CHAPTER I
INTRODUCTION

Background

This plan is an update of the Charles Mix County Pre-Disaster Mitigation Plan, which was approved by FEMA in 2008, and which then expired in November 2013. The purpose of the plan is to prevent or reduce losses to people and property that may result from future hazard events in Charles Mix County. The plan identifies and analyzes the hazards that the county is susceptible to, and proposes a mitigation strategy to minimize future damage that may be caused by those hazards. The document will serve as a strategic planning tool for use by Charles Mix County in its efforts to mitigate against future disaster events.

This is a multi-jurisdictional plan. All of the municipalities located within Charles Mix County were invited to participate in the plan's development, and each had participated when the current plan (that is, the plan now being updated) was being developed. Following is the list of municipalities that chose to participate in the plan's development by having a representative attend the planning meetings, providing input into the plan, and passing a resolution supporting and adopting the plan:

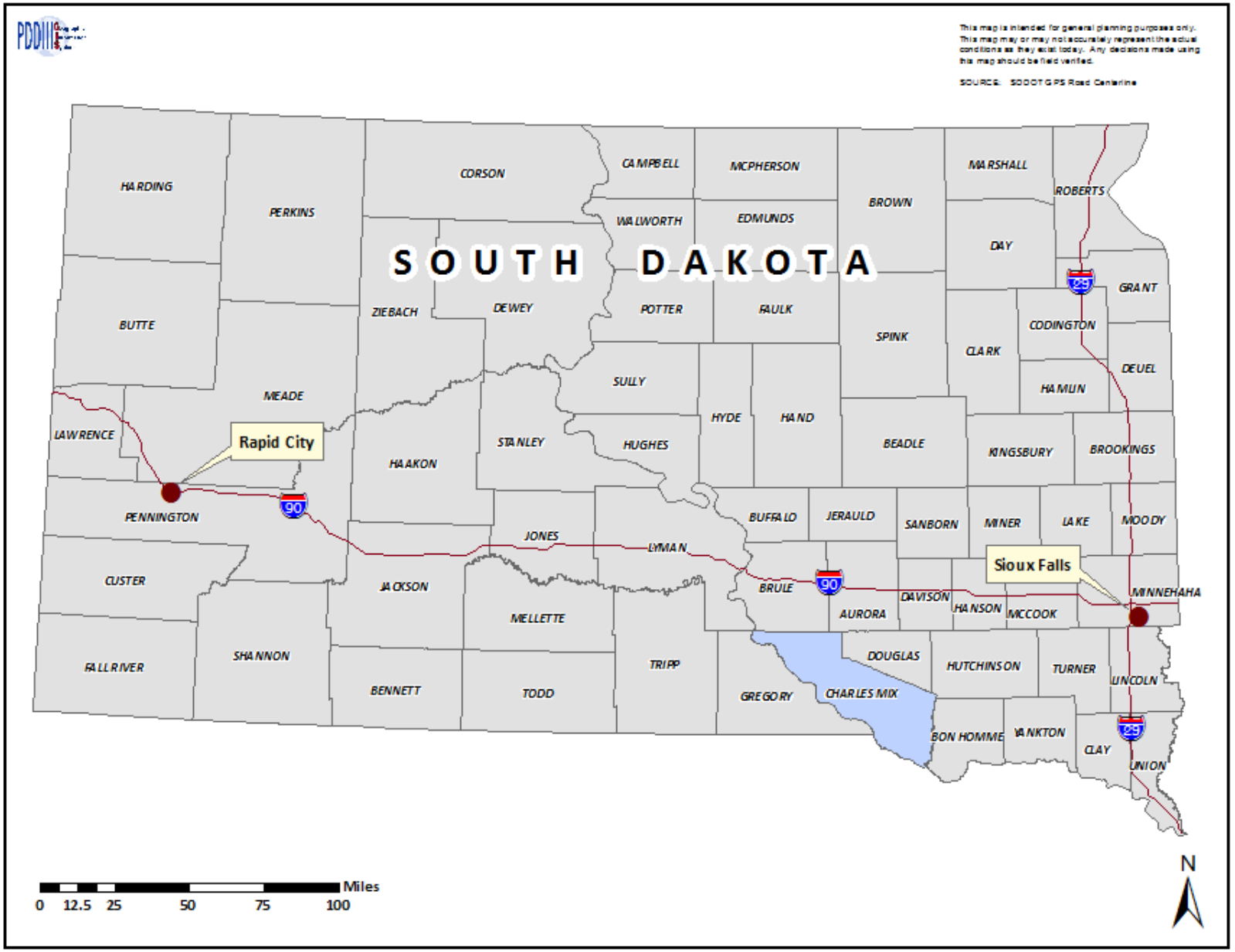
- Charles Mix County
- Town of Dante
- City of Lake Andes
- Town of Pickstown
- City of Platte
- City of Wagner

The City of Geddes and the Town of Ravinia were not represented at the planning meetings, nor did they participate in any other way in the planning process.

Other entities that participated in the plan's development by having a representative attend the planning meetings and/or contributing information to the plan included:

- Charles Mix Electric Association
- Randall Community Water District
- U.S. Army Corps of Engineers
- Wagner Community Memorial Hospital
- Platte Health Center (provided information, but did not attend meetings)
- Platte Colony/Academy Fire Department

Figure 1.1 – County Location



Planning Process

The effort that led to the development of this plan should be viewed as a part of the larger, integrated approach to hazard mitigation planning in South Dakota that is led by the South Dakota Office of Emergency Management. Production of the plan was the ultimate responsibility of the Charles Mix County Emergency Management Director, who served as the county's point of contact for all activities associated with this plan. Input was received from a disaster mitigation planning team that was put together by the Emergency Management Director and whose members are listed below in **Table 1.1**.

The plan itself was written by an outside contractor, Planning & Development District III of Yankton, South Dakota, one of the state's six regional planning entities. The office has an extensive amount of experience in producing various kinds of planning documents, including municipal ordinances, land use plans, and zoning ordinances, and it is an acknowledged leader in geographic information systems (GIS) technology in South Dakota. Furthermore, its staff has written disaster mitigation plans for all sixteen of the counties in the District's planning area, including Charles Mix County's original plan in 2008.

The following staff members of Planning & Development District III were involved in the production of the plan. John Clem, a Community Development Specialist, was the project manager and author of the plan. Assisting Mr. Clem was Harry Redman, a Geographic Information Systems Professional, who produced all the maps for the plan, directed the floodplain risk analysis (see next section), and completed the county land cover analysis described in the previous chapter. Additional research and information gathering was provided by Jen Moser, an administrative professional with Planning & Development District III.

The initial planning stages for this plan update began in 2013 when an application was submitted to FEMA for Hazard Mitigation Grant Program (HMGP) funds to help pay for the update. The HMGP funds were awarded to the County in February 2014. Following this, John Clem and the Charles Mix County Emergency Management Director began to develop the methodology and strategy to be used to update the plan. The first step was to organize the disaster mitigation planning team. This is the core group of individuals who attended the planning meetings, provided information and various documents that were used to produce the plan, proposed the mitigation actions included herein, reviewed drafts of the plan as it was being assembled, and reviewed and approved the final version of the plan.

Invited to participate on the planning team were the following:

- Charles Mix County staff (county commissioners, planning/zoning officials, floodplain administrator, GIS staff, director of equalization, highway superintendent)
- Municipal representatives from all Charles Mix County cities and towns (city council members, finance officers, public works staff, etc)
- Utility providers

- Health care providers
- Fire district representatives
- Township officials
- U.S. Army Corps of Engineers

Each individual on the planning team had at least one of the following attributes to contribute to the planning process:

- Significant understanding of how hazards affect the county and participating jurisdictions.
- Substantial knowledge of the county's infrastructure system.
- Resources at their disposal to assist in the planning effort, such as maps or data on past hazard events.
- The authority to help implement the mitigation strategy that was developed.

Table 1.1 lists the planning team members, including their attendance at the planning meetings that were held as the plan was being developed.

Table 1.1 – Participation in Plan Development

Name	Representing	Position	Meeting Attendance			
			Mtg 1 5/29/14	Mtg 2 6/26/14	Mtg 3 7/24/14	Mtg 4 9/25/14
John Clem	Planning District III	Planner (plan author)	X	X	X	X
Mike Kotab	Charles Mix Co	Emergency Mgmt Dir	X	X	X	X
Jack Soulek	Charles Mix Co	County Commissioner	X	X		X
Keith Mushitz	Charles Mix Co	County Commissioner				X
Sherri Fuchs	Charles Mix Co	Auditor	X			
Noreen Strid	Charles Mix Co	GIS Administrator	X	X	X	X
Denise Weber	Charles Mix Co	Director of Equalization	X		X	X
Jerry Horst	Charles Mix Co	Hwy Dept	X			
Douglas Kniffen	Charles Mix Co	Hwy Dept		X	X	X
Janeece Weber	Charles Mix Co	Equalization Office			X	
Karol Kniffen	Charles Mix Co	Treasurer			X	X
Randy Thaler	Charles Mix Co	Sheriff	X			
Dick Rysavy	Town of Dante	Mayor	X	X	X	X
Ann Rysavy	Town of Dante	Resident		X		
Mike Dangel	City of Lake Andes	Fire Dept volunteer	X	X	X	X
Jigs Cole	Town of Pickstown	Finance Officer	X			
Rick Gustad	City of Platte	Mayor/Fire Dept Chief	X	X		X
Brandon Semmler	City of Platte	Police Dept Chief	X			
Don Hosek	City of Wagner	Mayor	X			
Larry Blaha	City of Wagner	Public Works Director	X	X	X	X
John Brooks	Ch Mix Electric Assoc	Superintendent		X	X	
Matt Anderson	Randall Water District	Staff			X	X
Robert Durham	Randall Water District	Staff			X	
Chad Anderson	Randall Water District	Staff			X	
Cody Wilson	Army Corps of Engineers	Staff	X			
Beverly Jahns	Wagner Hospital	Administrator	X	X	X	X
David Kvigne	Wagner Hospital	Facility Maintenance	X	X	X	X

Name	Representing	Position	Meeting Attendance			
			Mtg 1 5/29/14	Mtg 2 6/26/14	Mtg 3 7/24/14	Mtg 4 9/25/14
Claude Olson	Platte Colony	Member	X			
Albert Stahl	Platte Colony	Member	X			
Keith Anderson	Platte Implement Co.	Employee	X			

Outreach Effort

Throughout the plan's development, efforts were made to obtain public involvement in the plan. At the outset of the process, public involvement was encouraged through a press release that was published prior to the first planning meeting in the Wagner *Post*, the Platte *Enterprise*, and the Lake Andes *Wave*. The press release also was posted on the following websites, as was the agenda for each of the planning meetings that were held:

- Charles Mix County (http://charlesmix.sdcounties.org/)
- City of Platte (http://www.plattesd.org/)
- City of Wagner (http://www.cityofwagner.org/)
- Planning & Development District III (http://www.districtiii.org/)

Emergency management directors in several nearby counties also were informed about the plan at the outset of the planning process, as was the South Dakota Office of Emergency Management. See **Appendix A** for documentation of the public outreach effort.

A press release announcing the completion of the plan was published in the local newspapers identified above, and the plan itself was made available for review and comment on the websites listed above.

Planning Meetings

To obtain information and input for the plan, a series of meetings of the mitigation planning team was held. Leadership and guidance at the planning meetings was provided by John Clem and the Emergency Management Director. An agenda was distributed to the planning team members prior to each meeting to help them prepare for the meetings, and the meeting minutes were sent out afterward to keep everybody informed of what was discussed and any decisions that were made. When team members had questions about a particular topic of discussion during the meetings, either Mr. Clem or the Emergency Management Director would step in.

The planning process associated with the plan's development was relaxed and informal, and free-flowing discussion was always encouraged. No subcommittees were formed, no votes were taken or motions made, and decisions were made by mutual consensus of the planning team members. Everyone's opinion was respected, nobody was discouraged from voicing their opinion, and no one was made to feel any less important than anyone else.

As the planning team was being assembled, arrangements were made for the first meeting. A meeting place and time was established, and a copy of the county's current hazard mitigation plan was sent to each prospective planning team member, along with an agenda for the meeting.

Meeting 1 - Introduction

The first meeting of the planning team focused on the following topics:

- Introducing the participants about the mitigation planning process;
- Discussion of how the plan would be developed in the coming months;
- Discussion of the various types of information that would be needed to develop the plan;
- Discussion of how to get broader input into the planning process, including the involvement of the general public; and
- Review of the county's current disaster mitigation plan.

During the discussion about input, the planning team discussed whether any other individuals or entities not already present should be involved in the planning process, and also strategized about how to get more public input into the plan. No ideas were brought forth, other than to continue press releases about the plan.

To conclude the meeting, the county's current hazard mitigation plan was reviewed, and the planning team was asked for their general opinions of the plan. The consensus of team members was that the plan could be improved in many areas, especially the risk assessment section.

Meeting 2 - Risk Assessment

The risk assessment phase began at the second planning meeting, starting with an identification of the hazards that impact the county. The team reviewed the hazards identified in the State of South Dakota Hazard Mitigation Plan, reviewed the risk assessment section of the county's current mitigation plan, and looked at historical records of hazard events that have occurred in the county. Following this review, the team finalized the list of hazards it wanted to focus on with this plan.

Information was then gathered from each of the participating jurisdictions about how each specific hazard affected their community. Discussion was augmented with a variety of maps, including aerial photography and parcel maps. During this discussion, a review was made of the existing resources and capabilities in each community available to accomplish hazard mitigation and for responding to emergencies. As part of this process, the team began identifying the most important community assets throughout the county. Particular emphasis was placed on the critical facilities in each jurisdiction. The assets are listed in **Chapter III** and shown on the hazard vulnerability maps included in that chapter.

With the hazards and community assets identified, the risk assessment could be completed. Various methods to analyze risk were used, as discussed in **Chapter III**, which was done after the meeting by Planning & Development District III staff. The results of the risk assessment were forwarded to the planning team for review prior to the next meeting. This included a summary of the textual information presented in **Chapter III**, maps showing hazard-prone areas, and tables showing the value of property potentially at risk in these areas.

Meeting 3 - Mitigation Strategy

The third meeting focused on development of the mitigation strategy. Formation of the strategy began with a review of the results of the risk assessment, which had been distributed to the planning team prior to the meeting. This led to discussion about the goals and objectives to be achieved with the mitigation plan. The list of goals and objectives that the planning team identified is included in **Chapter IV**.

With the goals and objectives determined, the team then began the process of determining the specific mitigation actions that could be taken to enable the goals to be achieved. This process began with the team reviewing the list of proposed actions included in the current mitigation plan, with discussion following about the progress that had been made on implementing the actions (a list summarizing the progress on the actions is included in **Chapter IV**).

A wide range of mitigation actions was considered at the meeting, based on a list of potential mitigation actions that was provided by the Planning & Development District III office for the team to review. After lengthy discussion, consensus was reached about the mitigation actions to include in the plan. Most of the information about the actions, such as estimated cost, the party responsible for implementation, and potential funding sources, was provided at the meeting. Prioritization of the actions in each jurisdiction also was determined, focusing on the benefits of each action versus the estimated cost.

Meeting 4 - Plan Implementation and Maintenance

Prior to the final meeting of the planning team, the Planning & Development District III office completed a first draft of the completed plan, which included the list of mitigation actions identified by the planning team. The draft was distributed to the team members for their review prior to the meeting.

The meeting began with a review of the draft, and a few errors were pointed out by team members, including the fact that some of the city limits shown in **Figure 3.4** through **Figure 3.11** were inaccurate. Additional information about some of the proposed mitigation actions also was provided at this time, such as cost estimates, and a final opportunity was given for the jurisdictions to propose any additional actions. The final list of actions proposed by the participating jurisdictions is presented in **Chapter IV** (see **Table 4.2**).

Discussion then followed about how the plan will be implemented. The team considered how the plan will be incorporated into the existing planning mechanisms at the county and local levels; how the plan will be monitored, evaluated, and updated; and how the public can be brought more into the planning process in the coming years. It was emphasized that cooperation and communication between the county and the participating jurisdictions will be very important going forward, and discussion occurred about how this could best be achieved. The Emergency Management Director emphasized the importance of ensuring that no local decisions be made or actions taken contrary to the goals of this plan.

After the meeting, needed corrections were made to the plan and additional information was added based on discussion at the meeting. A press release announcing the completion of the plan was then published in the local newspapers, and the plan was made available for review and comment on the county and local websites. No comments were received during the review period, which lasted one month. After the review period, the plan was submitted to the South Dakota Office of Emergency Management.

Acknowledgements

The Planning & Development District III office would like to thank the members of the Charles Mix County Disaster Mitigation Planning team for participating in the planning meetings that were held and for supplying information that was used to develop the plan. In addition, thanks are extended to the following individuals for their assistance in the plan's development:

- Jim Poppen, SD Office of Emergency Management
- Martin Christopherson, SD Office of Emergency Management
- Cindy Hansen, South Dakota Division of Wildland Fire
- Paul Reiter, South Dakota Division of Wildland Fire

CHAPTER II
COMMUNITY PROFILE

Background

This chapter serves as a basic introduction of the county. Topics addressed in this chapter cover the county's physical conditions, its population and socio-economic characteristics, utilities and infrastructure, and services. Following chapters are devoted to assessing risks in the county, presenting the county's mitigation strategy, and discussing how the county will implement the plan.

General Description

Charles Mix County is located in southeast South Dakota, about 100 miles west of Sioux Falls, the state's largest city (see **Figure 1.1**). The county covers 1,098 square miles in area. There are seven incorporated municipalities located within the county - Dante, Geddes, Lake Andes, Pickstown, Platte, Ravinia, and Wagner. The county seat is located in Lake Andes, and Wagner has the largest population. **Figure 2.1** shows the county's communities and road network. Unincorporated communities within the county include Academy, Marty, and Greenwood.

There are also a number of other populated places located within Charles Mix County, which are shown in **Figure 2.1**. This includes three Hutterite colonies, each of which has approximately 125 to 150 residents [1]. Also, there are several recreational areas in the county that contain a mixture of permanent housing and seasonally-occupied private camping areas. The two largest recreational areas are North Point, which is located just northwest of Pickstown (**Figure 2.2**), and Platte Creek (**Figure 2.3**), located several miles southwest of Platte. **Appendix D** provides basic information about the camping areas.

Physical Characteristics

The landscape in Charles Mix County is mostly open, and the terrain is generally level, except along the Missouri River, where wooded draws characterize the landscape. Much of the land in the county is devoted to agricultural production, primarily row crops such as corn, soybeans, and wheat, and there is also a considerable amount of pastureland.

[1] Hutterite Colonies are rural, agriculturally-based communities occupied by descendants of German people who cling to many of their traditional ways. There are more than 400 Hutterite colonies located in the north-central United States and Canada.

Figure 2.1 – Political Map

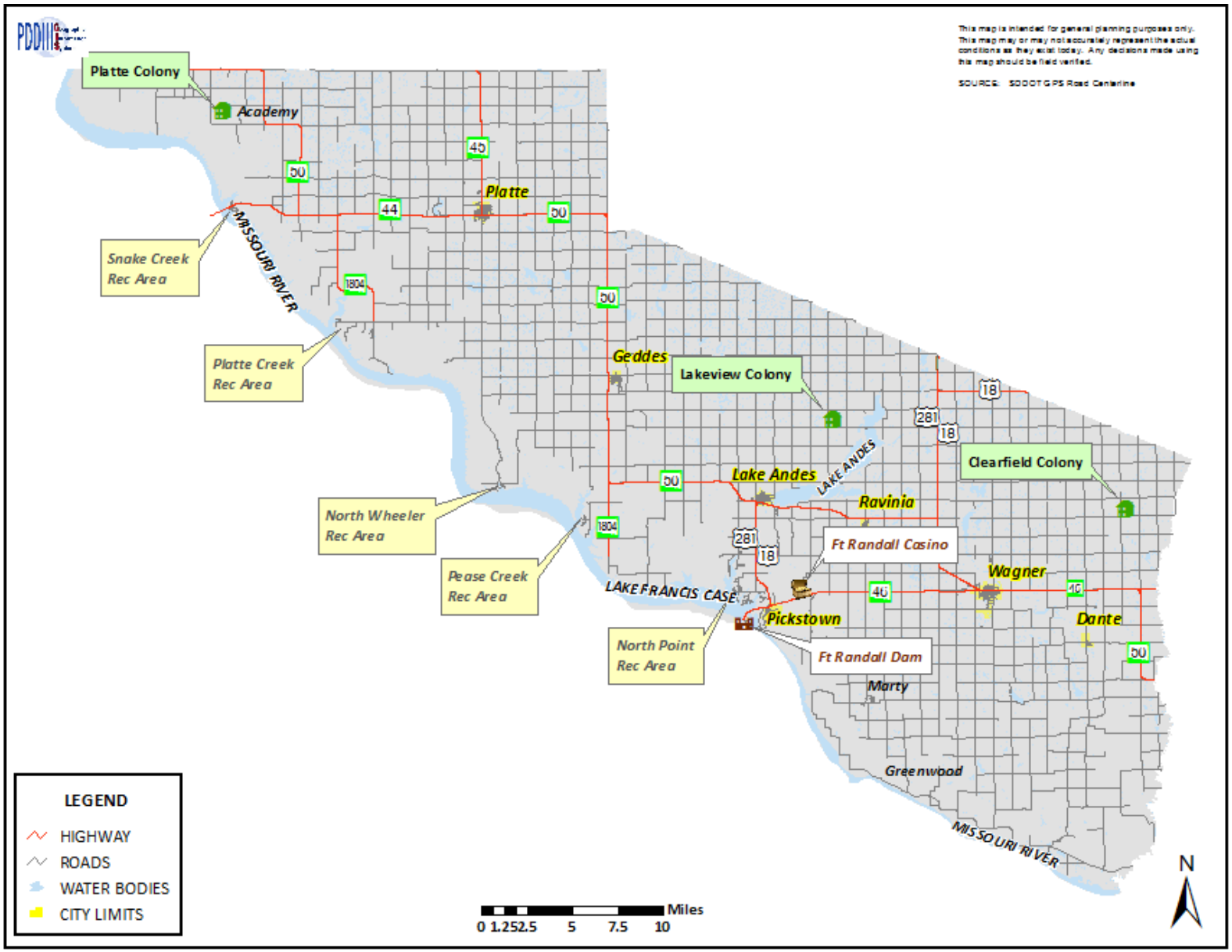


Figure 2.2 – North Point Recreation Area

Figure 2.3 – Platte Creek Recreation Area

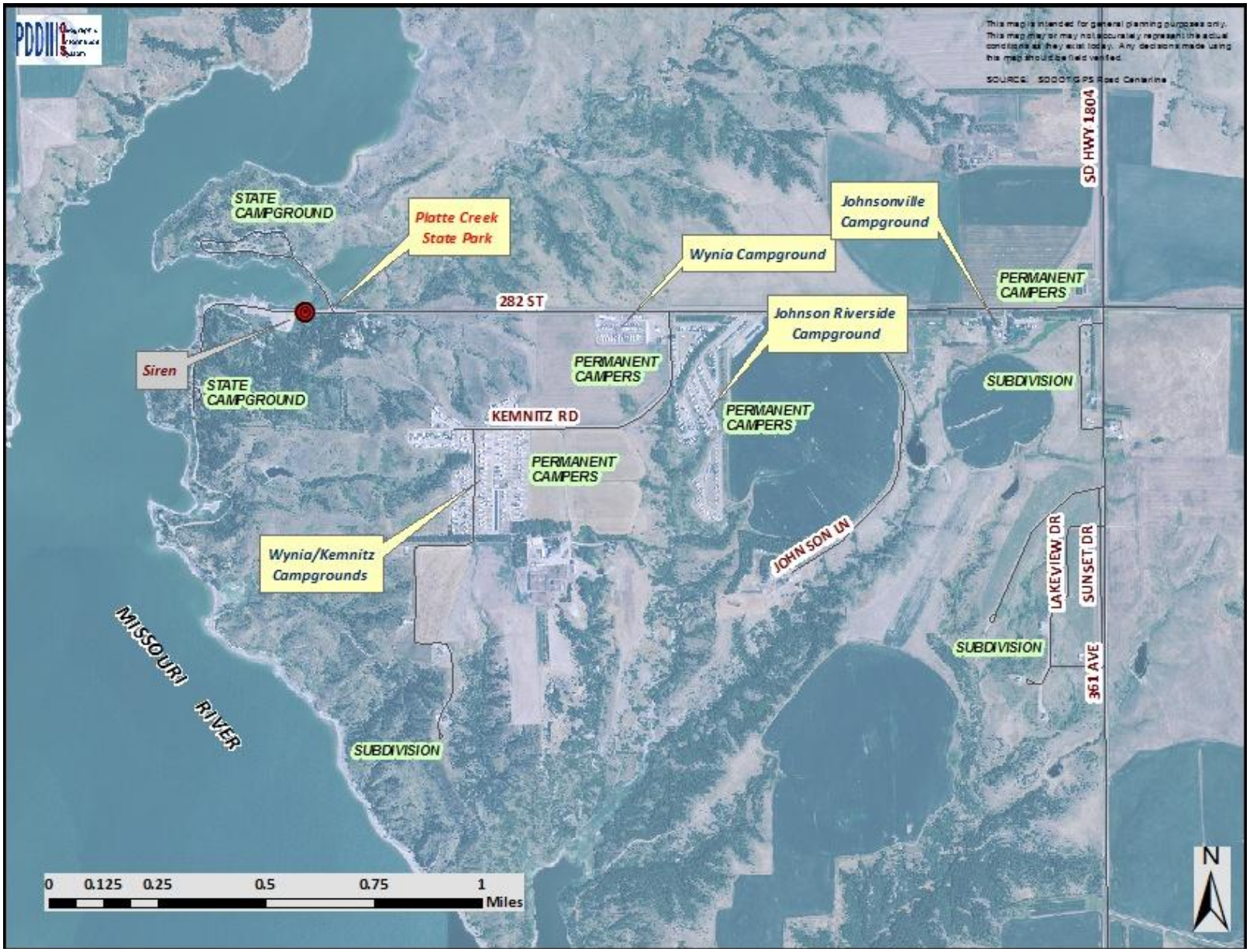


Table 2.1 provides a breakdown of the land cover in Charles Mix County. The table is based off satellite imagery downloaded from the United States Geological Service at http://www.mrlc.gov/, which was then processed using ArcGIS computer mapping software. As the table shows, the predominant types of land cover in the county are cultivated crops, pasture land, and grassland, which together comprise approximately 87 percent of the county's area. Developed land makes up only a very small fraction of the land area. **Figure 2.4** is a graphic representation of the county's land cover.

Table 2.1 - Vegetative Land Cover

Cover Type	Square Miles	% of Total Area
Cultivated crops	478.2	41.6
Pasture land	322.9	28.1
Grassland and Shrub/Scrub	197.1	17.1
Open water	58.2	5.1
Developed land (open space)	39.2	3.4
Forested land	25.8	2.2
Wetlands	24.5	2.1
Developed land (low to high intensity)	3.7	0.3
Barren land	0.5	----
Total Area	**1150.1**	

Source: United States Geological Service

Most soil in the county is fertile and well-drained, and therefore conducive to agriculture, as long as there is sufficient soil moisture. Excessive slopes and rocky soils are rare. Drainage is generally good, but there are many wetlands in the county, some of which are now used as waterfowl or wildlife production areas, while others have been drained for farming.

As in most of South Dakota, the climate of Charles Mix County is characterized as sub-humid and continental, which means that summers are often hot and winters can be very cold. There are no large bodies of water or mountain ranges to mitigate against these extremes. Precipitation averages about 20 to 25 inches per year, and during drought years the amount can be much less. Most of the precipitation occurs during the spring and early summer; winter snow is not frequent, but snow cover on the ground is fairly constant during many winters. Blizzards are a definite hazard.

Following is climate data in the county as reported from the Wagner weather station.

