CHAPTER 2: COMMUNITY PROFILE

RELATED DOCUMENTS

The Community Profile is an important piece of the updated Big Stone All-Hazard Mitigation Plan. This profile is used as a factual data point and includes the most recent available data.

To create this Community Profile, other Big Stone County documents were referenced.

- Comprehensive Plan
- Water Plan
- Zoning Map
- Zoning Ordinance
- Land Use Map
- FEMA Regulations

The coordinated use and implementation of these combined documents create a sound foundation for all hazard mitigation projects, plans, and activities to ensure they are tied to the county's land use and environmental regulations.

GENERAL COUNTY PROFILE

Location

Big Stone County is approximately 500 square miles located in southwestern Minnesota. It is approximately 212 miles northwest of Minneapolis- St. Paul and 132 miles west of St. Cloud. Big Stone County is bordered by Traverse County to the north, Stevens County to the northeast, Swift County to the east, Lac qui Parle County to the south, and state of South Dakota to the west.

History

Research has found that men lived on the shores of Big Stone Lake and Lake Traverse nearly 12,000 years ago. A skeleton, thought by some investigators to be that of one of these people, was exhumed from a gravel pit in Browns Valley Village, a few miles north of the Big Stone County line in 1934. known as "the Browns Valley Man". Along with the skeleton, now known as "the Browns Valley Man", six flint artifacts were found with the skeleton. These tools are classified as the oldest type found in America to date.

In 1874, Big Stone County officers were appointed, the boundaries of three commissioner districts were laid out, and the county seat located at Ortonville. Big Stone County saw a dramatic increase in population from 200 people in 1870 to 9,000 people in 1910. Railroad companies in Minnesota established settlements along their lines. The only city in Big Stone County that is not located along a railroad is the city of Clinton.

In 1881, the cities of Ortonville and Graceville were incorporated and the city of Correll was recorded. Also in 1881, a legislative act declared Big Stone County legally organized and Ortonville was selected as the county seat by majority vote. The other cities were incorporated

as follows: city of Clinton in 1890, city of Beardsley in 1891, city of Odessa in 1895, city of Barry in 1900, and city of Johnson in 1903.

Physical Characteristics

Climate and Precipitation

Big Stone County is characteristic of the Continental Climate Zone with its wide variation in climate. Big Stone County experiences short, warm summers and cold winters. The average high in Big Stone County is 82º F in July and the average low is 1º F in January.

Big Stone County has also experienced extreme temperatures. The hottest day that was recorded in Big Stone County was 108º F in 1988. The coldest day on record was –36º F in 1994. More specific temperature averages and records can be found in Table 1 below.

Table 2.1 BSC Average Monthly Temperature from 1971 - 2013 & Record Highs & Lows from 1959 - 2013

Month	Average High	Average Low	Mean	Record High	Record Low
January	20º F	1º F	11º F	63º F (1981)	-33º F (1977)
February	26º F	7º F	17º F	60º F (1987)	**-36º F (1994)**
March	37º F	20º F	29º F	77º F (2012)	-30º F (1962)
April	55º F	35º F	45º F	97º F (1980)	-1º F (1975)
May	69º F	47º F	58º F	95º F (1987)	22º F (1976)
June	77º F	57º F	67º F	106º F (1988)	35º F (1969)
July	82º F	62º F	72º F	**108º F (1988)**	41º F (1972)
August	79º F	59º F	69º F	105º F (1959)	36º F (1964)
September	71º F	50º F	60º F	100º F (1959)	21º F (1965)
October	57º F	37º F	47º F	92º F (1963)	11º F (1991)
November	39º F	22º F	31º F	78º F (1978)	-18º F (2013)
December	25º F	8º F	16º F	60º F (1998)	-31º F (1993)

Source: Midwestern Regional Climate Center Monthly Data Summary. Data pertains to station at Artichoke Lake.

As found in Table 2, the average annual precipitation in Big Stone County is 24 inches. About 63% of the annual precipitation occurs between May and September. Snowfall in winter months averages approximately 42 inches.

The sun shines 65% of the time in summer and 45% percent in winter. Prevailing winds are from the south.

Table 2.2 Big Stone County Average Monthly Precipitation & Snowfall from 1971 - 2013

Month	Precipitation in Inches	Snowfall in Inches
January	0.80	9.40
February	0.80	8.00
March	1.46	7.70
April	2.10	2.70
May	2.71	0.00
June	3.74	0.00
July	3.72	0.00
August	2.90	0.00
September	2.29	0.00
October	2.22	0.80
November	1.07	5.80
December	0.66	7.40
Annual	**24.47**	**41.80**

Source: Midwestern Regional Climate Center Monthly Data Summary. Data pertains to station at Artichoke Lake.

Geology and Topography

Big Stone County is comprised of approximately 500 square miles of land and water, all influenced by glaciation. The county is covered by a mixture of glacial till (a mixture of clay, sand, and silt along with gravel, cobbles and boulders), glacial lake sediments (particle sizes consisting mostly of clay and silt), and glacial outwash (sand and gravel-sized particles).

The topography of the Big Stone County is closely related to glacial activity, which is responsible for most of its natural features. The county is characterized by a gently rolling glacial drift plain, containing many closed depressions occupied by an abundance of small lakes and wetlands. A majority of the upland prairie is used for agriculture. Tree cover is concentrated on the banks of the Minnesota River Valley and its tributaries and around many of the lakes.

Soil

Soils develop from the breakdown of rock minerals and from plant and animal remains. The changing of rock into soil occurs over thousands of years. The soil in Big Stone County has been created from deposits originally left by glaciers. As an agricultural county, soils are one of its most valuable resources.

Big Stone County has a wide variety of soil types due to the assortment of glacial material left behind. In addition, the county's diverse landforms all contribute to a range of soil characteristics. Other important factors involved in the formation of Big Stone County's soils were climate, vegetation, and topography.

According to the Big Stone County Water Plan (2014), all of Big Stone County is prone to wind and/or water erosion. Water erosion results from soil removed from its original location by the force of water to lower slopes and plots. The potential for wind erosion occurs when wind velocities increase above 12 mph. Soil erosion by wind or water is dependent on soil type and

amount of protective cover. For additional information refer to the Water Plan (2008), Comprehensive Plan, and Soil Survey.

Land Use and Cover

Today, land use in Big Stone County is divided into four general categories: agricultural land, woodland, water and wetlands, and other, which includes urban uses. Agriculture is the largest land use composing about 86% of the county land. Woodland covers 3%, and water and wetlands make up 6% of the land. Four percent of the land is categorized as other. A more detailed land use breakdown is shown in Table 3 below.

Table 2.3 Big Stone County Land Use & Cover

Land Use	Acreage	Percentage of Total
Urban and Rural Development	4,668	1%
Cultivated Land	251,987	75%
Hay/Pasture/Grassland	39,384	12%
Brush Land	790	0.2%
Forested	9,431	3%
Water	19,095	6%
Bog/Marsh/Fen	12,545	4%
Mining	270	0.1%
Total	**338,170**	**100%**

Source: Minnesota Land Management Information Center "Minnesota Land Use and Cover: 1990's Census of the Land (8 category statewide)".

Agriculture. Agricultural activities are a vital industry in Big Stone County. According to the U.S. Department of Agriculture, the total market value of Big Stone County's agricultural products sold in 2012 exceeded $164 million. This was a 47% increase from 2007. In comparison, the total increase in Minnesota for the same time period was 38%, putting Big Stone County well above the state as a whole in terms of growth.

In 2012, cropland sales accounted for 84% of the market value of Big Stone County's agricultural products sold, while livestock sales accounted for 16%. In comparison, 65% of agricultural products sold in Minnesota were from cropland, while 35% was from livestock. The high percentage of cropland sales in Big Stone County shows that, while feedlots are becoming more prevalent in other counties, cropland continues to be the mainstay of the agricultural economy in Big Stone County. Table 2.4 outlines the changes that have taken place in the last 100 years in Big Stone County:

Table 2.4 BSC Crops by Type

	Corn-1919	Corn - 2012	Wheat-1919	Wheat-2012	Oats-1919	Oats-2012
Acres	25,738	88,680	79,517	12,448	30,343	50
Bushels/acre	26	156.6	7.8	52.1	24	79.2

Source: USDA National Agriculture Statistics Services: Census of Agriculture, 1919 & 2012

Eighty percent of the total cropland in Big Stone County is harvested cropland. Corn, soybeans and sugar beets are the main crops grown. Organic farming includes smaller crops such as vegetables, beef, dairy, and other niche markets, and has grown significantly in the past 20 years.

A recent trend in land use in some parts of the county has resulted in the loss of prime farmland to industrial and urban uses, shown in Table 2.5 below. The loss of prime farmland to other uses adds pressure on marginal lands, which generally are less productive because they are more erodible, subject to drought or difficult to cultivate. Government programs such as CPR and CREP have been established to keep marginal land out of production and have helped to prevent erosion. These programs also work to improve water quality in the region.

Table 2.5 BSC Farm Comparisons from 1987-2012

Farms	1987	1992	1997	2002	2007	2012
Farms (number)	504	460	420	446	452	400
Land in farms (acres)	277,071	262,207	253,988	274,038	252,291	248,778
Land in farms, average size of farm (acres)	550	570	605	614	558	622

Source: USDA, National Agricultural Statistics Service, 2014

CREP, CRP and other Government Programs. The Conservation Reserve Program (CRP) is the federal government's single largest environmental improvement program and one of its most productive and cost-efficient. There are 7,371 acres in Big Stone County enrolled in CRP, according to the Minnesota Board of Soil and Water Resources 2013.

Established in 1985, the CRP encourages farmers to voluntarily plant permanent areas of grass and trees on land that needs protection from erosion. The purpose of planting is meant to act as windbreaks or in places where vegetation can improve water quality or provide food and habitat for wildlife. Farmers must enter into contracts with the Commodity Credit Corporation (CCC) lasting between ten and fifteen years. In return, they receive annual rental payments, incentive payments for certain activities, and cost-share assistance to establish the protective vegetation. Land eligible for enrollment includes cropland that is physically and legally capable of being cropped in a normal manner and that has been planted or considered planted to an agricultural commodity in any two years from 1992 to 1996. The acreage must also be determined eligible and suitable for any of the following practices: filter strips, riparian buffers, shelter belts, field

windbreaks, living snow fences, grass waterways, shallow water areas for wildlife, salt-tolerant vegetation, and wellhead protection areas.

The Reinvest in Minnesota (RIM) Program protects water quality, reduces soil erosion, and enhances fish and wildlife habitat through retiring marginal lands from agricultural production and restoring previously drained wetlands. The program pays landowners a percentage of the value of their land to enroll it in a conservation easement. Types of land eligible for the program include drained wetlands (for restoration), highly erodible cropland, riparian agricultural land, pastured hillsides and sensitive ground water areas. The state legislature created the RIM Program in 1986 as a response to the concern of a coalition of environmental, conservation, and agricultural groups. As of August 2013, Big Stone County has 683 acres enrolled in the RIM program (Minnesota Board of Soil and Water Resources 2013).

One way the county has been able to address pollution issues are with the Minnesota River Conservation Reserve Easement Program (CREP). CREP gives landowners an opportunity to voluntarily enroll marginal cropland in a conservation easement program with 15 annual payments and a one-time bonus payment. Big Stone County has 772 acres enrolled in the CREP program (Minnesota Board of Soil and Water Resources 2013). With this program, landowners in the Minnesota River Basin can get paid to take cropland out of production as a way to improve water quality and wildlife habitat.

CREP combines the federal Conservation Reserve Program (CRP) with the State RIM Reserve Program. The program's goal is to protect and enhance up to 100,000 acres of environmentally sensitive land in the 37-county Minnesota River Basin; presently as of August 2013 Minnesota has 110,858 acres involved in the program. The Minnesota River CREP ended in September 2002.

The Wetlands Reserve Program (WRP) is the federal government's wetlands restoration program. It is a voluntary program that offers landowners the means and the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) manages the program as well as provides technical and financial support to help landowners who participate in WRP. In all cases, the landowner retains ownership and responsibility for the land, including any property taxes based on its reassessed value as wetland or nonagricultural land. The landowner controls access to the land; has the right to hunt, fish, trap, and pursue other appropriate recreational uses; and may sell or lease land enrolled in WRP. Big Stone County has 1,120 acres in permanent easement through WRP.

Waterfowl Production and Wildlife Management Areas. Waterfowl Production Areas (WPAs) preserve wetlands and grasslands that are critical to waterfowl and other wildlife. These public lands, managed by the U.S. Fish and Wildlife Service, were included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act. Part of the money collected through purchasing a Duck Stamp in Minnesota goes toward the acquisition and maintenance of these areas. Wildlife Management Areas are regulated by the Department of Natural Resources. Big Stone County has 83 Waterfowl Production and Wildlife Management Areas.

Big Stone National Wildlife Refuge. The Big Stone National Wildlife Refuge is located approximately two miles southeast of Ortonville. The 11,586-acre refuge was established in 1975 and is part of the Big Stone-Whetstone River Project of Minnesota and South Dakota authorized under the Flood Control Act of 1965. The Army Corps of Engineers purchased the lands in fee title in 1971 and built a dam to create a large reservoir. The lands were then transferred to the U.S. Fish and Wildlife Service in 1975. Through a cooperative agreement, the Army Corps of Engineers still maintains the water control facilities, but the Service has management responsibility for all refuge lands.

The dam in the Minnesota River created an additional 4,250 acres of wetlands, which provide resting places for migrating waterfowl and shorebirds and homes for summer residents such as common egrets, great blue herons, cormorants and many species of ducks.

The refuge still contains approximately 1,700 acres of native or unplowed prairie. Big Stone County has a great amount of tall prairie grass with wide expanses of grassland and only occasional oak trees. As many exotic grasses, woody shrubs and flowers seed themselves among native prairie species, refuge staff conducts controlled burns to restore and promote vigorous growth of native prairie plants.

HYDROLOGY

Big Stone County has abundant surface water resources with a large number of lakes, wetlands and numerous streams. The surface water bodies receive runoff and act as temporary reservoirs, making them very important in flood prevention and control. Big Stone County has a dozen lakes amounting to more than 300 acres. Approximately 30 square miles of the county's total 532 square miles are covered with water.

The Upper Minnesota River Watershed is estimated to have a positive water balance during both normal and dry years. A negative water balance exists when demand (withdrawal) exceeds input (precipitation, stream flow, rechargeable ground water). The average water supply and in stream flow for the Upper Minnesota River Watershed is about 49,000 acre-feet annually; the annual usage is about 3,000 acre-feet. The Bois de Sioux and the Pomme de Terre Watersheds both have only a trace of use and have stream flows that are equivalent to their annual availability of water.

Groundwater. Principal aquifers within the county's glacial drift outwash are of two main types: surficial drift aquifers, which are unconfined and are usually shallow and buried drift aquifers, which are pockets of confined sand and gravel separated by glacial till. Surficial drift aquifers are localized and usually do not cover a wide area. Buried drift aquifers are usually found at deeper depths. The county also has two minor aquifer types: Cretaceous and Precambrian. Both of these minor aquifers are contained within bedrock. These bedrock aquifers differ from the outwash aquifers in that they typically do not yield as many gallons per minute and well depths are typically deeper.

Wellhead Protection. Wellhead protection is a means of protecting public water supply wells by preventing contaminants from entering an area that contributes water to the well or well field over a period of time. The wellhead protection area is determined by using geologic and hydrologic criteria, such as physical characteristics of aquifers and the effects that pumping has on the rate and direction of groundwater movement. A management plan will be developed for the wellhead protection area that includes inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants, managing existing and future lands, and water uses that pose a threat to ground water quality. The goals of wellhead protection are to reduce use of costly treatment facilities, avoid having to drill new wells, and to avoid the need treat contaminated ground water.

Public water suppliers that completed a wellhead protection plan, but have not yet been adopted by the Minnesota Department of Health are Ortonville and Odessa (Minnesota Department of Health 2009). A public water supplier to be brought into the program will be the Big Stone Hutterite Colony. Other public water suppliers, and their assigned current phasing number, are: Beardsley (273), Lismore Colony (286), Graceville (648), Clinton (716), Correll (861), Big Stone Hutterite (887), and Johnson (908) (the lower the phasing number the sooner the city will be implemented into the program).

Taken from Source Water Protection (SWP) materials.

Surface Water. For additional information on Big Stone County surface water, refer to the 2014 Big Stone County Water Plan and the 2002 Comprehensive Plan.

Watersheds. Big Stone County lies in three major watersheds: the Upper Minnesota River, the Bois de Sioux, and the Pomme de Terre. The Minnesota River drainage system covers almost 80% of the county. Major sub-watersheds draining into the Minnesota River include Fish Creek, Salmonsen Creek, Stony Run, and Five Mile Creek. The west branch of the Mustinka River into the Mustinka-Bois de Sioux Watershed drains the northeast portion of the county. The eastern corner of the county is drained by Drywood Creek into the Pomme de Terre Watershed.

Wetlands. The term "wetlands" refers to low depressions in the landscape covered with shallow and sometimes intermittent water. Wetlands are also commonly referred to as marshes, swamps, potholes, sloughs, shallow lakes, and ponds. Wetlands differ in size, shape, and types of wet environment and derive their unique characteristics from climate, vegetation, soils and hydrologic conditions. Some have surface water only in the springtime during thaws or after rainstorms, while others may form shallow lakes that rarely dry up. They are classified according to their depth of water, total area, and seasonal life span.

Originally, wetlands were located throughout the entire county. With the advent of intensive agriculture practices and the application of land drainage techniques, many of the wetlands located on lands that were flat and suited to agricultural use have been drained. As a result, there are now relatively few wetlands in the flat till plain areas of the county. Most of the remaining wetlands are found in the moraine areas of the northern half of the county where the wetlands have either been preserved or where drainage is not economically feasible.

Rivers. The Minnesota River is the only prominent river in Big Stone County. The mouth of the Minnesota River is the little Minnesota River that meets in Browns Valley just north of Big Stone County. The Minnesota then heads south into Big Stone Lake, a widening of the river.

Lakes. Big Stone County has three prominent lakes, East Toqua, Artichoke, and Big Stone. East Toqua Lake is located in Graceville in the south and southwestern part of the city. The northern shore of the lake is within Graceville's corporate boundary and the southern end of the lake is located in Graceville Township. Big Stone Lake is located at the foot of Ortonville and forms the western border that separates Minnesota from South Dakota for 30 miles. Big Stone Lake is important to Ortonville for both its aesthetic value as well as its recreational value. Artichoke Lake is located on the eastern portion of the county, about 10 miles outside of Correll.

Efforts to maintain, control and improve the quality of Big Stone Lake have been ongoing for a number of years. Currently the Minnesota Pollution Control Agency Lake Water Quality Database lists Big Stone Lake's swimming use as "non-supported."

MPCA indicates that the lakes and streams are polluted with mercury, phosphorus, animal waste, and other contaminants. More specific information from the Minnesota Department of Natural Resources can be found in Table 6.

Table 2.6 BSC Characteristics for Big Stone, East Toqua, & Artichoke Lakes

Lake Name	Lake Area	Littoral Area	Maximum Depth	Water Clarity
Big Stone	12,610 Acres	12,484 acres	16 Feet	8.63 Feet
East Toqua	428 Acres	428 Acres	9 Feet	2 Feet
Artichoke	1,964 Acres	1,964 Acres	15.5 Feet	2 feet

Source: Minnesota Department of Natural Resources

Recreational Use of Water Resources. There are numerous recreational uses of surface water in Big Stone County. Hunting, canoeing, boating, and bird watching along Big Stone Lake and Marsh Lake are becoming popular activities. Big Stone Lake is a state canoe and boating route and the Minnesota River below the Lac qui Parle dam is a scenic river.

Pollution. As the surface waters in Big Stone County are limited, it is important to preserve and protect the water resources. The need to establish lake water quality criteria or standards have been recognized at the local, state, and federal levels of government. The Minnesota Pollution Control Agency (MPCA) is the primary agency charged with pollution monitoring, control, and abatement. The MPCA develops water quality standards for all water bodies in the state and sets effluent limits for each discharger that will maintain the appropriate standards.

Non-permitted waste disposal is a problem in some unincorporated areas. Sewage that is dumped directly into ditches contributes to the pollution problems of surface waters.

The Surface Water Toxic Control Program has identified for Section 304(1) of the Clean Water Act, Minnesota waters affected by pollutants. Point or non-point source discharges of toxicants and conventional or non-conventional pollutants, both impact the north and south portions of Lac qui Parle Lake because of nutrient pollution. Artichoke and Big Stone Lake have poor water clarity.

Drainage and Flooding. Large amounts of public and private capital have been invested in draining water from the landscape. This infrastructure radically improves the drainage efficiency of the landscape that benefits agricultural production. Drainage has also changed hydrology in recent years. As water storage on the landscape is reduced, peak stream flows come faster and higher in response to rain events and run off. Another issue is the recent explosion of pattern tiling that has accelerated these conditions. Older drainage infrastructure and receiving waters are often not adequate to meet the new peak flows generated with pattern tiling. Water flowing into these tiles, ditches, streams and rivers exceed the capacity of receiving waters; water backs up on and floods other lands within the drainage system causing great economic damage.

Big Stone County has an elaborate system of public ditches as well as many private ditches that drain into the legal drain system. As the landscape hydrology has been altered, higher peak flows are carving out larger channels. Unfortunately, this often results in the destabilization of the riverbanks.

Debris can also add to flooding issues. Downed trees caused problems at various bridges over the Minnesota River in the last round of major flooding. The trees commonly float into bridges and then get caught in the bridges forming logjams. Contractors are hired to lift fallen trees over bridges and return them to the river downstream of the bridge. Usually, the result of such actions causes trees to flow into succeeding bridges, again needing services for removal. Large flood events can and do kill trees within the floodplain, including large cottonwood and maples. In subsequent flood events these standing dead trees may be knocked down and washed away.

In 1991, Minnesota legislation approved the Wetland Conservation Act (WCA). The Act moves toward its no-net-loss goal by requiring persons proposing to drain or fill a wetland to: try to avoid disturbing the wetland, try to minimize any impact to the wetland, or to replace any lost wetland functions and values. The basic requirement is that wetlands must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetlands areas of at least equal public value under an approve replacement plan. The law mandates that counties and cities administer the Wetland Conservation Act. All cities in Big Stone County have by resolution requested the county to administer the Wetland Conservation Act within its incorporated boundaries. Big Stone County in turn has appointed the Big Stone Soil and Water Conservation District (SWCD) to administer this Act. A map of the wetlands in the county as well as a hydrology and drainage map can be found in Appendix 1.

Climate Change

The United States Environmental Protection Agency (EPA) defines climate change as any significant change in the measures of climate lasting for an extended period of time. It includes major changes in temperature, precipitation, wind patterns, or other effects, that occur over several decades or longer.

According to the EPA, the Earth's average temperature has risen by 1.4° F over the past century, and is projected to rise another 2 to 11.5° F over the next hundred years. Rising global temperatures are accompanied by changes in weather and climate. Several places have seen

changes in rainfall, resulting in more floods, droughts, intense rain, and more frequent and severe heat waves. As these changes in weather and climate changes become more pronounced in the coming decades, they will likely present challenges to our society and our environment.

History of Climate Change in Big Stone County

According to the Minnesota State Hazard Mitigation Plan 2014, climate change in Minnesota is already occurring in ways that will affect the environment, the economy and everyday life. Historical weather data show changing trends in some weather phenomenon over the past few decades, and future changes are likely. Intense study of these topics will continue into the future.

In addition, the state hazard mitigation plan provides historical climate trends for the Midwest and notes that,

> "The NOAA Technical Report NESDIS 142-3, Regional Climate Trends and Scenarios for the U.S. National Climate Assessment, provides physical climate information for use by the authors of the Third National Climate Assessment (NCA) report, in draft form as of late 2013. One section summarizes historical conditions in the U.S. Midwest and trends in temperature and precipitation metrics that are important in the region. The historical climate conditions are meant to provide a perspective on what has been happening in each region and what types of extreme events have historically been noteworthy, to provide a context for assessment of future impacts. Some key characteristics of the Midwest historical climate identified in this report that relate to the All-Hazard Mitigation Plan include:
>
> *• Climatic and hydroclimatic phenomena that have major impacts on the Midwest include floods, severe thunderstorms, summer drought, heat, excess rain, heat waves and winter storms.*
> *• Historical, annual temperatures increased during the early 20th century to a peak in the 1930s, decreased into the 1960s/1970s, and increased thereafter. Annual temperatures have generally been well above the 1901-1960 average since the late 1990s and the decade of the 2000s is the warmest on record. Section 3: State Profile 30*
> *• Precipitation has been near or above the 1901-1960 average for most years during the last 4 decades, and there have been no years with major precipitation deficiencies during the last 2 decades. The overall trend in annual precipitation is upward and statistically significant.*
> *• The frequency and intensity of extreme precipitation has increased, as indicated by multiple metrics of extremes, including the number of 5-year storms and total accumulated precipitation during the top 10 wettest days of the year.*
> *• Frequency of intense cold waves has been very low prior to the mid-1990s. Freeze-free season length averaged about 155-160 days before the 1930s; increased to about 160 days from the 1930s to 1980s; and since the 1980s has increased gradually and now averages about one week longer than during the 1930s to 1980s.*
> *• Frequencies of summertime minimum temperatures of 70°F or greater have increased in many of the larger urban areas in the region, equaling very high nighttime humidity. Statistically significant positive trends were found for five cities from 1950 to 2009.*
> *• Recent heat waves, such as the 1995 event in Chicago which led to 700 fatalities, have been accompanied by very high humidity levels and high nighttime temperatures, but not quite as extreme daytime high temperatures*

(Kunkel et al. 1996; Rogers et al. 2007)". (Department of Public Safety and Division of Homeland Security and Emergency Management 2014)

Big Stone County is not exception to this phenomena and its location in the Midwest makes it subject to these historical climate trends that will continue in the future.

Climate Change Risks for Big Stone County

Every four years, the United States Global Change Research Program publishes a National Climate Assessment Report (http://nca2014.globalchange.gov/highlights/regions/midwest) The 2014 report identified the following climate change impacts to the Midwest:

"Extreme heat, heavy downpours, and flooding will affect infrastructure, health, agriculture, forestry, transportation, air and water quality, and more. Climate change will also exacerbate a range of risks to the Great Lakes."

According to the Minnesota State Hazard Mitigation Plan 2014, temperatures are rising and weather patterns are changing, with increases in severe weather events and extreme precipitation. As a result, more flooding, ice storms, drought, and higher night time temperature lows create the risks of flood damage, dangerous driving conditions and power outages due to downed powerlines (Seeley presentation 2013), wild fire and health risks, and unsafe ice cover on lakes.

The state hazard mitigation plan also notes that climate change will likely have different effects on different geographical regions of the country as well as within the state of Minnesota. These effects may include relative temperature increases and precipitation trends. In the absence of smaller scale modeling, specific predictions for smaller geographical areas are not available. Therefore, the climate change risks associated with Big Stone County are not mutually exclusive, but rather the effects in the county may differ from those of the Midwest region.

Climate Change Adaptation for Big Stone County

The climate change associated with Big Stone County leads to increased risks from natural disasters of various types and requires that an increase in emergency preparedness will be needed to mitigate the risks that are most likely. Reducing greenhouse gas emissions are still a valuable mitigation strategy that is still being addressed by many levels of government, however the purpose of this plan is to prepare and adapt to the changes that are likely to come.

Big Stone County can contact and/or utilize the state Interagency Climate Adaptation Team (ICAT) report, the Minnesota Health Department Extreme Heat Toolkit, the Climate Adaptation Partnership (CAP), and the Insurance Federation of Minnesota (IFM) to access data or information on how adaptation to climate change can be better planned for and carried out.

Socioeconomic Profile

Population Trends

Big Stone County has lost residents over every decade except the period from 1930 to 1940, declining to its 2000 population of 5,820. The rate of decline has been steady except for a large drop in population during the 1980s. The current population consists of 48.9% males (2,571) and 51.1 % females (2,679). According to the 2010 census, 98.3% of Big Stone County residents identified as white. One percent of residents identified with two or more races. Of those, "White and American Indian or Alaska Native" made up over half this group. Table 2.7 identifies population projections for Big Stone County. Individual cities are profiled below.

Table 2.7 Big Stone County Population Projections

	2010 Population	2012 Estimate	2020 Projection	2025 Projection	2030 Projection	2035 Projection	2040 Projection	2045 Projection
Big Stone County	**5,820**	**5,250**	**5,388**	**5,371**	**5,336**	**5,277**	**5,215**	**5,156**

Source: Minnesota State Demographic Center 2014

Big Stone County is home to eight cities and fourteen townships. The following is a brief city-specific discussion of population and number of households. Table 2.8 provides a breakdown between township and city populations in the county and Table 2.9 provides detailed data of the county's population. A population distribution map can be found in Appendix 1.

Barry

The city of Barry is located approximately six miles west of Graceville along Minnesota Highway 28. Barry is also the county's smallest city with 22 residents and 10 households (Minnesota State Demographic Center and Metropolitan Council 2007). In addition to Minnesota State Highway 28, County Road 7 runs north/south through the center of the city and the Burlington Northern Railroad runs parallel to Highway 28. Barry shares borders with Toqua Township.

Barry's population has been declining since 1960, losing 35 residents over 40 years, over half its 1960 population. The city's population projections estimate that Barry should continue to decline at a slow, but steady rate over the next 20 years, possibly bringing the population as low as nine residents in the year 2020. While the population of Barry has been declining, the city has only four fewer households than it did in 1960.

Much of the land within Barry's city limits is not zoned; the zoned land in Barry is either residential or agricultural. There is a small section of industrially zoned land in the northern part of the city. Barry has also zoned an area in the northeastern portion of the town for parks and recreation.

Beardsley

The city of Beardsley is located approximately five miles east of the South Dakota border in northern Big Stone County. The city is situated along State Highway 28. The community is within five miles of Big Stone Lake, the county's largest lake. Beardsley shares borders with Browns Valley Township. The city's 232 people and 115 households make it the county's fourth largest city (Minnesota State Demographic Center and Metropolitan Council 2007).

The city's population has been declining since 1960, losing 178 residents. The number and size of households have also seen steady decline since 1980. The city's population projections estimate that Beardsley should continue to decline at a slow, but steady rate over the next 20 years, possibly bringing the population to 190 in the year 2020. Beardsley's close proximity to Big Stone Lake could play a significant part in the city's future and affect future growth.

The zoning is almost entirely residential with a large agriculture zone on the western edge of the city. A few blocks of commercial zoning are located along Highway 28 run through the center of the city. The northern section of Beardsley, as well as a segment running along the eastern edge has not been zoned. Decisions on what to do with this land will be very important to the city if growth occurs, and Beardsley should be prepared to make these decisions in such a way that will promote orderly growth.

Clinton

The city of Clinton is located 11 miles north of Ortonville and 8 miles south of Graceville along U.S. Highway 75. County Road 11 dissects the city from the northwest to the southeast. County Road 6 runs along the southern edge of the city. In addition, Eli Lake creates the majority of the city's eastern border. Clinton shares borders with Almond Township. Clinton is the county's third largest city with 422 people and 183 households (Minnesota State Demographic Center, Metropolitan Council 2007).

Clinton has experienced some fluctuation in population trends over the last 40 years, with an overall loss of 143 residents. Clinton's population peaked in 1980 at 622 residents before starting a rapid decline. Between 1990 and 2000 the city lost 121 residents, or 21 percent of the population. Population decline is expected to continue with an expected overall loss of 56 residents between the years of 2000 and 2020. The average household size has also seen some fluctuation, but is experiencing a general downward trend. This is consistent with the shrinking household sizes seen throughout the area.

Along the western and northern edges of the city limits there are large tracts of land zoned for agricultural purposes. The southeastern corner is largely residential land. Public buildings and lands scattered throughout the city limits and a few commercial and retail zones are located within the city limits.

Correll

The city of Correll is located approximately 15 miles southeast of Ortonville. County Road 25 runs north out of Correll from the southern part of the city. State Highway 7 runs right through the center of town in a southeast to northwest direction. Correll shares borders with Akron Township. The city is located within a mile of Marsh Lake. Correll is Big Stone County's third

smallest city with approximately 34 people and 17 households (Minnesota State Demographic Center and Metropolitan Council 2007).

Correll's population has declined rapidly since 1960. The time-period between 1980 and 1990 saw the most dramatic decrease with a loss of 23 residents, a loss of 28 percent of the 1980 population in only a decade. The population is expected to continue to decline at a relatively rapid rate. It is important to note, however, that the number of households has not seen quite as dramatic of a decline. There has been an overall loss of ten households since 1960, a loss of only 30 percent compared to a loss of 53 percent of the population since 1960. The average household size in Correll went from 3.06 in 1960 to 2.04 in 2000; this is a loss of slightly more than one person per household.

Most of the land within the city limits is agricultural land. Residential zones are clustered in the southeastern section of the city limits located both north and south of Highway 7. Commercial and recreation zones located along Highway 7 and just off of County Road 25 north of the highway. Correll has a park and recreation zone in the northeastern corner of the city.

Graceville

Graceville is located on East Toqua Lake at the intersection of Minnesota State Highway 28 and U.S. Highway 75. Graceville is located 20 miles north of Ortonville and is surrounded by Graceville Township. County Roads 13 and 20 run north out of town and the Burlington Northern/Santa Fe Railroad parallels State Highway 28 through Graceville.

The city's 2007 estimated population by the Minnesota State Demographic Center and Metropolitan Council, 583 makes Graceville the second most populated city in Big Stone County. Graceville lost 240 people since 1960; however, the total number of households in Graceville has seen a net increase of three households since 1960. A decreasing average number of persons per household are most likely the most significant contributing factor here. It is important to note that while the current population trends show decline, Graceville's location at the intersection of State Highway 28 and U.S. Highway 75, as well as the attraction of East Toqua Lake create an opportunity for growth that can and should be exploited.

The land in Graceville is zoned residentially. Almost all of the city land along the shores of East Toqua Lake is residential, with an exception of a small section of agricultural land in the southernmost tip of the city. Another small section of agricultural land is located on the northern edge of the city and commercial/retail zoning is in Graceville's downtown area and along State Highway 28 and U.S. Highway 75.

Johnson

The city of Johnson is located approximately eight miles east of Graceville along Minnesota State Highway 28. County Highway 21 runs north/south through town and the Burlington Northern/Santa Fe Railroad runs east/west through town paralleling Highway 28.

The population of Johnson has been generally declining since 1960. The only period of growth since 1960 was in 1980 when Johnson gained four residents. Since 1960, Johnson has lost half its population going from 64 residents in 1960 to 28 residents in 2007 (Minnesota State Demographic Center and Metropolitan Council 2007). It should be noted that the rate of decline in housing is less than that of the population and the decline appears to have leveled off in the 2007 Census estimate. The difference in the rates of decline for population and households indicates fewer persons per household, a trend that is commonly seen throughout Big Stone County and all rural Minnesota communities.

The majority of the land within the city's limits is agricultural land. The population is concentrated in the northwest corner of the corporate boundaries zoned residential land. The city of Johnson has a small segment of land zoned public land within the residential area, as well as a few scattered sections of vacant land in and around the residential area.

Odessa

The city of Odessa is located in the southern portion of Big Stone County, approximately six miles east of Ortonville. Odessa is located on the Minnesota River, which forms part of the southern boundary of the city. U.S. Highway 7 joins with U.S. Highway 75 as it runs along the northern edge of town. County Road 21 forms the eastern border of the city running north/south. County Road 19 runs north/south through the city, and County Road 28 runs east/west paralleling the Burlington Northern Railroad as it runs through Odessa. The community is located in the southeastern part of Odessa Township.

Odessa's population has steadily declined to its current estimated population of 97 residents (Minnesota State Demographic Center and Metropolitan Council 2007). The 1960s and 1990s showed the most dramatic declines in population losing 40 and 43 residents, respectively. The city has also seen steady decline in both the number of households and the average household size. These trends indicate that the population decline may likely continue into the future.

As is the case in many of Big Stone County's communities, agricultural land takes up a significant portion of the land located within the corporate boundaries. Odessa also had a considerable amount of residential land. A section of residentially zoned land is found to the north located along Highway 7/75, while the remaining residential land is clustered in the southeastern corner of the city's corporate boundaries. Odessa also has land zoned for commercial/retail and industrial uses, as well as for parks/recreation and public lands or public buildings.

Ortonville

The city of Ortonville is Big Stone County's largest city with an estimated population of 1,932 residents (Minnesota State Demographic Center and Metropolitan Council 2007). It is located in the southern part of the county at the foot of Big Stone Lake on the South Dakota border. The city is located at the junction of U.S. Highways 12 and 75 and Minnesota State Highway 7. The city is located almost entirely within Ortonville Township. A small section of the city extends up into Big Stone Township.

Since 1960, Ortonville's population has seen a steady decline. The biggest drop in population was seen between 1980 and 1990 when the city lost 345 residents, followed by another large decrease from 200 to (estimated 2007) of 1,932 residents. The number of households, however, grew until the 1980 Census after which point the number of households began to decline. The 2000 total of 923 households has declined dramatically to 829, below the 1960 count of 869. The average household size has seen steady decline in the last 40 years and appears to have leveled off a bit. Ortonville is the economic center of Big Stone County and has many wonderful amenities that would allow for promotion and attraction of new business and residents. Methods of such promotion will be of great concern in the future.

The northern section of the city is largely residential. Industrially zoned land is located in the southern portion of the city with the exception of one small section of industrial land located more toward the center of Ortonville. Commercial/retail zones are located along Highway 75 heading north out of the city and along the downtown area.

As shown in Table 2.8 below, the distribution of population within Big Stone County has not significantly changed from 1970 to 2012. Notably, the main trend shows an increase of people living in cities versus rural townships. The greatest change from 1970 to 2007 is the overall decrease in population from 9,428 to 5,473, a loss of 3,955 residents. Table 2.9 identifies population, household units, households, persons per household, and person in group quarter comparisons from 1970 to 2012 for the county as a whole.

