McPherson County
South Dakota

NATURAL HAZARD MITIGATION PLAN
EXPIRES:

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I. INTRODUCTION

CHANGES/REVISIONS TO INTRODUCTION:

The content of this section changed minimally since the prior plan update. Information on Community Lifelines was added. The format of the plan changed as maps and tables were added to provide information, rather than narrative.

INTRODUCTION

McPherson County is located in North Central South Dakota. McPherson County has determined that it is vulnerable to natural hazards that have the possibility of causing threats to the health, welfare, and security of its citizens. The cost of response and recovery from potential disasters in terms of potential loss of life, property or infrastructure can be reduced when planning efforts focus on mitigating the impacts of a natural hazard before an event occurs.

Mitigation planning is a process which identifies the county's vulnerabilities to natural hazards, identifies areas of potential risk, and then creates a plan for mitigating those risks, in effort to reduce the likelihood of loss of life and loss of property caused by natural hazards. With increased attention to mitigating natural hazards, communities can reduce threats to existing developments and prevent creating new risks by limiting and/or regulating future development. Many mitigation actions can be implemented at minimal cost.

This is not an emergency response or emergency management plan. Certainly, the plan can be used to identify weaknesses and/or refocus emergency response planning. Enhanced emergency response planning is an important mitigation strategy. However, the focus of this plan is to support better decision making directed toward avoidance of future risks and the implementation of activities or projects that will eliminate or reduce the risks caused by natural hazards.

PURPOSE OF THE NATURAL HAZARD MITIGATION PLAN

In October 2000, the Disaster Mitigation Act (DMA2K) was signed to amend the 1988 Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of the Disaster Mitigation Act requires that local governments, as a condition of receiving federal disaster mitigation funds, have a local disaster mitigation plan in place. The plan must:

1. Identify hazards and their associated risks and vulnerabilities.
2. Develop and prioritize mitigation activities; and
3. Encourage cooperation and communication between all levels of government and the public.

The purpose of this plan is to meet the hazard mitigation planning needs for McPherson County and participating entities. Consistent with the Federal Emergency Management Agency's guidelines, this plan will review all possible activities related to natural hazards to reach efficient solutions, link hazard management policies to specific activities, educate and facilitate communication with the public, build public and political support for mitigation activities, and develop implementation and planning requirements for future hazard mitigation projects.

PURPOSE

The purpose of the local natural hazard mitigation plan is to fulfill federal, state, and local hazard mitigation planning responsibilities; to promote pre and post disaster mitigation measures; implement short/long range strategies that minimize suffering, loss of life, and damage to property and infrastructure resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the county are exposed; and to eliminate or minimize conditions which would have an undesirable impact on the citizens, economy, environment, and the well-being of the county. This plan will aid city, township, and county agencies and officials in enhancing public awareness to the threat that hazards have on its citizens, property, and infrastructure; and what can be done to help prevent or reduce the vulnerability to risks of each McPherson County jurisdiction.

PLAN USE

First, the plan should be used to help local elected and appointed officials plan, design and implement programs and projects that will help reduce their community's vulnerability to natural hazards. Second, the plan should be used to facilitate inter-jurisdictional coordination and collaboration related to natural hazard mitigation planning and implementation. Third, the plan should be used to develop or provide guidance for local emergency response planning. Finally, when adopted, the plan will bring communities in compliance with the Disaster Mitigation Act of 2000.

SCOPE

1. Provide opportunities for public input and encourage participation and involvement regarding the mitigation plan.
2. Identify hazards and vulnerabilities within the county and local jurisdictions.
3. Combine risk assessments with public and emergency management ideas.
4. Develop goals based on the identified hazards and risks.
5. Review existing mitigation measures for gaps and establish projects to sufficiently fulfill the goals.
6. Prioritize and evaluate each strategy/objective.
7. Review other plans for cohesion and incorporation with the Natural Hazard Mitigation Plan.
8. Establish guidelines for updating and monitoring the plan.
9. Present the plan to McPherson County and the participating communities within the county for adoption.

LOCAL GOALS

These ideas form the basis for the development of the Plan and are shown from highest priority, at the top of the list, to those of lesser importance nearer the bottom.

- Protection of life before, during, and after the occurrence of a disaster;
- Protection of emergency response capabilities (critical infrastructure);
- Establish and maintain communication and warning systems;
- Protection of critical facilities;
- Government continuity;
- Protection of developed property, homes and businesses, industry, education opportunities and the cultural fabric of a community, by combining hazard loss reduction with the community's environmental, social, and economic needs; and
- Protection of natural resources and the environment, when considering mitigation measures.

LONG-TERM GOALS

- Eliminate or reduce the long-term risk to human life and property from identified natural and man-made hazards;
- Aid both the private and public sectors in understanding the risks they may be exposed to and finding mitigation strategies to reduce those risks;
- Avoid risk of exposure to identified hazards;
- Minimize the impacts of those risks when they cannot be avoided;
- Mitigate the impacts of damage as a result or identified hazards;
- Accomplish mitigation strategies in such a way that negative environmental impacts are minimized;
- Provide a basis for funding of projects outlined as hazard mitigation strategies; and
- Establish a regional platform to enable the community to take advantage of shared goals, resources, and the availability of outside resources.

WHAT IS HAZARD MITIGATION?

Hazard mitigation is defined as any cost-effective action(s) that has the effect of reducing, limiting, or preventing vulnerability of people, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories: First are those that keep the hazard away from people, property, and structures; second are those that keep people, property, and structures away from the hazard; and third are those that do not address the hazard at all but rather reduce the impact of the hazard on the victims, such as insurance. This mitigation plan has strategies that fall into all three categories.

Hazard mitigation measures must be practical and cost effective, as well as environmentally and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the value of anticipated damages.

Mitigation actions should be incorporated into the planning activities associated with capital improvements with consideration given to areas with the greatest vulnerability to natural hazards. Capital investments, whether for homes, roads, public utilities, pipelines, power plants, or public works, determine to a large extent the nature and degree of hazard vulnerability of a community. Once a capital facility is in place, very few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons, that zoning and ordinances (which manage development in high vulnerability areas) along with building codes (which ensure that new buildings are built to withstand the damaging forces of hazards) are often the most useful mitigation approaches local governments can implement.

In the past, mitigation measures have been the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to the perceived threat, some important mitigation measures take time to implement. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is useful for eliminating long-term risk to people, property, and infrastructure in South Dakota.

This plan evaluates the impacts, risks and vulnerabilities of natural hazards within the jurisdictional areas of the entire county. The plan supports, provides assistance, identifies and describes mitigation projects for each of the local jurisdictions who participated in the process of drafting the plan update. The suggested actions and plan implementation for local governments

could reduce the impact of future natural hazard occurrences. Lessening the impact of natural hazards can prevent such occurrences from becoming disastrous but will only be accomplished through coordinated partnership with emergency managers, political entities, public works officials, community planners and other dedicated individuals working to implement this program.

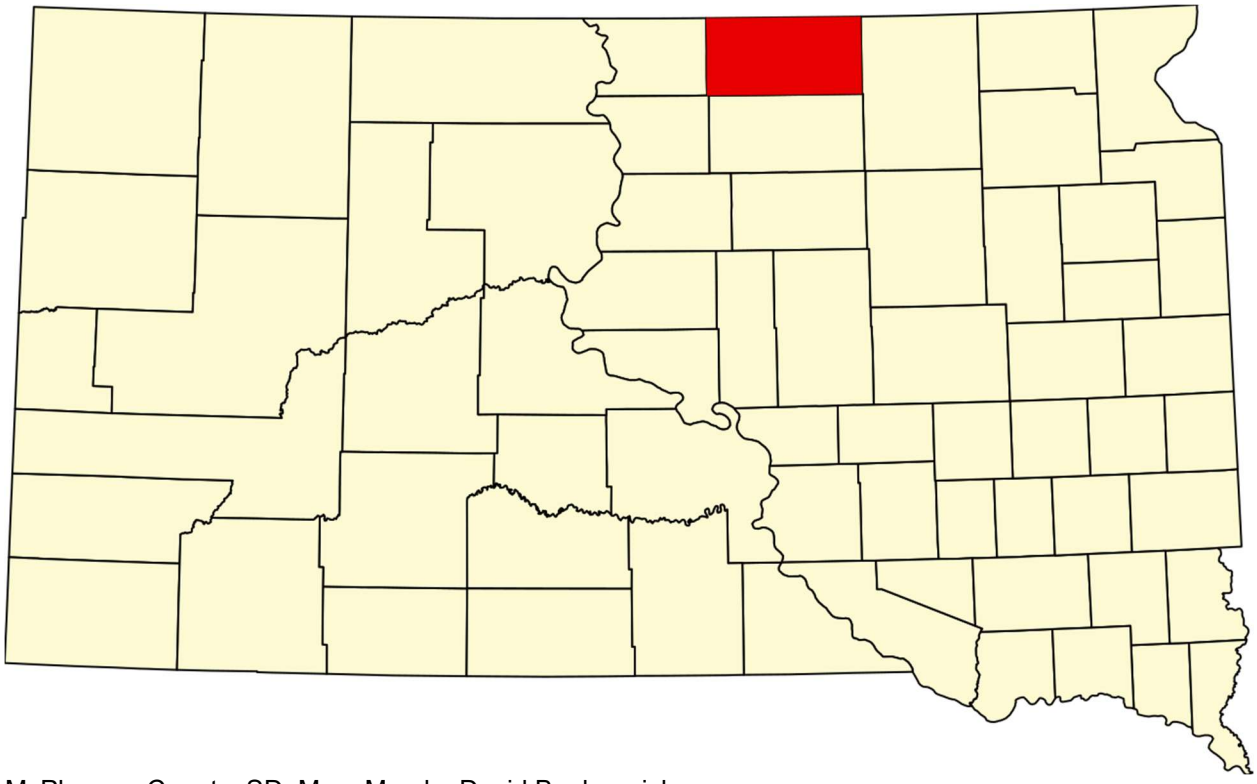
COMMUNITY LIFELINES

Mention has been given to Community Lifelines throughout the plan. These community lifelines are the focus of FEMA's response to natural hazards. The creation of Community Lifelines allowed FEMA to prioritize and deliver a concentrated response in mitigating effects in the event of a natural hazard. These community lifelines are:

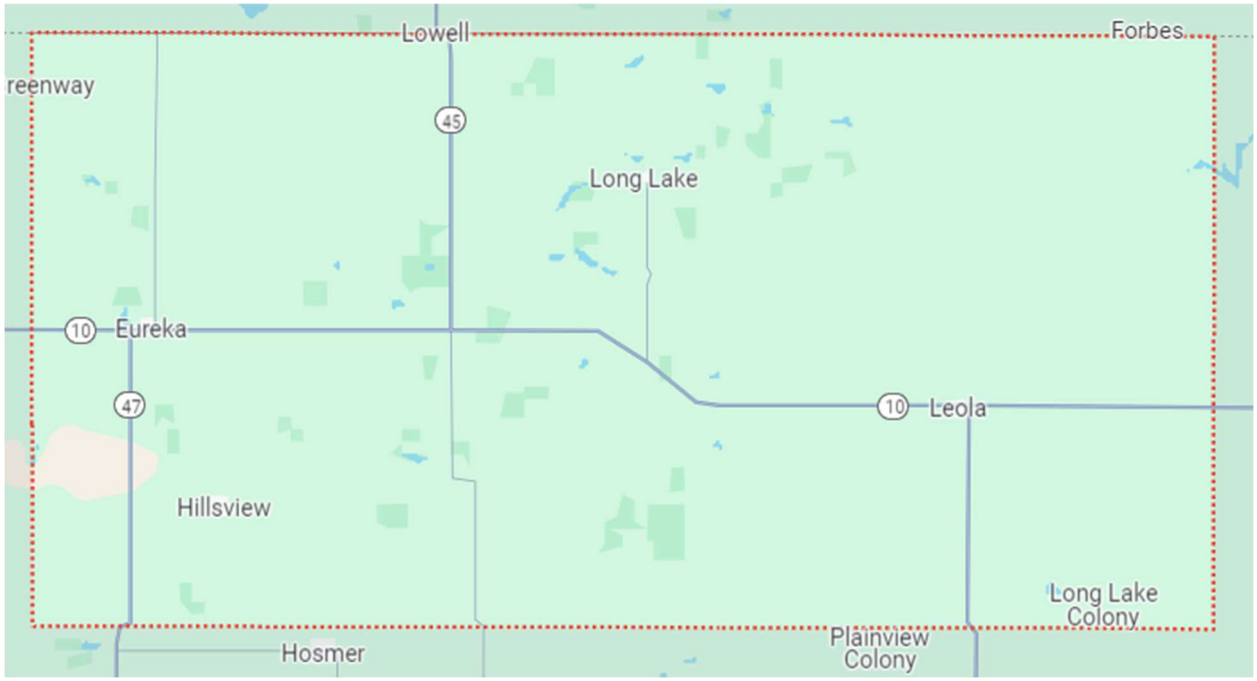
- Safety and Security: law enforcement/security, fire service, search and rescue, government services, community safety
- Food, Water, and Shelter: food, water, shelter, agriculture
- Health and Medical: medical care, public health, patient movement, medical supply chain, fatality management
- Energy (Power and Fuel): power grid, fuel
- Communications: infrastructures, responder communications, alerts, warnings, and messages, finance, 911 and dispatch
- Transportation: highway/roadway/motor vehicle, mass transit, railway, aviation, maritime
- Hazardous Materials: facilities, HAZMAT, pollutants, contaminants

These are recognized by FEMA as the basic services communities need to enable all other aspects of society to function. This prioritization of resources focuses FEMA's efforts. Each function is further broken into subcategories dedicated to prioritizing resources before and after a natural hazard event. These community lifelines are essential to mitigating and addressing natural hazard events and help focus response. By ensuring stability of community lifelines through mitigation before a disaster, it allows the process of responding to a disaster to become more efficient.

MCPHERSON COUNTY PROFILE



McPherson County, SD. Map. Map by David Benbennick.



McPherson County, SD

GEOGRAPHIC BACKGROUND

The geographic area of McPherson County is 1,137 square miles of land and 15 square miles of water. In March of 1884, Leola was made the county seat. Leola is situated at the intersections of SD Highway 10 and SD Highway 45.

The main industry in the county is agriculture. Most businesses within the county are agriculture-related or goods-related; necessary for serving the day-to-day needs of the rural population base.

The central and western parts of McPherson County are on the Missouri Coteau. The contour of the land is undulating to hilly. Many potholes or closed depressions exist in the central and western parts of the county, and the drainage pattern is poorly defined. Spring Creek is the main drainageway. It flows westward to the Oahe Reservoir. The eastern part of the county is on the Drift Prairie part of the James River Lowland. Relief is dominantly level to undulating. The drainage pattern is well defined. The two principal drainage ways are Foote Creek and Snake Creek. They flow southeast to the James River. Land elevations range from 1,400 feet above sea level in the southeastern part of the county to about 2,100 feet in the north-central part of the county.

POPULATION DEMOGRAPHICS

Table 1.1 McPherson County Demographics	
Statistic	**Location**
Total area (sq miles)	1,137
2020 Population	2,411
< 20	21%
20 - 29	11%
30 - 49	16%
50 - 64	20%
> 65	31%
Population Density	2.12
Households	872
Avg Household Size	3.2
Percent with children under 18	20%
Race	
White	94%
Native American	1%
Black	0%
Two or More Races	3%
Other Races	0%
Hispanic or Latino	2%
Median Income	$58,529
From 2020 Decennial Census and 2022 American Community Survey 5-Year Estimates	

Table 1.2 McPherson County Population	
Town	**Population**
Eureka	813
Leola*	434
Long Lake	27
Wetonka	16
Hillsview	2
Rural Population	1,119
Total	2,411
*** County Seat**	
from 2020 Decennial Census	

In addition to these communities, McPherson County also has four townships located in the northeast part of the county and two areas of unorganized territory called West McPherson and Central McPherson, as well as four Hutterite Colonies: Grassland Colony, Long Lake Colony,

Spring Creek Colony and Boulder Colony. The Hutterites are a communal people, living on hundreds of scattered colonies throughout the prairies of northwestern North America.

The colonies tend to have relatively large populations in comparison to some of the organized municipalities such as Wetonka, Long Lake, and Hillsview, ranging anywhere from 60 to 150 people in one colony. Typically, the colonies limit their populations and break off and create new colonies when the cap is met because the colonies are only designed to sustain a limited number of people. The exact population of the colonies is unknown.

ECONOMIC PROFILE

Agriculture is the principal enterprise in McPherson County. Corn, soybeans, wheat and hay are the main crops while cattle, hogs and poultry make up the livestock raised in the county.

In 1975 there were 670 farms in McPherson County with the average size farm being 1,090 acres according to the United States Department of Agriculture. The trend is toward fewer and larger farms. In 2022 the USDA Census of Agriculture, the estimated number of farms in McPherson County was approximately 330 with an average acreage of 1,977 per farm. Although there is a decline in the number of small farms along with a continuous trend in declining population, McPherson County's agriculture industry is surviving.

GOVERNANCE

McPherson County is governed by a five-member board of commissioners. The sheriff and three deputies provide law enforcement for the entire county. The sheriff also acts as the Emergency Manager for McPherson County. The City of Leola has an aldermanic government made up of seven members. The City of Eureka has an aldermanic government with a six-member board. Both Eureka and Leola contract with the sheriff's office for law enforcement within the city. Hillsview, Long Lake, and Wetonka all have a three-member board of trustees that serves as the governing body. They do not have their own law enforcement officials but are covered by the county sheriff's office.

The colonies have their own form of governance within. For the most part they live peacefully and tend to be self-sustaining and self-sufficient in most aspects of life. However, they do rely on public resources for law enforcement, medical and ambulatory services, and fire protection when necessary. McPherson County is required to provide those services to all areas that lie within the boundaries of the county. The colonies have adapted equipment as a means for hauling water to assist in fighting grassfires. FEM Electric provides power to all four of the colonies.

Due to the extremely rural nature of the county, it is important to note that many of the residents who serve in the public capacity are constantly stepping in and filling many other roles. For example, the county sheriff not only works as law enforcement but also volunteers for the local fire department as firefighter/emergency response personnel and serves in other capacities such as participating in the mitigation planning efforts of the county and volunteering for other local planning groups. While this is just one example, the general attitude of the people in McPherson County is to step in and help out whenever and wherever necessary. Despite the challenging expectations for those serving in many different capacities - taking on duties that in other places would be considered several different full-time positions, McPherson County residents are committed to helping their neighbors and take much pride in doing what they can with limited resources. In McPherson County, being self-sufficient and resourceful *is* the way of life.

CLIMATE
McPherson County is located in North-Central South Dakota, a place known to have some of the largest temperature variances in the world, from 35 degrees below zero Fahrenheit in the winter to 109 degrees Fahrenheit above zero in the summer. The annual precipitation average is 19 inches, of this approximately 80 percent falls between April and September. Thunderstorms occur approximately 36 days per year. The average seasonal snowfall is 35 inches. The prevailing wind is from the northwest with an average speed of 13 miles per hour. However, the county has experienced strong winds with speeds near 100mph. Wind speed tends to be the highest in the spring.

Sometimes the county experiences high precipitation and rapid snow melt which causes localized flooding of roads, culverts, and bridges. Eureka and Leola also experience lowland flooding within their communities during times of high-water table, excessive precipitation, and rapid snow melt.

TRANSPORTATION
SD Highway 10 is the main East/West route through the county and SD Highway 45 is the main North/South route through the county. In addition to Hwy 10 and 45, the county recognizes SD Hwy 47, SD Hwy 247, and SD Hwy 239 as major routes through the county. Other than the State and County road systems, no other transportation systems exist.

The Eureka City Airport has a single paved runway used by light private/general aviation and crop spraying aircraft. The airport does not have any navigation aid, communications or flight service capabilities.

The county has the Northern Border Pipeline main facility near Wetonka, and the pipeline traverses southeast to northwest through the county. No towns are serviced by the natural gas pipeline within McPherson County. The Dakota Access Pipeline, a crude oil pipeline also cuts across the very southwest corner of the county. No towns are serviced by this pipeline within McPherson County.

II. PREREQUISITES

CHANGES/REVISIONS TO PREREQUISITES:

One additional municipality (Long Lake) has expressed interest in adopting the plan for the 2025 update.

ADOPTION BY LOCAL GOVERNING BODY

The local governing body that oversees the update of the McPherson County Natural Hazard Mitigation Plan ("Plan" or "Mitigation Plan") is the McPherson County Commission. The Commission has tasked the McPherson County Emergency Management Office with the responsibility of ensuring that the Plan is compliant with Federal Emergency Management Agency (FEMA) Guidelines and corresponding regulations.

MULTI-JURISDICTIONAL PLAN PARTICIPATION

Requirement 201.6(c)(5) *For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance?*

> ***Element F1-a.*** *Does the plan include documentation of adoption?*
> ***Element F2-a****. Did each participant adopt the plan and provide documentation of that adoption?*

This plan is a multi-jurisdictional plan which serves the entire geographical area located within the boundaries of McPherson County, South Dakota. McPherson County has five incorporated municipalities. Three of the municipalities located within McPherson County elected to participate in the planning process and the update of the existing McPherson County Natural Hazard Mitigation Plan. It is understood that any municipality that didn't adopt the plan is covered by the County's adoption of the plan. The participating local jurisdictions include the following municipalities:

Table 2.1: Plan Participants

New Participants	Continuing Participants	Not Participating
Long Lake	Eureka	Hillsview
	Leola	Wetonka
	McPherson County	

The non-participants include Hillsview and Wetonka. Both of these communities are extremely small and have populations under 15 people.

The McPherson County Commission and each of the listed participating municipalities will pass resolutions to adopt the updated Plan. The Resolutions of Adoption are included as supporting documentation for the Plan. The dates of adoption by resolution for each of the jurisdictions are summarized in Table 2.2.

Table 2.2: Dates of Plan Adoption by Jurisdiction	
Jurisdiction	**Date of Adoption**
McPherson County	
Eureka	
Leola	
Long Lake	

All of the participating jurisdictions were involved in the plan update. Representatives from Eureka, Leola and Long Lake along with the County attended the planning meetings and provided valuable perspective on the changes required for the plan. All representatives took part in the risk assessment by reviewing the risk assessment worksheets, which are included in Appendix E and by profiling the risks. They also provided additional details on the process for development at the local level regarding building permits, regulations, and oversight which is documented in further detail in Chapter IV of the plan.

Representatives also took information from the planning meetings back to their respective councils and presented the progress of the plan update on a monthly basis. The Resolutions are included as Appendix B of this plan.

III. PLANNING PROCESS

CHANGES/REVISIONS TO PLANNING PROCESS:

The Planning Team conducted a Mitigation Survey of county residents to receive feedback on hazards affecting residents.
Additional information was added for county commissioners and city council members who participated and provided feedback during the planning process.

DOCUMENTATION OF THE PLANNING PROCESS

Requirement 201.6(b) *An open and public involvement process is essential to the development of an effective plan.*
Requirement 201.6(b)(1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.*
Requirement 201.6(c)(1) *The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

> ***A1-a.*** *Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?*
> ***A2-a.*** *Does the plan identify stakeholders involved or given an opportunity to be involved in the planning process and how each stakeholder was presented with this opportunity?*

McPherson County made an effort to reach a wide variety of stakeholders and individuals in the area, including vulnerable populations and underserved communities. Information about planning meetings was published in the local newspapers; included in public agendas, which are required to be posted 24 hours before a meeting; posted on social media; and sent out via email. Other methods used to inform and invite the public to meetings included direct outreach.

Specific entities that received notice of the meetings include: municipal and county entities, all fire and law enforcement departments in McPherson County, representatives from the local hospital and nursing home, rural water providers, rural electric cooperatives, school administrators, business leaders and others. The hospital and nursing home representatives were specifically because they work with vulnerable elderly populations.

At each planning meeting, attendees completed the risk assessment worksheets; discussed technical documents each jurisdiction had available; submitted information on crucial facilities/infrastructure; and developed mitigation actions among other information. Public representatives at the meetings then brought the information back to their respective councils/commissions and presented the progress of the plan, at which the public also had an opportunity to participate and comment on the plan.

Table 3.1 McPherson County Meeting Dates

Date	Location	Meeting Type	Advertisement	Stakeholders Represented
11/7/2023	McPherson County Courthouse	McPherson County	Agenda	McPherson County, Private Business, Members from the Public

		Commission Meeting		
9/16/2024	McPherson County Courthouse	Planning Meeting	Newspaper, Email	McPherson County, Eureka, Leola, Long Lake, Healthcare
10/7/2024	Leola City Hall	City Council Meeting	Agenda	City of Leola, Private Business, Members from the Public
10/7/2024	Meeting room in Long Lake Bar	Town Council Meeting	Agenda	Town of Long Lake
10/16/2024	Eureka City Hall	City Council Meeting	Agenda	Town of Eureka, Private Business, Library Board and Members of the Public
10/21/2024	McPherson County Courthouse	Planning Meeting	Newspaper, Email	McPherson County, Eureka, Leola, Long Lake, Healthcare
11/4/2024	Meeting room in Long Lake Bar	Town Council Meeting	Agenda	Town of Long Lake
Agendas are required to be posted 24 hours before the meeting at the principal office of the jurisdiction and on the jurisdiction's website. The agenda must be visible, readable and accessible.				