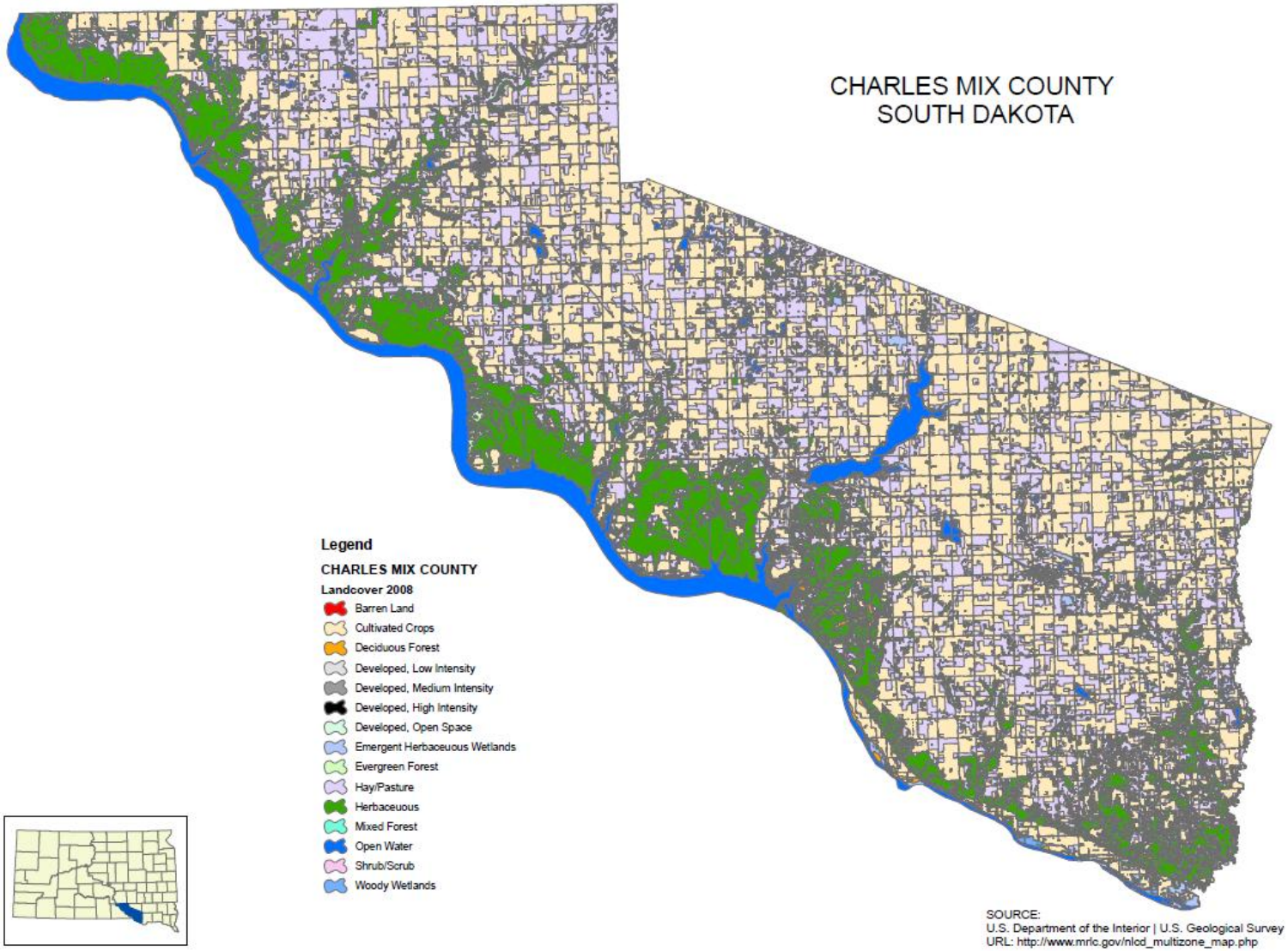
Table 2.2 - Monthly Climate Conditions in Charles Mix County (1916 – 2011)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave High	30.9	36.2	47.7	62.7	74.5	84.0	91.0	88.7	79.3	65.7	47.5	34.6	61.9
Ave Low	8.9	13.8	23.7	36.1	47.5	57.6	63.5	61.3	51.2	38.6	24.8	13.9	36.7
Ave Precip	0.7	0.9	1.6	2.7	3.5	3.8	2.8	2.7	2.5	1.7	1.0	0.8	24.7
Ave Snowfall	7.3	7.9	8.6	3.4	0.1	0.0	0.0	0.0	0.0	0.9	4.7	7.9	40.8
Ave Snow Depth	3	3	1	0	0	0	0	0	0	0	1	2	1

Source: High Plains Regional Climate Center (http://www.hprcc.unl.edu/data/historical/)

The average high and low are in degrees Fahrenheit; the precipitation figures are in inches

Figure 2.4 - County Land Cover



Socioeconomic Description

Charles Mix County is very sparsely populated. The county had a Census 2010 population of 9,129, and a population density of only 8.3 people per square mile. In comparison, the State of South Dakota, which is one of the least densely populated states in the nation, has a population density of 11.1 per square mile, and the national figure is 89.5. In addition to being sparsely populated, Charles Mix County has been experiencing a steady population decline for the last several decades, as **Table 2.3** shows, and the population is expected to continue decreasing.

Table 2.3 - Population Change

Entity	Pop 1920	Pop 1940	Pop 1960	Pop 1980	Pop 2000	Pop 2010	Pop 2020 Projected	Pop 2025 Projected
Charles Mix Co.	16,256	13,449	11,785	9,680	9,350	9,129	8,712	8,463

Sources: U.S. Census (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml); University of South Dakota Governmental Research Bureau

Table 2.4 provides basic demographic information for the county and each municipality within the county. The table shows that 35% of the county's population is composed of minorities, primarily Native Americans, many of whom live in the communities of Lake Andes and Wagner, as well as the unincorporated community of Marty.

Table 2.4 - Population Characteristics

Entity	Pop 2010	Median Age	Minority Population
Charles Mix Co.	9,129	39.0	35%
Dante	84	39.4	0%
Geddes	208	45.5	1%
Lake Andes	879	29.8	60%
Pickstown	201	44.7	32%
Platte	1,230	49.6	3%
Ravinia	61	14.1	57%
Wagner	1,566	42.1	46%

Source: U.S. Census (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

Charles Mix County's economy is dependent to a large extent upon agriculture. Industry and manufacturing are not a significant part of the local economy. In part because of the lack of high wage occupations, income levels in the county are well below state figures, as shown in **Table 2.5**. Poverty and unemployment rates tend to be fairly high among the county's Native American population, which also contributes to the county's lower than average socioeconomic standing.

Table 2.5 - Socioeconomic Characteristics (2010)

Entity	Median Family Income	Family Poverty Rate	Households Receiving Food Stamps	Unemployment Rate	High School Grad or Higher	Bachelor's Degree or Higher
Charles Mix Co.	$51,974	15.4%	16.1%	8.4%	85.2%	16.1%
South Dakota	$62,967	8.7%	9.9%	4.9%	90.1%	26.0%
United States	$64,585	10.9%	11.4%	9.3%	85.7%	28.5%

Source: U.S. Census (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml)

Infrastructure and Utilities

Transportation

Charles Mix County's main transportation routes are SD Highway 50, US Highway 18, US Highway 281, SD Highway 44, and SD Highway 45. The surface-type breakdown among Charles Mix County's roads, as of June 2014, is as follows:

- Hard surface 358 miles
- Gravel 1,154 miles
- Low maintenance 377 miles

There are no active railroad lines in the county, although there are plans to rehabilitate the old Napa Rail Line that once connected the communities of Dante, Wagner, Ravinia, Lake Andes, Geddes, and Platte. It is not known when the railroad line might be reactivated. Lake Andes, Platte, and Wagner each have a municipal airport suitable for small aircraft. The Wagner airport has a runway long enough to accommodate small jets.

Utilities

Water service is provided throughout Charles Mix County by the Randall Community Water District. The water district serves rural county residents individually, including those in Dante and Ravinia, and provides bulk water to the municipalities of Geddes, Lake Andes, Pickstown, Platte, and Wagner.

Each of the towns has its own wastewater collection and treatment system, except for Dante. Residents there, and in all the rural areas of the county, rely on septic systems

Solid waste service is provided by the Southern Missouri Recycling and Waste Management District, which operates a landfill located about 1.5 miles west of Lake Andes. Most of the household waste generated within Charles Mix County ends up at the landfill. Designated rubble sites are located outside the larger towns in the county.

Electric power is provided to rural county residents by the Charles Mix Electric Association, which also supplies power to the Fort Randall Casino, a major power user. NorthWestern Energy serves all municipal users, except those in Pickstown, which has its own municipal power system. Natural gas is not available anywhere in the county.

Telephone service is provided by a variety of companies. The Fort Randall Telephone Company serves Lake Andes, Pickstown, Ravinia, and Wagner; Midstate Communications serves Geddes and Platte; and the PrairieWave Community Telephone serves Dante. Cellular phone service is available throughout the county, but there are still some areas where signals are weak or non-existent.

Services

Medical Services

Basic medical service is available within Charles Mix County at medical clinics in Geddes, Lake Andes, Platte, and Wagner. More advanced service is available at the Platte Health Center and the Wagner Community Memorial Hospital, both of which are classified as critical access hospitals. The Indian Health Service operates a facility in Wagner, which is available for Native Americans. People needing serious medical attention can be transported to hospitals in Sioux Falls or elsewhere. The following table summarizes the medical services available at the Platte and Wagner hospitals.

Table 2.6 - Medical Facilities

Facility	Beds	Generator Size	Notes
Platte Health Center	65	350 kW	Can serve as a long-term shelter. Licensed acute care facility.
Wagner Community Hospital	20	100kW, 125Kw	Cannot serve as a long-term shelter. Licensed acute care facility. Recently completed major expansion.

Fire and Emergency Response

Several fire departments are based in Charles Mix County; they are located in Academy, Dante, Geddes, Lake Andes, Platte, Ravinia, and Wagner. Each department has basic firefighting and rescue equipment, and they all respond to structural fires, wildland fires, and to accident situations. The Platte, Wagner, and Lake Andes departments, being larger than the others, have a greater array of equipment and can respond to more serious situations. See **Table 3.3** on page 36-37 for more information on the departments.

There are two ambulance services in the county, one based in Platte and one with equipment in both Wagner and Lake Andes. The Platte service currently has 17 EMTs on staff, and has two ambulance vehicles. The Wagner/Lake Andes service has 20 EMTs and three ambulance vehicles.

Education

High schools are located in Lake Andes, Marty, Platte, and Wagner. Post-secondary education is not available in the county, except for the Ihanktonwan Community College in Marty, which is available for the Native American community.

CHAPTER III
RISK ASSESSMENT

Background

The risk assessment process provides the foundation for the rest of the mitigation planning process. It sets the stage for identifying mitigation goals and actions to help Charles Mix County become disaster resilient and keep county residents safe, and it answers the following questions: What are the hazards that could affect Charles Mix County? What could happen as a result of those hazards? How likely are the possible outcomes? When the outcomes occur, what are the likely consequences and losses?

As outlined in the South Dakota Hazard Mitigation Plan, the Federal Emergency Management Agency defines risk assessment terminology as follows:

- **Hazard**—A hazard is an act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing.
- **Vulnerability**—Vulnerability is susceptibility to physical injury, harm, damage, or economic loss. It depends on an asset's construction, contents, and economic value of its functions.
- **Exposure**—Exposure describes the people, property, systems, or functions that could be lost to a hazard. Generally, exposure includes what lies in the area the hazard could affect.
- **Risk**—Risk depends on hazards, vulnerability, and exposure. It is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.
- **Risk Assessment**—Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from hazards.

According to FEMA's mitigation planning guidance, the basic components of the risk assessment are: 1) identifying hazards that affect the community, 2) profiling the hazards, 3) conducting an inventory of community assets, and 4) estimating losses. This process measures the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards by assessing the vulnerability of people, buildings and other property, and infrastructure to natural hazards.

For this plan update, the planning team decided to make some significant changes to the risk assessment. The most important of the changes are as follows:

- The risk assessment has been reorganized to follow more closely the structure of the South Dakota Hazard Mitigation Plan. Notably, the loss estimation/ vulnerability assessment section for each hazard has been separated from the hazard profile section. The planning team felt that this separation was a more logical and clearer way to present the information.
- A section has been devoted to identifying community assets. Although the previous plan had a chapter titled "Critical Community Facilities", the chapter only consisted of a series of maps showing the location of critical infrastructure and assets in each community.
- More detailed information has been provided for many of the hazards regarding the risk they pose to each jurisdiction. In particular, flooding has been given more attention, in part because of the historic and unprecedented flooding that occurred along the Missouri River in 2011.
- Drought is analyzed in this plan, whereas it was not included in the current plan. Since drought is given a significant level of planning consideration in the South Dakota Hazard Mitigation Plan, the team thought it would be prudent to consider this hazard as well.
- More informative hazard vulnerability maps have been developed.
- The hazard profiles were updated with recent hazard events since the current plan was completed. These events also are shown in **Appendix E**.

Identifying Hazards

The planning team began the risk assessment by reviewing the South Dakota Hazard Mitigation Plan, focusing on the hazards identified in that plan. The team also reviewed the risk assessment section of the county's current mitigation plan, and decided that all of the hazards discussed in that plan should also be analyzed in this update (except that tornadoes and high wind events are considered in this plan under the broader category of "summer storms").

Following this, the planning participants reviewed historical records of hazard events that have occurred in the county, relying primarily on the National Climatic Data Center's Storm Events Database. Although its records only go back to 1996, detailed and useful information is provided for many of the events. A list of the hazard events since 1996 is presented in **Appendix E**. The Spatial Hazard Events and Losses Database for the United States (SHELDUS) was consulted for certain unusual or dramatic hazard events occurring prior to 1996. A weakness of this source is that it provides little useful information about each event, nor any descriptive details, so it is difficult to determine whether the event had much actual impact in the county. For this reason, it was decided not to include the SHELDUS events in **Appendix E**.

After reviewing these sources, the planning team settled on the hazards they wanted to address in this plan, those that they considered to pose a significant threat to the county. Following are the hazards addressed in this plan as selected by the team:

- **Winter storms (includes blizzards, heavy snow, icing, and high wind events)**
- **Summer storms (includes thunderstorms, tornados, hail, and high wind events)**
- **Flooding**
- **Drought**
- **Wildfire**

The planning team acknowledges that additional hazards could have been addressed in this plan. High wind events, for instance, are not considered separate from winter storms and summer storms. Following is a list of other hazards the team considered including in this plan, but chose not to, with a justification for their omission from this plan:

- Geologic hazards – these hazards, which include earthquakes and landslides, are given a limited level of planning analysis in the South Dakota Hazard Mitigation Plan. The planning team felt justified in excluding them from this plan, because there has never been a significant geologic hazard event in the recorded history of Charles Mix County. According to the U.S. Geological Service Earthquake Hazards Program website, of the 21,080 magnitude 3.5 or greater earthquakes recorded in the U.S. between 1974 and 2003, only ten occurred in South Dakota. According to the South Dakota Hazard Mitigation Plan, damage from earthquakes in the state has been minor - stuck doors and windows, foundations cracking, etc. The plan states that South Dakota is geologically stable, and that according to one estimate, there is only a 10 percent chance that a quake of at least 5.1 magnitude will occur anywhere in the state in any 100 year period [2]. Regarding landslides, a review of the United States Geological Survey's Landslide Incidence and Susceptibility Map does indicate the potential of a landslide occurring in the county along the Missouri River. However, any such event likely would be localized, minor in scale, and located far from any populated areas.
- Agricultural pests and diseases - this hazard is given a moderate level of planning analysis in the South Dakota Hazard Mitigation Plan. However, the planning team considered the subject matter to be outside the scope of their responsibilities.
- Hazardous materials - this hazard is given a moderate level of planning analysis in the South Dakota Hazard Mitigation Plan. But again, the planning team considered the subject matter to be outside the scope of this plan, as they wanted to focus on natural hazards.

[2] Earthquake magnitude is calculated from the relative size of seismograph tracings, a measurement that has been named the Richter scale. A magnitude 5 quake would cause doors to swing and objects to fall from shelves, but significant damage would be unlikely to occur.

Hazard Profiles

In this section, each of the hazards the planning team chose to focus on is described in terms of the hazard's ***location*** within Charles Mix County, its ***extent***, the ***history*** of the hazard's occurrence in the county, the ***probability*** of future events, and the local ***resources and capabilities*** available to mitigate against the hazard. In addition, a background description of each hazard is presented at the beginning of each hazard's profile.

- ***Location*** is the geographic areas within the county that are affected by each of the hazards. Hazard vulnerability maps are presented at the end of this chapter showing areas of the county and participating jurisdictions vulnerable to flooding and wildfires. Since the other hazards addressed in this plan are not geographically defined, they are not mapped.
- ***Extent*** is the strength or magnitude of the hazard. Extent is described in a variety of ways depending on the hazard, such as the value on an established scientific scale, such as EF1 on the Fujita Scale for tornadoes; other measures of magnitude, such as wind speed; and the duration of the event.
- A brief section on the ***history*** of each hazard's occurrence in the county is presented, highlighting the most significant events, including events since the last plan was completed. A comprehensive list of weather-related hazard events impacting the county since 1996 is presented in **Appendix E**, based on records from the National Climatic Data Center's Storm Events Database. **Table 3.1** below shows all of the hazard events resulting in a Presidential Disaster Declarations that have occurred in the county, including information on damage amounts resulting from the events [3].

Table 3.1 – Presidential Disaster Declarations Affecting Charles Mix County

Date Disaster Declared	Disaster Dec #	Type	Public Assistance Claims From County	Individual Assistance Claims From County	Damage to Charles Mix Electric Infrastructure
7/19/1984	717	Severe Storms and Flooding			
7/19/1993	999	Severe Storms, Tornadoes			
5/26/1995	1052	Severe Storms, Flooding			$36,000
1/05/1996	1075	Severe Winter Storm			$1,440,000
1/10/1997	1156	Severe Winter Storm			
4/07/1997	1173	Severe Flooding			
12/20/2005	1620	Severe Winter Storm			$1,533,950
7/09/2008	1774	Severe Storms and Flooding			
5/13/2010	1915	Flooding	$423,280		
5/13/2011	1984	Severe Storms and Flooding	$499,424	$28,357	$18,110

Sources: South Dakota Office of Emergency Management; http://www.fema.gov/disasters/grid/state-tribal-government; Charles Mix Electric Association

[3] Public assistance and Individual assistance claim information was provided by the South Dakota Office of Emergency Management. The information was not available for events prior to 2010.

- ***Probability*** of occurrence of a hazard impacting an area is the likelihood that such an event will occur. In this plan, a disaster or hazard with a "high" probability is one that is expected to occur at least five times over a ten year period, a "moderate" probability hazard is expected to occur at least once or twice in any given ten year period, and a "low" probability hazard would be expected to occur fewer than once per ten year period. Determination as to the probability of hazard events occurring in the future was based largely on an analysis of the frequency of past hazard events.
- Information about the existing ***resources and capabilities*** to mitigate against each hazard is included. This includes plans and regulatory mechanisms, administrative and technical resources, financial resources, and education and outreach.

Winter Storm

Description

Winter storms historically occur from late fall to the middle of spring, varying in intensity from mild to severe. Winter storms regularly destroy property and kill livestock and people. Such storms are generally classified into four categories with some taking the characteristics of several categories during distinct phases of the storm. These categories are freezing rain, sleet, snow, and blizzard.

Freezing rain coats objects with ice, creating dangerous conditions. Sleet does not generally cling to objects like freezing rain, but it does make the ground very slippery, increasing the number of traffic accidents and personal injuries due to falls. Heavy snow can make travel difficult, and can collapse roofs.

Blizzards occur when snow is combined with high wind, producing blowing snow that results in low visibility. When such conditions arise, blizzard warnings are issued. These warnings take effect when wind conditions are at least 35 mph and temperatures of 20 degrees Fahrenheit or less over an extended period of time are expected. Severe blizzard conditions exist when heavy snow is accompanied by winds of at least 45 mph and temperatures of 10 degrees Fahrenheit or lower. Early blizzards in South Dakota were so devastating that the state once had the dubious distinction of being called the Blizzard State.

Winter storms can have a big impact on the power lines operated by rural electric providers, especially when they are accompanied by high winds or freezing rain. They can knock down power lines, which tend to be the most vulnerable elements of the electrical grid, and can even snap the poles.

Location

The topography of South Dakota is such that no part of the state is immune from the effects of winter storms. Farmland and grassland, which covers most of the state (including Charles Mix County) offers little resistance to high winds and drifting snow, and there are no large

bodies of water or mountain ranges to mitigate against temperature extremes. All areas of the county are equally likely to be impacted.

Extent

The extent of winter storms in South Dakota can be quite substantial. In terms of snowfall, many such events have included more than 10 inches of snow. Wind speeds in excess of 50 miles an hour also have been reported in association with winter storms. In terms of duration, some winter storms in Charles Mix County have resulted in power outages of over a week in some rural locations (see below). In terms of onset, winter storms typically have long warning times, giving people time to prepare.

History

As **Table 3.1** shows, since 1980 there have been three Presidential disaster declarations involving a winter storm that have affected Charles Mix County. These declarations were made in 1996, 1997, and 2005. **Appendix E** lists all the significant winter storms that have impacted the county since 1996.

One of the most serious winter storms to occur in the state happened between October 22 and 24, 1995, resulting in FEMA Disaster Declaration 1075, which was declared in January 1996. As the storm moved eastward across South Dakota, ice and five to 15 inches of wet snow formed on electric lines, poles, and trees. Winds associated with the storm caused lines to slap together and poles to snap, producing widespread power outages to large portions of rural South Dakota, including Charles Mix County. The damage included broken poles, broken wires, and substation failures due to transmission line damage. The storm also forced major transportation delays because of snow accumulation on roadways and poor visibility. The combination of power outages and travel difficulty resulted in numerous cancellations and delays in school openings.

Statewide, the electric cooperatives lost nearly 9,500 poles and 170 transmission lines in this storm, resulting in damage estimated at $10 million to $10.3 million. Total statewide damage from the event was estimated at over $13 million, and approximately 30,290 households were affected by the power outages. Some cooperatives did not get power restored to all households until November 5. The power outages led to several rural water system pumping stations to go off-line, causing a loss of water service to members of rural water systems. The National Guard was utilized to provide generators to power these pumping stations, thereby restoring water service. Crews from electric cooperatives in neighboring states assisted local cooperatives with line repairs.

Another very serious winter storm to impact Charles Mix County occurred in late November 2005 when heavy freezing rain coated roads and power lines with ice up to three inches thick throughout much of southeast South Dakota. The storm resulted in FEMA Disaster Declaration 1620. In the affected area, a total of 9,400 power poles were damaged, leaving approximately 56,000 people without electricity for varying amounts of time. The Charles Mix Electric Association lost 1,100 poles in the county due to the storm; their total damages were over $1.5 million (see **Table 3.1**). Many roads were shut down for extended periods,

and most schools and businesses were forced to close. The southeast part of Charles Mix County suffered the most damage from this storm, with some households out of power for up to a week as power lines were being repaired.

A very unusual late-season winter storm struck much of eastern South Dakota in mid-April 2013, resulting in FEMA Disaster Declaration 4115. Although Charles Mix was not one of the designated counties in this disaster, the county did not escape from the effects of the storm, which featured heavy, wet snow and icing that brought down power lines and trees in various locations.

Probability

Based on the historic evidence, the probability of a significant winter storm affecting Charles Mix County in a given year is high. The probability of a winter storm causing substantial damage (e.g. power lines blown down) in any given year is at least moderate. It is a certainty that winter storms will continue to affect the county.

Resources and Capabilities

Following is a description of the local resources and capabilities available for dealing with winter storm events.

- The county and each of the towns has equipment for dealing with winter storms. A list of the equipment can be found in the Charles Mix County Local Emergency Operations Plan, which is updated regularly.
- Following are the facilities in the county that can serve as a shelter during extended power outages. A few of the facilities have a generator, while the others at least have a transfer switch which enables the county to bring in its portable generator (100 kW, capable of single or three-phase power) to provide power. Each facility is shown in the maps at the end of this chapter.
    - Dante - Community Auditorium/City Hall
    - Geddes - City Hall
    - Geddes - Community Center (former school gymnasium)
    - Lake Andes - Community Center (*has a generator*)
    - Lake Andes - Andes Central School
    - Marty - Marty Indian School
    - Pickstown - Rainbow Room Community Center
    - Platte - Community Center/City Hall
    - Platte - Platte Health Center (*has a generator*)
    - Platte - National Guard Armory
    - Wagner - Good Samaritan Center (*has a generator*)
    - Wagner - National Guard Armory
- The Charles Mix Electric Association maintains a list of priority projects in its four-year work plan. The Association's current work plan ends on December 31, 2014, and the new plan is now being developed. The Association is a party to the South Dakota Electric Cooperatives Mutual Aid Plan, which commits

participating cooperatives to come to the aid of other cooperatives in times of emergency.

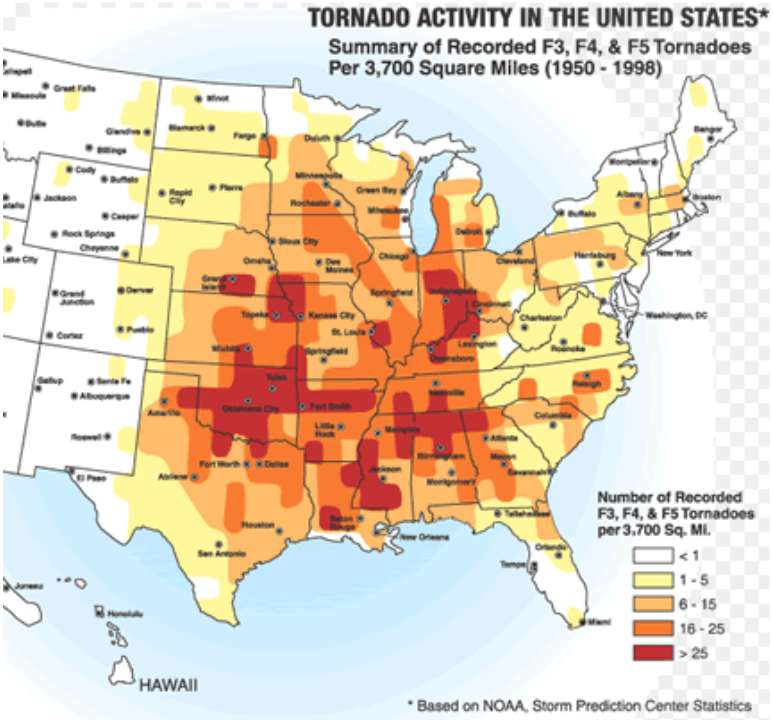
- The county participates actively in public awareness campaigns in conjunction with the State Office of Emergency Management and the National Weather Service, as well as sponsoring local awareness activities.
- The county LEPC plans for winter operations annually, which helps ensure a safe and efficient response for people in need of emergency assistance.

Summer storm

Description

Summer storms can include heavy rainfall, hail, tornadoes, and thunderstorm activity. These events usually are associated with unstable weather conditions. In Charles Mix County, most damage from summer storms occurs because of high wind events and/or hail. Hail is always closely connected with thunderstorms. Hailstones can be pea-sized, up to the size of baseballs. Large hailstones are dangerous to people and animals, but most hail damage is typically suffered by crops or structures. Almost every year someone in Charles Mix County reports some kind of hail damage to crops or buildings.

Tornadoes are the most dramatic type of summer storm experienced in Charles Mix County, and are a special source of concern. They are one of nature's most violent storms, capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be a mile wide and can extend for more than 50 miles. Tornadoes mostly occur in South Dakota during the months of May, June, and July. The greatest period of tornado activity is between 4 PM and 6 PM. Tornadoes present a difficult mitigation challenge, since few structures can withstand the violent winds of a twister.



All of South Dakota, including Charles Mix County, is located in what is referred to as "tornado alley" (see graphic). This part of the country is particularly susceptible to tornadoes in part because the terrain is relatively flat, which allows warm, humid air from the Gulf of Mexico and cool, dry air from Canada to crash into each other, creating large super cells. According to the National Oceanic and Atmospheric Administration's Storm Prediction Center, South Dakota ranked eighth in the nation in the frequency of tornadoes

from 1950 to 1994, with a total of 1,139 tornadoes reported in the state (an average of 25.3 per year). During this period, there were 11 deaths in the state attributed to tornadoes, and 243 injuries. South Dakota ranked 27th in the nation in tornado damage, with average annual losses of $3.8 million.

Location

Summer storms are equally likely to occur in all parts of the county.

Extent

The extent of summer storms can be measured in many ways. In terms of wind speed, **Appendix E** shows numerous records of storms occurring in the warmer months of the year that produced wind speeds over 60 miles per hour, with one resulting in speeds over 80 miles per hour. The table also shows numerous events with hail over one inch in diameter, including one event where a hailstone was measured at over six inches. Regarding tornadoes, there are no Charles Mix County records of a tornado with a magnitude greater than F1 in either the National Climatic Data Center's Storm Events Database or the SHELDUS database, but the possibility of such a tornado certainly does exist. In terms of onset, summer storms typically develop with a long warning time, although certain hazards associated with such storms, such as hail or tornadoes, can develop more suddenly.

History

Charles Mix County has experienced many summer storms that have caused significant damage. **Table 3.1** shows that several of these storms resulted in a Presidential disaster declaration. **Appendix E** is a comprehensive listing of all the significant summer storms that have occurred in the county since 1996, including several storms that were accompanied by tornadoes. The Spatial Hazard Events and Losses Database for the United States (SHELDUS) has records of many more tornadoes that occurred in the county prior to 1996.

One of the more significant summer storms in Charles Mix County occurred in June 2003 when a storm accompanied by large hail caused severe crop damage in a 15 mile-wide area over southern and eastern parts of the county. About 60,000 acres of crops were damaged or destroyed as hail accumulated to a depth of several inches in places, with drifts as high as four feet in the Wagner area. The hail cracked windows and damaged siding in the Wagner area.

In August 2007 a storm accompanied by hail impacted the Dante and Wagner areas. A state record size hailstone certified at almost 7" in diameter occurred at Dante.

Although there are no records of a truly devastating tornado event in Charles Mix County, several tornadoes have caused significant damage. In 1962, several houses in Lake Andes were damaged by a tornado, and in the early 1970s a tornado damaged some homes in Platte.

Probability

Based on the historical evidence, the probability of a summer storm causing minor damage somewhere in the county in a given year is high. However, the probability of a storm causing significant damage (e.g. damaging hail or a tornado) in the county in a given year is low to moderate.

Regarding tornadoes, data gathered by the National Oceanic and Atmospheric Administration indicate that approximately 80 percent of South Dakota's land base (an area that includes Charles Mix County) lies within an area expected to experience from one to five tornadoes per year per 1,000 square miles. Given that Charles Mix County has a total area of 1,098 square miles, it is reasonable to conclude that the county can expect to experience an average of one to five tornadoes per year. Records from the National Climatic Data Center's Storm Events Database show that only seven tornadoes have been recorded in Charles Mix County since 1996 (see **Appendix E**), but it is likely that more unreported tornadoes have occurred.

