2014

Sargent County Multi-Hazard Mitigation Plan

Sargent County Courthouse, Forman, ND

Table of Contents

Appendices

Section 2Executive Summary

On October 30, 2000, the President signed into law the Disaster Mitigation Act of 2000. Among its other features; the Disaster Mitigation Act of 2000 established a requirement that in order to remain eligible for Federal Disaster Mitigation grant funds, local and state governments must develop and adopt Multi-Hazard Mitigation Plans. On February 26, 2002, the Federal Emergency Management Agency published an Interim Final Rule that set forth the guidance and regulations under which such plans are to be developed. The Interim Final Rule provides detailed descriptions of both the planning process for states and local governments and the plan contents that emerge from the planning process. The original version of the Sargent County Multi-Hazard Mitigation Plan was approved by the state and FEMA in 2008 and adopted shortly thereafter by Sargent County and its seven cities. The Interim Final Rule specifies that jurisdictions must update their Multi-Hazard Mitigation Plans every five years.

Sargent County and the cities of Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland prepared this local hazard mitigation plan to better protect the people and property from the impacts of hazard events. In 2008 Sargent County and the cities of Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland prepared a Multi-Hazard Mitigation Plan that has expired. This plan is updating that plan to reflect the current status of Sargent County and the cities of Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland in 2014.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." Mitigation creates safer communities by reducing loss of life and property damage. Hazard mitigation planning is the process through which hazards that threaten communities are identified and profiled, likely impacts of those hazards are assessed, and mitigation strategies to lessen those impacts are identified, prioritized, and implemented. The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005). This plan demonstrates Sargent County's and the Cities of Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland commitment to reducing risks from hazards and serves as a tool to help decision makers direct and coordinate mitigation activities and resources, including local land use policies. This plan update entailed a comprehensive re-evaluation of all parts of the plan, including hazard profiles, risk assessment, mitigation goals, strategies, and mitigation priorities.

Sargent County has a varied history. Artifacts have been found dating hundreds of years before the people of European descent came to the area. The Mandan, Hidatsa, Blackfoot, Cree and Chippewa were gone before the settlers arrived. The Sioux were the only tribe left in the area

Sargent County's main industry is production agriculture. The value of agriculture products grown in 2007 was $127,741,000. Sargent County ranks 17th in the state for the total value of agricultural products sold. Common crops grown include Soybeans, Corn for grain, Wheat, and Forage. Crop products sold in in 2007 were $104,365,000. Livestock and poultry production is a large part of Sargent County's production agriculture with a 2007 value of $23,367,000 with $12,521,000 of this value attributed to cattle and calf sales. The land in farms totals 505,015 acres with the average farm size of 1,024 acres. 85.07% of the land is cropland while 9.34% of the land is pasture and 5.59% has other uses.
(Source:http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/North_Dakota/cp38081.pdf)

Sargent County's economy is also industrial based centered on the Bobcat Company in Gwinner. Bobcat Company is a business of Doosan Infracore International, a US-based subsidiary of Doosan Infracore. Other manufacturing firms have developed in Sargent County providing products to the Bobcat Company. Bobcat Company begun in 1947 as Melroe Manufacturing Company and through its history has manufactured a variety of products. Today, the Bobcat Company is a leading provider of compact equipment for global construction, rental, landscaping, agriculture, grounds maintenance, government, utility, industrial and mining markets. The Bobcat Company is North Dakota's largest manufacturer, with an extensive compact equipment distribution network throughout the world. Source: http://www.bobcat.com/

Industries providing employment include Manufacturing (32.1%), Educational, health and social services (18.3%), Agriculture, (17.3%).

Source: http://www.city-data.com/county/Sargent_County-ND.html

Read more: http://www.city-data.com/county/Sargent_County-ND.html#ixzz2wpP2um1E

Sargent County is located in Southeastern North Dakota. It is bordered by Richland County to the East, Ransom County to the North, and Dickey County to the West. The Southern Border of Sargent County is also the North Dakota/South Dakota Border or the 7th Standard Parallel. The South Dakota Counties of Marshall and Brown sit to the South of Sargent County. Sargent County has a total area of 867 square miles or 547, 200 acres of which 523,815 acres is farm land. North Dakota Game and Fish owns 2,108 acres and 10, 485 acres are owned by the U.S. Fish & Wildlife Service. The balance is in lakes (5,120 acres), roads, town sites, railroad lines, and airports. There are 271 miles of county roads, 835.75 miles of township roads and 97 miles of state highways. Source: http://sargentnd.com/

Contact information for the Sargent County Emergency Manager is Sandra Hanson. Ms. Hanson's office is located in the Sargent County Courthouse in Forman, ND. Her contact information is 701-724-6241 ext. 2 or email at sandra.hanson@co.sargent.nd.us.

2.1 How the Plan is organized

Section 2.1 How Plan is organized
Section 2.2 Plan background information
Section 2.3 Hazards and Risks
Section 2.4 Summary of goals, objectives, strategies and actions
Section 2.5 Planning steps
Section 2.6 Approval and adoption processes
Section 2.7 Implementation process
Section 2.8 Plan monitoring and maintenance

2.2 Plan Background Information

The purpose of a mitigation plan is to rationalize the process of determining appropriate hazard mitigation actions. Sargent County developed and approved a Multi-Hazard Mitigation Plan in 2008. This plan has expired; therefore, the adoption of a new plan has become top priority for Sargent County. The 2008 Hazard Mitigation Plan was carefully reviewed prior to the beginning of the planning process and referenced during the planning process.

2.3 Hazards and Risks

The document includes a detailed characterization of natural hazards in Sargent County; a risk assessment that describes potential losses to physical assets, people and operations; a set of goals, objectives, strategies and actions that will guide Sargent County's mitigation activities, and a detailed plan for implementing and monitoring the Plan. This Plan focuses on the natural hazards with the highest potential for damaging physical assets, people and operations in the County. Other hazards such as man-made hazards and technological hazards are also identified. Both the risk assessment section and goals sections reflect this emphasis, which was the result of careful consideration and a numerical ranking process carried out by the Multi-Hazard Mitigation Planning Committee as defined for the plan. Information has been gleaned from the Local Emergency Operations Plan, the Hazards Materials Risk Assessment, the Sargent County 2008 Hazard Mitigation Plan, the State of North Dakota Mitigation Plan, and other pertinent documents. Weather information was taken from National Weather Service historical documents gathered from the local weather spotter and other National Weather Service data sources. North Dakota Agricultural Weather Network (NDAWN) has also been looked at as a weather information source but the data is new and does not provide the long-range aspect of weather trends.

2.4 Summary of Goals, Objectives, Strategies and Actions

Section 7 of this Plan describes Sargent County's priorities for mitigation actions. The section prioritizes the actions, describes the funding required, potential sources of funding, the level of support, and the estimated timing of the action. The section also includes the County's hazard mitigation goals, objectives, and strategies.

Sargent County's Hazard Mitigation Goals

Goal 1: Explore Planning and Zoning Regulations.
Goal 2: Increase recruitment of volunteer emergency services.
Goal 3: Participation of Storm Ready, Firewise and like programs.
Goal 4: Reduce effects from flooding
Goal 5: Enhance firefighting capabilities
Goal 6: Reduce risk of biological hazards
Goal 7: Reduce risk of chemical hazards

These goals were developed by the local Multi-Hazard Mitigation Planning Committee. The original source used for goal development was the previous Multi-Hazard Mitigation Plan. There were no specific goals listed in the 2008 Multi-Hazard Mitigation Plan but the scope of the Plan included:

- Identify and prioritize disaster events that are most probable and destructive,
- Identify critical facilities,
- Identify areas within the community that are most vulnerable,
- Develop goals for reducing the effects of a disaster event,
- Develop specific projects to be implemented for each goal,
- Develop procedures for monitoring progress and updating the Plan, and
- Officially adopt the Plan.

Objectives and Strategies

Objectives are well-defined intermediate points in the process of achieving goals. Strategies are a specific course of action to achieve the objectives. Sargent County mitigation planning objectives can be found in Section 7.2 *Mitigation Objectives and Actions.*

Action Items for Sargent County

The Sargent County 2008 Mitigation Plan was updated to reflect the County's current priorities for specific activities to achieve the 7 goals. The priorities included in the plan revision are described in Section 7. This part of Section 7 includes information about the parties responsible for implementing the actions, and about potential sources of funding for mitigation activities. This section also integrates specific hazard mitigation projects that have been identified and scoped in accordance with the requirements in the STAPLEE criteria. The projects developed as part of the plan revision are listed in Section 8 of this plan.

2.5 Planning Steps

The planning steps closely followed the guidance outlined in FEMA's *Local Mitigation Planning Handbook* dated March 2013. The handbook outlines nine tasks to follow in the completion of the Hazard Mitigation Plan. They are:

1. **Task 1** - Determine the Planning Area and Resources
   Sargent County determined the planning area and overall scope of the planning project. Building on existing planning efforts and working with other entities were common approaches to defining the planning area. Identifying the plan's local lead and the need for outside technical assistance were important first steps in organizing the resources. In this multi-jurisdictional plan, all jurisdictions share the same commitment to developing a plan to reduce risks from hazards in their communities.

2. **Task 2** - Build the Planning Team
   The important activity of this task was to identify and engage the planning team. The planning process is as important as the plan itself, and the planning team helps shape and guides that process. Invited to serve on the Planning Team were representatives of the County Commission; representatives of the seven cities; Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland; Sargent County District Health; Water Resource Board; National Weather Service; Sargent County Auditor; Sargent County Weed Board; Sargent County Highway Department; Sargent County School Districts of Sargent Central in Forman, North Sargent in Gwinner; and Milnor; Sargent County Township Association; Cayuga Fire Department; Cogswell Fire Department; Forman Fire Department; Gwinner Fire Department; Havana Fire Department; Milnor Fire Department; Rutland Fire Department; Sargent County Sheriff; Sargent County Emergency Manger; Sargent County Tax Equalization Director; County Treasurer; Sargent County Social Services; 911 Coordinator; State's Attorney; County Agent; Emergency Medical Services; Emergency Managers from neighboring counties of Richland, Ransom, LaMoure, and Dickey; Dakota Valley Electric Cooperative; Cass County Electric; Ottertail Electric; and Dickey Service Network. The reason for this broad spectrum of individuals was to form a broad basis for the planning team. Each has a role in mitigation planning and has input for a successful mitigation plan. Regularity agencies were included to offer specific oversight to the planning process and to provide input on their area of expertise. The emergency manager consulted with them during the planning process on planning topics as necessary.

3. **Task 3** - Create an Outreach Strategy
   Identifying how to involve stakeholders and the public is an important aspect of mitigation planning. An open public involvement process is essential to the development of an effective plan. The documentation of these efforts ensures that the whole community understands how decisions were reached.

4. **Task 4** - Review Community Capabilities
   Conducting an assessment of existing plans, policies, studies, and programs was completed to identify the mitigation actions. Local capability for mitigation can vary significantly from community to community. In the development of multi-jurisdictional hazard mitigation plans, local governments with limited capacity or capability may use the planning process as a means to develop cooperative agreements, mutual aid agreements, or service agreements that enhance their capacity to undertake mitigation activities. Understanding what capabilities need to be changed or enhanced to reduce disaster losses allowed the planning team to address those shortfalls in the mitigation strategy. The main plan that was reviewed was the Local Emergency Operations Plan as other plans such as the Jobs Development Plan. The Local Emergency Operations Plan was valuable in identifying the roles and responsibilities of officials and agencies during emergency/disaster conditions. These officials/agencies had insights into Hazard Mitigation Plan development.

5. **Task 5** - Conduct a Risk Assessment
   Completion of the local risk assessment was completed by describing the hazards, identifying community assets, analyzing the risks or impacts of the hazards to those assets, and summarizing the results and overall vulnerability of the community.

6. **Task 6** - Develop a Mitigation Strategy
   In the planning process, developing a comprehensive mitigation strategy that is integrated with existing plans and programs in the community was important. These mitigation goals and actions established a path forward for creating a safer, more disaster resilient community.

7. **Task 7** - Keep the Plan Current
   Describing the requirements and recommendations for documenting how, when, and by whom the mitigation plan will be maintained over time is important to the plan development process. Identifying and adhering to monitoring and evaluation procedures will make the 5-year update process easier and more effective. The emergency manager will call a Hazard Mitigation Planning Committee meeting annually to review the plan and update the plan as necessary to include adding newly identified mitigation projects as County conditions change.

8. **Task 8** - Review and Adopt the Plan
   Incorporating feedback from the planning team, stakeholders, and the public on the final plan document is the first phase of reviewing and adopting the plan. A description of the final review and adoption of the plan document by the community and the process for FEMA plan approval is described in the plan. Details are described in Section 4.

9. **Task 9** – Create a Safe and Resilient Community
   The local mitigation plan is the representation of Sargent County's commitment to reducing long-term vulnerability and acts as a guide for decision makers as they commit resources for implementation. The planning process does not stop at adoption. Funding and resources are available to implement your plan. Proactively implementing the policies and actions identified in the mitigation plan increases community resilience and is an investment in Sargent County's future safety and sustainability. The process of monitoring and maintaining is outlined in Section 9, Plan Monitoring and Maintenance.

2.6 Approval and Adoption Processes

Task 8 discusses the process to review and adopt the revised Plan. The Sargent County Commission was responsible for approving and adopting the 2014 Hazard Mitigation Plan Update. The County Commission reviewed and approved the Plan Revision on .....

The cities in Sargent County reviewed and adopted the plan as follows:

Cayuga...
Cogswell...
Forman...
Gwinner...
Havana...
Milnor...
Rutland...

2.7 Implementation Process

The implementation process is described as part of the specific actions listed in the mitigation Strategy section. The first priority projects require funding. The first source of funding is local which will be pursued through County and City budgets. If local funding does not fund the projects, available Multi-Hazard Mitigation Grant funding will be applied for. When funding is approved, the projects will be carried out.

2.8 Plan Monitoring and Maintenance

Section 8 (Plan Monitoring and Maintenance) describes the schedule and procedures for ensuring that the Plan Revision stays current. The section identifies when the Plan must be updated, who is responsible for monitoring the Plan and ensuring that the update procedures are implemented. This section provides a combination of cyclical dates (oriented toward FEMA requirements) and triggering events that will initiate amendments Plan updates.

The Sargent County Emergency Manager is responsible for monitoring the Plan and initiating the cyclical update process.

Section 3 Background

3.1 Introduction

In the year 2000, the United States Congress passed legislation known as the Disaster Mitigation Act of 2000. The legislation established a requirement that jurisdictions nationwide must develop and implement natural hazard mitigation plans in order to remain eligible for various FEMA grant programs, including those that provide funding for hazard mitigation projects. In 2008 Sargent County developed and adopted its first Hazard Mitigation Plan which was reviewed and approved by North Dakota Department of Emergency Services and FEMA Region VIII in January 2008. Sargent County's Hazard Mitigation Plan expired in 2013. In 2013 a grant was awarded Sargent County by North Dakota Department of Emergency Services and FEMA Region VIII to update its Hazard Mitigation Plan.

3.1.1 Plan Scope

The original Sargent County Hazard Mitigation Plan was a concerted effort on the part of the county to develop all-hazards, county-wide approach to disaster damage reduction. The original Plan was completed in 2008 and has been used to better articulate accurate county needs based on a process that involves all stakeholders including the general public, government, and business.

The Hazard Mitigation Plan update integrates various newly-identified hazard mitigation strategies and actions, as described in Section 7.

The funding of the hazard mitigation strategies and actions may be local funding or may include grant funding. Grant funding comes from a variety of sources but usually funding is from the state. They include:

Disaster Funded Mitigation Assistance

Hazard Mitigation Grant Program (HMGP): Provides grants to States, Tribes, and local entities to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to purchasing supplies to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a disaster declaration is limited. The program may provide a state or tribe with up to 20 percent of the total disaster grants awarded by FEMA. The cost-share eligibility requirement for this grant is 75 percent federal/25 percent non-federal.

Hazard Mitigation Assistance Programs

Pre-Disaster Mitigation (PDM) Program: Provides funds to States, Tribes, and local entities, including public universities, for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project's potential savings must be more than the cost of implementing the project. In addition, funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The cost-share eligibility requirement for this grant is 75 percent Federal/25 percent non-Federal.

Flood Mitigation Assistance (FMA) Grant Program: The goal of the FMA grant program is to reduce or eliminate flood insurance claims under the National Flood Insurance Program (NFIP). Particular emphasis for this program is placed on mitigating repetitive loss properties. Repetitive loss properties are properties for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978. Grant funding is available for three types of grants, including planning, project, and technical assistance. Project grants, which use the majority of the program's total funding, are awarded to states, tribes, and local entities for planning and technical assistance and/or to apply mitigation measures to reduce flood losses to properties insured under the NFIP. The cost-share eligibility requirement for this grant is 75 percent federal/25 percent non-federal.

Repetitive Flood Claims (RFC) Program: Provides funding to reduce or eliminate the long-term risk of flood damage to residential and nonresidential structures insured under the NFIP that have had one or more claim payments for flood damages. All RFC grants are eligible for up to 100 percent federal funding.

Severe Repetitive Loss (SRL) Program: Provides funding to reduce or eliminate the long-term risk of flood damage to residential structures insured under the NFIP that have at least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any 10-year period, and the cumulative amount of such claims payments exceeds $20,000; or for which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any 10-year period. The cost-share eligibility requirement for this grant is 75 percent federal/25 percent non-federal.

3.2 Sargent County Government Offices and Responsibilities

Sargent County Government follows the North Dakota Constitution and North Dakota Law, therefore has established the following County officials. Their duties are listed below:

County Commissioners

The Board of County Commissioners serves as the elected ruling body of the county government structure. The Sargent County Commission is made up of 5 members and typically meet once a month or as the need arises may call special meetings as determined by the commission. Commissioners in Sargent County are elected at large. The Commission is responsible for administrative decisions for the county including their responsibility for the county budget, county road department, social service administration, appointments of many offices, and many other county concerns.

Auditor

The Auditor is responsible for a broad range of administrative duties. The primary duties are chief financial officer, elections officer and secretary to the county commission. Additional duties may include maintaining inventory of fixed assets, administering insurance coverage for county property, binding and storage of the official county newspaper as county record, and coordinating licenses and fees, such as hunting and fishing licenses, beer and liquor licenses, bingo and raffle permits.

Clerk of Court
The Clerk of District Court's primary responsibility is administration of court records, but they also summon jurors, maintain exhibits and attend court when it is in session. They also issue passports, birth certificates and death certificates.

Emergency Manager
The role of the Emergency Manager includes the coordination of services to provide adequate response to any disaster or potential disaster in their county. To do this, the Emergency Manager coordinates activities necessary to mitigate, plan for, respond to, and recover from any emergency or disaster that may occur in the county.

Highway Engineer
The Highway Engineer makes recommendations to the County Commission for county highway maintenance and upkeep. He works with county road maintenance crews and construction firms on maintaining, planning and providing for the transportation needs of county residents.

Recorder
The information filed and recorded in the County Recorder's office is used by the auditor, treasurer, commissioners and other county officials, along with the general public and business entities. These records primarily deal with real estate, such as patents, deeds, mortgages, bills of sale, security agreements, judgments, decrees, liens and certificates of sale.

Superintendent of Schools
Sargent County does not have a Superintendent of Schools at the county level. However the responsibilities of the Superintendent of Schools are shared by the County Auditor and the County Recorder. The Superintendent's duties include spelling bees, MATHCOUNTS, and other local and state contests. Superintendent of school duties are to plan and conduct workshops for the training of school bus drivers, assist teachers and administrators, and provide information on school law and legislative matters. The County Superintendent of Schools assumes the primary responsibility in restructuring school district boundaries should that become necessary.

Sheriff
The Sheriff's duties include making arrests, enforcing all state and local laws, maintaining jail facilities, transporting prisoners and mentally ill patients, serving legal papers, holding public sales of property under court orders and attending district court.
Sheriffs have the authority to enforce laws in cities and towns as well as rural areas. While many of the responsibilities are regulated by the state and federal government, the Sheriff's primary role is still to preserve peace and order in the county.

Social Service Director
The County Social Service office is responsible for carrying out many direct services to citizens. These services include food stamps, health care assistance, housing and home energy assistance, foster care, child/day care licensing, abuse and neglect intervention and many more ways to help people reach their maximum level of self-sufficiency.

State's Attorney
The State's Attorney serves as legal counsel and advisor to the county. The State's Attorney acts as prosecutor, representing the state in criminal cases. The State's Attorney provides guidance to

county commissioners and officials in interpreting the meaning of the North Dakota Century Code and legislation.

Tax Equalization Director/Assessment Officer
The responsibility of the Tax Equalization Director is to appraise all taxable property at a fair and equitable value. They also conduct educational campaigns to fully acquaint constituents with provisions of the property tax laws and responsibilities.

Treasurer
The Treasurer's office is used by taxpayers, state agencies, lending institutions and reality companies, providing easy access to tax and real estate records throughout the year to anyone who requests that information. Treasurers are responsible for keeping track of all property taxes, including delinquency and foreclosures, and act as accountant, financial manager and investor for the county.

Veterans Service Officer
The County Veterans Service Officer (VSO) advises local veterans and their dependents of their rights and entitlements under various federal and state laws. The VSO counsels and actively assists veterans with filling out the numerous and complex forms and paperwork required for obtaining benefits, which include compensation, pension, insurance, death benefits, hospitalization and education.

911 Communications
The 911 Communications in Sargent County is coordinated by the 911 Coordinator. This position keeps the addresses and telephone numbers updated in a data base for identification of 911 calls. Sargent County uses State Radio as its dispatch center. The dispatch center receives 9-1-1 calls generated from Sargent County and can provide lifesaving pre-arrival instructions to the caller until emergency responders have arrived on-scene. Emergency services, which include medical, fire, and law enforcement, are dispatched as dictated by the situation.

Extension Service
The purpose of the Extension Service is to create learning partnerships that help adults and youth enhance their lives and communities. To accomplish this Sargent County Agent strives to have the Sargent County Extension Service be the premier lifelong education network that helps Sargent County Citizens improve their quality of life. Programs include: Community, Economic Development and Leadership, Livestock Management, Farm Business Management, Crop Management, Natural Resource Management, Family Economics, 4-H Youth Development, Human Development and Family Science, Nutrition, Food Safety and Health, Horticulture and Forestry.

Public Health
Sargent County Public Health provides personal and population based health services to residents in Sargent County. The local public health infrastructure represents the capacity and expertise necessary to carry out services and programs. The health unit offers an array of services. The most common activities and services provided by local public health are child immunizations, adult immunizations, treatment of the elderly tobacco use preventions, high blood pressure screening, injury prevention screening, blood lead screening and Early and Periodic Screening Diagnosis and Treatment.

Risk Management
The Risk Management Division was established in 1995 to implement a program to address the State's exposures to tort liability claims and lawsuits due to the loss of sovereign immunity. Subsequently, in an effort to save premium dollars through a deductible program, and to establish a cross agency return-to-work program for the state of North Dakota, the 2001 Legislature directed the establishment of a single workers compensation state account. The administration of that program was assigned to the Risk Management Division of the Office of Management and Budget.

Weed Control
North Dakota Law requires every person to do all things necessary and proper to control the spread of noxious weeds. The Noxious Weed Team coordinates the efforts of the County Weed Board to implement integrated weed management programs. The Noxious Weed Team distributes funding through two programs, Target Assistance Grant (TAG) and Landowner Assistance Program (LAP). These funds are available to weed boards and landowners for controlling weeds on the state and county weed lists.

Water Board
The primary responsibility of the Water Board is to provide effective management of Sargent County's water resources. The vision is that present and future generations of Sargent County will enjoy an adequate supply of good quality water for people, agriculture, industry, and fish and wildlife through successful management and development of water resources to ensure health, safety, and prosperity, and balance the needs of generations to come. The Sargent County Water Resource Board is also participant of the Tri-County Joint Board, Red River Joint Board, and Dickey-Sargent Joint Water Resource District. The Sargent County Auditor serves on this board.

Township Government
Sargent County has 24 Townships. Townships have a variety of duties but the main duty is the building and maintaining of township roads. Townships support rural fire protection and rural ambulance services. Among the other duties of townships include animal impoundment, control of noxious weeds, provide aid to a District Fair Association, support an airport, and zoning.

City Government
The governing body of a city operating under the modern council form of government is the city council, which is composed of not less than four members, one of whom is the mayor, all elected at large or by wards. Candidates for the council shall run for either mayor or council member but not both at the same time. The terms of members of the council shall be four years, or until their successors are elected and qualified. However, the council shall establish by ordinance a procedure whereby one-half of all council members, as nearly as is practicable, are elected biennially.

School Districts
Sargent County has 643 children of school age. Sargent County has three school districts, Sargent Central in Forman, North Sargent in Gwinner; and Milnor. They provide K-12 education for 413 Sargent County students. The K-12 enrollment at Milnor is 218, North Sargent is 121, and Sargent Central 74 for a total of 413. The other 230 children attend school at Wyndmere, Lidgerwood, and Oakes.

3.3 Hazard Mitigation Responsibilities of County/City Agencies

In Section 3.2 the general duties of county/city officials was described. In this section the hazard mitigation responsibilities are described.

County Commission

The mitigation actions of the County Commission is to provide general guidance to the county officials to develop mitigation strategies emphasizing that mitigation may be short term or long term actions that when carried out will reduce the risk and vulnerability to the county citizens.

Auditor

Mitigation actions of the Auditor are to assist the County Commission with their responsibilities along with monitoring insurance claims for county property and making recommendations on how property losses may be reduced through mitigation.

Superintendent of Schools

As previously stated, the Superintendent of Schools duties are shared by the Auditor and Recorder. The mitigation responsibilities of this position include monitoring risk factors for school building maintenance and construction standards to ensure schools are safe for children and staff. The monitoring of roads used as school bus routes to ensure safe transportation with safe busses and trained school bus drivers are important tasks.

Social Service Director

Through the various social programs available for low income families, the Social Services Director can help ensure the health of the citizenry through proper nutrition and heated homes in the winter months through energy assistance. In addition through the responsibility of child/day care licensing safe day cares can prevail. This position also ensures liaison with private relief agencies for disaster victims.

State's Attorney

As the county legal counsel and advisor, the State's Attorney monitors the legality of mitigation actions or advises county officials on the liability facing the county if a mitigation action is not taken.

Tax Equalization Director/Assessment Officer

The Tax Equalization Director has access to the value of property throughout the county. Their mitigation responsibility is to help determine cost/benefit for mitigation actions. During the disaster recovery phase, the Tax Director determines the value of destroyed proplerty.

Extension Service

The varied responsibilities of the Extension Service gives this official a variety of mitigation responsibilities including crop and livestock disease prevention monitoring as well as advising people on proper nutrition which helps maintain proper health among the citizenry.

Risk Management

Primarily a safety position the Risk Management director can keep county officials safe by monitoring areas of risk and eliminating the risk through mitigation actions.

Water Board

Through the management of the county water resources the Water Board can establish drains and reservoirs to prevent property damage by flooding yet conserve water for long term use.

Township Government
Through the building and maintaining of township roads township governments can ensure roads are built to proper standards which can withstand floods or other calamities that can damage roads. They can impose load weight limits on roads to protect their integrity. Townships can zone to ensure structures are built in safe places such as out of the flood plain to proper building codes.

City Government
City governments much like the township governments can zone to ensure structures are built in safe places such as outside the flood plain and to proper building codes.

School Districts
The mitigation responsibilities of School Districts include monitoring risk factors for school building maintenance and construction standards to ensure schools are safe for children and staff. The monitoring of roads used as school bus routes to ensure safe transportation with safe busses and trained school bus drivers are important tasks.

Sargent County Emergency Management

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
    a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.
    b. Responsible for everyday operations of the county's Emergency Operations Center.
    c. Responsible for county wide communications system through the Sargent County Dispatch Center including radio and telephone systems. (also offer technical and administrative assistance to other county agencies in this area)
    d. Update and exercise emergency operations and mitigation plans.
    e. Coordinate state sponsored training for county agencies including law enforcement, public health, social services, fire departments, emergency medical services, etc.
    f. Coordinate the county's Local Emergency Planning Committee. (meets quarterly)
    g. Coordinate the county's Tier Two reporting (hazardous materials)
    h. Conduct public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.
    i. Work with schools and local businesses to help create site specific hazard response plans and present in-service education to local business employees.
    j. Responsible for timely and effective public information releases during emergency situations.
    k. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.
    l. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.
    m. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

a. Complete applications for federal and state funding such as the Hazard Mitigation Grant Program.
b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.
c. Participate in dam inspections with the Army Corp of Engineers owner/manager of the dam.

3. Leadership and coordination with local and non-local government agencies.
   a. Local Agencies: Sargent County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include Sargent County Commissioners, Sargent County District Health, Sargent County Road Department, Sargent County Sheriff's Department, and various other law enforcement, fire, communication, and emergency medical agencies.
   b. Non-local Agencies: Sargent County Emergency Management coordinates with numerous state and federal agencies. These agencies include the North Dakota Department of Emergency Services, North Dakota Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/emergency management concerns:
   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.
   b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.
   c. Sargent County is constantly striving to improve planning and exercise activities and response capabilities; however, with the county becoming technologically reliant and becoming more industrial, the threat of potential hazards increases, which increases the need for resources, training, and awareness.
   d. Zoning requirements for flood plain management need to be enforced.
   e. Consider continued hydrology studies to be done in flow areas, shoulder protection where open body of waters are located, and around culverts continued projects for completion in the future.