Agendas, Minutes and Sign In Sheets from the above meetings are included in Appendix A.

A1-b. *Does the plan list the jurisdiction(s) participating in the plan that seek approval and describe how they participated in the planning process?*

Table 3.2 was derived to help define "participation" for the local jurisdictions who intend on adopting the plan. Out of nine categories, each jurisdiction must have at least six of the participation requirements fulfilled.

Table 3.2 Local Jurisdiction Participation

Nature of Participation	McPherson County	Eureka	Leola	Long Lake
Attended Meetings or work sessions (a minimum of 1 meeting will be considered satisfactory).	X	X	X	X
Submitted inventory and summary of reports and plans relevant to hazard mitigation.	X	X	X	X
Submitted Risk Assessment Worksheet.	X	X	X	X
Submitted description of what is at risk (including local critical facilities and infrastructure at risk from specific hazards)	X	X	X	X
Submitted a description or map of local land-use patterns (current and proposed/expected).	X	X	X	X

Developed mitigation actions with an analysis/explanation of why those actions were selected.	X	X	X	X
Prioritized actions emphasizing relative cost-effectiveness.	X	X	X	X
Reviewed and commented on draft Plan.	X	X	X	X
Hosted opportunities for public involvement (allowed time for public comment at a city council/county commission meetings after giving a status report on the progress of the Plan update)	X	X	X	X

The McPherson County Emergency Manager and staff from Northeast Council of Governments led the development of the plan update. The core planning team members are listed in Table 3.3

Table 3.3: Plan Representatives for Local Jurisdictions

Jurisdiction	Name	**Title**
Eureka	Nicole Frerk	Finance Officer
	Wendy Brockel	Mayor
	Glen Olene	Eureka
Leola	Sondra Waltman	Finance Officer
Long Lake	Donna Hoffman	Finance Officer
McPherson County	Dave Ackerman	Sheriff/Emergency Manager
	Brooke Mehlhaff	Director of Equalization
	Lindley Howard	Auditor
	Hunter Heinrich	Assessor

At stakeholder planning meetings/work sessions, the local jurisdictions were represented by city council members, finance officers and/or public works employees. The city councils and county commissions discussed the progress of the plan at their council meetings.

The representatives from the municipalities were asked to share the progress of the plan at their monthly council/commission meetings and to ensure that those attending the meetings were aware that they are invited to make comments on and participate in the process of updating the new plan. Comments provided by local residents at the city council meetings were collected and incorporated into the plan.

> ***Element A3-a.*** *Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?*

PUBLIC INVOLVEMENT

Public meetings were held on two different dates at the McPherson County Courthouse throughout the planning process to inform the public about the required Mitigation Plan update. The Planning Meetings were open to the public and were advertised in newspapers, email and by direct outreach. County Commission Meetings and City Council meetings were another location where members of the public could participate in the planning process. State law requires Cities and Counties to publish meeting agendas at least 24 hours in advance of the

meeting. Natural Hazard Mitigation Plan was included on the agendas so the public would be notified.

See Table 3.1 McPherson County Meeting Dates for a list of all meetings open for public involvement.

SURVEY

In addition to the planning meetings, county commission and council meetings, the planning team decided to conduct a survey requesting feedback. The surveys asked about people's experiences with natural hazards, how they have been impacted, ideas for projects/actions that could reduce impacts from hazards. It also asked about storm shelters, surviving without power during a winter storm and who they trust to provide information on hazards.

The Eureka Chamber and Development and the City of Leola posted the survey link to their Facebook pages. To make the survey process equitable, paper copies of the survey were also made available in all towns for those who don't have access to the internet or preferred a paper copy. Paper copies were made available at planning meetings, they were also available at the City Offices in Leola and Long Lake along with the Eureka Community Development Company office. NECOG also met with the Eureka Senior Citizens (an identified vulnerable population) to talk about mitigation process and ask them to complete the survey. The two newspapers in the County also included information and a link to the survey in the newspaper and their Facebook page. There were 84 surveys completed, which is 3% of the population in McPherson County. Results of the survey are included as Appendix D.

The City of Eureka sent a text message alert to 223 people who have signed up for alerts, asking them to complete the survey.

The City of Leola included information on the survey with their monthly water bill and also met with the Leola Senior Citizens, who have been identified as a vulnerable population, to talk about mitigation process and ask them to complete the survey.

NEIGHBORING JURISDICTION PARTICIPATION

Requirement 201.6(b)(2) Element A2. *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities and agencies that have the authority to regulate development as well as businesses, academia and other private and non-profit interests to be involved in the planning process.*

A2-a. *Does the plan identify stakeholders involved or given an opportunity to be involved in the planning process and how each stakeholder was presented with this opportunity?*

At the beginning of the planning process, an email was sent to all neighboring emergency managers in the counties of: Brown, Edmunds, and Campbell Counties, South Dakota and McIntosh and Dickey Counties in North Dakota giving them opportunity to participate in McPherson County's planning process and provide input on the plan's content. After the plan was drafted, it was emailed to all of the participants and to the emergency managers in the neighboring counties. Everyone who received an email copy of the plan draft was allowed 30 days to comment on the draft.

TECHNICAL REVIEW OF EXISTING DOCUMENTS

201.6(b)(3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Element A4-a. *Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?*

The review and incorporation of existing plans, studies, reports and technical information was completed by the local jurisdictions with assistance from NECOG. Each of the communities were asked to provide a list of existing documents that they have available. Many of the smaller communities do not have measures in place for planning activities, nor do they have staff employed to handle planning measures.

The 2020 Plan was used as a resource for the new plan because most of the natural hazard profile research had already been completed when it was drafted. A summary of the technical review and incorporation of existing plans is included below.

REVIEW OF THE 2020 PLAN

Plan participants reviewed and analyzed the risk assessment and mitigation strategy sections of the plan and new information was included wherever necessary. Much of the information from the 2020 plan was still relevant. The plan author also used the 2022 Local Mitigation Planning Policy Guide, the 2023 Local Mitigation Planning Handbook as well as the 2020 Gap Reports provided by FEMA.

Each of the jurisdictions and all stakeholders at the planning meetings/work sessions were provided information on previous risks, critical infrastructure, mitigation strategies and were asked to review the information and provide any updated information available.

Table 3.4: McPherson County Record of Review (Summary)	
Existing Technical Documents	**Plan Incorporation**
Comprehensive Plan	Development Trends; Intro-Profile
Local Emergency Operations Plan	Assessing Vulnerability
Bridge Plan	NA
City and County Zoning Ordinances	Development Trends
Flood Damage Prevention Ordinance	NFIP Sections
Building Code	Development Trends
Drainage Ordinance	NA
South Dakota State Hazard Mitigation Plan (2024)	Risk Assessment; Hazard Identification
South Dakota Hazard Identification and Risk Assessment (2022)	Risk Assessment; Hazard Identification
South Dakota Drought Mitigation Plan (2015)	Risk Assessment; Hazard Identification
NOAA Storm Events Database	Risk Assessment; Hazard Identification
National Inventory of Dams	Risk Assessment; Hazard Identification
U.S. Drought Monitor	Risk Assessment; Hazard Identification
Existing Land Use maps	Incorporated in Zoning Ordinance
McPherson County Hazmat Plan	NA
Flood Insurance Rate Map (Eureka)	Risk Assessment, Hazard Identification, Mitigation Strategy

Per South Dakota Codified Law, when any local unit of government in South Dakota has not adopted a building code ordinance, the design standard shall be based on the 2021 edition of the International Building Code as published by the International Code Council, Incorporated.

The use of existing policies and technical documents tends to be less involved than what might be seen in larger cities or communities. For instance, while State Law requires that a comprehensive plan be adopted prior to incorporating zoning ordinances, it is common for communities to have outdated comprehensive plans, some dating back to the late 1970's.

IV. HAZARD IDENTIFICATION AND RISK ASSESSMENT

CHANGES/REVISIONS TO RISK ASSESSMENT:
The section was streamlined to list each hazard and the following sub-sections were included under each hazard – hazard description, hazard history, future probability amidst a changing climate and a vulnerability assessment for each hazard.

Presidential disaster declarations were added.

Information on Vulnerable Populations, including social vulnerability was added.

IDENTIFYING HAZARDS

Requirement 201.6(c)(2)(i)*. The risk assessment shall include a description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

> ***Element B1-a.*** *Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?*
> ***Element B1-b.*** *Does the plan include information on the location of each identified hazard?*
> ***Element B1-c.*** *Does the plan describe the extent for each identified hazard?*
> ***Element B1-d.*** *Does the plan include the history of previous hazard events for each identified hazard?*
> ***Element B1-e.*** *Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change on the type, location and range of anticipated intensities of identified hazards?*

IDENTIFYING HAZARDS
A comprehensive list of hazards was evaluated and placed into three separate categories depending on the likelihood of the disaster occurring in McPherson County. Hazards that occur at least once a year or more were placed in the High Probability column; hazards that may have occurred in the past or could occur in the future but do not occur on a yearly basis were placed in the low probability column; and hazards or disasters that have never occurred in the area before and are unlikely to occur in McPherson County any time in the future were placed in the Unlikely to Occur column.

Due to the topographical features of the area and the nature of the natural hazards that affect the geographical area covered by this plan, most areas of McPherson County have similar likelihood of being affected by the natural hazards identified, unless otherwise noted. Only the natural hazards from the High Probability and Low Probability Columns will be further evaluated throughout this plan. Manmade hazards and hazards in the Unlikely to Occur column will not be further evaluated in the plan.

Hazards were identified for this plan in several ways, including: observing development patterns, receiving input from jurisdictions, holding public meetings, public survey, historical occurrences, evaluating previous disaster declarations and consulting the *2024 State Hazard*

Mitigation Plan and *South Dakota Hazard Identification and Risk Assessment 2022, NOAA Storm Events Database, National Inventory of Dams, U.S. Drought Monitor,* and direct outreach to the State Fire Marshal's Office.

Plan participants considered the following hazards but decided not to include them in this analysis because they are unlikely to occur in the area and if they do occur, they rarely cause damage: Earthquakes, Ice Jams, Landslides, Subsidence. They did note that a 3.2 magnitude earthquake was reported in December 2020 just south of McPherson County. On the rare occasion that earthquakes do occur in South Dakota, they rarely cause damage. Other hazards that have never occurred in South Dakota and were not part of this analysis are: avalanches, coastal erosion, coastal storms, hurricanes, tsunamis, and volcanoes.

According to the public survey conducted, 56% of the people responding to the survey said they have been affected by a natural disaster in the last 5 years. Of those impacted, 50% said they had been impacted by Severe Winter Weather; followed by Severe Summer Storms (35%), Strong Winds (33%); Drought (22%); Extreme Temperatures (14%) and Flooding (6%). Less than 5% of the respondents have been negatively impacted by Tornados, Wildfires or Other Natural Disasters. Over 52% said that the natural hazard caused damage to personal property. Twenty-four percent (24%) had to take an alternate route to work, school, etc. and 7% were displaced from their primary residence for more than 3 days due to a natural disaster.

When asked which natural hazards were most likely to occur in their area, respondents ranked the hazards as follows: Strong Winds, Severe Winter Weather, Severe Summer Storms, Drought, Extreme Temperatures, Tornados, Flood and Wildfires.

When asked about mitigation strategies that could reduce impacts from natural hazards, many respondents talked about the need for early warning systems (sirens), snow plowing, notification and alert systems, maintaining electric service, and storm shelters.

Thirty one percent (31%) of respondents did not know where a storm shelter was located in their area. However, ninety-one (91%) of respondents said they have a safe place to go in the event of a tornado – mainly their basement or their neighbor's basement.

Nearly 50% of all survey respondents indicated that they were age 65 and over. This shows the planning team's efforts to reach vulnerable populations in McPherson County (those 65 and over) were successful.

Table 4.1 is a comprehensive list of natural hazards completed by plan participants located within McPherson County.

Table 4.1: Hazards Categorized by Likelihood of Occurrence

High Probability	Low Probability	Unlikely to Occur
Blizzard/Winter Storm	Dam Failure	Avalanche
Drought	Flash Flood	Coastal Storm
Extreme Cold	Flood	Earthquakes
Extreme Heat	Rapid Snow Melt	Hurricane
Freezing Rain/Sleet/Ice	Tornado	Ice Jams
Hail	Urban Fire	Landslides
Heavy Rain	Wildfire	Subsidence

Heavy Snow		Volcanic Ash
Lightning		Volcanic Explosion
Strong Wind		Tsunami
Thunderstorms		
Utility Interruptions**	** Utility interruptions are not a natural hazard but often occur as a result of natural hazards such as ice storms and strong winds.	

Table 4.2: Significant Hazard Occurrences 2014-2023

Type of Hazard	# of Days with Event Since 2014	# of Years	Probability of Future Events, as a %	Source
Blizzards/Winter Storms	25	9		NOAA
Dam Failure	0	0	0	NIV and ADSO
Drought	18	5		NOAA and Drought Monitor
Extreme Cold	25	10		NOAA
Extreme Heat	4	3		NOAA
Flash Flood	2	2		NOAA
Flood	8	4		NOAA
Freezing Rain/Sleet/Ice	4	4		NOAA
Hail	32	10		NOAA
Heavy Rain	1	1		NOAA
Heavy Snow	13	7		NOAA
Lightning	1	1		NOAA
Rapid Snow Melt				
Strong/High Winds	29	9		NOAA
Thunderstorm	26	9		NOAA (Thunderstorm Wind)
Tornado (incl. Funnel Cloud)	4	3		NOAA
Utility Interruption				
Wildfire	122			State Fire Marshal

NATURAL HAZARDS IN THE PLAN JURISDICTION

Descriptions of the natural hazards likely to occur in the Plan Jurisdiction have not been changed from the 2020 version of the McPherson County Natural Hazard Mitigation Plan. For the purpose of consistency throughout the plan, additional definitions were included to reflect all of the hazards that have a chance of occurring in the area and all of the hazards are alphabetized. Information in the plan has been re-organized to include the hazard description, hazard history, future probability, vulnerability assessment under each hazard subheading.

HAZARD PROFILE [§201.6(c)(2)(ii)]

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type of the… location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Most of the hazards identified, such as tornados, severe wind, thunderstorms, hail, winter storms, blizzards, wildfires, etc. have the potential of occurring anywhere in the County. However, certain hazards, such as flooding and dam failure are site specific. Previous occurrences are listed individually by location in Appendix C.

Additionally, the hazard history, including extent (i.e., magnitude or severity) of each hazard, information on previous occurrences of each hazard and the probability of future events (i.e., chance or occurrence) for each hazard are addressed in the following section. While the planning committee reviewed all hazard occurrences that have been reported in the last 10 years, the list for some of the hazards was extremely long. The information provided in the tables is not a complete history, but rather an overview of the hazard events which have occurred over the last ten years. The planning committee felt the hazard trend for the last 10 years could be summarized in this section and decided to include any new occurrences that have taken place since the previous plan was drafted.

There have been 3 presidential disaster declarations related to natural hazards in the last 10 years. They were all either related to flooding, severe summer storms, severe winter weather or tornadoes. There were also 3 presidential disaster declarations related to the COVID-19 pandemic. Table 4.3 has more detailed information on the disaster declarations.

Table 4.3 Presidential Disaster Declarations in McPherson County

Declaration Date	Incident Period	Disaster Dec #	Type	Public Assistance Cost	Individual Assistance Cost
2/1/2017	12/24/2016 - 12/26/2016	4298	Severe Winter Storm	$9,834,694	
6/7/2019	3/13/2019 - 4/26/2019	4440	Severe Winter Storm, Snowstorm and Flooding	$60,762,752	$2,154,577
3/13/2020	1/20/2020 - 5/11/2023	3475	Covid-19 Pandemic		
4/5/2020	1/20/2020 - 5/11/2023	4527	Covid-19 Pandemic	$39,679,727	$9,820,077

8/2/2022	6/11/2022 – 6/14/2022	4664	Severe Storm, Straight-line Winds, Tornadoes and Flooding	$1,642,321	$0

Future Probability was created using historical data when applicable and consideration for future climate change considerations.

Weather patterns can increase in magnitude and frequency due to climate change and its effects on weather patterns. According to Laura Edwards, State of South Dakota Climatologist, weather extremes will become more common as climate change shifts average temperatures upwards. The swings from high to low precipitation will not be as gradual. Winters will become warmer on average as the climate continues to shift.

DAM FAILURE

Hazard Description

Dams function to serve the needs of flood control, recreation, and water management. During a flood, a dam's ability to serve as a control agent may be challenged. An excessive amount of water may result in a dam breach, simply an overflowing. Dams that are old or unstable, dams that receive extreme amounts of water, or dams that get debris pile-up behind their face may result in dam failure, a cracking and/or breaking. The County has nine dams but only one has been identified as a significant hazard, the others are all classified as low-hazard dams.[1]

Dam breach or failure is of lesser concern for the citizens of McPherson County than flooding due to the location of the dams in the County. Dam Failure is usually associated with intense rainfall or a prolonged flood condition (rainy day), or it can occur anytime (clear day). Dam failure can be caused by a variety of sources, to include: faulty design, construction and operational inadequacies, outliving its useful life, intentional breaches, or a flood event larger than the design. The greatest threat from dam failure is to people and property in areas immediately below the dam since flood discharges decrease as the flood wave moves downstream.

In general, Eureka Dam is in reasonably good structural condition. It is, however, seriously inadequate hydrologically because the dam is capable of passing about thirty percent of the Probable Maximum Flood (PMF).

The locations of the dams are found in Table 4.4:

4.4 Dam Locations in McPherson County

Name	Owner	Inspection Date	Hazard Potential	Condition Assessment	Height	Storage
Leola Dam	SD School and Public Lands	10/20/2022	Low	N/A	12 ft	245 acre ft
Eureka Lake	City of Eureka		Significant	N/A	15 ft	594 acre ft
Crompton Lake	SD School and Public Lands	10/20/2022	Low	N/A	20 ft	1,225 acre ft

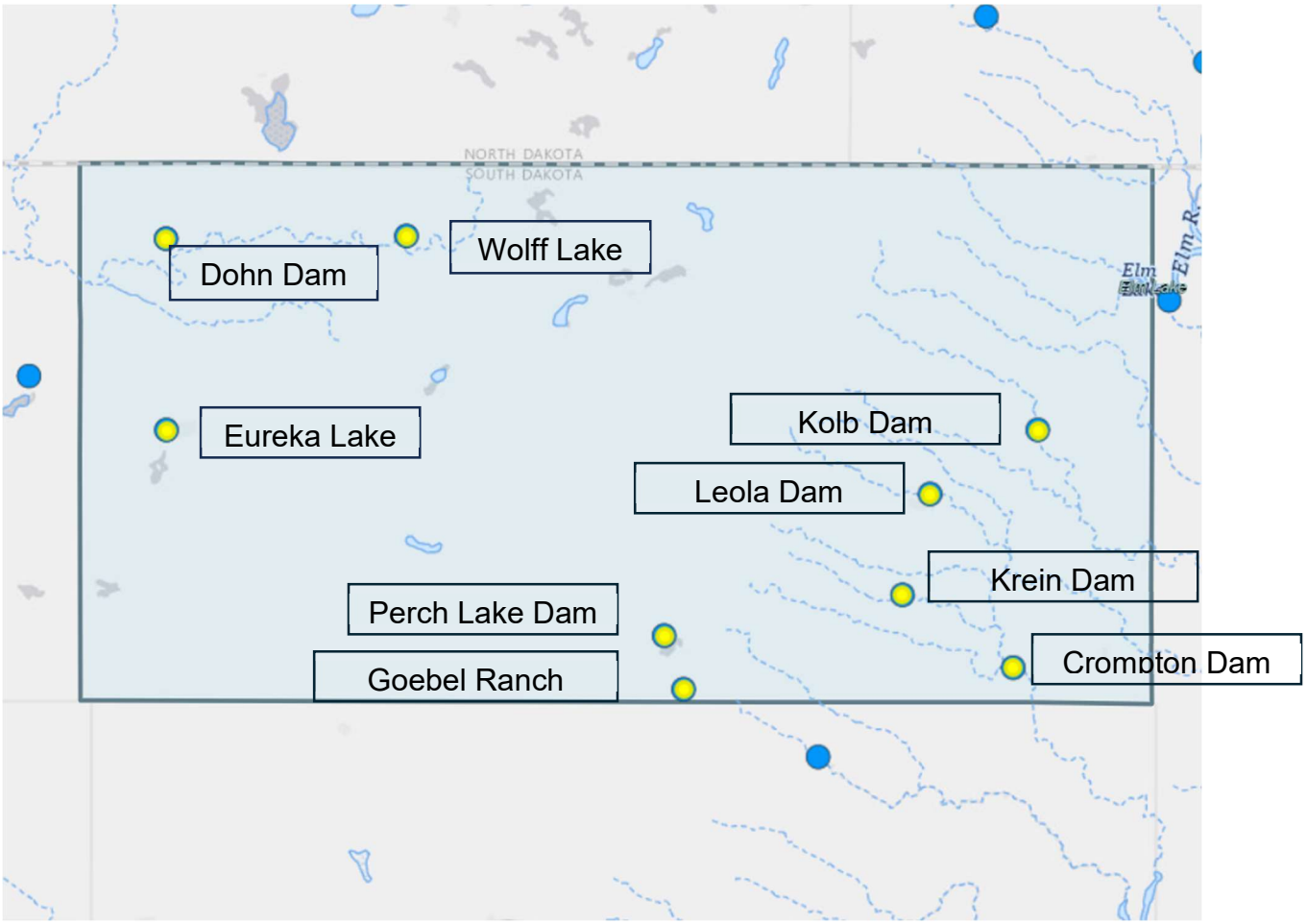
[1] National Inventory of Dams. September 2024.

Wolff Lake	SD School and Public Lands	05/31/2017	Low	N/A	20 ft	285 acre ft
Dohn Dam	Private		Low	N/A	17 ft	153 acre ft
Krein Dam	Private		Low	N/A	10 ft	560 acre ft
Perch Lake Dam	US Fish and Wildlife Service	10/21/2020	Low	Poor	26 ft	472 acre ft
Goebel Ranch Dam	Wetlands American Trust c/o Ducks Unlimited		Low	N/A	12 ft	230 acre ft
Kolb Dam	Private		Low	N/A	9 ft	248 acre ft

National Inventory of Dams

Condition Assessment Definitions	
Satisfactory	No existing or potential deficiencies are recognized
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydraulic and/or seismic events may result in a dam safety deficiency.
Poor	A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary.
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action.
Not Rated	This dam has not been inspected or has been inspected but not rated.

Hazard Potential Definitions
High Hazard dams are those where failure or mis-operation will probably cause loss of human life.
Significant Hazard dams are those where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities or other impacts.



Hazard History

There have been zero dam failures or incidents in McPherson County according to the National Inventory of Dams and the Association of Dam Safety Officials. Other than Eureka Lake, which is located in the town of Eureka, and Leola Dam, which is just north of the town of Leola, the other dams are located in rural areas away from populations centers.

In the public survey, no respondents said that dam failure is likely to occur in their county and no one had been negatively affected by dam failure in the past years.

Future Probability Amidst A Changing Climate

Heavy rainfall is increasing in intensity and frequency across the United States and globally and is expected to continue to increase.[2] These heavy rainfall events increase the risk of dam failure, such as that with the Hiddenwood Dam in Walworth County in 2018 (approximately 13 miles SW of McPherson County). Flooding caused by heavy rains could create situations such as overtopping. Future climate variations could have a greater impact on older dams, whose construction wasn't designed for more intense wet and dry weather patterns.

[2] Wuebbles, D.J., et. Al. 2017: Executive summary. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I U.S. Global Change Research Program, Washington, DC.

The frequency of extreme precipitation events has increased. Since 1990, South Dakota has averaged 22% more 2-inch rain events compared to the long-term average. Annual precipitation is projected to increase, with the largest increases occurring during spring and winter. Increases in the frequency and intensity of extreme precipitation events are also projected, potentially leading to increased runoff and flooding.[3]

Vulnerability Assessment

Most of the dams in McPherson County (other than Eureka Lake and Leola Dam) are in areas where if failure occurred, there would be little damage to people or property. Eureka Lake is considered a significant risk, which is defined as those where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities or other impacts. The classification is based on the potential of downstream consequences of the dam failing, not the condition of the dam. The City of Eureka is not required to have an emergency action plan in the event of a failure.

Vulnerable populations would be those with potential to be impacted by the downstream hazard, such as homeowners or travelers on roadways. Crops and/or pastureland are also vulnerable to a dam failure.

During the risk assessment activity at the planning meetings, participants in all jurisdictions identified that they have a low vulnerability to dam failure, except for the City of Eureka because of the dam that created Eureka Lake. If the dam were to fail, it could cause significant damage to the houses, businesses and infrastructure in Eureka. However, they have recognized that the probability of a failure of this dike is low. Because the Town of Long Lake is not located near any dams, they have identified it is not a hazard to their jurisdiction.

