

# CHAPTER I

## PLANNING PROCESS

### Background

This plan is an update of the Davison County Pre-Disaster Mitigation Plan, which was approved by FEMA in February 2011. The purpose of the plan is to prevent or reduce losses to people and property that may result from future hazard events in Davison 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 Davison County in its efforts to mitigate against future disaster events.

This is a multi-jurisdictional plan. All of the municipalities located within Davison County were invited to participate in the plan's development, as they had 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 representatives attend the planning meetings, by providing input into the plan, and by passing a resolution supporting and adopting the plan<sup>1</sup>:

- Davison County
- City of Mitchell

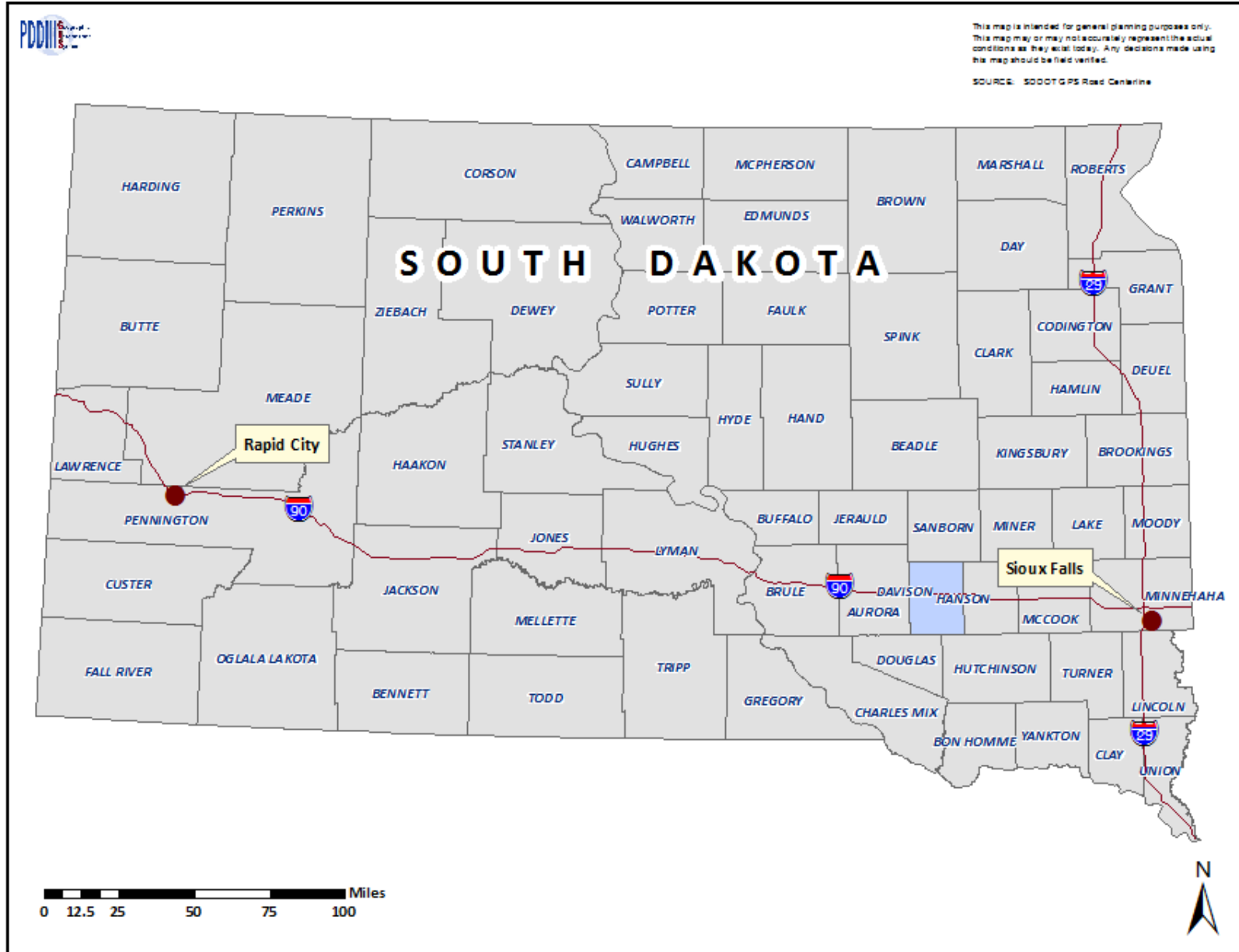
Production of the plan was the ultimate responsibility of the Davison County Emergency Management Director, who served as the county's point of contact for all activities associated with this plan. Input was received from a disaster mitigation planning team that was put together by the Emergency Management Director and whose members are listed in **Table 1.1** on page 4.

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 Davison County's current plan.

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<sup>1</sup> Two municipalities within the county - the Town of Ethan and the City of Mount Vernon- chose not to participate in the development of this plan.

Figure 1.1 – County Location



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 **Chapter III**), and completed the county land cover analysis (see **Chapter II**).

## **Development of Planning Team**

The initial planning stages for this plan update began in 2014 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 October 2014. Following this, John Clem and the Davison 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. Personnel at the county and municipal level with the authority to regulate development were a priority for inclusion on the team. Invited to participate on the planning team were the following:

- Davison County representatives (including county commissioners, planning/zoning officials, floodplain administrator, GIS staff, director of equalization, and highway superintendent)
- Municipal representatives from each town within the county (city council members, finance officers, planning/zoning staff, public works staff, etc)
- Utility providers, including the Central Electric Cooperative and the Davison Rural Water System
- Health care providers, including the Avera Queen of Peace Hospital in Mitchell
- Fire district representatives
- Township officials
- Major businesses
- James River Water Development District

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 09/09/15	Mtg 2 10/14/15	Mtg 3 11/18/15
John Clem	Planning District III	Planner (Plan Author)	X	X	X
Jeff Bathke	Davison County	Emergency Management Dir	X	X	X
Mark Jenniges	Davison County	Deputy EMD		X	X
Susan Kiepke	Davison County	Auditor	X	X	X
Steve Brink	Davison County	Sheriff	X	X	
Denny Kiner	Davison County	County Commission		X	
Andy Mentele	Davison County	Search and Rescue			X
Jerry Toomey	City of Mitchell	Mayor	X		X
Stephanie Ellwein	City of Mitchell	City administrator	X		
Michelle Bathke	City of Mitchell	Finance Officer	X	X	
Lyndon Overweg	City of Mitchell	Police Chief		X	
Marlene Haines	City of Mitchell	911		X	
Jon Vermeulen	City of Mitchell	Sewer Superintendent		X	
Kevin Roth	City of Mitchell	Street Superintendent		X	
Paul Morris	Mitchell Fire Dept		X	X	X
Michael Koster	Mitchell Police Dept		X	X	
Marius Laursen	Mitchell Fire Dept		X		
Bruce Sparks	Central Electric Coop		X		
Dan Schroeder	Davison Rural Water	Manager			X
Vicki Lehrman	Queen of Peace Hosp		X	X	X
Carey Brenner	Firesteel Healthcare			X	
Gary Cole	Salvation Army		X	X	
Summer Geraets	American Red Cross		X		
Natalie Van Drongelen	SD Dept of Health	Davison Co Health Nurse	X		
Jessica Scharfenberg	SD Dept of Health				X
Logan Teut	POET Ethanol (Loomis)		X		
Dave Beintema	SD OEM	Region 6 Coordinator		X	X
Dale Wilson	CHS Farmers Alliance			X	X
Robert Mayer	SD Hwy Patrol			X	
Dan Muck	Mitchell School District				X
Jake Shewna	Mitchell Daily Republic	Staff reporter	X		
Evan Hendershot	Mitchell Daily Republic	Staff reporter		X	

## Outreach Effort

Throughout the plan's development, efforts were made to obtain public involvement in the plan. Emergency management directors in several nearby counties were informed about the plan update prior to first meeting, as was the South Dakota Office of Emergency

Management, and press releases following the first two meetings were run in the Mitchell *Daily Republic*.

Agendas for the planning meetings were posted on the Davison County website and the Planning & Development District III website. At the end of the process, a press release announcing the completion of the plan was published in the *Daily Republic*, and the plan was made available for review and comment on the county website. See **Appendix A** for documentation of the public outreach effort.

## **Planning Meetings**

A series of meetings of the mitigation planning team was held as the plan was being developed. The purpose of the meetings was to gather information about the history of disasters in the county and their impact, to update the list of critical and important community facilities, to develop the mitigation strategy, and to determine how the plan will be implemented.

Leadership and guidance at the planning meetings was provided by Planning & Development District III staff 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 District III staff 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 and Begin Risk Assessment*

The first meeting of the planning team introduced the participants to the mitigation planning process, and discussion occurred about how the plan would be developed in the coming months. Discussion also occurred about how to get broader public input into the planning process, and whether any other individuals or entities not already present should be invited to participate in the planning process. It was noted that the meeting was announced on the Davison County website.

Following this, the county's current disaster mitigation plan was reviewed, and the planning team was asked for their general opinions of the plan. The consensus of team members was that some parts of the plan should be updated with more current and relevant information.

After this, the risk assessment began, 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 determined which 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. This was done after the meeting by Planning & Development District III staff using various methods, as discussed further in **Chapter III**. 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 2 - Complete Risk Assessment and Begin Mitigation Strategy*

The second meeting focused on development of the mitigation strategy. Formation of the strategy began with a review of the results of the risk assessment. 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 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 had been provided prior to the meeting for the team to review. The list was based on FEMA's guidance document *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*. 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.

After the meeting, the Planning & Development District III office completed a first draft of the 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 next meeting.

### *Meeting 3 - Complete Mitigation Strategy and Develop Implementation Plan*

The final meeting began with a review of the draft. Additional information about some of the proposed mitigation actions 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, and who will be responsible for ensuring the mitigation actions identified in the plan are carried out. 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. Another point of emphasis was that no local decisions should be made or actions taken that are contrary to the goals of this plan.

Maintenance of the plan also was discussed, specifically how the plan will be monitored, evaluated, and updated in the coming years. The meeting ended with a discussion about how the general public and other stakeholders can be brought more into the mitigation planning process in the future.

After the meeting, additional information was added based on discussion at the meeting. A press release announcing the completion of the plan was then published in the *Mitchell Daily Republic*, and the plan was made available for review and comment at the emergency management office and on the Davison County and Planning & Development District III website.

## **Acknowledgements**

The Planning & Development District III office would like to thank the members of the Davison 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. We would particularly like to thank Emergency Management Director Jeff Bathke for making all the arrangements necessary for the planning meetings that were held, and for going above and

beyond to provide data, information, and documents that were very useful as the plan was being developed. This was truly a team effort.

Thanks also are extended to Jim Poppen, Martin Christopherson, Kyle Kafka, and Marc Macy at the South Dakota Office of Emergency Management for providing information that was used in the plan, as well as guidance in assembling the plan. We also would like to acknowledge the information and data that was provided by Cindy Hansen and Paul Reiter at the 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

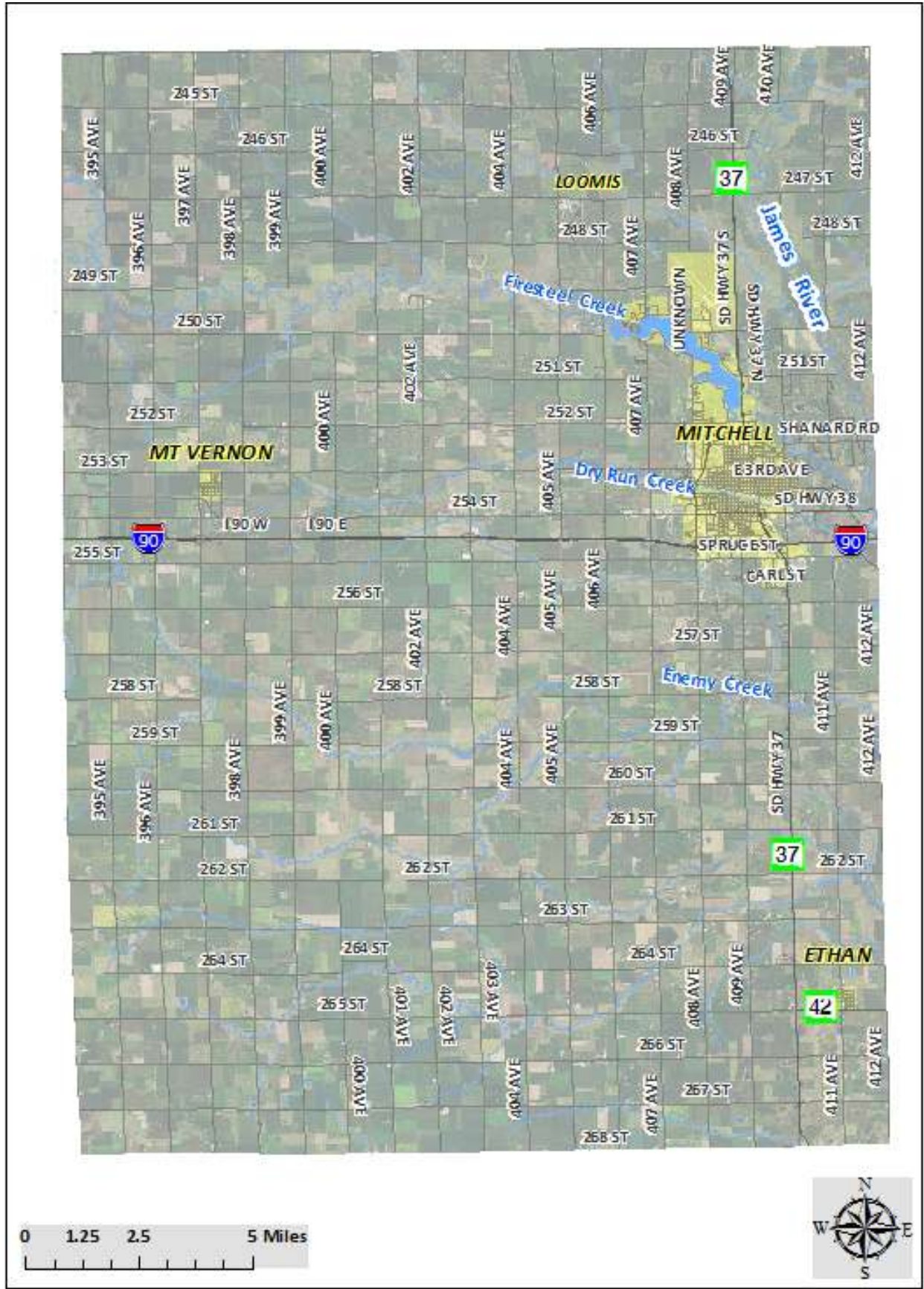
Davison County is located in southeast South Dakota, about 70 miles west of Sioux Falls, the state's largest city (see **Figure 1.1**). The county covers about 436 square miles in area, and its population according to the 2010 Census was 19,504. There are three incorporated municipalities located within the county - Ethan (pop 331), Mitchell (pop 15,254), and Mount Vernon (pop 462). Unincorporated communities within the county include Loomis (pop 47). The county seat is located in Mitchell. **Figure 2.1** shows the county's communities and highway network.

### Physical Characteristics

Outside of Mitchell, Davison County is lightly settled, with most of the land devoted to agricultural production. The landscape is mostly open, and the terrain is generally fairly level, except for undulating areas along the James River and some of the larger streams in the county, including Firesteel Creek. Prominent bodies of water in addition to the James River include Firesteel Creek, which is impounded just north of Mitchell to form Lake Mitchell.

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. Several feeding and farrowing hog confinement barns are located in the county.

Figure 2.1 - Political Map



**Table 2.1** provides a breakdown of the land cover in Davison County. The table is based off satellite imagery from the United States Geological Service's National Land Cover Database, which was processed using ArcGIS computer mapping software. As the table shows, the predominant types of land cover in the county are cultivated crops and pasture land, which together comprise over 80 percent of the county's area. Developed land makes up a small fraction of the land area. **Figure 2.2** 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	221.6	50.8
Pasture land	140.0	32.1
Grassland and Shrub/Scrub	28.7	6.6
Developed land (open space)	19.1	4.4
Wetlands	11.8	2.7
Developed land (low to high intensity)	6.5	1.5
Forested land	6.3	1.4
Open water	2.4	0.5
Barren land	0.2	0.0
<b>Total Area</b>	<b>436.6</b>	<b>100.0</b>

<http://www.mrlc.gov/index.php>

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

As in most of South Dakota, the climate of Davison 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 22 inches per year, but 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 and other types of winter storms are a definite hazard. Following is climate data in the county as reported from the Mitchell weather station.

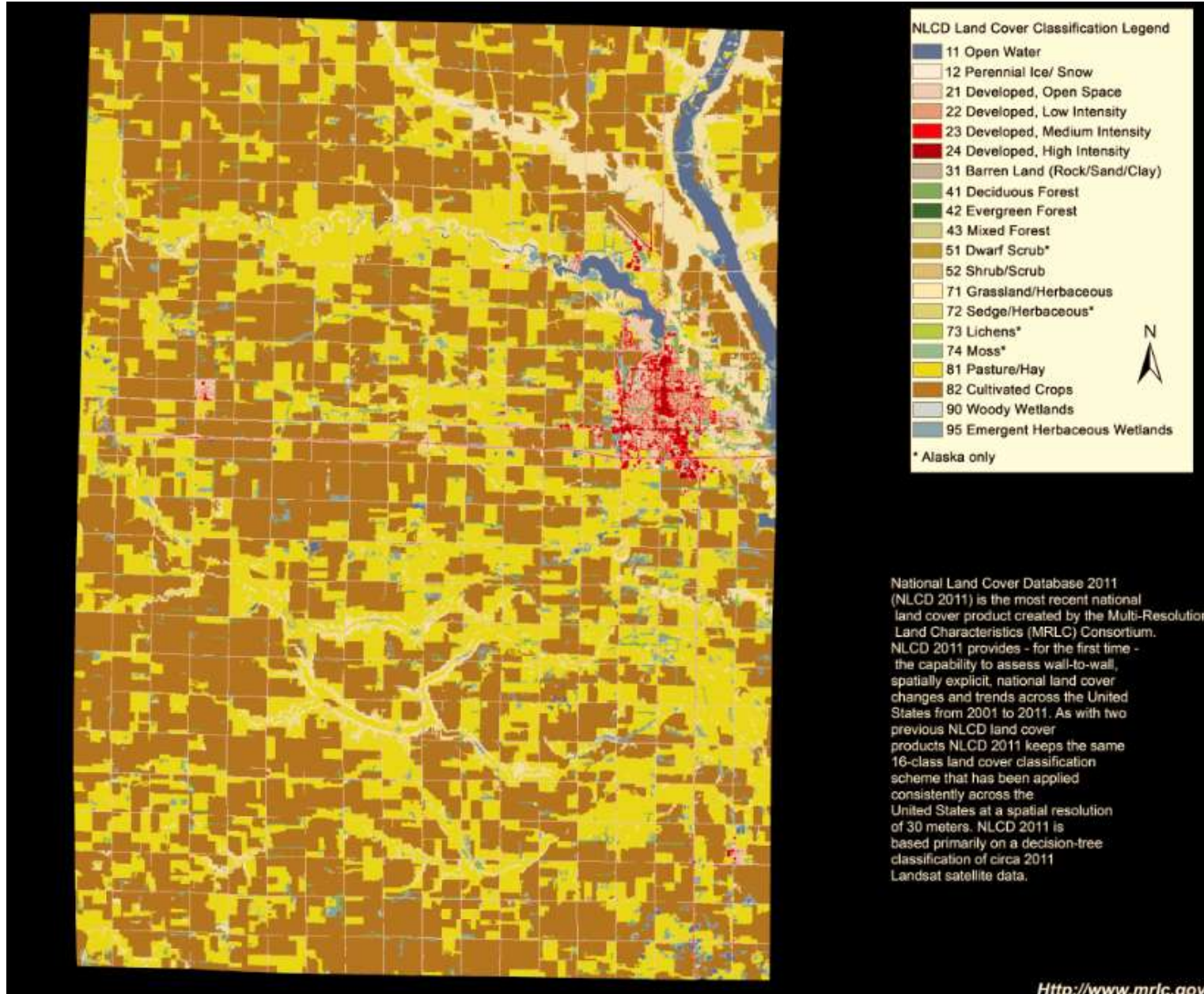
**Table 2.2 - Monthly Climate Conditions in Davison County (1893 - 2003)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave High	27.0	31.6	43.8	60.2	72.0	81.2	87.8	85.9	76.6	63.8	45.3	31.7	58.9
Ave Low	5.9	10.1	21.7	35.1	46.6	56.6	61.7	59.3	49.4	37.3	23.5	11.6	34.9
Ave Precip	0.5	0.7	1.3	2.5	3.1	3.8	2.8	2.6	2.2	1.5	0.8	0.5	22.3
Ave Snowfall	5.5	7.2	7.0	2.2	0.0	0.0	0.0	0.0	0.0	0.5	3.4	5.2	31.0

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

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

Figure 2.2 - County Land Cover



Any impact that climate change may have on the county is difficult to predict with any certainty, and therefore difficult to plan for. At this time, many climate prediction models indicate that the climate in the central United States may become somewhat warmer and drier. This may increase the frequency and severity of droughts in the future, and possibly also wildfires and severe summer weather.