Sargent County Highway Department

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions)
   a. Design bridges, culverts, and overflow sections. The county is working to reduce the total number of bridges by either eliminating them entirely or removing the structures and using a "low water crossing" on lower service roads only. The county highway department follows a very detailed list of design standards for all projects within the county.
   b. Continually working with the Department of Transportation on various projects since the DOT dispenses federal funding. While the DOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

a. Responsible for and have authority to regulate and inspect all projects completed within the county.
b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.
c. All funding in one way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with local and non-local agencies.
   a. Local Agencies: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.
   b. Non-local Agencies: The County Highway Department coordinates with various state and federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the North Dakota Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the North Dakota Historical Society.
      3. General recommendations/emergency management concerns:
   a. Sargent County Highway Department should assist local government with floodplain management and water development permitting.

Sargent County District Health Unit

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions)
   a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Sargent County District Health will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.
   b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.
   c. Programs include waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.
   a. Sargent County District Health is a unit of state government that operates through agreements or memorandums of understanding with the North Dakota Department of Health to enforce state public health statutes within the five county districts. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with local and non-local government agencies.

a. Local Agencies: Within the scope of public health, Sargent County District Health coordinates with the following local agencies: Sargent County Emergency Management, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.
b. Non-local Agencies: Within the scope of public health, Sargent County District Health coordinates with the following agencies: North Dakota Department of Health and state and federal law enforcement agencies.

4. General recommendations/emergency management concerns.
   a. If a public health disaster occurs, the Public Health Unit is understaffed. Should Sargent County District Health be called upon for expertise at a time of emergency or disaster, it normally does not have the resources to handle the event without support from other public health agencies.
   b. Public Health equipment that may be used in a disaster such as radios or air sampling equipment is not readily available at the Public Health Unit. This equipment could be housed at the Public Health Unit and thus would be available for both daily use and emergency/disaster use.
   c. Sargent County District Health Unit is a stand-alone District Health Unit. For emergency preparedness it is in the South East Regional Public Health Network. This network as set forth by Senate Bill 2030 and passed in the 2013 Legislative Session shares core public health activities as identified by community health needs.

Sargent County Sheriff's Department

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.
   b. Provide 911 emergency operations through its communications division.
   c. Provide standard law enforcement manpower and equipment including: 2 employees, 1 4-wheel drive vehicle and 2 police cruisers.
   d. In disaster situations, provide warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.
   e. Coordinate the necessary resources to obtain a dive rescue team.
   f. Provide public awareness and educational programs such as 911 education, safe kids program, etc.
   g. Mutual aid agreements with all surrounding counties and the North Dakota State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects: None

3. Leadership and coordination with local and non-local government agencies.
   a. Local Agencies: Within the scope of law enforcement, the Sargent County Sheriff's Department coordinates with various local agencies. These agencies include Sargent County Emergency Management and various local police departments.
   b. Non-local Agencies: Sargent County Sheriff's Department coordinates with appropriate state and federal agencies including: North Dakota Highway Patrol, North Dakota Attorney

Generals' Office, Bureau of Criminal Investigation, North Dakota State Radio, North Dakota Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/emergency management concerns.
   a. Explore funding resources to upgrade technology such as mobile data terminals, computers, etc.
   b. Upgrade communication integration among other state and federal agencies (information sharing)

Volunteer Fire Departments

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.
   b. Respond to accidents in order to provide rescue assistance.
   c. Assist emergency medical services in providing emergency assistance to sick and injured (first responders).
   d. Provide standard firefighting manpower and equipment.
   e. Respond to spills and releases of hazardous materials with limited tactical involvement. The Department is trained to the Awareness Level; their main role is procuring resources trained to the proper level to respond to the incident. They assist in mitigating the detrimental human and environmental effects of these occurrences.
   f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.
   g. Provide training for department members that enable them to effectively and efficiently carry out their respective duties and responsibilities.
   h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.
   i. Assist in enforcement of city fire ordinances.
   j. Fire investigation.
   k. Inspect and certify alarm systems, fire extinguishers, etc.
   l. Assist with the county's tier two reporting (hazardous materials storage sites)
   m. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects: None

3. Leadership and coordination with local and non-local government agencies.
   a. Local Agencies: In efforts to decrease vulnerability to hazards, the Steele city fire department coordinates with various local agencies. These agencies include Sargent County Emergency Management, Sargent County Sheriff's Department, rural fire departments, Sargent County Highway Department, and various local EMS agencies.
   b. Non-local Agencies: North Dakota State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/emergency management concerns.
   a. City/rural fire departments do not have the training or equipment to safely respond to hazardous material incidents or heavy industrial accidents.

b. No career firefighters are on duty on a 24-hour basis, which is inadequate for optimal emergency response. Also, volunteer firefighters' access to stations is sometimes difficult during severe weather situations.
c. Explore funding resources for the above concerns.

Sargent County Extension Service

1. Mitigation and risk reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. The Sargent County Extension Service is linked in a unique partnership with North Dakota State University to provide practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.
   b. County extension agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.
   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage producers.
   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.
   e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.
   f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.
   g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects.
   a. Authority is federal level.

3. Leadership and coordination with other government agencies:
   a. Local Agencies: Sargent County Emergency Management and Sargent County District Health.
   b. Non-local Agencies: North Dakota State University, North Dakota State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/emergency management concerns:
   a. Urban development taking over agricultural lands.

Other Agency Resources

1. Mitigation and risk reduction.

Cogswell Fire Protection District: General fire suppression, rescue, hazardous materials response, public awareness and educational programs. The fire department responds to spills and releases of hazardous materials with limited tactical involvement. For hazardous

materials response their main role is procuring resources trained to the proper level to respond to the incident.

Forman Rural Fire Protection District: General fire suppression, rescue, hazardous materials response, public awareness and educational programs. The fire department responds to spills and releases of hazardous materials with limited tactical involvement. For hazardous materials response their main role is procuring resources trained to the proper level to respond to the incident.

Gwinner Fire Protection District: General fire suppression, rescue, hazardous materials response, public awareness and educational programs. The fire department responds to spills and releases of hazardous materials with limited tactical involvement. For hazardous materials response their main role is procuring resources trained to the proper level to respond to the incident.

Milnor Fire Protection District: General fire suppression, rescue, hazardous materials response, public awareness and educational programs. The fire department responds to spills and releases of hazardous materials with limited tactical involvement. For hazardous materials response their main role is procuring resources trained to the proper level to respond to the incident.

Rutland-Cayuga Fire Protection District: General fire suppression, rescue, hazardous materials response, public awareness and educational programs. The fire department responds to spills and releases of hazardous materials with limited tactical involvement. For hazardous materials response their main role is procuring resources trained to the proper level to respond to the incident.

Sargent County Ambulance Services: Emergency response, patient care, transport, and public awareness and continuing education programs.

Dakota Valley Electric Cooperative, Cass County Electric, Ottertail Electric:
Provide engineering expertise, heavy equipment, and damage assessment. (Utilities)

Dickey Service Network: Telephone, Internet, and Cable Television Services.

Army Corps of Engineers: Water management within the county. Provide technical expertise, sandbags, and heavy equipment.

North Dakota Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

State Fire Marshal: Hazmat route utilization; hazmat technical assistance; situation and damage assessment.

North Dakota Forestry Service: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

North Dakota Game and Fish: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

State Radio Communications: Exercise readiness of warning systems and communication support.

Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; hazmat technical assistance; state land use program.

Job Service: Situation assessment and administration of disaster unemployment assistance programs.

Sargent County keeps a viable Emergency Operations Plan current through plan revisions, training, and exercises. The Hazard Mitigation Plan is compatible with the Emergency Operations Plan in that those existing authorities, policies, programs, and resources are within the realm of the Hazard Mitigation Plan. The organizational chart of the Emergency Operations Plan is listed below.

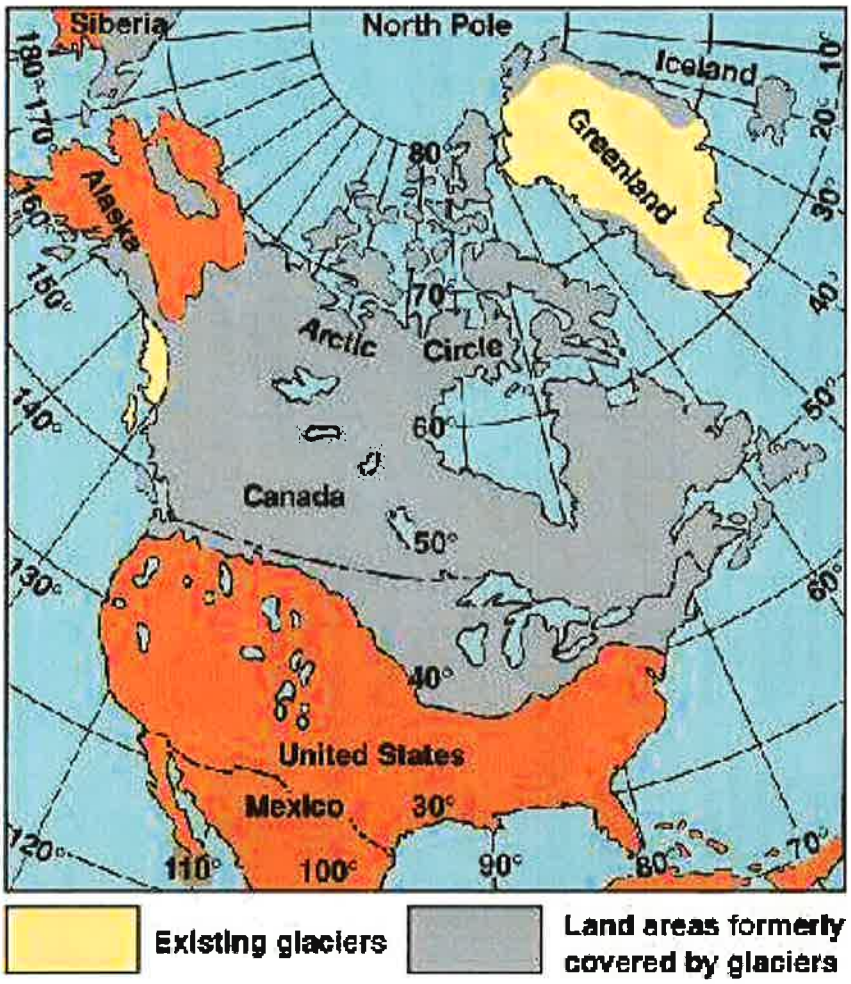
Coordination and Control Relationship Chart
Emergency Management

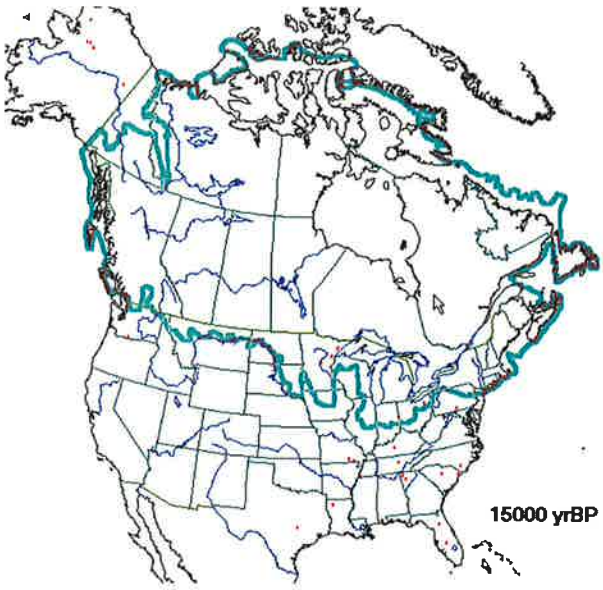
Chief Elected Official County Commission City Council								
Emergency Manager, EOC Emergency Operations Staff								
Functional Coordinators								
Coordination and Control Functional Coordinator Chief Elected Official	**Damage Assessment Functional Coordinator Tax Equalization**	**Administration Functional Coordinator Auditor**	**Public Safety Functional Coordinator Sheriff/Chief of Police**	**Individual and Family Assistance Functional Coordinator Human Services**	**Health and Medical Functional Coordinator Health District**	**Warning Functional Coordinator Chief Elected Official**	**Communications Functional Coordinator Sheriff**	**Public Works/Transportation Functional Coordinator Road Super/Engineering**
Task Coordinators								
Emergency Manager	Public Works	Treasurer	Law Enforcement	Human Services	District Health Units	Law Enforcement	Communications Center	Engineering
Law Enforcement	Assessor	Assessor	Public Works	ARC	Hospitals	Radio/TV	RACES	Road Department
Auditor	Auditor	State's Attorney	Clerk of Court	VOAD	EMS	PIO	Amateur Radio	Wastewater Facilities
Treasurer	Treasurer		Search and Rescue	Housing	Vector Control	Fire Departments	PSAP	Forestry
Fire Departments	Law Enforcement		Auxiliary Groups	Clerk of Court	Pharmacies			Water Treatment
Public Works/Engineering	Fire Departments		Bomb Squad	Veteran's Services	Clinics			Facility Maintenance
Assessor	Emergency Management		Fire Departments		Nursing Homes			Airport Authority
State's Attorney			HazMat Team					Planning
Tax Equalization								

3.3.1 Geography

The last Great Ice Age, which began about 1.6 million years ago, dramatically affected the geology and life of North Dakota and Sargent County. Glaciers advanced into North Dakota from Canada on numerous occasions and extended as far south as the Missouri River to the west and into South Dakota to the south during the last major glacial advance. When the glaciers melted, the sediment incorporated in the ice was deposited. Artifacts indicate that the first people to reside in North Dakota were here about 11,000 years ago. They were big game hunters preying on mammoths and other large mammals. The climate became warmer and drier between 8,500 and 4,500 years ago, the kinds of plants and animals that live in North Dakota today became established at that time. The glacial anticyclone depicts how Sargent County was formed. The ice sheet pushed huge quantities of glacial till into what is now Sargent County.

Map below is showing the locations of Pleistocene continental glaciers in the Northern Hemisphere. Source: http://higheredbcs.wiley.com

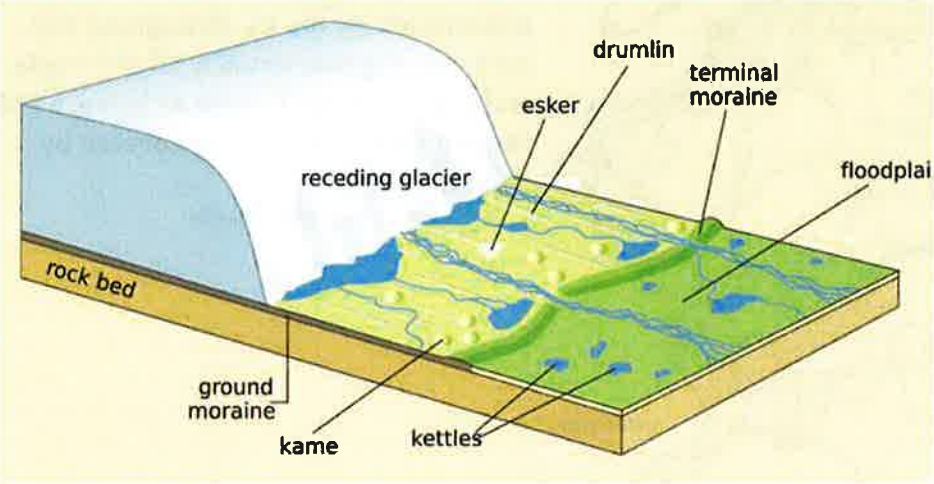




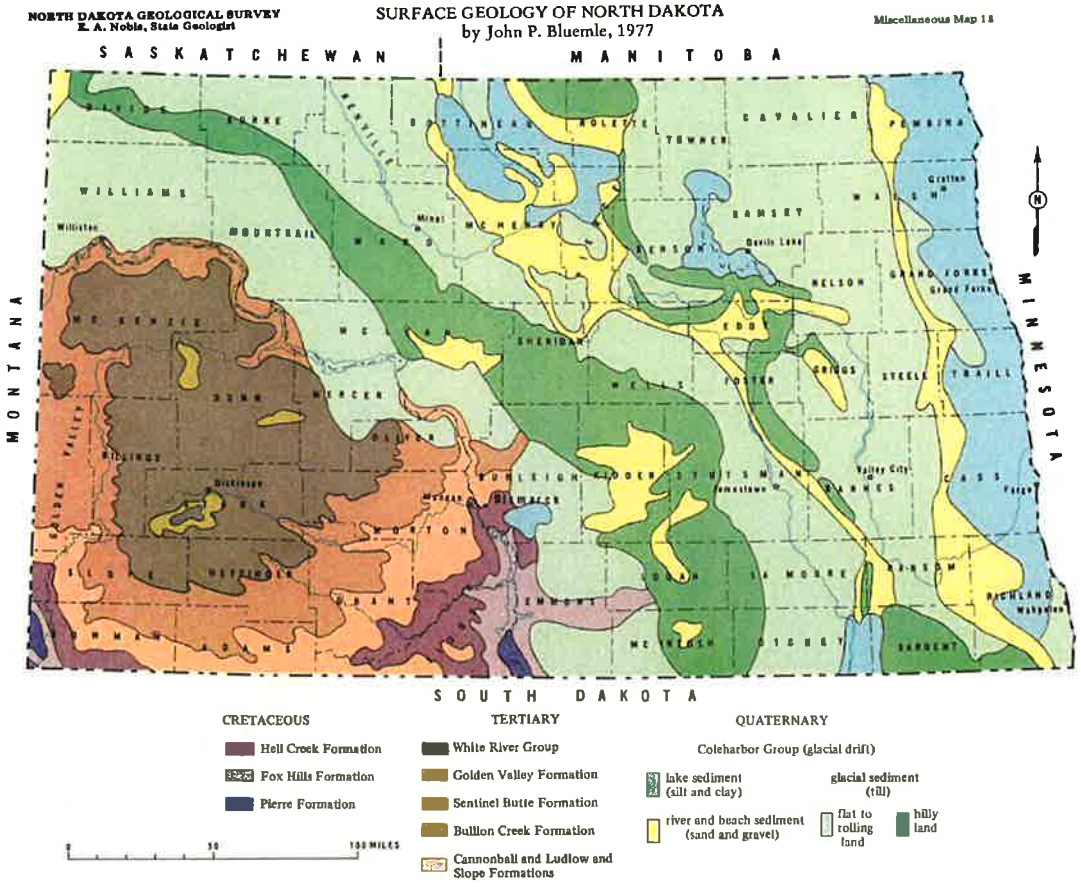
The map to the left outlines in blue the extent of the Laurentide Ice Sheet 15,000 years ago. Geologists have found material left by the ice throughout this area, proving that virtually all of Canada and most of North Dakota including all of Sargent County were once covered by thick glacial ice.

Source: www.ncdc.noaa.gov

Diagram outlining the glacial deposits and depicting their formation as glaciers retreated. These glacial features are common in Sargent County.

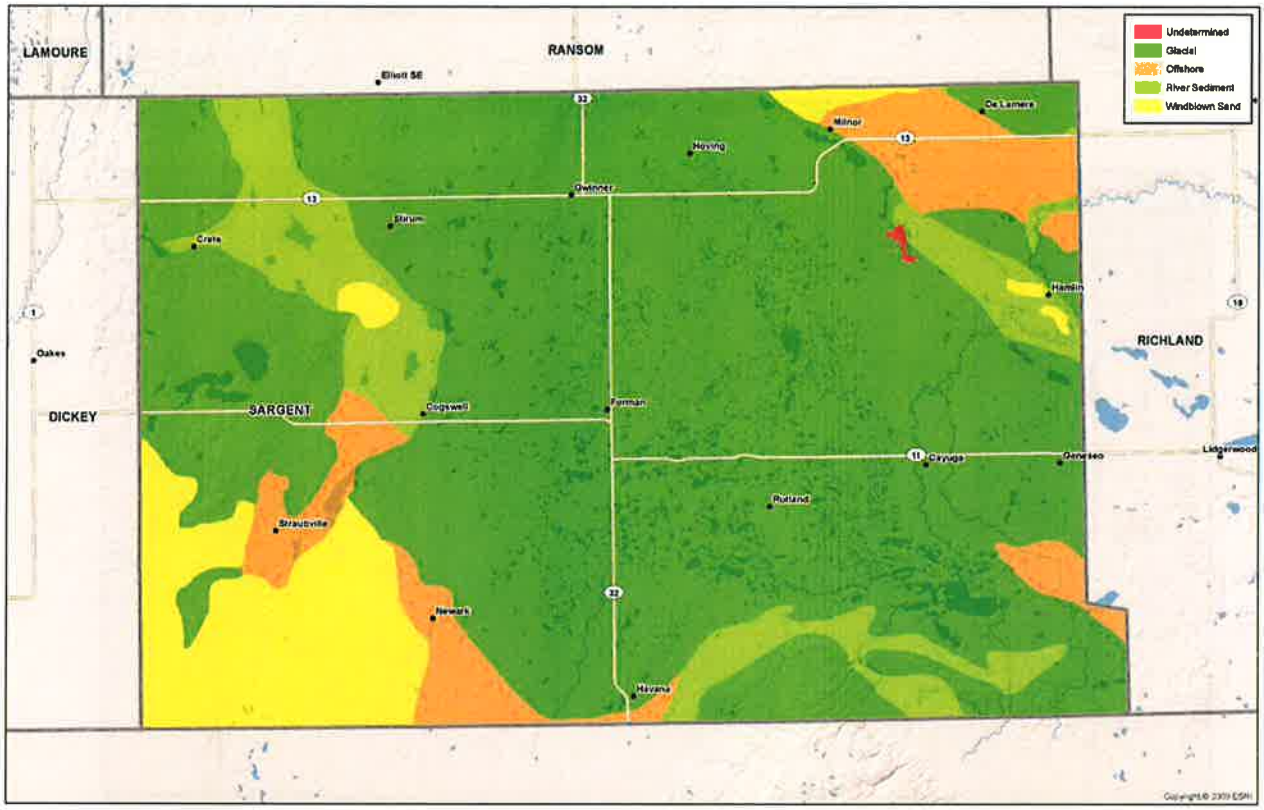


The map below depicts the surface geology of North Dakota and how it was influenced by Glacial activity. One can see how Sargent County fits into the whole picture of the state.



The map below depicts Sargent County's geological formations. Land use today is influenced by these geological formations.

Surface Geology map



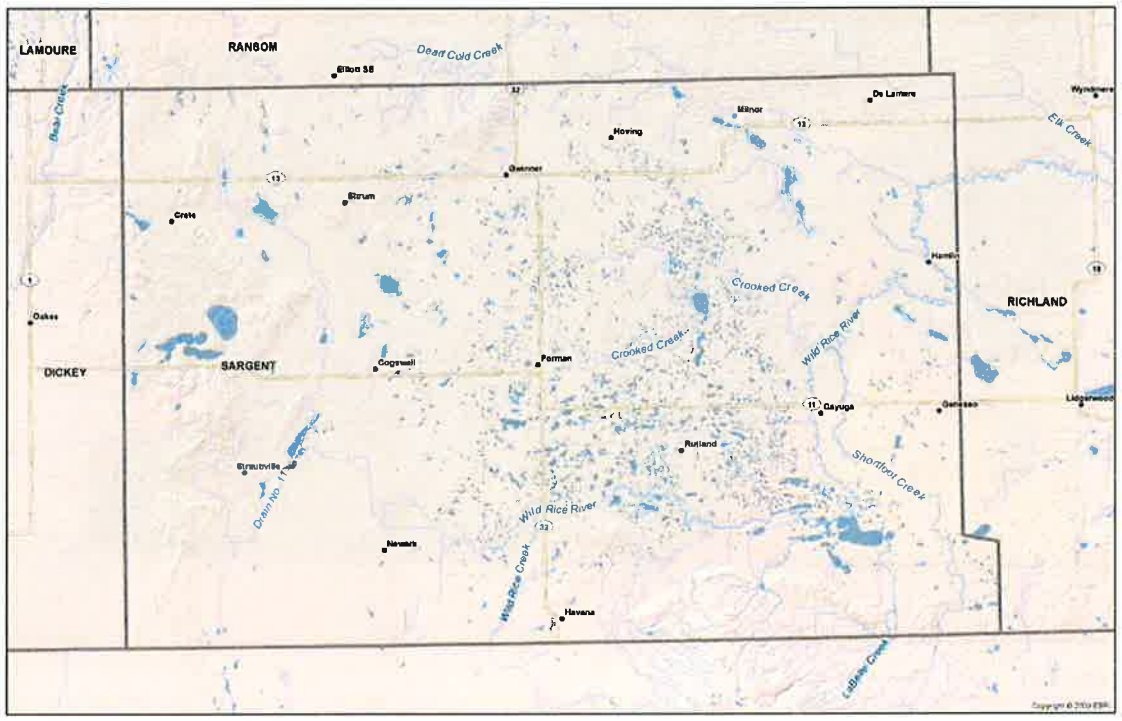
Source: ND GIS Hub

As the earth warmed and the glacier was receding a variety of actions occurred that affected the deposits of glacial till. The Surface Geology Map demonstrates this variety of post glacial action that occurred. A large portion of the county is covered by glacial till which is populated with potholes and small lakes. The "offshore" deposits are deposits bordering post glacial lakes the most notable was Lake Agassiz to the east. A post glacial lake also formed in southwestern Sargent County. The light green color on the map outlines the river sediments formed by glacial melt water flowing into the post glacial lakes. The yellow color on the map (wind-blown sand) depicts the lake sediments. The light green depicts hilly land which was caused by the glacial till deposits, most notably the Sisseton Hills.

The result of this geographical history is a varied terrain throughout the county. There are areas dispersed throughout the county especially in the southern part of the county

that are quite hilly, described as knob and kettle terrain as a result of dead ice moraine. In this area streams are beginning to form and carry runoff water (snowmelt or heavy rainfall) to lower elevations. Tributaries of the Wild Rice River are part of this system. In the central part of the county the landscape is filled with potholes and small lakes. The majority of Sargent County is drained internally into these potholes and lakes. Problems exist during wet periods in that the water bodies fill and overflow causing infrastructure damage. There exist areas with little or no drainage giving the water no place to go.