DROUGHT

Hazard Description

According to the 2015 South Dakota Drought Mitigation Plan, drought is a complex and a gradual phenomenon in South Dakota. Although droughts can be characterized as emergencies, they differ from other emergency events in that most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts typically occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.[4]

Drought is an extended period of months or years when a region notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below average precipitation. It can have a substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy. Drought can have a widespread impact on agriculture.

According to the National Weather Service, “Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that

[3] NOAA National Centers for Environmental Information | State Climate Summareis 2022 150-SD
[4] South Dakota Drought Mitigation Plan. 2015.

occurs in virtually all climate zones, from very wet to very dry. Human factors, such as water demand and water management, can exacerbate the impact that drought has on a region." [5]

Generally, this occurs when a region receives consistently below average precipitation. It can have a substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy.

The fact that South Dakota's economy is closely tied to agriculture only magnifies the potential loss which could be suffered by the state's economy during drought conditions. Table 4.5 identifies drought occurrences from the past 23 years.

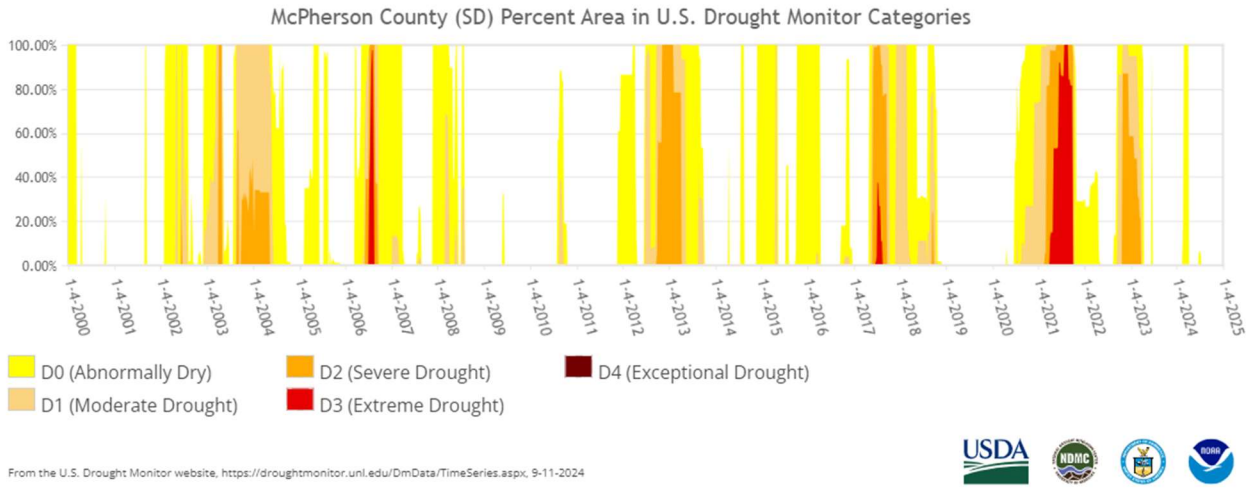
The U.S. Drought Monitor measures the extent of a drought using the Drought Intensity on a Scale:

Drought Category System
D0 – Abnormally Dry
D1 – Moderate Drought
D2 – Severe Drought
D3 – Extreme Drought
D4 – Exceptional Drought

Hazard History

Table 4.5 25 Year Drought History 2020-2023 Number of Years with at least One Drought Category					
Location	**D0**	**D1**	**D2**	**D3**	**D4**
McPherson	20	11	7	3	0

US Drought Monitor Time Series. 2024.



US Drought Monitor Time Series. 2024.

[5] https://www.weather.gov/safety/drought. September 2024.

Table 4.6 Hazard History and Future Probability					
Event Type	**Abnormally Dry**	**Moderate Drought**	**Severe Drought**	**Extreme Drought**	**Exceptional Drought**
Number of Years with Event	20	11	7	3	0
Years of Data	24	24	24	24	24
Probability of Future Event in Any Given Year	83%	46%	29%	13%	0%
Probability Calculation	20/24 = 83%	11/24 = 46%	7/24 = 29%	3/24 = 13%	0/24 = 0%

In the public survey, Drought was ranked as the 4th most likely hazard to occur in McPherson County and 21% of respondents had been negatively affected by drought in the past ten years.

Major drought occurrences:

2017 – McPherson County experienced drought in the summer and through the Fall of 2017. Most of the counties across central and north central South Dakota had enacted burn bans due to the very high to extreme fire danger. Many counties, including McPherson, issued drought declarations with the Governor declaring a statewide drought emergency. The South Dakota Drought Task force was also activated. During that period, much of central and northern South Dakota had only received 50 to 75 percent of normal precipitation. McPherson County enacted a burn ban in June 2017.

2021 – McPherson County and much of South Dakota experienced drought from April – October 2021. The Grassland Fire Danger reached high to very high several times with a handful of grass fires occurring. Pasture and range conditions and livestock water sources were rated very poor in quality. Statewide, South Dakota recorded its 4th warmest and its driest June since record keeping began in 1895. Impacts from the ongoing and worsening drought include below to much below normal stream flows, entirely dry or very low stock ponds, creeks and marshes, and fire danger increased due to fuels that had begun to be or had already completely cured. Additionally, crop and pasture and range conditions had been rated poor to very poor across the board. South Dakota governor declared a statewide state of emergency for drought conditions, and the USDA designated several counites as primary natural disaster areas. Many comparisons were made to the 1988 drought. Historically dry fuels were observed in central and north central South Dakota, with ERC/Energy Release Components above the 90th percentile (ERC-measure of the fuel moisture related to potential fire intensity).

A strong possibility exists for simultaneous emergencies during droughts. Wildfires are the most common.

A history of Drought conditions can be found in Appendix C.

Future Probability Amidst A Changing Climate

The intensity of droughts is projected to increase. Droughts are a natural part of the climate system, and because the projected precipitation increases are expected to occur during the cooler months, South Dakota will remain vulnerable to periodic drought. Increases in

evaporation rates due to rising temperatures may increase the rate of soil moisture loss and the intensity of naturally occurring droughts.[6]

Vulnerability Assessment

South Dakota's economy is closely tied to agriculture which magnifies the potential loss which could be suffered by the state's economy during drought conditions. The agriculture sector is severely affected by the lack of vegetation and water for livestock. Crop and pasture yields can be greatly diminished during periods of drought. All of McPherson County is very dependent on agriculture, both livestock and crop production.

South Dakota's Drought Mitigation Plan states that a decrease in the amount of precipitation can adversely affect stream flows and reservoirs, lakes, and groundwater levels. With the lower levels of moisture caused by drought, the chance of wildfire increases. Drought can also impact many factors, both directly and indirectly. These factors include higher water and food prices, water restrictions, air and water quality, and restricted access to recreational areas.

Increased dust is associated with droughts. Older adults (31% of McPherson County residents are 65 or older) are more susceptible to air pollution such as dust, making them more vulnerable to drought than the general population.

During the risk assessment activity at the planning meetings, participants in all counties identified that they are moderately vulnerable to drought. While it may not occur every year, drought can be devastating to the agricultural economy, damaging crops and grass available for livestock, as well as the local economies that depend on agriculture and farmers/ranchers to keep the economy growing. Small businesses in rural areas can be greatly impacted by drought if farmers/ranchers aren't spending money at these small businesses.

EXTREME TEMPERATURES

Hazard Description

Extreme temperatures in McPherson County are common occurrences.

Extreme Cold - What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered "extreme cold," however, northern South Dakota is prone to much more extreme temperatures than other areas in the country. Temperatures typically range between zero to 100 degrees Fahrenheit, so extreme cold could be defined in the McPherson County planning jurisdiction as temperatures below zero.

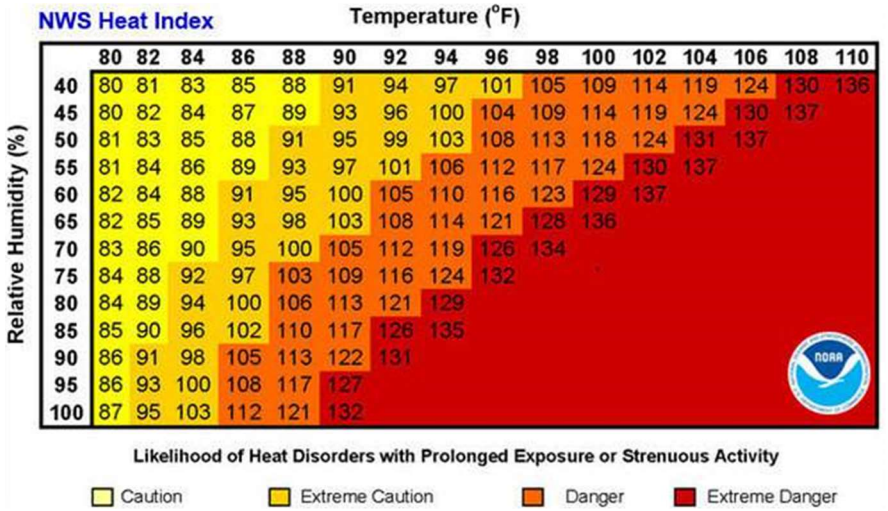
Extreme Cold temperatures often accompany a winter storm, so power failures and icy roads are common occurrences. Whenever temperatures drop decidedly below normal and as wind speed increases, heat can leave the body more rapidly. These weather-related conditions may lead to serious health problems.

Extreme Heat, also known as a heat wave, is a prolonged period of excessively hot weather, which may be accompanied by high humidity. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high

[6] State Climate Summaries. 2022. NOAA National Centers for Environmental Information. HTTPS://STATESUMMARIES.NCICS.ORG/CHAPTER/SD/

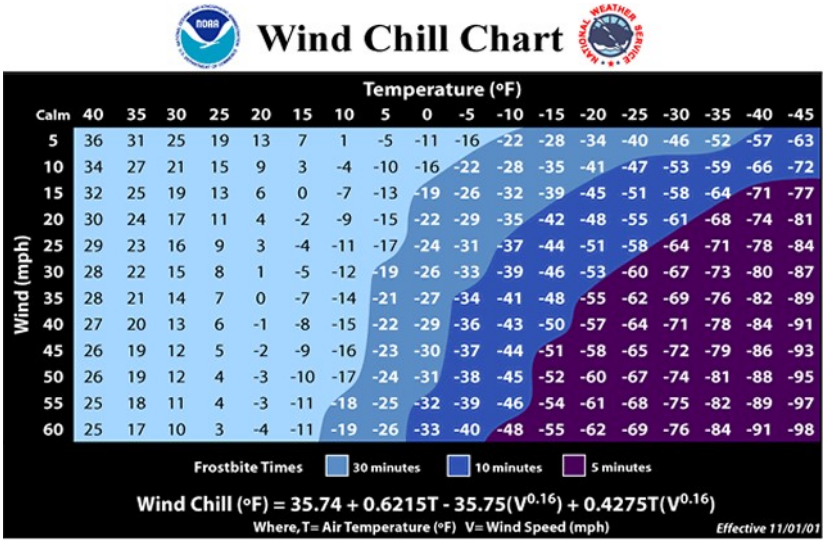
temperature for the region and last for several weeks. Temperatures in McPherson County have a very wide range typically between zero to 100 degrees Fahrenheit, therefore anything outside those ranges could be considered extreme. The term is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century.

Extreme temperatures in McPherson County are common occurrences. The information was found on the NOAA website and can be found in Appendix C. It is possible that people in the area



Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

have adapted to this type of extreme temperatures and thus such weather events are not reported as often as they occur. It is also possible that the information has only in recent years been tracked or reported.



Wind (mph)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Hazard History

Table 4.7 Hazard History and Future Probability		
Event Type	**Extreme Cold**	**Extreme Heat**
Number of Days with Event	25	4
Number of Years with Event	10	3
Years of Data	10	10
Possible Number of Days with Event per Year	2.5	.4
Occurrence Calculation	25/10 = 2.5	4/10 = .4
Probability of Future Event in Any Given Year	100%	30%
Probability Calculation	10/10 = 100%	3/10 = 30%

In the public survey, Extreme Temperatures were ranked as the 5th most likely hazard to occur in McPherson County and 14% of respondents had been negatively affected by Extreme Temperatures in the past ten years.

Extreme Cold History
January 2014 - The coldest air in recent history moved into the region during the early morning hours of the 5th and continued into the afternoon hours of the 6th. The combination of sub-zero temperatures with north winds produced dangerously cold wind chills from 40 below to around 55 degrees below zero. Winds gusted to over 40 mph at times. Several area activities were cancelled, as well as many schools on Monday the 6th. Some of the coldest wind chills include: 51 below in Leola.

December 2017/January 2018 - Extreme wind chills which began on December 30, 2017 across central and northeast South Dakota continued into January 1, 2018. Wind chills of 35 to near 55 degrees below zero occurred off and on during this time. Record lows set on the morning of January 1st were in the 30s below zero with even some 40s below zero. Temperatures did not respond well for daytime highs on January 1st as several record low highs in the single digits below zero occurred. Some of the most bitter wind chills on the 1st include minus 45 degrees at Eureka.

January 2019 - Following in behind a high wind/blizzard event, bitter cold arctic air along with northwest winds brought extreme wind chills to north central and northeast South Dakota. The extreme wind chills began during the morning hours of the 29th and continued through the morning hours of the 31st. Many record lows and record low maximums were set mainly on the 30th. Highs were in the teens below zero on the 30th across the east. Some of the record low temperatures were 37 degrees below zero at Eureka.
.
Most schools along with college campuses and businesses across the region had late starts or cancelled classes for two days. Mail service was also cancelled. Extreme wind chills from 35 degrees below to near 60 degrees below zero occurred. Some of the lowest wind chills include 47 degrees below zero at Aberdeen; 54 degrees below zero at Watertown; and 59 degrees below zero at Sisseton.

February 2019 - Arctic air brought extreme wind chills to central and northeast South Dakota from the early morning to around noon on the 8th. Wind chills ranged from 35 degrees below

zero to nearly 50 degrees below zero. Many activities were cancelled and schools started late or closed for the day. Some of the lowest wind chills included 47 degrees below Eureka.

March 2019 - Extremely cold arctic air dominated the weather across central and northeast South Dakota from the late evening of the 2nd through the morning of the 3rd. Record lows in the teens below and 20s below zero were set across the region. Most of the record lows shattered the previous record lows by 5 to 10 degrees. In fact, Britton in northeast South Dakota fell to 29 degrees below zero breaking the old record of 19 degrees below zero.

The arctic cold along with north winds brought dangerously cold wind chills ranging from 35 below zero to near 55 below zero across the region. Some of the extreme wind chills included 49 degrees below at Eureka.

February 2021 – A potent and persistent outbreak of Arctic air affected the entire region from February 6th through the 17th. The coldest days of the outbreak for many occurred Valentine's Day weekend, when high temperatures averaged around ten below zero, in northeastern South Dakota, to the single digits above zero, in central South Dakota. On February 14th, low temperatures dropped into the 20s to the 30s degrees below zero range. Extreme wind chills of 35 degrees to 55 degrees below zero also occurred on several days during the outbreak. The magnitude of the cold during this outbreak was fairly rare compared to the past 50 years, at least in terms of the persistence of the Arctic air. This was especially impressive considering the lack of deep, fresh snow cover across most of the area. If there had been widespread deep, fresh snowpack ahead of this Arctic outbreak, low temperatures would have been more severe and more often approaching record territory.

Impacts from this extreme and persistent cold include many frozen and/or broken water pipes (the limited snow depth did not help in this regard) and froze-over home sewer vents, dead vehicle batteries, school delays, and church cancellations. The prolonged cold caused significant strains to the power grid as demand spiked both locally and across several other states. Thousands of customers were at least briefly without power locally, particularly during the morning of Feb 16th. Concerns for rolling blackouts lingered for several days in this regard due to the continued extreme demand/strain, and people were repeatedly asked to conserve energy however possible.

December 2022 - A series of Arctic air masses crossed the region over period of 6 days beginning on Sunday, December 18th. Temperatures failed to even reach 5 degrees above zero during this period, with temperatures consistently dropping into the teens below zero at night. An unusually potent blast of cold air for December followed in behind a reinforcing Arctic front Tuesday night, December 20th, into Wednesday, December 21st, along with a trace to as much as 2 to 3 inches of new snowfall on top of the pre-existing snowpack. High temperatures on the 22nd were as cold as -12 F in Watertown and -10 F in Aberdeen and Mobridge. Wind gusts of 35 to 55 mph behind this front impacted the region from the 21st through the 23rd, resulting in an extended period of life-threatening wind chills in the -35 to -60 degree F range and ground blizzard conditions for many. The coldest measured wind chills from the 21st into the 22nd include -minus 59 F at Eureka; the coldest on the 23rd include minus 52 F at Eureka.

The extreme cold made the threat to stranded motorists even more dangerous, as numerous roads became impassable. Nearly the entire state was shut down, for the second time this December, as roads were either deemed No Travel Advised or closed by the SDDOT.

Numerous vehicle accidents and rescues occurred, and numerous schools closed throughout the event.

Extreme Heat History

July 2016 - A very warm and abnormally large upper-level high pressure area along with high dew points brought high heat indices to central and northeast South Dakota. High temperatures were in the upper 80s to the 100s with overnight lows in the upper 60s to the mid-70s. A few of the highest heat index values include: 110 degrees at Eureka.

July 2022 - Hot temperatures in the 90s and lower 100s, along with dew point temperatures in the 60s and lower 70s, produced heat indices of 100 to near 110 degrees during the afternoon of July 18th. Some activities were postponed or canceled due to the heat.

August 2022 - Hot and humid air with highs in the 90s and dewpoints around 70 degrees set up across central and eastern South Dakota during the day Friday. This was just ahead of a front that was slowly migrating southeast, though the frontal passage brought little relief as temperatures on the north side of the front still topped out close to the century mark, with dewpoints remaining in the 60s. Morning lows both Friday and Saturday remained in the 70s for most of the area. Over 70 weather stations in central, north central and northeast South Dakota reporting a heat index of 100 degrees or higher at some point during the day.

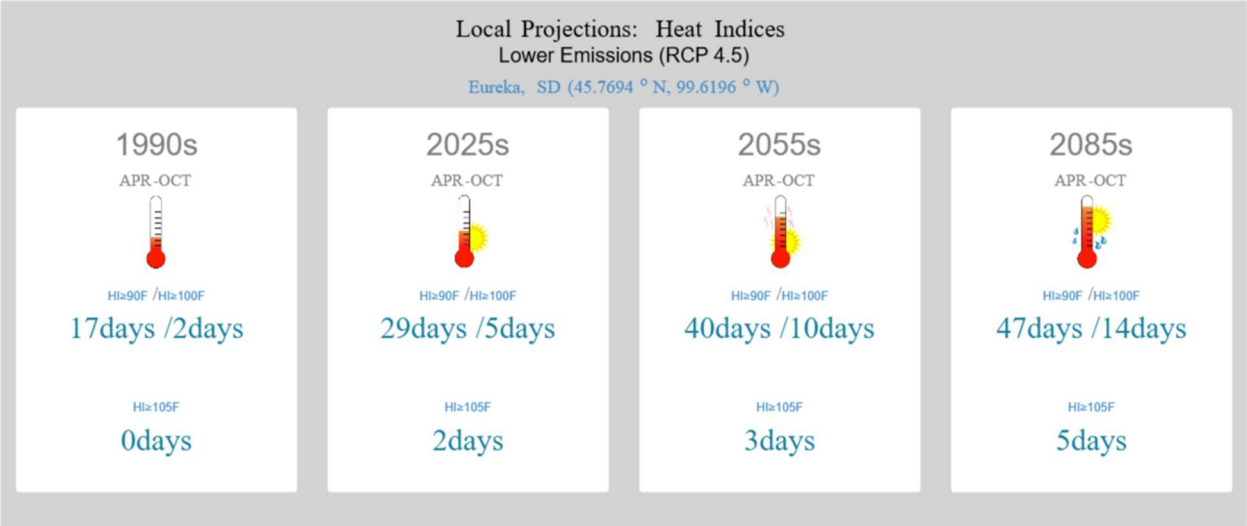
August 2024 - Another hot and humid airmass moved into the region in late August. 30 weather stations across 16 counties in central and northeast South Dakota reporting a heat index above 105 degrees that afternoon. This was thanks to temperatures in the upper 90s and dewpoints up to 80 degrees. Aberdeen would also see a record warm low temperature of 75 degrees that morning.

Future Probability Amidst A Changing Climate

Extreme temperatures in the contiguous United States are projected to increase even more than average temperatures (very high confidence). Both extremely cold days and extremely warm days are expected to become warmer. Cold waves are predicted to become less intense while heat waves will become more intense.[7]

According to The Climate Toolbox, the number of days with a Heat Index over 90F is expected to increase in the future. [8]

[7] Wuebbles, D.J., et. Al. 2017: Executive summary. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I U.S. Global Change Research Program, Washington, DC.
[8] The Climate Toolbox. https://climatetoolbox.org/tool/Future-Climate-Dashboard. Accessed 11/27/2024.



The Climate Toolbox also predicts that average winter temperatures will also increase and that the average coldest temperature will also increase in the future. [9]

Vulnerability Assessment

Extreme cold is a dangerous situation that can bring on health emergencies for susceptible people, such as those without shelter or who are stranded, or who live in a home that is poorly insulated or without heat. Exposure is the biggest threat/vulnerability to human life; however, incidences of exposure are isolated and thus unlikely to happen.

Severe heat waves have caused catastrophic crop damage, thousands of deaths from hyperthermia, and widespread power failures due to increased use of air conditioning. Loss of power, crop damage and harm to livestock are the largest vulnerability to the county during extreme heat. All have an effect on quality of life, however, neither are detrimental to the existence of the population in McPherson County.

[9] The Climate Toolbox. https://climatetoolbox.org/tool/Future-Climate-Dashboard. Accessed 11/27/24.

During the risk assessment activity at the planning meetings, participants identified that extreme temperatures are highly likely to occur and that they have a medium vulnerability to extreme temperatures.

The elderly and those without central air conditioning or adequate furnaces can be the most vulnerable to extreme temperatures. Thirty one percent (31%) of McPherson County's population is over 65. According to Headwaters Economics *Populations at Risk*, age is the single greatest risk factor related to illness or death from extreme heat.[10]

The agricultural sector, especially livestock, can be particularly vulnerable to extreme temperatures. However, cattle do have the ability to acclimate to changing environmental conditions. During periods of extreme cold, livestock can be particularly impacted during heavy snow or freezing rain conditions where their hides get and remain wet. Heat stress in livestock is dependent on nigh time temperatures. Animals that don't cool sufficiently at night are candidates for increased heat loads the following day.[11]

FEMA's National Risk Index shows that there is a Relatively High Risk Index for Cold Waves and a Relatively Low Risk Index for Heat Waves.

FLOOD (including Rapid Snow Melt and Heavy Rain)

Flooding is a temporary overflow of water onto lands not normally covered by water. Flooding submerges land, produces measurable property damage, or forces evacuation of people and vital resources. Floods can result in injuries and even loss of life when quickly moving water is involved. Six inches of moving water is enough to sweep a vehicle off a road. Disruption of communication, transportation, electric service, and community services, along with contamination of water supplies and transportation accidents are very possible. Floods can develop slowly as rivers swell during an extended period of rain, or during a warming trend following a heavy snow. Even a very small stream or dry creek bed can overflow and create flooding. Two different types of flooding hazards are present within McPherson County.

1. Inundation flooding occurs most often in the spring. The greatest risks are realized typically during a rapid snowmelt before ice is completely off all of the rivers. Flooding is a longer event than flash flooding. Flooding can last for days to weeks.

2. Flash Flooding typically occurs during the summer months. This flooding is primarily localized, though enough rain can be produced to cause inundation flooding in areas along rivers and streams or in town if the storm sewer system cannot handle the rainfall. Heavy, slow-moving thunderstorms often produce large amounts of rain. The threat of flooding is increased during times of high soil moisture. In addition, debris carried by water can significantly compromise the effectiveness of otherwise adequately designed bridges, dams, culverts, and other structures. Flash flooding is typically a shorter event than inundation flooding.

3. Heavy Rain is defined as precipitation falling with intensity in excess of 0.30 inches (0.762 cm) per hour. Short periods of intense rainfall can cause flash flooding while longer periods of widespread heavy rain can cause rivers to overflow.

[10] Headwaters Economics. Populations at Risk. 2024.

[11] SDSU Extension: Cold Stress Impacts on Cattle and Heat Stress Impact on Cattle

Floods present a risk to life and property, including buildings, their contents, and their use. Floods can affect crops and livestock. Floods can also affect lifeline utilities (e.g., water, sewer, and power), transportation, jobs, tourism, the environment, and the local and regional economies. The impact of a flood event can vary based on geographic location to waterways, soil content and ground cover, and construction. The extent of the damage of flooding ranges from very narrow to widespread based on the type of flooding and other circumstances such as previous rainfall, rate of precipitation accumulation, and the time of year.[12]

Table 4.8 Flood Recurrence Intervals	
Intervals	**Percentage**
10 years	10% probability of occurring in any given year
25 years	4% probability of occurring in any given year
50 years	2% probability of occurring in any given year
100 years	1% probability of occurring in any given year
500 years	0.2% probability of occurring in any given year

Flood recurrence intervals: statistical expectation of inundation frequency (SD Enhanced Mitigation Plan 2024).