Table 2.8 BSC Distribution of Population between Cities & Rural Areas from 1960 -2012

	1960		1970		1980		1990		2000		2010		2012 (Est.)	
Townships	4,497	48%	3,592	43%	3,461	2,127	2,127	39%	2,419	40%	2,127	39%	1,953	37%
Cities	4,931	52%	4,738	57%	4,656	3,346	3,346	61%	3,695	60%	3,346	61%	3,297	63%
Total	**9,428**	**100%**	**8,330**	**100%**	**8,117**	**5,473**	**5,473**	**100%**	**6,114**	**100%**	**5,473**	**100%**	**5,250**	**100%**

Source: U.S. Census Bureau, 2008-2012 American Community Survey, Minnesota State Demographic Center and Metropolitan Council

Table 2.9 BSC Population Profiles

	1970	1980	1990	2000	2010	2012	2000-2010 Change		2010-2012 Change	
							Actual	Percent	Actual	Percent
Population	7,941	7,716	6,285	5,820	5,269	5,250	-551	-9%	-19	0%
Housing Units	3,024	3,493	3,192	3,171	3,115	3,129	-56	-2%	14	0%
Households	--	2,873	2,463	2,377	2,293	2,329	-84	-4%	36	2%
Persons per Household	--	2.69	2.55	2.38	2.24	2.19	0	-6%	0	-2%
Persons in Group Quarters	--	269	298	173	137	156	-36	-21%	19	14%

Source: U.S. Census Bureau, 2008-2012 American Community Survey, Minnesota State Demographic Center and Metropolitan Council

Household characteristics have a direct impact on land use, housing needs, social services, and educational expenses. Changes in household size have a direct and proportional effect on demand exerted and types of housing necessary for communities. As household size decreases, the demand for housing units will increase. Big Stone County had an estimated 3,129 housing units in 2012. Table 2.10 identifies the status of vacant houses in 2012. The conditions, type and variety of housing offered by communities directly influence the sustainability and vitality of the entire county. General county-wide housing characteristics are shown in Table 11.

Table 2.10 BSC Vacancy Status in 2012

Vacancy Status	Number of Units
For rent	39
For sale only	20
Rented or sold, not occupied	11
For seasonal, recreational, or occasional use	455
For migrant workers	0
Other vacant	275
Total	**800**

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.11 BSC Housing Characteristics in 2012

Total Housing Units	Total Structures Built	Owner Occupied	Renter Occupied	Total Occupied	Vacant
2010 or later	14	5	2	7	7
2000 to 2009	135	92	25	117	18
1990 to 1999	241	111	57	168	73
1980 to 1989	324	177	77	254	70
1970 to 1979	297	181	47	228	69
1960 to 1969	406	239	88	327	79
1940 to 1959	701	395	82	477	224
1939 or earlier	1,011	659	92	751	260
Total	**3,129**	**1,859**	**470**	**2,329**	**800**

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Age and Sex Characteristics

Since 1970, the county's population has "aged." Minnesota Planning predicts that the percent increase in elderly population will grow at a faster rate than the total population over the next 30 years. It is during this time frame that "baby boomers" will reach retirement age. This is a strong indicator of the need for many senior-related services, including senior housing and transit services.

Tables 2.12 and 2.13 show age and sex characteristics in Big Stone County. When evaluating data, each of the cities within the county had very similar distribution to the county as a whole. The entire county has a greater percentage of elderly people compared to that of the state.

Table 2.12 BSC Age Characteristics in 2012

	Under 18	18 and Older	Under 65	65 and Over
Minnesota	24%	76%	87%	13%
Big Stone County	21%	79%	74%	26%
Barry	6%	94%	100%	0%
Beardsley	23%	77%	82%	18%
Clinton	25%	75%	70%	30%
Correll	0%	100%	72%	28%
Graceville	16%	84%	65%	35%
Johnson	0%	100%	60%	40%
Odessa	22%	78%	80%	20%
Ortonville	18%	82%	72%	29%

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.13 BSC Sex Characteristics in 2012

	Male	Female
Minnesota	49%	51%
Big Stone County	49%	51%

Source: U.S. Census Bureau, 2010 Census

Economic Synopsis

Big Stone County's economic atmosphere supports an agricultural base, recreation, tourism, services, retail, trade and government. With strong and mature manufacturing and service-related industries, Big Stone County provides an ideal location for expansion of established businesses, as well as additional ventures. With excellent access to transportation systems, close proximity to the major urban centers; Big Stone County is positioned to have a vibrant economy for many years to come.

Fifty-eight percent of Big Stone County residents 16 years old and over are in the labor force and three percent are unemployed, according to the 2012 Census. Tables 2.13 and 2.1415 provide an in-depth breakdown of labor statistics and occupations by business and industry types in Big Stone County from 2012. In short, over 50 percent of the civilian labor force population was employed and likely in the Educational/Health/Social Services, Agriculture, Forestry, Fishing and Hunting, and Mining industries, or in retail trade.

Table 2.13 BSC Labor Statistics in 2012

Employment Status	Number	Percent
Population 16 years and older	4,270	100%
In labor force	2,508	59%
Civilian labor force	2,506	59%
Employed	2,421	57%
Unemployed	85	2%
Percent of civilian labor force	2	0%
Armed Forces	1,762	41%
Not in labor force	**2,378**	**100%**
Commuting to Work	1,708	72%
Car, truck, or van – drove alone	216	9%
Car, truck, or van -- carpooled	15	1%
Public transportation (including taxicab)	141	6%
Walked	39	2%
Other means	259	11%
Worked at home	17.8	(X)
Mean travel time to work (minutes)	4,270	100%

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.14 BSC Industries for the Employed Civilian Population in 2012

Agriculture, Forestry, Fishing and Hunting, and Mining	330
Construction	202
Manufacturing	185
Wholesale Trade	94
Retail Trade	265
Transportation and Warehousing, and Utilities	157
Information	19
Finance, Insurance, Real Estate and Rental and Leasing	111
Professional, Scientific, Management, Administrative, and Waste Management Services	95
Educational, Health and Social Services	677
Arts, Entertainment, Recreation, Accommodation and Food Services	73
Other Services (except public administration)	100
Public Administration	113
Total	**2,421**

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.15 identifies the major employers in Big Stone County with three of the top five organizations falling into this category. The remaining categories are government organizations.

Table 2.15 BSC Major Employers

Employer	Number of Employees
Ortonville Public School District #62	214
Ortonville Area Health Services	180
Graceville Health Center	120
City of Ortonville	96
Big Stone County	65
Total	**675**

Source: U.S. Census Bureau, 2008-2012 American Community Survey

As shown in Table 2.16 below, the highest percentages of households (58 percent) and families (60 percent) fall into the income range of $15,000 to $49,999 in Big Stone County. The median household income for Big Stone County in 2000 was $30,721. This amount is slightly higher than the estimated Regional Income Estimate found in Table 18 below, with Big Stone County's estimate income of $30,091 for 2006.

Table 2.16 BSC Income Statistics in 2012

	Households		Families	
	Number	**Percentage**	**Number**	**Percentage**
Less than $10,000	171	7%	44	3%
$10,000 to $14,999	204	9%	97	6%
$15,000 to $24,999	269	13%	164	10%
$25,000 to $34,999	229	10%	149	9%
$35,000 to $49,999	394	17%	291	18%
$50,000 to $74,999	525	23%	386	24%
$75,000 to $99,999	213	9%	185	12%
$100,000 to $149,999	183	8%	170	11%
$150,000 to $199,999	68	3%	66	4%
$200,000 or more	46	2%	44	3%
Total	**2,302**	**100%**	**1,596**	**100%**
Median household or family income	*$45,545*	-	*$52,500*	-

Note: Household count contains both families and persons living alone.
Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.17 Median Household Income within Region and Statewide

Region	2000	2010	2012	% Change: 2000-2012
Minnesota	$ 47,111	$ 57,243	$ 59,126	20.3%
Yellow Medicine	$ 34,393	$ 50,288	$ 52,134	34.0%
Big Stone	**$ 30,721**	**$ 42,870**	**$ 45,545**	**32.5%**
Swift	$ 34,820	$ 41,486	$ 45,984	24.3%
Chippewa	$ 35,582	$ 43,956	$ 46,579	23.6%
Lac qui Parle	$ 32,626	$ 45,550	$ 50,203	35.0%

Source: U.S. Census Bureau American Community Survey 5-Year Estimates, 2008-2012

Tables 2.18 and 2.19 compare monthly housing expenses for renter-occupied units and owner-occupied units. In 2012, nearly half of renters had rent lower than $499 dollars a month, while one third of mortgage holding owner-occupied units (32 percent) spent between $700 and $999 dollars per month.

Table 2.18 BSC Gross Rent in 2012

Monthly Rent	Number	Percent
Less than $200	62	16%
$200 to $299	31	8%
$300 to $499	100	25%
$500 to $749	106	27%
$750 to $999	47	12%
$1,000 to $1,499	44	11%
$1,500 or more	9	2%
No cash rent	71	x
Total	**470**	**100%**
Median of rented units	*$514*	

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Table 2.19 BSC Owner-Occupied Selected Monthly Owner Costs in 2012

Monthly Payments	Number	Percent
With a mortgage	858	46%
Less than $300	6	1%
$300 to $499	49	6%
$500 to $699	149	17%
$700 to $999	277	32%
$1,000 to $1,499	248	29%
$1,500 to $1,999	77	9%
$2,000 or more	52	6%
Median of mortgaged units	*$931*	X
Not mortgaged	1,001	54%
Median of not mortgaged units	*$372*	X
Total	**1,859**	**100**

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Community Infrastructure

This section identifies Big Stone County's schools, public facilities, parks and natural resources, and available modes of transportation offering transit, airport facilities, roads, and a multitude of trail opportunities. A complete listing of telecommunication and power facilities has been provided along with city-specific water and sewer systems currently in place throughout the county.

Schools

Big Stone County has three school districts Clinton-Graceville-Beardsley, Ortonville, and Lac qui Parle Valley. Clinton-Graceville-Beardsley host four cities: Clinton, Graceville, Beardsley, and Johnson. Ortonville hosts two cities: Ortonville and Odessa. Lac qui Parle Valley hosts the city of Correll.

Table 2.20 BSC Schools & Locations

Big Stone County Schools	Addresses
James Knoll Elementary	200 Trojan Drive, Ortonville, MN 56278
Ortonville High School	200 Trojan Drive, Ortonville, MN 56278
Ortonville Community Education	200 Trojan Drive, Ortonville, MN 56278
Clinton-Graceville-Beardsley Senior	712 Third Street, Graceville, MN 56240
Clinton-Graceville-Beardsley Elementary	South Main, Beardsley, MN 56211
Big Stone Colony Elementary	26051 Big Stone County Rd, Graceville, MN 56240
Lismore Colony Elementary	80391 330th St, Clinton, MN 56225

Public Facilities

Public Facilities have been mapped in the appendix. Important public facilities include city and town halls, county courthouse, libraries, parks, churches and historic resources. These places provide both public services and create an important sense of community character. Most public facilities are located in the cities. There are parks and wildlife management areas located in the county.

Table 2.21 BSC City Facilities

Beardsley	
Fire Hall/City Hall	Main Street
Clinton	
Memorial Building	Main Street, PO Box 5
Fire Hall/City Hall	111 Main Street
Correll	
Fire Hall/City Hall	Main Avenue
Graceville	

City Hall	415 Studdart Avenue
Public Library	415 Studdart Avenue
Odessa	
Fire Hall/City Hall	County Hwy 28
Ortonville	
Swimming Pool and Skating Rink	328 Otto Avenue
Police Station	225 3rd Street NW
Public Library	412 2nd Street NW
Waste Treatment Plant	Jackson Street
Water Department	400 O'Neil Street

Parks

Big Stone County Toqua Park is located in Graceville. The park offers 12 campsites, playground, softball field, volleyball court, swimming beach and a golf course.

Big Stone Lake State Park is located on the shores of Big Stone Lake, a border lake between Minnesota and South Dakota and the source of the Minnesota River. Established in 1961, the park consists of three distinct units: the Meadowbrook Area, the Overlook Area, and the Bonanza Area. Eight miles northwest of Ortonville on Highway 7, the Meadowbrook Area is the largest of the three. Once farmland, this area is slowly being restored to prairie, woodland, and wet-meadow communities.

Big Stone National Wildlife Refuge is located two miles southwest of Ortonville. The Minnesota River winds 11.5 miles through the refuge. It consists of 11,521 acres of which 1,700 acres are native prairie. A four-mile auto tour route provides a view of major habitats. Enjoy hiking trails, fishing, hunting, canoeing, snow shoeing and cross country skiing. The refuge also is a favorite for bird watching enthusiasts.

Transportation

Roads

Big Stone County is well served by an extensive roadway network that connects the county with the rest of the region and Minnesota. State, county, township, and city roads are all included in the roadway network. It is the primary means of transportation for both goods and people within and out of the county. A map of the big Stone County Transportation system can be found in Appendix 1.

Trunk Highway System

Big Stone County has two U.S. Trunk highways: 12 and 75, and two Minnesota Trunk Highways: 7 and 28. These roads are constructed and maintained by the Minnesota Department of Transportation (Mn/DOT). There are 51.7 miles of U.S. Highways and 59 miles of MN Highways in Big Stone County.

County Roads

These roads are established, constructed, and improved by the County Board. They are under the sole authority of the county board. There are 197.8 miles of county roads.

Township Roads

Roads established by and under the authority of the township board, or reverted to township jurisdiction by the county board. These roads are constructed and maintained by township boundaries. Township roads stretch to 349.5 miles.

City Streets

These roads serve as direct access from residential properties and/or commercial establishments and are classified as any street under the jurisdiction of a municipality not otherwise designated as a trunk highway, county state aid street, and highway or county highway. City streets stretch 15.1 miles.

Transit

Mass transit is an essential public service to provide for increased capacity on heavily traveled roads, transportation access to disabled persons or those otherwise unable to drive, supports dense land use development, decreases dependence on car use, and helps prevent the creation of additional air pollution from diminished individual car use.

Big Stone County has one large mass transit provider, Prairie Five Rides. Prairie Five Community Action Council, Inc. serves the entire five county region. It began serving the public with buses in July of 1995, and merged with Ortonville Area Transit July 1, 1999. Prairie Five started with five buses in 1995. The buses run from approximately 7 a.m. until 5:00 p.m., Monday through Friday and Prairie Five RIDES now operates 10 vehicles (small buses). In 2007, Prairie Five RIDES gave 76,851 rides driving 407,018 miles, compared to 2008 where they provided 83,405 rides and drove 399,071 miles.

Airports

Graceville and Ortonville have airports in the county. The Kapaun-Wilson Airport near Graceville has a turf runway 2,495 feet in length and 150 feet wide. The Ortonville Municipal Airport has a paved, 3,417 ft. runway 74 ft. wide. It also has a turf runway, 2,158 ft. in length and 300 ft. wide.

Railroads

There are two active rail lines in Big Stone County. Burlington Northern/Santa Fe (BNSF) operates a class two-rail line that runs along the northern edge of the county, running on the northern side of State Highway 28 through the communities of Johnson, Graceville, Barry and Beardsley. BNSF owns 1,626 miles of rail line within Minnesota, approximately 35 percent of the total mileage in the state. The other rail line in Big Stone County is operated by Twin Cities & Western Railroad Company (TC&W). The TC&W line is a class three line that runs parallel to State Highway 7 on the southern edge of the county to Ortonville. It runs through the communities of Correll, Odessa, and Ortonville.

Mn/DOT's Office of Freight, Rail and Waterways has identified both the rail lines in Big Stone County as primary rail lines. Primary rail lines make national and international connections between producers and markets and ensure protection of the current and future broad economic interests of the state.

A key element in rail transportation is the availability and capacity of elevators, especially considering the importance of grain movement in Minnesota. Four grain elevators have access to rail lines in Big Stone County that are licensed to buy and/or sell grain. Considering the importance of the rail lines and how much they handle in freight shipments, the elevators' role in the rail network is significant. Below is Table 23 listing the four grain elevators that are adjacent to rail lines in the county. In addition to the four elevators located along rail lines, there is an elevator in Clinton with a storage capacity of 20,000 bushel that is not located on a rail line.

Table 2.22 BSC Grain Elevators along Rail Lines

Location	Storage Capacity
Barry	652,000 bushels
Beardsley	978,000 bushels
Odessa	220,000 bushels
Ortonville	854,000 bushels

Trails

Big Stone County has a variety of trails available to the public located throughout the entire county. Table 2.23 below identifies all major trail systems and their particular uses including snowmobiling, walking, and horse trails.

Table 2.23 BSC Trails

Trail Name	County	Location/ Descriptions	Length (miles)	Surface	Use
Ridgerunners Snowmobile Trail	Big Stone, Swift	Routes throughout counties	140	Snow	Snowmobile
Sno Riders Trail	Big Stone, Traverse	Hwy 28/Hwy 75	96.6 GPS-verified 26 additional	Snow	Snowmobile
Big Stone Lake State Park	Big Stone	In State Park	51	Natural	Walk 19 Snowmobile 16 Horse 16

Source: UMVRDC Trail Planning Guide (2000)

Telecommunication and Power Facilities

Internet, Electric, Gas and Phone

Table 2.24 below indicates the telecommunication and power facilities within Big Stone County.

Table 2.24 BSC Telecommunication and Power Facilities

City	Telecommunication Internet, Cellular, Cable	Electric	Gas	Phone
Barry	Cell 2000 (Ortonville)	Otter Tail Power	LP	Century Tel
Beardsley	Info Link	Otter Tail Power		Century Tel
Clinton	MediaCom, NatesNet	Otter Tail Power	Border States Co-op	Verizon, CenturyLink
Graceville	Info Link Rural Cellular MediaCom	Otter Tail Power	LP Tri County Co-op	Century Tel
Odessa	Fed Tel or Info Link Rural Cellular No Cable	Otter Tail Power	LP Cenex	Federated Tel
Ortonville	Info Link Cell 2000 Mid-continent	City Of Ortonville	Peoples Natural Gas	Qwest

*Data Unavailable from Correll and Johnson.

Radio

Big Stone County has one radio station located in Ortonville. The radio station identification is KDIO on AM 1350. KDIO gives weather updates that are provided by the National Weather Service.

Sewer and Water Systems

Johnson and Correll do not have a city wastewater system and depend on Individual Sewage Treatment Systems (ISTS). ISTS are used for the treatment and disposal of wastewater from individual homes, isolated communities, industries or institutional facilities. ISTS is an effective way to treat wastewater but can have the reverse effect if improperly designed, installed or maintained. For more information on ISTS, refer to the Big Stone County local Water Management Plan 2003. Table 2.25 indicates sewer and water systems for all communities in the county.

Table 2.25 BSC Sewer and Water Systems

City/Location	Storm Sewer	Sanitary Sewer	Public Water
Barry		X	X
Beardsley		X	X
Clinton	X	X	X
Correll	X		X
Graceville	X	X	X
Johnson			X
Odessa	X	X	X
Ortonville	X	X	X

Source: Big Stone County Local Water Management Plan

Emergency Response

A county's ability to respond to an emergency situation or event is based on service areas, facilities, and equipment. An understanding of response times and abilities is critical in protecting the citizens of Big Stone County. The existing facilities and equipment in the county are intended to address local needs and support regional needs. Big Stone County is considered a mutual aid county and provides and receives support from adjacent counties. The following summary and description serves as an inventory of the response facilities for Big Stone County.

Medical Facilities

Big Stone County is served by two hospitals and one clinic (Table 2.26). Ortonville has two ambulances and Graceville has one ambulance.

Table 2.26 BSC Hospitals & Clinics

Hospitals & Clinics	Location
Clinton Community Clinic	Box 366 Main Street, Clinton, MN
Graceville Health Care Center	115 W 2nd Street, Graceville, MN
Ortonville Area Health Services	450 Eastvold Avenue, Ortonville, MN

Fire Services

There are no full-time fire departments in Big Stone County. All fire departments are volunteer-based with responsibilities divided into four response zones. The Department of Natural Resources (DNR) is responsible for fire protection on state forest and parkland and the U.S. Fish and Wildlife Service (USFWS) is responsible for fire protection the Big Stone National Wildlife Refuge. The DNR and USFWS work closely with local fire units for protection of these lands through contracting agreements. Additionally, all fire departments have mutual aid agreements.

Table 2.27 BSC Fire Capabilities

City	Pumpers	Tankers	Grass Rigs	Air Packs	Number of Firemen

Source: Big Stone County, City Surveys 2015

Public Safety

Emergency Operations Center

The Emergency Operations Center is located in the Big Stone County Sheriff's Department in the courthouse.

Emergency Warning Systems

The Big Stone County Public Service Answering Point (PSAP) is the Big Stone County warning point. The Big Stone County Sheriff has overall responsibility for ensuring that all notifications received by the warning point are handled properly. The Big Stone County warning point is responsible for proper receipt and dissemination of all emergency notifications.

The Aberdeen NOAA is responsible for disseminating all watches and warnings to the Big Stone County warning point, except warnings for conditions generated within the county itself. The Big Stone County warning points is at the sheriff's office in Ortonville, which has 24-hour warning capability.

Police Departments

There is one police department in Big Stone County, located in Ortonville. The other cities in Big Stone County contract with the sheriff's office for police services (Table 2.28).

Table 2.28 BSC Law Enforcement Capabilities

Location	Officers	Squad Cars
Big Stone County Sheriff	4 full-time, 4 part-time	7 vehicles 1 boat 1 snowmobile
Ortonville Police Department	3 full-time, 3 part-time	2 vehicles

Source: Big Stone County Emergency Manager

Countryside Public Health

Countryside Public Health Services is the County Department of Health for Chippewa, Swift, Lac qui Parle, Big Stone and Yellow Medicine counties. Part of their mission is designed to protect the health of the general population by emphasizing the prevention of disease, injury, disability and death though effective coordination, use of community resources, and provide education, training, WIC program, disease prevention and control and environmental programs. Countryside Public Health has the ability to respond to health emergencies and is currently developing a Medical Reserve Corp (MRC) for volunteers.

Heavy Equipment Inventory

Private Contractors

Private contractors in Ortonville, Odessa and Graceville have equipment that can be used in emergencies found in Table 2.29.

Table 2.29 BSC Heavy Equipment Inventory

City/Location	Private Contractors	Equipment Available
Graceville	Sullivan Excavating Greg Vold	Backhoes and other heavy equipment that would be vary useful for helping out in a disaster
Odessa	Hillman Excavating Ronglein Excavating	Backhoe and sometimes helps with snow Removal with a pay loader, road graders and backhoes
Ortonville	Ronglien Excavating Sev' Gravel and Excavating Hoxtell's Dray Line Royal Flush Sanitation	All equipment Trucks and backhoes Trucks and backhoe Septic service Skid Steer

Property

Land Uses

Land uses are regulated in Big Stone County through the county ordinance. Cities in Big Stone County have zoning ordinances that regulate the building construction and location of manufactured home parks.

Manufactured Home Parks

There is one manufactured home park in Big Stone County located in Ortonville. Manufactured home parks must follow guidelines as set forth in the Ortonville Ordinance Code.

Current Codes

Ortonville, Odessa, Graceville and Big Stone County have floodplain ordinances which regulate the structures that can be built in the floodplain. Big Stone County has numerous ordinances pertinent to hazard mitigation including a Solid Waste Management Ordinance which regulates residential and commercial garbage disposal, recycling and household hazardous waste, Shoreland Management Ordinance that lays out development densities, minimum lot sizes, structure and sewage treatment setbacks and vegetation removal limitations. Big Stone County also has a Floodplain Management Ordinance that helps the community stay ahead of flooding issues.

CHAPTER 3: HAZARD INVENTORY

The hazard inventory chapter is divided into two parts: Natural Hazards and Manmade/Technological Hazards, defined by the Minnesota State Hazard Mitigation Plan.

Definition – Natural Hazard
Natural hazards are those presented by the physical world, rather than those presented by humans. In a natural hazard, there is an interaction between the physical world, the constructed environment, and the people that occupy them. Natural Hazards are primarily atmospheric or geologic.

Definition – Technological Hazard
Technological hazards are those presented by humans, rather than those presented by nature. They are comprised of substances and processes that are flammable, combustible, explosive, toxic, noxious, corrosive, oxidizers, irritants, or radioactive.

NATURAL HAZARDS – PRESENTED BY THE PHYSICAL WORLD

Introduction

Source: Minnesota State Hazard Mitigation Plan

Guarding against the unpredictable forces of nature has always been a goal of society. Ways to accomplish this goal include informing society of known hazards and constructing building environments to prevent serious damage from occurring. As the forces of nature can strike with unpredictable fury, there is always an element of risk associated with natural hazards. To inventory hazards that have occurred in Big Stone County the Local Task Force committee identified hazards, established relationships between hazards, recognized current plans and programs in place to mitigate hazards, and highlighted gaps and overall deficiencies in current plans and programs.

For the purposes of this plan, natural hazards identified are organized into these groups:

1. **Violent Storms**
    a. Winter Storms
       Blizzards, Ice Storms, Sleet Storms, Heavy Snow or Snow Storm
    b. Summer Storms
       Thunderstorms, Lightning, Tornadoes, Hailstorms, Windstorms
2. **Extreme Temperatures**
   Summer Heat, Winter Cold
3. **Floods**
4. **Drought**
5. **Wildfires**
6. **Dam Failures**

Violent Storms

Violent storms can occur throughout the year in Big Stone County. For practical purposes violent storms are categorized as summer or winter storms although there is no sharp end or beginning to when they might occur.

Winter Storms

Big Stone County experiences three basic types of winter storms: blizzards, heavy snow events and ice storms. Ice storms include freezing rain, freezing drizzle and sleet.

Table 3.1 BSC Winter Events from 1993 - 2013

Winter	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Number of Events	6	3	10	13	1	2	0	7	2	0
Winter	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**	**2012-2013**
Number of Events	2	1	4	1	6	11	5	10	3	9
Events include: blizzards, winter storm, heavy snow, ice storm, low and extreme wind chills										

Source: National Climatic Data Center – Event Query 2014

Blizzards Blizzards, the most violent of winter storms, are characterized by low temperatures usually below 20° Fahrenheit, strong winds in excess of 35 miles per hour, and blowing snow that creates visibility issues at one-quarter mile or less for at least three hours. Blowing snow leads to whiteouts and drifting on the roadways, causing stranded motorists and the difficulty or inability of emergency vehicles to respond to incidents. While blizzards can occur in Big Stone County from October through April, they most commonly occur from November through the end of March.

Ice Storms Freezing rain, the most serious of ice storms, occurs during a precipitation event when warm air aloft exceeds 32° while the surface remains below the freezing point. When precipitation originating as rain or drizzle contacts physical structures on the surface, ice forms on all surfaces creating problems for traffic, utility lines, and tree limbs.

Sleet Storms Sleet forms when precipitation originating as rain falls through a rather large layer of the atmosphere with below freezing temperatures, allowing raindrops to freeze before reaching the ground. Sleet is also commonly referred to as ice pellets. Sleet storms are usually of shorter duration than freezing rain and generally create fewer problems.

Heavy Snow or Snowstorm In Minnesota, six or more inches of snow in a 12-hour period or eight or more inches of snow in a 24-hour period defines a heavy snow event. Snow is considered heavy when visibility drops below one-quarter mile regardless of wind speed.

History of Winter Storms in Big Stone County

Between January 1996 and March 2013, the National Climatic Data Center reported 30 blizzards. The winters of 1995–1996 and 1996–1997 were exceptionally extreme. Six blizzards were reported during the season of 1995-1996 and six blizzards were reported during 1996-1997. In addition, heavy snow, high wind and winter storms made these two winters difficult for Big Stone County. The winter of 1996-1997 was declared a Presidential disaster because of the snow emergency. There were many school closings during this winter. Snow removal was extremely expensive and large snow load both damaged and destroyed buildings. More recently, there were record setting snowfalls in December of 2010 and April of 2008.

There are two weather stations in or near Big Stone County, located in Artichoke Lake and Browns Valley. Tables 3.2 and 3.3 show the snowfall records for these two weather stations.

Table 3.2 BSC Snowfall Extremes by Month from 1973 - 2013

Month	Artichoke Lake		Browns Valley	
	High (in)	Year	High (in)	Year
January	26.0	2001	30.7	1975
February	22.6	2001	24.2	2001
March	18.1	2008	24.5	1997
April	17.0	2008	26.0	2008
May	0	-	0	-
June	0	-	0	-
July	0	-	0	-
August	0	-	0	-
September	0	-	0	-
October	7.5	1995	4.2	2009
November	18.7	1977	26.0	1985
December	31.1	2010	21.7	2009
Season (Jul-Jun)	68.3	1993-1994	86.5	1996-1997

Source: Midwest Regional Climate Center 2014

Table 3.3 BSC Largest One-day Snowfall in Artichoke Lake and Browns Valley from 1973 - 2013

Month	Artichoke Lake		Browns Valley	
	1-Day Max (in)	Date	1-Day Max (in)	Date
January	10	1/4/1997	17.5	1/5/1997
February	10	2/10/2013	12	2/21/2011
March	10.5	3/21/2008	15	3/20/1982
April	8	4/28/1994	12	4/26/2008
May	-	-	-	-
June	-	-	-	-
July	-	-	-	-
August	-	-	-	-
September	-	-	-	-
October	4	10/24/1995	2	10/15/2009
November	8.5	11/9/1977	10.5	11/25/1993
December	10	12/9/2012	9	12/25/2009
Season (Jul-Jun)	10.5	1/4/1997	17.5	1/5/1997

Source: Midwest Regional Climate Center 2014

Relationship to Other Hazards – Cascading Effects

Because most of Big Stone County is relatively flat, dangerous winter conditions are created when the wind blows including drifting, white outs and wind chills. Drifting and blizzard conditions can occur even if there are no new snow accumulations. During the winter of 1996-1997, drifts were higher than most street vehicles. The winter of 1996-1997 also contributed to record spring flooding. This event is discussed in the flooding section.

Summer Storms

Thunderstorms Thunderstorms are the most common summer storm in Big Stone County, occurring primarily during the months of May through August with the most severe storms most likely to occur from mid-May through mid-July. Thunderstorms are usually localized and produced by cumulonimbus clouds, always accompanied by lightening, and often have strong wind gusts, heavy rain, and sometimes hail or tornadoes.

Lightning While windstorms and tornadoes are significant hazards associated with severe thunderstorms, lightning is the most frequent hazard associated with thunderstorms and the hazard that results in the greatest loss of life. Lightning occurs to balance the difference between positive and negative discharges within a cloud, between two clouds and between the cloud and the ground. For example, a negative charge at the base of the cloud is attracted to a positive charge on the ground. When the difference between the two charges becomes great enough a lightning bolt strikes. The charge is usually strongest on tall buildings, trees and other objects protruding from the surface. Consequently, such objects are more likely to be struck than lower objects.

While cloud-to-ground lightning poses the greatest threat to people and objects on the ground it actually accounts for only 20 percent of all lightning strikes. The remaining lightning occurs

within the cloud, from cloud to cloud, or from the ground to the cloud. Within-cloud lightning is the most common type.

Tornadoes Tornadoes are the most violent of all storms. A tornado is a rapidly rotating column of air, spawned by a cumulonimbus cloud. When it drops to the ground it can create significant damage and loss of life. Tornadoes always occur in association with thunderstorms. While somewhat more common in southern Minnesota, they have occurred in all counties in the state.

Tornadoes are most likely to occur during warm, humid spells during the months of May, June, July, and August but have occurred as early as March and as late as November in Minnesota. On occasion tornadoes called cold air funnels occur after the passage of a cold front when air is much less humid but the air aloft is very cold creating enough instability to make funnel clouds. Most tornadoes occur during the warm part of the day – late afternoon or early evening; over 80 percent of tornadoes occur between noon and midnight.

The tornado's path typically ranges from 250 feet to a quarter of a mile in width. The speed of a tornado varies but commonly is between 20 and 30 mph. However, larger and faster tornadoes have occurred in Minnesota. Most tornadoes stay on the ground for less than five minutes. Tornadoes frequently move from the southwest to the northeast but this, too, is variable and consequently cannot be counted on in all instances.

Hailstorms Hail is considered ice and is a result of severe thunderstorms. Hail is formed when strong updrafts within the cumulonimbus cloud carry water droplets above the freezing level or when ice pellets in the cloud collide with water droplets. The water droplets freeze or attach themselves to the ice pellets and begin to freeze as strong updraft winds toss the pellets and droplets back up into colder regions of the cloud. Both gravity and downdrafts in the cloud pull the pellets down, where they encounter more droplets that attach and freeze as the pellets are tossed once again to higher levels in the cloud. This process continues until the hailstones become too heavy to be supported by the updrafts and fall to the ground as hail.

Most hail in Minnesota ranges in size from pea-size to golf-ball sized hail. Larger hailstones have been reported but are much less common. Strong updrafts are usually associated with severe thunderstorms. The area covered by individual hailstorms is highly variable because of the changing nature of the cumulonimbus cloud. While almost all areas of southern Minnesota can expect some hail during the summer months, most hail is not large enough to cause significant crop or property damage.

Windstorms Windstorms can and do occur in all months of the year but the most severe windstorms usually occur during severe thunderstorms in the warm months. These include tornadoes and downburst or straight line winds. Winds of greater than 60 mph are also associated with intense winter, spring, and fall low-pressure systems. These inflict damage to buildings and in some cases overturn high profile vehicles.

A downburst is a severe, localized downdraft from a thunderstorm or a rain shower. This outflow of cool or colder air can create damaging winds. Winds up to 130 mph have been reported in the strongest thunderstorms. Downburst winds can cause as much damage as a small tornado

and are frequently confused with tornadoes because of the extensive damage they cause. As these downburst winds spread out they are often referred to as straight-line winds. They can cause major structural and tree damage over a relatively large area.

Strong winds combined with saturated soils can lead to wide spread loss of trees. This becomes a problem in communities when downed trees injure people, damage property, knock down power lines, or impede traffic. Downed power lines present a risk of electrocution or fire. Risks associated with downed trees can be managed through proper tree selection and proper maintenance programs. Some communities desire the look and feel of tree-shaded roads. This desire may lead a community to encourage the planting of trees that are too large for the boulevards, resulting in a greater risk of property damage.

History of Summer Storms in Big Stone County

At one time or another Big Stone County has experienced all of the summer storms described above. Thunderstorms, hail storms, and windstorms are relatively common and can, among other things, topple trees, cause destruction to homes, and destroy agriculture crops. Table 3.4 lists the number of summer storm events between 1955 and 2013, as reported by the National Climatic Data Center. The average number of each type of events per year in Big Stone County is also calculated.

Table 3.4 BSC Summer Storms from 1955 - 2013

	Thunderstorm Wind 1955-2013	High Wind 1955-2013	Hailstorms 1955-2013	Tornados 1955-2013
Events	42	17	46	6
Years	58	58	58	58
Average per year	0.72	0.29	0.79	0.10

Source: National Climatic Data Center – Event Query 2014

According to the Storm Database, the county has experienced six tornados since 1967. None have been very strong and none have affected urban areas, and in general the county has been spared from significant tornado damage.

Clinton Tornado, May 17, 1996. The Clinton Tornado occurred eight miles southwest of Clinton. An F3 tornado crossing Big Stone Lake from Roberts County, South Dakota destroyed one cabin at the Meadow Brook Resort, took the roof off another cabin, and another cabin was demolished when a large tree fell onto it. Several boats on Big Stone Lake were overturned. Approximately 150 buildings sustained damage or were destroyed as the tornado moved northeast across Big Stone County through the townships of Prior, Big Stone, Almond, Malta, and Moonshine. Southwest of Clinton, a pontoon boat and a camper were destroyed. East of Clinton, a farm lost all buildings with severe damage to their home, the cupboards fell off the walls and doors would not close, signifying a twisted frame. Northeast of Clinton, another farm suffered damage to all structures and half the roof was torn from their home. Two miles south of

Johnson, a house (rambler) was completely destroyed and several barns and machine sheds were ruined, before the tornado lifted. Many trees were uprooted in the path of the tornado across Big Stone County and much of the power was out in the county as power lines were downed.

Relationship to Other Hazards – Cascading Effects

Flooding. Thunderstorms and heavy rain can cause flooding and property damage as well as disrupt emergency response, transportation, and communication.

Transportation, Emergency Services, and Utility Disruption. Violent storms of all types can cause property damage, loss of life, personal injury, disrupt transportation, communication, and emergency services, and threaten public health and safety. Summer storms can present significant threats to essential public infrastructure and services such as power, water supply systems, and sanitary systems. Utility disruptions, in particular, are most likely to occur if a violent storm were to destroy an "electrical center" located in cities. It could take up to a full day to restore communication power, pending the service provider.

Fire. The storms listed above could down power lines, which could lead to fires.

Violent Storms and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

Winter Storms and Climate Change Winter storms have had a large impact on public safety in Minnesota historically. Snowstorm frequency and annual total snowfall have the potential to increase in the future. These events increase energy demand and pressure on the systems that provide energy that can result in power outages. As these events increase in the future there is a risk of reduced reliability in services, increased number of outages, and rising energy costs that can affect public health.

Climate change will likely have different effects on different geographical regions of the country as well as within the state of Minnesota. In the absence of downscaled modeling, more specific predictions for smaller geographical areas are not available at this time. Therefore, the climate change risks associated with Yellow Medicine County are not mutually exclusive, but rather the effects in the county may differ from those of the state and Midwest region.

Summer Storms and Climate Change

Lightning and Climate Change

According to the Draft National Climate Assessment (NCA), projections for the intensity and frequency of tornadoes, hail, and the damaging thunderstorm winds and the conditions associated with lightning are not certain (NCA, 2013, p. 26). The plan also stated that severe rain events are becoming more common and may include an additional risk of lightning.

Tornadoes and Climate Change

Tornadoes and other severe thunderstorm phenomena in the U.S. cause more deaths and similar amounts of annual property damage as hurricanes. Recent research has provided connections between global warming and the factors that cause tornadoes and severe thunderstorms. However, there is still a lot of research that has gone unexplored due to the

challenges of observing these events and creating the computer models to simulate them (NCA, page 60).

Hail and Climate Change
The NCA reports uncertainty in predicting storm events associated with summer storms. However, during recent decades, the occurrence of very heavy precipitation has increased in Minnesota and it is predicted that this trend will continue into the future.

Windstorms and Climate Change
The NCA reported a slight increase of the frequency and intensity of winter storms and that the tracks of winter storms have shifted northward over the U.S. However, the lack of quality data sets makes assessment of these patterns difficult. Trends of storms remain uncertain and research will continue to investigate the connections between climate change and severe storms" (NCA, page 59).

Plans and Programs for all Severe Storms

Severe Storm Spotters Network. This program, sponsored by the National Weather Service (NWS), enlists the help of trained volunteers to spot severe storm conditions and report this information to the NWS. No tornado warning is given unless the storm has been spotted by someone or is confirmed by NWS radar reports. Big Stone County has 80 emergency responders that have been trained as severe weather spotters and always has enough volunteers to make this an effective program.

Severe Weather Awareness Week. Each spring Big Stone County Emergency Management personnel conduct a severe weather-training workshop for schools, hospitals and nursing home personnel.

Severe Weather Shelters The Armory in Ortonville has been designated as a safe shelter for all campers in the area.

Windbreaks. Mn/DOT and the Big Stone County Soil and Water Conservation District have been promoting a living snow fence program. Strategically planted strips of trees, shrubs and or native grasses can use natural snow fences to protect highways and dramatically reduce blowing and drifting snow. Mn/DOT has worked with the USDA to access CRP resources to help implement this program.