Sargent County River/Lake Map



Source: ND GIS Hub

3.3.2 Climate

General

Climate is the average of weather conditions, as a factor in the environment. Climate underlies the production, distribution and exchange of commodities derived from both the plant and animal kingdoms; it influences methods of agriculture and the way of life of the citizens of Sargent County. Sargent County is located in the higher mid-latitudes. This results in incoming solar radiation being direct during the summer months and indirect during the winter months. The pattern of four different distinct seasons (spring, summer, fall, and winter) is characteristic of the middle latitudes. The length of day and night is also affected by the mid-latitude location. On June 21, the date of the summer solstice the sun rises at 5:39 AM CDT and sets at 9:35 PM CDT resulting in nearly 16

hours of daylight. In contrast on December 21, the date of the winter solstice the sun rises at 8:10 AM CST and sets at 4:48 PM CST resulting in 8.5 hours of daylight. The long hours of sun exposure to plant life during the summer months speeds the growth in the relative short growing season of 135 days. Source: National Weather Service - http://www.crh.noaa.gov/fgf/ and http://aa.usno.navy.mil/data/.
Latitude is not the only factor that affects the climate of Sargent County. The Rocky Mountains to the west in Montana serve as a barrier between North Dakota and the Pacific Ocean blocking moist Pacific air from reaching the state reducing the potential rainfall and moderate temperatures we would otherwise experience. Furthermore the Rocky Mountains serve as a funnel for cold artic air to slide east of the Rockies onto the Great Plains (including Sargent County) giving Sargent County cold winter temperatures. Source: National Weather Service - http://www.crh.noaa.gov/fgf/

Temperature

Sargent County truly represents a continental climate with cold winters and hot summers. January is the coldest month in Sargent County. The average January maximum temperature is 19.8 degrees Fahrenheit while the average January minimum temperature is -.02 degrees Fahrenheit. The average January temperature is 10 degrees Fahrenheit. July is typically the warmest month. The average maximum temperature for July is 82.7 degrees Fahrenheit while the average minimum temperature for July is 59.6 degrees Fahrenheit. The average July temperature is 70 degrees Fahrenheit. The record high temperature for North Dakota is held by Steele in Kidder County. The record is 121 degrees Fahrenheit set on July 6, 1936. The coldest temperature in North Dakota was set in Parshall on February 15, 1936 where the temperature was -60 degrees Fahrenheit. Source: National Weather Service - http://www.crh.noaa.gov/fgf/ and http://ggweather.com/normals/

Climate data for Forman, North Dakota (1981–2010)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °F (°C)	19.8 (−6.8)	25.3 (−3.7)	37.7 (3.2)	55.6 (13.1)	68.0 (20)	76.8 (24.9)	82.7 (28.2)	81.8 (27.7)	71.5 (21.9)	57.0 (13.9)	38.4 (3.6)	23.9 (−4.5)	53.2 (11.8)
Average low °F (°C)	−0.2 (−17.9)	5.3 (−14.8)	18.2 (−7.7)	32.1 (0.1)	44.5 (6.9)	54.7 (12.6)	59.6 (15.3)	56.8 (13.8)	46.5 (8.1)	33.8 (1)	19.7 (−6.8)	3.9 (−15.6)	31.4 (−0.3)
Precipitation inches (mm)	0.58 (14.7)	0.51 (13)	1.13 (28.7)	1.78 (45.2)	2.74 (69.6)	4.07 (103.4)	3.35 (85.1)	2.15 (54.6)	2.46 (62.5)	2.09 (53.1)	0.90 (22.9)	0.59 (15)	22.35 (567.7)
Snowfall inches (cm)	8.2 (20.8)	5.9 (15)	6.7 (17)	2.8 (7.1)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.4 (1)	6.4 (16.3)	7.8 (19.8)	38.4 (97.5)

Source: NOAA[10]

Precipitation

Sargent County's average annual precipitation is 22.35 inches resulting in a semi-aired climate. The total precipitation is not large but more than three-fourths of the annual precipitation typically falls during the growing season. About half of the precipitation

typically falls during May, June, and July. February typically is the driest month with only .51 inches of precipitation while June typically is the wettest with 4.07 inches of precipitation. The wettest year was 1916 with 35.51 inches of precipitation; July of that year had 10.10 inches of precipitation. 1936 is the driest year on record with 9.06 inches of precipitation. 1976 was also a very dry year with only 9.43 inches of precipitation. Almost half of the precipitation, 4.24 inches, that year fell in the major growing season months of May-August. Snowfall amounts average 38.4 inches per winter season. The lowest amount of snowfall was the winter of 1908-1909 with 1.5 inches of snow while the winter of 1969-1970 had the largest amount of snow, 103.0 inches. Source: National Weather Service - http://www.crh.noaa.gov/fgf/

Wind

The average wind velocity is about 10 miles per hour. The most common single wind direction is the North West, but the county gets winds from every direction of the compass. Since 2007 wind gusts resulting from thunderstorms have been known to exceed 75 MPH. The strongest reported wind is 127 MPH. Source: National Weather Service - http://www.crh.noaa.gov/fgf/

Climate Conclusion

Sargent County experiences a typical continental climate with cold winters and warm summers. Temperature and precipitation averages are higher than most of North Dakota. The factors that make up the climate of Sargent County result in sometimes violent and damaging weather systems. Included among these are high winds, tornadoes, thunderstorms, floods, excessive heat, excessive cold, blizzards, drought, hail, sleet, and freezing rainfall. The frequency of these severe weather events and damages are explained in Section 5.

3.3.3 County History

Native Americans were the first to live in what is now Sargent County. Artifacts have been found dating hundreds of years before the people of European descent came to the area. The Mandan, Hidatsa, Blackfoot, Cree and Chippewa were gone before the settlers arrived. The Sioux were the only tribe left in the area. The writing rock known as the Alter Stone, arrow points, spear points, pottery, hammers and tethering stones have been found in all parts of the county. Windy Mound, the highest point in the Sisseton Hills, overlooks the county and on a clear day most of the county can be seen. It was there that the Indians held services for dead members of the tribes.

The coming of the railroad played a major role in Sargent County settlement by people of European descent. Prior to the coming of the railroad there were a few white settlers but they lacked efficient transportation to market their agricultural products and purchase manufactured goods they needed. In the spring of 1879 a government survey

party led by E. H. Antwerp came into the county at a point, which is now called the Sisseton Hills. At that time there were no white settlers, by the next year some white people, mostly Norwegians and Germans had come into the area and staked claims. From 1880 to 1890 most of the pioneers moved into the county following the building of the Soo, Great Northern and Northern Pacific railroads. Sargent County was created from the southern half of Ransom County, and named in honor of H. E. Sargent, who was an official of the Northern Pacific Railroad. The Northern Pacific Railroad built its line into Milnor in 1883, across the county and into Oakes by 1900. The Great Northern and Soo Line Railroads built tracks shortly thereafter in the southern part of the County. On July 16, 1883 Territorial Governor Ordway appointed the first commissioners and designated Milnor as the county seat. The following year the first county election was held and Forman was chosen as the county seat. In 1920 the county's population peaked at 9655. At the turn of the century there were 18 towns in the county. Now there are seven cities: Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland. There are six unincorporated villages: Brampton, Crete, Delamere, Geneseo, Stirum and Straubville. There are 24 townships. The average farm size has grown from 300 acres in the early 1900's to over 1024 acres today. The first farmer was John Longie of Tewaukon and the first community was Hamlin in northern Herman Township. Source: http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/North_Dakota/cp38081.pdf

3.3.4 Transportation

Sargent County has an extensive county and township transportation system linking farms to the city markets and sources of consumer goods. Gravel is the main surface coating for county roads. This causes problems during the spring at snow-melt and when the frost comes out of the ground and during periods of heavy rainfall. Under those conditions road surfaces become muddy and soft creating dangerous road conditions. Gravel roads are also more prone to washouts as excess water may exceed culvert capacity as it moves from one pothole/lake to another during high water periods. Gravel roads are also subject to traffic impacts. As farms have become larger, farm trucks have become larger. Small grain, soybean, and corn harvest times can cause severe road damage as heavy farm trucks move the harvested crops to storage or markets.

The main county roads and their surface are listed below. These roads are maintained by Sargent County.

Table 3.3.4.1 Sargent County Roads

Road Name	General Location	Surface
County Road 10	Milnor to Rutland	Gravel/Paved

Source: Sargent County

Table 3.3.4.2 State Highways in Sargent County

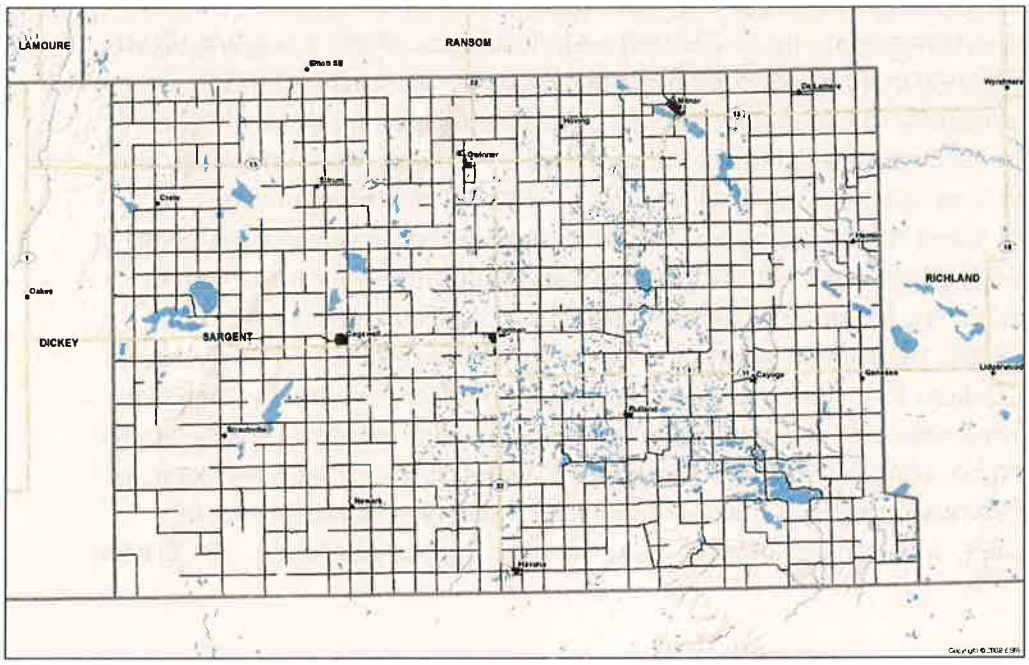
Highway	Route Direction
North Dakota Highway 13	East/West across the Northern Portion of the County
North Dakota Highway 32	North/South across the Central Portion of the County
North Dakota Highway 11	East/West across the Central Portion of the County

Source: North Dakota Department of Transportation

The development of automobiles and commercial trucks brought about the building of highways in the United States. North Dakota Highway 32 runs north and south through Sargent County, it is part of a system that begins in South Dakota as South Dakota Highway 27 and enters Canada at the Walhalla/Winkler port of entry and becomes part of the Manitoba highway system. ND Highway 13 begins in eastern North Dakota at Wahpeton and ends at the Missouri River in central North Dakota. ND Highway 11 begins in Minnesota as Highway 55 and runs from East to West through Southern North Dakota to United States Highway 83 west of Hague in Emmons County.

The transportation system is outlined in the following map. The letter G indicates the road is a gravel surface, the letter G/P indicates portions of the road are gravel surfaced, portions are paved. State Highways 13, 32, and 11 are paved surfaces.

Map Source: ND GIS Hu b, the letters "G" (gravel surface) and "P" (paved surface) have been added by the plan author.



The three state highways are important for Sargent County trade and commerce as they tie the county to the rest of the state and country. Data collected is demonstrated in the table below.

Table 3.3.4.3 Sargent County Traffic Counts

Highway	Total Traffic Count	Commercial Traffic Count
ND Highway 13 East of Gwinner	1740	265
ND Highway 13 West of Gwinner	1220	115
ND Highway 13 between ND Highway 32 and Gwinner	2385	375
ND Highway 11 East of Highway 32	670	115
ND Highway 11 West of Forman	715	85
ND Highway 32 North of Gwinner	1655	130
ND Highway 32 South of Gwinner	1040	245
ND Highway 32 North of Forman	1125	255
ND Highway 32 between Forman and ND Highway 11	1240	170
ND Highway 32 at the South Dakota Line	610	155

Source: http://www.dot.nd.gov/road-map/pdf/traffic/trafficstate_2010.pdf

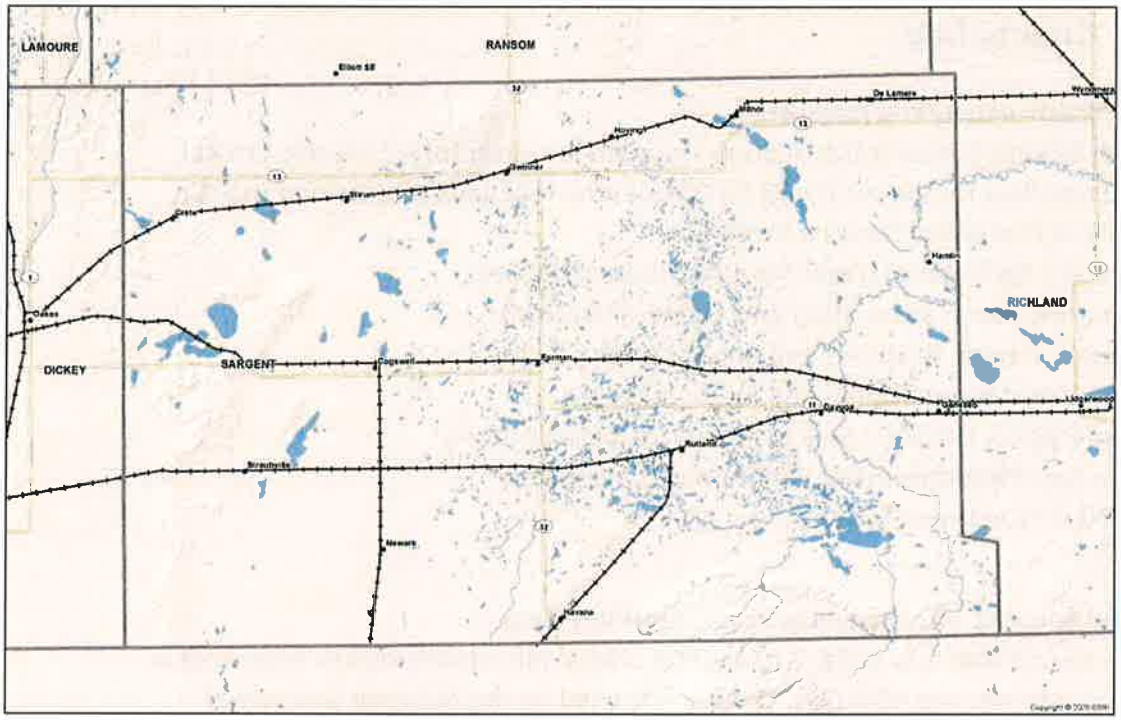
Railways

Red River Valley & Western Railroad goes through the northern part of Sargent County. This railroad began operations on July 19th, 1987 over track acquired from the Burlington Northern Railroad. Since then, RRVW has experienced solid growth in terms of freight volume, employment and physical improvements. They operate over 500

miles of track that provides local freight services used for transporting grain, fuel and fertilizer that can accommodate up to 286,000 pound rail cars. RRVW's ongoing effort to expand and find new markets for customers has brought new business to the railroad. RRVW presently serves more than 60 customers, including 7-grain shuttle facilities, 33 grain elevators and a number of processors. Dakota, Missouri Valley, and Western Railroad runs also through Sargent County. DMVW started operations in September, 1990, when the company was the successful bidder to operate 360 miles of Soo Line track and trackage rights in North Dakota and Montana. DMVW's original network consisted of track between Oakes to Washburn, and Flaxton to Whitetail, Montana. Since 1990, DMVW has added the following line segments to its network in southeast North Dakota to include Oakes to Hankinson and Geneseo Jct. to Aberdeen, SD. DMVW Railroad operates approximately 525 miles of track in North Dakota, South Dakota and Montana. DMVW's network includes 435 miles of track that is leased from Canadian Pacific Railway (core), 12 miles of track from McKenzie to Moffit, North Dakota (Linton Line), and 78 miles of track from Geneseo, ND, to Aberdeen, SD, (Britton Line).

The three maps below depict railroad lines in Sargent County. The first map outlines in detail the concentration of railroad lines and how thoroughly the county is served by the railroad companies. The second map shows how the Red River Valley and Western Railroad service in Sargent County fits into the broad spectrum of service statewide and nationwide. The third map shows how the Dakota, Missouri Valley & Western Railroad, Inc. service in Sargent County fits into the broad spectrum of service statewide and nationwide.

Sargent County Railroad Service, Source: ND GIS Hub



Red River Valley & Western Railroad Company

Source: http://www.rrvw.net/who-we-are/map/

Dakota, Missouri Valley & Western Railroad, Inc, Source: http://dmvwrr.com/index/transportation.htm

Assets

3.3.5 County/City

Critical Infrastructure/Key Resources
The North Dakota Critical Infrastructure Program has inventoried specific Critical Infrastructure/Key Resources (CIKR) facilities in the following sectors that may be vulnerable 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

Homeland Security Infrastructure Program (HSIP) Data
One data source that was utilized to analyze critical infrastructure/key resources in Sargent County 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: Energy, Public Health, Transportation, Emergency Services, Communications, and Water. The data identified Sargent County as having 16 Energy, two Public Health, 7 Transportation, 14 Emergency Services, and 4 Critical Facilities. There are no water critical facilities identified in Sargent County.

Other Critical Infrastructure/Key Resources, Data Sources
An additional source of critical facility data was the North Dakota Fire and Tornado Fund. This fund provides insurance to state and local governments and districts. 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. The insurance data for counties, cities, townships, fire districts, water districts and others such as ambulance services include:

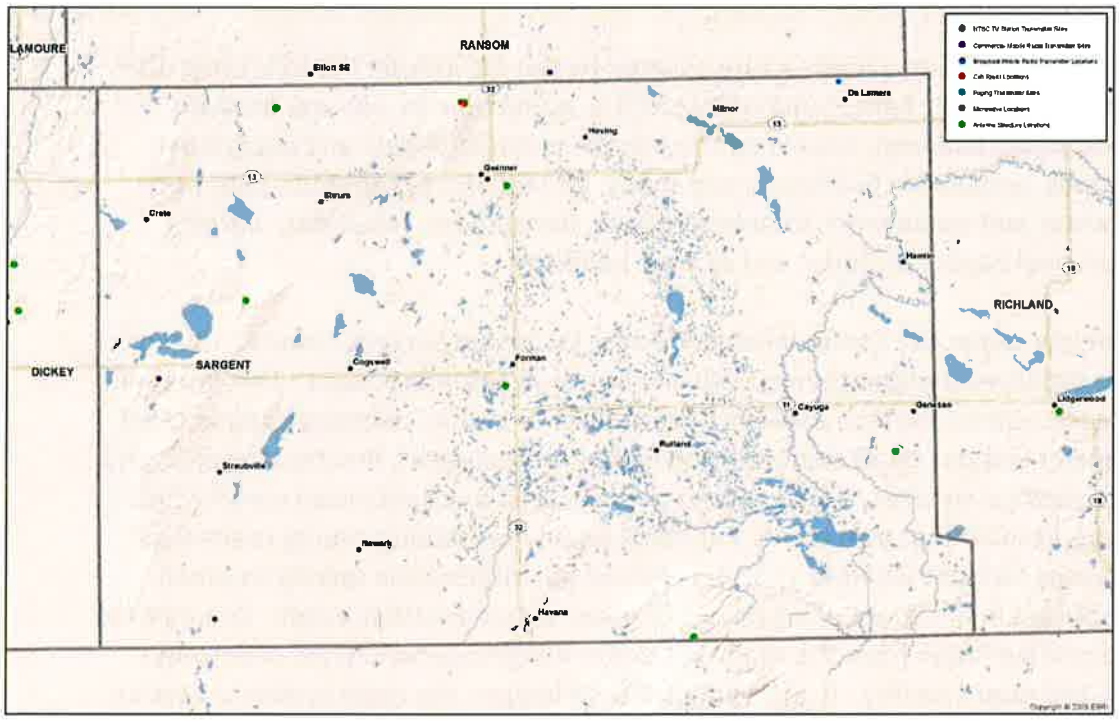
Number of Building Properties:	79
Building Property Value:	$18,844,733
Number of Personal Property Policies:	57
Personal Property Value:	$1,822,752
Number of Outdoor Properties:	40

Outdoor Property Value:	$3,435,607
Total Property Value:	**$24,103,086**

The types of facilities and infrastructure covered by this list include the following: the County Courthouse, city halls, community centers, pump houses, communications facilities including, buildings, county communication system towers and equipment, police stations, 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.

The map below shows the communication towers located in Sargent County. The cell towers are displayed along with microwave towers and antenna towers. The antenna towers are the county communications towers used for county communications. First responder agencies use these towers including law enforcement, fire departments, and emergency medical services. These towers are also used by county road crews which are very important in that as they are out blading and maintaining county roads they serve as severe summer weather spotters and can get information quickly to other county resources in the event of a tornado or other severe weather event. County road crews also remove snow from the roadways under dangerous conditions of extreme wind chills and poor visibility. If an accident should happen the radio system is used to call for assistance. School busses also use the county radio system which is critical for the safety of children being transported to and from school especially in winter months when extreme cold or hampered visibility conditions exist. If a school bus breaks down or becomes stuck in a blocked road or goes off the road the county radio system is used to call for assistance.

3.3.5 Communication Towers - Locations in Sargent County



Source: ND GIS Hub

In addition to Sargent County and its subdivisions property, the state also owns property in Sargent County. The listing includes three state agency building properties valued at $258,795. Sources: North Dakota State Mitigation Plan 2013 Revision, 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

Buildings

Besides critical facilities and state-owned buildings, other structures such as residences and businesses in Sargent County are also threatened by natural and human-caused hazards. Sargent County has 3,328 privately owned buildings valued at $521,880,000. 2,004 of these buildings are housing units of which 1,715 are occupied with an average value of $72,400. Sources: HAZUS MH 2.1; 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

Housing Units

The number of housing units in Sargent County in 2010 was 2,022. Sargent County housing units tend to be owned more than the rest of the state in that 20% are renters

compared to 35% statewide. Sources: http://www.city-data.com/county/Sargent_County-ND.html, United States Census Quick facts.

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. It is projected that North Dakota's population will increase to 841,820 by 2025 which is a 25.2% increase. Sargent County's population is expected to decrease from 2,435 in 2010 to 2,246 in 2025 or a decrease of 7.80%. Sources: U.S. Census Bureau and the Center for Social Research at NDSU

Listed in the table below are 2012 Sargent County Population statistics as compared to neighboring counties. Richland County was not included because the urban area of Wahpeton having statistics that is incomparable to rural Sargent County.

3.3.6 Economic, Ecologic, Historic, and Social Values

County	Sargent	Ransom	Dickey
Total Population (2010)	3,896	5,457	5,289
Persons under 5 years	5.3%	5.4%	6.1%
Persons under 18 Years	21.8%	23%	22.8%
Persons 65 Years and over	19%	20.1%	22%
Female Persons	47.2%	49.2%	50.6%
White alone	97.1%	97.6%	96.5%
Black or African American alone	0.3%	0.4%	1.0%
Native American or Alaska Native alone	0.1%	0.5%	0.7%
Asian alone	0.6%	0.4%	0.4%
Native Hawaiian or other Pacific Islander alone	0.1%	0	0
Two or more races	0.9%	1.1%	1.3%
Hispanic or Latino alone	2.5%	1.4%	2.4%
White alone, not Hispanic or Latino	94.8%	96.3%	94.6%
High school graduate or higher (25 + Years old)	88.7%	89.1%	86.2%
Bachelor's Degree or higher (25 + Years old)	18.2%	16.8%	23.5%
Housing Units	2,022	2,664	2,649
Homeownership Rate (2008-2012)	76.6%	70.9%	73.7%
Housing units in Multi-unit Structures (2008-2012)	11.3%	13.9%	17.4%
Median value of owner-occupied housing units (2008-2012)	$69,900	$88,800	$69,100
Households (2008-2012)	1,763	2,298	2,181
Persons per household (2008-2012)	2.18	2.31	2.27
Per Capita money income in last 12 months	$27,181	$24,424	$25,425

Agriculture in Sargent County

Agriculture is the primary industry in North Dakota and Sargent County. Agricultural production comprises about 90 percent of the County's total land area. North Dakota leads the nation in the production of several crops such as dry edible beans, navy beans, pinto beans canola, flaxseed, honey, sunflower oil, durum wheat, and spring wheat. The 470 farms in Sargent County make a significant contribution to the state's overall agriculture production producing a crop value of $104,365,000, $23,376,000 value of livestock, for a total of value of $127,741,000.

Source: National Agricultural Statistics Service, 2007 Census of Agriculture. (At the time this plan update was under development, the 2012 Census of Agriculture had not yet been released.)

Following are other agricultural statistics which point out the importance of agriculture in Sargent County:

In 2012 Sargent County had 505,015 acres of land in farms.

Average value of agricultural products sold per farm: $166,718

Average value of crops sold per acre for harvested cropland: $182.80

The value of nursery, greenhouse, floriculture, and sod as a percentage of the total market value of agricultural products sold: 0.00%

The value of livestock, poultry, and their products as a percentage of the total market value of agricultural products sold: 18.34%

Average total farm production expenses per farm: $120,845

Harvested cropland as a percentage of land in farms: 69.17%

Irrigated harvested cropland as a percentage of land in farms: 4.43%

Average market value of all machinery and equipment per farm: $154,636

The percentage of farms operated by a family or individual: 89.77%

Average age of principal farm operators: 53 years

Average number of cattle and calves per 100 acres of all land in farms: 5.08

Corn for grain: 70,476 harvested acres

All wheat for grain: 98,386 harvested acres

Soybeans for beans: 146,297 harvested acres.

Source: http://www.city-data.com/county/Sargent_County-ND.html

There are no major agricultural commodity storage facilities in Sargent County. Sargent County does have potato storage facilities but the commodity is stored there on a temporary basis and transported for processing. Major grain storage facilities are in neighboring counties of_____.

Other sectors of the economy include mining (gravel), construction, manufacturing, transportation, communications, utilities, wholesale trade, retail trade, professional and public services, finance, insurance, education, and real estate.

General Economy

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. Sargent County has not been directly impacted by the oil and gas industry therefore has basically not had significant economic growth. The per capita personal income and percentage of the population in poverty for Sargent County is shown in Table 3.3.6.1. The State statistics are also depicted for comparison purposes.

Table 3.3.6.1 Per Capita Personal Income and Poverty Statistics

County	Per capita income in past 12 months (in 2011 inflation-adjusted $) 2007-2011	Median household income ($) 2007-2011	People of all ages in poverty (%) 2007-2011
Sargent	$26,258	$52,154	7.1
North Dakota	**$27,305**	**$49,415**	**12.3**

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

Social Vulnerability

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 2008-2010 is the most recent data. The index can be used by the county to help determine where social vulnerability and exposure to hazards overlaps and how and where mitigation resources might best be used. Sargent County has a medium-low Social Vulnerability to Environmental Hazards ranking along with 10 other North Dakota counties. Other rankings in the state include 20 counties with a high rating, 6 counties with a medium rating, 11 counties with a medium-high rating, and 2 counties with a low rating. 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

Ecological, Historical, and Social Values

The ecological, historical, and social values of Sargent County 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 Whooping Crane has been identified in Sargent County as an Endangered Species, the Dakota Skipper, Poweshiek Skipperling, and the Northern Long Eared Bat as proposed, and Sprague's Pipit as a Candidate.
http://www.fws.gov/northdakotafieldoffice/SEtable.pdf.

Tewaukon National Wildlife Refuge Sign

Whooping Cranes

Located in Sargent County is the 8,363 acreTewaukon National Wildlife Refuge which is located astride the Wild Rice River, which flows from west to east and then north out of Lake Tewaukon. Numerous pothole wetlands dot the gently rolling glacial till plain which forms the prairie. A mile or two to the south rise the Sisseton Hills, a glacial moraine.

Rich bird and animal life associated with the many lakes and marshes made the Lake Tewaukon area a heavily used hunting and living site for early man. Historian S.M. Thorfinnson writes in Sargent County History, that Lake Tewaukon was named for an ancient religious leader, the "Son of Heaven or the Great Khan, Te Wauk Kon" who directed the building of a temple on the high hill south of the lake. "Indians of many tribes had been here for hundreds of years before the white man came," says Thorfinnson.

The earliest known map of the area was completed in 1838 and named Lake Tewaukon "Pole Cat Lake". Later it was called "Skunk Lake," due, no doubt, to the smell of algae

rotting in the summer sun. The county's first farm was started in 1878 on the east side of Lake Tewaukon.

For many years much of the area was farmed. Concern for wildlife by many local sportsmen resulted in authorization of the Tewaukon National Wildlife Refuge in 1934. Gradually, the land was purchased and habitat improvement projects were begun. Grass, trees, and shrubs were planted and wildlife food plots were established. In the 1960's four large dams were built to control the Wild Rice River resulting in hundreds of acres of lakes and marshes, and creating nesting and migration habitat for waterfowl.

Nearby the Tewaukon National Wildlife Refuge is the Tewaukon Wetland Management District. The Tewaukon Wetland Management District includes lands in three counties (Ransom, Richland, Sargent) in the southeastern corner of North Dakota.

The district provides crucial nesting habitat for ground nesting birds by protecting the fragile prairie potholes that are necessary for waterfowl breeding. These areas are crucial due to the extensive agricultural use of the land in this area. The district has 106 Waterfowl Production Area Units totaling 14,159 acres, 590 wetland easements protecting 34,824 wetland acres and 23 grassland easements totaling 10,757 acres. It also has two easement and small fee refuges totaling 1,466 acres.

Duck Hatchlings

Prairie Lily

The District also provides migratory stopovers for migrating birds.

Migrating Snow Geese

Sources: http://www.fws.gov/tewaukon/
http://www.wildernet.com/pages/area.cfm?areaID=US0395&CU_ID=1,
http://gf.nd.gov/hunting/waterfowl/light-geese/migration#slider.

Table 3.3.6.1 Sargent County Wildlife Management Areas

Wildlife Management Area (WMA)	Acres	Location	Wildlife
Crete Slough	150	11 miles west, 1 mile south, and ½ mile east of Gwinner	Waterfowl
Meszaros Slough	598	3 ½ milessouth, and 3 ½ miles west of Cogswell	Waterfowl
Taayer Lake	80	8 miles east of Oakes or 6 miles west, 1 mile north, 1 mile west, and 1 mile north of Cogswell	Waterfowl

Conservation Reserve Program (CRP) land is coming back into agricultural production. The cultivating of these grasslands and planting of crops will have a detrimental effect on wildlife and the natural ecological system will be tested.

According to the National Park Service's National Register of Historic Places, as of May 2012, Sargent County has one resource listed in the National Register of Historic Places, the county courthouse in Forman.

3.3.7 Future Growth and Land Use Trends

Sargent County has been steadily losing population since 1930. The U.S. Census indicates that between 2000 and 2010, Sargent County lost 12.29% of its population going from 4,366 to 3,829 people or a loss of 537 people. It would appear that this trend would continue but this may prove untrue in the 2020 Census. Currently agriculture and manufacturing are the basis of the Sargent County economy and this is expected to

continue. The agricultural commodity prices are currently high which is making farming more profitable. More young people will stay in the county and pursue production agriculture. The United States economy is currently coming out of a recession. As economic conditions improve, the demand for Sargent County products such as the Bobcat Skid Steer Loader may increase.