Resources and Capabilities

Following is a description of the local resources and capabilities available for dealing with summer storms.

- Outdoor warning sirens are located in most of the populated areas of Charles Mix County, and are shown in the maps presented at the end of this chapter. Each siren is tested regularly, and all but the Marty siren can be activated from the 911 dispatch center in Lake Andes. Following are details about the sirens:
  - Dante - one siren; has battery backup.
  - Geddes - one siren; has battery backup.
  - Lake Andes - two sirens; one of the sirens has battery backup.
  - Marty - one siren; has battery backup; can be activated from Marty Indian School
  - Pickstown - one siren; does not have battery backup.
  - Platte - one siren; has battery backup.
  - Ravinia - one siren; has battery backup.
  - Wagner - two sirens; one siren has generator backup, the other has battery backup.
  - Platte Creek Rec Area - one siren; has battery backup.
  - North Point Rec Area - the State of South Dakota will install a siren here in 2014. Testing is occurring now to determine the best location.
  - Pease Creek Rec Area - the State of South Dakota will install a siren here in 2015.
- Designated storm shelters are located in most of the communities, as listed earlier on page 24. However, none of the facilities is constructed to the specifications required of a tornado safe room. The basement of the county

courthouse in Lake Andes is one public location where people could go to seek shelter from a tornado.

- As described above under the Winter Storm profile section, the Charles Mix Electric Association maintains a list of priority projects in its four-year work plan, and the Association is a party to the South Dakota Electric Cooperatives Mutual Aid Plan.
- Weather spotters are in place throughout the county.
- The county participates actively in public awareness campaigns in conjunction with the State Office of Emergency Management and the National Weather Service, as well as sponsoring local awareness activities.

Flooding

Description

Floods are among the most serious and costly disaster events. In South Dakota, there are two main climatologic causes of flooding: runoff from rainfall and runoff from melting snow. The water from rainfall or melting snow flows overland until it reaches a nearby river or lake. If the river or lake cannot hold all of the water that is entering it, some of the water will begin to overflow, causing flooding. The size of the flood is influenced by such factors as the intensity or length of the rainfall, melting rate of the snow, and the infiltration of the water into the ground.

Following is a description of the four types of flooding that have the potential of impacting Charles Mix County, based on information in the South Dakota Hazard Mitigation Plan:

- Flash flooding, which results from several inches or more of rain falling in a very short period of time. This high intensity rainfall is commonly caused by powerful thunderstorms that cover a small geographic area. The flood that occurs as a result of this runoff happens very rapidly, and is generally very destructive, although usually only a small area is affected.
- Long-rain flooding, which results after several days or even weeks of fairly low-intensity rainfall over a widespread area. This is the most common cause of major flooding. The ground becomes "water logged," and the water can no longer infiltrate into the ground. The flooding that results is often widespread, covering hundreds of square miles, and can last for several days or many weeks.
- Flooding resulting from melting snow in the spring. This type has characteristics of both flash floods and long-rain floods. The area covered is generally not as large as that covered by the long-rain flood, but is typically larger than that covered by the flash flood. Generally, the flood lasts for several days, occurring when large amounts of snow melt rapidly due to warm temperatures. The flooding can be made worse if the ground remains frozen while the snow is melting, causing the melt water to run off to nearby rivers and lakes rather than infiltrating into the ground. Some of the largest floods in South Dakota have been the result of melting snow and ice.

- Dam failure, resulting from natural or man-made causes. Charles Mix County is vulnerable to this type of flood primarily because of the Fort Randall Dam, which impounds the Missouri River and is considered a high hazard dam. In addition, there are several other smaller dams in the county classified as significant hazard dams[4]. The county also could be impacted by failure of any of the upstream Missouri River dams, especially Big Bend or Oahe (see below).

Location

In the past, the greatest flooding threat in Charles Mix County was along the Missouri River, which flows south/southeastward across South Dakota in a deep, wide channel, draining almost the entire state. Flooding along the river used to be an annual threat until a series of huge dams along the river, including Fort Randall, was constructed in the 1950s. Now, most of the Missouri River within South Dakota consists of a chain of reservoirs impounded by the dams. From north to south, these dams are Oahe, Big Bend, Fort Randall, and Gavins Point, which were built for flood control, to provide water for irrigation, and for the generation of hydroelectricity. The Fort Randall Dam is located near Pickstown and it impounds Lake Francis Case (see **Figure 2.1**).

Because of the dams, the threat of flooding from the Missouri River has been greatly reduced, although it has not been entirely eliminated. In 2011, significant flooding along the river did occur; as described in the *History* section, damage was substantial. The primary cause of the flooding was very heavy snowmelt at the river's source in the Rocky Mountains, along with extremely high spring rains throughout much of the river's drainage basin. The complicated politics concerning river management also played a role in the disaster that unfolded over the next few months.

In addition to land adjacent to the Missouri River, flood hazard zones are located along some of the river's tributary streams, along Choteau Creek, along an unnamed drainage in Wagner, and in the community of Marty (see maps at end of this chapter). Other low-lying areas of the county also are vulnerable to flooding, whether or not they are located in a designated flood zone. For instance, the small community of Ravinia was impacted by severe flooding in 2008 (see *History* section).

Extent

The extent of flooding in Charles Mix County has rarely been truly significant, with the flooding that occurred in Ravinia in 2008 and the epic Missouri River flood of 2011 being notable exceptions. As described in **Appendix E**, the Missouri reached a record 8.8 feet above flood stage near the small community of Greenwood at the peak of the flooding.

In terms of duration, flooding in the county after very heavy rain events or during snowmelt after snowy winters can cause road closures lasting from less than a day to several months.

[4] A high hazard dam is one whose loss would cause major economic loss, and in which there are anywhere from a few to hundreds of inhabited structures located in the predicted area of inundation. A significant hazard dam is one whose loss would cause appreciable economic loss, and in which there are one or two inhabited structures located in the predicted area of inundation.

A typical example is 290th Street south of Geddes, for which the County received Hazard Mitigation Grant Program funding in 2012. In 2007 and in 2010, floodwater inundated the roadway, causing it to be closed for over a month while the water receded and repairs were made to the road.

History

Many flooding events have impacted the county. **Table 3.1** shows those that resulted in a Presidential disaster declaration, while **Appendix E** shows several other flood events that have impacted the county. Following is a summary of some of the more significant floods the county has experienced.

Serious flooding in 1984 resulted in FEMA Disaster Declaration 717, which caused almost $4.5 million of damage in the affected counties.

Flooding in 1995 resulted in FEMA Disaster Declaration 1052. All of South Dakota had above normal precipitation from January through May, with many weather stations in the central and eastern portions of the state experiencing their all-time wettest Spring. Damage was caused by ground saturation and flooding due to very high residual groundwater tables from 1994, heavy winter snow and spring rain, and rapid snowmelt. Many roads were under water due to high groundwater saturation, causing interruption of emergency services. Damage also included power transmission and distribution facilities owned by rural electric cooperatives. In the area impacted by the flood, surveys identified over 3,000 homes with some type of damage, the majority caused by groundwater seepage of one to three inches into basements. In many areas the water table rose almost to the surface, saturating septic drain fields and preventing proper treatment of wastewater. The total damage estimate in the affected counties was over $35 million, which included $9.3 million in damage to public infrastructure.

Flooding in 1997 resulted in FEMA Disaster Declaration 1173, which was declared for all counties in South Dakota. At the time, the event was considered one of the top ten natural disasters ranked by FEMA relief costs. From November 1996 through February 1997, the weather across the eastern part of the state was cold and very wet, with record setting snowfall in many places. The persistent cold greatly limited snowmelt between storms, which caused snow to pile up from 10 to 24 inches deep. An early April blizzard added to the snow pack, and heavy rain later in the month combined to further saturate the ground. Prairie potholes turned into lakes, causing many people to be evacuated from their homes and farms, and preventing farmers from planting thousands of acres of land. The flood caused over $87 million in damage statewide, and took the lives of two people. In Charles Mix County, many township roads were damaged and culverts in various places were destroyed.

Flooding in 2008 resulted in FEMA Disaster Declaration 1774, which particularly affected the southeast part of the county. The community of Ravinia was especially impacted, with many of the town's roads under water for a period of about ten days. The high water caused the town's sewage lift station to fail, which left residents without sewer service for

several weeks, and some houses suffered water damage. Big pumping equipment, including some provided by the U.S. Army Corps of Engineers, had to be brought in to deal with the situation.

Flooding in the spring and summer of 2010 resulted in FEMA Disaster Declaration 1915. Heavy rainfall of up to six inches caused widespread flash flooding of many county and township roads, residences, and fields. Some residences were damaged by the floodwater, and some temporary evacuations were necessary. The former Yankton Sioux tribal administration building in Marty suffered so much damage that it had to be abandoned (it had also suffered flood damage in 2007 and 2008). See **Appendix E** for more details about this event.

The Missouri River flood of 2011 may have been the most notable flooding event ever to occur in the recorded history of South Dakota, resulting in FEMA Disaster Declaration 1984. Although Charles Mix County did not suffer as much damage as some other parts of the state, the county did feel the impact of the event. The flood began to develop in May and increased throughout the month as runoff from excessive upstream snowmelt and rain reached the area. Lowland areas along the river began to flood, impacting recreational facilities and some roads. By the end of June the river reached a record 8.8 feet above flood stage near Greenwood, where two households were evacuated and one house was lost to floodwaters. A newly built cabin located near the river a few miles east of the North Wheeler Recreation Area also suffered some flood damage. Many local roads in the southeastern part of the county in the vicinity of the Missouri were damaged, and a great deal of farmland along the river was flooded. A slow drop in the river began in July and by late September flooding finally ended.

Probability

Based on the historic evidence, the probability of minor flooding occurring somewhere in the county in a given year is moderate, but the probability of flooding resulting in significant damage is low. It is a certainty that flooding will continue to impact the county to some degree, no matter what mitigation actions are pursued.

Resources and Capabilities

An important resource available to mitigate against damage from flooding is managing development in floodplains and other areas prone to flooding. Charles Mix County and most of the municipalities in the county participate in the National Flood Insurance Program (NFIP) and have passed an ordinance to reduce future flood risk. Each flood ordinance mandates that all construction, including both new construction and substantial improvements, must have the lowest floor (including basement), elevated to at least one foot above the base flood elevation. Most of the ordinances also have requirements for new construction and substantial improvements regarding anchoring, types of construction materials that may be used, and utility systems. The Wagner ordinance mandates that subdivision proposals must be consistent with the need to minimize flood damage. The following table provides information on NFIP participation in the county and participating jurisdictions.

Table 3.2 – National Flood Insurance Program Participation (as of Dec 31, 2013)

Jurisdiction	CID #	NFIP Status	FIRM Effective Date	Insurance Policies in Place	Amount of Insurance
Charles Mix Co	460257	Participating	6/02/2004	1	$140,000
Dante	465466	Participating	6/02/2004	0	$0
Geddes	460113	Not Participating			
Lake Andes	460187	Participating	2/07/1975	0	$0
Pickstown	465468	Participating	6/02/2004	0	$0
Platte	460212	Participating	6/08/1998	2	$102,500
Ravinia	465469	Not Participating			
Wagner	460224	Participating	6/02/2004	5	$226,000

Sources: FEMA Community Status Book Report; http://bsa.nfipstat.fema.gov/reports/reports.html

Following is a description of other local resources and capabilities available for mitigating damage from flooding.

- The county passed a drainage ordinance in 2013. The ordinance is enforced by a drainage board consisting of the county commission.
- Inspection and maintenance of dams, culverts, and other drainage structures is performed regularly in the county.
- The county keeps a supply of sandbags in reserve for flood fighting operations.

In regards to the threat of flooding along the Missouri River, the U.S. Army Corps of Engineers has an emergency preparedness plan in place for the Fort Randall Dam. The Corps also has jurisdictional control over construction activity below the 1,365 foot elevation mark around Lake Francis Case, which is considered the ordinary high water (OHW) level. Any work below this elevation requires regulatory review and permitting, and in no case would the Corps issue a permit for a habitable structure.

Drought

Description

Drought is a deficiency in precipitation over an extended period of time, 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 occurs in virtually all climate zones. Human factors, such as water demand and water management, can exacerbate the impact that drought has on a region.

Droughts can occur at any time of the year, but the consequences are worse during the summer growing season, especially after winters with below normal precipitation. A small departure in normal precipitation during the months of June through August can have a significantly negative impact on crop production. The demand for water for multiple uses also impacts water availability. Rural water systems that were originally designed to supply

water for people are now also being used for cattle and to fight wildfires, taxing the limits of the systems.

Drought in South Dakota is often accompanied by periods of extreme heat. According to the National Weather Service, among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll on human life. Between 1936 and 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation, and in the heat wave of 1980, more than 1,250 people died. Elderly people, small children, those with chronic illnesses, and those on certain medications are particularly susceptible to heat stress.

Location

All areas of the county are equally likely to be impacted by drought.

Extent

Charles Mix County has experienced some very significant droughts over the years. In an area that is so highly dependent on agriculture, the impact of a major drought can be significant. The dust bowl years of the 1930s are an obvious example of what can happen when the rain stops falling. Although agricultural practices today are more advanced, and most agricultural producers now have crop insurance, the impacts of drought can still be very serious.

History

There are 19 drought events recorded for the county in the Storm Events Database since 1996, with seven events occurring in 2012. The 2012 drought was so devastating that the State of South Dakota activated a Drought Task Force. Beyond the recent past, the dust bowl years of the 1930s were particularly severe for Charles Mix County, not to mention much of the rest of the United States.

Probability

Based on an analysis of the frequency of past hazard events, the probability of a significant drought occurring in Charles Mix County in any given year is moderate, expected to occur at least once or twice in a ten year period. The probability of a truly severe drought impacting the county, such as occurred in 2012, is low, expected to occur fewer than once per ten years.

At the statewide level, the developers of the South Dakota Hazard Mitigation Plan cite tree ring research spanning a period of about 400 years indicating that multi-year droughts as significant as the 1930s drought occur on average every 57 years in South Dakota. Based on historical records, notable droughts have occurred somewhere in the state on average about every 12 years.

Resources and Capabilities

Resources at the local level in Charles Mix County to mitigate the impacts of drought are limited. The Randall Community Water District does have restrictions on the amount of water that it will distribute to the communities it serves. During times of very high water usage, as might occur during a summer drought when people are watering their lawns, the towns therefore could ask their residents to cut back their usage. However, this has never happened before.

Resources available at the state or regional level include the State Drought Task Force, which was activated during the severe drought of 2012. The goal of the task force is to monitor drought conditions by gathering the most current data available and to make sure that South Dakotans have access to that information as quickly as possible. The group coordinates the exchange of drought information among government agencies and agriculture groups, fire managers, and water-supply organizations. Another resource is the Natural Resource Conservation Service, which has information available about how to deal with droughts.

Wildfire

Description

Wildfires are uncontrolled conflagrations that spread freely through the environment. Such fires that occur near populated areas pose threats not only to natural resources, but also to human life and personal property. Wildfires are not as serious a concern in Charles Mix County as in other more forested parts of the country, but the opinion of the planning team is that the hazard does warrant some attention in this plan.

Each of the local fire departments in Charles Mix County submits reports to the South Dakota Division of Wildland Fire about the fires they fight. The division compiles the reports and produces a comprehensive database of all the records, which the planning team was able to obtain for fires occurring between 2000 and 2013. According to the database, the most common specific cause of wildfires in Charles Mix County since 2000 has been from debris that caught fire, followed closely by equipment that ignited vegetation. Human-caused fires, such as fireworks, also have been fairly common. Lightning only accounted for about three percent of all fires reported.

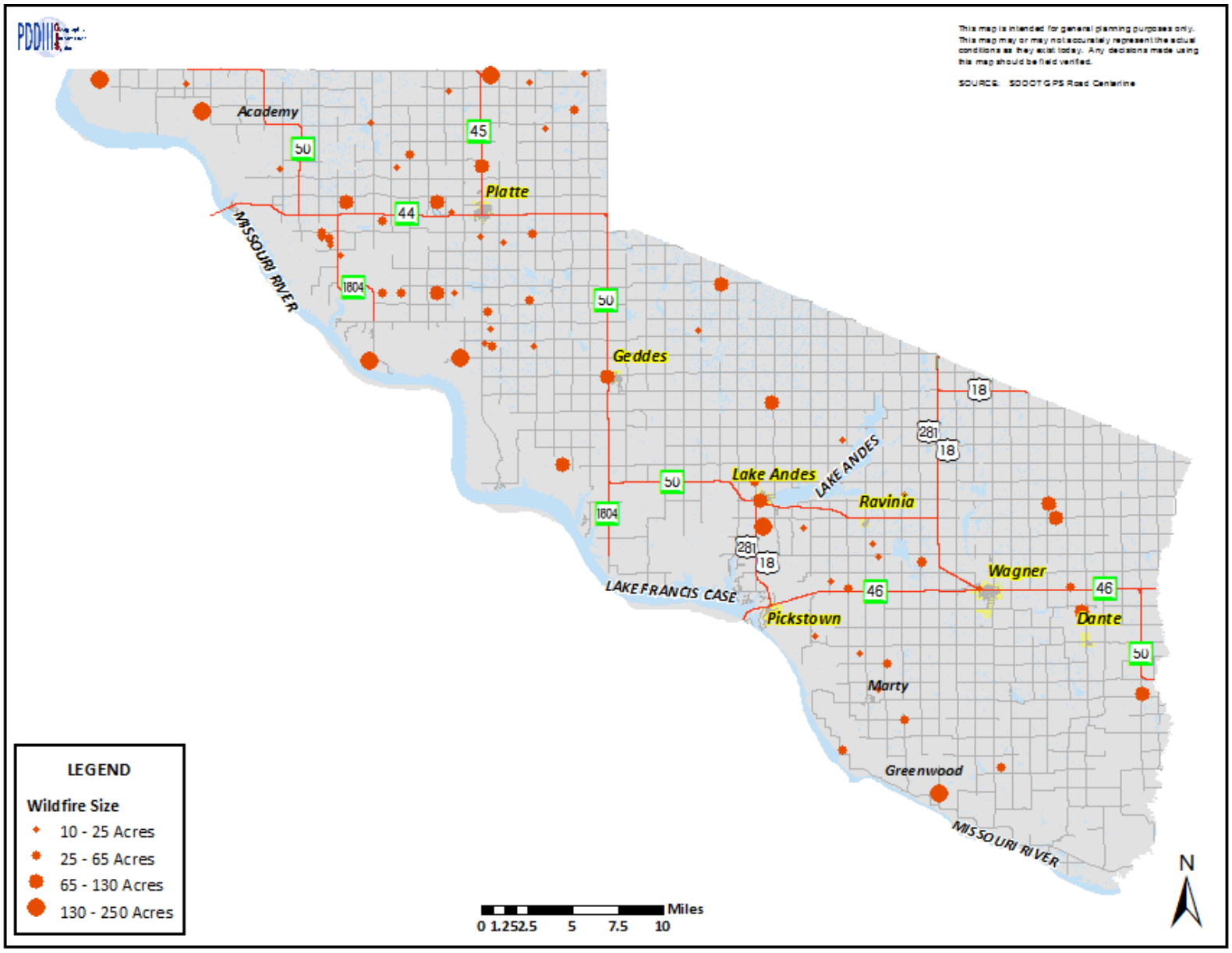
Location

Wildfires in Charles Mix County are most likely to occur in large areas of extensive brush or unmanaged vegetation. This includes the hills and draws along the Missouri River, which contains a significant amount of cedar trees and thick brush. The location of fires affecting ten acres or more in the county since 2000 is shown in **Figure 3.1**.

Extent

Most of the wildfires reported from the county have been fairly small, impacting less than an acre, but 19 of the fires since 2000 have covered 100 or more acres. See **Table 3.11** on page 56 for additional details.

Figure 3.1 - Location of Wildfires in Charles Mix County



History

Many notable wildfires have occurred in Charles Mix County, but nothing on a truly destructive scale. The largest known fire to occur in the county was the Chalk Rock Fire of 1985, which consumed 1,800 acres. Since 2000, the largest fire in the county affected 800 acres. There have been no fire-related Presidential disaster declarations involving Charles Mix County.

Probability

Small scale wildfires are likely to occur somewhere in the county virtually every year. They are more likely to occur during extended dry periods, and are most dangerous when they are spread by high winds. Based on past history, the probability of a wildfire causing significant damage in the county in a given year is low.

Resources and Capabilities

Several fire departments are based in the county. Each department has volunteer firefighters who have had training in fighting wildfires; the level of training varies from basic to advanced. The departments also have adequate equipment and protective gear for their volunteers to handle most of the wildfires they are likely to encounter. Various mutual aid agreements also are in place which helps ensure that assistance is available during particularly serious wildfires and other emergency events. A summary of the capabilities of each fire department is presented in the following table.

Table 3.3 - Fire Department Resources and Capabilities

Dept	Vols	Vehicles	Special Equipment	HazMat Capability
Academy	25	One Type 4 engine One Type 6 engine One Type 6 tender		None
Dante	15	One Type 3 engine One Type 4 engine One Type 6 engine		None
Geddes	30	Two Type 2 engines Two Type 6 engines Three Type 2 tenders		None
L Andes	30	One Type 1 engine Three Type 6 engines One Type 2 tender One Light rescue	Equipment for confined space; ropes for high angle rescue; 35' extension ladder	None
Platte	34	Two Type 1 engines One Type S3 tender One Type S2 tender Four Type 6 wildland engines One Type 7 wildland engine One 1-Ton crew cab pickup	One trailer-mounted 1,000 GPM pump	Operations Level
Ravinia	15	One Type 1 engine Two Type 6 engines		None

Wagner	25	Two Type 1 engines Two Type 6 engines One Type 2 tender One Rescue vehicle		Operations Level

Following is a summary of the other local resources and capabilities available for dealing with wildfires.

- The county has a wildfire preparedness plan, which was developed with the assistance of the South Dakota Dept of Agriculture.
- The county adopted a burn ban ordinance in August 2012, during the extreme drought of that year, which prohibits open burning when the National Weather Service's Grassland Fire Danger Index is at the Very High or Extreme level.
- A requirement is in place that those wanting to start controlled burns must contact the E-911 dispatch center in Lake Andes first.

Community Assets

Hazards can affect all parts of the community, but their impact on certain community assets is particularly important to consider. In this section, the most important community assets and facilities in Charles Mix County are identified. The section begins by identifying those assets and facilities that would play a critical role in helping the community respond to a hazard event. Following this, certain other important community assets are identified, and the section ends with a brief discussion of some of the most vulnerable populations in the county.

Hazard Response

The assets listed below would play an especially critical role during a hazard event, helping the community respond to and recover from the event. The assets are shown in the maps located at the end of this chapter.

Equipment and personnel

- Charles Mix County Emergency Management Office
- Dante Fire Dept
- Geddes Fire Dept
- Lake Andes Fire Dept
- Pickstown Fire Dept
- Platte Fire Dept
- Wagner Fire Dept

Major Medical facilities

- Platte Health Center
- Wagner Community Memorial Hospital

Shelters

- Dante - Community Auditorium/City Hall
- Geddes - Community Center/City Hall
- Geddes - Community Center (former school gymnasium)
- Lake Andes - Community Center (*has a generator*)
- Lake Andes - Andes Central School
- Marty - Marty Indian School
- Pickstown - Rainbow Room Community Center
- Platte - Community Center/City Hall
- Platte - Platte Health Center (*has a generator*)
- Platte - National Guard Armory
- Wagner - Good Samaritan Center (*has a generator*)
- Wagner - National Guard Armory

Notification

- Dante warning siren
- Geddes warning siren
- Lake Andes warning siren (two)
- Marty warning siren
- Pickstown warning siren
- Platte warning siren
- Ravinia warning siren
- Wagner warning siren (two)
- Platte Creek Recreation Area warning siren
- North Point Recreation Area (to be installed in 2014)
- Pease Creek Recreation Area (to be installed in 2015)

Other Important Assets

Included in this category are assets and facilities that are important to the basic everyday functioning of communities. However, they would not necessarily be critical in helping the community respond to a particular hazard, although they could play a part. The schools, for example, could be used to shelter people during long-term power outages. Included here are some of the larger businesses in the county, the closure of which following a major disaster could have a significant economic impact on the local economy. Each of the assets, except for the businesses, is shown in the maps located at the end of this chapter.

Governmental offices

- Charles Mix County Courthouse
- Dante city office

- Geddes city office
- Lake Andes city office
- Pickstown city office
- Platte city office
- Wagner city office
- Yankton Sioux Tribal Office (Wagner)

Educational Facilities

- Andes Central School (Lake Andes) (K-12)
- Platte Community School (K-12)
- Wagner Community School (K-12)
- Marty Indian School (K-12)
- Ihanktonwan Community College (Marty)

Major Businesses

- Buche's Food (Wagner)
- Commercial State Bank (Wagner)
- Dakota Manufacturing Company (Platte)
- Fort Randall Casino (located between Pickstown and Wagner)
- Meyerink Farm Service (Platte)
- Platte Food Center
- Platte Livestock Market
- Wagner Building Supply

Other Important Facilities

- U.S. Army Corps of Engineers (Pickstown)
- Charles Mix Electric Association (office in Lake Andes)
- Randall Community Water District (office in Lake Andes)
- Charles Mix County 4-H building (Lake Andes)

Vulnerable Populations

The issue of vulnerable populations is important to consider, because such populations may be particularly vulnerable to disaster events. Vulnerable populations include the very young, the elderly, those with physical or mental disabilities, and the very poor. They can also include populations that tend to be isolated in some way from the rest of the community, such as those who are not fluent in English.

The South Dakota Hazard Mitigation Plan includes a section on social vulnerability, using the Social Vulnerability Index for the United States. This index, compiled by the University of South Carolina Hazards and Vulnerability Research Institute, measures the social

vulnerability of all counties in the nation to environmental hazards. The index synthesizes 30 socioeconomic variables, which research suggests contribute to reduction in a community's ability to prepare for, respond to, and recover from hazards. The primary variables are race and class, wealth, percentage of elderly residents, Hispanic ethnicity, special needs individuals, Native American ethnicity, and service industry employment. According to the index, Charles Mix County is in the top 20% of the most socially vulnerable counties in the nation to environmental hazards, ranking 11th among South Dakota counties.

In the context of this plan, a specific population of concern is the aged, who tend to be more vulnerable to the effects of hazard events because of their physical or mental condition, or other factors. Many of the aged live in nursing homes and assisted living facilities. There are three such facilities in the county, the Lake Andes Nursing Home, the Platte Nursing Home, and the Wagner Good Samaritan Home, which are shown in the maps at the end of this chapter. Each facility has a generator available for use when power is disrupted.

Estimating Losses

This section assesses the vulnerability of Charles Mix County and the participating jurisdictions to the hazards profiled earlier in this chapter. Vulnerability is defined as the extent to which people and property are exposed to harm or damages created by a hazard. Much of the vulnerability analysis was done by the Planning & Development District III office, including research on local disaster events that had occurred since the original plan was developed.

The method of determining vulnerability varies by the type of hazard and the availability of data, but each methodology is based on either potential for loss or actual losses. Following is a description of each specific methodology used.

Potential Loss Methodologies

- FEMA's HAZUS loss estimation software was used to estimate potential losses from flooding in each community. HAZUS produces a flood polygon and flood-depth grid that represents the 100-year floodplain, with losses calculated using national baseline inventories (buildings and population) at the census block level. The maps generated by HAZUS are not as accurate as FEMA's Flood Insurance Rate Maps, nor is the resulting data, but HAZUS is still a helpful planning tool for communities that have not been mapped by the National Flood Insurance Program [5].

[5] A major limitation is the inadequacies associated with the hydrologic and hydraulic modeling of the HAZUS model, especially in sparsely populated areas where census blocks - the basis of the loss calculations - are large. The software assumes the population and building inventory to be evenly distributed over the census blocks, whereas in reality flooding may occur only in a small part of the block where there are few buildings or people. Also, HAZUS uses default national databases that may not be applicable at the local level.

- FEMA Flood Insurance Rate Maps were used to identify 100-year flood zones in the county. Using GIS, these flood zones were overlaid on parcel layer data to provide estimates of loss potential at the community level.
- Data on the population living in wildfire threat zones was used to estimate potential wildfire losses. This methodology, from the SILVIS Lab at the University of Wisconsin–Madison, was not used when the current plan was being developed.
- The value of buildings within the county was used to estimate potential losses due to winter storms and summer storms (building exposure).
- Population density within the county was used to estimate potential losses due to winter storms and summer storms.

Actual Loss Methodologies

- The National Climatic Data Center's Storm Events Database was consulted for historical information regarding weather-related events back to 1996 (see **Appendix E**).
- The Spatial Hazard Events and Losses Database for the United States (SHELDUS) was consulted for information on certain hazard events prior to 1996. As mentioned earlier, a major weakness of this source is that it provides very little useful information about each event, nor any descriptive details, so it is difficult to determine whether the event had much actual impact in the county.
- Damage amounts were obtained for those disasters that impacted the county and resulted in a Presidential disaster declaration. Information was obtained from the South Dakota Office of Emergency Management and from the Charles Mix Electric Cooperative (see **Table 3.1**).
- Information from the National Drought Mitigation Center's Drought Impact Reporter was used to assess the local impact of droughts.
- Data from the South Dakota Division of Wildland Fire was used to assess the historical impact of wildfires in the county.
- Data from the U.S. Dept of Agriculture Risk Management Agency was used to assess crop loss due to a variety of natural hazards.