## **Socioeconomic Description**

Although not very populous in comparison with the rest of the country, Davison County is the 10th largest among South Dakota's 66 counties, with a 2010 Census population of 19,504. The population density is 44.7 people per square mile; in comparison, the State of South Dakota has a population density of 10.5 per square mile, and the national figure is 89.5.

The county has been experiencing slow but steady population growth for the last several decades, as **Table 2.3** shows. The county has increased in population by 13% since 1990, and the population is expected to continue increasing moderately. Most of the growth is expected to occur in and near Mitchell, especially around Lake Mitchell, and in the vicinity of the Wild Oak Golf Course on the eastern edge of the city.

**Table 2.3 - Davison County Population Change**

Pop 1950	Pop 1960	Pop 1970	Pop 1980	Pop 1990	Pop 2000	Pop 2010	Pop 2014 Estimate	Pop 2020 Projected	Pop 2030 Projected
16,522	16,681	17,319	17,820	17,503	18,741	19,504	19,885	20,410	21,082

Sources: U.S. Census ([factfinder.census.gov/faces/nav/jsf/pages/index.xhtml](http://factfinder.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. The table shows that an overwhelming percentage of the county's population is composed of whites. The median age of the county's population is slightly higher than the South Dakota figure, but is actually much lower than many other more rural counties in the state. This is an indication that many of the young people are able to stay in the county for jobs, rather than going elsewhere to find opportunities.

**Table 2.4 - Racial and Age Characteristics (2010)**

Entity	White Population	Black Population	American Indian Population	Asian Population	Other Racial Group	Population Under 20	Population 65 and Over	Median Age
<b>Davison Co</b>	94.4%	0.4%	3.0%	0.2%	2.0%	26.4%	16.8%	38.4
<b>South Dakota</b>	85.3%	1.5%	8.8%	1.1%	3.3%	27.6%	14.6%	36.8
<b>United States</b>	73.9%	12.6%	0.8%	5.0%	7.7%	26.3%	13.7%	37.4

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

Davison County’s primary economic base is manufacturing and retail, although agriculture is also important. Large retailers such as Cabela’s attract consumers from far outside the county. Tourism also is important to the local economy, especially during the summer as people travel to the Black Hills and other western destinations on Interstate Highway 90. Many of these people stop in Mitchell to visit the Corn Palace. Davison County also is a popular destination for hunters during the fall hunting season.

**Table 2.5 - Workforce Characteristics (2010)**

Entity	Agriculture, Forestry, Fishing, Mining	Manufacturing	Unemployment Rate
Davison Co.	5.4%	11.3%	2.3%
South Dakota	7.0%	9.5%	4.9%
United States	2.0%	10.5%	9.3%

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

The table below shows income and education statistics in the county compared to state and national figures. Because of the local availability of quality jobs, the county's favorable location along a major transportation route (Interstate 90), and other factors, economic prospects for Davison County appear to be solid.

**Table 2.6 - Income and Education (2010)**

Entity	Median Family Income	Family Poverty Rate	Households Receiving Food Stamps	High School Grad or Higher	Bachelor's Degree or Higher
Davison Co.	\$64,238	10.2%	9.1%	90.2%	25.9%
South Dakota	\$62,967	8.7%	9.9%	90.1%	26.0%
United States	\$64,585	10.9%	11.4%	85.7%	28.5%

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

## **Infrastructure and Utilities**

### *Transportation*

The primary transportation routes in Davison County are Interstate Highway 90, which runs east-west through the county, and SD Highway 37, which runs north-south. Rail freight service is provided by the Burlington Northern Railroad, which operates on the state rail line. The Dakota Southern Railroad operates on a line owned by the MRC Regional Rail Authority. Grain loading facilities are located in Mitchell, Ethan and Mount Vernon.

The City of Mitchell owns an airport located just north of the city. It has two runways and averages about 40 flights per day; it is busiest during the fall when hunters fly in from out of state. For more information about the airport, see <http://www.airnav.com/airport/KMHE>.

## *Utilities*

The Davison Rural Water System serves most rural residents of Davison County, and provides bulk water to Ethan, Mitchell, and Mount Vernon. The Hanson Rural Water System serves the eastern fringe of the county, and the Aurora-Brule System serves parts of Baker and Union townships in the southwest part of the county.

Each municipality has a wastewater collection system that stores effluent in stabilization ponds, where it is allowed to evaporate over time. Rural households, and residents of Loomis, must rely on individual septic tanks and drainfields. New development on the outskirts of Mitchell will require additional sewer lines extending into formerly rural areas. This new development will require advanced planning regarding the city's sewage treatment system, which at this time is not capable of handling the city's sewage in certain areas, most notably in the area just north of the northwest tip of Lake Mitchell.

Each municipality has a designated rubble site. Household waste generated within the county is sent to the Mitchell Regional Landfill, located approximately two miles southeast of Mitchell.

Electric power is provided to rural county residents by the Central Electric Cooperative, while Northwestern Public Service provides power to customers in Mitchell, Ethan, and Mount Vernon. Northwestern also serves the residential areas around Lake Mitchell. NorthWestern Energy provides natural gas service to Ethan, Mitchell, and Mount Vernon.

## **Services**

### *Medical Services*

The major medical facility in Davison County is Avera Queen of Peace Hospital in Mitchell, which consists of several medical facilities serving a nineteen-county area. The hospital is equipped with the region's most advanced medical technology, and it is the largest employer in Davison County, with over 700 employees.

### *Fire and Emergency Response*

Davison County is served by six different fire departments. Ethan and Mount Vernon have volunteer fire departments. The City of Mitchell has both full-time and volunteer firemen. Ambulance services are dispatched from Mitchell. Each of the departments has basic firefighting and rescue equipment, and they all respond to structural fires, wildland fires, and to accident situations. See **Table 3.4** on page 32 for more information about the departments.

### *Education*

High schools are located in Ethan, Mount Vernon, and Mitchell. Post-secondary education is available in Mitchell at Dakota Wesleyan University and the Mitchell Technical Institute.

# 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 Davison County become disaster resilient and keep county residents safe, and it answers the following questions: What are the hazards that could affect Davison 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**—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. The previous plan merely showed 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.
- 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 **Table C.2** in **Appendix C**.

## **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, with the addition of drought.

Following this, the planning participants reviewed historical records of hazard events that have occurred in the county, relying on the National Climatic Data Center's Storm Events Database, which has records for certain types of storm events as far back as 1950. This database is quite useful, although the preponderance of records from recent times for many of the event types seems to indicate an inconsistency in how the data was reported, rather than an increase in the frequency of the events. See **Table C.2** in **Appendix C** for a list of the storm events.

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 but chose not to include in this plan, with a justification for their omission:

- Earthquakes – this hazard is given a limited level of planning analysis in the South Dakota Hazard Mitigation Plan, which states that damage from earthquakes in the state has been minor - stuck doors and windows, foundations cracking, etc. A map generated through the U.S. Geological Service Earthquake Hazards Program website indicates that there is only about a one or two percent chance that a quake of at least magnitude 5 will occur in Davison County in any 100 year period, and virtually no chance of a magnitude 6 or greater earthquake <sup>2</sup>. Furthermore, no significant earthquake has ever occurred in recorded history in Davison County; the largest earthquake was a magnitude 3.2 recorded in 1957. Given all this information, the planning team felt justified in not considering earthquakes.
- Landslides - this hazard also is given a limited level of planning analysis in the South Dakota Hazard Mitigation Plan. However, a review of the United States Geological Survey's Landslide Incidence and Susceptibility Map shows virtually no chance of a significant landslide occurring in Davison County.
- Agricultural pests and diseases - this hazard is given a moderate level of planning analysis in the South Dakota Hazard Mitigation Plan. The recent outbreak of the bird flu in various locations in South Dakota is a noteworthy example of this type of hazard, but the planning team considered the subject matter to be outside the scope of its 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. Davison County completed an update to its hazardous materials plan in 2014.

## **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 Davison 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. Some hazards, such as winter storms, summer storms, and drought,

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<sup>2</sup> A magnitude 5 earthquake is considered moderate, potentially causing varying amounts of damage to poorly constructed buildings, but significant damage would be unlikely to occur. A magnitude 6 quake is strong, with the potential to cause damage to well-built structures.

do not have a geographic definition at this level of analysis, since they impact all areas of the county more or less equally. Flooding and wildfires, however, do impact specific areas of the county more than others. Areas prone to flooding are shown in the maps presented at the end of this chapter, while a map showing areas most vulnerable to fires is presented on page 45.

- **Extent** is the strength or magnitude of the hazard, which is described in a variety of ways depending on the type of hazard. For example, tornado strength is measured on the Fujita Scale, high wind events are measured by speed, fire is measured in terms of acres affected, and certain hazards are measured in terms of 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 current plan was completed. More information about the hazard events that have impacted the county is presented in **Appendix C**. This includes a comprehensive list of weather-related hazard events that have occurred in the county, and records of hazard events that resulted in a major disaster declaration in the county.
- **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. There is a long warning time associated with most winter storms, giving people time to prepare, but they still have a major impact in South Dakota, regularly destroying property and killing livestock. Such storms are generally classified into four categories - freezing rain, sleet, snow, and blizzard - with some taking the characteristics of different categories during distinct phases of the storm.

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 Davison 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*

Winter storms in South Dakota can pack quite a punch. The extent of such storms can be measured in many ways. In terms of snowfall, many winter storms in Davison County have dropped several inches or more of snow. In terms of duration, some winter storms in the county have resulted in power outages of over a week in some rural locations. Regarding wind speed, **Table C.2** in **Appendix C** shows numerous records of high wind events occurring during the winter months with wind speeds in excess of 50 miles an hour.

#### *History*

As **Table C.1** in **Appendix C** shows, there have been several major disaster declarations involving a winter storm that have affected Davison County. **Table C.2** in **Appendix C** lists many other significant winter storms that have impacted the county.

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 Davison 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. Total statewide damage from the event was estimated at over \$13 million, and approximately 30,290 households were affected by

power outages. Crews from electric cooperatives in neighboring states assisted local cooperatives with line repairs.

Another very serious winter storm to impact Davison 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 Central Electric Cooperative recorded total damages over \$3 million (see **Table C.1** in **Appendix C**). Many roads were shut down for extended periods, and most schools and businesses were forced to close. 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. The storm featured heavy, wet snow and icing that brought down power lines and trees in many areas.

*Probability*

Based on the historic evidence, the probability of a significant winter storm affecting Davison 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 Davison County Local Emergency Operations Plan, which is updated regularly.
- Following are the facilities in the county that have been designated as a disaster relief shelter, which are available for use following a major disaster. These facilities would play an important role during an extended power outage.

**Table 3.1 – Relief Shelter Facilities**

Community	Facility	Capacity	Generator	Kitchen	Cots/ Blankets
Ethan	Public School	1,450	Portable	Yes	0
Mitchell	Corn Palace	2,000	Backup on site	Yes	30
Mitchell	4-H Fairgrounds Bldg	1,100	Yes	Yes	0
Mitchell	James Valley Community Ctr	625	No	Yes	0
Mitchell	Salvation Army	40	No	Yes	20
Mitchell	United Methodist Church	185	No	Yes	0
Mitchell	Mitchell Rec Center	1,000	No	Yes	0
Mt Vernon	Public School	1,050	No	Yes	0

- The Central Electric Cooperative maintains a list of priority projects in its work plan. The Cooperative 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.

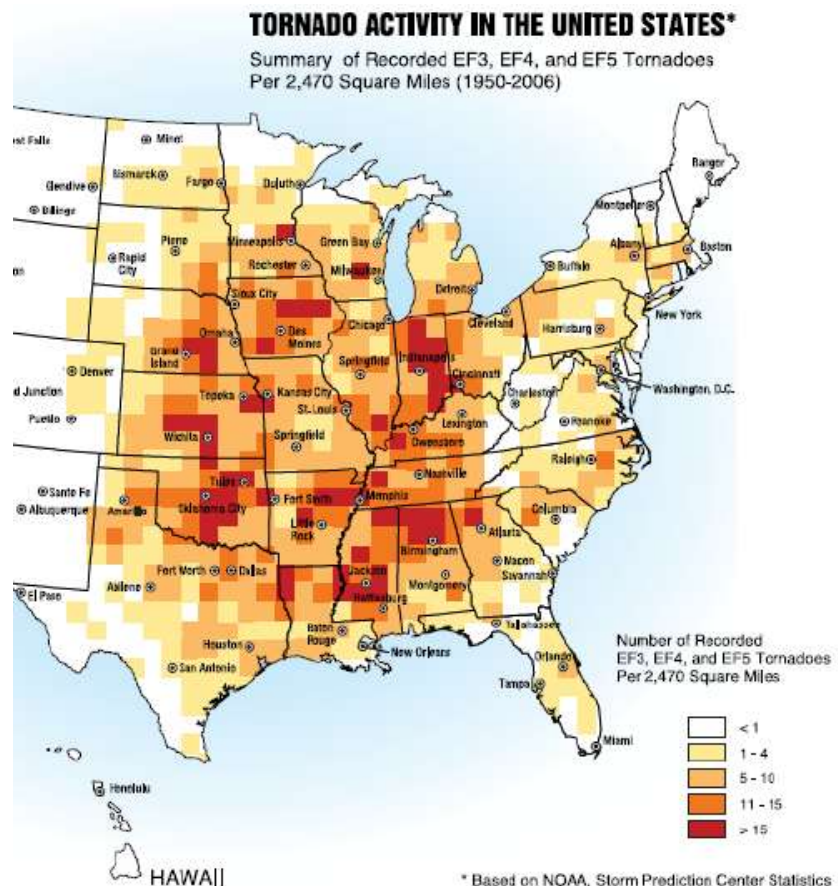
## Summer storm

### *Description*

Summer storms can include heavy rainfall, hail, tornadoes, and thunderstorm activity. These events usually are associated with unstable weather conditions. In Davison 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 Davison County reports some kind of hail damage to crops or buildings.

Tornadoes are the most dramatic type of summer storm experienced in Davison 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.

South Dakota 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 27<sup>th</sup> 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, **Table C.2** in **Appendix C** shows numerous records of thunderstorms that produced wind speeds over 60 miles per hour, with one estimated at over 100 miles per hour. **Table C.2** also shows many events with hail over two inches in diameter, and ten records of a tornado with a magnitude greater than F1. 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*

As **Table C.1** in **Appendix C** shows, there have been several major disaster declarations involving a summer storm that have affected Davison County. **Table C.2** in **Appendix C** lists many other significant summer storms that have impacted the county. One notable summer storm occurred on August 5, 2000 when a wet microburst with winds estimated at 120 mph caused heavy damage in and around Mitchell. Apartments and several mobile homes were destroyed, vehicles were overturned, and other damage occurred to buildings and vehicles. The damage path was approximately a mile and a half long and a mile wide, extending over the southwest part of Mitchell.

#### *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 Davison County) lies within an area expected to experience from one to five tornadoes per year per 1,000 square miles. Using this measure, it is reasonable to conclude that Davison County can expect to experience at least one tornado in a typical year.

## *Resources and Capabilities*

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

- Davison County, Mitchell, Ethan, and Mount Vernon all have been designated “Storm Ready” by the National Weather Service (few other communities in South Dakota have this designation).
- National Building Code standards are enforced in Mitchell. The city currently uses the 2012 International Building Code standards. All new structures built in the city must be constructed with a minimum level of structural integrity to withstand high winds.
- Each community in Davison County has an outdoor warning system. There are nine sirens in Mitchell and one each in Ethan and Mount Vernon. All of the sirens have battery backup systems, and all are tested monthly.
- Designated emergency storm shelters are located in Mitchell (Davison County Courthouse), Ethan (Ethan Public School), and Mount Vernon (downtown gym). Each shelter is open anytime the siren in that community is sounding.
- The National Weather Service has a NOAA weather radio transmitter located in Davison County. Davison County also utilizes a cable interrupt system as well as a tone-alert radio system for alert and warning activities.
- Davison County participates actively in public awareness campaigns in conjunction with the South Dakota Office of Emergency Management and the National Weather Service, and sponsors local awareness activities.
- As described above under the Winter Storm profile section, the Central Electric Cooperative maintains a list of priority projects in its work plan, and the Cooperative is a party to the South Dakota Electric Cooperatives Mutual Aid Plan.

## **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 Davison 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. Davison County is vulnerable to this type of flood primarily because of the Lake Mitchell Dam, which is classified as a high hazard dam<sup>3</sup>.

#### *Location*

One of the main areas impacted by flooding in Davison County is along the James River, which, according to the South Dakota Hazard Mitigation Plan, is one of the most flood prone rivers in South Dakota. Draining 12,609 square miles of land in South Dakota, the James flows in a southeasterly direction through the northeast portion of Davison County. The river lacks good drainage features (the slope of the river is only .28 feet per mile), and the river's valley varies in width from a few hundred feet to three miles. Consequently, the James overruns its banks frequently during the spring snow melt, much of the drainage remaining in small swales and basins.

#### *Extent*

Major flooding can occur in Davison County when the James River overflows its banks. Given the river's large drainage basin and the fact that it moves so slowly, excess water from snowmelt and spring rains simply has nowhere to go. During really serious floods, considerable damage occurs to farmland along the river, ruining crops that have already been planted or making planting impossible. James River flooding also can impact local roads, which often remain closed for long periods of time. During the worst years of flooding along the river, the river rises so high that bridges over the river have to be closed. In 2010, the most recent year of severe flooding along the river, all the bridges in Davison County crossing the James River, other than the Interstate Hwy 90 bridge, were closed for approximately six weeks.