3.4 North Dakota State Plan

The North Dakota State Hazard Mitigation Plan is in draft format at the time of this revision. The State Plan re-aligned the hazards facing North Dakota. The Sargent County Planning Committee decided to follow the same hazards as listed in the state plan to avoid confusion in the future. This also aligns the hazards with THIRA (Threat and Hazard Identification and Risk Assessment) which is being conducted at the time of this revision. The 2014 North Dakota Hazard Mitigation Plan was referenced for data topics pertaining to Sargent County. It is found on the North Dakota Department of Emergency Services website, www.nd.gov/des.

Section 4 Planning Process

The planning process began with the consultant, Wenck Associates, reviewing the existing plan in October, 2013. When the review was completed the consultant met with the emergency manager, Sandra Hanson. During this meeting a draft planning schedule was developed which included the date for the Kick-Off Meeting. The meeting invitees were selected through the emergency manager identifying agencies, especially regulatory agencies such as the Water Board and Township Officers Association that have mitigation experiences and insights that can initiate mitigation measures. These regulatory agencies gave input during the meetings regarding vulnerabilities and potential mitigation strategies. Interviews were conducted with city officials and county officials as well as regulatory agencies that have a mitigation planning role. They were invited to each meeting and these interviews that were conducted with these agency representatives were successful to gather mitigation thoughts, ideas, and potential actions.

The Kick-Off Meeting was conducted in Forman on October 24, 2013. This meeting was advertised by .....Participating in this meeting was a broad spectrum of county and city officials. Representatives of counties neighboring Sargent County were invited the Kick-Off Meeting including Richland, Ransom, and Dickey Counties. Those participating in the meeting are included below in the table. Members of the Sargent County planning committee are denoted with asterisks (*) behind their name.

Name	Agency/Department	Phone Number (701)	E-Mail
Sandra Hanson*	Sargent County Emergency	724-6241	sandra.hanson@co.sargent.nd.us

Emergency Manager, Tax Equalization Director	Manager, Tax Equalization Director		
Trent Nelson*, Fire Chief	Forman Fire Department	678-4094	Tonconstruction@gmail.net
Michael William, firefighter	Forman Fire Department	680-8528	
Dennis Howey		680-8103	dshowey@drtel.net
Sue Hower	Gwinner First Responders	680-1184	
Ron Narum, Mayor	City of Rutland	724-3908	
Bill Anderson, County Commissioner	Sargent County	724-3661	
Jeff Anderson, Fire Chief	Gwinner Fire Department	680-2519	Jxxxxxx @ Hotmail.com
John Sakry, Fire Chief	Milnor Fire Department	640-0995	sakryplumbing@drtel.net
Trish Pearson, Auditor and City Commission	City of Forman	680-2377	auditor@formannd.com
Paige Cary	Sargent County	724-6269	Paigexxxxx@yahoo.com
Shannon Hajek, Safety Officer	Havana-Forman Fire Department	724-3145	
Kenneth Jarolimek, Consultant	Wenck Associates	751-3370	kjarolimek@wenck.com

Sargent County planning committee are denoted with asterisks (*) behind their name.

The Kick-Off Meeting agenda covered the following topics.

- Define Mitigation
- Why we are updating the current Hazard Mitigation Plan
- Define Planning area
- Review planning Process
- Sargent County Hazard Mitigation Planning Survey
- Take initial action to form a planning team

A separate meeting was held with the County Commissioners and City representatives immediately after the meeting. The Memorandum of Agreement (MOA) was explained to them. The county and city representatives took the MOA under advisement and went back to their specific jurisdiction and acted on the MOA. The emergency manager took the MOA's for the cities that were not there and contacted them for MOA signature. The Mayors signed the MOA and returned it to the emergency manager.

In the interim, the consultant continued gathering information to include in the plan sections mainly dealing with Sargent County's background and risk assessment. The next planning meeting was held January 29, 2014. This meeting was advertised on the ..... During this meeting the risk assessment and hazard analysis was reviewed by the participants and amended as necessary. The third planning meeting was held in Rutland and the draft plan was reviewed by the meeting participants and input was made to update the draft plan.

During the planning process several attempts were made to include the public to get public input. The emergency manager placed articles in the official county newspaper, ... An important method of getting the public involved was

moving the planning meetings around the county. The first meeting was held in Forman, the second in Gwinner, and the third in Rutland. The ..... Details of this process can be found in Attachment A.

Sandra Hanson and Kenneth Jarolimek conducted interviews with a number of people as necessary. During these interviews discussed were the basics of hazard identification, hazadrd vulnerability, and potential mitigation actions. The individuals involved in these personal interviews included:

Name	Agency/Department	Phone Number	E-Mail

Various plans were used for input into the Sargent County Hazard Mitigation Plan. They are listed in the table below along with the information gathered from the plans. .

Plan Used as a Resource	Information gleaned from the Plan
Local Emergency Operations Plan	Hazard Analysis Risk Assessment Planning Committee Members (Functional and Task Coordinators)
Sargent County Hazardous Materials Plan	Hazardous Materials fixed facilities Hazardous Materials transportation routes (rail and highway) Hazardous Materials Pipelines
ND State Hazard Mitigation Plan	Re-Alignment of hazard listing Risk and vulnerability data
Sargent County 2008 Hazard Mitigation Plan	Vulnerability and Risk Assessment Crosswalk

A Public Opinion Survey was conducted and 52 responses were received. The results of the survey helped develop planning strategies. The results are listed in Appendix ____.

The emergency manager invited the cities of Cayuga, Cogswell, Forman, Gwinner, Havana, Milnor, and Rutland to the Hazard Mitigation Committee meetings. The emergency manager used e-mail, phone calls, and letters to invite city representatives. The Hazard Mitigation Planning Team envisions using this Hazard Mitigation Plan to provide the foundation for Local Emergency Operations Plan revisions, THIRA development, Economic Development Plans, and any Comprehensive Plans that may be

developed in the future. The Hazard Mitigation Planning Team is encouraging development and updating of these plans.

Section 5 Hazard Identification and Risk Assessment

Sargent County is vulnerable to many types of natural, technological, and human caused hazards. Examples of natural hazards that have impacted the region include flooding, wild land fire, severe winter weather, and severe summer weather including tornadoes, wind storms and drought. Technological hazards are caused by human processes. Technological hazards that exist in the region include explosions, urban fires, uncontrolled chemical or hazardous material release (either at a fixed location or in transit), and power outage. Human-caused hazards are the result of direct (purposeful) actions of humans. Possible human-caused hazards include homeland security incidents, transportation accidents, and urban fire. Hazards that may be classified as both natural and/or human caused such as communicable disease and shortage of critical materials and infrastructure affect Sargent County.

The degree of vulnerability is dependent on the severity of the incident and on the total population affected. As an example, an F-4 tornado touching down in an open field may do crop or fence line damage but may not cause any injuries or deaths. If a F-4 tornado strikes a farmstead or city it may cause injury, death, and tremendous property damage including damage to critical infrastructure. Throughout Section 5, the degree of vulnerability for each hazard is explained based on these criteria.

5.1 Risk Assessment

Risk is a numerical calculation of potential future damages. Although the range of events from various hazards all have some potential to affect the county, the hazard ranking determined that the flood, severe winter storm, severe summer storm, urban fire, hazardous materials, and windstorm are the hazards that pose the greatest risk to Sargent County.

The 2013 hazard identification process produced a list of twelve probable hazard groups to be profiled. Table 5.1.1 shows the hazards and why they were identified by the Planning Committee. 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. The process to identify new hazards in future plan updates should include:

1. Evaluation of the identified hazards by stakeholders
2. Review of other county plans and programs for other hazards identified and/or managed
3. Review of local and tribal mitigation plans for other hazards identified
4. Review of recent disaster history for new hazards

It was noted that the North Dakota State plan identified fourteen probable hazard groups; however, two of these hazards, dam failure and geologic hazards, were not identified by Sargent County as a hazard group. This was a decision made based on the process to identify new hazards as the stakeholders determined not to include these hazards and there was no data to support them as hazards in the county.

Table 5.1.1 Sargent County Major Hazards

Hazard Profile	Why Identified	History
Communicable Disease (including human, animal, and plant diseases)	Global disease threat History of pandemics Dependence on agricultural economy	1918-1919 Influenza Epidemic Wheat rust 1930's
Drought	History of droughts Importance of large water users and agriculture to the county's economy Numerous USDA disaster declarations and county declared disasters and emergencies	17 Drought Disaster Declarations from 1980 to 2012
Flood (closed basin)	Extensive history of floods and high losses Ongoing, persistent closed basin flooding Numerous Presidential disaster declarations for flooding	12 Disaster Declarations from 1993 to 2013
Hazardous Material Release	History of major hazardous material releases Highways, railroads, pipelines, and fixed facilities exist	14 reported spills from

Hazard Profile	Why Identified	History
	throughout the county Regular truck and rail traffic transport hazardous materials through the county Numerous fixed facilities house agricultural chemicals and water treatment chemicals	1995 to 2013. Increase in crude oil transport via railroad.
Homeland Security Incident	National indications and foreign threats of future terrorist attacks Potential for school violence and other domestic attacks Additional emphasis on the potential for cyber-terrorism was added in the 2014 update	None to date, vulnerable because of major industry.
Shortage or Outage of Critical Materials or Infrastructure	Daily and operational dependence on utilities, fuel, and communications History of power and communication outages History of critical material shortages	3 past events plus numerous power outages.
Severe Summer Weather (including tornadoes, hail, downbursts, strong winds, and lightning)	Extensive history of damaging tornadoes, hail, downbursts, lightning, and strong winds throughout the county Numerous Presidential disaster declarations for severe storms The name of this hazard was revised for the 2014 update	57 events in the last 5 years.
Transportation Accident (including vehicular, railway, and aircraft accidents)	Potential for a serious accident involving multiple patients History of highway closures Potential train derailments	123 Highway Accidents in 2011
Urban Fire or Structure Collapse	History of urban fires Potential for structure collapses for a variety of reasons	Agricultural building fire in 2013 in Rutland
Windstorms	Due to the unique issues related to windstorm in Sargent County that may not be associated with thunderstorm activity, the county team determined this should be a separately profiled hazard in the 2014 plan update.	Located in Wind Zones II and III. 23 wind events from 2000-2003
Wild land Fire	History of large and damaging wild land fires Scattered government lands and natural fuels throughout the county	2 burn bans in 2008 and 2012.
Severe Winter Weather (including blizzards, heavy snow, ice storms, and extreme cold)	History of blizzards, severe winter storms, heavy snow, ice storms, and extreme wind chills High probability of blizzards and other potentially damaging storms Presidential disaster declarations for severe winter storms The name of this hazard was revised for the 2014 update	56 events from 2006 through 2013

Source: North Dakota State Hazard Mitigation Plan, 2013 Revision.

5.2 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 Sargent County. 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: A 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 county wide source of hazard information for Sargent County. 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 Sargent County. This county wide risk assessment is the cornerstone of the mitigation strategy and provides the basis for many of the mitigation goals, objectives, and initiatives.

The Sargent County risk assessment consists of hazard profiles that evaluate the risks from each hazard to the county. A county wide inventory describing the values at risk, such as county-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.

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 can have varying levels of risk based on location. Other hazards, such as winter storms or drought, cover larger geographic areas and the delineation of hazard areas is not typically available or useful. 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 Sargent County 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 the county. Where this was possible, a rating of high, moderate-high, moderate, low-moderate, or low was assigned. The ratings are comparative within the hazard, and are not necessarily an indication of the hazard level when compared to other hazards.

Table 5.2.1 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 5.2.2 Risk Analysis Classifications (Rating Scale is A to D – A is highest)

		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

To assess risks, the planning team studied which hazards have the higher disaster potential, the potential losses of each hazard, vulnerability to county owned facilities and critical infrastructure, and future development.

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. The prioritization of hazards into high, moderate, and low categories is based on the classification of hazards by the county 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.

Sargent County had just started the Threat and Hazard Identification and Risk Assessment (THIRA) at the time of the 2014 Hazard Mitigation Plan update. Thus, this will not be implemented in the Sargent County Hazard Mitigation Plan at this time.

Natural Hazards are by far the greatest potential threat to Sargent County. The 15 federally declared disasters from 1993 to 2013 all were natural hazard caused. The most common was flooding as demonstrated in table 5.2.3. Severe summer weather and winter weather are common occurrences.

Table 5.2.3 Presidential Disaster and Emergency Declarations 1993 to present.
(Data on Sargent County included in each declaration was not available for prior years)

Disaster Number	Date	Hazard
DR 1001	June-July, 1993	Flood, Severe Storms
DR 1050	March-May, 1995	Flood, Severe Storms
DR 1118	March 12-June 21, 1996	Flood
DR 1157	January 2-31, 1997	Winter Storms
DR 1174	February 28-May 24, 1997	Flood, Severe Storms
DR 1279	March 1-July 19, 1999	Flood, Severe Storms, Tornadoes, Snow and Ice
DR 1334	April 5-August 12, 2000	Flood, Severe Storms
DR 1376	March 1-July 31, 2001	Flood
DR 1597	June 1-July 7, 2005	Flood, Severe Storms
EM 3247	September 2005	Hurricane Katrina
	2006 or 2007	Flood
DR 1829	March 13-August 10, 2008	Flood, Severe Storms
DR 1907	February 26-July 15, 2010	Flood
DR-1981	February 14-July 20, 2011	Flood

Source: FEMA

5.3 Capabilities

Sargent County has developed capabilities over the years to combat the hazards most prevalent hazards they face. However with limited resources and changing incidents it is impossible to combat them all. Each of the communities; Forman, Milnor, Gwinner, Rutland-Cayuga and Cogswell have established a fire department. The fire departments are all volunteer, however they have trained to a level they are capable of maintaining. Mutual Aid Agreements exist among the fire departments to combat large fires.

The Sargent County Sheriff's Office and the three deputies provide law enforcement to Sargent County and communities within the county on contract. Mutual aid plays a big part in supplementing law enforcement; agreements are in place with neighboring Counties Sheriff's Offices.

Sargent County Emergency Medical Services are trained to handle emergency medical needs in Sargent County. In the event of a catastrophic event such as a tornado, additional resources can be procured through mutual aid or the State Health Department's Health Care Standards System. This system can be used to procure additional personnel, equipment, supplies or other necessary emergency health care products.

County roads are maintained by the County Road Department. The county has adequate equipment and trained personnel to properly maintain the roads and do snow removal. The City of Gwinner, Milnor and Forman have their own Public Works Department which maintains the streets, does snow removal, and provides high quality potable water through reverse osmosis, garbage services, and sewage disposal. The other towns in the county are not large enough to provide full service public works departments but do some snow removal, sewage disposal, and other limited services. Garbage is done on a contract basis with individuals and contractors.

Public Health actions are carried out by Sargent County District Health. The resources are limited; support comes from the North Dakota Department of Health.

Social Services provide disaster assistance through evacuation and sheltering support plus disaster recovery programs. The County Social Services Department has limited resources and relies on the North Dakota VOAD agencies and the North Dakota Department of Human Services to carry out its responsibilities when it becomes overwhelmed.

In addition Sargent County participates in the North Dakota Department of Emergency Services Regional Response System which includes all response resources including law enforcement, fire, emergency medical and incident management. The first level of additional resources is local with regional response from Fargo. Resources provided include Fire Department personnel trained to the technician level, Emergency Medical Services, a SWAT Team, a Bomb Squad, and Public Works resources.

Gwinner, Forman and Milnor have adopted building codes which it enforces through a building inspector. All other jurisdictions in the county use the State Building Code; however the county lacks resources for enforcement. The county uses the State Electrical Code and State Electrical Board inspectors for electrical inspections.

5.4 Hazard Description and Vulnerability and Risk Assessment

Listed below are the major hazards facing Sargent County citizens. Each of these hazards have the potential for causing the loss of life, serious injury, property damage, property loss, economic impacts, environmental damage, and other social and cultural

damages. These hazards are described and their vulnerability factors are included in the hazard description.

5.4.1 Flood (Including Closed Basin, Ice Jam, and Flash Floods)

Table 5.4.1.1 Flood Risk Analysis -As determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Limited	10-25% of jurisdiction affected
Risk Class	**B**	Moderate Risk Requires Prompt action Address via Mitigation and Contingency plans
Seasonal Pattern	Late March to late April, throughout summer for flash flood	
Duration	1 week to 10 days	
Speed of Onset	Hours if flash flooding, days if seasonal spring flooding	

Flooding needs special attention in the Sargent County Multi-Hazard Mitigation Plan because it has caused the most hardship in the disruption of people's lives and the most financial losses for individuals, businesses, and governments. Flooding is Sargent County's most costly and repetitive natural hazard. Floodplains have been developed with structures such as houses, roads, railroads, industrial sites, businesses, agricultural fields, and recreational facilities. 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.

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. Floods can occur when 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 heavy snow pack which is affected by a rapid warming

trend as well as spring rain falling directly on the snow pack. Another source of flooding occurs when heavy rain falls in such a short time that the soil cannot absorb it. Flooding is also caused when heavy rain falls over a prolonged period of time, and the ground becomes saturated and cannot absorb the additional moisture.

The Sargent County cities are not immune to flooding but have started to mitigate flooding through identifying proper drainage and limiting structure locations to being built out of the flood plain. Rural areas are more subject to flooding because the lakes, creeks, and sloughs fill with water and flow into each other causing road damage. Many farmsteads are built on higher land therefore are not subject to flooding. Through the years Sargent County has successfully mitigated numerous rural road flood incidents through grade raises as part of disaster recovery efforts. As flood caused road washouts were repaired, the road grade was raised to prevent water from going over the road and washing it out. The Hazard Mitigation Planning Committee carefully studied post disaster mitigation actions that were completed and concluded the rural road flooding situation needs to be continually monitored. Even though no current mitigation actions were identified, the Hazard Mitigation Planning Committee agreed there may be flooding incidents that occur that can be solved through mitigation actions. These additional mitigation actions can be placed in the plan as the plan undergoes its annual review.

Sargent County Major Drainage Basins

Sargent County is included in the Hudson Bay drainage that includes the Souris and Red River systems. 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.

Flooding in Sargent County can be the result of culverts plugging by ice or debris or by excessive water exceeding culvert capacity. A plugged culvert causes the roads to act as a dam resulting in the water backing up behind the road. Road damages can occur if the water overtops the road causing gravel wash, a road washout or a culvert washout.

The analysis of flood damage reduction needs and alternative corrective measures recognizes the nature of the areas subject to flooding, number of people affected, present and projected annual flood damages, probabilities of flooding, and the duration and depth of flooding. Both structural and nonstructural approaches for reducing or preventing flood damages require evaluation.

Structural measures are considered essential to the economic and social well-being of those urban areas where existing damages are high, the floodplain has been intensively developed, and many people are affected by recurring floods. Structural measures are assumed to be designed to provide protection for urban areas against floods having a one- percent chance of being exceeded during any single year (100-year flood). The regulation of floodplain land use and development in areas subject to urban growth is viewed as an integral element in any overall urban flood damage reduction program.

A variety of measures, including channel modification such as developing drains to remove water from low lying areas to include culvert installation to properly drain and distribute flood water are considered appropriate elements for reducing flood damages. The installation of home drainage systems with a sump pump can effectively reduce the water table around a home and eliminate or reduce basement flooding.

Structural/nonstructural measures for rural flood damage reductions are assumed to be designed to provide protection against floods having a ten-percent chance of being equaled or exceeded during a single year. A much higher degree of protection for rural areas is usually not economically feasible.

Types of Flooding

Several different types of flooding occur in Sargent County; they include Riverine Flooding, Closed Basin Flooding, Ice Jam Flooding, Flash Flooding, and Groundwater Flooding. The spring flood danger period is generally from March through May. 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. The table below describes recent incidents of flooding in Sargent County.

5.4.1.2 Recent flood events in Sargent County – 2007 to 2013

Flood Type	Date	Description
Flash Flood	5/6/2007	Strong surge of moistures and thunderstorms had rain amounts in Sargent and Ransom Counties between two days of 4 to 6 inches.
Heavy Rain – Flash Flood	5/21/2011	Low pressures systems stacked had caused thunderstorms with heavy rains and farm fields flooded
Flash Flood	6/20/2013	Several rounds of late night rains produced flash flooding that caused widespread street and basement flooding in Gwinner. Highway 13 was closed as wells as the Bobcat plant was partially flooded with several inches of water on the floor. One fatality in neighboring Ransom County as a pickup was swept off North Dakota Highway 32 into Dead Colt Creek. The vehicle floated downstream and was eventually submerged resulting in one fatality by 8 am CDT.
Flood	5/6/2007	Wild Rice River between Brampton and Rutland rose due to heavy rains and caused closures of rural roads.
Flood	6/2/2007	Heavy rainfall in May showed values of 200 percent of normal. Milnor created a levee to prevent Storm Lake from spilling into town.
Flood	6/15/2007	Continuous rain from June 13th to 14th caused approximately 2 to 5 inches total. Several rural roads were closed.
Flood	3/22/2009	Warmer weather caused snowmelt and run off and additional snow causing flooding through March 31, 2009

Flood	4/1/2009	Flood due to heavy wet snow melting and later spring and rains. Flooding continued to May 1, 2009
Flood	3/18/2010	High snow amounts and light rain caused early flooding near Crete, Delamere, Geneseo and Straubville
Flood	4/1/2010	Water levels remain high due to melting through middle of April
Flood	4/3/2011	Snow melt began and high water amounts from previous years and current year caused flooding through mid April

Data from http://www.ncdc.noaa.gov/stormevents/ - January 2007 to September 2013

Riverine Flooding

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Sargent County has a low risk for riverine flooding.

To provide additional details on the populations and assets vulnerable to riverine flooding, a GIS-based analysis was completed utilizing Q3 data. As discussed previously, a DFIRM is a digital version of 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.

A vulnerability analysis was completed to determine populations and assets at risk utilizing the census block data available as part of FEMA's HAZUS MH 2.1. Sargent County is one of the counties that does not have this GIS map data in North Dakota and thus has a low vulnerability rating. Source: FEMA DFIRM, Preliminary DFIRM, and Q3 Data; HAZUS MH 2.1

Closed Basin

Unique to North Dakota is flooding due to closed basin circumstances; in a closed basin, 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. Sargent County has numerous small closed basins caused by glaciation features which have flooding issues. Closed Basin Flooding is the primary cause of flood damages in Sargent County.

Ice Jams

Flooding can also result from ice jamming or blockage along drainage areas blocking culverts or drainage channels. Ice breaking up into pieces, called floes, moves along with the flowing water bunching up developing a dam like structure. Sargent County can have ice jams developing as water moves from one closed basin to another but this is a rare occurrence.

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 man-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. In Sargent County a flash flood is usually caused by severe thunderstorms, heavy rains on snowpack, or slow moving storms. 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. Since the year 2000, Sargent County has experienced 13 separate flash flood events with one of these events causing a fatality in neighboring Ransom County. In 2013, a worker leaving the Bobcat plant in Gwinner and traveling north on Highway 32. His vehicle was swept away in Ransom County due to the rising creek. Total property damage from these thirteen events is $34,000 while the crop damage is $150,000 reported. Source: National Climatic Data Center, data downloaded on March 2014, http://www.ncdc.noaa.gov/stormevents/

Groundwater Flooding

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. Basement flooding can cause extensive damage to homes and businesses. Often this type of flooding occurs during or following lengthy periods of heavy rainfall or melting of a heavy snowpack. All of Sargent County is subject to ground water flooding. Numerous rural areas within Sargent County have high water tables which cause ground water flooding.

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. 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. Sargent County is included on this list for having a levee which is >>>>>

Flood Damages

As history has shown, essentially all jurisdictions in Sargent County 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 city to city.

Any county, township, or state highway in Sargent County is vulnerable to flood damage due to the Closed Basin Flooding that occurs in Sargent County. Critical structures (sewer, water, pump stations) located throughout the cities would be affected by ground saturation and overland flooding in low lying areas.

Slow-rising floods usually have a fair amount of warning time and allow people to evacuate from the hazard areas. Flash 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. All jurisdictions in Sargent County are at risk from flood deaths even though none have occurred in recent years. 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 Sargent County. Flooding may reduce profits and delay the beginning of the planting season. When an extreme flood event occurs 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 may additionally have an impact on commerce.

Dirty floodwaters often contaminate or destroy everything they touch especially flood waters that may carry toxic chemicals, many of them agricultural chemicals. Road washouts often disrupt economic activities when farm to market roads are damaged. In addition social activities are cancelled and travel is limited plus it is costly to make road repair. 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 filling the prairie potholes and lakes with water.

The sections that follow provide additional details regarding populations and values at risk to 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.

Public Infrastructure Flood Damages

Since 1989, Sargent County has been included in fifteen flooding Presidential Declarations and/or Emergencies. The most recent Sargent County Presidential Declarations have been for public infrastructure flood damages, mainly road damages. The declarations and damages are depicted in table 5.4.1.3.

Table 5.4.1.3 Flood Public Infrastructure Damages

Disaster Number	Year	Number of Damaged Sites	Dollar Amount of Damages
DR 1829	2009		
DR 1907	2010		
DR 1981	2011		

Source: ND Department of Emergency Services

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).

Total losses for Sargent County are estimated to be low-moderate rating as depicted by the table below.

Table 5.4.1.4 Sargent County Losses

Business	Residential		Commercial		Other		
Disruption ($)	Building Loss	Contents Loss	Building Loss	Contents Loss	Building Loss	Contents Loss	Total Loss Losses Rating
$35,000	$87,000	$43,000	$13,000	$50,000	$21,000	$73,000	Low - Moderate

Source: FEMA Average Annualized Loss Summary

Flood Crop Losses

An analysis based on crop insurance payments to insured crops for flood damages is available for Sargent 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 5.4.1.5 Flood-Related Crop Insurance Payments Analysis (2003-2012)

Value of Crops-2007 Census of Agriculture	Crop Insurance Paid 2003-2012	Annualized Crop Insurance paid	Annualized Estimated Crop Losses	Crop Loss Ratio (Annualized Estimated Crop Losses/Value of Crops
$104,365,000	$115,252,979	$11,525,297.90	$12,949,772.92	12.4%

National Flood Insurance Program

The Federal Disaster Protection Act of 1973 requires state and local government to participate in the National Flood Insurance Program (NFIP) as a condition to the receipt of any federal loan or grant for construction projects in flood prone areas. The National Flood Insurance Program offers flood insurance to homeowners and businesses. 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. Participation in the NFIP requires communities to adopt floodplain regulations that meet NFIP objectives, which are: New buildings must be protected from flooding damages that occur as a result of the 100-year flood, and new development must not cause an increase in flood damages to other property. There are no identified buildings in the county in a mapped flood plain and there are no future plans for construction of buildings in any mapped areas. Flood Plain management is being enforced. During the personal interviews and planning meetings the value of evaluating flood plain ordinances was identified. Are flood plain ordinances enforced?

Table 5.4.1.6 Communities in Sargent County Participating in the NFIP

Jurisdiction	CID#	Entry Date	Mapped
Sargent County	380295	05/04/98	NSFHA
City of Cogswell	381064	11/05/85	NSFHA
City of Forman	380228	12/11/85	NSFHA
City of Milnor	380239	03/18/86	NSFHA
City of Rutland	380200	01/30/84	NSFHA

Local residents indicated that flooding has been a consistent, albeit controllable problem. Sargent County does not have any flood insurance policies and residents have not made any flood insurance claims.

There are no DFIRM maps of Sargent County communities.

Repetitive Loss Property

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. Sargent County has no repetitive loss property.

Source: USDA Risk Management Agency, 2012

5.4.2 Severe Winter Weather

Table 5.4.2.1 Severe Winter Weather Risk Analysis - determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Limited	10-25% of jurisdiction affected
Risk Class	**B**	Moderate Risk Requires Prompt action Address via Mitigation and Contingency plans
Seasonal Pattern	Winter – November to March/April	
Duration	Average – 48 to 72 hours, Maximum 5 days, Minimum 12-14 hours	
Speed of Onset	12-24 hours, Advance Warning is possible with ample warning from National Weather Service but actual speed of onset will vary	

Severe Winter Weather occurs in many forms and varies significantly in size, strength, intensity, duration, and impact. There are many elements to consider in the definition of a winter storm. The elements are the temperature, temperature extremes, wind and wind chill temperatures, and snow and blowing snow. Low visibility, heavy snow, and cold temperatures can combine to bring the area affected by a winter storm to a complete standstill. Utility and communications systems are often interrupted. Road systems are rendered impassible causing school, job, and shopping shutdowns. People in rural areas are especially hard hit if they do not have adequate stocks of food and fuel on hand. Severe winter weather has the same effect on the rural Sargent County as it does on the cities. The cities are not large enough or have enough large structures to block the winds that accompany severe winter storms. The entire county, rural and urban is affected by severe winter storms.