Hazard History

Table 4.9 Hazard History and Future Probability			
Event Type	**Flash Flood**	**Flood**	**Heavy Rain**
Number of Days with Event	2	8	1
Number of Years with Event	2	4	1
Years of Data	10 (2014-2023)	10 (2014-2023)	10 (2014-2023)
Possible Number of Days with Event per Year	0.2	0.8	0.1
Occurrence Calculation	2/10 = 0.2	8/10 = 0.8	1/10 = 0.1
Probability of Future Event in Any Given Year	20%	40%	10%
Probability Calculation	2/10 = 20%	4/10 = 40%	1/10 = 10%

In the public survey, Flooding was ranked as the 7th most likely hazard to occur in McPherson County and 6% of respondents had been negatively affected by Flooding in the past ten years.

McPherson County has been a part of a number of past flooding events that have hit the region.

May 2018 - An extreme rainfall event/severe weather occurred and dumped between 4 – 13 inches of rain over McPherson County causing flash flooding. The system also brought high winds and golf ball sized hail. This is the same storm event that resulted in the failure of Hiddenwood Dam in Walworth County, about 13 miles SW of McPherson County. Many roads and cropland were flooded and damaged. Several roads had to be barricaded. There was some sandbagging at some farmsteads with several homes receiving water in their basements.

[12] 2024 State of SD Enhanced Hazard Mitigation Plan

The South Dakota governor requested a Presidential Disaster Declaration for Campbell, Walworth, and McPherson counties. The total estimated damage in all three counties was $3,115,000.

Some extreme rainfall amounts include, 3.96 inches at Eureka, 6.17 inches 11 miles southwest of Eureka, 6.70 inches 5 miles west of Hillsview, 8 inches 5 miles west of Long Lake, 9 inches at Long Lake, 9.5 inches 4 miles north northwest of Long Lake, and 13.15 inches 3 miles northwest of Long Lake.

Severe weather with hail up to the size of golf balls along with winds gusting to near 80 mph also brought damage to parts of central and north central South Dakota. The city of Eureka reported significant roof and property damage due to large hail.

Spring 2019 - The winter of 2018-2019 had heavy snowfall totals and the snowstorms continued into the Spring of 2019. The high snowfall and resulting melting contributed to flooding in the County. On March 30, County Road 23, two miles south of Highway 10 went underwater and was closed. All counties declared emergencies/disasters in March and April due to the widespread flooding and March blizzard. South Dakota's governor declared a disaster for the state in March. This declaration was followed by a disaster declaration by the President of the United States.

July 2020 - Heavy rains caused the flooding of several secondary roads in southeast McPherson County near the Long Lake Colony. One car stalled after driving into a flooded road.

A complete 10-year history of Flooding can be found in in Appendix C.

Future Probability Amidst A Changing Climate

The *South Dakota State Hazard Mitigation Plan 2019* points out that the special flood hazard areas are expected to increase nationwide by as much as 40%-50% over the next 100 years. This is attributed not only to the increase in precipitation but also to the increased urbanization of areas.

The frequency of extreme precipitation events has increased. Since 1990, South Dakota has averaged 22% more 2-inch rain events compared to the long-term average.[13]

The Northern Great Plains region is expected to see an increase in less frequent but more extreme precipitation events accompanied by longer periods without precipitation. Flooding is more likely to occur when drier soils are inundated with heavy amounts of water. As the region sees drier conditions with periods of extreme precipitation, it is more likely the amount of flash flooding events will also increase. Precipitation amounts vary from season to season. Over the past decades, general precipitation has increased throughout the United States. The season with the greatest increase was fall, which has had an increase of 15% since the twentieth century. The winter months and summer months have shown a negative percent change over time, in some areas as much as -5% to -10%.[14]

Vulnerability Assessment

[13] State Climate Summaries. 2022. NOAA National Centers for Environmental Information. HTTPS://STATESUMMARIES.NCICS.ORG/CHAPTER/SD/

[14] Wuebbles, D.J., et. Al. 2017: Executive summary. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I U.S. Global Change Research Program, Washington, DC.

During the risk assessment activity at the planning meetings, there were varying results about vulnerability to flooding within the County. Participants noted that flooding and flash flooding had a low probability of occurring in the County.

Floods can result in injuries and even loss of life when quickly moving water is involved. Six inches of moving water is enough to sweep a vehicle off a road. Disruption of communication, transportation, electric service, and community services, along with contamination of water supplies and transportation accidents are very possible.

Heavy Rain causes damage to property such as homes and roads. Often when heavy rains occur in McPherson County it causes sewers to back up in homes due to excess water entering the wastewater collection lines. The excess water sometimes has no place to go and thus basements fill up with water which results in damage to water heaters, furnaces, and damage to living quarters for people who live in basement apartments. Storm sewers are built for the typical storm and therefore do not accommodate for excessive or heavy rains. Roads and bridges can be washed out, thus causing traffic hazards for travelers and commuters. Many times the roads have to be closed causing rural traffic to have to take alternate routes which can sometimes be an additional 5-10 miles out of the way. All areas of the County are vulnerable when heavy rains occur.

NATIONAL FLOOD INSURANCE PROGRAM PARTICIPATION

Requirement: 201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

> ***Element C2-a.*** *Does the plan contain a narrative description or a table/list of their participation activities?*

To be a participating community in the National Flood Insurance Program (NFIP), the community must complete an application, adopt a resolution of intent to participate and cooperate with FEMA, and adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria. The floodplain management ordinance must also adopt any Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map (FHBM) for the community.

Eureka is the only city in McPherson County that participates in the National Flood Insurance Program. The County and all the other jurisdictions do not participate in the National Flood Insurance Program. Eureka has an identified Flood Hazard Boundary Map (FHBM) from 1978.

Training and information on NFIP have not been passed down as positions have turned over. Since Eureka faces a lack of information and training, they have committed to adding a mitigation strategy to improve their knowledge of, and capacity to implement, the NFIP program.

NFIP Policies and Claims

Requirement: 201.6(c)(2)(ii)): *Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods?*

> ***Element B2-C.*** *Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?*

There are zero NFIP policies in place in McPherson County. There has never been a claim filed or any repetitive loss properties or severe repetitive loss properties under the NFIP program in McPherson County.

Table 4.10 NFIP Participation						
Community Name	**Curr Eff Map Date**	**Entry Date**	**Flood Zone or NSFHA**	**Implementation Designee**	**Adoption of Floodplain Ordinance** **Implementation/ Enforcement**	**Description of Community Assistance** **Substantial Damage/Improvement Provisions**
Communities Participating in the NFIP						
Eureka	10/01/1986 (L)	10/1/1986	Partial Zone A (around Lake); Majority of City is NSFHA	Finance Officer	The City adopted the floodplain ordinance in 1985. The City owns all of the land located in the floodplain.	The City of Eureka has been a part of the NFIP since 1986. They will enforce development in floodplain areas as necessary. New construction or substantial improvements must have lowest floor at BFE
Communities Not Participating in the NFIP						
McPherson County						
Leola						
Long Lake						
Wetonka						
Hillsview						
(L) Original FIRM by Letter NSFHA – No Special Flood Hazard Area						

Community Rating System Program

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP, and
3. Encourage a comprehensive approach to floodplain management.

CRS is voluntary and up to each community. None of the jurisdictions within McPherson County participate.

SUMMER STORMS (including Hail, Lightning, Thunderstorm Winds)

Hazard Description

Summer Storms are generally defined as atmospheric hazards resulting from changes in temperature and air pressure which cause thunderstorms that may cause hail, lightning, strong winds, and tornados. Summer storms are considered a weather event rather than a natural hazard; therefore, summer storms are not evaluated as a natural hazard throughout this plan.

Hail is formed through rising currents of air in a storm. These currents carry water droplets to a height at which they freeze and subsequently fall to earth as round ice particles. Hailstones usually consist mostly of water ice and measure between 5 and 150 millimeters in diameter, with the larger stones coming from severe and dangerous thunderstorms.

Lightning results from a buildup of electrical charges that happens during the formation of a thunderstorm. The rapidly rising air within the cloud, combined with precipitation movement within the cloud, results in these charges. Giant sparks of electricity occur between the positive and negative charges both within the atmosphere and between the cloud and the ground. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity, known as lightning. Lightning bolts reach temperatures near 50,000˚ F in a split second. The rapid heating and expansion, and cooling of air near the lightning bolt causes thunder.

The extent or severity of lightning can range from significant to insignificant depending on where it strikes and what structures are hit. Water towers, cell phone towers, power lines, trees, buildings, and other structures all have the possibility of being struck by lightning. People who leave shelter during thunderstorms to watch or follow lightning also have the possibility of being struck by lightning.

Thunderstorms are formed when moisture, rapidly rising warm air, and a lifting mechanism such as clashing warm and cold air masses combine. The three most dangerous items associated with thunderstorms are hail, lightning, and strong winds. Thunderstorms and high wind occurrences in the County are also very common. Appendix C denotes the extent and severity of such hazards. The County continues to educate residents of the dangers of such storms through public service announcements and other printed media.

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.15 below shows the hailstone measurements utilized by the NWS.

Table 4.11 Hail Severity		
Hail Diameter (inches)	**Description**	**Severity**
1/4”	Pea	Non-Severe Hail Does not typically cause damage and does not warrant severe thunderstorm warning from NWS.
1/2”	Marble/mothball	
3/4”	Penny	
7/8”	Nickel	
1” (severe)	Quarter	Severe Hail Research has shown that damage occurs after hail reaches around 1” diameter and larger. Hail of this size will trigger a severe thunderstorm warning from NWS.
1 1/4”	Half Dollar	
1 1/2”	Walnut/Ping Pong Ball	
1 3/4”	Golf Ball	
2”	Hen Egg/Lime	
2 1/2”	Tennis Ball	
2 3/4”	Baseball	
3”	Teacup/Large Apple	
4”	Softball	
4 1/2”	Grapefruit	

Source: 2024 State Mitigation Plan and NWS.

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the NWS to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. All areas of McPherson County are at risk of experiencing lightning in any of these categories. The LAL is reproduced in Table 4.17.

Table 4.12 Lightning Activity Level	
Scale	**Description**
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning

Lightning is common in this county; it is evident that the information reported on the NOAA Storm Event Database is inaccurate and incomplete as it only shows one lightning incident in the past ten years. That one incident did result in lightning striking a garage and putting a hole in the garage roof. NOAA only counts lightning strikes that were significant enough in some way to be reported; the actual number of lightning strikes is undoubtedly far higher. Earth Networks tracks lightning data and Table 4.18 shows the number of lightning pulses that occurred in the area in 2020.

The complete history of summer storm hazards can be found in Appendix C.

Table 4.13 Hazard History and Future Probability			
Event Type	**Hail**	**Lightning***	**Thunderstorm Wind**
Number of Days with Event	32	1	26
Number of Years with Event	10	1	9
Years of Data	10 (2014-2023)	10 (2014-2023)	10 (2014-2023)
Possible Number of Days with Event per Year	3.2	0.1	2.6
Occurrence Calculation	32/10 = 3.2	1/10 = 0.1	26/10 = 2.6
Probability of Future Event in Any Given Year	100%	100%*	90%
Probability Calculation	10/10 = 100%		9/10 = 90%

Earth Networks prepared a 2020 Lightning Report that included lightning data for South Dakota throughout 2020. A lightning pulse is a surge of electric current in lightning usually accompanied by a burst of light. Pulses are classified as In-cloud (IC) or Cloud-to-Ground (CG). Total number of thunder days in each county (the total number of days in the year when lightning was detected by ENTLN) are also included. The period covered is January 1, 2020 to December 31, 2020.

Table 4.14 Total Lightning Pulses		
County	**Total Lightning Pulses**	**Total Thunder Days**
McPherson	157,646	48

In the public survey, Summer Storms were ranked as the 3rd most likely hazard to occur in McPherson County and 35% of respondents had been negatively affected by Summer Storms in the past ten years.

Obviously, with such a high number of occurrences it is reasonable to expect that at least some property or crop damage was sustained in the communities during some of the occurrences, even though the damage may not have been reported or recorded. Hail is common for this region during the spring, summer, and fall and causes thousands of dollars of damage every year. Unfortunately, the total damages for each event are not available but hopefully in the near future a method for collecting this data will evolve so that it can be made available to local governments for mitigation planning.

The City of Eureka reported significant damage to roofs and other property due to large hail in a May 2018 storm that generated 1.75-inch diameter hail. Another storm in Eureka in September 2018 with the same size hail resulted in reports of broken windows from hail damage.

Future Probability Amidst A Changing Climate

As the atmosphere warms further due to climate change, the increased heat in the atmosphere provides more energy for severe storms. The frequency of severe weather events has increased steadily over the last century. The number of weather- related disasters during the 1990s was four times that of the 1950s and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate.[15]

Vulnerability Assessment

During the risk assessment activity at the planning meeting, participants identified that they have a medium to high vulnerability to summer storms and corresponding hazards such as hail, heavy rain, lightning, and thunderstorms.

Warning time for summer storms is normally several hours, sufficient for relocation and evacuation if necessary. However, tornadoes may occur with little or no warning.

Hail causes damage to property such as crops, vehicles, windows, roofs, and structures. McPherson County is vulnerable to hail, like most other areas in the State due to the nature of the hazard. Mitigating for hail is difficult and is usually found in the form of insurance policies for structures, vehicles, and crops.

Lightning often strikes the tallest objects within the area. Water towers, cell phone towers, power lines, trees, and common buildings and structures all have the possibility of being struck by lightning. In towns trees and poles often receive the most strikes. In rural areas, shorter objects are more vulnerable to being struck. Electrical lines and poles are also vulnerable because of their height and charge. In addition, many streetlights function with sensors. Since thunderstorms often occur during hours of darkness, lightning strikes close to sensored lights cause the lights to go out, causing a potential hazard for drivers. Flickering lights and short blackouts are not at all uncommon in the county.

One of lightning's dangerous attributes includes the ability to cause fires. Since the entire county is vulnerable to lightning strikes and subsequent fires, these fires will be treated under the fire section of this plan.

Often associated with summer storms are utility problems. Electrical transmission lines are susceptible to breaking during high winds and hail. Tall trees located near electrical lines can be broken in wind or by lightning strikes and land on electrical lines, severing connections. Any electrical complications bring associated risk of food spoilage, appliance burnout, loss of water, and potential harm to in-house life support dependents. Limited loss of power is common on an annual basis. Typical power interruptions last around 1 to 3 hours. Most residents are prepared to deal with this.

Lightning strikes are known to cause wildfires.

[15] State of South Dakota Hazard Mitigation Plan. 2024.

Thunderstorms cause lightning and sometimes large amounts of rain in a small timeframe. The entire county experiences thunderstorms on a regular basis and is only vulnerable when weather events outside the norm occur.

TORNADO

Hazard Description

Tornados are violent windstorms that may occur singularly or in multiples as a result of severe thunderstorms. They develop when cool air overrides warm air, causing the warm air to rapidly rise. Many of these resulting vortices stay in the atmosphere, though touchdown can occur.

Tornados occur most often in South Dakota during the months of May, June, and July. The greatest period of tornado activity (and actually all of the tornadoes in the last ten years) is from 12:00 pm to midnight. Within this time frame, most tornadoes occur between 4 pm and 6 pm.

The Enhanced Fujita Tornado Damage Scale categorizes tornadoes based on their wind speed:

Table 4.15 Enhanced Fujita Tornado Damage Scale	
EF Rating	**3 Second Gust (mph)**
F0	65-85 mph
F1	86-110 mph
F2	111-135 mph
F3	136-165 mph
F4	166-200 mph
F5	Over 200 mph

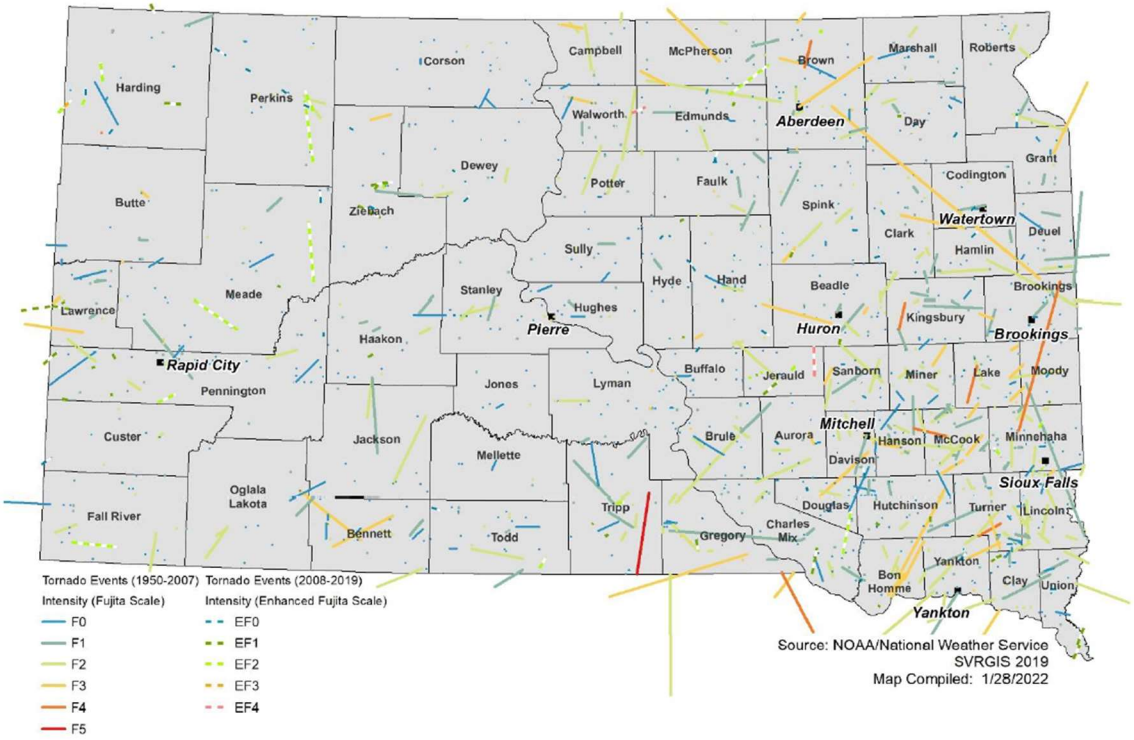
National Weather Service

Hazard History

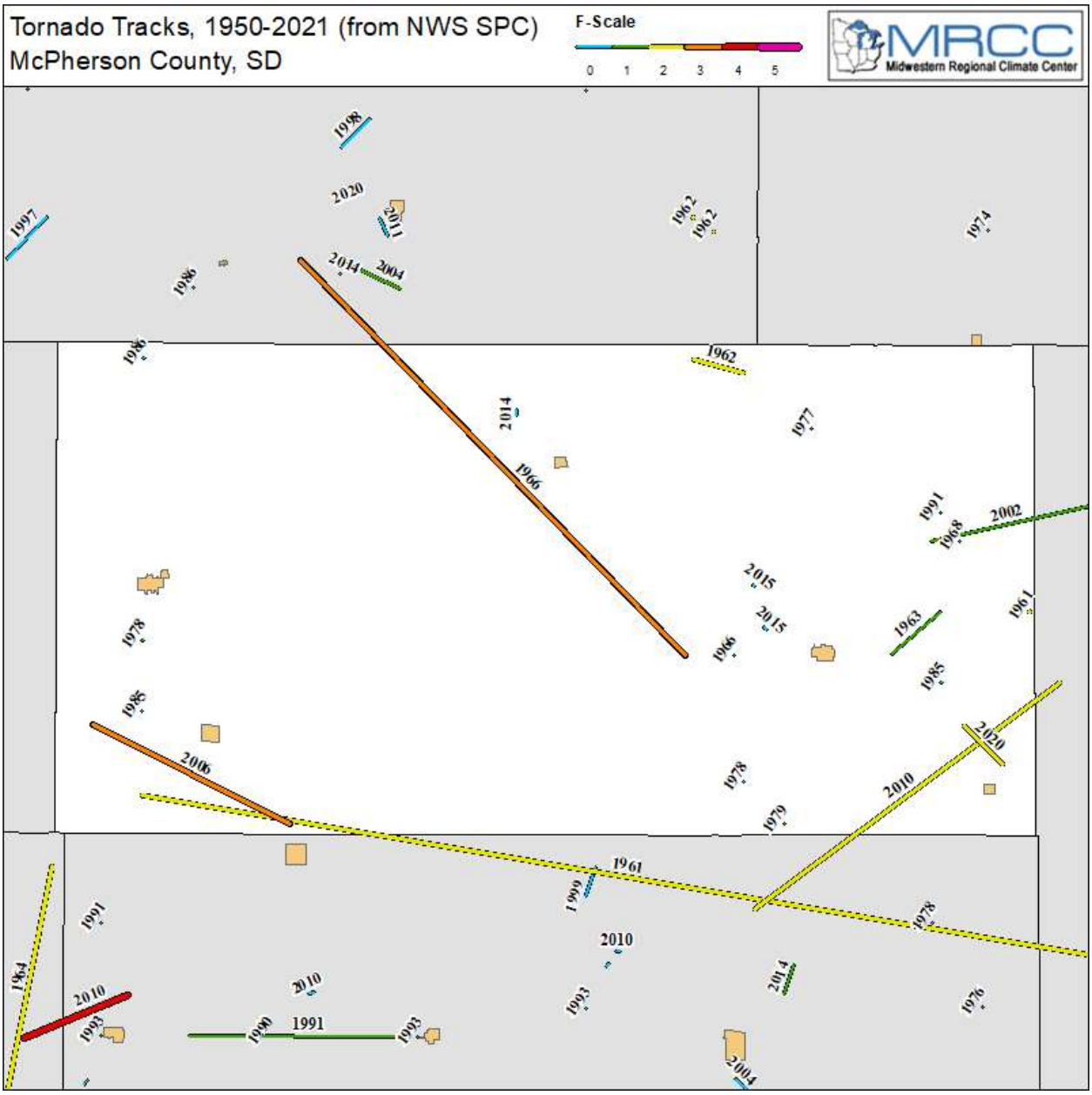
The annual risk for intense summer storms is very high. Warning time for summer storms is normally several hours, sufficient for relocation and evacuation if necessary. However, tornadoes may occur with little or no warning. Appendix C includes the tornado history in McPherson County over the course of the past 10 years. There have been four occurrences of tornados in McPherson County in the last ten years.

Table 4.16 Hazard History and Future Probability		
Event Type	**Tornados**	**Magnitude**
Number of Days with Event	4	All EF0
Number of Years with Event	3	
Years of Data	10 (2014-2023)	
Possible Number of Days with Event per Year	.40	
Occurrence Calculation	4/10 = .40	
Probability of Future Event in Any Given Year	30%	
Probability Calculation	3/10 = 30%	

Figure 3-64 Tornado Paths in South Dakota 1955-2019



From the 2024 South Dakota State Mitigation Plan



Midwest Regional Climate Center. Tornado data from the National Weather Service Storm Prediction Center[16]

In September 2014, a quick moving thunderstorm produced a brief tornado touchdown. A weak tornado touched down quickly northwest of Long Lake with no damage reported.

In July 2015, a weak upper-level low pressure trough along with a surface warm front brought numerous thunderstorms to the region. Large hail, damaging winds, flash flooding, along with a few tornadoes occurred. A small rope tornado touched down briefly in an open field.

In July 2020, after some early morning severe thunderstorms produced large hail and severe winds, an outflow boundary descended southeast across north central and northeast South

[16] https://mrcc.purdue.edu/gismaps/cntytorn

Dakota during the evening producing more severe thunderstorms for the region. Severe wind gusts up to near 100 mph, large hail up to golf balls, along with an EF2 tornado brought significant damage.

A tornado touched down 3 miles north northwest of Wetonka causing significant damage to the Grassland Hutterite Colony. A large machine shop lost the roof and wall. A large, empty, anchored grain bin was completely removed from its base and the adjacent feed mill was significantly damaged. A 400 foot by 80-foot turkey barn was completely destroyed along with a smaller outbuilding. Debris from these two buildings was scattered in many directions. A trailer was flipped, freight storage unit rotated and two other outbuildings had complete loss of roof panels. Roof and siding damage occurred to many of the residential buildings. Tree and crop damage had also occurred. The tornado tracked over 2 miles southeast, crossing McPherson County Highway 23 and ending about one mile north northeast of Wetonka. Debris from the Grassland Colony was dispersed along the entire track of the tornado.

The information provided illustrates how several tornados can occur very close together in the same area. While the 10-year history for McPherson County does not indicate that tornados occur very often and when they do the tornados many times do not touch down, or cause any damage; however, many of the neighboring counties have had severe damage caused by tornado so it is reasonable to expect that similar tornado events can occur in McPherson County.