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<sup>3</sup> 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.

## *History*

As shown in **Table C.1** in **Appendix C**, several flood events have resulted in a major disaster declaration in Davison County. **Table C.2** in **Appendix C** shows many other flooding 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. Significant water damage occurred in Mount Vernon, with up to four feet of water in homes. Twenty homes were evacuated along Dry Run Creek in Mitchell, and sewage was five feet deep in parts of Mitchell.

Flooding in 1993 resulted in FEMA Disaster Declaration 999, which impacted 39 counties in South Dakota. The flood caused \$53,427,320 in damage throughout the state, and \$11,024,621 of damage to public infrastructure. At the time, the disaster was considered one of the top ten natural disasters ranked by FEMA relief costs. In Davison County, the James River inundated thousands of acres of farmland.

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. Flooding occurred along the James River from the end of March through April, and all time record stages were reached near Mitchell on April 22. 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. The James River Water Development District estimated that five years of flooding had destroyed or severely damaged approximately 75 percent of the forested areas in the James River valley.

Flooding in 2010 in eastern South Dakota was the worst in a decade, resulting in FEMA Disaster Declaration 1915. The James River met or set records for highest ever flood stage at several locations along the river, including Mitchell. Farmland and low-lying areas along the river basin were inundated, and some of the bridges over the river had to be closed until floodwaters subsided, including the SD Highway 38 bridge east of Mitchell (as shown here in an article from the March 19, 2010 Mitchell *Daily Republic*). Several other locations along the James River and Enemy and Twelvemile Creek were under water. Three houses located east of Mitchell were in jeopardy of flooding, but escaped major damage (see **Figure 3.4a**).



*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. Major flood damage in the county is most likely along the James River. 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. Davison County, Ethan, Mitchell, and Mount Vernon participate in the National Flood Insurance Program (NFIP), and each has adopted regulations designed to reduce flood risk within the jurisdiction (with the exception of Ethan, where there is no special flood hazard area). In Mitchell, encroachment into identified floodways, including fill, new construction, and substantial improvements, is prohibited unless certification by a registered engineer or architect is provided demonstrating that encroachments will not result in an increase in flood levels during the base flood discharge. The Davison County flood ordinance is being updated at this time, and is expected to be completed in 2016. The following table provides information on NFIP participation in the county.

**Table 3.2 – National Flood Insurance Program Information**

Jurisdiction	NFIP Participation Status	Date Entered Program	Current Effective Map Date	Insurance Policies in Place	Amount of Insurance	Total Losses	Total Paid
<b>Davison Co.</b>	YES	4/01/1987	9/29/2010	8	\$1,865,200	2	\$834
<b>Ethan</b>	YES	3/08/1989	9/29/2010	0	---	0	---
<b>Mitchell</b>	YES	2/01/1979	9/29/2010	27	\$3,859,200	11	\$84,238
<b>Mt Vernon</b>	YES	6/11/1976	9/29/2010	0	---	0	---

Source: [bsa.nfipstat.fema.gov/reports/reports.html](http://bsa.nfipstat.fema.gov/reports/reports.html)

Information current as of October 31, 2014; loss and payment amounts are totals since 1978.

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

- Davison County has a drainage ordinance that provides a framework for landowners in the county to help them plan and execute drainage activities that could affect their land and neighboring land. The ordinance, first established in 1987 and updated in 2013, is enforced by the Davison County Planning and Zoning Administrator, working under the Davison County Drainage Commission.
- Davison County is a member of the James River Water Development District. The Davison County Commission works with the district regarding James River management issues. Actions that have been funded by the district include removal of downed trees along the river, which has improved water flow.
- The City of Mitchell enforces storm water regulations that require new developments of five acres or more to have detention ponds installed sufficient to reduce runoff from a 100-year storm to that from a five-year storm. Subdivision plans must be approved by the public works director, and must conform to the natural contour of the land. Storm sewers must be designed to carry a minimum of the 5-year storm, and the public works director may require holding the 100-year storm and releasing water at the 5-year pre-developed rate.
- There is an emergency preparedness plan in place for the Lake Mitchell Dam.
- Davison County and the City of Mitchell conduct periodic debris clearing operations in major drainages, including Firesteel Creek and Dry Run Creek.
- Davison County completed a storm bypass structure in 2000 around Mount Vernon using FEMA disaster mitigation funding.
- Major upgrades have been made recently to Ethan's storm water drainage system, including installation of storm sewer piping and ditch cleaning.
- Significant storm water drainage improvements have been made recently in Mitchell, including construction of a new detention pond to mitigate flooding in the area around Avera Queen of Peace Hospital. FEMA hazard mitigation funds were used in the project, which was completed in 2015.

## **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, people with certain medical conditions, 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*

Davison 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 most agricultural producers now have crop insurance and agricultural practices today are more advanced (such as no-till farming and the development of more drought-tolerant crops), the impacts of drought can still be serious.

### *History*

There are 17 drought events recorded for Davison County in the Storm Events Database (see **Table C.2** in **Appendix C**), but obviously many more have occurred, since the earliest drought record in the database is from 1999. The 2012 drought was one of the worst ever; it was so devastating that the State of South Dakota activated a Drought Task Force. A drought in 1976 also was very severe, resulting in an Emergency Declaration that affected almost all counties in South Dakota. The dust bowl years of the 1930s also were particularly severe for Davison 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 Davison 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 Davison County to mitigate the impacts of drought are limited. Each community could implement restrictions against non-essential water use; the City of Mitchell used to do this when the water level in Lake Mitchell, the city's previous water source before joining the Davison Rural Water System, was low. Davison Rural Water does have restrictions on the amount of water that it will provide to the communities it serves, and in turn the towns could ask their residents to cut back water usage if needed.

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 Davison 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.

### *Location*

Wildfires in Davison County are most likely to occur in large areas of extensive brush or unmanaged vegetation, including pastures and other types of grassland. This also includes the hills and draws along the James River, which contain a significant amount of trees and thick brush.

### *Extent*

Each of the local fire departments in Davison 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 in the county from 2000 through May 2015. The following table summarizes this information in terms of the size of the fires that have been fought. It shows that the great majority of the fires have been fairly small, most impacting fewer than three acres.

**Table 3.3 – Wildfires in Davison County**

Less Than 3 Acres	3 to 9 Acres	10 to 24 Acres	25 to 49 Acres	50 to 99 Acres	100 + Acres
105	25	29	9	4	5

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

According to the database, the most common specific causes of wildfires in Davison County are from debris catching fire, from equipment igniting vegetation, and from campfires, although it should be noted that the cause for many of the fires is not known. Information is not available on the dollar amount of damage caused by any of the wildfires, or whether any injuries or deaths occurred.

### *History*

Many wildfires have occurred in Davison County, but nothing on a truly destructive scale. The largest recent fire was one that burned 250 acres in April 2015.

### *Probability*

Very localized, small scale fires are likely to occur somewhere in the county virtually every year. They are more likely to occur during extended dry periods, and can be particularly 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*

Various resources are available locally to mitigate wildfires. Davison County adopted an ordinance in 2012 that prohibits open burning during dry, windy, and other dangerous conditions. The county commission issues burn bans in coordination with the Davison County Emergency Management Director and the local fire chiefs. Each fire department based in the county has firefighters who have had training in fighting wildfires, and each is equipped with apparatus and equipment to handle most of the wildfires they are likely to encounter. Various mutual aid agreements are in place which helps ensure that assistance is available during particularly serious wildfires and other emergency events. A current summary of the capabilities of the departments is presented in the following table.

**Table 3.4 - Fire Department/Ambulance Service Resources and Capabilities**

Dept	Members	Vehicles	HazMat Capability	EMTs	Ambulance Vehicles
Ethan	37	11	None	3	0
Mitchell	24	13	Operational	24	4
Mt Vernon	28	6	None	2	0

## **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 Davison 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*

- Davison County Emergency Management Office
- Fire department in Ethan, Mitchell, and Mt Vernon

#### *Major Medical facilities*

- Avera Queen of Peace Hospital

#### *Shelters*

- A designated emergency storm shelter and disaster relief shelter is located in each community.

#### *Notification*

- Warning siren(s) in each community

### **Other Important Assets**

Included in this category are assets and facilities that are important to the basic everyday functioning of communities, including governmental offices, educational facilities, major businesses, and other facilities. These assets generally would not have a direct role in the local response to a disaster event, although they could play a part.



Many of the assets listed below are shown on the maps presented at the end of this chapter, including the commercial grain storage facilities (grain elevators). These facilities are the economic heart of many small towns in South Dakota and are a very important part of the local economies. They also are particularly vulnerable to fires since they can hold enormous amounts of grain, which is very combustible.

*Governmental offices*

- Davison County Courthouse
- Municipal finance office in each community

*Educational Facilities*

- Ethan Public School (K-12)
- Mount Vernon Public School (K-12)
- Longfellow Elementary School - Mitchell
- Gertie Bell Rogers Elementary School - Mitchell
- LB Williams Elementary School - Mitchell
- John Paul Elementary School - Mitchell
- Mitchell Christian School (K-12)
- Mitchell High School (9-12)
- Dakota Wesleyan University
- Mitchell Technical Institute

*Major Businesses*

Ethan

- Ethan Co-op Lumber
- Farmers Alliance grain elevator

Loomis

- POET Biorefining Ethanol Plant

Mitchell

<i>Employer</i>	<i>Employees</i>
• Avera Health Care System	715
• Trail King	515
• Mitchell School District	450
• Wal-Mart	270
• AKG	270
• Graphic Packaging	225
• Twin City Fan	205

## Mount Vernon

- Edinger Anhydrous Ammonia
- Farmers Elevator grain elevator

## 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, Davison County is not within the top 20% of the most socially vulnerable counties in the nation to environmental hazards; it ranks 42nd among South Dakota's 66 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. Such facilities are located in Mitchell, as shown in **Figure 3.4b**.

## Estimating Losses

This section assesses the vulnerability of Davison 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 digital 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.

- 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<sup>4</sup>.
- 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.
- Housing characteristics within each community were used to help determine the potential local impact of severe summer storms.

### **Actual Loss Methodologies**

- The National Climatic Data Center's Storm Events Database was consulted for historical information regarding weather-related events (see **Table C.2** in **Appendix C**).
- Records from FEMA were consulted for federal assistance provided to Davison County following major disaster declarations through FEMA's Public Assistance program (see **Table C.1** in **Appendix C**).
- Data from the U.S. Dept of Agriculture Risk Management Agency was used to assess crop loss due to a variety of natural hazards.
- 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.

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

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<sup>4</sup> A major limitation of HAZUS is the inadequacies associated with its hydrologic and hydraulic modeling, 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.

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.
- Discussion with county officials about where housing development and other growth may be occurring.

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 areas prone to flooding in the communities.

### **Winter Storms**

All areas of South Dakota, including Davison County, are vulnerable to winter storms. 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 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

Prior Events:

**Tables C.1 and C.2 in Appendix C** show many significant winter storms that have been recorded in Davison County. These events have included blizzards, ice storms, heavy snows, and extreme cold events, as well as high wind events that occurred in the winter months. According to the South Dakota Hazard Mitigation Plan, 74 winter storm events were recorded in Davison County between 1950 and 2012, ranking the county tied for 16th among the state's 66 counties.

Past Damage Amounts:

Winter storms have the potential to cause significant amounts of damage. For instance, the ice storm that occurred in November 2005 resulted in over \$3 million of public assistance costs to the Central Electric Cooperative for its infrastructure within Davison County.

Given Davison 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 Davison County due to various types of winter weather events between 2000 and 2013 was obtained from the Risk Management Agency, and is presented in the following table. For the 2000 through 2013 period of analysis, winter weather-related payouts represented about 2% of all indemnity payouts in Davison County.

**Table 3.5 – Crop Loss Due to Winter Weather**

Year	Frost	Freeze	Cold Winter	Cold Wet Weather
2000	\$15,614	\$0	\$75,640	\$0
2001	\$5,322	\$0	\$176,637	\$0
2002	\$3,817	\$2,582	\$10,613	\$14,543
2003	\$340	\$0	\$2,263	\$0
2004	\$6,151	\$1,365	\$1,008	\$25,563
2005	\$16,920	\$14,899	\$0	\$3,922
2006	\$0	\$0	\$6,771	\$0
2007	\$1,930	\$3,718	\$19,963	\$0
2008	\$0	\$0	\$50,894	\$2,599
2009	\$0	\$7,199	\$441,894	\$28,391
2010	\$0	\$0	\$1,781	\$59,995
2011	\$0	\$2,458	\$115,179	\$110,263
2012	\$0	\$0	\$0	\$4,589
2013	\$0	\$0	\$49,729	\$165,792

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

### Building Exposure:

The total value of buildings in Davison County is approximately \$1,924,360,000, according to the South Dakota Hazard Mitigation Plan, which ranks the county 10th among the state's 66 counties. The median figure for South Dakota counties is \$580,276,000. The county's building exposure can be considered high.

### Population Density:

Davison County is the 10th most populous county in South Dakota. Compared to the rest of the state, Davison is densely populated, with an average of 44.7 people per square mile, much higher than the overall state figure of 10.5 people per square mile. However, this is much lower than the national average of 89.5 people per square mile. Davison County can be considered at least moderate in terms of population density.

### *Development Trends and Future Vulnerability*

Considering all these factors, Davison County's vulnerability to winter storms can be considered high (Davison is rated in the South Dakota Hazard Mitigation Plan as one of only six counties in the state that is highly vulnerable to winter storms), and vulnerability is likely to remain high. As **Table 2.3** showed, the population of Davison County has been increasing at a moderate rate, and this trend is expected to continue. Most of the growth is expected to occur in and near Mitchell, especially around Lake Mitchell, and in the vicinity of the Wild Oak Golf Course on the eastern edge of the city. This growth may slightly increase the county's vulnerability to winter storms, but probably not to any significant degree.

### **Summer Storms**

All areas of Davison 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, property damage if a populated area is struck, and flooding from heavy rain. Like the rest of the Great Plains, Davison County is especially vulnerable to summer storms accompanied by high wind because the landscape is open and there is little topographic relief to block the wind. Structures located at higher elevations are somewhat more vulnerable to high wind events.

The county's vulnerability to summer storms is analyzed first on a general county-level basis, and then specifically for each community. This approach was taken because even though all areas of the county are equally likely to be impacted by summer storms, there are differences in the built environment within each community that may affect their vulnerability to summer storms.

### *General Summer Storm Vulnerability*

To assess the county's vulnerability to summer storms, the methodology used in the South Dakota Hazard Mitigation Plan was adopted for this plan (except that tornadoes and windstorms are considered together). 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:

**Tables C.1 and C.2 in Appendix C** show many significant summer storms that have been recorded in Davison County. These events include hailstorms, thunderstorms, lightning, and tornadoes, as well as high wind events that occurred during the summer. **Table C.2** shows numerous summer storm events, including 24 recorded tornadoes, ten of which were greater in magnitude than F1. According to the South Dakota Hazard Mitigation Plan, Davison County is tied for 27th among the state's 66 counties for the number of tornadoes recorded since 1950, and is tied for 23rd in the number of tornadoes with a magnitude greater than F1.

Past Damage Amounts:

Summer storms have the potential to cause significant amounts of damage. A recent example was a hailstorm in July 2009 that caused several hundred thousand dollars of property and crop damage in Davison County. As shown in **Table C.2**, many summer storm events have caused 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 Davison County due to hail as well as high wind events between 2000 and 2013 was obtained from the Risk Management Agency, and is presented in the following table. The high amount of hail loss in 2009 was due mostly to corn and soybeans that was destroyed in the July storm mentioned above. For the 2000 through 2013 period of analysis, summer storm-related payouts represented about 2% of all indemnity payouts in Davison County.

**Table 3.6 – Crop Loss Due to Severe Summer Weather**

Year	Hail	High Wind	Tornado	Year	Hail	High Wind	Tornado
2000	\$43,668	\$3,872	\$9,768	2007	\$0	\$197	\$0
2001	\$4,691	\$303	\$0	2008	\$91,820	\$39,474	\$0
2002	\$25,234	\$0	\$0	2009	\$981,470	\$360	\$0
2003	\$125,417	\$1,490	\$0	2010	\$0	\$621	\$0
2004	\$146,651	\$7,092	\$0	2011	\$0	\$94,960	\$0
2005	\$9,595	\$0	\$0	2012	\$40,490	\$0	\$0
2006	\$464	\$83	\$0	2013	\$3,065	\$0	\$0

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

Building Exposure:

The total value of buildings in Davison County is approximately \$1,924,360,000, according to the South Dakota Hazard Mitigation Plan, which ranks the county 10th among the state's

66 counties. The median figure for South Dakota counties is \$580,276,000. The county's building exposure can be considered high.

**Population Density:**

Davison County is the 10th most populous county in South Dakota. Compared to the rest of the state, Davison is densely populated, with an average of 44.7 people per square mile, much higher than the overall state figure of 10.5 people per square mile. However, this is much lower than the national average of 89.5 people per square mile. Davison County can be considered at least moderate in terms of population density.

*Local Summer Storm Vulnerability*

At the community level, differences in the local housing stock were analyzed to help determine in a relative sense which communities may be more or less vulnerable to a summer storm powerful enough to cause property damage, such as a tornado or other high wind event. (In absolute terms, Mitchell is by far the most vulnerable community, given its much greater concentration of people and property.) The following variables were considered:

- Median value of owner occupied homes
- Percentage of housing stock built prior to 1950
- Percentage of housing stock built since 1990
- Percentage of mobile homes

**Table 3.7 – Housing Stock Characteristics**

Community	Median Value Owner-Occupied Homes	Housing Stock Built Prior to 1950	Housing Stock Built Since 1990	Mobile Homes
Ethan	\$80,000	44.5%	17.6%	0.0%
Mitchell	\$117,000	28.4%	23.5%	5.2%
Mt Vernon	\$66,800	46.7%	24.5%	9.0%

Source: US Census ([factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?\\_afpt=table](https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?_afpt=table))

As the table shows, the typical home in Mitchell is considerably more valuable than elsewhere in the county, and also is likely to be newer. All other things being equal, it can be assumed that a violent summer storm striking Mitchell would be likely to cause relatively more property damage than a storm occurring in either Ethan or Mount Vernon. The higher percentage of mobile homes in Mitchell and Mount Vernon may put the people in those communities at somewhat higher risk to summer storms with a tornado.

*Development Trends and Future Vulnerability*

Davison County's overall vulnerability to summer storms can be considered moderate, and it is likely to remain so. As **Table 2.3** showed, the population of Davison County has been increasing at a moderate rate, and this trend is expected to continue. Most of the growth is expected to occur in and near Mitchell, especially around Lake Mitchell, and in the vicinity



of the Wild Oak Golf Course on the eastern edge of the city. This growth may slightly increase the county's future vulnerability to summer storms and other hazards.

## **Flooding**

Like all counties in South Dakota, Davison is vulnerable to flooding. Because of 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*

Davison County is definitely 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 Davison County is \$6,417,000. The median figure for all South Dakota counties is approximately \$2,800,000. Overall, Davison ranks 15th among the state's 66 counties in this measure of vulnerability. The potential displaced population in the county was determined to be 530 people.