The three significant incidents that occur in the winter are the WINTER STORM, BLIZZARD, and ICE STORM. A brief explanation of each follows:

> Winter Storms are a combination of snow and wind that threatens life but are not severe enough to be a blizzard.
>
> A Blizzard occurs when a considerable snowfall is accompanied by winds of 35 MPH or more. Visibility is reduced to one-quarter mile or less. Accompanying the blizzard are fine, powdery particles of snow which are whipped from the surface in such great density that the visibility is only a few yards, thus creating a

blinding condition or whiteout. A severe blizzard is a condition with winds 45 MPH or more, visibilities near zero, and temperatures 10 degrees F or less. A blizzard is the most dramatic and perilous of all winter storms.

Ice Storms are a condition that will produce significant and damaging accumulations of ice when heavy rains are combined with below freezing surface temperatures. Ice storms down trees, power lines, communications towers, etc., and make driving impossible.

SPECIAL NOTE: While these definitions may not sound serious, the combinations of temperatures, wind, snow, wind chill temperatures, and reduced visibilities can make these storms very deadly and costly in terms of property damage and recovery operations. Even with ample warning time, people succumb each year from the storms such as those defined above. The livestock industry can be severely impacted during winter storm situations. The snow can prevent cattlemen from getting feed and water to their livestock. Heavy snow can cause shelter roofs to cave in, crushing or suffocating livestock. One major loss of livestock in the past blizzards has been due to dehydration. Cattle cannot lick enough snow to satisfy their thirst. Cattle will die from lack of water before they succumb to cold or suffocation.

Threat: A winter storm may impact the entire county, or only an isolated area within the county. The winter season can begin as early as September and last into April. However the freak May winter storm catches people off guard and may cause more damage than a comparable expected winter storm in January when people are prepared. Generally, a period from mid-November through early April provides the bulk of winter storms. On the average, there are three to four severe winter storms each year; however, blizzards are not the only events in the winter that can cause life-threatening conditions.

When there are prolonged periods of cold with high winds, or periods of extremely cold temperatures, citizen welfare and property is threatened. Ice storms with wind, or heavy snow without wind, have been dangerous and costly to business, industry, state and local governments, and our citizens. But by far, the blizzard is the most deadly.

The northern track winds produce the Alberta Low Pressure System, commonly called the Alberta Clipper. This is usually a fast moving storm producing blizzard conditions for a relatively short period of time. They are usually followed by extreme low temperatures. Alberta Lows have traveled as fast as 90 MPH and have never been known to become stationary. The southern track winds produce the Colorado Low Pressure System. This type of storm moves more slowly and more erratically than the Alberta Low. The Colorado Lows have traveled as fast as 60 MPH, but have also been known to stop and become stationary for as long as 18 hours. Both of these storm systems can be deadly.

Blizzard conditions can also exist without a major storm being near the county. This occurs when strong surface winds blow snow that has already fallen. This is called a ground blizzard. Visibilities can be reduced to zero even though the sun is shining. These conditions can exist for more than a day to less than one hour. Since these conditions are usually accompanied by very cold temperatures and extreme wind chill temperatures, ground blizzards can be as deadly as a conventional blizzard. Highway travel can be impacted by snow sticking to a sun-warmed highway resulting in dangerous travel conditions.

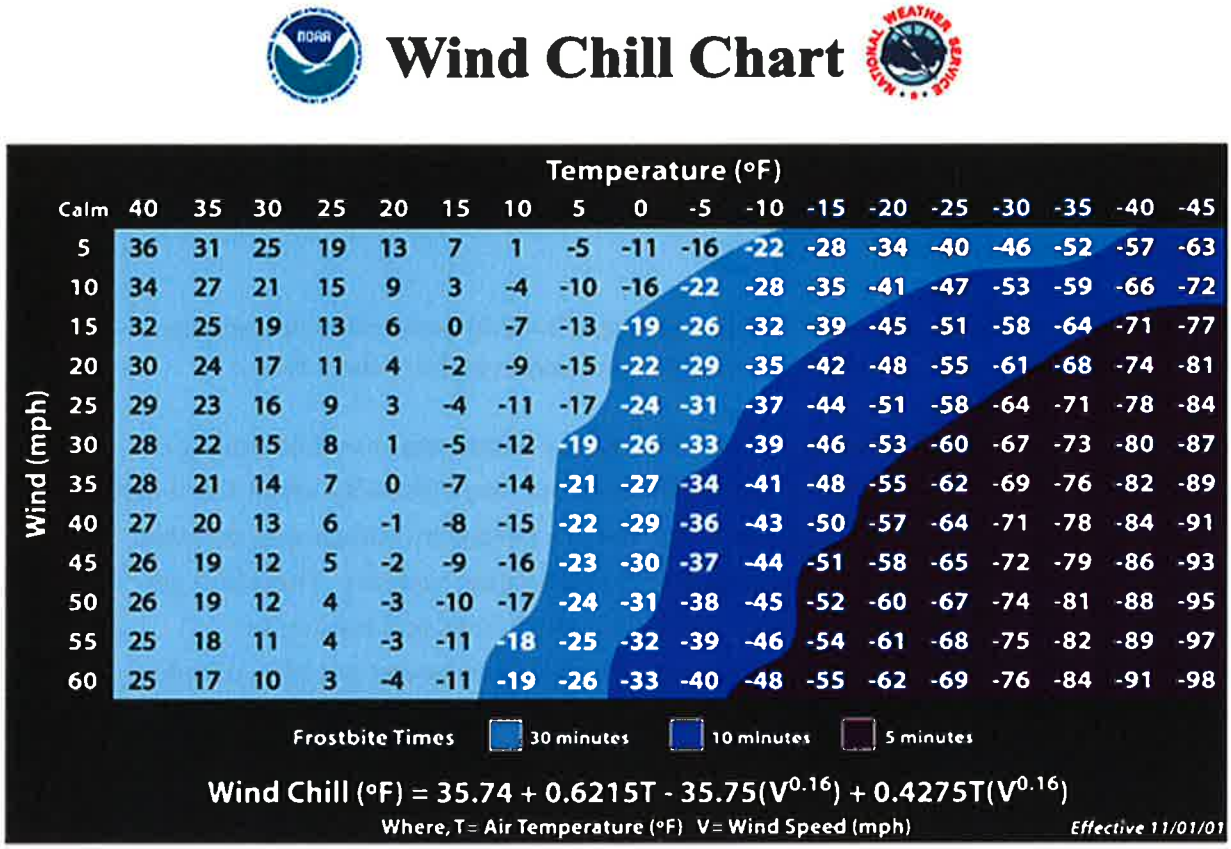
Low temperatures combined with high winds (Table 5.4.2.2) are extremely dangerous and can cause extensive damage to a person if exposed even for a short time.

The population of North Dakota is most threatened by winter storms while driving or when electric service is lost. Homes and businesses that use electricity are at risk when electric service is lost. Homes and businesses that are heated by natural gas, propane, and fuel oil require electricity to run the blowers and heating systems. Therefore, an extended power outage during winter may make many homes and businesses dangerously cold. Additionally, during extended winter-time power outages, people may make the mistake of bringing portable generators, propane or charcoal barbeque grills, camping stoves, or other heat sources into their homes 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. Transportation accidents are more common during poor road and visibility conditions and may result in injuries or deaths. These situations, accompanied by stranded motorists that need to be rescued, represent significant threats to the population.

Other problems for people are accentuated under winter storm conditions. Overexertion due to winter activities can and does cause heart attacks. Automobile accidents are prevalent. The loss of life during winter storms is partly due to the occasional lapse between severe blizzards, giving people a false sense of security. Sometimes a lack of adherence to simple, important and necessary precautions, or even apathy results in loss of property, injury, and even death.

Hypothermia has often been called "THE KILLER OF THE UNPREPARED". It is also the number one killer of many outdoor sports enthusiasts. Hypothermia is a condition where the body temperature, or core temperature, is lowered. The blood is cooled, reducing the oxygen carried to the brain and dulling the senses. The victim becomes fatigued, delirious, and loses dexterity of arms and legs. If the body's core temperature continues to drop to about 85 degrees Fahrenheit, the victim eventually slips into unconsciousness. If treatment is not started immediately, the end result is arrest of the circulatory and respiratory systems and death.

Table 5.4.2.2 National Weather Service Wind Chill Chart



Source: National Weather Service

Table 5.4.2.3 - Winter Storm Data and Unusual Weather Phenomena in Sargent County 2006/2007 - 2012/2013

Type	Date	Event Description
Blizzard	3/1/2007	Blizzard conditions developed 3/1/07 evening and many roads closed including Interstate to March 3rd.
Blizzard	2/9/2008	Cold air with north to northwest winds caused ground blizzard and no travel in much of eastern North Dakota
Blizzard	12/13/2008	Surface low pressure out of Colorado, no travel advised, wind chills, closure of Interstate, and school/church closures
Blizzard	1/11/2009	Blizzard conditions in open country due to four to five inches of new snow
Blizzard	3/9/2009	Colorado low tracked with additional snow of several waves of 6 to 13 inches as well as snow drifts causing travel closures
Blizzard	12/24/2009	Low pressure, snow and strong winds with warmer temperatures caused travel to shut down through December 26th
Blizzard	1/25/2010	Low pressure and southern Canadian air causing whiteout conditions and some snow drifts
Blizzard	12/30/2010	Surface low pressure had travel stopped across North Dakota during this blizzard caused by fresh snow.
Blizzard	12/31/2010	A second blizzard stared as additional snow fell and transportation was shut down again through January 1, 2011
Blizzard	3/11/2011	Late winter blizzard began that caught many off guard even though warned, several road closures
Blizzard	2/10/2013	Moisture laden Colorado Low tracked and freezing rain, fog and snow fell. Schools were closed and travel was not possible due to whiteouts
Blizzard	3/17/2013	Surface low pressure moved across the area with fresh snow causing whiteout conditions
Blizzard	4/14/2013	As the winter storm developed, strong winds produced ground blizzard and additional snow
Extreme Cold	2/3/2007	Wind Chill temperatures of minus forth to fifty-five

Type	Date	Event Description
Extreme Cold	1/29/2008	Cold air pushed into area with wind chills of forty to fifty below zero.
Extreme Cold	2/9/2008	Temperatures fell with winds to force wind chills of forty to fifty below zero.
Extreme Cold	12/15/2008	In wake of blizzard, northwest winds caused temperatures to drop to forty to fifty below.
Extreme Cold	12/20/2008	After the winter storm, cold and winds persist with forty to fifty below zero.
Extreme Cold	1/14/2009	Very cold Arctic air caused wind chills of forty to sixty below until January 16, 2009
Extreme Cold	1/7/2010	Following the snow events, wind chills fell to forty below zero
Extreme Cold	2/1/2011	High pressure causing temperatures to drop to forty below or colder
Extreme Cold	2/8/2011	Surface high pressure dropped and wind chills hit forty below again
Extreme Cold	1/18/2012	Cold front moves through with temperatures to drop and wind chills of thirty five to forty five below zero.
Extreme Cold	1/20/2013	Low temperatures and winds dropped temperatures to 40 to 50 below
Extreme Cold	1/31/2013	Frigid air moved into the area causing Wind Chill warning through February 1st
Heavy Snow	3/20/2008	Low pressure brought six to seven inches of snow to the area.
Heavy Snow	12/29/2008	Surface low pressure pushed out heavy snow of 8 to 14 inches
Heavy Snow	12/23/2009	Heavy snow over area.
Heavy Snow	1/6/2010	Six to ten inches fell in the area
Heavy Snow	11/22/2010	Close to a foot of snow in a narrow band of snow
Heavy Snow	12/3/2010	Surface low pressure and inverted through had again a thin band of snow of six to nine inches
Heavy Snow	12/15/2010	Snow of 8 to 11 inches in southeast North Dakota
Heavy Snow	1/28/2013	Reports of six to twelve inches of snow were provided
Winter Storm	2/24/2007	Colorado Low sent an inverted through to North Dakota. Three rounds of snow, highest snow near Havanna of 14.1 inches
Winter Storm	2/27/2007	Colorado Low sent an inverted through to North Dakota with blizzard conditions in some areas
Winter Storm	3/1/2007	Initial storm on 2/27/07 continued with additional snow and blizzard conditions. Schools were closed. Cayuga reported 21 inches of snow.
Winter Storm	4/2/2007	Upper jet over northern plains with weak area of low pressure tracked north causing this storm. Schools closed and 9 inches of snow at Havanna.
Winter Storm	12/1/2007	Colorado low with snow and wind for an early winter storm. Visibilities were reduced and snow amounts between 6 and 11 inches.
Winter Storm	4/6/2008	Surface low press set up rain followed by snow in this late storm to 8 to 12 inches of snow.
Winter Storm	4/10/2008	Low pressure brought a variety of snow and wind with reduced visibility and snow amounts of 6 to 13 inches.
Winter Storm	12/19/2008	Inverted trough moved across eastern North Dakota with 4 to 6 inches of snow.
Winter Storm	2/25/2009	Surface low passed over the area with snow amounts of 10 to 16 inches and school closures
Winter Storm	3/29/2009	Colorado low and snow fell causing heavy wet snow amounts to break several March snowfall total records
Winter Storm	1/22/2010	Temperatures stayed warming causing rain, sleet and snow to the area
Winter Storm	2/13/2010	A storm originating from Manitoba caused six to twelve inches of snow and some blowing in the open areas
Winter Storm	10/26/2010	Snow moved in and rain and some sleet
Winter Storm	2/20/2011	Strong winter winds and six to 10 inches of snow in the area

Type	Date	Event Description
Winter Storm	3/22/2011	Surface low pressure causing freezing rain, sleet and snow that prompted road closures
Winter Storm	2/28/2012	Colorado low caused gust northeast winds to blow fresh snow and this was followed by cold air
Winter Storm	12/8/2012	Near six inches of snow fell and caused blowing snow in open country due to wind gusts
Winter Storm	1/11/2013	Surface low pressure brought snow, freezing rain and wind to cause lower visibilities
Winter Storm	3/3/2013	Low pressure and snow fell across eastern North Dakota
Winter Storm	3/17/2013	Surface low pressure moved across the area along with low visibilities and snow up to six inches
Winter Storm	4/11/2013	Snow accumulations of six inches across the area prompted this storm
Winter Storm	4/14/2013	Low pressure causing another late storm with the heavy wet snow.

Source: National Weather Service

Table 5.4.2.4 Summary of total severe winter weather events – 2007-2013

Heavy Snow	8
Cold/Wind Chill	12
Winter Storm	22
Blizzard Conditions	13

(Note: Some weather systems may have caused more than one type of weather event.)

Source: National Weather Service

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. An early winter storm may come before the harvest of late crops such as sunflowers and corn is completed resulting in crop damage. Cattle operations are affected by extreme cold temperatures or wet conditions during calving operations and keeping animals hydrated during blizzards. Winter storms may slow transportation resulting in business closures and delivery delays. Schools close temporarily if conditions are dangerous for children to be transported to and from school. Sargent County schools are especially affected because many of the children live in rural areas and are transported by school bus.

The greatest threats to the population from winter weather are the inaccessibility to facilities due to poor road conditions, utility outages, and 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. In addition there is a potential for pipes to freeze and burst during cold weather if the home or business heating system fails. Water can easily damage the interiors of structures and their contents. The most common cause of heating system failure is the loss of electricity during an ice storm. Facilities with back-up generators are better equipped to handle a winter storm situation should the power go out. When roads are impassable, social events may also be postponed or cancelled. Another risk factor in relation to winter storms are blocked rural roads and blocked city streets. The planning committee determined that living snow fences are an effective

mitigation measure to capture blowing snow before it can block roads. Living snow fences are listed in the mitigation measures and will be studied for placement and effectiveness to protect the city streets and rural roads.

Sargent County rural residents are determined to be self-sufficient during winter storms. They expect winter storms to occur and stock up on necessary supplies and medicines during the winter months. The city residents do not have the self sufficiency of rural residents and are more vulnerable to electricity or heating system outages than rural residents.

To refine and assess the relative vulnerability of Sargent 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 5.4.2.5 summarizes the calculated ranges applied to determine the overall vulnerability ranking based on the scores which ranged from 10 through 39.

Table 5.4.2.5 Ranking 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 (2003-2012) which shows the vulnerability rankings derived from the analysis of data from these sources. Sargent County has a vulnerability score of 19, therefore a low to moderate winter storm vulnerability rating.

5.4.3 Severe Summer Weather (Including Tornadoes, Hail, Downbursts, Thunderstorm Winds, Lightning, and Extreme Heat)

Table 5.4.3.1 Severe Summer Weather Risk Analysis - determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Limited	10-25% of jurisdiction affected
Risk Class	**B**	Moderate Risk Requires Prompt action Address via Mitigation and Contingency plans
Seasonal Pattern	Summer – June to August	
Duration	15 minutes to 24 hours, Depends on whether the storm consists of heavy rains, hail, lightning, severe thunderstorms, tornadoes, heavy winds, and/or flash flooding.	
Speed of Onset	12-24 hours, Advance Warning is possible with ample warning from National Weather Service but actual speed of onset will vary	

Sargent County has high risk vulnerability for Severe Summer Weather events. Severe thunderstorms can occur any time of the day or night, but are most frequent during the late afternoon and evening hours. This is mostly due to the daytime heating which creates the extra heat energy to form these large thunderstorms. 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. The criteria used by the National Weather Service for calling a thunderstorm severe are winds of 58 MPH or more and/or hail three-quarters of an inch larger in diameter. There are other elements that make thunderstorms deadly, such as severe lightning, heavy rains, hail, straight-line winds, and tornadoes.

There is a difference in risk to the damage caused by severe summer weather events. If a rural area of Sargent County is struck by a severe summer weather event such as a tornado, high winds, hail, or heavy rains; there may be crop and minor property damage such as fence lines or major damage if a farmstead is struck. If one of the cities in Sargent County; Gwinner, Forman, Milnor, Rutland, Cogswell or Cayuga; was struck by a tornado there would be major property damage and personal injury or maybe even death.

The general makeup of a severe thunderstorm is similar to that of a regular thunderstorm, except that each element is enhanced or more intense. This can be seen in the cloud formations and the weather that the storm produces. 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. Strong winds, hail, and tornadoes are also dangers associated with some thunderstorms.

About 10 percent of the thunderstorms that occur 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, Sargent County averages between 30-50 days of thunderstorm activity. 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.

Downbursts and Strong Winds

When a thunderstorm approaches, there is always the possibility of strong straight-line winds. The winds may blow vehicles off the road, break windows in buildings, cause other structural damage, down power lines, and they are dangerous to individuals

caught outdoors. Special concern is eye and respiratory damage due to blowing dust and soil as well as other bodily damage caused by blowing debris.

The updrafts and downdrafts create severe turbulence in and for several miles around the thunderstorm. Velocities in these frequently exceed 100 MPH and can reach over 170 MPH.

When downdrafts of very high speeds remain concentrated as they hit the ground, they can easily level buildings and flattens trees. These very strong winds are called downburst winds, and can be as deadly as tornadoes even though they are not related to them.

When strong down drafts spread out after hitting the ground, they can still be dangerous. These are called straight-line winds. The speed of the wind coming out of the front of the cell is added to the speed of the storm. For example, if the winds coming out of the thunderstorm are traveling at 40 MPH and the storm itself is moving 40 MPH, the wind speed in relation to the ground is 80 MPH. Wind speeds this high are not uncommon during the summer months.

Lightning

Lightning damage results from four effects of the lightning strike: electrocution of humans and animals, vaporization of materials along the path of the strike, fire caused by the high temperature produced by the strike, and a sudden power surge than can damage electrical and electronic equipment. Property losses from lightning include damage to buildings, livestock, electric power systems, the commercial aviation industry, forests, and grasslands. Annually lightning kills more people in the United States than tornadoes.

Tornado

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. 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.

According to the National Weather Service, Sargent County experienced 22 reported tornadoes since 1950; 10 of those reported tornadoes were between 1996 and 2013. However there may be more tornadoes occurring that go unreported due to the rural nature of Sargent County.

Tornadoes are nature's most violent windstorm. Most fatalities occur when people are struck by flying debris or do not leave mobile homes and automobiles. Flying debris causes over 90 percent of all tornado fatalities. The winds of the tornado can reach speeds of 300 MPH, and at these speeds, neither man nor nature makes many things that can hold together. The one thing to remember about tornadoes is that nothing can be done about them and they will go where they want. Get to shelter immediately. With this in mind, the best place to go is underground, or as underground as possible (to avoid the winds and flying debris). Two extremely dangerous areas to consider for shelter, should a tornado strike, are mobile homes or vehicles (autos, trucks, campers, etc.). Most tornadoes take place during the evening hours when people are at home.

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 300 mph, and they can have lifetimes exceeding one hour and stay on the ground for over 50 miles. The tornado photos below depict the three tornado stages.

Table 5.4.3.2 Tornado Stages

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 2006, enhancements to this scale resulted in more

accurate categorizations of damage and the associated wind speeds. Both scales are shown in the table below.

Table 5.4.3.3 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 110 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 Sargent County. Hail can cause injury and even death to both humans and farm animals. When hail gets larger than one-half inch in diameter, it is time to seek shelter. Since the head is the most vulnerable part of the body, it should be protected while seeking shelter.

The damaging aspects of hail storms 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 can vary from year to year but generally represent between 1 and 2 percent of the annual crop value. Property hail losses have been increasing with time affecting automobiles, homes and businesses, and farm machinery. Even though there may be variances from year to year, Sargent County experiences on the average of two hail storm occurrences per year.

Table 5.4.3.4 Hail Reports since 1996

Community	Date	Size	Community	Date	Size
Cayuga	5/17/1996	1.00 in.	Crete, Milnor	5/7/2005	0.75 in.
Havana	5/31/1996	1.00 in.	Straubville	5/8/2005	0.75 in.
Straubville	5/17/1997	0.75 in.	Cogswell	6/7/2005	1.00 in.

Cayuga	6/4/1997	0.75 in.
Cogswell, Milnor	6/28/1997	0.75 in.
Forman	7/25/1997	1.00 in.
Brampton, Cogswell	8/2/1997	0.75 in.
Cogswell	8/29/1997	0.75 in.
Crete, Gwinner	6/10/1998	1.75 in.
Brampton, Cogswell	6/24/1998	1.50 in.
Forman	6/24/1998	0.75 in.
Rutland, Cogswell	5/9/1999	0.75 in.
Cogswell, Forman	6/21/1999	1.00 in.
Milnor	7/1/2000	1.75 in.
Crete, Gwinner	7/4/2000	0.75 in.
Forman	7/5/2000	0.75 in.
Gwinner	7/12/2000	0.75 in.
Brampton	7/24/2000	1.00 in.
Gwinner	9/2/2000	1.00 in.
Cogswell	6/9/2001	0.75 in.
Crete, Geneseo	7/30/2001	1.00 in.
Cayuga	8/26/2001	1.00 in.
Delamere	8/26/2001	0.75 in.
Gwinner	9/6/2001	0.75 in.
Havana, Forman, Gwinner	4/18/2002	0.75 in.
Gwinner	6/22/2002	0.75 in.
Milnor	6/25/2002	0.88 in.
Forman, Crete, Cayuga	7/9/2002	1.50 in.
Rutland, Havana	7/31/2002	1.75 in.
Milnor	8/16/2002	1.75 in.
Havana	6/23/2003	0.75 in.
Straubville	7/3/2003	1.00 in.
Brampton, Straubville, Brampton, Milnor, Havana, Geneseo	7/3/2003	1.75 in.
Straubville, Cogswell, Forman, Brampton	7/20/2003	2.50 in.
Milnor	5/11/2004	0.88 in.
Straubville	5/29/2004	0.88 in.
Geneseo	6/4/2004	0.75 in.
Milnor, Gwinner	8/25/2004	0.88 in.
Straubville, Brampton, Crete, Stirum, Forman, Cayuga	8/26/2004	0.88 in.
Havana	10/28/2004	1.00 in.
Milnor, Gwinner	6/20/2005	1.00 in.
Gwinner	6/26/2005	0.75 in.
Cayuga, Havana	6/29/2005	1.50 in.
Brampton	9/16/2005	0.88 in.
Forman, Stirum	4/28/2006	1.00 in.
Gwinner, Cayuga, Geneseo	4/28/2006	0.75 in.
Cayuga	6/5/2006	1.25 in.
Cayuga	6/14/2006	0.88 in.
Geneseo	6/14/2006	0.88 in.
Straubville	8/9/2006	1.00 in.
Forman	8/10/2006	1.75 in.
Brampton	8/23/2006	1.00 in.
Brampton	6/11/2008	0.88 in.
Straubville	6/14/2008	0.75 in.
Brampton	6/27/2008	0.75 in.
Crete	7/10/2008	0.75 in.
Brampton	7/31/2008	0.75 in.
Geneseo	9/25/2008	0.88 in.
Delamere	6/18/2009	0.75 in.
Brampton	4/30/2010	0.88 in.
Forman	5/22/2010	1.00 in.
Ransom Twp	5/22/2010	1.00 in.
Nicholson Twp	5/24/2010	1.25 in.
Rutland	5/24/2010	0.75 in.
Brampton	5/9/2011	0.75 in.
Rutland	5/21/2011	1.00 in.
Geneseo	6/17/2012	1.00 in.
Cayuga	5/18/2013	0.75 in.
Straubville	6/19/2013	1.00 in.
Rutland, Straubville	6/19/2013	1.50 in.
Forman	6/20/2013	1.25 in.
Forman	7/12/2013	1.00 in.
Nicholson Twp	9/18/2013	1.75 in.
Havana, Forman, Brampton	9/18/2013	1.50 in.

Source: http://www.ncdc.noaa.gov/stormevents/

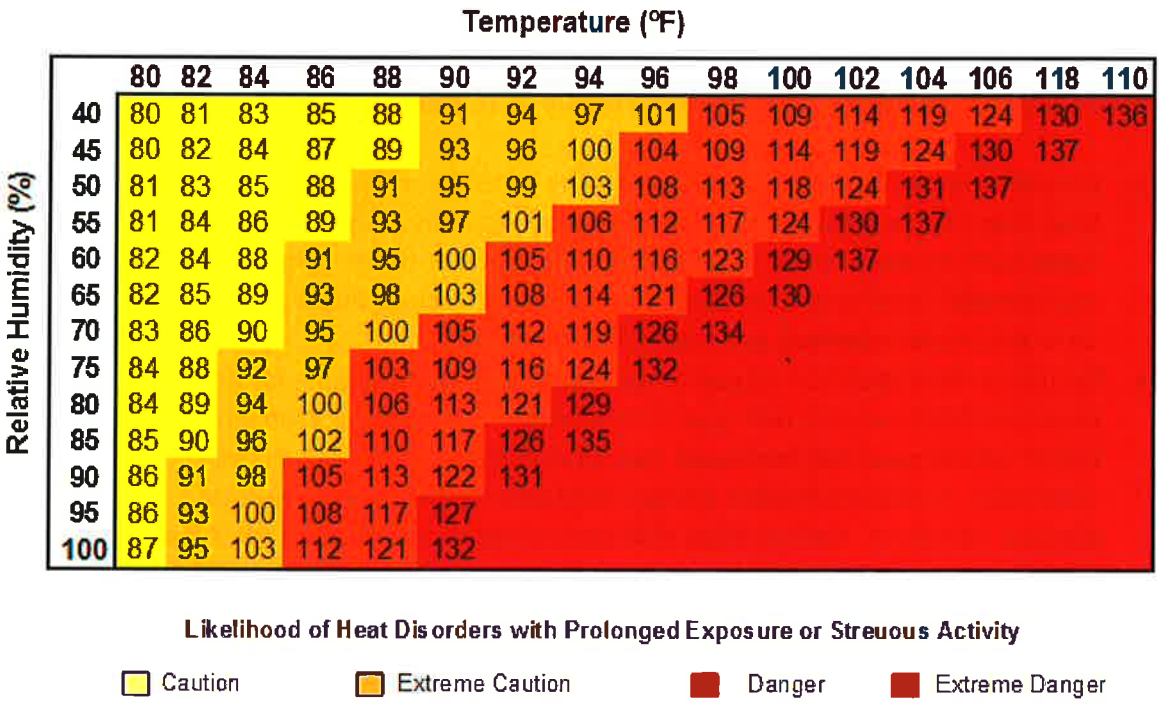
Extreme Heat

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. 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.

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.

Table 5.4.3.5 Heat Index



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.

Table 5.4.3.6 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 Bismarck can issue the following heat-related advisory as conditions warrant.

- Excessive Heat Outlook: is 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: is 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.

