insurance rate changes.
- Providing guidance to local hazard mitigation planners for better and more depth of analysis of their hazard identification and risk assessment (HIRA) is need.

Emerging State Capabilities

- Further development of DES Regional Emergency Management Coordinator positions that can help specific regions of the State focus on and engage in mitigation.
- Growing and improving relationships with the regional councils and the associated regional mitigation plan possibilities.
- Improved relationships with the tribal nations.
- Use of the Statewide Seamless Map for mitigation project engineering and design and hazardous structure identification.
- Better data for trend analysis for mapping and mitigation.
- Coordination efforts, such as the Silver Jackets Program, to coordinate state and federal agencies on specific issues.

Additional Needs

- Qualifying standards for mitigation planners.
- A mitigation curriculum through the North Dakota League of Cities for local officials.

7.2. Mitigation Funding Sources

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, however, 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 7.6** shows the current mitigation funding sources that are used in North Dakota. **Table 7.7** shows other, less traditional funding sources that may be used to fund future mitigation activities.

Table 7.6. Current Mitigation Funding Sources

Name	Description	Managing Agencies	Typical Funding
Community Assistance Program (CAP)	Provides funding to states to assist communities in complying with NFIP requirements.	FEMA ND SWC	As of Fiscal Year 2013: Federal: $ 106,855* State: 35,618 Total: $ 142,473 Budget
Dam Safety Program	Provides funding to the State to promote dam safety through emergency action plans and exercises.	FEMA ND SWC	$95,047 FEMA funding annually on average over the past 5 years
Flood Mitigation Assistance Program (FMA)	Provides pre-disaster funding for repetitive flood loss property reduction.	FEMA ND DES	$12,595,643* in 2009 for home acquisitions
Hazard Mitigation Grant Program (HMGP)	Provides post-disaster mitigation funding.	FEMA ND DES	23 disasters from 1998-July 2013 $100,589,908* received over this timeframe. Not including disaster funds in 2013.
Community Development Block Grant Supplemental Disaster Recovery Program	Provides funds for the effects of the 2011 flooding disaster and recovery needs.	ND Dept of Commerce 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.	FHWA ND DOT	$665,000 in 2011-2012 all in NE corner of State.
Map Modernization Program / RiskMAP	Provides funding to establish or update floodplain mapping.	FEMA ND SWC	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
Pre-Disaster Mitigation Program	Provides grants through a competitive process for specific mitigation projects, including planning.	FEMA ND DES	$505,780* in FY 2009 $440,785* in FY 2008 $366,494* in FY 2007 $10,395* in FY 2006 $3,139,729* in FY 2005
State Water Commission	Provides cost-share assistance for flood control, water supply, recreation, snagging	ND SWC	$500,000 state monies projected for 7/1/13 through

Name	Description	Managing Agencies	Typical Funding
Cost-Share Program	and clearing, studies, irrigation, bank stabilization, and technical assistance projects.		6/30/15.
Cultural Heritage Grant program	Provides cost-share assistance for local museums and historical societies including recovery efforts of historical properties affected by flooding throughout the State.	State Historical Society of North Dakota	$504,550 for the years of 2011-2013

* federal share

Sources: North Dakota Department of Emergency Services, North Dakota Forest Service, North Dakota State Water Commission, North Dakota Department of Transportation.

Table 7.7. Potential Mitigation Funding Sources

Name	Description	Managing Agencies
AmeriCorps	Provides funding for volunteers to serve communities, including disaster prevention.	▪ Corporation for National & Community Service
Assistance to Firefighters Grants	Provides funding for fire prevention and safety activities and firefighting equipment.	▪ Department of Homeland Security
Clean Water Act Section 319 Grants	Provides grants for a wide variety of activities related to non-point source pollution runoff mitigation.	▪ US Environmental Protection Agency
Community Development Block Grant (CDBG)	Provides funding for sustainable community development, including disaster mitigation projects.	▪ US Housing and Urban Development
Economic Development Administration (EDA) Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities.	▪ US Economic Development Administration
Emergency Management Performance Grants (EMPG)	Enhances and sustains all-hazard emergency management capabilities, including mitigation.	▪ North Dakota Department of Emergency Services ▪ Federal Emergency Management Agency
Emergency Watershed Protection	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds.	▪ US Natural Resources Conservation Service
Environmental Quality Incentives Program	Provides funding and technical assistance to farmers and ranchers to promote agricultural production and environmental quality as compatible	▪ US Natural Resources Conservation Service

Name	Description	Managing Agencies
	goals.	
Hazardous Fuels Mitigation Program	Provides funding for the reduction of hazardous wildfire fuels.	▪ US Bureau of Land Management
Homeland Security Grants	Through multiple grants, provides funding for homeland security activities. Some projects can be considered mitigation.	▪ North Dakota Department of Emergency Services ▪ US Department of Justice ▪ US Department of Homeland Security
Housing and Urban Development (HUD) Grants	Provides a number of grants related to safe housing actions.	▪ US Housing and Urban Development
Individual Assistance (IA)	Following a disaster, funds can mitigate hazards when repairing individual and family homes.	▪ North Dakota Department of Emergency Services ▪ 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.	▪ US Fish, Wildlife, & Parks
North American Wetland Conservation Fund	Provides funding for wetland conservation projects.	▪ US Fish, Wildlife, & Parks
NRCS Conservation Programs	Provides funding through a number of programs for the conservation of natural resources.	▪ US Natural Resources Conservation Service
Partners for Fish and Wildlife	Provides financial and technical assistance to landowners for wetland restoration projects in "Focus Areas" of the State.	▪ US Fish, Wildlife & Parks
Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas.	▪ US Department of Agriculture, 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.	▪ US Small Business Administration (SBA)
Small Flood Control Projects	Authority of USACE to construct small flood control projects.	▪ US Army Corps of Engineers (USACE)
Streambank & Shoreline Protection	Authority of USACE to construct	▪ US Army Corps of Engineers (USACE)

Name	Description	Managing Agencies
	streambank stabilization projects.	
Wetland Program Development Grants (WPDGs)	Provides funding for studies related to water pollution prevention.	▪ US Environmental Protection Agency
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.	▪ North Dakota Department of Health ▪ US Environmental Protection Agency

This list of potential funding sources is certainly not all inclusive. Opportunities for mitigation funding from other sources may exist. State agencies continue to identify and work with foundations and non-government entities to secure outside funding for mitigation purposes.

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 subgrantees must also cover a percentage of the project. Often, this local match is covered by in-kind services, 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.

Funding Sources' Strengths

- The State provides cash match in many cases.
- Unlike the rest of the country, the State of North Dakota is experiencing prosperous economic activity, including a state surplus and progressive economic stability and opportunities.
- The State has the ability to leverage funding from the state emergency fund for mitigation.

Funding Sources' Weaknesses

- The local match requirement can be a large deterrent in some communities.
- Some communities do not have a clear understanding of what is eligible as match.
- Inability of all jurisdictions to generate income for mitigation purposes.

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 that are not guaranteed funding.

7.3. Local and Tribal Capability Assessment

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 can be difficult. 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 state mitigation plan. Following a disaster, local jurisdictions regularly assist the Interagency Hazard Mitigation Team and attend State Hazard Mitigation Team meetings when invited.

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.

This state hazard mitigation plan does not dictate which jurisdictions must conduct each mitigation measure. Although there are statewide goals, local jurisdictions must agree to support the actions that are most appropriate for their area, and with limited resources, this can be difficult.

The local mitigation expectations and responsibilities are:

- Develop, update, and implement their local mitigation plans, supplements, and updates.
- Provide input to the state multi-hazard mitigation plan 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.

7.3.1. Current and Emerging Local and Tribal Capabilities

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.

Local and Tribal Capabilities' Strengths

- 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 mil 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.

Local and Tribal Capabilities' Weaknesses

- 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 Hazard and Identification Risk Assessments (HIRA) in local plans lack depth.
- The lack of implementation of hazard mitigation plans 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.

Additional Needs

- Qualified local contractors for mitigation planning assistance.
- Continued mitigation and grant application training.

7.4. Local and Tribal Mitigation Planning

Even prior to the Disaster Mitigation Act of 2000, local and statewide mitigation planning has been a high priority in North Dakota. In fact, most counties already had mitigation plans before the regulations were created. Many of those plans were then modified to reflect the new federal requirements. As of August 2013, 42 counties and two tribal reservations have FEMA approved mitigation plans, as shown in **Figure 7.6**. The status map is updated regularly at http://des-ndgov.maps.arcgis.com/apps/StorytellingTextLegend/index.html?appid=acbe329c13594ed0af7b78c9ff756532. The State of North Dakota is comprised of 53 counties and 4 tribal reservations. The local hazard mitigation plans 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 hazard mitigation plan for the mentioned county or tribe and all incorporated jurisdictions within that county, unless otherwise stated.)

Because most jurisdictions require some form of assistance in developing their local hazard mitigation plans, North Dakota DES has a mitigation section available to provide technical assistance to jurisdictions in the development of their local plans. The technical assistance provided by the North Dakota Department of Emergency Services (DES) for local and tribal mitigation planning includes the following:

- Hazard mitigation planning workshops that provide opportunities for an exchange of ideas and the development of mitigation actions based on evaluations of state and local needs.
- 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.
- Applicant briefings for disaster programs. Applicants 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.

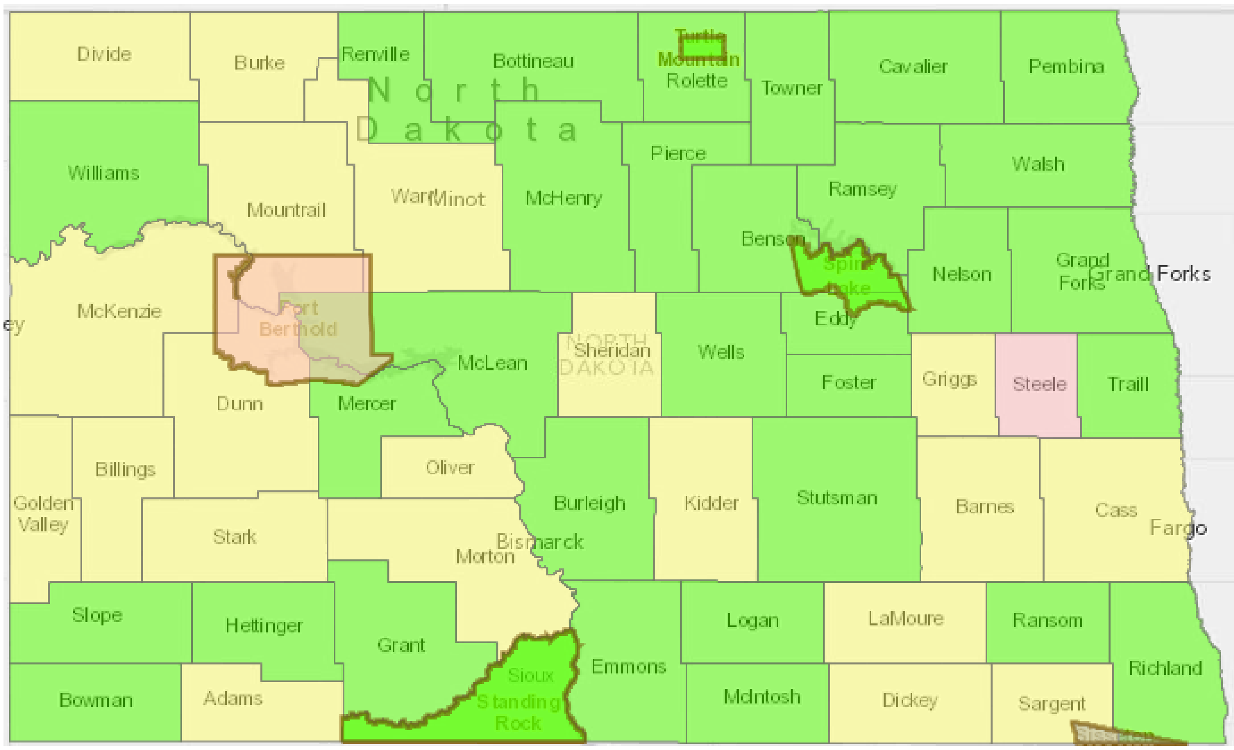
North Dakota DES will continue to provide similar types of technical assistance with local and tribal mitigation planning to those jurisdictions lacking approved plans and those requiring updates.

Funding sources that can be used to develop local hazard mitigation plans include the Pre-Disaster Mitigation (PDM) Program, the Hazard Mitigation Grant Program (HMGP), and the National Flood Mitigation Program. Technical assistance will continue for local plan updates, and the data and strategies provided in this updated state plan will likely benefit the local jurisdictions in collecting hazard data and developing mitigation projects.

Reviews of the plans are conducted by North Dakota DES mitigation staff (except for during extended disaster situations when additional assistance is requested). All local hazard mitigation plans must meet the federal plan requirements, address the specific hazard mitigation needs of the applicable jurisdictions, and complement the state hazard mitigation plan. DES mitigation staff use the FEMA Local Mitigation Plan Review Tool to ensure the federal requirements are met. If the reviewer decides the plan meets the requirements, the plan is signed by the State Hazard Mitigation Officer and then forwarded on to FEMA for approval. If the plan does not meet the criteria, the plan is returned to the jurisdiction with specific comments on changes or additions that need to be made. Reviews by the State are completed within 60 days of receipt, usually sooner.

Once the local plan has gone through the review and coordination phase of its development, all recommended changes have been made, and the plan has received conditional state and federal approval, the plan must be formally adopted by the local jurisdictions.

Figure 7.6. Map of Local Mitigation Plan Status in North Dakota



Note: Green shading = Plan Approved, Yellow shading = Plan Under Development, Pink shading = No plan.
Source: NDDES, dated 6/24/13

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 jurisdictions throughout the planning process, as requested by the jurisdictions.

Once the local plans are approved, they are integrated into the state plan 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 of the State; and
- Changing or eliminating existing mitigation actions that have not produced the anticipated results.

The results of the reviews are incorporated into the state multi-hazard mitigation plan at a minimum during the regular three-year update process. Changes can be implemented sooner, depending on circumstances involved.

Future mitigation projects and actions will be based on the local 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.

7.5. Project Management

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. **Table 7.8** shows the most common mitigation grant programs that offer funding for mitigation projects and planning and the state agency that manages that program.

Table 7.8. Mitigation Programs Administered by State Agencies

Program	Lead Agency
Pre-Disaster Mitigation (PDM) Program	ND Department of Emergency Services
Hazard Mitigation Grant Program (HMGP)	ND Department of Emergency Services
National Flood Mitigation Fund	ND Department of Emergency Services
Map Modernization Program / RiskMAP	ND State Water Commission
National Fire Plan Program	ND Forest Service
Living Snow Fence Program	ND Forest Service ND Department of Transportation
Hazardous Materials Emergency Preparedness Program	ND Department of Emergency Services

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. A timeline for the HMGP follows as an example:

- HMGP Applicant Briefings – within 60 days of the declaration
- Request for HMGP Notice of Intent – within 90 days of the declaration
- Assembly of the State Hazard Mitigation Team 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 1 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. Disasters in 2011 & 2012 did not allow staff time to complete the "Mitigation Year in Review" but DES plans to reinstate this as part of the annual review process in the future.

7.5.1. Technical Assistance

For the various Federal Emergency Management Agency (FEMA) mitigation grant programs, local 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 applicants 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 applicants. State agencies, specifically the Department of Emergency Services and the State Water Commission, fulfill these roles by providing technical assistance.

Specific to the Hazard Mitigation Grant Program (HMGP), following the disaster, the State gets the funding numbers 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.

Similarly, when FEMA issues guidance for the pre- and post-disaster programs, that information is passed on to the 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.

7.5.2. Eligibility Criteria

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 and local 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.

Federal Eligibility Criteria

All hazard mitigation projects submitted for consideration must meet the Hazard Mitigation Grant Program criteria outlined in the Code of Federal Regulations (CFR) Title 44, §206.434. To meet these requirements, the project must:

- Be an eligible applicant (state, tribal, and local governments, private non-profit organizations).
- Have an approved local mitigation plan as outlined in 44 CFR 201.6 or approved tribal mitigation plan as outlined in 44 CFR 201.7.
- Be in conformance with this state and the local mitigation plan.
- Have a beneficial impact upon the designed disaster area, whether or not it is located in the designated area, if post-disaster.
- Be in compliance with 44 CFR Part 9, Flood Management and Protection of Wetlands, and 44 CFR Part 10, Environmental Considerations.
- Solve a problem independently or constitute a functional portion of a solution where there is assurance that the project as a whole will be completed. Projects that merely identify or analyze hazards or problems are not eligible.
- Be cost effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster by demonstrating that the project:
  - Addresses a problem that has been repetitive, or a problem that poses a significant risk to public health and safety if left unsolved.
  - Will not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future disasters were to occur.
  - Has been determined to be the most practical, effective, and environmentally sound alternative after consideration of a range of options.
  - Contributes to a long-term solution to the problem it is intended to address.
  - Considers long-term changes to the areas and entities it protects.
  - Has manageable future maintenance and modification requirements.

Please check the specific federal sections for additional information and exceptions.

State Eligibility Criteria

Additional criteria established by the State include:

- The project must complement existing or proposed state mitigation goals and objectives.

- The project must complement existing or proposed mitigation goals and objectives for the jurisdiction submitting the project.
- The jurisdiction requesting the project must be able to complete the project as submitted.
- The jurisdiction submitting the project must be able to meet any matching funds requirements.
- The project must be able to make a bigger impact on the local and state mitigation program than other non-selected projects.
- Local and tribal governments must be in good standing in the NFIP (or have not yet been mapped), and otherwise eligible to receive federal funding.
- All projects must be managed in accordance with local, state, and federal ordinances, laws, and regulations.
- Individual property owners are not eligible to receive federal funds directly as a grantee or sub-grantee and are not authorized to manage grant projects.

Acquisition Projects

While acquisitions are not the only mitigation projects considered and undertaken by the State and local governments, they have been the type of project most frequently submitted and approved and are the top hazard mitigation priority in the State. In addition to the eligibility criteria listed, acquisition projects must also meet the following criteria:

- The application must specifically identify the properties to be included in the project.
- The sellers' participation must be voluntary, and the sellers must be able to prove ownership of the property involved in the project.
- The offer must be based on pre-flood fair market value, determined by a State of North Dakota board certified appraiser or a post-flood sales contract value.
- Duplication of benefits, Small Business Administration (SBA) loans, and private mortgages must be satisfied from proceeds first.
- The acquisition property must be removed within 90 days of the closing.
- Local government entities, or certain non-profit entities, must accept all acquisition property titles that are officially annotated to comply (in perpetuity) with federal open space deed restrictions.
- The acquisition property becomes ineligible for any future federal assistance, except possibly federal crop insurance.

Elevation Projects

The elevation option may be used when elevation is more cost effective and desirable over the long term, such as when the cost of the land is so high that an acquisition is impractical. To be eligible to participate, the local governmental/non-profit entity must meet the following criteria:

- The application must specifically identify the properties to be included in the project.
- The owners' participation must be voluntary, and the owners must be able to prove ownership of the property involved in the project.

- The elevation must be practical, structurally sound, and in compliance with local building codes and zoning rules.
- The project must elevate the lowest floor to or above the flood level or as designated by the local floodplain ordinance if more stringent by:
  - Extending the walls of the house upward and raising the lowest floor.
  - Converting the existing lower area of the house to non-habitable space and building a new second story for living space.
  - Lifting the entire house, with the floor slab attached, and building a new foundation to elevate the house.

In A zones, where flood hazards are less severe, property owners may elect to elevate buildings either on an open foundation or on continuous foundation walls that extend below the base flood elevation (BFE). If continuous walls are used below the BFE, they must be equipped with openings that allow floodwaters to flow into and out of the area enclosed by the walls.

Owners of substantially damaged houses in special flood hazard areas must be willing to voluntarily demolish the remnants of the house and build a new house on the same site with an elevated lowest floor at or above the flood level or in compliance with the local floodplain ordinance if more stringent. As an alternative, owners of substantially damaged houses in special flood hazard areas may elect to repair the house and elevate the lowest floor at or above the flood level or in compliance with the local floodplain ordinance if more stringent, as part of the repair process.

Relocation Projects

Relocation may be used when relocating a structure is more practical and cost effective, or when the threat is so repetitive and/or severe that it is more advantageous to relocate a structure or structures, up to and including entire communities, entirely out of harm's way. To be eligible to participate, the local governmental/non-profit entity must meet the following criteria:

- The application must specifically identify the properties to be included in the project.
- The owners' participation must be voluntary, and the owners must be able to prove ownership of the property involved in the project.
- Structures relocated from acquired property must be placed entirely outside of the 100-year floodplain. (Note: Relocation site must be pre-identified and annotated within the grant application.)
- Structures generally must be relocated from acquired property within 90 days of closing.
- Ownership of acquired property may not be conveyed to private citizens or entities; ownership may be conveyed to other public entities or non-profit organizations with the approval of the state and FEMA.
- Local governmental entities, or certain non-profit entities, must accept any acquired property titles that are officially annotated to comply (in perpetuity) with federal open space deed restrictions.

- Any acquisition property (e.g., any vacated lot acquired through the project) becomes ineligible for any future federal disaster assistance, except possibly federal crop insurance.

Floodproofing Projects

Floodproofing may be the most practical option in limited danger areas. To be eligible to participate, the local governmental/non-profit entity must demonstrate that this measure will best resolve the danger to the property based on the following criteria:

- The property is in an area that is not subject to flash flooding.
- Extensive cleanup normally is not required after a flood event.
- One of the two floodproofing processes described below is the most advantageous measure to employ over the long term.
- Wet floodproofing allows water to enter the structure, thereby equalizing pressure on walls and floors. Building contents such as furnaces and appliances are located out of reach of the floodwaters.
- Dry floodproofing is a process that uses waterproofing compounds, sheeting, or other impermeable materials to prevent floodwaters from entering the structure.

Structural Mitigation Projects

Structural mitigation applies to infrastructure-type mitigation projects. To be eligible under the Public Assistance Program, the jurisdiction must meet all of the eligibility criteria of the program including, but not limited to:

- The project is required as a result of the declared event.
- The project is within the designated disaster area.
- The project is the legal responsibility of an eligible applicant.

Tornado Safe Rooms

Projects designed to protect people from tornadoes and high winds must comply with FEMA Publications 320, *Taking Shelter from the Storm: Building a Safe Room Inside Your House*, and 361, *Design and Construction Guidance for Community Shelters*.

Other Mitigation Projects

The majority of North Dakota's approved mitigation projects have been generated by flood related disasters. Other projects may be approved, depending on the availability of funds, state and local priorities, proof of cost-benefit, and project submissions.

The criteria listed in this section of the plan are the basic criteria for each type of project. These criteria may be modified based on any of the following issues:

- The specific disaster situation
- Location of the affected areas

- Availability of funds
- Unique program requirements of the funding source
- Current state and/or local hazard mitigation priorities
- Number/type of mitigation projects submitted by local governments

7.5.3. Project Review

When applications for grant funding are submitted, the Department of Emergency Services performs a basic review each of the proposed projects for eligibility, cost effectiveness, and environmental considerations. Often more information is needed, and a dialogue between the applicant and the State results in a more complete application. Once a project is deemed eligible based on federal, state, and grant specific criteria, the project is further considered in detail for cost effectiveness (see **Section 7.5.4**) and environmental review (see **Section 7.5.6**). If needed, the State Hazard Mitigation Team (SHMT) or elements thereof are convened to review the project for technical feasibility and effectiveness. The SHMT may conduct field reviews and consider alternatives.

Certain types of projects are eligible for streamlined reviews to keep the process moving quickly and efficiently. These include:

- Acquisition of real property in a hazard area,
- Relocation of structures from a hazard area,
- Elevation of structures above the base flood elevation in accordance with local ordinances,
- Retrofit of residential/commercial buildings,
- Minor structural flood control measures,
- Vegetation management,
- Phase I design, engineering, or impact studies, and
- Five percent initiative projects.

During these streamlined reviews, the State will:

- Ensure all projects are consistent with current codes, standards, and permit requirements.
- Ensure all costs included in the budget are eligible.
- Ensure that all project application data, including cost-benefit and environmental reviews, are input into NEMIS or other management system.
- Ensure funding is not duplicated with other sources.

7.5.4. Benefit-Cost Analysis

The benefit-cost analysis (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 damages 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 relatively quickly and accurately.

In 2009, the State began using the Benefit-Cost Analysis (BCA) Tool Kit software to conduct benefit-cost analyses for FEMA mitigation grants. 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.

Generally, 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.

7.5.5. Prioritization

Historically, North Dakota has not had to use prioritization schemes to an extensive level. 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 them on for federal analysis. Should prioritizations be needed, the State Hazard Mitigation Team 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 set forth as follows. 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.

Prioritization of Projects

The State of North Dakota has established priorities for hazard mitigation projects. These priorities are established by the Governor based on recommendations provided by the IHMT or the SHMT. At any time, the Governor may change these priorities, but typically follows the recommendations of the IHMT, SHMT, or DES mitigation team.

Following a disaster, a priority list for the Hazard Mitigation Grant Program 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 National Flood Insurance Program (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, prioritization of specific projects, when needed, considers the following:

- Does the project addresses 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?

Prioritization of Planning Grants

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 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 DES will consider:

- If the community meets the criteria for the specific source of funds.
- Past experience in dealing with the community on other grants (such as disaster grants, mitigation projects, etc.).
- 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. This review considers the impact to community infrastructure as well as families and businesses.
- The number of non-declared disasters that have impacted the community. This review considers 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 in areas under its jurisdiction.
- If the community has demonstrated its ability to form effective public-private hazard mitigation partnerships.

Prioritization of State Technical and Financial Assistance

North Dakota strives to meet all of the technical and financial assistance requests it receives for hazard mitigation; however, the State’s personnel and finances do have limitations, so when prioritization is needed, such as may be the case following a major disaster, the following criteria are considered:

- The extent and nature of the hazards to be mitigated.
- The degree of commitment of the local government to reduce damage from future disasters.
- The degree of commitment of the local government to support the hazard mitigation measures to be carried out using the technical and financial assistance.

- The extent to which the hazard mitigation measures to be carried out, using the technical and financial assistance, contribute to established state and local mitigation goals and priorities.
- The extent to which prioritized cost-effective mitigation activities that produce meaningful and definable outcomes are clearly identified.
- The opportunity to fund activities that maximize net benefits to society.
- The extent to which assistance will fund activities in small, impoverished communities.

Provisions for Small, Impoverished Communities

A small, impoverished community is a community of 3,000 or fewer in population that is economically disadvantaged, as determined by the State. Additional criteria may also be established by FEMA and other federal agencies.

While the State does not maintain a list of communities specifically designated as small and impoverished, it does have communities that have been designated as distressed and targeted. North Dakota DES and other state agencies received assistance from the North Dakota Department of Commerce in determining those communities that meet the distressed and targeted criteria.

The President may increase the federal cost share to 90 percent of the total cost of mitigation activities carried out by small, impoverished communities; however, all other requirements will be the same as any other community participating in mitigation activities.

7.5.6. Environmental Review

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, DES 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.

7.5.7. Grant Management

Although no longer a concept used by FEMA, North Dakota was a managing state through the Hazard Mitigation Grant Program (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.

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. In addition, the standard HMGP acquisition application and quarterly reports developed by North Dakota were used by FEMA Headquarters for use as the NEMIS standard.

Upon initiation of a mitigation grant program, DES determines the management costs and submits the related budgets and work plans to FEMA. For HMGP, the State ensures compliance with the standard disaster grant agreement articles. The State also completes an Application for Federal Assistance, SF-424. Even before formal applications are submitted, DES provides FEMA with advanced estimates of project funding amounts.

During the application process, DES provides FEMA with project summaries and the complete application. DES 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.

DES monitors the progress of the projects through local contacts to ensure the projects are on time and within budget. DES submits quarterly reports for each disaster and grant program. Once work has commenced, invoices submitted by the subgrantees are verified by DES and paid. DES ensures project progress; the communication of such information is passed on through quarterly reports and regular conference calls with FEMA Region VIII.

Once a project is completed, DES and/or the SHMT inspect the project site, collect open space certifications, and complete the NEMIS property site inventory, as applicable. DES then completes the paperwork required to closeout the project and eventually the disaster or program. If a project will not be completed within the performance period, DES works with the subgrantee to request an extension 60 days prior to the end of the performance period and subsequently encourages project completion. Projects are then monitored for future losses mitigated.

7.5.8. Project Monitoring and Evaluation

Projects through the PDM, HMGP, and NFIP programs are monitored by the North Dakota Department of Emergency Services (DES). DES uses spreadsheets, project files, quarterly reports, and other methods to track and monitor projects. If needed, DES contacts the subgrantees to ensure the projects will be completed on time or to determine if they will need an extension. Upon project completion, DES collects the documentation for project closeout.

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.

North Dakota DES uses Geographic Information System (GIS) and Global Positioning System (GPS) technology to document acquisition and other projects and to further refine the monitoring of the projects.

In addition, North Dakota DES 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. DES 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.

7.6. Mitigation Implementation System Summary

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. Each mitigation program is managed somewhat differently depending on the funding available and grant requirements. The more traditional Federal Emergency Management Agency (FEMA) mitigation programs are managed by the North Dakota Department of Emergency Services (HMGP, PDM, and NFMF). DES relies on a State Hazard Mitigation Team, with representation from many state agencies, and an Interagency Hazard Mitigation Team, 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 has 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 multi-hazard mitigation plan. 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 benefit cost analysis, prioritized against other projects if needed, reviewed for environmental impacts, and ultimately 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.

The following section is a DRAFT of what will become Chapter 8 in the updated North Dakota Multi-Hazard Mitigation Plan. Please review for content and accuracy. Items highlighted in yellow are areas that need verification or where more information or clarification would be helpful or is pending.

8. Plan Maintenance

An important aspect of any useable plan is the maintenance and upkeep of the document. 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 level. 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 will remain viable for the State of North Dakota for many years, the plan maintenance responsibilities lie with the North Dakota Department of Emergency Services and the State Hazard Mitigation Team.

These plan maintenance concepts were updated in 2010 and 2013 to better reflect the maintenance process used in recent years and to allow for more manageable maintenance during disaster periods, given the current three year update cycle. In 2005, the concept of a "Mitigation Year in Review" meeting and report was added and they were completed in 2005 through 2010. Staff resources working presidential disasters in 2010 through 2012 did not allow for a formal "Mitigation Year in Review" document to be produced. *Was the plan was reviewed following each of the disasters?* NDDES is planning to re-instate these yearly meetings and reports as part of the NDMHMP in 2013. No other significant changes were made to the plan maintenance concepts during the 2013 update process.

8.1. Plan Monitoring

The plan will be monitored by the North Dakota Department of Emergency Services (DES). At a minimum, the plan is reviewed after each disaster, or in the absence of such, annually. Each time the State Hazard Mitigation Team convenes, the team discusses mitigation progress. The project status is reported on and 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, DES and/or the team:

- 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.

- Review existing state/federal programs to ensure that the state takes full advantage of possible funding sources in implementing the state hazard mitigation program.

8.2 Plan Evaluation

After each disaster, or annually in the absence of such, the North Dakota Department of Emergency Services mitigation team will conduct a review of the plan. Changes to the plan and a more thorough evaluation will be made in the third year of the plan update cycle. The criteria utilized to evaluate the Plan will be obtained from the FEMA Standard Plan Review Crosswalk, or the Enhanced Plan Crosswalk should Enhanced Plan status be desired in the future. All disaster or emergency incidents will be evaluated for general/specific mitigation recommendations that should be added to the plan. Coordination within the North Dakota Department of Emergency Services mitigation team is accomplished on a monthly basis.

A general evaluation of the plan is conducted as needed by the State Hazard Mitigation Team. 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 DES for incorporation in future plan updates.

8.3 Plan Updates

As disasters occur, projects are completed, and hazard information is improved, the State of North Dakota Multi-Hazard Mitigation Plan will need to be updated. To remain an active and approved plan, an updated plan must be submitted to the Federal Emergency Management Agency every three years. In February 2013 FEMA entered a proposed rule to the Federal Register for changing the state mitigation plan update requirement from three to five years. Should this rule pass the plan update schedule will be revised accordingly. Assuming the three year requirement remains, the next formal submission will be in March 2017. Table 8.1 shows the schedule of plan updates. 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.