At the conclusion of the vulnerability assessment for each hazard, development trends are analyzed to determine whether the county's vulnerability to the hazard might increase in the future. For instance, development in a floodplain can increase a community's vulnerability to flooding, and it can also increase the probability of flooding elsewhere as former permeable surface areas are converted to impermeable surfaces. Information on development trends in the county was obtained by the following:

- Analysis of population trends and projections.
- Analysis of building permits issued in Charles Mix County. **Figure 3.2** shows the location of each permit issued since 2008. A quick glance at the map shows that much development is occurring at the North Point and Platte Creek Recreation Areas, with growth also concentrated around Platte and Wagner.

At the end of the chapter, a map of each community is presented showing the important community assets discussed in the previous section. The maps also show the mapped 100-year flood zones in the communities, as well as area identified by the HAZUS software as being flood prone.

Winter Storms

All areas of South Dakota are vulnerable to winter storms, and Charles Mix County is certainly no exception. The consequences of winter storms can be great. They can disrupt the power supply when electrical lines are brought down by high winds, falling trees, or extreme ice buildup. Everyday activities can be significantly disrupted when road conditions deteriorate because of snow cover or precipitation that freezes on road pavement. In extreme situations, roads can be closed because of accumulated snow for days or even weeks. Winter storms also can cause significant crop losses when they occur early in the growing season.

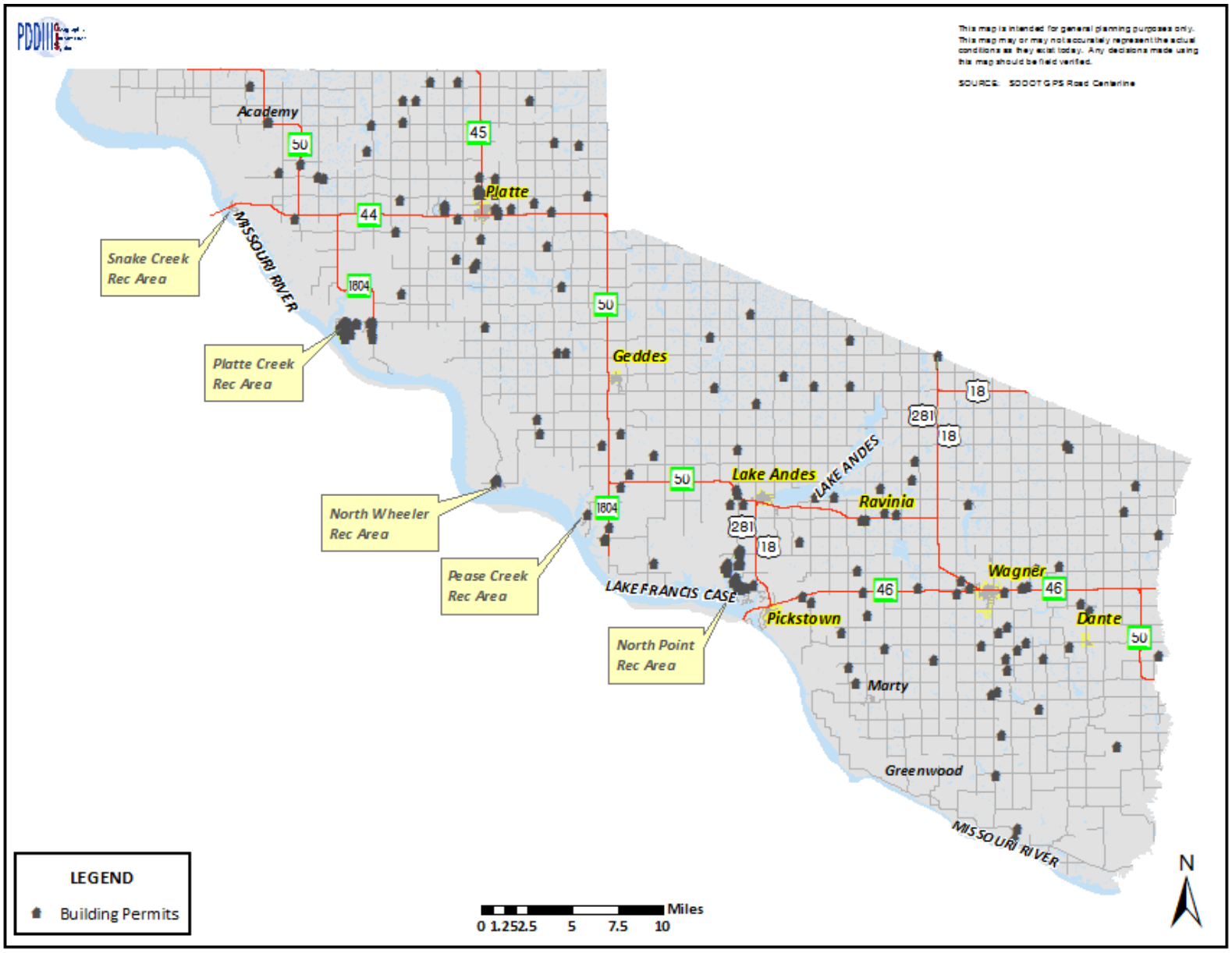
The rural areas of the county may be somewhat more vulnerable to winter storms than the towns. One of the primary reasons for this is the fact that electricity is brought to the rural areas by many miles of rural power lines, which are vulnerable to being brought down by storms accompanied by high winds or freezing rain (high winds can snap power poles, and freezing rain and sleet forms ice on the lines, making them heavy and more susceptible to being blown down). The rural elderly are at particular risk at these times, because they cannot as easily withstand extremes in temperature, and because they are more likely to depend upon certain in-home health care systems that require electricity to operate.

Isolation also increases the vulnerability of people living in the rural areas of the county. For instance, if rural roads are blocked by snow for extended periods of time, people cannot travel into town for groceries, medical supplies, or other important items.

To assess the county's vulnerability to winter storms, the methodology that was used in the South Dakota Hazard Mitigation Plan was essentially followed for this plan. The following factors were considered:

- The number of prior winter storm events in the county
- Past damage amounts
- The county's building exposure
- Population density

Figure 3.2 - Building Permit Activity in Charles Mix County



Prior Events:

Appendix E shows all the significant winter storms that have been recorded in Charles Mix County since 1996. The information is taken from the National Climatic Data Center's Storm Events database, and it includes some descriptive detail about the events where available. The table shows numerous winter storm events have occurred in the county. In addition, the Storm Events database has records of several high wind events in the county that occurred in the months of November through February.

Past Damage Amounts:

Winter storms have the potential to cause significant amounts of damage. The ice storm that occurred in November 2005 caused an estimated $1 million dollars of property damage in Charles Mix County, and many other winter weather events have caused significant amounts of damage in the county, as shown in **Appendix E**.

Given Charles Mix County's agriculturally-based economy, another method to determine vulnerability is to look at the impact of winter storms on the county's agricultural producers. Farmers typically protect themselves from the impacts of adverse weather and other natural hazards by insuring their crops against losses through multi-peril crop insurance, which is underwritten by the Risk Management Agency, a part of the U.S. Dept of Agriculture. Data on indemnity payouts for crop loss in Charles Mix County due to various types of winter weather events between 2000 and 2013 was obtained from the Risk Management Agency, and is presented below in **Table 3.4**. As the table shows, 2001 and 2013 were particularly difficult years. Virtually the entire amount of the payouts for both years was attributed to winter wheat (wheat that is planted in the fall and lies dormant over the winter) that was lost due to very cold winter conditions. For the 2000 through 2013 period of analysis, winter weather-related payouts represented about 5% of all indemnity payouts in Charles Mix County.

Table 3.4 – Crop Loss Due to Winter Weather

Year	Frost	Freeze	Cold Winter	Cold Wet Weather
2000	$0	$0	$39,746	$0
2001	$0	$0	$2,153,449	$69,357
2002	$9,043	$6,871	$49,019	$4,429
2003	$0	$0	$318	$0
2004	$46,546	$37,281	$11,405	$1,438
2005	$9,643	$557	$7,339	$0
2006	$0	$572	$1,744	$0
2007	$14,625	$2,612	$113,639	$33,727
2008	$0	$0	$70,469	$7,695
2009	$0	$0	$490,004	$12,636
2010	$0	$0	$1,904	$66,952
2011	$0	$12,901	$15,099	$242,264
2012	$5,694	$0	$0	$5,008

2013	$0	$29,734	$2,877,250	$57,147
Totals	**$85,551**	**$90,528**	**$5,831,385**	**$500,653**

Source: USDA Risk Management Agency (http://www.rma.usda.gov/data/cause.html)

Building Exposure:

The total value of buildings in Charles Mix County is approximately $920,018,000, according to the South Dakota Hazard Mitigation Plan, which ranks the county 18th of the state's 66 counties. The median figure for South Dakota counties is $580,276,000. The county's building exposure can be considered moderate.

Population Density:

Charles Mix County is very sparsely populated, with an average of only 8.3 people per square mile, less than the state figure of 10.7 people per square mile. Given that South Dakota is itself considered to be very rural, Charles Mix County would have to be rated low in terms of population density.

Winter Storm Vulnerability Summary:

Considering all these factors, Charles Mix County's vulnerability to winter storms can be considered moderate. It is a certainty that winter storms will continue to impact the county in the future.

Development Trends and Future Vulnerability

As **Table 2.3** showed, the population of Charles Mix County has been declining for the last several decades, and no major development has occurred anywhere in the county since the current plan was approved in 2008. Little growth is expected in the future, indicating that the county' vulnerability to most hazards is not likely to greatly increase in the future.

One area of concern, however, is the development that is occurring at the campground/ recreation areas scattered throughout the county. **Figure 3.2** illustrates where development is occurring in the county, much of which is concentrated in and around the North Point and Platte Creek Recreation Areas. Much of the development occurring at North Point and Platte Creek consists of modest homes and trailers that are only occupied during the summer, but the North Cottage Bay and Svatos Addition developments at North Point and the subdivisions at Platte Creek have several homes valued at $500,000 or more. People living in these areas are somewhat more vulnerable to winter storms than those living in the cities and towns, where more services and infrastructure are available.

Summer Storms

All areas of Charles Mix County are vulnerable to summer storms, especially those that are accompanied by tornadoes, lightning, or large hail. Typical damage from summer storms includes blown down power lines, crop damage from hail and high wind, and flooding as the result of heavy rain. Like the rest of the Great Plains, Charles Mix County is especially vulnerable to summer storms accompanied by high wind. This is because the landscape is

open and there is little topographic relief to block the wind. Infrastructure and facilities located at higher elevations, such as the bluffs along the Missouri River, may be particularly vulnerable to high wind events. The Missouri River bluffs are only lightly settled, but they do contain a number of communication towers and one significant structure, the Fort Randall Casino (see **Figure 2.1**).

To assess the county's vulnerability to summer storms, the methodology used in the South Dakota Hazard Mitigation Plan was adopted for this plan (where that plan analyzed tornadoes and windstorms separately, they are combined here). The following factors were considered:

- The number of prior summer storm events in the county
- Past damage amounts
- The county's building exposure
- Population density

Prior events:

Appendix E show all the significant summer storms that have been recorded in Charles Mix County since 1996. These storms include hail events, thunderstorms, lightning, and tornadoes. The information is taken from the National Climatic Data Center's Storm Events database, and it includes some descriptive detail about the events where available. The table shows numerous summer storm events. In addition, the Storm Events database has several records of high wind events in the county that occurred in the months of March through October.

Seven of the summer storms in the Storm Events database included a tornado, which is typical for most South Dakota counties (the South Dakota county average for this time period is 8.7 tornadoes). The Spatial Hazard Events and Losses Database for the United States (SHELDUS) has records of many additional tornadoes that occurred in Charles Mix County prior to 1996, but it cannot be determined from that source whether any of the tornadoes caused any significant damage in the county. Neither database has a record of a tornado occurring in Charles Mix County with a magnitude greater than F1.

Past Damage Amounts:

Summer storms have the potential to cause significant amounts of damage. A summer storm in July 1998 that was accompanied by hail caused an estimated $1 million dollars of property damage in Charles Mix County, and $2.2 million dollars of crop damage. A hail storm in August 1996 caused an estimated $500,000 of crop damage. As shown in **Appendix E**, many other summer storm events have caused lesser amounts of property and/or crop damage in the county.

As with winter storms, another method to determine the county's vulnerability to summer storms is to look at the impact of such storms on the county's agricultural producers. Summer storms can cause a lot of damage to cropland, especially when they are accompanied by hail. Data on indemnity payouts for crop loss in Charles Mix County due to

hail as well as high wind events between 2000 and 2013 was obtained from the Risk Management Agency, and is presented below in **Table 3.5**. For the 2000 through 2013 period of analysis, summer storm-related payouts represented less than 2% of all indemnity payouts in Charles Mix County.

Table 3.5 – Crop Loss Due to Severe Summer Weather

Year	Hail	High Wind
2000	$413,489	$214
2001	$375,561	$16
2002	$64,077	$0
2003	$226,745	$0
2004	$3,200	$13,485
2005	$111,209	$3,481
2006	$14,582	$6,572
2007	$80,854	$89,411
2008	$62,213	$27,452
2009	$35,303	$3,066
2010	$87,868	$10,940
2011	$42,087	$4,093
2012	$0	$138,964
2013	$0	$484,012
Totals	**$1,517,188**	**$781,706**

Source: USDA Risk Management Agency (http://www.rma.usda.gov/data/cause.html)

Building Exposure:

The total value of buildings in Charles Mix County is approximately $920,018,000, according to the South Dakota Hazard Mitigation Plan, which ranks the county 18th of the state's 66 counties. The median figure for South Dakota counties is $580,276,000. The county's building exposure can be considered moderate.

Population Density:

Charles Mix County is very sparsely populated, with an average of only 8.3 people per square mile, even less than the state figure of 10.7 people. Given that South Dakota is itself very rural, Charles Mix County can be rated low in terms of population density.

Summer Storm Vulnerability Summary:

Considering all these factors, Charles Mix County's vulnerability to summer storms can be considered moderate. This is not to minimize the impact that such storms can have on the county, especially when they include tornadoes. It is a certainty that summer storms will continue to impact the county in the future.

Development Trends and Future Vulnerability

As **Table 2.3** showed, the population of Charles Mix County has been declining for the last several decades, and no major development has occurred anywhere in the county since the

current plan was approved in 2008. Little growth is expected in the future, indicating that the county' vulnerability to most hazards is not likely to greatly increase in the future.

However, the development occurring at the North Point and Platte Creek recreation areas is a concern regarding summer storms, as is the expansion occurring at many of the other campground/recreation areas scattered throughout the county. So far in 2014, a total of 76 camping pads have been added to the campgrounds (see **Appendix D** for details). These recreational areas are particularly busy during the summer months with visitors and people living in their summer homes, many of which are nothing more than modified trailers offering little protection from tornadoes and other violent summer weather. The lack of warning sirens and storm shelters at most of the areas puts people at additional risk.

Flooding

Like all counties in South Dakota, Charles Mix is vulnerable to flooding. Given the specific nature of flooding, the county's vulnerability to flooding will be analyzed first on a general county-level basis, and then specifically for each community. Given the degree to which flooding is geographically-based, this approach made the most sense to the planning team.

General Flood Vulnerability

Charles Mix County definitely is vulnerable to flooding. According to the HAZUS analysis that was run for the South Dakota Hazard Mitigation Plan (see Table 3-45 of that plan), the potential building damage loss from flooding in Charles Mix County is $4,020,000. The median figure for all South Dakota counties is approximately $2,800,000. Overall, Charles Mix ranks 23rd out of the state's 66 counties in this measure of vulnerability. The potential displaced population in the county was determined to be 232 people, compared to the median for South Dakota counties of 255.

There are a total of ten National Flood Insurance Program policies in Charles Mix County, with four claims having been paid since 1978 totaling $265,077. The number of claims ranks Charles Mix 33rd among the state's counties, and the amount paid ranks the county 19th. There is one repetitive loss property in Charles Mix County, the former Yankton Sioux tribal administration building in Marty. Claims were made on this property following flood events in 2007, 2008, and 2010 totaling $181,763. Damage was so severe in 2010 that the building was abandoned, and it sits vacant today.

In addition to impacting buildings and other structures, a good deal of public and private infrastructure throughout the county is vulnerable to flooding. Flood damage frequently involves washed out or damaged roads and drainage culverts, often occurring in the spring, especially following winters with heavy snow. Roads and infrastructure in the vicinity of Choteau Creek, Mosquito Creek, and Platte Creek typically experience the most damage; these problem areas are shown in **Figure 3.3**. Choteau Creek, which passes near Dante and Wagner, has historically caused the most trouble. Over the years it has become almost completely silted in to the point where now even a small amount of rain causes it to

overrun its banks. There are no longer any houses or other structures located near the creek, so vulnerability is limited primarily to roads and public infrastructure.

Flooding also has a big impact on agriculture. Spring flooding can delay farmers getting into their fields to plant, and later in the growing season it can damage crops. Data on indemnity payouts for crop loss in Charles Mix County due to flooding, as well as excess moisture/precipitation, between 2000 and 2013 was obtained from the Risk Management Agency, and is presented below in **Table 3.6**. For the 2000 through 2013 period of analysis, flood-related payouts represented about 8% of all indemnity payouts in Charles Mix County, second only to drought.

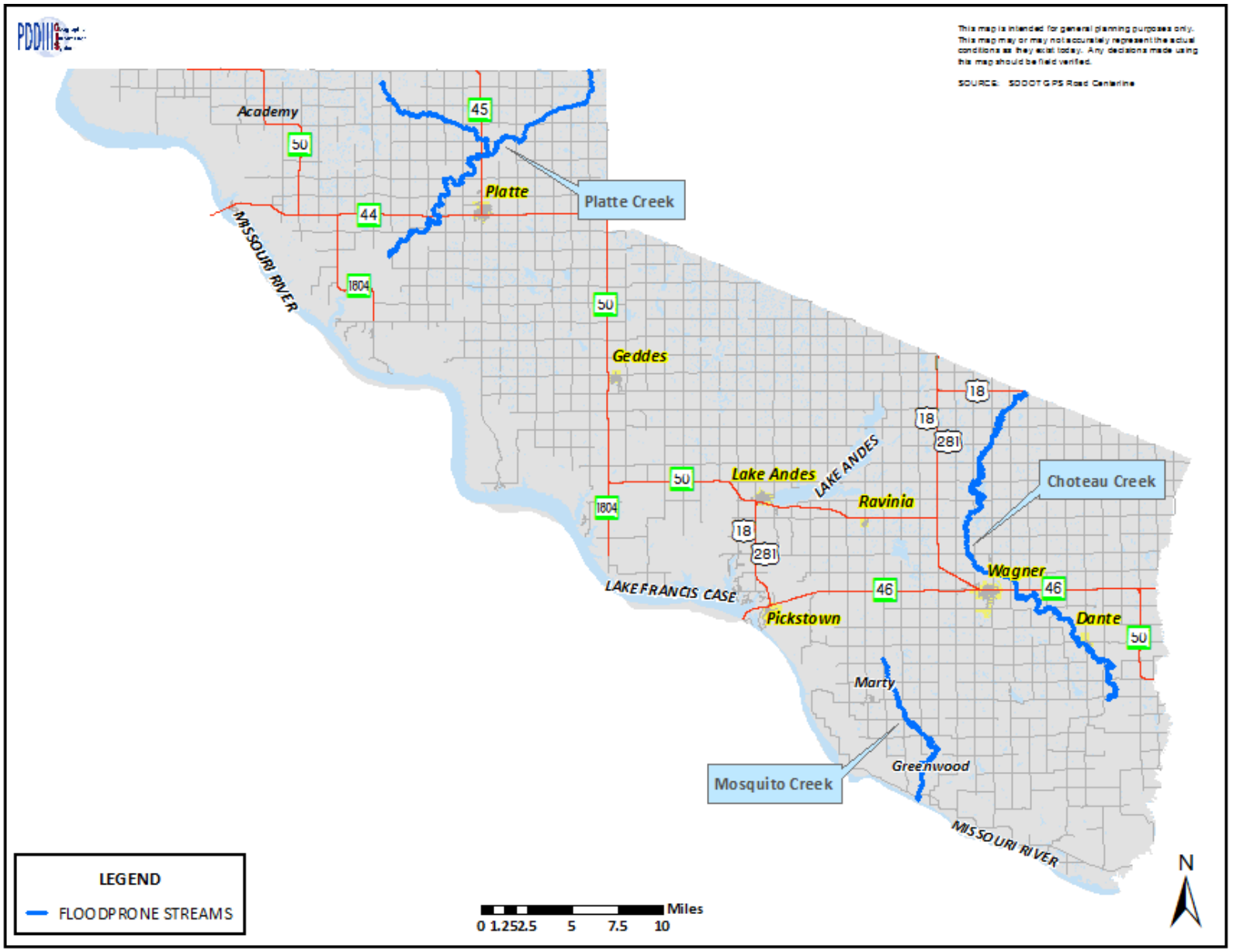
Table 3.6 – Crop Loss Due to Flooding

Year	Flooding	Excess Moisture/Precip
2000	$0	$82,550
2001	$5,245	$974,871
2002	$0	$73,376
2003	$2,569	$51,353
2004	$6,865	$33,176
2005	$0	$199,489
2006	$0	$33,175
2007	$602	$825,566
2008	$48,996	$2,187,792
2009	$3,201	$239,729
2010	$38,809	$2,372,014
2011	$793,062	$2,641,241
2012	$0	$64,080
2013	$0	$59,443
Totals	**$899,349**	**$9,837,855**

Source: USDA Risk Management Agency (http://www.rma.usda.gov/data/cause.html)

Before analyzing flood vulnerability at the local level, the issue of flooding along the Missouri River needs to be discussed. As mentioned earlier, it had once been thought that the system of dams on the river, including the Fort Randall Dam near Pickstown, had essentially eliminated the threat of flooding along the river. However, flooding did occur along the Missouri in 2011, due to heavy snowmelt at the river's source in the Rocky Mountains and extremely high rainfall throughout the river's drainage basin in the spring of 2011. Mismanagement of dam releases exacerbated the situation. Most of the flooded area in Charles Mix County was pasture or cropland, but infrastructure and some property also was impacted, as described earlier.

Figure 3.3 - Rural Areas of Charles Mix County Particularly Vulnerable to Flooding



Local Flood Vulnerability

At the community level, FEMA's HAZUS loss estimation software was the primary method used to estimate potential losses from flooding. Similar to the methodology used in the South Dakota Hazard Mitigation Plan, the following indicators were used to assess potential flood losses:

- Building structural damage
- Building damage loss ratio (the percentage of the total building inventory in each community that could be damaged from flooding in any given year)
- Building content loss
- Debris generated
- Population displaced
- Short term shelter needs

The results of the HAZUS analysis are shown in **Table 3.7**. It should be noted that the HAZUS runs included land not only within each city's incorporated limits, but also in the area surrounding each community. The flood prone areas identified by the software in Lake Andes, Pickstown, and Ravinia are actually located outside each town's city limits. The table shows that Wagner is much more vulnerable to flooding than any of the other communities. There is also some vulnerability in Dante, Lake Andes (primarily in an Indian Housing area southeast of town), and Marty. The HAZUS software failed to run in Geddes and Platte, presumably because of the lack of significant drainage features in those communities.

Table 3.7 – HAZUS Base Flood Loss Estimation Results

Community	Building Structural Damage	Building Damage Loss Ratio	Building Content Loss	Debris Generated	Population Displaced	Short Term Shelter Needs
Dante	$13,000	0.68%	$6,000	17 tons	3	0
Geddes	*HAZUS FAILED TO RUN*					
Lake Andes	$70,000	0.74%	$35,000	72 tons	19	3
Marty	$48,000	***	$24,000	40 tons	6	0
Pickstown	$1,000	0.01%	$0	1 ton	0	0
Platte	*HAZUS FAILED TO RUN*					
Ravinia	$1,000	0.16%	$0	1 ton	1	0
Wagner	$882,000	2.02%	$1,557,000	745 tons	262	216

Source: FEMA HAZUS loss estimation software; Charles Mix County Director of Equalization

*** Most of the property in Marty is tax exempt; therefore a realistic damage loss ratio cannot be determined

For those communities with a mapped 100-year floodplain (Dante, Marty, and Wagner), GIS was used to overlay the floodplains on parcel data to determine the amount of residential and commercial property potentially at risk. **Table 3.8** below shows the result of the analysis; note that the figures reflect only those parcels on which the structure itself - not just part of the parcel - is located within the floodplain. The table shows that Wagner has the most amount of property located in the floodplain, although the property loss ratio

(amount of property at risk compared to the total building inventory) is higher in Dante. No analysis was done for Marty, since all property located in the floodplain there is tax exempt.

Table 3.8 – Value of Property in 100-Year Floodplain

	Assessed Value (Residential)	Assessed Value (Commercial)	Property Loss Ratio
Dante	$225,800	$10,500	12.3%
Wagner	$2,126,500	$1,191,400	7.6%

Sources: FEMA Flood Insurance Rate Maps; Charles Mix County GIS Administrator; Charles Mix County Director of Equalization

The maps presented at the end of this chapter - **Figure 3.4** through **Figure 3.11** - show the location of the areas identified by the HAZUS software as being prone to flooding in each community. The maps for Dante, Marty, and Wagner also show the mapped 100-year flood zones. As would be expected, there is considerable overlap between the HAZUS areas and the flood zones.

Additional detail gathered from the planning team is provided below regarding the vulnerability to flooding in each of the communities.

- Dante: Flooding is a persistent problem in Dante. The community was built on low-lying ground near Choteau Creek, and rainwater runs across farmland north and east of Dante on its way to the creek. During the last several years the situation has gotten worse, in part because much of the farmland surrounding Dante has been stripped of its vegetation, which once helped slow runoff. Without the vegetation, rainwater now rushes south toward 300th Street (aka Warren Avenue), where it overwhelms the ditches and spreads onto adjacent property. Heavy rain events can cause significant damage as water overtops 300th Street and gets into basements.
- Geddes: There is not much vulnerability to flooding in Geddes, nor any history of any significant flooding ever occurring in the community. Flooding in 2007 did cause very minor damage to a county garage located on the south side of town.
- Lake Andes: No significant flood damage has been known to occur within the city itself. As indicated above, there is some vulnerability just outside the city limits, especially in the Indian Housing area southeast of town.
- Marty: This community is situated in a low-lying area and is vulnerable to flooding. In 2010, a period of very heavy rain caused damage to several structures, including the Yankton Sioux Tribe's central administration building. Damage to the building was so extensive that Tribal leaders determined that repairing it would be too expensive. It now sits vacant.
- Pickstown: Located at the top of a ridge overlooking the Missouri River, there is very little flood risk here, and no history of any significant flood damage.
- Platte: There is some vulnerability to small-scale flooding in Platte, especially in the northeast and northwest parts of the community. **Figure 3.9** shows these areas, where sandbagging occasionally has been necessarily to prevent more

extensive flooding. The situation is much better than it used to be after a large diameter storm sewer pipe was installed in the early 2000s under a natural drainageway that runs through the community. Further drainage improvements were made following minor flooding in Platte in 2011.

- Ravinia: Standing water after heavy rain events is a problem in Ravinia, because of the town's flat topography and lack of drainage infrastructure. There are no businesses in this small community, but several homes have been impacted by flooding in the past, as has the town's utility infrastructure, as detailed in the previous section.
- Wagner: This community is vulnerable to flooding, particularly on the south side of town. Several houses in this area are located in the flood zone, as shown in **Figure 3.11**. The City recently completed a project using HMGP funding to install larger culverts under Front Avenue to improve drainage and reduce flooding in the area.

Development Trends and Future Vulnerability

As **Table 2.3** showed, the population of Charles Mix County has been declining for the last several decades, and no major development has occurred anywhere in the county since the current plan was approved in 2008. Little growth is expected in the future, indicating that the county' vulnerability to most hazards is not likely to greatly increase in the future.

The development that has been occurring at the recreation areas along Lake Francis Case may somewhat increase the vulnerability to flooding. Fortunately, there are regulations governing work activity below the lake's ordinary high water (OHW) level of 1,365 feet, as described earlier on page 32. During the flood of 2011, the lake reached an elevation of 1,374 feet, within one foot of the top of the flood control pool, which is the highest water level the lake can hold without going over the spillway gates. As mentioned earlier, a cabin located about seven miles southwest of Geddes suffered flood damage, and water got within 20 feet of some homes in the North Cottage Bay development at the North Point Recreation Area.

Another factor that could increase the county's vulnerability to flooding is the conversion of wetlands and other marginal land to agricultural production that has been occurring over the last several years as prices for corn, soybeans, and other commodities have increased. Farming these marginal lands may increase the probability and severity of flooding in certain areas as the land’s natural capacity to absorb excess surface water is decreased. This development generally is happening far from built-up areas, but there could be negative impacts on rural roads and infrastructure.

Drought

Without question, Charles Mix County is vulnerable to drought. As shown in **Appendix E**, there are 19 drought records for the county in the Storm Events Database since 1996, with events recorded in 1999, 2000, 2006, 2012, and 2013.