Table 5.4.3.7 Summer Storm Data and Unusual Weather Phenomena in Sargent County 2007-2013

Event	Date	Event Description
Extreme Heat	7/16/2011	Continuous thunderstorms and minimal relief from the heat at night with heat index of 130 through July 20th
Tornado	7/15/2007	Tornado
Tornado	8/12/2010	Tornado touchdown south of Geneseo and tracked into Richland county with damage in several open fields
Tornado	7/10/2011	Tornado enshrouded in downburst winds and rains yet visible briefly near Cogswell where snapped power poles and destroyed pole sheds and steel grain bins, Tornado wrapped in heavy rains yet visible near DeLamere that showed speed of 100 mph and damaged, snapped and uprooted trees there
Tornado	7/12/2013	Brief tornado touchdown near Cayuga with winds of 70mph
Wind - Thunderstorm	6/17/2007	Cold and warm fronts collide and thunderstorm winds created several trees to uproot near DeLamere
Wind - Thunderstorm	7/15/2007	Numerous large tree branches down near Milnor and Cayuga

Event	Date	Event Description
Wind - Thunderstorm	6/11/2008	Winds caused by surface low, corrugated steel roof ripped off hog barn near Havana
Wind - Thunderstorm	10/26/2008	Cold front caused high winds of 40mph
Wind - Thunderstorm	5/9/2011	Brampton reported winds to blow down tree branches and basketball hoop
Wind - Thunderstorm	5/30/2011	Gwinner reported much damage to include a 18 inch diameter tree knocked down
Wind - Thunderstorm	7/10/2011	Thunderstorm winds peaked around 127 mph as reported near Straubville yet damage of roofs at Havana, power lines, irrigation systems damaged near Cogswell, and rural crop damage extensive through the county
Wind - Thunderstorm	7/17/2011	Damage reports from Gwinner and Stirum from strong winds causing trees to snap or fall
Wind - Thunderstorm	7/26/2011	Damage reports near Straubville showing four inch diameter tree branches blown down
Wind - Thunderstorm	7/30/2011	Damage reports near Gwinner and Cayuga having strong wind gusts and property damage done by trees
Wind - Thunderstorm	5/2/2012	Wind gusts showed snapped power poles near Gwinner and tree uprooted near Cayuga
Wind - Thunderstorm	7/6/2012	Wind gusts caused damage near Crete with 60 mph speeds and tree branches broken
Wind - Thunderstorm	9/9/2013	Thunderstorm winds passed over area and at Gwinner three to six inch diameter tree branches were blown down.

Source: National Weather Service

Table 5.4.3.8 Total severe summer weather events 2007-2013

High Winds	13
Hail	16
Tornado	4
Excessive Heat	1

(Note: Some weather systems may have caused more than one type of weather event.)

Source: National Weather Service

Table 5.4.3.9 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

Sargent County rural residents are determined to be self-sufficient during summer storms. They expect summer storms to occur and heed watches and warnings put out by the National Weather Service plus because of the nature of the prairie landscape they can see severe summer storms moving toward them. The city residents do not have the self sufficiency of rural residents and are more vulnerable to electricity outages caused by severe summer storms as they do not have the electrical generators rural residents have. In addition, older people have chosen to move out of the country to the cities to be closer to services and for community support.

Table 5.4.3.9 Severe Summer Weather Vulnerability

Tornado	Hail	Extreme Heat	Thunderstorm Winds	Lightning	Overall Vulnerability Ranking
Low	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate

5.4.4 Hazardous Materials

Table 5.4.4.1 Hazardous Materials Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Limited	10-25% of jurisdiction affected
Risk Class	**B**	Moderate Risk Requires Prompt action Address via Mitigation and Contingency plans
Seasonal Pattern	None	
Duration	Average 1 to 6 hours	
Speed of Onset	Minimal warning	

Hazardous materials are any substance in any quantity or form which may pose an unreasonable risk to the safety, health, environment, and property of citizens. The term "hazardous materials" covers a wide array of products, from relatively innocuous ones such as hair spray in aerosol dispensers and wash preservatives such as creosote to highly toxic or poisonous materials such as polychlorinated biphenyl (PCB's) and phosgene gas. The potential severity of hazards of these materials is varied but the primary reason for their designation is their risk to public safety.

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

1. Explosives (Class 1)
2. Gases (Class 2)
3. Flammable and combustible liquids (Class 3)
4. Flammable solids, spontaneously combustible, and dangerous when wet (Class 4)
5. Oxidizing substances and organic peroxides (Class 5)
6. Toxic/poisonous substances and poison inhalation (Class 6)
7. Radioactive materials (Class 7)
8. Corrosive substances (Class 8)
9. Miscellaneous hazardous materials/products, substances, or organisms (Class 9)

Hazardous materials are defined and/or managed under a number of federal, state, and local laws, regulations, plans, and ordinances. Further definitions can be found in law,

i.e. Federal Water Pollution Act, Clean Water Act, Comprehensive Environmental Response, Compensation and Liability Act and Amendments, Low Level Radioactive Waste Policy Act, Nuclear Waste Policy Act, the Hazardous Materials Transportation Act, etc. Hazardous materials (HAZMAT) incidents can be categorized into two distinct groups. These are HAZMAT incidents of a transportation nature and those that occur at a stationary fixed facility.

Incidents of transportation are any occurrence resulting in the uncontrolled release of materials during transport that is capable of posing a risk to health, safety, and property as determined in the Department of Transportation (DOT) Regulations. Over 18,000 materials are covered under the DOT regulations. The population likely to be seriously affected would be within the most densely populated 2.5-mile radius around a major transportation route (i.e., highway, rail lines, or pipeline) along which hazardous materials move.

A stationary hazardous materials incident is any occurrence resulting in the uncontrolled release of materials from a fixed site capable of posing a risk to health, safety, and property as determined in EPA's regulations. Areas at risk include the locations of hazardous materials manufacturing, processing, or storage facilities, as well as all hazardous waste treatment, storage, and disposal (legal and illegal) sites.

The most common hazardous material found in Sargent County is anhydrous ammonia. Anhydrous Ammonia is used in agricultural application to fields. There is also a significant concentration of industry in Gwinner between the Bobcat facility and Dakota Plains Southeast propane facility. Nuclear fuels are not produced or used and likely not transported through Sargent County either by railway or state highway. Hazardous materials releases often are viewed in a worst case scenario resulting in the loss of life and the contamination of soils, lakes, aquifers, and wildlife habitat; however, the majority of incidents involve small spills and releases requiring little response or recovery action. The problem for county and city government and first response agencies 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. The rural nature of Sargent County make the manufacturing of methamphetamine a strong possibility as meth manufacturing can go undetected.

The County is exposed to and is at risk from accidents and/or incidents involving hazardous materials. The economy is based primarily on agriculture, and therefore one of the most critical risks is anhydrous ammonia. This chemical is stored in or near most

of the population centers in the county. It is also a threat when in transport to fields and stationary at farms.

In the past, states and local governments have concentrated emergency preparedness (operational planning, training, etc.) activities on just the transportation of hazardous materials.

Since the amendments of CERCLA (Title III) Emergency Planning and Community Right-To-Know law, we have improved our hazardous materials planning base for fixed facility disasters or emergency situations.

It is common to view hazardous materials accidents and incidents in terms of the worst case. The vast majority of these accidents and incidents, however, involve small spills and releases requiring little response or recovery actions. The problem for decision makers at all levels of government is to create a safe system for the use, storage, transportation, etc. of hazardous materials while retaining the state's economic viability.

Although many of the accidents and incidents (spills and releases) are small, a single hazardous materials accident can result in the loss of many lives and cause millions of dollars of property damage. Water supplies, sewer lagoons, fish and wildlife habitats can be threatened if hazardous materials leak into rivers, streams, underground water resources, and other environmentally sensitive areas. A hazardous materials spill in rural Sargent County has less effect on the population than a hazardous materials spill in one of the Sargent County cities of Gwinner, Milnor, Forman, Rutland, Cogswell and/or Cayuga because of the less population at risk. However the environmental risks are basically the same.

In 2011, 115 Tier II Facilities reported to the ND Department of Emergency Services that they had chemicals in storage. Seventy reported they had Extremely Hazardous Substances.

Hazardous materials have major components that affect the response to and recovery from an incident. These components include planning through the LEPC, training, equipment procurement, and exercises. These elements combined can provide an effective overall response; however, within the volunteer structure of fire departments in the county, the available resources increase the chances that major harm may be incurred by first responders or the public. Table 5.4.4.2 lists hazardous materials spills reported, tables 5.4.4.2 and 5.4.4.3 define the hazard areas in the county. Due to the potential exposure of a hazmat release at a fixed facility all of the populated cities and their populations would be in the impact (hot) zone.

Table 5.4.4.2 Reported Hazardous Materials Spills

Date Reported	Township –	Containment	Volume	Units

	Range			
2011-10-22	13205620	Anhydrous Ammonia	1450	gallons
2011-05-07	12905826	Crude Oil	500	Barrels
2011-03-08	12905826	Crude Oil	5	Gallons
2011-03-04	13205626	Tires on fire		
2010-12-14	13005501	RR Diesel Fuel	30	Gallons
2009-04-20	1305507	Hydraulic Oil	3	Gallons
2006-02-23	13205626	Mobil 15 Hydraulic Fluid	500	Gallons
2005-06-21	13205806	10-34-0 liquid fertilizer	1300	Gallons
2002-10-29	13205212	Diesel fuel	200	Gallons

Source: http://www.ndhealth.gov/EHS/Spills/

The most significant of these hazardous materials spills was in May 2011. There were over 400 barrels of crude oil with damages reported at $1,337,494. Source: U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration. All of the other incidents were cleaned up to North Dakota Department of Health standards with minimal environment impact. No injuries or deaths were associated with these incidents.

Table 5.4.4.3 Tier II Reporting Facilities

Facility Name	Address	City	State	Zip Code
Dickey Rural Telephone	P.O. Box 69	Ellendale	ND	584365
AT&T	ONE AT&t WAY 1A111B	BEDMINISTER	NJ	07921
Waste Management	First City Tower; 1001 Fannin, Suite 4000	Houston	TX	77002
Dickey Rural Telephone	P.O. Box 69	Ellendale	ND	58436
Western Area Power Administration	P.O. Box 1173	Bismarck	ND	58502-1173
Western Area Power Administration	P.O. Box 1173	Bismarck	ND	58502-1173
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Full Circle Ag	PO Box 58	Britton	SD	576430
Dakota Valley Electric Cooperative	7296 Highway 281	Edgeley	ND	58433

Dakota Valley Electric Cooperative	7296 Highway 281	Edgeley	ND	58433
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Facility Name	Address	City	State	Zip Code
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Dakota Plains Coop	151 9th Avenue NW	Valley City	ND	58072
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430

Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Full Circle Ag	520 Vander Horck St	Britton	SD	57430
Aggregate Industries	800 Holiday Drive #240 - PO Box 1036	Moorhead	MN	56561
Aggregate Industries	800 Holiday Drive #240 - PO Box 1036	Moorhead	MN	56561
Aggregate Industries	800 Holiday Drive #240 - PO Box 1036	Moorhead	MN	56561
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Facility Name	**Address**	**City**	**State**	**Zip Code**
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
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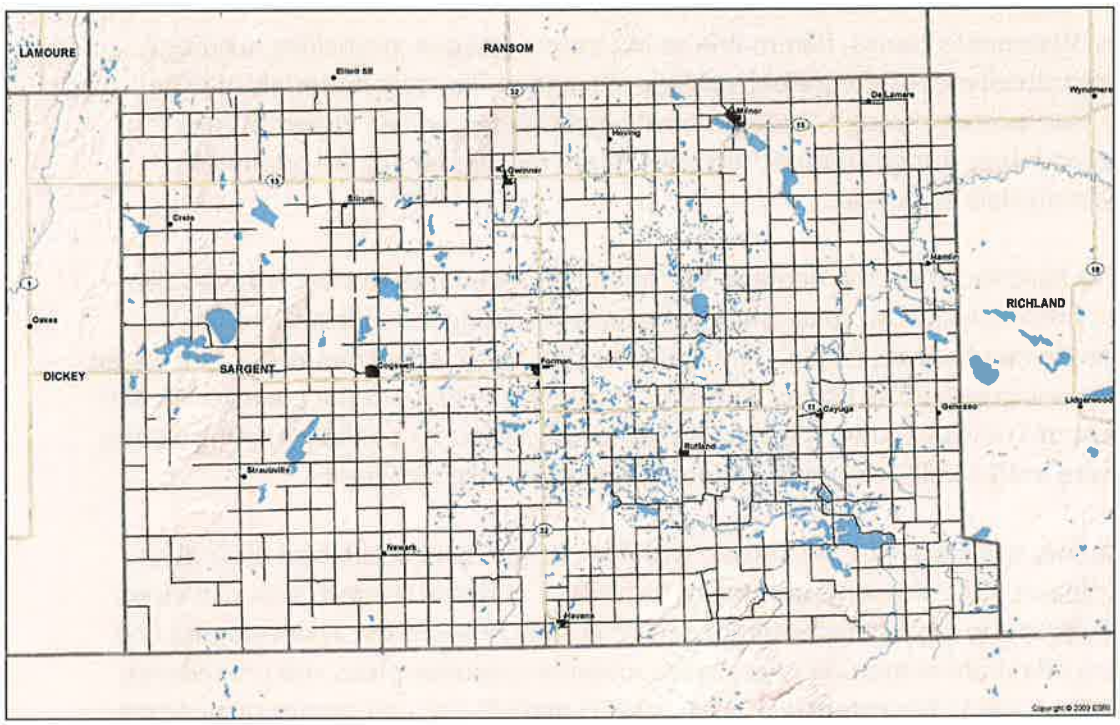
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Facility Name	Address	City	State	Zip Code
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Bobcat	210 1st Ave	Gwinner	ND	58040
Columbia Grain	225 5th STR N	Oakes	ND	58474
Columbia Grain	225 5th STR N	Oakes	ND	58474
Columbia Grain	225 5th STR N	Oakes	ND	58474
TransCanada Keystone Pipeline, LP	13710 FNB Parkway Suite 300	Omaha	NE	68154
Central Power Electric Coop	525 20th Ave SW	Minot	ND	58701
Central Power Electric Coop	525 20th Ave SW	Minot	ND	58701
Dakota Valley Electric Coop	14051 Highway 13	Milnor	ND	58060
Dakota Valley Electric Coop	14051 Highway 13	Milnor	ND	58060
Dakota Valley Electric Coop	14051 Highway 13	Milnor	ND	58060

Source: ND Department of Emergency Services

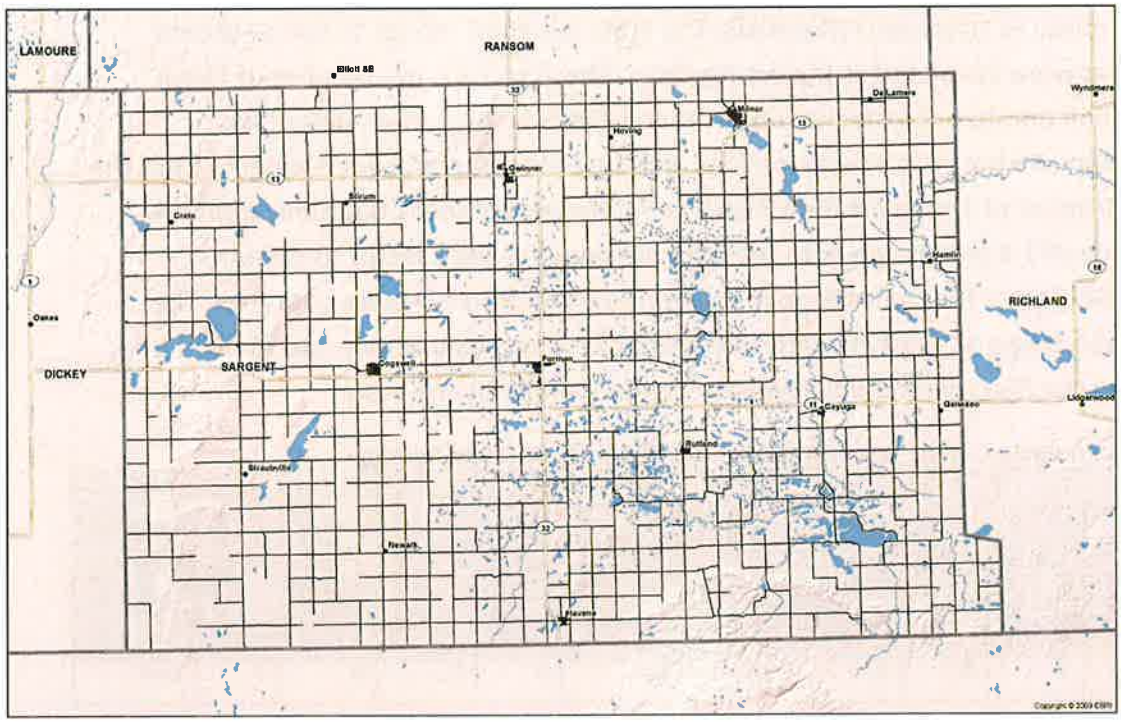
Table 5.4.4.4 Hazmat Routes and Fixed Facilities



Source: ND GIS HUB

Table 5.4.4.5 Transmission Lines and Pipeline Map

MAP



Source: ND GIS HUB

Explosives, flammable liquids, flammable solids, gases, poisons, pesticides, oxidizing substances, miscellaneous dangerous substances, and radioactive materials may be used in or transported through Sargent County on State Highways. However, an interstate road does not go through Sargent County thus lessening the pounds of hazardous materials each year.

In regard to fixed facilities, the demand for North Dakota energy resources raises the chances of fire, explosion, or toxic chemical release affecting our citizens and will continue to demand our attention. The pipelines that carry large amounts of petroleum products have increased the risk for hazardous materials release in the county. The US Department of Transportation, Pipeline and Hazardous Materials Safety Administration reports there are 27 miles of Haz-Mat Liquid pipeline in Sargent County.

Sargent County will always be concerned with the prospects of accidental hazardous material releases. The threat of accidental hazardous material releases that can affect life, health, property or the environment can be greatly reduced by: 1) developing and maintaining adequate community hazardous material response plans and procedures; 2) adequately training hazardous material workers and off-site emergency responders; 3) educating the public about hazardous materials safety; 4) enforcing basic hazardous material safety regulations; and 5) mitigating, wherever possible, the threat of accidental hazardous material releases.

The statistical analysis method was used to refine and assess the relative vulnerability to Sargent 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 in relation to other North Dakota Counties. The rating of the Sargent County Hazard Mitigation Planning Team (moderate to high) is in contrast to the low vulnerability given to Sargent County by the state.

Table 5.4.4.6 Sargent County Hazardous Vulnerability Analysis (State Rating)

# 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
115	2	0	0	0	0	27	1	0	0	3	Low

5.4.5 Urban Fire

Table 5.4.5.1 Urban Fire Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Limited	10-25% of jurisdiction affected
Risk Class	**B**	Moderate Risk Requires Prompt action Address via Mitigation and Contingency plans
Seasonal Pattern	None – Winter highest probability of risk due to the higher demands on heating systems, increased use of portable heating units, etc	
Duration	Average 1 to 6 hours, length of time depends on how many buildings are involved; what type of fire it is; how it started	
Speed of Onset	Minimal warning	

Factors that influence the potential for urban fires include: electrical devices, incendiary-arson, smoking materials, heating devices, fuel systems, sparks, spills, spontaneous combustion and the levels of human activity in urban areas.

Among the rational motives for arson are profit, (accomplished through insurance fraud), revenge, labor, racial or religious strife, and concealment of another crime such as murder, burglary, or vandalism. Burning for profit is probably the most common arson motive. When in financial trouble, normal law-abiding citizens may see arson as a way to collect money, and as an easy way out of the problem. Arsonists are very seldom convicted. With little threat of being caught hanging over the perpetrator's head, arson continues unabated.

The increasing costs of petroleum based home heating products have caused families to rediscover alternate methods to heat their homes. As a result, the use of space heaters, fireplaces, and wood burning stoves has created a new fire hazard.

Many portable LP (propane) gas or kerosene heaters with self-contained fuel supplies are hazardous appliances, even when used according to the manufacturer's instructions. They are potential fire hazards because of their open flames. Leakage of fuel from their container could cause an explosion. The fuel vapor is also a source of indoor pollution. Most of us have very limited experience with wood burners. As a result, a number of fires are caused by faulty installation of stoves and chimneys. Wood heat has a poor safety record and requires extra attention and work. The misuse of wood burning stoves has increased at an alarming rate.

The hazardous materials situation in this country is a steadily growing phenomenon. Chemical plant fires may pose an unreasonable risk to the safety and health, the environment, and the property of citizens. The term "hazardous materials" covers a wide array of products, from relatively innocuous ones such as hairspray in aerosol

dispensers and wash preservatives to extremely hazardous materials. It is often difficult for officials to gather information on the size of the structure, the types of products sold, and number of employees during working hours, whether there are any explosives, and what level of inventory the business may have.

Urban fires are a concern to emergency management officials because they can be a killer of people, while they destroy property and critical resources needed for residents of both the urban and rural areas.

The ability to suppress urban fires was considered by the planning committee. The planning committee looked at the capability of the fire departments based on number of firefighters, the training, paging capability, dispatching capabilities, and mutual aid agreements. The firefighters in Sargent County are all volunteer, they are trained to the highest level possible based on the funding and the time the volunteers are able to put into training. The ability to train to current standards is inadequate but they are trained to their capability level. X percent of the firefighters can be notified by pagers. A unique system of sending text messages to firefighters via cell phone has been developed by Fire Departments. The text message that is sent out tells the volunteers where the fire is. Rural firefighters can go directly to the fire saving time and resources as other firefighters have brought the trucks and equipment to the fire. All the fire departments are dispatched by State Radio Communications which offers professional uniform services for the fire departments. The Sargent County Fire Departments have a strong mutual aid system. When a fire requires mutual aid other departments are prepared to provide mutual aid support. The number of volunteer firefighters is listed in the table below.

Number of Firefighters by Department			
Rutland-Cayuga		Milnor	
Forman-Cogswell		Gwinner	

Source: Sargent County Emergency Manager

Because of limited resources within the county, it is necessary for several agencies representing local, state, and federal governments to share responsibility for both fire mitigation measures and fire response operations.

The county has experienced at least one home fire within town in the last six years. Some of the other major fires include the following as stated here. In 2013, the community of Rutland had an agricultural storage warehouse burn. Several fire departments were called in for mutual aid as wind and weather conditions were extreme as well as there was a neighboring elevator that could have been involved in the blaze. OTHER FIRES...

5.4.6 Windstorm

Table 5.4.6.1 Windstorm Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Likely	10-100% probability in the next year or at least 1 chance in next 10
Severity	Critical	25-50% of jurisdiction affected
Risk Class	**B**	Moderate risk condition
Seasonal Pattern	None	
Duration	Hours/Days – unpredictable and dependent on specific event	
Speed of Onset	Adequate warnings – National Weather Service does issue high wind watches and warnings	

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.

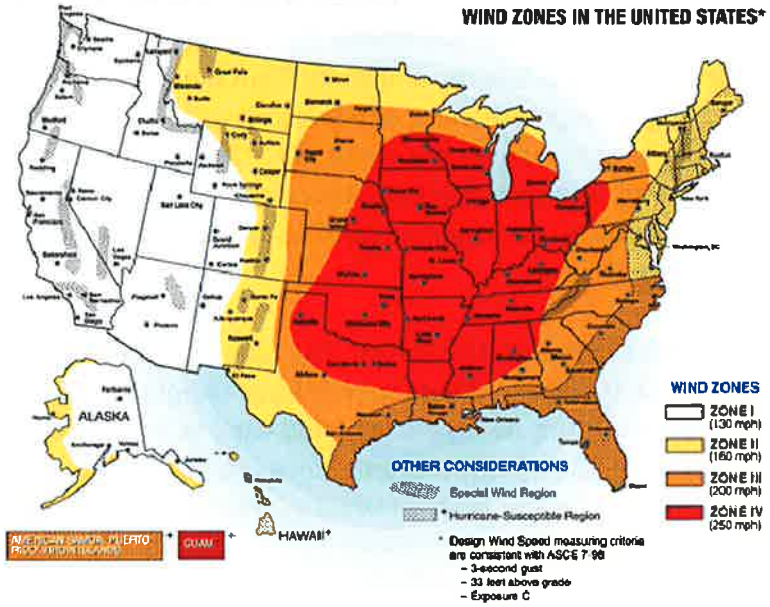
FEMA recognizes four wind zones in the United States. The map below recognizes Sargent County is in wind zone III (South). Winds speeds have the potential of reaching up to 200 miles per hour in Zone III. The strongest reported wind in Sargent County is 127 MPH. Sargent County has had 18 high wind events since the year 2000. Although mentioned in other hazards, below is a summary of Wind events since 2007.

Table 5.4.5.1 Urban Fire Risk Analysis - Determined by the Hazard Mitigation Planning Team

Type	Date	Description
Wind	2/13/2011	An Alberta Clipper tracked causing strong winds to 40 to 50mph
Wind	1/19/2013	Cold front surged with northwest winds up to 50+ mph
Wind - Thunderstorm	6/17/2007	Cold and warm fronts collide and thunderstorm winds created several trees to uproot near DeLamere
Wind - Thunderstorm	7/15/2007	Numerous large tree branches down near Milnor and Cayuga
Wind - Thunderstorm	6/11/2008	Winds caused by surface low, corrugated steel roof ripped off hog barn near Havana
Wind - Thunderstorm	10/26/2008	Cold front caused high winds of 40mph
Wind - Thunderstorm	5/9/2011	Brampton reported winds to blow down tree branches and basketball hoop
Wind - Thunderstorm	5/30/2011	Gwinner reported much damage to include a 18 inch diameter tree knocked down
Wind - Thunderstorm	7/10/2011	Thunderstorm winds peaked around 127 mph as reported near Straubville yet damage of roofs at Havana, power lines, irrigation systems damaged near Cogswell, and rural crop damage extensive through the county
Wind - Thunderstorm	7/17/2011	Damage reports from Gwinner and Stirum from strong winds causing trees to snap or fall
Wind - Thunderstorm	7/26/2011	Damage reports near Straubville showing four inch diameter tree branches blown down
Wind - Thunderstorm	7/30/2011	Damage reports near Gwinner and Cayuga having strong wind gusts and property damage done by trees
Wind - Thunderstorm	5/2/2012	Wind gusts showed snapped power poles near Gwinner and tree uprooted near Cayuga

Wind - Thunderstorm	7/6/2012	Wind gusts caused damage near Crete with 60 mph speeds and tree branches broken
Wind - Thunderstorm	9/9/2013	Thunderstorm winds passed over area and at Gwinner three to six inch diameter tree branches were blown down.
Wind - Winter Storm	1/31/2009	Surface low pressure out of southern Canada caused gusts up to 58 mph
Wind - Winter Storm	10/26/2010	Low pressure and pressure gradient had wind speeds of 40mph
Wind - Winter Storm	3/27/2012	Gusts of southeast winds during early morning hours followed by a stronger wind gust to produce damage in Sargent County
Wind - Thunderstorm	8/14/2009	Tropical like moisture with dew points produced wind gusts near Crete that caused branches 4 to 6 inches diameter to blow down.

Table 5.4.6.2 United States Wind Zones



Since structures are vulnerable to strong winds, those inside them are also at risk. The National Weather Service office in Grand Forks warns for high winds events in Sargent County. 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, campers, and automobiles are not safe places to take shelter during high wind events. Sargent County does have a significant amount of occupied mobile homes and campers especially during summer weekends and holidays at recreational lakes. High wind vulnerability is higher in the cities of Milnor, Gwinner, Forman, Rutland, Cogswell, and Cayuga because of the close proximity of structures. If high winds cause damage to one structure, a piece of the building may cause damage to another building. Trees are also common in the cities of Milnor, Gwinner, Forman, Rutland, Cogswell, and Cayuga. High winds may cause branches to break off or an entire tree may become uprooted causing property damage to homes, businesses or vehicles. In the rural areas, other than farmsteads high winds may damage crops and injure livestock but cause little property loss.

The planning committee studied the types of structure construction and the number of manufactured homes and the risk/vulnerability to windstorms. All the homes are built with wood, steel or brick... The number of manufactured homes is small and the wooden structures are generally built to withstand high winds.

City	Number of Homes	Number of Manufactured Homes	Manufactured Homes Percentage
Milnor			
Gwinner			
Forman			
Rutland			
Cayuga			
Cogswell			

Source: United States Census Bureau, Sargent County Tax Equalization Director

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). The table below illustrates Sargent County's windstorm vulnerability from the State which is lower than that of the Planning Committee.

Table 5.4.6.3 Vulnerability to Windstorm Events

Social Vul. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure
6	18	$0	$0	$521,880	4.5	$23,376,000

Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vulnerability Score	Overall Vulnerability Ranking
$104,365,000	$1,012,716	$1,137,883	$113,788	19	Low

5.4.7 Communicable Disease (Including Human, Animal, and Plant Diseases)

Table 5.4.7.1 Communicable Disease Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Likely	10-100% probability in the next year or at least 1 chance in next 10
Severity	Limited	10-25% of jurisdiction affected
Risk Class	C	Moderate-Low risk condition
Seasonal Pattern	None	
Duration	Weeks/Months	
Speed of Onset	Unpredictable and dependent on specific event	

Communicable Diseases are rated as a moderate-low risk for Sargent County. They can be both natural and adversarial in nature.

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. Flood 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.

Human Disease

Fortunately, Sargent County 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. Sargent County was affected by this influenza outbreak. 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)

The cities in Sargent County; Gwinner, Forman, Milnor, Rutland, Cogswell and Cayuga are more prone to disease outbreaks than the rural areas. Transmittable diseases are more easily spread among populations living in close proximity to each other than people living far apart such as in the county's rural areas.