Table 8.1. Schedule of Plan Updates

Plan Section	Post-Disaster or Annually	Every 3 Years
Adoption Documentation		X
Introduction		X
Planning Process		X
Statewide Inventory		X
Risk Assessment / Hazard Profiles		X
Mitigation Strategy	X	X
Mitigation Implementation System		X

Plan Maintenance		X
Appendices		X

8.4 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 generally takes about a year or more to be effectively completed. The following is a synopsis of the steps to be taken when updating this plan:

- Begin tracking communications associated with the plan update.
- Review existing plan and crosswalk and identify needed updates.
- Identify who will be responsible for updating the plan (i.e. agency personnel, contractors, etc.) and the timeframe for completing the update.
- Secure any necessary funding sources.
- If necessary, develop a request for proposals, evaluate proposals, and award contract(s).
- Begin tracking significant plan changes.
- Evaluate and update the planning process.
- Review the stakeholder contact list, make necessary changes, and identify new stakeholders.
- Initiate plan outreach and discussion, including a stakeholder meeting.
- Consider the addition, removal, or modification of hazards identified in the plan.
- Update and revise membership of the mitigation planning committees.
- Evaluate risk assessment methodologies and data sources.
- Evaluate and update state inventory information.
- Evaluate and update the hazard profiles, including interaction with the mitigation planning committees.
- Evaluate and update the risk assessment summary.
- Evaluate and update the mitigation strategy, including interaction with the mitigation planning committees.
- Evaluate and update the mitigation implementation system, including interaction with relevant state agencies.
- Evaluate and update the plan maintenance.
- Develop the necessary annual mitigation reports.
- Integrate new and updated local and tribal mitigation plans.
- Integrate new and updated related state plans.
- Evaluate and update other plans sections (i.e. table of contents, adoption documentation, introduction, appendices, etc.)
- Identify and add any additional sections or information needed.
- Review updated plan in its entirety.

- Conduct updated plan outreach, including public information, comment period, and stakeholder meeting.
- Integrate additional comments received.
- Finalize plan document.
- Complete crosswalk and submit final plan to FEMA for review and approval.
- If necessary, make additional modifications as required.
- Obtain signed letter from the Governor adopting the plan.

The update process is also summarized in Chapter 3 of this plan. Included in that chapter is a table developed during the 2013-1014 update that can be used as a tool for future updates to review each sections of the plan and determine the specific update needs.

Monitoring Progress of Mitigation Activities

8.4.1. 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, subgrantees shall submit a letter with all final project documentation and a final inspection report to DES requesting closeout. The State Hazard Mitigation Officer, 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 subgrantees, 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.

8.4.2. Reviewing Progress on Achieving Goals in Mitigation Strategy

Progress towards achieving this plan's goals will be checked in on annually through the annual meeting of the SHMT mentioned previously. The progress will be evaluated and assessed in more detail in year three of the three year update cycle. All of the proposed actions listed in the Table 6.3 in Chapter 6 support one or more of these goals. As the progress on these recommended actions is tracked, progress on achieving the above eight goals will also be monitored and summarized in Table 6.2. If any of the goals are not receiving adequate attention, it will become apparent as the table is periodically updated.

8.4.3. System for Reviewing Progress on Implementing Activities and Projects of Mitigation Strategy

The procedures for reviewing the progress associated with implementing activities and projects related to the mitigation strategy were discussed in the previous two sections and also in more detail in Chapter 7. It is further recommended that the DES prepare an annual report on progress towards mitigation projects, and incorporate this information into other agencies' periodic reports where applicable (e.g., SWC, DOT, Agriculture, etc.)

8.4.4. Implementation of Previously Planned Mitigation Actions

The Status of Mitigation Actions summary table (Table 6.2) in Chapter 6 shows those actions that have been implemented to date, as well as those that are ongoing. Several mitigation actions have been implemented as planned and many more are ongoing. The discussion under the Status Update column in this table contains a summary discussion of action implementation. This discussion will be updated with each three year update cycle so that successes and challenges with action implementation are documented.

Appendix A. MITIGATION PLANNING COMMITTEES

Communicable Disease

Name	Agency/Organization	Member Since
Tim Wiedrich, *Lead*	NDDoH	2010
Dr. Stephen Pickard	NDDoH	2013
Doug Goehring	N.D. Department of Agriculture	2013
Dr. Susan Keller	N.D. Division of Animal Health	2010
Dr. Beth Carlson	N.D. Division of Animal Health	2013
Kari Herrick	N.D. Department of Agriculture	2013
David Hirsch	U.S. Animal Plant and Health Inspection Services (APHIS)	2013
Stan Misek	North Dakota Stockmen's Association	2013
Fred Frederickson	North Dakota Stockmen's Association	2013

Dam Failure

Name	Agency/Organization	Member Since
Karen Goff, *Lead*	N.D. State Water Commission (SWC)	2007
Laura Ackerman	SWC	2013
Jon Kelsch	SWC	2010
Randy Ehlis	U.S. Bureau of Reclamation	2010
Steve Parker	U.S. Bureau of Reclamation	2007
Fred Anderson	N.D. Department of Mineral Resources	2010
Dennis Reep	Natural Resources Conservation Service	2010
Jason Johnston	N.D. Parks and Recreation Department	2010
Jerry Weigel	N.D. Game and Fish Department	2013
Leonard Alberts	Bureau of Indian Affairs	2013
Corey King	National Weather Service	2013
Jeffrey Savadel	National Weather Service	2010
Mark Koenig	U.S. Army Corps of Engineers	2013
Kim Thomas	U.S. Army Corps of Engineers	2013
Jess Earle	NDDES, Division of Homeland Security	2013

Drought

Name	Agency/Organization	Member Since
Linda Weispfenning, *Lead*	SWC	2010
Kari Herrick	N.D. Department of Agriculture	2013
Pat Fridgen	SWC	2007
Darin Langerud	SWC	2007
Randy Ehlis	U.S. Bureau of Reclamation	2010
Gregg Wiche	U.S. Geological Survey	2010
Steve Robinson	U.S. Geological Survey	2013
Stan Misek	North Dakota Stockmen's Association	2013
Fred Frederickson	North Dakota Stockmen's Association	2013

Name	Agency/Organization	Member Since
Corey King	National Weather Service	2013
Jeffrey Savadel	National Weather Service	2010
Adnan Akyuz	North Dakota State University	2010
Justin Messner	NDDES, Division of Homeland Security	2013

Flood

Name	Agency/Organization	Member Since
Kelly Casteel, Co-*Lead*	SWC	2010
Jon Kelsch, *Co-Lead*	SWC	2010
April Walker	City of Fargo	2013
Fred Anderson	N.D. Department of Mineral Resources	2010
Jason Johnston	N.D. Parks and Recreation Department	2010
Karen Assel	N.D. Parks and Recreation Department	2007
Kathleen Tweeten	North Dakota State University Extension Service	2013
Pat Fridgen	SWC	2007
Mike Hall	SWC	2010
Jon Kelsch	SWC	2010
Jeff Klein	SWC	2007
Laura Horner	SWC	2013
Laura Ackerman	SWC	2013
Linda Weispfenning	SWC	2010
Ken Yantes	North Dakota Township Officers Association	2010
Brad Darr	N.D. Department of Transportation	2010
Randy Ehlis	U.S. Bureau of Reclamation	2010
Steve Parker	U.S. Bureau of Reclamation	2007
Corey King	National Weather Service	2013
Mark Koenig	U.S. Army Corps of Engineers	2013
Kim Thomas	U.S. Army Corps of Engineers	2013
Gregg Wiche	U.S. Geological Survey	2010
Steve Robinson	U.S. Geological Survey	2013
Shirley Dykshoorn	Lutheran Disaster Response	2013
Jenny Gomke	Lutheran Disaster Response	2013
Dennis Reep	Natural Resources Conservation Service	2010
Adnan Akyuz	North Dakota State University	2010
Lorna Meidinger	State Historical Society of North Dakota	2013
Ann Jenks	State Historical Society of North Dakota	2013
Christy Roemmich	N.D. Association of Rural Electric Cooperatives	2013
Paul Davis	N.D. Association of Rural Electrical Cooperatives	2013

Geologic Hazards

Name	Agency/Organization	Member Since
Fred Anderson, *Lead*	N.D. Department of Mineral Resources	2010
Jess Earle	NDDES, Division of Homeland Security	2013
Donald Schwert	North Dakota State University	2013
Gregg Wiche	U.S. Geological Survey	2010
Steve Parker	U.S. Bureau of Reclamation	2007
Nick Renna	Federal Highway Administration	2013

Name	Agency/Organization	Member Since
Lorna Meidinger	State Historical Society of North Dakota	2013
Randy Ehlis	U.S. Bureau of Reclamation	2010

Hazardous Material Release

Name	Agency/Organization	Member Since
Curt Erickson, *Lead*	NDDoH	2010
Gary Haberstroh	NDDoH	2013
Steve Tillotson	NDDoH	2013
Scott Radig	NDDoH	2013
Kris Roberts	NDDoH	2010
Jim Semerad	NDDoH	2013
Larry Thelen	NDDoH	2010
Gary Stockert	City of Bismarck	2010
Jeffrey Savadel	National Weather Service	2010
Ray DeBoer	NDDES, Division of Homeland Security	2007
Fred Anderson	N.D. Department of Mineral Resources	2010
Dave Hvinden	N.D. Department of Mineral Resources	2007
Rob Knuth	N.D. Firefighters Association	2013
Renee Loh	N.D. Firefighters Association	2010
LTC Mark Quire	N.D. National Guard, 81st Civil Support Team	2013
Major Pat Flanagan	N.D. National Guard, 81st Civil Support Team	2013
CPT Dave Jablonsky	N.D. National Guard, 81st Civil Support Team	2013
Stephen Herda	N.D. National Guard	2013
Doug Goehring	N.D. Department of Agriculture	2013
Spencer Wagner	N.D. Department of Agriculture	2013
Steve Dirksen	Fargo Fire Department	2013
Randy Ehlis	U.S. Bureau of Reclamation	2010

Homeland Security Incident

Name	Agency/Organization	Member Since
Debbie LaCombe, *Lead*	NDDES, Division of Homeland Security	2007
Ben Leingang	State and Local Intelligence Center (Bureau of Criminal Investigation)	2013
Lonnie Grabowska	N.D. Bureau of Criminal Investigation (BCI)	2013
Brad Smith	State and Local Intelligence Center (Highway Patrol)	2010
Major Mike Gerhardt	N.D. Highway Patrol	2013
Tim Wiedrich	N.D. Department of Health (NDDoH)	2010
Don Ronsberg	U.S. Department of Homeland Security	2010
Steve Parker	U.S. Bureau of Reclamation	2007
Art Bakke	N.D. Information Technology Department	2010
Gary Stockert	City of Bismarck	2010
LTC Mark Quire	N.D. National Guard, 81st Civil Support Team	2013
CPT Dave Jablonsky	N.D. National Guard, 81st Civil Support Team	2013
Major Pat Flanagan	N.D. National Guard, 81st Civil Support Team	2013

Severe Summer Weather

Name	Agency/Organization	Member Since
Darin Langerud, *Lead*	SWC	2007
Corey King	National Weather Service	2013
Jeffrey Savadel	National Weather Service	2010
Jeff Rotenberger	N.D. Department of Commerce	2010
Karen Assel	N.D. Parks and Recreation Department	2010
Russ Korzeniewski	N.D. Department of Human Services	2013
Jason Johnston	N.D. Parks and Recreation Department	2010
Adnan Akyuz	North Dakota State University	2010
Steve Dirksen	Fargo Fire Department	2013
Brad Darr	N.D. Department of Transportation	2010

Severe Winter Weather

Name	Agency/Organization	Member Since
Tom Claeys, *Lead*	N.D. Forest Service	2007
Jeff Rotenberger	N.D. Department of Commerce	2010
Brad Darr	N.D. Department of Transportation	2010
Corey King	National Weather Service	2013
Christy Roemmich	N.D. Association of Rural Electrical Cooperatives	2013
Paul Davis	N.D. Association of Rural Electrical Cooperatives	2013
Dr. Adnan Akyuz	North Dakota State University	2010
Melanie Moen	American Red Cross	2013
Russ Korzeniewski	N.D. Department of Human Services	2013

Shortage or Outage of Critical Materials or Infrastructure

Name	Agency/Organization	Member Since
Jeff Rotenberger, Co-*Lead*	N.D. Department of Commerce	2010
Corey King, Co-*Lead*	National Weather Service	2013
Christy Roemmich	N.D. Association of Rural Electric Cooperatives	2013
Paul Davis	N.D. Association of Rural Electrical Cooperatives	2013
Gary Allen	802 Evergreen Lane, Cando, ND 58324	2013
Tim Morris	Wal-Mart-North Bismarck	2013
Jon Boyle	Division of Facilities Management	2007
Steve Parker	U.S. Bureau of Reclamation	2007
Jeffrey Savadel	National Weather Service	2010
Adnan Akyuz	North Dakota State University	2010
Larry Taborsky	N.D. Aeronautics Commission	2013
Darin Langerud	SWC	2007
Justin Messner	NDDES, Division of Homeland Security	2013

Transportation Accident

Name	Agency/Organization	Member Since
Brad Darr, *Lead*	N.D. Department of Transportation	2010
Major Mike Gerhardt	N.D. Highway Patrol	2013
Nick Renna	Federal Highway Administration	2013

Name	Agency/Organization	Member Since
Mark Schrader	Federal Highway Administration	
Larry Taborsky	N.D. Aeronautics Commission	2013
Stan Misek	North Dakota Stockmen's Association	2013
Fred Frederickson	North Dakota Stockmen's Association	2013

Urban Fire or Structure Collapse

Name	Agency/Organization	Member Since
Ray Lambert, *Lead*	N.D. Fire Marshal	2010
Joel Boesflug	City of Bismarck	2013
Steve Dirksen	Fargo Fire Department	2013
Gary Stockert	City of Bismarck	2010
Russ Korzeniewski	N.D. Department of Human Services	2013
Shirley Dykshoorn	Lutheran Disaster Response	2013
Jenny Gomke	Lutheran Disaster Response	2013
Rob Knuth	N.D. Firefighters Association	2013
Renee Loh	N.D. Firefighters Association	2010
Melanie Moen	American Red Cross	2013

Wildland Fire

Name	Agency/Organization	Member Since
Sarah Tunge, *Lead*	N.D. Forest Service	2010
Tom Claeys	N.D. Forest Service	2007
Maure Sand	U.S. Forest Service	2013
Corey King	National Weather Service	2013
Ray Lambert	N.D. Fire Marshal	2010
Doug Myers	ND Fire Marshal	2013
Rob Knuth	N.D. Firefighters Association	2013
Renee Loh	N.D. Firefighters Association	2010
Karen Assel	N.D. Parks and Recreation	2007
Jeb Williams	N.D. Game and Fish Department	2013
Melanie Moen	American Red Cross	2013
Shirley Dykshoorn	Lutheran Disaster Response	2013
Brad Darr	N.D. Department of Transportation	2010

Windstorm

Name	Agency/Organization	Member Since
Corey King, *Lead*	National Weather Service	2013
Jeffrey Savadel	National Weather Service	2010
Darin Langerud	SWC	2007
Adnan Akyuz	North Dakota State University	2010

NDHMP Update Steering Committee

Name	Agency/Organization	Member Since
Greg Wilz, *Chair*	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	2007
Lonnie Hoffer	NDDES, Division of Homeland Security	1989
Andrea Travnicek	Governor's Office	2013
Mike Hallesy	Williams County	2013
Tim Wiedrich	N.D. Department of Health (NDDoH)	2010
Tim Fay	N.D. State Water Commission (SWC)	2013
Bruce Engelhardt	N.D. State Water Commission (SWC)	2010

Plan Development Coordinators

Name	Agency/Organization	Member Since
Kathleen Donahue, *State Lead*	NDDES, Division of Homeland Security	2010
Mary Senger, *Local Lead*	Burleigh County	2010
Jeff Brislawn, *Consultant to Group*	AMEC Environment and Infrastructure	2013
Laurie Bestgen, CFM, *Consultant to Group*	AMEC Environment and Infrastructure	2013
Kari Valentine, *Consultant to Group*	AMEC Environment and Infrastructure	2013

Critical Facilities and Infrastructure

Name	Agency/Organization	Member Since
Kirk Hagel, *Lead*	NDDES, Division of Homeland Security	2010
Jon Godfread	Greater North Dakota Chamber	2013
Jeff Bitz	N.D. Insurance Department	2013
Randy Ehlis	U.S. Bureau of Reclamation	2010
Tim Morris	Wal-Mart-North Bismarck	2013
Jon Boyle	Division of Facilities Management	2007
Connie Sprynczynatyk	N.D. League of Cities	2013
Rebecca Haag	N.D. League of Cities	2013
Dennis Reep	Natural Resources Conservation Service	2010
Larry Lee	N.D. Information Technology Department	2013
Jeff Rotenberger	N.D. Department of Commerce	2010
Mike Lynk	NDDES, Division of State Radio	2010
Christy Roemmich	N.D. Association of Rural Electrical Cooperatives	2013
Paul Davis	N.D. Association of Rural Electrical Cooperatives	2013

Oil and Gas Industry Expansion

Name	Agency/Organization	Member Since
Mike Hallesy, Lead	Williams County	2013
Bethany Kurz	University of North Dakota, Environmental Research Center for Oil and Gas	2013
Fred Anderson	N.D. Department of Mineral Resources	2010
Dave Hvinden	N.D. Department of Mineral Resources	2007
Vicky Steiner	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion	2013

Name	Agency/Organization	Member Since
	Counties Association	
Brady Pelton	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	2013
Sandy Rohde	Dunn County	2013
L. David Glatt	N.D. Department of Health	2013
Kris Roberts	NDDoH	2010
Max Wetz	N.D. Housing Finance Authority (NDHFA)	2013
Jolene Kline	NDHFA	2013
Jon Godfread	Greater North Dakota Chamber	2013
Tim Wiedrich	N.D. Department of Health (NDDoH)	2010
Brad Darr	N.D. Department of Transportation	2010
Kathleen Tweeten	NDSU Extension Service	2013
Kevin Stewart	North Dakota Safety Council	2013
Ryan Rauschenberger	Office of the Tax Commissioner	2013
Curt Zimmerman	Workforce Safety and Insurance	2013

Land Use and Future Construction and Development

Name	Agency/Organization	Member Since
Lonnie Hoffer, *Lead*	NDDES, Division of Homeland Security	1989
Paul Govig	N.D. Department of Commerce, Division of Community Services	2013
Brady Pelton	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	2013
Ken Yantes	North Dakota Township Officers Association	2010
Scott Davis	N.D. Indian Affairs Commission	2013
Steve Sitting Bear	N.D. Indian Affairs Commission	2013
Jon Godfread	Greater North Dakota Chamber	2013
Steve Zimmer	City of West Fargo	2013
L. David Glatt	N.D. Department of Health	2013
Gary Haberstroh	NDDoH	2013
Bob Humann	Bank of North Dakota	2013
Bryan Klipfel	Workforce Safety and Insurance	2010
Mike Hallesy	Williams County	2013
Sandy Rohde	Dunn County	2013
Kathleen Tweeten	NDSU Extension Service	2013
Michael Ziesch	North Dakota Job Service	2013
Justin Messner	NDDES, Division of Homeland Security	2013

THIRA Incorporation

Name	Agency/Organization	Member Since
Sean Johnson, *Lead*	NDDES, Division of Homeland Security	2010
Jess Earle	NDDES, Division of Homeland Security	2013
Kathleen Donahue	NDDES, Division of Homeland Security	2010

Mitigation Strategy

Name	Agency/Organization	Member Since
Jeff Klein, Co-*Lead*	SWC	2007
Kathleen Donahue, *Co-Lead*	NDDES, Division of Homeland Security	2010
Sean Johnson, *Lead*	NDDES, Division of Homeland Security	2010
Karen Goff	SWC	2007
Linda Weispfenning	SWC	2010
Kelly Casteel	SWC	2010
Jon Kelsch	SWC	2010
Fred Anderson	N.D. Department of Mineral Resources	2010
Curt Erickson	NDDoH	2010
Debbie LaCombe	NDDES, Division of Homeland Security	2007
Corey King	National Weather Service	2013
Darin Langerud	SWC	2007
Sarah Tunge	N.D. Forest Service	2010
Ray Lambert	N.D. Fire Marshal	2010
Tom Claeys	N.D. Forest Service	2007
Brad Darr	N.D. Department of Transportation	2010
April Walker	City of Fargo	2013
Paul Messner	NDDES, Division of Homeland Security	2013
Sean Johnson	NDDES, Division of Homeland Security	2010
Lonnie Hoffer	NDDES, Division of Homeland Security	1989
Tim Wiedrich	NDDoH	2010
Christy Roemmich	N.D. Association of Rural Electrical Cooperatives	2013
Paul Davis	N.D. Association of Rural Electrical Cooperatives	2013
Dr. Stephen Pickard	NDDoH	2013
Mark Koenig	U.S. Army Corps of Engineers	2013
Steve Zimmer	City of West Fargo	2013
Mike Hallesy	Williams County	2013

Mitigation Implementation System

Name	Agency/Organization	Member Since
Paul Messner, *Lead*	NDDES, Division of Homeland Security	2013
Jess Earle	NDDES, Division of Homeland Security	2013
Amy Anton	NDDES, Division of Homeland Security	2007
Kathleen Donahue	NDDES, Division of Homeland Security	2010
Linda Weispfenning	SWC	2010
Jon Kelsch	SWC	2010

Appendix B. INVITED STAKEHOLDERS, PARTICIPATION, AND PUBLIC INFORMATION

Table B1. Invited Stakeholders and Participation in 2010

First Name	Last Name	Agency/Organization	2010 Participation
Libby	Gravning	Adams County Emergency Manager	
Michelle	Marthaller	Adams County Emergency Manager	
		Altru Hospital	
Stephen	Miller	American Planning Association, Western Central Chapter	
Megan	Kruger	American Red Cross, Mid-Dakota Chapter	
Allan	McGeough	American Red Cross, Mid-Dakota Chapter	
Marijo	Peterson	American Red Cross, Minn-Kota Chapter	
Tom	Tezel	American Red Cross, Minn-Kota Chapter	
Greg	Voss	American Red Cross, Minn-Kota Chapter	
Melanie	Moen	American Red Cross, West Dakota Chapter	
Janel	Schmitz	American Red Cross, West Dakota Chapter	Meeting Committee(s)
Julie	Dahle	Bank of North Dakota	
Janice	Pratt	Bank of North Dakota	
Kimberly	Franklin	Barnes County Emergency Manager	
Kathi	Risch	Basin Electric Power Cooperative	
Dawn	Flemmer	Benson County Emergency Manager	
Pam	Shrauger	Big Sky Hazard Management LLC	Oversight Meetings
Pat	Rummel	Billings County Emergency Manager	
Gary	Stockert	Bismarck Emergency Manager	Committee(s) Review Comments
Rick	Hummel	Bottineau County Emergency Manager North Dakota Emergency Management Association	
Karla	Germann	Bowman County Emergency Manager	
Dean	Pearson	Bowman County Emergency Manager	
Barry	Jager	Burke County Emergency Manager	
Mary	Senger	Burleigh County Emergency Manager Emmons County Emergency Manager	
Amy	McBeth	Burlington Northern Santa Fe Railroad	
Gus	Melonas	Burlington Northern Santa Fe Railroad	
Mark	Seland	Canadian Pacific Soo Line Railroad	

First Name	Last Name	Agency/Organization	2010 Participation
Dave	Rogness	Cass County/Fargo Emergency Manager	
Leon	Schlafmann	Cass County/Fargo Emergency Manager	
		Cass County/Fargo Emergency Manager	
Karen	Kempert	Cavalier County Emergency Manager	
		Central Dakota Humane Society	
Timothy	Mahoney	City of Fargo Innovis Health	Committee(s)
		Dakota Missouri Valley & Western Railroad	
Charlie	Russell	Dickey County Emergency Manager	
Rob	Melby	Divide County Emergency Manager	
Denise	Brew	Dunn County Emergency Manager	
Tammy	Roehrich	Eddy County Emergency Manager	
Dana	Allen	Environmental Protection Agency	
John	Stumpf	Excel Energy	
Douglas	Bausch	Federal Emergency Management Agency	Data
Julie	Baxter	Federal Emergency Management Agency	Meeting
Barbara	Fitzpatrick	Federal Emergency Management Agency	
Rich	Hansen	Federal Emergency Management Agency	
Michael	Hillenburg	Federal Emergency Management Agency	
Jeanine	Neipert	Federal Emergency Management Agency	Meeting
Wade	Nofziger	Federal Emergency Management Agency	Meeting
Ryan	Pietramali	Federal Emergency Management Agency	
Donna	Rakocy	Federal Emergency Management Agency	
Jesse	Rozelle	Federal Emergency Management Agency	Data
Ron	Hartl	Federal Highway Administration	
Mark	Schrader	Federal Highway Administration	Meeting Committee(s) Review
Dale	Townsend	Foster County Emergency Manager	
Carrie	Law	Golden Valley Emergency Manager	
Jim	Campbell	Grand Forks Emergency Manager	
Donna	Flaten	Grand Forks Emergency Manager	Comments
JoAnn	Ozbun	Grant County Emergency Manager	
Roger	Rohrer	Great River Energy	Webinar
Robert	Hook	Griggs County Emergency Manager	
Ilene	Hardmeyer	Hettinger County Emergency Manager	
Cherie	Abrahams	Holland America Line	
		Humane Society of Fargo	
		Humane Society of Grand Forks	
		James River Humane Society	

First Name	Last Name	Agency/Organization	2010 Participation
Martin	Richman	Jamestown Hospital	
Maren	Daley	Job Service of North Dakota	
Jim	Albrecht	Kidder County Emergency Manager	
Irv	Rustad	Lake Agassiz Regional Council	
Amber	Schaan	Lake Agassiz Regional Council	
Sheri	Gartner	LaMoure County Emergency Manager	
Paul	Rechlin	Lewis and Clark Regional Council	
Cynthia	Doll	Logan County Emergency Manager	
Marvin	Sola	McHenry County Emergency Manager	
DeLoris	Rudolph	McIntosh County Emergency Manager	
Jerry	Samuelson	McKenzie County Emergency Manager	
Todd	Schreiner	McLean County Emergency Manager	Committee(s) Review Comments
Luke	Steen	McLean Electric Cooperative, Inc.	Webinar
		Medcenter One	
Carmen	Reed	Mercer County Emergency Manager	
Kerry	Monson	Mercy Medical Center	
Tami	Solberg	Mercy Medical Center	
Roger	Gilbertson	Meritcare Health System	
David	Loer	Minnkota Power Cooperative/Square Butte Electric Cooperative	
Gary	Paulson	Montana-Dakota Utilities	
Dan	Sharp	Montana-Dakota Utilities	
Art	Thompson	Montana-Dakota Utilities	
Tammy	Lapp-Harris	Morton County Emergency Manager	
Don	Longmuir	Mountrail County Emergency Manager	
Mark	Holter	Mountrail-Williams Electric Cooperative	Webinar
John Paul	Martin	National Weather Service, Bismarck	Meeting Committee(s) Data Review Comments
Jeff	Savadel	National Weather Service, Bismarck	Meeting Committee(s) Review Comments
Greg	Gust	National Weather Service, Grand Forks	Committee(s)
Michael	Lukes	National Weather Service, Grand Forks	
Dennis	Reep	Natural Resources Conservation Services	
Doug	VanDaalen	Natural Resources Conservation Services	
Sharon	Young	Nelson County Emergency Manager	
Rick	Anderson	North Central Regional Planning Council	

First Name	Last Name	Agency/Organization	2010 Participation
Lawrence	Taborsky	North Dakota Aeronautics Commission	
Bradley	Fields	North Dakota Aeronautics Commission	Meeting
Malinda	Weninger	North Dakota Aeronautics Commission	
Gary	Knutson	North Dakota Agricultural Association	
Doreen	Riedman	North Dakota Association of Builders	
Mark	Johnson	North Dakota Association of Counties	
Jim	Mott	North Dakota Association of Fire Chiefs	
		North Dakota Association of Nonprofit Organizations	
		North Dakota Association of Realtors	
Wally	Kalmbach	North Dakota Association of RECs/RETs	Meeting Committee(s) Review Comments
Thomas	Hanson	North Dakota Association of Soil Conservation Districts	
David	Crothers	North Dakota Association of Telecommunications Cooperative	
Matt	Sagsveen	North Dakota Attorney General's Office	Meeting Webinar
Jeff	White	North Dakota Attorney General's Office	Committee(s)
Steven	Edwardson	North Dakota Barley Council	
Nancy Jo	Bateman	North Dakota Beef Commission	
Beth	Carlson	North Dakota Board of Animal Health	
Susan	Keller	North Dakota Board of Animal Health	Committee(s)
Dave	MacIver	North Dakota Chamber of Commerce	
Andy	Peterson	North Dakota Chamber of Commerce	
		North Dakota Child Support Enforcement	
Karl	Altenburg	North Dakota Civil Air Patrol	
Darrel	Pittman	North Dakota Civil Air Patrol	
Jan	Webb	North Dakota Council on the Arts	
		North Dakota County Commissioners Association	
Wayne	Carlson	North Dakota Department of Agriculture	
Kenneth	Junkert	North Dakota Department of Agriculture	
Betty	Nelson	North Dakota Department of Agriculture	
Tom	Silbernagel	North Dakota Department of Agriculture	
Gary	Wagner	North Dakota Department of Agriculture	
Wayne	Kutzer	North Dakota Department of Career and Technical Education	
Brenda	Schuler	North Dakota Department of Career and Technical Education	
Leigh Ann	Huether	North Dakota Department of Commerce	Data
Jeff	Rotenberger	North Dakota Department of Commerce	Meeting Committee(s)
Jim	Boyd	North Dakota Department of Commerce, Division of Community Services	

First Name	Last Name	Agency/Organization	2010 Participation
Wayne	Glaser	North Dakota Department of Commerce, Division of Community Services	
Myles	Noon	North Dakota Department of Corrections and Rehabilitation	
Corky	Stromme	North Dakota Department of Corrections and Rehabilitation	
Paul	Lucy	North Dakota Department of Economic Development	
Amy	Anton	North Dakota Department of Emergency Services	Review Comments
Raymond	DeBoer	North Dakota Department of Emergency Services	Webinar Committee(s) Data
Tom	Doering	North Dakota Department of Emergency Services	Webinar Review Comments
Kathleen	Donahue	North Dakota Department of Emergency Services	Committee(s) Review Comments
Cecily	Fong	North Dakota Department of Emergency Services	Webinar Comments
Kirk	Hagel	North Dakota Department of Emergency Services	Committee(s) Data
Brandon	Hoechst	North Dakota Department of Emergency Services	Webinar
Lonnie	Hoffer	North Dakota Department of Emergency Services	Oversight Meetings
Sean	Johnson	North Dakota Department of Emergency Services	Oversight Meetings
Cherie	Merrick	North Dakota Department of Emergency Services	Oversight Meeting
Paul	Messner	North Dakota Department of Emergency Services	Review
Raymond	Morrell	North Dakota Department of Emergency Services	Oversight Meetings Data Review Comments
Rick	Robinson	North Dakota Department of Emergency Services	Webinar
Greg	Wilz	North Dakota Department of Emergency Services	Meeting Review Comments
Bob	Entringer	North Dakota Department of Financial Institutions	
Lois	Hartman	North Dakota Department of Financial Institutions	
Tim	Karsky	North Dakota Department of Financial Institutions	
Terry	Dwelle	North Dakota Department of Health	
Dave	Glatt	North Dakota Department of Health	
Aaron	Russell	North Dakota Department of Health	Meeting
Brenda	Vossler	North Dakota Department of Health	
Tim	Wiedrich	North Dakota Department of Health	Committee(s) Review Comments
Kathy	Kulesa	North Dakota Department of Human Rights	