In the public survey, Tornados were ranked as the 6th most likely hazard to occur in McPherson County and 4% of respondents had been negatively affected by Tornados in the past ten years.

Future Probability Amidst A Changing Climate

There presently is not enough data or research to quantify the magnitude of change that climate change may have related to tornado frequency and intensity. NASA's Earth Observatory has conducted studies which aim to understand the interaction between climate change and tornadoes. Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others do not, beyond knowing that they require a certain type of wind shear. Tornadoes come from about 1 percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation.[17]

Vulnerability Assessment

During the risk assessment activity during the planning meetings, jurisdictions had different views on how likely a tornado was to occur in their area. However, most everyone agreed that if a tornado does occur, their area is highly vulnerable to damage. The National Risk Index rates McPherson County as Very Low Risk Index for tornados.

Often associated with summer storms are utility problems. Electric services have historically buried powerlines in the county. High voltage electrical transmission lines run the length of McPherson County. These lines are susceptible to breaking during high winds and hail. Tall trees located near electrical lines can be broken in wind or by lightning strikes and land on electrical lines, severing connections. Any electrical complications bring associated risk of food spoilage, appliance burnout, loss of water, and potential harm to in-house life support dependents. Limited loss of power is common on an annual basis. Typical power interruptions last around 1 to 3 hours. Most residents are prepared to deal with this.

[17] State of South Dakota Hazard Mitigation Plan. 2024.

When evaluating new methods of warning systems, the county and towns should evaluate that warning systems consider different vulnerable populations, such as those without access to technology, language barriers, and cognitive disabilities.

According to Headwaters Economics' *Populations at Risk* report, in McPherson County, only 4% of all occupied housing units are mobile homes, which are highly vulnerable to tornados and other extreme weather events..[18] During planning meetings, it was confirmed that there are not many areas of the County where mobile homes are common. Most homes in the County have basements for residents to seek shelter.

WILDLAND FIRES

Hazard Description

Wildland Fires are uncontrolled conflagrations that spread freely through the environment. Other names such as brush fire, bushfire, forest fire, grass fire, hill fire, peat fire, vegetation fire, and wildland fire may be used to describe the same phenomenon. A wildfire differs from the other fires by its extensive size; the speed at which it can spread out from its original source; its ability to change direction unexpectedly; and to jump gaps, such as roads, rivers, and fire breaks.

Fires start when an ignition source is brought into contact with a combustible material that is subjected to sufficient heat and has an adequate supply of oxygen from the ambient air. Ignition may be triggered by natural sources such as a lightning strike or may be attributed to a human source such as "discarded cigarettes, sparks from equipment, and arched power lines.

Wildfires occur primarily during drought conditions. Wildfires can cause extensive damage, both to property and human life and can occur anywhere in the county. Even though wildfires can have various beneficial effects on wilderness areas for plant species that are dependent on the effects of fire for growth and reproduction, large wildfires often have detrimental atmospheric consequences, and too frequent wildfires may cause other negative ecological effects.

A large part of the county is comprised of pasturelands. Wildfires that occur on this land type can spread quickly, especially during periods of high winds. There are no urban interface areas in McPherson County, so the likelihood of occurrence is not more prevalent in any part of the County. Property at risk includes all public and private land and structures in the fire's path. Most fires occur in the summer months, but wildfires can occur any time of the year. Major fire events are more likely to occur during or after conditions of prolonged drought, high winds, widespread tree damage often caused by severe storms, and insect infestations. The magnitude of wildfires depends upon several different factors such as base fuel, terrain, and weather conditions.

Compared to the rest of the country, FEMA's National Risk Index scores McPherson County with a very low risk. The occurrence of major fire events is heightened when there is prolonged drought or severe storms affiliated with widespread tree damage. With a predicted decrease in precipitation and an expected higher frequency of drought conditions, the intensity and frequency of wildfire events are expected to increase.

[18] Headwaters Economics. Populations at Risk. 2024.

Hazard History

Information on past events was taken from two primary sources – the State Fire Marshal's Office and the National Interagency Fire Council.

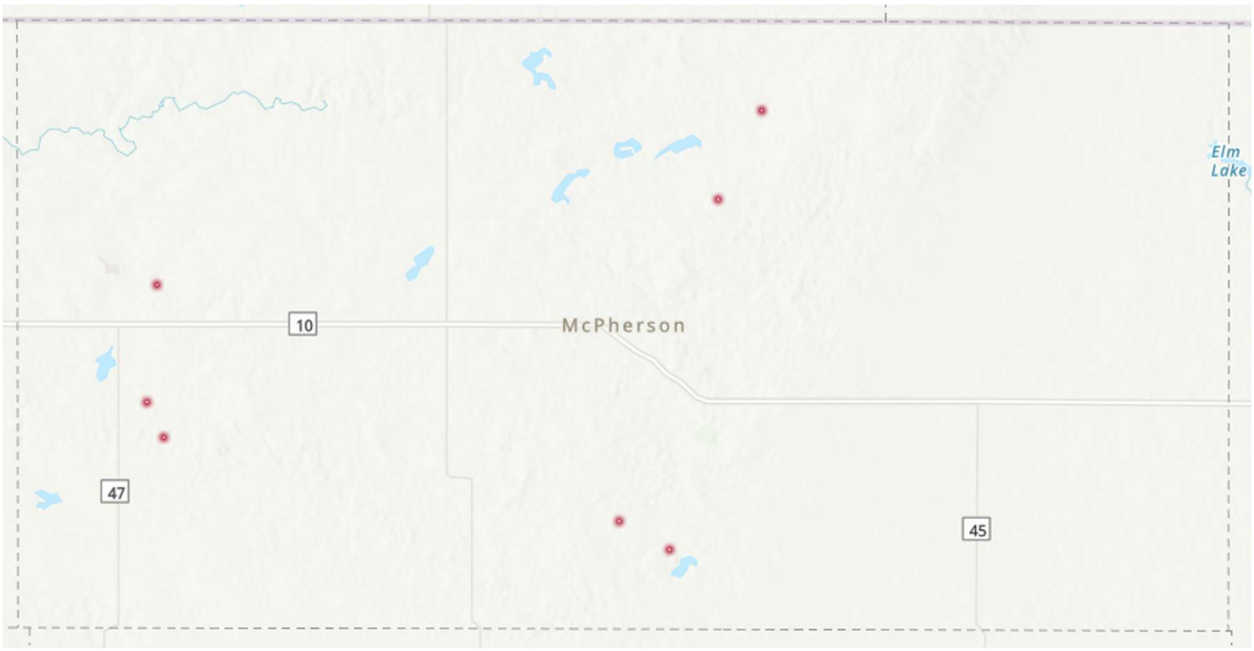
The State Fire Marshal's information is derived from the reports submitted by the local fire departments who respond to the fires. For the purpose of this plan, we have used the numbers provided by the State Fire Marshal's Office as a point of reference in determining the likelihood of fire hazard occurrence within the jurisdictions. The cause of the other fires is not listed, so it is not known for certain whether all or some of these fires are result of a natural occurrence or as a result of human behavior. Additionally, information was provided about the number of injuries and fatalities reported as a result of these fires and total dollars lost. A summary of the fire incident reports is provided by county in Table 4.12.

Table 4.17 Summary of Fire Incident Reports for McPherson County between 2012-2022	
Structure Fire	31
Vehicle Fire	36
Other Fire	122
Total Fires	189
Civilian Injuries	2
Civilian Fatalities	3
Fire Service Injuries	1
Fire Service Fatalities	0
Total Fire Losses	**$2,498,850**

State Fire Marshals' Office

Table 4.18 Summary of Fire Incident Reports for McPherson County between 2014-2023	
Human Caused	2
Lightning	0
Undetermined	5
Total Fires Reported	7

National Interagency Fire Council



National Interagency Fire Council

Information from the State Fire Marshal's Office does not indicate the extent (size) of the fires. All fires reported from the National Interagency Fire Council noted the extent of the fires.

USDA Forest Service wildfire class include the following:

Table 4.19 Extent of Wildfire Classes and Occurrence in McPherson County between 2014-2023		
Wildfire Class	**Size**	**Number of Occurrences**
Wildfire Class A	<1 acres	5
Wildfire Class B	1-9.9 acres	1
Wildfire Class C	10-99 acres	1
Wildfire Class D	100-299 acres	0
Wildfire Class E	300-999 acres	0
Wildfire Class F	1,000-4,999 acres	0
Wildfire Class G	5,000-9,999 acres	0
Wildfire Class H	10,000-49,999 acres	0
Wildfire Class I	50,000-99,999 acres	0

Table 4.20 Hazard History Future Hazard Probability based on National Interagency Fire Council Data	
County	**McPherson**
Number of Days with Event	6
Number of Years with Event	2
Years of Data	10 (2014-2023)
Possible Number of Days with Event per Year	.60
Occurrence Calculation	6/10 = .60
Probability of Future Event in Any Given Year	20%

Probability Calculation	2/10 = 20%

In the public survey, Wildfires were ranked as the 8th most likely hazard to occur in McPherson County and 3% of respondents had been negatively affected by Wildfires in the past ten years.

Future Probability Amidst A Changing Climate

Wildfire conditions across South Dakota and the western United States in general are likely to worsen in the future due to climate change. This is due to increasing temperatures, an increase in annual precipitation, and drought as a regular occurrence. The increase in temperatures can dry out fuels more rapidly. The increase in moisture can provide favorable conditions for fuel (vegetation) growth.[19]

Vulnerability Assessment

During the risk assessment activity during the planning meetings, jurisdictions had different views on how likely a wildifre was to occur in their area. However, most everyone agreed that if a wildfire does occur, their area has a medium vulnerability to wildfires. The National Risk Index rates McPherson County as Relatively Low Risk Index for wildfires.

Older adults (31% of McPherson County residents are 65 or older) are more susceptible to air pollution such as dust, which is associated with wildfires, making them more vulnerable to drought than the general population.

Since there are no remote forested regions in McPherson County, wildfires can be easily spotted and are capable of being maintained. Fire interference with traffic on highways is not a major concern.

Moisture amounts have the biggest impact on fire situations. During wet years, fire danger is low. More controlled burns are conducted and less mishaps occur. During dry years, severe restrictions are placed on any types of burns.

Hunting season brings thousands of hunters to the area. Shots have the potential to ignite dry grassland, hay bales, or storage areas. This is a risk that is addressed in hunting education and safety.

The most important factor in mitigating against wildfires continues to be common sense and adherence to burning regulations and suggestions disseminated by the County.

The McPherson County Commission has adopted an Open Burning Regulation Ordinance permanently defining when open burning is prohibited. No person shall set any open fire in McPherson County when the National Weather Service has declared the Grassland Fire Danger Indes to be in the very high or extreme category or a Red Flag Warning has been issued in McPherson County. The County Commission may also prohibit open burning if the above conditions aren't met but climactic conditions pose a fire threat to the public health and safety. The full ordinance is included as Appendix G.

WIND – HIGH/STRONG

[19] State of South Dakota Hazard Mitigation Plan. 2024.

Hazard Description

Strong winds are usually defined as winds over 40 mph, are not uncommon in the area. Strong winds can cause destruction of property and create a safety hazard resulting from flying debris. Strong winds also include severe localized wind blasting down from thunderstorms. These downward blasts of air are categorized as either microbursts or macrobursts depending on the amount geographical area they cover. Microbursts cover an area less than 2.5 miles in diameter and macrobursts cover an area greater than 2.5 miles in diameter.

The magnitude and severity of wind events can be measured by the Beaufort Wind Scale. The replication of the scale only reflects land-based effects. Beaufort Level 12 events have occurred in McPherson County.

Table 4.21 Beaufort Wind Scale

Force	Speed (mph)	Description	Specifications (for use on land)
0	0-1	Calm	Calm; smoke rises vertically
1	1-3	Light Air	Direction of wind shown by smoke drift, but not by wind vanes
2	4-7	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind
3	8-12	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag
4	13-18	Moderate Breeze	Raises dust and loose paper; small branches are moved
5	19-24	Fresh Breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters
6	25-31	Strong Breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty
7	32-38	Near Gale	Whole trees in motion; inconvenience felt when walking against the wind
8	39-46	Gale	Breaks twigs off trees; generally impedes progress
9	47-54	Severe Gale	Slight structural damage occurs (chimneypots and slates removed)
10	55-63	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs
11	64-72	Violent Storm	Very rarely experienced; accompanied by widespread damage
12	72-83	Hurricane	

Past Events

Table 4.22 Hazard History Future Hazard Probability

Event Type	High Wind	Magnitude
Number of Days with Event	29	40-96 mph
Number of Years with Event	9	
Years of Data	10 (2014-2023)	

Possible Number of Days with Event per Year	2.9	
Occurrence Calculation	29/10 = 2.9	
Probability of Future Event in Any Given Year	90%	
Probability Calculation	9/10 = 90%	

It is universally agreed that high winds are highly probable in McPherson County and NOAA data confirms that agreement. Severe wind events are common in eastern South Dakota. Several times a year the residents of McPherson County can expect to experience strong winds in excess of 40 mph. Gusts of wind in excess of 80 mph have also been recorded for the area. NOAA shows 29 reports of high/severe wind during the last ten years. Many of the storm reports state that there was property and tree damage, but no value is placed on the damage.

In the public survey, Strong Winds were ranked as the 1st most likely hazard to occur in McPherson County and 33% of respondents had been negatively affected by Strong Winds in the past ten years.

A complete 10-year history of High/Severe Winds can be found in Appendix C.

Future Probability Amidst A Changing Climate

According to the Fourth National Climate Assessment, there presently is not enough data or research to quantify the magnitude of potential change that climate change may have on windstorms. Future updates to the mitigation plan should include the latest research on how the windstorm hazard frequency and severity could change.[20]

Vulnerability Assessment

During the risk assessment activity at the planning meetings, participants agreed that high or strong winds are highly likely to occur in the area. Participants viewed their area as having a medium to high vulnerability to high or strong winds.

Strong Winds can be detrimental to the area. Trees, poles, power lines, and weak structures are all susceptible and vulnerable to strong winds. When strong winds knock down trees, poles, power lines, and structures it creates additional traffic hazards for travelers and commuters. Strong winds are a common occurrence in all of McPherson County. Another area of particular vulnerability would be those areas with dense tree growth where dead or decaying trees lose their stability and can be blown over or knocked down easily. The farming community tends to be vulnerable because many old farm sites have weak, dilapidated, or crumbling structures or structures such as grain bins which can easily be blown over.

According to Headwaters Economics' *Populations at Risk* report, in McPherson County, only 4% of all occupied housing units are mobile homes, which are highly vulnerable to tornados and other extreme weather events..[21] During planning meetings, it was confirmed that there are not many areas of the County where mobile homes are common. Most homes in the County have basements for residents to seek shelter.

[20] State of South Dakota Hazard Mitigation Plan. 2024.
[21] Headwaters Economics. Populations at Risk. 2024.

WINTER STORMS (including Blizzards, Freezing Rain/Ice, Heavy Snow, Sleet, Snow, Winter Storms and Winter Weather)

Hazard Description

Generally winter weather can range from freezing rain to blizzard conditions and can occur between October and April. Because of the multiple categories NOAA has for winter weather, the probability of winter storms combines several hazards including blizzards, heavy snow, ice storms, winter storms and winter weather.

Snow and ice storms are common in the plan jurisdiction. While such storms would be considered extreme in many parts of the United States, the consistent nature of such weather hazards are expected in this area. All types of winter weather are not unusual in the county. Thus, planning and response mechanisms for snow and ice storms are vital to the County and are routine procedures in the area due to the common nature of such storms.

Winter storms in South Dakota are known to cover large geographical areas, often an entire county or multiple counties can be affected by a single storm. All of the storms identified in Appendix C were considered to have occurred countywide. Due to the multiple occurrences of winter storms each year, an exhaustive compilation is not possible.

Snow is a common occurrence throughout the County during the months from October to April. Average snowfall in a season is about 38 inches. Accumulations in dry years can be as little as 5-10 inches, while wet years can see yearly totals up to 80 inches. Snow is a major contributing factor to flooding, primarily during the spring months of melting.

Heavy Snow is snowfall accumulating to 4 inches or more in 12 hours or less. Or snowfall accumulating to 6 inches or more in 24 hours or less.

Blizzards are snow storms that last at least three hours with sustained wind speeds of 35 mph or greater, visibility of less than a quarter mile, temperatures lower than 20 degrees F and white out conditions. Snow accumulations vary, but another contributing factor is loose snow existing on the ground which can get blown around and aggravate the white out conditions resulting in limited or zero visibility. These conditions are extremely dangerous to motorists and cause many traffic accidents each year; many resulting in death. When such conditions arise, blizzard warnings or severe blizzard warnings are issued. Severe blizzard conditions exist when winds obtain speeds of at least 45 mph plus a great density of falling or blowing snow and a temperature of 10°F or lower.

Freezing Rain/Ice occurs when temperatures drop below 30 degrees F and rain starts to fall. Freezing rain covers objects with ice, creating dangerous conditions due to slippery surfaces, platforms, sidewalks, roads, and highways. Sometimes ice is unnoticeable and is then referred to as black ice. Black ice creates dangerous conditions, especially for traffic. Additionally, a quarter inch of frozen rain can significantly damage trees, electrical wires, weak structures, and other objects due to the additional weight bearing down on them.

Severe Winter Storms deposit four or more inches of snow in a 12-hour period or six inches of snow during a 24-hour period. Such storms are generally classified into four categories with some taking the characteristics of several categories during distinct phases of the storm. These categories include: freezing rain, sleet, snow, and blizzard. Generally winter storms can range from moderate snow to blizzard conditions and can occur between October and April

Sleet does not generally cling to objects like freezing rain, but it does make the ground very slippery. This also increases the number of traffic accidents and personal injuries due to falls. Sleet can severely slow down operations within a community. Not only is there a danger of slipping, but with wind, sleet pellets become powerful projectiles that may damage structures, vehicles, or other objects.

The extent rating of winter storms that cause issues in South Dakota includes storms forecasted to be Winter Storm Warnings or Blizzard Warnings. The NWS issues a Winter Storm Warning when conditions that can quickly become life threatening and are more serious than an inconvenience are imminent or already occurring. Heavy snows, or a combination of snow, freezing rain or extreme wind chill due to strong wind, may bring widespread or lengthy road closures and hazardous travel conditions, plus threaten temporary loss of community services such as power and water. Deep snow and additional strong wind chill or frostbite may be a threat to even the appropriately dressed individual or to even the strongest person exposed to the frigid weather for only a short period.

NOAA's National Centers for Environmental Information is now producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes (see table below). The RSI is a regional index; a separate index is produced for each of the six NCEI climate regions in the eastern two-thirds of the nation. South Dakota is included in the Northern Rockies and Plains Region, along with Nebraska, North Dakota, Wyoming, and Montana.9 RSI ratings from 1 to 5 are possible in South Dakota.

Table 4.23 Regional Snowfall Index

Category	Description
1	Notable
2	Significant
3	Major
4	Crippling
5	Extreme

Hazard History

Table 4.24 Hazard History and Future Hazard Probability

Event Type	Blizzard	Heavy Snow	Ice Storm	Winter Storm	Winter Weather
Number of Days with Event	15	13	3	5	5
Number of Years with Event	8	7	3	3	3
Years of Data	10 (2014-2023)	10 (2014-2023)	10 (2014-2023)	10 (2014-2023)	10 (2014-2023)
Possible Number of Days with Event per Year	1.5	1.3	.30	.50	.50
Occurrence Calculation	15/10 = 1.5	13/10 = 1.3	3/10 = .2	5/10 = 0.5	5/10 = 0.5

Probability of Future Event in Any Given Year	80%	70%	30%	30%	30%
Probability Calculation	8/10 = 80%	7/10 = 70%	3/10 = 30%	3/10 = 30%	3/10 = 30%

Complete Winter Storm History taken from the NOAA website can be found in Appendix C.

In the public survey, Severe Winter Weather was ranked as the 2nd most likely hazard to occur in McPherson County and 50% of respondents had been negatively affected by Severe Winter Weather in the past ten years.

April 1997 An ice storm that affected Edmunds and McPherson counties damaged 400 utility poles and caused 1,500 wire breaks. FEM Electric customers on 600 meters were without power for seven days. Business and economic impacts of this storm were estimated at $3,000,000 and emergency repair and restoration costs were estimated at $1,000,000.

December 2016 - An intense surface low pressure area moved from northeast Colorado to South Dakota from the 24th through the 26th. This storm was unusually warm for the region for late December and produced record breaking heavy rain along with flooding in some cases. Significant icing occurred across areas at or just below the freezing point, which resulted in widespread tree and power pole and line damage to the area. Some downed branches and trees fell onto homes across the region. This storm also brought high winds along with snow and blizzard conditions to the region. This significant storm resulted in massive power outages, stranded motorists and closed roads.

Ice accumulations were significant across central and northeastern South Dakota with over an inch accumulation for some locations. High winds during this event increased the amount of power pole, line, and tree damage. Those who did not see freezing rain accumulations had to deal with ice as well. The ponding of the heavy rain froze overnight once much colder air moved in. Roads and walkways became treacherous ice rinks and remained as such for many days. There were numerous injuries from slips on the ice, as well as several vehicular accidents and flight cancellations. Livestock were also affected, though most made it through the storm. Dairy operations dealt with frozen drinking water tanks.

Precipitation amounts were very impressive for late December, as the system had near record levels of atmospheric moisture to work with. Rain or freezing rain was the predominant precipitation type for those roughly east of the Missouri River on the 25th. Some of the heaviest rainfall amounts include: 0.99 inches at Eureka, 1.11 inches at Leola. From this rainfall, ice accumulation amounts ranged from a quarter inch to nearly an inch and a half in places.

Rare thunderstorms, more indicative of spring than winter, were also widely reported on both the rain and snow side of this system across the area on the 25th.

High winds gusting to over 70 mph impacted the entire region on the 25th and 26th. The combination of snow and ice and high winds snapped or otherwise damaged hundreds of power poles, downed several thousand miles of power lines, damaged several hundred transmission structures and brought many substations down. Many roads were blocked by power lines. Overall, more than one hundred linemen worked to bring the power back.

Twenty-one counties encompassing 30 communities and 3 Indian reservations were impacted. Entire communities, thousands of homes and businesses, and ultimately over 12,000 people went without power. For some, power was not restored for 10 days despite tireless efforts. All power was restored by January 4th, 2017. Water and sewer systems shut down for several days for some communities and emergency shelters were necessary. County and city governments were overwhelmed by ice accumulations and blizzard conditions and struggled with maintaining accessibility even for emergency traffic. Road conditions deteriorated to the point where it took up to several hours for emergency officials to respond to 911 calls. The storm proved to be fatal when a Walworth County man fell, hit his head and succumbed to the elements on Christmas Day.

Due to widespread significant impacts, the Governor of South Dakota declared a State of Emergency on the 26th which helped facilitate the movement of out-of-state crews to aid with power restoration. There was also a Presidential Disaster Declaration for damage to public property. The total estimated damage was near $8 million for central and northeast South Dakota.

March 2018 - An intense surface low pressure area brought scattered showers and thunderstorms along with heavy snow to much of north central and northeast South Dakota from the 5th to the 6th. The scattered showers and thunderstorms moved across the region during the early morning hours of the 5th while heavy snow developed from the mid-morning to the early afternoon. There were several reports of thundersnow across the region. Snowfall amounts ranged from 6 to as much as 18 inches before it ended on the 6th. The very heavy snow resulted in closed businesses, schools, government offices, difficult travel conditions with several accidents reported, along with closed highways and Insterstate-29. Many activities and events were also postponed or cancelled.

Some snowfall amounts from across the region include: 8 inches at Eureka, 11 inches at Leola.

Due to the track of the surface low pressure area, the western part of our region experienced heavy snow and very strong northwest winds bringing blizzard conditions.

December 2018 - A large upper-level low pressure trough from the southwest United States brought a couple rounds of snow to the region. The snow began in the morning hours of the 26th from midnight to noon and ended in the morning hours of the 28th. There was also mixed precipitation including freezing drizzle with the first wave. Heavy snowfall amounts ranged from 6 to 13 inches. Northwest winds increased to 25 to 40 mph in the morning and afternoon with gusts to over 50 mph on the 27th resulting in widespread blizzard conditions across much of the region, ending in the morning hours of the 28th.

Travel was greatly affected or completely halted with no travel advised across much of the region. Many reports of vehicles becoming stuck or ending up in the ditch occurred. There were also many activities and events postponed or cancelled along with many businesses closed.

January 2019 - An intense clipper system followed by a powerful arctic boundary moved across the region from northwest to southeast from the morning of the 27th to the morning of the 28th. Fresh snowfall of 1 to 5 inches on the 27th was followed by high winds gusting from 55 to over 70 mph which brought ground blizzard conditions from the evening into the early morning hours. Visibility was frequently down to zero in ground blizzard conditions. The winds and low visibility hit quickly, catching many people off guard. Many people became stranded or went into the ditch and had to be rescued. There was a no travel advisory for the area.