As was shown in **Table 3.2** on page 28, there are a total of 35 National Flood Insurance Program policies in Davison County, with 13 losses having occurred since 1978 totaling \$85,072 in payments. The number of losses for Davison County ranks 26th in the state, while the amount paid ranks 29th. There is one repetitive loss property in Davison County, with two claims on the property totaling \$17,207 in damages paid.

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 the James River typically experience the most severe flooding. However, the threat to homes and other private property along the James is slight - people simply know better than to build near the river. Moreover, there are no towns in Davison County located along the James River.

Flooding also has a major 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 Davison County due to flooding, as well as excess moisture/precipitation, between 2000 and 2013 was obtained from the Risk Management Agency, and is presented in the following table. For the 2000 through 2013 period of analysis, flood-related payouts represented about 23% of all indemnity payouts in Davison County, second only to drought. Much of the crop loss from flooding in Davison County is due to the James River overflowing its banks onto cropland adjacent to the river.

**Table 3.8 – Crop Loss Due to Flooding**

Year	Flooding	Excess Moisture/ Precip	Year	Flooding	Excess Moisture/ Precip
2000	\$0	\$91,454	2007	\$1,073	\$1,446,417
2001	\$0	\$2,997,536	2008	\$1,202	\$1,940,475
2002	\$0	\$49,663	2009	\$0	\$892,510
2003	\$0	\$108,791	2010	\$0	\$2,950,729
2004	\$11,994	\$1,212,270	2011	\$0	\$5,974,266
2005	\$0	\$292,172	2012	\$0	\$348,514
2006	\$0	\$33,157	2013	\$0	\$173,660

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

The county also is vulnerable to flooding because of the presence of the Lake Mitchell Dam on the northern edge of Mitchell. The dam, which impounds Firesteel Creek, is considered to be a high hazard dam. It was built in 1928, and its spillway was repaired in 1999. Its normal storage capacity is 8,960 acre-feet, with a maximum capacity of 19,585. South Dakota Highway 37 is located just east of the dam’s embankment (within 100 feet in places), and the Mitchell water treatment complex is located directly across the highway from Lake Mitchell. If the dam failed and a catastrophic flood occurred, both the highway and the treatment facility would be affected. Three downstream bridges would be in jeopardy, plus several residential properties within two miles of the dam (as measured along Firesteel Creek). Due to the short distance between the dam and the nearest homeowners, the Lake Mitchell Emergency Preparedness Plan states that floodwater would affect the properties so quickly that flood wave predictions are “immaterial”<sup>5</sup>.

#### *Local Flood Vulnerability*

At the community level, vulnerability to flooding was determined by using FEMA's HAZUS loss estimation software, and by overlaying flood zones shown on FEMA's digital Flood Insurance Rate Maps on parcel layer data. The maps presented at the end of this chapter show the location of the flood prone areas in each community.

Similar to the methodology used in the South Dakota Hazard Mitigation Plan, the HAZUS analysis used the following indicators to assess potential flood losses:

- Building structural damage
- Number of households displaced
- Number of people needing short term shelter

The results of the HAZUS analysis are shown in the following table. It should be noted that the HAZUS runs included land not only within each city's incorporated limits, but also in the area surrounding the communities.

<sup>5</sup> It is believed that the nearest homeowner could be in grave danger if the dam failed. According to the City of Mitchell Public Works Director, the individual was advised when he built his home in 2004 that he could lose his life and property in the event of a catastrophic flood.

**Table 3.9 – HAZUS Base Flood Loss Estimation Results**

Community	Building Structural Damage	Households Displaced	People Needing Shelter
Ethan	\$0	4	0
Mitchell (Firesteel Creek)	\$2,981,800	83	46
Mitchell (Dry Run Creek)	\$3,067,405	506	193
Mitchell (Enemy Creek)	\$63,550	58	19
Mt Vernon	\$112,840	14	1

Source: FEMA HAZUS loss estimation software

Using GIS technology, the flood prone areas in each community (as identified by HAZUS or as shown on FEMA's digital Flood Insurance Rate Maps) were overlaid on parcel data to determine the amount of property potentially at risk to flooding. The table below shows the result of the analysis; note again that the HAZUS runs may have included some land outside the cities' corporate limits.

**Table 3.10 – Property in Flood Prone Areas**

Community	Number of Housing Units	Assessed Value (Residential)	Assessed Value (Commercial)
Ethan	0	\$0	\$0
Mitchell	27	\$1,966,940	\$1,562,070
Mt Vernon	23	\$1,461,720	\$486,375

Sources: HAZUS; FEMA Flood Insurance Rate Maps; Davison County Director of Equalization

*Development Trends and Future Vulnerability*

As **Table 2.3** showed, the population of Davison County has been increasing at a moderate rate, and this trend is expected to continue. Most of the growth is expected to occur in and near Mitchell, especially around Lake Mitchell, and in the vicinity of the Wild Oak Golf Course on the eastern edge of the city. This growth does not appear likely to increase the county's vulnerability to flooding, as it is not occurring in areas prone to flooding.

However, one 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, Davison County is vulnerable to drought. As shown in **Table C.2** in **Appendix C**, there are 17 drought records for the county in the Storm Events Database just since 1999, with many more droughts known to have occurred before then.

The biggest impact of drought in Davison 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 Davison County due to drought and heat between 2000 and 2013 was obtained from the Risk Management Agency, and is presented in the following table. As the table shows, the drought in 2012 was particularly severe, with Davison County ranking 12th among South Dakota counties in drought losses that year. For the 2000 through 2013 period of analysis, drought-related payouts accounted for almost 69% of all indemnity payouts in Davison 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 Davison County farmers <sup>6</sup>.

**Table 3.11 – Crop Loss Due to Drought and Heat**

Year	Drought	Heat	Year	Drought	Heat
2000	\$626,697	\$8,672	2007	\$739,937	\$72,042
2001	\$1,365,562	\$3,467	2008	\$1,594,127	\$30,629
2002	\$7,885,578	\$35,898	2009	\$2,561	\$0
2003	\$382,096	\$28,118	2010	\$0	\$0
2004	\$319,419	\$0	2011	\$244,581	\$119,391
2005	\$3,012,178	\$275,131	2012	\$30,199,836	\$845,036
2006	\$7,539,421	\$398,925	2013	\$478,045	\$6,849

Source: USDA Risk Management Agency ([www.rma.usda.gov/data/cause.html](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 categories, 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.

**Table 3.12 – Drought Impacts in Davison County**

Agriculture	Business & Industry	Energy	Fire	Plants & Wildlife	Relief, Response, Restrictions	Society & Public Health	Tourism & Recreation	Water Supply	TOTAL
97	12	5	9	10	47	19	2	12	213

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

<sup>6</sup> 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.

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, Davison is tied for 37th in total number of impacts among the state's 66 counties, indicating that the county may be somewhat less vulnerable to drought than most other counties in the state.

### *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. It also should be noted that climate change may increase the frequency and severity of droughts in the future, according to many climate prediction models.

### **Wildfire**

The historical evidence shows that Davison County is not especially vulnerable to wildfires. In addition to looking at the records of wildfires that have occurred in the county, 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 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 that only a very small percentage of the Davison County land base is in the High (red) or Moderate (yellow) risk zones. The total population living in these risk zones is summarized in the table below, which is based on 2010 Census Block data.

**Table 3.13 – Population in Wildfire Risk Zones in Davison County**

Housing Units	Total Population	Median Home Value	Total Home Value
277	661	\$108,800	\$30,137,600

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

The population of 661 living in a High or Moderate Risk threat zone ranks Davison County 34th among South Dakota counties, representing about three percent of the county's population. 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), and the median number of people living in a High or Moderate Risk threat zone among the state's counties is 745. The overall vulnerability to wildfire in Davison County appears to be fairly 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 between 2000 and 2013 showed \$1,510 for crop loss due to wildfire in 2011.

*Development Trends and Future Vulnerability*

The development occurring in Davison County may marginally increase the county's future vulnerability to wildfires, but probably not to any significant degree.

**Risk Assessment Summary**

In this section, the vulnerability of Davison County to each of the hazards profiled is summarized. The summary is presented starting with a general county-level overview, and then looking specifically at each of the communities. Maps are presented at the end of the section to augment the analysis, showing areas in the county and within each community where vulnerability to flooding exists; the graphic on page 45 showed areas most vulnerable to wildfire.

Vulnerability to winter storms, summer storms, and drought is not mapped, as those hazards are likely to occur in all areas of the county more or less equally. Because of this,

the vulnerability summaries for the communities are similar, although differences in the built environment within each community do affect their vulnerability to these hazards.

- **Davison County**

*Winter storms:* All areas of the county are highly vulnerable to winter storms. People living in the rural areas of the county are especially vulnerable to winter storms because they are dependent on miles of exposed power lines for electricity. Major winter storms accompanied by heavy snow or freezing rain contribute to the vulnerability of the rural areas by making roads dangerous for travel. Winter storms accompanied by very high winds have the potential to damage residential and commercial property in the county, but damage to infrastructure (especially to power lines) is of much greater concern. In summary, it is a certainty that the county will remain quite vulnerable to winter storms no matter what mitigation actions are taken.

*Summer storms:* All areas of the county are vulnerable to summer storms, and are highly vulnerable to summer storms that are accompanied by tornadoes or hail. Violent summer weather is not uncommon in this part of the country (see "tornado alley" graphic on page 22). Although the county's land base is rather small, most of the land in the county outside the Mitchell area is devoted to raising crops, which are quite vulnerable to the effects of hail and other violent summer weather. The lack of building codes in the county impacts the county's vulnerability to summer storms accompanied by high winds.

*Flooding:* Certain areas of the county are vulnerable to flooding, especially along the James River. Most of the vulnerability is to cropland and to rural county and township roads. Flood damage to rural residences generally is not a major concern, but three residential properties located near the river just east of Mitchell were nearly flooded in 2010 (see **Figure 3.4a**). As discussed on page 42, the area downstream of the Lake Mitchell Dam just north of Mitchell also is vulnerable to flooding.

*Drought:* All areas of the county are vulnerable to drought. Drought's impact in the county is primarily to the agricultural sector, as the water supply throughout the county to residential and commercial users appears to be secure at this time. Each water provider - Davison Rural Water System, Hanson Rural Water System, and Aurora-Brule Water System - gets water from the Missouri River, and none have ever had difficulty delivering sufficient water to their customers.

*Wildfire:* The overall vulnerability to wildfire in the county is fairly low.

- **Town of Ethan**

*Winter storms:* The town is vulnerable to winter storms; business and school closings, power outages, and traffic disruptions are all possible in the town as the result of severe winter storms. The town has equipment to adequately handle most snowfall events, but temporary travel inconveniences are inevitable during especially heavy snowfalls. Winter storms accompanied by very high winds have the potential to damage residential and commercial property in the town, but tree damage (and property damage from falling trees) is more typical. There are no building codes in the town to mitigate risk to winter storms.

*Summer storms:* The town is vulnerable to summer storms accompanied by high winds, tornadoes, or hail. In terms of potential property loss, Ethan is somewhat more

vulnerable to summer storms than the rural parts of the county. However, the value of a typical house in Ethan is modest, and the overall housing stock is relatively old - only 18 percent of homes in Ethan have been built since 1990 (the state figure is 30%), whereas 45 percent of homes were built before 1950 (the state figure is 25%). The lack of building codes in the town impacts the local vulnerability to summer storms accompanied by high winds.

*Flooding:* There appears to be little vulnerability to flooding in the community, although the HAZUS software did identify a small area prone to flooding on the northwest edge of town.

*Drought:* The town is somewhat vulnerable to drought. However, its water supply through the Davison Rural Water System is secure. Davison has never had difficulty delivering enough water to the town.

*Wildfire:* There is essentially no vulnerability to wildfire in the town.

- **City of Mitchell**

*Winter storms:* All areas of Davison County are vulnerable to winter storms, but the loss potential is much greater in Mitchell, given its concentration of population, buildings, and critical infrastructure. Business and school closings, power outages, and traffic disruptions are all possible in the city as the result of severe winter storms. The city has equipment to adequately handle most snowfall events, but temporary travel inconveniences are inevitable during especially heavy snowfalls. Winter storms accompanied by very high winds have the potential to damage residential and commercial property in the city, but tree damage (and property damage from falling trees) is more typical. Risk is mitigated somewhat because Mitchell enforces National Building Code standards, which mandates that all new structures built in the city must be constructed with a minimum level of structural integrity to withstand high winds.

*Summer storms:* The city is vulnerable to summer storms accompanied by high winds, tornadoes, or hail. Given its much higher concentration of residential, commercial, and public property, Mitchell is much more vulnerable to summer storms than any other part of the county in terms of potential property loss. Also, as shown in **Table 3.7**, the typical house in Mitchell is much more valuable than elsewhere in the county, and the housing stock is newer overall, so the city is more vulnerable to property loss in relative terms as well. Property risk is mitigated somewhat because Mitchell enforces National Building Code standards, which mandates that all new structures built in the city must be constructed with a minimum level of structural integrity to withstand high winds.

*Flooding:* The city is quite vulnerable to flooding, as both the historical evidence and the potential flood loss tables (**Tables 3.9** and **3.10**) indicate. Dry Run Creek runs through the heart of the community, while Firesteel Creek and Enemy Creek flow through areas just north and south of the city (see **Figures 3.4a** and **3.4b**). A total of over \$3.5 million of residential and commercial property is vulnerable to flooding in Mitchell, as is some important infrastructure. The city's water treatment plant is partially located in the floodplain below the Lake Mitchell Dam (see **Figure 3.4a**). Two major businesses - a cement plant and a car dealership - are located in the Dry Run Creek flood hazard area (**Figure 3.4b**).



*Drought:* The city is somewhat vulnerable to drought. However, its water supply through the Davison Rural Water System is secure. Davison has never had difficulty delivering enough water to the town. In the past, prior to joining Davison Rural Water, Mitchell's water source was Lake Mitchell. When the water level in the lake was low, the city would ask its residents to cut back on non-essential water use.

*Wildfire:* There is little vulnerability to wildfire in the city itself, but wooded areas on the outskirts of Mitchell may be somewhat vulnerable (see figure on page 45).

- **City of Mount Vernon**

*Winter storms:* The city is vulnerable to winter storms; business and school closings, power outages, and traffic disruptions are all possible in the city as the result of severe winter storms. The city has equipment to adequately handle most snowfall events, but temporary travel inconveniences are inevitable during especially heavy snowfalls. Winter storms accompanied by very high winds have the potential to damage residential and commercial property in the city, but tree damage (and property damage from falling trees) is more typical. There are no building codes in the city to mitigate risk to winter storms.

*Summer storms:* The city is vulnerable to summer storms accompanied by high winds, tornadoes, or hail. In terms of potential property loss, Mount Vernon is somewhat more vulnerable to summer storms than the rural parts of the county. However, the value of a typical house in Mount Vernon is quite modest, and the overall housing stock is relatively old - although 25 percent of homes in Mount Vernon have been built since 1990 (near the state figure of 30%), almost 47 percent of homes were built before 1950 (the state figure is 25%). The lack of building codes in the city impacts the local vulnerability to summer storms accompanied by high winds.

*Flooding:* The city is definitely vulnerable to flooding, as **Table 3.9** and **Table 3.10** both clearly indicate. A total of over \$1.9 million of residential and commercial property is at risk, or about \$4,216 on a per capita basis. In addition to the many residential properties located in the flood hazard zone, several commercial properties (including one block in the downtown area), and two public properties - the fire hall and the Mount Vernon Public School - are affected.

*Drought:* The town is somewhat vulnerable to drought. However, its water supply through the Davison Rural Water System is secure. Davison has never had difficulty delivering enough water to the town.

*Wildfire:* There is essentially no vulnerability to wildfire in the city.

Figure 3.1 - Residential Building Permits Issued in Davison County (2010 - 2015)