First Name	Last Name	Agency/Organization	2010 Participation
Joseph	Crawford	North Dakota Department of Human Services	
Julie	Leer	North Dakota Department of Human Services	
Tara	Skjee Hoffmann	North Dakota Department of Human Services	
Robin	Bosch	North Dakota Department of Labor	
Lisa	Fair McEvers	North Dakota Department of Labor	
Fred	Anderson	North Dakota Department of Mineral Resources, Geological Survey	Meeting Committee(s) Data Review Comments
Dave	Hvinden	North Dakota Department of Mineral Resources, Oil & Gas	Webinar Committee(s) Review Comments
Valeria	Fischer	North Dakota Department of Public Instruction	
Bob	Marthaller	North Dakota Department of Public Instruction	
Wayne	Sanstead	North Dakota Department of Public Instruction	
Brad	Darr	North Dakota Department of Transportation	Meeting Committee(s) Data Review Comments
Gary	Doerr	North Dakota Department of Transportation	Data
Ed	Ryen	North Dakota Department of Transportation	
Lonnie	Wangen	North Dakota Department of Veterans Affairs	
Jim	Crow	North Dakota Division of State Radio	
Mike	Lynk	North Dakota Division of State Radio	
Carol	Goodman	North Dakota Economic Development Association	
		North Dakota Emergency Medical Services Association	
Ronda	Berg	North Dakota Facilities Management	
John	Boyle	North Dakota Facilities Management	
Renee	Loh	North Dakota Firefighters Association	Meetings Committee(s) Review Comments
Thomas	Claeys	North Dakota Forest Service	Meeting
David	Geyer	North Dakota Forest Service	Committee(s)
Larry	Kotchman	North Dakota Forest Service	
Geremy	Olson	North Dakota Forest Service	Committee(s) Data Review Comments
Sarah	Tunge	North Dakota Forest Service	Meeting
Steve	Dyke	North Dakota Game & Fish	
Mike	McKenna	North Dakota Game & Fish	

First Name	Last Name	Agency/Organization	2010 Participation
Roger	Rostvet	North Dakota Game & Fish	
Steve	Strege	North Dakota Grain Dealers Association	
Dan	Wogsland	North Dakota Grain Growers Association	
Neil	Johnson	North Dakota Highway Patrol	
Kathy	Loreen Nelson	North Dakota Highway Patrol	
Eric	Pederson	North Dakota Highway Patrol	Meeting Committee(s) Review Comments
James	Prochniak	North Dakota Highway Patrol	
Brad	Smith	North Dakota Highway Patrol	
Mike	Anderson	North Dakota Housing Finance Agency	
Celeste	Burke	North Dakota Housing Finance Agency	
Chad	Kramer	North Dakota Indian Affairs Commission	
Lynn	Helms	North Dakota Industrial Commission, Oil & Gas Division	
Mike	Ressler	North Dakota Information Technology Department	
Jeff	Bitz	North Dakota Insurance Department	
Laurie	Scully	North Dakota Insurance Department	Data
Judie	Lee	North Dakota Interagency Program for Assistive Technology	
Connie	Sprynczynatyk	North Dakota League of Cities	
Thomas	Balzer	North Dakota Motor Carriers Association	
Jon	Erickson	North Dakota National Guard	
Daryl	Roerick	North Dakota National Guard	
		North Dakota Natural Resources Trust	
Allen	Hoberg	North Dakota Office of Administrative Hearings	
Terry	Milas	North Dakota Office of Management and Budget, Risk Management	
Glenna	Ellison	North Dakota Office of the Attorney General	
Wayne	Stenehjem	North Dakota Office of the Attorney General	
Robert	Peterson	North Dakota Office of the State Auditor	
Mark	Bohrer	North Dakota Oil and Gas Division	
Karen	Assel	North Dakota Parks and Recreation	
Jason	Johnston	North Dakota Parks and Recreation	Meetings Committee(s) Review Comments
Doug	Prchal	North Dakota Parks and Recreation	
Maureen	Trnka	North Dakota Parks and Recreation	
Mark	Zimmerman	North Dakota Parks and Recreation	
Lori	Malafa	North Dakota Peace Officers Association	
		North Dakota Petroleum Council	
Steve	Zimmer	North Dakota Planning Association	

First Name	Last Name	Agency/Organization	2010 Participation
Mike	Rud	North Dakota Propane Gas Association North Dakota Retail Association	
Lois	Mackey	North Dakota Public Health Association	
Patrick	Fahn	North Dakota Public Service Commission	
Melody	Kruckenberg	North Dakota Rural Water Systems Association	
Adnan	Akyuz	North Dakota State Climate Office	Committee(s)
John	Elstad	North Dakota State Fire Marshal's Office	
Linda	Hippen	North Dakota State Fire Marshal's Office	Data
Ray	Lambert	North Dakota State Fire Marshal's Office	Committee(s) Review
Merlan	Paaverud, Jr.	North Dakota State Historical Society	
Carol	Cwiak	North Dakota State University	
Duane	Hauck	North Dakota State University Extension Service	
Kelly	Casteel	North Dakota State Water Commission	Meetings Committee(s)
Bruce	Engelhardt	North Dakota State Water Commission	
Pat	Fridgen	North Dakota State Water Commission	Meetings Committee(s) Data Review Comments
Dale	Frink	North Dakota State Water Commission	
Karen	Goff	North Dakota State Water Commission	Committee(s) Data Review Comments
Mike	Hall	North Dakota State Water Commission	Committee(s)
Jon	Kelsch	North Dakota State Water Commission	Meeting Committee(s) Review Comments
Lee	Klapprodt	North Dakota State Water Commission	Committee(s)
Jeff	Klein	North Dakota State Water Commission	Committee(s) Data
Bruce	Lange	North Dakota State Water Commission	
Darin	Langerud	North Dakota State Water Commission	Meeting Committee(s) Data Review Comments
Todd	Sando	North Dakota State Water Commission	
Linda	Weispfenning	North Dakota State Water Commission	Meeting Committee(s) Review
Julie	Ellingson	North Dakota Stockmen's Association	
Nancy	Walz	North Dakota Technology Policy and Planning	

First Name	Last Name	Agency/Organization	2010 Participation
Patricia	Gisinger	North Dakota Telephone Association	
Sara	Otte Coleman	North Dakota Tourism Division	
Ken	Yantes	North Dakota Township Officers Association	Meeting
William	Goetz	North Dakota University System	
Kit	O'Neill	North Dakota Voluntary Organizations Active in Disaster	
Bonnie	Turner	North Dakota Voluntary Organizations Active in Disaster	
G	Padmanabhan	North Dakota Water Resources Research Institute	
Paul	Govig	North Dakota Workforce Development Division	
James	Hirsch	North Dakota Workforce Development Division	
Tammy	Dolan	North Dakota Workforce Safety and Insurance	
Bryan	Klipfel	North Dakota Workforce Safety and Insurance	
Jeff	Boyce	Northern Border Pipeline	
Beth	Jensen	Northern Border Pipeline	
		Northern Plains Railroad	
Lisa	Reichenberg	Oliver County Emergency Manager	
Marlowe	Johnson	Otter Tail Power Company	
Ryan	Smith	Otter Tail Power Company	
Monica	Brusseau	Pembina County Emergency Manager	Webinar
Jill	Pedersen	Pembina County Emergency Manager	
Duane	Veach	Pierce County Emergency Manager	
Daniel	Holli	Plains Pipeline, L.P.; North Dakota Pipeline Association	
Tim	Heisler	Ramsey County Emergency Manager	
Teresa	Rotenberger	Ransom County Emergency Manager	
Janet	Dvorak	Red River Regional Council	
Julius	Wangler	Red River Regional Council	
Cynthia	Olson	Red River Valley & Western Railroad	
Andy	Thompson	Red River Valley & Western Railroad	
Kristy	Titus	Renville County Emergency Manager	
Brett	Lambrecht	Richland County Emergency Manager	
Eldon	Moors	Rolette County Emergency Manager	
Gene	Buresh	Roosevelt-Custer Regional Council	Meeting Committee(s)
Rod	Landblom	Roosevelt-Custer Regional Council	
Harold	Baugh	Salvation Army	
James	Castor	Salvation Army	
Dale	Hale	Salvation Army	
Chuck	Hendrickson	Salvation Army	
Timothy	Miller	Salvation Army	
Adam	Moore	Salvation Army	

First Name	Last Name	Agency/Organization	2010 Participation
Sandra	Hanson	Sargent County Emergency Manager	Comments
Wayne	Houston	Sheridan County Emergency Manager	
Frank	Landeis	Sioux County Emergency Manager	
Leonica	Alkire	Sitting Bull College	
Dick	Frederick	Slope County Emergency Manager	
Greg	Hagen	Souris Basin Regional Council	
		Souris Valley Humane Society	
Mary	Geffre	South Central Dakota Regional Council	
Deb	Kantrud	South Central Dakota Regional Council	Webinar
Duane	Spooner	South Central Dakota Regional Council	
Joe	Alberts	Spirit Lake Sioux Emergency Manager	
Christine	Moresfield	SRT Communications	
Nancy	Willis	St. Alexius Medical Center	
Tamala	Anderson	St. Joseph's Hospital	
Becky	Elkins	St. Joseph's Hospital	
Everett	Iron Eyes	Standing Rock Sioux Emergency Manager	
Brent	Pringle	Stark County Emergency Manager	
Don	Huso	Steele County Emergency Manager	
Jerry	Bergquist	Stutsman County Emergency Manager	
Cliff	Whitman	Three Affiliated Tribes Emergency Manager	Committee(s)
Larry	Halverson	Towner County Emergency Manager	
Mike	Crocker	Traill County Emergency Manager	
Everette	Enno	Tri-County Regional Development Council	
		Trinity Hospital	
Anita	Blue	Turtle Mountain Chippewa Emergency Manager	
Tom	Barnett	Upper Missouri G & T Electric	
Randall	Behm	US Army Corps of Engineers	
Tim	Bertschi	US Army Corps of Engineers	
Bill	Csajko	US Army Corps of Engineers	
Craig	Evans	US Army Corps of Engineers	
Bonnie	Greenleaf	US Army Corps of Engineers	
Greg	Johnson	US Army Corps of Engineers	
Paul	Kosterman	US Army Corps of Engineers	
Joseph	Mose	US Army Corps of Engineers	
Mark	Nelson	US Army Corps of Engineers	
Becky	Shipman	US Army Corps of Engineers	
Aaron	Snyder	US Army Corps of Engineers	
Tom	Sully	US Army Corps of Engineers	

First Name	Last Name	Agency/Organization	2010 Participation
Pam	Vedros	US Army Corps of Engineers	
Dana	Werner	US Army Corps of Engineers	
Terryl	Williams	US Army Corps of Engineers	
Michael	Wyatt	US Army Corps of Engineers	
Lonny	Bagley	US Bureau of Land Management	
Dennis	Brietzman	US Bureau of Reclamation	
Randy	Ehlis	US Bureau of Reclamation	Meeting Committee(s) Review
Dave	Hartman	US Bureau of Reclamation	Committee(s)
Myron	Lepp	US Department of Agriculture, Rural Development	
Dale	Van Eckhout	US Department of Agriculture, Rural Development	
Donald	Warren	US Department of Agriculture, Rural Development	
		US Department of Housing and Urban Development	
Terry	Ellsworth	US Fish and Wildlife Services	
Gregg	Wiche	US Geological Survey	
Andrew	Banta	US National Park Service, Fort Union Trading Post	
Brian	McCutchen	US National Park Service, Knife River Indian Villages	
Valerie	Naylor	US National Park Service, Theodore Roosevelt National Park	
Brent	Nelson	Walsh County Emergency Manager	
Alan	Reynolds	Ward County Emergency Manager	
Tammy	Roehrich	Wells County Emergency Manager	
Mike	Hallesy	Williams County Emergency Manager	
Kevin	Connell	Williston Basin Interstate Pipeline	
Don	Johnson	Williston Basin Interstate Pipeline	Webinar
Craig	Wagner	Williston Basin Interstate Pipeline	

Table B2. Invited Stakeholders and Participation in 2013

First Name	Last Name	Agency/Organization	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
Melanie	Moen	American Red Cross	X			X
Bob	Humann	Bank of North Dakota				X
Ron	Staiger	Bismarck Civic Center	X			X
Leonard	Alberts	Bureau of Indian Affairs				X
Jeana	Scheffler	Burleigh County	X			X
Mary	Senger	Burleigh County		X	X	X
Karen	Kempert	Cavalier County		X		X

First Name	Last Name	Agency/Organization	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
Joel	Boesflug	City of Bismarck				X
Gary	Stockert	City of Bismarck	X	X	X	X
April	Walker	City of Fargo	X			X
Steve	Zimmer	City of West Fargo	X			X
Jon	Boyle	Division of Facilities Management				X
Sandy	Rohde	Dunn County	X	X	X	X
Steve	Dirksen	Fargo Fire Department	X			X
Nick	Renna	Federal Highway Administration		X		X
Mark	Schrader	Federal Highway Administration				X
Will	Arwood	FEMA Region VIII			X	X
Jenine	Neipurt	FEMA Region VIII		X	X	X
Steve	Dyke	Game and Fish Department	X			X
Jon	Godfread	Greater North Dakota Chamber				X
Jenny	Yearous	Historical Society of North Dakota	X		X	X
Shirley	Dykshoorn	Lutheran Disaster Response	X			X
Jenny	Gomke	Lutheran Disaster Response		X	X	X
Joshua	Simmers	N.D. Aeronautics Commission		X	X	X
Larry	Taborsky	N.D. Aeronautics Commission	X			X
Brady	Pelton	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	*X*	X	X	X
Vicky	Steiner	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association				X
Paul	Davis	N.D. Association of Rural Electrical Cooperatives	X			X
Christy	Roemmich	N.D. Association of Rural Electrical Cooperatives	X		X	X
Lonnie	Grabowska	N.D. Bureau of Criminal Investigation (BCI)	X	X	X	X
Doug	Goehring	N.D. Department of Agriculture	X			X
Kari	Herrick	N.D. Department of Agriculture	X	X	X	X
Spencer	Wagner	N.D. Department of Agriculture	X			X
Jeff	Rotenberger	N.D. Department of Commerce	X	X		X
Paul	Govig	N.D. Department of Commerce, Division of Community Services	*X*			X
Jared	Huibregtse	N.D. Department of Emergency Services (NDDES)		X		X
Gary	Simmons	N.D. Department of Emergency Services (NDDES)		X	X	X

First Name	Last Name	Agency/Organization	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
Brenda	Vossler	N.D. Department of Emergency Services (NDDES)	X	X	X	X
Amy	Anton	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X			X
Ray	DeBoer	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Kathleen	Donahue	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Jess	Earle	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Kirk	Hagel	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X			X
Lonnie	Hoffer	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Sean	Johnson	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X			X
Debbie	LaCombe	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Justin	Messner	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Paul	Messner	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X	X	X	X
Greg	Wilz	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	X		X	X
Mike	Lynk	N.D. Department of Emergency Services (NDDES), Division of State Radio				X
Curt	Erickson	N.D. Department of Health	X	X	X	X
L. David	Glatt	N.D. Department of Health				X
Gary	Haberstroh	N.D. Department of Health	X	X	X	X
Dr. Stephen	Pickard	N.D. Department of Health	X	X	X	X
Scott	Radig	N.D. Department of Health				X
Kris	Roberts	N.D. Department of Health	X			X
Jim	Semerad	N.D. Department of Health				X
Larry	Thelen	N.D. Department of Health				X
Steve	Tillotson	N.D. Department of Health	X		X	X
Tim	Wiedrich	N.D. Department of Health				X
Russ	Korzeniewski	N.D. Department of Human Services	X	X	X	X
Fred	Anderson	N.D. Department of Mineral Resources	X			X
Brad	Darr	N.D. Department of Transportation	X	X	X	X
Dr. Beth	Carlson	N.D. Division of Animal Health				X
Dr. Susan	Keller	N.D. Division of Animal Health				X
Ray	Lambert	N.D. Fire Marshal	X			X
Doug	Myers	N.D. Fire Marshal		X		X
Rob	Knuth	N.D. Firefighters Association				X

First Name	Last Name	Agency/Organization	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
Renee	Loh	N.D. Firefighters Association			X	X
Tom	Claeys	N.D. Forest Service	X			X
Sarah	Tunge	N.D. Forest Service	X	X		X
Jerry	Weigel	N.D. Game and Fish Department				X
Jeb	Williams	N.D. Game and Fish Department				X
Major Mike	Gerhart	N.D. Highway Patrol		X	X	X
Jolene	Klein	N.D. Housing Finance Agency			X	X
Mike	Anderson	N.D. Housing Finance Authority (NDHFA)	X			X
Scott	Davis	N.D. Indian Affairs Commission				X
Steve	Sitting Bear	N.D. Indian Affairs Commission	X			X
Art	Bakke	N.D. Information Technology Department	X			X
Larry	Lee	N.D. Information Technology Department	X	X	X	X
Jeff	Bitz	N.D. Insurance Department	X	X		X
Rebecca	Haag	N.D. League of Cities	*X*			X
Connie	Sprynczynatyk	N.D. League of Cities				X
Stephen	Herda	N.D. National Guard				X
Major Pat	Flanagan	N.D. National Guard, 81st Civil Support Team	X			X
CPT Dave	Jablonsky	N.D. National Guard, 81st Civil Support Team	X			X
LTC Mark	Quire	N.D. National Guard, 81st Civil Support Team				X
Karen	Assel	N.D. Parks and Recreation				X
Jason	Johnston	N.D. Parks and Recreation				X
Laura	Ackerman	N.D. State Water Commission (SWC)			X	X
Kelly	Casteel	N.D. State Water Commission (SWC)		X		X
Bruce	Engelhardt	N.D. State Water Commission (SWC)				X
Tim	Fay	N.D. State Water Commission (SWC)	X	X		X
Pat	Fridgen	N.D. State Water Commission (SWC)	X		X	X
Karen	Goff	N.D. State Water Commission (SWC)	X		X	X
Mike	Hall	N.D. State Water Commission (SWC)	X	X	X	X
Laura	Horner	N.D. State Water Commission (SWC)	X			X
Jon	Kelsch	N.D. State Water Commission (SWC)	X			X
Jeff	Klein	N.D. State Water Commission (SWC)	*X*			X
Darin	Langerud	N.D. State Water Commission (SWC)	X	X	X	X
Linda	Weispfenning	N.D. State Water Commission (SWC)	X	X	X	X
Corey	King	National Weather Service	X		X	X
Jeffrey	Savadel	National Weather Service	X	X	X	X
Dennis	Reep	Natural Resources Conservation Service				X

First Name	Last Name	Agency/Organization	Attended 1st Mtg.	Attended 2nd Mtg.	Attended 3rd Mtg.	Invited to Comment on Draft Plan
Michael	Ziesch	North Dakota Job Service		X	X	X
Kevin	Stewart	North Dakota Safety Council	X			X
Dr. Adnan	Akyuz	North Dakota State University	X			X
Donald	Schwert	North Dakota State University				X
Kathleen	Tweeten	North Dakota State University Extension Service			X	X
Fred	Frederickson	North Dakota Stockmen's Association	*X*			X
Stan	Misek	North Dakota Stockmen's Association				X
Ken	Yantes	North Dakota Township Officers Association	*X*	X	X	X
Gary	Allen	Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	*X*		X	X
Ryan	Rauschenberger	Office of the Tax Commissioner	X	X		X
Deb	Kantrud	SCDRC	X	X		X
Ben	Leingang	State and Local Intelligence Center (Bureau of Criminal Investigation)				X
Brad	Smith	State and Local Intelligence Center (Highway Patrol)	X			X
David	Hirsch	U.S. Animal Plant and Health Inspection Services (APHIS)	X		X	X
Mark	Koenig	U.S. Army Corps of Engineers				X
Kim	Thomas	U.S. Army Corps of Engineers				X
Randy	Ehlis	U.S. Bureau of Reclamation	X			X
Steve	Parker	U.S. Bureau of Reclamation				X
Don	Ronsberg	U.S. Department of Homeland Security	X			X
Maure	Sand	U.S. Forest Service	X			X
Steve	Robinson	U.S. Geological Survey	*X*	X		X
Gregg	Wiche	U.S. Geological Survey	X			X
Bethany	Kurz	University of North Dakota, Environmental Research Center for Oil and Gas	X			X
Tim	Morris	Wal-Mart-North Bismarck	X			X
Mike	Hallesy	Williams County	X	X	X	X
Bryan	Klipfel	Workforce Safety and Insurance		X		X
Mary	Tello-Pool			X		X

Department of Emergency Services

Post Office Box 5511 ~ Bismarck, ND 58506-5511

Tel: 701-328-8154 ~ Fax: 701-328-8181

FOR IMMEDIATE RELEASE

December 13, 2007

Contact: Cecily Fong

(701) 328-8100

Cell - (701) 391-8158

Email – cfong@nd.gov

ND DEPARTMENT OF EMERGENCY SERVICES UPDATES STATEWIDE DISASTER MITIGATION PLAN

BISMARCK, N.D. – Floods, tornadoes, wild fires, and terrorism are only some of the hazards profiled in the recently released State of North Dakota Enhanced Multi-Hazard Mitigation Plan. In total, twelve hazards are profiled in the plan, with winter storms, summer storms, drought, and floods identified as the hazards with the greatest potential to cause significant damages and overwhelm the communities.

The plan considers many aspects of each hazard such as the probability of it occurring, the potential for the loss of life and property, and possible impacts on the economy. The plan does not stop at profiling hazards, however. It also focuses on long-term initiatives and strategies that could prevent or reduce future losses. Most of the initiatives are projects that can be done in local communities such as home acquisitions in hazard areas, building code adoption and enforcement, road and drainage improvements, and public education programs. Each of the initiatives relate to at least one of the seven goals listed in the plan. Many communities are eligible to apply for funding through various grant programs offered by the state and federal governments.

North Dakota is required to have a statewide multi-hazard mitigation plan and is required to review the plan every three years. If the enhanced plan is approved by the Federal Emergency Management Agency (FEMA), North Dakota will be one of only six states with this type of plan. An enhanced plan will provide an additional five percent in funding for hazard mitigation and disaster recovery back to North Dakota communities.

Representatives from across the state have been evaluating and updating the plan for several months and encourage the public to provide additional comment. Sections of the plan can be read and downloaded from the internet at: www.nd.gov/des. Comments are due by January 2, 2008 and can be submitted to nddes@nd.gov or ND Department of Emergency Services, PO Box 5511, Bismarck, ND 58506-5511.

###

The following public notice was placed in each of the North Dakota daily newspapers twice during the weeks of December 16, 2007 and December 23, 2007.

Public Notice

The ND Department

of Emergency Services

is seeking public

comment on the North

Dakota Enhanced

M u l t i - H a z a r d

Mitigation Plan that was

recently completed. The

plan is located at

www. n d . g o v / d e s .

Comments should be

received by January 2,

2008 and should be

directed to:

NDDES

PO Box 5511

Bismarck, ND

58506-5511

Tel: 701-328-8100

Fax: 701-328-8181

Email: nddes@nd.gov

For Immediate Release

November 1, 2010

Contact: Cecily Fong, 701-328-8100

State Updates Disaster Mitigation Plan

Bismarck, ND – The ND Department of Emergency Services has recently reviewed and updated the state's multi-hazard mitigation plan. North Dakota is required to have a statewide mitigation plan that is reviewed and updated every three years. The plan is available at www.nd.gov/des and the department seeks public comment on the plan. A public forum will be held November 17, 2010 at the ND Association of Counties at 9:00 am.

The Federal Emergency Management Agency (FEMA) also reviews the plan and provides approval. An approved plan is a pre-requisite for using federal dollars available for disaster recovery such as the Public Assistance program and the various Hazard Mitigation Grant programs.

Floods, tornadoes, wildfires, and terrorism are only some of the hazards profiled. In total, thirteen hazards are identified in the plan with winter storms, summer storms, drought, and floods identified as the hazards with the greatest potential to cause significant damage and overwhelm communities.

The plan considers many aspects of each hazard such as the probability of it occurring, the potential for the loss of life and property, and possible impacts on the economy. The plan does not stop at profiling hazards, however. It also focuses on long-term initiatives and strategies that could prevent or reduce future losses. Most of the initiatives are projects that can be done in the local communities such as home acquisitions in hazard areas, building code adoption and enforcement, road and drainage improvements, and public education programs. Each of the initiatives relate to at least one of the seven goals listed in the plan. Many communities are eligible to apply for funding through various grant programs offered by the state and federal governments.

Representatives from across the state have been evaluating and updating the plan for several months and encourage the public to provide additional comment. The plan can be read and downloaded at: www.nd.gov/des. Comments are due by January 2, 2011 and can be submitted to nddes@nd.gov or ND Department of Emergency Services, PO Box 5511, Bismarck, ND 58506-5511.

###

The following public notice was placed in each of the North Dakota daily newspapers between

October 29, 2010 and November 1, 2010. The example that follows was in the Devils Lake Journal on October 29, 2010, page 11.

PUBLIC NOTICES

Public Notice

The ND Department of Emergency Services is seeking public comment on the North Dakota Enhanced Multi - Hazard Mitigation Plan that was recently completed. The plan is located at www.nd.gov/des.

Comments should be received by January 2, 2011 and should be directed to:
NDDES
PO Box 5511
Bismarck, ND
58506-5511
Tel: 701-328-8100
Fax: 701-328-8181
Email: nddes@nd.gov

(c10:29)

During the 2013-2014 update process the public was given an opportunity to complete a public opinion survey on hazards and hazard mitigation. The text of the email advertising the survey is provided here:

For Immediate Release
July 11, 2013

Contact:
Kathleen Donahue, 701-328-8113 or kdonahue@nd.gov
Cecily Fong, 701-328-8100 or cfong@nd.gov

NDDES Requests Participation in Survey

Bismarck, ND – The North Dakota Department of Emergency Services is conducting a public opinion survey to determine how North Dakota citizens rate hazards and hazard mitigation strategies.

The survey, available at http://www.nd.gov/des/disaster/state-multi-hazard-plan-hazards-survey/, identifies a broad range of hazards including fires, floods, space weather, severe summer weather and severe winter weather. Survey results will provide NDDES information that will be used to update the State of North Dakota's Multi-Hazard Mitigation Plan.

The plan is heavily dependent on the participation of representatives from state and federal agencies, the public, and other stakeholder groups and it is a critical requirement for securing Federal Emergency Management Agency mitigation funding for the state.

The current Multi-Hazard Mitigation Plan, implemented for a three-year period, is due to expire March 2, 2014.

# # #

Cecily Fong
Public Information Officer
ND Department of Emergency Services
Office: 701.328.8154
Cell: 701.391.8158
cfong@nd.gov

Follow us on Facebook - www.facebook.com/NDDES
Follow us on Twitter - www.twitter.com/NDDES

Appendix C. MEETING ATTENDANCE RECORDS

REGISTRY
ND STATE MULTI-HAZARD MITIGATION PLAN UPDATE MEETING
JUNE 19th, 2007

	NAME	AGENCY	PHONE NUMBER	EMAIL ADDRESS
1	BRUCE LANGE	WATER COMM	328-2759	blange@ND.GOV
2	Ryan Smith	OtterTail Power	218-739-8508	rsmith@otpco.com
3	GARY NESS	ND AERO	328-9650	GNESS@ND.GOV
4	Connie Wetzel	MortonCty	667-3307	Cwetzel@nd.gov
5	Shawna Paul	Emmons Co.	254-4486	smpaul@nd.gov
6	Jason Johnston	NDPRD	328-5376	jjohnston@nd.gov
7	Pam Shrauger	BSHM	406-581-4512	pam@bigskyhazards.com
8	LONNIE HOFFER	DES	328-8100	lhoffer@ND.gov
9	DAVE HVINDEN	DMR	328-8037	dhvinden@nd.gov
10	FRED ANDERSON	DMR	328-8013	fjanderson@nd.gov
11	Terry Milas	RiskManagement	328-7582	tmilas@nd.gov
12	TODD A. SCHREINER	NWS	462-8541	todd.schreiner@noaa.gov
13	Brent Pringle	Stark Co	456-7912	BPringle@nd.gov
14	Bonnie Turner	VOAD	800-950-2901	bTurner@Lssnd.org
15	ED LODWIG	DES	572-7707	
16	Rick Hummel	DES	228-5916	
17	Wayne Hokenson	NDDES	328-8167	whokenso@nd.gov
18	Glenna Ellison	AG	328-1256	gellison@nd.gov
19	DAVID MASSEY	DPI	328-2393	dmassey@nd.gov.
20	Jeff Klein	NDSWC	701-328-4898	jjklein@nd.gov

REGISTRY
ND STATE MULTI-HAZARD MITIGATION PLAN UPDATE MEETING
JUNE 19th, 2007

	NAME	AGENCY	PHONE NUMBER	EMAIL ADDRESS
1	ELDON KREIN	NDHRA	328-7070	EKREIN@NDHRA.ORG;
2	Wally Kalmbach	NDAREC	667-6401	wKalmbach@ndarec.com
3	Cliff Whitman	TAT Emergency Mgmt	701-627-4805	cwhitman@mhanation.com
4	Gary Stockert	Bis EM	222-6727	gstockert@nd.gov
5	Ray Lambert	Fire marshal	328-5555	RLambert@ND.GOV
6	Cynthia Olson	RRVW Railroad	218-643-4994	cynthia.olson@rrvw.net
7	Doug Van Daalen	NRCS	530-2094	doug.vandaalen@nd.usda.gov
8	Jan Pratt	BND	328-5764	jpratt@nd.gov
9	Nan Johnson	FEMA R8	(303)235-4838	nan.johnson@dhs.gov
10	David Geyer	ND Forest Service	701-328-9944	David.Geyer@ndsu.edu
11	WES WIEDENMEYER	NRCS	701-530-2086	WES.WIEDENMEYER@nd.usda.gov
12	Tara Skjoe Hoffman	NDDHS	701-328-2311	soskj@nd.gov
13	Janna Charrier	ND-DES	328-8262	jcharrier@nd.gov
14	Dave Hartman	USBR	701-250-4242	dHartman@GP.USBR.GOV
15	Deidre Quel	BoAH	701-328-2354	dquel@nd.gov
16				
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REGISTRY
ND STATE MULTI-HAZARD MITIGATION PLAN UPDATE MEETING
JUNE 19th, 2007

	NAME	AGENCY	PHONE NUMBER	EMAIL ADDRESS
1	GARY KOSTELECKY	STARK COUNTY	456-7605	GRKOST@ND.GOV
2	Cody Schulz	DES	328-8256	cjschulz@nd.gov
3				
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North Dakota Enhanced State Multi-Hazard Mitigation Plan Workshop
Tuesday, November 6, 2007 from 10am – 3pm CST
Comfort Inn, 1030 East Interstate Avenue, Bismarck, North Dakota

Name	Title(s) and Organization(s)	E-mail and Phone Number
Mark Schrader	Environmental Engineer FHWA	Mark.Schrader@dot.gov (701) 250-4343 x 111
Betty Nelson	Admin off. ND Agriculture Dept	bnelson@nd.gov 701 328 4158
Tod Schreiner	McLean Co	tschreiner@nd.gov 701-462-8541
Rick Hummel	Bottineau Co EM	Rhummel@ND.gov 701-228 5916
Ron Hartl	Assistant Division Administrator Federal Highway Administration	Ronny.Hartl@fhwa.dot.gov 701-250-4343 x107
Tammy Lapp-Harris	Morton County Emergency Manager	tlapp@nd.gov 701-667-3307
Terry Milas	Loss control Analyst Risk Management	TMilas@nd.go 701-328-7582
Jan Pratt	Bus. Continuity Adm. BND	jpratt@nd.gov 701-328-5764
Linda Weispfenning	ND State Water Comm.	lweispfenning@nd.gov 701-328-4968
DENNIS REED	USDA. NRCS	DENNIS.REED@ND.USDA.GOV 701-530-2091

North Dakota Enhanced State Multi-Hazard Mitigation Plan Workshop
Tuesday, November 6, 2007 from 10am – 3pm CST
Comfort Inn, 1030 East Interstate Avenue, Bismarck, North Dakota

Name	Title(s) and Organization(s)	E-mail and Phone Number
Wayne Hokenson	Hazard Mitigation Specialist ND Dept. of Emergency Services	whokenso@nd.gov 701-328-8167
John Elstad	ND State Fire Marshal	jelstad@nd.gov 328-5555
Pam Shrauger	consultant Big Sky Hazard Mgmt	pam@bigskyhazards.com 406-581-4512
JEFF KLEIN	STATE NFIP COORDINATOR NDSWC	701-328-4898 jjklein@nd.gov
DARIN LANGERUD	DIRECTOR, ND ATMOSPHERIC RESOURCE BOARD, ND STATE WATER COMM.	dlangerud@nd.gov 701.328.2788
PATRICK FRIDGEN	Natural Resource Economist State Water Commission	pfridgen@nd.gov 701-328-4964
ELDON KREIN	DIRECTOR, PROPERTY MANAGEMENT ND HOUSING FINANCE AGENCY	EKREIN@NDHFA.ORG 701-328-8080
TINA BEACH	Pipeline Safety Awareness Coordinator Williston Basin Interstate Pipeline	tina.beach@wbip.com 406-359-7316
Susan Keller	~~State~~ Veterinarian – BOAH / NDDA	skeller@nd.gov 701-328-2655

North Dakota Enhanced State Multi-Hazard Mitigation Plan Workshop
Tuesday, November 6, 2007 from 10am – 3pm CST
Comfort Inn, 1030 East Interstate Avenue, Bismarck, North Dakota

Name	Title(s) and Organization(s)	E-mail and Phone Number
Wade Nofziger	Mitigation Specialist FEMA R8	wade.nofziger@dhs.gov 303-235-7945
Myron C Lepp	Administrative Officer - USDA Rural Development	701-530-2054
GARY KOSTELECKY	STARK COUNTY E. MGR	GRKOST@ND.GOV 701 456 7605
Jeff Boyce	Senior O&M Tech Northern Border Pipeline	Jeff_Boyce@TransCanada.Com 701 870 0348
Greg Wilz	Director, Homeland Security	gwilz@nd.gov. 701 328-8100
Daniel Holli	Environmental specialist/Remediation plains pipeline, L.P. north Dakota Pipeline Assoc.	dholli@paalp.com 701-575-4254
Mary Senger	Burleigh Co Emergency Mgt	msenger@nd.gov 701-222-6727
LONNIE HOFFER	Div OF HomeLand Security	lhoffer@ND.gov 701 328-8100

North Dakota Enhanced State Multi-Hazard Mitigation Plan Workshop
Tuesday, November 6, 2007 from 10am – 3pm CST
Comfort Inn, 1030 East Interstate Avenue, Bismarck, North Dakota

Name	Title(s) and Organization(s)	E-mail and Phone Number
Bruce Frenge	WATER RESOURCE PROG. ADMIN ND STATE WATER COMMISSION	701 328 2759 flange@ND.GOV
Lee Klapprodt	Director Planning & Ed Division ND SWC	lklapprodt@nd.gov.
Jesse L Vollmer	Board Animal Health	328-2612 jlvollmer@nd.gov

State of North Dakota Multi-Hazard Mitigation Plan Stakeholder Meeting

National Energy Center for Excellence, Bismarck State College, Bismarck, North Dakota

March 3, 2010, 9:00-11:30 a.m.