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. Source: North Dakota Department of Health, 2013

Food borne illness is very frequent and infections can be very serious. For instance, some bacterial causing food borne 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. Food borne infections commonly occur in outbreaks which can be local (family, restaurant, community social gatherings) 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. Salmonella, Shigella, Campylobacter, and Shiga-toxin positive E. coli are food borne bacteria. Source: North Dakota Department of Health; **Note:** Other significant causes of food borne illness not included here do occur and are monitored by NDDoH.

The table below 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.

Table 5.4.7.2 Hazard Frequency and Impact Ranges

Frequency	*No regional history*				Smallpox Outbreak
	No local history			Severe Strain Influenza	
	100 years		Mild Strain Influenza		
	50 years	Food Borne Illnesses			
	Annually				
		Negligible	*Limited*	*Critical*	*Catastrophic*
		Impact			

Quantifying the probability of a human epidemic affecting Sargent County 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. Sargent County is in a rural setting, and therefore, is somewhat isolated from the rapid spread of global diseases. As well, there is no interstate highway in the county that limits international travel.

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 Sargent County represents a severe magnitude event. Almost any highly contagious, incapacitating disease that enters the

Sargent County population would quickly overwhelm local 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. The target rate of 90% has been set by the ND Department of Health. The coverage rate for Sargent County Kindergarten children is between 90% and 100 % for the major diseases. In 2011, the rate of vaccination for North Dakota children was 82.8 percent and 72.7 percent nationally. Source, ND Department of Health

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.

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 county population plus visitors are at risk to contracting a communicable disease that surface in Sargent County. Although infectious diseases are not subject to geographic boundaries, several populations in Sargent County are specifically at higher risk to infectious diseases including day care facilities, schools and the elderly care facility in Forman, Milnor and Gwinner. The county economy relies heavily on the agriculture, 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 Sargent County include education and utility services.

The county is not very vulnerable to a major disease outbreak. Sargent County has a low population and a low percentage of children under age 5 (5.4%) and an average to slightly higher than average population over 65 at 19%. There is no population living in group quarters except for the elder care facility in Forman. 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. Source: U.S. Census Bureau, 2010 Decennial Census.

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 Sargent County. 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 Sargent County:

1. 1,528 persons would become ill and may require outpatient care
2. 43 persons may require hospitalization
3. 12 persons may die

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 food borne illnesses each year in the United States, accounting for 325,000 hospitalizations and more than 5,000 deaths. Food borne disease is extremely costly. Health experts estimate that the yearly cost of all food borne 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. It is difficult to estimate losses to Animal and Plant Disease due to the variables involved. Sargent County's potential loss estimates if disease resulted in 20 percent loss to crops and livestock would be $20,873,000 for crops and $4,675,200 loss for livestock.

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. There is no hospital in Sargent County with the closest hospitals at Oakes (Dickey County) or Lisbon (Ransom County). Sargent County is in a designated Health Professional Shortage Area. Source: University of North Dakota School of Medicine and Health Sciences, 2012

Animal Disease

Rabies is an animal disease that is tracked very closely by NDDoH. In 2012 Sargent County had less than 10 animals tested for rabies and none were positive. However, in 2013, there was one animal tested positive within the county. Source: North Dakota Department of Health, http://www.ndhealth.gov/disease/Rabies/.

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. During the period of 1989 to 2009, Sargent County had 9 cases of anthrax confirmed. Source: North Dakota Department of Agriculture

Epizootic Hemorrhagic Disease is a potential disease for Sargent County. It has been found in southwestern North Dakota particularly among deer but livestock can also be affected. The disease is spread by a midge or gnat that transfers the disease when biting the animal. Sargent County has not been affected at this time by Epizootic Hemorrhagic Disease. Sargent County is the second largest sheep producing county in North Dakota. Sheep are susceptible to blue tongue which is also spread by a midge or a mite. Sargent County has not been affected at this time by Blue Tongue Disease. Tuberculosis was identified in a cow in southwestern ND in the summer of 2013. Extensive background checks provided information that the animal was imported from another state and further testing found that the disease did not spread to the surrounding area. The North Dakota Department of Agriculture Animal Health Division

and the North Dakota State Board of Animal Health support eight elements to keep North Dakota and Sargent County Tuberculosis free. These elements are 1) State Program Requirements, 2) Zoning, 3) Surveillance, 4) Affected Herd Management and Epidemiologic Investigations, 5) Indemnity, 6) Interstate Movement Requirements, 7) Import Requirements, Approved Proved Procedures Related to Official Tests and Laboratories. Source: http://www.nd.gov/ndda/files/resource/DocketAPHIS2011-0044TBBrucProgramFramework.pdf

Animal diseases extending nationally would have an overarching effect on the national economy. More directly, though, Sargent County's economy relies heavily on the agricultural industry. With an animal disease, over 22,000 head of cattle 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 $104,365,000 and the value of livestock and poultry sales totaled $23,376,000 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). Source: http://www.agcensus.usda.gov/publications/2007

Vigilance and accurate disease occurrence reporting are key to preventing huge scale economic losses to livestock producers and the county overall economy.

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. 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 Sargent County. 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 the (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. Wheat Stem Rust – UG99 (Race TTKSK): Wheat stem rust (puccinia graminis f.sp.tritici) is historically the most damaging disease of wheat. The disease has the capacity to turn a healthy looking crop, only weeks away from harvest, into nothing more than a tangle of black stems and shriveled grains at harvest. Under suitable conditions yield losses of 70% or more are possible. Wheat stem rust is highly mobile, spreading rapidly over large distances by wind or via accidental human transmission (infected clothing or plant material). Wheat stem rust has largely been under control for over three decades due to the widespread use resistant cultivars. In 1999, a new virulent race of stem rust was identified from wheat fields in Uganda – popularly known as Ug99 after the year and country of discovery. Using North American scientific nomenclature, Ug99 is known as race TTKSK. Ug99 (Race TTKSK) is a cause for concern as it exhibits unique virulence patterns. No other race of stem rust has been observed to overcome so many wheat resistance genes, including the very important gene Sr31. By 2007, Ug99 (Race TTKSK) had spread via wind movements out of East Africa, into Yemen and as far as Iran. Rust pathogens change rapidly, often by mutation. Six additional variants are now recognized in the Ug99 lineage. All exhibit an identical DNA fingerprint, but differ in virulence patterns. Additional important resistance genes have now been defeated by variants of Ug99. Ug99 or variants are considered a major threat to wheat production with an estimated 80-90% of global wheat cultivars susceptible. Sources: http://www.ag.ndsu.edu/pubs/smgrains/pp1361.pdf
http://www.fao.org/agriculture/crops/rust/stem/rust-report/stem-ug99racettksk/en/

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 Sargent County or 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

4. 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 which includes Sargent County. Procedures used are those described in the United States/Canada agreement for the survey. Following these guidelines officially demonstrates the State's negative pest status; ensuring results will be recognized by Canada facilitating the movement of seed potatoes across the 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.

According to the 2007 Census of Agriculture, Sargent County had 493 farms with 505,015 cropland acres with annual cash receipts totaling over $104,365,000 in 2007. Additionally, should a disease be especially severe for a particular species, that species could be eradicated from the county resulting in ecologic imbalances.

General Impacts

The structural integrities of critical facilities in Sargent County are not threatened by communicable disease. 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, and the medical clinic and long term care facilities could quickly become overwhelmed. Diseases can spread quickly in special needs facilities such as schools and assisted living. Often these facilities, as well as the 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.

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 Sargent County ages, the vulnerability to this hazard is likely to increase.

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

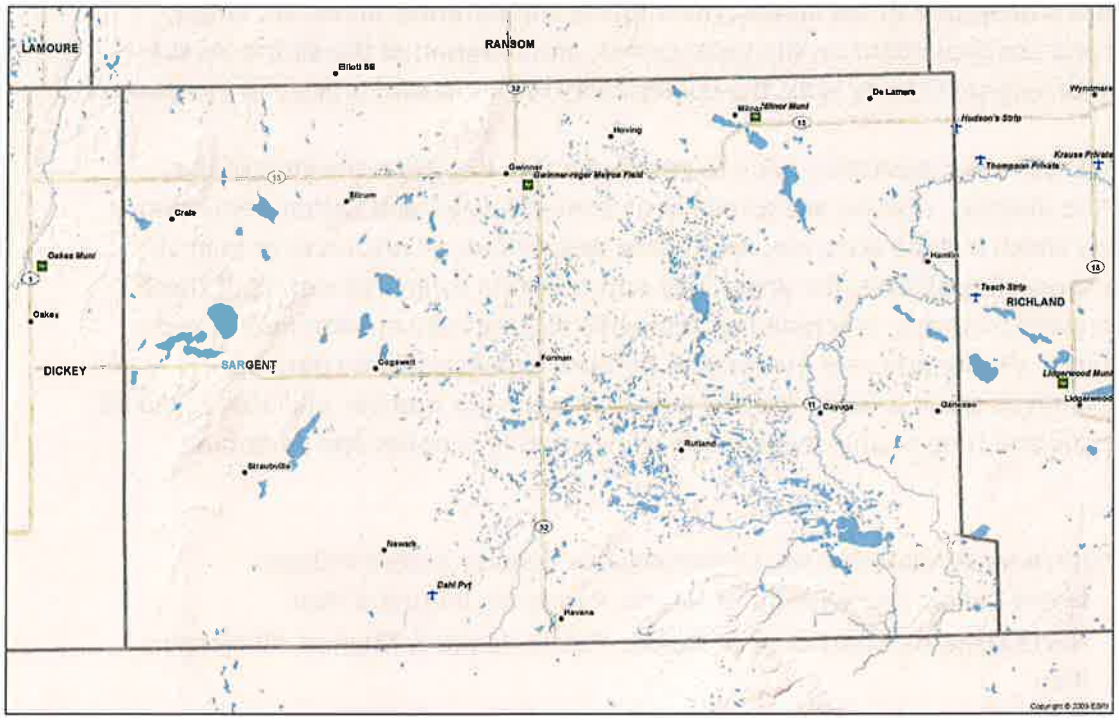
5.4.8 Transportation Accidents

Table 5.4.8.1 Transportation Accidents Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Highly Likely	Nearly 100% probability in the next year
Severity	Negligible	Less than 10% of jurisdiction affected
Risk Class	**C**	Moderate-Low risk condition
Seasonal Pattern	None	
Duration	Situation Dependent, Average: 1 to 4 hours	
Speed of Onset	Minimal Warning	

In Sargent County, transportation accidents can almost always be expected to occur in specific areas such as roadways, railroads, or other transportation infrastructure. The exception is air transportation accidents that can occur anywhere and at any time. Sargent County does not have a major airport and has limited exposure to commercial airlines flying over the county. However, there is significant amount of small aircraft that fly out of the local airports including agricultural chemical application planes or crop dusters.

Sargent County Airports



Source: ND GIS Hub

Sargent County does significant agricultural railroad infrastructure with the Red River Valley & Western Railroad that goes through the northern part of Sargent County and the Dakota, Missouri Valley, and Western Railroad that also runs through central Sargent County. These rails provide local freight services used for transporting grain, fuel and fertilizer that can accommodate up to 286,000 pound rail cars. However, the rails main business in the area is supporting shuttle facilities and grain elevators. North Dakota State Highways 11, 13 and 32 cross through Sargent County. In 2011, Sargent County had 46 highway accidents with costs of $284,790. There were five injuries costing and no fatalities. 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.

Another type of transportation is farm equipment. The county has a strong agricultural influence and thus has all-terrain vehicle and off-road vehicles that also travel the county roads and highways along with various types and sizes of tractors, combines, and other farm equipment. Unfortunately, there have been at least one child fatality due to this type of agricultural transportation in Sargent County and other adult and child fatalities with off-road vehicles in neighboring counties within the past five-years.

The hazard rating of moderate was determined based on presence of infrastructure in the county. Transportation accidents can occur at any time but the most vulnerable times are during periods of winter weather. Winter storms can cause poor visibility and icy road conditions greatly increasing the hazard. Sunny and windy winter days often result in icy road conditions. The sun warms the highway surface and the wind causes blowing snow. The snow will stick on the warm highway surface resulting in treacherous icy highway conditions on highways perpendicular to the wind direction. ND Department of Transportation provides highway conditions at http://www.dot.nd.gov/travel-info-v2/. This site can be accessed from the ND State Government home page ww.nd.gov or through the Department of Transportation's home page www.dot.nd.gov. A variety of information can be procured from this site including a weather camera which is located near Forman at the junction of State Highways 11 and 32. The camera is a live broadcast; the travel information is updated as needed but a minimum of three times a day.

In conclusion the degree of risk of a transportation accident in one of the cities of Sargent County; Gwinner, Forman, Milnor, Rutland, Cogswell and Cayuga and the rural areas is clear. Transportation accidents can happen anywhere but a train derailment in one of the cities can cause loss of property and injuries and even death if the train derailment occurred in a city rather than in a rural area where only the environment may be damaged.

5.4.9 Wild Land Fire

Table 5.4.9.1 Wild Land Fire Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Possible	1-10% probability next year, or at least 1 chance in the next 100 years
Severity	**Negligible**	Less than 10% of jurisdiction affected
Risk Class	D	Low risk condition
Seasonal Pattern	April 15 to October 31	
Duration	Average: 1 to 6 hours	
Speed of Onset	Minimal Warning	

A wild land fire is an unplanned fire, a term which includes grass fires, forest fires and scrub fires, be it man caused or natural in origin. Severe wild land fire conditions have historically represented a threat of potential destruction within North Dakota. Wild land fires in Sargent County generally are grass fires. Negative impacts of wild land fire include loss of life, property and resource damage or destruction, severe emotional crisis, widespread economic impact, disrupted and fiscally impacted government services, and environmental degradation.

Wild land/urban interface is defined as the zone where structures and other human development meet or intermingle with undeveloped wild land or vegetative fuel. In Sargent County, the wild land/urban interface typically is where the edge of local communities adjoins agricultural field which may include 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. The CRP cover planted in Sargent County is perennial grasses. 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 and farmsteads. Sargent County does have CRP acres, however the number of acres is decreasing as agricultural commodities are increasing in value and CRP is converted into cropland.

The degree of risk between the cities of Gwinner, Forman, Milnor, Rutland, Cayuga, and Cogswell and the rural Sargent County area is high. The cities have a low risk while the grasslands, dry cropland, and dried out wetlands in the rural areas are at high risk.

The ability to suppress wild land fires was considered by the planning committee. The planning committee looked at the capability of the fire departments based on number of firefighters, the training, paging capability, dispatching capabilities, and mutual aid agreements. The firefighters in Sargent County are all volunteer, they are trained to the highest level possible based on the funding and the time the volunteers are able to put into training. The ability to train to current standards is inadequate but they are trained to their capability level. X percent of the firefighters can be notified by pagers. A unique system of sending text messages to firefighters via cell phone has been developed by … The text message that is sent out tells the volunteers where the fire is. Rural firefighters can go directly to the fire saving time and resources as other firefighters have brought the trucks and equipment to the fire. All the fire departments are dispatched by State Radio Communications which offers professional uniform services for the fire departments. The Sargent County Fire Departments have a strong mutual aid system. When a fire requires mutual aid other departments are prepared to provide mutual aid support. The number of volunteer firefighters is listed in the table below.

Number of Firefighters by Department			
Milnor		Gwinner	
Forman-Cogswell		Rutland-Cayuga	

Source: Sargent County Emergency Manager

There are several causes of wild land fires. They include human activity which may be agricultural or industrial activities including transportation; arson; debris burns; camping; fireworks around the 4th of July; or natural causes such as lightning. Debris burns may include garbage, agricultural waste, or the burning of ditches and sloughs which get out of control.

Lightning can present particularly difficult problems when dry thunderstorms move across an area suffering from seasonal drought. In Sargent County, the most common ignition sources include railroad and agricultural equipment mechanical failure and carelessness of individuals.

Multiple fires can be started simultaneously, as is often the case in North Dakota. In dry fuel areas, these fires can cause massive damage before containment. Dry vegetation, associated with temporary drought like conditions, is the primary fuel source for south central North Dakota wild land fires. The rate of spread of a fire varies directly with wind speed. The frequent windy conditions typical to the region as noted in Plan Section 5 causes wild land fires to spread rapidly.

The county experiences wild land fire every year. Factors that influence the potential for wild land fire include type, amounts and conditions of fuel supply (vegetation), temperatures, wind conditions, 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 quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Fires are reported annually which result from the use of farm machinery in fields and pastures. For example, any time during and after the small grain harvest until stubble is worked or snow cover exists, machinery or other vehicles and equipment can create a dangerous fire potential. On average, Sargent County has three to five large fires a year. Recent cited fires of a large magnitude near Milnor that entered into and burned into the Sheyenne National Grasslands. The vegetation and lack of roads into the threatened area made this fire difficult to suppress.

Wild land fires are of concern to emergency management officials because they can be a killer of people, livestock, and wildlife while they destroy wildlife habitat and agricultural crops. They can destroy personal and real property, shelterbelts, forage, watersheds, and can degrade scenic and recreational areas. Soil erosion, silting of lakes and wetlands, contamination of wells, flooding and damage to utilities can also follow extensive wild land fire. In addition air quality may be reduced due to heavy smoke from wild land fires causing or exasperating respiratory problems for people.

While continuing to use the land intensely for agricultural purposes, the population has increased recreational use of the land; therefore, more land usage creates added need for strong mitigation activities to ensure minimal property loss and threat to both wildlife and human population. Sargent County has not had many burn bans over the years as the fire danger index for the region generally stays low enough where the ban would not take effect.

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 wild land 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.

Annual crops and perennial grasses furnish most of the fuel for Sargent County wild land fires and constitute the largest economic loss. This comprises nearly 90% of available fuels for wild land fires. Fires in these areas are characterized by high rates of spread and moderate intensity.

Sargent County has a moderate risk for wild land fire. An additional source consulted to demonstrate how wild land fire risk varies across the state is the wild land-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 Wild land Urban Interface or Intermix areas. To reduce the risk of wild land fire, Sargent County has implemented two burn bans in the

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)

1. High Density Intermix
2. Medium Density Intermix
3. High Density Interface

Moderate Risk Threat Zone (areas of lower housing unit density within areas of high vegetation

4. Medium Density Interface
5. Low Density Intermix

Low Risk Threat Zone (either no vegetation, or no housing density)

6. Low Density Interface
7. High Density No Vegetation
8. Medium Density No Vegetation
9. Wild land Intermix
10. Uninhabited Vegetation
11. Uninhabited No Vegetation
12. Low Density No Vegetation
13. Wild land No Vegetation

The SILVIS Census Blocks were selected within GIS. The total population and number of housing units within each zone was summarized based on 2010 Census Block data included in the SILVIS data set.

Table 5.4.9.2 Population and Housing Units in SILVIS High and Moderate Risk Threat Zones

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
47	29	37	23	84	52

Source: SILVIS Lab Wild land Urban Interface Data

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. With only 52 total housing units in the High and Moderate Risk Categories and with each having a median value of $72,000, Sargent County has a housing unit value risk valued at $3,764,800. Source: SILVIS Wild land Urban Interface Data, U.S. Census American Community Survey 5-yr Estimates 2007-2011

5.4.10 Drought

Table 5.4.10.1 Drought Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Possible	1-10% probability next year, or at least 1 chance in the next 100 years
Severity	Critical	25-50% of jurisdiction affected
Risk Class	**B**	Moderate risk condition
Seasonal Pattern	None – Patterns can last over several seasons when	

	precipitation is limited but most dramatic effects occur in the summer when temperatures are high and crops are affected
Duration	Months/Years
Speed of Onset	Slow onset – A drought occurs over time; therefore, it can be watched and anticipated, but its exact beginning and end are often times difficult to determine.

Drought is a condition of climatic dryness which is severe enough to reduce soil moisture and water 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. In addition to severe damage to vegetation, soil in a drought area becomes dry and crumbles. Often, topsoil is blown away by hot, dry winds. Lakes, wetlands, and wells may dry up during a drought, thus wildlife and livestock suffer and even die. Although agriculture production is the most obvious recipient of drought losses, this hazard will also attack urban areas by impacting domestic and industrial water supplies.

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:

1. *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.
2. *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.
3. *Hydrological drought* refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow 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.
4. *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 Sargent County averages 24 inches. About 75 percent of the annual precipitation occurs during the crop season from April to September. Source: North Dakota State Climate Office, 2013

Weather forecasters cannot predict with certainty just when a drought will occur, but they do know that these drier than normal periods tend to alternate with wetter than normal periods. Droughts of the past can be read in the growth rings of trees. In wet periods, the ring is thicker than in dry periods. Precipitation deficits as little as four to six inches can cause severe drought conditions.

Drought severity regarding our agriculture procedures depends on time of year, timing of precipitation, amount of stored soil water, type of crop, stage of growth, and meteorological variables such as temperature, humidity, and wind.

A number of secondary hazards are generally associated with drought. Rural grassland fires increase because of dry vegetation. Reduction in vegetation cover will expose the soil to wind, and dust storms and soil erosion will occur. Because of reduction in surface water levels, the water quality of surface water can become stagnant affecting livestock and recreational use.

Deterioration in water quality, in turn, results in injury and death to plants and animals. Stagnant pools provide favorable habitats for insects, particularly mosquitoes which can carry west Nile disease. Grasshoppers which consume large amounts of remaining vegetation thrive in drought conditions affecting crops, pastures, and hay land. Finally, with the return of the rains, the dry and unstable topsoil is vulnerable to gullying and flooding, and erosion.

There is a wide range of possible consequences that have occurred and can occur again in regard to drought.

Drought is a creeping phenomenon, pervasive in nature. The effects of drought are slowly accumulated and tend to persist over long periods of time. This is in contrast to sudden and short-lived impacts of floods, winter storms, and tornadoes. It is difficult to determine when a drought begins and when it ends. Often the question of whether or not an extended dry spell is, in fact, a drought causes considerable debate among meteorologists, farmers, public officials, and other agriculture experts.

The effects of drought directly impact economic and social stability of the area concerned. Losses do not usually include direct structural damage or traumatic loss of human life but usually result in psychological impacts on individuals and families because of economic losses.

The amount, duration, and extent of moisture deficiency necessary to establish a drought threshold vary considerably. For example, a certain lack of precipitation may cripple the livestock industry early on, but not affect urban water systems until later.

A typical drought could start with very limited winter snowfalls. Next, spring would be marked by significant precipitation deficiencies combined with conditions characterized by warmer temperatures and wind.

The first impact may be felt when normal spring greening does not occur. Thus, an extended spring rural fire danger may result. The livestock industry also feels early effects because natural feed supplies are impacted.

Next, spring planting plans may be affected. As the drought conditions continue growth and production of cash crops and feed grains become questionable. Impact, resulting in fire danger is again felt on grasslands in midsummer until late fall or winter. Agriculture related business may not feel drought effects immediately, but based on continuance and duration and spending habits of farmers and livestock producers, significant impact results. Eventually, all of Sargent County's agricultural economy suffers severely. Besides impact on food production, prices, farm income, agriculture trade, living standards, natural vegetation and wildlife habitat the quality and quantity of water resources are greatly reduced by drought.

Water problems caused by drought can range from reduced recreation opportunities, to impacting hydro-electric power production, to reduction in quantity and quality of both business and domestic supplies.

In the 1930's drought struck hard at the farmer and the Great Plains region as a whole, and elicited massive aid from state and federal sources. Maladjusted farming techniques, poor market prices, and a depressed economy lay at the heart of the problem. Drought prompted the conscious adoption of new drought adjustments, stimulated the creation of governmental agencies to promote agriculture and regional adjustment, and accelerated trends already underway. Thereafter, conservation practices spread; irrigation increased; operations became more flexible with larger farm sizes, diversification, and improved management practices; a federal crop insurance program was established, and credit institutions liberalized; and regional economy was diversified.

During this period, impressive drought-related research was carried out by the U.S. Department of Agriculture (USDA), State Agricultural Experiment Station Systems, and agricultural colleges and universities. Notable accomplishments were technologies for soil erosion control, soil moisture conservation, higher yielding grain varieties, improved fertilizers, and better farm management.

When drought struck again in the early 1950's, the impact was much less severe. The widespread financial distress, interstate migration, and regional disruption characteristic of the Dust Bowl era were largely absent. Although comparable in meteorological severity (even if not spatially uniform) the impact was moderated by the trends in adjustment, as well as by improved farm prices and a healthy economy. Again, attention was directed to drought adjustment and research. Strong emphasis was placed on water conservation and augmentation, weather modification research, weather prediction and control, groundwater recharge, irrigation and river basin development, increasing runoff, evaporation control, desalination, phreatophyte control, and irrigation canal lining.

More recent drought response of the 1970's and 1980's by state and federal government has been 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 business, and some water related assistance.

Despite some gains in reducing the hardships caused by drought since the 1930's, converging population trends, decreasing food reserves, limitations and relative scarcities of some resources, and growing dependencies suggest that another major drought could have serious repercussions at local, state, and national levels. The changes in the nature and extent of potential consequences call for broader and more balanced mitigation efforts.

Sargent County has experienced less drought periods than the rest of the state as the soil types and weather patterns appear to favor Sargent County. Sargent County is mainly a farming county and sloughs are the main source of water for cattle. Drought has a tremendous impact on the farming community as well as those living in the cities that depend on the farm economy. This hot dry weather retarded the growth of crops, leaving them weak and vulnerable. Damage is estimated to be in the tens of millions of dollars statewide.

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. The Palmer Drought Severity Index is the most common method of drought measurement for Sargent County. Source: National Drought Mitigation Center, 2013
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. Sargent County has an extensive network of ground monitoring wells and surface water gauges put in place and monitored by the State Water Commission because of the heavy use of irrigation in Sargent County. Ground water information, including hydrographs, recent water levels and chemistry conditions, can be found at http://mapservice.swc.state.nd.us/ .

Droughts cannot be defined with certainty as extremely dry periods often alternate with wetter than normal periods. Since 1930, Sargent County has suffered drought in the 1930s, 1950s, early 1960s, mid 1970s, early 1980s, 1988 through 1991, 2002 through 2004, and 2006. During the period from 1980 to 2012, Sargent County has been included in XX drought USDA Secretarial Drought Declarations. Sources: Federal Emergency Management Agency, 2007; Farm Service Agency, 2007; North Dakota Department of Emergency Services, 2007; USDA Farm Service Agency, 2013

1930s Dust Bowl: June 1929 was one of the driest on record in North Dakota, followed by continuing drought conditions throughout the 1930s. 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

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 evaporation control.

1970s and 1980s: 1976 was the driest year in North Dakota since the 1930s according to the State Historical Society of North Dakota. The years 1984 to 1987 were very dry and the county was experiencing drought conditions. The cattle were without hay, sloughs dried up, dugouts were dry, and it was hard to get water to the cattle. In the late fall of 1987, rain brought relief to the county. In June 1988, it was the hottest June on record at every major station across North Dakota. There were 13 to 22 days with temperatures of 90 degrees or more. In the southwest and south-central sections, 7 to 10 of these days were 100 degrees or more. 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.

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. 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.

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. 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.

Typically, the most profound impact of drought is to the economy. Important sectors of the Sargent County economy that can experience impacts from drought include agriculture 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 hot temperatures occur during the drought period or in severe cases the ground water is depleted and irrigation water supplies are rationed.

According to the USDA census, Sargent County does have a low drought vulnerability, yet Sargent County has annualized crop losses of $765,504 due to drought during the period from 2003-2012. During this period, drought related crop insurance paid $6,812,987 in insurance claims. With 89% of the crop damages insured, crop damages totaled $7,655,042. Source: USDA Risk Management Agency; 2007 USDA Census of Agriculture

Generally, facilities/buildings themselves are not physically threatened by drought. However, critical infrastructure, particularly those systems that rely on ground water for operations, can be negatively affected by drought. If public water supplies are lost, this would in turn negatively impact the function of city government services. Sargent County municipal water systems depend on ground water and rural water systems. The levels at which specific areas begin to experience ground water impacts depend on the aquifer and the depth of the well. Drought has a tremendous effect on the rural areas in the areas of crop and livestock production as well as wild land fire risk.

5.4.11 Homeland Security Incident (Including Multiple Types of Terrorism and Cyber- Terrorism)

Table 5.4.11.1 Homeland Security Risk Analysis - Determined by the Hazard Mitigation Planning Team

Frequency	Possible	1-10% probability in the next year, or at least 1 chance in next 100 years
Severity	Negligible	Less than 10% of jurisdiction affected
Risk Class	**D**	Low Risk Condition
Seasonal Pattern	None	
Duration	Unknown	
Speed of Onset	Little to no warning	

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** 5.4.7, 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.

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. Facilities at risk for cyber terrorism in Sargent County include county and city government, financial facilities, and other businesses. Dickey Rural Networks, in neighboring Dickey County, is especially at risk as it provides telephone, internet connectivity, and cable television to governments, businesses, and residences through fiber optic cable in all of Sargent County.