The biggest impact of drought in Charles Mix County is in the agricultural sector. This is not surprising, given the county's heavy reliance on farming. Data on indemnity payouts for crop loss in Charles Mix County due to drought and heat between 2000 and 2013 was obtained from the Risk Management Agency, and is presented below in **Table 3.9**. As the table shows, the drought in 2012 was particularly severe; in fact, only three other counties in South Dakota suffered more loss than did Charles Mix County. For the 2000 through 2013 period of analysis, drought-related payouts accounted for almost 81% of all indemnity payouts in Charles Mix County, far higher than any other type of payout. Much of this was due to the huge drought payouts of 2012, and it is not known if such a high percentage would be reflected over a longer period of analysis. Regardless, it is safe to say that drought is one of the costliest natural hazards facing Charles Mix County farmers[6].

Table 3.9 – Crop Loss Due to Drought and Heat

Year	Drought	Heat
2000	$3,975,006	$172,324
2001	$1,025,123	$40,178
2002	$14,953,511	$275,651
2003	$5,502,026	$485,110
2004	$6,066,001	$69,579
2005	$3,845,588	$498,974
2006	$6,728,369	$499,665
2007	$264,170	$122,117
2008	$713,654	$10,413
2009	$114,384	$12,252
2010	$177,754	$0
2011	$27,809	$104,207
2012	$57,689,233	$1,513,245
2013	$4,499,216	$123,371
Totals	**$105,581,844**	**$3,927,086**

Source: USDA Risk Management Agency (http://www.rma.usda.gov/data/cause.html)

Following the lead of the South Dakota Hazard Mitigation Plan, vulnerability also was assessed by reviewing information from the National Drought Mitigation Center's Drought Impact Reporter. As described on the Center's website, the Drought Impact Reporter is an interactive mapping tool designed to compile and display drought impact information across the United States from a variety of sources, such as media, government agencies, and the public. It considers impacts in a broad range of areas, including the social, economic, and environmental realms.

A summary of impacts from the Drought Impact Reporter for the period 1950 through 2013 is presented in the following table.

[6] Drought also appears to be the costliest natural hazard statewide for South Dakota farmers. From 2000 through 2013, drought payouts accounted for just under 50% of all indemnity payouts in the state. The next highest type of payout was from excess moisture/precipitation, representing about 30% of payouts.

Table 3.10 – Drought Impacts in Charles Mix County

Agriculture	Business & Industry	Energy	Fire	Plants & Wildlife	Relief, Response, Restrictions	Society & Public Health	Tourism & Recreation	Water Supply	TOTAL
141	18	7	10	22	60	28	6	36	328

Source: National Drought Mitigation Center's Drought Impact Reporter
(http://drought.unl.edu/MonitoringTools/DroughtImpactReporter.aspx)

For some perspective on what these figures mean, it is useful to review the drought assessment section of the South Dakota Hazard Mitigation Plan, which assessed drought vulnerability among all counties in South Dakota. According to the plan, Charles Mix ranked 16th in total number of impacts among the state's 66 counties, indicating that the county may be somewhat more vulnerable to drought than most other counties in the state. Areas where the county had significantly more impacts than average were Tourism & Recreation, Water Supply, and Plants & Wildlife. The county's location along the Missouri River would account for the high scores in the first two of these areas, while the Lake Andes National Wildlife Refuge probably accounts for the high score in the Plants & Wildlife category.

The high score in the water supply category may not be a completely accurate reflection of reality. This is because the Randall Community Water District, the primary water supplier for county residents, gets its water from the Missouri River, which is a reliable source of water even during droughts. Several years ago the water intake structures were extended farther out into the river to ensure that low water levels would not impact the district's ability to draw in water.

Development Trends and Future Vulnerability

The county's vulnerability to drought is certain to continue for the foreseeable future. If anything, it may increase in coming years if current land use trends continue and more marginal land is brought into agricultural production.

Wildfire

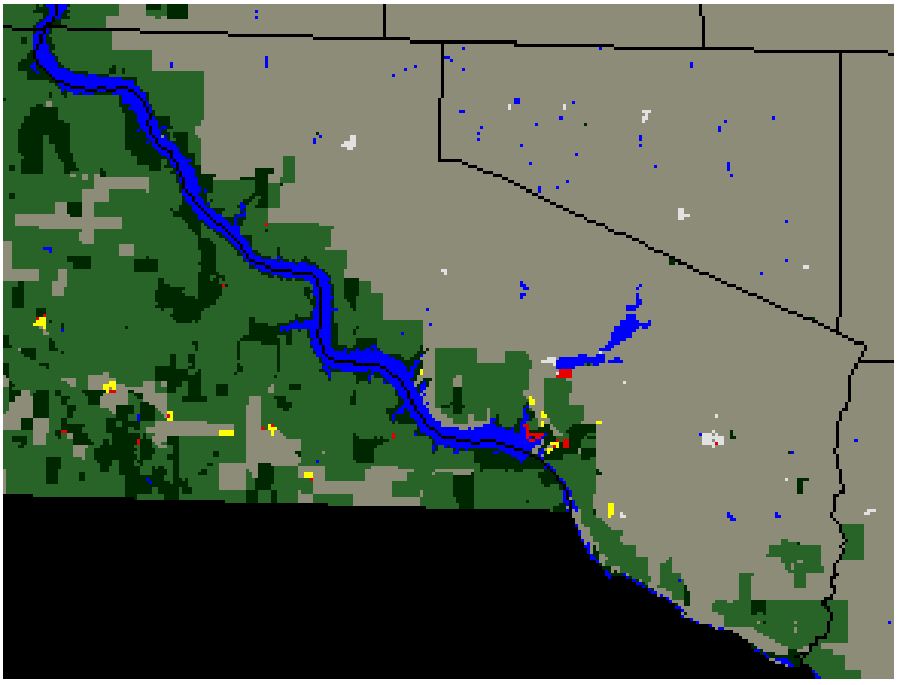
Charles Mix County is somewhat vulnerable to wildfires, especially during extended dry periods and when winds are high. One way vulnerability can be assessed is by analyzing the records of wildfires reported from the county. The following table summarizes information about the fires reported from the local fire departments to the South Dakota Division of Wildland Fire. The table shows that most of the fires have been fairly small, most impacting less than an acre (**Figure 3.1** on page 35 shows the location of the fires that affected ten or more acres). No injuries or deaths were associated with any of the fires. Information is not available on the dollar amount of damage caused by any of the wildfires reported.

Table 3.11 – Wildfires in Charles Mix County

Year	Less Than 1 Acre	1 to 9 Acres	10 to 24 Acres	25 to 99 Acres	100 Acres Or More	Homes Threatened	Homes Lost
2000	3	7	3	0	2	0	0
2001	1	1	0	0	0	0	0
2002	30	9	4	4	1	0	0
2003	16	10	2	1	0	0	0
2004	8	3	1	0	0	0	0
2005	14	3	2	1	1	0	0
2006	22	10	4	3	6	0	0
2007	14	6	1	0	0	0	0
2008	9	3	0	1	1	0	0
2009	6	1	3	1	0	1	0
2010	22	3	1	3	1	1	0
2011	16	11	9	6	2	3	1
2012	50	18	6	16	5	2	0
2013	6	3	2	3	0	1	0
TOTAL	**217**	**88**	**38**	**39**	**19**	**8**	**1**

Source: South Dakota Division of Wildland Fire (based on reports from the local fire departments)

Wildfire risk also can be analyzed using data from the SILVIS Lab at the University of Wisconsin. The SILVIS data is classified into various categories based on the density of housing and vegetation in specific areas. Areas are classified as High, Moderate, or Low Risk threat zones. High Risk zones are areas of moderate to high density housing within heavily vegetated areas, Moderate Risk zones are areas of lower housing unit density within areas of high vegetation, and Low Risk zones have either no vegetation, or very low density housing.



The map presented here, from the SILVIS website, shows the areas of greatest wildfire risk in the county. Following is an explanation of the various colors:

- Gray (no shading): Areas with little vegetation other than crops. There is little to no wildfire vulnerability in these areas.
- Dark green: Vegetated areas with no housing. Since these areas are not populated, there is no wildfire vulnerability.
- Green: Vegetated areas with low-density housing. The wildfire risk in these areas is low.
- Yellow: Wildland-urban interface areas. Here the risk is generally moderate, except in areas with very high density housing, where the risk is high.
- Red: Intermix communities, defined as places where housing and wildland vegetation intermingle, the vegetation being continuous and occupying more than 50 percent of the land, and the housing density being greater than one house per 40 acres. Here the risk is wildfire risk is high.

The map shows small areas of Charles Mix County in the High (red) or Moderate (yellow) risk zones. The total population and number of housing units in Charles Mix County in these zones is summarized in the table below, based on 2010 Census Block data.

Table 3.12 – Population in Wildfire Risk Zones in Charles Mix County

Housing Units	Total Population	Median Home Value	Total Home Value
199	376	$67,700	$13,472,300

Source: State of South Dakota Hazard Mitigation Plan, based on data from the SILVIS Lab at the University of Wisconsin–Madison

The population of 376 living in a High or Moderate Risk threat zone in Charles Mix County represents about four percent of the county's total population of 9,129. Putting things in perspective, in the state of South Dakota as a whole about 26 percent of the population is living in a High or Moderate Risk threat zone, most of them in the heavily forested Black Hills region. For further perspective, the median number of people living in a High or Moderate Risk threat zone among the state's 66 counties is 745, which ranks Charles Mix 42nd. It seems safe to conclude then that the overall vulnerability to wildfire in Charles Mix County is low.

This is not to say that there is no threat. Even in areas of the county without much woody vegetation, wildfires are possible. They can occur in pastures and other types of grassland, wetlands (many of which dry out in the summer), and wildlife production areas. The loss potential from these fires is generally slight, although occasional damage has been reported. Wildfire impacts on the county's agricultural producers are insignificant; data on indemnity payouts show no payouts for crop loss due to wildfire in Charles Mix County between 2000 and 2013.

Development Trends and Future Vulnerability

The development that is occurring at the recreation areas along Lake Francis Case is of some concern regarding wildfire vulnerability, as is the expansion of the campgrounds. The biggest concern is that there is no water supply on hand at any of the developments, so water would have to be trucked in to fight a fire. Another issue is that some of the homes are being built in areas prone to wildfires. For instance, Sand Dollar Cove at the North Point Recreation Area borders a field that is usually planted in wheat every other year (wheat stubble is quite prone to igniting), while other development is occurring in wooded, brushy areas. Another problem is that much of the seasonal housing is being built in very close proximity. Sand Dollar Cove exemplifies this trend - if one of the homes or garages there caught fire, it could rapidly spread to neighboring structures.

Reactivation of the Napa Rail Line also could slightly increase the county's vulnerability to wildfires. It is possible that sparks from trains could ignite vegetation along the tracks, especially during hot, dry, and windy conditions. Vulnerability to wildfires is not expected to increase elsewhere in the county.