The snowfall began between 10 am and noon and ended from 6 pm to 8 pm in the evening of the 27th before the high winds/blizzard conditions came in. Some of the highest wind gusts include 72 mph 13 miles east of Eureka. The ground blizzard was then followed by extreme wind chills from the 29th through the 31st.

March 2019 - A record breaking surface low pressure area moved across the central plains and brought rain, freezing rain, sleet, heavy snow and blizzard conditions to most all of central and northeast South Dakota. In between the rain and snow, a band of freezing rain and sleet occurred. Ice accumulation up to quarter to a half inch combined with high winds brought down some power lines and poles bringing many power outages along with bringing treacherous travel.

The heavy snow and strong winds also brought some cattle losses across the region along with some damage to buildings. Nearly all schools were closed. The State B Basketball Tournament in Aberdeen was also affected by the storm with a delay in the start time. Emergency declarations were issued for many counties for the hazardous travel conditions and impassable roads along with livestock losses and structure damage. The declarations included subsequent flooding at the end of March. Agricultural producers were eligible for loans from the USDA who incurred losses from the blizzard.

Some of the snowfall amounts include 10 inches at Eureka. Locations with a foot or more include, 12 inches 13 miles west of Leola, and 9 miles south of Long Lake. The high winds and heavy snow created 5-to-10-foot drifts.

April 2019 - A historic blizzard affected all of central and northeast South Dakota from April 11th into the 12th. The storm came in two waves. The first wave brought a band of moderate to heavy snow and thunder as it lifted from south to north across the region during the early morning hours of the 10th. The thunder snow with this first wave brought snowfall rates of 2 inches or more an hour with initial snowfall accumulations of 2 to 10 inches. There were some areas of light freezing rain from Pierre to Watertown in the early morning hours of the 10th.

The second wave of heavy snow and strong north winds were with the main surface low pressure area moving across the central plains. The heavy snow in combination with winds gusting to 35 to 50 mph brought widespread blizzard conditions along with heavy drifting. At the storm's end, most locations received anywhere from 4 to 15 inches of snowfall with some locations reporting extraordinary snowfall amounts of 16 to 30 inches.

The blizzard had wide ranging impacts across the region, mainly to cattle producers and roadways. Countless roads were blocked or impassable. Thousands of ranchers were affected. There were stranded herds of cows with countless calves buried in the snow (many lost). There were also some spotty power outages. Most area roads were designated by the DOT as no travel advised. Many vehicles became stuck across the region with several rescues taking place. There were also several accidents reported. Schools were closed for two days along with state offices throughout central and northeast South Dakota. With the ongoing flooding across the region from the expansive snowmelt from the winter, the additional snowmelt water from this blizzard would only exacerbate the widespread flooding across the region. Many counties declared disasters in March with several more counties declaring disasters in April for the flooding and the March blizzard.

Snowfall amounts include 7 inches at Eureka.

October 2019 - A strong and rare winter storm brought heavy wet snow along with an initial period of heavy sleet to central and northeast South Dakota. Snowfall amounts ranged from 6 to 13 inches with sleet amounts of 1 to 2 inches. Strong northwest winds of 25 to 35 mph with gusts to 40 to 50 mph did bring some blowing snow creating lower visibility along with drifting snow. Travel was significantly disrupted or halted with a few accidents occurring. Many schools were closed, and events were delayed or cancelled. The early heavy snow greatly affected harvest along with damaging some of the crops.

Locations with a foot or more include, 12 inches at Eureka.

November – December 2019 - A deep low-pressure system tracked across the Northern Plains in the days following Thanksgiving and produced widespread heavy snow across most of central and northeast South Dakota. Areas of freezing drizzle occurred on Thanksgiving Day and on Friday the 29th, bringing some spotty icy conditions. Heavy, wet snow then tracked from south to north across the area from the late afternoon of the 29th persisting into Saturday the 30th. The snow then ended during the morning hours of December 1st. See November 2019 storm data.

Northwest winds gusting to 30 to 50 mph caused areas of blowing snow reducing visibilities, affecting holiday travel. Road conditions deteriorated quickly through the event, with many No Travel Advised statements. Several accidents occurred across the region. By the time the storm let up in the morning hours of December 1st, anywhere from 6 to 17 inches of snow occurred.

Locations with more than a foot of snow include 16 inches at Eureka.

January 2020 - A strong surface low pressure system tracked from Wyoming across South Dakota on Friday, January 17th and Saturday, January 18th. Two periods of snowfall occurred with this system with the first snow event starting early to mid-morning Friday across northeast South Dakota and ending by late afternoon. Moderate to heavy snowfall with south winds from 30 to 40 mph gusting to over 50 mph brought a period of blizzard conditions to northeast South Dakota from the morning to the late afternoon on Friday. By Friday evening, a brief lull in the winds allowed for improvements to the visibility.

A second quick period of snowfall occurred in the late evening and early morning hours with an Arctic cold front coming in from the northwest. Northwest winds of 30 to 40 mph gusting to over 50 mph behind the front brought a second round of blizzard conditions from late Friday evening into the early morning hours Saturday. Ground blizzard conditions then continued through much of the day Saturday across northeast South Dakota. Very cold air moved in with the northwest winds as well.

Some power outages occurred along with many vehicles in ditches. The Arctic front surge on Friday evening caught a resident in McPherson County off guard. He left Long Lake in the late evening where about 3 inches of snow had fallen with no wind. As he traveled to Highway 10 and turned west, the Arctic front hit with very strong winds and blizzard conditions. His pickup went into the ditch only 3 miles from home. He was stuck through the night into Saturday morning the 18th. He stayed with his vehicle and cleared his tailpipe every half hour. The pickup heater quit working at 3 am and the windows iced up. Ground blizzard conditions remained into Saturday when he was rescued about 1030 am. There was also another vehicle stranded about 100 yards away. On Friday, many schools were closed with nearly all activities canceled or

postponed for the weekend. The governor closed state branch executive offices for Friday afternoon.

Snowfall amounts ranged from 1 to 6 inches from the Missouri River east through northeast South Dakota. The highest amounts included 3 inches at Sisseton, Webster, Aberdeen, Long Lake, and Clear Lake; 4 inches at Eureka, Bowdle, and Faulkton; 5 inches at Clark, Roy Lake, and Castlewood; and 6 inches at Summit, Milbank, and 3 miles east of Watertown.

October 2020 - The second of three rare October heavy snow events occurred across north central and northeast South Dakota on October 21st and 22nd. An upper-level low pressure trough from the northwest traversing over rare October cold air brought heavy snow of 6 to 13 inches to the region. Roads became snow covered and difficult to travel. Also, school starts were delayed or were closed for the day.

Snowfall amounts from across the region include: 11 inches 11 miles southwest of Eureka and 12 inches 5 miles northwest of Leola.

The three rare heavy snow producing systems along with the abnormally cold air set numerous temperature and snowfall records. Most locations across the region had both their top ten coldest and snowiest Octobers on record. There were also numerous daily temperature records set for many locations from the 19th through the 28th.

November 2022 - A low pressure system tracked from Colorado through southeast South Dakota. Initially, a period of freezing drizzle resulted in hazardous travel conditions and at least one request for No Travel Advised early on the morning of the 9th between the Missouri and James River Valleys. Temperatures briefly moderated during the day for a few locations but then fell back to near or below freezing during the course of the afternoon and evening on the 9th. The main push of moisture, which involved a mix of steady freezing rain and occasional sleet, developed during the evening of the 9th and moved north through the overnight hours. Widespread accumulations of freezing drizzle and freezing rain totaled between a quarter inch and one-half inch of ice, with an estimated one inch of total ice accumulation in Gettysburg. The combination of ice and strong winds that followed resulted in widespread tree damage and power interruptions between the Missouri and James River Valleys. Well below average temperatures moved in behind this system, which only prolonged impacts as temperatures remained below 32 F for many days, preventing a natural thaw of the ice and snow. Additionally, freezing drizzle changed over to heavy snow in far north central South Dakota. McPherson county Sheriff requested a Local Area Emergency with no travel advised due to ice covered roads resulting in hazardous travel conditions across the county.

December 2022 - A strong area of low pressure brought strong winds and periods of snow and heavy snow over a 4 plus day period. The bulk of the snow across central South Dakota fell between 6am on December 13th through 6am on December 14th, with more variability across northeastern South Dakota.

The South Dakota Department of Transportation placed nearly the entire state under No Travel Advised or had road closures by Thursday December 15th, as numerous roads had become impassable. Numerous vehicle accidents and rescues occurred as well. Additionally, school was cancelled for multiple consecutive days at numerous locations.

The snow and heavy snow were just one component of a highly impactful, major winter storm. This storm was severe, widespread and prolonged in nature, and produced freezing rain, heavy

snow and/or blizzard conditions from December 12th-16th across the region. A Major Disaster Declaration was declared on February 27th by Governor Noem for several counties across central and northeastern South Dakota for winter weather from December 12-25th. Six inches of snow was recorded by 8am on the 14th 5 miles SE of Leola. Additional accumulating snow fell thereafter.

December 2022 - An unusually potent blast of cold air for December followed in behind a reinforcing Arctic front Tuesday night, December 20th, into Wednesday, December 21st, along with a trace to as much as 2 to 4 inches of new snowfall on top of the pre-existing loose snowpack. Wind gusts of 35 to 55 mph behind this front impacted the region from December 21st through December 23rd, resulting in an extended period of life-threatening wind chills in the -35 to -60 degree F range and ground blizzard conditions.

The extreme cold made the threat to stranded motorists even more dangerous, as numerous roads became impassable. Nearly the entire state was virtually shut down, for the second time this December, as roads were either deemed No Travel Advised or closed by the South Dakota Department of Transportation. Additional impacts included numerous vehicle accidents and rescues, as well as numerous school closures. Governor Noem declared a Winter Storm Emergency on December 22nd, which activated the SD National Guard and allowed assistance from the state to county governments as needed. Furthermore, a Major Disaster Declaration was declared on February 27th by Governor Noem for several counties across central and northeastern South Dakota for winter weather from December 12-25th.

Future Probability Amidst A Changing Climate

The winter season is warming at a faster rate than any other season in the Northern Plains Region, and this is also true for South Dakota. Winter storms and blizzards, however, will continue to be a severe weather hazard in the State. Warmer winter temperatures could mean more ice and freezing rain events, which often impact electrical utilities and communication systems, but can also affect agricultural livestock and roads and transportation. A warmer winter climate could reduce energy consumption for heating in the long run, but there will still be some periods of exceptional cold temperatures. The northern U.S. has experienced an increase in the frequency of large snowfall events, where other places in the country have been decreasing. Some analyses have shown an increase in winter storm frequency and intensity, with storm tracks moving northward since 1950. There remains some uncertainty in projections for the coming decades, but the rising trend of extreme precipitation events in general (including winter season) will continue to be a hazard. According to the Fourth National Climate Assessment, rising temperatures in the Northern Great Plains have resulted in shorter snow seasons and rapid melting of winter snowpack.[22]

Vulnerability Assessment

During the risk assessment activity at the planning meetings, participants mostly agreed that severe winter weather is highly likely to occur in the area. Participants viewed their area as having a medium to high vulnerability to severe winter weather.

FEMA's National Risk Index scores winter weather risk in McPherson County as Relatively Moderate.

While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe

[22] State of South Dakota Hazard Mitigation Plan. 2024.

winter storm than others, particularly the loss of electrical power. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes or other special needs housing and those with inadequate housing or inadequate heating. may also be vulnerable if electrical outages are prolonged. [11]

People that live in McPherson County are especially vulnerable to these conditions because people tend to leave their homes to get places such as work, school, and stores rather than staying inside. The greatest danger during winter weather is traveling because people often get stuck, stranded, and lost when driving their vehicles which usually prompts others such as family and or emergency responders to go out in the conditions to rescue them. Many individuals venture out in inclement weather because they need to get to work or school; want to observe the weather, or to rescue stranded family or friends. While it is difficult to quantify or find historical data on those that have accidents or get stranded during severe weather events, severe winter driving conditions raise the vulnerability of the commuting population.

Freezing Rain/Ice causes adverse conditions such as slippery surfaces and extra weight buildup on power lines, poles, trees, and structures. The additional weight can often cause weak structures to cave in and cause tree branches and power lines to break and fall. McPherson County and the local jurisdictions within are susceptible to these conditions due to the types of structures and surfaces that exist in the county that cannot be protected from freezing rain. Traffic on the roads and highways tends to be the biggest hazard during freezing rain conditions because vehicles often slide off the road which prompts emergency responders and others to have to go out on rescue missions in adverse conditions.

Heavy snow can immobilize transportation, down power lines and trees and cause the collapsing of weaker structures. Livestock and wildlife are also very vulnerable during periods of heavy snow. Most storms can be considered to have occurred countywide.

Additionally, winter storms often result in some forms of utility mishaps. High voltage electric transmission/distribution lines are prominent in the area. These lines are susceptible to breaking under freezing rain and icy conditions and severing during high blizzard winds. Within the county there are fiber optics associated with phone transmissions that are the lifeline to communications. Any electrical complications bring associated risk of food spoilage, appliance burnout, loss of water, and potential harm for in-house life support users. Limited loss of power is not uncommon on an annual basis. A typical power interruption lasts from 1 to 3 hours. Most residents are prepared to deal with this type of inconvenience.

Populations at highest vulnerability for this type of hazard are rural homeowners, which account for approximately 46% of the district, and the elderly, which is 31% of the total population in McPherson County. As with any weather event, those dependent upon healthcare supplies and other essentials will also bear the brunt of highway closures and slowed transportation due to snow and ice. Emergency services will also be delayed during winter storms. Some of the critical facilities that could be utilized in disaster situations do not have backup generators. Also, some facilities have generators that only power a portion of operations.

Severe Winter Storms have a high risk of occurrence. Heavy snow can immobilize transportation, down power lines and trees and cause the collapsing of weaker structures. Livestock and wildlife are also very vulnerable during periods of heavy snow.

Snow Drifts are caused by wind blowing snow and cold temperatures. These drifts can be small finger drifts on roadways causing cautionary driving, or 20-foot-high drifts that block entire highways, roads, and farmyards for several days.

Snow removal policies and emergency response are at excellent performance and no projects will be considered in this area. Generators provide back-up power to many critical facilities within Redfield and in rural areas. However, some of the critical facilities that could be utilized in disaster situations do not have backup generators. Also, some facilities have generators that only power a portion of operations.

ASSESSING VULNERABILITY: OVERVIEW

Requirement 201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

VULNERABLE POPULATIONS

Natural hazards can take a hard toll on vulnerable populations such as the elderly, young children, individuals with low incomes and individuals with disabilities.

The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards. It was designed and built by FEMA in close collaboration with various stakeholders and partners in academia; local, state and federal government; and private industry.

Social Vulnerability

Social Vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks to human cause threats such as toxic chemical spills. The CDC's Social Vulnerability Index (CDC/ATSDR SVI 2022) groups sixteen factors into four themes that summarize the extent to which the area is socially vulnerable to a disaster. The factors include economic data as well as date regarding education, family characteristics, housing, language ability, ethnicity and vehicle access. Overall Social Vulnerability combines all of the variables to provide a comprehensive assessment.

Table 4.25 CDC/ATSDR Social Vulnerability Index 2022

County	Overall Social Vulnerability	Socioeconomic Status	Household Characteristics	Racial and Ethnic Minority Status	Housing Type/ Transportation
McPherson	Moderately Low	Moderately Low	High	Low	Moderately Low

Socioeconomic Status includes those below 150% poverty, unemployed, housing costs burden, no high school diploma and no health insurance. 13.2% of people in McPherson County are in poverty. 4.8% of people in McPherson County are both in poverty and over the age of 65.

Headwaters Economics' *Populations at Risk* report explains that natural disasters disproportionally impact the poor because of factors such as inadequate housing, social

exclusion, a diminished ability to evacuate, lack of property insurance, and more acute emotional stress. Low-income people also are more likely to be overlooked during emergency response following disasters. Low-income residents are also less likely to have adequate property insurance, so they may bear an even greater burden from property damage due to natural disasters.

Household Characteristics includes those aged 65 and older, aged 17 and younger, civilians with disabilities, single parent household, and English language proficiency. As discussed previously, 31% of McPherson County residents are over the age of 65. 17% of households are made up of people who are over the age of 65 and live alone, which makes them more vulnerable to many natural hazards.

Headwaters Economics' *Populations at Risk* report explains that race and ethnicity are strongly correlated with vulnerability to natural hazards.

According to Headwaters Economics *Populations at Risk,* older adults also are at increased risk of compromised health related to environmental hazards and climate change. Age is the single greatest risk factor related to illness or death from extreme heat. The elderly are more likely to have pre-existing medical conditions or compromised mobility, which reduces their ability to respond to natural disasters. Older adults are more susceptible to air pollution such as ground level ozone, particulate matter, or dust. Increased dust is associated with drought, wildfires, and high wind events.[23]

Racial and Ethnicity are self-identified by Census respondents who choose the race or races they most closely identify with. Ethnicity has two categories: Hispanic and Latino or Non-Hispanic and Latino. Hispanics and Latinos can be of any race. 4.3% of people in McPherson County self-identify as a race other than white. Only 1% of the people in McPherson County identify as Hispanic ethnicity.

According to Headwaters Economics' *Populations at Risk* report, minorities tend to be particularly vulnerable to disasters and extreme heat events. This is due to language skills, housing patterns, quality of housing, community isolation, and cultural barriers.

Housing Type/Transportation includes multi-unit structures, mobile homes, crowding, no vehicle, group quarters. 21.4% of all occupied housing units in McPherson County are rental units and mobile homes make up 3.9% of all occupied housing units.

According to Headwaters Economics' *Populations at Risk* report, Mobile homes are more likely to be damaged in extreme weather, which poses a risk for both the structure and the occupants.

Requirement B2-a*. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?*

The following paragraphs summarize the description of the jurisdiction's vulnerability to each hazard and the impact of each hazard on the jurisdiction**.**

McPherson County Narrative of Overall Vulnerability

McPherson County has identified that they have a high vulnerability to blizzards/winter storms, drought, extreme temperatures, flooding, freezing rain/sleet/ice, hail, lightning, strong winds,

[23] Headwaters Economics. Populations at Risk. 2024.

tornados, urban fires, utility interruptions and wildfires. These hazards were given a rating of “H” for high vulnerability or “M” for moderate vulnerability in Table 4.1.

Many of these winter hazards (blizzards/winter storms, extreme cold, freezing rain/sleet/ice) pose the risk of knocking down utility lines which results in loss of power. Due to the extreme weather conditions in Northeastern South Dakota, the threat of losing power for even a few days can be deadly. During the winter months, an event that causes disruption of utilities can take days to repair. Sometimes ice storms take out several miles of power lines and it takes weeks to repair the line and get them up and running again. With no power, many people are left without a source for heat which in turn increases the risk of people freezing to death in their homes.

Meeting participants also noted that while drought might not impact the cities as much, it does have a great impact on the communities as a whole. The region is very dependent on agriculture. Approximately 28% of the people in McPherson county are agricultural producers.[24] When drought impacts their operation and income, it also has a compounding effect on the region – they won’t be spending as much money with local businesses in town.

The elderly (31% of McPherson County’s population), especially those that live alone, are also more vulnerable to extreme heat and tornados. 17% of the people in McPherson County are over the age of 65 and live alone.

Eureka Narrative of Overall Vulnerability: The Town of Eureka has identified that they are particularly vulnerable to blizzards/winter storms, dam failure, drought, extreme temperatures, flooding (including flash flooding), freezing rain/sleet/ice, hail, heavy snow, lightning, rapid snow melt, strong winds, thunderstorms, tornados, utility interruption and wild fires. These hazards were given a rating of “H” for high vulnerability or “M” for moderate vulnerability in Table 4.1.

Residents in Eureka face the same vulnerabilities to winter hazards as described above for McPherson County.

41% of people in Eureka are over the age of 65, making Eureka slightly more vulnerable than the county as a whole. About 9% of households in Eureka are people over the age of 65 that also live alone.

In addition, there are also several people in the community that have life-preserving medical devices that require power for operation. Even though these hazards have a high chance of occurring and causing disruption to daily activities, the City of Eureka is incredibly self-sufficient. Eureka experienced an event where they lost power for several days with temperatures well below zero. The hospital allowed people with medical devices that require power to take shelter at the hospital. Additionally, the fire department has a backup generator on site, so that facility can be used for additional shelter space if needed.

The lift stations and water tower have backup generators, and the City also has artesian wells that can be used as a secondary water source if they lose their water tower. The City has three lift stations; one of them used to occasionally flood during periods of high rain or wet weather. Water entered the system through one of the manholes, which then backed up the lift station. The City completed a project to move two of the manholes to higher elevation, which solved the problem.

[24] 2022 Census of Agriculture. McPherson County Profile.

Strong winds and tornados are common in Eureka. While most people take shelter in their basements, the City has a public storm shelter at City Hall which is designated for public use during these types of events.

The City does own a campground, which makes those camping there more vulnerable to strong winds, summer storms and tornados. However, the local girl scouts have constructed a tornado storm shelter at City Park which is big enough to accommodate eight to ten people. The shelter was built according to FEMA codes and has been approved by FEMA.

Eureka has a manmade lake that is used for recreation. There is a culvert that allows the water in Eureka Lake to run to the west side of county road 47 which splits the lake into East and West Lake. All of the area on the west side of County Road 47 is considered “West” lake. West Lake is more likely to flood but since it is deed restricted only undeveloped land would be affected. The lake is filled by artesian wells when the water levels are low. When the levels are high due to snow melt and excessive rain, the water runs into West Lake. West Lake is not owned by the City, however the land surrounding West Lake is city owned. The City regulates the land around the lake and no building or development is allowed.

Eureka is the only community in McPherson County that participates in the NFIP program, however, the level of participation is minimal. The community joined the NFIP in 1986 but due to lack of understanding of the program not much has been accomplished. The current city staff has no training on the NFIP program and therefore doesn’t have a detailed understanding of the program. However, they have indicated in their mitigation strategy that they will pursue better knowledge of the program and determine whether or not they should even be participating. Since there has never been a flood insurance policy sold in Eureka, it may not be worth the hassle of the paperwork involved. The area around Eureka Dam that is not already developed is owned by the City and deed restricted, so nothing will be built there. The homes and other developments around the lake that currently exist are all at least six to seven feet above elevation of the dam.

Eureka takes a lot of pride in their ability to be self sufficient and their ability to come together as a community and take care of people without outside help during events like the ice storm that left them without power for several days with temperatures well below zero. The whole community plays a role in mitigation efforts, which is clearly demonstrated by the proactive approach they have taken in establishing storm sewer, shelters, backup power for utilities, and a plan for extended periods without power. Eureka is also proactive in restricting development in areas that have the potential of being flooded.

Leola Narrative of Overall Vulnerability: The Town of Leola has identified that they are particularly vulnerable to: blizzards/winter storms, flood, freezing rain/sleet/ice, hail, heavy rain, heavy snow, strong winds, tornado and urban fires. These hazards were given a rating of “H” for high vulnerability or “M” for moderate vulnerability in Table 4.1.

Residents in Leola face the same vulnerabilities to winter hazards as described above for McPherson County.

17% of people in Leola are over the age of 65, making Leola less vulnerable than the county as a whole. About 8% of households in Leola are people over the age of 65 that also live alone.

The City has renovated the Citizens Building as a storm shelter; however, there is no backup generator at the facility. There is an elevator in the Citizens Building that will provide ADA

access to the lower level which will serve as a storm shelter. The County Courthouse has also been designated as a storm shelter. Many of the residents have also taken it upon themselves to purchase backup generators for their homes to accommodate their specific needs.

Leola has a flatter terrain than some of the other communities in McPherson County which makes it more vulnerable to overland flooding which occurs after periods of excessive rain, heavy snow, and rapid snowmelt. During and after heavy rain events, the community has problems with the basements filling with water on the west side of town.

Leola also has a campground, which makes those camping there more vulnerable to strong winds, summer storms and tornados. However, the available storm shelters in town reduce that vulnerability.

In the event of an urban or wildfire, the water from Lundquist Lake on the northeast side of town can be used as a secondary water source for fighting fires.

Long Lake Narrative of Overall Vulnerability:

The Town of Long Lake has also identified that they are particularly vulnerable to blizzards/winter storms, drought, extreme temperatures, freezing rain/sleet/ice, hail, heavy rain, heavy snow, lightning, strong winds, tornados, utility interruption and urban and wildfires. These hazards were given a rating of “H” for high vulnerability or “M” for moderate vulnerability in Table 4.1.

Long Lake has a similar vulnerability to winter weather hazards as every other jurisdiction in McPherson County. They may have an added vulnerability because of the distance to the nearest town. They are 26 miles from Eureka and 21 miles to Leola. The nearest hospital is 20 miles away in Ashley, ND.

60% of people in Long Lake are over the age of 65, making Long Lake more vulnerable than the county as a whole. About 55% of households in Long Lake are people over the age of 65 that also live alone.

Long Lake is comprised of mostly older homes, some of which are not in good condition, and many structures such as garages, pole barns and outbuildings that are used mostly for equipment storage. Due to the age of the structures, the structures themselves could be deemed vulnerable to heavy snow, strong wind, fires, or tornado events.