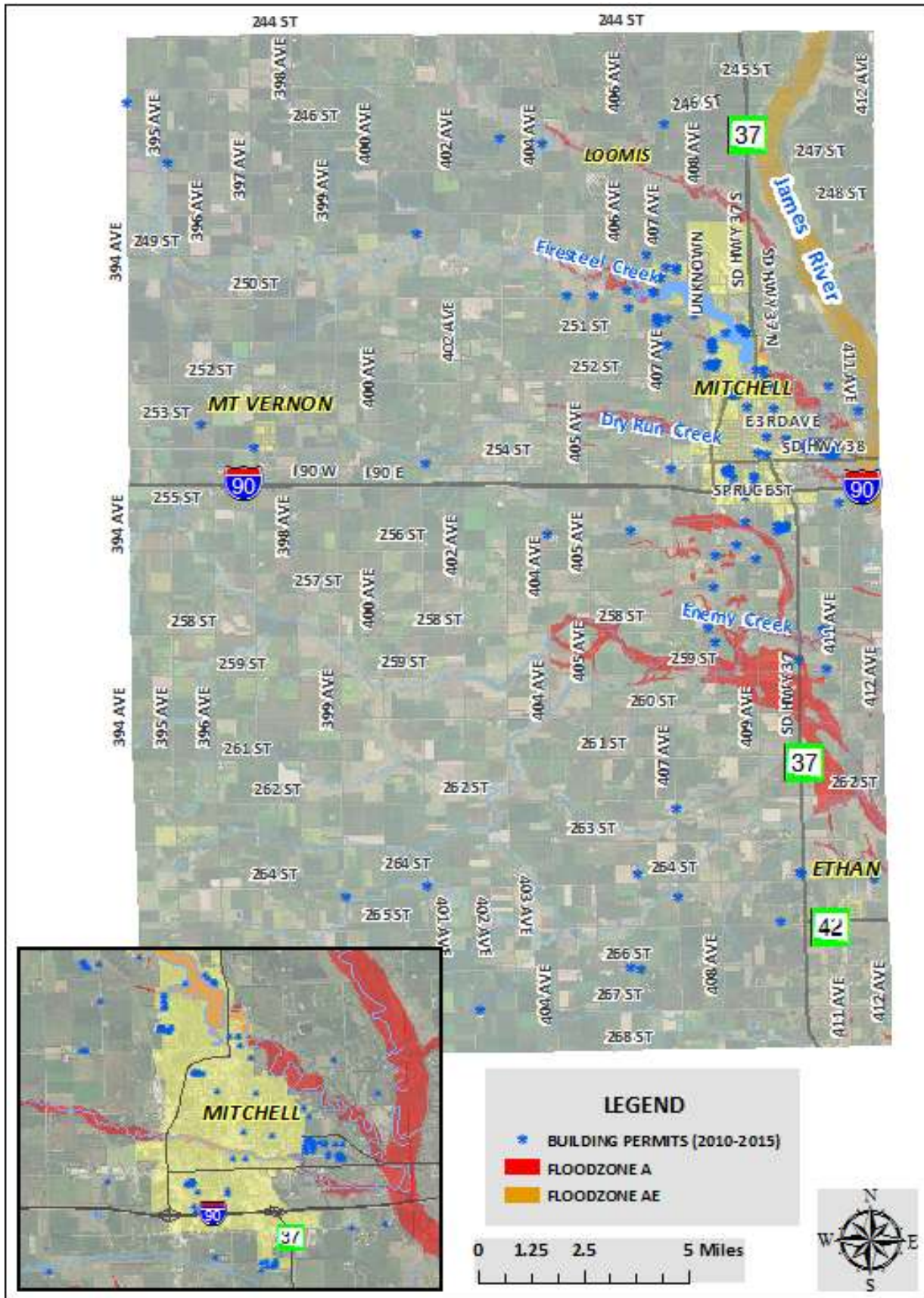


Figure 3.2 - Davison County

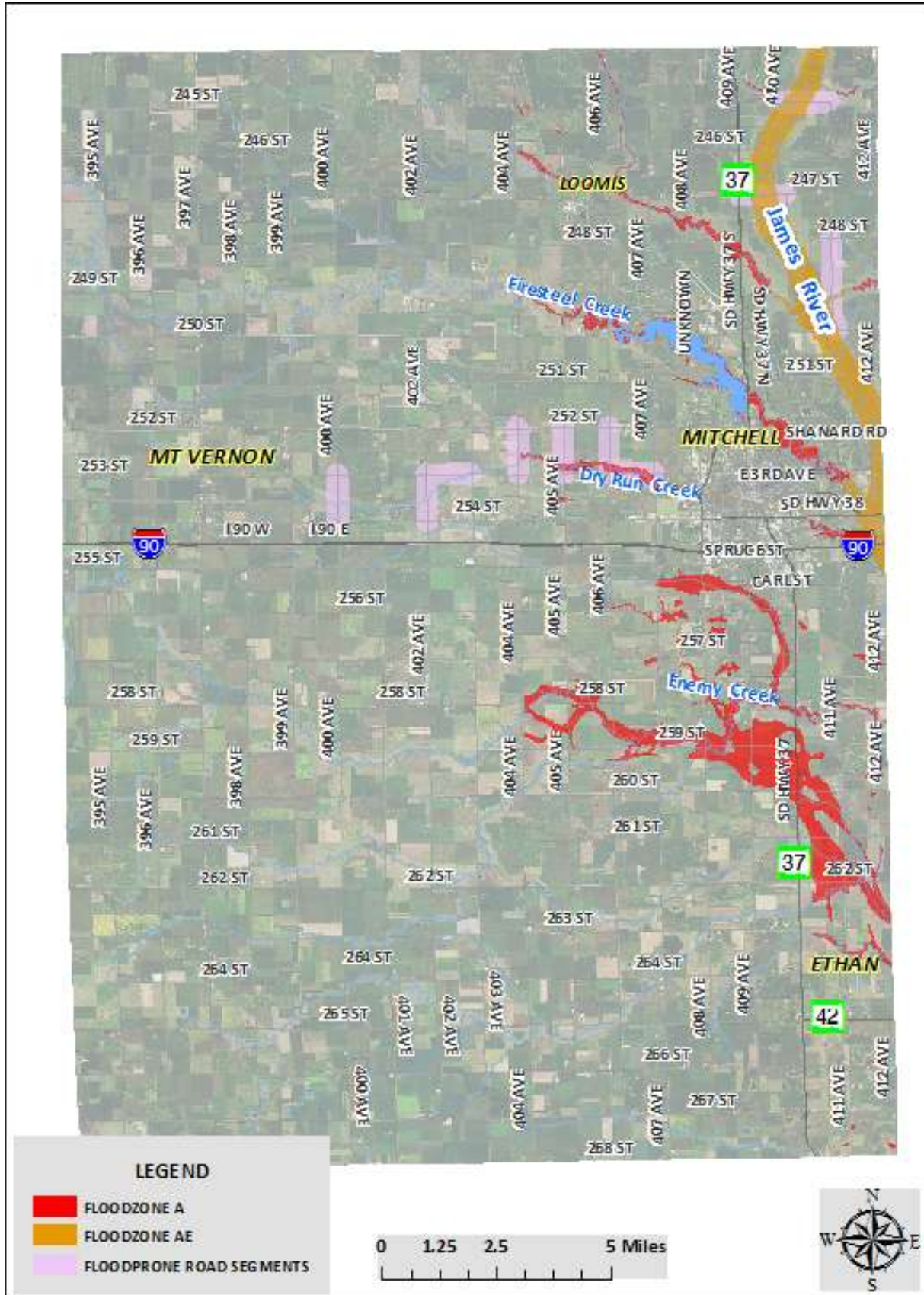


Figure 3.3 - Ethan



Figure 3.4a - Mitchell Area

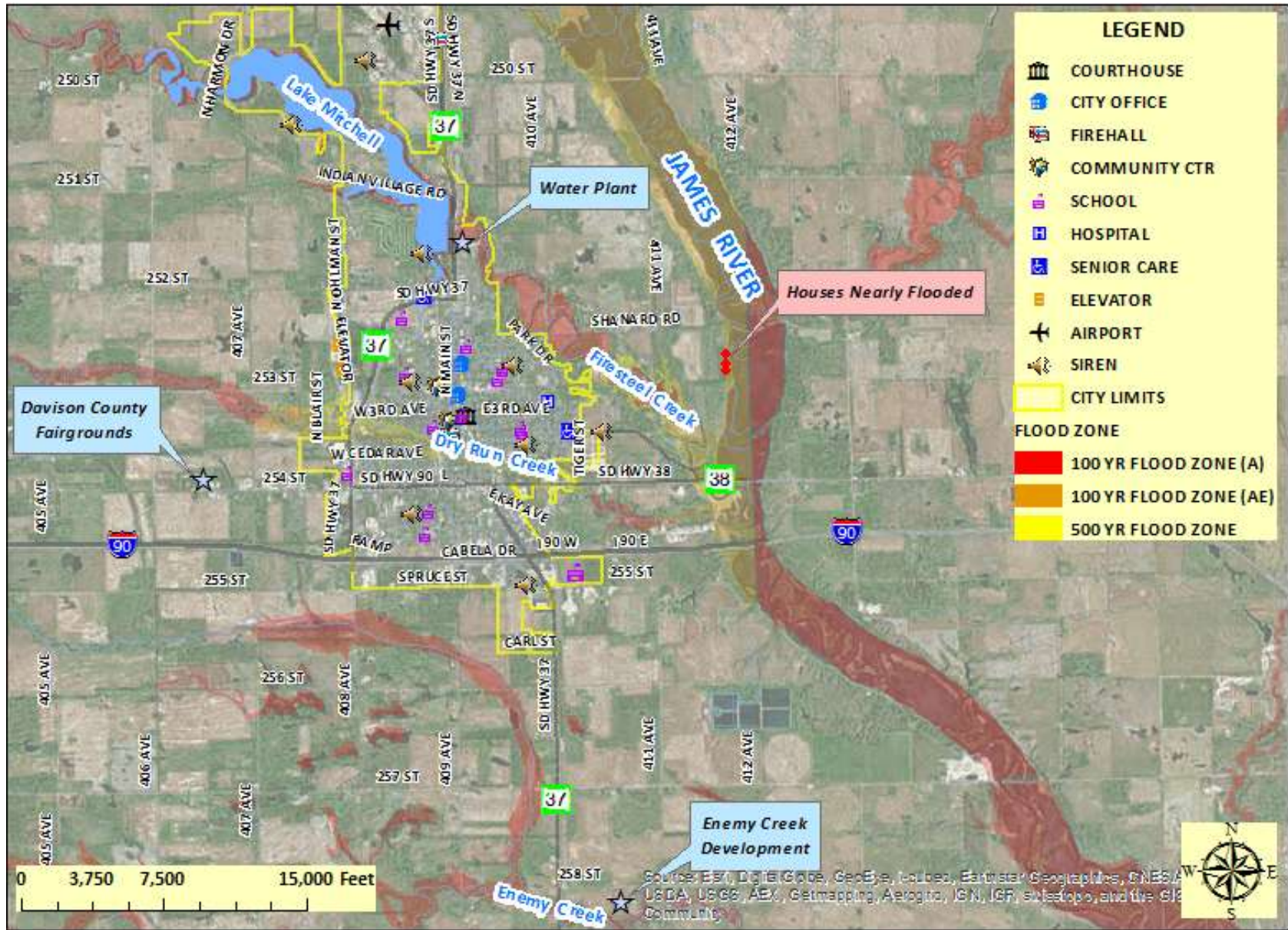


Figure 3.4b - Mitchell (Central City)

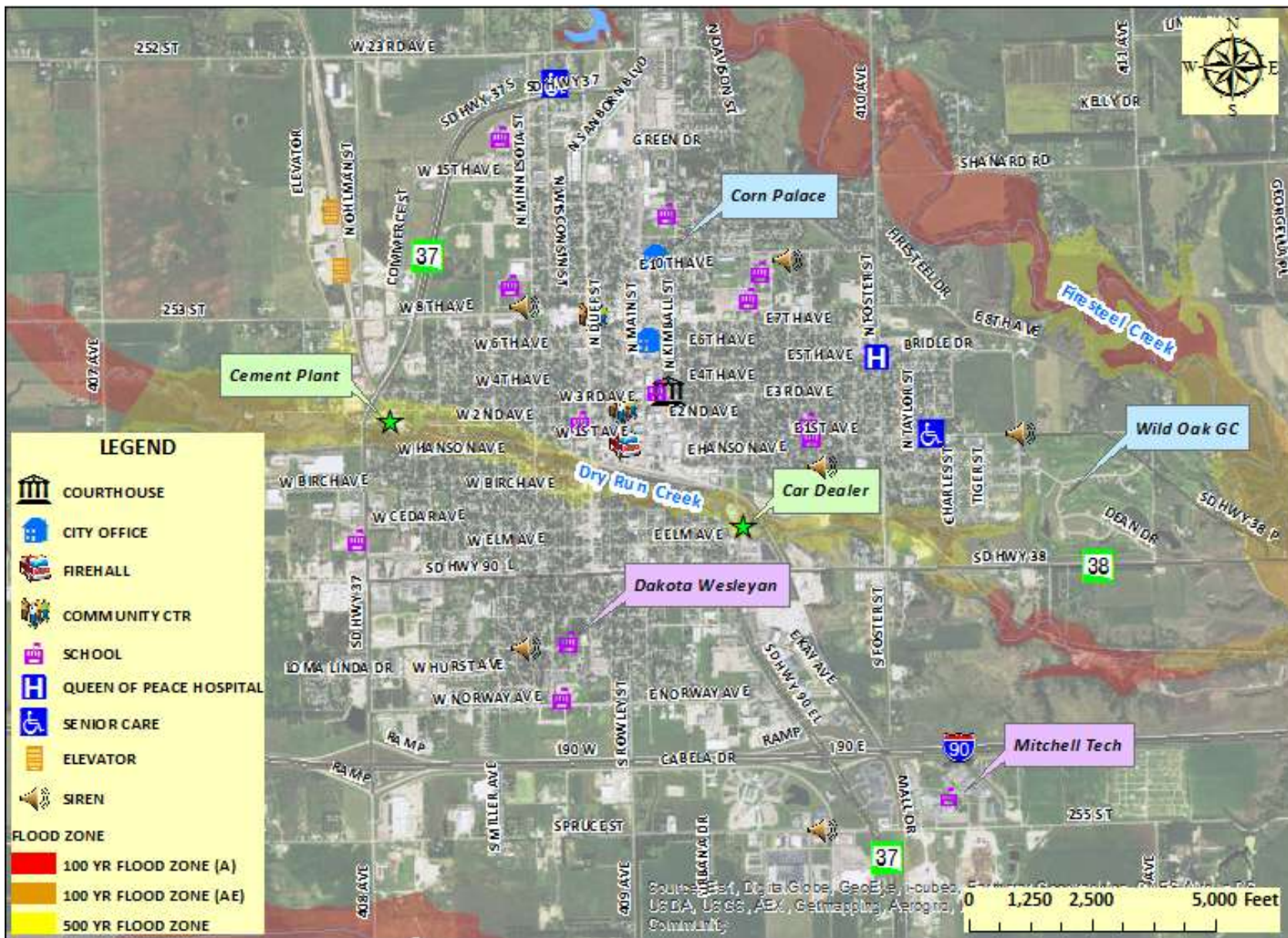
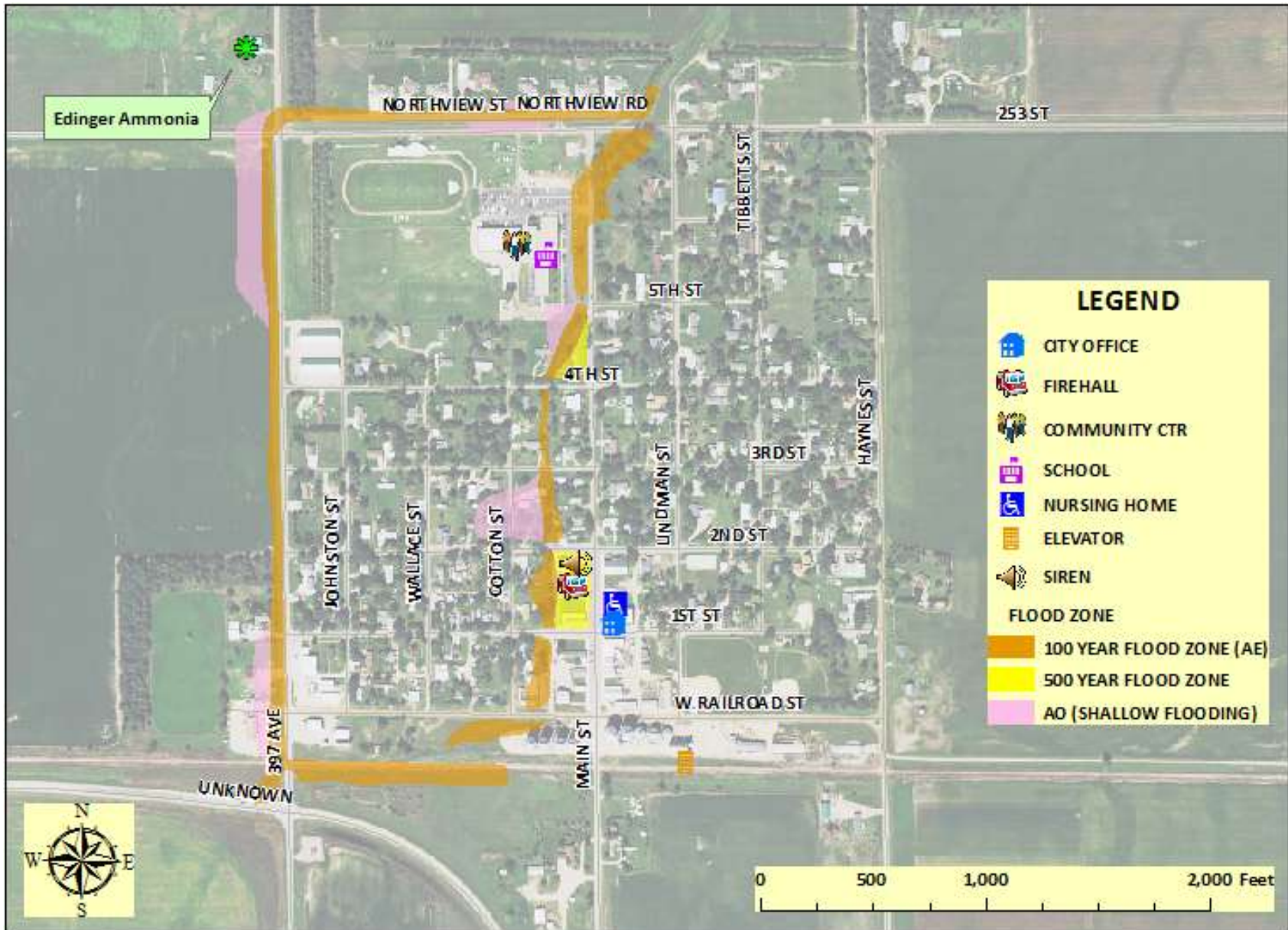


Figure 3.5 - Mount Vernon



# CHAPTER IV

## RISK MITIGATION STRATEGY

### **Background**

The previous chapter described the types of hazards most likely to impact Davison 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. The team began by reviewing the goals listed on pages 49 and 50 of the county's current plan. 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 62). In the end, the team decided to essentially follow the goals stated in the State of South Dakota hazard mitigation plan. Here are the general goals that the team decided upon:

- Minimize loss of life and injuries from hazards.
- Minimize damage to existing and future structures within hazard areas.
- Reduce losses to critical facilities, utilities, and infrastructure from hazards.
- Reduce impacts to the economy and the environment from hazards.

After the team had settled on the 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 and infrastructure 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 and infrastructure 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 and infrastructure 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 and infrastructure losses due 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**

<b>Mitigation Action</b>	<b>Hazard</b>	<b>Current Status</b>
<b>DAVISON COUNTY</b>		
Ensure continued NFIP compliance and implement policies that will reduce risk exposure to flooding. Improve level of communication with State NFIP coordinator.	Flooding	County still compliant
Encourage people in flood-prone areas to buy flood insurance.	Flooding	Continuing on a case by case basis. County flood ordinance is being updated at this time.
Continue working with the James River Water Development District regarding James River management.	Flooding	Continuing
Elevate 500 ft of 405 Ave between 252nd and 253rd Streets.	Flooding	No progress - the township does not have sufficient funds
Gather data to create a more precise loss estimate for winter storms.	Winter storm	No progress

<b>Mitigation Action</b>	<b>Hazard</b>	<b>Current Status</b>
Gather data to create a more precise loss estimate for summer storms.	Summer storm	No progress
Adopt and enforce National Building Code standards.	Summer storm	No progress yet, but county commission is considering adopting standards.
Develop disaster mitigation public awareness program.	All disasters	Outreach efforts are being made to educate the public about disaster mitigation.
Aggressively enforce burn bans as conditions warrant.	Wildfire	Continuing
<b>TOWN OF ETHAN</b>		
Ensure continued NFIP compliance and implement policies that will reduce risk exposure to flooding. Improve level of communication with State NFIP coordinator.	Flooding	Town still compliant
Upgrade storm water infrastructure.	Flooding	Some progress - the town's sanitary and storm sewer systems have been separated.
Build a tornado safe room or community shelter.	Summer storm	No progress
Reimbursement for firefighter training and certifications.	Wildfire	Completed
<b>CITY OF MITCHELL</b>		
Ensure continued NFIP compliance and implement policies that will reduce risk exposure to flooding. Improve level of communication with State NFIP coordinator.	Flooding	City still compliant
Encourage people in flood-prone areas to buy flood insurance.	Flooding	Continuing on a case by case basis.
Upgrade storm water infrastructure.	Flooding	Some progress has been made, including a detention pond to prevent flooding at Queen of Peace Hospital.
Initiate study to determine degree of vulnerability to flooding below Lake Mitchell Dam, including predicted area of inundation if the dam failed.	Flooding	No progress
Reimbursement for firefighter training and certifications.	Wildfire	Completed
<b>CITY OF MOUNT VERNON</b>		
Ensure continued NFIP compliance and implement policies that will reduce risk exposure to flooding. Improve level of communication with State NFIP coordinator.	Flooding	City still compliant
Engineering study of storm water flow, including development of storm water runoff map.	Flooding	No further progress
Upgrade storm water infrastructure, including curbing and guttering of city streets.	Flooding	No progress
Upgrade wastewater infrastructure.	Flooding	Mostly completed
Generator purchase.	Winter storm	Completed - a generator has been installed in fire hall, and sewage lift station.
Reimbursement for firefighter training and certifications.	Wildfire	Completed
<b>CENTRAL ELECTRIC COOPERATIVE</b>		
Project #1 - Replace 3 miles of overhead line with underground line.	Winter storm	Completed

Mitigation Action	Hazard	Current Status
Project #2 - Replace 6 miles of overhead line with underground line.	Winter storm	Completed
Project #3 - Replace 4.5 miles of overhead line with underground line.	Winter storm	Completed
Project #4 - Replace 2 miles of overhead line with underground line.	Winter storm	Completed

Following this review, the team looked at a list of potential mitigation actions based on FEMA's guidance document *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards* that had been previously provided to the team members. The actions on the list can be grouped into the following general categories:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include:
  - Adopting zoning regulations.
  - Preserving open space.
  - Reviewing and strengthening local flood ordinances.
  - Adopting stormwater management regulations.
  - Adopting National Building Code standards.
  - Developing ordinances to restrict the use of public water resources for non-essential usage.
  