Live Weather Conditions. NOAA weather radios were distributed to most schools and nursing homes in the county.

Severe Weather Warning System. All the county's cities have emergency sirens to warn residents in the event of severe summer weather.

Hourly Data. Hourly weather data is available online from various websites, including the MnDOT Website.

Gaps and Deficiencies

- Some homes in the county lack basements that would provide shelter in the event of a tornado or damaging winds from a severe thunderstorm. Moreover, none of the county's nursing homes have basement shelters or other suitable shelter for residents. In the event of a violent storm residents are moved to an interior hall away from windows.
- The manufactured home park in Ortonville is quite old and may not provide adequate safety shelters for residents.
- Graceville has no place for campers at Toqua Park in Big Stone County for storms.

Extreme Temperatures

Located in the center of the continent, Minnesota and Big Stone County experience the extremes of summer heat and winter cold. Summer temperatures in Big Stone County have been as high as 110°F while winter temperatures have been as cold as -41°F. Both heat and cold pose risks for people, animals, equipment, and infrastructure.

History of Summer Heat in Big Stone County

In July, the warmest month of the year, the average high temperature is 84°F in most of Big Stone County. On average the county experiences 19 - 20 days of 90°F or higher during a summer. The all-time recorded high is 110°F in Browns Valley, which occurred in 1988.

Table 3.5 BSC Temperature Extremes

	Highest Temp	Date	Lowest Temp	Date
Artichoke Lake	108°F	July 31, 1988	-36°F	February 9, 1994
Browns Valley	110°F	July 6, 1988	-41°F	February 9, 1994

Source: Midwest Regional Climate Center 2014

While summers are typically warm but pleasant in Big Stone County, it is not uncommon to experience high dew points and temperatures in the 90s for several days in a row. Extended periods of warm, humid weather can create significant risks for people, particularly those that may lack air conditioning or proper insulation or ventilation in their homes. Animals are also at risk during extended periods of heat and humidity.

Heat Index has been developed as a measure that combines humidity and temperature to better reflect the risk of warm weather to people and animals. The index measures the apparent temperature in the shade. People exposed to the sun would experience an even higher apparent temperature. A heat index of 105°F is considered dangerous. With prolonged exposure, it could result in heat stroke, heat exhaustion, and heat cramps. People are reminded to use extreme caution when the heat index is between 90° and 105°F. A heat index of 95°F occurs when the temperature is 90°F and the relative humidity is 50 percent. This is more of a problem when these conditions are present for several days in a row, allowing buildings to become hotter and hotter as the conditions persist.

According to the State Climatologist, there is some evidence that current dew points are not only higher but are occurring with greater frequency than was true in the past. If that is true, Big Stone County residents can expect an increasing number of hours with heat indexes in the danger category.

History of Winter Cold in Big Stone County

On average, January is the coldest month, with daytime highs of averaging 22°F and nighttime lows of 0°F. These averages, however, do not tell the entire story. Maximum temperatures in January have been as high as 69°F and minimums as low as 40°F below zero in Big Stone County. The winter months, on average, produce about 37-42 days of 0°F or lower.

Cold weather is often accompanied by winds creating a dangerous wind chill effect, putting both people and livestock at risk. Most of the county is at risk of this kind of weather because of its relatively flat, open character. More wooded, hilly areas of the county are less severely affected by wind chill. Wind chills of -35°F and lower can present significant risk, particularly if people are not properly clothed or protected. A -15°F air temperature with wind speeds of 10 miles per hour creates a wind chill of 35 degrees below zero. Under these conditions, frostbite can occur in just minutes on exposed skin.

Relationship to Other Hazards – Cascading Effects

Violent Storms. Temperature extremes are often associated with weather extremes such as snowstorms and blizzards.

Drought. Extended high temperature extremes can phase into drought.

Wildfire. Dry, hot conditions can increase the risk of wildfires.

Collapsed Structures. Structural weakness results from building material failure, settling, and other factors. Tornadoes, floods, high winds, snow, heavy rainfall, may cause major damage to structures.

Utility Failure. Heavy utility use to heat or cool buildings can cause utility damage or failure.

Extreme Temperatures and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

The average temperature in Minnesota has increased more than 1.5 ° F since recordkeeping began in 1895 and that increased warming has been occurring in recent decades (Interagency Climate Adaptation Team, p. 4). Midwest annual temperatures have generally been well above the 1901-1960 average since the late 1990s. The warmest decade on record occurred during the 2000s (Kunkel, K.E. et al, 2013). In addition, the Midwest has experienced major heat waves and their frequency has increased over the last six decades (Perera et al. 2012). In the U.S., mortality rates increase 4% on days with heat waves in comparison with non-heat wave days (Anderson and Bell 2011). It's been projected that heat stress will increase as summer temperatures and humidity continue to increase (Schoof, 2012).

In regards to extreme cold temperatures, the Minnesota State Hazard Mitigation Plan 2014 states that there is not yet any observable trend related to extreme cold events and climate change in Minnesota. Historically, cold temperatures have always been a part of Minnesota's climate and extreme cold events will continue. However, an increase in extreme precipitation or ice storms due to climate changes could lead to a higher risk of exposure to cold temperatures during power outages or other storm-related hazards during extreme cold.

The state hazard mitigation plan also notes that climate change will likely have different effects on different geographical regions of the country as well as within the state of Minnesota. In the absence of downscaled modeling, more specific predictions for smaller geographical areas are not available at this time. Therefore, the climate change risks associated with Big Stone County

are not mutually exclusive, but rather the effects in the county may differ from those of the state and Midwest region.

Plans and Programs for Extreme Temperatures

The following programs and projects are in addition to the ones already mentioned for violent storms:

School Closings. The county's school districts each have their own school closing policy. The superintendents decide when to send students home based on current weather forecasts. Local radio stations partner with the districts to make sure school closure announcements are out by 6:00 a.m. or earlier.

*Heat Advisories***.** The local radio and TV media in concert with the National Weather Service issues a heat advisory when the combination of temperature and humidity create risks for people and animals. A heat index of 105 to 114 ^{o} F warrants a heat advisory. This occurs when air temperature reaches 95°F and the relative humidity is 50 percent. An excessive heat warning is issued when the heat index reaches 115°F. This occurs with an air temperature of 95°F and relative humidity of 60 percent. An index of 115 ^{o} F or higher creates severe risk for both humans and animals.

Wind Chill Warnings. The local radio and TV media collaborate with the National Weather Service and issue wind chill warnings when temperatures are 30° F or below. Severe wind chill warnings are provided when conditions warrant and when severe risk and safety is a factor. Wind chills of -40°F or lower frequently prompt the closing of schools to protect children, particularly those that might have to wait outside for extended periods of time.

Program Gaps or Deficiencies for Extreme Temperatures

- There are no identified locations, with backup generators for heating/cooling, in the county that are available for residents to go in case of a power outage during extreme temperatures and weather events. Clinton has a location for residents to go, although it is not in a written policy.

Flooding

A flood is defined as an overflowing of water onto an area of land that is normally dry. The term "100-year flood" is misleading - it is not a flood that will occur once every 100 years; rather, it is the flood elevation that has a one percent chance of being equaled or exceeded each year. Thus, a 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. A structure located within a flood hazard area has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage. One-hundred year floodplains have been identified, mapped and used for further analysis using a Geographic Information System (GIS).

Floods generally occur from natural causes, usually weather-related, such as a sudden snowmelt, often in conjunction with a wet or rainy spring or with sudden and very heavy rain

falls. Floods can, however, result from human causes such as a dam impoundment bursting. Additional water hazards considered in this section include flash floods, washouts, and ice freezes that have potential to affect dams and culverts. In the spring of 2009 and 2010, a great amount of water overflowed roads causing a major washout and road closures throughout the county.

History of Flooding in Big Stone County

Issues that arose from the 1997 and 2001 flood events:

Entire County

- Roads damaged from hauling of sand, etc.
- Flooded county and township roads, bridges and culverts.
- Flooded county ditches.
- High groundwater all over.
- Flooding all over county – streams, creeks and wetlands as well as the major rivers and lakes.
- Many roads closed.
- Lives at risk, especially in 1997.
- In 1997 only, septic tanks backed up into homes (many rural septic systems have been updated since).
- Eighty-two cabins and/or residences in the county were flooded. This does not include residences within city limits.
- Every road in Big Stone County had some flooding. A portion of every road was closed because of the flooding.
- In 2001 flooding was much less because of weather conditions. The lake was four feet lower.

Townships

High water over township road in Otrey Township. The road has been under water for three years but was not a mail or bus route. Other roads often flood during large rain events.

- Slough – erosion - gravel road is eroding away. Animals (muskrats) are causing erosion and rip-rap is needed for river banks. Safety issues arise as roads are continually used by public.

Clinton

- Slough within community, no natural runoff – which led to flooded homes:
    - Currently a pump system is used, but it is a slow process.
    - A solution would be to put in a stand pipe in storm sewers.

Graceville

- Northwest corner of Graceville flooded in 1997 and 2001.
- Since the 2001 floods, ditches and dikes have increased in capacity to hold floodwaters by four times. Graceville should be safe from future flood events.

Ortonville

- One house flooded by creek in 1997.
- Overflow for dike along Big Stone Lake.
- Eleven homes flooded in 1997 and twelve in 2001. All these homes are located on the Peninsula. Another home flooded in 2001 due to ice buildup. After the 1997 flood, these homes raised main floors or built homes higher. The residences near the flood area do not have basements and all residents had an opportunity to be bought out, but not all owners choose to do so.
- Other repairs on the Peninsula included replacing water mains and bad sewer mains. The road was redone above these utilities to protect in future flood events. The lift station was also replaced and raised from the original location. The city was only able to do one-half of the bad sewer main; they would like to finish the three-fourths mile.

Figure 3.1

Flooding Reports from the National Climatic Data Center (NCDC)
Storm Event Database
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

100-year Flood, 1997

As temperatures began to warm up towards the end of March, the near record to record snow pack across Big Stone and Traverse Counties began to melt and runoff, filling up ditches, lakes, creeks, streams, and low-lying areas. The extensive amount of water, inundated many county and township roads as well as some highways. Many sections on the roads were broken up or washed out. Some culverts were damaged or blown out and some bridges were damaged or washed out by ice chunks and high water flows. Thus, road closures occurred with rerouting taking place for school buses, mail carriers, farmers, ranchers, etc. Many acres of farmland and pastureland were underwater. Due to the high ground water level, some homes received water in their basements. Also, some farms were surrounded by water and were inaccessible, leaving some people and livestock stranded. The flooding continued into April.

Late March flooding from the meltdown of the near record to record snow pack continued throughout April. Most of the snowmelt across Big Stone and Traverse Counties occurred in early April. Ditches, lakes, creeks, streams, and low-lying areas continued to rise and flood into April. Many sections of county and township roads as well as some highways were inundated, broken up, or washed out. Many culverts were damaged or blown out and some bridges were damaged or washed out by ice chunks and high water flows. Thus, road closures were extensive with rerouting taking place for almost everyone, especially school buses, mail carriers, farmers, ranchers, etc. Some of the roads were closed up to several weeks. Countless acres of farmland and pastureland were under water. As a result, many of the crops were not planted or there were significant delays in planting. High ground water resulted in water in many basements. Also, some farms were surrounded by water and were inaccessible, leaving some people and livestock stranded. In early April, President Clinton declared Big Stone and Traverse Counties a federal disaster area. The total damage estimate for the flooding was $5 million.

Near record to record snowmelt runoff combined with heavy rains of 1.5 to 2.5 inches on April 5th caused the Big Stone Lake to rise to a record level of 973.45 feet above sea level, two feet above the old record in 1952. The rising lake threatened to breech the Big Stone Dam. As a result, extensive evacuations took place downstream from the Whetstone River and the Big Stone Dam. If the earthen dam would break, water from the lake and river would travel down the Minnesota River flooding homes and farms in low areas. Residents were urged to move to higher ground. Hundreds of people worked around the clock filling sandbags to fortify the dam. All of the residents of the town of Odessa were evacuated on the 6th. People on the peninsula in Ortonville were ordered to move out on the 5th and traffic on Highway 12 was stopped. As Big Stone Lake rose to a record level, many homes, resorts, and businesses in parts of Ortonville and along the lake were flooded and significantly damaged. This was the worst flooding for this area in history.

Flooding, April 7, 2001

Heavy rains of one to two and one-half inches combined with snowmelt runoff brought flooding to parts of Traverse and Big Stone Counties. Several roads were flooded with some receiving damage.

Relationship with Other Hazards – Cascading Effects

Hazardous Materials. Structures that house hazardous materials may be flooded causing leaks or transportation routes may be washed out, causing overturned vehicles.

Infectious Disease. Water issues often translate into issues around infectious diseases. Water contamination and wastewater removal many times go along with flooding issues. Diseases such as hepatitis A, giardia, cryptosporidium, and West Nile virus are potential hazards that have direct links to water.

Transportation, Emergency Services, and Utility Disruption. Violent storms of all types can cause property damage, loss of life, personal injury, disrupt transportation and communication and emergency services. Further, public health and safety, and essential public infrastructure and services such as power, water supply systems and sanitary systems, could be threatened. Utility disruptions in particular, are most likely to occur if a flood were to destroy an "electrical center" located in cities and may take up to a day to restore communication power, pending the service provider.

Landslide and Debris Flow. Destabilized stream banks are related to flooding. As rivers evolve they carve out a channel adequate to handle typical peak flows (1-2 year flood events). As landscape hydrology alters, higher peak flows carve out larger channels. Unfortunately, this often results in riverbanks being destabilized. Across the region these unstable banks have threatened farmlands, roads and homes. Bank stabilization projects are expensive and often only shift the problem to a different place along the stream. Long term mitigation for riverbank stabilization is 1) holding water on the landscape and 2) proper setback of infrastructure and building from rivers.

Debris flow includes downed trees being carried by floodwaters. These trees caused problems at various bridges over the Minnesota River in the last round of major flooding. The trees ran into bridges and got caught forming logjams. Contractors lifted the trees over bridges and returned them to the river downstream of the bridge, with the end result of trees floating to succeeding bridges to be lifted over again. Large flood events can and do kill trees within the flood plain, including large cottonwood and maples. In subsequent flood events these standing dead trees can be knocked down and washed away, causing havoc to communities and counties.

Floods and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

Precipitation change has led to increased magnitude of flooding. In conjunction with increased precipitation, seasonal changes have occurred with trends of wetter springs and drier summers and falls.

Plans and Programs for Floods

County Flood Area Map and Controls. The current county official Flood Insurance Rate Map (FIRM) identifies the 100-year flood areas. The county zoning ordinance controls the permitted land uses in these areas, what can be built and how.

Ortonville and Graceville Flood Map and Controls. Both Ortonville and Graceville have identified 100-year flood areas on the official FIRM maps and adopted in its zoning ordinance appropriate zoning and land use controls governing these areas.

Response Plan. A response plan to a flood emergency has been developed and local resources and personnel have been committed to it.

Program Gaps or Deficiencies for Flooding

- The Peninsula along Big Stone Lake is subject to large flood events.
- Some of the Township roads left under water after the 1993 and 1997 floods still need to be addressed.
- Township roads that receive repeated flooding need to be rip-rapped. Lake Toqua near Graceville could also have its banks rip-rapped.

Erosion

Erosion is the gradual wearing-away of land surface materials, especially rocks, sediments, and soils, by the action of water, wind, or a glacier. Usually erosion also involves the transfer or eroded material from one place to another (The American Heritage Dictionary of Student Science). Erosion can occur on farmland, stream banks, bluffs, and coastlines and can be the result of both natural and man-made activities.

History of Erosion in Big Stone County

The soils of Big Stone County are subject to both water and wind erosion. Water erosion results from soil removed from its original location by the force of water to lower slopes and plots. The potential for wind erosion occurs when wind velocities exceed 12 mph. The Big Stone County Water Plan (2014) states that approximately 75% of the land in Big Stone County is used for agriculture. A majority of this land is filled with cash crops, which causes soil to be more susceptible to both wind and water erosion.

Erosion and Climate Change

The Minnesota State Hazard Mitigation Plan 2014 states that flash flooding can contribute to erosion of stream banks. Impervious surfaces from human development as well as the predicted increases in heavy rain events in the future may contribute to flash flooding leading to erosion for stream and river banks in Big Stone County.

Plans and Programs for Erosion

Big Stone County Water Plan (2014) The Big Stone County Water Plan Update (2010) still lists erosion and sediment control as a priority concern for the county. The plan provides 5 action steps for the next five years to address soil and stream bank erosion in Big Stone County.

Program Gaps or Deficiencies for Erosion

Drought

Drought is defined as a prolonged period of dry weather or a lack of rainfall.

History of Drought in Big Stone County

Big Stone County has experienced prolonged periods without rainfall. The most severe in climatic records occurred during the 1930's. None so prolonged has been experienced since. The famous dust storm of 1934 was the "very worst dust storm in the history of the county". The wind was not particularly strong that day, but the dust was so thick in the air that at 4:00 p.m. it was pitch dark. Car lights were barely visible and lights in buildings looked murky.

Record annual low precipitation according to the Artichoke Lake Data Station was 11.2 inches in 1976. The record low for the summer was 2.08 inches in 1922 and for the month of July was .29 inches in 1936.

Drought of 1920's & 1930's. Perhaps the most devastating weather-driven events in American history were the droughts of the 1920's and 1930's, which significantly impacted Minnesota's economic, social, and natural landscapes. Abnormally dry and hot weather during the growing season throughout the better part of two decades turned Minnesota farm fields to dust and small lakes into muddy ponds. The parched soil was easily taken up by strong winds, often turning day into night. The drought peaked with the heat of the summer of 1936, setting many high temperature records that still stand today.

Drought of 1974-77. Drought-like conditions began in the winter of 1974 and extended through the summer of 1977. The dry conditions of these years lowered water levels in wells and caused record low stream flows throughout the state. Late summer forest fires broke out, and conflicts arose between domestic well owners and neighboring high capacity well owners. The DNR Division of Waters formulated new policies to resolve these resource management problems and user conflicts. Many of these new policies formed the basis of subsequent amendments to agency rules and state statutes.

Drought of 1987-89. The warm, dry winter of 1986-87 was the beginning of this period of little rainfall and extreme dryness. Drought conditions became very serious in mid-June 1988 when Mississippi River flow levels threatened to drop below the Minneapolis Water Works intake pipes at the City of Fridley. Below normal precipitation coupled with declining lake levels, ground water levels, and stream flow to create statewide concern. To facilitate coordination of drought response actions, a State Drought Task Force was convened by the director of the Division of Waters. The State Drought Task Force brought together local, state, and federal officials to share information and coordinate drought response strategies. Several actions were taken following the summer of 1988 to better prepare the state for the next drought. The Governor appointed a "Twin Cities Water Supply Task Force" specifically to make recommendations on how to meet future water demands in the event of low flow conditions on the Mississippi River. The Corps of Engineers initiated review of its operating plans for the Mississippi River headwaters reservoirs, and the 1989 legislature charged the Metropolitan Council with preparing water use and supply plans for the metropolitan area. In the summer of 1988, rains finally came in August, but not soon enough to save agriculture crops.

Drought of 2003. For a three-month period from mid-July through mid-October, a stubbornly persistent weather pattern resulted in extremely dry weather across the state of Minnesota. Few widespread rain events moved through the state during this time period and precipitation totals were less than six inches across much of Minnesota. Total rainfall for the mid-July through mid-October period fell short of historical averages by four or more inches in many areas. Rainfall deficits exceeded seven inches in parts of southeastern Minnesota. When compared with other July 15 through October 20 time periods in the historical database, mid-July through mid-October 2003 rainfall totals rank among the lowest on record for many areas of south central and southeastern Minnesota, as well as a small portion of west central Minnesota.

Drought of 2006. From August 1st to August 29th, Big Stone County experienced severe drought conditions that hit west central Minnesota. Rains from two to six inches late in the month alleviated drought conditions in the county and improved the drought situation by the end of August.

Relationship with Other Hazards – Cascading Effects

Wildfires. Woods, brush land, and non-cultivated fields stressed by drought, significantly increases the risks of wildfire.

Drought and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

Drought events have occurred throughout Minnesota's history. However, the Minnesota State Hazard Mitigation Plan 2014 reports that the impact of climate change on droughts is uncertain. During the past century there was no change that occurred for the duration of droughts in the Midwest, but the average number of days without precipitation is anticipated to increase in the future. In addition, the projection of higher air temperatures can cause increases in surface evaporation and water loss from plants. This could lead to drier soils where the sun heats the soil and the adjacent air instead of moisture with the result of hotter summers and drier climatic conditions.

Plans and Programs of Drought

Water Plan. The current DNR hydrology map identifies the major and minor aquifers serving the county and has mapped them.

Shoreline Zoning. Big Stone County has adopted via ordinance the state's statutory shoreline and riparian zoning classifications and minimum standards.

Program Gaps and Deficiencies for Droughts

- Semi-annual or annual water consumption by various major consumers, urban residential, industrial/commercial or agricultural, is not documented or known.
- Water conservation provisions and use restrictions in times of drought are not included in county or city ordinances.

Wildfire

A wildfire is an uncontrolled fire spread through vegetative fuels, posing danger and destruction to property. Wildfires can occur in undeveloped areas and spread to urban areas where structures and other human development are more concentrated. While some wildfires are started by natural causes such as lightning, humans cause four out of every five wildfires. Burning debris, arson, and carelessness are the leading causes of wildfires. As a natural hazard, a wildfire is often the direct result of a lightning strike that may destroy personal property and public land areas, especially on state and national forest lands. The greatest risks of wildfires are the destruction of timber, property, wildlife, and injury or loss of life to people living in or using the area for recreational activities.

Wildfire risks are not limited to public lands. There are extensive tracts of privately owned grasslands as well. These include both conservation program lands (CRP, RIM, CREP, etc.) and "rough ground" that has been hayed, pastured, or left wild. These private lands particularly in combination with public lands (such as WMA, SNA, State Parks, WPA, etc.) can combine to create substantial blocks of grasslands.

To date, there has been very little injury or loss of property resulting from wildfire in the Upper Minnesota Valley Region. However, there are some risks that should be managed to mitigate potential disasters.

History of Wildfires in Big Stone County

Wildfires occur throughout the state of Minnesota. According to the Minnesota State Fire Marshal, there are more than 2,000 annual wildfires with an estimated loss of more than $13 million dollars.

In the past couple of years, there has been at least one major fire. The Dismal Swamp Fire burned about 300 acres. In neighboring counties near the city of Milan, a huge wildfire burned over 3,000 acres in 2003. In 2004, a wildfire started in the Big Stone Wildlife Refuge in Lac qui Parle County and due to southeasterly winds, burned over a thousand acres in Lac qui Parle County. Had the winds been different, the entire river bottom could have burned.

Yearly occurrences are wildfires started along the railroads and farmland. Two other potential wildfire hazards are along power lines and utility structures and timber bridges. Farm equipment's hot exhaust can also start fields on fire.

Wildfire behavior is based on three primary factors: fuel, topography and weather. When dry weather mixes with windy conditions, areas with fuel have the potential for a wildfire to spread out of control as it did in the 2003 fire near Milan. Big Stone County currently has 10,011.7 acres enrolled in CREP, RIM, CRP and the Wetland Reserve Program. These areas are left for wildlife habitat and are not burned on a regular basis. As a result, years of dead grasses accumulate on these lands and are a good fuel for any fire that may start. The Minnesota River Valley and the Wildlife Management Areas also provide an abundance of fuel for wildfires. Wildlife Management Areas occupy about 3,261 acres in Big Stone County.

Topography is also important in determining wildfire potential, because it affects the movement of air and fire over the ground surface and the majority of Big Stone County is relatively flat. The slope and shape of terrain can change the rate of speed at which the fire travels.

Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity and wind affect the severity and duration of wildfires. These conditions are similar throughout the county. Although higher wind speeds are possible in the northern portion of the county due to the lack of vegetation and slope, the area is dominated by agricultural uses and lacks major stands of forests.

Relationship with Other Hazards – Cascading Effects

Flooding and Erosion. Major wildfires can completely destroy ground cover which can cause heavy erosion and loss of all vegetation. If heavy rains follow a major fire, flash floods, landslides and mudflows can occur since vegetation is essential in deterring flooding during heavy rainfalls or spring runoff.

Hazardous Materials. Anhydrous ammonia tanks that sit in the countryside or on farms are at risk if a wildfire occurred. While most tanks can be moved quickly, fire departments and response teams may not be aware of their presence.

Wildfires and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

On a global scale, fire risk will increase by 10-30% because of higher summer temperatures. The Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis by the U.S.D.A. Forest Service and Northern Institute of Applied Climate Science report that national and global studies agree wildfire risk will increase in the region, however there are a lack of studies that specifically address wildfire potential in assessment areas.

Droughts and drought fires have occurred throughout the history of Minnesota. No change has been found in the duration of Midwest droughts during the past century, but the average number of days without rain is predicted to increase along with temperatures. As a result, extreme heat events and associated wildfire risks are predicted to become more prevalent.

In addition, the increase of the fluctuations between drought, extreme rain events, and the increase in temperature will lead to changes in forest composition and distribution. These changes also will contribute to drier conditions that may cause increased fire risk as well.

Plans and Programs for Wildfires

Fire Districts and Departments. Fire departments (FD) respond to any structure fires that are in their own fire district and help when needed in other districts (West Central Firefighters Association) and often work together on large fires. All the FDs in the county are on the city level and are a part of the West Central Firefighters Association (also includes fire departments in surrounding counties).

West Central Firefighters Association. These fire departments agree to make available to each other their fire-fighting equipment and personnel in the case of emergencies, and each has the legal authority to send its fire-fighting equipment and personnel into other communities.

Zoning. The Big Stone County Zoning Department, which includes the county building inspector, regulates the development of new housing. The department also is in charge of enforcing safety restrictions including setbacks, lot coverage, lot depth and structure height. In addition, the Unified Building Code sets standards for roofing in cities. The fire marshal inspects commercial structures for potential fire hazards..

DNR Training. County firefighters participate in annual wildfire training classes offered by the Minnesota Department of Natural Resources-Forestry Department. The DNR also works with local firefighters in promoting their Fire Smart program, a fire prevention program involving local public schools geared towards children.

State Land Management. The DNR operates and regulates all state lands within the county, including management of Lac qui Parle State Park and Lac qui Parle Wildlife Management Area. The park currently is primarily managed for recreational activities. Wildfires are minimized by thinning brush and vegetation around the park, particularly around the campground areas.

Federal Land Management. The U.S. Fish & Wildlife Service manages the Big Stone National Wildlife Refuge.

Mutual Aid Agreements. A mutual aid agreement exists between the Big Stone National Wildlife Refuge and the city of Odessa.

FireWise. The DNR participates in a national wildfire education program called FireWise. This program provides tools for risk assessment and risk reduction and is available to communities who would like to do a detailed risk assessment. Small grants are available for 50 percent of projects.

Evacuation Plan. The county's cities have evacuation plans delineating routes residents should take in the event of large fires.

Dry Hydrants. Currently, there are three dry hydrants in Big Stone County. Dry hydrants have been demonstrated as an effective tool in assuring a steady and close by source of water for responding to both major wild land and structural fires in rural areas. Dry Hydrants use a non-pressurized pipe system and are hooked directly into a natural water source such as a pond or stream. Assessments should be made to determine where existing dry hydrants are, where fire risks are greatest, and where water bodies suitable to support a dry hydrant are located. Suitable placement of additional dry hydrants may be difficult as the area to fight wildfires is extremely large.

Education and Outreach. Education is available through existing resources and channels, such as the University of Minnesota Extension Service and Soil and Water Conservation Districts.

Evacuation Plan. The county's cities have evacuation plans delineating routes residents should take in the event of large fires.

Training for Fire Departments. Most of the fire departments in Big Stone County are well trained for fighting wildfires.

Equipment. All fire departments have 4-wheelers and other equipment for fighting wildfires.

Communication. Dispatch is notified when DNR or any other major burn is started in order to better prepare for fires that lose control or re-ignite at a later time.

Dry Hydrants. Currently there are three dry hydrants in Big Stone County: one at Artichoke Lake, one at the Louisburg road and one at Meadowbrook Access on Big Stone Lake. Dry hydrants have been demonstrated as an effective tool in assuring a steady and close by source of water for responding to major wild land and structural fires in rural areas. Assessments should be made to determine where existing dry hydrants are, where fire risks are greatest, and where water bodies suitable to support a dry hydrant are located. Otrey Lake may be a suitable place for a dry hydrant. Suitable placement of additional dry hydrants may be difficult as the area to fight wildfires is extremely large.

Program Gaps or Deficiencies for Wildfires

- There is currently no program to ensure that fire is considered when planning conservation plantings that include woody cover. Firebreaks should be included to protect homes and woody cover as well as allowing the use of fire as a management tool. (If a tree and shrub planting is placed in the middle of a prairie planting, it may be difficult to accomplish a prescribed management burn of that property without damaging or destroying the woody component. It may also be impossible to protect that planting in the event of a wildfire.)
- There are many CRP, CREP and other natural areas that are not managed with prescribed burns. These areas should continue to work with professional agencies to manage the land with prescribed burns to help reduce trash and debris that can create a large wildfire hazard.

Dam Failure

Dam failure is defined as the collapse or failure of an impoundment resulting in downstream flooding. Dam failures can cause loss of life and extensive property damages; and could result from an array of situations, including flood events, poor operation, lack of maintenance and repair, and terrorism.

The main purpose of dams is to hold water, which is important during high water or floods, especially during spring runoff and immediately after heavy rains. Although dams act to prevent harm from flooding, they do pose potential threats in the event of failure. Dam failure can push a wall of water down to the valley below, causing serious destruction in its path.

History of Dam Failure in Big Stone County

The worst recorded dam failure in U.S. history occurred in Johnstown, Pennsylvania, in 1889. More than 2,200 people were killed when a dam failed, sending a huge wall of water downstream, completely destroying the town below. Although risks are minimal, dam failure can occur in Minnesota. Several dam failures have occurred in Minnesota in the past, but none have been reported in Big Stone County.

Lac qui Parle Flood Control and Water Conservation Project were authorized by Congress in 1936 and were partially constructed as a W.P.A. project. The Corps completed construction of their portion of the project from 1941-1951 and operation of the project was transferred from the state to the Corps of Engineers in 1950. This project is located on the Upper Minnesota River in western Minnesota near the South Dakota border. It consists of the Lac qui Parle Dam, Marsh Lake Dam, Highway 75 Dam, Watson Sag Weir and diversion channel on the Big Stone River.

Long Tom Dam is located up river from the city of Odessa. If this dam failed, there could be some damage to the city of Odessa.

Relations with Other Hazards – Cascading Effects

Flood. Dam failure, although the risk is minimal, has the potential to be devastating to the areas within the floodplain and around the stream directly below the dam in Montevideo and Granite Falls. If the Lac qui Parle Dam were to fail, Montevideo and Granite Falls would be impacted. Dam failure would cause immediate flash flooding, destruction of property, erosion of crops, and the potential destruction of infrastructure.

Dam Failure and Climate Change

Source: Minnesota State Hazard Mitigation Plan 2014

Dams are designed based on assumptions about a river's annual flow behavior. These assumptions will determine the volume of water behind the dam and the amount of water flowing through the dam at any one time. Changes in weather patterns due to climate change may change the hydrograph, or expected flow pattern.

Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events are a mechanism that also results in increased discharges downstream. It is conceivable that bigger rainfalls at earlier times in the year could threaten a dam's designed margin of safety, causing dam operators to release greater volumes of water

earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream.

While climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures. Climate change is adding a new level of uncertainty that needs to be considered with respect to assumptions made during the dam construction.

Plans and Programs for Dam Failure

Floodplain Ordinance. The county floodplain ordinance prohibits further development on the properties in the floodplain, including property directly below the dam.

Dam Inspection. The Minnesota Department of Natural Resources regulates nearly 900 of the numerous dams in the state. The DNR and U.S. Army Corps of Engineers regularly inspect the dam and reservoir capabilities for flooding and dam failure. Their report indicates that dam sizes are adequate for any major floods or spring runoff.

Program Gaps or Deficiencies for Dam Failure

- None Listed.

Introduction

Source: Minnesota State Hazard Mitigation Plan

Technological hazards are a part of everyday life, a result the modern world in which we live. The challenge is to benefit from the use of technology while limiting potential harm to the community. In order to fully realize the benefits of technology, it is necessary to plan an effective response to unwanted technological emergencies before they occur.

From a hazard mitigation perspective, the existence of technological hazards in the community poses a risk to life, health, or property, just as natural hazards do. The use of hazardous materials in manufacturing and transportation can be extremely harmful if an unwanted release occurs and the use of nuclear materials in the presence of a community creates risks that must be managed. While dam failure can result from natural hazards, dams will still have a catastrophic impact on those downstream if poor engineering or construction cause it to fail. Further, the furnishings in our homes make a pleasant living environment, but are often flammable and produce toxic gases if ignited.

For the purposes of this plan, technological hazards identified are organized into these groups:

1. **Infectious Diseases**
2. **Fire**
3. **Hazardous Material**
4. **Water Supply Contamination**
5. **Wastewater Treatment System Failure**
6. **Civil Disturbance/Terrorism**
7. **Airplane Incidents/Accidents**

Infectious Diseases

An infectious disease is defined as an organism or matter that has the potential to spread or affect a population in adverse ways. Infectious diseases have the potential to affect any form of life at any time based on local conditions, living standards, basic hygiene, pasteurization, and water treatment. Despite breakthroughs in both medicine and technology, infectious diseases continue to pose a major public health risk. Today, the issue of emerging and re-emerging infectious diseases is at the forefront of public health concern. The very young, older adults and hospitalized or institutionalized patients are at an increased risk for many infectious diseases. Changes in demographics, lifestyle, technology, land use practices, food production and distribution methods, child care practices, as well as increasing poverty, have roles in emerging infections.

Many infectious diseases are preventable and controllable. Prevention and control of infectious diseases involve collection of accurate condition assessment data. Outbreak detection and investigation and the development of appropriate control strategies (both short and long term)

are based on specific epidemiological data. These activities require close collaboration among clinical providers (especially infection-control practitioners within hospitals), clinical laboratories, state and local health departments, and federal agencies. Furthermore, a need exists for continued education of food industry professionals, health-care students and providers, as well as research to improve immunizations, diagnostic methods, and therapeutic modalities. The prevention of infectious diseases requires multidisciplinary interventions involving public health professionals, medical practitioners, researchers, community-based organizations, private and volunteer groups, industrial representatives, and educational systems.

History of Infectious Diseases in Big Stone County

Minnesota has not had an infectious disease outbreak that has reached epidemic proportions in decades. Bog Stone County has experienced individual cases of infectious diseases over the last 50 years that have been considered isolated occurrences or minor exposures.

In contrast to typical natural disasters in which critical components of the physical infrastructure may be threatened or destroyed, an infectious disease outbreak may also pose significant threats to the people responsible for critical community services due to wide spread absenteeism in the workforce. In the non-health sector, this might include highly specialized workers in the public safety, utility, transportation, or food service industries, and will likely vary from jurisdiction to jurisdiction. State and local officials should carefully consider which services and key personnel within relevant firms or organizations are essential. It is important to identify where absenteeism would pose a serious threat to public safety or would significantly interfere with the ongoing response to the outbreak. To offset this issue, Countryside Public Health has collaborated with Big Stone County to create a Continuity of Operations Plan that determines priority activities that will help to ensure an office will be able to remain open during times of high absenteeism.

In general, infectious diseases would have no effect on physical property. There would be, however, a negative impact on the economy in the case of a widespread outbreak. Businesses may be forced to shut down for an extended period. Big Stone County's entire population is susceptible to exposure from an infectious disease because of the random nature of diseases. Infection rates and exposure risk will vary based on the disease, individual sanitation habits, and personal behaviors. Large population concentrations and sites with large numbers of people are especially at risk in the event of an outbreak. The following infectious diseases, divided by type, could be considered a health risk and disaster if a large outbreak occurred.

Human Health

Pandemic A pandemic occurs when a disease is prevalent throughout an entire country, continent, or world, greatly affecting the human population. Many pandemics have occurred throughout history including small pox, cholera, measles, tuberculosis, and more recently HIV/AIDS and influenza. In November 2005, the U.S. Department of Health and Human Services (HHS) released a comprehensive plan for responding to a possible pandemic (Minnesota Department of Health 2009). Numerous state, local, and private entities have defined responsibilities to fulfill in the event of pandemic. For instance, the Department of Public Safety is responsible for organizing and coordinating a statewide response to a pandemic

and the Minnesota Department of Health along with the Countryside Public Health and other local healthcare providers will work to minimize the impact of a pandemic on human health. To date, pandemics have not occurred in Big Stone County or in the State of Minnesota.

Vaccine Preventable Diseases

While most medicines treat diseases, vaccines prevent diseases by stimulating the immune system with the same germs that can cause the disease. Vaccines contain germs that have either been killed or weakened, which cause the immune system to produce antibodies as if a person was exposed to the disease. This process gives people immunity to a particular disease without actually having the disease. There are a number of vaccine preventable diseases that could affect residents of Big Stone County. More information on vaccine preventable diseases can be found on the Center for Disease Control and Prevention website: http://www.cdc.gov/vaccines/vpd-vac/.

It is important that all people in good health are up-to-date on their vaccinations. Some individuals such as the very young, those in poor health, and the elderly should not get particular vaccinations. This is when 'Herd Immunity' helps to prevent the spread of these diseases. Although certain vaccinations are required for children to attend school, only approximately 90% of children are vaccinated. In addition, studies have shown that only 40-60% of vaccines are effective in the elderly. Everyone else must be vaccinated in order to prevent a disease outbreak among those who cannot be vaccinated.

Seasonal Influenza According to the CDC, influenza (flu) is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and lungs. Flu viruses are believed to spread via droplets made when people with flu cough, sneeze, or talk. Possible symptoms of the seasonal flu include fever, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, and possible vomiting and diarrhea. The best way to prevent seasonal influenza is to get vaccinated. Each year, a new vaccination is created that works to protect against new strains of Influenza Type A and Influenza Type B. One of the most severe strains in recent years was H1N1, also known as Swine Flu, which was first detected in 2009. More information can be at http://www.cdc.gov/flu/.

Hepatitis A Hepatitis A is an enterically transmitted viral disease that causes fever, malaise, anorexia, nausea, and abdominal discomfort, followed within a few days by jaundice. The disease ranges in clinical severity from no symptoms to a mild illness lasting one and two weeks to a severely disabling disease lasting several months. In developing countries, hepatitis A virus is usually acquired during childhood, most frequently as a symptomatic or mild infection. Transmission can occur by direct person-to-person contact; exposure to contaminated water, ice or shellfish harvested from sewage-contaminated water; or from fruits, vegetables, or foods eaten uncooked, which can become contaminated during harvesting or subsequent handling. Minnesota saw 145 cases of Hepatitis A in 1998 and just 19 cases in 2014 (Minnesota Department of Health 2015). It has however, become more prevalent again as people eat outside of the home more frequently.