Long Lake does not have a tornado shelter, but most people seek shelter in their basements or with their neighbors if they do not have one.

While Long Lake is considering passing a nuisance ordinance and enforcing a stricter building code, the City Council is made up of only three people and the City does not have any full-time staff. As with most Class 3 Municipalities, enforcement of ordinances is very difficult if not impossible. A community that does not have a full-time finance officer or maintenance personnel is not likely to hire a full-time code enforcement officer.

Fires pose a significant risk to the town because Long Lake does not have a city water supply or fire hydrants. While Long Lake used to have an agreement with WEB Rural Water to fill a 1,000-gallon poly tank for additional water supply for fire emergencies, WEB no longer provides water for fire protection. Water is supplied directly to individual users rather than as bulk supply to the

town. The only ability Long Lake has to fight fires is the local volunteer fire department which has two grass rigs that hold about 1,000 gallons each. Long Lake relies heavily on mutual aid from neighboring communities such as Ashley, North Dakota and Leola and Eureka. All of these communities are at least 20 miles away. With additional aid being at least 25 minutes (possibly longer since all of the fire departments rely on volunteers) it is possible for a structure or wildfire to spread rapidly and become out of control before additional aid arrives. The Town of Long Lake is located 1.5 miles from the lake named Long Lake which could easily be used to draw water from if dry hydrants were installed. This would cut down significantly on the amount of time it would take to fill trucks during a fire event.

Long Lake does not experience flooding or flood-related issues. The Town of Long Lake is located about 1.5 miles from Long Lake and the elevation difference is significant enough that the lake does not pose a threat.

ADDRESSING VULNERABILTY: REPETITIVE LOSS PROPERTIES

> ***Requirement B2-c.*** *Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?*

The NFIP defines repetitive loss properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. At least two of the claims must be more than 10 days apart. There are no repetitive loss properties or severe repetitive loss properties in McPherson County.

ASSESSING VULNERABILITY: IDENTIFYING STRUCTURES

Requirement 201.6(c)(2)(ii)(A). *The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.*

> ***Element B2-b.*** *For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?*

One of the primary purposes of this plan is to identify people, structures, systems, natural, historic & cultural resources, critical facilities and community events and determining which are particularly at risk of damage or from natural hazards or exposure to natural hazards. The jurisdictions within McPherson County want to ensure they have the ability to mitigate future disasters. Plan participants were asked what community facilities and assets are important or critical to their communities. The following tables identify critical structures and if they serve vulnerable populations. It is also noted if those assets are Economic or Historical assets. Areas of overlap between vulnerable structures/people and potential natural hazards are then identified as “vulnerable” areas that should be mitigated whenever possible.

Participants acknowledged that determining what is “critical” can mean something different to every community and that the information provided in the table is not comprehensive. However, the information provided by the plan participants was used as a baseline and can be supplemented in future years during the annual plan review and/or during the 5-year update. By using information provided by the representatives from each community, it also helps establish a sense of ownership in the mitigation plan.

While the information may not be comprehensive it does give FEMA, SDOEM, and any other readers of the Plan an idea of how communities in rural South Dakota feel about certain structures. For example, FEMA may not view a City Park as a “critical” structure, however, in many small communities the City Park or baseball field is the hub of where activities take place

and may also be the only thing that attracts tourists and people from outside the community. So, it may be the case that without these “landmarks” the communities’ existence would be at stake.

The County’s bridges and culverts were mentioned as critical infrastructure but are not listed in their entirety. These records are kept with the South Dakota Department of Transportation. Additionally, bridge inspections take place once a year and are reported to the South Dakota Department of Transportation.

The City of Eureka has many structures that are vital to emergency operations including the County’s only hospital, a nursing home. The McPherson County Courthouse is located in Leola and also serves at the local emergency operations center when needed. Table 4.26 is a list of critical facilities that would cause the greatest distress in the county if destruction occurred.

Finally, the plan participants were asked to identify which of the critical structures or facilities are particularly vulnerable to natural hazards and future hazards due to climate variations. All facilities share the same risk for most all hazards, unless otherwise noted.

Table 4.26: Assets/Critical Structures								
McPherson County								
FEMA Lifeline	**Asset/Critical Facilities**	**Owner**	**Count**	**Vulnerable Population**	**Economic**	**Historic**	**Hazard Vulnerability**	**Notes**
Transportation	Eureka Pole Structure	County		X			All	
Transportation	Eureka Wooden Shop	County		X			All	
Transportation	Eureka Steel Building	County		X			All	
Transportation	Long Lake Storage Bldg	County		X			All	
Transportation	Leola Wood Bldg	County		X			All	
Transportation	Leola Steel Bldg	County		X			All	
Transportation	Leola Pole Bldg	County		X			All	
Safety and Security	County Courthouse	County	1	X		X	All	
City of Eureka								
Safety and Security	City Hall/Police Station//Library	City		X			All	
Safety and Security	Firehall	Fire Dept		X			All	
Transportation	City Shop	City		X			All	
Transportation	County Highway	County		X			All	
Water Systems	Water Tower	City		X			All	
Water Systems	City Well	City	1	X			All	
Water Systems	WEB Water Reservoir	WEB Water		X			All	
Water Systems	Wastewater Lagoon	City		X			All	
Water Systems	Lift Station at Fire Hall	City	3	X			All	Fire Hall, Ballpark, West Lift station
N/A	City Parks	City		X			All	
N/A	Eureka School & Auditorium	School District		X			All	

N/A	Eureka School Bus Building	School District		X			All	
N/A	Senior Citizen's Building	Private Bldg		X			All	
Health and Medical	Avera Eureka Health Care Center	Nursing Home		X			All	
Health and Medical	Eureka Community Health Services - Avera	Hospital/Assisted Living		X			All	Managed by Avera
Transportation	Airport	Govt Structure					All	
Health and Medical	Vision Care Clinic	Private		X	X		All	
N/A	Eureka Manufacturing	Private			X		All	
N/A	Dakota Woodworking	Private Bldg			X		All	
	Round Reservoir & equipment	Private					All	
City of Leola								
Safety and Security	Municipal Building	City		X			All	
Safety and Security	Leola Fire Dept	VFD		X			All	
N/A	Leola Citizens Building	City		X			All	
Transportation and Water Systems	City Shop/ Water Tower/ Storage Tank	City		X			All	
Water Systems	Lagoon	City		X				
N/A	Campground	City		X			All	
Transportation	SD DOT Building	State					All	
N/A	Leola School	School District		X			All	
N/A	USPS Building	Private		X			All	
	Library/Med Building	City		X			All	
N/A	Leola Bus Garage	School District		X			All	
N/A	Cortrust Bank & Ins.	Private			X		All	
N/A	Agtegra	Coop	3		X		All	
N/A	Gene's Oil	Private			X		All	
Communications	Valley Telecommunication	Coop			X		All	
Food, Hydration and Shelter	Leola Grocery	Private			X		All	
N/A	American Legion/ Bar	Public			X		All	

N/A	USDA Farm Service Agency	Federal					All	
N/A	Swimming Pool	City		X			All	
N/A	United Methodist Church	Church					All	
N/A	St. James Lutheran	Church					All	
N/A	St. Paul's Lutheran	Church					All	
N/A	OLPH Catholic	Church					All	
N/A	McPherson Co Abstract & Title Company	Private					All	
N/A	G's Convenience	Private			X		All	
N/A	North Central Heritage Museum	Public					All	
N/A	Swine Robotics	Private	2		X		All	2 locations
Town of Long Lake								
N/A	Old School/Community Building	City		X			All	
N/A	Apartment Building	Private		X			All	
N/A	Long Lake Bar & Café	Private			X		All	
N/A	Church	Private		X			All	
Transportation	County Shed	County					All	
Safety and Security	Fire Hall	Govt		X			All	
N/A	American Legion	Private					All	
Water Systems	Lagoon	City		X			All	
N/A	Long Lake Meat Market	Private			X			

The City of Leola also mentioned that Rhubarb Days/Leola Fest is an important festival/event in their community. This is a large community festival held every summer. Hundreds attend the event in the town of 434. Held at the end of June, the risk of a thunderstorm (including hail and lightning), heavy rain, heavy winds or tornados during the event is high. The city does have two storm shelters (Citizens Building and Courthouse) where attendees could take shelter, if needed.

ASSESSING VULNERABILITY: ESTIMATING POTENTIAL LOSSES

Requirement 210.6(c)(2)(ii)(B). *[The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in…this section and a description of the methodology used to prepare the estimate.*

Requirement 201.6(c)(2)(ii)(A). *The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.*

> ***Element B2-b.*** *For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?*

As mentioned elsewhere in the plan, the population of every jurisdiction in McPherson County is decreasing. According to the 2000 Census, the total population in the county was 2,904; in 2010, the Census reported 2,459 people and the 2020 Census recorded 2,411 people. The population has dropped by 17% in the last 20 years. That trend is expected to continue, leading to fewer people in the county at risk of natural hazards and fewer occupied dwellings and other assets at risk to natural hazards. Any future developments that occur in the county will also be relatively small and won't impact the overall vulnerability to natural hazards.

The table below shows results from the public survey conducted by the planning team. One of the questions on the survey asked residents if they had been negatively affected by natural hazards in the past five years. The table also shows climate change projections and the potential impact that could have on the County. It is reasonable to assume that these natural hazards will continue to impact the people that live in these five counites in the future.

Table 4.27 Climate Change Projections and Impacts

Natural Hazard	% of People Negatively Affected by Hazard	Climate Change Projection	Potential Impact
Dam Failure	0%	Heavy rainfall is increasing in intensity and frequency which could increase the risk of dam failure.	There is one significant hazard dams in McPherson County, which is the dam at Eureka Lake.
Drought	21%	Intensity of droughts is projected to increase due to rising temperatures and increased soil moisture loss	The agriculture sector is most vulnerable – including crops, pastureland and livestock.
Extreme Temperatures	14%	Extreme temperatures are expected to increase. Extremely warm days are expected to become warmer.	Population without air conditioning or adequate furnaces. Agriculture sector is also vulnerable. Elderly population also at risk.
Floods	6%	Heavy rainfall is increasing which could lead to more flooding.	Most of the County is in a NSFHA. Occasional basement flooding due to groundwater seepage. Buildings

			and infrastructure can be impacted by flash flooding after heavy rainfall or due to rapid snowmelt.
Summer Storms (Hail and Lightning)	35%	As the atmosphere warms, increased heat provides more energy for severe storms.	Hail can damage structures, vehicles and crops. Lightning can start wildfires. Summer storms can also impact the electrical grid.
Tornados	4%	Unknown how climate change can impact the frequency and intensity of tornados.	Tornados can be destructive to nearly all community assets.
Wildland Fires	3%	Due to increasing temperatures, wildfires could become more common.	Wildland fires affect pasture and crop land.
Winds – High/Strong	33%	Unknown how climate change can impact the magnitude of windstorms.	Winds can impact trees, power lines, mobile homes and weak structures.
Winter Weather	49%	Winters are expected to become warmer overall. This could lead to more ice and freezing rain events or large snowfall events.	Most impacts are to populations in regard to electrical outages, and decreased travel (or riskier travel).

The planning team also collected information from the McPherson County Director of Equalization about the number of properties and values in each jurisdiction. Tables 4.28-4.31 show the number of structures and tax assessed value of those structures. All properties with structures, whether owner occupied or not were included in the valuations. The reports provided by the assessor's office did not include the type of structure (for example, a residential structure may be a house or an unattached garage). It's also important to note that this only includes structures and not ag land, which has a considerable value ($779 million) but isn't typically permanently impacted by natural hazards.

4.28 McPherson Estimated Potential Dollar Losses to Vulnerable Structures (not including Eureka, Leola, Long Lake figures)			
Type of Structure	Number of Structures	Value of Structures	Number of People
Residential	367	$33,041,577	
Mobile Home	62	$4,252,555	
Commercial	15	$1,309,902	
Agricultural	577	$43,347,591	
Other	85	$6,733,431	
Total	**1,106**	**$88,685,056**	**1,137**

4.29 Eureka Estimated Potential Dollar Losses to Vulnerable Structures			
Type of Structure	Number of Structures	Value of Structures	Number of People
Residential	776	$30,821,096	
Mobile Home	19	$928,891	
Commercial	79	$6,234,996	

Agricultural	4	$18,918	
Other	1	$95,110	
Total	**879**	**$38,099,011**	**813**

4.30 Leola Estimated Potential Dollar Losses to Vulnerable Structures			
Type of Structure	Number of Structures	Value of Structures	Number of People
Residential	360	$14,604,309	
Mobile Home	11	$365,898	
Commercial	44	$2,717,613	
Agricultural	39	$323,984	
Total	**454**	**$18,011,804**	**434**

4.31 Long Lake Estimated Potential Dollar Losses to Vulnerable Structures			
Type of Structure	Number of Structures	Value of Structures	Number of People
Residential	59	$733,744	
Commercial	6	$127,977	
Agricultural	2	$14,259	
Total	**67**	**$875,980**	**27**

*Other residential includes non-primary residences, garages, sheds, etc.

ASSESSING VULNERABILITY: ANALYZING DEVELOPMENT TRENDS

Requirement 201.6(c)(2)(ii)(C). *{The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Requirement 201.6(c)(3) *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.*

> ***Element C1-a.*** *Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use development ordinances or regulations?*
>
> ***Element C1-b.*** *Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?*

Requirement 201.6(d)(3). *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.*

> ***Element E1-a.*** *Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?*

The land use and development trends for each jurisdiction were identified by the representatives from each of the jurisdictions. None of the communities in McPherson County are experiencing growth or development at this time as all of the jurisdictions have experienced declining populations over the past two decades. At this time McPherson County communities are just trying to maintain the population they have, so the trend for development is sustaining the population and businesses that currently exist with the hope of attracting new residents and businesses to the county. Due to the small populations McPherson County jurisdictions do not maintain plans for growth and development.

There are areas of planning and development that have room for improvement such as zoning ordinances, comprehensive planning, municipal ordinances, improving their knowledge of the NFIP program and floodplain ordinance, as well as floodplain management.

CURRENT DEVELOPMENT TRENDS

McPherson County

The County Assessor regulates all development in the County, outside of Eureka and Leola. All new building construction requires a building permit from the County Zoning Officer. The Zoning Officer can issue a building permit if the application conforms with the zoning ordinances. If the application requires a variance or a conditional use permit, then the McPherson County Planning and Zoning Board will make the decision.

McPherson County recently revised their zoning ordinances.

McPherson County currently has a drainage permit ordinance and a process to follow for any landowners wishing to alter the drainage on their land. Projects can vary from changing the size of a culvert to altering drainage tiles to tiling land and more. Landowners need to apply for a permit from the County and provide any necessary documentation as required. An engineering analysis showing the downstream impacts of the proposed drainage may be required, depending on the project; a decision is made on a case-by-case basis by the Drainage Board. The County Highway Superintendent may be asked to provide information on impacts to county infrastructure and/or to survey the work being done once a drainage permit is approved. The county commission, acting as the drainage board, makes all decisions on approving or denying the application.

The McPherson County Drainage Permit Ordinance is included as Appendix F.

As mentioned in the McPherson County Profile section of the plan, there are 4 Hutterite Colonies in the County. One of the colonies is adding a new residential development which will house about 100-200 people. While the colonies are pretty self-sufficient, they do rely on volunteer fire departments and volunteer EMS in the event of an emergency.

City of Eureka
The City of Eureka utilizes the City's planning and zoning code book that was last created in 2001. Due to a lack of personnel, the City relies on contractors to follow code and does not have a process or staff for oversight and/or determining compliance. The area around Eureka Dam that is not already developed is owned by the City and deed restricted, so nothing will be built there. The homes and other developments around the lake that currently exist are outside of the floodplain.

In the last 5 years, there has been a new hospital/medical clinic/assisted living facility built. There have also been a few new commercial buildings as well as a handful of houses in the last few years. Overall, the amount of development is small and hasn't impacted the county's overall vulnerability to hazards.

The City has purchased land on the west side of town that may be used for commercial or residential purposes in the future. No decision has been made on how the land will actually be used.

City of Leola
The City of Leola regulates development within the city limits. As long as a building permit application meets all zoning requirements, a building permit is issued. The City does have a zoning administrator that reviews the application and inspects the property for setback requirements, etc. The Leola Development Corporation also has a hand in bringing any new developments and businesses to town.

There have been discussions in the past about developing housing around Lundquist Lake. This land is privately owned. It's uncertain if those plans are still moving forward. The City is not mapped for Special Flood Hazard Areas or flood risk, so the associated risks with a housing development in this area are unknown. Plan author has communicated the importance of determining those risks before moving forward with any type of plans for this area.

In the last five years, Leola underwent an extensive water improvement project that included the replacement of the existing water system. The work also included the installation of new valves,

curb stops, asphalt street repair, concrete sidewalk and driveway repair, and gravel surfacing repair.

Overall, the amount of development in Leola is small and hasn't impacted the county's overall vulnerability to hazards.

Town of Long Lake
Long Lake is a very small town (population 27) so not much development takes place. The Town is considering updating their nuisance ordinance to help clean up some properties in town. The County is responsible for issuing building permits in Long Lake.

UNIQUE OR VARIED RISK ASSESSMENT

Requirement 201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

> ***Element B1-f.*** *For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or varying from those affecting the overall planning area?*

While the extent to which each jurisdiction is affected by hazards varies slightly between the local jurisdictions, the implications are the same. Thus, the steering committee decided that all areas outside the municipal jurisdictions of Eureka and Leola are equally affected by the types of hazards/risks previously discussed in the plan. Leola and Eureka are exceptions because of their proximity to the dams/lakes.

McPherson County
McPherson County has four Hutterite Colonies. As mentioned in the McPherson County Profile section, the Hutterites are a communal people, with several houses located in one colony. The colonies do pose a unique or varied risk as they are all located in very rural areas of the county and while they are pretty self sufficient, they do rely on volunteer fire departments and volunteer EMS in the event of an emergency.

City of Eureka
Other than the area of the west side of town around the lake, Eureka doesn't have other areas of town that are susceptible to flooding. Eureka is the largest town in the County and is home to the only hospital, nursing home, and assisted living facility in the county.

City of Leola
Leola is the County Seat of McPherson County. The City of Leola doesn't have major drainage issues. Most homes have basements that people can take shelter in during a storm. There are also two designated storm shelters in town (the Citizens Building and the County Courthouse).

Town of Long Lake
Long Lake is different from Eureka and Long Lake because of its size (only 27 people live in town). Long Lake has identified that Dam Failure is not a hazard for the City. They are several miles from the nearest dam. Other than that, they don't face any hazards or risks that are different from any other place in the County.

VI. MITIGATION STRATEGY

CHANGES/REVISIONS TO THE MITIGATION SECTION:
Mitigation Strategies were added for each hazard identified. The format of this section was changed to group projects by hazard (not necessarily by jurisdiction). Separate sections were added to identify projects that have been completed as well as projects that are no longer a priority for the various jurisdictions.

MITIGATION REQUIREMENTS

Requirement 201.6(c)(3). *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources and its ability to expand on and improve these existing tools.*

> ***Element C1-a.*** *Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use development ordinances or regulations?*
>
> ***Element C1-b.*** *Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?*

Requirement 201.6(c)(3)(i): *The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

> ***Element C3-a.*** *Does the plan include goals to reduce the risk from the hazards identified in the plan?*

Requirement 201.6(c)(3)(ii). *The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard with particular emphasis on new and existing buildings and infrastructure.*

> ***Element C4-a.*** *Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?*
> ***Element C4-b.*** *Does the plan include one or more actions(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?*

Requirement 201.6(c)(3)(iii). *The hazard mitigation strategy shall include an action plan, describing how the action identified in…this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Requirement 2016.6(c)(3)(iv). *For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

> ***Element C5-b.*** *Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?*

MITIGATION OVERVIEW

The State Hazard Mitigation Plan addresses four types of mitigation actions, including: local plans and regulations, structure and infrastructure projects, natural systems protection and educated and awareness.

After meetings with the local jurisdictions, stakeholders and opportunities for public input, a series of mitigation goals were devised to best aid the County in reducing the impacts of natural hazards. Projects previously identified in the plan were discussed to determine which of the projects had enough merit to be included in the updated plan and to determine if the projects meet the hazard mitigation needs of all jurisdictions. These projects were evaluated based on a preliminary evaluation cost/benefit ratio and priority based on either historical damages or anticipated damage. Consideration of prioritization also included possible future impacts due to climate variations and vulnerable and underserved populations.

A *high* priority classification means that the project should be implemented as soon as possible and would minimize losses at a very efficient rate. A *moderate* classification means that the project should be carefully considered and completed after the high priority projects have been completed. A *low* priority means that the project should not be considered in the near future. However, it is a potential solution and should not be eliminated until further evaluation can be completed.

A timeframe for completion, oversight, funding sources, and any other relevant issues were addressed. These implementation strategies are geared toward the specific goal and area. Notes were added to some projects for further clarification. For projects involving multiple jurisdictions, it is assumed that each jurisdiction will independently complete the project, unless otherwise noted that one jurisdiction will take the lead and work collaboratively.

None of the jurisdictions have adopted their own building codes. It is acknowledged that building codes play an important role in mitigating many hazards. However, due to the rural nature of the area and the limited staffing ability and time of all of the jurisdictions, many of them may not find a benefit in adopting their own building codes. Per South Dakota Codified Law, when any local unit of government in South Dakota has not adopted a building code ordinance, the design standard shall be based on the 2021 edition of the International Building Code as published by the International Code Council, Incorporated.

McPherson County does have a comprehensive plan and zoning ordinances in place. They have somewhat limited abilities to expand or improve these capabilities at this time. The county's Emergency Manager is a part-time position. The Emergency Manager is also the County Sheriff. Many other county employees have multiple roles. They do have a membership with their planning district, Northeast Council of Governments, which can provide some technical assistance as needed.

Eureka and Leola both have some planning mechanisms in place. However, due to their small population and the fact that their finance officers have multiple roles, their ability to expand or improve on these capabilities is also limited.

Because of its size (population of 27), Long Lake has very limited capabilities and resources. They have a part-time Finance Officer and a three-member volunteer Town Board.

Table 5.1 Mitigation Capabilities	
	Local Jurisdiction

	McPherson Co	Eureka	Leola	Long Lake
Plans				
Comprehensive Plan	Yes	Yes	Yes	No
Community Wildfire Protection Plan	No	No	No	No
Capital Improvements Plan	No	Airport	No	No
Local Emergency Operations Plan	Yes	C	C	C
Land Use Plan	No	No	No	No
Stormwater Management Plan	No	No	No	No
Bridge Plan	Yes	No	No	No
Community Operation Plan	No	No	No	No
Hazardous Materials Plan	Yes	C	C	C
Land Use Planning and Ordinances				
Zoning Ordinance	Yes	Yes	Yes	No
Flood Damage Prevention Ordinance	No	Yes	No	No
Open Burning Ordinance	Yes	No	No	No
Flood Insurance Rate Map (FIRM)	No	Yes	No	No
Floodplain Management Plan	No	No	No	No
Building Code	Int'l Bldg Code (IBC)	IBC	IBC	IBC
Drainage Ordinance	Yes	No	No	No
Subdivision Ordinance	No	No	No	No
Elevation Certificates	No	No	No	No
Mitigation Capabilities - Administrative				
Building Official	Yes	No	Zoning Admin	No
Civil Engineer	No	No	No	No
Community Planner*	No	No	No	No
Floodplain Administrator	No	Yes	No	No
GIS Coordinator*	Yes	No	No	No
Emergency Manager	Yes	C	C	C
Planning Commission	Zoning Board	Yes	Yes	No
Membership with NECOG	Yes	Yes	C	C
Mitigation Capabilities – Technical				
Grant Writing*	No	No	No	No
Hazard Vulnerability Analysis	No	No	No	No
GIS Analysis*	No	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes	Yes
Other Studies/Reports/Maps				
Flood Insurance Studies/Engineering Studies/H&H Studies	No	No	No	No
Critical Facilities Map	No	No	No	No
Existing Land Use maps	Yes	Yes	Yes	No

Dam Inspection Report	No	No	No	No
Funding Resources				
Capital Improvement Project Funding	No	No	No	No
Community Development Block Grant	Yes	Yes	Yes	Yes
Water Fees	No	Yes	Yes	Yes
Sewer Fees	No	Yes	Yes	Yes
Electricity Fees	No	No	No	No
Stormwater Utility Fee	No	No	No	No
Federal (non-FEMA) Funding	Yes	Yes	Yes	Yes
State Funding Programs	Yes	Yes	Yes	Yes
Education and Outreach				
Community Newsletter	No	No	No[+]	No
Local Newspaper	Yes	Yes	Yes	Yes
Website	Yes	No^	Yes	No
Social Media	Yes	No^	Yes	No
Text Alerts	No	Yes	Yes	No
Hazard Awareness Campaigns	Yes	No	No	No
Org. Rep. to Interact with Vulnerable Pop.	No	No	No	No
C: the jurisdiction is regulated under the County's policy/program/technical document				
*Some portions of services such as Planning, GIS Coordination/Analysis, Grant Writing can be provided through membership with the NECOG.				
^Eureka Chamber and Development Company has website that posts some information for City of Eureka.				
[+]The City of Leola does include fliers with community information/events in the monthly water bills.				