Homeland Security

The probability of a homeland security incident affecting Sargent County directly is difficult to determine. Overall there are no specific terrorist targets that have been identified Sargent County and the county is not an area at high risk for civil unrest. As with any area, a shooting by a disgruntled employee or student is also possible. There have been reports of terrorist type behavior on Face book towards the schools in the area in recent years following the tragedy at Sandy Hook as in other schools throughout the nation. And therefore, a large scale attack cannot be ruled out, and a small probability exists. Of greater probability is a terrorist attack that has an indirect effect on the county through its economy. The September 11th, 2001 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 Sargent County, 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 across the country have struggled with similar events, and therefore, such an incident is possible.

Whereas other hazards have a track record within the county, civil disorder and terrorism have had no significant record of occurrences, but, that by no means indicates that such a tragedy could not happen. Such events can cause possible deaths, injuries, and significant property damage in a concentrated area. The most likely scenario would come from a transient threat or from farm groups suffering from economic crisis.

Table 5.4.11.2 Terrorism Prone Critical Facilities.

Facility	Visibility	Criticality	Impact	PTE	Hazard	Site	Collateral	Total
Water Tower	Information is confidential and held in 2003 ODP Assessment							
Water Treatment Plant								
Natural Gas Pipeline								
Natural Gas Pumping Stations								
Natural Gas Pipeline Ports								

Oil Pipeline		
Power Transmission Line-Dakota Valley, Ottertail		
Dakota Plains - Southeastpropane		
Railroad		
Bulk Fuel-		
Public Health Unit		
Health Clinics		
Nursing Home – Forman		
Schools – Gwinner, Forman, Milnor		
Government buildings		
Fertilizer / Ag Chemical Plants		
Grain and Ag Chemical handling facilities.		

Table 5.4.11.2 identifies those facilities in the county that have been identified as being at risk from a civil disorder/terrorist event. The method for calculating the total risk was identified by the Department of Homeland Security for their 2003 Office for Domestic Preparedness Assessment and included:

- Visibility of the target on an area, local, regional, state and national level.
- Criticality of the target to the local jurisdiction, regional and national level.
- Impact on the community, region, and nation.
- Potential threat elements within the area that have reason to target the facility.
- Other hazards such as CBRNE that may have a secondary effect.
- Population that may be affected at the facility.
- Collateral population that may be affected near the facility.

For security reasons the total score was utilized to represent the overall assessment of the facility. Further questions should be addressed to local law enforcement and the emergency manager.

5.4.12 Shortage or Outage of Critical Materials or Infrastructure

Table 5.4.12.1 Shortage or outage of Critical Materials or Infrastructure Risk Analysis - determined by the Hazard Mitigation Planning Team

Frequency	Possible	1-10% probability in the next year, or at least 1 chance in next 100 years
Severity	Critical	25-50% of jurisdiction affected
Risk Class	**B**	Moderate risk condition
Seasonal Pattern	None - Highest probability of occurrence is during or after another hazardous incident that has somehow depleted resources	
Duration	Days to Weeks	
Speed of Onset	Minimal warning	

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 Sargent County 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 Sargent County 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 Dakota Valley Electric and Otter Tail through overhead 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 and internet services are provided by Dickey Rural Network while cellular several phone services are provided by several national companies. Privately-owned gas stations are located throughout the county.

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 increasing in relation to our dependence on technology and basically affect electronic devices. There are no recorded space weather effects in Sargent County. The nearest storm affected Montreal, Canada on March 13, 1989 when a geomagnetic storm took out their commercial electric power for 9 hours.

Geographic Location

Essentially all jurisdictions rely on critical materials and infrastructure in some fashion. Mapping of utility and communications infrastructure is maintained by the individual services providers. The County Emergency Operations Plan maintains lists of providers of public utilities in the county for electricity, natural gas, and telecommunications.

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 statewide to meet the dangers inherent from a critical fuel shortage to the citizens of North Dakota. 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 county'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 and early spring storms 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.
Generally, the more frequent events have a low impact, and the high impact events occur less frequently. All types of events may not appear, 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.

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. Sargent County was impacted with a widespread power outage from an April winter storm in 1997. During the blizzard of 1997, there was a concern with the elderly due to no water and no electricity, especially those who were on oxygen. It was critical that they had water and electricity so they had to be relocated to the Four Seasons Healthcare where there was a backup generator.

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.

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.

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, 11 housing units in Sargent County rely on utility gas for heat, 622 rely on propane, 626 rely on electric heat, 416 rely on fuel oil/kerosene, and 6 on coal, and 15 residents listed other sources of heat. (Source: American Community Survey, 2007-2011, House Heating Fuel) 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, cooking, and cleaning. 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 activities in the county are also vulnerable to prolonged outage events as modern agricultural practices are reliant on energy; such as water wells, 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.

To rate the risk of shortage or outage of critical materials or infrastructure, the ratings are based on population. 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. Sargent County population is less than 4,000.

Determining the probability that a shortage or outage will occur in a given area is not practical or feasible. Some of the factors that would put Sargent County at a higher risk are lack of transportation ways to enter into the county to provide critical materials as there is no interstate, rail lines are largely agricultural based routes and air ports are small. The sudden and devastating occurrence of a severe natural disaster or human caused to include an extended period of severe cold weather; the disruption of a supply system; an embargo, which could result from international global conflict or other significant events, can disrupt the availability of fuels and other critical energy products. Such occurrences could impact future energy supplies and place extreme pressure on existing supplies, threatening the health, safety, and well-being of the citizens.

Section 6 Hazard Prioritization

Hazard prioritization was accomplished by determining which hazards had caused prior fatalities, caused injury, resulted in property damage, had the potential to cause the

most economic hardship within the county and had the potential to affect Sargent County residents in the future. Based on review of the historical record and local knowledge, Sargent County identified four major natural hazards that consistently affect this geographic area – drought, flooding, severe winter storms and severe summer storms including high winds, hail and tornadoes. The threat of hazardous material incidents is a technological hazard present in Sargent County due to transportation corridors (e.g. highway, railroad) through the area. Security of infrastructure from terrorism was also identified as a technological hazard of concern. Hazards discussed and evaluated during the interviews and public meetings are presented in Table 6.1. After the chart was completed based on public and committee input, the chart was reviewed by the committee at a planning meeting.

Table 6.1 Hazard Risk Class, Priority and Impact

Risk Class:	C	A	A	B	C	C	B	D	C	D	D	B
HAZARD:	Flood	Severe Winter Weather	Severe Summer Weather	Hazard-ous Material	Urban Fire	Wild Land Fire	Drought	Communi cable Disease	Trans-portation Accident	Short of Critical Material	Home-land Security	Wind Storms
Blocked Roads	X	X	X	X	X	X			X		X	X
Building Collapse		X	X	X	X	X			X		X	X
Business Interruptions	X	X	X	X	X	X	X	X	X	X	X	X
Delayed Emergency Response	X	X	X	X	X	X		X	X	X	X	X
Downed Power Lines	X	X	X	X	X	X			x		X	X
Downed Trees	X	X	X		X	X					X	X
Evacuation (Full)			X	X		X			x		X	
Evacuation (Localized)	X	X	X	X	X	X		X	X	X	X	
Explosion		X	X	X	X	X			X		X	
Flooding (Street)	X		X									
Flooding (Structure)	X		X									
HAZMAT Release	X	X	X	X	X	X		X			X	X
Increased Fire Potential		X	X	X	X	X	X	X			X	X
Increased Public Safety Runs	X	X	X	X	X	X		X	X	X	X	X
Loss of Potable Water		X	X	X	X		X	X	X	X	X	
Loss of Medical Facilities	X	X	X	X	X			X	X	X	X	
Loss of Power	X	X	X	X	X	X		X	X	X	X	X
Mass Casualties		X	X	X	X			X	X		X	
Property Damage	X	X	X	X	X	X	X	X		X	X	X
School Closure		X	X	X	X			X	X	X	X	
Sewer Backup	X	X	X	X	X			X	X	X	X	
Livestock		X	X	X		X	X	X	x	X	X	

Injury/Death												
Loss of Economy	X	X	X	X	X	X	X	X	x	X	X	X

Key: A is the highest risk factor; D is the lowest risk factor.

Section 7 Mitigation Strategy

Specific mitigation goals and projects were developed for Sargent County in conjunction with the public meetings and stakeholder interviews. A matrix developed for project ranking that emphasized cost-benefit and input from local officials was used to determine project prioritization. Following is a description of goals and objectives used to mitigate natural and technological hazards that builds on the community's existing capabilities. Project implementation and legal framework are discussed at the conclusion of this section.

7.1 Local Hazard Mitigation Goals

The plan goals describe the overall direction that Sargent County agencies, organizations, and citizens can take to work toward mitigating risk from natural and technological hazards. Goals and objectives of the plan were developed during public interviews and meetings with public officials and subject matter experts. They were finalized at a planning meeting.

Sargent County's Hazard Mitigation Goals

Goal 1: Explore Planning and Zoning Regulations.
Goal 2: Increase recruitment of volunteer emergency services.
Goal 3: Participation of Storm Ready, Firewise and like programs.
Goal 4: Reduce effects from flooding
Goal 5: Enhance firefighting capabilities
Goal 6: Reduce risk of biological hazards
Goal 7: Reduce risk of chemical hazard

7.2 Mitigation Objectives and Actions

The broad range of potential mitigation activities presented was considered, and Table 7.2.1.1 is a list of mitigation objectives and the actions (projects) identified by the county. Although some of these projects may not be eligible for FEMA funding, counties may secure alternate funding sources to implement these projects in the future.

This list is designed to give the county a tool in project management and coordination. During the risk analysis phase of the multi-hazard mitigation plan, the emergency manager has the lead in coordinating with all appropriate agencies to facilitate the planning process; however, once a hazard has been identified for mitigation, the emergency manager steps back from the leadership role and will assume the role of team participant. The lead role in project development shifts to the county department or city responsible for project management, such as the Road department. Sargent County and city officials have been through 15 disaster declarations in recent years. Through the response and recovery process they have become experts in determining the potential impact of many of the categories involved. Support was given by the North Dakota Department of Emergency Services, as well as consulting with neighboring counties to determine the most appropriate course of action.

7.2.1 Sargent County Mitigation Projects

When the 2008 Multi-Hazard Mitigation Plan was completed, the planning committee identified 11 projects. Some of these were completed; others were not because of lack of resources and a change of priorities. The 2008 Multi-Hazard Mitigation Projects are listed in the table below.

Projects identified in 2008 Hazard Mitigation Plan							
#	Project	Hazard Mitigated	Affected Jurisdictions	Lead Agency	Cost	Funding Source	Status
1	Retain services of storm spotter network throughout the county	Severe summer and winter weather	All of Sargent County	Sargent County Emergency Management	10k	Local county & fire funds	
2	Purchase public warning systems in the four unincorporated communities for weather or other warnings	Severe summer and winter weather, hazmat, other threats	Delamere Geneseo Stirum Brampton	Sargent County Emergency Management	28,000	local & grant funds	
3	Retain shelters identified in communities that could be used for the public	Severe Summer weather, winter weather, hazmat, flooding	7 incorporated communities	Emergency Management	unknown	local & grant funds	

4	Sewer system cannot handle runoff in streets which causes flooding in homes need to upgrade current system	Flood	City of Forman	City of Forman	1.2 M	grants & local Funds	
5	New color coded maps for emergency vehicle routes	All Hazards	All of Sargent County to include rural and 7 incorporated communities & 4 unincorporated	Sargent County Emergency Management and Sargent County Highway Dept.	12k	Local funds and HLS Grants	
6	Acquisitions	All Hazards	All of Sargent County to include rural and 7 incorporated communities	Sargent County Emergency Management, Incorporated cities, County	unknown	Local Funds and Mitigation Grants	
7	Road modifications & culvert sizing	Flooding, severe summer weather, severe winter weather	All of Sargent County road systems incl. cities & twps	Sargent County Emergency Management, County Road Department, Twp officers, city officials	unknown	Local funds and grants	
8	WMD training/exercises for local emergency responders and officials	Civil Disorder/Terrorism	All of Sargent County to include 7 fire depart. Law Enforce., 2 amb., 1 first rspndr, local gov., priv. ind.	Sargent County Emergency Management and Fire Dept.	4k	grants & local Funds	
9	Public awareness training for an event occurrence	National Security	all of sargent County	Law Enforcement Emergency Management	2k	grants & local Funds	
10	Flood reduction & threat	Flood	Milnor	City of Milnor and Milnor Flood Task Force Committee	unknown	local & grant funds	
11	Public awareness & training for biological occurrence	Civil Disorder/Terrorism, Natural occurrence	All of Sargent County	County Public Health District Local Clinics, Emergency Management	$5,000.00	Local funds and CDC grants	

Completed projects in Sargent County

I think the following comments are worth mentioning, as the townships on their own and also some of it with the help of FEMA funds have completed a lot of aggressive work towards the reduction/prevention of future damage. This work needs to be acknowledged and commended.

24 townships did various culvert replacements due to Hydrology studies done and culvert resizing done to assist in water flow restrictions and or access to protect roads from washing out year after year.

The townships have done many areas of riprapping around culverts for prevention of washout of culverts as well.

They have also done shoulder work to include such things as riprapping, using fabric in some areas, using what we call the step sloping to prevent open water washing up against road shoulders causing the roads to wash out.

These types of sites are many and I am not going to take the time to list every single site between the years of 2007 and 2013.

Other projects

Verner Township – Sec 26/25 road project inserted new culverts, built up road, added riprap for shoulder protection. 2011 project

History-This site has washed out many times thru the years. The slough that has now grown into a lake due to the 15 flooding events has caused the road to wash out several times throughout the years. If the road did not wash out it was under water for long lengths of time. This is a main road for the area. The township had the area studied by an engineering firm. It was determined that a different set of culverts were needed and due to the large body of water the shoulders needed some protection. They went in and placed a few large boulders to break up the waves prior to them hitting shore, and used fabric and riprap on the shoulder. They raised the road a couple of feet to allow for seasonal increases in water levels of the slough.

County Road 2 located between sec 26/35 road project- a major grade raise project. This is a federally assisted road and it had several areas of washout due to the increase of water levels of Kraft Slough. This road received an emergency grade raise in 2009, and then in 2010 received a permanent grade raise. Largely funded by County and funded by Federal funds.

County Asphalt Road 10 located in the SE corner of sec 36 was washed out by flood waters. This was a bridge that was replaced with a large squash culvert from previous high water flooding events. This location has a history of flooding. The washout of the road as well as the 2 twp roads that intersect with it was repaired to a mitigated level in 2009. The county used an

engineering firm to study the area and provide alternative repairs to reduce or prevent the loss of the road in future flood events. New squashed culverts were put in at an angle that accepted the wild rice river with better ease, sized up differently and additional culverts, riprapping, fabric and sodding was completed to assist in stabilizing the banks of the area around the culverts.

Milnor City:

Milnor City has had instances of flooding throughout the years, going back to 1975. They suffered major flooding in 1997/1998/1999/2007/2009/2010 with minor flooding in 2011. They lose street access, homes are sandbagged/ Golf Course Structures and the course suffer loss; businesses suffer economic and property loss. Residences suffer personal property loss as well as home damages.

2006 the Milnor School District placed cameras in a portion of the school hallways for safety purposes.

2007 lost a road at the intersection of Fifth Ave and Seventh St. This is a location where a legal drain runs through the community and under this intersection. The City with the assistance of the SC Water Board, hired an engineer to do a study of the area and provide input on a repair that would provide future mitigation for reduction/prevention of future damages. Two different squash culverts were added at an angle that provided better water flow through the system. Bank repair and improvements were completed.

2007 flood waters entered the community from the NW part of town. The flood waters were overland flooding. Houses suffered damage along Ninth AVE as well as Mobile homes in Park lane MH Park. The city led a project to build a permanent dike on the south side of the legal drain that runs through the NW part of the community.

This project was assisted financially by the SC Water Board and the City of Milnor.

2009 flood waters traveled overland flooding Storm Lake and causing Storm Lake to leave its banks.

The Golf course is located in this area taking the largest part of the water and holding it. The water levels over topped First St. causing the residences and businesses along First St. to protect their property and fight the water.

There is a Fish & Wildlife easement drain running through the golf course that takes pressure off Storm Lake and leads it to the legal drain. The water overtopped the F & W drain. The city built permanent dikes along this bank system to provide the drain with the opportunity to hold more water within its banks for high water events.

Milnor City Financed this project completed in 2009

2009 the city bought two large capacity pumps to add to their resource list for flood fighting.

2010 The city bought flood blatters to use as temporary dikes to add to their resource list for flood fighting.

Milnor City placed safe routes to school in their community in 2008 using federal grant funds and City funds

Milnor City added a bike path along a county road that is Milnor City Main Street for safety of the pedestrians/bikers in 2007. Federal grant funds and City Funds were used.

2007 flooding caused damage to the city storm water system and lift stations. The city updated the system and flood proofed the lift stations with a project in 2008-2009. City Funds and Federal grant funds were used.

2007 a siren was placed in the city to add to the city's outdoor warning system.

Forman City has had flooding issues in the city in 1996/1997/1998/2007/2009/2010/2011.

Forman City through mitigation funds placed a tile system along the north end of the community running adjacent through a portion of the community along the Railroad track under elm ST. This tile took water that in previous floods was running through a MH park and through residential/business area on top the ground causing flood issues.

2010 project the city replaced the tile system as part of flood protection using city and federal mitigation funds.

The tile system runs to an open drain system that is located beginning at Third and Maple in the SE portion of the community running through the block 13 and out of town to connect to a natural drain. The open drain was cleaned out.

2010 an assessment district was developed to provide funds to assist in maintaining the tile/open drain system that was placed/replaced through the city.

2007 project- The Forman Golf Course placed a dike along a natural drain that runs into and through course # 9. Previously this water would overtop the drain and run overland through the course and into a portion of the community.

2007 projects- 3 lift stations were raised and flood proofed

2008 Forman City used city funds and federal funds to repair/update/improve their city storm sewer system throughout the city.

Sargent Central School placed cameras in the hallways and other strategically located areas during a 2010 remodel/construction for safety.

2007 a siren was purchased with Homeland Security funds to assist the city in adding outdoor warning to the city.

Gwinner City has had less flooding then other communities in the county. But has suffered flash flooding events when sudden downpours occur that drop 7 -12 inches in a very short time.

2007 Gwinner City worked with the State DOT to add a traffic light to the intersection of Hwy 13 and 1st St. for school safety.

2007 a siren was purchased with Homeland security funds to assist the city in adding to their outdoor warning system.

2008 the city placed a bike path running along Hwy 13 for safety of pedestrians/bikers

Cayuga City upgraded their Lift station in 2010 to provide better protection from overland flooding

Rutland City upgraded their lift station in 2008 to provide better protection from overland flooding

2009 A policy was developed by the SC Water District and the SC Commission that all culverts over the size of 18"s that is being replaced needs to have a hydrology study done first look at the upstream and downstream effects on infrastructure.

SC Water District has adopted a schedule for cattail spraying along their entire system of legal drains they are responsible for. This schedule is setup to spray a certain sector each year and repeating as the schedule is setup. The spraying of cattails assists in flooding by allowing the drains to operate as they should and also to keep the cattails from becoming a restriction problem at certain points along the drain system causing jams and water to build up and flow out of its banks.

2010 Sargent County Park Board completed repair/improvement work to a small dam located at Silver Lake to provide the water levels some increased room in the lake for water retention during spring or heavy rain runoffs.

Non-FEMA Sponsored Projects

There were a couple locations where the state highways have been built up by ND DOT.

Hwy 11 between Forman and Rutland in two locations

Hwy 13 west of Gwinner

Hwy 13 east of Milnor with a grade raise and culvert replacement

Hwy 32 South of Forman with a grade raise

The Railroad raised a lot of portions of their tracks traveling through Forman, Cogswell, and into Oakes due to water work done in 2010.

ND DOT took out a curve on Hwy 32 that curved onto Hwy 11 south of Forman for Traffic safety and a curve that was located on the south end of Forman connecting Hwy 11 and Hwy 32.

Proposed Mitigation Projects

Proposed Mitigation Projects are listed in table 7.2.1.

Projects

#	Project	Hazard Mitigated	Affected Juris-dictions	Lead Agency	Funding Sources	Cost	Time-frame

7.3 Project Ranking and Prioritization

Table 7.2.1 identified specific actions to achieve identified goals, an appropriate responsible party for each action, a schedule for accomplishment, suggested funding sources and priority rankings. Table 7.3.1 provides the basis for this initial prioritization of the actions using the STAPLEE criteria. STAPLEE is an acronym utilized to determine if a project is socially acceptable, technically feasible, administrative possible, politically acceptable, legal, economical (cost/benefit), and environmentally sound. In drafting this initial prioritization, the Sargent County Office of Emergency Management and the Hazard Mitigation Planning Committee worked cooperatively to determine which STAPLEE criteria each action did or was likely to meet. The criteria that were considered "met" are identified with a "+"and the criteria that were considered not met are identified with a "0". The methodology also allows for a "-" designation when impacts are expected to be negative, but none of the projects required this rating at this time.

The benefit-cost review is depicted in the economic criteria of the STAPLEE designation. The planning team considered the benefits that will result from a mitigation action versus the cost. A full benefit-cost analysis, such as the FEMA Benefit-Cost Analysis Toolkit was not considered necessary but a planning-level assessment of whether the costs are reasonable compared to the probable benefits was evaluated. The cost estimates are based on experience and judgment of the planning team. Explain here the rationale of the project selection by the planning team. The major criteria the committee took into account were (what?).

The committee in this process defined High, Medium, and Low priorities to be assigned as follows:

- **High:** Meets five of the seven STAPLEE criteria
- **Medium:** Meets four of the seven STAPLEE criteria
- **Low:** Meets three of the seven STAPLEE criteria

This prioritization will be revisited in the future by the Sargent County Office of Emergency Management and the Hazard Mitigation Planning Committee as the plan goes through its annual reviews.

Table 7.3.1 Prioritization of Sargent County Hazard Mitigation Projects

Action	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total	Priority

7.4 Project Implementation and Legal Framework

The county will use the STAPLEE criteria to focus project prioritization. Mitigation projects will be considered for funding through federal and state grant programs, and when other funds are made available through the county. The LEPC, a consortium of local officials and disaster planning personnel, will be the coordinating agency for project implementation. The LEPC has the capacity to organize resources, prepare grant applications, and oversee project implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of, or responsible for, implementing activities and programs. The emergency manager will be responsible for mitigation project administration. A number of state and local regulations and policies form the legal framework available to implement Sargent County's hazard mitigation goals and projects. A list of these regulations and plans is presented below.

State of North Dakota

- North Dakota Subdivision and Platting Act
- North Dakota building codes
- North Dakota Sanitation in Subdivision

Local

- Comprehensive growth policy (under development)
- Sargent County subdivision regulations

- Septic sewer permits

A summary of how the multi-hazard mitigation plan can be integrated into this legal framework is presented below.

- Use the multi-hazard mitigation plan to help the county's comprehensive growth policy meet the goal of protecting public health and property from natural hazards.
- Initiate zoning ordinances in conjunction with flood mitigation projects to prevent development in flood-prone areas.
- Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant on the state level.
- Develop incentives for local governments, citizens, and businesses to pursue hazard mitigation projects.
- Allocate county resources and assistance for mitigation projects.
- Partner with other organizations and agencies in south central North Dakota to support hazard mitigation activities

Section 8 Plan Monitoring and Maintenance

The plan maintenance section of this document details the formal process that will ensure that the Sargent County Multi-Hazard Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the plan and producing a plan revision every five years. This section describes how the county will integrate public participation throughout the plan maintenance process. Also included in this section is an explanation of how Sargent County government intends to incorporate the mitigation strategies outlined in this plan into existing planning mechanisms.

8.1 Monitoring and Updating the Plan

The 2008 Sargent County Mitigation Plan was reviewed annually and updates made as necessary. This plan will also be reviewed annually, or as deemed necessary by knowledge of new hazards, vulnerabilities, or other pertinent reasons. The review will determine whether a plan update is needed prior to the required five year update. The plan review will identify new mitigation projects and evaluate the effectiveness of mitigation priorities and existing programs. The emergency manager will be responsible for scheduling a meeting of the Sargent County Board of Commissioners to review and

update the plan. The meeting will be open to the public and advertised in the local newspaper to solicit public input. The board, assisted by the local emergency planning committee (LEPC) and the public, will review the goals and mitigation projects to determine their relevance to changing situations in the county, as well as changes in state or federal policy, and to ensure they are addressing current and expected conditions. The board and public will also review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data. The list of critical facilities will also be reviewed and enhanced with additional details. The emergency manager will give a status report detailing the success of various mitigation projects, difficulties encountered, success of coordination efforts, and which strategies should be revised. The status report will be published in the local newspaper to update local citizens. The emergency manager will be responsible for the five year plan and updating the plan as appropriate, and will have six months to make appropriate changes to the plan before submitting it to the board and public for review and approval. Before the end of the five-year period, the updated plan will be submitted to the State Hazard Mitigation Officer and FEMA for acceptance. The emergency manager will notify all holders of the county plan when changes have been made.

8.2 Implementation through Existing Programs

Sargent County is currently developing a comprehensive growth policy to address statewide planning goals and legislative requirements. The multi-hazard mitigation plan provides a series of projects – many of which will be closely related to the goals and objectives of the county growth policy. Sargent County will have the opportunity to implement hazard mitigation projects through existing programs and procedures. Local officials will work with the county departments to ensure hazard mitigation projects are consistent with planning goals and integrate them, where appropriate.

The city assessor offices and fire departments are responsible for administering the building codes in local municipalities. After the adoption of the mitigation plan, they will work with the State Building Code Office to make sure that the county adopts, and is enforcing, the minimum standards established in the state building codes. In addition, the county building department will work with other agencies at the state level to review, develop and ensure building codes that are adequate to mitigate or prevent damage by natural hazards. This is to ensure that life-safety criteria are met for new construction.

The Local Emergency Operations Plan and the Sargent County Hazardous Materials Plan are two county-wide plans that will draw information from the Multi-Hazard Mitigation Plan for pertinent updates. In addition any city plans such as the Steele Betterment Committee will use the Multi-Hazard Mitigation Plan for background information.

Within six months of formal adoption of the multi hazard mitigation plan, mitigation goals will be incorporated into the county comprehensive growth policy. Meetings of the board will provide an opportunity for local officials to report back on the progress made on the integration of mitigation planning elements into county planning documents and procedures.

8.3 Continued Public Involvement

Sargent County is dedicated to involving the public directly in review and updates of the multi-hazard mitigation plan. The public will have many opportunities to provide feedback about the plan. Copies of the plan will be catalogued and kept at all appropriate agencies in the county as well as at the public library. The existence and location of these copies will be publicized in the county newspaper. Section 2.0 of the plan includes the address and the phone number of the emergency manager responsible for keeping track of public comments on the plan.

A series of public meetings will also be held prior to each annual review and five year update, or at lesser intervals when deemed necessary by the board. The meetings will provide the public a forum for which they can express their concerns, opinions, or ideas about the plan. The emergency manager will be responsible for using county resources to publicize the annual public meetings and maintain public involvement through the official county newspaper and other means.

Hazard profiles define the frequency, location, and intensity of hazards that may impact a community. Profiles were developed for hazards that historically have had the most effect on the community and the ones that the community identified as being of most concern during public meetings.

The frequency of past hazard events was calculated to determine the probability of future hazards occurring. Accurate and consistent records have not been kept for many hazards. Where records have been kept, they are often heavily biased towards only reflecting hazards that occurred in the more populated areas of the jurisdiction. This is especially problematic in areas like Sargent County that are largely rural. Data from the NOAA National Climate Data Center Storm Events database and the North Dakota Department of Emergency Services was used to compile frequencies of natural hazards.

Hazard impact areas describe to what geographic extent a hazard can impact a jurisdiction and are uniquely defined on a hazard-by-hazard basis as discussed below. For purposes of conducting the risk analysis, all the hazard impact areas were defined as the percentage of area in each census block that would be affected.

The hazards most likely to affect Sargent County were derived from a number of sources. Hazard information was compiled by examining data from Department of

Emergency Services, FEMA, and the NWS, reviewing historical newspaper articles, and interviewing local experts. Most importantly, during the public meeting, the residents of Sargent County voiced their opinions on what hazards had affected their lives and their communities.

Earthquake activity:

Sargent County-area historical earthquake activity is significantly above North Dakota state average. It is 95% smaller than the overall U.S. average.

On 7/9/1975 at 14:54:15, a magnitude 4.6 (4.6 MB, Class: Light, Intensity: IV - V) earthquake occurred 79.8 miles away from the county center
On 6/5/1993 at 01:24:53, a magnitude 4.1 (4.1 LG, Depth: 6.2 mi) earthquake occurred 68.6 miles away from the county center
On 10/20/1995 at 15:57:18, a magnitude 3.7 (3.7 LG, Depth: 3.1 mi, Class: Light, Intensity: II - III) earthquake occurred 40.7 miles away from the county center
Magnitude types: regional Lg-wave magnitude (LG), body-wave magnitude (MB)

Source: http://www.city-data.com/county/Sargent_County-ND.html#ixzz2wc40JXqr