Name	Title(s) & Organization(s)	E-mail or Mailing Address
Jon Kelsch	NDSWC	JKelsch@nd.gov
PATRICK FRIDGEN	ND STATE WAT. COMM.	pfridgen@nd.gov
DARIN LANGERUD	ND SWC	dlangerud@nd.gov
JULIE BAXTER	FEMA RVIII	julie.baxter@dhs.gov
Renee Loh	NDF A	renee@nfa.net
Kelly Casteel	ND SWC	Kcasteel@ND.gov
Mark Schrader	FHWA	Mark.Schrader@dot.gov
Dave Hartman	USBR	DHartman@USBR.gov
Pam Shrauger	Big Sky Hazard Management LLC	pam@bigskyhazards.com

State of North Dakota Multi-Hazard Mitigation Plan Stakeholder Meeting

National Energy Center for Excellence, Bismarck State College, Bismarck, North Dakota

March 3, 2010, 9:00-11:30 a.m.

Name	Title(s) & Organization(s)	E-mail or Mailing Address
Gene Buresh	Roosevelt-Custer Regional Council	bureshanooseveltcuster.com
Lonnie Hoffer	ND Dept of Emergency Services	lhoffer@ND.gov
Jason Johnston	ND Parks & Recreation	jjohnston@nd.gov
Sean Johnson	ND Div of Homeland Security	sjjohnson@nd.gov
Wally Kalmbach	ND Assoc. of RECs	wkalmbach@ndarec.com
Jeff Savadel	NOAA/National Weather Service	jeffrey.savadel@noaa.gov
Wade Nofziger	Mitigation Specialist FEMA Region 8, Denver	wade.nofziger@dhs.gov
Randy Ehlis	Emergency Management Plan Coordinator Bureau of Reclamation	Rehlis@usbr.gov

State of North Dakota Multi-Hazard Mitigation Plan Stakeholder Meeting

National Energy Center for Excellence, Bismarck State College, Bismarck, North Dakota

March 3, 2010, 9:00-11:30 a.m.

Name	Title(s) & Organization(s)	E-mail or Mailing Address
Linda Weispfenning	Planner - ND State Water Commission	lweispfenning@nd.gov
Fred Anderson	N.D. Geological Survey	fjanderson@nd.gov
Ray Morrell	Mitigation Specialist ND Dept of Emergency Services	rmorrell@nd.gov
Jeff Rotenberger	Energy Program Mgr. ND Dept of Commerce	jprotenberger@nd.gov
Matt Sagsveen	N.D. Attorney Gen. Office	masagsve@nd.gov.
Eric Pedersen	ND Highway Patrol	ejpeders@nd.gov
Janel Schmitz	American Red Cross	jschmitz@ndredcross.org

11 Nov 10 Stakeholder/ Public Meeting for State MHMP
0900-1100 ND Association of Counties

Name	Agency/Organization	E-Mail	Phone
Jason Johnston	ND Parks & Recreation	jjohnston@nd.gov	328-5376
Cherie Merrick	ND Dept of Emergency Svcs	cmerrick@nd.gov	328-8100
Lonnie Hoffer	ND DES	lhoffer@nd.gov	328-8100
Tom Claeys	ND Forest Service	thomas.claeys@ndsu.edu	328-9945
Sarah Tunge	ND Forest Service	sarah.tunge@ndsu.edu	228-4169
Pam Shrauger	Big Sky Hazard Mgmt	pam@bigskyhazards.com	406-581-4512
Ray Morrell	NDDES	rmorrell@nd.gov	328-8107
Sean M Johnson	NDDES	smjohnson@nd.gov	328-8265
Ken Yantes	ND Township Officers Assn	ken@ndtoa.com	701-655-3513
Jeanine Neiport	FEMA, Region VIII	jeanine.neiport@dhs.gov	303 854 7607
Kelly Casteel	ND SWC	kcasteel@nd.gov	701-328-2762
Patrick Fridgen	ND SWC	pfridgen@nd.gov	701-328-4964
Aaron Russell	ND DOH EPR	amrussell@nd.gov	328-9752
Bradley Fields	ND Aeronautics Commission	bdfields@nd.gov	328-8650
Brad Darr	ND DOT	bdarr@nd.gov	328 4443
Renee Loh	NDFA Exec Dir Firefighters	renee@ndfa.com	222-2799
John Paul Martin	~~NWS~~ NOAA - NWS	JOHN.PAUL.MARTIN@NOAA.GOV	250-4495
Rick Robinson	SEOC		
Tom	SEOC		
Brandon	SEOC		
Ray DeBoer	SEOC		
Deb Kantrud			
	Dept Mineral Resources		
Roger	Red River		
Mark	Mountrail		
Greg Wilz	NDDES		

WEBINAR

State of North Dakota Multi-Hazard Mitigation Plan, Stakeholder / Public Meeting

Wednesday, November 17, 2010 from 9 – 11 am CST

Webinar Attendees

Attendees			PIN
			-
Brandon Hoechst	(guest)	bhoechst@nd.gov	-
Cecily Fong	(guest)	cfong@nd.gov	-
David Hvinden	(guest)	dhvinden@nd.gov	-
Deb Kantrud	(guest)	dkantrud@scdrc.org	-
Don Johnson	(guest)	don.johnson@wbip.com	-
Luke Steen	(guest)	lukeds@mcleanelectric.com	-
Mark Holter	(guest)	mholter@mwec.com	-
Matthew Sagsveen	(guest)	masagsve@nd.gov	-
Monica Brusseau	(guest)	emplanner@nd.gov	-
Ray DeBoer	(guest)	rdeboer@nd.gov	-
Richard Robinson	(guest)	rnrobinson@nd.gov	-
Roger Rohrer	(guest)	rrohrer@grenergy.com	-
Tom Doering	(guest)	tdoering@nd.gov	-
			-

State of North Dakota Multi-Hazard Mitigation Plan Kickoff Meeting

Date: March 11, 2013
Time: 2:00 p.m.

Place: Bismarck Comfort Inn

This email is to invite you to the upcoming Hazard Mitigation Kick-Off Meeting scheduled for 2:00 p.m. Monday, March 11, 2013 at the Bismarck Comfort Inn. You are receiving this email either because you are currently a member of North Dakota State Hazard Mitigation Team or because you have been identified as a new committee member for this update cycle.

As you may know, the mitigation plan requires a broad spectrum of insights – ***including yours*** – to identify ways to minimize or eliminate the impacts of hazards on our fellow North Dakotans.

The State of North Dakota Multi-Hazard Mitigation Plan is a critical requirement for securing Federal Emergency Management Agency mitigation funding for the state of North Dakota. After an update in 2011, it is once again time to begin the plan update process to prevent a gap in Mitigation Plan coverage for North Dakota. The current plan is nearing the end of its three year life with an expiration date of March 2, 2014.

The North Dakota Department of Emergency Services, Division of Homeland Security, has taken the lead in updating this plan. The State has engaged a consultant, AMEC Environment and Infrastructure, to manage the planning project. AMEC will facilitate the planning process, collect the necessary data, and perform other technical services, including updating the risk assessment and plan document. However, NDDES and AMEC will need your insights as a subject matter expert to successfully complete this project.

The hazard mitigation planning process is heavily dependent on the participation of representatives from state and federal agencies, the public, and other stakeholder groups.

Your participation on the committee is requested due to your ability to contribute needed information, technical knowledge, or other valuable experience to the plan. We hope you will please plan to attend and/or designate a representative to attend the kickoff meeting, which will discuss the benefits of updating North Dakota's Multi-Hazard Mitigation Plan, the project schedule, and data needs from other agencies. The plan is posted on our website at the following location under Hazard Mitigation Toolbox: http://www.nd.gov/des/disaster/.

Please send respond to this e-mail by **Monday, March 4, 2013,** or contact Kathleen Donahue, N.D. Department of Emergency Services, at kdonahue@nd.gov, 701.328.8113 or 701.391.1225.

If you have any questions, problems or concerns please do not hesitate to call me at (701) 328-8259, or my email, lhoffer@nd.gov.

Sincerely,

Lonnie Hoffer, Disaster Recovery Chief
N.D. Department of Emergency Services

State Multi-Hazard Mitigation Plan Update:
Project Kickoff Meeting

Comfort Inn
1030 E. Interstate Avenue, Bismarck ND 58503
Monday, March 11, 2013, 2:00 p.m.

Welcome	Greg Wilz, Director Division of Homeland Security, N.D. Department of Emergency Services (NDDES)
Introductions	Lonnie Hoffer, Disaster Recovery Chief Division of Homeland Security, NDDES
Overview of the Disaster Mitigation Act of 2000 Planning Requirements	Jeff Brislawn, Hazard Mitigation Lead/Associate AMEC Environment and Infrastructure, Hazard Mitigation and Emergency Management Program
Plan Update Objectives and Timeline	Jeff Brislawn
Solid Foundation for Updates: North Dakota's History of Planning Put into Progress	Lonnie Hoffer, Disaster Recovery Chief Division of Homeland Security, NDDES
Role and Structure of the Hazard Mitigation Planning Committees	Kathleen Donahue, Deputy Chief Division of Homeland Security NDDES
Hazard Identification Update ■ Hazards and rankings ■ Notable events since the last update ■ Key data sources to be utilized ■ Roll-up of local and tribal plans	Jeff Brislawn Kari Valentine, CFM, Mitigation Planner AMEC Environment and Infrastructure
Data Collection Needs	Kari Valentine
Next Steps	Lonnie Hoffer

North Dakota Multi-Hazard Mitigation Team Meeting – Kick-Off Meeting SIGN-In Sheet

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Adnan	Akyuz	North Dakota State University	adnan.akyuz@ndsu.edu	701.231.6577	
Gary	Allen	Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	garya@nplains.com	701.968.1749	
Fred	Anderson	N.D. Department of Mineral Resources	fjanderson@nd.gov	701.328.8037	
Mike	Anderson	N.D. Housing Finance Authority (NDHFA)	maanders@ndhfa.org	701.328.8050	
Karen	Assel	N.D. Parks and Recreation Department	kassel@nd.gov	701.328.5356	
Art	Bakke	N.D. Information Technology Department	ambakke@nd.gov	701.328.1985	
Joanne	Beckman	Minot State University	joanne.beckman@minotstateu.edu	701-224-2614	
Jeff	Bitz	N.D. Insurance Department	jbitz@nd.gov	701.328.9606	
Joel	Boesflug	City of Bismarck	jboespfl@nd.gov	701.355.1423	
Jon	Boyle	Division of Facilities Management	jaboyle@nd.gov	701.328.4002	
Dane	Braun	N.D. Department of Agriculture	danebraun@nd.gov	701.328.4764	
Jeff	Brislawn	AMEC Environment and Infrastructure	jeff.brislawn@amec.com	303-820-4654	
Amy	Anton	NDDES	ajanton@nd.gov	328-8124	
Steve S.	[illegible]	NDJAC	[illegible]	328-2406	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Beth	Carlson	N.D. Division of Animal Health	bwcarlson@nd.gov	701.328.2653	
Kelly	Casteel	SWC	kcasteel@nd.gov	701.328.2762	
Tom	Claeys	N.D. Forest Service	thomas.claeys@ndsu.edu	701.328.9945	Tom Claeys
Brad	Darr	N.D. Department of Transportation	bdarr@nd.gov	701.328.4443	Brad Darr
Paul	Davis	N.D. Association of Rural Electrical Cooperatives	pdavis@ndarec.com	701.667.6423	P Davis
Scott	Davis	N.D. Indian Affairs Commission	sjdavis@nd.gov	701.328.2432	
Ray	DeBoer	NDDES, Division of Homeland Security	rdeboer@nd.gov	701.328.8112	Ray DeBoer
Steve	Dirksen	Fargo Fire Department	sdirksen@cityoffargo.com	701.241.8137	Steve Dirksen
Steve	Dyke	Game and Fish Department	sdyke@nd.gov	328.6347	Steve Dyke
Kathleen	Donahue	NDDES, Division of Homeland Security	kdonahue@nd.gov	701.328.8113	Kathleen Donahue
Shirley	Dykshoorn	Lutheran Disaster Response	sdykshoorn@lssnd.org	701.429.4730	Shirley Dykshoorn
Jess	Earle	NDDES, Division of Homeland Security	jearle@nd.gov	701.328.8115	J Earle
Randy	Ehlis	U.S. Bureau of Reclamation	rehlis@usbr.gov	221-1283 / ~~701.250.4242~~	Randy Ehlis

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Bruce	Engelhardt	N.D. State Water Commission (SWC)	bengelhardt@nd.gov	701.328.4958	
Curt	Erickson	NDDoH	cerickso@nd.gov	701.328.5160	
Tim	Fay	N.D. State Water Commission (SWC)	tfay@nd.gov	701.328.4956	
Pat	Flanagan	81st Civil Support Team N.D. National Guard	patrick.r.flanagan.mil@mail.mil	701.333.6902	
Fred	Frederickson	North Dakota Stockmen's Association	N/A	701.290.3993	
Pat	Fridgen	SWC	pfridgen@nd.gov	701.328.4964	
Mike	Gerhardt	N.D. Highway Patrol	mtgerhart@nd.gov	701.328.1875	
L. David	Glatt	N.D. Department of Health	dglatt@nd.gov	701.328.5152	
Jon	Godfread	Greater North Dakota Chamber	jon@ndchamber.com	701.222.0929	
Doug	Goehring	N.D. Department of Agriculture	goehring@nd.gov	701.328.2231	
Karen	Goff	SWC	kgoff@nd.gov	701.328.4953	
Paul	Govig	N.D. Department of Commerce, Division of Community Services	pgovig@nd.gov	702.328.4499	
Lonnie	Grabowska	N.D. Bureau of Criminal Investigation (BCI)	lgrabowska@nd.gov	701.328.5500	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Rebecca	Haag	N.D. League of Cities	becky@ndlc.org	701.223.3518	Rebecca Haag
Gary	Haberstroh	NDDoH	ghaberst@nd.gov	701.328.5206	Gary Haberstroh
Kirk	Hagel	NDDES, Division of Homeland Security	kihagel@nd.gov	701.328.8168	
Mike	Hall	SWC	mihall@nd.gov	701.328.4971	
Mike	~~Hallesey~~ Hallesy	Williams County	mikeh@co.williams.nd.us	701.577.7707	Mike Hallesy
Stephen	Herda	N.D. National Guard	stephen.herda@us.army.mil	701.333.2070	
David	Hirsch	U.S. Animal Plant and Health Inspection Services (APHIS)	david.c.hirsch@aphis.usda.gov	701.250,4473	D Hirsch
Lonnie	Hoffer	NDDES, Division of Homeland Security	lhoffer@nd.gov	701.328.8259	Lonnie D. Hoffer
Laura	Horner	SWC	~~lauramhorner@nd.gov~~ lmhorner@nd.gov	701.328.2759	Laura Horner
Bob	Humann	Bank of North Dakota	bhumann@nd.gov	701.328.5703	
Dave	Hvinden	N.D. Department of Mineral Resources	dhvinden@nd.gov	701.328.8027	
Judd	Jasmer	N.D. Game and Fish Department	jjasmer@nd.gov	701.227.7431	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
		for Oil and Gas			
Debbie	LaCombe	NDDES, Division of Homeland Security	dlacombe@nd.gov	701.328.8119	
Ray	Lambert	N.D. Fire Marshal	rlambert@nd.gov	701.328.5555	for
Darin	Langerud	SWC	dlangerud@nd.gov	701.328.4751	
Larry	Lee	N.D. Information Technology Department	lalee@nd.gov	701.328.2721	Larry Q Lee
Ben	Leingang	State and Local Intelligence Center (Bureau of Criminal Investigation)	BL439@nd.gov	701.328.8171	
Greg	Link	N.D. Game and Fish Department	glink@nd.gov	701.328.6331	
Renee	Loh	N.D. Firefighters Association	renee@ndfa.net	701.222.2799	
Mike	Lynk	NDDES, Division of State Radio	mlynk@nd.gov	701.328.8150	
Justin	Messner	NDDES, Division of Homeland Security	jmessner@nd.gov	701.328.8255	
Paul	Messner	NDDES, Division of Homeland Security	pmessner@nd.gov	701.328.8115	Paul Messner
Stan	Misek	North Dakota Stockmen's Association	smisek@ndstockmen.org	701.223.2522	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Sean	Johnson	NDDES, Division of Homeland Security	smjohnson@nd.gov	701.328.8265	
Jason	Johnston	N.D. Parks and Recreation Department	jjohnston@nd.gov	701.328.5376	
Deb	Kantrud	South Central Dakota Regional Council	dkantrud@scdrc.org	701.952.8060	
Susan	Keller	N.D. Division of Animal Health		701.328.2657	
Jon	Kelsch	SWC	jkelsch@nd.gov	701.328.4948	
Karen	Kempert	Cavalier County	kkempert@nd.gov	701.256.3911	
Corey	King	National Weather Service	corey.king@noaa.gov	701.250.4495	
Jeff	Klein	SWC	jjklein@nd.gov jklein@nd.gov	701.328.4898	JEFF KLEIN
Bryan	Klipfel	Workforce Safety and Insurance	bklipfel@nd.gov	701.328.6024	
Rob	Knuth	N.D. Firefighters Association	rob@ndfa.net	701.222.2799	
Mark	Koenig	U.S. Army Corps of Engineers	mark.e.koenig@usace.army.mil	651.290.5205	
Russ	Korzeniewski	N.D. Department of Human Services	rkorzeniewski@nd.gov	701.328.4190	
Bethany	Kurz	University of North Dakota, Environmental Research Center	bkurz@undeerc.org	701.777.5050	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Melanie	Moen	American Red Cross	melanie.moen@redcross.org	701.223.6700	
Tim	Morris	Wal-Mart-North Bismarck	morris41504@~~hotmail.com~~ msn.com	701-226-9789 ~~701.323.05[illegible]~~	
Steve	Parker	U.S. Bureau of Reclamation	sparker@usbr.gov	605.394.9757, ext. 3013	
Brady	Pelton	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	brady.pelton@midconetwork.com	701.260.2479	
Stephen	Pickard	NDDoH	spickard@nd.gov	701.328.2365	
Mark	Quire	N.D. National Guard	mark.a.quire.mil@mail.mil	701.333.6901	
Scott	Radig	NDDoH	sradig@nd.gov	701.328.5158	
Ryan	Rauschenberger	Office of the Tax commissioner	rarauchenberger@nd.gov	701.328.8035	
Dennis	Reep	Natural Resources Conservation Service	dennis.reep@nd.usda.gov	701.530.2091	
Nick	Renna	Federal Highway Administration	nicholas.renna@dot.gov	701.250-4343 ext. 112	
Kris	Roberts	NDDoH	kroberts@nd.gov	701.328.5236	
Steve	Robinson	U.S. Geological Survey	srobinson@usgs.gov	701.250.7404	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Christy	Roemmich	N.D. Association of Rural Electric Cooperatives	croemmich@ndarec.com	701.667.6410	Christy Roemmich
Sandy	Rohde	Dunn County	sandy.rohde@dunncounty.nd.org	701.573.4609	Sandy Rohde
Don	Ronsberg	U.S. Department of Homeland Security	donald.ronsberg@hq.dhs.gov ~~don~~.ronsberg@dhs.gov	701.516.3940	D. Ronsberg
Jeff	Rotenberger	N.D. Department of Commerce	jprotenberger@nd.gov	701.328.4137	[illegible]
Maure	Sand	U.S. Forest Service	msand@fs.fed.us	701.250.4443	Maure Sand
Jeff	Savadel	National Weather Service	ray jeff.savadel@noaa.gov	701.250.4495	[illegible]
Jeana	Scheffler	Burleigh County	jscheffler@nd.gov	701.222.6727	[illegible]
Mark	Schrader	Federal Highway Administration	mark.schrader@dot.gov	701.250.4343, Ext. 111	
Donald	Schwertz	North Dakota State University	donald.schwert@ndsu.edu	701.231.7496	
Jim	Semerad	NDDoH	jsemerad@nd.gov	701.328.5179	
Brad	Smith	State and Local Intelligence Center (Highway Patrol)	btsmith@nd.gov	701.328.8169	Brady T. Smith
Connie	Sprynczynatyk	N.D. League of Cities	connie@ndlc.org	701.223.3518	
Ron	Staiger	Bismarck Civic Center	rstaiger@nd.gov	701.355.1381	Ron Staiger

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North Dakota Multi-Hazard Mitigation Team Meeting – Kick-Off Meeting SIGN-In Sheet

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Vicky	Steiner	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	vsteiner@ndsupernet.net	701.290.1339	
Kevin	Stewart	North Dakota Safety Council	kevins@ndsc.org	701.751.6107	[signature]
Gary	Stockert	City of Bismarck	gstockert@nd.gov	701.255.5212	[signature]
Larry	TABORSKY ~~Taborksy~~	N.D. Aeronautics Commission	ltaborsky@nd.gov	701.328.9650	[signature]
Larry	Thelen	NDDoH	lthelen@nd.gov	701.328.5257	
Kim	Thomas	U.S. Army Corps of Engineers	kimberly.s.thomas@usace.army.mil	402.995.2448	
Steve	Tillotson	NDDoH	stillots@nd.gov	701.328.5163	[signature]
Jon	Tonneson	NDDES, Division of Homeland Security	jtonneson@nd.gov	701.328.8120	[signature]
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Kathleen	Tweeten	North Dakota State University Extension Service	kathleen.tweeten@ndsu.edu	701.328.9718	
Kari	Valentine	AMEC Environment and Infrastructure	kari.valentine@amec.com	816.436.6351	Kari Valentine

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM MEETING – KICK-OFF MEETING SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Kick-off Meeting	**Meeting Date/Time:** March 11, 2013, 2:00 pm
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last Name	Department/Agency	Email	Phone #	Signature
Jesse	Vollmer	N.D. Division of Animal Health	jlvollmer@nd.gov	701.328.2612	
April	Walker	City of Fargo	awalker@cityoffargo.com	701.241.1554	April Walker
Linda	Weispfenning	SWC	lweispfenning@nd.gov	701.328.4976	
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Ken	Yantes	NDTOA	Ken@NDTOA.com	701-250-4118	Ken Yantes
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Kari	Herrick	ND Ag Dept	kherrick@nd.gov	(701)328-4760	

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State Multi-Hazard Mitigation Plan Update:
Planning Meeting #2: Updating the Risk Assessment and Plan Goals
Comfort Inn
1030 E. Interstate Avenue, Bismarck ND 58503
Wednesday, June 5, 2013, 8:30 to 11:30 a.m.

Welcome	Greg Wilz, Director Division of Homeland Security, N.D. Department of Emergency Services (NDDES)
Introductions	Lonnie Hoffer, Disaster Recovery Chief Division of Homeland Security, NDDES
Brief Review of the Disaster Mitigation Act of 2000 Planning Requirements	Jeff Brislawn, CFM, Hazard Mitigation Lead/Associate AMEC Environment and Infrastructure, Hazard Mitigation and Emergency Management Program
Risk Assessment Update	Jeff Brislawn Laurie Bestgen, CFM, Mitigation Planner AMEC Environment and Infrastructure
Updating Plan Goals	Laurie Bestgen
Introduction of Update to Mitigation Initiatives	Laurie Bestgen
Next Steps	Jeff Brislawn Kathleen Donahue, Deputy Chief, Recovery and Mitigation Division of Homeland Security, NDDES

NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2				**Meeting Date/Time:** June 5, 2013, 8:30 to 11:30 pm		
Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC				**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND		
First	**Last**	**Title**	**Agency**	**Office, Cell**	***E-Mail***	**Signature**
Dr. Adnan	Akyuz	State Climatologist	North Dakota State University	701.231.6577, 701.799.3635	adnan.akyuz@ndsu.edu	
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Fred	Anderson	GeoTech Support Staff Officer	N.D. Department of Mineral Resources	701.328.8037	fjanderson@nd.gov	
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Jeff	Bitz	Administrator, Fire and Tornado Fund	N.D. Insurance Department	701.328.9606	jbitz@nd.gov	[signature]
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2				Meeting Date/Time: June 5, 2013, 8:30 to 11:30 pm		
Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC				**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND		
First	**Last**	**Title**	**Agency**	**Office, Cell**	***E-Mail***	**Signature**
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

Meeting Date/Time: June 5, 2013, 8:30 to 11:30 pm

Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Major Pat	Flanagan	Deputy Commander of Civil Support Team	N.D. National Guard, 81st Civil Support Team	701.333.6902	patrick.r.flanagan.mil@mail.mil	
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2				**Meeting Date/Time:** June 5, 2013, 8:30 to 11:30 pm		
Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC				**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND		
First	**Last**	**Title**	**Agency**	**Office, Cell**	***E-Mail***	**Signature**
Mike	Hall	Silver Jackets Coordinator	SWC	701.328.4971	mihall@nd.gov	[signature]
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Bob	Humann	Senior Vice President and Chief Lending Officer	Bank of North Dakota	701.328.5703	bhumann@nd.gov	
CPT Dave	Jablonsky	Operations Officer	N.D. National Guard, 81st Civil Support Team	701.290.0660	david.m.jablonsky.mil@mail.mil	
Sean	Johnson	Plans Officer	NDDES, Division of Homeland Security	701.328.8265	smjohnson@nd.gov	
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Jon	Kelsch	Chief, Design and Operations	SWC	701.328.4948	jkelsch@nd.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET						
Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2				**Meeting Date/Time:** June 5, 2013, 8:30 to 11:30 pm		
Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC				**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND		
First	**Last**	**Title**	**Agency**	**Office, Cell**	***E-Mail***	**Signature**
Corey	King	Emergency Response Specialist	National Weather Service	701.250.4495	corey.king@noaa.gov	
Jeff	Klein	National Flood Insurance Program (NFIP) Coordinator	SWC	701.328.4898	jjklein@nd.gov	
Bryan	Klipfel	Director	Workforce Safety and Insurance	701.328.6024	bklipfel@nd.gov	Bryan Klipfel
Rob	Knuth	Training Manager	N.D. Firefighters Association	701.222.2799	rob@ndfa.net	
Mark	Koenig	Emergency Manager, St. Paul District	U.S. Army Corps of Engineers	651.290.5205	mark.e.koenig@usace.army.mil	
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Bethany	Kurz	Senior Research Manager	University of North Dakota, Environmental Research Center for Oil and Gas	701.777.5050	bkurz@undeerc.org	
Debbie	LaCombe	Grants and Training Chief	NDDES, Division of Homeland Security	701.328.8119	dlacombe@nd.gov	Debbie LaCombe
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Larry	Lee	Contingency Planner	N.D. Information Technology Department	701.328.2721	lalee@nd.gov	Larry D Lee
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

Meeting Date/Time: June 5, 2013, 8:30 to 11:30 pm

Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Renee	Loh	Executive Director	N.D. Firefighters Association	701.222.2799	renee@ndfa.net	
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Paul	Messner	State Hazard Mitigation Officer	NDDES, Division of Homeland Security	701.328.8115	pmessner@nd.gov	Paul Messner
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Melanie	Moen	Emergency Services Director	American Red Cross	701.223.6700	melanie.moen@redcross.org	
Tim	Morris	Store Manager	Wal-Mart-North Bismarck	701.226.9789	morris41504@hotmail.com	
Steve	Parker	Safety and Security Director	U.S. Bureau of Reclamation	605.394.9757, ext. 3013	sparker@usbr.gov	
Brady	Pelton	Deputy Executive Director	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	701.260.2479	brady.pelton@midconetwork.com	[signature]
Dr. Stephen	Pickard	Career Epidemiology Field Officer	NDDoH	701.328.2365	spickard@nd.gov	[signature]
LTC Mark	Quire	Commander of the Civil Support Team	N.D. National Guard, 81st Civil Support Team	701.333.6901	mark.a.quire.mil@mail.mil	
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

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Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Ryan	Rauschenberger	Deputy Tax Commissioner	Office of the Tax Commissioner	701.328.8035	rarauschenberger@nd.gov	Ryan Rauschenberger
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Nick	Renna	Safety/Traffic Ops/ITS Engineer	Federal Highway Administration	701.250-4343 ext. 112	nicholas.renna@dot.gov	[illegible]
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Steve	Robinson	Surveillance Chief	U.S. Geological Survey	701.250.7404	smrobins@usgs.gov	[illegible]
Christy	Roemmich	Safety Coordinator	N.D. Association of Rural Electrical Cooperatives	701.667.6410	croemmich@ndarec.com	
Sandy	Rohde	Planning & Zoning Administrator	Dunn County	701.573.4609	sandy.rohde@dunncountynd.org	Sandy Rohde
Don	Ronsberg	Protective Security Advisor	U.S. Department of Homeland Security	701.516.3940	donald.ronsberg@hq.dhs.gov	
Jeff	Rotenberger	Energy Assurance Program Manager	N.D. Department of Commerce	701.328.4137	jprotenberger@nd.gov	[illegible]
Maure	Sand	Fire Management Officer	U.S. Forest Service	701.250.4443	msand@fs.fed.us	
Jeffrey	Savadel	Meteorologist-in-Charge	National Weather Service	701.250.4495	jeffrey.savadel@noaa.gov	[illegible]
Mark	Schrader	Environmental and Right-of-Way Engineer	Federal Highway Administration	701.250.4343, Ext. 111	mark.schrader@dot.gov	
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

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Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Jim	Semerad	Air Quality, Manager Permitting and Compliance	NDDoH	701.328.5179	jsemerad@nd.gov	
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Vicky	Steiner	Executive Director	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	701.290.1339	vsteiner@ndsupernet.net	
Kevin	Stewart	First Aid Coordinator	North Dakota Safety Council	701.751.6107	kevins@ndsc.org	
Gary	Stockert	Emergency Manager	City of Bismarck	701.255.5212	gstockert@nd.gov	[signature]
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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #2 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

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Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
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Spencer	Wagner	Fertilizer Specialist	N.D. Department of Agriculture	701.328.1508	wagner@nd.gov	
April	Walker	City Engineer	City of Fargo	701.241.1554	awalker@cityoffargo.com	
Jerry	Weigel	Fisheries Production & Development Section Leader	N.D. Game and Fish Department	701.220.5342	jweigel@nd.gov	
Linda	Weispfenning	Planner	SWC	701.328.4967	lweispfenning@nd.gov	[illegible]
Gregg	Wiche	Director, USGS Water Science Center	U.S. Geological Survey	701.250.7401	gjwiche@usgs.gov	
Tim	Wiedrich	Director, Emergency Preparedness and Response	N.D. Department of Health (NDDoH)	701.328.4520, 701.328.2270	twiedric@nd.gov	[illegible]
Jeb	Williams	Assistant Wildfire Chief	N.D. Game and Fish Department	701.328.6686	jwilliams@nd.gov	
Greg	Wilz	Director	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	701.328.8100	gwilz@nd.gov	
Ken	Yantes	Secretary/Director of Governmental Relations	North Dakota Township Officers Association	701.230.4118	ken@ndtoa.com	Ken Yantes
Michael	Ziesch	Labor Market Information Manager	North Dakota Job Service	701.328.2888	mziesch@nd.gov	[illegible]

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North Dakota Multi-Hazard Mitigation Team – Planning Meeting #2 SIGN-IN Sheet

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #2

Meeting Date/Time: June 5, 2013, 8:30 to 11:30 pm

Facilitators: Jeff Brislawn & Laurie Bestgen, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	*E-Mail*	Signature
Steve	Zimmer	Senior City Planner, Past President of the North Dakota Planning Association	City of West Fargo	701.433.5320	steven.zimmer@westfargond.gov	
Jared	Huibregtse	Intern DES	NDDES			
Gary	Simmons	DES	NDDES			
[illegible]	[illegible]	D.	ND DES			
Deb	Kantrud	EX DIR SCDRC				
Doug	Myers	Deputy State Fire Marshall	ND Fire Marshall	328-5555	DLMYERS@ND.GOV	
Jomine	Weispert	HM & Specialist [illegible]	FEMA	303-854-7607		
[illegible]						
Karen	Kempert	Emergency Mgr	Cavalier Co	701 370-2087		K Kempert
Brenda	Vossler	TE Officer ~~DES~~	DES			
Jenny	Gomke	Case Mgr.	LDR	701-271-3288		Jenny Gomke

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State Multi-Hazard Mitigation Plan Update
Planning Meeting #3: Mitigation Strategy
Comfort Inn
1030 E. Interstate Avenue, Bismarck ND 58503
Tuesday, July 16, 2013, 8:30 to 11:30 a.m.