Figure 3.4 - Dante

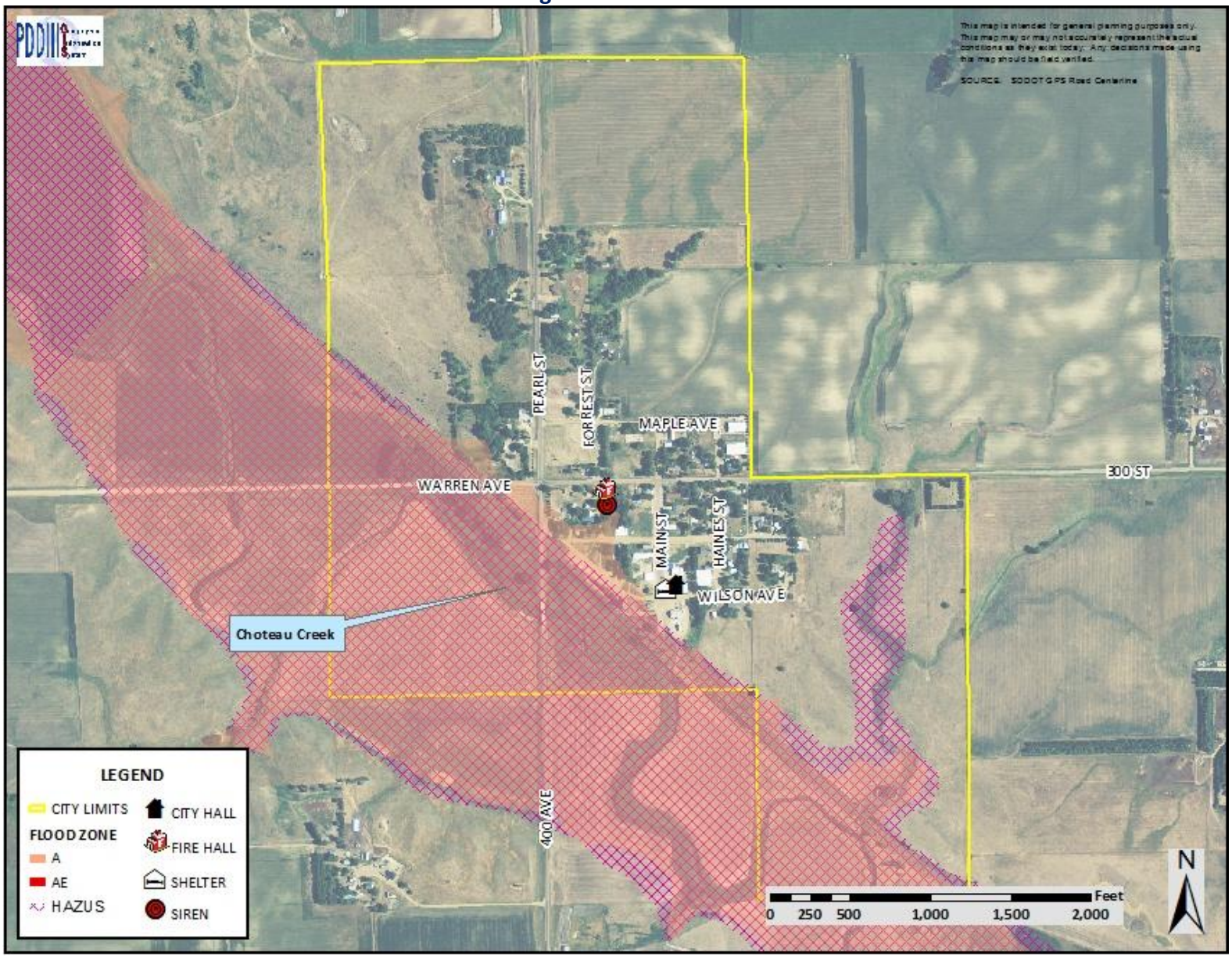


Figure 3.5 - Geddes

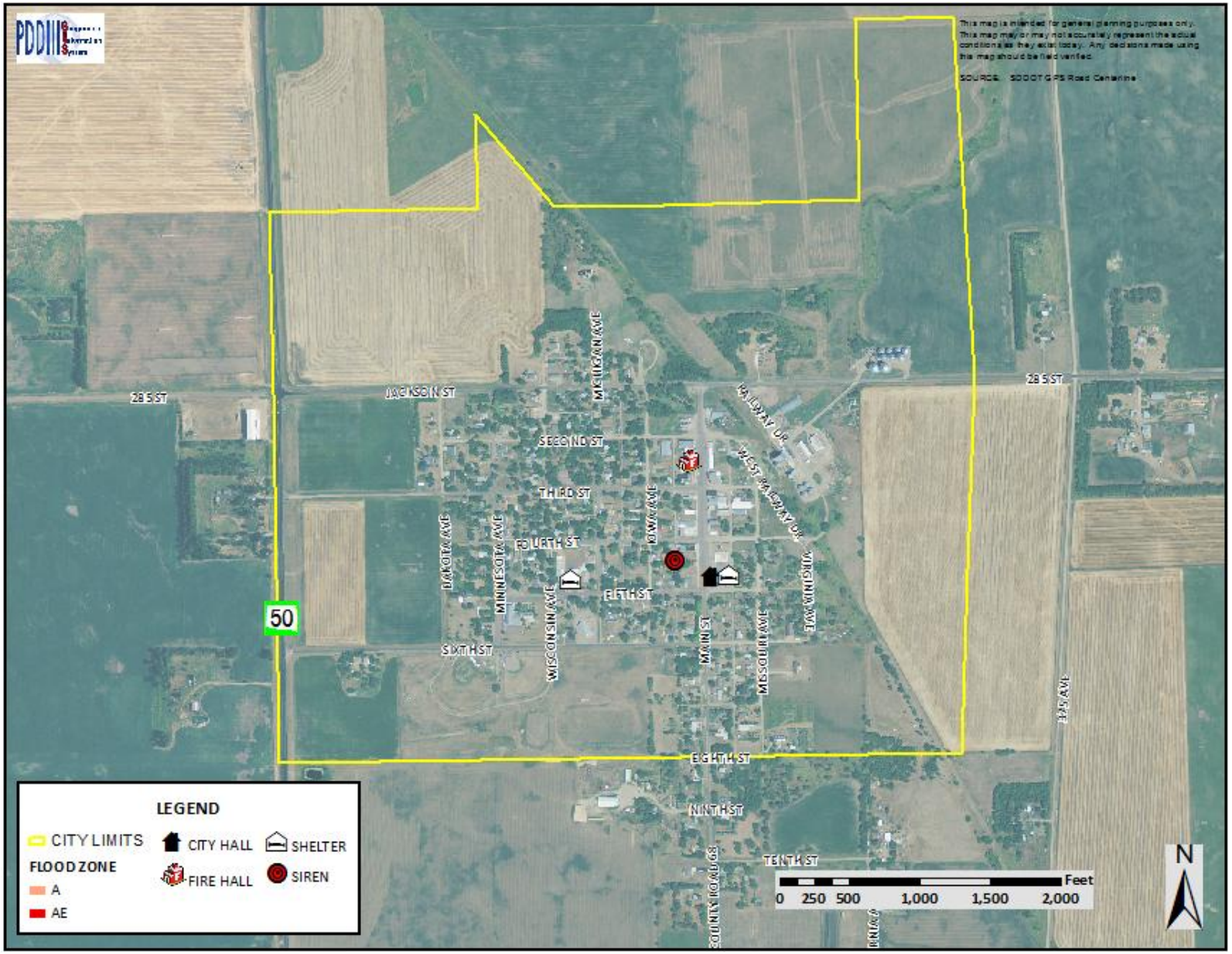


Figure 3.6 - Lake Andes

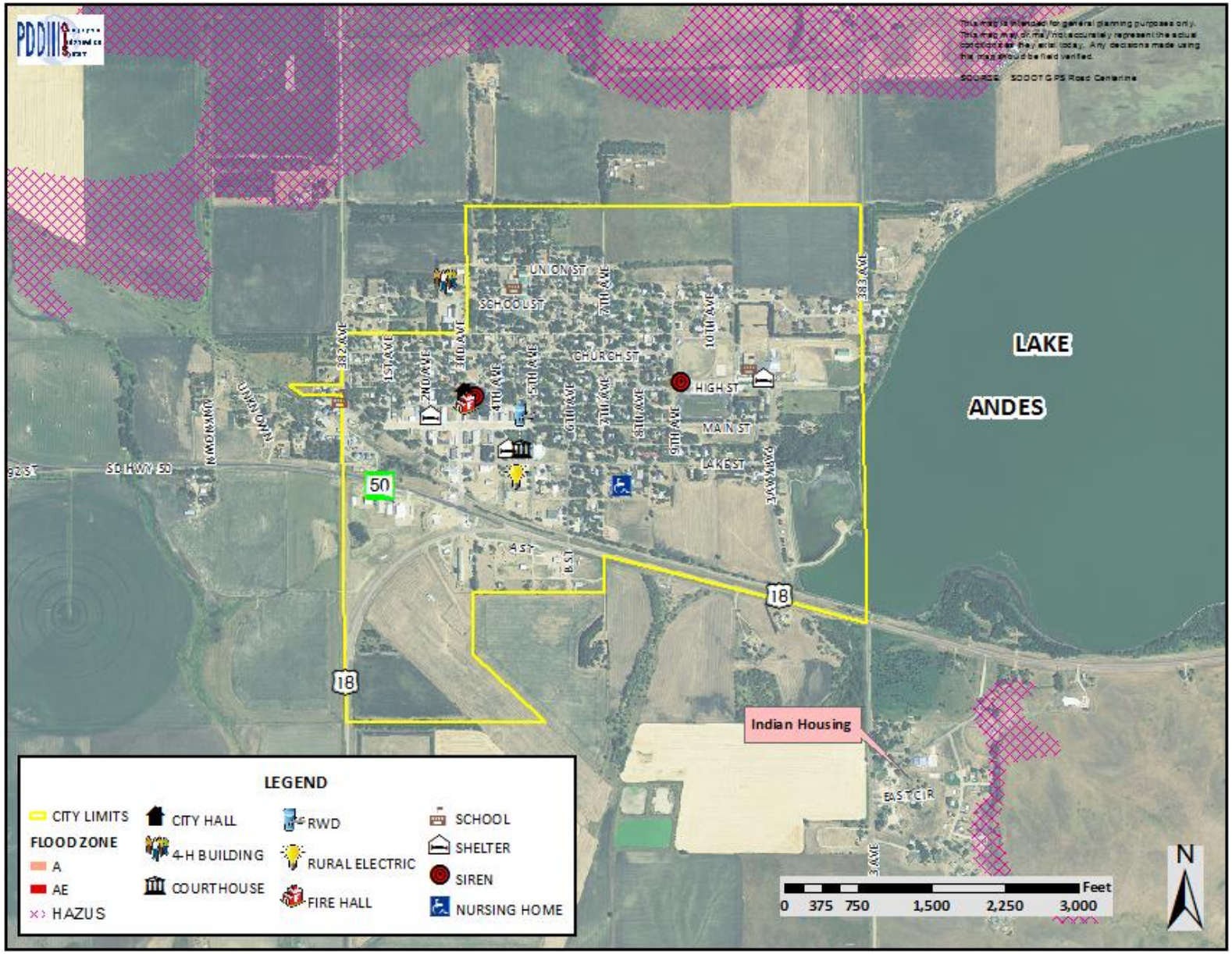


Figure 3.7 - Marty

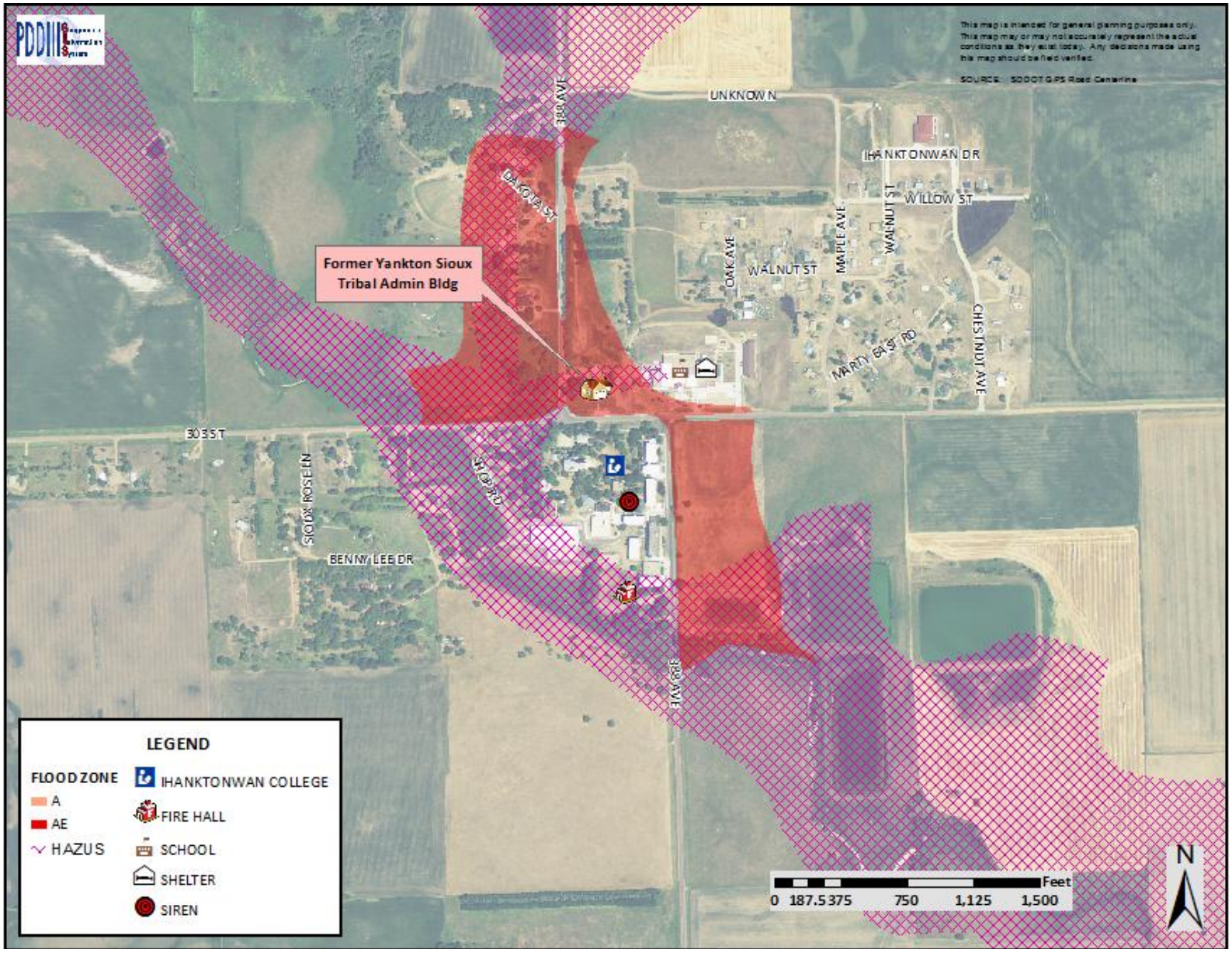


Figure 3.8 - Pickstown

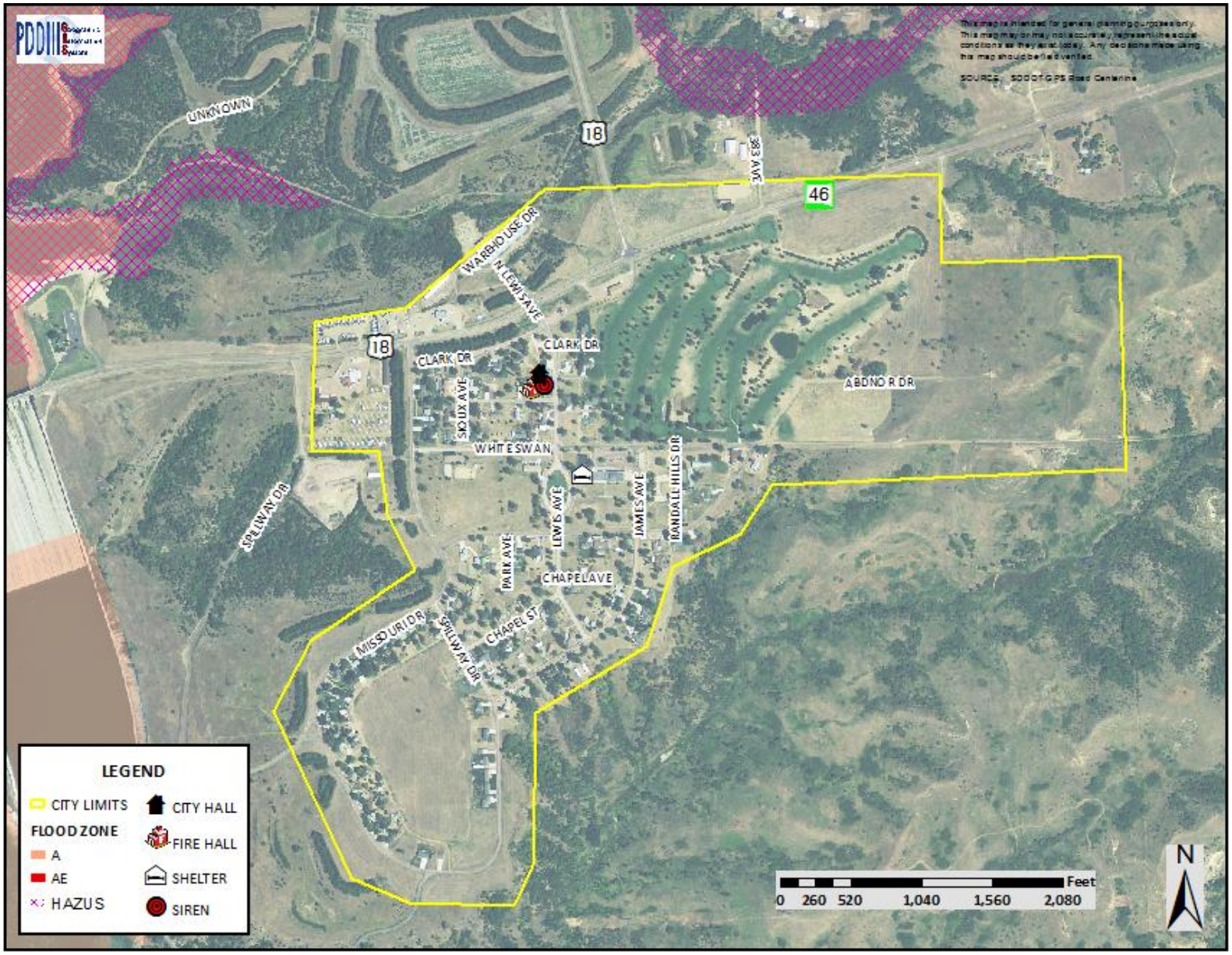


Figure 3.9 - Platte

Figure 3.10 - Ravinia

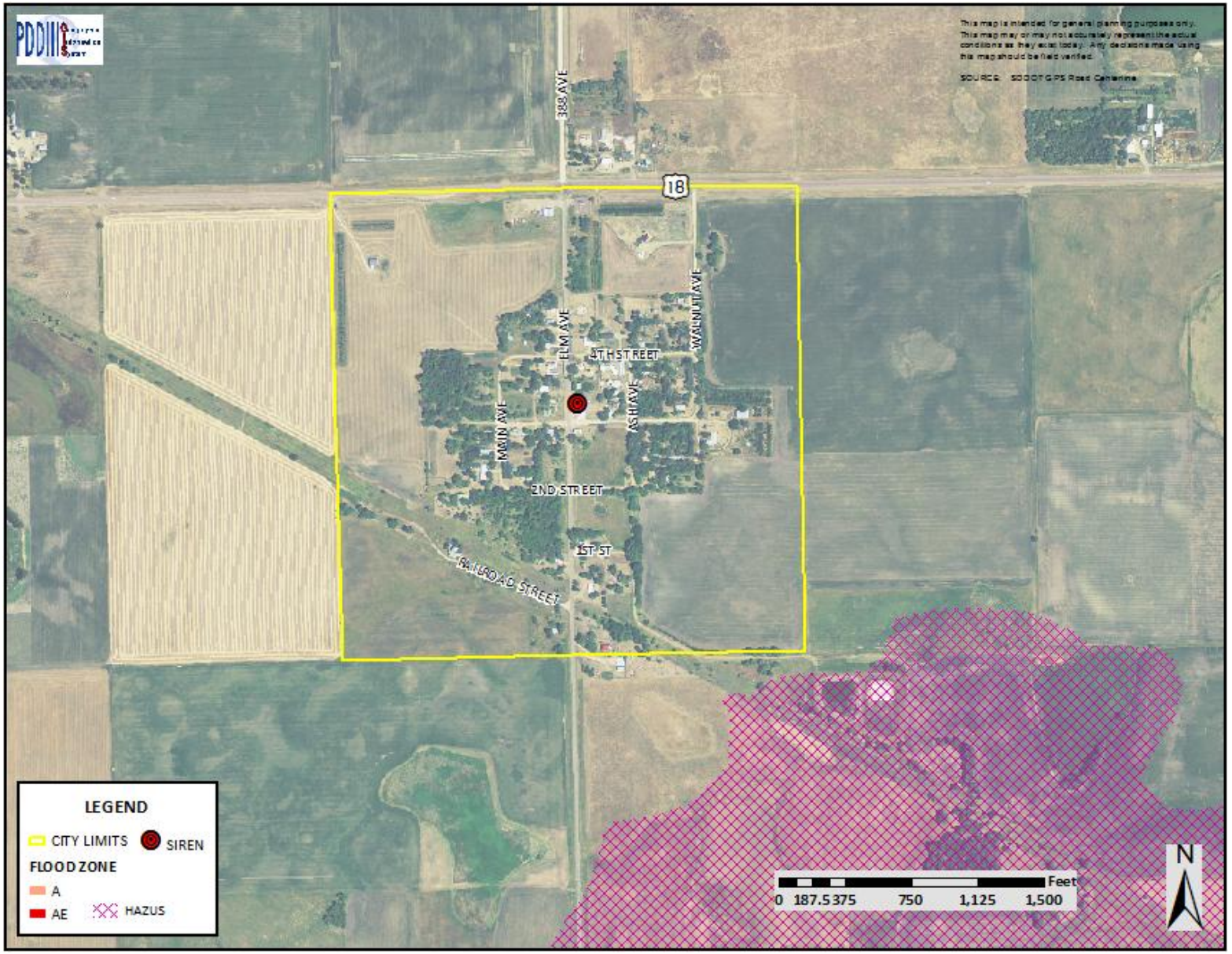
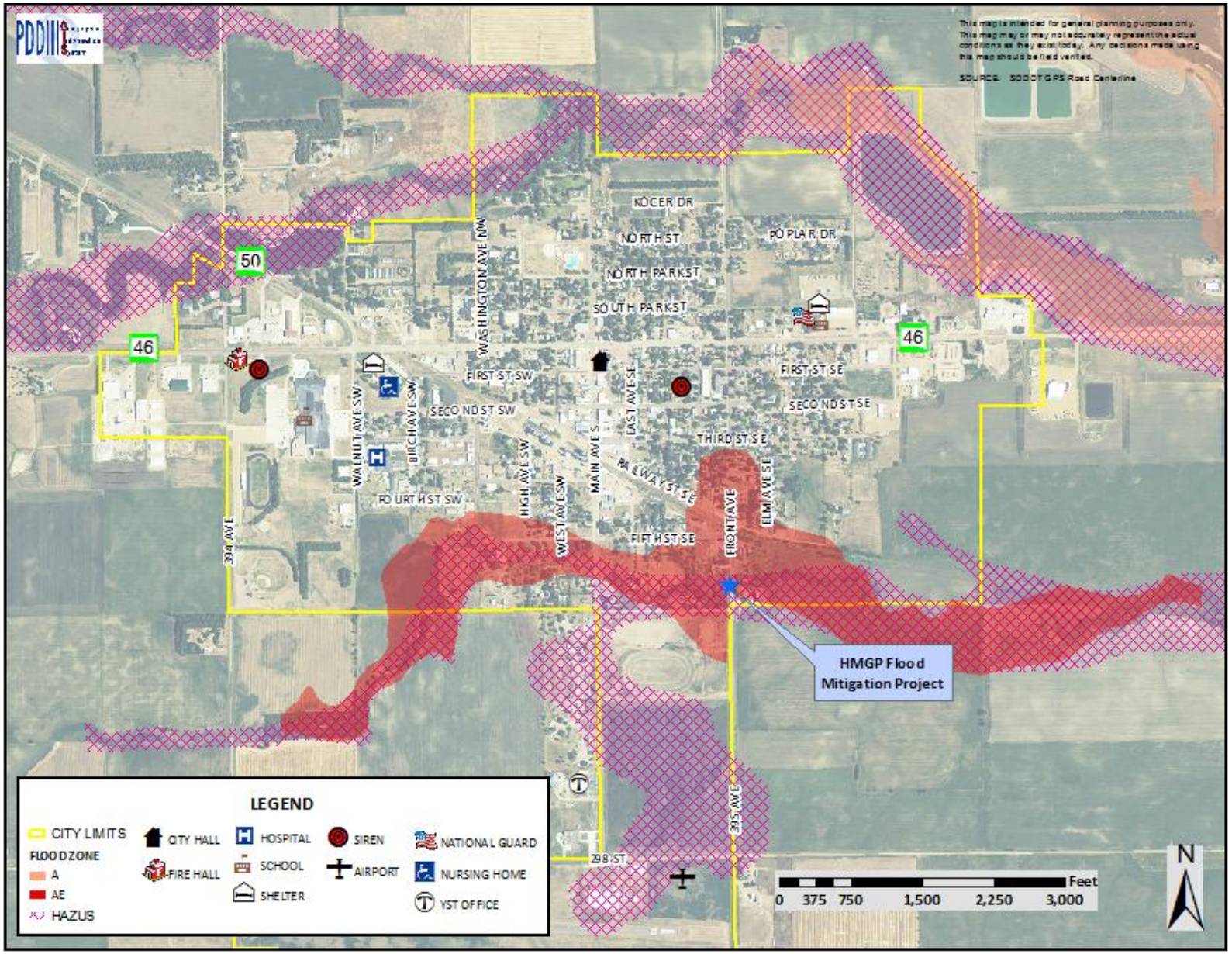


Figure 3.11 - Wagner



CHAPTER IV
RISK MITIGATION STRATEGY

Background

The previous chapter described the types of hazards most likely to impact Charles Mix County, and discussed the county's vulnerability to each of the hazards. This chapter identifies the hazard mitigation goals and objectives that the planning team decided upon, and then focuses on a presentation of the mitigation actions proposed to achieve the goals and objectives. A table showing all of the proposed actions is included. The chapter concludes with a discussion about how the proposed actions were prioritized.

Mitigation Goals and Objectives

With the risk assessment completed, the planning team turned its attention to identifying the goals and objectives it wanted to achieve. Making sure the plan's goals did not conflict with the goals stated in the State of South Dakota hazard mitigation plan was a point of emphasis. The team also wanted to ensure that its goals were consistent with and supported the priorities of the other planning documents that were reviewed as this plan was being developed (a list of the documents is provided on page 78).

The team also reviewed the goals listed on page 4 in the current plan, concluding that some of the goals are still valid (such as "Reduce damage from winter storms" and "Reduce damage from flooding"), while others did not properly belong in a listing of goals (such as "Ensure that generators are available for essential facilities during power outages").

After this discussion was complete, the team decided to develop a completely new set of mitigation goals and objectives. Following is the list of goals the team decided upon:

- Minimize loss of life and injuries due to natural hazards.
- Minimize damage to existing and future structures due to natural hazards.
- Reduce impacts to the economy and the environment due to natural hazards.
- Enhance local mitigation capabilities to ensure individual safety, reduce damage to public infrastructure, and ensure continuity of public services.
- Increase disaster mitigation education, outreach, and public awareness.

After the team had settled on the general goals, they began to focus more narrowly on each hazard by reviewing the results of the risk assessment and analyzing each jurisdiction's vulnerability to the hazards, and the severity of the threat posed by the hazards. Much of the discussion focused on damage caused by past hazard events, and what could be done to lessen or eliminate damage from future events. The planning team also considered how

future development might affect the jurisdictions' vulnerability to each of the hazards faced.

Following are the specific mitigation objectives for each of the hazards:

Winter storm

- Reduce property losses due to winter storms.
- Ensure that people are adequately protected from the effects of winter storms.
- Minimize disruptions to the power distribution system.

Summer storm

- Reduce property losses due to summer storms.
- Ensure that people are adequately protected from the effects of summer storms.
- Ensure that people have adequate warning when violent weather is imminent.

Flooding

- Reduce property losses due to flooding.
- Minimize development in areas that are prone to flooding.
- Maintain the natural and man-made systems that protect people and property from floods.

Drought

- Reduce economic and environmental impacts due to drought.

Wildfire

- Reduce property losses due to wildfires.
- Minimize development in areas that are prone to wildfires.

Mitigation Actions

With the goals and objectives identified, the planning team began the process of identifying specific mitigation actions that could be taken to accomplish the goals. The team began by reviewing the actions listed in the county's current disaster mitigation plan and discussing the progress that had been made to implement the actions. A list of the actions and a summary of the implementation status of each action is shown in the following table.

Table 4.1 – Progress on Implementing Previously Proposed Actions

Mitigation Action	Hazard	Current Status
Ensure continued NFIP compliance in Ch Mix County	Flooding	Completed
Ensure continued NFIP compliance in Platte	Flooding	Completed

Mitigation Action	Hazard	Current Status
Ensure continued NFIP compliance in Wagner	Flooding	Completed
Ensure continued NFIP compliance in Pickstown	Flooding	Completed
Ensure continued NFIP compliance in Lake Andes	Flooding	Completed
Participate in National Flood Program - Dante	Flooding	Completed
Drainage improvements in Geddes	Flooding	Some progress
Drainage improvements in Ravinia	Flooding	No progress
Drainage improvements in Wagner	Flooding	Some progress
Drainage improvements in Pickstown	Flooding	No progress
Drainage improvements in Dante	Flooding	No progress
Drainage improvements in Lake Andes	Flooding	No progress
Drainage improvements in Platte	Flooding	Some progress
Choteau Creek improvements	Flooding	No progress
Howard Township drainage improvements	Flooding	No progress
Bury two miles of utility lines from Wagner substation	Winter Storm	Completed
Bury overhead power lines in Pickstown	Winter Storm	No progress
Construct storm shelter in Ravinia	Summer Storm	No progress
Erect tornado shelter signage in Platte city parks	Summer Storm	No progress
Improve road to communication towers near L. Andes	General	No progress
Develop Charles Mix County zoning ordinance	General	No progress
Update Charles Mix Co township and community maps	General	Some progress
Upgrade Charles Mix County digital orthophotography	General	No progress
Audit 911 database	General	Some progress

Following this review, the team looked at a list of potential mitigation actions that was provided by Planning & Development District III for the team's consideration. The actions on the list can be grouped into the following general categories:

- Planning and regulatory mechanisms:
  - Adoption and enforcement of zoning for those jurisdictions without zoning.
  - Review and strengthen local flood ordinances.
  - Adoption of stormwater management regulations.
  - Adoption and enforcement of National Building Code standards.

- Infrastructure projects:
  - Upgrading surface water drainage infrastructure, such as storm sewer piping.
  - Replacing overhead utility lines with underground lines.
  - Elevating roads in flood-prone areas.
  - Making structural retrofits to facilities.
  - Building tornado safe rooms.

- Natural systems protection:
  - Using low-lying areas as natural water retention ponds.

- Wetland restoration and preservation.
- Stream corridor restoration

- Education and outreach programs:
  - Developing a disaster mitigation public awareness program.
  - Participation in the StormReady program.
  - Participation in the Firewise Communities program.
  - Presentations to school groups or neighborhood organizations.
  - Mailings to residents in hazard-prone areas.

Although the intention of this plan is to focus on disaster mitigation, some actions to enhance disaster preparedness also were discussed. Actions considered in this category included installation of warning sirens in areas currently not well served, acquisition of emergency power generators for critical facilities, creating mutual aid agreements with neighboring communities, and purchasing communications equipment for emergency responders.

The final list of mitigation actions identified by the planning team is shown in **Table 4.2**. Maps show some of the specific projects - **Figure 4.1** shows a project that the Town of Dante intends to submit for HMGP funding, and **Figure 4.2** shows three of the Charles Mix Electric Association's highest priority projects.

Table 4.2 lists the actions in the priority order agreed upon by the planning team. Prioritizing the actions is important because it is likely that few of the jurisdictions proposing multiple actions will be able to undertake all of them at once, especially when costly projects are being considered. Those actions providing the most overall benefit in terms of cost are likely to be pursued first, while some lower priority actions may never be implemented.

The prioritization process was informal and somewhat subjective, but a methodology did help guide the process. This framework, which was suggested by the Planning & Development District III office, is based on the following criteria:

- Overall benefit - how many lives or how much property will be protected, and how much disruption will be prevented? Are there any critical facilities or important public infrastructure that will be protected?
- Financial feasibility - how expensive will the action be? Could the action qualify for grant or loan funding?
- Political feasibility – will the public support the action? Are there any groups or interests that may be opposed to the action and thus prevent it from being implemented?
- Technical feasibility – does the technology exist for the action to be implemented? Is the action likely to function as intended?

- Environmental feasibility - does the action have the potential to have an adverse impact on the environment?
- Legal feasibility – are there any legal issues that might prevent the action from being implemented?

Guesswork was kept to a minimum. For instance, in determining the potential benefit of a given action, the amount of property that would be protected by the action could in some cases be estimated with a fair amount of certainty. Assessing the proposed actions in relation to the other criteria was sometimes more difficult. Determining the political feasibility of the actions may have been the most subjective part of the process, but the planning team members generally had a good idea of how the public and vested interests would support the actions.

In addition to the priority rating assigned by the planning team to each action ("High", "Medium", or "Low"), **Table 4.2** also includes the following information about each of the proposed mitigation actions:

- The party(s) primarily responsible for implementing the action.
- The estimated time frame needed to accomplish the action. Short term actions are those that can be accomplished within a few years, while Long term actions may take several years or longer to accomplish due to cost or other factors.
- The estimated cost to implement the action.
- Resources that may be available to help fund the action.

Particular attention should be paid to funding resources, because, given the reality of tight local budgets, some of the actions realistically cannot be implemented without substantial grant assistance. With such assistance, it is possible that many of the more expensive projects can be undertaken without placing too high a burden on local budgets. Following are some of the potential sources of funding to help accomplish the mitigation actions identified in this plan:

<u>FEMA grant programs</u>

- Hazard Mitigation Grant Program (HMGP) [7]
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

<u>Other grant and loan programs/sources</u>

- Community Development Block Grant program
- Economic Development Administration
- FEMA Assistance to Firefighters Grant program

[7] To date, two projects within the county have been awarded HMGP funds. In 2012 the County was awarded HMGP funds to make improvements to 290th Street, a rural road south of Geddes that has experienced repeated flooding. That project was successfully completed in 2013. In 2014, the City of Wagner completed an HMGP-funded project to reduce flooding along Front Avenue on the south side of town (See **Figure 3.11**).

- South Central Water Development District
- South Dakota State Homeland Security Program
- South Dakota Dept of Environment and Natural Resources
- South Dakota Dept of Transportation Community Access grant program
- US Department of Agriculture Rural Development grant/loan program

Local resources

- General obligation bonds
- Revenue bonds
- Tax Increment Financing (TIF) districts

Table 4.2 - Proposed Mitigation Actions

CHARLES MIX COUNTY ACTIONS	PRIORITY	PARTY	TIME	COST	RESOURCES
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	County Floodplain Administrator	SHORT	N/A	N/A
Improve county/township roads to mitigate against damage from flooding. See **Figure 3.3** for the general areas needing most help.	HIGH	County Hwy Superintendent	MID	≈ $50K to-$100K per project	DOT
Generator acquisition for County Emergency Operations Center.	HIGH	Emergency Mgmt Dir	SHORT	≈ $30,000	HMGP
Formalize mutual aid agreements among local fire departments.	HIGH	Emergency Mgmt Dir; Fire Depts	SHORT	N/A	N/A
Continue to enforce burn bans when conditions warrant.	HIGH	County Commission	SHORT	N/A	N/A
Consider enrolling in a public safety notification system (e.g. Nixle).	MED	Emergency Mgmt Director	SHORT	≈ $7,000 annually	N/A
Clean out Choteau Creek to improve water flow and reduce flood risk.	MED	County Drainage Board	LONG	Unknown	HMGP
Erect a warning siren at the Platte Colony.	MED	Emergency Mgmt Dir; Platte Colony	MID	≈ $25,000	HMGP
Construct a storm shelter at the Platte Colony.	MED	Emergency Mgmt Dir; Platte Colony	MID	Unknown	HMGP
Construct a storm shelter at any or all of the recreation areas (especially North Point, Pease Creek, and Platte Creek).	MED	Emergency Mgmt Dir	LONG	Unknown	HMGP
Become registered in and participate in the StormReady Community Program.	LOW	Emergency Mgmt Director	MID	Unknown	OEM
Consider adoption of a comprehensive drought response plan.	LOW	Emergency Mgmt Dir	MID	N/A	N/A
Gather data to create a more precise loss estimate for wildfire.	LOW	Emergency Mgmt Dir	MID	Unknown	N/A
DANTE ACTIONS	**PRIORITY**	**PARTY**	**TIME**	**COST**	**RESOURCES**
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	City Finance Officer	SHORT	N/A	N/A
Reshapes the ditches and install new culverts along 300th Street (aka Warren Ave). See **Figure 4.1** for project location.	HIGH	Mayor	SHORT	$35,000	HMGP

LAKE ANDES ACTIONS	PRIORITY	PARTY	TIME	COST	RESOURCES
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	City Finance Officer	SHORT	N/A	N/A
Replace warning siren.	MED	Public works dept	SHORT	≈ $25,000	HMGP
Generator acquisition for important community facilities, including 4-H building, pumphouse, and siren.	MED	Public works dept	MID	≈ $30,000	HMGP
PICKSTOWN ACTIONS	**PRIORITY**	**PARTY**	**TIME**	**COST**	**RESOURCES**
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	City Finance Officer	SHORT	N/A	N/A
Install transfer switch in Rainbow Room Community Center.	MED	Public works dept	SHORT	≈ $5,000	OEM
Acquire battery backup for warning siren.	MED	Public works dept	SHORT	≈ $5,000	HMGP
PLATTE ACTIONS	**PRIORITY**	**PARTY**	**TIME**	**COST**	**RESOURCES**
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	City Finance Officer	SHORT	N/A	N/A
Generator acquisition for fire hall.	MED	Platte Fire Dept	SHORT	≈ $40,000	HMGP
Upgrade or replace warning siren.	MED	Public works dept	SHORT	≈ $25,000	HMGP
Make drainage improvements on the west side of town.	MED	Mayor	LONG	≈$500,000[8]	HMGP
WAGNER ACTIONS	**PRIORITY**	**PARTY**	**TIME**	**COST**	**RESOURCES**
Ensure continued NFIP compliance and implement policies that reduce risk exposure to flooding. Work to improve the level of communication and coordination with the State NFIP coordinator.	HIGH	City Finance Officer	SHORT	N/A	N/A
Generator acquisition for new city shop building.	HIGH	City Finance Officer	SHORT	≈ $40,000	HMGP
Clean out creek on south side of town to improve water flow and reduce flood risk The creek's floodplain is shown in **Figure 3.11**.	HIGH	Public works dept	LONG	$2,000,000	HMGP
Generator acquisition for fire hall.	MED	Wagner Fire Dept	SHORT	≈ $40,000	HMGP
Relocate east side siren farther north; acquire new siren to serve south side of community.	MED	Public works dept	MID	≈ $30,000	HMGP

[8] A considerable amount of land would have to be purchased to offset the wetlands that would be destroyed by the project, thus greatly increasing the project's cost. Because of this, the project is unlikely ever to be undertaken.

CHARLES MIX ELECTRIC ASSOCIATION ACTIONS	PRIORITY	PARTY	TIME	COST	RESOURCES
Install 4.0 miles of underground utility line (**Project 1 in Figure 4.2**). This line would tie together the Riverview and Geddes substations, and provide an added tie to the Platte substation.	HIGH	Ch Mix Electric Assoc	MID	$400,000	HMGP
Replace 8.0 miles of old 3-phase overhead line with underground line (**Project 2 in Figure 4.2**). This would provide a much more reliable tie between the White Swan and Geddes substations, and would give the Randall Water District more reliable service for their pump station.	HIGH	Ch Mix Electric Assoc	MID	$800,000	HMGP
Replace 5.5 miles of old 3-phase line with underground line (**Project 3 in Figure 4.2**). This line serves most of northeast Charles Mix County, including the Clearfield Hutterite Colony. The segment was badly damaged during the 2005 ice storm, leaving some customers without power for 10 to 12 days.	HIGH	Ch Mix Electric Assoc	MID	$550,000	HMGP

Potential Resources for Funding Assistance:

CDBG	Community Development Block Grant	DENR	South Dakota Dept of Environment and Natural Resources
DOT	South Dakota Department of Transportation	EDA	Economic Development Administration
AFG	FEMA Assistance to Firefighters Grant program	HMGP	FEMA Hazard Mitigation Grant Program
SCWDD	South Central Water Development District	USDA RD	US Department of Agriculture Rural Development
OEM	SD Office of Emergency Management		

Figure 4.1 - Potential Mitigation Project in Dante

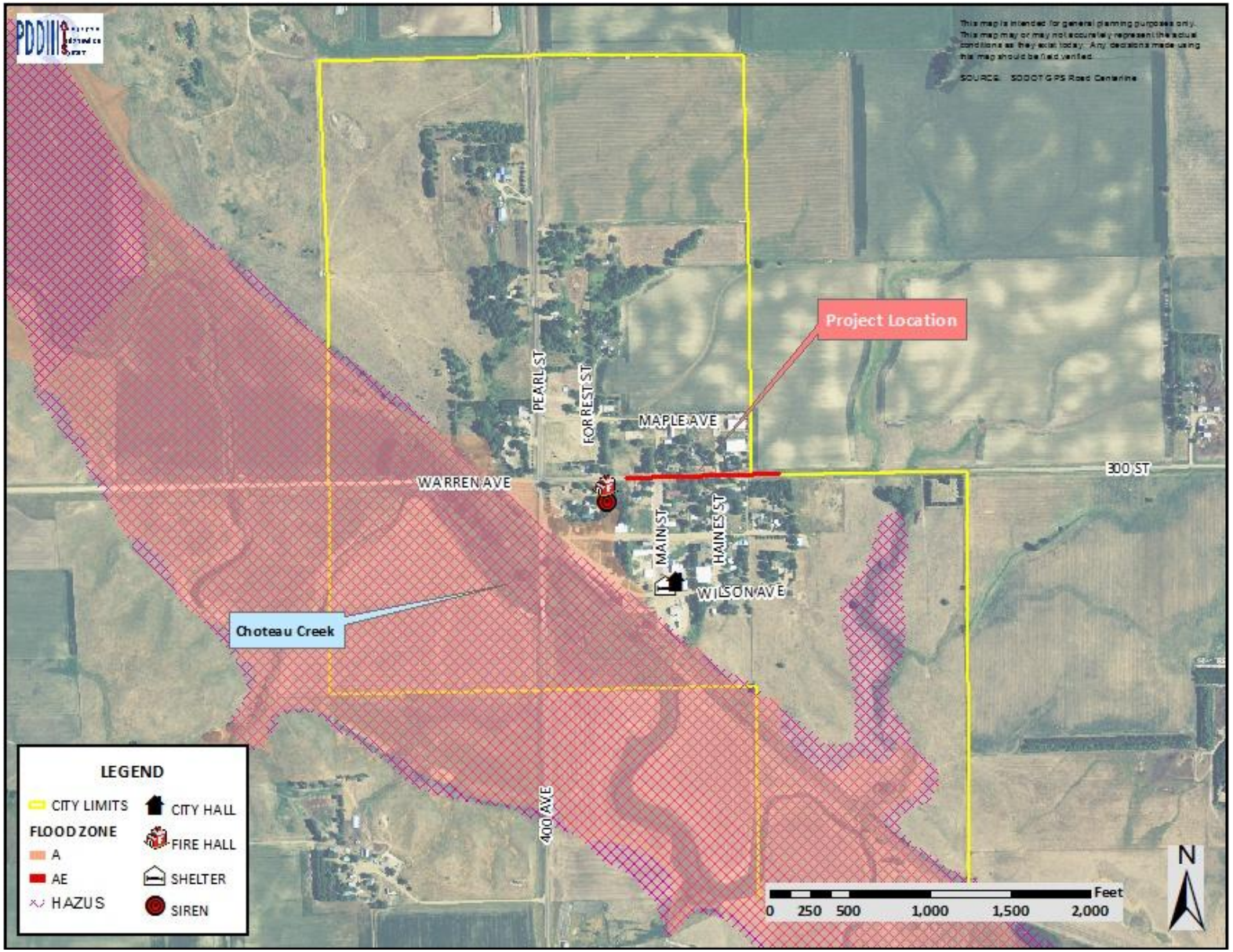
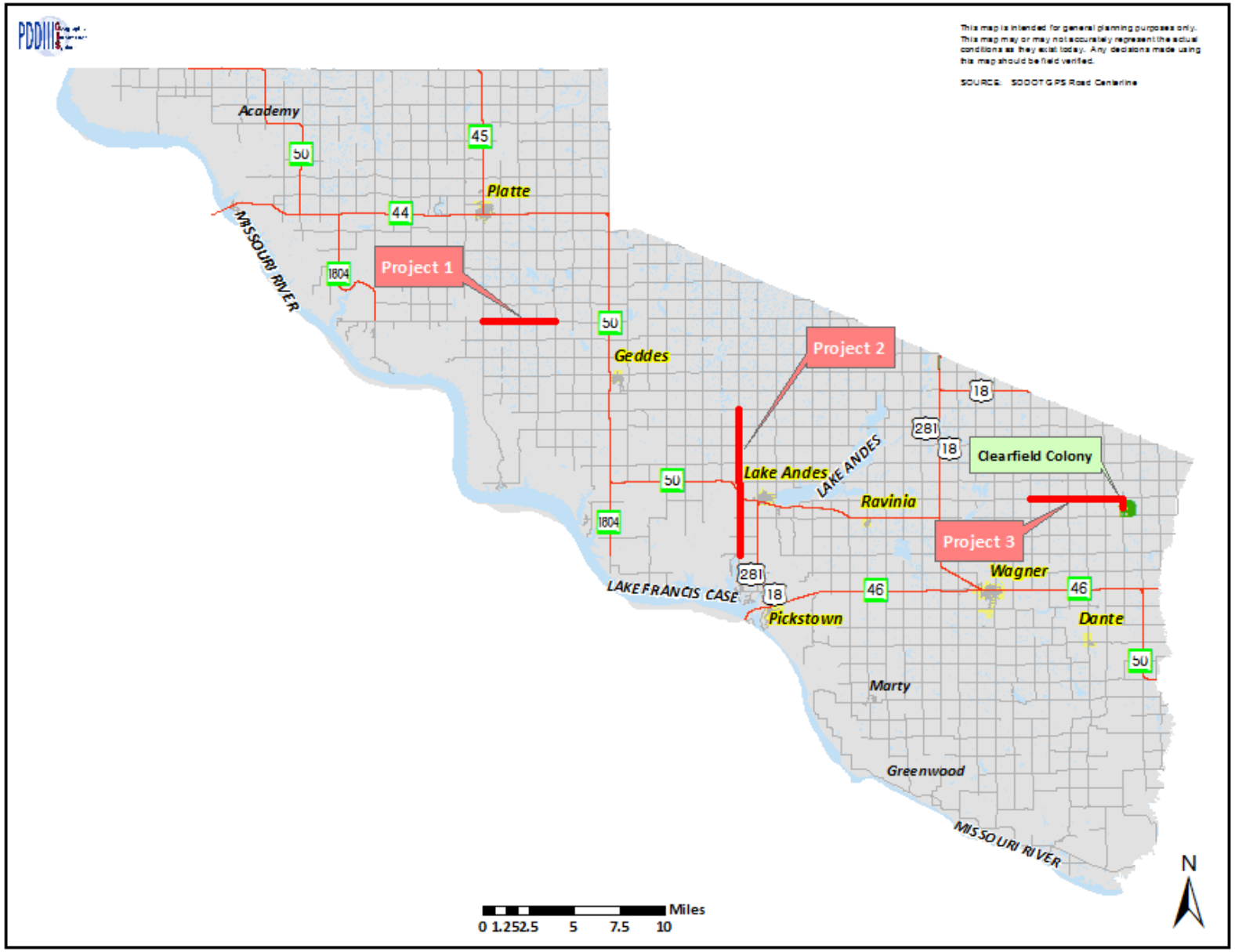


Figure 4.2 - Charles Mix Electric Association High Priority Projects



Mitigation Action Plan

The Charles Mix County Hazard Mitigation Plan is the backbone for disaster mitigation planning within the county. To remain useful, the plan cannot exist in a vacuum – it is designed to work with other local planning and development tools and mechanisms, and local officials and policy makers need to be familiar with it. This section first describes how the mitigation plan will be incorporated into existing planning mechanisms, and concludes by describing how the mitigation strategy will be implemented.