Other vaccine preventable diseases include small pox, measles, mumps, rubella, pertussis (Whooping Cough) and more. More detailed information can be found at www.cdc.gov/vaccines/vpd-vac/ .

Vector Borne Diseases

Vector borne diseases are bacterial and viral diseases transmitted by mosquitoes, ticks, and fleas. According to the Center for Disease Control and Prevention, vector borne diseases include some of the world's most destructive diseases. They have become an increasing threat to human health as globalization increases and environment and climate change take place. Many vector borne diseases can infect animals as well as humans. Common vector borne diseases in Minnesota include West Nile Virus, La Crosse Encephalitis, Lyme Disease, and Rocky Mountain Spotted Fever. Chikungunya is a mosquito transmitted disease believed to have originated in the Caribbean. Chikungunya was found in Florida in July of 2014. There have been no cases reported in Minnesota to date. More information on vector borne diseases can be found at http://www.cdc.gov/ncezid/dvbd/.

West Nile Virus (WNV) The virus made its first appearance in Minnesota in July 2002. In the fall of 2003, the first West Nile death in Minnesota was reported. As of July 2009, Minnesota has reported 2559 human cases of West Nile and a total of seven deaths. Big Stone County has experienced 3 cases in since 2010 (Countryside Public Health).

Most people with the West Nile virus will experience only mild symptoms – or no symptoms at all. Less than one out of every 150 people who become infected will become severely ill. However, in some cases, West Nile can cause encephalitis, an inflammation of the brain. Approximately 10 percent of these encephalitis cases are fatal. Symptoms of the illness usually show up two to 15 days after being bitten. They can include headache, high fever, muscle weakness, stiff neck, disorientation, tremors, convulsions, paralysis and coma. People who suspect that they may have West Nile are recommended to see a physician.

Respiratory Illnesses

Respiratory Illnesses such as Pertussis (Whooping Cough), SARS (Severe Acute Respiratory Syndrome), MERS (Middle East Respiratory Syndrome), Enterovirus 68, and other flu viruses are common in the United States and around the world. Many of these illnesses could be prevented with vaccination. However, viruses and bacteria are constantly changing and mutating making vaccines and antibiotics outdated quickly. This is the reason new flu vaccines come out each year. More information on respiratory illnesses can be found at http://www.cdc.gov/ncird/.

Gastrointestinal Illnesses

Many gastrointestinal illnesses in humans are a result of germs passed on by animals or other humans through water, food, and direct contact. Common illnesses include Salmonella, E.Coli, Norovirus (Norwalk Virus), and Cryptosporidium (Crypto). Hand washing is the first step to prevent the transfer of these illnesses. More information can be found at http://www.cdc.gov/zoonotic/gi/.

Ebola Virus The 2014 Ebola epidemic is the largest in history, killing over 10,000 people in West Africa. Since it was discovered in 1976, there have been sporadic outbreaks in humans in Africa. Although the Ebola virus was reported in the United States on a few occasions in 2014, no cases have been reported in Minnesota. Symptoms of Ebola include fever, headache, muscle pain, weakness, fatigue, diarrhea, vomiting, abdominal pain, and unexplained hemorrhaging. Further information on the Ebola virus can be found at http://www.cdc.gov/vhf/ebola/.

Animal Health

Wildlife diseases are a major area of concern in colonial water birds or major concentrations of waterfowl. Diseases, such as Newcastles Disease or West Nile, exist in the wild and outbreaks will occur. However, the extent to which animals die or disease is spread can be minimized through early identification.

Animal diseases of concern, particularly in cattle and flocks in Big Stone County nearby areas include Mad Cow Disease (Bovine Spongiform Encephalopathy), Foot-and Mouth disease, Chronic Wasting Disease, Rabies, and Brucellosis. Most recently, in early 2015, H5N2 Avian Influenza was found in commercial turkey flocks in seven counties near Big Stone, including Lac qui Parle and Swift Counties, immediately to the south. Precautions are being taken to prevent the spread of this virus and efforts are being made to identify the source. The MN Board of Animal Health is the lead investigator in this outbreak. Minnesota Department of Health is monitoring workers for illness. More information on these and other animal health issues can be found at http://www.aphis.usda.gov/wps/portal/aphis/home/.

Relationship to Other Hazards – Cascading Effects

Associated with Other Disasters Infectious disease outbreaks can occur as primary events themselves, or they may be secondary events to another disaster or emergency such as a terrorist attack, biological accident or natural hazard event.

Riots/Civil Disturbance. If an epidemic event were to occur, deaths, fear and misinformation could trigger large-scale riots, panic and lawlessness. Infectious diseases have the potential to be local, regional, statewide or national in scope and magnitude.

Plans and Programs for Infectious Diseases

Emergency Operations Plan Big Stone County currently has an emergency operations plan. This plan outlines procedures for county and local governments for contacting appropriate state and federal agencies, guidelines and strategies for dealing with infectious diseases, and command structures with the County Health Department and the Emergency Manager for Big Stone County. Public education lies with public health as well. Much of the information is coordinated with the Center for Disease Control and Prevention and the Minnesota Department of Health.

Emergency Response Plan Response plans are incorporated into the Emergency Operations Plan and are added as needed. Countryside Public Health maintains emergency response plans and the state provides a framework as new plans are necessary.

Cooperation with State Health Department Countryside Public Health works with the Minnesota Department of Health to address infectious diseases that are listed in Chapter 4605.7040 Disease and Reports (such as Encephalitis, Hepatitis, Influenza, Lyme Disease, Tuberculosis and Syphilis). If any of these or other listed diseases should appear in Big Stone County, the county works in cooperation with both the state health department and the Centers for Disease Control and Prevention.

Notification Communication between Countryside Public Health, the Minnesota Department of Health and the Center for Disease Control operates 24 hours, seven days a week depending on where an outbreak first occurs. Countryside Public Health, Big stone County Answering Point and the County Emergency Manager receive health alerts via email and fax with instruction with how to proceed. Hospitals, clinics, city administrators, emergency managers and county commissioners are notified by both Countryside Public Health and the Minnesota Department of Health.

Health Alert Network The Health Alert Network has been developed as part of Center for Disease Control's (CDC) Public Health Emergency Preparedness & Response Program. This network is tested twice yearly. The Health Alert Network coordinates and maintains CDC's Public Health Emergency Preparedness & Response Website (http://www.bt.cdc.gov/). The Health Alert Network (HAN) is a nationwide, integrated information and communications system serving as a platform for distribution of health alerts, dissemination of prevention guidelines and other information, distance learning, national disease surveillance and electronic laboratory reporting, as well as for CDC's bioterrorism and related initiatives to strengthen preparedness at the local and state levels. The Health Alert Network ensures:

- High-speed, secure Internet connections for local health officials, providing access to CDC's prevention recommendations, practice guidelines, and disease data.
- Capacity for rapid and secure communications with first responder agencies and other health officials.
- Capacity to securely transmit surveillance, laboratory, and other sensitive data.
- On-line, Internet- and satellite-based distance learning systems.
- Early warning broadcast alert systems.
- Public health agencies achieve high levels of organizational capacity.

Vaccination Program Minnesota Vaccine for Children (MVFC) is a program that is set up for children in lower income families without insurance. This covers children so they can be vaccinated for infectious diseases. MNVFC is also available at local clinics. The program is designed to assist families of need in protecting their children from infectious diseases.

Quarantine/Isolation Plan The state is ultimately responsible to handle quarantine/isolation issues. Countryside Public Health has developed a Quarantine/Isolation Plan that would provide follow-up to those in isolation/quarantine and ensure their basic needs are met.

Program Gaps or Deficiencies for Infectious Diseases

- Countryside Public Health has a plan in place with multiple ways to reach the public. This plan requires and receives continuous review, constant monitoring, and updates as necessary.

Fire

Urban fires are blazes that spread through structures, posing danger and destruction to property. These fires include any instance of uncontrolled burning which results in structural damage to residential, commercial, industrial, institutional or other properties in developed areas. Fires can occur in any community, and pose threats year round.

History of Fires in Big Stone County

According to the State Fire Marshal Division through the Fire Reporting System updated in 2007, Big Stone County has had two fire-related deaths in the last 24 years.

Fires have occurred throughout the entire county (See Table 3.6) and in 2007; Big Stone County had a total of 25 fire runs, 21 "other" runs, and lost a total of $217,200 dollars. A grain elevator in Beardsley exploded into fire 25 years ago from dust particles. This is one example of the fire hazards in Big Stone County. However, fires are more probable in the cities due to the density and number of both residential and commercial structures, thus cooking, electrical failure and chimneys cause many of the residential fires, in Big Stone County.

Table 3.6 Big Stone County and Community Breakdowns of Fire-related Information in 2012

Community	Total Fire Run	Total Other Run	Dollar Loss
Big Stone County	41	28	$155,800
Barry	*	*	*
Beardsley	8	7	$0
Correll	*	*	*
Graceville	9	3	$80,600
Johnson	*	*	*
Odessa	12	3	$0
Ortonville	2	6	$0
*Cities did not report to State Fire Marshal.			

Source: MN Dept of Public Safety's "Fire in Minnesota: Annual Report 2012"

Relationship with Other Hazards – Cascading Effects

Service Disruptions. Major fires can completely destroy structures, including essential public facilities. Utilities such as electric and gas lines can be damaged and even destroyed.

Health Risks. Destruction or damage to essential infrastructure such as water and wastewater facilities can cause public health risk. Firefighting is a high risk job and puts a person in danger of harm at any time.

Hazardous Materials. Many times hazardous materials are highly flammable causing fires to spread rapidly and increasing danger to human lives in the event of explosion.

Plans and Programs for Fires

Fire Districts and Departments. Structure fires are served by local fire districts and fire departments and each district is responsible for fires within their boundaries; however, they often work together on larger fires. All fire departments in the county are on the city level, but they are also a part of the West Central Firefighters Association (which includes fire departments in the surrounding counties).

West Central Firefighters Association. A group of fire departments agreed to make available to each other fire-fighting equipment and personnel in the case of emergencies. Each fire department has the legal authority to send its fire-fighting equipment and personnel to other communities.

Zoning. The Big Stone County Zoning Department control development of new construction, including the enforcement of safety restrictions like setbacks, coverage, depth and structure height requirements. The city building inspector is responsible for all new construction in cities.

State Training. County firefighters participate in mandatory firefighting training classes offered by the state.

Evacuation Plans. Evacuation plans exist in the all cities.

Program Gaps or Deficiencies for Fires

- None Listed.

Hazardous Materials

Hazardous materials are chemical substances, which if released or misused can threaten the environment and/or health of a community. These chemicals are used in industry, agriculture, medicine, research, and consumer goods throughout Big Stone County. Hazardous materials are found in the county in the forms of explosives, flammable and combustible substances, corrosives, poisons, and radioactive materials.

A hazardous material spill or release poses risks to life, health, and property. An incident can force the evacuation of a few people, a section of a facility, or an entire neighborhood or community, resulting in significant economic impact and possible property damage. Spilled material is costly to clean up and may render the area of the spill unusable for an extended period of time. Hazardous materials incidences are generally associated with transportation accidents or accidents at fixed facilities.

History of Hazardous Materials in Big Stone County

Hazardous materials exist as part of everyday life in Big Stone County. These materials make life easier and more comfortable for residents throughout the county. The challenge is to use, store, and transport hazardous materials in a safe way that does not harm communities and prepare an effective response to unwanted releases of hazardous materials when they occur. A hazardous materials accident can occur anywhere at any time.

According to the Minnesota Pollution Control Agency (see Table 3.7 next page), 14 spills have occurred in Big Stone County from July 2002 to July 2009. Two of the 14 hazardous material events had spills totaling over 2,500 gallons of material and one spill totaling 100 pounds of fertilizer. Of the 14 spills, 10 took place in Ortonville. Five communities, Barry, Correll, Graceville, Johnson, and Odessa, had no reported spills during the time frame, and Beardsley had a single event in 2009 at the Farmers Coop Grain Elevator. For a complete list of all hazardous spill events and amount of product released, see Appendix 5. The specific hazards created by a release are dependent on the hazardous characteristics of the material, the amount released, the location of the release, and the weather and topographic conditions in the area. Identifying specific materials and those involved in transportation can provide a more specific assessment of the vulnerability.

Table 3.7 BSC Hazardous Spills from 2002 – 2009 (Working on obtaining current data)

City	Number of Spills	Product Type
Barry	0	N/A
Beardsley	1	Barrel Spill – Unknown Material/Amount
Clinton	3	Agriculture Pesticide, Anhydrous Ammonia (Fertilizer)
Correll	0	N/A
Graceville	0	N/A
Johnson	0	N/A
Odessa	0	N/A
Ortonville	10	Fertilizer, Sewage/Wastewater, Mercury, Light Fuel Oil, Used Oil, and Other
Total	**14**	

Source: Minnesota Pollution Control Agency, 2009

The major concern for hazardous materials events for fixed facilities are primarily in the cities of Big Stone County along transportation corridors. Ortonville contains the majority of the county's population and employers. The transportation of hazardous materials in Big Stone County is highly unpredictable. People and property on or immediately adjacent to transportation corridors throughout the county are at higher risk than those located one mile or more from a major county corridor. Big Stone County assumes that the highest risk of an incident would be to areas in proximity to both rail lines and major roads and from large quantities of hazardous materials moving into and out of Big Stone County.

Transportation

Road, rail, aircraft, and pipeline all move hazardous materials presenting differing levels of risk. Transported products include hazardous materials passing from producers to users, between storage and use facilities as well as hazardous waste from generators to treatment and disposal facilities.

The road system in Big Stone County provides a network to transport both hazardous and non-hazardous material throughout the region and between local communities. Risks of a hazardous material events vary based on the classification of the road and its proximity to people and property. The risk of a major event is most severe in more populated western portions of the county and along state highways. According to the most recent findings at the Minnesota Department of Transportation, more than half of all accidents involving hazardous materials have occurred on the state roadways. Roads are a major concern in Big Stone County due to the lack of information available regarding what is traveling on the road system on a daily basis.

Approximately 11% of all statewide transportation incidents involving hazardous material in 2002 were from rail transport, according to MnDOT statistics. Valve leakage and safety valve

releases are sources of material spills on pressurized and general service tank cars or other hazardous materials containers such as covered hoppers, inter-modal trailers/containers or portable tanks. Leaks manifest themselves as odors or vaporous clouds from tanker top valves; spraying or splashing from tanker top valves; wetness on the side of the car; or drainage from the bottom outlet valve. Depending on the type of rail car involved, a leak or spill could result in hundreds to thousands of gallons/pounds of a substance being released.

Big Stone County has one small municipally-run airport that operates a general use facility for small businesses and pleasure uses only. Large amounts of flammable liquids, lubricants and chemicals are stored at the facility. Accidents involving aircraft and chemicals related to their operation create a potential situation where hazardous material could be released. In addition, any hazardous cargo brought into the facility for transport further increases the risk of an incident.

Fixed Facilities

A variety of hazardous materials exist in fixed facilities throughout Big Stone County, ranging from stored flammable liquids to radioactive materials and chemical agents. Some materials are particularly lethal even in small amounts, while others require strong concentrations with prolonged exposure periods to cause harm. Businesses housing hazardous materials are listed in the Emergency Operations Plan.

Facilities storing or using hazardous materials above minimum amounts have developed and filed a Risk Management Plan with the Local Emergency Planning Committee, State Emergency Response Commission and the Environmental Protection Agency. Each plan identifies significant hazards for the facility, likely release scenario for the hazards, estimated population impacted by the release, and specific steps to take in the event of a release to protect a population from harm. Power outages are an ongoing issue in Big Stone County as a result of blizzards, flooding, and other weather related extremes. Power outages are common for a few hours during the day in the summer time.

Methamphetamine and Clandestine Drug Labs

A clandestine drug lab (or clan lab) is a collection of materials and ingredients used to manufacture illegal drugs. Methamphetamine (meth) is the drug most commonly made in Minnesota labs. The Minnesota Department of Health surveyed all 87 counties twice in 2005 from January to June and July to December to tract the number of meth lab discoveries and received information from 75 counties. A total of 128 labs were found throughout all counties, 95 from January to June and 33 from July to December. The number of meth lab discoveries decline continued in 2006 with 73 found throughout Minnesota (Minnesota Department of Health 2006, 2007). The majority of these labs were located away from the largest population centers, in rural or semi-rural areas. Big Stone County has not found any meth labs in the area.

Each drug lab is a potential hazardous waste site requiring evaluation and possibly cleanup by hazardous waste (HazMat) professionals. There are possible health effects in people exposed to lab chemicals before, during and after the drug-making process. While many of the ingredients used to make illicit drugs are common household products, both the production process and the mixtures produced can be extremely dangerous. In Minnesota, numerous law enforcement officers and staff from health, social service and other agencies have collapsed or become ill at clan lab sites. Jail and hospital staff members have become ill from exposure to meth lab chemicals on the clothing of people living or working at lab sites. The Minnesota Department of Health has received reports of people who have moved into former lab sites and have suffered chest and respiratory symptoms months after lab chemicals were removed.

The impact of illegal drug-making labs is also felt by neighbors and occupants when labs catch fire, explode, and cause the release of chemicals and chemical waste into the surrounding environment. Finally, clan labs have been associated with increased crime in the surrounding community, including domestic abuse, theft and child endangerment.

Roughly 50 percent of Minnesota residences where drug labs have been discovered have also housed children. Recognizing the special risks to children living in lab environments, the Minnesota legislature has recently expanded child neglect and endangerment law to include endangerment through exposure to illegal drug manufacture and sales. In 2005, the Minnesota Legislature passed a law intended to reduce the number of meth labs and increase penalties for illegal meth usage.

In many Minnesota communities, there are no laws requiring cleanup of a hazardous waste site (particularly one contaminated by non-standard use of common household products) in a private residence. The Minnesota Bureau of Criminal Apprehension is usually involved in the case and the cleanup to make sure it is thoroughly investigated and cleaned.

Relationship to Other Hazards – Cascading Effects

Water Supply Contamination. If a spill occurred and polluted potable groundwater.

Wastewater Treatment System Failure. System failure would have direct impact on human and animal health.

Plans and Programs for Hazardous Materials

State Agency Cooperation. Big Stone County works directly with the appropriate state agencies to address needs for responding to and mitigating the impacts of a hazardous event.

Emergency Operations Plan. Big Stone County currently has an emergency operations plan, known as the Big Stone County Emergency Operations Plan, which outlines procedures for dealing with hazardous material accidents, spills or releases.

Hazardous Chemicals Collection. Big Stone County's Emergency Manager works with the Department of Public Safety and Emergency Response Commission to assist in the statewide collection of hazardous chemicals including household waste.

Water Plan. Big Stone County's Local Comprehensive Water Plan recognizes that the county's ground water is impacted by both agricultural and residential fertilizer and pesticide applications. It further recognizes the number of hazardous waste generators by minor civil division from the Minnesota Pollution Control Agency.

Environmental Health Regulations. Big Stone County and the cities of Montevideo and Granite Falls have worked to develop environmental health regulations and a County Safety Procedures and Policy Guide. These documents are cross-departmental plans that deal with hazardous material and act as guidelines to protect the county citizens.

GIS System. Big Stone County contracted with ProWest and Associates to develop an internet-based mapping system that utilizes GIS data. This program will be made available to the general public and to private industries on a fee-based system. The program will be operational in 2011.

Training of Emergency Personnel. All emergency personnel are trained to at least the minimum Hazardous Materials Awareness level and all first responder groups conduct the required Occupational Health and Safety Administration training on a yearly basis.

Southwest Emergency Preparedness Team (SWEPT). SWEPT maintains chempak cash in the southwest region for EMS and hospital staff to use for treatment of chemical spills or terrorism event.

Program Gaps or Deficiencies for Hazardous Materials

- A countywide warning system for a hazardous material disaster is currently being implemented. More education for the general public is needed. The alternative emergency response would require people to go door to door to inform residents of a major catastrophe. Many residents would be left without a prompt warning in the event of a major catastrophe.
- Although some provisions have been made, policies and procedures are not in place to deal with a Meth lab incident in the county.

Water Supply Contamination

Water supply contamination is the introduction of point and non-point source pollutants into public ground water and/or surface water supplies. Although minimal, water supply contamination does pose a threat in Big Stone County.

Microbiological and chemical contaminants can enter water supplies. Chemicals can leach through soils from leaking underground storage tanks, feedlots, and waste disposal sites. Human wastes and pesticides can also be carried to lakes and streams during heavy rains or snow melt.

History of Water Supply Contamination in Big Stone County

Drinking water in Big Stone County comes from groundwater and all cities in Big Stone County have municipal water systems. All water plants are in good working condition, and undergo annual inspections by their municipal employees. Individual wells provide drinking water for the remaining cities and rural residences within Big Stone County.

The entities in Big Stone County that will be required to develop a wellhead protection plan are: Beardsley, Lismore Colony, Graceville, Clinton, Correll, Big Stone Hutterite, and Johnson and will do so in the five to ten years. The city of Odessa's wellhead protection plan has been completed, but not yet approved by the Minnesota Department of Health; and the City of Ortonville is currently completing their plan.

Relationships with Other Hazards – Cascading Effects

Infectious Diseases. Polluted human water sources can produce illness and epidemics in both humans and animals.

Plans and Programs for Water Supply Contamination

Drinking Water Standards, Requirements. The U.S. Environmental Protection Agency (EPA), as required by the Safe Drinking Water Act of 1974, sets uniform nationwide minimum standards for drinking water. State public health and environmental agencies have the primary responsibility for ensuring that each public water supplier meets these federal drinking water standards or more stringent ones established by the state.

Public Water Supply Monitoring. The EPA requires an ongoing water quality-monitoring program to ensure public water systems are working properly. Local officials work together with the Minnesota Department of Health and the EPA to ensure that all public water supplies are safe. The EPA also requires all local suppliers to promptly inform the public if their supply becomes contaminated. Countryside Public Health Service inspects inspections of drinking water in restaurants, bars and other private businesses at least annually.

Wellhead Protection Program. Big Stone County is in its first stage of setting up a wellhead protection plan that is required by the state of Minnesota. The cities in the county will be doing wellhead protection plans to comply with state and federal guidelines set up for wellheads.

Well Construction and Testing. Since 1974, all water wells (public and private) constructed in Minnesota must meet the location and construction requirements of the Minnesota Well Code. Countryside Public Health has a certified lab to test for well contamination. Big Stone County

urban residents will not have to cover the costs for the initial phase since they fall under the 33,000 populations, the Minnesota Department of Health will cut the costs for this phase. For public water supplies, water is tested every year for somewhere between 85 and 90 different pollutants and has to meet high expectations to pass. If a business does not meet these criteria, an engineer is asked to check the water more frequently.

Feedlot Pollution Prevention. Several steps are being taken to protect ground water sources from feedlot runoff. County ordinances require that all feedlots within the county participate in the state's feedlot programs and county extension services promote best management practices to minimize runoff from feedlots into rivers. County zoning ordinances also limits feedlot locations. To expand an existing feedlot is allowed according to feedlot management ordinance MN Rule Chapter 7020.

Sealed Wells. Soil and Water Conservation District has received grant money to help home owners seal their unused wells.

Emergency Water Source. The National Guard would provide drinking water in the event of contamination.

Program Gaps and Deficiencies for Water Supply Contamination

- Although many have been removed, there are still some existing wells that are not in compliance with the 1974 standards.

Wastewater Treatment System Failure

Wastewater treatment and disposal is an important part of our need to protect and preserve Minnesota's water resources. Although minimal, failure of wastewater treatment systems poses a potential risk in Big Stone County. Numerous hazards can disable water treatment plants, including severe flooding.

History of Wastewater Treatment System Failure in Big Stone County

Wastewater systems typically pose higher risks of failure during the spring, when melting snow and runoff can cause flooding. The City of Ortonville's wastewater treatment system was close to danger in the 1997 flood. A levee has been installed to decrease damage during flood events.

Relationships with Other Hazards – Cascading Effects

Infectious Diseases. The failure of septic treatment facilities and systems can have immediate adverse impacts on human health through communicable diseases and epidemics.

Water Supply Contamination. The failure of septic treatment facilities and systems can have immediate adverse impacts on potable water supplies.

Plans and Programs for Wastewater Treatment System Failure

Certified Operators and Inspections. The Minnesota Pollution Control Agency (MPCA) requires routine inspections of all public wastewater systems. These operators are required to take state training to maintain their certified operator status.

State Permit Enforcement. The Minnesota Pollution Control Agency (MPCA) regulates wastewater systems. State staff in the water-quality point-source program issue permits, monitors compliance through data review and inspections, and enforce permit conditions.

Individual Septic Tank Inspections. Big Stone County inspects individual septic tanks at the point of sale. There is also a fund to help owners upgrade their septic tanks to MPCA standards.

Program Gaps or Deficiencies for Wastewater Treatment System Failure

- Not all emergency plans address necessary steps to take in the event of a facility failure.
- Human-induced events, like terrorism, are not addressed in all emergency plans.

Civil Disturbance/Terrorism

Human-caused hazards can be intentional, criminal, malicious uses of force and violence to perpetrate disasters against people or property. They can be the result of terrorism – actions intended to intimidate or coerce a government or the civilian population to further political or social objectives – which can be either domestic or international, depending on the origin, base and objectives of the terrorist organization.

Hazards can result from the use of weapons of mass destruction, including biological, chemical, nuclear and radiological weapons; arson, incendiary, explosive and armed attacks; industrial sabotage and intentional hazardous materials releases; and cyber terrorism.

History of Terrorism/Civil Disturbances in Big Stone County

Big Stone County has no history of terrorist or individual acts designed to cause disasters against people or property. Vandalism, assaults and other criminal acts do occur, but these isolated incidents fall within the purview of local law enforcement.

School Violence. Violence in schools has become an increasingly important topic among teachers, students, and police; focusing on bullying, school shootings, vandalism, and overall safety. Regardless of the availability of drugs, alcohol, and weapons to youth, it appears as though school incidences are decreasing. This fact is demonstrated in the Minnesota Student Surveys completed in 2001 and 2007 in Big Stone County. The majority of students "strongly agree or agree" to feeling safe walking to and from school and at school.

In general, surveyed students in 6th, 9th, and 12th grade had fewer people threatened (except for 9th grade female students with a slight increase) and pushed/shoved/grabbed in the previous 12 months from 2001 to 2007. The number of incidences remained primarily constant was those students kicked, bitten, or hit with increases in these events for only 9th grade students.

From 2001 to 2007, the numbers remained consistent with how often (number of days) students brought a gun onto school property with all students reporting at least 98 percent at never bringing guns to schools and senior males at 91percent. The numbers remained constant for how often student brought non-gun weapons to school (above 90%), with all but senior males at 88 percent – a slight increase from 2001.

Relationship to Other Hazards – Cascading Effects

Cascading effects of an intentional human-caused disaster are highly dependent on the specific mode used and asset targeted. Many of these have been detailed in the technological hazards portion of the plan covering dam failure and hazardous materials incidents. Fires and secondary explosions are possible with explosive attacks, and fires from arson attacks can extend beyond the intended target.

Plans and Programs for Terrorism/Civil Disturbances

Cooperation with State, Federal Officials. Big Stone County officials are working with state and federal officials on domestic preparedness efforts, including with the Department of Health to ensure that health care facilities are prepared for bio-terrorism events.

School Multi-Hazard Emergency Plans. Since 2003, every school district in Minnesota has been mandated by state statute to institute multi-hazard emergency planning including at least quarterly drills and exercises. Each plan and practice is required to include prevention and response strategies – in particular to school violence. Each school implements their particular plans differently, while holding to the same basic tenets and works with their respective law enforcement.

Emergency Plans. The hospital plan, EMS Plan, Countryside Public Health Plan, and Big Stone County's Emergency Operations Plan identify the chempak cash that can be requested for treatment if chemical exposure is identified.

Program Gaps and Deficiencies for Terrorism

- The Big Stone County Courthouse, Ortonville's City Hall, and Graceville's Community Building do not have fire suppression systems.
- Design and operations of facilities in the county were not developed with terrorism prevention in mind.

CHAPTER 4: RISK ASSESSMENT

OVERVIEW

The following risk assessment is divided into three parts. The first part consists of Hazard Prioritizations for each hazard which are based on the information provided in Chapter Three. The second part discusses county vulnerability to natural hazards (Vulnerable Areas within Big Stone County), while the third part consists of maps of each city's land use and critical facilities.

PRIORITIZED RISK ASSESSMENT

The following pages summarize important information about each hazard in the form of the subsequent risk assessment. This subsequent risk assessment was completed by the Big Stone County All-Hazard Mitigation Task Force, who considered each of the following hazards in terms of four criteria. The four criteria included frequency of occurrence, warning time, potential severity, and risk level. The values for the prioritized risk assessment were determined by a variety of resources including meetings and discussions with the Local Task Force, Technical Task Force team, city representatives, and the County Emergency Manager to determine a ranking for each hazard based on the risk assessment criteria. This raking method allowed quantification of each hazard's risk level by assigning number values to the criteria. From this number, an overall ranking for each hazard was determined, which allowed the hazards to be compared in order to assess which hazards pose the greatest risk in Big Stone County. Information from the community profile, analysis of historic disasters, and information provided by the task force and public to identify past, present and future disasters were also taken into consideration.

Frequency of Occurrence: This asks how often it may happen and how likely is it that the hazard will occur. The number values are determined by:

1 Unlikely
2 Occasional
3 Likely
4 Highly Likely

Warning Time: This asks how much warning time is available prior to the event.

1 More than 12 Hours
2 6-12 Hours
3 3-6 Hours
4 None-Minimal

Potential Severity: This asks how severe the impact will be in a general sense.

1 Limited
2 Minor
3 Major
4 Substantial

Risk Level: The risk level looks at the amount of risk there will be overall as a result of the event.

1 Minimal
2 Limited
3 High
4 Very High

Table 4.1 Hazard: Violent Storms and Extreme Temperatures

Hazard	**Winter Weather** Blizzard, Ice Storms, Heavy Snow, Extreme Cold	**Summer Weather** Thunderstorm, Lightning, Hail, Straight Line Winds, Extreme Heat	**Tornado**
Location	County	County	County
Historic events	3-6 storms per year 0-3 blizzards per year Extreme cold 1-5 days per year	0-2 storms per year 1-5 days of extreme heat per year	6 tornado occurrences in past 56 years, F3 in 1996 near Clinton
Likely to happen now?	Yes	Yes	No
How often?	3-6 storms per year 1-3 blizzards per year Often below freezing Extreme cold 1-5 days per year	1-2 storms per year 1-5 days of extreme heat per year	0 per year
Where would it strike?	County	County	County
How bad could hazard get?	2-3 days / storm, multiple storms in one season, limited visibility, record snow is 17.5 in./day and 86.5 in. in one season, record, cold is -41°, wind chill is factor	Lightning, strong wind and hail Record temp. is 110° Humidity is a factor	F4 reported in neighboring county
When would hazard likely occur?	November – March	Spring - Fall	Spring - Fall
What other hazards could occur simultaneously?	Wind, transportation accidents, extreme temp, collapsed structure/gas leaks, spring flooding, disruption of utilities	Flooding, lightning, hail, wind, trans. accidents, drought, violent storms, wildfire, collapsed structure	Hazardous materials, utility failure, fire, collapsed structure, gas leaks
Economic impacts	Cost of snow removal, loss of livestock, school closing, store closing	Loss of livestock, fire potential, agriculture and property damage	Structure loss and community shut down
Loss of life impacts	Dangerous to transport emergencies, heat turn-off, transportation accidents	Lightning strike, heat stroke, rare	Extremely dangerous
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **3** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**	Citizens/People: **3** Animals/Livestock: **3** Housing: **2** Critical Structures: **2** Infrastructure: **3** **Total: 3**	Citizens/People: **3** Animals/Livestock: **3** Housing: **3** Critical Structures: **3** Infrastructure: **3** **Total: 3**
Risk Assessment			
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 3.38	Frequency of Occurrence 3.71	Frequency of Occurrence 2.38
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 2.43	Warning Time 2.83	Warning Time 3.13
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 2.75	Potential Severity* 3.8	Potential Severity* 2.88
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 2.63	Risk Level** 3.0	Risk Level** 2.75
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.80**	**Overall Priority** **3.34**	**Overall Priority** **2.79**

Table 4.2 Hazard: Flood

Hazard	100-year Floods	Other Flooding/Flash Floods
Location	Along the Minnesota River, Big Stone Lake and Toqua Lake near Graceville	County, Clinton, Graceville
Historic events	1997, 2001, 2010	2009, 2011, 2014
Likely to happen now?	Yes	Yes
How often?	1% likelihood annually; 2 times per 10 years	2 times per 10 years
Where would it strike?	Along Big Stone Lake, especially Peninsula	Along rivers, drainage ditches, wetlands, basements, etc.
How bad could hazard get?	1997 was record year	Fast moving water, unable to prepare for floods
When would hazard likely occur?	Spring	Spring/Summer
What other hazards could occur simultaneously?	Utility failure, landslide, debris flow, interrupt transportation routes (emergencies), infectious diseases, hazardous material spills	Utility failure, landslide, debris flow, interrupt transportation routes (emergencies), infectious diseases, hazardous material spills
Economic impacts	Sandbagging and repair roads, expensive, agricultural loss	Repair roads expensive, agriculture loss
Loss of life impacts	Danger if sandbagging	Danger if sandbagging
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **2** Animals/Livestock: **2** Housing: **2** Critical Structures: **2** Infrastructure: **3** **Total: 2**	Citizens/People: **3** Animals/Livestock: **2** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**
Risk Assessment		
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 2.0	Frequency of Occurrence 2.86
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 1.0	Warning Time 2.71
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.0	Potential Severity* 2.86
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 2.5	Risk Level** 2.17
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.13**	**Overall Priority** **2.65**

Table 4.3 Hazard: Drought

Hazard	Drought
Location	County
Historic events	1976, 1988, 2003
Likely to happen now?	Occasionally
How often?	One time per 15-20 years
Where would it strike?	County
How bad could hazard get?	1930's dust bowl
When would hazard likely occur?	Summer
What other hazards could occur simultaneously?	Utility failure (water, wastewater), Wildfires
Economic impacts	Crops/Agriculture
Loss of life impacts	Unlikely
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **2** Animals/Livestock: **3** Housing: **1** Critical Structures: **1** Infrastructure: **1** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 2.13
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 1.25
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 2.5
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 2.43
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.08**

Table 4.4 Hazard: Wildfire

Hazard	Wildfire
Location	County – especially along the MN River Valley and CRP/CREP land
Historic events	2004
Likely to happen now?	Yes
How often?	Each year the potential increases as natural areas increase and managed burns do not take fuel away. 7,330.5 acres burned 4/16/2004 - 4/20/2004 40 acres burned 4/25/2000 to 5/8/2000
Where would it strike?	County – especially along the MN River Valley and CRP/CREP land
How bad could hazard get?	Potential for hundreds of acres to burn
When would hazard likely occur?	Summer
What other hazards could occur simultaneously?	Erosion/landslide, severe wind, scrap tire fires, structure fires, hazardous materials, utility failure
Economic impacts	Extremely expensive for local fire departments
Loss of life impacts	Extremely dangerous for firefighters 2 deaths in past 24 years
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **2** Animals/Livestock: **2** Housing: **2** Critical Structures: **1** Infrastructure:**1** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.75
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 3.13
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 2.17
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.71
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.19**

Table 4.5 Hazard: Dam Failure

Hazard	Dam Failure
Location	Along Minnesota River
Historic events	None
Likely to happen now?	No
How often?	Unlikely
Where would it strike?	Big Stone Lake Dam
How bad could hazard get?	Could affect Odessa
When would hazard likely occur?	Spring/Summer/Fall – due to thaw or rain event
What other hazards could occur simultaneously?	Flooding
Economic impacts	Could impact all of Odessa's businesses
Loss of life impacts	If sudden event, people could die
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **2** Animals/Livestock: **2** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**
Risk Level	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.13
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 2.29
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.22
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.25
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **1.97**

Table 4.6 Hazard: Infectious Diseases

Hazard	**All Infectious Diseases**
Location	County
Historic events	No major events
Likely to happen now?	Unlikely
How often?	Infrequent
Where would it strike?	Hospitals/Schools – large vulnerable populations
How bad could hazard get?	Major outbreak of life-threatening disease
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Riots, terrorist attack, natural hazard event
Economic impacts	Tourism industry All industries with workers not at jobs
Loss of life impacts	Major if life-threatening outbreak
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **2** Housing: **1** Critical Structures: **2** Infrastructure: **1** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.88
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 None-Minimal	Warning Time 1.38
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.0
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.75
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.0**

Table 4.7 Hazard: Fire

Hazard	Structure Fire
Location	Buildings/Cities/County
Historic events	Grain Bins, Downtown Buildings
Likely to happen now?	Yes
How often?	Potential is always there
Where would it strike?	Structures throughout county
How bad could hazard get?	Entire structure could burn
When would hazard likely occur?	All year-round
What other hazards could occur simultaneously?	Wildfire, hazardous materials, service disruptions, other weather events
Economic impacts	Could destroy business if fire is bad enough
Loss of life impacts	Potential if hazardous materials present Elderly and very young at risk 2 lives lost in past 24 years
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **2** Housing: **3** Critical Structures: **3** Infrastructure:**2** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 2.14
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 Non-Minimal	Warning Time 3.71
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.14
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 2.71
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.93**

Table 4.8 Hazard: Hazardous Materials

Hazard	Hazardous Materials
Location	Major transportation routes (railroads, highways) Pipeline locations All cities have at least one major highway
Historic events	2007
Likely to happen now?	Occasionally Potential increases as hazardous materials increase 14 hazardous material spills in 6 years, (2 annual likelihood)
How often?	14 hazardous material spills in 6 years, (2 annually)
Where would it strike?	Specific locations throughout county, along transportation routes in county and local businesses that have hazardous materials delivered, Meth Labs can occur anywhere.
How bad could hazard get?	Major spill could be devastating to human and animal life Meth Labs make people extremely sick.
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Wildfire, storm, water supply contamination, wastewater contamination
Economic impacts	Could shut down area of spill
Loss of life impacts	Potential depending on material
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **2** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.88
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 Non-Minimal	Warning Time 4.0
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 2.63
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.63
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.54**

Table 4.9 Hazard: Water Supply Contamination

Hazard	Water Supply Contamination
Location	County Cities point and non-point sources
Historic events	None
Likely to happen now?	Unlikely
How often?	Flood events – 2 times every 10 years
Where would it strike?	County
How bad could hazard get?	Water source could be contaminated for large population
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases
Economic impacts	Tourism, expensive to ship water in
Loss of life impacts	Potential to be life threatening
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **3** Housing: **2** Critical Structures: **2** Infrastructure: **3** **Total: 3**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.13
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 Non-Minimal	Warning Time 3.63
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.25
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.5
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.78**

Table 4.10 Hazard: Wastewater Treatment System Failure

Hazard	Wastewater Treatment System Failure
Location	County
Historic events	Individual systems and municipal systems have either gotten old or flooding has prevented from working
Likely to happen now?	Somewhat likely
How often?	During flood or as systems age
Where would it strike?	County
How bad could hazard get?	Water source could be contaminated
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases, flood, water supply contamination
Economic impacts	During flood, losing wastewater system is expensive and inconvenient
Loss of life impacts	Could affect lives if contaminated water
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **3** Animals/Livestock: **2** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.75
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 Non-Minimal	Warning Time 2.75
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 2.38
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.25
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.03**

Table 4.11 Hazard: Civil Disturbance / Terrorism

Hazard	Civil Disturbance / Terrorism
Location	County, cities, dam, airports, water systems
Historic events	None
Likely to happen now?	Unlikely
How often?	School violence is increasing annually No actual "terrorism" events in County
Where would it strike?	County
How bad could hazard get?	Threaten way of life
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases, flood, dam failure, water supply contaminations, hazardous materials
Economic impacts	Potential to be devastating
Loss of life impacts	Potential to affect lives
Risk Level 1 Minimal 2 Limited 3 High 4 Very High	Citizens/People: **2** Animals/Livestock:**2** Housing: **2** Critical Structures: **2** Infrastructure: **2** **Total: 2**
Risk Assessment	
1 Unlikely 2 Occasional 3 Likely 4 Highly Likely	Frequency of Occurrence 1.0
1 More than 12 Hours 2 6-12 Hours 3 3-6 Hours 4 Non-Minimal	Warning Time 4.0
1 Limited 2 Minor 3 Major 4 Substantial	Potential Severity* 3.13
1 Minimal 2 Limited 3 High 4 Very High	Risk Level** 1.38
(Total divided by 4) **1 Very low** **2 Low** **3 Moderate** **4 High**	**Overall Priority** **2.38**

The Overall Hazard Priority Levels were determined by calculating the average risk level for each hazard. The hazard was determined to be “Very Low” if the average risk number was between 1 and 1.49, “Low” if it was between 1.5 and 2.49, “Moderate” if between 2.5 and 3.49 and “High” if it was 3.5 or above. No hazards were determined to be of very low or high risk at the time of this document. The hazards were listed in numerical order for the Yellow Medicine Local Task Force to review and comment on at the third Local Task Force meeting in Clinton, MN on November 13, 2014. The team was presented with the Overall Hazard Priority Level determined by their risk assessments and the initial Overall Hazard Priority Level from the previous All-Hazard Mitigation Plan. Staff facilitators discussed differences between the two lists and opened up conversation on changes to be made. During this meeting, Summer Weather and Winter Weather were moved up on the list to numbers 2 and 4 respectively, while Tornado and Water Supply Contamination moved down on the list to their current locations, numbers 3 and 5 respectively. All other hazards kept their same locations on the list.