Welcome	Greg Wilz, Director Division of Homeland Security, N.D. Department of Emergency Services (NDDES)
Introductions	Lonnie Hoffer, Disaster Recovery Chief Division of Homeland Security, NDDES
Brief Review of Planning Process and Risk Assessment Key Issues	Jeff Brislawn, CFM, Hazard Mitigation Lead/Associate AMEC Environment and Infrastructure
Capability Assessment Update	Kari Valentine, CFM, Mitigation Planner AMEC Environment and Infrastructure
Updating Plan Goals	Kari Valentine/Jeff Brislawn
Update to Mitigation Initiatives	Kari Valentine/Jeff Brislawn
Mitigation Initiatives Work Session	Group Process
Public Survey	Kathleen Donahue, Deputy Chief, Recovery and Mitigation Division of Homeland Security, NDDES
Funding Sources and Plan Maintenance Update	Jeff Brislawn
Next Steps	Jeff Brislawn Kathleen Donahue

NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Dr. Adnan	Akyuz	State Climatologist	North Dakota State University	701.231.6577, 701.799.3635	adnan.akyuz@ndsu.edu	
Leonard	Alberts	Civil Engineer and Regional Safety of Dams Officer	Bureau of Indian Affairs	605.226.7621	Leonard.Alberts@bia.gov	
Gary	Allen	Manager of Engineering	Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative	701.968.1749	garya@nplains.com	Gary Allen
Fred	Anderson	GeoTech Support Staff Officer	N.D. Department of Mineral Resources	701.328.8037	fjanderson@nd.gov	
Mike	Anderson	Executive Director	N.D. Housing Finance Authority (NDHFA)	701.328.8050	maanders@ndhfa.org	
Amy	Anton	Operations and Planning Chief	NDDES, Division of Homeland Security	701.328.8124	ajanton@nd.gov	
Will	Arwood	HMA Specialist	FEMA			[illegible]
Karen	Assel	Assistant Field Manager	N.D. Parks and Recreation	701.328.5356	kassel@nd.gov	
Art	Bakke	Enterprise Information Security Administrator	N.D. Information Technology Department	701.328.1985	ambakke@nd.gov	
Jeff	Bitz	Administrator, Fire and Tornado Fund	N.D. Insurance Department	701.328.9606	jbitz@nd.gov	
Joel	Boesflug	Fire Chief	City of Bismarck	701.355.1423	jboespfl@nd.gov	
Jon	Boyle	Director	Division of Facilities Management	701.328.4002	jaboyle@nd.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3	**Meeting Date/Time:** July 16, 2013, 8:30 to 11:30 am
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Dr. Beth	Carlson	Assistant State Veterinarian	N.D. Division of Animal Health	701.328.2653	bwcarlson@nd.gov	
Kelly	Casteel	Water Resource Engineer Manager	SWC	701.328.2762	kcasteel@nd.gov	
Tom	Claeys	Forestry and Fire Management Team Leader	N.D. Forest Service	701.328.9945	thomas.claeys@ndsu.edu	
Brad	Darr	State Maintenance Engineer	N.D. Department of Transportation	701.328.4443	bdarr@nd.gov	Brad Darr
Paul	Davis	Safety Director	N.D. Association of Rural Electrical Cooperatives	701.667.6423	pdavis@ndarec.com	
Scott	Davis	Director	N.D. Indian Affairs Commission	701.328.2432	sjdavis@nd.gov	
Ray	DeBoer	Coordinator, Haz-Chem Prepared and Response Program	NDDES, Division of Homeland Security	701.328.8112	rdeboer@nd.gov	Ray DeBoer
Steve	Dirksen	Fire Chief	Fargo Fire Department	701.241.8137	sdirksen@cityoffargo.com	
Kathleen	Donahue	Deputy Chief, Recovery and Mitigation	NDDES, Division of Homeland Security	701.328.8113, 701.391.1225	kdonahue@nd.gov	Kathleen Donahue
Shirley	Dykshoorn	Director	Lutheran Disaster Response	701.429.4730	sdykshoorn@lssnd.org	
Jess	Earle	Mitigation Specialist	NDDES, Division of Homeland Security	701.328.8115	jearle@nd.gov	J Earle
Randy	Ehlis	Emergency Action Plan Coordinator	U.S. Bureau of Reclamation	701.221.1283	rehlis@usbr.gov	
Bruce	Engelhardt	Director of Water Development	N.D. State Water Commission (SWC)	701.328.4958	bengelhardt@nd.gov	

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North Dakota Multi-Hazard Mitigation Team – Planning Meeting #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Curt	Erickson	Manager of the Hazardous Waste Program	NDDoH	701.328.5160	cericksо@nd.gov	Curt Erickson
Tim	Fay	Head of Investigations Sections	N.D. State Water Commission (SWC)	701.328.4956	tfay@nd.gov	
Major Pat	Flanagan	Deputy Commander of Civil Support Team	N.D. National Guard, 81st Civil Support Team	701.333.6902	patrick.r.flanagan.mil@mail.mil	
Fred	Frederickson	East River Fieldman	North Dakota Stockmen's Association	701.290.3993	N/A	
Pat	Fridgen	Division Director, Planning and Education	SWC	701.328.4964	pfridgen@nd.gov	[illegible]
Major Mike	Gerhart	Field Operations Director	N.D. Highway Patrol	701.328.1875	mtgerhart@nd.gov	[illegible]
L. David	Glatt	Chief, Environmental Health Section	N.D. Department of Health	701.328.5152	dglatt@nd.gov	
Jon	Godfread	Vice President for Government Affairs	Greater North Dakota Chamber	701.222.0929	jon@ndchamber.com	
Doug	Goehring	Agriculture Commissioner	N.D. Department of Agriculture	701.328.2231	goehring@nd.gov	
Karen	Goff	Dam Safety Engineer	N.D. State Water Commission (SWC)	701.328.4953	kgoff@nd.gov	Karen Goff
Jenny	Gomke	Case Manager	LDR			
Paul	Govig	Director	N.D. Department of Commerce, Division of Community Services	702.328.4499	pgovig@nd.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Lonnie	Grabowska	Deputy Director	N.D. Bureau of Criminal Investigation (BCI)	701.328.5500	lgrabowska@nd.gov	[signature]
Rebecca	Haag	Member Services Manager	N.D. League of Cities	701.223.3518	becky@ndlc.org	
Gary	Haberstroh	Environmental Engineer	NDDoH	701.328.5206	ghaberst@nd.gov	[signature]
Kirk	Hagel	CI/KR Program Manager & Security Manager	NDDES, Division of Homeland Security	701.328.8168	kihagel@nd.gov	
Mike	Hall	Silver Jackets Coordinator	SWC	701.328.4971	mihall@nd.gov	[signature]
Mike	Hallesy	Emergency Manager	Williams County	701.577.7707	mikeh@co.williams.nd.us	[signature]
Stephen	Herda	Lieutenant Colonel	N.D. National Guard	701.333.2070	stephen.herda@us.army.mil	
Kari	Herrick	Policy Analyst and Public Information Specialist	N.D. Department of Agriculture	701.328.4766	kherrick@nd.gov	[signature]
David	Hirsch	State Plant Health Director	U.S. Animal Plant and Health Inspection Services (APHIS)	701.250,4473, 701.527.7820	david.c.hirsch@aphis.usda.gov	[signature]
Lonnie	Hoffer	Disaster Recovery Chief	NDDES, Division of Homeland Security	701.328.8259, 701.400.1602	lhoffer@nd.gov	[signature]
Laura	Horner	Water Resource Program Administrator	SWC	701.328.2759	lmhorner@nd.gov	
Bob	Humann	Senior Vice President and Chief Lending Officer	Bank of North Dakota	701.328.5703	bhumann@nd.gov	

NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project:
North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators:
Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
CPT Dave	Jablonsky	Operations Officer	N.D. National Guard, 81st Civil Support Team	701.290.0660	david.m.jablonsky.mil@mail.mil	
Ken	Jarolimek		Wenck Associates			
Ann	Jenks	State Archivist	State Historical Society of North Dakota			
Sean	Johnson	Plans Officer	NDDES, Division of Homeland Security	701.328.8265	smjohnson@nd.gov	
Jason	Johnston	Project Manager	N.D. Parks and Recreation Department	701.328.5376	jjohnston@nd.gov	
Deb	Kantrud	Executive Director				
Dr. Susan	Keller	State Veterinarian	N.D. Division of Animal Health	701.328.2657	skeller@nd.gov	
Jon	Kelsch	Chief, Design and Operations	SWC	701.328.4948	jkelsch@nd.gov	
Corey	King	Emergency Response Specialist	National Weather Service	701.250.4495	corey.king@noaa.gov	Cy King
Jeff	Klein	National Flood Insurance Program (NFIP) Coordinator	SWC	701.328.4898	jjklein@nd.gov	
~~Bryan~~ Curt	~~Klipfel~~ Zimmerman	~~Director~~ Facility Director	Workforce Safety and Insurance	701.328.6024	bklipfel@nd.gov	
Rob	Knuth	Training Manager	N.D. Firefighters Association	701.222.2799	rob@ndfa.net	
Mark	Koenig	Emergency Manager, St. Paul District	U.S. Army Corps of Engineers	651.290.5205	mark.e.koenig@usace.army.mil	

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North Dakota Multi-Hazard Mitigation Team – Planning Meeting #3 Sign-In Sheet

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Russ	Korzeniewski	Disaster Preparedness Administrator/Risk Manager	N.D. Department of Human Services	701.328.4190	rkorzeniewski@nd.gov	[signature]
Bethany	Kurz	Senior Research Manager	University of North Dakota, Environmental Research Center for Oil and Gas	701.777.5050	bkurz@undeerc.org	
Debbie	LaCombe	Grants and Training Chief	NDDES, Division of Homeland Security	701.328.8119	dlacombe@nd.gov	Debbie LaCombe
Ray	Lambert	Fire Marshal	N.D. Fire Marshal	701.328.5555	rlambert@nd.gov	
Darin	Langerud	Director, Atmospheric Resource Board	SWC	701.328.4751	dlangerud@nd.gov	D. Langerud
Larry	Lee	Contingency Planner	N.D. Information Technology Department	701.328.2721	lalee@nd.gov	Larry D Lee
Ben	Leingang	Director	State and Local Intelligence Center (Bureau of Criminal Investigation)	701.328.8171	BL439@nd.gov	
Renee	Loh	Executive Director	N.D. Firefighters Association	701.222.2799	renee@ndfa.net	Renee Loh
Mike	Lynk	Director	NDDES, Division of State Radio	701.328.8150	mlynk@nd.gov	
Lorna	Meidinger	Architechural Historian	State Historical Society of North Dakota	701.328.2089	lbmeidinger@nd.gov	
Justin	Messner	Mitigation Specialist	NDDES, Division of Homeland Security	701.328.8255	jmessner@nd.gov	Justin Messner

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3	**Meeting Date/Time:** July 16, 2013, 8:30 to 11:30 am
Facilitators: Jeff Brislawn & Kari Valentine, AMEC	**Place/Room:** Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Paul	Messner	State Hazard Mitigation Officer	NDDES, Division of Homeland Security	701.328.8115	pmessner@nd.gov	Paul Messner
Stan	Misek	Chief Brand Inspector	North Dakota Stockmen's Association	701.223.2522	smisek@ndstockmen.org	
Melanie	Moen	Emergency Services Director	American Red Cross	701.223.6700	melanie.moen@redcross.org	
Tim	Morris	Store Manager	Wal-Mart-North Bismarck	701.226.9789	morris41504@hotmail.com	
Doug	Myers	Deputy State Fire Marshal	ND Fire Marshal	701.328.5553	dlmyers@nd.gov	
Jeanine	Neipert	HMA Specialist	FEMA	303 854 7207	jneipert@fema.dhs.gov	[illegible]
Steve	Parker	Safety and Security Director	U.S. Bureau of Reclamation	605.394.9757, ext. 3013	sparker@usbr.gov	
Brady	Pelton	Deputy Executive Director	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	701.260.2479	brady.pelton@midconetwork.com	[illegible]
Dr. Stephen	Pickard	Career Epidemiology Field Officer	NDDoH	701.328.2365	spickard@nd.gov	[illegible]
LTC Mark	Quire	Commander of the Civil Support Team	N.D. National Guard, 81st Civil Support Team	701.333.6901	mark.a.quire.mil@mail.mil	
Scott	Radig	Director, Waste Management Director	NDDoH	701.328.5158	sradig@nd.gov	
Ryan	Rauschenberger	Deputy Tax Commissioner	Office of the Tax Commissioner	701.328.8035	rarauschenberger@nd.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project:
North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators:
Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Dennis	Reep	State Conservation Engineer	Natural Resources Conservation Service	701.530.2091	dennis.reep@nd.usda.gov	
Nick	Renna	Safety/Traffic Ops/ITS Engineer	Federal Highway Administration	701.250-4343 ext. 112	icholas.renna@dot.gov	
Kris	Roberts	Oil Field Response Geologist	NDDoH	701.328.5236	kroberts@nd.gov	
Steve	Robinson	Surveillance Chief	U.S. Geological Survey	701.250.7404	smrobins@usgs.gov	
Christy	Roemmich	Safety Coordinator	N.D. Association of Rural Electrical Cooperatives	701.667.6410	croemmich@ndarec.com	Christy Roemmich
Sandy	Rohde	Planning & Zoning Administrator	Dunn County	701.573.4609	sandy.rohde@dunncountynd.org	Sandy Rohde
Don	Ronsberg	Protective Security Advisor	U.S. Department of Homeland Security	701.516.3940	donald.ronsberg@hq.dhs.gov	
Jeff	Rotenberger	Energy Assurance Program Manager	N.D. Department of Commerce	701.328.4137	jprotenberger@nd.gov	
Maure	Sand	Fire Management Officer	U.S. Forest Service	701.250.4443	msand@fs.fed.us	
Jeffrey	Savadel	Meteorologist-in-Charge	National Weather Service	701.250.4495	jeffrey.savadel@noaa.gov	[illegible]
Mark	Schrader	Environmental and Right-of-Way Engineer	Federal Highway Administration	701.250.4343, Ext. 111	mark.schrader@dot.gov	
Donald	Schwert	Professor & Chair of Geosciences	North Dakota State University	701.231.7496	donald.schwert@ndsu.edu	
Jim	Semerad	Air Quality, Manager Permitting and Compliance	NDDoH	701.328.5179	jsemerad@nd.gov	

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North Dakota Multi-Hazard Mitigation Team – Planning Meeting #3 SIGN-In Sheet

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	*E-Mail*	Signature
Mary	Senger	Emergency Manager	Burleigh County	701.222.6727	*msenger@nd.gov*	Mary Senger
Steve	Sitting Bear	Administrative Officer II	N.D. Indian Affairs Commission	701.328.4206	*ssittingbear@nd.gov*	
Joshua	Simmers		ND Aeronautics Commission			[illegible]
Gary	Simmons	Mitigation Specialist	N.D. Department of Emergency Services	701.328.8115	*gsimmons@nd.gov*	Gary Simmons
Brad	Smith	Sergeant	State and Local Intelligence Center (Highway Patrol)	701.328.8169	*btsmith@nd.gov*	
Connie	Sprynczynatyk	Executive Director	N.D. League of Cities	701.223.3518	*connie@ndlc.org*	
Vicky	Steiner	Executive Director	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association	701.290.1339	*vsteiner@ndsupernet.net*	
Kevin	Stewart	First Aid Coordinator	North Dakota Safety Council	701.751.6107	*kevins@ndsc.org*	
Gary	Stockert	Emergency Manager	City of Bismarck	701.255.5212	*gstockert@nd.gov*	Gary Stockert
Larry	Taborsky	Executive Director	N.D. Aeronautics Commission	701.328.9650	*ltaborsky@nd.gov*	
Larry	Thelen	Program Manager, Drinking Water, Municipal Facilities	NDDoH	701.328.5257	*lthelen@nd.gov*	
Kim	Thomas	Emergency Manager, Omaha District	U.S. Army Corps of Engineers	402.995.2448	*kimberly.s.thomas@usace.army.mil*	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Steve	Tillotson	Assistant Director, Waste Management Director	NDDoH	701.328.5163	stillots@nd.gov	Steve Tillotson
Andrea	Travnicek	Govenor's Senior Policy Advisor	Governor's Office	701.328.2200	atravnicek@nd.gov	
Sarah	Tunge	Fire Manager	N.D. Forest Service	701.328.9985	sarah.tunge@ndsu.edu	
Kathleen	Tweeten	Director, NDSU Extension Center for Community Vitality	North Dakota State University Extension Service	701.328.9718	kathleen.tweeten@ndsu.edu	Kathleen Tweeten
Brenda	Vossler	Training and Exercise Officer	NDDES	701.328.8106	bvossler@nd.gov	Brenda Vossler
Spencer	Wagner	Fertilizer Specialist	N.D. Department of Agriculture	701.328.1508	wagner@nd.gov	
April	Walker	City Engineer	City of Fargo	701.241.1554	awalker@cityoffargo.com	
Jerry	Weigel	Fisheries Production & Development Section Leader	N.D. Game and Fish Department	701.220.5342	jweigel@nd.gov	
Linda	Weispfenning	Planner	SWC	701.328.4967	lweispfenning@nd.gov	Linda Weispfenning
Gregg	Wiche	Director, USGS Water Science Center	U.S. Geological Survey	701.250.7401	gjwiche@usgs.gov	
Tim	Wiedrich	Director, Emergency Preparedness and Response	N.D. Department of Health (NDDoH)	701.328.4520, 701.328.2270	twiedric@nd.gov	
Jeb	Williams	Assistant Wildfire Chief	N.D. Game and Fish Department	701.328.6686	jwilliams@nd.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Greg	Wilz	Director	N.D. Department of Emergency Services (NDDES), Division of Homeland Security	701.328.8100	gwilz@nd.gov	[signature]
Ken	Yantes	Secretary/Director of Governmental Relations	North Dakota Township Officers Association	701.230.4118	ken@ndtoa.com	Ken Yantes
Jenny	Yearous	Curator of Collections Management	Historical Society of North Dakota	701.328.2099	jyearous@nd.gov	Jenny Yearous
Michael	Ziesch	Labor Market Information Manager	North Dakota Job Service	701.328.2888	mziesch@nd.gov	Michael Ziesch
Steve	Zimmer	Senior City Planner, Past President of the North Dakota Planning Association	City of West Fargo	701.433.5320	steven.zimmer@westfargond.gov	

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NORTH DAKOTA MULTI-HAZARD MITIGATION TEAM – PLANNING MEETING #3 SIGN-IN SHEET

Project: North Dakota Multi-Hazard Mitigation Plan Update – Planning Meeting #3

Meeting Date/Time: July 16, 2013, 8:30 to 11:30 am

Facilitators: Jeff Brislawn & Kari Valentine, AMEC

Place/Room: Comfort Inn, 1030 E. Interstate Avenue, Bismarck, ND

First	Last	Title	Agency	Office, Cell	E-Mail	Signature
Laura	Ackerman	Water Resource Engineer	ND State Water Commission	328-4868 (o)	lcackerman@nd.gov	Laura C Ackerman
Jolene	Kline	Acting Executive Dir	NDHFA	328.8072	JKline@ndhfa.org	Jolene Kline
Jenny	Gomke	Case manager	LDR	701-271-3288	JSnyder@lssnd.org	Jenny Gomke
Janine	Neipert	Mitigation	FEMA RVIII	3038547607	jneipert@fema.dhs.gov	[illegible]

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Appendix D. MEETING SUMMARIES

North Dakota Enhanced Multi-Hazard Mitigation Plan

Workshop Notes

Tuesday, June 19, 2007 from 10am-3pm CDT

Kelly Inn, 1800 North 12th Street, Bismarck, North Dakota

Attendees:

Fred Anderson	ND Department of Mineral Resources
Janna Charrier	ND Department of Emergency Services
Glenna Ellison	ND Office of Attorney General
David Geyer	ND Forest Service
Dave Hartman	US Bureau of Reclamation
Lonnie Hoffer	ND Department of Emergency Services
Wayne Hokenson	ND Department of Emergency Services
Rick Hummel	Bottineau County Emergency Management
Dave Hvinden	ND Department of Mineral Resources
Nan Johnson	US Federal Emergency Management Agency, Region 8
Jason Johnston	ND State Parks and Recreation Department
Wally Kalmbach	ND Association of Rural Electric Cooperatives
Jeff Klein	ND State Water Commission
Gary Kostelecky	Stark County Emergency Management
Eldon Krein	ND Housing Finance Agency
Ray Lambert	ND Fire Marshal
Bruce Lange	ND State Water Commission
Ed Lodwig	Williams County Emergency Management
David Massey	ND Office of Public Instruction
Terry Milas	ND Office of Management and Budget, Risk Management Division
Gary Ness	ND Aeronautics Commission
Cynthia Olson	Red River Valley and Western Railroad
Shawna Paul	Emmons County Emergency Management
Jan Pratt	Bank of North Dakota
Brent Pringle	Stark County Emergency Management
Deidre Qual	ND Department of Agriculture
Todd Schreiner	McLean County Emergency Management
Cody Schulz	ND Department of Emergency Services
Pam Shrauger	Big Sky Hazard Management LLC

Tara Skjee Hoffman	ND Department of Human Services
Ryan Smith	Otter Tail Power Company
Gary Stockert	City of Bismarck Emergency Management
Bonnie Turner	ND Voluntary Organizations Active in Disaster
Doug Van Daalen	US Natural Resources Conservation Service
Connie Wetzel	Morton County Emergency Management
Cliff Whitman	Three Affiliated Tribes Emergency Management
Wes Wiedenmeyer	US Natural Resources Conservation Service

Plan Background

Lonnie Hoffer, North Dakota State Hazard Mitigation Officer, provided background on mitigation planning and activities in the State of North Dakota. The concept of mitigation planning has been around for many years. In fact, North Dakota had a multi-hazard mitigation plan long before they became more formalized and required through the Disaster Mitigation Act of 2000.

North Dakota successfully completed a "standard" mitigation plan in 2005 and is now looking to upgrade to an "enhanced" mitigation plan. By having an approved "enhanced" mitigation plan, the state will be eligible for 20% of the total federal disaster assistance to be provided for the Hazard Mitigation Grant Program. With a "standard" plan, the percentage is 15%.

Enhanced Mitigation Plan Outline

Pam Shrauger, the consultant with Big Sky Hazard Management LLC hired to coordinate the plan's enhancement, distributed a draft outline for the updated plan and reviewed many of its major components. For a copy of this outline, please contact Pam at 406-581-4512 or pam@bigskyhazards.com.

Hazard Identification

Through discussions during the workshop and additional recommendations from Department of Emergency Services staff, the following hazards were identified for inclusion in the plan:

- Communicable Disease (this is a new addition)
- Dam Failure
- Drought
- Flood
- Hazardous Material Release
- Homeland Security Incident (renamed from Terrorism/National Security Incident)
- Shortage or Outage of Critical Materials or Infrastructure (renamed to broaden scope)
- Summer Storm
- Transportation Accident (this is a new addition)
- Urban Fire or Structure Collapse (the structure collapse component was added)
- Wildland Fire (renamed from Rural Fire and includes all vegetation fires)

- Winter Storm

The Mass Casualty/Fatality hazard was eliminated and will be integrated into the hazard profiles of the hazards that could cause mass casualties or fatalities.

Hazard Review Committees:

The following people signed up (or were nominated) to sit on the following hazard review committees. These committees will be used to review hazard profiles and come up with mitigation strategies for the hazards. Feel free to submit additional names and contact information to pam@bigskyhazards.com.

Communicable Disease

Dave Hartman	US Bureau of Reclamation
Terry Milas	ND Office of Management and Budget, Risk Management Division
Jan Pratt	Bank of North Dakota
Deidre Qual	ND Department of Agriculture

Dam Failure

Dave Hartman	US Bureau of Reclamation
Karen Goff	ND State Water Commission
Bruce Lange	ND State Water Commission
Cliff Whitman	Three Affiliated Tribes Emergency Management
Wes Wiedenmeyer	US Natural Resources Conservation Service

Drought

Leroy Kalpprodt	ND State Water Commission
Darin Langerud	ND State Water Commission
Shawna Paul	Emmons County Emergency Management
Deidre Qual	ND Department of Agriculture
Doug Van Daalen	US Natural Resources Conservation Service

Flood

Jason Johnston	ND State Parks and Recreation Department
Jeff Klein	ND State Water Commission
Bruce Lange	ND State Water Commission
Deidre Qual	ND Department of Agriculture

Hazardous Material Release

Dave Hvinden	ND Department of Mineral Resources
Ed Lodwig	Williams County Emergency Management

Brent Pringle	Stark County Emergency Management
Gary Stockert	City of Bismarck Emergency Management
Cliff Whitman	Three Affiliated Tribes Emergency Management

Homeland Security Incident

Dave Hartman	US Bureau of Reclamation
Terry Milas	ND Office of Management and Budget, Risk Management Division
Gary Stockert	City of Bismarck Emergency Management
Cliff Whitman	Three Affiliated Tribes Emergency Management

Shortage or Outage of Critical Materials or Infrastructure

Nominated…

Wally Kalmbach	ND Association of Rural Electric Cooperatives
Ryan Smith	Otter Tail Power Company

Summer Storm

Jason Johnston	ND State Parks and Recreation Department
Wally Kalmbach	ND Association of Rural Electric Cooperatives
Gary Kostelecky	Stark County Emergency Management
Bruce Lange	ND State Water Commission
Darin Langerud	ND State Water Commission
Shawna Paul	Emmons County Emergency Management
Jan Pratt	Bank of North Dakota
Deidre Qual	ND Department of Agriculture
Todd Schreiner	McLean County Emergency Management

Transportation Accident

Ed Lodwig	Williams County Emergency Management
Cliff Whitman	Three Affiliated Tribes Emergency Management

Urban Fire or Structure Collapse

David Geyer	ND Forest Service
Rick Hummel	Bottineau County Emergency Management
Leroy Kalpprodt	ND State Water Commission
Ray Lambert	ND Fire Marshal

Wildland Fire

David Geyer	ND Forest Service
Rick Hummel	Bottineau County Emergency Management

Jason Johnston	ND State Parks and Recreation Department
Ray Lambert	ND Fire Marshal
Ed Lodwig	Williams County Emergency Management
Todd Schreiner	McLean County Emergency Management

Winter Storm

Jason Johnston	ND State Parks and Recreation Department
Wally Kalmbach	ND Association of Rural Electric Cooperatives
Shawna Paul	Emmons County Emergency Management
Deidre Qual	ND Department of Agriculture
Todd Schreiner	McLean County Emergency Management

Critical Facilities and Infrastructure Issues (not a hazard)

Eldon Krein	ND Housing Finance Agency
Brent Pringle	Stark County Emergency Management
Don Ronsberg	ND Department of Emergency Services
Ryan Smith	Otter Tail Power Company
Gary Stockert	City of Bismarck Emergency Management

<u>New Information Sources</u>

The following were identified as important information and data sources for the plan's update:

- Local and Tribal Pre-Disaster Mitigation Plans
- Local Hazardous Material Teams
- ND Association of Builders
- ND Association of Counties
- ND Continuum of Government Team
- ND Department of Agriculture
- ND Division of Community Services, State Building Code
- ND Department of Emergency Services
- ND Department of Health
- ND Department of Human Services
- ND Department of Transportation
- ND Fire Marshal Division
- ND Geographic Information Systems
- ND Insurance Department
- ND League of Cities
- ND National Guard
- ND Office of Attorney General (for plan review)
- ND State Emergency Response Commission

- ND Forest Service, State Forest Plan
- ND State Highway Patrol, Motor Carrier Services
- ND State Water Commission
- Pipeline Owners
- US Army Corps of Engineers
- US Bureau of Reclamation
- US Department of Agriculture, Farm Service Agency
- US Environmental Protection Agency
- US Federal Aviation Administration
- US Federal Railroad Administration
- US Federal Highway Administration
- US Geological Survey
- US National Weather Service

Existing Mitigation Programs

The following mitigation programs and funding mechanisms were identified as active within the State of North Dakota:

- Bureau of Indian Affairs
- Community Development Block Grant
- Dam Safety
- Flood Mitigation Assistance
- Hazard Mitigation Grant Program
- Hazardous Materials Emergency Preparedness Planning Grants
- Homeland Security, Critical Infrastructure Protection Program
- Housing and Urban Development
- Local and Tribal Mitigation Programs
- National Flood Insurance Program Map Modernization
- National Flood Insurance Program Repetitive Loss
- North Dakota Department of Transportation
- Pre-Disaster Mitigation Competitive
- Public Assistance/Individual Assistance
- Private and Industry Programs
- Rural Development Administration
- Small Business Administration
- State Building Code Program
- State Fire Assistance
- Voluntary Organizations Active in Disaster

Review of Existing Mitigation Strategies

A listing of the mitigation strategies in the 2005 state mitigation plan was reviewed in groups, and the following changes were recommended. Additional opportunities to make suggestions to the mitigation strategies will be available throughout the planning process.

Dam Failure

- Combine the strategies of: Emergency Action Plans, Emergency Preventative Response, and Comprehensive Emergency Operational Planning
- Add a strategy related to Downstream Zoning
- Clarify the Legislation strategy

Drought

- Add a strategy related to Water Rights and include Irrigation
- Expand upon the Weather Modification Research strategy. This is funded through a state program, but is it practical?

Flood

- Emphasize that there are alternatives other than rip-rap bank stabilization
- Consider environmental strategies that prevent fish species crossovers that destroy fisheries during floods
- Add a strategy related to encouraging National Flood Insurance Program Participation

Hazardous Material Release

- Drop the Develop and Manage a Haz-Mat Database if this is already completed
- Add Groundwater Considerations to the Develop Plume Data and Flow Patterns strategy
- Expand the Vehicle Inspection Program to include Planes and Trains
- Add Disposal Regulations to the Development of a State Haz-Mat Collection Program
- Add a strategy related to Storage Tank Regulations
- Add a strategy related to Security for Industrial and Power Plants and Oil Fields

Shortage or Outage of Critical Materials or Infrastructure

- Combine the strategies of: Relaxation of Vehicle Weight and Size Restrictions, Public Transit, and Lower Speed Limits
- Update the strategy related to Renewable Energy Generation
- Transfer the Emergency Medical Stockpile strategy to Communicable Disease
- Consider dropping the Food and Shelter strategy

- Add a strategy related to Power Outage Prevention

Summer Storm

- Combine the Public Awareness, Training, and Education strategy with Encourage Participation in the Federal Crop Insurance Program
- Drop the Measures to Protect Equipment from Damage of Lightning Strikes strategy
- Add a strategy related to Building Safe Rooms and Tornado Shelters
- Add a strategy related to Anchoring Mobile Homes
- Add a strategy related to Building Code Improvements
- Add a strategy related to NOAA Weather Radios
- Add a strategy related to Warning Sirens
- Add a strategy related to the Emergency Alert System

Transportation Accident

- Add a strategy related to Developing a Hazard Analysis
- Add a strategy related to Transportation Engineering
- Add a strategy related to Transportation Barriers

Urban Fire or Structure Collapse

- Add a strategy related to Training Firefighters
- Add a strategy related to Identifying Available Resources, Alliances, and Mutual Aid
- Add a strategy related to Fire and Building Code Improvements
- Add a strategy related to Special Needs Transportation
- Add a strategy related to Road Closures

Wildland Fire

- Update strategies related to Training, Response, and Intergovernmental Cooperation
- Add a strategy related to Building Partnerships with Other Agencies
- Add a strategy related to Community Wildfire Protection Plans
- Add a strategy related to Fire Restrictions and Education

<u>Possible Mitigation Program Improvements</u>

These items were generally brought up throughout the meeting or through written comments:

- The issue of the FEMA benefit-cost requirement of 1:1 being difficult for rural counties to meet was brought up. Some small amounts of discretionary funds may be available for these types of projects.