Plan Incorporation

It is important that the goals and actions included in this plan be integrated with the governmental operations of each of the participating jurisdiction. To achieve this integration, this plan should reflect and build on local plans and policies, such as comprehensive plans and economic development plans. Future updates of this plan should not be made without reviewing these planning tools, nor should they be modified without first consulting this plan. This integration is important, because neither this plan nor any of the others will work effectively if they contain contrary goals or policy recommendations.

Following are some of the local planning and policy documents this plan is designed to work with, each of which was reviewed as this plan was being developed:

- Charles Mix County Comprehensive Plan
- Charles Mix County Local Emergency Operations Plan
- Dante Temporary Zoning Ordinance
- Pickstown Comprehensive Plan and Zoning Ordinance
- Platte Comprehensive Plan and Zoning Ordinance
- Wagner Comprehensive Plan and Zoning Ordinance
- Wagner Housing Plan - this is an important document in relation to this plan as it discusses where housing development may occur outside the city limits.
- Charles Mix Electric Association construction work plan - three of the Association's highest priority projects, which will be included in the Association's next work plan, are described in **Table 4.2** and illustrated in **Figure 4.2**.

To ensure that this plan functions smoothly with local priorities, the Charles Mix County Emergency Management Director, as well as other individuals responsible for implementing aspects of this plan, should be familiar with these planning documents. To help encourage the flow of information, the director will appear at least annually at a city council meeting in each jurisdiction participating in this plan to provide an update on plan implementation and to obtain additional input on local mitigation priorities.

Plan Implementation

Each jurisdiction participating in this plan will play a critical role in carrying out the plan's mitigation strategy. It is anticipated that the governing body of each jurisdiction will appoint an individual who will be responsible for ensuring this happens. This individual will

be responsible for understanding the mitigation plan, and will represent the jurisdiction at the Charles Mix County Local Emergency Planning Committee's annual mitigation plan review meeting (see **Plan Monitoring and Evaluation** section of **Chapter V**).

The mitigation strategy must be considered during the budgetary process, at both the county and local levels. Each of the jurisdictions prepares an annual budget, and the proposed actions listed in **Table 4.2** should be reflected in the local budgets. In this way, the plan will not become a mere "wish list" of ideas for which there is no practical funding mechanism. For those jurisdictions that lack planning tools and mechanisms, this may be the only practical way for the plan to be implemented.

Determining which projects in each community may be submitted for federal funds will be based on a FEMA-approved benefit/cost method, in which the proposed action must have a positive benefit-cost ratio. Projects also will be prioritized and selected for implementation based on other considerations, including planning objectives, community support, funding availability, and environmental concerns.

For additional details about how the mitigation strategy will be implemented, please refer back to **Table 4.2**. The table includes basic information regarding the party(s) primarily responsible for implementing the mitigation actions, the estimated time frame needed to accomplish the actions, and resources that may be available to help accomplish the actions.

CHAPTER V
PLAN MAINTENANCE

Background

Plan maintenance is a continuous process, which involves monitoring, evaluating, and updating the plan. It provides the foundation for an ongoing mitigation program and helps ensure that the plan remains relevant and effective. This chapter addresses how Charles Mix County officials intend to ensure that the plan will remain a dynamic, useful tool for mitigating against the impact of future disaster events.

Plan Monitoring and Evaluation

The primary responsibility for monitoring the plan and evaluating its effectiveness lies with the Charles Mix County Emergency Management Director. The director will work with the support of the Charles Mix County Local Emergency Planning Committee (LEPC). The LEPC meets quarterly and includes representation from each jurisdiction participating in this plan.

One of the LEPC's meetings each year will be devoted primarily to plan evaluation. It is anticipated that discussion will occur about whether the risk assessment remains valid, whether the mitigation goals and objectives identified in the plan remain sound, and whether any mitigation actions should be added to or removed from the plan. Each of the jurisdictions participating in this plan will be invited to send a representative to the meeting to report on local progress implementing the actions identified herein. The representative also will have an opportunity to bring up additional mitigation actions to add to the plan, and to discuss whether development or other factors are affecting the jurisdiction's vulnerability to any hazards.

After the meeting, the Emergency Management Director will compile a plan evaluation report, which will describe whether or not the plan is achieving its goals and purposes, whether expected outcomes are occurring, and whether the parties responsible for implementing the mitigation strategy are participating as expected. The report will be presented to the Charles Mix County Commission and to each of the participating jurisdictions so that all parties understand the progress being made on implementing the plan. The LEPC will use the report to determine whether the implementation strategy needs to be revised and whether the plan itself may need to be updated.

For the plan to remain effective, evaluation needs to be an ongoing process. This will help ensure that the plan remains relevant and able to meet local conditions and priorities,

which can change. Following are some of the factors that can have a major impact on mitigation plans:

- Occurrence of a significant disaster event – Serious events can reveal flaws in local jurisdictions' disaster preparedness plans. The 9/11 terrorist strikes are a dramatic example of this type of event. Closer to home, the Missouri River flooding that occurred in 2011 is a good example of an event significant enough to necessitate a reexamination of local mitigation strategies.
- Change in the nature or magnitude of risks – Changing environmental conditions, increased development in sensitive areas, and other factors can be significant enough to cause localities to rethink their mitigation strategies.
- Change in funding availability – The availability of money often determines whether an action can be implemented. For example, local budget cuts can delay, or prevent altogether, a mitigation project's implementation. On the other hand, grant opportunities for specific types of mitigation actions may argue for their implementation.
- Change in local priorities – Local priorities regarding mitigation projects can change for a number of reasons. Regular meetings between the Charles Mix County commission and the local township boards are one way in which the county stays current on the townships' needs regarding their roads, bridges, and other infrastructure.
- Legal factors – Laws and regulatory requirements may change, which may make certain mitigation actions more or less feasible or desirable.
- Technological change – Advances in technology may make it possible in the future to address certain types of hazards more effectively or at lower cost.
- Other factors – There are many other factors that can have an impact on local disaster mitigation priorities and strategies. For example, a detailed engineering analysis may indicate that a proposed mitigation action may be much costlier than first estimated, which could make the action unpractical to pursue.

Updating the Plan

Updating the plan may occur at any time in response to the factors identified above. Otherwise, it is expected that the County will begin the process of updating the plan approximately one year prior to the plan's expiration date. Plan updates will reflect changes in growth and development, changing mitigation priorities, and progress in implementing the plan. Led by the Emergency Management Director, the process will consist of the following general steps:

- Obtain funding assistance
- Hire contractor to write the plan
- Organize planning team
- Begin soliciting public participation and input
- Hold meetings of planning team to develop the plan

- Make draft of the plan available for public review and comment
- Submit plan for State review
- Revise plan as needed based on reviewer comments
- Plan submitted by State to FEMA
- Revise plan as needed based on reviewer comments
- Jurisdictional adoption of approved plan

Public Involvement

Throughout the plan's development, a sustained effort was made to involve the public in the plan. Outreach included press releases and agendas that were published in the local newspapers and on community websites. The effort did meet with some success when a businessman with the Platte Implement Company saw an article in the Platte newspaper and decided to attend the first planning meeting. Still, the mitigation planning team acknowledges that more public involvement could have improved the plan by bringing different voices and opinions into the process.

Looking forward, the outreach strategy will evolve over time as different methods are used to get greater public participation in the mitigation planning process. The plan will be available for the public to see at the county courthouse and in each city office. It also will be made available on the Charles Mix County, Platte, and Wagner websites. Other outreach activities may include:

- Publishing more press releases and articles about the plan in the local newspapers.
- Conducting more outreach activities, such as the Emergency Management Director visiting schools and community groups.
- Including information about the plan with utility billing statements.

Another way for the public to participate in the mitigation planning process will be through the mitigation plan review meeting of the Charles Mix County LEPC. Each of these meetings is made known to the public through a public notice in the local newspapers, and it is anticipated that a press release will be placed in the newspapers as well, stating that the plan will be reviewed at the meeting and that comments from the public are encouraged.

All comments and suggestions received from the public through any of the forums described above will be included in a public comment section in the plan’s appendix.

APPENDICES

APPENDIX A: Outreach Effort

This section documents the outreach effort that was used to solicit input into the plan. This effort included a message that was sent out via email to prospective planning team members prior to the first meeting, an email that was sent prior to the first meeting to emergency management directors in several nearby counties, and a press release about the plan that was placed in the local newspapers.

Information about the first planning meeting also was made available on the City of Platte and City of Wagner websites, as well as the Planning & Development District III website. The agenda for each subsequent planning team meeting also was posted on these websites. Another article was placed in the local newspapers prior to the final planning team meeting.

The remainder of this section shows the public outreach items, including reproductions of some of the emails that were sent and the articles as they appeared in the newspapers.

Meeting #1 - Message to Planning Team:

Charles Mix County Disaster Mitigation Plan Update

Charles Mix County is in the process of updating its disaster mitigation plan. The main purpose of this is to better prepare the County in the event of a disaster or emergency situation. Another practical purpose is to ensure that the County, and the municipalities within the county that participate in the process, remain eligible to apply for Hazard Mitigation Grant Program funds from FEMA.

The first of a series of planning meetings regarding the plan update will be held at 7:00 PM on **May 29th** in the County Administrative Building, which is located on Fourth Street across from the courthouse in Lake Andes. We are looking for input from the cities and towns within the county, as well as the rural utility providers and certain other organizations, which is why you are receiving this message. It is important that your city/organization be represented at the meeting.

Proposed agenda items for the meeting are as follows:

1. **Introduction**
   - Introduction of team members
   - Why are we here? (Discuss disaster mitigation planning process)
   - Discuss steps to complete plan, including hazard identification, vulnerability assessment, and development of a hazard mitigation strategy

2. **Information that will be needed to develop plan**

- Information/data about past disasters (damage amounts, areas affected, etc)
- Identification of hazard prone areas (flood hazard zones, wildfire areas, etc)
- Development trends (demographics, housing starts)
- Current disaster mitigation capabilities

3. Outreach discussion

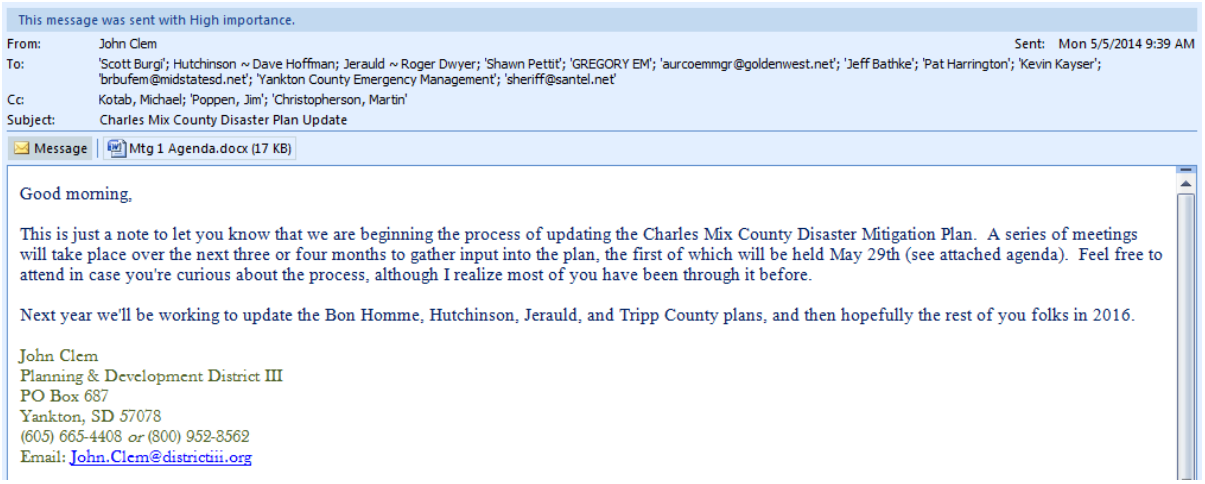
- Encouraging public input
- Participation by other stakeholders

4. Review County's existing disaster mitigation plan

5. Schedule next meeting

The meeting is open to the public, so if you know someone else who may be interested in attending, please encourage them to come. Additional information about the meeting can be obtained by calling Charles Mix County Emergency Management Director Mike Kotab at (605) 491-3134, or John Clem with the Planning & Development District III Office at (800) 952-3562.

Meeting #1 - Email to Emergency Management Directors in Other Counties:



This message was sent with High importance.

From: John Clem Sent: Mon 5/5/2014 9:39 AM

To: 'Scott Burgi'; Hutchinson ~ Dave Hoffman; Jerauld ~ Roger Dwyer; 'Shawn Pettit'; 'GREGORY EM'; 'aurcoemmgr@goldenwest.net'; 'Jeff Bathke'; 'Pat Harrington'; 'Kevin Kayser'; 'brbufem@midstatesd.net'; 'Yankton County Emergency Management'; 'sheriff@santel.net'

Cc: Kotab, Michael; 'Poppen, Jim'; 'Christopherson, Martin'

Subject: Charles Mix County Disaster Plan Update

Message | Mtg 1 Agenda.docx (17 KB)

Good morning,

This is just a note to let you know that we are beginning the process of updating the Charles Mix County Disaster Mitigation Plan. A series of meetings will take place over the next three or four months to gather input into the plan, the first of which will be held May 29th (see attached agenda). Feel free to attend in case you're curious about the process, although I realize most of you have been through it before.

Next year we'll be working to update the Bon Homme, Hutchinson, Jerauld, and Tripp County plans, and then hopefully the rest of you folks in 2016.

John Clem
Planning & Development District III
PO Box 687
Yankton, SD 57078
(605) 665-4408 *or* (800) 952-3562
Email: John.Clem@districtiii.org

Meeting #1 - Article Published in the Wagner Post May 14, 2014:

Disaster Preparedness Meeting

Blizzards, tornadoes, and floods are a few of the natural hazards that strike this part of the country. Events like this have the potential of causing thousands of dollars annually in damage to property. To lessen the impact of these disasters in the future, Charles Mix County is beginning the process of updating its current Disaster Mitigation Plan.

A series of public meetings will occur this year to obtain input as the plan is developed. These meetings are open to everyone. If you have an idea about what can be done to prepare for future disaster events occurring in Charles Mix County, you are urged to attend the meetings.

The first meeting will be held at on May 29 at 7:00 PM in the County Administrative Building, which is located on Fourth Street across from the courthouse. Proposed agenda items for the initial meeting include why the plan is being updated, how the process will develop in the months ahead, and assigning responsibilities. Participants also will be able to review the county's current disaster mitigation plan.

Additional information about the meeting can be obtained by calling Charles Mix County Emergency Management Director Mike Kotab at 605 491-3134. This is an excellent opportunity for your voice to be heard.

JAG C

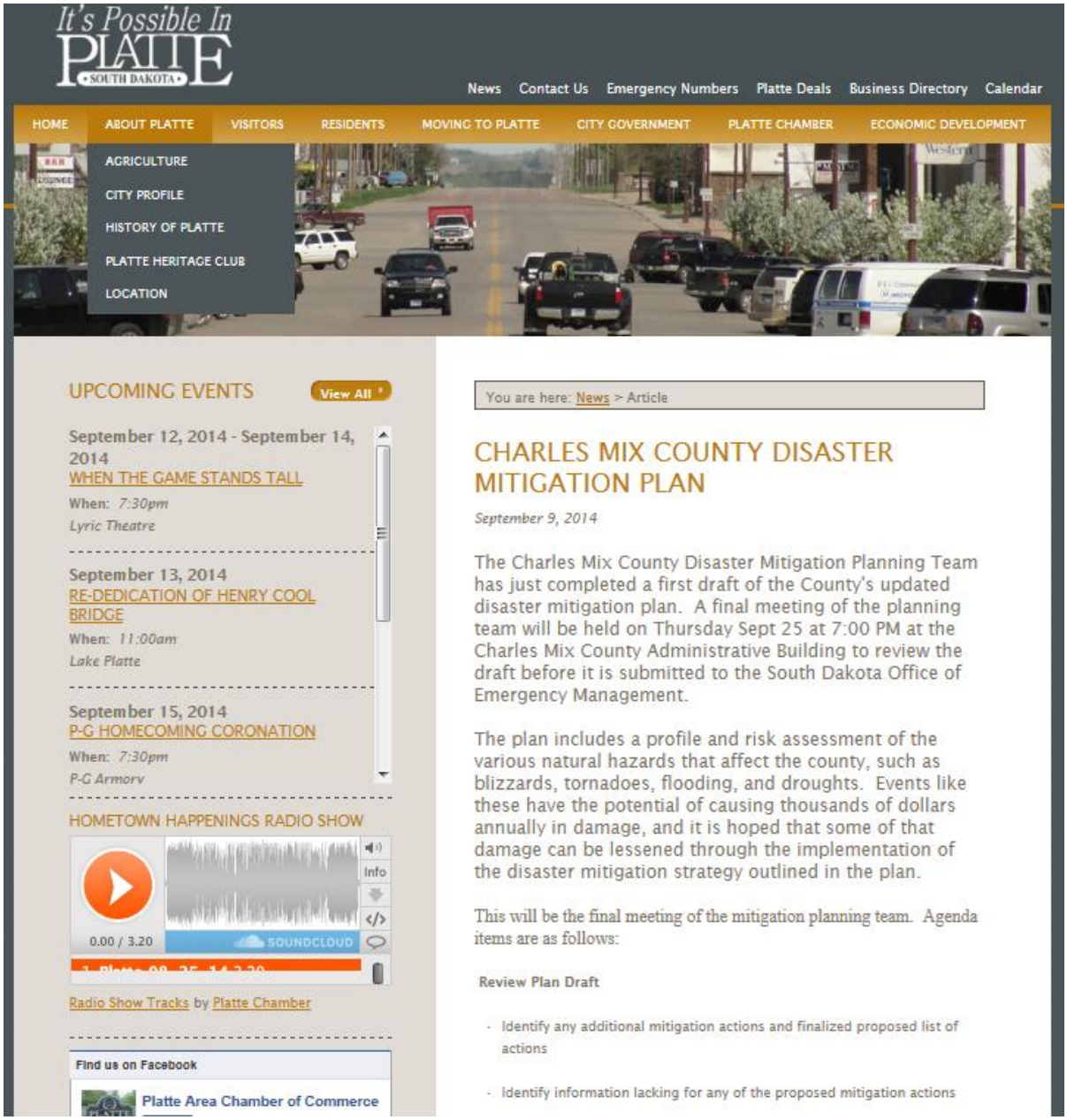
WCS students Keegan Sully a poster design competition.

Meeting #2 - Screenshot of the City of Platte Website:

Meeting #3 - Screenshot of the City of Wagner Website:

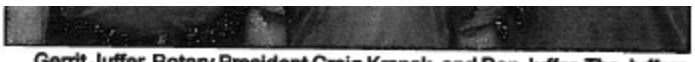
Meeting #3 - Screenshot of the Planning & Development District III Website:

Meeting #4 - Screenshot of the City of Platte Website:



Meeting #4 - Article Published in the Wagner Post September 10, 2014:

spent every weekend installing home solar systems to provide power to 59 of the 550 households in el Heiz, with financial



Gerrit Juffer, Rotary President Craig Krsnak, and Don Juffer. The Juffers were acknowledged for being Paul Harris x2 members.

Charles Mix County disaster mitigation plan

The Charles Mix County Disaster Mitigation Planning Team has just completed a first draft of the County's updated disaster mitigation plan. A final meeting of the planning team will be held on Thursday September 25th at 7:00 p.m., at the Charles Mix County Administrative Building to review the draft before it is submitted to the South Dakota Office of Emergency Management.

The plan includes a profile and risk assessment of the various natural hazards that affect the county, such as blizzards, tornadoes, flooding, and droughts. Events like these have the potential of causing thousands of dollars annually in damage, and it is hoped that some of that damage can be lessened through the implementation of the disaster mitigation strategy outlined in the plan.

This meeting is open to the public. If you are interested in reviewing the plan, you are urged to attend the meeting. This is an excellent opportunity for your voice to be heard. Additional information about the meeting can be obtained by calling Charles Mix County Emergency Management Director Mike Kotab at (605) 491-3134, or John Clem with the Planning & Development District III Office at (800) 952-3562.

APPENDIX B: Planning Meeting Items

This section consists of items from the planning meetings, including agendas, signup sheets, and minutes. The agendas were distributed to the planning team prior to each meeting, and the minutes were sent out immediately following each meeting. Team members were asked to sign in at each meeting.

Charles Mix County Disaster Mitigation Plan Update

Meeting #1 Agenda

May 29, 2014 at 7:00 PM
Charles Mix County Administrative Building

1. **Introduction**
   - Introduction of team members
   - Why are we here? (Discuss disaster mitigation planning process)
   - Discuss steps to complete plan, including hazard identification, vulnerability assessment, and development of a hazard mitigation strategy

2. **Information that will be needed to develop plan**
   - Information/data about past disasters (damage amounts, areas affected, etc)
   - Identification of hazard prone areas (flood hazard zones, wildfire areas, etc)
   - Development trends (demographics, housing starts)
   - Current disaster mitigation capabilities

3. **Outreach discussion**
   - Encouraging public input
   - Participation by other stakeholders

4. **Review County's existing disaster mitigation plan**

5. **Schedule next meeting**

Meeting #1 Signup Sheet

Charles Mix County Pre-Disaster Mitigation Planning Meeting #1

May 29, 2014

Charles Mix County Administrative Building

NAME	REPRESENTING
John Clem	Planning District III
Randy THALER	CMSO
Dick Bystry	Dante
Don HoseK	Wagner
Jeary Blaha	Wagner
Beverly Jake	Wagner
David King	Wagner Community Hospital
Jigs Cole	Pickstown
Claude R. Olson	Academy
Albert Stahl	Academy Fire
Keith Anderson	Platte
Jack D. Sandal	Lake Andes Comm.
Sherri Fuchs	Charles Mix
Doreen Stad	Charles Mix
Denise Wilke	Charles Mix
Jerry Horst	Charles Mix Co Hwy.
Cody Wilson	US Army COE
Mike Dangel	Lake Andes Fire Dept. / Charles Mix Electric
Brandon Semrad	Platte Police Dept.
Zach Bush	Platte City / Fire Dept.
Mike Kotab	Charles Mix EMD

Meeting #1 Minutes

May 29, 2014
County Administration Building

The meeting was brought to order by Emergency Management Director Mike Kotab at 7:00 PM. Mr. Kotab introduced John Clem of Planning and Development District III, who began the meeting by asking everyone to introduce themselves. One person from Platte mentioned he was there because he saw an article about the meeting in the newspaper.

Mr. Clem then started to explain the disaster mitigation planning process, and the reason for updating the county's plan. He stated that the plan is required to be updated every five years, and that it expired last fall. He mentioned that until the new plan is approved, FEMA will not be able to award any hazard mitigation funds for projects within the county. This would include a potential drainage project in Dante.

Mr. Clem then discussed the steps that will be required to complete the plan, including identifying hazards that impact the county, analyzing the risk they pose, and then creating a strategy to address the risks. He thought that about three more meetings would be needed, with the next one focusing on the risk assessment.

Mr. Clem then mentioned the kind of information he would need from the team to complete the plan. This would include info on development trends in the county, especially in areas that might be prone to flooding or fires; damage details from past hazard events; identification of areas prone to certain hazards; and what local capabilities may exist for dealing with hazards. He said he would be contacting certain individuals after the meeting to get this information. Mr. Kotab stepped in to emphasize that the full cooperation of each of the towns was critical to get the information needed to make the plan a success.

Mr. Clem then asked the team if they had any thoughts on encouraging more public input into the plan. This discussion was fairly brief, and did not result in any new ideas.

A general review of the current (2008) plan was then made. Some people did not have a copy of the plan with them, but Mr. Kotab had brought extra copies for people to look at. Mr. Clem explained that he considered the plan a "Model T", and that the plans he has completed since then are much better. He said the Charles Mix plan will be even better yet. The discussion ended with broad agreement that the current plan could be improved in many areas.

Mr. Clem stated that the next meeting would focus on the risk assessment. It was decided that the next meeting would be held on June 26th.

The meeting was adjourned at 8:25 PM.

Minutes taken by Mike Kotab, Emergency Management Director

Charles Mix County PDM Plan Update
Meeting #2 Agenda

Thursday June 26, 2014 at 7:00 PM
Charles Mix County Administrative Building

This meeting will focus on the plan's risk assessment section. The following items will be discussed:

1. Identify Hazards
- Review of hazards in SD Mitigation Plan
- Review hazards profiled in current county plan
- Review of historical records of hazard events in the county
- Finalize list of hazards to address in plan

2. Profile Hazards
- Location - area of county impacted by each hazard
- Extent - scope of possible impact for each hazard
- History - discuss history of each hazard's impact on county
- Existing resources and capabilities

3. Identify Community Assets
- Critical community assets and facilities in each town
- Other important local assets
- Vulnerable populations

4. Assess Vulnerability to Hazards Identified
- Winter storm
- Summer storms
- Flooding
- Drought
- Wildfire?
- Other hazards?

5. Schedule Next Meeting

Meeting #2 Signup Sheet

Charles Mix County Pre-Disaster Mitigation Planning Meeting #2

June 26, 2014

Charles Mix County Administrative Building

NAME	REPRESENTING
John Clem	Planning District III
[illegible]	City of Lake Andes
Mike Kytch	Charles Mix Em / Dante FD
David Kay	WCMHA
Beverly [illegible]	WCMH.
[illegible]	Charles Mix Co
[illegible]	Charles Mix Co
(2) Mike + Ann Rysavy	City of Dante
Rick Gustad	City of Platte + Platte Fire
John Brooks	Charles Mix Electric
Maureen Styrid	Charles Mix GIS
Mike Dangel	Lake Andes Fire Dept

Meeting #2 Minutes

June 26, 2014
County Administration Building

The meeting was brought to order by Emergency Management Director Mike Kotab at 7:00 PM. Mr. Kotab introduced John Clem of Planning and Development District III, who said this meeting would focus on the risk assessment, which he called the heart of the plan. He then asked some questions to clear up a few things from the first meeting.

Mr. Clem then began by listing the hazards addressed in the state plan. It was agreed that we didn't need to worry too much about earthquakes, mudslides, etc. Also, hazardous materials could be addressed in a HazMat plan. He then turned to the current plan and mentioned that drought wasn't covered there. The team decided it should be brought into this plan.

Then discussion occurred about each of the hazards, how they impacted each community, the history of their occurrence, and about the existing capabilities to fight each hazard.

Flooding: we talked about how the county was impacted by the Missouri River flood. We discussed flooding at North Point.

Winter storms: information was provided by Charles Mix Electric about damages they have had from past disasters.

Wildfire: Mike Kotab provided information about fire dept resources. The county passed a burn ban ordinance in 2012, which Mike will send to Mr. Clem.

Drought: It was mentioned that none of the towns has ever asked its residents to cut back their water usage.

Tornadoes: Mr. Clem asked if any of the towns has ever been hit directly by a tornado. It was stated that Lake Andes was hit in 1962, and Platte was hit in the early 1970s. It was mentioned that a state-record hailstone was recorded at Dante in 2007.

We talked about future development at the recreation areas. Mr. Clem passed out maps of the North Point and Platte Creek rec areas, which were out of date and don't show a lot of the homes now there. It was stated that some of the houses being built cost $500,000 or more.

Flooding in each of the towns was covered.

Mr. Clem stated that the next meeting would focus on the mitigation actions that each town would like to pursue. It was decided that the next meeting would be held on July 24th.

The meeting was adjourned at 8:50 PM.

Charles Mix County PDM Plan Update
Meeting #3 Agenda

Thursday July 24, 2014 at 7:00 PM
Charles Mix County Administrative Building

This meeting focuses on development of the plan's mitigation strategy. The following items will be reviewed:

1. Review Results of Risk Assessment
- Winter storm vulnerability
- Summer storm vulnerability
- Flood vulnerability (look at maps and tables)
- Drought vulnerability
- Wildfire vulnerability (look at maps and tables)

2. Identify Mitigation Goals and Priorities
- Winter storm
- Summer storm
- Flooding
- Drought
- Wildfire

3. Identify Mitigation Actions
- Review list of mitigation actions in current plan, including progress on implementation
- Determine which mitigation actions to include in this plan
- Gather information about mitigation actions (cost, responsibility for implementation, etc.)
- Prioritize mitigation actions

4. Schedule Next Meeting

Prior to the next meeting, a draft copy of the completed plan will be distributed to the planning team. The draft will be reviewed at the next meeting, at which time comments and suggestions will be considered. Comments also can be sent prior to the meeting to Mike Kotab (Miko@tntwagner.com) or John Clem (John.Clem@districtiii.org).