Table 4.12 Overall Hazard Priority Levels in Yellow Medicine County

Hazard	Big Stone County	Special Areas of Concern
1. Flash/Other Flooding	**3.18**	**County, Clinton, Ortonville, Graceville**
2. Summer Weather Thunderstorm, Lightening, Hail, Wind (excluding tornado) Extreme Heat	**2.86**	**County**
3.Tornado	**3.17**	**County**
4. Winter Weather Blizzard, Ice Storms, Heavy Snow, Extreme Cold	**2.34**	**County**
5. Water Supply Contamination	**3.17**	**County**
6. Hazardous Materials	**3.07**	**All Cities**
7. Structure Fire	**2.93**	**County**
8. Civil Disturbance/ Terrorism	**2.65**	**County**
9. Drought	**2.59**	**County**
10. 100-year Floods	**2.33**	**County, Ortonville, Odessa**
11. Infectious Disease	**2.26**	**County**
12. Wastewater Treatment System Failure	**2.09**	**County**
13. Wildfire	**2.07**	**County, CREP & CRP Lands, grasslands and forests**
14. Dam Failure	**2.06**	**Odessa**

The purpose of this section is to identify vulnerable areas in relation to Chapter 3 (Hazard Inventory), which provides detailed information on the potential hazards that may impact Big Stone County and/or cities within Big Stone County. This section identifies vulnerable areas and highlights specific events that have occurred throughout the county, as they pertain to four types of natural hazardous events: tornadoes, flooding, wildfires, and dam failure. The risk assessment maps for Big Stone County identify areas that may be more prone to these hazardous events.

Tornados

According to the National Climatic Data Center, Big Stone County has experienced six tornados since 1950. The three most recent tornadoes were recorded to have magnitudes of F0. None of these tornadoes have been very strong and there hasn't been significant damage to urban areas. In general the county has been spared from significant tornado damage. The most destructive tornado in Big Stone County was an F3 tornado that occurred in Clinton, MN on May 17, 1996. Approximately 150 buildings sustained damage or were destroyed as the tornado moved northeast across Big Stone County through the townships of Prior, Big Stone, Almond, Malta, and Moonshine. See Figure 4.1 for a visual representation of tornado paths in Big Stone County.

Traditionally, tornados are seen as a countywide hazard. In order to predict estimated damage caused by an F4/F5 tornado, Big Stone County based fiscal analysis on the recommendation of the National Weather Service Data Management Department. According to the NWS, an acceptable method to estimate damage from a F4/F5 tornado in a small community would be to model the event in Greensburg, Kansas with a population of approximately 1,500 people. The devastation totaled around $250 million dollars – approximately 95% of the city. To model an F4/F5 tornado, the NWS suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses, produced by 2009 market values. Table 4.13 below highlights this information, providing the number of parcels damaged and estimated damage value by city, with a final damage amount of $147,231,672 dollars impacting 2,087 parcels of residences, commercial/industrial buildings, schools, churches, and government-owned properties (summation of all city parcels and assessed parcel values).

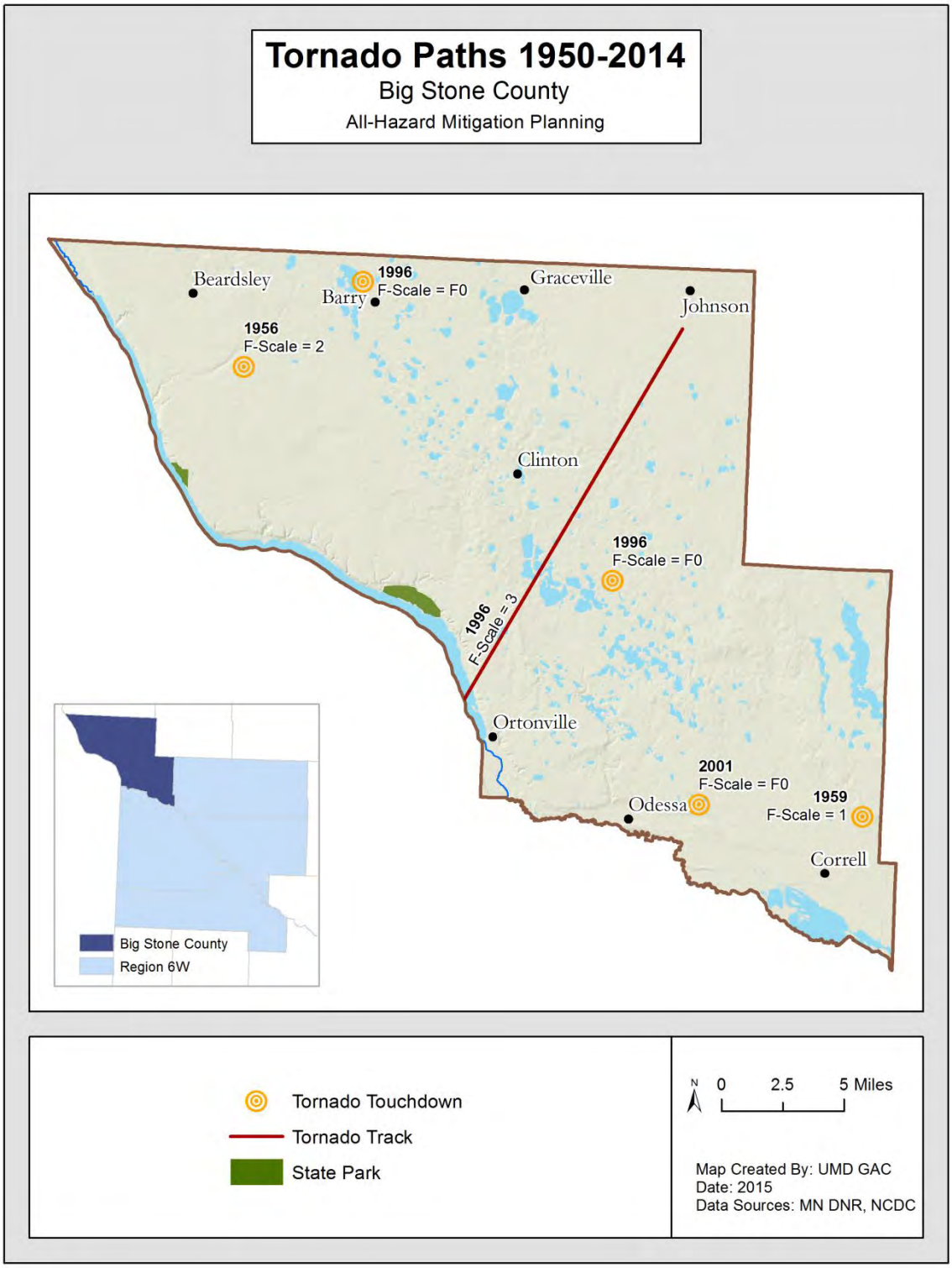
Table 4.13 BSC Estimated potential damage by an F4/F5 Tornado

Geographic Area	Total Number of Parcels	Total Value of Parcels	90% of Total Parcels	Estimated Damage Value
Barry	36	$1,340,300	32	$1,206,270
Beardsley	199	$6,952,300	179	$6,257,070
Clinton	289	$17,660,100	260	$15,894,090
Correll	71	$1,294,800	64	$1,165,320
Graceville	348	$26,616,000	313	$23,954,400
Johnson	14	$305,847	13	$275,262
Odessa	119	$3,471,100	107	$3,123,990
Ortonville	1,243	$105,950,300	1,119	$95,355,270
Total (Big Stone County)	**2,319**	$163,590,746	**2,087**	**$147,231,672**

Source: Big Stone County Assessor, 2009

One major tornado occurred in Big Stone County on May 17, 1996, eight miles southwest of Clinton. An F3 tornado crossing Big Stone Lake from Roberts County, South Dakota destroyed one cabin at the Meadow Brook Resort, took the roof off another cabin, and another cabin was demolished when a large tree fell onto it. Several boats on Big Stone Lake were overturned. Approximately 150 buildings sustained damage or were destroyed as the tornado moved northeast across Big Stone County through the townships of Prior, Big Stone, Almond, Malta, and Moonshine. Southwest of Clinton, a pontoon boat and a camper were destroyed. East of Clinton, a farm lost all of its buildings and sustained severe damage to their home, the cupboards fell off the walls and doors would not close, signifying a twisted frame. Northeast of Clinton, another farm suffered damage to all structures and half the roof was torn from their home. Two miles south of Johnson, a house (rambler) was completely destroyed and several barns and machine sheds were ruined before the tornado lifted. Many trees were uprooted in the path of the tornado across Big Stone County. Much of the power was out in the county as power lines were downed.

Figure 4.1 Tornado Paths from 1950 to 2014 in Big Stone County



Floods

Flooding in the county occurs primarily in the spring during periods of peak conditions (rainfall and snowmelt) and in areas where the soil has low permeability qualities. Flood damage may also result from improperly maintained or undersized ditches, excess drainage in the upper reaches of the watered, or lack of upland retention structures. Major effects of excessive rainfall are the flooding of agricultural lands and road washouts. According to estimates by the US Army Corp of Engineers, Soil Conservation Service, and FEMA, there are approximately 25,914 acres (see Table 51) in the 100-year floodplain and 70.57 acres in the 500-year floodplain in Big Stone County. See Figure 5 (page 20) for a visual representation of 100 and 500-year floodplains in Big Stone County. Table 4.14 below identifies the number of floodplain acres throughout Big Stone County. It is important to note that these acreages were found utilizing digital Flood Insurance Rate Maps from April 17, 2006 and therefore illustrate the most accurate data available for Big Stone County.

Table 4.14 BSC & Cities 100 & 500-Year Floodplain Acreages

	Total acres	Acres in 100-Year Floodplain	Acres in 500-Year Floodplain	Total Acres in 100 & 500-Year Floodplain	Percent of land in 100 & 500-Year Floodplains
Big Stone County	338,316	24,969	70	25,039	7.4%
Graceville	351	52	0.23	52.23	14.8%
Odessa	618	130	0.34	130.34	21%
Ortonville	2,554	763	0	763	29.8%

Source: FEMA, 2006

In order to predict an estimated damage value if all 100-year floodplains were flooded throughout the county at a given time; all structures (or parcels when data was unavailable) were identified on individual city basis, in addition to the number of rural housing/farmsteads throughout the county. Table 4.15 provides the number of structures and their assessed 2009 values within 100-year floodplains in all cities and Big Stone County. This data was gathered through city-specific inventories and are detailed further in the City Risk Assessment section of this chapter. The Big Stone County Assessor provided assessed values of structures located within 100-year floodplains and any Critical Facility or parcel located in the floodplain was included in this risk assessment.

Table 4.15 Summary of Expenses to Fight Flooding

Geographic Area	1997 Flood	2001 Flood	Total
Big Stone County	$1,837,352	$410,876	$2,248,228
Ortonville	$733,002	$54,687	$787,689
Total	$2,570,354	$465,563	$3,035,917

Source: Big Stone County & City of Ortonville, 2002

The following section is a Flood Hazard Analysis for Big Stone County that was completed by the University of Minnesota Duluth Geospatial Analysis Center. This analysis focuses on the potential impacts of a 100-year (1%) flood event, detailing the distribution of potential economic loss in Big Stone County.

Flood Hazard Analysis for Big Stone County

For Upper Minnesota Valley Regional Development Commission
Level II Flood Hazard Analysis performed using FEMA Hazus-MH

Contact Information:

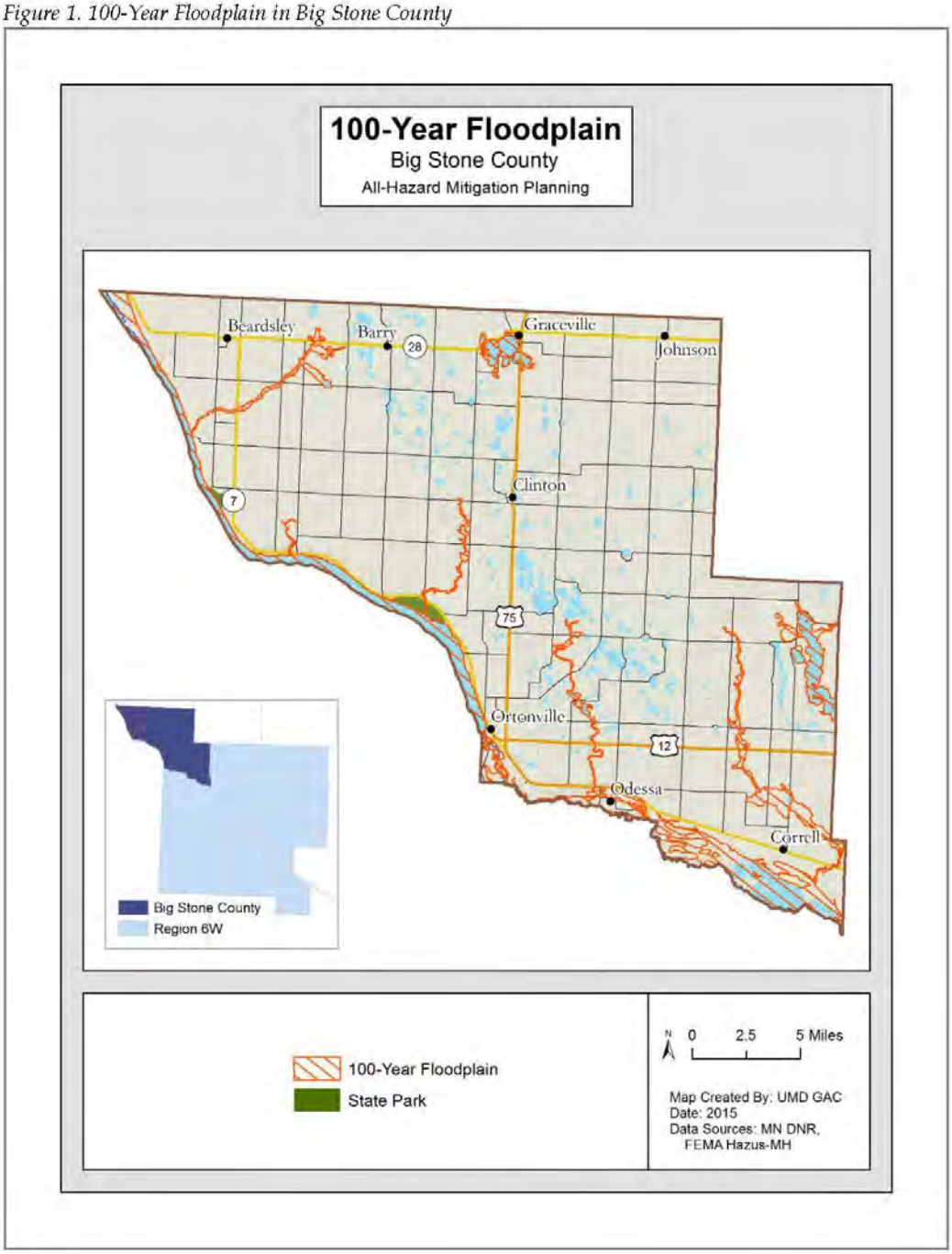
Project Coordination:
Stacey L. Stark, MS, GISP
Geospatial Analysis Center
College of Liberal Arts
1123 University Drive
329 Cina Hall
Duluth, MN 55812
Email: slstark@d.umn.edu
Tel: 218-726-7438 Fax: 218-726-6540

Geospatial Analysis Center

Big Stone County Hazus-MH Hazard Analysis

Hazus-MH 2.1 in ArcGIS 10.0 sp3 was used to estimate the damages incurred for a 100-year flood event in Big Stone County using a DFIRM (digital flood insurance rate map) and a 10-meter DEM (digital elevation model) to create a flood depth grid. The resulting depth grid is shown in Figure 1.

Figure 1. 100-Year Floodplain in Big Stone County



Big Stone County specific building data was sourced from the parcel tax and spatial databases to include building valuations, occupancy class, square footage, year built, and number of stories. A shapefile named Parcel_TaxInfo.shp was obtained from the IT Department at Big Stone County. This spatial dataset included 3365 parcels with buildings and a populated occupancy class field out of 6996. The building values and assessment codes (used as occupancy codes) were obtained from the County Auditor only for those parcels with buildings. The number of stories and year built fields were obtained through the 3rd party data management consultant, Computer Professionals Unlimited.

In cases where building value, square footage, year built, or number of stories were missing, values were assigned based on best practices from values in the other 4 fields. The data were then assigned to one parcel centroid, which served as a surrogate for the each parcel's buildings to aggregate to the associated census block for use in the Hazus-MH model.

According to the Big Stone County general building stock [updated with these parcel data], the Hazus-MH model estimates there are 3,365 buildings in the region with a total replacement value (excluding contents) of $244 million (2006 dollars). Approximately 71% of the buildings (and 57% of the building value) are associated with residential housing. Using the Big Stone County updated general building stock, the Hazus model estimated 36 buildings will be at least moderately damaged. This is over 43% of the total number of buildings in the scenario. There are an estimated 5 buildings that would be completely destroyed.

The total economic loss estimated for the flood is $5.7 million dollars, which represents 8.5% of the total replacement value of the scenario buildings. Building losses are broken into 2 categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood. The total building-related losses were $5.7 million dollars. 1% of the estimated losses were related to the business interruption of the region. Residential occupancies made up 64% of the total loss.

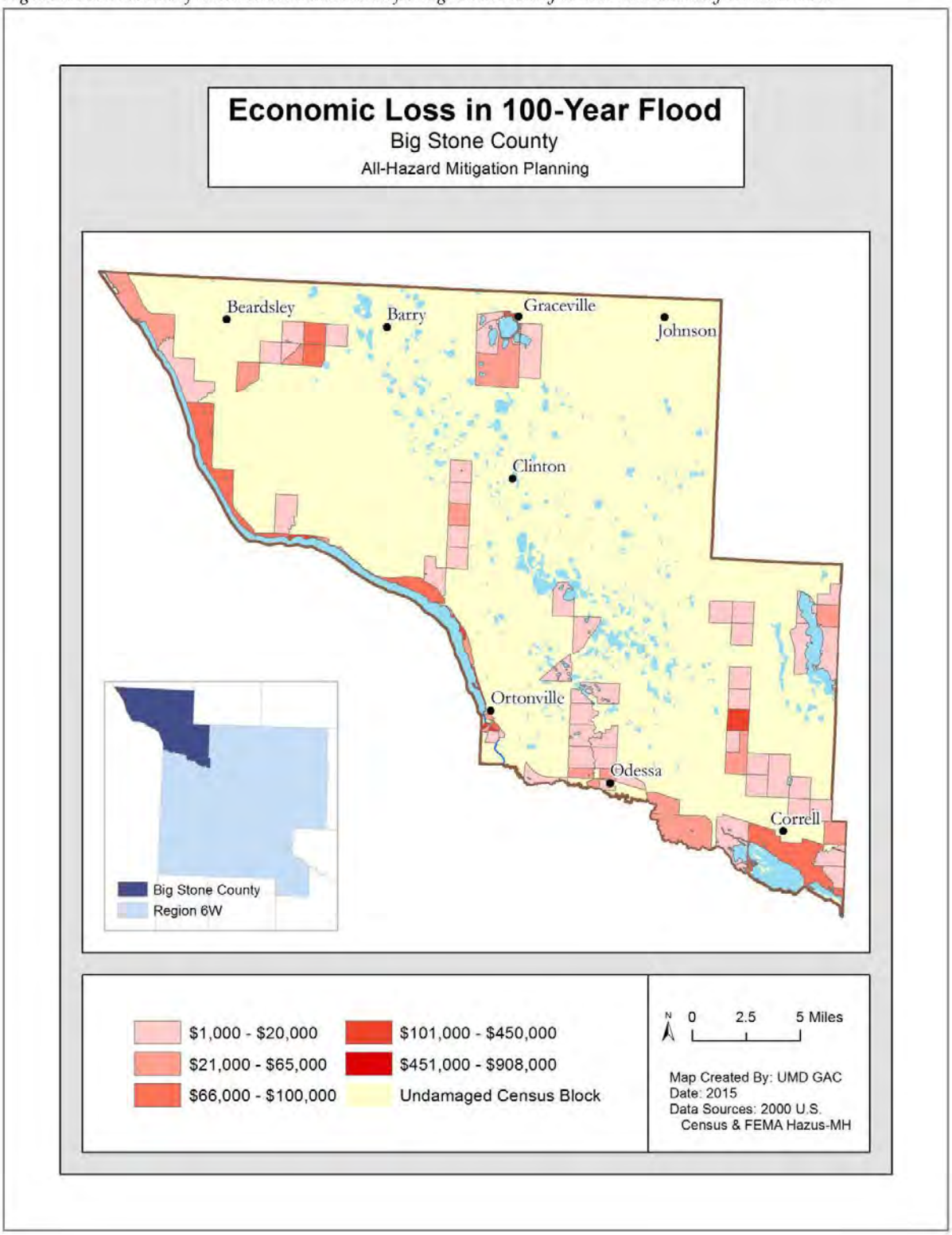
The reported building counts should be interpreted as degrees of loss rather than an exact number of buildings exposed to flooding. These numbers were derived from aggregate building inventories which are assumed to be dispersed evenly across census blocks. Hazus-MH requires that a predetermined amount of square footage of a typical building sustain damage in order to produce a damaged building count. If only a minimal amount of damage to buildings is predicted, it is possible to see zero damaged building counts while also seeing economic losses.

The total estimated number of damaged buildings, total building losses, and estimated total economic losses for the countywide 100-year flood are shown in Table 1. The distribution of economic losses for Big Stone County is depicted in Figure 2.

Table 1. Big Stone County Total Economic Loss from 100-Year Flood

General Occupancy	Estimated Total Buildings	Total Damaged Buildings	Total Building Exposure (In $1000s)	Total Economic Loss (In $1000s)	Building Loss (In $1000s)
Agricultural	588	1	$47,622	$1,426	$221
Commercial	244	2	$28,999	$351	$58
Education	10	0	$9,320	$0	$0
Government	85	0	$10,396	$249	$34
Industrial	19	0	$912	$15	$2
Religious/Non-Profit	43	0	$7,283	$42	$4
Residential	2,376	34	$139,361	$3,640	$2,412
Total	**3,365**	**37**	**$243,893**	**$5,723**	**$2,731**

Figure 2. Distribution of Estimated Economic Loss for Big Stone County in 100-Year Flood by Census Block



Census blocks of concern should be reviewed in more detail to determine the actual percentage of facilities that fall within the flood hazard areas.

Figure 3 shows the census block estimate clipped to the actual 100-year flood boundary for Ortonville, and Figure 4 shows this same information for Graceville.

Figure 3. 100-Year Flood Loss Estimates in Ortonville

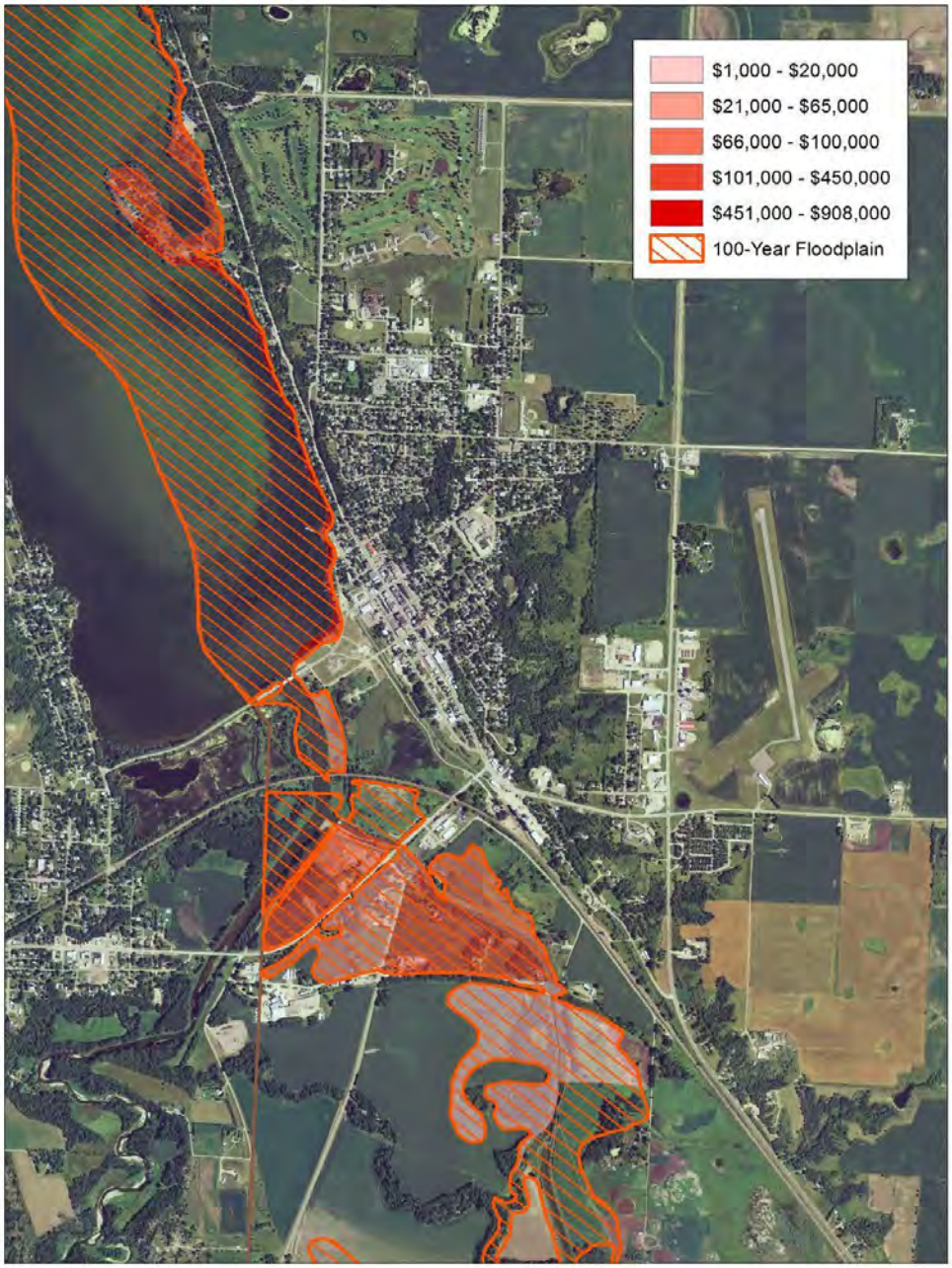
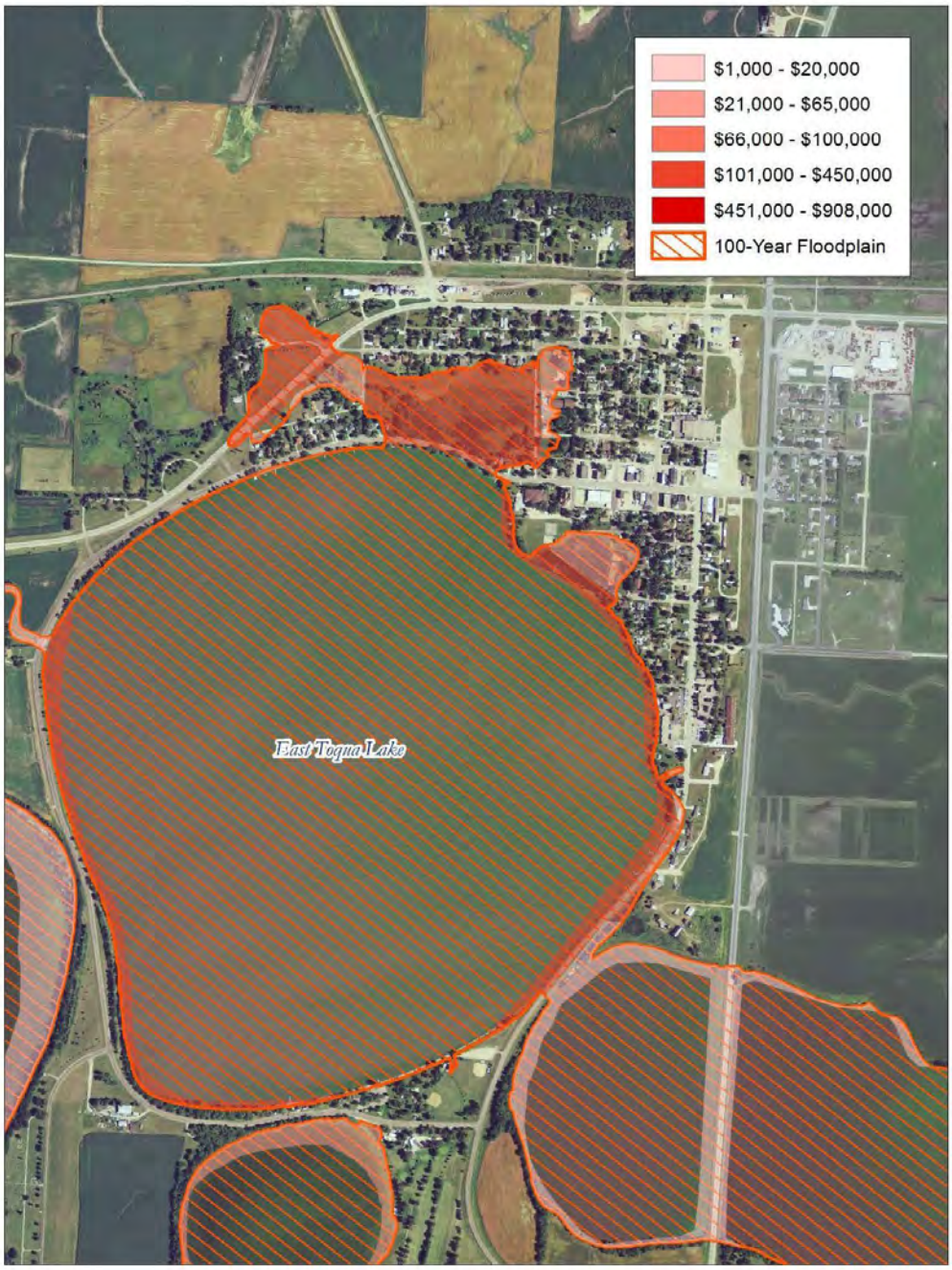


Figure 4. 100-Year Flood Loss Estimates in Graceville



The aggregate losses reported in this study may be overstated because values are distributed evenly in a census block. The 5 census blocks showing the highest estimated loss values are shown in Table 2, with their spatial extents shown in Figure 5, Figure 6, Figure 7, Figure 8, and Figure 9. All 5 census blocks are located in either in Ortonville or Graceville.

Table 2. Big Stone County Census Blocks with the Greatest Estimated Losses in the 100-Year Floodplain

Census Block Number	Total Estimated Loss	Location
270119503003008	$908,000	Ortonville
270119503003009	$450,000	Ortonville
270119502002056	$410,000	Graceville
270119502003108	$297,000	Ortonville
270119502002069	$245,000	Graceville

Figure 5. Census Block #270119503003008 and 100-Year Floodplain, Ortonville

Figure 6. Census Block #270119503003009 and 100-Year Floodplain, Ortonville

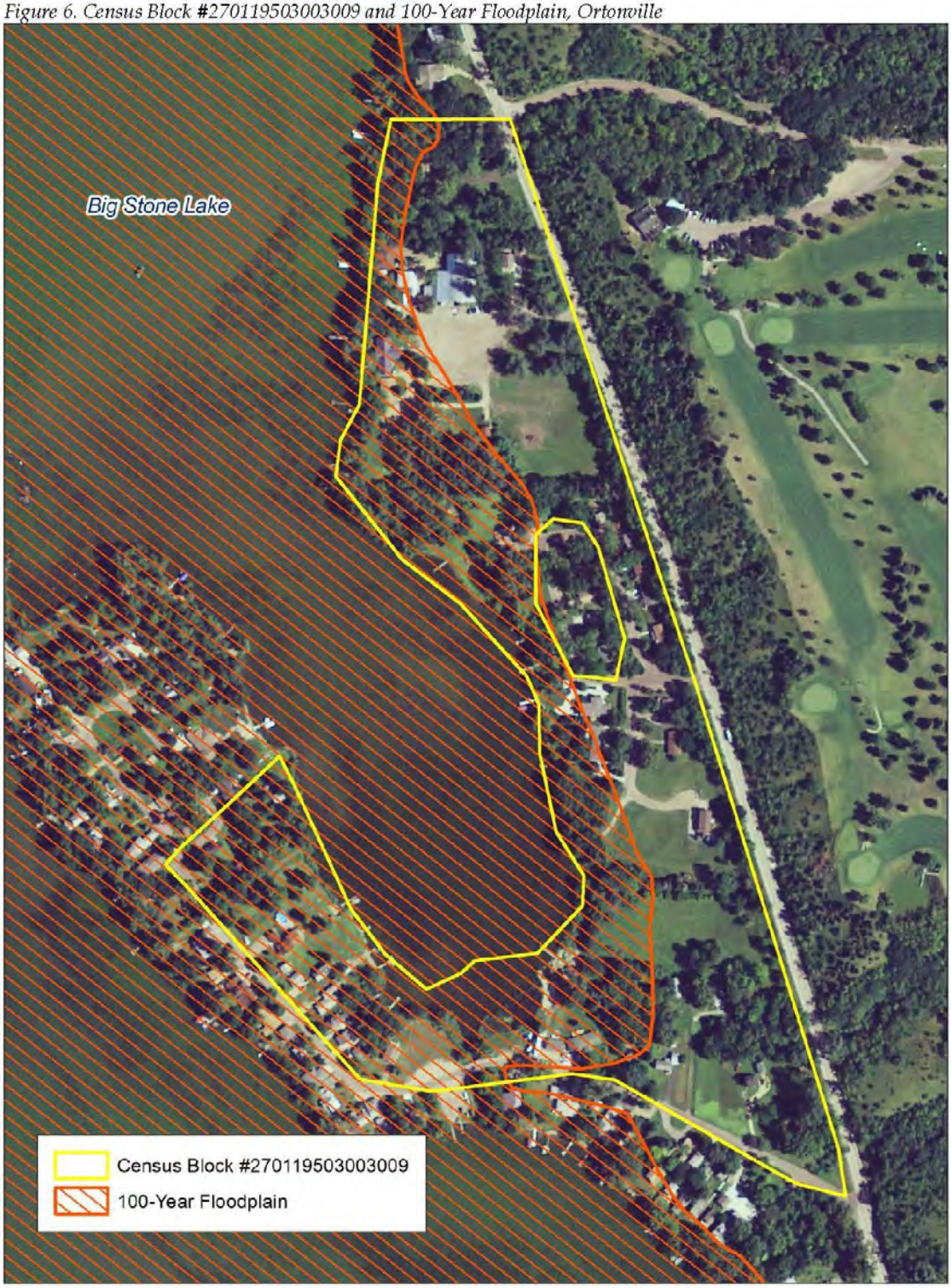


Figure 7. Census Block #270119502002056 and 100-Year Floodplain, Graceville

Figure 8. Census Block #270119502003108 and 100-Year Floodplain, Ortonville

Figure 9. Census Block #270119502002069 and 100-Year Floodplain, Graceville

Another analysis was performed by selecting the parcels with the highest values (building plus contents) that fell within the 100-year floodplain. The results of this analysis (and total building values) are shown in Table 3.