Dam Failure

Goal 1: Reduce the impact of dam failure in McPherson County

Project 1	Explore options for creating an Emergency Action Plan for Eureka Dam.
Jurisdictions	Eureka and McPherson County
Responsible Entity	Eureka Public Works Director (Lead) and County Emergency Manager
Priority	Low
Funding Source	BRIC, HMGP
Timeframe	3-5 years
Notes	An Emergency Action Plan is not required for the dam but may be a best practice.

Project 2	Explore options with SD School and Public Lands for creating an Emergency Action Plan for Leola Dam.
Jurisdictions	Leola and McPherson County
Responsible Entity	Mayor (Lead) and County Emergency Manager
Priority	Low
Funding Source	SD School and Public Lands, BRIC, HMGP
Timeframe	3-5 years
Notes	The dam is owned by the SD School and Public Lands so the City would need to coordinate with them. An Emergency Action Plan is not required for the dam but may be a best practice.

Dam Failure is not a hazard for the Town of Long Lake.

Drought

Goal 1: Reduce the impact of drought in McPherson County

Project 1	Review and use burn bans, as necessary. Where burn bans aren't implemented; provide education and awareness around the risks and proper use of controlled burns to prevent fires during drought conditions.
Jurisdictions	All Jurisdictions
Responsible Entity	County Commission and City Councils
Priority	Moderate
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	McPherson County has a burn ban ordinance that prohibits open fires if the Grassland Fire Danger Index is Very High or Extreme or a Red Flag Warning has been issued. In Leola, all burning must be covered by a screen to prevent embers from escaping. The City also follows the County on implementing burn bans.

Project 2	Review and enforce water restrictions when applicable. Or provide information on water conservation in areas where ordinances aren't available.
Jurisdictions	All Jurisdictions
Responsible Entity	County Commission and City Councils
Priority	Moderate
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	

Project 3	Have rural fire departments install dry fire hydrants
Jurisdictions	Long Lake and McPherson County
Responsible Entity	Long Lake Town Board and Emergency Manager (Lead)
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 Years
Notes	The Town of Long Lake does not have any means for fire protection other than the fire trucks. The fire department does not have a place in Long Lake to fill their trucks. With a dry fire hydrant installed by the nearby lakes, the trucks could siphon from the lakes for additional water. The hydrants would be non-pressurized.

Project 4	Add water storage tanks as a secondary water source in the event of a fire
Jurisdictions	Long Lake
Responsible Entity	Long Lake Town Board
Priority	Moderate
Funding Source	SD DANR
Timeframe	3-5 years

Extreme Temperatures

Goal 1: Reduce the impact of extreme temperatures in the McPherson County

Project 1	Educate citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager/City Finance Officers
Priority	High
Funding Source	NA – No cost aside from staff time
Timeframe	Ongoing
Notes	Special consideration should be given to vulnerable populations such as those over the age of 65. Information could be disseminated with water bills, the local newspaper, radio, social media, text messaging systems, etc.

Flooding

Goal 1: Reduce the impact of flooding in the McPherson County

Project 1	Identify roads that need to be elevated to prevent from becoming inundated with water due to heavy rains, rapid snow melt, flash floods or other flooding hazards. Identify culverts that need to be upsized.
Jurisdictions	All Jurisdictions
Responsible Entity	Highway Superintendent/Public Works Director/Maintenance Supervisor
Priority	Low
Funding Source	HMGP, BRIC
Timeframe	Ongoing

Project 2	Improve knowledge of, and capacity to implement the NFIP program. Training could include emergency manager, city finance offices, county planning and zoning officials, and city and county employees and governing board members and/or floodplain administrators to ensure there are numerous knowledgeable people in the area to implement and follow NFIP policies and procedures to better protect the citizens of Eureka from flooding.
Jurisdictions	Eureka (McPherson County, Leola and Long Lake don't participate in NFIP).
Responsible Entity	Floodplain Administrator
Priority	Low
Funding Source	NA – No cost aside from staff time
Timeframe	Ongoing
Notes	Much of the City is in a NSFHA. All land in Zone A is owned by the City.

Project 3	Address drainage issues throughout Eureka, Leola and the County by conducting a hydrology study to determine if culvert resizing and/or grade raises are necessary.
Jurisdictions	Eureka, Leola and McPherson County
Responsible Entity	Public Works Director (Eureka), Maintenance Supervisor (Leola) and Emergency Manager (County)
Priority	Low
Funding Source	HMGP, BRIC, USDA RD and SD DANR
Timeframe	3-5 years
Notes:	Leola added 2 culverts in town which have minimized drainage issues. The jurisdictions anticipate using Advance Assistance funds so it is possible a complete BCA would not be necessary.

Project 4	Inspect culverts to determine if replacements are needed for proper flow.
Jurisdictions	Eureka and Leola
Responsible Entity	Public Works Director (Eureka) and Maintenance Supervisor (Leola)
Priority	Low

Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	Leola has worked with a contractor to do this work.

Summer Storms

Goal 1: Reduce the impact of summer storms in McPherson County

Project 1	Evaluate existing shelters and other structures, such as schools, to determine usefulness (and accessibility) as storm shelters. Retrofitting these facilities should be considered, as necessary. Construct storm shelters wherever needed throughout the county and place signage along major thoroughfares where travelers can see the locations of the nearest shelters.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager and/or Finance Officers
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 years

Project 2	Update warning siren system in Long Lake and throughout the County
Jurisdictions	Long Lake and McPherson County
Responsible Entity	Long Lake Town Board and Emergency Manager (Lead)
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 years
Notes	The siren in Long Lake cannot be activated remotely and needs to be replaced.

Project 3	Improve public awareness of the hazards caused by summer storms. Include information on the steps citizens can take to protect themselves when summer storms occur.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager or Finance Officer
Priority	High
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	Disseminate information during Severe Weather Awareness Week. Information could be disseminated with water bills, the local newspaper, radio, social media, text messaging systems, etc. Jurisdictions could also participate in NWS StormReady Program. Topics could include safety issues on downed power lines or survival strategies during storms. Special considerations should be given to vulnerable populations such as those over the age of 65

Project 4	Identify nuisance properties and weak or compromised structures throughout town and work with private owners to ensure their property is not a hazard.
Jurisdictions	Long Lake
Responsible Entity	Long Lake Town Board
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	Ongoing
Notes	Long Lake has started the process to update their nuisance ordinance and look at options for enforcement of ordinance.

Tornados

Goal 1: Reduce the impact of tornados in McPherson County

Project 1	Evaluate existing shelters and other structures, such as schools, to determine usefulness (and accessibility) as storm shelters. Retrofitting these facilities should be considered, as necessary. Construct storm shelters wherever needed throughout the county and place signage along major thoroughfares where travelers can see the locations of the nearest shelters.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager or Finance Officer
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 years

Project 2	Update warning siren system in Long Lake and throughout the County
Jurisdictions	Long Lake and McPherson County
Responsible Entity	Long Lake Town Board and Emergency Manager (Lead)
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 years
Notes	The siren in Long Lake cannot be activated remotely and needs to be replaced.

Project 3	Protect the public from tornados through information and education.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager or Finance Officer
Priority	High
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	Information could be disseminated through news releases, emergency checklists, and social media. Topics could include taking shelter, safe rooms, and the safest places within houses during tornados. Special considerations should be given to vulnerable populations such as those over the age of 65

Wildland Fires

Goal 1: Reduce the impact of wildland fires in McPherson County

Project 1	Review and use burn bans, as necessary. Where burn bans aren't implemented; provide education and awareness around the use of controlled burns.
Jurisdictions	All Jurisdictions
Responsible Entity	County Commission and City Councils
Priority	Moderate
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	McPherson County has a burn ban ordinance that prohibits open fires if the Grassland Fire Danger Index is Very High or Extreme or a Red Flag Warning has been issued. In Leola, all burning must be covered by a screen to prevent embers from escaping. The City also follows the County on implementing burn bans.

Project 2	Have rural fire departments install dry fire hydrants
Jurisdictions	Long Lake and McPherson County
Responsible Entity	Long Lake Town Board and Emergency Manager (Lead)
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	3-5 Years
Notes	The Town of Long Lake does not have any means for fire protection other than the fire trucks. The fire department does not have a place in Long Lake to fill their trucks. With a dry fire hydrant installed by the nearby lakes, the trucks could siphon from the lakes for additional water. The hydrants would be non-pressurized.

Project 3	Add water storage tanks as a secondary water source in the event of a fire
Jurisdictions	Long Lake
Responsible Entity	Long Lake Town Board
Priority	Moderate
Funding Source	SD DANR
Timeframe	3-5 years

High/Strong Winds

Goal 1: Reduce the impact of high/strong winds in McPherson County

Project 1	Provide more public education on mobile home safety during high wind events.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager and Finance Officers

Priority	Low
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	This could address orientation of mobile homes in regard to prevailing winds along with the use of tie downs.

Winter Storms

Goal 1: Reduce the impact of winter storms in McPherson County

Project 1	Improve public awareness of the hazards and impacts caused by severe winter storms. Include information on the steps they can take to protect themselves when winter storms occur.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager, Finance Officers
Priority	High
Funding Source	NA – No cost other than staff time
Timeframe	Ongoing
Notes	Information on severe storms is often provided via cell phone alerts, radio station, TV stations and weather-related apps. Topics could include informing the public about severe winter weather impacts or traveler emergency preparedness information about severe winter weather hazards. Special considerations should be given to vulnerable populations such as those over the age of 65

Project 1	Install backup generators at fire halls, storm shelters and other critical facilities as necessary to ensure vital services can continue during power outages.
Jurisdictions	All Jurisdictions
Responsible Entity	County Emergency Manager, Finance Officers
Priority	Moderate
Funding Source	HMGP, BRIC
Timeframe	Ongoing

Changes since the last plan update

Requirement 201.6(d)(3). *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.*

> ***Element E2-b.*** *Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?*

Several changes to mitigation projects have been made since the last plan update in 2020. In some cases, projects have been streamlined and/or several projects in the previous plan have been combined into one overall project in this plan update. There were several projects related to storm shelters, raising roads and fire/burn bans that have been simplified and/or consolidated since the last plan update.

Projects from the 2020 plan that have been completed.

McPherson County
Goal 1 – Reduce the impact of flooding in McPherson County
Project #5 – Replace box culvert on county Road 19 near the Leola Dam to address flooding issues.

McPherson County
Goal 1 – Reduce the impact of severe winter storms on the citizens of McPherson County
Project #2 – Survey areas in need of snow shelterbelts and plant trees accordingly.
Discussion – Eureka has done some tree plantings to act as a living snow fence.

Eureka
Goal 3 – Reduce the impact of severe winter storms on the citizens of Eureka
Project #1 – Identify winter storm shelter and provide backup generator for power. It is possible an existing building within the city could be retrofitted to serve as a storm shelter.
Discussion: City Hall can be used as a winter storm shelter as well as the hospital.

Leola
Goal 2 – Reduce the impact of flood hazard within the City of Leola
Project #1 – Increase the size of the spillway at the dam to prevent flooding which occurs on the north side of town

Leola
Goal 3 – Reduce the impact of severe winter storms
Project #2 – Install a backup generator at the water tower to allow pumps to continue to fill water tower in the event of a prolonged power outage caused by severe winter/summer storms.

Projects from the 2020 plan that have been removed due to no longer being a priority.

McPherson County
Goal 1 – Reduce the impact of flooding in McPherson County.
Project #3 – Use HAZUS software to determine flood risk throughout the county.
Discussion: Staff are not trained on using HAZUS software.

McPherson County
Goal 1 – Reduce the impact of severe summer storms in McPherson County.
Project #5 – Use HAZUS software to estimate losses particularly for tornados
Discussion: Staff are not trained on using HAZUS software.

McPherson County
Goal 1 – Reduce the impact of wildfires and drought
Project #3 – Work with State Forester to complete a wildfire risk assessment and to create a wildfire risk map.
Discussion: There are no forested areas in McPherson County.

Long Lake
Goal 1 – Reduce the impact of severe winter storms

Project #1 – Purchase and install a stationary standby generator to operate the fire hall and storm shelter if power is lost.
Discussion: Most people have personal generators at home so Long Lake feels that a winter storm shelter is not needed.

IMPLEMENTATION OF MITIGATION ACTIONS

Element C5-a. *Does the plan describe criteria used for prioritizing actions?*

Prioritization Strategy for Mitigation Actions

The strategy for prioritization has always been to work with the projects that will have the greater impact and benefit for the public. These projects are currently prioritized based on a number of factors, including: 1) Feasibility, 2) Impact to the public, 3) Improvements to the systems that will provide the greatest operational flexibility, 4) Perceived Benefit to Cost ratio. As with any strategy, possibility of change exists due to the fact that some of these factors may change as newer and better information becomes available. Final cost estimates and further analysis of total benefits would need to be completed in order to do a true benefit cost analysis. After that information is completed, some of the priorities may change. Many of the projects are identified as “ongoing” and have little to no cost. These are mitigation measures that are part of typical, day to day, activities of the counties or cities and due to their ongoing nature are obviously not prioritized in the same manner as projects that will require actual construction and case in order to be realized.

Upon adoption of the updated McPherson County Mitigation Plan, each jurisdiction will become responsible for implementing its own mitigation actions. Those who do not participate or adopt the plan will be required to coordinate all mitigation actions with the County. The planning required for implementation is the sole responsibility of the local jurisdictions that have participated in the plan update. Jurisdictions that participated and adopted the plan can implement mitigation actions as they deem appropriate. A benefit cost analysis will be conducted on an individual basis after the decision is made to move forward with a project. Some municipalities indicated that they do not have the financial capability to move forward with projects identified in the Plan at this time, however, they will consider applying for funds through the State and federal agencies once such funds become available. If and when the municipalities are able to secure funding for the mitigation projects, they will move forward with the projects identified.

VI. PLAN MAINTENANCE

CHANGES/REVISIONS TO PLAN MAINTENANCE:

Only minor changes were made to the plan maintenance section of the plan.

MONITORING, EVALUATING, AND UPDATING THE PLAN

Requirement 201.6(c)(4)(i). *The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

> ***Element D2-a.*** *Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?*
>
> ***Element D2-b.*** *Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process much identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.*
>
> ***Element D2-c.*** *Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?*

McPherson County and all of the participating local jurisdictions thereof will incorporate the findings and projects of the Plan in all planning areas as appropriate. Periodic monitoring and reporting of the plan is required to ensure that the goals and objectives for the McPherson County mitigation plan are kept current and that local mitigation efforts are being carried out.

During the process of implementing mitigation strategies, the county or communities within the county may experience lack of funding, budget cuts, staff turnover, and/or a general failure of projects. These scenarios are not in themselves a reason to discontinue and fail to update the Natural Hazard Mitigation Plan. A good plan needs to provide for periodic monitoring and evaluation of its successes and failures and allow for appropriate changes to be made.

ANNUAL REPORTING PROCEDURES

The plan shall be reviewed annually, as required by the County Emergency Manager, or as the situation dictates, such as following a disaster declaration. The McPherson County Emergency Manager will review the plan annually in conjunction with the budgeting process and ensure the following:

1. The County Elected body will receive an annual report and/or presentation on the implementation status of the plan.
2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the plan. This may include items such as:
    i. Have there been any recent disaster events?
    ii. Should the list of hazards in the plan be updated?
    iii. Do any new critical facilities or infrastructure need to be added?

iv. Has any development occurred that would create or reduce risks?
v. Have any policies, plans or regulations changed or been adopted?
vi. Has NFIP participation changed for any jurisdiction?
vii. What mitigation actions have been completed?
viii. Are there any new mitigation actions to consider?
ix. How can public participation improve?
x. What challenges or obstacles have there been to implementing mitigation actions?

3. The report will recommend, as appropriate, any required changes or amendments to the plan.
4. The report will include budget needs for any upcoming projects that require local match.

FIVE YEAR PLAN REVIEW

Requirement 201.6(d)(3). *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.*

> ***Element E2-a.*** *Does the plan describe how it was revised due to changes in community priorities?*

The planning process for this update was strengthened by having additional planning meetings as compared to 2020. A public survey was also implemented to gain additional public input. There are also additional municipalities that have decided to adopt this plan update as compared to the 2020 plan update.

Participants evaluated their priorities regarding hazard mitigation planning and determined that their priorities and goals – to reduce the impacts of natural hazards in their areas remains the same as it did in the 2020 update.

Every five years the plan will be reviewed, and a complete update will be initiated. All information in the plan will be evaluated for completeness and accuracy based on new information or data sources. New property development activities will be added to the plan and evaluated for impacts. New or improved sources of hazard related data will also be included.

In future years, if the County relies on grant dollars to hire a contractor to write the Natural Hazard Mitigation Plan update, the County will initiate the process of applying for and securing such funding in the third year of the plan to ensure the funding is in place by the fourth year of the plan. The fifth year will then be used to write the plan update, which in turn will prevent any lapse in time where the county does not have a current approved plan on file.

The goals, objectives, and mitigation strategies will be readdressed and amended as necessary based on new information, additional experience and the implementation progress of the plan. The approach to this plan update effort will be essentially the same as the one used for the original plan development.

The Emergency Manager will meet with the County Commission and Plan Participants for review and approval prior to final submission of the updated plan.

PLAN AMENDMENTS

Plan amendments will be considered by the McPherson County Emergency Manager, during the plan's annual review to take place at the end of each county fiscal year. All affected local jurisdictions (cities, towns, and counties) will be required to hold a public hearing and adopt the recommended amendment by resolution prior to considerations by the planning committee.

INCORPORATION INTO EXISTING PLANNING MECHANISMS

Requirement: §201.6(c)(4)(ii). *The plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

> ***Element D3-a.*** *Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?*
>
> ***Element D3-b.*** *Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?*
>
> ***Element D3-c.*** *For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?*

Requirement 201.6(d)(3). *A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.*

> ***Element E2-c.*** *Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?*

Eureka is the only jurisdiction located in McPherson County that has both a comprehensive plan and a capital improvements plan (for their airport). Leola has a comprehensive plan but no capital improvements plans. All of the other jurisdictions do not have the resources, staff, funding, or need for such planning mechanisms. The McPherson County Comprehensive plan includes all of the municipalities. The City of Eureka and McPherson County will consider the mitigation requirements, goals, actions, and projects when it considers and reviews the other existing planning documents such as the capital improvements plan. The Eureka and Leola mitigation projects will be considered and prioritized in conjunction with non-mitigation projects, such as water and wastewater infrastructure improvements, new construction of schools, libraries, parks, etc.

The rest of the local jurisdictions cannot incorporate the requirements of the mitigation plan into other planning mechanisms because they do not have any other planning mechanisms that currently exist.

The risk assessment which was conducted for the purpose of this plan is specific to mitigation actions and projects included in the Plan and thus is not tied into any other mechanisms that would initiate conversations or actions by the city councils to move forward with actions or projects outlined in the Plan. Absence of such mechanisms creates a problem for the local jurisdictions because ideas, projects, and actions identified as a result of the Plan update process often never move forward because they are forgotten about, and no mechanism exists to initiate the process of completing such projects. Thus, the local jurisdictions identified one unrelated mechanism, which could be used to remedy the problem of mitigation projects getting

lost in a bookshelf. Municipalities are required by State law to prepare budgets for the upcoming year and typically consider any expenditure for the upcoming year at that time. South Dakota Codified Law 9-21-2 provides that:

> 9-21-2 The governing body of each municipality shall, no later than its first regular meeting in September of each year or within ten days thereafter, introduce the annual appropriation ordinance for the ensuing fiscal year, in which it shall appropriate the sums of money necessary to meet all lawful expenses and liabilities of the municipality….an annual budget for these funds shall be developed and published no later than December thirty-first of each year.
>
> 7-21-2 Commissioners to adopt annual budget. It shall be the duty of the board of county commissioners of each and every county to prepare and adopt an annual budget of all of the contemplated expenditures and revenues of the county and all of its institutions and agencies for each fiscal year, save and except so much of such contemplated expenditures as are for the making or maintenance of special improvements.

Since all of the local jurisdictions lack planning mechanisms in which to incorporate the mitigation actions identified in this plan, it was determined that each year when the budget is prepared the municipalities will also consider the mitigation actions at that time. The local jurisdictions will post a permanent memo to their files as a reminder for them to incorporate their annual review of the mitigation actions identified into the budget preparation process. This does not require the projects be included in the budget, it merely serves as a reminder to the City and County officials that they have identified mitigation projects in the plan that should be considered if the budget allows for it.

CONTINUED PUBLIC PARTICIPATION/INVOLVEMENT

Requirement: 201.6(c)(4)(iii). *The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.*

> ***Element D1-a.*** *Does the plan describe how communities will continue to seek future public participation after the plan has been approved?*

During interim periods between the five-year update, efforts will be continued to encourage and facilitate public involvement and input. The plan will be available for public view and comment at the Emergency Management Office and the NECOG office. Comments will be received at any time.

All ongoing workshops and trainings will be open to the public and appropriately advertised. Ongoing press releases and interviews will help disseminate information to the general public and encourage participation.

As implementation of the mitigation strategies continues in each local jurisdiction, the primary means of public involvement will be the jurisdiction’s own public comment and hearing process. State law as it applies to municipalities and counties requires this as a minimum for many of the proposed implementation measures. Effort will be made to encourage cities, towns and counties to go beyond the minimum required to receive public input and engage stakeholders such as social media.

POTENTIAL FUNDING SOURCES

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. None of the local jurisdictions have the funds available to more forward with mitigation projects at this time, thus, the Potential Funding Sources section was included so that the local jurisdictions can work towards securing funding for the projects. Inevitably, due to the small tax base and small population most of the local jurisdictions do not have the ability to generate enough revenue to support anything beyond the basic needs of the community. Thus, mitigation projects will not be completed without a large amount of funding support from State or Federal programs.

The McPherson County jurisdictions will continue to seek outside funding assistance for mitigation projects in both the pre- and post-disaster environment. Primary Federal and State grant programs have been identified and briefly discussed, along with local and non-governmental funding sources, as a resource for the local jurisdictions.

Federal

The following federal grant programs have been identified as funding sources which specifically target hazard mitigation projects:

Title: Building Resilient Infrastructure and Communities (BRIC) Grant Program Agency: Federal Emergency Management Agency
The BRIC program supports states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC supports the undertaking of new and innovative projects that reduce the risks faced from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency. The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination thereof. Special accommodations will be made for “small and impoverished communities,” who will be eligible for 90% Federal share/10% non-Federal. FEMA provides BRIC grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: State and local hazard mitigation planning, technical assistance (e.g. risk assessments, project development), mitigation projects, acquisition or relocation of vulnerable properties, Hazard retrofits, Minor structural hazard control or protection projects, and community outreach and education (up to 10% of State allocation).

Title: Hazard Mitigation Grant Program (HMGP) Agency: Federal Emergency Management Agency
The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration. To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993,

federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Title: Pre-Disaster Mitigation Program
Agency: Federal Emergency Management Agency

Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for small and impoverished communities who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: State and local hazard mitigation planning, Technical assistance (e.g. risk assessments, project development), Mitigation Projects, Acquisition or relocation of vulnerable properties, Hazard retrofits, Minor structural hazard control or protection projects, Community outreach and education (up to 10% of State allocation)

Title: Flood Mitigation Assistance Program
Agency: Federal Emergency Management Agency

FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Public Assistance (Infrastructure) Program, Section 406
Agency: Federal Emergency Management Agency

FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:

*Roads, bridges & culverts
*Draining & irrigation channels
*Schools, city halls & other buildings
*Water, power & sanitary systems
*Airports & parks

Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:

*Universities and other schools
*Hospitals & clinics
*Volunteer fire & ambulance
*Power cooperatives & other utilities
*Custodial care & retirement facilities
*Museums & community centers

Title: SBA Disaster Assistance Program
Agency: US Small Business Administration

The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.SBA loans can be utilized by their recipients to incorporate mitigation techniques into the repair and restoration of their business.

Title: Community Development Block Grants
Agency: US Department of Housing and Urban Development

The community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income people. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

Title: Water and Environmental Programs
Agency: USDA Rural Development

Through Rural Utilities Service Water and Environmental Programs (WEP), rural communities obtain the technical assistance and financing necessary to develop drinking water and waste

disposal systems. Safe drinking water and sanitary waste disposal systems are vital not only to public health, but also to the economic vitality of rural America. WEP provides funding for the construction of water and waste facilities in rural communities and is proud to be the only Federal program exclusively focused on rural water and waste infrastructure needs of rural communities with populations of 10,000 or less.

State

Title: Sanitary and Storm Sewer Project Funding Agency: South Dakota Department of Agriculture and Natural Resources
The Consolidated Water Facilities Construction Program was established to provide grants and loans for water related projects. The amount of funds available is dependent upon the amount appropriated by the Legislature and the amount of funds previously awarded.

Local

Local governments depend upon local property taxes as their primary source of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

Non-Governmental

Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, Land Trusts and other non-profit organizations.