- **Education and Outreach:** Actions to inform and educate elected officials, stakeholders, property owners, and the general public about potential risks from hazards and potential ways to mitigate them. Examples include:
  - Developing a disaster mitigation public awareness program.
  - Participating in the StormReady program.
  - Participating in the Firewise Communities program.
  - Making presentations to school groups or neighborhood organizations.
  - Mailings to residents in hazard-prone areas.
  - Encouraging people to take various water-saving measures.
  
- **Property Protection:** Actions that modify existing buildings or infrastructure to protect them from a hazard or remove them from the hazard area. Examples include:
  - Property acquisition, elevation, or relocation (includes elevating roads in flood-prone areas).
  - Making structural retrofits to facilities.
  - Replacing overhead utility lines with underground lines.
  
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include:

- Using low-lying areas as natural water retention ponds.
  - Restoring and preserving wetlands.
  - Restoring stream corridors.
  - Forest and vegetation management.
  - Providing incentives for xeriscaping.
- Structural Projects: Actions that involve the construction of new structures to reduce the impact of a hazard. Examples include:
    - Upgrading stormwater infrastructure, such as culverts and storm sewer piping.
    - Building floodwalls.
    - Building tornado safe rooms.

It was explained to the planning team that hazard mitigation is defined as *sustained action* taken to reduce or eliminate the long-term risk to people and property from hazards, as opposed to preparedness planning. Still, some actions to enhance disaster preparedness 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, and purchasing communications equipment for emergency responders.

The final list of mitigation actions identified by the planning team is shown in **Table 4.2**, which lists the actions in the priority order agreed upon by the planning team. Prioritizing the actions is important because it is unlikely that 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 completed within a few years, while Long term actions may take several years or more 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:

#### FEMA grant programs

- Hazard Mitigation Grant Program (HMGP) <sup>7</sup>
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

#### Other grant and loan programs/sources

- Community Development Block Grant program
- Economic Development Administration
- FEMA Assistance to Firefighters Grant program
- James River Water Development District
- South Dakota State Homeland Security Program
- South Dakota Dept of Environment and Natural Resources

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<sup>7</sup> To date, one project within the county has been awarded HMGP funds. The City of Mitchell was awarded HMGP funding to implement a project to protect the Avera Queen of Peace Hospital from flooding. The project was completed in 2015.

- 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

## **Mitigation Action Plan**

The Davison 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:

- Davison County Comprehensive Plan
- Davison County Local Emergency Operations Plan
- Davison County Drainage Plan
- Davison County Master Transportation Plan
- Davison County Hazardous Materials Plan
- City of Mitchell Comprehensive Plan and Zoning Ordinance
- Central Electric Cooperative construction work plan
- Lake Mitchell Dam Emergency Preparedness Plan

The plan also needs to work in conjunction with the local flood ordinances in each community to reduce future flood risk. As discussed earlier, these ordinances are in place at the county level, and in Mitchell and Mount Vernon.

**Table 4.2 - Proposed Mitigation Actions**

<b>DAVISON COUNTY ACTIONS</b>	<b>PRIORITY</b>	<b>PARTY</b>	<b>TIME</b>	<b>COST</b>	<b>RESOURCES</b>
Implement building code standards.	HIGH	County Commission; Planning Director	SHORT	Minimal	N/A
Siren installation at Loomis.	HIGH	County EMD	MID	\$30,000	HMGP; OEM
Siren installation at Enemy Creek development.	HIGH	County EMD	MID	\$30,000	HMGP; OEM
Siren installation at Davison County fairgrounds.	HIGH	County EMD	MID	\$30,000	HMGP; OEM
Ensure continued National Flood Insurance Program compliance. County will work to encourage more people to acquire flood insurance.	HIGH	County Floodplain Administrator	SHORT	Minimal	N/A
Continue working with the James River Water Development District regarding management of the James River.	HIGH	County Commission	SHORT	Minimal	N/A
Make improvements to Kibbee Ditch.	HIGH	County Commission	LONG	\$4,500,000	HMGP; DENR; JRWDD
Make improvements to Firesteel Creek.	HIGH	County Commission	LONG	\$6,000,000	HMGP; DENR; JRWDD
Make drainage improvements to county roads to mitigate against flooding.	HIGH	County Commission; Hwy Superintendent	MID/ LONG	\$1,000,000	HMGP
Participate in reverse 911 emergency notification system (e.g. Code Red).	MED	County EMD	MID	≈\$30,000	OEM
Renew status in StormReady Program, and contact National Weather Service to maintain program requirements.	MED	County EMD	SHORT	Minimal	N/A
Update county burning ordinance to require people doing open burns to contact authorities.	MED	County Commission	SHORT	Minimal	N/A
Generator acquisition for Ethan public school.	MED	County EMD; Ethan School Board	MID	\$50,000	HMGP
Generator acquisition for Mount Vernon public school.	MED	County EMD; Mt Vernon School Board	MID	\$50,000	HMGP
Install emergency storm shelter in Ethan	MED	County EMD; Ethan Town Board	MID	≈\$65,000	HMGP
Install emergency storm shelter in Mount Vernon.	MED	County EMD; Mt Vernon City Council	MID	≈\$65,000	HMGP
<b>MITCHELL ACTIONS</b>	<b>PRIORITY</b>	<b>PARTY</b>	<b>TIME</b>	<b>COST</b>	<b>RESOURCES</b>
Install emergency storm shelters at soccer complex and at city campground.	HIGH	City Council; Public Works Director	MID	\$750,000	HMGP

Ensure continued NFIP compliance by contacting state NFIP coordinator for more information about NFIP program.	HIGH	City Council; City Floodplain Admin	SHORT	Minimal	N/A
Make improvements to Dry Run Creek, including lowering box culvert at Minnesota Street.	HIGH	City Council; Public Works Director	LONG	\$9,500,000	HMGP; DENR; JRWDD
Require groups with over 200 participants coming into Mitchell to have an emergency response plan in case emergency shelter is needed.	HIGH	City Council; Planning Director	SHORT	Minimal	N/A
Continue participation in StormReady Program.	MED	City Council	SHORT	Minimal	N/A

**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
JRWDD	James River Water Development District	USDA RD	US Department of Agriculture Rural Development
OEM	SD Office of Emergency Management		



To ensure that this plan functions smoothly with local priorities, the Davison 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. These visits will occur in conjunction with the director's annual visit to each municipality to update them on Davison County Emergency Management's activities for the previous year.

### **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 a person or form a committee responsible for ensuring this happens. The individual/committee will be responsible for understanding the mitigation plan, and would represent the jurisdiction at the Davison 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 Davison 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 Davison County Emergency Management Director. The director will work with the support of the Davison County Local Emergency Planning Committee (LEPC). The LEPC meets on a monthly basis, and it includes representation from all municipalities within the county, including Ethan and Mount Vernon, which chose not to participate in the development of this plan.

It is anticipated that the LEPC will review the plan annually. Major points of discussion would include whether the risk assessment remains valid, whether the mitigation goals and objectives identified in the plan remain sound, and progress being made on implementing the mitigation actions identified in the plan. An opportunity would be provided to add additional mitigation actions to the plan as needed, and to discuss whether development or other factors are affecting any of the jurisdictions' vulnerability to any hazards.

After the LEPC's plan review 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 Davison 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.
- 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. As discussed earlier, climate change may increase the county's vulnerability to drought, and possibly other hazards.
- 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 Davison 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 12 to 18 months 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 development of this plan update, a sustained effort was made to involve the general public in the plan. Outreach included press releases that were published in the *Mitchell Daily Republic* and information posted on the Davison County website. Looking forward, the outreach strategy will evolve over time as different methods are used to get greater public participation in the mitigation planning process. Once approved, the plan will be available for the public to see at the emergency management office, and on the Davison County website. Other outreach activities may include:

- Community visits by the Emergency Management Director to discuss the plan (local schools, civic meetings, etc)
- Press releases and articles about the plan published in the local newspapers.
- Information about the plan included 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 Davison County LEPC. The meeting will be made known to the public through a notice in the *Mitchell Daily Republic* 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
Appendix B	Planning Meeting Items
Appendix C	History of Previous Hazard Occurrences
Appendix D	References

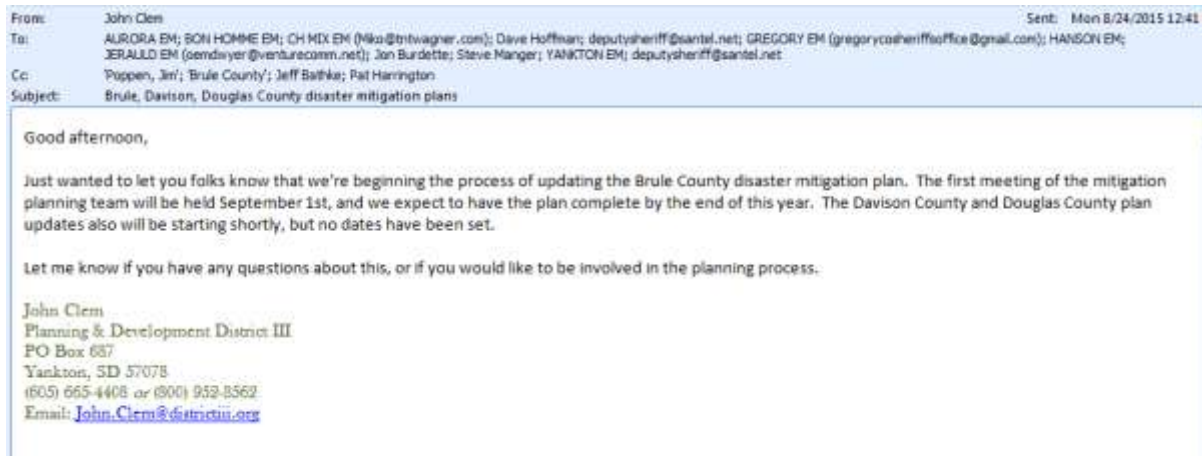
## **APPENDIX A: Outreach Effort**

This section documents the outreach effort that was used to solicit input into the plan. The effort included an email that was sent prior to the first meeting to emergency management directors in several nearby counties, and another message that was sent to prospective planning team members prior to the first planning team meeting.

Press releases about the plan were placed in the Mitchell *Daily Republic* following the first two planning meetings and during the public review period after the final meeting, and information about the plan update also was made available on the Davison County website, as well as the Planning & Development District III website.

The remainder of this section shows the public outreach items, including reproductions of some of the emails that were sent, screenshots of the Davison County website, and the articles as they appeared in the *Daily Republic*.

### ***Email to Emergency Management Directors:***



## Email sent prior to Meeting #1:

From: Jeff Bathke [jeffb@davisoncounty.org] Sent: Thu 9/3/2015 5:13  
To: Bathke, Michelle; Brett Scott; Bruce Sparks; Gene Dainert; John Claggett; John Clem; John Vermeulen; Kathy Goetsch; kens@centralec.coop; MtVernonCity; nputnam@cityofmitchell.org; Tim McGarran; Town of Ethan ~ Sonya Hespe; Andy Mentele; Becky Pitz; Brian McLure; Carey Brenner; Dan Nuck; David Baker (aurcoemng@goldenwest.net); Dennis Walz; Denny Kiner Sr.; Ernie Anderson; J. P. Skelly (jornneis@kornq107.com); Jackie Horton; Jeff Bathke; Jerry Toomey (toomey@cityofmitchell.org); Kevin Kayser; Logan Teut; Lyndon Overweg; Major Gary Cole; Major Vickie Cole; Marius Laursen; Marlene Hanes; Moyer, Sgt. Robert (Robert.J.Mayer@state.sd.us);  
Cc:  
Subject: LEPC Meeting

Message: LEPC Minutes 8-12-15.pdf (113 KB) LEPC Agenda 9-9-15.pdf (106 KB) Disaster Mitigation Plan Agenda Meeting .pdf (197 KB)

LEPC Members and Pre-Disaster Mitigation Planning Members,

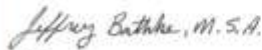
The next LEPC Meeting will be September 9, 2015 at 10:30 AM in the Emergency Operation Center (EOC) in the courthouse. We will have a very brief LEPC Meeting, then turn the meeting over to John Clem from District III, who is updating the Davison County Pre-Disaster Mitigation Plan (PDM), which was last completed in 2003-2004. The plan is developed to prevent or reduce the cost incurred by businesses, property owners, and governmental entities from disasters that may occur in Davison County. The plan identifies and analyzes the hazards that occur in the county, and proposes a mitigation strategy to minimize future damage caused by those hazards.

Representation from Davison County, Mitchell, Mt. Vernon, and Ethan are highly encouraged to attend the strategic planning meetings. Local Emergency Planning Committee (LEPC) members, as well as others who will respond to an emergency situation, should be in attendance. The plan will assess risks in the county, present the county's mitigation strategy, and discuss how the county will implement the plan.

If everyone shows up it may be crowded, but we will fit. Please let me know if you are not able to make the meeting, if you have not already done so. Please be thinking of any areas the county can address to mitigate severe damage.

Attached you will find (copies will be provided at the meeting):

1. August LEPC Minutes
2. September LEPC Agenda
3. Disaster Mitigation Plan Agenda



Jeff Bathke  
Director of Planning & Zoning and Emergency Management  
Davison County

***From Davison County website:***

### **DISASTER MITIGATION MEETING**

Blizzards, tornadoes, and floods are a few of the natural hazards that strike this part of the country. Events like these have the potential of causing thousands of dollars annually in damage to property. To lessen the impact of these disasters in the future, Davison 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 Davison County, you are urged to attend the meetings.

The first meeting will be held September 9, 2015 at 10:30 AM in the Davison County Emergency Operations Center on the first floor of the courthouse. Agenda items for the initial meeting include why the plan is being updated, and identifying and profiling the hazards that impact the county. We will also review the county's current disaster mitigation plan.

Additional information about the meeting can be obtained by calling the Davison County Emergency Management Office at 605 995-8615 or by email @ [jeffb@davisoncounty.org](mailto:jeffb@davisoncounty.org). You can also call John Clem at (800) 952-3562, or email him @ [John.Clem@districtiii.org](mailto:John.Clem@districtiii.org). This is an excellent opportunity for your voice to be heard.



Article published after Meeting #1 in Mitchell Daily Republic Sept 10, 2015:

## County opens discussions for a disaster relief plan

By JAKE SHAMA  
The Daily Republic

Mitchell officials are working to ensure Davison County continues to receive aid from the Federal Emergency Management Agency.

John Clem, community development specialist from Planning & Development District III, based in Yankton, led a discussion Wednesday in the Davison County Courthouse to create a relief plan, which will ensure Davison County is eligible for all FEMA aid. It was the first of three meetings that will take place.

Although FEMA does not require the update, the national disaster relief organization requests all counties to update disaster relief plans every five years.

"Technically, the county doesn't have to do it," Clem said, "but if they don't, then they aren't eligible for certain types of FEMA funding."

Without this update, FEMA would continue to provide emergency services after a disaster such as a tornado or flood, but Davison County would lose access to FEMA's disaster mitigation funds, which can

be used for development projects before a disaster takes place.

"Instead of being reactionary after a disaster happens, these funds are to do a project to make the situation better," Clem said.

Clem said the funds are often used to bury power lines. He said Central Electric has submitted requests for funding before to bury lines in rural areas of Davison County.

The plan will cost \$10,000 to implement, the cheapest in the state, Clem said. However, this can be

See **DISASTER**, Page A6



A board of officials representing organizations and departments throughout Mitchell Wednesday to discuss the creation of a new disaster relief plan for Davison County.



**Today's forecast:** Intervals of clouds and sunshine. North-northeast winds 6-12 mph. Details, Page 2.



**High** **Low**  
**70°** **42°**

**Delivery questions?**  
Circulation: 996-5514  
**Story tips?**  
Newsroom: 996-5516

Classified .....	B5	Life .....	
Comics .....	B4	TV guide .....	
Sports .....	B1	Obituaries .....	
Business .....	A4	Opinion .....	

**Email sent prior to Meeting #2:**

From: Jeff Bathke [jeffb@davisoncounty.org] Sent: Mon 10/5/2015 10:00 AM  
 To:  
 Cc:  
 Subject: LEPC/PDM Meeting

Message | [Mtg 2 Agenda.docx \(16 KB\)](#)

Greetings,


A few are not able to make this meeting, but several are; so we will have the second Pre-Disaster Mitigation Plan (PDM) meeting on October 7<sup>th</sup> @ 10:30 AM in the EOC on the 1<sup>st</sup> floor of the Courthouse.

Representation from each city/organization are **highly encouraged to attend** the strategic planning meetings. Local Emergency Planning Committee (LEPC) members, as well as others who will respond to an emergency situation, should also be in attendance.

The plan was developed to prevent or reduce the cost incurred by businesses, property owners, and governmental entities from disasters that may occur in Davison County. The plan identifies and analyzes the hazards that occur in the county, and proposes a mitigation strategy to minimize future damage caused by those hazards.

District III Planning has been contracted to update the plan. The plan will assess risks in the county, present the county's mitigation strategy, and discuss how the county will implement the plan. I have attached the agenda and will have copies available at the meeting.

Thanks,

  
 Jeff Bathke  
 Director of Planning & Zoning and Emergency Management  
 Davison County  
[jeffb@davisoncountv.org](mailto:jeffb@davisoncountv.org)  
 605-995-8615  
 605-999-2863

**Article published after Meeting #2 in Mitchell Daily Republic Oct 8, 2015:**

# Local emergency officials continue to make disaster mitigation progress

By EVAN HENDERSHOT  
The Daily Republic

Davison County officials continued their proactive steps to reduce the severity of potential disasters in the region.

The Davison County disaster mitigation plan is nearly complete after the second meeting of city, county and local health officials at the Davison County Courthouse on Wednesday.

The plan, which is meant to help the county get as much assistance from the Federal Emergency Management Agency as possible, will likely be completed at the group's third and final meeting.

But two attendees of the meeting, Davison County Emergency Management Director Jeff Bathke and Mitchell Chief of Public Safety Lyndon Overweg each had an item to add before the first draft of the plan is completed.

When John Clem, a community development specialist from the Yankton-based Planning and Development District III who led the meeting, asked for any updates on flood vulnerability in the county, Bathke brought the group of 19 officials' attention to the Dry Run Creek flood plain.

Bathke said there are currently about 100 homes in the flood plain adjacent to Dry Run Creek, many of which do not know they are in the recently redrawn flood plain altered by FEMA. Dry Run Creek runs west to east from South Minnesota Street to South Burr Street.