- Guidance is needed regarding critical facilities and infrastructure. PDM rules require them to be analyzed and presented in the state, tribal, and local plans, yet the security concerns and requirements of DHS to keep those protected makes it difficult. The conflicting federal requirements need to be recognized, and guidance is needed to clarify what the best practice is.
- Without a Mass Casualty hazard, emphasize those consequences in the individual hazard profiles.
- Living snow fences (tree shelter belts) to block snow is a good strategy. Have North Dakota State University do research on hydrophilic crops that could be flooded by water using the Waffle® plan in the Red River Valley.
- Stress enforcement and make determinations of who will do it. With this mandated in a plan, it may further funding.

<u>Next Steps</u>

Look for future information through e-mails to stakeholders. Those on the hazard review committees will be asked to review and provide guidance and expertise on specific sections. Conference calls may be needed. Another full stakeholders meeting will be held to solicit comments on the draft plan towards the end of the year.

North Dakota Enhanced Multi-Hazard Mitigation Plan

Workshop Notes

Tuesday, November 6, 2007 from 10am-3pm CST

Comfort Inn, 1030 East Interstate Avenue, Bismarck, North Dakota

<u>Attendees:</u>

Tina Beach	Williston Basin Interstate Pipeline
Jeff Boyce	Northern Border Pipeline
John Elstad	ND State Fire Marshal
Pat Fridgen	ND State Water Commission
Ron Hartl	Federal Highway Administration
Lonnie Hoffer	ND Department of Emergency Services
Wayne Hokenson	ND Department of Emergency Services
Daniel Holli	Plains Pipeline, L.P.; ND Pipeline Association
Rick Hummel	Bottineau County Emergency Management
Susan Keller	ND Board of Animal Health
Lee Klapprodt	ND State Water Commission
Jeff Klein	ND State Water Commission
Gary Kostelecky	Stark County Emergency Management
Eldon Krein	ND Housing Finance Agency
Bruce Lange	ND State Water Commission
Darin Langerud	ND State Water Commission
Tammy Lapp-Harris	Morton County Emergency Management
Myron Lepp	US Department of Agriculture, Rural Development
Terry Milas	ND Office of Management and Budget, Risk Management Division
Betty Nelson	ND Department of Agriculture
Wade Nofziger	Federal Emergency Management Agency
Jan Pratt	Bank of North Dakota
Dennis Reep	US Department of Agriculture, Natural Resources Conservation Service
Mark Schrader	Federal Highway Administration
Todd Schreiner	McLean County Emergency Management
Mary Senger	Burleigh County Emergency Management
Pam Shrauger	Big Sky Hazard Management LLC
Jesse Vollmer	ND Board of Animal Health
Linda Weispfenning	ND State Water Commission
Greg Wilz	ND Division of Homeland Security

Purpose

Lonnie Hoffer, North Dakota State Hazard Mitigation Officer, and Wade Nofziger, Federal Emergency Management Agency, gave a brief history of mitigation in North Dakota and emphasized the benefits of hazard mitigation. Flood acquisitions in Grand Forks are a great example of how mitigation can save taxpayers' money. Substantial savings were seen during the 2006 Red River flood because of mitigation done after the 1997 flood.

Mitigation, not to be confused with preparedness, response, or recovery, is the primary focus of the North Dakota Enhanced Multi-Hazard Mitigation Plan. The plan will follow the requirements of the Disaster Mitigation Act of 2000. Once "enhanced" status is achieved, the state with will be eligible for 20% of the total federal disaster assistance through the Hazard Mitigation Grant Program, as opposed to 15% with a "standard" designation.

Comments on Draft Plan Sections

Substantial changes have been made to the 2005 standard plan during its update. The plan was re-organized for readability. Enhancements to meet federal requirements were made; additional and updated data were incorporated into the plan. Many of the preparedness and response elements were removed to give the plan a clearer mitigation focus. The updated draft plan sections are also being reviewed by a wider group of hazard experts; organizations providing comments to date include:

- Federal Emergency Management Agency (from 1 person)
- National Weather Service (from 3 people)
- ND Department of Agriculture (from 2 people)
- ND Department of Emergency Services (from 4 people)
- ND State Water Commission (from 4 people)
- US Fish and Wildlife Service (from 1 person)

Draft sections of the plan can be reviewed at: http://www.bigskyhazards.com/draftplans.asp. Note that changes are continuously being made based on comments and information received. A notice will be e-mailed out when a completely reviewed draft is posted, followed by a 30-day comment period. The plan will then be submitted to FEMA for approval. Once conditional approval is received, the Governor's approval and assurances will be sought.

A sampling of maps was shown at the meeting. Additional digital data sources that will be investigated include: the ND Atmospheric Resource Board Hail database, the ND Department of Health Chemical Release database, the ND Department of Transportation traffic fatality database, the ND Forest Service Wildland Fire database, and the ND Fire Marshal Structure Fire database.

Hazard Prioritizations

A handout summarizing historic and potential losses from each of the hazards was distributed. The addition of state declared disasters and emergencies would benefit the historical information. Lonnie Hoffer will try to compile this information.

Several ways of prioritizing the hazards were discussed including group consensus, pairwise comparison and weighting, voting, and local risk class analyses. An analysis of the risk classes assigned in the local, FEMA-approved multi-hazard mitigation plans will be conducted to serve as the basis for the prioritization. The local jurisdictions used a consistent approach to classify the hazards. In the meantime, the general consensus listed the hazards as follows based on the frequency, historical and potential impacts, and other factors:

High Hazards:

- Flood
- Summer Storm
- Drought
- Winter Storm

Moderate Hazards:

- Dam Failure
- Communicable Disease
- Hazardous Material Release
- Wildland Fire

Low Hazards:

- Homeland Security Incident
- Urban Fire or Structure Collapse
- Shortage or Outage of Critical Materials or Infrastructure (some discussion on being moderate)
- Transportation Accident

Note: These ratings may change slightly based on the results of the local risk class analysis. The updated ratings will be listed in the Risk Assessment Summary section.

Mitigation Strategy

The goals, objectives, and initiatives were reviewed. Most of the types of projects that would be completed in the state are listed. More importantly, local plans should have their desired projects listed in their plans.

From Planning Into Action

The local/tribal mitigation capabilities and limitations were identified as follows:

- Funding (+/-)
- Jurisdictions/Authorities (+/-)
- Funding/Fiscal Responsibilities (+/-)
- Personnel/Time (+/-)
- Mitigation and Grant Application Training/Expertise (+/-)
- Priority Differences/Other Priorities (+/-)
- Proximity of (Time Since) a Major Event/"See it and Believe it"/Other National and Statewide Events going on in the Media (+/-)
- People that Care about the Communities (+)
- Lots of/Lack of Community Support (+/-)
- Lack of Clear and Consistent Direction from Feds and State (-)

Most mitigation activities take place at the local level. A handout was distributed outlining the initiatives that could be conducted at the state government level. All initiatives are worthwhile, otherwise they wouldn't be in the plan, but they were assigned high, moderate, and low priorities, as required by FEMA. The "hazardous material regulations" project will be renamed to "household waste regulations."

One identified problem is that many of the initiatives do not have a good funding source. The Mitigation Funding Sources section will list several possible funding options. The lead agencies will probably need to get creative with finding funding or integrating the initiatives into existing programs. Many activities also hinge on legislative changes that may or may not occur.

Many other state plans and programs were considered and integrated into the mitigation plan. The next challenge is to take the Enhanced Multi-Hazard Mitigation Plan and integrate it into other plans and programs. The pipeline companies generally get mitigation information through training provided by their respective companies but would also like to see critical facilities and special needs populations kept from areas near their pipelines. Zoning may be the local land use mechanism to achieve this. Data from the mitigation plan, particularly the risk assessment, may also be useful in emergency operations plans and other related documents. The ultimate integration goal is to change the way people think about hazard mitigation and integrate it into their everyday thinking and practices.

State of North Dakota Multi-Hazard Mitigation Plan, Stakeholder Meeting Notes

Wednesday, March 3, 2010 from 9 – 11:30 am CST

National Energy Center for Excellence, Bismarck State College, Bismarck, North Dakota

Attendees:

Fred Anderson	North Dakota Geological Survey
Julie Baxter	Federal Emergency Management Agency
Gene Buresh	Roosevelt-Custer Regional Council
Kelly Casteel	North Dakota State Water Commission
Randy Ehlis	US Bureau of Reclamation
Pat Fridgen	North Dakota State Water Commission
Dave Hartman	US Bureau of Reclamation
Lonnie Hoffer	North Dakota Department of Emergency Services
Sean Johnson	North Dakota Department of Emergency Services
Jason Johnston	North Dakota Parks and Recreation
Wally Kalmbach	North Dakota Association of Rural Electric Cooperatives
Jon Kelsch	North Dakota State Water Commission
Darin Langerud	North Dakota State Water Commission
Renee Loh	North Dakota Firefighter's Association
Ray Morrell	North Dakota Department of Emergency Services
Wade Nofziger	Federal Emergency Management Agency
Eric Pederson	North Dakota Highway Patrol
Jeff Rotenberger	North Dakota Department of Commerce
Matt Sagsveen	North Dakota Attorney General's Office
Jeff Savadel	National Weather Service
Janel Schmitz	American Red Cross
Mark Schrader	Federal Highway Administration
Pam Shrauger	Big Sky Hazard Management LLC
Linda Weispfenning	North Dakota State Water Commission

Introductions, Welcome, and Purpose:

Following introductions and administrative items, Lonnie Hoffer provided a welcome, emphasizing the importance of the state mitigation plan and a bit of its history. Pam Shrauger explained that state mitigation plans are required to be updated every three years and is not a one agency effort. We are trying to integrate mitigation into all levels and facets of government. Participants were asked to fill out a Participant Survey.

Defining Mitigation:

What is disaster mitigation?
Long term, sustainable actions that reduce or eliminate the impacts of hazards.
Examples:

- Building codes

- Land use regulations (including flood ordinances)
- Planning and education
- Property acquisition and relocation
- Physical modifications to structures, infrastructure, and landscapes

Mitigation is often the "unsung hero" in disasters.

Overview of the Plan Update Process and Timeline:

A consultant, Big Sky Hazard Management LLC, has been hired to facilitate and do the "hard" work such as researching, writing, mapping, documenting, and making sure the requirements are met, but the "process" is the most important part because:

- Buy-in and acceptance is critical
- Plans can easily become doorstops if not useful
- Cross agency/jurisdiction relationships are important in emergencies and non-emergencies
- Mitigation is an education process and "cultural" shift for some
- You are the agents for bringing this to decision makers and the general public

See handout titled "Plan Update Process". Please contact Pam Shrauger with questions or comments at any point during the planning process.

All interested stakeholders, even those that were unable to attend the meeting, are encouraged to sign up for one or several Mitigation Planning Committees. Mitigation Planning Committees are sub-groups that allow more focused discussion and review of a particular topic. These committees will primarily be asked to review information and perhaps participate in a conference call or other discussion if needed. Participation shouldn't be too time consuming, but is extremely important for that ownership component, education, and accuracy. Last update was focused only on the hazards, but this time, would like committees for the overall planning process, land use and future construction/development, mitigation strategies and implementation system. Committee categories include: Communicable Disease, Dam Failure, Drought, Flood, Hazardous Material Release, Homeland Security Incident, Shortage or Outage of Critical Materials or Infrastructure, Summer Storm, Transportation Accident, Urban Fire or Structure Collapse, Wildland Fire, Winter Storm, Landslide and Other Geologic Hazards, Planning Process, Critical Facilities and Infrastructure, Land Use and Recent and Future Construction and Development, Mitigation Strategy, and Mitigation Implementation System.

Existing Plan and Methodologies:

See handout titled "Existing Plan (January 2008) Abbreviated Table of Contents".

Existing Plan Basics

- Adoption by the Governor
- Planning Process
    - Still a team concept
    - Expanded stakeholder list
    - Public document

- Risk Assessment: 2 major subsections
  - Statewide Inventory
  - Hazard Profiles

Risk Assessment Methodologies

- For each hazard profile:
  - Characteristics (description)
  - History
  - Probability: based on history, where feasible
  - Magnitude: realistic worst case scenario
  - Mapping: generally by county
  - Vulnerabilities to:
    - State-Owned Buildings and Property: ND State Tornado and Fire Fund data, may try to integrate some GIS
    - Critical Facilities and Infrastructure: some ND State Tornado and Fire Fund data and qualitative descriptions, may try to integrate some Critical Infrastructure Program data
    - Jurisdictions (counties and reservations): based on impacts to property, population, and values; each jurisdiction is given a very high, high, moderate, or low rating, and risk classes from local plans are also listed. The concept is to give a statewide picture of where the most vulnerable and least vulnerable areas are in the state for that particular hazard, not to say whether or not the hazard is significant in a particular location. Flood is a good example since it is a formidable hazard statewide, but some areas are just more prone than others. So, a county may get a "low" hazard rating when compared to other counties in the state, but it is still a "high" hazard for that particular county. The local mitigation plans should address these ratings through the "risk class" system. See tables that follow.
    - Future Development: based on mechanisms currently in place to limit or regulate development in hazardous areas (i.e. flood ordinances, zoning, etc.)
  - Data limitations and other key documents
- Risk Assessment Summary
  - General estimated historical vs. estimated potential losses statewide
  - All hazard ratings for each county/reservation
  - Statewide hazard rankings

Used in local mitigation plans and also state operations:

Table 4.1B Local 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
SEVERITY	
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 4.1C Local Risk Analysis Classifications

		SEVERITY			
		Negligible	*Limited*	*Critical*	*Catastrophic*
FREQUENCY	*Highly Likely*	**C**	**B**	**A**	**A**
	Likely	**C**	**C**	**B**	**A**
	Possible	**D**	**C**	**B**	**B**
	Unlikely	**D**	**D**	**C**	**C**

Statewide Hazard Rankings (based on the rankings provided in local plans)

- High Hazards:
  - Winter Storm
  - Summer Storm
  - Drought
  - Flood
- Moderate Hazards:
  - Communicable Disease
  - Hazardous Material Release
  - Wildland Fire
  - Shortage or Outage of Critical Materials or Infrastructure
- Low Hazards:
  - Urban Fire or Structure Collapse
  - Homeland Security Incident
  - Transportation Accident
  - Dam Failure

Mitigation Strategy

- *Goal 1: Encourage sound state and local planning related to hazard understanding and mitigation.*
  Examples: Mitigation Planning, Data Collection and Improvements, Field Studies, Mapping Improvements
- *Goal 2: Enhance the public's awareness of hazards.*
  Examples: Public Education, Education of Local Officials
- *Goal 3: Reduce the impact future development has on potential losses and vulnerabilities.*
  Examples: Building Codes, Zoning and Ordinances
- *Goal 4: Reduce impacts of flooding to people and property in North Dakota.*
  Examples: Flood Control, Bank Stabilization, Acquisitions, Relocations, Storm Water Management, Roadway Protection, Floodproofing, Dam Safety
- *Goal 5: Mitigate the effects severe summer and winter weather have on people and property.*
  Examples: Warning Systems, Weather Spotter Training, Tornado Safe Rooms and Shelters, Window Films, Electric Infrastructure Protection, Snow Fences
- *Goal 6: Reduce impacts of drought and wildland fires on North Dakota communities.*
  Examples: Water Management, Agriculture Practices, Weather Modification, Water Supply Issues, Firewise Programs, Firebreaks, Emergency Haying and Grazing
- *Goal 7: Reduce population and property losses from human-caused hazards.*
  Examples: Inspection Programs, Regulations, Security, Back-up Power, Fire Safety Systems, Transportation Improvements

The plan breaks the initiatives out further based on ones performed at the state level vs. local level and prioritizes state initiatives and identifies lead agencies, potential funding, and timeframes.

Mitigation Implementation System

- Outlines how mitigation is implemented in the state
- Lists the programs through which mitigation is currently performed, including strengths, weaknesses, and changes
- Lists state laws and regulations that promote or limit mitigation
- Project Management essentially outlines the grant process and includes descriptions of the state's technical assistance, eligibility criteria, project review, benefit-cost analysis, prioritization, environmental review, grant management, and project monitoring and evaluation

See handout titled "Mitigation Programs".

Existing Plan Basics

- Plan Maintenance responsibilities lie with the State Hazard Mitigation Team and ND DES (may need to re-evaluate)
- Appendices
    - Planning Committees
    - Invited Stakeholders
    - Public Information and Outreach
    - Meeting Attendance Records
    - Meeting Agendas and Summaries
    - References
    - Acronyms
    - Plan Crosswalks
    - Annual Reports
    - Interagency Reports (by listing)
    - Local and Tribal Mitigation Plans (by listing)

Disaster and Mitigation Highlights 2008-2010:

Ray Morrell provided a summary of the disasters and mitigation work since 2008.

In 2007, the Northwood tornado disaster (1726) provided about $1.8 million in Hazard Mitigation Grant Program (HMGP) funds. Some of this funding was used to bury utility lines and some was used for planning.

In 2009, the flood disaster (1829) provided about $21.2 million in HMGP funds. Many acquisition projects in 17 jurisdictions are planned.

On Friday, the southwest North Dakota winter storm was declared (1879). Notices about the availability of HMGP funds just went out and applicant briefings are being scheduled.

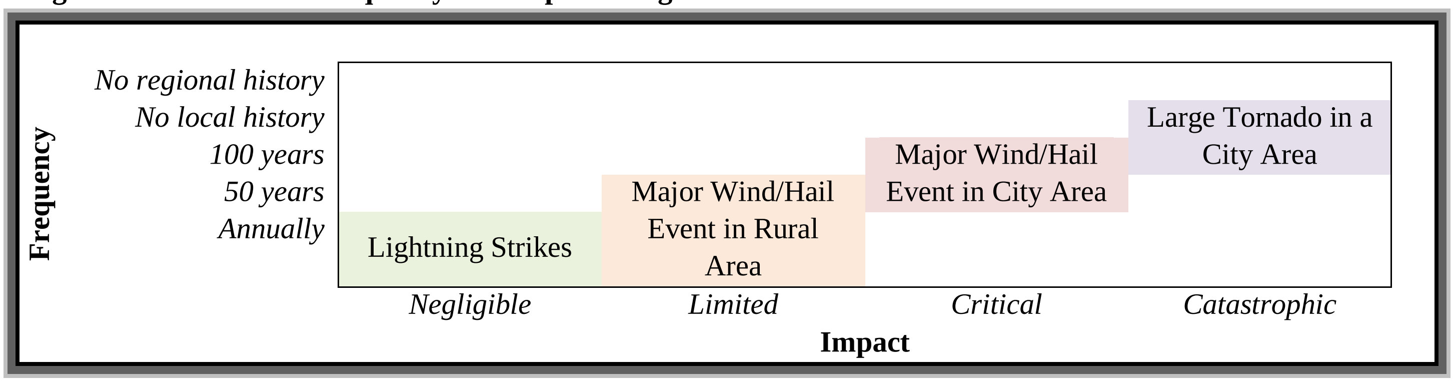
Through nationally available funding in the Flood Mitigation Assistance (FMA) Program, the acquisitions of about 44 structures in Cass County are proposed for acquisition totaling about $11 million.

Plan Updates:

Proposed updates include the following:

- Some format changes to improve usability.
- Addition of new disaster info, mitigation work completed, planning process updates, etc.
- Data and associated mapping and analysis updates, where applicable and available.
- Map projections.
- Lots of little things identified in the FEMA crosswalk.
- Addition of some new features developed by Big Sky Hazard Management LLC, such as the following summer storm example from the Ramsey County Plan.

Figure 4.8.3A Hazard Frequency and Impact Ranges



Source: Ramsey County Multi-Hazard Mitigation Plan, January 2010

Ideas from Meeting Participants:

- Identify Subject Matter Experts for Mitigation Planning Committees from state emergency plan lead and support agencies.
- Consider landslide, earthquake, and other geologic/mining hazards for inclusion. At a minimum, add information to the Hazard Identification section. They may be able to be covered under another hazard.
- Idea for mitigation: building Park and Recreation comfort stations to safe room standards.
- Add considerations for new oil fields and related transportation problems in the Hazardous Material Release hazard profile.
- Add Level 1 HAZUS data for flood completed by FEMA for each county.

Program Improvements:

Ideas from Meeting Participants:

- Document best practices and successes.
- Develop Losses Avoided studies, such as the 2009 flood event and perhaps some articles from the Rural Electric Cooperatives. The Red River study from 2006 showed a 7:1 ratio for losses avoided to mitigation dollars spent.
- Highlight non-structural mitigation measures such as National Weather Service Storm Ready program and communities that adopt standards higher than the minimums for the National Flood Insurance Program
- State Water Commission will provide a study done by North Dakota State University on losses avoided through the Weather Modification Program. Ratios of 15-25:1 were found.

- Legislation that would allow more flexible county and township relationships (examples: counties could assist townships in clearing snow blocked roads, counties could more readily host mitigation grants for townships).
- Demonstrate the losses that could be avoided using various land use regulations and educate local leaders and the public.
- Work through the Department of Transportation to consider road improvements and maintenance as new oil resource development occurs.

Next Steps:

Update work will begin with Mitigation Planning Committees. The next stakeholder meeting won't be until the fall when a draft updated plan is available. Please contact Big Sky Hazard Management LLC with questions, comments, or data in the meantime.

State of North Dakota Multi-Hazard Mitigation Plan, Stakeholder / Public Meeting Notes

Wednesday, November 17, 2010 from 9 – 11 am CST

North Dakota Association of Counties, 1661 Capitol Way, Bismarck, North Dakota

Attendees:

▪ Monica Brusseau	Pembina County Emergency Management	Webinar
▪ Kelly Casteel	North Dakota State Water Commission	
▪ Tom Claeys	North Dakota Forest Service	
▪ Brad Darr	North Dakota Department of Transportation	
▪ Ray DeBoer	North Dakota Department of Emergency Services	Webinar
▪ Tom Doering	North Dakota Department of Emergency Services	Webinar
▪ Bradley Fields	North Dakota Aeronautics Commission	
▪ Cecily Fong	North Dakota Department of Emergency Services	Webinar
▪ Patrick Fridgen	North Dakota State Water Commission	
▪ Brandon Hoechst	North Dakota Department of Emergency Services	Webinar
▪ Lonnie Hoffer	North Dakota Department of Emergency Services	
▪ Mark Holter	Mountrail-Williams Electric Cooperative	Webinar
▪ Dave Hvinden	North Dakota Department of Mineral Resources	Webinar
▪ Don Johnson	Williston Basin Interstate Pipeline Company	Webinar
▪ Sean Johnson	North Dakota Department of Emergency Services	
▪ Jason Johnston	North Dakota Parks and Recreation	
▪ Deb Kantrud	South Central Dakota Regional Council	Webinar
▪ Renee Loh	North Dakota Firefighter's Association	
▪ John Paul Martin	National Weather Service	
▪ Cherie Merrick	North Dakota Department of Emergency Services	
▪ Ray Morrell	North Dakota Department of Emergency Services	
▪ Jeanine Neipert	Federal Emergency Management Agency, Region VIII	
▪ Rick Robinson	North Dakota Department of Emergency Services	Webinar
▪ Roger Rohrer	Great River Energy	Webinar
▪ Aaron Russell	North Dakota Department of Health	
▪ Matthew Sagsveen	North Dakota Attorney General's Office	Webinar
▪ Pam Shrauger	Big Sky Hazard Management LLC	
▪ Luke Steen	McLean Electric Cooperative, Inc.	Webinar
▪ Sarah Tunge	North Dakota Forest Service	
▪ Greg Wilz	North Dakota Department of Emergency Services	
▪ Ken Yantes	North Dakota Township Officers Association	

Presentation:

This meeting and webinar consisted primarily of a presentation on the plan and significant changes to the plan since 2007. When needed, additional information was provided by meeting attendees. The slides from the presentation follow, along with any questions or additional notes.

Individual introductions: name, organization
Administrative: fire exits, restrooms, sign-in sheet, webinar
Welcome: Brief welcome provided by Lonnie Hoffer and Greg Wilz. Thank you for participating. Comments accepted at anytime.
Planning Purpose: The state mitigation plan is required to be updated every 3 years, is not a 1 agency effort, and we are attempting to integrate into all levels and facets of government. Update process began about 9 months ago.
Meeting Purpose: Provide an overview and educate those that may not be entirely familiar with the plan contents or are new. Highlight the key plan changes for those that are more familiar. Allow opportunity for comments.

WHAT IS DISASTER MITIGATION?

- Long term, sustainable actions that reduce or eliminate the impacts of hazards.
- Examples:
  - Building codes
  - Land use regulations (including flood ordinances)
  - Planning and education
  - Property acquisition and relocation
  - Physical modifications to structures, infrastructure, and landscapes
- Mitigation is often the “unsung hero” in disasters.

State of North Dakota Multi-Hazard Mitigation Plan

PLAN OVERVIEW

Items in purple are new or significantly changed.

PLAN CONTENTS

- Adoption Documentation
- Introduction
- Planning Process
- Statewide Inventory
- Risk Assessment / Hazard Profiles
- Mitigation Strategy
- Mitigation Implementation System
- Plan Maintenance
- Appendices

ADOPTION DOCUMENTATION

- Adoption through a letter signed by the Governor
- "Demonstrates the state's commitment to fulfilling mitigation objectives outlined in the Plan"
- Authorizes identified agencies to execute responsibilities
- Assures compliance with federal statutes and regulations

INTRODUCTION

- Purpose
  - Serve as a consolidated, comprehensive source of statewide hazard information
  - Educate government leaders and the public on their vulnerabilities
  - Prioritize and promote cost-effective mitigation solutions
  - Provide guidance to organizations and agencies statewide regarding hazard mitigation
  - Support requests for grant funding
  - Encourage long-term community sustainability
  - Improve coordination of mitigation efforts across the state
- Scope
- Authority
- North Dakota Overview

PLANNING PROCESS

- Background
- Roles and Responsibilities (DES, SHMT, Mitigation Planning Committees, etc.)
- Workshops
- Public Participation and Comment Integration
- Integration of Other Plans and Programs
- Risk Assessment Methodologies
- Hazard Identification

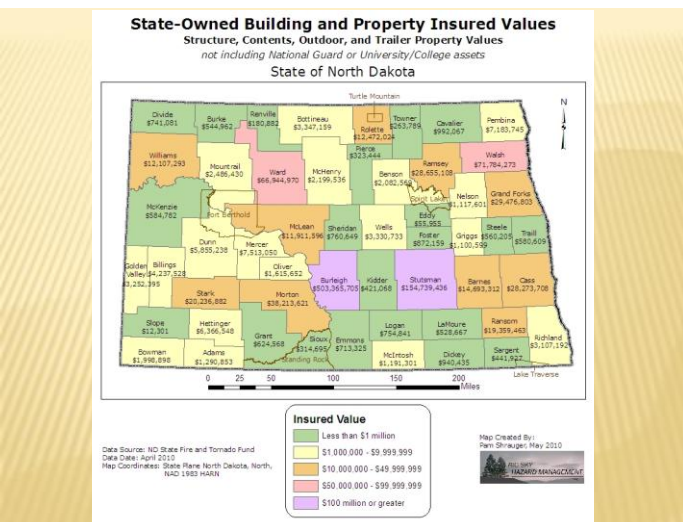
HAZARD IDENTIFICATION

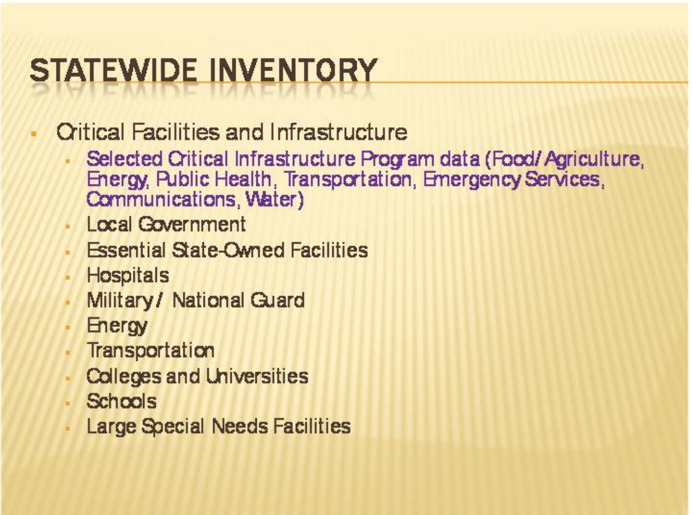
- Communicable Disease
- Dam Failure
- Drought
- Flood
- Geologic Hazards
- Hazardous Material Release
- Homeland Security Incident
- Shortage or Outage of Critical Materials or Infrastructure
- Summer Storm
- Transportation Accident
- Urban Fire or Structure Collapse
- Wildland Fire
- Winter Weather

STATEWIDE INVENTORY

- **State-Owned Buildings and Property**

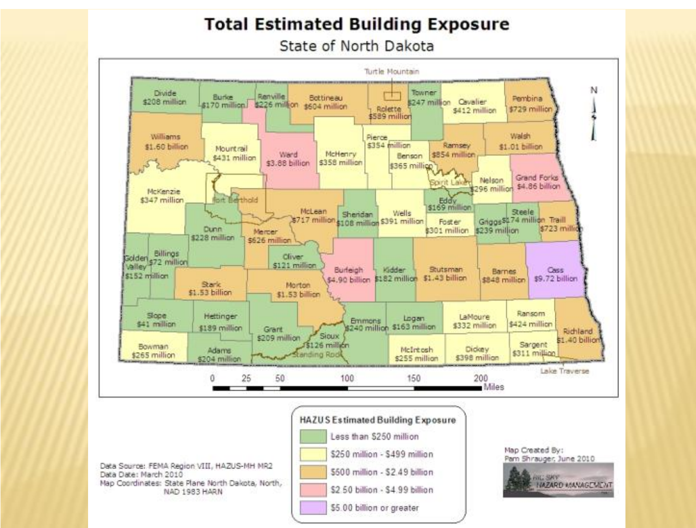
Data provided by the North Dakota Insurance Department, State Fire and Tornado Fund.
State-owned buildings are not in GIS format yet but this is listed as an initiative in the mitigation strategy.



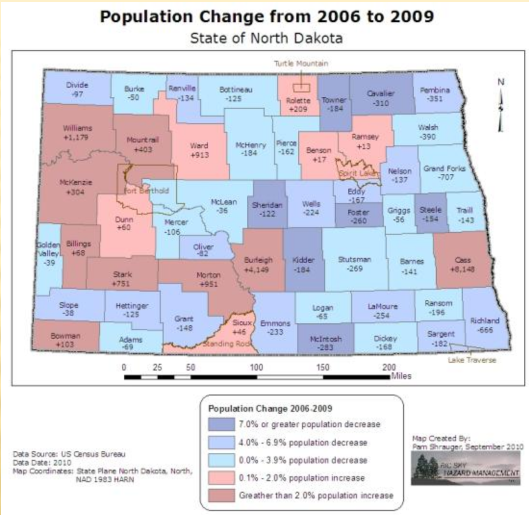


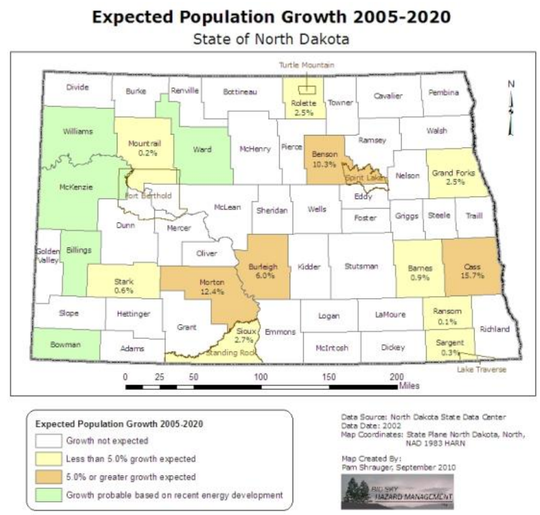
New data provided by the North Dakota Critical Infrastructure Program.