Table 3. Big Stone County Properties with Highest Building/Contents Value Intersecting 100-Year Floodplain

Edited Parcel ID Number	Parcel Building + Contents Total Value	Class Description	Building Area (ft^2)
03-0094-000	$653,800	Agriculture	n/a
05-0237-000	$580,200	Agriculture	1,200
22-0690-000	$389,700	Single Family Dwelling	970
22-0719-000	$348,300	Single Family Dwelling	852
22-0725-000	$333,000	Single Family Dwelling	768
13-0224-012	$324,000	Single Family Dwelling	1,600
13-0371-000	$259,950	Single Family Dwelling	1,464
22-0796-000	$236,100	Single Family Dwelling	1,240
13-0337-000	$222,150	Single Family Dwelling	672
22-1126-000	$221,700	Single Family Dwelling	2,252
Total:	***$3,568,900***		

Hazus-MH Essential Facility Loss Analysis

Essential facilities encounter the same impacts as other buildings within the flood boundary: structural failure, extensive water damage to the facility, and loss of facility functionality (i.e. a damaged police station will no longer be able to serve the community). No essential facilities (care facilities, fire stations, police stations, and schools) included in the Hazus-MH analysis fall within the 100-year flood boundary.

Hazus-MH Shelter Requirement Analysis

Hazus-MH estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus-MH also estimates those displaced people that may require accommodations in temporary public shelters. The countywide 100-year flood model estimates 91 households may be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, the model estimates 124 people (out of a 2000 census population of 5,802) may seek temporary shelter in public shelters.

Hazus-MH Debris Generation Analysis

Hazus estimates the amount of debris that may be generated by the flood. The countywide 100-year flood model breaks debris into 3 general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,078 tons of debris may be generated. Of the total amount, Finishes composes 45% of the total and Structural composes 32% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 43 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Flood Hazard Analysis for Big Stone County

For Upper Minnesota Valley Regional Development Commission
Level II Flood Hazard Analysis performed using FEMA Hazus-MH

Contact Information:

Project Coordination:
Stacey L. Stark, MS, GISP
Geospatial Analysis Center
College of Liberal Arts
1123 University Drive
329 Cina Hall
Duluth, MN 55812
Email: slstark@d.umn.edu
Tel: 218-726-7438 Fax: 218-726-6540

Geospatial Analysis Center

Wildfires

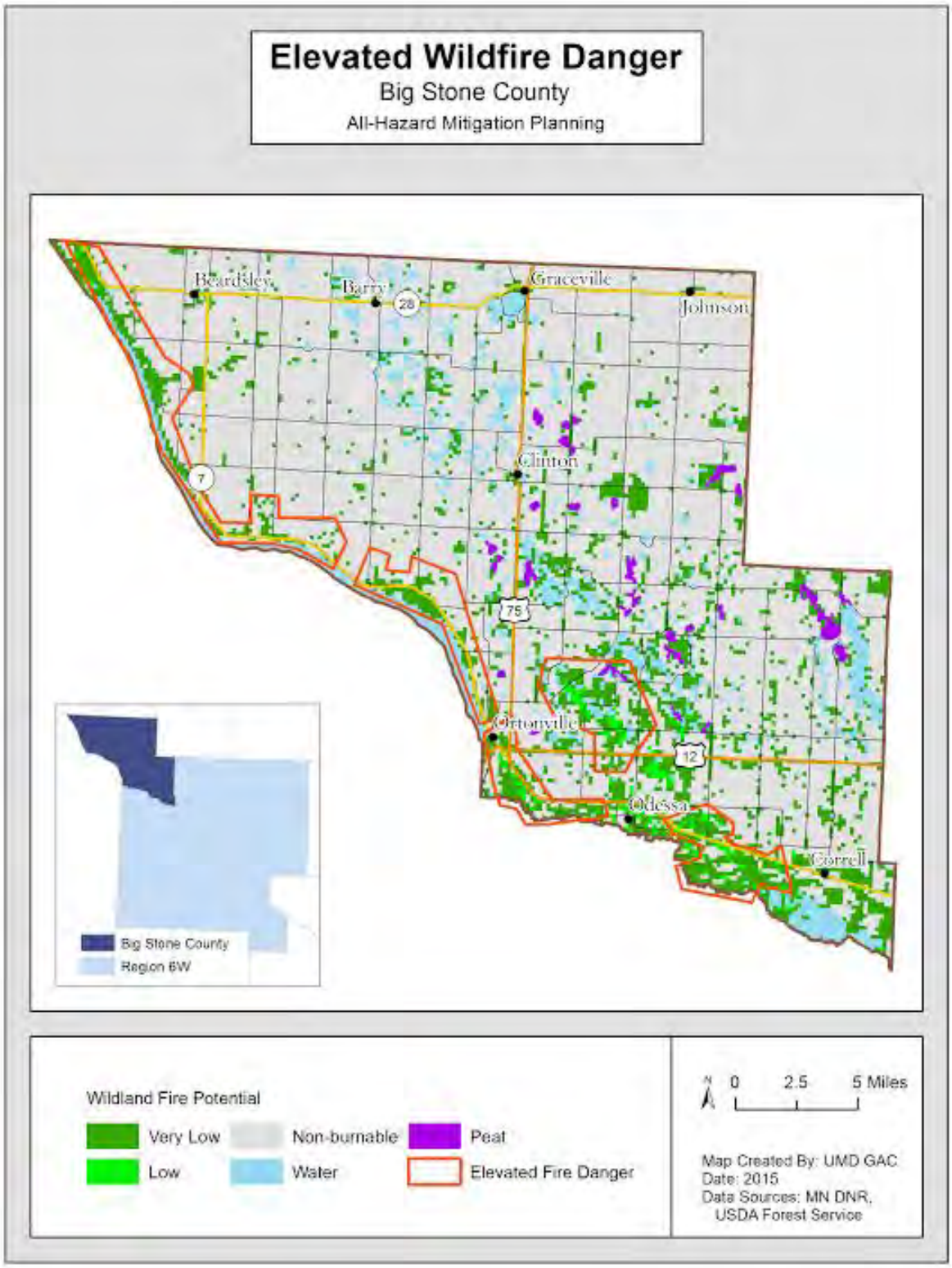
According to the Minnesota State Fire Marshal, there are more than 2,000 annual wildfires with an estimated loss of more than $13 million dollars statewide. Every year, wildfires are started along the railroads and farmland. Three other potential wildfire hazards are power lines, utility structures, and timber bridges. Hot exhaust from farm equipment could also start fields on fire.

As of May 2014, Big Stone County has 9,576 acres enrolled in CREP, RIM, CRP and the Wetland Reserve Program. These areas are left for wildlife habitat and are not burned on a regular basis. As a result, years of dead grasses accumulate on these lands and are a good fuel for any fire that may start. The Minnesota River Valley and the Wildlife Management Areas also provides an abundance of fuel for wildfires. Wildlife Management Areas occupy approximately 11,877 acres in Big Stone County. Big Stone County currently has 28,479 acres of grasslands and 9,431 acres of forests (See Table 4.16 below). Figure 4.2 identifies five areas across the county, which contain large patches of grasslands (11,856 acres) and forests (3,081 acres). Also, located within the five areas are 171 farmsteads and an additional 94 farmsteads found within a ½ mile radius of the Elevated Fire Danger areas. These areas are primarily located along the western border near the Minnesota River in the Upper Minnesota River Valley.

Table 4.16 BSC General Wildfire Information

Acreages:	**Grasslands**	**Forests**
Acres in “Five Large Patch Areas”	11,856	3,081
Total Acres in County	28,479	9,431
Farmsteads located within:	**Large Patch Areas**	**½ Mile of Large Patch Areas**
Number of Farmsteads	171	94

Figure 4.2 Elevated Wildfire Danger in Big Stone County

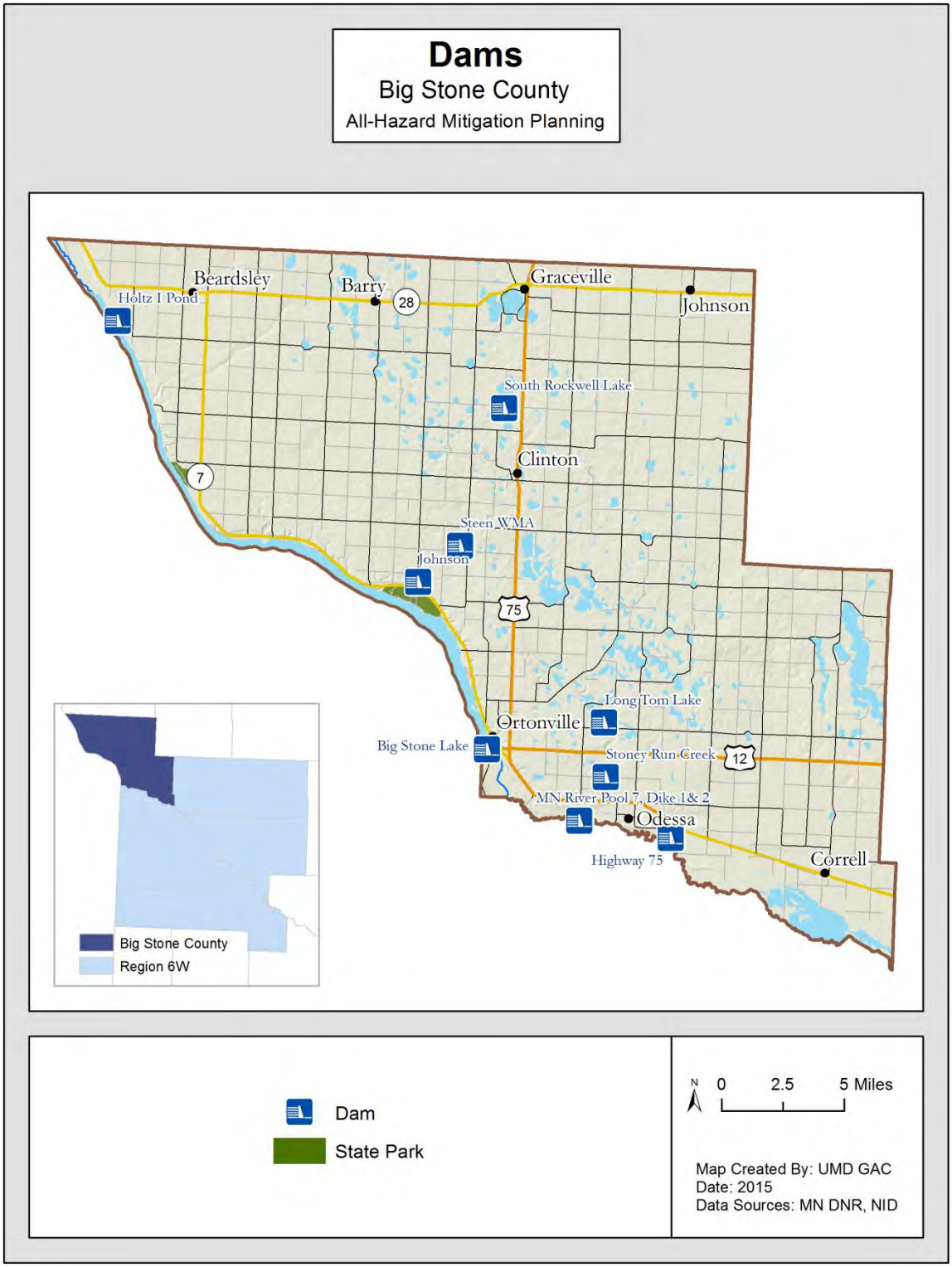


Dam Failure

Dam failure is defined as the collapse or failure of an impoundment resulting in downstream flooding. Dam failures can result in loss of life and extensive property damages. They may result from an array of situations, including flood events, poor operation, lack of maintenance and repair and terrorism.

Big Stone County has 9 dams located within the boundary, eight of which are considered “Low Head Dams” which means if they failed, it would not be life threatening. Big Stone Lake has a recreational dam that would not impact any structure if it failed, located in the City of Ortonville. The Long Tome Dam is located up river from the City of Odessa. If this dam were to fail, the City could be impacted and sustain damage. The damage could include up to 30 homes and all major businesses within the Community.

Figure 4.3 Dams in Yellow Medicine County



COMMUNITY BASED RISK ASSESSMENTS

In previous Big Stone County All-Hazard Mitigation Plan updates, all cities underwent a broad risk assessment. Each community within Big Stone County received a survey and two inventories to gather information to complete the project with the Emergency Manager. The risk assessment survey requested identification of likely hazards that may affect the community as well as current land use development trends and the potential of future development. The risk assessment inventories were geared toward identifying vulnerable structures that may be affected by different hazard area boundaries and an inventory of community assets. Sample surveys and inventories, as well as information included in the previous plan update are found in Appendix 11[1]. Each community-based risk assessment was divided into four sections: existing development trends, potential of future growth and development vulnerability assessment of structures by hazard, and an inventory of community assets.

The task force had many discussions about the transportation of hazardous materials through the county during the 2015 Hazard Mitigation Plan update. Since the 2010 update, there has been an increase in crude oil transportation throughout western Minnesota coming from the Bakken Oil Fields in North Dakota. This is discussed in further detail in Hazardous Materials section of Chapter 3. It was determined that cities need to be aware of the areas of potential impact from a hazardous material spill. This section contains a map of each city in Big Stone County with a ½ mile buffer around rail lines and U.S. and state highways. It is becoming increasingly important for cities to be cognizant of which of its critical facilities and major employers are located within this hazard zone. In addition to evacuation plans, cities should consider these zones when locating new schools, hospitals, emergency operations centers, etc.

Included below is an updated summary of existing development trends as well as potential for future growth and development for each city within Big Stone County. The second portion of the city specific risk assessments includes land use information and an inventory of community assets for each city in Big Stone County. Each city's asset locations were identified and placed on a map of the city as well as its respective transportation of hazardous material maps. This is to show the connection between hazard boundaries and the location of assets. Assets vary from community to community; so all assets were categorized into one of seven categories:

- Major Employers (as defined by community)
- Police Department
- Fire Department
- Hospitals
- Schools
- Historical Structures (as defined by community and State Historic Preservation Office)
- Institutional Buildings (government-owned structure, not related to Emergency Services)
- Multi-Family Housing

[1] UMVRDC did not have access to data more recent than 2009. Therefore, outlined is the total number of parcels within each land use category and a 2009 market rate value for the parcel for all non-exempt entities. All exempt parcels including hospitals, churches, government-owned facilities, and schools, have market values from 2004 as those properties are only assessed once every six years. It is important to note that Yellow Medicine's survey underestimates the actual number of structure within each community. Further, the market value utilized for the community-based risk assessment is for both the structure and the land, which causes an over-estimation of structure value.

- Public Facilities (Park, Pool, General Public Asset)
- Schools (Educational-related structure).

For the next update of the All-Hazard Mitigation Plan, the market value for exempt properties should be updated with more recent assessment values and will include updated square footage numbers. Some properties selected as Community Assets did not have accurate square footage measurements.

City of Barry, Minnesota

Existing Development Trends.
Barry is Big Stone County's smallest city with 13 residents and 5 households (Minnesota State Demographic Center 2013). Barry's population has been declining since 1960, losing 47 residents in 53 years. The city's population projections estimate that Barry should continue to decline at a slow, but steady rate, possibly bringing the population as low as nine residents in the year 2020. While the population of Barry has been declining, the city has only seven fewer households than it did in 1960. Barry has not completed any redevelopment projects or had any land use changes in the last 10 years. The City of Barry's general land use category breakdown exists as the following shown in Table 55 below.

Table 4.17 City of Barry – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	33	50.00%
Commercial	4	6.06%
Agricultural	14	21.21%
Government	5	7.58%
Total	66	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
The City of Barry is focusing on maintaining their current residents and working to keep the residences filled with families. The City plans to apply for funding to provide maintenance for small home repairs in the future. As no future development is expected, there is no increase in vulnerability expected over the next five years, but future vulnerability will be re-evaluated during subsequent plan updates.

Figure 4.4 Barry Land Use

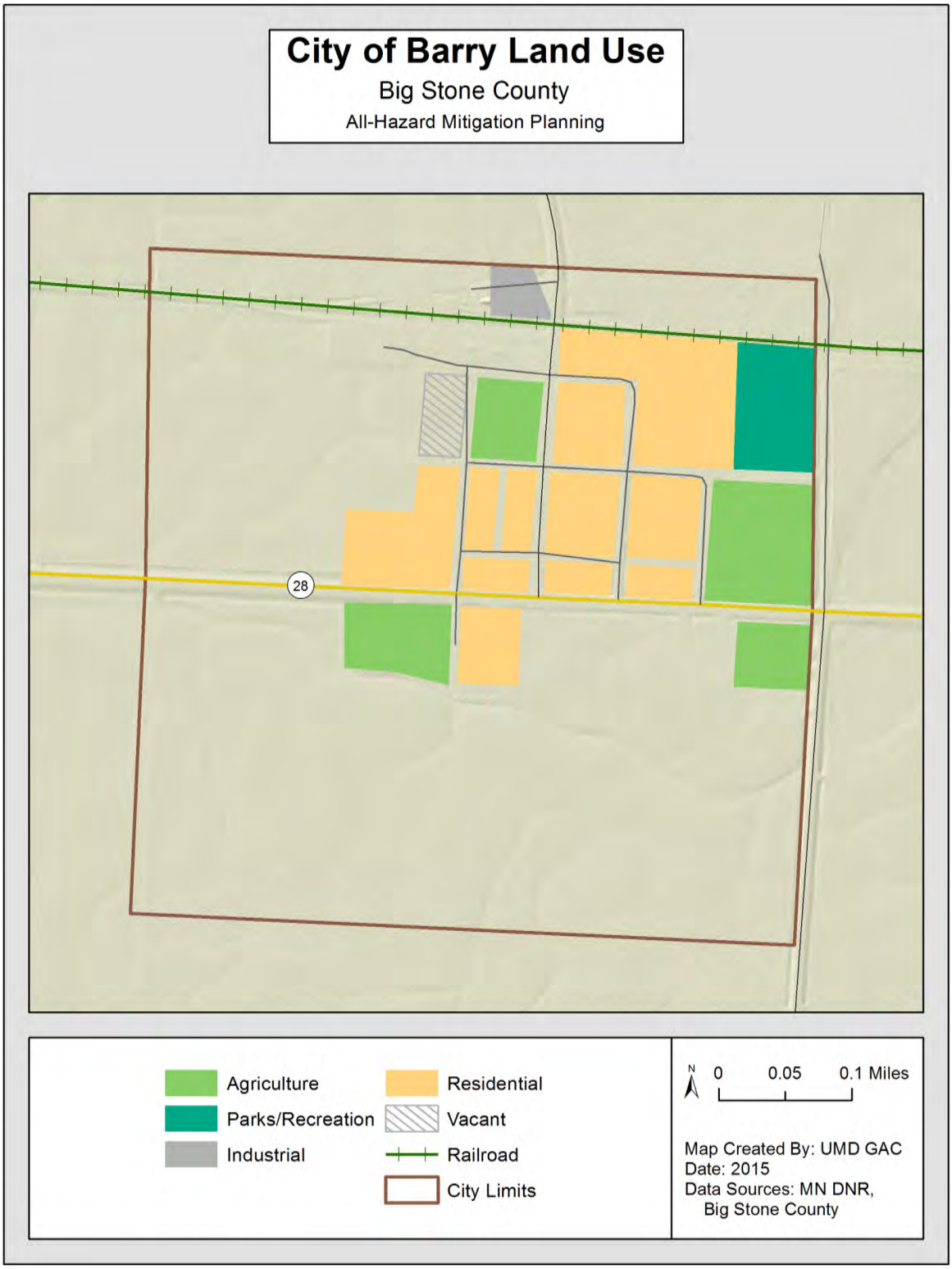


Figure 4.5 Barry Community Assets/Critical Facilities

Figure 4.6 Barry Transportation of Hazardous Materials

City of Beardsley, Minnesota

Existing Development Trends.
The City of Beardsley has approximately 224 people and 103 households making it Big Stone County's fourth largest city (Minnesota State Demographic Center 2013). The city's population has declined since 1960, losing 186 residents. The number and size of households have also seen steady decline since 1980. The city's population projections estimate that Beardsley should continue to decline at a slow but steady rate over the next 20 years, possibly bringing the population to 190 by the year 2020. Beardsley has not completed any redevelopment projects or had any land use changes in the last 10 years. The City of Beardsley's general land use category breakdown exists as the following shown in Table 4.18 below.

Table 4.18 City of Beardsley – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	172	71.07%
Commercial	28	11.57%
Agricultural	8	3.31%
Government	24	9.92%
Religious	5	2.07%
Total	242	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
Beardsley's close proximity to Big Stone Lake could play a significant part in the city's future and affect future growth. The zoning is almost entirely residential with a large agriculture zone on the western edge of the city. The northern section of Beardsley, as well as a segment running along the eastern edge has not been zoned. Decisions on what to do with this land will be very important to the city if growth occurs, and Beardsley is be prepared to make these decisions in such a way that will promote orderly growth and prevent vulnerability to structures as these areas may be within potential hazardous areas of tornados and transportation of hazardous materials.

Figure 4.7 Beardsley Land Use

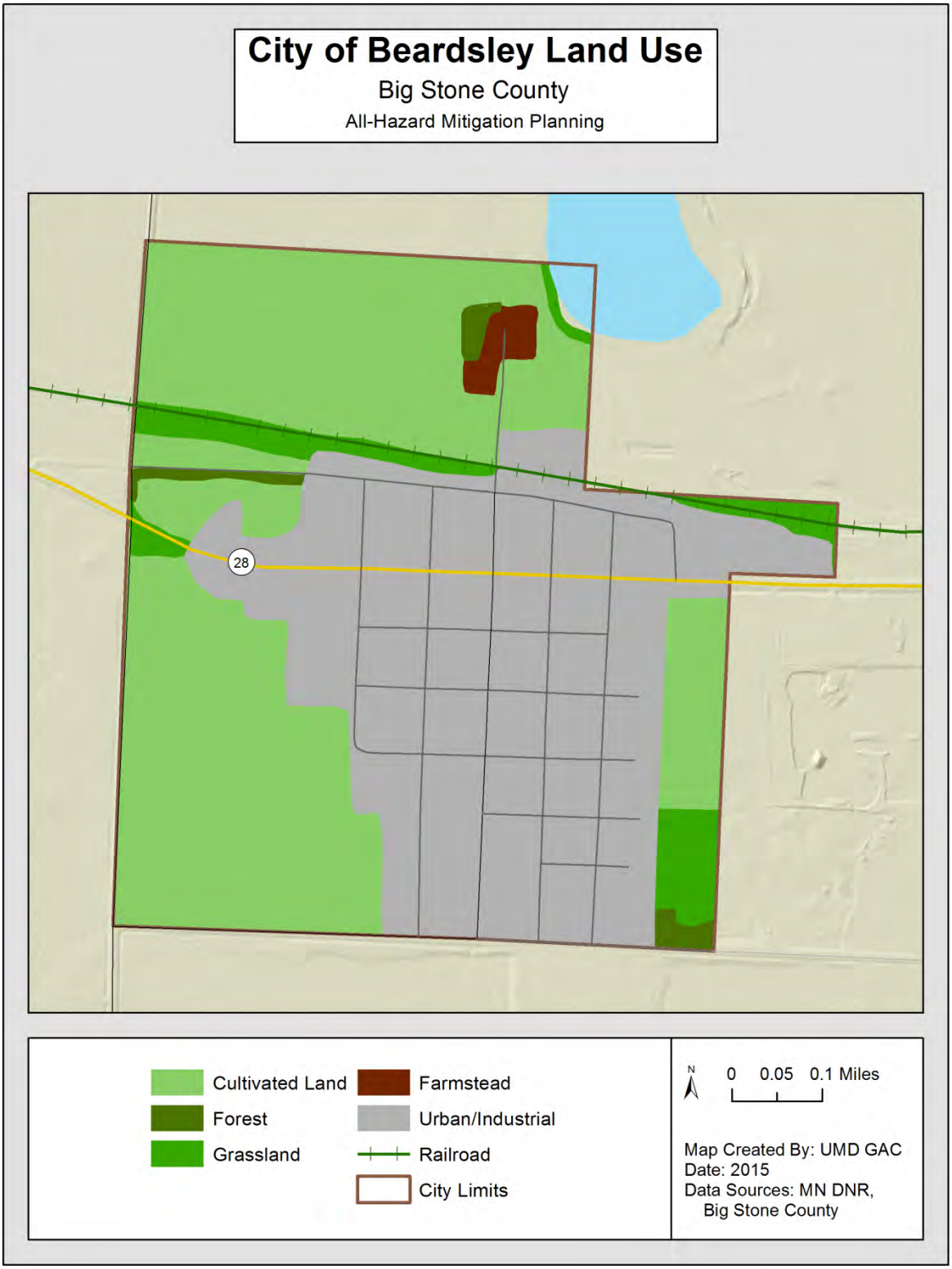


Figure 4.8 Beardsley Community Assets/Critical Facilities

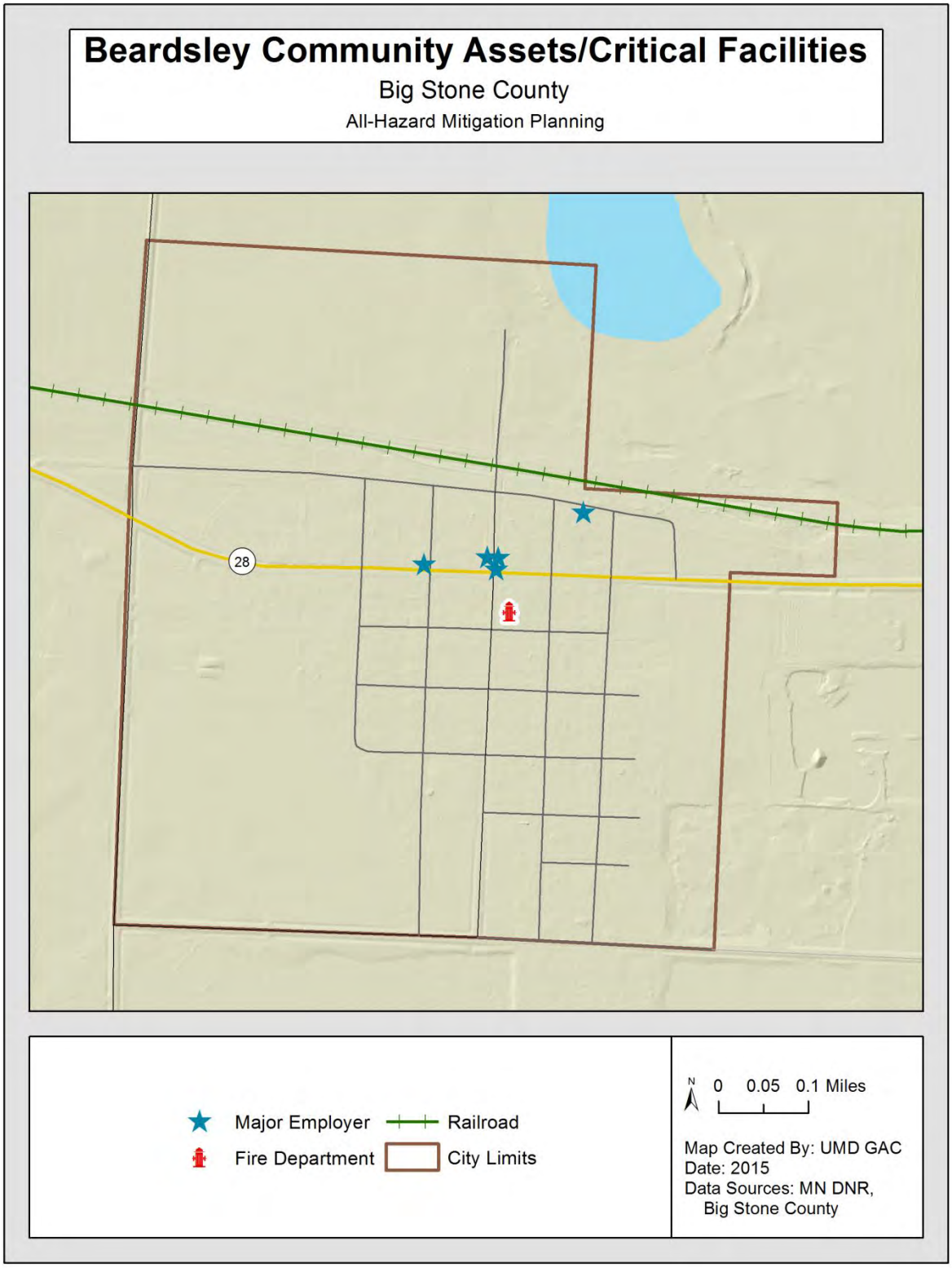


Figure 4.9 Beardsley Transportation of Hazardous Materials

City of Clinton, Minnesota

Existing Development Trends.

Clinton is the county's third largest city with 435 people and 196 households (Minnesota State Demographic Center, Metropolitan Council 2013). Clinton has experienced some fluctuation in population trends over the last half century, with an overall loss of 130 residents. Clinton's population peaked in 1980 at 622 residents before starting to decline. Between 1990 and 2000 the city lost 121 residents, or 21 percent of the population. Population decline is expected to continue between 2000 and 2020. The average household size has also seen some fluctuation, but is generally decreasing. This is consistent with the shrinking household sizes seen throughout the area. The City of Clinton has not completed any annexations or development projects in the past 10 years. The City of Clinton's general land use category breakdown exists as the following shown in Table 4.19 below.

Table 4.19 City of Clinton – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	243	71.47%
Commercial	34	10.00%
Agricultural	13	3.82%
Government	35	10.29%
Religious	7	2.06%
Industrial	2	0.59%
Total	340	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.

Along the western and northern edges of the city limits there are large tracts of land zoned for agricultural purposes, which may be available for development within city limits. However, as no development is expected in the next five years, there is no increase in vulnerability expected and future vulnerability will be re-evaluated during subsequent plan updates.

Figure 4.10 Clinton Land Use

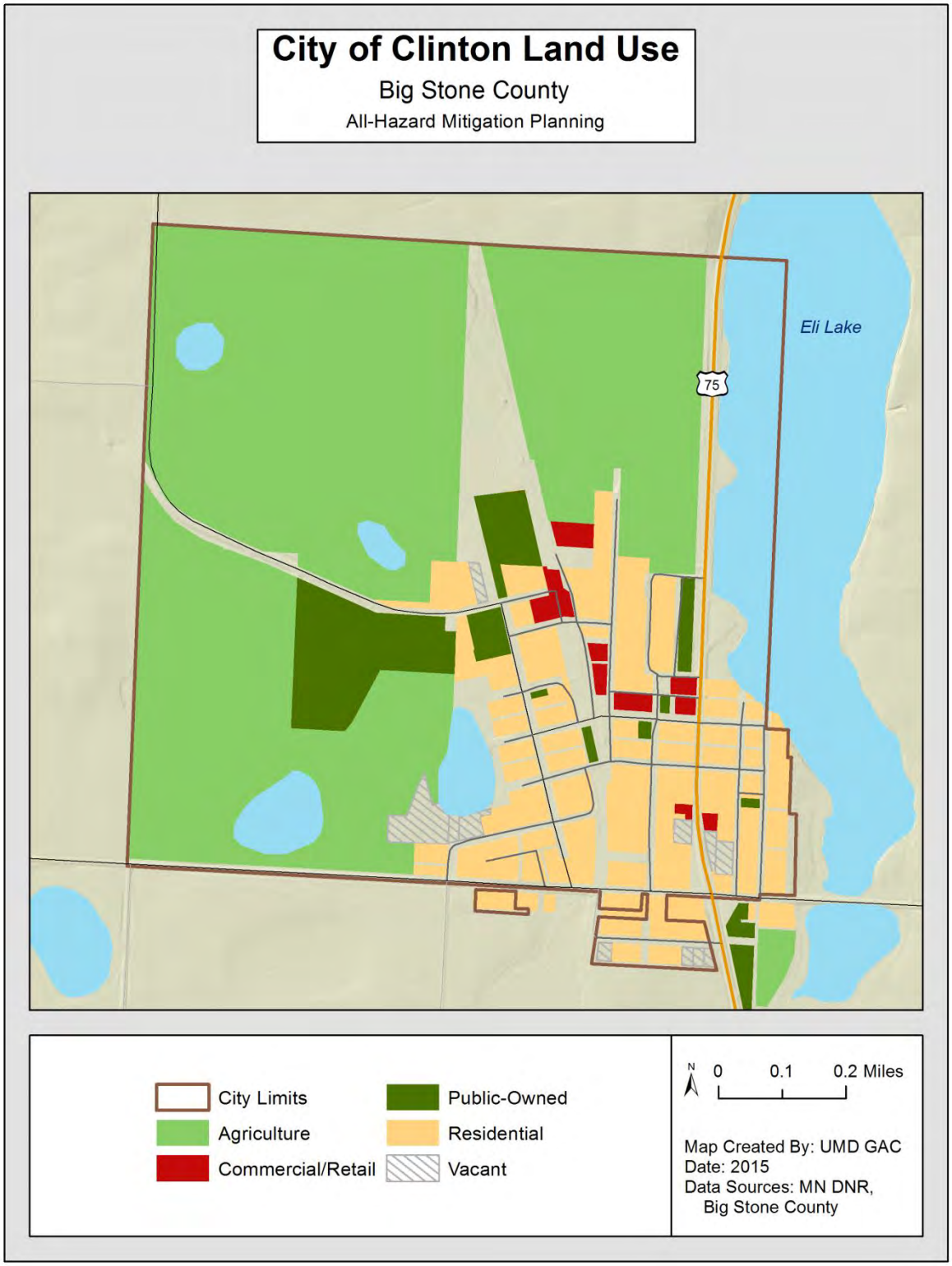


Figure 4.11 Clinton Community Assets/Critical Facilities

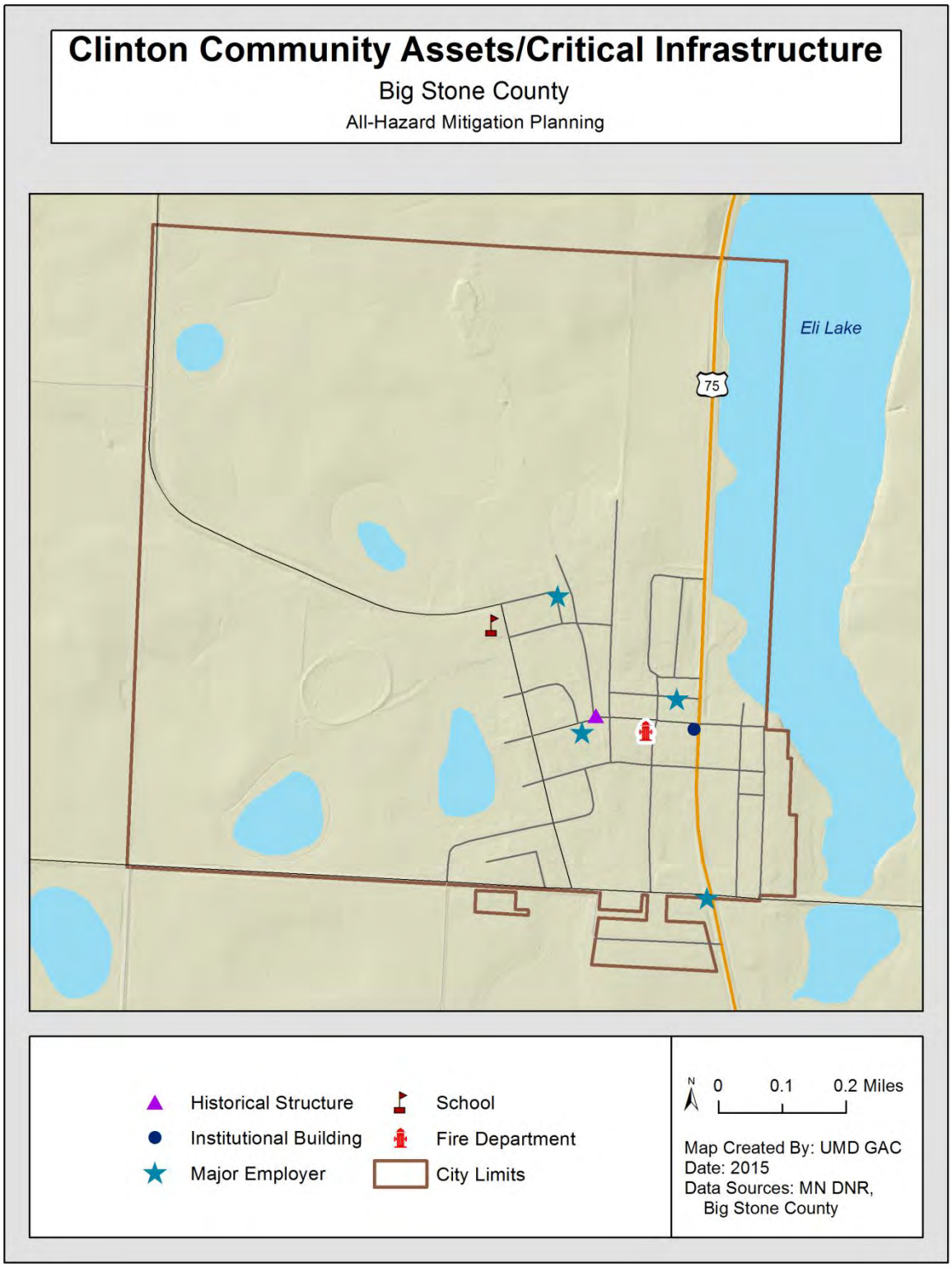
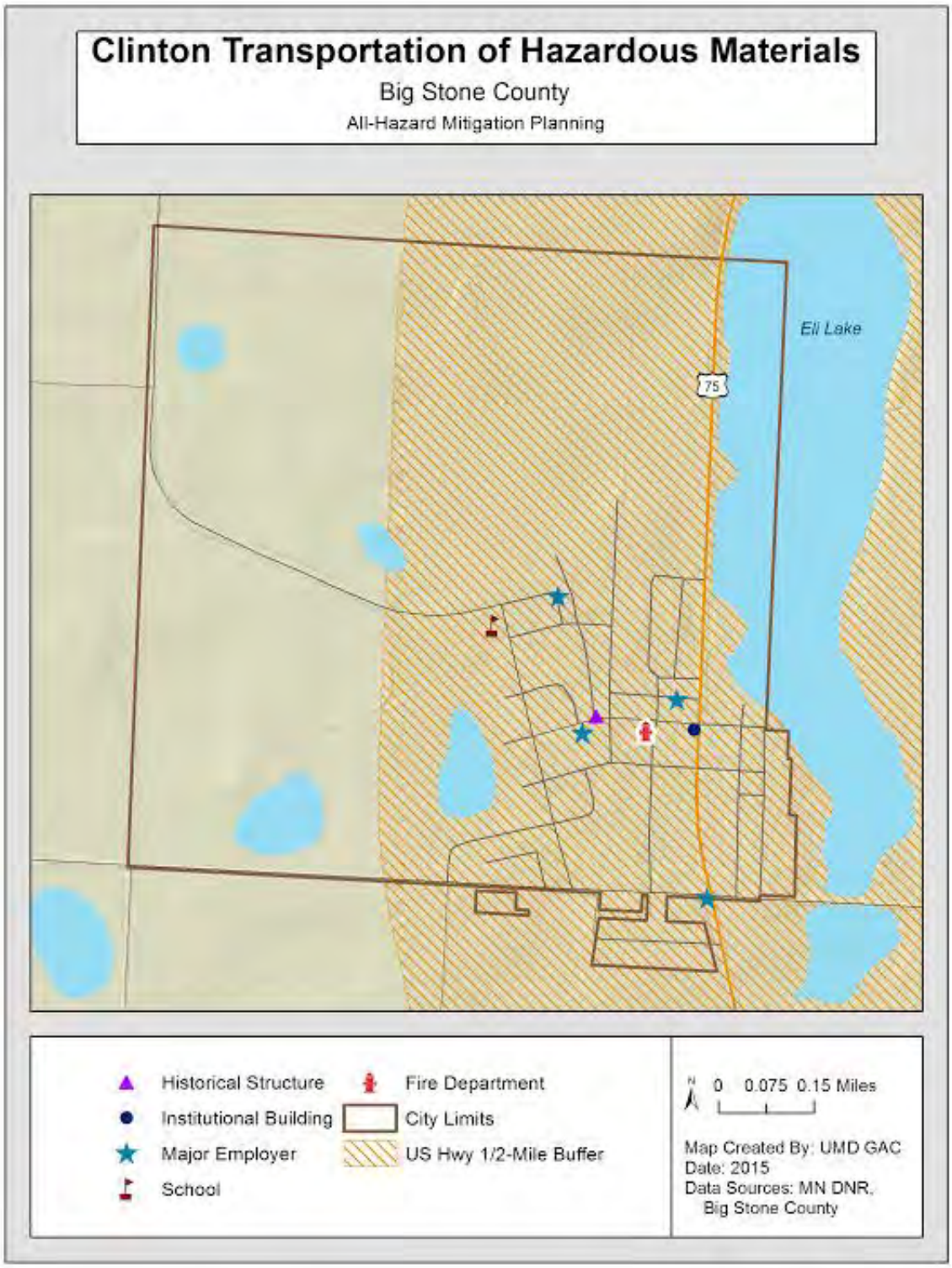


Figure 4.12 Clinton Transportation of Hazardous Materials



City of Correll, Minnesota

Existing Development Trends.
Correll is Big Stone County's third smallest city with an estimated population of 32 people and 17 households (Minnesota State Demographic Center 2013). Correll's population has declined rapidly since 1960. The most dramatic decrease was between 1980 and 1990, when Correll lost 23 residents. The population is expected to continue to decline. It is important to note, however, that the number of households has not seen quite as dramatic of a decline. There has been an overall loss of ten households since 1960, a loss of only 30 percent compared to a loss of 53 percent of the population since 1960. The average household size in Correll went from 3.06 in 1960 to 1.88 in 2013; this is a loss of slightly more than one person per household. The City of Correll has not completed any annexations or development projects in the past 10 years and its general land use category breakdown exists as the following shown in Table 4.20 below.