The committee decided the county should attempt to encourage residents near the flood plain to purchase flood insurance in an attempt to mitigate the potential costs to the homeowner after a disaster.

Bathke said they could add the flood plain information to the county's website to increase awareness about where the flood plain is located. He said this could lead to more people installing soil embankments to get out of the danger of the flood plain.

**See MITIGATION, Page A6**



**BATHKE**



**OVERWEG**

Mostly cloudy  
inds at 10-20

**High Low**

Delivery questions?  
Circulation: 998,5514

Classified ..... B6 Life ..... A7

## Email sent prior to Meeting #3:

From: Jeff Bathe [mailto:jeff@daivsoncounty.org] Sent: Mon 11/9/2015 5:53  
To: Bathe, Michelle; Brett Scott; Bruce Spain; Dale Wilson; Dan Schroeder; Davis Barick; Gena Deibert; Jake Dhama; John Caggatt; (johncaggatt@ent-hl.net); John Clark; John Harmsen (jharmsen@cityofmitchell.org); Kathy Goetsch; kate@centralia.com; Miamoncity; rgsuzan@cityofmitchell.org; Tim McGinnis; Town of Ethel - Sonya Hepp; Andy Henkle; Becky Pitt; Berlema, Dave (Dave.Berlema@state.sd.us); Brian McClure; Carey Brenner; Dan Pugh; David Baker (darcleming@quidevest.net); Dennis Wiley; Denny Kiser Sr.; Ernie Anderson; J. P. Shady (shady@quidevest.net); Jodie Horton; Jeff Bathe; Jerry Toomey (jtoomey@cityofmitchell.org); Kevin Kayser; Logan Teft; Lyndal Overveg; Major Gary Cole; Major Wade Cole; Mark Laursen; Mark Jennings; Marlene Haines; Mayor, Sgt. Robert (Robert.J.Navar@state.sd.us); Michele Carpenter (m.carpenter@lakotacounting.net); Mike Kistler  
Cc:  
Subject: November LEPC/PDM Meeting  
Message: 1-LEPC Agenda 11-18-15.pdf (337 KB); 6-Disaster Mitigation Plan Agenda-Meeting #3.pdf (155 KB); 7-Disaster Mitigation Plan-Meeting #3 Questions.pdf (165 KB); LEPC Unsigned Minutes 10-7-15.pdf (114 KB)

Greetings,

The third and final Pre-Disaster Mitigation Plan (PDM) meeting will be November 18<sup>th</sup> @ 10:30 AM in the EOC on the 1<sup>st</sup> floor of the Courthouse. Note this is a week later than our normal meeting due to Veterans Day.

Representation from each city/organization are **highly encouraged to attend** the strategic planning meetings. Local Emergency Planning Committee (LEPC) members, as well as others who will respond to an emergency situation, should also be in attendance.

The plan was developed to prevent or reduce the cost incurred by businesses, property owners, and governmental entities from disasters that may occur in Davison County. The plan identifies and analyzes the hazards that occur in the county, and proposes a mitigation strategy to minimize future damage caused by those hazards.

District III Planning has been contracted to update the plan. The plan will assess risks in the county, present the county's mitigation strategy, and discuss how the county will implement the plan.

I have attached the following documents, have placed them on the County website, and will have copies available at the meeting.

1. LEPC Agenda
2. PDM Agenda
3. PDM Questions for discussion items.
4. Minutes from October 7<sup>th</sup> Meeting.

Thanks,



Jeff Bathe  
Director of Planning & Zoning and Emergency Management  
Davison County  
[jeff@daivsoncounty.org](mailto:jeff@daivsoncounty.org)  
605-995-8615  
605-999-2863

## **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.

# Meeting #1 Agenda

**September 9, 2015 at 10:30 AM at the Davison County Courthouse**

Davison County is beginning the process of updating its disaster mitigation plan. A series of planning meetings will be held this year to gather information for the plan. 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. Proposed agenda items for the meeting are as follows:

**1. Introduction**

- Introduction of team members
- Discuss disaster mitigation planning process, including why the plan is being updated
- Discuss steps to complete plan (identify hazards, assess vulnerabilities, develop mitigation strategy)

**2. Discuss 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 resources and capabilities

**3. Outreach discussion**

- Encouraging public input
- Participation by other stakeholders

**4. Identify Hazards**

- Review hazards profiled in SD Mitigation Plan
- Review hazards profiled in county's current mitigation plan
- Determine which hazards to address in plan

**5. 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, especially major events
- Existing resources and capabilities

**6. Identify Community Assets**

- Critical community assets and facilities in each town
- Other important local assets
- Vulnerable populations

District III will complete the risk assessment prior to Meeting #2. A summary of the results of the risk assessment will be distributed to the planning team prior to the next meeting.



## Meeting #1 Minutes

**Sept 9, 2015**

Meeting began at 10:30

Introductions – John Clem of Planning District III to update Disaster Mitigation Plan

FEMA requires plan to apply for hazard mitigation funding. City rec'd funds for flooding at Queen of Peace Hospital. Will have three meetings and then submit plan for approval to FEMA. This meeting is to assess risks, next meeting to propose projects to address risk. Mr Clem said he would like building permits issued since 2010 to track growth. Also needs copies of flood ordinances, open burning ordinance.

How to encourage public participation. Was article run in paper – legal notice section? Paper to run article following this meeting.

Hazard review – reviewed current Mitigation Plan. Blizzards, tornados, drought, flooding are important. Clem noted drought not included in current plan, but probably should have been. Hazardous material incidents covered by hazmat plan, just been updated by District III.

Hazard impact – Flood areas noted, Dry Run Creek included. James River is still a major problem. Winter storms are a major threat, powerline burial is a popular mitigation type. Central Electric has rec'd these funds before. Water supply not a problem now that Mitchell buys bulk water from Davison Water System; Lake Mitchell now a backup source only.

Review history of events – some info available online. Info better for more recent events. James River flooding in 2010 closed every bridge north of I-90 for six weeks. Drought impact in 2012 was tremendous.

Need details on shelters. Is county still in Storm Ready program? Mitchell has updated to 2012 Intl Building Code this year. Map of siren coverage in each city looked at. Mitchell stormwater regs require detention ponds to reduce 100 yr flood to 5 yr flood. Mt Vernon did a hazard mitigation project many years ago to help reduce flooding.

Reviewed city maps and added missing info. Nursing homes identified.

Next meeting is Oct 14. Mr Clem will contact county for building permit info, ordinances and other info after this meeting.

Meeting adjourned.

## Meeting #2 Agenda

**October 7, 2015 at 10:30 AM at the Davison County EOC**

Davison County is in the process of updating its disaster mitigation plan. A series of planning meetings is being held this year to gather information for the plan. The first meeting was held last month. This meeting will focus on developing a mitigation strategy to address the hazards that were identified at the first meeting. Agenda items for the meeting are as follows:

- 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**
  
- 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 each mitigation action (cost, responsibility for implementation, etc.)
  - Prioritize mitigation actions

Prior to Meeting #3, 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. There will also be an opportunity to include additional mitigation actions. Comments also can be sent prior to the meeting to the Davison County Emergency Management Office ([jeffb@davisoncounty.org](mailto:jeffb@davisoncounty.org)) or to John Clem ([John.Clem@districtiii.org](mailto:John.Clem@districtiii.org)).



## Meeting #2 Signup Sheet

### Davison County Pre-Disaster Mitigation Planning Meeting #2

October 7, 2015

Davison County Courthouse

NAME	REPRESENTING
John Clem	Planning District III
Jeff Bathke	Davison County
Paul Morris	Mitchell Fire
Dale Wilson	CHS/Farmers Alliance
Lyndon Overweg	City of Mitchell - Dept Public Safety
Steve Brink	Davison Co. S.O.
Mike Kester-	Mitchell Police
Marlene Haines	Mitchell Regional 911 - Dept of Public Safety
Vicki Lehrman	Arera Queen of Peace
Susan Kiepke	Davison County
Jenny Kiner	Davison County Commission
Carey Brenner	Firesteel Healthcare Community
GARY COLE	SALVATION ARMY
Joe Benken	SDAEM
Robert Mayer	SD Highway Patrol
Michelle Bathke	City of Mitchell
Jon Vermeulen	City of Mitchell Wastewater
<b>KEVIN ROHT</b>	<b>CITY OF MITCHELL</b> Streets
Mark Jeniges	Davison County Deputy EMS

## Meeting #2 Minutes

**October 8, 2015**

Meeting began at 10:30.

Introductions – John Clem of Planning District III to update Disaster Mitigation Plan.

Clem has questions from meeting 1. Mitchell stormwater – effects developments of at least 5 acres. There may be an update of Lake Mitchell dam plan – Jeff to check.

Davison Rural Water gets water from Missouri river.

Risk assessment results went over, tables looked at. Drought damages very high. Looked at flood maps, FEMA revised in 2012 – many people now in floodzone along Dry Run Creek and don't know it.

Clem then went over goals and objectives of this plan.

Clem went over projects in current plan. Encouraging people to buy flood insurance: Jeff is working on this and says he can get info about NFIP onto county website. Jeff will check with Rusty about 405 Avenue project. Generator for Mt Vernon – has been done for fire hall and sewage system.

Clem then asked what projects should be put in the new plan. Looked at list of actions.

Storm Ready program should continue.

Warning sirens in Loomis, Enemy Creek and fairground.

Dry Run Creek, Shannard Road need work to prevent flooding.

Commissioner Kiner says Kibbee ditch work needed. Jeff will discuss with Rusty other roads that may need improvements.

Generators needed for Mt Vernon and Ethan schools.

Should update county's burning ordinance.

Lyndon Overweg brought up reverse 911 emergency notification system, such as Code Red, cost about \$10,000. Is their FEMA funding for this – Clem to check with state.

Tornado shelters possibly for soccer complex. Divine Concrete makes small ones and we could place multiple ones there. Not sure how many.

Clem will complete a first draft of the plan and send to Jeff when finished. Next meeting we will go over draft and talk about how the plan will work. Next meeting is Nov 18 at 10:30.

Meeting adjourned.

## Meeting #3 Agenda

**November 18, 2015 at 10:30 AM at the Davison County Courthouse**

The Davison 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 to review the draft before it is submitted to the South Dakota Office of Emergency Management. Agenda items for the meeting 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 implemented at the county and community levels?
- How will the plan be incorporated into existing planning documents and processes?

**3. Discuss Plan Maintenance**

- How will the plan be monitored and evaluated?
- How will the plan be updated?
- How can we get broader public input into the planning process?

District III will complete the plan after this meeting, and then there will be a public review period of approximately one month before the plan is submitted to the SD Office of Emergency Management (SDOEM). Any comments or suggestions received during the review period will be included in the plan. Please contact the Davison County Emergency Management Office ([jeffb@davisoncounty.org](mailto:jeffb@davisoncounty.org)) or John Clem ([John.Clem@districtiii.org](mailto:John.Clem@districtiii.org)) if you have any further questions. Thank you.



## Meeting #3 Minutes

**November 18, 2015**

Meeting began at 10:30.

Introductions – John Clem of Planning District III to update Disaster Mitigation Plan.

Clem has a few questions. North Western does provide gas service to Ethan. County does not have building codes, but discussion continues at county commission meetings. Need info for Mt Vernon fire dept, Jeff thought he had sent that. Clem will check again.

Looked at draft of plan. Need to add storm shelters for Ethan and Mt Vernon to hold about 120 people each, cost is about \$65,000. For Firesteel Creek and Dry Run Creek improvements, it would be hard to map where work is needed, so decision is not to include maps. One known project associated with Firesteel is lowering box culvert at Minnesota Street.

Clem mentioned that since Ethan and Mt Vernon did not send anyone to these meetings that they can't be considered as part of this plan and would have to work through the county if they wanted to submit a project for funding.

Clem said that implementing the plan was important and that the cities need to be aware of the plan. Jeff meets each year with the council in each city, and was there in September. Ethan and Mt Vernon didn't have any projects for the plan. Jeff will send Clem his presentation to the cities.

County LEPC meets each month. Ethan is represented by a council member, Mt Vernon by public works director. Plan must be reviewed by LEPC each year, and then updated every 5 yrs. Public must be at least aware of this. Jeff says all info about county emergency mgmt is on county's website.

Clem will complete the plan soon and forward it to Jeff. He would like a press release in the paper, and then will submit plan to state by end of December.

Meeting adjourned.

## **APPENDIX C: History of Previous Hazard Occurrences**

This appendix provides details about hazard events that have impacted Davison County in the past. **Table C.1** below lists all of the events since 1970 that resulted in a major disaster declaration in which Davison County was part of the designated area. Records from FEMA were consulted for federal assistance provided to the county following each disaster through FEMA's Public Assistance program (information is lacking for most of the events). The table includes damages reported by the Central Electric Cooperative for their infrastructure located within Davison County.

**Table C.1 – Major Disaster Declarations Affecting Davison County**

Dec #	Date Disaster Declared	Type	Public Assistance To County	Damage To Central Electric Coop
3015	Jun 1976	Drought		
717	Jul 1984	Severe storms; Flooding		
999	Jul 1993	Severe storms; Tornado		
1052	May 1995	Severe storms; Flooding		
1075	Jan 1996	Ice storm		
1156	Feb 1997	Severe winter storm; Blizzard		
1173	Apr 1997	Severe storms; Flooding		
1620	Dec 2005	Severe winter storm	\$265,781	\$3,218,744
1702	May 2007	Severe storms; Tornado; Flooding		
1759	May 2008	Severe winter storm		\$283,500
4115	May 2013	Severe winter storm		\$122,651

Sources: [www.fema.gov/disasters/grid/state-tribal-government/72](http://www.fema.gov/disasters/grid/state-tribal-government/72); [www.fema.gov/data-feeds/openfema-dataset-public-assistance-funded-projects-summaries-v1](http://www.fema.gov/data-feeds/openfema-dataset-public-assistance-funded-projects-summaries-v1); Central Electric Cooperative

**Table C.2** is a comprehensive list of the most significant hazard events reported for Davison County from 1950 through 2014, 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.

The Storm Events Database is useful, but it does have limitations. One problem is that records for certain hazard events, including winter storms and blizzards, only go back to the 1990s. Another issue is that damage amounts in most cases are estimates, especially for events that impacted multiple counties. Also note that the database contains a preponderance of records from recent times for many of the event types. This is likely due to an inconsistency in how the data was reported, rather than an actual increase in the frequency of events affecting the county.

The table includes the following information about the events:

- Date - multiple events may be shown for a single day because a storm system may contain many specific storm events affecting different locations.
- Type of event
- Descriptive information - details are provided for some of the more noteworthy events back to the 1990s.
- Magnitude - the magnitude of tornadoes, hail, thunderstorm winds, and high wind events is given. For events occurring since 2000 the speed is represented by either the highest measured wind gust (M) or the highest estimated wind gust (E). Note that speeds are shown in knots - multiply figure by 1.15 to get approximate speed in miles per hour.
- Property and crop damage - the National Weather Service uses all available data from the sources identified above in compiling the damage amounts, but the figures should be considered as broad estimates. In many cases, damage amounts are unknown.

**Table C.2 – History of Significant Hazard Events in Davison County**

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
6/7/1953	Tornado		F0		
6/14/1953	Tornado		F2	25	
5/27/1954	Tornado		F2	25	
8/10/1958	Hail		1.75 in.		
7/14/1961	Thunderstorm Wind		60 kts.		
4/26/1962	Tornado		F2	25	
5/14/1962	Tornado		F3		
5/14/1962	Hail		4.00 in.		
5/21/1962	Tornado		F3	2500	
6/20/1968	Tornado		F3		
8/8/1969	Tornado		F2	25	
7/18/1970	Thunderstorm Wind		85 kts.		
7/9/1971	Thunderstorm Wind		62 kts.		
7/1/1973	Thunderstorm Wind		65 kts.		
6/21/1974	Hail		1.75 in.		
6/21/1974	Thunderstorm Wind		61 kts.		
5/22/1975	Thunderstorm Wind		65 kts.		
6/19/1975	Thunderstorm Wind		69 kts.		
6/21/1975	Tornado		F0		
8/11/1975	Thunderstorm Wind		65 kts.		
8/10/1976	Thunderstorm Wind		61 kts.		

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
6/10/1977	Thunderstorm Wind		62 kts.		
7/29/1979	Hail		1.50 in.		
8/31/1979	Thunderstorm Wind		61 kts.		
8/18/1980	Thunderstorm Wind		68 kts.		
7/2/1982	Thunderstorm Wind		61 kts.		
7/20/1982	Thunderstorm Wind		61 kts.		
7/21/1982	Thunderstorm Wind		61 kts.		
6/30/1983	Thunderstorm Wind		61 kts.		
7/18/1983	Thunderstorm Wind		69 kts.		
4/19/1985	Tornado		F1	25	
4/19/1985	Thunderstorm Wind		65 kts.		
5/11/1985	Tornado		F0		
5/11/1985	Tornado		F0		
5/11/1985	Hail		1.50 in.		
6/29/1986	Tornado		F0		
5/28/1989	Thunderstorm Wind		0 kts.		
5/12/1991	Tornado		F0		
6/16/1992	Tornado		F2	2.5	
6/16/1992	Tornado		F2	2.5	
6/16/1992	Hail		1.75 in.		
6/7/1995	Thunderstorm Wind		60 kts.	50	30
1/17/1996	Blizzard	A blizzard spread across the area from the west. Snow 3 to 12 inches deep was accompanied by 50 to 60 mph winds and very cold temperatures. The wind chill dropped to around -70. Roads and many businesses and schools were shut down. The total destruction of at least 3 homes by fire was due in part to the inability of firefighters to travel across blocked roads. Several accidents occurred and other vehicles slid into ditches or became stranded.			
1/24/1996	Heavy Snow				
1/29/1996	Extreme cold	Wind chill readings as cold as 80 below zero occurred as winds over 30 mph combined with temperatures of 10 below to 30 below zero. Many vehicles failed to start, but the main impact was financial with greatly increased heating energy use, and purchase of supplies and services to ensure furnace operation.			
2/10/1996	High Wind		58 kts.	30	
3/24/1996	Blizzard	Snow accumulating 3 to 8 inches was accompanied by winds over 50 mph at times, producing widespread whiteout conditions. Numerous vehicles slid into ditches and many people were stranded in vehicles. There were some rollovers and other accidents.		20	
4/25/1996	High Wind		62 kts.	10	
5/24/1996	High Wind		50 kts.		
6/20/1996	Hail		2.00 in.		



DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
6/20/1996	Hail		1.75 in.		
10/29/1996	High Wind		57 kts.	30	
11/14/1996	Ice Storm	Several periods of freezing rain caused widespread damage and paralyzed travel. Widespread damage occurred to electrical poles and lines, leaving thousands without power for up to four days. Numerous accidents occurred. Tree damage was widespread with tree debris blocking several roads and sidewalks. Some farm buildings and other small structures were damaged by the weight of ice and snow on roofs.		100	
12/14/1996	Heavy Snow				
12/16/1996	Blizzard				
1/4/1997	Blizzard				
1/9/1997	Blizzard				
1/15/1997	Extreme cold	Temperatures a few degrees below zero accompanied by wind gusts over 40 mph created wind chills as cold as 70 below zero. Drifting snow and areas of low visibility in blowing snow also occurred in open areas.			
2/3/1997	Heavy Snow				
3/12/1997	Flood	Widespread snowmelt flooding began in March and continued through the end of the month. Record flooding occurred on the James River. 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. Travel was severely hampered by flooded roads in some areas. Farmland flooding was severe and widespread.			
4/1/1997	Flood				
4/6/1997	High Wind		63 kts.	10	
4/9/1997	Heavy Snow				
5/1/1997	Flood				
6/20/1997	Thunderstorm Wind	Thunderstorm winds caused widespread damage to trees, power lines, farm structures, and homes. Five people were injured at Ethan when a mobile home was destroyed.	78 kts.	500	
7/16/1997	Lightning			1	
7/24/1997	Hail		1.75 in.		
7/24/1997	Lightning			4	
12/30/1997	High Wind		50 kts.	3	
3/31/1998	Heavy Snow	Snowfall of 6 to 16 inches occurred over a large area, causing some damage to power lines resulting in power outages.		100	
5/14/1998	Hail		1.75 in.		
5/23/1998	Flood				
7/6/1998	Hail		1.75 in.		
7/18/1998	Thunderstorm Wind		52 kts.	10	
8/24/1998	Hail		1.75 in.		
11/10/1998	Blizzard	Up to 14 inches of snow combined with winds as high as 60 mph caused damage to trees and power lines. Power outages of up to 2 days resulted. Many roads were closed.		20	

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
1/1/1999	Winter Storm				
1/20/1999	Winter Weather				
5/12/1999	Flood				
6/7/1999	Tornado		F0		
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				
1/10/2000	High Wind		52 kts. M	3	
2/1/2000	Drought	Dry weather that prevailed during the fall continued in February, Dry surface and soil conditions remained 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				
4/5/2000	High Wind		56 kts. M	30	
4/19/2000	Hail		1.75 in.		
6/9/2000	Thunderstorm Wind		61 kts. M	60	
8/5/2000	Tornado	A brief tornado damaged several structures.	F1	100	
8/5/2000	Thunderstorm Wind	A wet microburst with winds estimated at 120 mph caused heavy damage in and around Mitchell. Apartments and several mobile homes were destroyed, vehicles were overturned, and other damage occurred to buildings and vehicles. Widespread tree and power line damage also occurred. Ten people were injured, although most of the injuries were minor. The damage path was approximately a mile and a half long and a mile wide, extending over the southwest part of Mitchell.	104 kts. E	8000	
8/7/2000	Tornado	An F1 tornado damaged several farm buildings, caused tree damage, and blew down at least one power line.	F1	30	
11/6/2000	Winter Storm				
11/11/2000	Winter Storm				
12/16/2000	Blizzard				
12/28/2000	High Wind		52 kts. E		
1/29/2001	Blizzard	Over 10 inches of snow with winds up to 45 mph produced widespread blizzard conditions. Visibilities were often near zero, and roads were blocked by the falling and drifting snow. Travel became impossible as many roads were closed to travel, including Interstate 90. Many businesses, government offices, and schools were closed. During the storm, the roof of a dairy barn collapsed north of Mt. Vernon, killing at least 10 cows, and injuring several others.		50	

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
2/7/2001	Winter Storm				
2/24/2001	Winter Storm				
4/1/2001	Flood				
4/29/2001	High Wind		53 kts. M	10	
5/1/2001	Flood				
6/13/2001	Hail		1.75 in.		
11/26/2001	Heavy Snow	Most areas of southeast South Dakota received at least 8 inches of snow, with Mitchell receiving 16 inches. The snowfall closed many schools and businesses, closed some government offices, and severely hampered transportation. The wet and heavy nature of the snow made it difficult to clear away.			
2/11/2002	High Wind		50 kts. M		
3/14/2002	Winter Storm				
7/24/2002	Hail	Large hail caused severe damage to numerous vehicles, including many at car dealerships. Damage also occurred to windows, siding, and shingles on buildings. The hail caused damage to greens at a municipal golf course.	2.50 in.	3000	
7/24/2002	Hail		1.75 in.		
8/6/2002	Flash Flood				
8/11/2002	Thunderstorm Wind		58 kts. M	30	
8/20/2002	Hail		1.75 in.		
8/20/2002	Flash Flood				
2/11/2003	High Wind		50 kts. M		
2/14/2003	Winter Weather				
4/6/2003	Winter Weather				
6/24/2003	Tornado	A tornado damaged crops, trees, and numerous buildings on several farms. On one farm the northeast corner of a home was heavily damaged, and several buildings including a barn, a granary, and a machine shed were destroyed. Large trees were blown down.	F2	500	
6/24/2003	Tornado		F0		
6/24/2003	Hail		1.75 in.		
6/24/2003	Hail		1.75 in.		
6/24/2003	Thunderstorm Wind		61 kts. E	10	
6/24/2003	Thunderstorm Wind		61 kts. E	10	
6/24/2003	Thunderstorm Wind		61 kts. E		
7/4/2003	Hail		1.75 in.		
7/4/2003	Thunderstorm Wind		61 kts. E	20	
7/4/2003	Thunderstorm Wind		65 kts. E		
11/3/2003	Winter Weather				
11/22/2003	Winter Storm				
12/2/2003	Winter Weather				

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
12/8/2003	Winter Weather				
2/11/2004	Winter Weather				
3/15/2004	Winter Weather				
5/16/2004	Flash Flood				
7/20/2004	Hail		1.75 in.	50	
7/20/2004	Hail		1.75 in.		
7/21/2004	Thunderstorm Wind		61 kts. E		
8/31/2004	Lightning	Lightning struck and damaged the brick chimney at the public safety building.		10	
9/4/2004	Lightning			2	
1/4/2005	Heavy Snow				
3/10/2005	High Wind		54 kts. M	100	
3/17/2005	Winter Weather				
6/4/2005	Flash Flood	Heavy rainfall of up to four inches caused widespread street flooding, especially on the west side of Mitchell. At least 10 vehicles stalled in high water. At least 12 homes and businesses were flooded, as well as several lower level apartments. The basement of one apartment building was flooded by 10 feet of water, knocking out boilers and a hot water heater.		20	
6/9/2005	Flash Flood				
6/12/2005	Flood				
6/20/2005	Flash Flood	Heavy rain caused flooding of streets.			
6/24/2005	Thunderstorm Wind		63 kts. M		
8/3/2005	Hail		2.50 in.		
8/3/2005	Hail		1.75 in.		
11/8/2005	High Wind		52 kts. E	5	
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.		1000	
11/28/2005	Blizzard	Snowfall from 4 to 15 inches combined with winds gusting over 50 mph to produce blizzard conditions. Heaviest snowfall was near and west of the James River, in the area where a severe ice storm immediately preceded the blizzard. Several reports of 6 to 8 foot drifts were received. Travel was made impossible in many areas as roads were closed for extended periods. Most schools and businesses not already closed because of the ice storm were forced to close. The winds during the blizzard continued to bring down power lines and poles, most of which had been coated and weighted down by ice in the area hit by the ice storm.		100	
11/30/2005	Winter Weather				

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
1/1/2006	Winter Weather				
3/12/2006	Winter Storm				
7/18/2006	Drought				
8/1/2006	Drought				
12/20/2006	Winter Weather				
12/29/2006	Winter Storm	Freezing rain caused heavy icing of roads, trees, and power lines, and was accompanied by 2 to 5 inches of snow, with most of the snow preceding the freezing rain. Travel was brought to a standstill at places. Many vehicles slid off roads, and 13 were injured in 3 accidents. Ice accumulation was a quarter to a half inch over much of the area. The ice brought down tree branches and power lines, causing power outages.		100	
1/8/2007	High Wind		52 kts. M		
2/12/2007	Winter Weather				
2/24/2007	Winter Storm	Rain changed to freezing rain, causing light icing before the precipitation quickly changed to snow. Snow accumulated 5 to 7 inches. The icing and subsequent snow accumulation made travel very difficult, with several vehicle accidents and numerous vehicles sliding into ditches.			
2/28/2007	Heavy Snow				
3/1/2007	Blizzard				
3/12/2007	Flood				
4/10/2007	Winter Weather				
5/5/2007	Tornado		EFO		
5/5/2007	Tornado		EFO		
5/5/2007	Hail		1.75 in.		
5/5/2007	Flood	Heavy rainfall caused flooding of low areas including fields, homes, businesses, schools, roads, streams, and bridges. The flooding was a longer term event than flash flooding. Long term major flooding of the James River also resulted, with the river peaking at 7.4 feet above flood stage near Mitchell on May 10th. Some parks and other recreation areas were affected, especially in and near Mitchell. A few roads and bridges were washed out by the high water. The flooding delayed planting of crops in some areas.		200	
5/22/2007	Flash Flood				
6/1/2007	Flood				
8/10/2007	High Wind		56 kts. M		
12/1/2007	Winter Weather				
2/11/2008	Winter Weather				
3/31/2008	Winter Weather				
4/10/2008	Blizzard				
4/25/2008	Heavy Snow				
6/5/2008	Thunderstorm Wind		61 kts. E		
6/5/2008	Flash Flood				

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
6/6/2008	Flood				
7/6/2008	Flash Flood				
7/27/2008	Hail		2.75 in.		
7/27/2008	Hail		2.00 in.		
7/27/2008	Hail		1.75 in.		
7/27/2008	Hail		1.75 in.		
11/6/2008	Blizzard				
11/7/2008	Winter Weather				
12/14/2008	Blizzard				
12/20/2008	Winter Weather				
1/12/2009	Winter Weather				
2/26/2009	Winter Weather				
3/24/2009	Flood				
3/31/2009	Blizzard				
4/1/2009	Flood				
4/4/2009	Blizzard				
5/1/2009	Flood				
6/1/2009	Flood				
6/16/2009	Tornado		EF0		
6/16/2009	Hail		1.75 in.		
6/16/2009	Hail		1.75 in.		
7/1/2009	Flood				
7/9/2009	Hail		2.50 in.		
7/9/2009	Hail		1.75 in.		
7/9/2009	Hail		1.75 in.		
7/9/2009	Thunderstorm Wind		61 kts. E		
7/9/2009	Thunderstorm Wind		65 kts. M		
7/13/2009	Hail		1.75 in.		
8/1/2009	Flood				
8/2/2009	Thunderstorm Wind		61 kts. E	10	
8/2/2009	Thunderstorm Wind		61 kts. E		
8/8/2009	Hail		4.00 in.		
12/8/2009	Winter Weather				
12/23/2009	Blizzard	Prolonged snowfall produced heavy accumulations over southeast South Dakota, ranging up to over 20 inches in several areas. The snowfall took place from two days before to the day after Christmas. The snowfall was accompanied by increasing north to northwest winds which caused widespread blizzard conditions on Christmas day and the start of the next day.			

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
1/6/2010	Blizzard	Snowfall of 3 to 6 inches, previously existing snow cover, and northwest winds gusting to over 40 mph produced widespread blizzard conditions, with visibilities less than a quarter mile. New snowfall included 5 inches at Mitchell. 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 during the latter part of the storm. This extreme cold continued into the next day, Friday, January 8th.			
1/7/2010	Extreme cold	Persistent north/northwest winds combined with very cold air to produce wind chill values that dropped to 35 below zero.			
1/25/2010	Winter Weather				
2/13/2010	Winter Weather				
3/11/2010	Flood				
3/12/2010	Flood				
4/1/2010	Flood				
5/1/2010	Flood				
6/1/2010	Flash Flood				
6/1/2010	Flood				
6/5/2010	Flood				
6/11/2010	Thunderstorm Wind		52 kts. E	5	
6/11/2010	Flash Flood	Heavy rainfall of at least 3 inches caused Enemy Creek to overflow and flood nearby roads. The rainfall also caused flooding of roads and basements in Mitchell. A motorcycle business was flooded, resulting in damage to merchandise, although little damage to the motorcycles was reported.		75	
6/12/2010	Flash Flood	Heavy rain caused flash flooding of several roads, including Interstate 90.			
7/1/2010	Flood				
7/10/2010	Hail		1.25 in.		
7/10/2010	Thunderstorm Wind		56 kts. E	10	
7/10/2010	Flash Flood				
7/21/2010	Flash Flood	Heavy rainfall of over 4 inches caused widespread flash flooding of streets, yards, basements, and some homes and businesses in and near Mitchell. Water was up to two feet deep in some streets. Flooded businesses included the Queen of Peace Hospital, where flooding was reported in the emergency department and in a corridor.		100	
7/23/2010	Thunderstorm Wind		61 kts. E	25	
7/23/2010	Thunderstorm Wind		61 kts. E	10	
7/23/2010	Thunderstorm Wind		61 kts. E	10	
7/23/2010	Thunderstorm Wind		61 kts. E		
7/31/2010	Flood				
8/1/2010	Flood				
8/1/2010	Flood				
8/30/2010	Thunderstorm Wind		61 kts. E		

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
9/20/2010	Flood				
10/26/2010	High Wind		52 kts. E		
11/20/2010	Winter Weather				
12/10/2010	Blizzard				
12/20/2010	Winter Weather				
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	Winter Weather				
1/31/2011	Winter Weather				
2/1/2011	Extreme cold	North/northwest winds averaging 15 to 30 mph combined with temperatures dropping below zero to produce wind chills of 35 to 40 below zero.			
2/20/2011	Heavy Snow				
3/16/2011	Flood				
4/1/2011	Flood	Major flooding of the James River, as well as flooding of small streams and lakes in the county, continued through April. Much farmland remained flooded, both near to and away from the James River. The James River was 6.7 feet above flood stage near Mitchell on April 1st, and fell very slowly during the month. A large area of land and numerous roads were flooded at the start of the month. Water was running over other roads, from flooded streams, creeks, and fields as well as from the James River. Many roads were heavily damaged. Some homes and businesses were also flooded, with the flooding of these places slowly alleviating through the month. High water and groundwater levels from record precipitation in the year 2010, a main reason the flooding onset was so fast in March, was also a main reason that the flooding subsided so slowly during April.		1000	
5/1/2011	Flood				
6/1/2011	Flood	Moderate to major flooding of the James River, ongoing since the snowmelt season in March, continued through June. Farmland and other lowlands near the river remained flooded, with the water level first falling slowly, then rising due to runoff from heavy rain. The highest stage near Mitchell was 4.9 feet above flood stage at the end of the month, though this was still almost a foot below the peak stage in May.			
6/13/2011	Hail		1.75 in.		
6/13/2011	Flash Flood	Heavy rainfall produced flash flooding which flooded fields, a few roads, and washed out a bridge.		30	
6/21/2011	Flood				
7/1/2011	Flood	Moderate to major flooding of the James River, ongoing since the snowmelt season in March, continued through July. Farmland and other lowlands near the river remained flooded, with the water level varying slightly up and down due to sporadic heavy rainfall. The highest stage near Mitchell was 4.9 feet above flood stage on July 3rd, slightly higher than the peak stage of June, but not as high as peak levels earlier in the Spring.			



DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
7/15/2011	Excessive Heat				
8/1/2011	Flood	Moderate to major flooding of the James River, ongoing since the snowmelt season in March, continued into early August, with the flooding continuing but very slowly abating through the month. Flooding of farmland and other lowlands near the river very slowly abated. The highest stage near Mitchell was 4.6 feet above flood stage on August 1st.			
8/11/2011	Thunderstorm Wind		61 kts. E	10	
9/1/2011	Flood	Flooding of the James River, ongoing since the snowmelt season in March, abated very slowly through September. Flooding of farmland and other lowlands steadily decreased, and very few roads continued to be affected. The highest stage near Mitchell was 2.3 feet above flood stage on September 2nd.			
2/13/2012	Winter Weather				
2/29/2012	Winter Weather				
4/15/2012	High Wind		53 kts. M		
5/5/2012	Hail	Large hail caused widespread damage to vehicles, buildings, and structures in and near Mitchell. In addition to dented vehicles and broken windows, the hail damaged the roofs and siding of homes and businesses. Two of the highest individual damage amounts included \$175,000 to the Corn Palace, the roof of which needed replacing, and \$100,000 damage to the roof of the Central Electric Cooperative Building. The roofs of numerous homes suffered lesser damages, and siding was also damaged. Damaged vehicles included several law enforcement and other city and county government vehicles.	2.50 in.	2000	
5/5/2012	Hail		2.50 in.		
5/5/2012	Thunderstorm Wind		68 kts. M	1	
5/6/2012	Flood				
6/26/2012	Excessive Heat				
7/1/2012	Drought	Drought conditions became established over the area. Stress on crops increased with no relief during the month. Hot weather added to the stress. Crop damage became certain. Severe non-ag water supply problems were not observed, but the long term dry conditions raised fears for the future.			
7/2/2012	Excessive Heat				
7/15/2012	Excessive Heat				
7/18/2012	Excessive Heat				
8/1/2012	Excessive Heat				
8/1/2012	Drought	Drought was generally listed as severe to extreme for the area, and was being compared to the worst of the dust bowl years, though not yet over as long a time period. Stress on crops continued, even though August was less hot than July. Crop damage was quite evident. Many local governments had water use restrictions in place.			
8/3/2012	Thunderstorm Wind		69 kts. M	15	
9/1/2012	Drought	Drought continued over southeast South Dakota. Rainfall for the month varied from around half to less than a quarter of normal. Stress on crops that prevailed over the growing season became more evident with the start of harvest. Local governments continued to use water use restrictions.			

DATE	EVENT TYPE	DESCRIPTION	MAG	PROP DAMAGE (\$1,000s)	CROP DAMAGE (\$1,000s)
10/1/2012	Drought	Drought conditions continued over all of southeast South Dakota in October with well below normal rainfall keeping soil and vegetation dry.			
10/17/2012	High Wind		53 kts. M		
11/1/2012	Drought	Drought conditions continued over all of southeast South Dakota in November.			
12/1/2012	Drought	Drought conditions continued over all of southeast South Dakota in December. Although precipitation was generally normal to above normal, the amount of excess over the low winter normals was not enough to relieve the dry conditions. The effects of the drought on farmers and ranchers continued. Hunting was also affected, with low pheasant numbers, and disease in the deer population.			
12/9/2012	Blizzard				
12/18/2012	Winter Weather				
12/27/2012	Winter Weather				
1/1/2013	Drought				
2/1/2013	Drought				
2/10/2013	Blizzard	Variable snowfall of 2 to 8 inches, northwest winds gusting to 45 mph, and snow cover existing before the storm in part of the area, produced blizzard conditions with visibilities below a quarter mile in blowing snow in many areas. The low visibilities and drifting snow forced some businesses to close, and also forced several school closings on Monday February 11th.			
3/1/2013	Drought				
4/1/2013	Drought				
4/9/2013	Winter Storm	An extended period of precipitation began with freezing rain and freezing drizzle producing light to moderate ice accumulations, then changing to sleet and then snow, with sleet and snow accumulations reaching 10 inches near Mitchell. Several branches and power lines were downed by the weight of ice and accompanying wind. The winter precipitation made travel very difficult to impossible, resulting in schools and businesses being forced to close.			
12/3/2013	Winter Storm	Snow, heavy in areas, accumulated up to 8 inches from the evening of December 3rd through the afternoon of December 4th. Difficult travel conditions forced delayed openings or early closings of some schools and businesses on December 4th.			
1/16/2014	High Wind		56 kts. M		
1/26/2014	High Wind		50 kts. E		
8/23/2014	Thunderstorm Wind		61 kts. E	20	

Source: [www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=46,SOUTH DAKOTA](http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=46,SOUTH DAKOTA)

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