New and future development is important because losses can often be mitigated through land use regulations. New development since 2007 is highlighted.



Data for this graphic was obtained from HAZUS-MH loss estimation software.

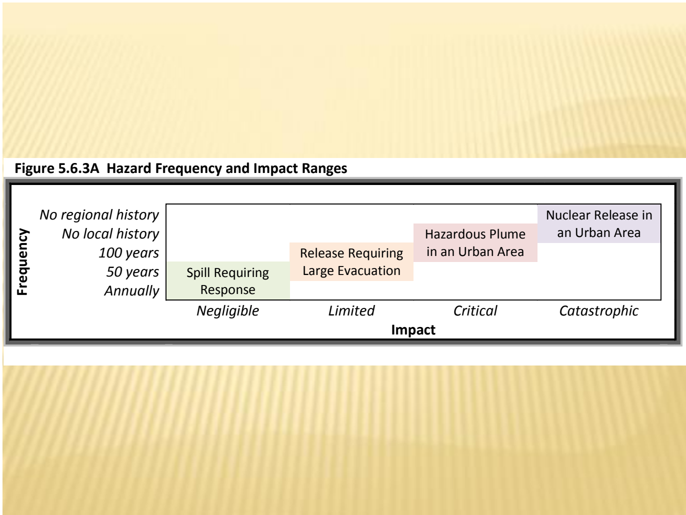




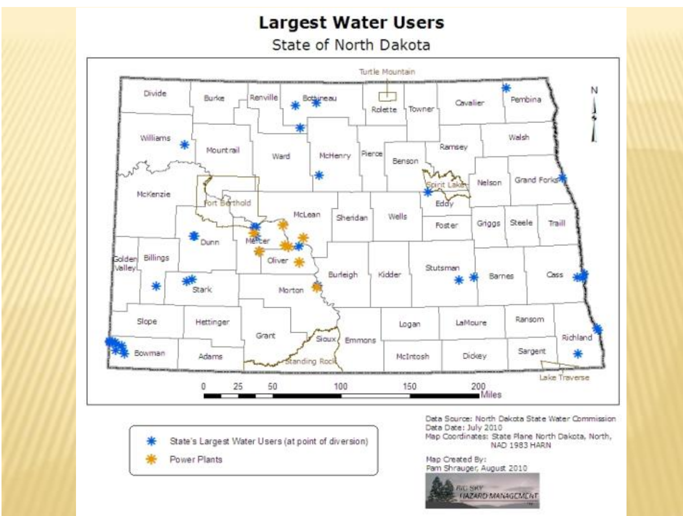
Estimates of growth in brown and tan were based on studies produced with 2000 Census data. Clearly, the oil boom was not anticipated at the time of the study, so the counties in green were added to the list of counties with expected population growth.

RISK ASSESSMENT / HAZARD PROFILES

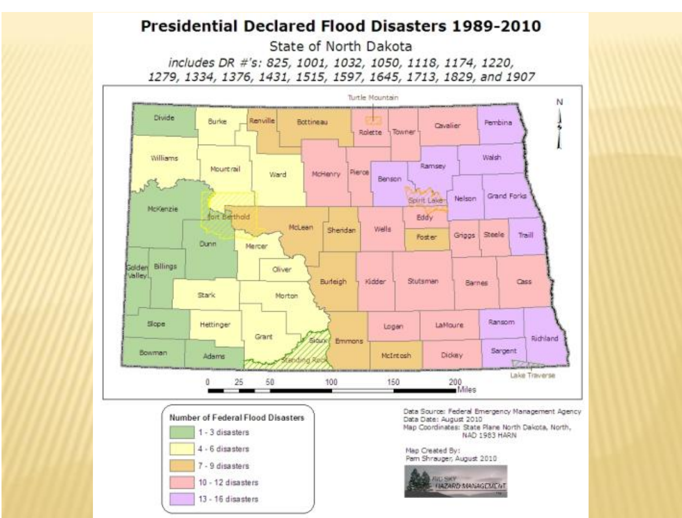
- For each hazard:
  - Characteristics
  - History
  - Probability and Magnitude
  - Mapping
  - Vulnerabilities to Jurisdictions
  - Vulnerabilities of State-Owned Buildings and Property
  - Vulnerabilities of Critical Facilities and Infrastructure
  - Vulnerabilities to New and Future Development
  - Data Limitations and Other Key Documents

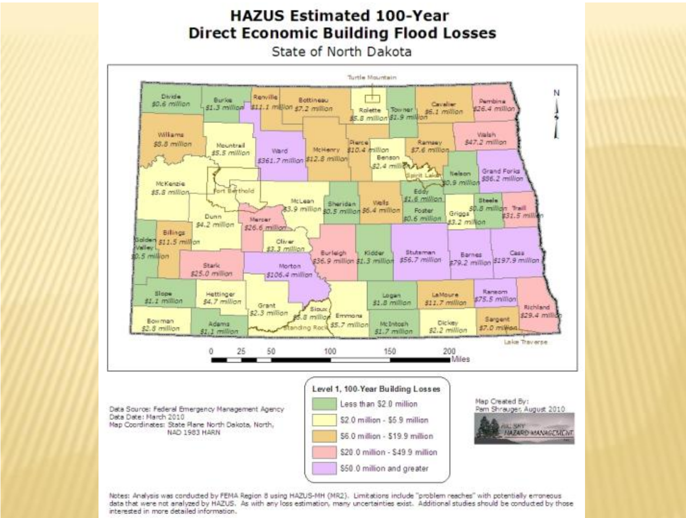


Example of a new graphic used to show the variations of incident frequency and impacts. This graphic is from the hazardous material release profile, but all hazard profiles have one.



Example of new data provided by the State Water Commission used to profile the drought hazard.



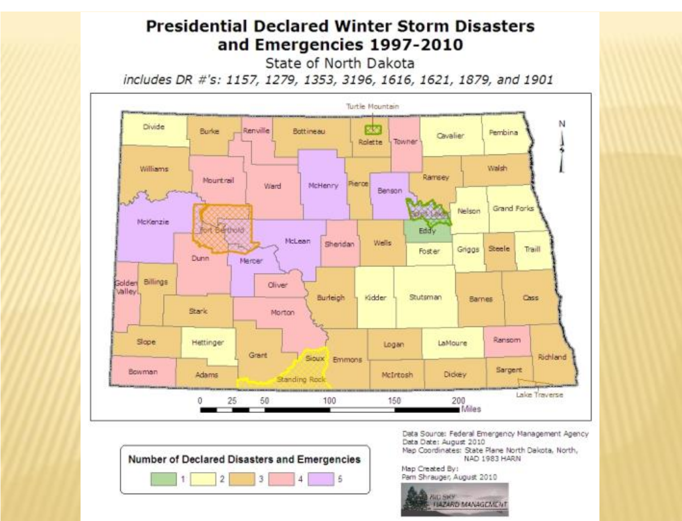


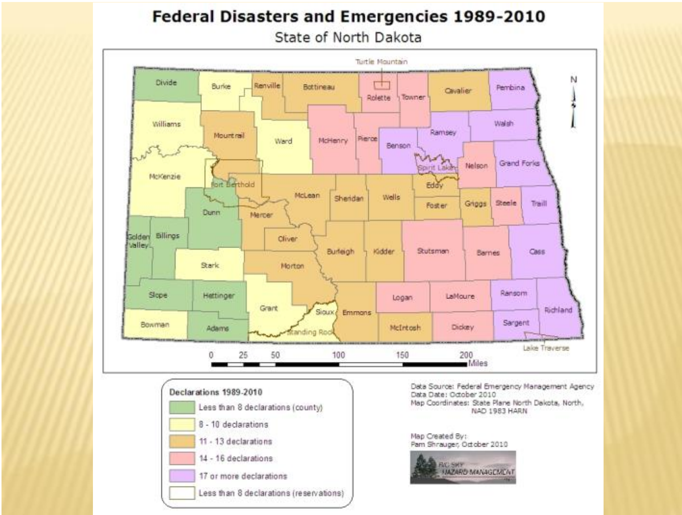
FEMA Region VIII conducted Level 1 HAZUS analyses for flood for each county in the state. This data, that takes many hours of computer processing time, was integrated into the flood hazard profile.

Table 5.9.2K Summer Storm Events Summary from 1995-2009

Event Type	North Dakota
Reported Tornadoes	542 events Highest Magnitude: F4/EF4 (F5 since 1950) $91,888,000+ property damage $5,860,000+ crop damage 2 fatalities 34 injuries
Reported Severe Hail	4,257 events Highest Magnitude: 5.00” $457,455,000+ property damage $176,085,000+ crop damage 20 injuries
Reported Severe Thunderstorm Winds	1,891 events Highest Magnitude: 143 mph $214,940,000+ property damage $185,448,000+ crop damage 2 fatalities 28 injuries
Reported Damaging Lightning Strikes	92 events $1,793,000+ property damage 1 fatality 7 injuries

Note: Flash flood events related to summer storms are addressed in Section 5.4.
Source: National Climatic Data Center, 2010.





RISK ASSESSMENT SUMMARY

Statewide Hazard Rankings

- High Hazards:
  - Winter Storm
  - Summer Storm
  - Drought
  - Flood
- Moderate Hazards:
  - Communicable Disease
  - Hazardous Material Release
  - Wildland Fire
  - Shortage or Outage of Critical Materials or Infrastructure
- Low Hazards:
  - Homeland Security Incident
  - Geologic Hazards
  - Urban Fire or Structure Collapse
  - Dam Failure
  - Transportation Accident

Basis for these are the rankings is a compilation of the rankings provided in the local mitigation plans. The hazards are also listed by priority within the high, moderate, and low listings.

MITIGATION STRATEGY

- *Goal 1: Encourage sound state and local planning related to hazard understanding and mitigation.*
- *Goal 2: Enhance the public's awareness of hazards.*
- *Goal 3: Reduce the impact future development has on potential losses and vulnerabilities.*
- *Goal 4: Reduce impacts of flooding to people and property in North Dakota.*
- *Goal 5: Mitigate the effects severe summer and winter weather have on people and property.*
- *Goal 6: Reduce impacts of drought and wildland fires on North Dakota communities.*
- *Goal 7: Reduce population and property losses from human-caused hazards.*

GOAL 1: ENCOURAGE SOUND STATE AND LOCAL PLANNING RELATED TO HAZARD UNDERSTANDING AND MITIGATION.

- *Objective 1.1:* Increase and improve mitigation planning efforts at the state, tribal, and local levels through technical assistance, plan development, and plan updates.
  - Mitigation Planning
  - Basin-Wide Water Management Planning
- *Objective 1.2*: Improve hazard understanding and risk assessments through individual hazard studies and analyses using digital data.
  - Data Digitization
  - Impacts Database
  - Hazardous Materials Field Study
  - Utility and Critical Material Studies
  - Transportation Database
  - Wildland Fire Database
  - Floodplain Map Modernization

GOAL 2: ENHANCE THE PUBLIC'S AWARENESS OF HAZARDS.

- *Objective 2.1:* Provide the public with information that allows individuals to make sound personal and financial decisions before a disaster threatens.
  - Public Education
  - Situational Awareness
  - Insurance Education

GOAL 3: REDUCE THE IMPACT FUTURE DEVELOPMENT HAS ON POTENTIAL LOSSES AND VULNERABILITIES.

- *Objective 3.1:* Use land management tools to mitigate disasters before construction occurs.
  - Building Codes
  - Zoning and Ordinances
  - Restrictive Covenants

GOAL 4: REDUCE IMPACTS OF FLOODING TO PEOPLE AND PROPERTY IN NORTH DAKOTA.

- *Objective 4.1:* Prevent floodwaters from entering developed areas.
  - Bank Stabilization
  - Flood Control
- *Objective 4.2:* Reduce property and infrastructure losses to developed areas during periods of flood.
  - Property Acquisition, Relocation, and Elevation
  - Storm Water Management and Roadway Protection
  - Floodproofing
- *Objective 4.3:* Prevent flood losses due to dam failures.
  - Dam Safety
- *Objective 4.4:* Improve financial protection from flood while minimizing the risk to future development.
  - National Flood Insurance Program

GOAL 5: MITIGATE THE EFFECTS SEVERE SUMMER AND WINTER WEATHER HAVE ON PEOPLE AND PROPERTY.

- *Objective 5.1:* Improve severe weather warnings and public notifications to increase personal protective actions during severe summer and winter weather.
  - Warning Systems
  - Weather Spotter Training
- *Objective 5.2:* Provide safe places for the public to take protective actions during extreme weather events.
  - Tornado Safe Rooms and Shelter
  - Window Safety Film
- *Objective 5.3:* Protect critical facilities and infrastructure from strong wind, heavy snow, and hail events.
  - Electric Infrastructure Protection
  - Snow Fences
  - Impact Resistant Building Materials

GOAL 6: REDUCE IMPACTS OF DROUGHT AND WILDLAND FIRES ON NORTH DAKOTA COMMUNITIES.

- *Objective 6.1:* Support practices that reduce drought losses and impacts.
  - Drought Water Management
  - Drought Land and Crop Practices
  - Weather Modification
  - Water Supply Intakes
- *Objective 6.2:* Reduce the vulnerability of homes and businesses from approaching wildland fires.
  - Firewise Programs
  - Firebreaks
  - Emergency Haying and Grazing

GOAL 7: REDUCE POPULATION AND PROPERTY LOSSES FROM HUMAN-CAUSED HAZARDS.

- *Objective 7.1:* Prevent intentional and accidental acts through observations, regulations, and enforcement.
  - Transportation Inspection Programs
  - Household Hazardous Waste Regulations
  - Facility Hardening and Security
- *Objective 7.2:* Reduce the impact of human-caused hazards by lessening the probability of disasters or by keeping a small disaster from becoming larger.
  - Back-up Power
  - Transportation Engineering and Systems
  - Smoke Detectors and Sprinkler Systems

MITIGATION IMPLEMENTATION SYSTEM

- State Capability Assessment
  - All-Hazard Mitigation Programs
    - Pre-Disaster Mitigation Program
    - Hazard Mitigation Grant Program
    - Public Assistance Program
    - Community Development Block Grant
    - Building Code Program

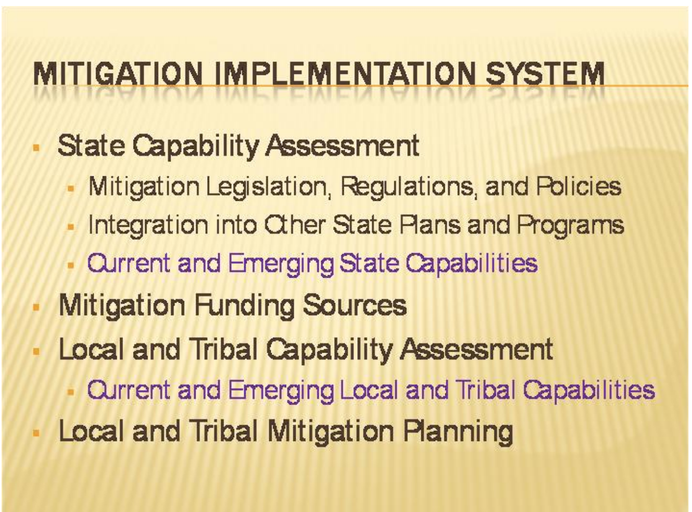
Added sections for “Changes since 2007” and “Ideas for Improvement” to each of the mitigation program sections

MITIGATION IMPLEMENTATION SYSTEM

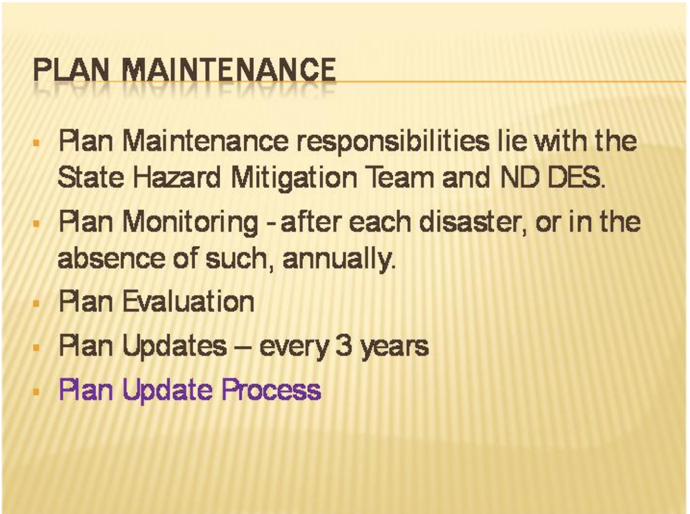
- State Capability Assessment
  - Flood-Specific Programs
    - Silver Jackets Program
    - National Flood Insurance Program
    - Community Assistance Program
    - Map Modernization Program
    - Community Rating System
    - Flood Mitigation Assistance
    - Repetitive Flood Claims Program
    - Severe Repetitive Loss Program

The Silver Jackets Program is a new program that facilitates communication of flood problems through state and federal agencies.

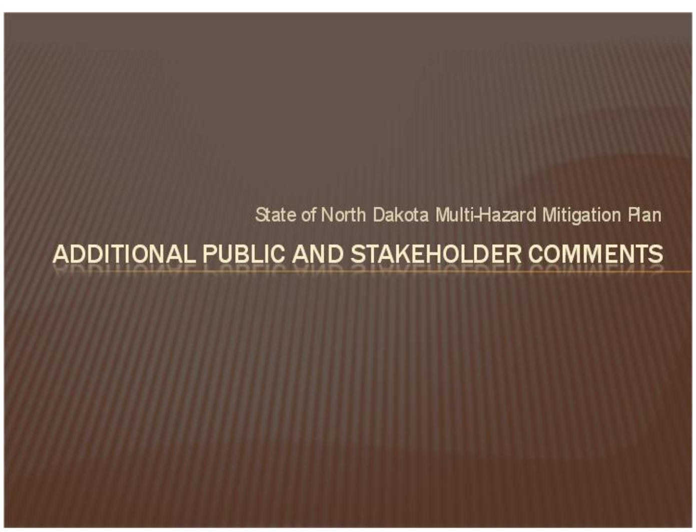
The Community Assistance Program is not a new program but was broken out from the National Flood Insurance Program to evaluate separately.



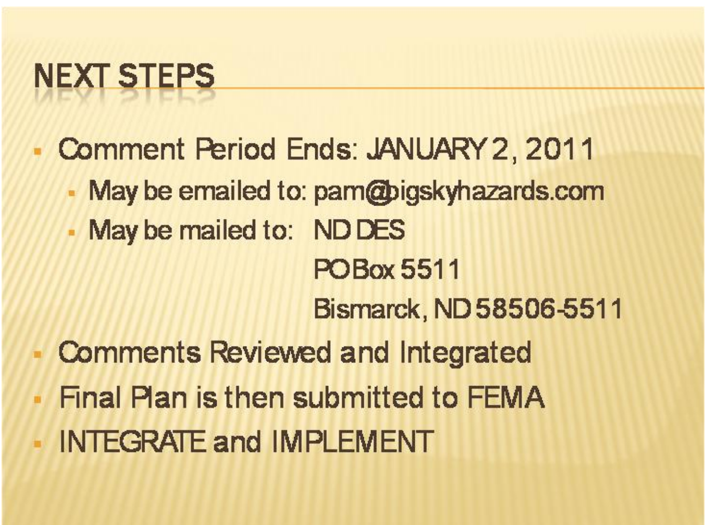
Added a table to highlight important state mitigation policies
Added a table for recommended legislative changes
Provides opportunities for other agencies



Added a plan update process checklist so the process can be replicated.



No additional comments provided.



The draft plan can be found online at:
www.nd.gov/des

Comments can also be emailed to:
nddes@nd.gov

Summary of the North Dakota Multi-Hazard Mitigation Plan Update
Project Kickoff Meeting
Monday, March 11, 2013
2:00p.m. to 4:30 p.m.
Comfort Inn
Bismarck, ND

Introductions and Opening Remarks

Lonnie Hoffer, Disaster Recovery Chief, Division of Homeland Security, N.D. Department of Emergency Services (NDDES), welcomed participants and provided an overview of how the state's investment in mitigation has enhanced efforts to protect citizens. The attendees introduced themselves and the agency they were representing. Eighty-two (82) persons, representing a mix of North Dakota state agencies, federal agencies, local emergency managers, regional planning council, American Red Cross, faith-based response agencies, and universities were present and documented on the sign-in sheet (Attachment 1). Other stakeholders present included representatives from the N.D. Stockmen's Association, Wal-Mart, and rural electric cooperatives.

Greg Wilz, Director of the Division of Homeland Security, NDDES, underscored the importance of each agency's contribution to the update of the N.D. Multi-Hazard Mitigation Plan. Because North Dakota has an approved plan, the state received an estimated $78 million in Hazard Mitigation Grant Program funding, which represents 15 percent of the 2011 flood disaster cost. Greg told the group that the updated currently underway will further efforts to achieve the ultimate goal of an Enhanced Multi-Hazard Mitigation Plan status. This status will ensure the state receives an additional 5 percent of disaster dollars for mitigation funding.

Lonnie introduced Jeff Brislawn and Kari Valentine from AMEC Environment and Infrastructure, the consultants hired to facilitate the planning process and to develop the updated state multi-hazard mitigation plan. Supporting documents also were provided as handouts.

Disaster Mitigation Act (DMA) Requirements, and the Planning Process

A PowerPoint presentation facilitated by Jeff Brislawn included the meeting agenda, recent disaster declarations in N.D., and the requirements of the Disaster Mitigation Act of 2002. The first Disaster Mitigation Act plan in North Dakota was the North Dakota Multi-Hazard Mitigation Plan in 2000, updated in 2002, 2004, 2007, 2011, and now we are starting the March 2013 update. The last plan update can be found at http://www.nd.gov/des/disaster/.

The Multi-Hazard Mitigation Plan Update will use FEMA's Four-Phase DMA Planning Guidance. The plan is intended to organize resources, identify assets at risk, and develop the mitigation plan in ways that will reduce impacts through long-term, sustainable mitigation projects. The plan will also maintain eligibility for FEMA mitigation grant funding.

Plan Update Timeline

The following table shows the project timelines. Emails will be sent out with the date and time details for meetings #2 and #3.

Kickoff Meeting	March 11, 2013
Data Collection Guide	Due April 10, 2013
Meeting #2	May 2013 - Discuss Draft Risk Assessment and Mitigation Strategy
Meeting #3	June 2013 - Discuss Mitigation Actions
State Hazard Mitigation Team Review of Draft Plan Update	October 2013
Submit Draft Plan to NDDES and forward to FEMA	November 2013
FEMA Final Approval	March 2014

History of Planning Put Into Progress in North Dakota

Lonnie highlighted information on the history and success of federal and state mitigation grant projects in North Dakota. There have been approximately 2,300 flood-damaged structures removed from the floodway/floodplain. Another project type that North Dakota has been successful with is installation of snow fences consisting of a windbreak of trees and shrubs to help slow down and catch snow. Projects have placed 1+ million trees, covering 476 miles to protect 121 miles of road. Additional successful project types include retention ponds, elevating electrical transformers and retrofitting doors and windows in flood risk areas, promoting Firewise programs, providing NOAA all-hazard radios to residents, purchasing back-up generators, and keeping vital records safe at secure sties. The federal grants that supported these mitigation efforts would not have been possible without the forethought and initial planning in mitigation.

Role and Structure of the Hazard Mitigation Planning Committees

Kathleen Donahue, Deputy Chief, Division of Homeland Security, NDDES described the role of the State Hazard Mitigation Planning Team.

- Participate in up to three meetings,
- Identify data to help update the analyses of various hazards,
- Review written plan material related to your area of expertise, and
- Identify ways to mitigate hazards.

In addition, NDDES has updated the Mitigation Team Committees with committee leads and members. The Mitigation Team Committees are organized by hazards and specific plan development components as seen below:

- Steering Committee
- Communicable Diseases
- Dam Failure
- Drought
- Flood
- Geologic Hazards
- Hazardous Materials
- Homeland Security
- Shortage/Outage Critical Materials and Infrastructure
- Summer Storm
- Transportation Accident
- Space Weather
- Urban Fire/Structural Collapse
- Wildland Fire
- Winter Storm
- Critical Facilities/Infrastructure
- Oil and Gas Expansion
- Land Use
- Threat Hazard Identification and Risk Assessment (THIRA) Incorporation
- Mitigation Strategy
- Mitigation Implementation

Committees are subject to change based on feedback from the group. (*Subsequent recommended revisions included the following: Including adding Extreme Heat and High Winds as hazards; including Space Weather as part of the Shortages of Critical materials and Infrastructure); renaming Summer storms to Severe Summer Weather; and renaming Winter Storm to Extreme Winter Weather).*

It is the role of the Mitigation Team Committee members to ensure the resulting statewide mitigation activities reviewed and developed during the planning process coordinate with all levels of government in North Dakota. The plan update will describe the interagency coordination among the various state, federal, local, and private sector entities in North Dakota.

Review of Identified Hazards

Kari Valentine with AMEC presented the 13 categories of hazards from the 2011 plan by priority ranking of high, moderate and low based on the probability and extent of potential impacts. During the presentation of information for each hazard, Kari asked the meeting attendees to identify any recent data or studies that should be incorporated. The following table summarizes the 13 categories of hazards and the key points discussed during the meeting.

Hazard	Meeting Discussion
Winter Storm	- Livestock mortality. In 2009 this was tracked by USDA off and on. 1997 was remembered as a bad year. - Suggestion to include uninsured crop losses, infrastructure

Page 3

Hazard	Meeting Discussion
	damage/power loss, and healthcare impacts. Rural Electric Association has data on customer outages and the State Association has data from past two years. - 2002 was a year of extreme cold and had railway tracks break and cause train derailment with hazmat releases.
Summer Storm	- Not all debris has been picked up and disposed of from recent tornadoes. - Wind is included in this hazard, but high winds occur year round. Committee would like it discussed with winter storms also or listed as a separate hazard.
Drought	- Contact WAPA concerning hydro-electric impacts. - Problems with water intake lines for towns near Lake Sakakawea. - Livestock losses from drinking high sulfate water - Ethanol production impacts contact USDA. - USDA weekly Crop Health Reports may be useful. - NASS cattle numbers by year. - Grasshopper outbreaks in late 80s - Extreme Heat could be moved to Summer Storm.
Flood	- Look into the USDA RMA crop loss and prevent planting data. - USGS reports - See county and Devils Lake reports on the land loss from rising lake levels. It is a constant moving target. - Debris management issues (FEMA reimbursements - ½ are not covered) - Crop loss - Private losses discussed, Insurance Department does not have this information. Lonnie has SBA loan information. - FEMA Region VIII losses and HAZUS studies. - Causes transportation delays for trains and major highways.
Communicable Disease	- Department of Health - Plant and animal health data available at State
Hazardous Materials	- Oil and Gas Division and Health Dept have spill database. - Some information is sensitive for this public plan. - Temporary housing with the energy boom is a concern. - Transportation infrastructure vulnerable with higher truck traffic in State.
Wildland Fire	- Asked to include Inter Mix Sites as well as urban Interface Sites. - Include fire suppression costs
Shortage or Outage of Critical Materials or Infrastructure	- Diesel fuel shortages have occurred with truckers and farmers. Governor has issued Hour of Service waiver. - Communication Infrastructure failure has occurred with cell phone towers, telephone outage. - May 1, 2011 "May Day" ice storm caused power losses for 5 days. - Infrastructure failure should include fiber optics being dependent on electric power. - Workers accidently cutting lines during pipeline development. - Rural EMS response problems during Minot flooding and surrounding counties affected - Geomagnetic storms

Hazard	Meeting Discussion
	- Elderly populations vulnerable - State Energy Assurance Plan (EAP) has maps and risk assessment. It is a sensitive document.
Homeland Security Incident	- THIRA is multi-hazard plan - How does Cyber threat fit? THIRA or EAP.
Geologic Hazards	- Valley City has homes impacted by landslides. - Resources include the Dept of Mineral Resources, DOT, NPS – Theodore Roosevelt Park, PSC for mine subsidence, and Montana Bureau of Mines and Geology. - River bank stabilization issues in Red River Valley
Urban Fire or Structure Collapse	- No additional information was discussed.
Dam Failure/ Levee Failure	- Requested to add Dam level definitions to plan. - Suggested to move Levee Failure discussion to flood hazard. - Look at Canadian dams that can impact N.D. - Devils Lake natural levee considered a dam. - Local plans may have agriculture land impact data. - USACE Silver Jackets has levee data
Transportation Accidents	- 4 major train derailments in past 2 years, 1 from a flooding washout. - Resources include Highway Patrol & State Fire Marshal's Office. - Include EMS statistics from Health Dept. - Livestock incidents. If Canadian cattle, then must involve national veterinarian, if N.D. cattle, then just involves state veterinarian.

This plan update will also roll-up and analyze the FEMA approved local and tribal plans. The analysis will include: hazard identification and rankings, goals and strategies, and mitigation action identification.

Data Collection Needs and Next Steps

An electronic Data Collection Guide was distributed to attendees via email after the meeting. It is designed to facilitate gathering updated information on capabilities, initiatives, and funding sources available for mitigation activities in North Dakota. The HMPC was asked to return the updated information data to Kathleen Donahue and Kari Valentine by April 10th. *(The deadline was subsequently extended to April 17, 2013.)*

The Next Steps are to review and complete the Data Collection Guide, send information on hazard incidents and other recent studies of interest to NDDES and AMEC, and to look for future communication on upcoming meeting details.

Adjourn

The meeting adjourned at 4:30pm.

Attachment 1: Copy of Sign-In Sheets

Summary of the North Dakota Multi-Hazard Mitigation Plan Update
Strategy Meeting
Tuesday, March 12, 2013
8:00a.m. to 11:30 a.m.
N.D. Department of Emergency Services Office, Fraine Barracks Lane – Bldg 35
Bismarck, N.D.

Agenda

This document is a record of attendance and a summary of the items discussed during this Strategy Meeting. The meeting included a discussion of the Overview of Next Steps, the Oil and Gas Expansion, Land Use and Future Construction and Development in the State, and the Threat and Hazard Identification and Risk Assessment (THIRA).

Introductions and Opening Remarks

Welcoming remarks were provided by Greg Wilz, Director of the Division of Homeland Security, North Dakota Department of Emergency Services (NDDES). The 19 attendees introduced themselves and the agency they were representing. The following is the list of attendees.

First Name	Last Name	Agency Representing
Fred	Anderson	ND Department of Mineral Resources
Kelly	Casteel	ND State Water Commission
Kathleen	Donahue	ND Department of Emergency Services
Jess	Earle	ND Department of Emergency Services
Tim	Fay	ND State Water Commission
Gary	Haberstroh	ND Department of Health
Mike	Hallesy	Williams County, ND, Emergency Management
Lonnie	Hoffer	ND Department of Emergency Services
Sean	Johnson	ND Department of Emergency Services
Bethany	Kurz	University of ND, Energy & Environmental Research Center
Justin	Messner	ND Department of Emergency Services
Paul	Messner	ND Department of Emergency Services
Brady	Pelton	ND Association of Oil & Gas Producing Counties
Jeff	Rotenberger	ND Department of Commerce
Jeana	Scheffler	Burleigh County, ND, Emergency Management
Greg	Wilz	ND Department of Emergency Services
Steve	Zimmer	West Fargo/N.D. Planning Association (NDPA)
AMEC Representatives		
Jeff	Brislawn	AMEC
Kari	Valentine	AMEC
Susan	Belt	AMEC – via conference call during THIRA discussion

Overview of Next Steps

Lonnie stated that the Data Collection Guide would be sent out via email to all participants. The next meeting dates would be established quickly and sent out to invitees.

Oil and Gas Industry Expansion

Greg explained to participants that the rapid oil and energy development requires an analysis of risk and opportunity to mitigate that risk. The following issues related to the Oil and Gas Industry Expansion in the state were discussed and are summarized by topic in the table below: transportation, housing, trade waste, hazardous materials spills, fresh water supply, overloaded infrastructure, cyber threats to SCADA infrastructure, contracting services, proximity of oil well sites to missile silos, mixture of cultures, and immunizations needed.