Table 4.20 City of Correll – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	60	60.00%
Commercial	15	15.00%
Agricultural	7	7.00%
Industrial	1	1.00%
Government	9	9.00%
Religious	4	4.00%
Total	100	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
Most of the land within the city limits is agricultural land and the current focus of the community is to maintain its housing stock with the potential to expand agricultural land in the future. As no future development is expected, there is no increase in vulnerability expected over the next five years, but future vulnerability will be re-evaluated during subsequent plan updates.

Figure 4.13 Correll Land Use

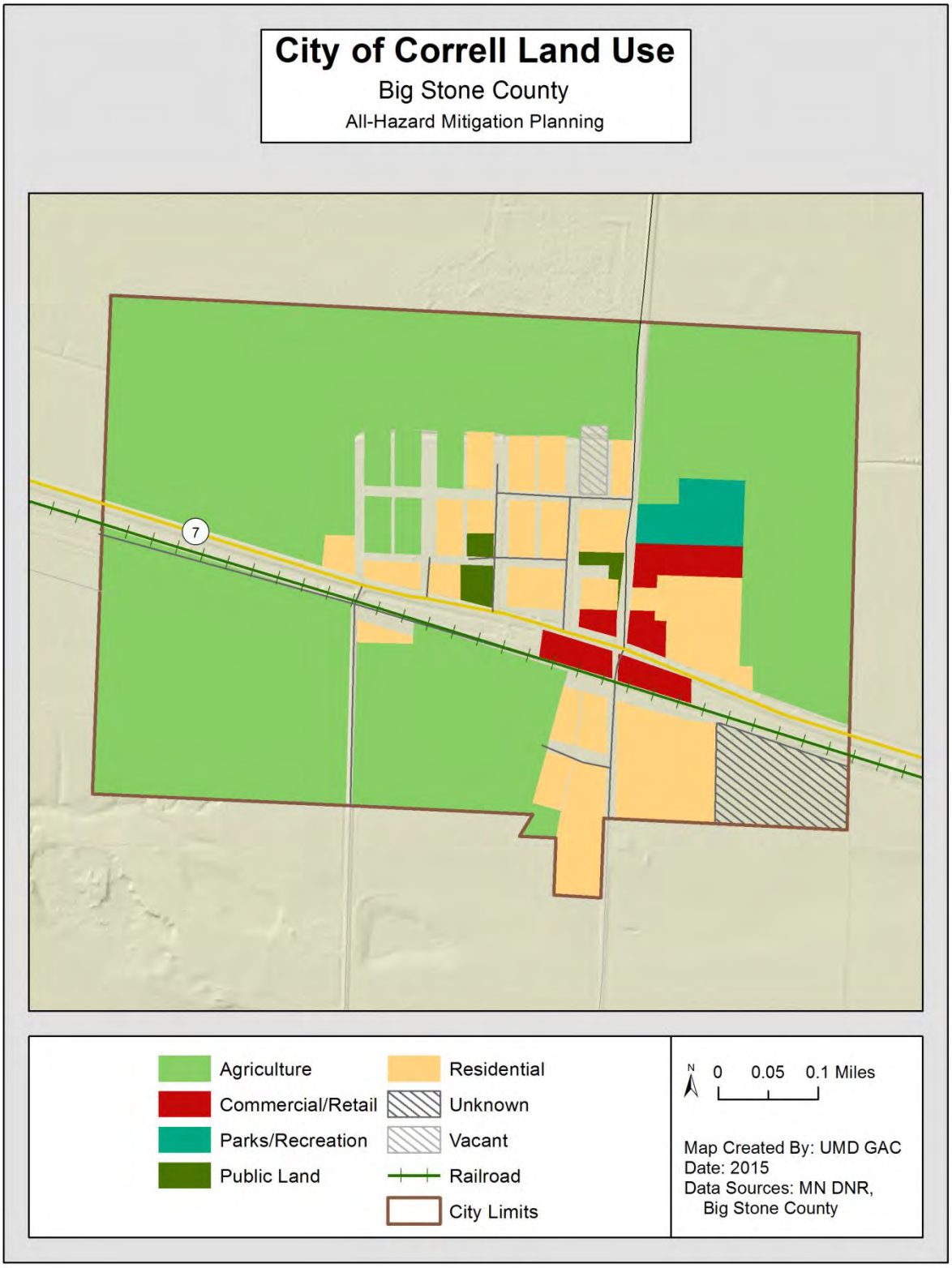


Figure 4.14 Correll Community Assets/Critical Facilities

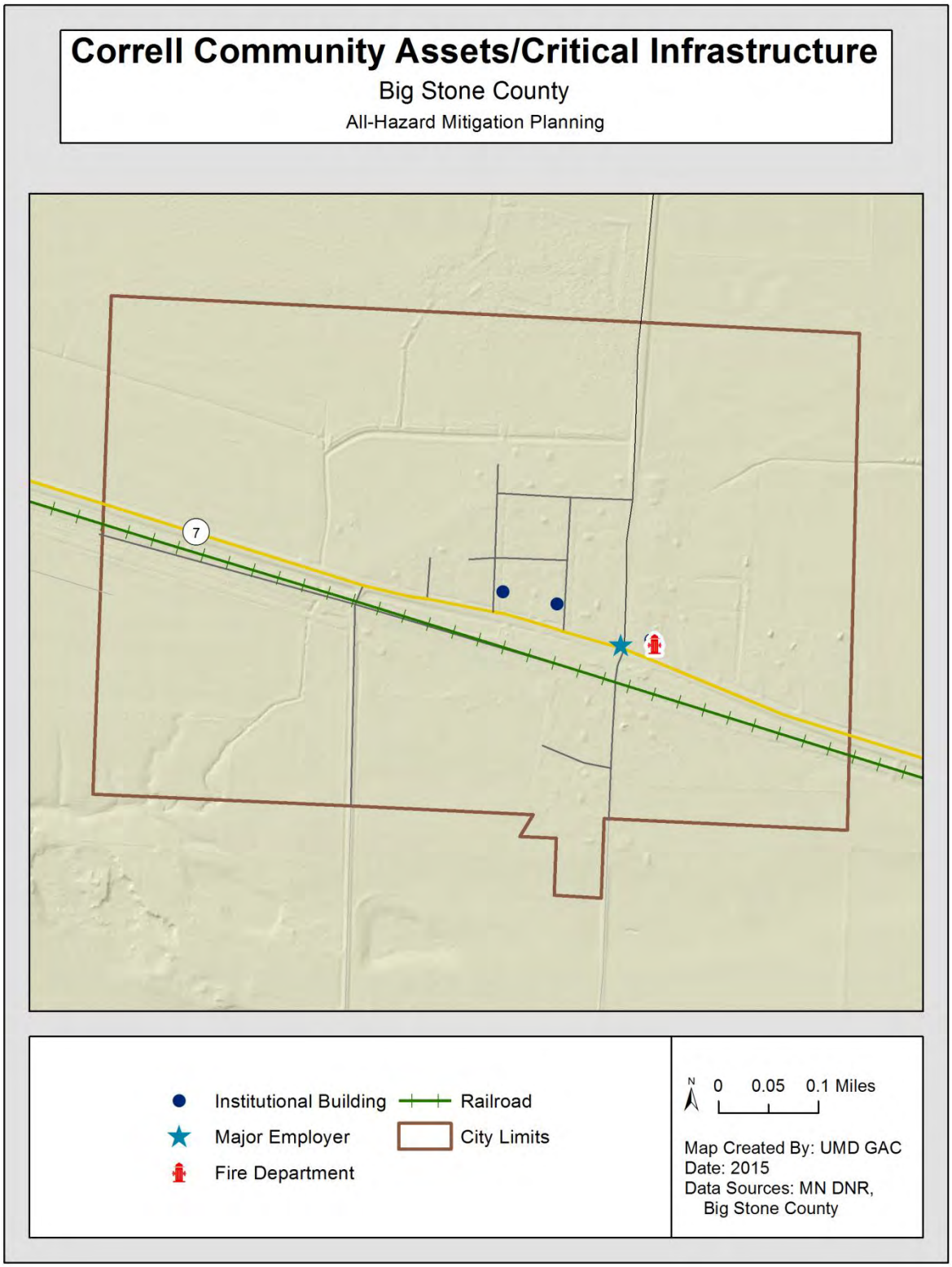


Figure 4.15 Correll Transportation of Hazardous Materials

City of Graceville, Minnesota

Existing Development Trends.
Graceville's 2013 estimated population by the Minnesota State Demographic Center is 576, making it the second most populated city in Big Stone County. Graceville has lost nearly 250 residents since 1960; however, the total number of households in Graceville has seen a net increase of 16 households since 1960. The increase in the number of households and decrease in overall population indicates a decrease in overall household size, which is consistent with the general population trends in Big Stone County and rural Minnesota. It is important to note that while the current population trends show decline, Graceville's location at the intersection of State Highway 28 and U.S. Highway 75, as well as the attraction of East Toqua Lake creates an opportunity for growth that can and could be exploited. In the past 15 years, 13 acres of agricultural land were annexed by the City of Graceville and zoned as residential. As of 2005, eight new homes were built on the newly annexed land. As of 2005, two land use changes occurred in Graceville, from residential to commercial in order to support small business development. One other development project directed by the City took place in 2005. The City developed "Grace Village" a 16-unit assisted living center/nursing home. There is also a new City Shop building on Main Street. Outside of these projects, no other development ventures have taken place in Graceville. The current land use allotments for the City of Graceville are shown in Table 4.21

Table 4.21 City of Graceville – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	305	70.44%
Commercial	55	12.70%
Agricultural	8	1.85%
Government	48	11.09%
Religious/Non-Profit	7	1.62%
Total	**433**	**100.00%**

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
Graceville's future growth area for development focuses on residential development. The areas identified are located east of Highway 75 and south of Graceville along the lake. These areas are not located within 100-year floodplains and would not increase the city's vulnerability in terms of future structures. Currently, one residence and garages/storage sheds are located within the 100-year floodplain. Within defined 100-year floodplains, the City of Graceville will only allow future park development, due to a Floodplain Ordinance passed in 2006.

Figure 4.16 Graceville Land Use

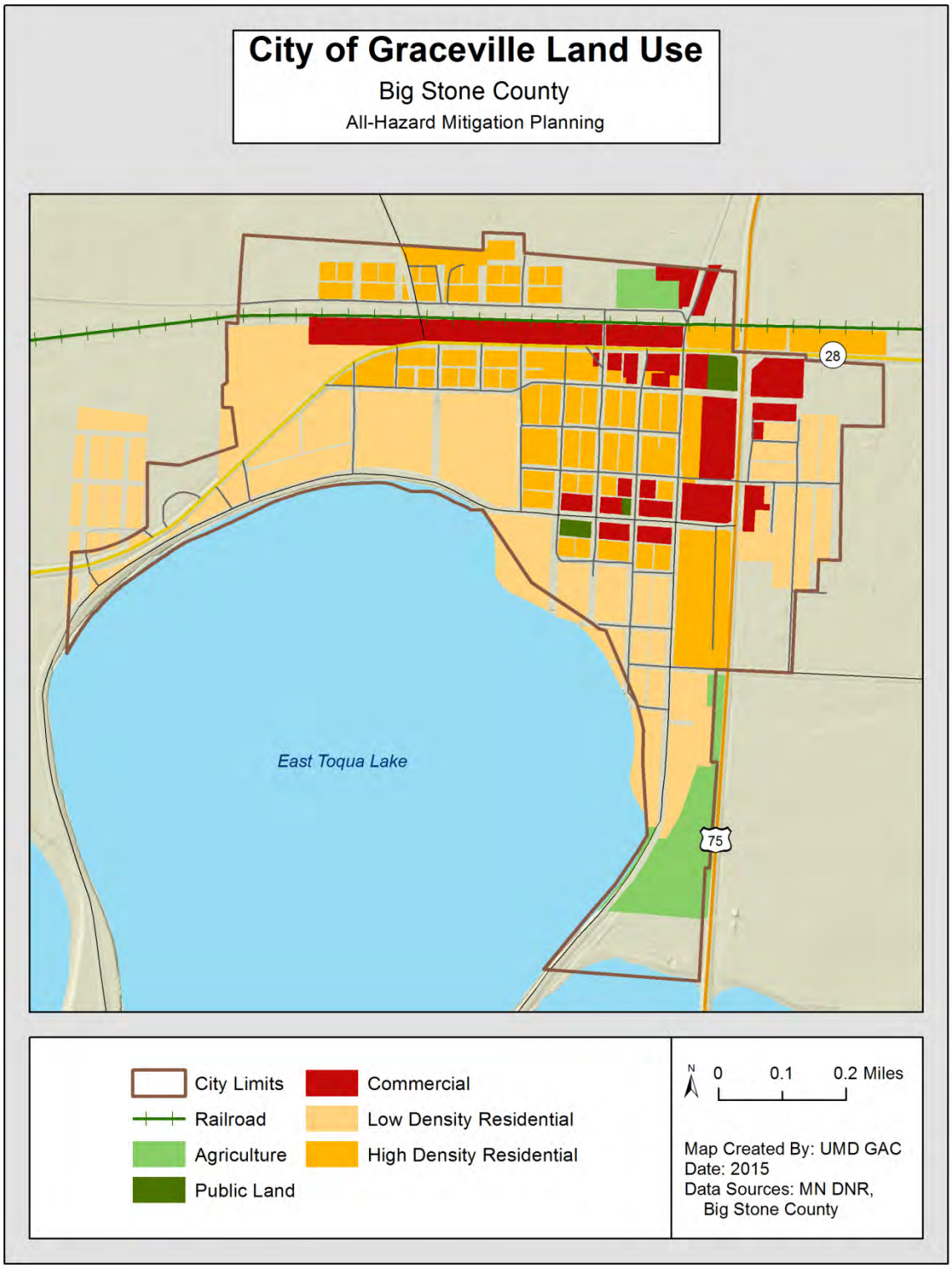


Figure 4.17 Graceville Community Assets/Critical Facilities

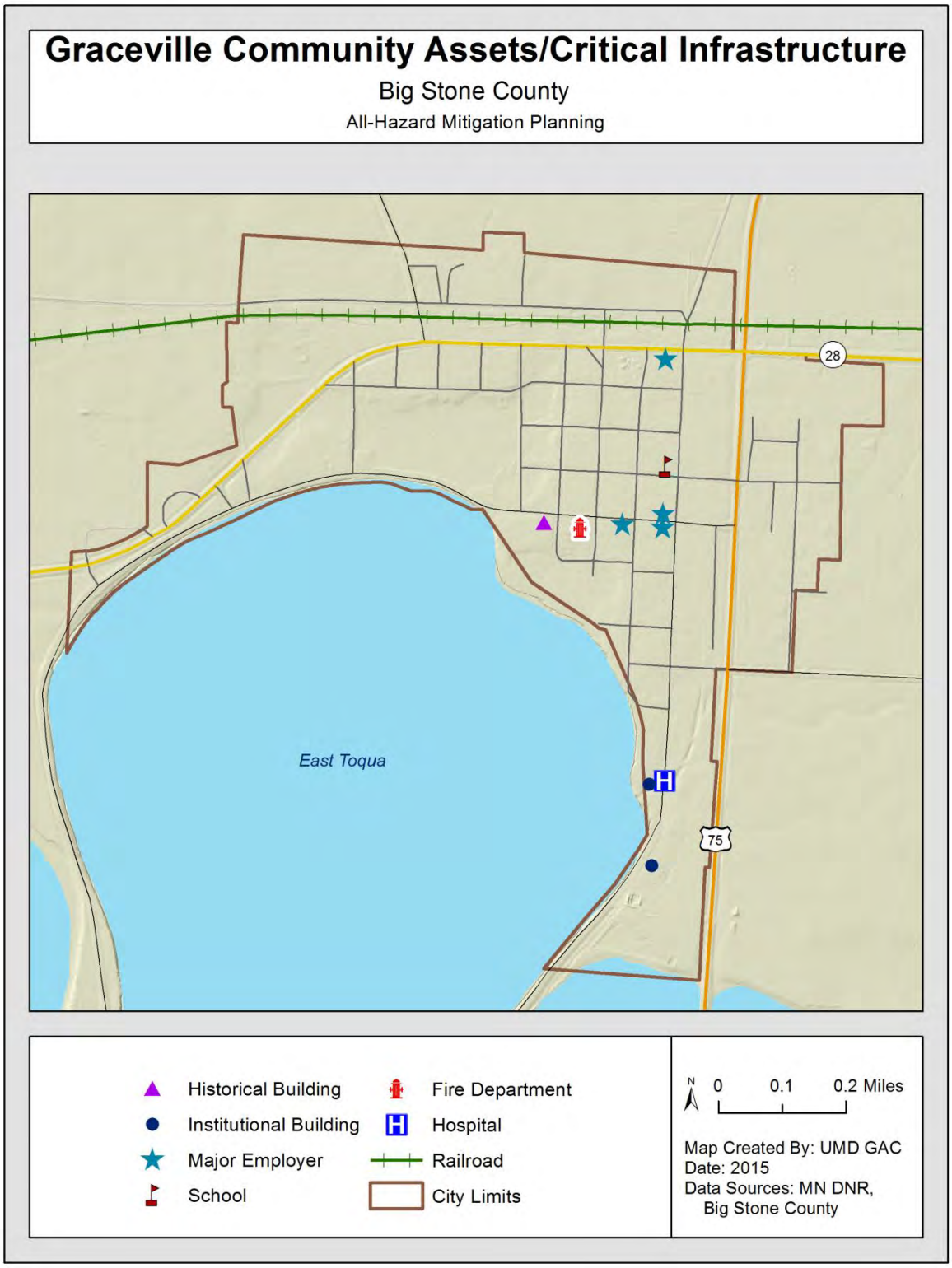


Figure 4.18 Graceville Transportation of Hazardous Materials

City of Johnson, Minnesota

Existing Development Trends.
The population of Johnson has been generally declining since 1960. The only period of growth since 1960 was in 1980 when Johnson gained four residents. Since 1960, Johnson has lost half its population, going from 64 residents in 1960 to 29 residents in 2013 (Minnesota State Demographic Center 2013). It should be noted that the rate of decline in households is less than that of the population and the decline appears to have leveled off in the 2007 Census estimate. The difference in the rates of decline for population and households indicates fewer persons per household, a trend that is commonly seen throughout Big Stone County and many rural Minnesota communities. While Johnson has not completed any redevelopment projects in the city, the City has removed multiple vacant buildings within city limits. City Hall was removed in 1999-2000 and the Johnson Grain Elevator and storage bins were removed from 2007-2008. The City of Johnson's general land use category breakdown exists as the following shown in Table 4.22 below.

Table 4.22. City of Johnson – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Agricultural	4	7.69%
Residential	38	73.08%
Government	4	7.69%
Religious-Non-Profit	1	1.92%
Total	37	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
Johnson's future growth area for development is within current city limits. The focus of Johnson is to maintain its current housing stock by sustaining residents and keeping homes updated. As no future development is expected, there is no increase in vulnerability expected over the next five years. Future vulnerability will be re-evaluated during subsequent plan updates.

Figure 4.19 Johnson Land Use

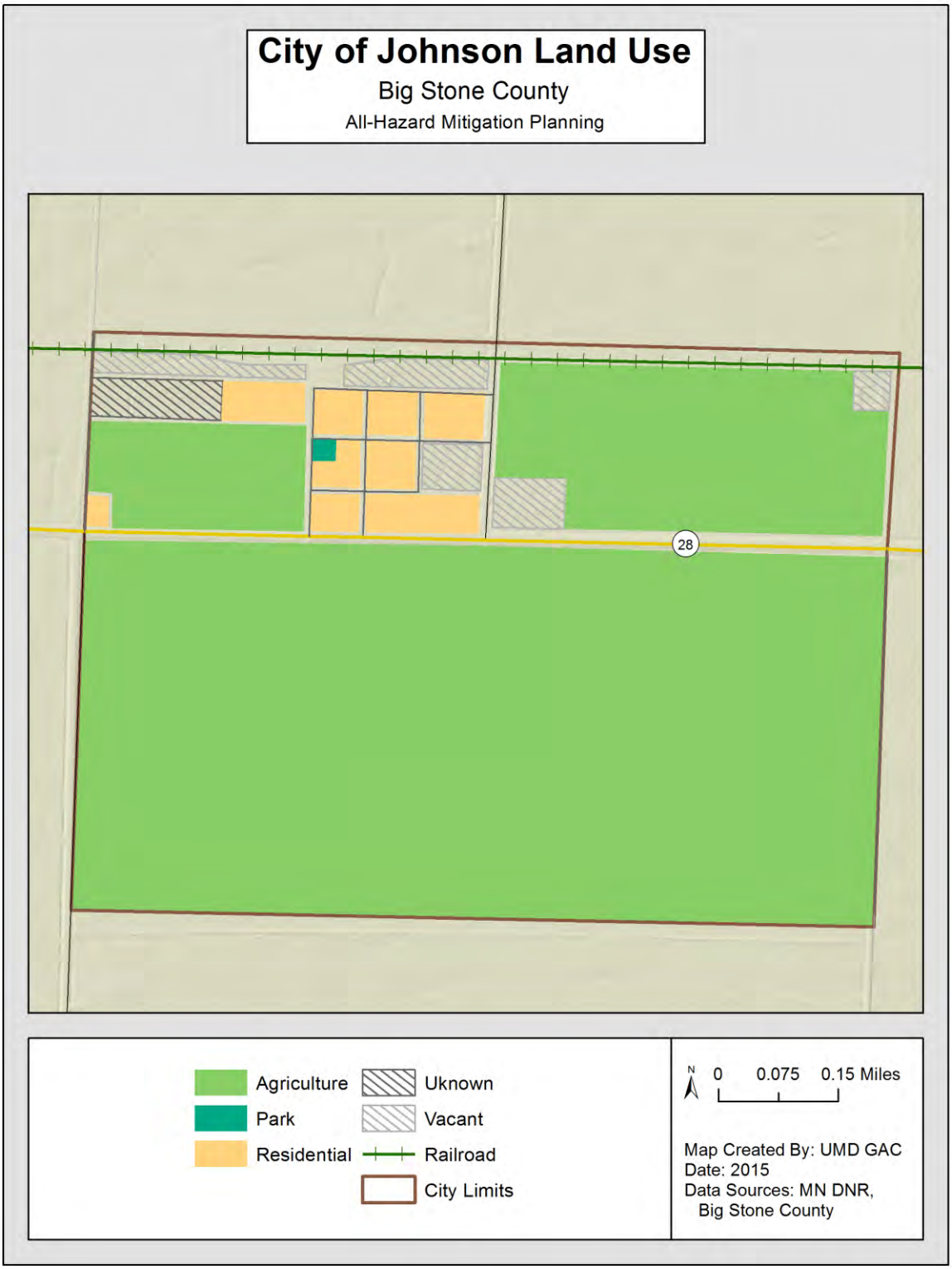
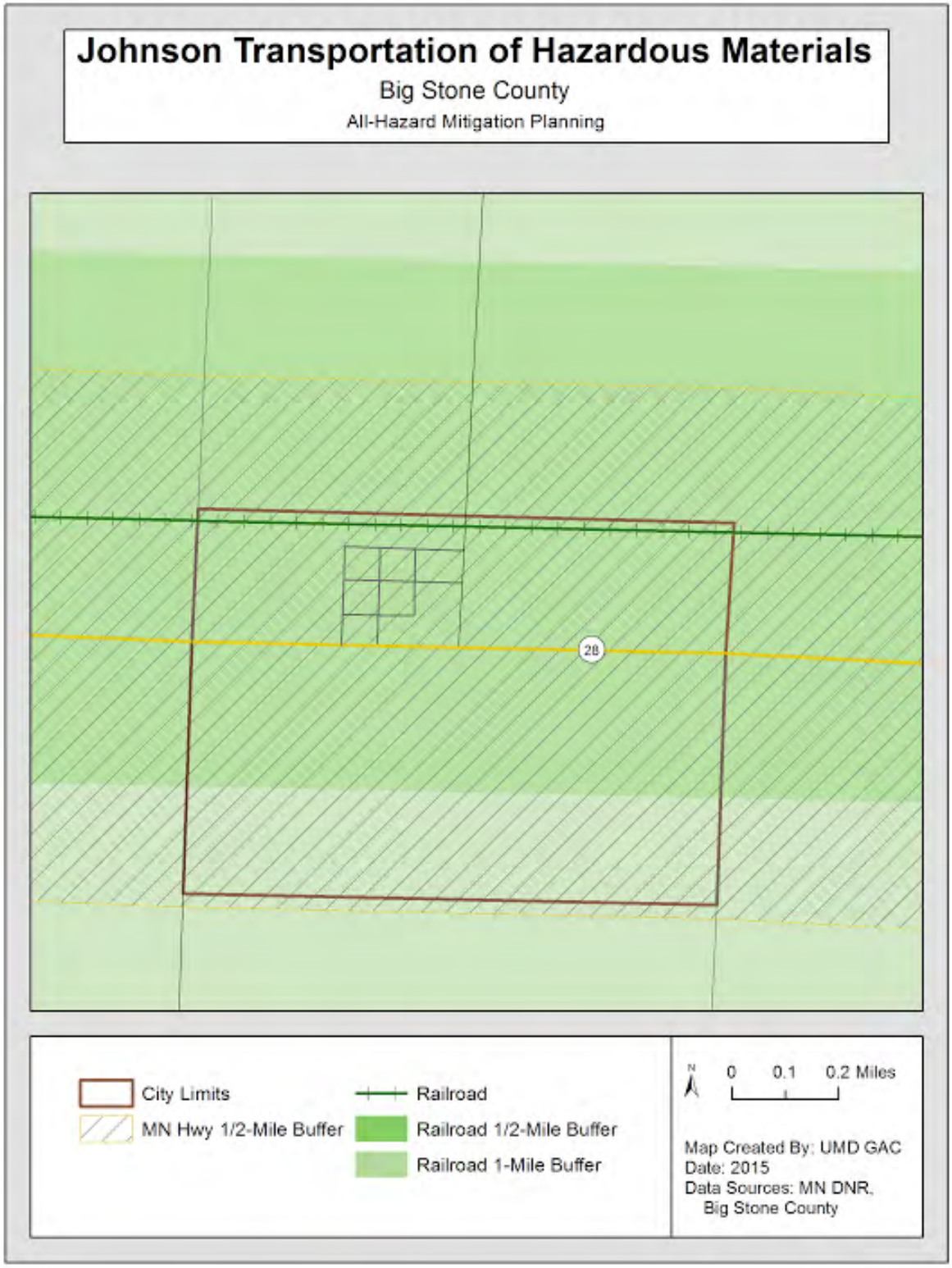


Figure 4.20 Johnson Community Assets/Critical Facilities

Figure 4.21 Johnson Transportation of Hazardous Materials



City of Odessa, Minnesota

Existing Development Trends.
In 2007, Odessa had an estimated population of 97. However, in 2013, the estimated population of Odessa increased to 127 (Minnesota State Demographic Center 2013). The 1960s and 1990s showed the most dramatic declines in population losing 40 and 43 residents, respectively. The city saw steady decline in both the number of households and the average household size, until recently. The number of households in the City of Odessa has remained at 55 since 2000. With a population increase, the number of persons per household has increased from 2.05 in 2000 to 2.31 in 2013. While Odessa has not completed extensive redevelopment projects in the city, the City has rezoned land from agriculture to residential. Additionally, in 2010, Odessa built a new fire hall. The City of Odessa's general land use category breakdown exists as the following shown in Table 4.23 below.

Table 4.23 City of Odessa – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Agricultural	11	7.75%
Residential	87	61.27%
Commercial	20	14.08%
Government	17	11.97%
Religious/Non-profit	6	4.23%
Total	142	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
Odessa's future growth area for development as identified by Odessa staff is located in the southeast corner and is not located in a 100-year floodplain; therefore future development would not increase City vulnerability. The city intends to focus on residential development and maintain its current housing stock. As no future development is expected, there is no increase in vulnerability expected over the next five years. Future vulnerability will be re-evaluated during subsequent plan updates.

Figure 4.22 Odessa Land Use

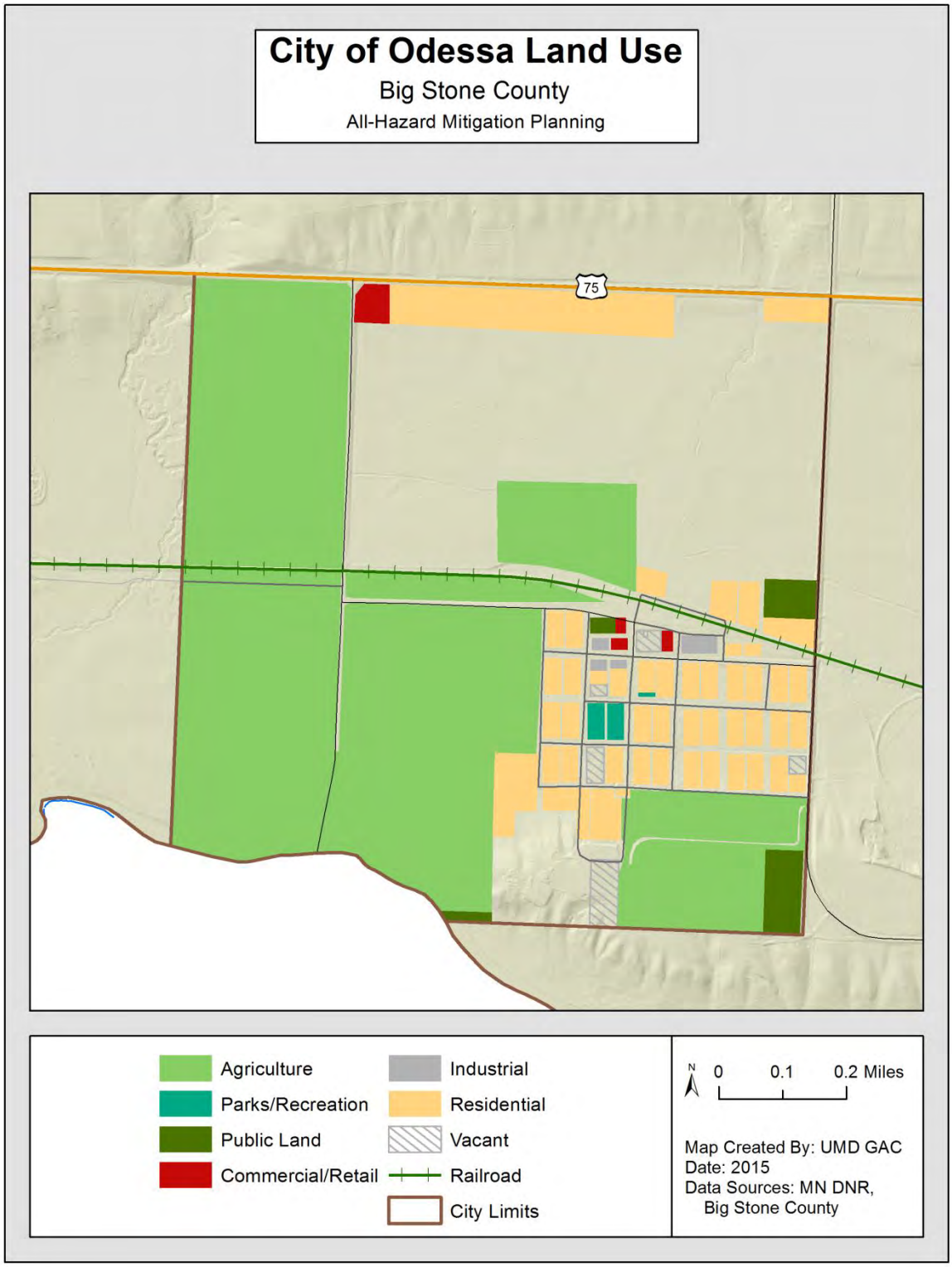


Figure 4.23 Odessa Community Assets/Critical Facilities

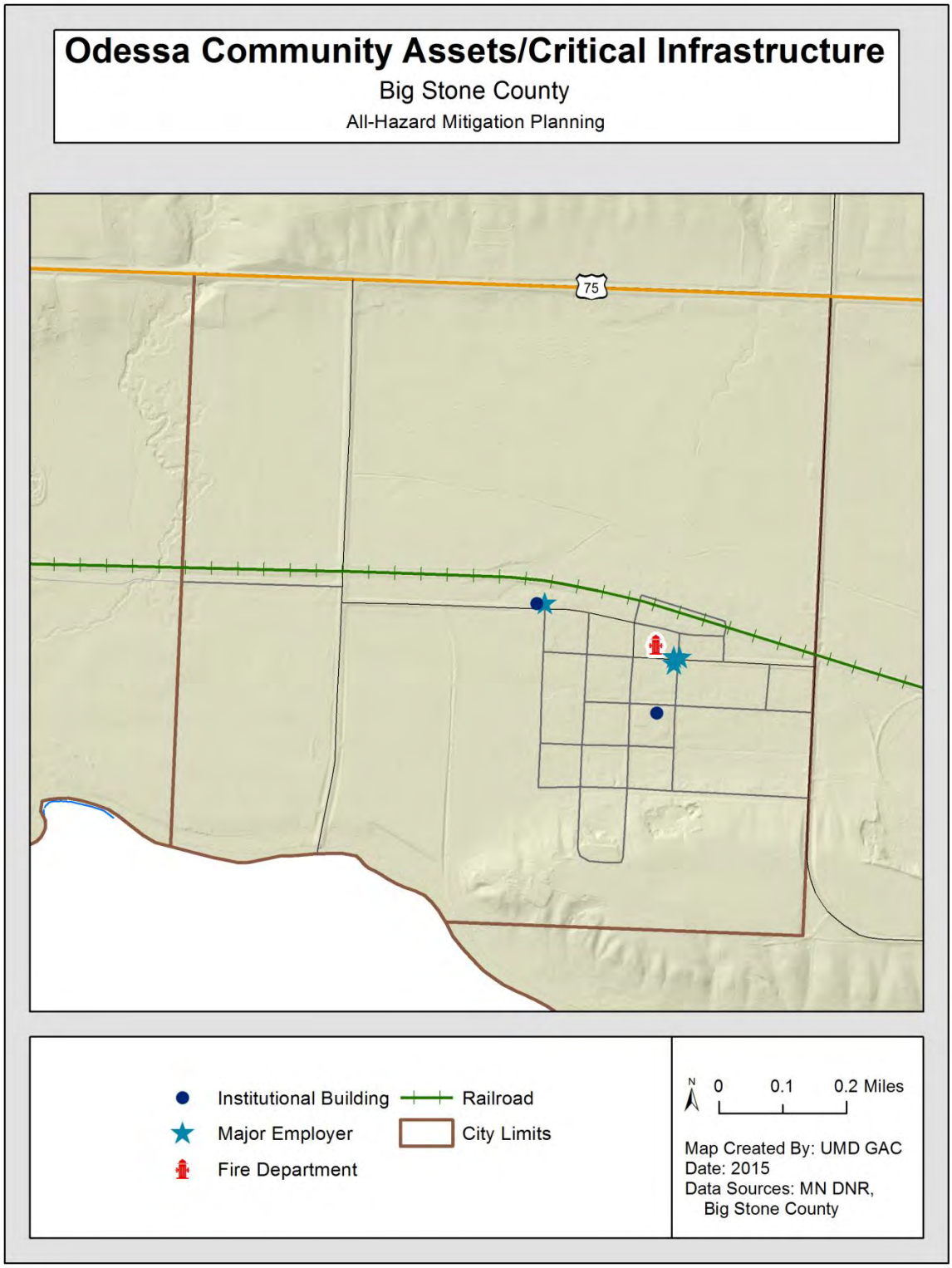
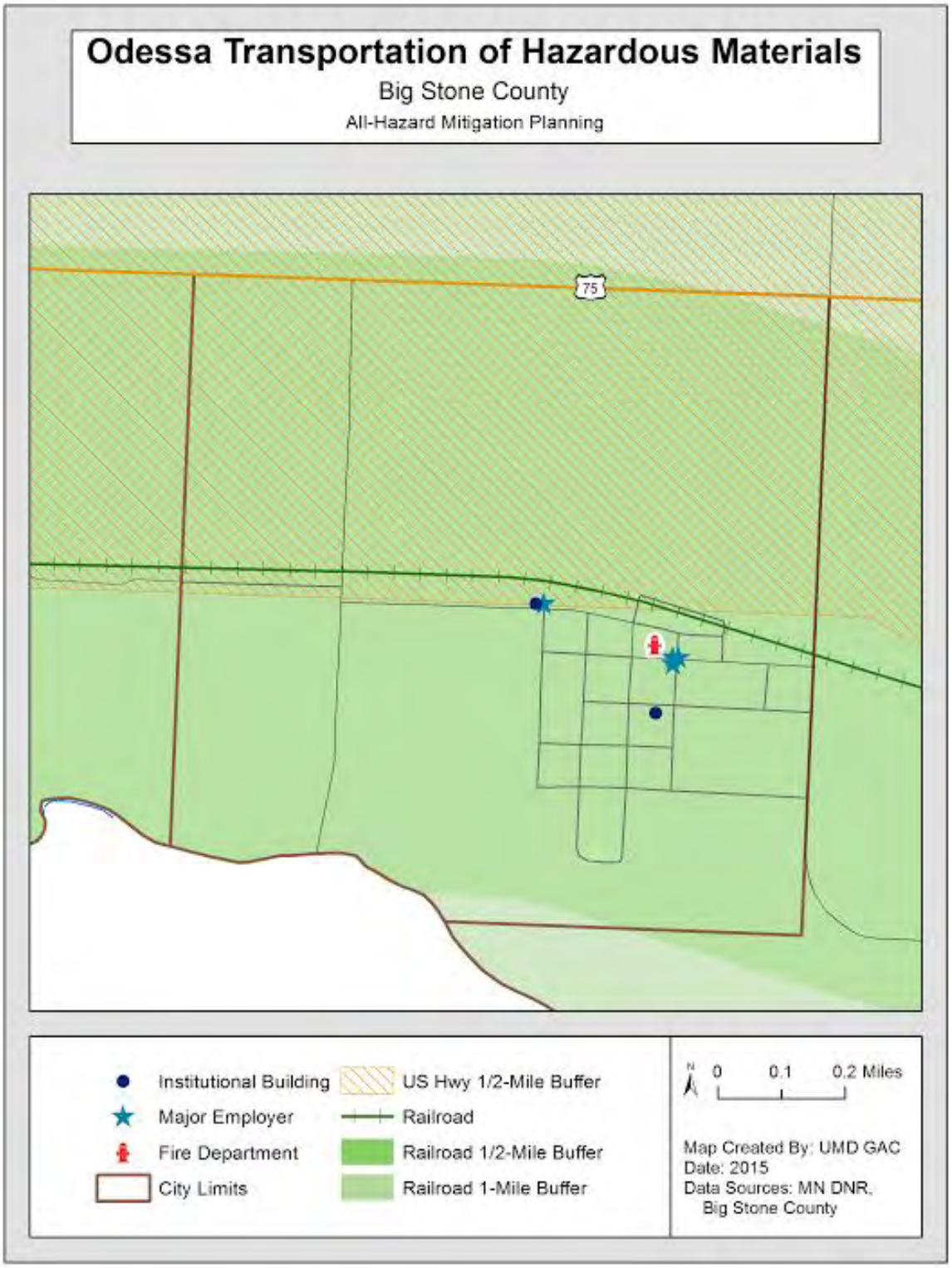


Figure 4.24 Odessa Transportation of Hazardous Materials



City of Ortonville, Minnesota

Existing Development Trends.
Since 1960, Ortonville's population has seen a steady decline. The biggest drop in population was seen between 1980 and 1990 when the city lost 345 residents. Ortonville's population continued has continued to decrease in recent years. According to population estimates by the Minnesota State Demographic Center, Ortonville had 1,871 residents in 2013. The number of households in Ortonville grew until the 1980 Census after which point the number of households began to decline. Between 2000 and 2013, the number of households decreased 923 to 870. The average household size has seen steady decline in the last half century, which is consistent with other cities in rural and western Minnesota. Ortonville is the economic center of Big Stone County and has many wonderful amenities that would allow for promotion and attraction of new business and residents. Methods of such promotion will be of great concern in the future.