Meeting #3 Signup Sheet

Charles Mix County Pre-Disaster Mitigation Planning Meeting #3

July 24, 2014

Charles Mix County Administrative Building

NAME	REPRESENTING
[illegible]	WCMHA
Beverly [illegible]	WCMH-A
Tony Bloeser	City of Wagner
[illegible]	Charles Mix County
[illegible]	Chas Mix Co Hwy Dept
[illegible]	City of Dante
John [illegible]	Charles Mix Electric
Mike [illegible]	Charles Mix EM / Dante FD
John Clem	Planning District III
Matthew Andersh	RCWD
Maureen Stang	Charles Mix GIS
Mike Dargel	Lake Andes Fire Dept. / Wagner LA Ambulance
ROBERT DURHAM	RCWD
Chad Anderson	Randall Community Water District
Janece Weber	Director of Equalization
Karol Kruger	Charles Mix Co Treas

Meeting #3 Minutes

July 24, 2014
County Administration Building

The meeting was brought to order by Emergency Management Director Mike Kotab at 7:00 PM. Mr. Kotab introduced John Clem, who said this meeting would involve reviewing results of the risk assessment and then developing the mitigation strategy. Mr. Clem handed out text of the risk assessment section of the plan and pointed out various tables and maps, including flooding info in the towns and a map of areas of the county where wildfire is a hazard. He said some of the flood analysis wasn't yet finished, but thought it would be soon. He also passed out a map showing where development is occurring.

Then we looked at a large wall map prepared by the county highway superintendent of areas that flood most often. Those areas are Choteau Creek, Mosquito Creek, and Platte Creek. It was mentioned that you could once ride a horse under one of the bridges over Choteau Creek, but now you can barely crawl under it.

Mr. Clem then asked about what has been done with the mitigation projects included in the previous plan. It was pointed out that some have been accomplished, including burying power lines into Wagner and drainage improvements in Platte, but many others have not.

We then discussed mitigation goals before starting to identify mitigation projects. Mr. Clem referred everyone to a list of possible projects for the team to consider. Some people had copies, but Mike Kotab printed out extras. Generators were discussed at length, and so were siren needs. It was mentioned that the rec areas could use sirens and Mr. Kotab said that the state will be installing a siren at North Point this year and at Pease Creek next year. Shelter needs also discussed at the rec areas, but Mike thought that should be a low priority because those areas are privately owned and they should be spending the money, not the county. And who would be responsible for maintaining them?

Drainage projects were brought up. Larry Blaha said a project is needed in Wagner to improve water flow along the creek on the south side of town - he estimated cost at $2 million. In Platte improvements have been made, but there could be need for more - Mr. Clem said he would contact the city since Rick couldn't be here tonight.

Many other things were talked about. Mike said he plans to get mutual aid agreements in place for all the fire depts. StormReady was discussed, but the cost is unknown.

Mr. Clem stated that he would go back and complete a first draft of the plan and send it out to the team for review before the next meeting. It was decided that the next meeting would be held on September 25th.

The meeting was adjourned at 8:55 PM.

Charles Mix County PDM Plan Update
Meeting #4 Agenda

Thursday September 25, 2014 at 7:00 PM
Charles Mix County Administrative Building

This will be the final meeting of the mitigation planning team. Agenda items are as follows:

1. Review Plan Draft
- Identify any additional mitigation actions and finalize the proposed list of actions
- Identify information lacking for any of the proposed mitigation actions
- Review other parts of plan as needed

2. Discuss Plan Implementation
- How will the plan be incorporated into existing planning documents and processes?
- Who will be responsible for ensuring the plan functions at the local and county levels?
- How can we get broader public input into the planning process?

3. Plan Monitoring
- How will the plan be monitored and evaluated?
- How will the plan be updated?
- Who will report on progress on plan implementation?

4. Plan Completion
- Discuss logistics of public review period
- Submission of plan to State Office of Emergency Management

Meeting #4 Signup Sheet

Charles Mix County Pre-Disaster Mitigation Planning Meeting #4

Sept 25, 2014

Charles Mix County Administrative Building

NAME	REPRESENTING
John Clem	Planning District III
David King	WEMHA
Beverly John	WCMH-Avera
Jack S. [illegible]	Charles Mix Co.
Larry Bohler	City of Wagner, Wagner Fire Dist
[illegible] Knigten	Charles Mix Co.
Noreen [illegible]	Charles Mix Co [illegible]
Mike [illegible]	Charles Mix EM / Dante FD
[illegible]	Charlse Mix County
Denise Weber	Charles Mix County
[illegible]	City of [illegible]
Mike Dorgel	Lake Andes Fire / Charles Mix Electric
[illegible]	Platte Fire / City of Platte
Karol Knudsen	Wagner
Matthew [illegible]	RCWD

Meeting #4 Minutes

September 25, 2014
County Administration Building

The meeting was brought to order by Emergency Management Director Mike Kotab at 7:00 PM. Mr. Kotab introduced John Clem, who said this was the final meeting and that the main goals he wanted to achieve was to make sure the table of mitigation actions was right, and then to discuss how the plan would be implemented.

Mr. Clem began by asking the team for their comments on the first draft of the plan. Noreen Strid pointed out a few errors, including the fact that the city limits in the maps were not accurate. Mr. Clem said he would make the changes necessary.

Mr. Clem then referred everyone to Table 4.2. It was pointed out that a proposed action to add a generator to the Good Samaritan Center in Wagner had already been accomplished. Mr. Clem then asked the reps from the Wagner hospital if they wanted to add any actions, and they said no. Discussion occurred about a potential drainage project in Platte, but environmental issues are such that the project would be very expensive and unlikely ever to be done. Additional information was gathered for some of the projects, including the cost of the projects for Charles Mix Electric.

Then we discussed how the plan will work with the other planning documents in the county and towns. The consensus was that the best way to achieve that would be for each city council to appoint someone from their city to be responsible for knowing the plan and representing the city on the LEPC. The local budgetary process was then discussed, and Mr Blaha mentioned that the Wagner project was funded through the general fund.

Then we discussed how the plan will be evaluated and updated if needed. It was decided that the LEPC was the best way to do that and that one of its meetings each year would be devoted to the plan. To get local input, Mr. Kotab said he would contact each town prior to the meeting and invite them to attend the meeting. If they have a project in mind, or if something has happened to affect the town's vulnerability to hazards, then they can bring that to the attention of the LEPC.

Mr. Clem then thanked everyone for their participation in the meetings. He said he would go back to his office and thought he would have the plan completed within a couple of weeks. Then would follow a short review period before the plan is sent to Pierre. It was decided that the best way for the public to review the plan would be to run a short article in the local papers and make it available on the county and local websites.

The meeting was adjourned at 8:30 PM.

APPENDIX C: Campground Information

Following is information on all the campground areas located within the county:

- Kemnitz Campground - 190 pads (25 added in 2014)
- Wynia Campground – 175 pads (18 added in 2014).
- Riverside Campground – 154 pads (18 added in 2014).
- Cwach Campground – 107 pads (additional pads being added)
- Curly's Campground – 107 pads
- Svatos Campground – 78 pads. This is a new campground.
- Johnsonville Campground – 43 pads (15 added in 2014)
- Outback (in Pickstown City limits) - 40 pads. The campground has six storm shelters.
- Erickson Campground – 31 pads
- North Wheeler Campground – 29 pads
- Vacation Haven (in Pickstown City limits) – 25 pads
- Holters Campground – 10 pads. This is a new campground.
- Creasey Campground – 8 pads

APPENDIX D: History of Previous Hazard Occurrences

The following table is a list of the most significant hazard events that occurred in Charles Mix County from 1996 through 2013, as recorded in the National Climatic Data Center's Storm Events Database. The National Climatic Data Center receives storm data from the National Weather Service, which gets its information from a variety of sources, including county, state and federal emergency management officials, local law enforcement officials, National Weather Service damage surveys, the insurance industry, and the general public. Descriptive information is provided for some of the more noteworthy events.

The table includes the magnitude of many of the events, and the amount of damage caused. Regarding magnitude of the High Wind events, the figures are in miles per hour, and represent the highest measured wind gust (MG) or the highest estimated wind gust (EG). For the property and crop damage amounts, the National Weather Service uses all available data from the sources identified above, but the amounts should be considered as broad estimates. In many cases, damage figures are unknown.

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
1/17/1996	Blizzard			$20,000	
1/29/1996	Cold/Wind Chill				
2/10/1996	High Wind		67 MPH MG	$60,000	
3/24/1996	Blizzard			$10,000	
4/12/1996	Heavy Snow				
4/25/1996	High Wind		71 MPH MG	$10,000	
6/19/1996	Hail		1.75 "		
7/7/1996	Hail	Hail caused scattered property and crop damage.	2.50 "		
8/4/1996	Hail	Hail caused an unknown amount of crop damage over a path 1.5 miles wide and 5 miles long.	0.88 "		
8/6/1996	Hail	Hail damaged crops with the heaviest damage occurring in a strip 2 miles wide and 6 miles long southeast of Wagner.	1.75 "		$500,000
10/29/1996	High Wind		66 MPH MG	$50,000	
11/14/1996	Ice Storm			$20,000	
12/16/1996	Blizzard				
12/25/1996	Heavy Snow				
1/4/1997	Blizzard				
1/9/1997	Blizzard				
1/15/1997	Cold/Wind Chill				
2/3/1997	Heavy Snow				
3/12/1997	Flood	Widespread snowmelt flooding began in March and continued through the end of the month. Widespread flooding of farmland and other lowlands occurred, both near and away from major river basins. Many roads, farm buildings, and some homes and businesses were flooded. Many basements were flooded just from groundwater seepage.		$20,000	

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
4/1/1997	Flood				
4/6/1997	High Wind		72 MPH MG	$10,000	
4/9/1997	Heavy Snow				
6/11/1997	Flash Flood	Rainfall of 3 to 6 inches flooded roads, basements, and some vehicles and homes. The flooding resulted from overflow of drainage ditches, sewer systems, at least one creek, and simple ponding of water in low areas.		$30,000	
6/20/1997	Thunderstorm Wind		70 MPH MG	$50,000	
7/27/1997	Hail		0.75 "		
8/29/1997	Thunderstorm Wind		60 MPH MG		
11/2/1997	High Wind			$3,300	
3/31/1998	Heavy Snow			$10,000	
5/14/1998	Hail		0.88 "		
7/5/1998	Hail		0.75 "		
7/6/1998	Hail	Large hail destroyed or damaged crops, broke windows, and damaged vehicles and many farm buildings. The hail covered the ground in places and was accompanied by strong winds and heavy rain.	1.75 "	$1,000,000	$2,200,000
8/19/1998	Hail		0.75 "		
11/10/1998	Blizzard			$20,000	
5/3/1999	Tornado	Thunderstorm winds blew over several large cottonwood trees.	F0		
5/10/1999	Hail		1.00 "		
5/22/1999	Hail	Hail damaged crops near Platte.	0.75 "		
6/4/1999	Hail		1.50 "		
6/7/1999	Hail		0.75 "		
6/22/1999	Hail		0.75 "		
7/2/1999	Thunderstorm Wind	Thunderstorm winds caused widespread tree damage, destroyed an unoccupied trailer home south of Platte, damaged calf shelters and other farm structures. The winds also blew off a 30 foot section of a metal roof at a pork plant near Academy, and overturned campers.	69 MPH MG	$100,000	
11/1/1999	Drought	Generally dry weather that began in August continued through November. Dry surface and soil conditions became quite pronounced in November. Water levels fell, especially in small streams and lakes. Damage to winter wheat crops was feared. The area experienced the third driest fall (September through November) period on record. Unusually warm weather during the month contributed to the drying. The most noticeable manifestation of the dry conditions was the large number of grass fires across the area. While damage was mainly limited to the grasslands, considerable manpower and expense was needed to fight the fires.			
12/1/1999	Drought	Dry weather that began in August continued through December. Grass fires continued to be a problem. Agricultural concern was mostly for the future start of the growing season, but there were some effects on winter wheat.			
1/10/2000	High Wind		49 MPH EG		
2/1/2000	Drought	Dry weather that prevailed during the fall continued in February, Dry surface and soil conditions remained			

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
		quite pronounced. Water levels continued to fall slowly. especially in wetlands, small streams, and lakes. Above normal temperatures contributed to further drying. Grass fires were again a problem in some areas.			
3/1/2000	Drought				
4/1/2000	Drought	Dry weather continued, allowing dry surface and soil conditions to continue. Rainfall in the middle and later parts of the month alleviated the short term dryness somewhat, but soil moisture was still inadequate for the long term. Water levels remained low, especially in some small lakes.			
4/5/2000	High Wind		64 MPH EG	$17,000	
5/11/2000	Thunderstorm Wind		66 MPH MG		
6/19/2000	Hail		0.75 "		
8/7/2000	Tornado; Hail	An F1 tornado damaged three homes, and damaged cropland.	F1	$100,000	
8/16/2000	Hail		0.75 "		
11/11/2000	Winter Storm				
12/16/2000	Blizzard				
12/28/2000	High Wind		60 MPH EG		
1/29/2001	Blizzard				
2/7/2001	Winter Storm				
2/24/2001	Winter Storm				
6/9/2001	Thunderstorm Wind	Thunderstorm winds up to 70 mph blew over two grain bins, moving one of them a half mile. A calf shelter also was destroyed, a livestock trailer was overturned, and there was tree damage.	70 MPH EG	$20,000	
7/7/2001	Lightning	Lightning splintered a large tree in the yard of a Lake Andes home.		$1,000	
7/21/2001	Thunderstorm Wind	Thunderstorm winds up to 70 mph destroyed part of a large cattle shed near Dante.	70 MPH EG	$100,000	
7/30/2001	Thunderstorm Wind	Thunderstorm winds up to 85 mph blew off a door and part of the roof at the Wagner airport, blew down trees and power poles, and blew two farm wagons across a highway. The temperature rose over 20 degrees in a few minutes, briefly reaching 99 degrees.	86 MPH MG	$50,000	
7/31/2001	Thunderstorm Wind		66 MPH EG		
8/29/2001	Hail	Large hail fell in an area from near Marty east to Dante, including the town of Wagner. Damage was reported to vehicles and crops, but the amount of damage was not known.	2.75 "		
10/9/2001	Hail		1.50 "		
11/26/2001	Heavy Snow				
2/11/2002	High Wind		57 MPH EG		
3/14/2002	Winter Storm				
5/5/2002	Hail		1.00 "		
5/7/2002	Hail		0.88 "		
7/9/2002	Hail		0.88 "		
7/24/2002	Hail		0.75 "		

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
8/9/2002	Hail		0.75 "		
8/11/2002	Hail		0.88 "		
8/16/2002	Hail		0.88 "		
1/15/2003	Heavy Snow				
2/14/2003	Winter Weather				
3/3/2003	Winter Weather				
4/6/2003	Heavy Snow				
6/5/2003	Hail	Large hail covered the ground and caused severe crop damage in a 15 mile-wide area over southern and eastern Charles Mix County. About 60,000 acres of crops were damaged or destroyed, but the amount of loss was not available due to the complications of figuring damages in the case of replanted crops. The hail accumulated to a depth of several inches in places, with drifts as high as four feet in the Wagner area. The hail cracked windows and damaged siding in the Wagner area.	1.75 "		
6/24/2003	Tornado	An F1 tornado damaged or destroyed several buildings at an abandoned farm near Lake Andes, and also caused tree damage.	F0		
7/3/2003	Thunderstorm Wind	Thunderstorm winds up to 55 mph blew down at least four large trees in Geddes. One tree damaged a car when it fell.	60 MPH EG	$2,000	
7/5/2003	Thunderstorm Wind		60 MPH EG		
8/19/2003	Thunderstorm Wind		60 MPH EG		
11/22/2003	Winter Storm				
12/8/2003	Winter Storm				
2/11/2004	Winter Weather				
3/15/2004	Heavy Snow				
4/18/2004	Hail		0.88 "		
5/16/2004	Hail		0.88 "		
5/29/2004	Hail	Large hail damaged vehicles and cracked windows in Marty. Crop damage was suspected. The amount of property and crop damage was not known.	1.75 "		
7/12/2004	Hail		1.00 "		
7/15/2004	Tornado	A tornado moved from northwest to southeast over open country through Charles Mix County on a ten mile track. The tornado damaged crops, but did not cause any property damage. The tornado was observed to be about a quarter mile wide early in its life, then steadily narrowed before dissipating.	F0		$5,000
10/29/2004	High Wind		61 MPH MG		
1/4/2005	Heavy Snow				
3/10/2005	High Wind		60 MPH EG	$10,000	
5/7/2005	Hail		0.75 "		
6/7/2005	Thunderstorm Wind	Thunderstorm winds up to 55 mph caused tree damage in Geddes, including several branches blown down.	60 MPH EG		
6/20/2005	Thunderstorm Wind		70 MPH EG		
6/21/2005	Flash Flood	Heavy rain caused flooding of numerous roads and several small streams. SD Hwy 50 was closed because			

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
		of flooding between L. Andes and Ravinia. In Wagner, water up to 3 feet deep flooded roads near a stream.			
7/6/2005	Hail		0.50 "		$10,000
8/3/2005	Hail		0.75 "		
8/25/2005	Hail		1.00 "		
9/12/2005	Hail		1.00 "		
9/18/2005	Hail		0.75 "		
11/8/2005	High Wind		60 MPH EG	$20,000	
11/27/2005	Ice Storm	Heavy freezing rain coated roads, and power lines with ice up to 3 inches thick throughout SE South Dakota. Many roads were shut down for extended periods. Most schools and businesses were forced to close. Many miles of power lines and thousands of poles were brought down, resulting in power outages to thousands of households. In some rural areas, power was out for more than two weeks. Many people took shelter wherever they could. Damage to power poles and lines was so great that repairs required assistance from crews from eight states.		$1,000,000	
11/28/2005	Blizzard			$100,000	
11/30/2005	Winter Weather				
12/2/2005	Winter Weather				
2/16/2006	Winter Weather				
3/12/2006	Winter Weather				
3/19/2006	Winter Storm				
6/16/2006	Thunderstorm Wind	Thunderstorm winds up to 65 mph caused tree damage in Dante, including small trees blown down.	66 MPH EG		
7/18/2006	Drought				
8/1/2006	Drought				
9/16/2006	Hail		0.75 "		
12/20/2006	Winter Storm			$40,000	
12/29/2006	Winter Storm				
2/12/2007	Winter Weather				
2/24/2007	Winter Storm				
2/28/2007	Heavy Snow				
3/1/2007	Blizzard				
4/21/2007	Hail		0.88 "		
5/4/2007	Hail		0.88 "		
5/5/2007	Tornado		F0		
5/22/2007	Flash Flood				
6/6/2007	Thunderstorm Wind		66 MPH EG		
6/21/2007	Hail		0.75 "		
6/21/2007	Flash Flood	Thunderstorm winds caused tree and power line damage, with resulting power outages. Large hail was accompanied by very heavy rain. Flash flooding occurred near Pickstown.			

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
7/17/2007	Hail		1.00 "		
7/18/2007	Hail		1.00 "		
8/3/2007	Thunderstorm Wind	Thunderstorm winds blew the roof off a hog confinement building and scattered debris over a field.	70 MPH EG		$5,000
8/9/2007	Hail	Winds estimated at 60 mph occurred. Large hail whitened the ground at Lake Andes. Thunderstorm winds caused significant tree damage in Platte.	0.88 "		
8/10/2007	Hail		0.75 "		
8/21/2007	Hail	Hail occurred in a wide area, with particularly large hail in the Dante and Wagner areas. A state record size hailstone certified at almost 7" in diameter occurred at Dante.	6.13 "		
9/29/2007	Hail; High Wind		0.75 "		
12/1/2007	Winter Weather				
12/25/2007	Winter Weather				
1/20/2008	Winter Weather				
1/23/2008	Winter Weather				
2/11/2008	Winter Weather				
3/16/2008	Winter Weather				
3/31/2008	Heavy Snow				
4/10/2008	Blizzard				
4/25/2008	Heavy Snow				
5/6/2008	Hail		0.88 "		
5/30/2008	Hail		0.75 "		
6/2/2008	Hail		1.00 "		
6/3/2008	Hail		1.00 "		
6/4/2008	Flash Flood	Heavy rain caused flash flooding of roads in and near Dante.			
6/5/2008	Tornado	The storm produced an EF1 tornado near Marty and caused flash flooding in Wagner. 1.75 in. hail recorded.	F1	$100,000	
6/17/2008	Hail		0.88 "		
6/19/2008	Hail		0.88 "		
7/28/2008	Thunderstorm Wind		60 MPH EG		
8/14/2008	Hail		0.88 "		
10/26/2008	High Wind		45 MPH EG		
11/6/2008	Blizzard				
11/7/2008	Winter Weather				
12/14/2008	Blizzard				
12/20/2008	Winter Weather				
2/26/2009	Winter Weather				
3/23/2009	Thunderstorm Wind		60 MPH EG		
3/30/2009	Blizzard				

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
4/4/2009	Blizzard				
6/23/2009	Hail		0.75 "		
6/25/2009	Thunderstorm Wind		60 MPH EG		
6/26/2009	Thunderstorm Wind		60 MPH EG	$5,000	
6/29/2009	Hail		0.75 "		
8/8/2009	Hail		1.00 "	$1,000	
8/12/2009	Thunderstorm Wind		60 MPH EG		
9/2/2009	Thunderstorm Wind	Heavy winds up to 70 mph caused tree damage and some property damage, including a greenhouse that was moved several feet.	70 MPH EG	$5,000	
12/8/2009	Winter Weather				
12/23/2009	Blizzard				
1/6/2010	Blizzard	Snowfall of 3 to 6 inches and winds gusting over 40 mph produced widespread blizzard conditions, with visibilities less than a quarter mile. New snowfall included 6 inches at Pickstown. Schools and businesses were closed, and travel became impossible in much of the area. The wind combined with cold temperatures to produce wind chills colder than 35 below zero.			
1/7/2010	Extreme Cold/Wind Chill				
1/25/2010	Winter Weather	Northwest winds gusting to over 50 mph, along with existing loose snow cover, caused blowing snow with visibilities of a quarter mile or less in areas.			
5/24/2010	Thunderstorm Wind	Heavy winds up to 65 mph blew down power poles and caused tree damage in Platte. The wind also destroyed a small shed and damaged equipment on a farm southwest of Platte.	64 MPH EG	$5,000	
6/1/2010	Hail		0.88 "		
6/12/2010	Flash Flood	Heavy rainfall of up to 6 inches caused widespread flash flooding of many roads, residences, and fields, causing damage to and forcing evacuation of numerous residences. The Yankton Sioux reservation was especially hard hit, with the tribal headquarters made unusable, and 63 families displaced from their homes. Estimated damage was $1 million.		$1,000,000	
7/6/2010	Hail		1.00 "		
7/10/2010	Hai; Flash Flood				
7/23/2010	Hail		1.00 "		
8/8/2010	Thunderstorm Wind		60 MPH EG		
8/10/2010	Thunderstorm Wind		64 MPH EG	$5,000	
8/19/2010	Thunderstorm Wind		64 MPH EG	$5,000	
8/30/2010	Thunderstorm Wind		70 MPH EG	$1,000	
9/22/2010	Flash Flood				
10/26/2010	High Wind		60 MPH EG		
12/10/2010	Winter Weather	Snowfall ranging from 2 to 8 inches was accompanied by sustained winds reaching 40 mph at times, with gusts as high as 55 mph. The snowfall, strong winds, and existing snow cover resulted in widespread blizzard conditions. Travel was impossible in much of the area, and businesses and schools were forced to close.			

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
12/31/2010	Blizzard	Snowfall of 6 to 10 inches and winds gusting to over 40 mph produced widespread blizzard conditions. Roads were closed and many businesses were forced to close as travel became difficult to impossible.			
1/1/2011	Blizzard				
1/9/2011	Heavy Snow	Heavy snow occurred in the area, including 9 inches in Pickstown.			
1/22/2011	Winter Weather				
2/1/2011	Extreme Cold/Wind Chill				
2/20/2011	Heavy Snow	Heavy snowfall, including 7 inches at Platte, severely limited travel and commerce over the northwest part of the county, with some roads becoming blocked. Winds averaging 20 to 30 mph contributed to the problems by causing drifting snow and areas of reduced visibilities in blowing snow. The snow was preceded by freezing rain and sleet, causing icing of travel surfaces. In the southeast part of the county, the precipitation was mainly freezing rain and sleet, with some ice accumulation on trees and power lines.			
3/7/2011	Winter Weather				
3/20/2011	Hail		0.75 "		
4/9/2011	Hail		1.00 "		
4/15/2011	Heavy Snow				
5/20/2011	Flood	Flooding along the Missouri River developed in May, increasing throughout the month as runoff from excessive upstream snowmelt and rain reached the area. Lowland areas along the river began to flood, impacting recreational facilities and some roads. The river reached 3.2 feet above flood stage near Greenwood at the end of the month.			
5/29/2011	Hail		0.88 "		
5/30/2011	Tornado		F0		
6/1/2011	Flood	Flooding along the Missouri River from upstream spring snowmelt and heavy rain worsened in June. Lowland areas along the river, including many roads and recreational areas and a few homes, were flooded. The river reached a record 8.8 feet above flood stage near Greenwood at the end of the month.			
6/20/2011	Flash Flood	Runoff from heavy rain caused record flooding of Platte Creek, with several roads under water. The creek reached 2.1 feet above flood stage near Platte at the end of June.			
7/1/2011	Flood	Record Missouri River flooding continued in July. Populated areas evacuated before the month remained evacuated, with a few additional evacuations made. Damage continued to many homes, businesses, recreation areas, and low lying areas. A very slow drop in the river began before the end of the month.			
7/1/2011	Flood	Runoff from heavy rain caused continued record flooding of Platte Creek, with several roads under water. The creek crested at a record 2.7 feet above flood stage near Platte on July 8th.			
7/15/2011	Excessive Heat				
8/1/2011	Flood	Major impacts from Missouri River flooding continued into August, with flooding varying from minor to major, and evacuated areas remaining evacuated. Water levels receded very slowly during the month, and effects of the flooding slowly began to abate, but in			

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
		many places the extent of damage to homes, businesses, and lowlands was beginning to become evident.			
8/5/2011	Flash Flood				
8/7/2011	Thunderstorm Wind		60 MPH EG		
8/18/2011	Thunderstorm Wind		60 MPH EG		
9/1/2011	Flood	Missouri River flooding decreased steadily in September, and ended along most of the river by late in the month. As the water retreated, additional damage continued to be revealed.			
10/4/2011	Wildfire	Several wildfires broke out in Charles Mix County during a four day period. Warm and dry weather, strong winds, and dry vegetation contributed to the fires starting and spreading. The fires affected grassland and cropland, including baled hay. Several wildfires damaged grassland and crops. The largest fire started just south of Lake Andes and burned about 400 large round hay bales, plus grassland. One firefighter suffered smoke inhalation, and firefighters were called to the same site the next day as flames sparked up again. The amount of crop damage was not known.			
2/13/2012	Winter Weather				
4/15/2012	High Wind		61 MPH EG		
5/5/2012	Hail		1.50 "		
6/1/2012	Drought	Drought conditions began in the late spring and persisted throughout the year. Crop loss was very substantial. Extreme heat made the drought even worse.			
6/13/2012	Hail		1.75 "		
6/26/2012	Excessive Heat				
7/1/2012	Drought				
7/2/2012	Excessive Heat				
7/15/2012	Excessive Heat				
7/18/2012	Excessive Heat				
8/1/2012	Thunderstorm Wind		60 MPH EG		
8/1/2012	Drought				
8/1/2012	Excessive Heat				
8/3/2012	Hail		1.00 "		
9/1/2012	Drought				
10/1/2012	Drought				
10/17/2012	High Wind	Persistent very strong northwest winds, with a peak gust of 66 mph recorded at Lake Andes.	66 MPH MG		
11/1/2012	Drought				
12/1/2012	Drought				
12/9/2012	Blizzard	Northwest winds gusting to 50 mph and loose snow cover combined to lower visibilities to near zero with blowing snow over much of the area. Travel was brought to a standstill and businesses were closed.			
12/27/2012	Winter Weather				
1/1/2013	Drought				

DATE	EVENT	DESCRIPTION	MAGNITUDE	PROPERTY DAMAGE	CROP DAMAGE
2/1/2013	Drought				
2/10/2013	Blizzard	Snowfall of 2 to 4 inches was accompanied by northwest winds gusting to 45 mph, producing blizzard conditions with widespread visibilities below a quarter mile. The low visibilities and drifting snow closed roads and some businesses, and forced school closings.			
3/1/2013	Drought				
3/9/2013	Winter Weather	Rain changed to wet snow and accumulated 3 to 5 inches in the northwest part of Charles Mix County. Academy reported 4 inches.			
4/1/2013	Drought				
4/9/2013	Winter Storm	An extended period of precipitation began with freezing rain and freezing drizzle producing light ice accumulations, then changing to sleet and then snow, with sleet and snow accumulations reaching 9.5 inches at Platte. The winter precipitation made travel very difficult, resulting in schools and businesses being forced to close.			
4/22/2013	Winter Weather	A late season blizzard dumped a substantial amount of snow in the area. The storm resulted in FEMA Disaster Declaration DR-4115.			
5/1/2013	Drought				
6/21/2013	Hail		1.00 "		
7/7/2013	Flash Flood				
7/7/2013	Thunderstorm Wind		60 MPH EG		
12/3/2013	Winter Storm				

Source: National Climatic Data Center's Storm Events Database

APPENDIX E: References

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