Topic	Meeting Discussion
Transportation	- Increased truck traffic problems - Jefferson Line Bus Service drops off people in Williston daily who are unskilled, looking for work and with no place to stay. - Increased transportation infrastructure impacts - Over 5,000 bridges in the state many in poor shape - Train traffic is also increasing as a result of the energy industry growth. - The state has limited capacity for transporting oil.
Housing	- Man Camps run by oil companies. They are metal, anchored solid. At first, there was not much local review process of the camp sites. They were always leveraging up and asking for expansion of facilities. Now there is a moratorium and no new man camps expansion allowed. - Man camps are located near frontage roads, highway access and water supplies and zoned as commercial/light industrial. - Camper Clusters consist of RV's parked very close together that are not bolted in the ground and are vulnerable to natural hazards and fires. Potential for mass casualty event. - Some people are living in cars - New housing construction is occurring quickly. But because of inflated prices, residents are not able to purchase. - Rental housing prices are inflated. Locals who are on fixed incomes and have rented for years are now unable to stay in the homes because rental prices have escalated. - Property values have increased 40% in one year. There are legislative proposals to cap this increase.
Trade waste and hazardous material spills	- HazMat is being transported by railway and roads throughout State. - Increase in Transload sites (transfer of one mode of transport to another) have potential for more haz mat spills - Number of spills is increasing and creating clean-up issues. - Mountains of pallets, filter socks & sand bags have been created when the waste is not accepted at disposal sites. - Some materials have low level radioactivity from natural background radiation associated with the Bakken formation. - Hydrogen sulfide gas concentrations are typically lower in

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Topic	Meeting Discussion
	Bakken oil, not as much of a concern at well sites but some concerns about concentrations in holding tanks.
Fresh water supply	- Fresh water is needed for drilling and new water depos are being created. - Water used for agriculture irrigation has shifted to energy industry water usage.
Overloaded infrastructure	- Waste water from Man Camps is being transported everywhere. Some to proper disposal sites-some is not disposed of properly. - The city of Williston is trying to deal with land use issues by annexing more land in the city limits (doubled in size) so they can use their established land use regulations. - Waste water in Williston is running at capacity. - All 9 fire departments in Williams County are operated by volunteer fire fighters. - EMS is all volunteer except Williston has paid staff. - Clinics and Trinity Hospital are operating at full capacity. - Williston built their own apartment building that is operated by a management company to have a place for additional service people (law enforcement, EMS, etc) to live. The rent is based on the individual's salary not the inflated prices.
SCADA cyber threats	- The possibility of increased vulnerability to cyber threats due to increasing SCADA systems associated with pipeline infrastructure was discussed; the extent of new SCADA system development was unknown.
Contracting services	- Problems with sub-par contractors. Some buildings are not being built to code. McKenzie County building codes administrators are checking up on everything in their county and they are considered a model county.
Proximity of oil well sites to missile silos	- The concern is about the proximity of oil well drilling sites to the Minot Air Force Base's active missile silos. It was stated that an AFB liaison exists and coordination is occurring and it was unclear how much of an issue this is since the silos are reinforced.
Mixture of cultures	- Language barriers - Locals feel that they are "so far from normal". - Increased crime
Immunizations	- The Upper Missouri Health District offered immunization clinics for students but very few people showed up.

Land Use and Future Construction and Development in the State

Topic	Meeting Discussion
Geological	- Dept of Mineral Resources has geological mapping completed in the eastern part of the State, but not completed in western part of the State. - Contact PSC for mapping of subsidence related to mining. - Unclaimed uranium mines are still an issue. - Red River Valley/ Fargo area is all clay soil and has swelling soil problems.
Floodplain Issues	- With climate shifts, we are seeing more frequency and longer intensity of flood events.

Topic	Meeting Discussion
	- Risks as they relate to floodplains need to be revisited - Historically, the large flooding events in 1914, 1975 & 2011 are because of high rainfall creating these events, not snowmelt. These have also been the most dangerous events. - Some concern about growth in floodplains, particularly along Missouri. - Floodplain management not always working at local level as intended due to local developer influence and politics. - Minot 2011 flooding was a learning event. People cannot afford dry land houses due to inflated housing market caused by expansion in oil and gas industry. - State law requires construction in the floodplain to be 1 foot above Base Flood Elevation (BFE). State engineers review all floodway construction proposals. - Law in West Fargo is 2 feet above BFE and a developer/individual must purchase 40 acre parcels if they want to develop in floodplain. This is deterring major floodplain development.
Education of proper land use	- An undercurrent of the State Hazard Mitigation Plan is that proper land use choices lead to better outcomes and more sustainable communities. This can be accomplished with additional education to locals. - Lots of education needed for floodplain residents
Local zoning issues	- Small towns historically liked "no zoning" so they could build wherever they wanted. Now, with the energy industry, small towns want land zoning. - Industrial uses encroaching adjacent to residential
Energy Industry	- Amplifies all hazards and growth issues throughout the State.
Planning	- ND Department of Commerce planning initiative under legislative consideration. If approved could provide $1M to help assist smaller communities with comprehensive planning. There is no specific hazard element required in comp plans by the State. - Implementation of local mitigation plans an issue - Some hazard mitigation plans completed by Regional Planning Councils but sometimes there is a disconnect.

Threat and Hazard Identification and Risk Assessment (THIRA)

Sean Johnson, Plans and Intelligence Officer, NDDES gave a briefing on the THIRA objectives and planning requirements and N.D. THIRA. It is an unclassified, For Official Use Only document. The document will be provided to AMEC under this understanding. After the briefing by Sean, it is AMEC's intent to incorporate the relevant THIRA hazard context and related capabilities and mitigation considerations into the State Multi-Hazard Mitigation Plan.

Adjourn

The meeting adjourned at 11:30am.

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Summary of the North Dakota Multi-Hazard Mitigation Plan Update
Meeting #2: Updating the Risk Assessment and Plan Goals
Wednesday, June 5, 2013
8:30 a.m.-11:30 a.m.
Comfort Inn
Bismarck, ND

Introductions and Opening Remarks

Lonnie Hoffer, Disaster Recovery Chief, Division of Homeland Security, N.D. Department of Emergency Services (NDDES), welcomed participants and thanked them for providing data that has been utilized in updating the risk assessment. The attendees introduced themselves and the agency they were representing. Forty-six (46) persons, representing a mix of North Dakota state agencies, associations, federal agencies, and local emergency managers were present and documented on the sign-in sheet (Attachment 1).

Jeff Brislawn and Laurie Bestgen from AMEC Environment and Infrastructure facilitated the remainder of the meeting utilizing a PowerPoint presentation. A booklet that included the agenda, the PowerPoint presentation, a roster of Multi-Hazard Mitigation Team Members, and additional supporting documentation was provided to all meeting participants.

Disaster Mitigation Act (DMA) Requirements and the Planning Process

Mr. Brislawn provided a brief overview of the purpose of Hazard Mitigation Planning and requirements of the Disaster Mitigation Act of 2000. The history of Hazard Mitigation Planning in North Dakota was discussed and the link was provided for the previous 2011 plan: http://www.nd.gov/des/disaster/.

The Multi-Hazard Mitigation Plan Update will use FEMA's Four-Phase DMA Planning Guidance. The phases include: 1) organize resources 2) assess risk, 3) develop the mitigation plan, and 4) Implement the plan/monitor progress. The 2014 plan update effort is now in phases 3 and 4.

Risk Assessment Update

Mr. Brislawn and Ms. Bestgen presented information and analysis results developed for the 14 hazards identified as applicable to North Dakota. The PowerPoint presentation provided details and analysis results for each hazard. The following table summarizes the 14 hazards and any comments or discussion that occurred.

Hazard	Meeting Discussion
Winter Storm	- There was a suggestion to pull frost/freeze insurance payments out of the crop loss data. Inclusion of this cause of loss may skew the Winter Storm losses. - There was a suggestion to add data regarding livestock exposure. Losses to livestock would also be helpful if a source of data is identified classifying losses by cause.
Summer Storm	- There was a suggestion to add data regarding livestock exposure. Losses to livestock would also be helpful if a source of data is identified classifying losses by cause.
Drought	- The Department of Agriculture may have additional data regarding losses to uninsurable crops.
Flood	- There was discussion of mitigation efforts that have been put in place such as constructing a dam in the Devils Lake Basin. AMEC will include this information in the narrative along with the potential impacts to downstream counties in the event of failure or overtopping of the dam.
Communicable Disease	- Comments indicate that the amounts used for cost of hospitalization may be too low. AMEC will check this data.
Hazardous Materials	- AMEC is working with NDDES to gather additional data on previous incidents to show how this risk varies across the State.
Wildland Fire	- There was discussion that this hazard may need to be categorized as a High Risk, rather than Moderate Risk. - Small fires should not be overlooked as these can become large fires depending on response times/capabilities of the local fire department. - The North Dakota Forest Service and Fire Marshal's Office may have additional data available to improve the analysis. - There was discussion regarding inclusion of CRP acres. The plan narrative includes the total number of CRP acres in the State, but AMEC has not found a source for county-level data. If this is available, please provide.
Shortage or Outage of Critical Materials or Infrastructure	- No additional comments
Windstorm	- The number of injuries and deaths is the same as the Thunderstorm Wind hazard discussion. AMEC will check the data to determine if this is an error, coincidence, or limitation in the data source.
Homeland Security Incident	- There were comments that other standardized costs associated with the scenarios would enhance the analysis; such as injuries and hospitalization.
Geologic Hazards	- No additional comments
Urban Fire or Structure Collapse	- There was discussion of small agricultural fires that damage equipment or stored harvest. The fires of this kind that have been reported to the ND Forest Service have been included in the Wildland Fire hazard section.
Dam Failure	- The State Water Commission has retained a firm that is in the process of re-evaluating the hazard classification of dams. This may result in several medium hazard dams being moved to a high hazard classification. The results will not be available for this update. However, they should be final prior to the next State plan update.

Transportation Accidents	- There was discussion regarding the need to factor in previous events (crashes) data into the overall vulnerability. - There was a comment that traffic volume data would be a better indicator of vulnerability, if available. - There was a question as to whether fatality accidents were included in the data. AMEC will check this. If not, the ND DOT will provide. - There was a comment to include train derailment data as well as accidents at railroad crossings. - A question was raised as to whether data was available for reservations as they were not represented the same as the county location on the vulnerability map.

After the discussion of each hazard, Ms. Bestgen provided an overview of the data that has been provided for State owned and operated facilities from the North Dakota Tornado and Fire fund. The plan document will include a breakdown by county of the facilities that are insured through this fund as well as a summary of specific historic claims data for various hazards. The presentation included summary data for state agency facilities/property only, not including universities or National Guard Properties. There was a question as to whether or not this data includes leased facilities. Ms. Bestgen answered that the personal property policies account for equipment and property that is utilized in leased facilities. This is evidenced by the larger number of personal property policies (1,432) compared to building property policies (829) in the records for policies held by state agencies.

Updating Plan Goals and Introduction of Update to Mitigation Initiatives

Mr. Brislawn facilitated discussion of the seven (7) plan goals that were included in the Mitigation Strategy of the previous plan. There was some discussion recommending re-wording some of the goals as well as to consolidate the hazard-specific goals into one or two more broad goals. The consensus was for AMEC to develop some suggested changes to the goals for further discussion at Meeting #3.

Next Steps

Mr. Brislawn provided information on the remaining steps to complete the 2014 North Dakota Multi-Hazard Mitigation Plan Update summarized below:

- Draft Risk Assessment Chapter to State Hazard Mitigation Team-Late June 2013
- Meeting #3: Mitigation Strategy-July 16, 2013
- State Hazard Mitigation Team Review of Entire Draft Plan Update-October 2013
- Submit Draft Plan to NDDES and forward to FEMA-November 2013
- FEMA Final Approval-March 2014

Adjourn

The meeting adjourned at 11:30 a.m.

Summary of the North Dakota Multi-Hazard Mitigation Plan Update
Meeting #3: Mitigation Strategy
Tuesday, July 16, 2013
8:30 a.m.-11:30 a.m.
Comfort Inn
Bismarck, ND

This document is a record of attendance and a summary of the items discussed during the North Dakota Multi-Hazard Mitigation Plan Update meeting. The meeting included the following topics: review of planning process, risk assessment key issues, capability assessment update, updating plan goals, mitigation initiatives, work session on initiatives, public survey, plan maintenance, and next steps in plan update. A booklet that included the agenda, the PowerPoint presentation, a roster of Multi-Hazard Mitigation Team Members, and additional supporting documentation was provided to all meeting participants.

Introductions and Opening Remarks

Greg Wilz, Director of the Division of Homeland Security, NDDES, thanked everyone for attending this third and final meeting for the Multi-Hazard Mitigation Plan Update. He stated he appreciated the consistent and dedicated support of the participants to this major plan update process. This meeting is the "so what" in other words, now where do we go from here and will focus on updating the mitigation strategy.

Lonnie Hoffer, Disaster Recovery Chief, Division of Homeland Security, N.D. Department of Emergency Services (NDDES), stated he was glad to see the turnout at this meeting. He stated he wants this plan to be a working reference document for everyone to use. Then the attendees introduced themselves and the agency they were representing. Forty-six (46) persons, representing a mix of North Dakota state agencies, associations, federal agencies, and local emergency managers were present and documented in Attachment 1.

Jeff Brislawn and Kari Valentine from AMEC Environment and Infrastructure facilitated the remainder of the meeting utilizing a PowerPoint presentation.

Disaster Mitigation Act (DMA) Planning Guidance

Mr. Brislawn provided a brief status of the Multi-Hazard Mitigation Plan Update using FEMA's Four-Phase DMA Planning Guidance. The phases include: 1) organize resources 2) assess risk, 3) develop the mitigation plan, and 4) implement the plan/monitor progress. The 2014 plan update effort is now in phases 3 and 4.

Risk Assessment Update

Mr. Brislawn stated that the draft Hazard Identification and Risk Assessment (HIRA) is available for the State Hazard Mitigation Team members to review and asked if anyone was having difficulty accessing it. No one stated they were having difficulties. It is available on a file transfer site at: ftp://NorthDakota:State2013@amftp.amec.com

User name: **North Dakota**
Password: **State2013**

Mr. Brislawn asked that comments be send to laurie.bestgen@amec.com by August 5th. Also Chapter 4, Assets at Risk/Changes in Development was posted on the same file transfer site for team member review.

Key Issues from Risk Assessment

Mr. Brislawn discussed the general issues and hazard specific key issues that arose from the risk assessment. This was presented to allow the team members to be aware of the issues before moving ahead into the mitigation initiatives.

Changes in Capabilities at State and Local Level

Ms. Valentine asked the State Hazard Mitigation Team members to review Attachment 2 in the booklet and validate the State/local strengths, State/local weaknesses, and State/local emerging capabilities. Several team members shared thoughts such as: state legislature being aware of the State's flooding problems and thus made additional funding available through State Water Commission, the discussion of emerging trend analyses being completed at DES, and the problem of debris management in the counties and cities. These new strengths, weaknesses and emerging capabilities will be incorporated in the plan update.

Updating Plan Goals

Ms. Valentine stated that the plan goals were discussed at planning meeting #2 in June, but a consensus was not reached. One thought was that the Local Hazard Mitigation

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Plan goals should be compared to the State goals before anything should be changed. AMEC completed a review of the local plan goals and the results are in the table below.

State Goal	Local Goals Compared to State Goals
Goal 1	7% of local goals correlate to this planning goal
Goal 2	15% of local goals have public education
Goal 3	20% of local goals minimize losses
Goals 4-7	23% of goals reduce the risk of hazards & only 5% of these are hazard specific
	35% of local goals are "other" categories

The State Hazard Mitigation Team members had an extensive discussion of the purpose and goals for this plan update. The following is the consensus of the purpose and goals:

Purpose: Minimize the vulnerability of the life and health of people, property, environment, and economy of North Dakota and its communities from the impacts of natural and technological hazards as well as adversarial threats.

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, dam failure, geological hazards, transportation accidents, urban fire or structural collapse, and windstorm to people and property in North Dakota.

Mitigation Initiatives Review

Ms. Valentine asked the team members to review the 2011 Mitigation Initiatives listed in Attachment 3 with the description, lead agencies, and the 2013 status. The initiatives have multiple lead agencies listed and we would like to change that. We recommend that there should be one state agency to take ownership per initiative and then list supporting agencies. We would like this to be a discussion in your working group.

Mr. Brislawn reviewed a list of new mitigation initiative ideas for the team members to think about as they develop their new initiatives.

Work Session for Mitigation Initiatives

Instructions were given to work with your hazard specific committees to determine:

1. Lead agency and support agencies for on-going initiatives, and
2. New Mitigation Initiatives to submit for the plan.

Then for each on-going initiative that needs modifications/changes, please put on a Mitigation Initiative Worksheet. A sample is on Attachment 4.

For each new initiative, the lead agency needs to complete both a Mitigation Initiative Worksheet and a Prioritization of Initiative Worksheet (sample as Attachment 5).

The working groups had about 30 minutes to discuss, work on sample Mitigation Initiative Worksheets and then report out to the group their initiatives. These worksheets have been sent out electronically to all team members and there are due to Kari Valentine, kari.valentine@amec.com by August 5th.

Some of the ideas for new mitigation initiatives included mitigating loss of critical communication, mitigation of cyber threats, identification of hazardous materials truck routes and expanding regional hazmat teams. Director Wilz reported on the seamless basemap initiative that is underway and will improve accuracy of GIS base layers to support a multitude of emergency management and other applications. The effort is being spearheaded by DES and DOT in partnership with a GIS technical committee. The effort will include the ability to track culvert replacements and mitigation project implementation, allowing for future loss avoidance studies.

Public Survey

Ms. Donahue informed the team members that NDDES is conducting a public survey with the plan update. She encouraged everyone to complete the survey and to ask their co-workers, family and friends in North Dakota to complete also.

A news release for the Hazard Mitigation Plan survey was emailed to the team members. The link is http://www.nd.gov/des/disaster/state-multi-hazard-plan-hazards-survey and it is critical to the planning process. The deadline to complete the survey is **August 30.**

Mitigation Funding Sources
Mr. Brislawn stated that the mitigation funding sources for the plan update needed team member's input as well. A copy of the mitigation funding sources from the 2011 plan was included in the booklet as a part of Attachment 2. He asked team members to please let us know if there are changes to the mitigation funding sources.

Plan Maintenance
Mr. Brislawn informed the team members that NDDES has the overall responsibility for plan monitoring and maintenance. He recommended that annual reviews of the plan be reinstated. A team member recommended that committee leaders gather to report the mitigation initiative status on an annual basis and that the State Hazard Mitigation Team reconvene every other year to discuss the entire plan.

Next Steps – Plan Timeline

Mr. Brislawn provided information on the remaining steps to complete the 2014 North Dakota Multi-Hazard Mitigation Plan Update summarized below:

- Comments on draft HIRA and New Mitigation Initiatives are due August 5, 2013
- State Hazard Mitigation Team Review of Entire Draft Plan Update-October 2013
- Submit Draft Plan to NDDES and forward to FEMA-November 2013
- FEMA Final Approval-March 2014

Adjourn
The meeting adjourned at 11:30 a.m.

Attachment 1: Attendees

First	Last	Title	Agency
Laura	Ackerman	Water Resource Engineer	ND SWC
Gary	Allen	Manager of Engineering	Northern Plains Electric Cooperative, Dakota Valley Electric Cooperative
Will	Arwood	HMA Specialist	FEMA Region VIII
Brad	Darr	State Maintenance Engineer	N.D. Department of Transportation
Ray	DeBoer	Coordinator, Haz-Chem Prepared and Response Program	NDDES, Division of Homeland Security
Kathleen	Donahue	Deputy Chief, Recovery and Mitigation	NDDES, Division of Homeland Security
Jess	Earle	Mitigation Specialist	NDDES, Division of Homeland Security
Curt	Erickson	Manager of the Hazardous Waste Program	NDDoH
Pat	Fridgen	Division Director, Planning and Education	SWC
Major Mike	Gerhart	Field Operations Director	N.D. Highway Patrol
Karen	Goff	Dam Safety Engineer	N.D. State Water Commission (SWC)
Jenny	Gomke	Case Manager	Lutheran Disaster Response
Lonnie	Grabowska	Deputy Director	N.D. Bureau of Criminal Investigation (BCI)
Gary	Haberstroh	Environmental Engineer	NDDoH
Mike	Hall	Silver Jackets Coordinator	SWC
Mike	Hallesy	Emergency Manager	Williams County
Kari	Herrick	Policy Analyst and Public Information Specialist	N.D. Department of Agriculture
David	Hirsch	State Plant Health Director	U.S. Animal Plant and Health Inspection Services (APHIS)
Lonnie	Hoffer	Disaster Recovery Chief	NDDES, Division of Homeland Security
Corey	King	Emergency Response Specialist	National Weather Service
Jolene	Klein	Acting Executive Director	ND Housing Finance Agency
Russ	Korzeniewski	Disaster Preparedness Administrator/Risk Manager	N.D. Department of Human Services
Debbie	LaCombe	Grants and Training Chief	NDDES, Division of Homeland Security
Darin	Langerud	Director, Atmospheric Resource Board	SWC
Larry	Lee	Contingency Planner	N.D. Information Technology Department

First	Last	Title	Agency
Renee	Loh	Executive Director	N.D. Firefighters Association
Justin	Messner	Mitigation Specialist	NDDES, Division of Homeland Security
Paul	Messner	State Hazard Mitigation Officer	NDDES, Division of Homeland Security
Jeanine	Neipert	HMA Specialist	FEMA Region VIII
Brady	Pelton	Deputy Executive Director	N.D. Association of Oil and Gas Producing Counties & N.D. Coal Conversion Counties Association
Dr. Stephen	Pickard	Career Epidemiology Field Officer	NDDoH
Christy	Roemmich	Safety Coordinator	N.D. Association of Rural Electrical Cooperatives
Sandy	Rohde	Planning & Zoning Administrator	Dunn County
Jeffrey	Savadel	Meteorologist-in-Charge	National Weather Service
Mary	Senger	Emergency Manager	Burleigh County
Joshua	Simmers		ND Aeronautics Commission
Gary	Simmons		NDDES
Gary	Stockert	Emergency Manager	City of Bismarck
Steve	Tillotson	Assistant Director, Waste Management Director	NDDoH
Kathleen	Tweeten	Director, NDSU Extension Center for Community Vitality	North Dakota State University Extension Service
Brenda	Vossler	TE Officer	NDDES
Linda	Weispfenning	Planner	SWC
Greg	Wilz	Director	N.D. Department of Emergency Services (NDDES), Division of Homeland Security
Ken	Yantes	Secretary/Director of Governmental Relations	North Dakota Township Officers Association
Jenny	Yearous	Curator of Collections Management	Historical Society of North Dakota
Michael	Ziesch	Labor Market Information Manager	North Dakota Job Service

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Appendix F. ACRONYMS

AAL – Average Annualized Loss
ACV – Actual Cash Value
APHIS – Animal and Plant Health Inspection Service
BCA – Benefit Cost Analysis
BCI – Bureau of Criminal Investigation
BCR – Benefit Cost Ratio
BIA – Bureau of Indian Affairs
BLM – Bureau of Land Management
BFE – Base Flood Elevation
BNSF – Burlington Northern Santa Fe
BP = Building Property
BSE – Bovine Spongiform Encephalopathy
CAP – Community Assistance Program
CAP-SSSE – Community Assistance Program – State Support Service Element
CAV – Community Assistance Visit
CBRNE – Chemical Biological Radiological Nuclear Explosive
CDBG – Community Development Block Grant
CDC – U.S. Centers for Disease Control
CFR – Code of Federal Regulations
CIKR – Critical Infrastructure and Key Resources
CIP – Critical Infrastructure Program
CIS – Community Information System
CMI – Crop Moisture Index
CMP – Cloud Modification Project
COG – Continuum of Government
COOP – Continuity of Operations Plan
CPG – Crisis Preparedness Guide
CPRI – Calculated Priority Risk Index
CRP – Conservation Reserve Program
CRREL – Cold Regions Research and Engineering Laboratory
CRS – Community Rating System
CTP – Cooperating Technical Partner
DCS – Division of Community Services
DDS – Department of Domestic Security
DEM- Digital Evaluation Model
DES – Department of Emergency Services
DFIRM – Digital Flood Insurance Rate Map
DHS – Department of Homeland Security
DMA2K – Disaster Mitigation Act of 2000
DMVW – Dakota Missouri Valley and Western
DOJ – Department of Justice

DOT – Department of Transportation
DR - Disaster
EAP – Emergency Action Plan
EDA – Economic Development Administration
EIA – Energy Information Administration
EM - Emergency
EMAP – Emergency Management Accreditation Program
EMCAPS – Electronic Mass Casual Assessment and Planning Scenarios
EMPG – Emergency Management Performance Grants
EMS – Emergency Medical Services
EO – Executive Order
EOC – Emergency Operations Center
EOP – Emergency Operations Plan
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
FALN – Armed Forces of National Liberation (translated)
FAS – Federal Aid System
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency
FHBM – Flood Hazard Boundary Map
FHWA – Federal Highway Administration
FIRM – Flood Insurance Rate Map
FIS – Flood Insurance Study
FMA – Flood Mitigation Assistance
FWS – Fish & Wildlife Service
FY – Fiscal Year
GIS – Geographic Information System
GPS – Global Positioning System
HAZUS-MH – Hazards United States Multi-Hazard
HI – Heat Index
HILF – High Impact, Low Frequency
HMA – Hazard Mitigation Assistance
HMEP – Hazardous Materials Emergency Program
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HSIP – Homeland Security Infrastructure Protection
HUD – Housing and Urban Development
HVAC – Heating, Ventilating, and Air Conditioning
HVE – Homegrown Violent Extremist
IA – Individual Assistance
ICC – Increased Cost of Compliance
ICT – Information and Communication Technology
IED – Improvised Explosive Device
IGETT – Integrated Geospatial Education and Technology Training
IHMT – Interagency Hazard Mitigation Team
LAMP – Levee Analysis Mapping Procedures

LEPC – Local Emergency Planning Committee
LP – Liquefied Petroleum
LSP – Levee Safety Program
MLI – Mid-Term Levee Inventory
MOU – Memorandum of Understanding
NCDC – National Climatic Data Center
ND – North Dakota
NDBCI – North Dakota Bureau of Criminal Investigation
NDCC – North Dakota Century Code
NDDES – North Dakota Department of Emergency Services
NDHP – North Dakota Highway Patrol
NDDoH – North Dakota Department of Health
NDDOT – North Dakota Department of Transportation
NDPRD – North Dakota Parks and Recreation Department
NDSU – North Dakota State University
NDUS – North Dakota University System
NEMIS – National Emergency Management Information System
NFIP – National Flood Insurance Program
NFIRS – National Fire Incident Reporting System
NFP – National Fire Plan
NID – National Inventory of Dams
NIFC – National Interagency Fire Center
NLD – National Levee Database
NNSA – National Nuclear Security Administration
NOAA – National Oceanic and Atmospheric Administration
NPDP – National Performance of Dams Program
NRC – National Response Center
NRCS – Natural Resources Conservation Service
NSF – National Science Foundation
NTSB – National Transportation & Safety Board
NWS – National Weather Service
OMB – Office of Management and Budget
OP – Outdoor Property
PA – Public Assistance
PCB – Polychlorinated Biphenyl
PCN – Potato Cyst Nematodes
PDM – Pre-Disaster Mitigation
PDM-C – Pre-Disaster Mitigation Competitive
PDSI – Palmer Drought Severity Index
PL – Public Law
PP – Personal Property
PPQ – Plant Protection and Quarantine
RAADs – Roads Acting as Dams
RDI – Reclamation Drought Index
RFA – Rural Fire Assistance
RFC – Repetitive Flood Claims

RiskMAP – Risk Mapping, Assessment, and Planning
RMP – Risk Management Plan
RV – Replacement Value
SARA – Superfund Amendment Reauthorization Act
SARS – Severe Acute Respiratory Syndrome
SBA – Small Business Administration
SEOP – State Emergency Operations Plan
SF – Standard Form
SFA – State Fire Assistance
SFHA – Special Flood Hazard Area
SHELDUS – Spatial Hazard Events and Losses Database for the United States
SHMO – State Hazard Mitigation Officer
SHMT – State Hazard Mitigation Team
SIR – Significant Incident Reporting database
SLIC – State and Local Intelligence Center
SPI – Standardized Precipitation Index
SRL – Severe Repetitive Loss
STAPLEE – Social, Technical, Administrative, Political, Legal, Economic, and Environmental
SWAT – Special Weapons and Tactics
SWC – State Water Commission
SWSI – Surface Water Supply Index
THIRA – Threat and Hazard Identification Risk Assessment
TP – Trailer Property
UASI – Urban Area Security Initiative
UND – University of North Dakota
US – United States
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
USFA – United States Fire Administration
USFS – United States Forest Service
VA – Veterans Affairs
WMA – Wildlife Management Area
WMD – Weapons of Mass Destruction
WPDG – Wetland Program Development Grants
WRD – Water Resource District
WUI – Wildland Urban Interface

Appendix G. Local and Tribal Mitigation Plans Status as of June 24, 2013

County/Tribe	Status	Current Approval Date	Current Expiration Date
Adams	Expired; new plan in development		
Barnes	Approved; new plan in development	6/10/2010	6/10/2015
Benson	Approved	11/28/2011	11/28/2016
Billings	Expired; new plan in development		
Bottineau	Approved	7/9/2010	7/9/2015
Bowman	Approved	5/14/2013	5/14/2018
Burke	Expired; new plan approved pending adoption	12/17/2007	12/17/2012
Burleigh	Approved	3/8/2010	3/8/2015
Cass	Approved; new plan in development	1/14/2009	1/14/2014
Cavalier	Approved	3/6/2013	3/16/2018
Dickey	Expired; new plan in development		
Dunn	Expired; new plan approved pending adoption		
Eddy	Approved		
Emmons	Approved	4/26/2011	4/26/2016
Foster	Approved; new plan in development	2/16/2010	2/16/2015
Golden Valley	Expired; new plan in development	9/30/2010	9/30/2015
Grand Forks	Approved; new plan in development	6/26/2009	6/26/2014
Grant	Approved	11/21/2011	11/21/2016
Griggs	Expired; new plan in development		
Hettinger	Approved; new plan in development	11/1/2010	11/1/2015
Kidder	Expired; new plan in development	4/10/2007	4/10/2012
LaMoure	Approved; new plan in development	12/2/2009	12/2/2014
Logan	Approved	6/10/2010	6/10/2015
McHenry	Approved	11/22/2010	11/22/2015
McIntosh	Approved	11/20/2009	11/20/2014
McKenzie	No plan; new plan in development		
McLean	Approved	8/24/2009	8/24/2014
Mercer	Approved	4/26/2011	4/26/2016
Morton	Expired; new plan in development		
Mountrail	Expired; new plan in development		
Nelson	Approved	4/23/2010	4/23/2015
Oliver	Expired; new plan in development		
Pembina	Approved	6/11/2010	6/11/2015
Pierce	Approved	6/17/2013	6/16/2018

County/Tribe	Status	Current Approval Date	Current Expiration Date
Ramsey	Approved	3/10/2010	3/10/2015
Ransom	Approved	3/30/2010	3/30/2015
Renville	Approved	11/5/2009	11/5/2014
Richland	Approved	9/24/2010	9/24/2015
Rolette	Approved	2/23/2011	2/23/2016
Sargent	Approved; new plan in development	11/20/2008	11/20/2013
Sheridan	No plan; new plan in development		
Sioux	Approved	6/3/2011	6/3/2016
Siting Bull Tribal College	Expired	3/28/2007	3/28/2012
Slope	Approved	5/14/2013	5/14/2018
Spirit Lake Tribe	Approved	9/19/2011	9/19/2016
Standing Rock Indian Reservation	Approved	6/3/2011	6/3/2016
Stark	Expired; new plan in development		
Steele	No plan		
Stutsman	Approved; new plan in development	2/8/2011	2/8/2016
Three Affiliated Tribes of the Fort Berthold Reservation	Expired		
Turtle Mountain Band of Chippewa	Approved	6/3/2011	6/3/2016
Towner	Approved	11/22/2010	11/22/2015
Traill	Approved	9/24/2010	9/24/2015
Walsh	Approved	11/5/2009	11/5/2014
Ward	Approved pending adoption	9/10/2008	9/10/2013
Wells	Approved	4/26/2011	4/26/2016
Williams	Approved	6/21/2010	6/21/2015