The City of Ortonville undertook a large annexation in 2007 (29.45 acres of agricultural land to residential), in addition to numerous city projects in the past five years. In 2005, the Fairway View Senior Community (Assisted Living Facility) was built with 18 independent room spaces, 8 assisted living rooms, and 6 memory-care rooms. The City has spent funds to acquire tax-forfeited land throughout the city including vacant homes, bare lots, and hotels, in order to gain more tax base and increase the market value of structures. Further, Ortonville offers a portfolio to interested persons highlighting different commercial and residential properties throughout the city primed for redevelopment. These are all infill development opportunities. In August of 2008, the second phase of the Ortonville Area Health Services Hospital began construction and the first phase was completed in December of 2009. The final phase is expected to be completed by September 2010. The City of Ortonville's general land use category breakdown exists as the following show in Table 86 below.

Table 4.24 City of Ortonville – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Agricultural	27	1.86%
Residential	1,073	73.75%
Commercial	175	12.03%
Industrial	7	0.48%
Government	149	10.24%
Religious/Non- Profit	30	2.06%
Total	1,455	100.00%

Source: Big Stone County Assessor, 2009

Potential for Future Growth and Development.
The City of Ortonville has designated five main areas for future development, along with their desired future land use types. The first is the "Downtown Business District" focusing on commercial, retail, and residential apartments (mixed-use development projects). The second is North of the Ortonville City limits on the shores of Big Stone Lake, zoned for single-family residential development. The third area focuses on the Golf Course and surrounding area to

develop future residential properties and potentially annex additional land for further development. The fourth area is the land located west of the Ortonville Airport, for a mixed-use development, in addition to increased residential and commercial/retail development along U.S. Highway 75. The fifth and final area is at the intersection of U.S. Highway 75/State Highway 7 and U.S. Highway 12 for commercial/retail use and potentially industrial development. None of these areas are within 100-year floodplains or would increase the vulnerability of the City in terms of future development.

Figure 4.25 Ortonville Land Use

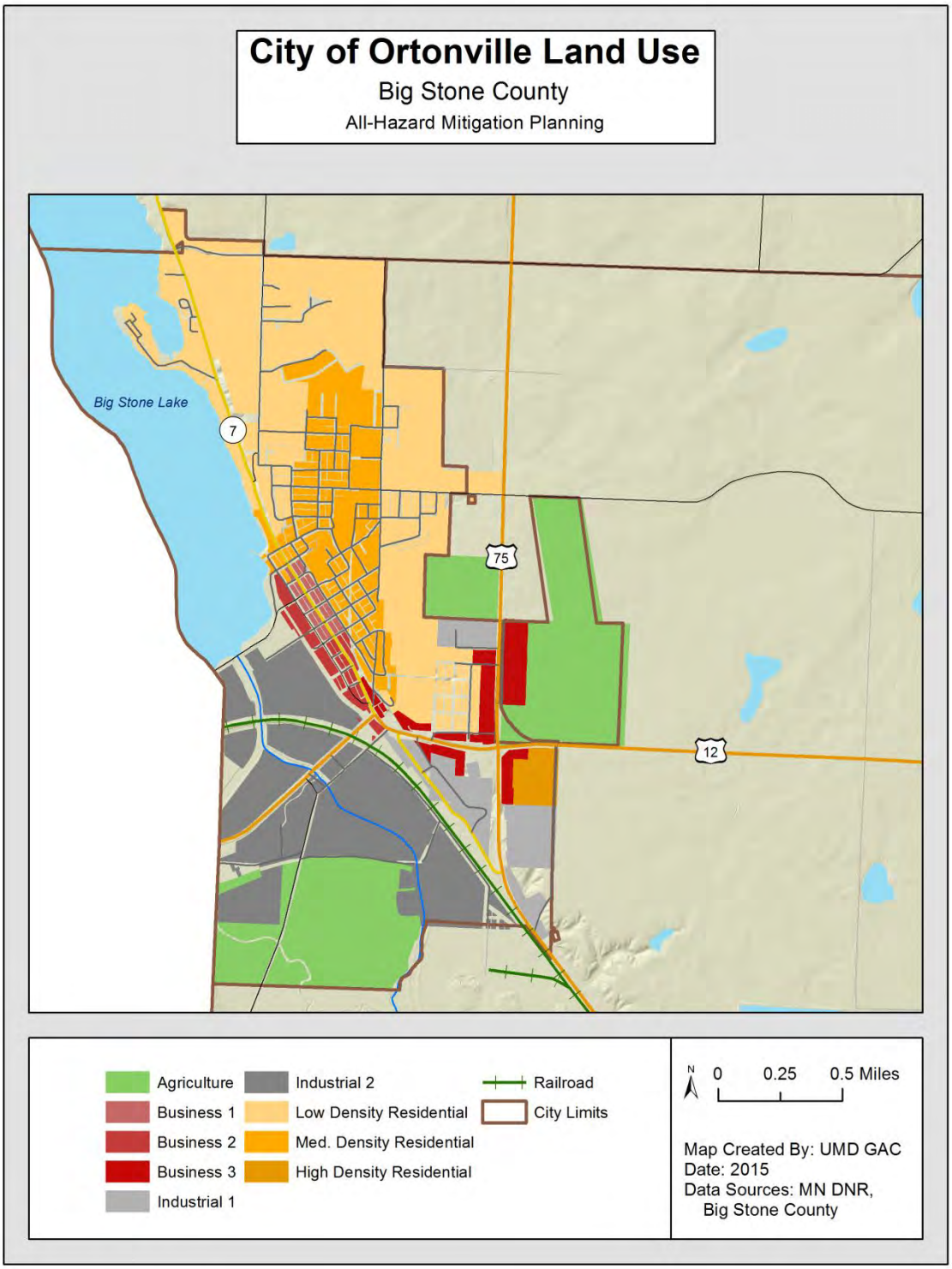


Figure 4.26 Ortonville Community Assets/Critical Facilities

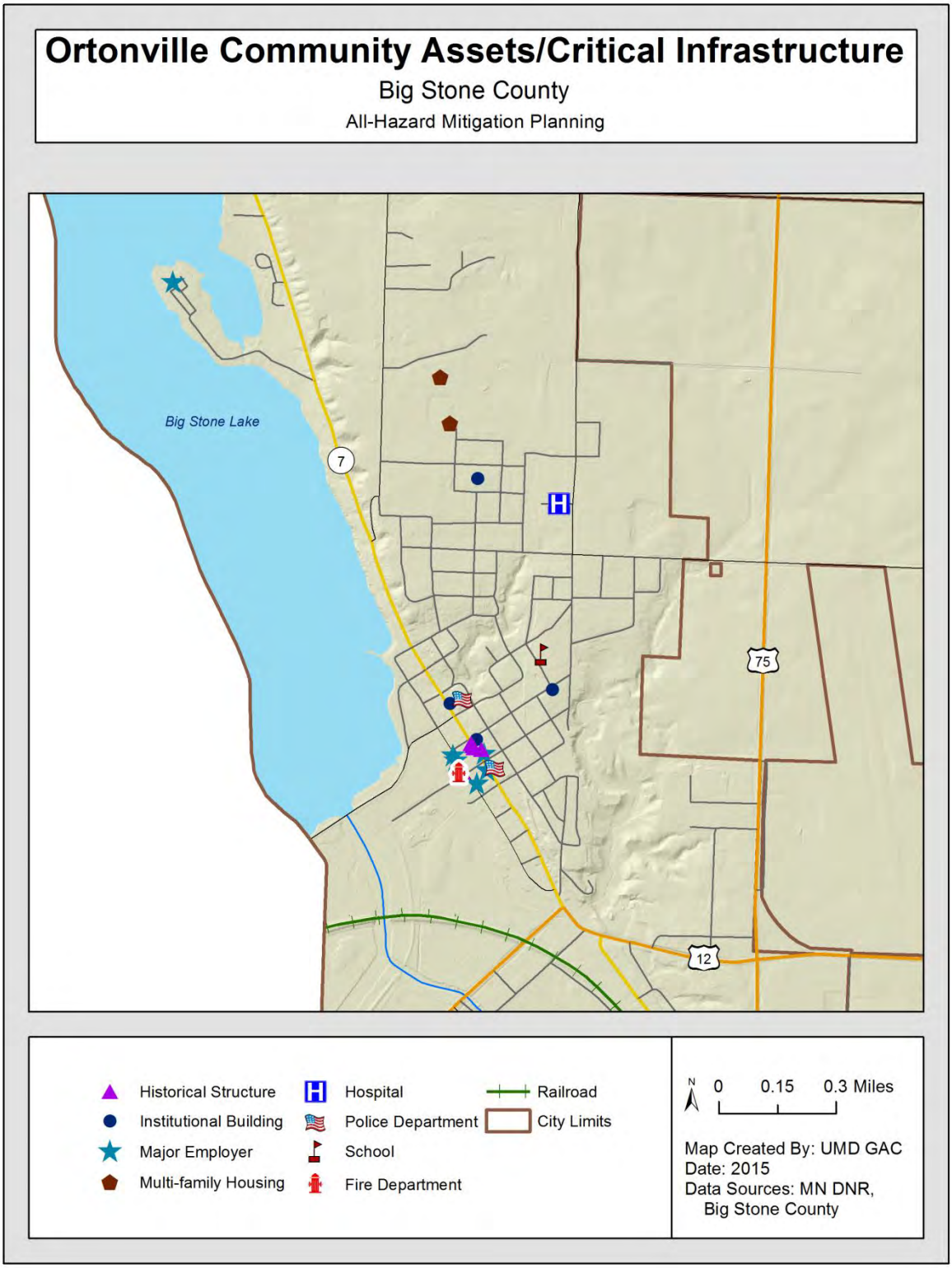
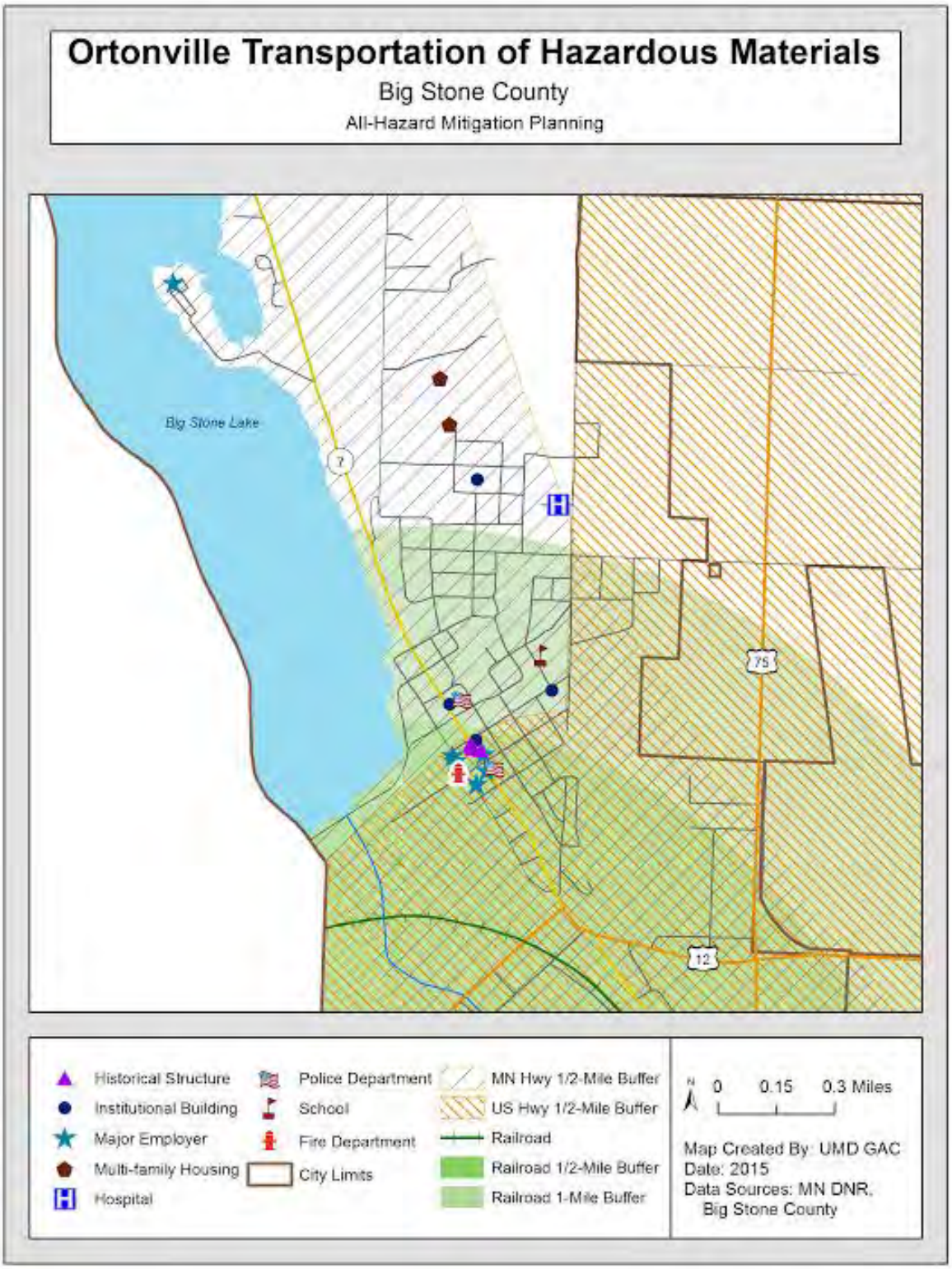


Figure 4.27 Ortonville Transportation of Hazardous Materials



CHAPTER 5: GOALS, OBJECTIVES, AND STRATEGIES FOR NATURAL HAZARDS

OVERVIEW

The following tables outline the goals, objectives, and mitigation strategies for natural hazards important to Big Stone County. The goals are used as a framework for the objectives and mitigation strategies, which in turn, provide specific information on how mitigation decisions should be made. The goals, objectives, and strategies are based on the issues identified by the Local Task Force and the risk assessment in this plan. The chapter is divided into three sections; completed strategies by Big Stone County and cities, current goals, objectives, and strategies for Big Stone County and cities, and the prioritization of strategies.

DEFINITIONS

Goals are general statements. **Objectives** are action statements and start with an action verb. **Strategies** support the action of the objective.

The **Time Frame** was determined by the task force and the County Emergency Manager as an estimated timeline in which to complete the strategy.

The **Time Frame – Recurring** is a strategy type that does not have a specific length of time. Once the strategy has been completed, the responsible entity will re-start the strategy.

Responsible Entity is the entity in charge of initiating and completing the strategy identified. This was determined by the task force and County Emergency Manager as the most likely entity to complete the strategy.

The **Estimated Cost** was an educated guess of the cost of each strategy. Some strategies would not cost extra and were denoted "—". Some costs were not known and denoted as "unknown".

The **Funding Partner** is a potential partner for the county/city to obtain funding from in order to complete a strategy.

GENERAL MITIGATION VISION

"The county will strive to work with surrounding communities and local emergency responders to create and implement a proactive and results-oriented all-hazard mitigation plan that will make the county and region a safer and more sustainable place to live by protecting and enhancing the resources of the county as they relate to hazards that may have an impact in the future."

DEVELOPMENT OF STRATEGIES

To determine strategies for each hazard identified in the risk assessment (Chapter 4) small group problem-solving techniques were used at the third task force meeting on November 13th, 2014. Once the hazards most likely to affect Big Stone County were identified and prioritized, the task force assembled to review these hazards and their rankings and identify strategies to address mitigation for each hazard. Past hazard activities in the county influenced strategy development and strategy ranking (i.e.1997 and 2001 flooding). In many cases, as the hazards were identified for the inventory, strategies were also discussed, providing a good starting point for the conversation.

The following outlines the plan's strategy development process. 1) Working toward group consensus, each hazard was reviewed individually. 2) Participants offered suggestions and input which stimulated a lively discussion as part of the planning process. All suggestions were considered and recorded by the facilitator. 3) A limited amount of time was set on each hazard by the facilitator to move the group forward. 4) Debate followed before the group was asked to decide if it should be part of the plan – group consensus was needed. 5) The group noted they could not be totally inclusive – some strategies may not even be considered and others may not be feasible.

General Criteria

1. History
2. Successful Strategies
3. Need
4. Risks
5. Effectiveness
6. Building on what already exists
7. Legal Authority
8. Environmental Impact

Cost/Benefit Criteria

1. Costs/Efficiencies
2. Economic Impact
3. Budget Requirements
4. Overall Impact
5. Resources Needed (Social & Fiscal)
6. Benefits Provided by Project (Social & Fiscal)

Identifying costs that would be attached to each strategy was the most difficult part of the process. Due to limited time and resources to develop the plan it wasn't feasible to spend a lot of time on estimating the costs. It is critical for the Board to constantly be evaluating the costs as part of implementation and maintenance for the All-Hazard Mitigation Plan. Strategies that dealt with rural areas seemed harder to include in the plan – more costly, harder to regulate, and would need population buy-in. Many strategies are costly, labor intensive, time consuming and it is difficult to identify the lead for the strategy. It was determined that the Emergency Manager will perform a cost-benefit review for all potential future project applications. Participants in the planning process agreed that to implement an ordinance or regulation was not the difficult part of certain strategies – would it be possible and feasible to follow-through? Participants started with strategies that were manageable to see notable progress – "baby steps". It was reasonable to include strategies that have been started, but not yet completed.

In addition to creating new mitigation strategies for Big Stone County, the Local Task Force analyzed strategies found in the 2010 All-Hazard Mitigation Plan. The process for strategy analysis included two steps: Step 1) Discuss a strategy and determine its "status", Step 2) Determine why the strategy has that status. Four different "Statuses" were available to assign to a strategy: 1) Completed, 2) Still Feasible 3) Recurring - does not have a specific time length and once the strategy is completed the responsible entity will restart the strategy, and 4) No longer relevant. Once a strategy was assigned a status by the Local Task Force through group consensus, the Local Task Force had to determine **why** it received that status designation. For example, a Flood Strategy that received "not completed – strategy is still feasible" may have not been completed due to fund shortage; however, a jurisdiction may see that flood project as still important to complete in the future.

Following the third Local Task Force meeting, the task force participated in an online survey to prioritize mitigation strategies. The results of this survey (located in Appendix 11) were compared with the prioritized hazard list and the top strategies were pulled out for the top three natural hazards (Violent Storms and Extreme Temperatures, Flooding, and Wildfire). The prioritized strategy list was reviewed, discussed, and verified at the fourth Task Force meeting on March 26th, 2015.

HMPG Funded Strategies: Big Stone County and Cities

Table 5.1 YMC & Cities Hazard Mitigation Grant Program Funded Strategies (FEMA-Related)

SUBGRANTEE	PROJECT	FEDERAL SHARE	DR-PROJECT NUMBER	CITY/LOCATION	DATE STARTED
Big Stone County	Overhead Line Conversion	$2,802,195	DR-1078	Big Stone, Stevens, & Swift Counties	August 1996
City of Clinton	Living Snow Fence	$14,140	DR-1175.40	Clinton, MN	September 2009

Source: MN HSEM Mitigation Database: Appendix L, 2015

COMPLETED STRATEGIES

Table 5.2 BSC & Cities Completed Strategies in Past 10 Years for Natural Hazards

Hazard	Strategies	Responsible Entity
Violent Storms & Extreme Temperatures	Worked to find financing for a new ambulance in Ortonville. Purchased a new ambulance in 2006 and a used ambulance in 2009.	Ortonville
Violent Storms & Extreme Temperatures	Purchased a portable generator for electricity losses for Community Building.	Graceville
Flood	Adopted Floodplain Ordinances.	Graceville, Odessa, Ortonville
Flood	Purchased 4 portable water pumps to have on-hand in event of flood.	Graceville
Flood	Purchased and store 1,000 sandbags in event of flood.	Graceville
Flood	Completed an Engineering Study that looked at rip-rapping in Central Park and Erosion Control.	Ortonville
Flood	Determined if existing Regulatory Floodplain Elevation (971) is adequate and adjust accordingly. New dFIRM maps for Big Stone County dated April 2006.	Big Stone County Zoning
Flood	Built and a purchased a lift station and necessary infrastructure for sewer system.	Odessa
Flood	Worked to raise the five township roads under water.	Roads raised and/or rip-rapped in Almond Township (1), Toqua Township (2), Otrey Township (1), and Artichoke Township (1).
Flood	Monitored and cleared waterways, culverts and ditches. Ortonville Township completed maintenance work on a malfunctioning tile.	Ortonville Township
Wildfire	Created a contract between DNR and local fire departments to organize repose to large wildfires. This contract should address the entities responsible for wildfires on state and federal-owned land.	Correll, Odessa
Wildfire	Encouraged DNR to give training locally. Look for funds for training if necessary.	Beardsley, Correll, Graceville, Odessa, Ortonville
Wildfire	Installed a dry hydrant at Otrey Lake. Big Stone County currently has 4 active dry hydrants.	Big Stone County

Fire	Purchased pagers and other needed equipment for local fire departments.	Beardsley, Correll, Graceville, Odessa, Ortonville
Water Supply Contamination	Implemented/Adopted Wellhead Protection Plans.	Odessa, Ortonville
Water Supply Contamination	Completed a Water Supply Plan in conjunction with Mn DNR.	Ortonville
Civil Disturbance/Terrorism	Installed security alarms at Water Treatment Plants/Well houses.	Johnson, Odessa, Ortonville

Violent Storms and Extreme Temperatures

Goal 1: Provide accessible safe rooms for shelter from violent storms.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Encourage all new homes without basements to have a safe room where residents may go during violent storms.	A. Educate homeowners on safe shelters with newspaper or radio announcements or when people apply for building permits.	Recurring	All Cities and County	$500	--
2. Require all new manufactured home parks to provide safe room for park residents either through a structure on site or a plan of evacuation to safe shelter off site.	A. Work with the manufactured park in Ortonville to develop a Safe Room Plan. Require that the safe room plan go through the local governing unit each year for review. Through this process, determine a safe room for mobile homes.	1 year	Ortonville	N/A	County
3. Ensure that all hospital, school and nursing home facilities have a severe storm plan in place.	A. The County Emergency Management Director should continue to do periodic visits and review plans annually.	Recurring	County EM	$500 per city	FEMA
4. Ensure that public and open areas have a safe room identified.	A. Build safe rooms at city, county, and state campgrounds and parks, and other locations of unprotected populations (i.e. schools, manufactured home parks, all recreational parks, religious camps, apartment buildings, nursing homes, medical facilities, etc.) to protect users from violent storms.	Recurring	All Cities and County	$75,000-$150,000/ shelter	FEMA
	B. Discuss with City Council to determine whether or not to build a safe room. ***New Strategy**	1-2 years	Clinton	Staff Time	--
	C. Build safe rooms as needed.	2-15 years	All Cities	$75,000-$150,000/ shelter	FEMA

Violent Storms and Extreme Temperatures

Goal 2: Improve and maintain severe storm warning system for all county residents.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Assess adequacy of existing emergency warning sirens.	A. The County Emergency Management Director should review countywide siren needs and look for funding to provide new/improved warning systems.	Recurring	County EM	--	FEMA
2. Ensure that all sectors of the county have immediate access to severe weather warnings and weather radios.	A. Educate the public on the use of weather radios.	Recurring	County EM	$500	FEMA
3. Assess adequacy of existing emergency equipment.	A. The County Emergency Management Director should review emergency equipment needs annually.	Recurring	County EM	--	--
	B. Research and obtain funding for implementing cell phone notifications for severe weather events and other hazardous events.	2-5 years	County Emergency Manager, County	Unknown	--
4. Ensure that roads are kept clear during heavy snow events. ***New Objective**	A. Build a Living Snow Fence surrounding town. ***New Strategy**	10 years	County Engineer, County	High	FEMA

Violent Storms and Extreme Temperatures

Goal 3: Protect people and county infrastructure from the impacts of severe weather.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Keep electric lines away from trees.	A. Work with power companies.	Recurring	All Cities and County	--	FEMA
	B. Underground burial of power lines.	Recurring	County, All Cities, Minnesota Valley REC	--	
2. Encourage people to limit travel on state and major county highways when weather conditions warrant.	A. Continue to enforce the current plans and procedures in place.	Recurring	County Law Enforcement	--	--

Goal 4: Provide emergency response to protect people in the event of a severe weather disaster.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Ensure that County and City Emergency Operations Plans are kept up-to-date.	A. Each community should continue to meet annually with the County Emergency Manager and emergency personnel (Fire, Police, Ambulance – when applicable) to assess the County Emergency Operations Plan.	Recurring	County Emergency Manager, All Cities	--	--

Flood

Goal 1: Eliminate nonconforming structures in the identified 100-year floodplain.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Enforce the current zoning ordinances that provide for the amortization and elimination of existing nonconforming private structures and uses in identified 100-year floodplains.	A. Enforce the County and City Floodplain Ordinance to keep new structures out of floodplains. Review building permits to determine if they want to locate in the floodplain.	Recurring	County Zoning, Graceville, Ortonville, and Odessa	$1,000/year	--
2. Protect routinely flooded structures and areas throughout Big Stone County. ***New Objective**	A. Purchase and place two 24-inch culverts under Nursing Home/Assisted Living Center "Link" and Driveway to prevent flooding. ***New Strategy**	1-5 years	Graceville	$15,000	FEMA
	B. Flood proof 7 homes. ***New Strategy**	2-5 years	Clinton	Moderate	FEMA
	C. Install twelve new culverts, complete ditching, land excavation, and cleaning of ditches. ***New Strategy**	5 years	Johnson	High	FEMA

Flood

Goal 2: Minimize the damage from flooding along Big Stone Lake and in Ortonville.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Determine if existing Regulatory Floodplain Elevation (971) is adequate and adjust accordingly.	A. Work with the DNR to evaluate flood level.	Recurring	County Zoning	$10,000	--
2. Whetstone Project….			Ortonville and County		

Goal 3: Minimize the damage from flooding on township roads.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Assess damage from flood events.	A. Provide riprap to stabilize roads to prevent repeated flood damage.	2-5 years	County Engineer and Townships	$500,000	DNR/FEMA
2. Raise township roads left under water after the 2009/2010 floods. ***New Objective**	A. Identify roads that continually flood during spring and work to find funding resources to raise or stabilize roads as needed. ***New Strategy**	2-5 years	County Engineer and Townships	$500,000 - $1,000,000	DNR/FEMA

3. Keep township roads and fields from flooding.	A. Monitor and clear waterways, culverts and ditches.	Recurring	Townships and County Engineer	Low	DNR/FEMA

Goal 4: Maintain NFIP Compliance for participating jurisdictions.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Develop and implement strategies to demonstrate "Continued Compliance".	A. Work with MN DNR to review and update the Floodplain Management Ordinance as required.	Recurring	Graceville, Odessa, Ortonville, County	--	--
	B. Work with MN DNR on development applications in identified Flood Prone Areas.	Recurring	Clinton, Graceville, Odessa, Ortonville, County	--	--
	C. Encourage property owners in "Flood Prone" areas to purchase flood insurance.	Recurring	Clinton, Graceville, Odessa, Ortonville, County	--	--
	D. Discourage zoning variances in Flood Hazard Areas.	Recurring	Graceville, Odessa, Ortonville, County	--	--
***New Goal, Objective, and Strategies**	E. Discourage development in Flood Prone Areas.	Recurring	Clinton	--	--

Erosion

Goal 1: Minimize property damage and reduce economic impacts of erosion.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
Limit the potential loss of property and economic impact from river and ravine erosion, landslides, and slope failure. ***New Goal, Objectives, and Strategies**	A. Support demolition and/or relocation of dwellings and infrastructure to prevent loss of property due to erosion, landslides, or slope failure	Recurring	County Emergency Manager	Unknown	FEMA, MN DNR
Prevent possibility of damage from river and ravine erosion, landslides, and slope failure.	A. Review, update, and enforce zoning ordinances that prohibit building in areas that are susceptible to water erosion, landslides, and slope failure.	1-2 years	County, All Cities	--	--
Educate the public on possible effects of erosion, landslides, and slope failure.	A. Increase public awareness and knowledge on erosion landslides, and slope failure, targeting individuals and businesses located in high risk areas.	Recurring	County Emergency Manager, County Zoning	--	--

Drought

Goal 1: Monitor the county's ground water supplies and demands.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Establish a comprehensive and ongoing water monitoring program.	A. Continue to monitor aquifer levels and water quality. Work with DNR to ensure that permitted water use is not depleting water resources in Big Stone Lake and other lakes.	Recurring (annually)	SWCD	--	MnDNR
2. Support conservation.	A. Continue to support conservation programs in the county that conserve water and decrease the moisture in the soil.	Recurring	County SWCD, RCS	--	--
	B. Establish an ordinance for water use restrictions in times of drought. ***New Strategy**	1-3 years	All Cities, County Zoning	--	--

Wildfire

Goal 1: Prevent Wildfires					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Minimize the amount of fuel in areas prone to fire damage.	A. Encourage carefully controlled burns. FSA allows controlled burns on CREP and CRP. The FSA offers cost share for controlled burns on CREP and CRP land. Encourage landowner responsibility.	Recurring	FSA, SWCD, DNR, USFWS	--	--
2. Minimize wildfire risks within Big Stone State Park and the National Wildlife Refuge.	A. Work with the U.S. Fish and Wildlife Service to minimize wildfire risks.	Recurring	USFWS, DNR	--	--
3. Provide education to the public about wildfire prevention.	A. Work with the FSA office to provide education to landowners. Some landowners may not realize that burning is allowed and beneficial.	Recurring	FSA, Local Fire Departments, County Law Enforcement		--

Wildfire

Goal 2: Minimize structure loss from wildfire and protect the safety of residents and firefighters.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Provide education to the public about wildfire prevention.	A. Work with neighborhood associations and provide materials to the public on property maintenance.	Recurring	County, All City Fire Departments	$5,000	--
2. Minimize impact of wildfire in residential areas by creating firebreaks between structures and areas with wildfire fuel.	A. Educate the public about firebreaks. FSA allows firebreaks (tilled or mowed strips) on CREP and CRP land – acreage used for firebreaks can be included in CRP. Provide resources to landowners who may not have equipment to create firebreaks.	Recurring	FSA, Local Fire Departments, County Board	Low	--
3. Promote training programs between the DNR and local firefighters.	A. Encourage DNR to give training locally. Look for funds for training if necessary.	Recurring	Local Fire Departments & County EM	--	--
4. Increase access to equipment suitable to fighting wildfires.	A. Do an inventory of equipment available and keep up-to-date list of equipment needed for local fire departments. Look for grants for additional equipment if necessary.	Recurring	Local Fire Departments & DNR	--	--
5. Install dry hydrants in suitable areas.	A. Identify locations for dry hydrants and install as needed and as funding is available.	2-5 years	Local Fire Departments & DNR	--	MnDNR/ FEMA

Dam Failure

Goal 1: Prevent structure from cracking or breaking.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Ensure dam construction is maintained and functioning properly.	A. Coordinate dam inspections with the DNR and UMRWD.	Recurring	County, DNR, UMRWD	--	MnDNR

Goal 2: Provide safety to residents					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Warn residents of danger if dam failure occurs.	A. Monitor water levels of the reservoir and gauge water capacity. Ensure that emergency plans for dam failures are annually updated. Encourage UMRWD to work with local agencies to keep plans current.	Recurring	UMRWD	--	--

NATIONAL FLOOD INSURANCE PROGRAM (NFIP).

The National Flood Insurance Program (NFIP) is a program regulated by the Federal Emergency Management Agency (FEMA). The NFIP provides maps for local floodplain management in an effort to reduce federal expenditures due to flood events throughout the nation. The NFIP is also the primary source for flood insurance for flood-properties and those located in 100 and 500-year floodplains. The NFIP has three basic requirements: floodplain identification and mapping, floodplain management, and the purchasing of flood insurance. Floodplains are found in four cities within Big Stone County. Currently, all four jurisdictions and the County actively participate in the NFIP. Graceville, Odessa, Ortonville, and Big Stone County all have Floodplain Management Ordinances in effect. The City of Clinton also participates in the program, but they have No Special Flood Hazard Areas identified in the community; however they are considering passing a Floodplain Ordinance in 2010. Four communities, Barry, Beardsley, Correll, and Johnson do not participate in the program as they do not have Special Flood Hazard Areas. The NFIP participation from the initial Big Stone County All-Hazard Mitigation Plan has not changed in the past five years. Table 5.4 identifies NFIP participation, dates of Initial Flood Insurance Rate Maps (FIRM), current effectiveness of map dates, and Emergency Dates if applicable.

Table 5.4 BSC & Cities NFIP Participation

Jurisdiction	NFIP Status	Initial FIRM Identified	Current Effective Map Date	Emergency Date
Barry	**Not Participating**	no data	No Special Flood Hazard Areas	no data
Beardsley	**Not Participating**	no data	No Special Flood Hazard Areas	no data
Clinton	**Participating**	**4/17/2006**	No Special Flood Hazard Areas	**4/17/2006**
Correll	**Not Participating**	no data	No Special Flood Hazard Areas	no data
Graceville	**Participating**	**4/17/2006**	**4/17/2006**	**4/14/2006**
Johnson	**Not Participating**	no data	No Special Flood Hazard Areas	no data
Odessa	**Participating**	**4/17/2006**	**4/17/2006**	**1/3/1985**
Ortonville	**Participating**	**2/19/1986**	**4/17/2006**	**2/19/1986**
Big Stone County	**Participating**	**6/17/1986**	**4/17/2006**	**6/17/1986**

Source: MN DNR 2015

Table 5.5 provides FEMA's NFIP Insurance Report for Odessa, Ortonville, and Big Stone County. Information attainted in this report identifies total insurance premium amounts, number of existing policies, total insurance coverage, and total claims and amounts paid to each jurisdiction since 1978.

Table 5.5 FEMA NFIP Insurance Report

Jurisdiction	Total Premium	Number of Policies	Total Coverage	Total Claims Since 1978	Total Paid Since 1978
Graceville	$4,350	4	$360,800	NA	NA
Odessa	$1,362	4	$633,000	3	$2,657
Ortonville	$20,989	24	$3,062,800	40	$384,338
Big Stone County	$18,465	30	$4,800,900	44	$498,981
TOTAL	$28,757	50	$7,637,900	87	$537,847

Source: FEMA Policy & Claim Statistics for Flood Insurance, 2015

NFIP Continued Compliance

FEMA mandates that all communities participating in the NFIP must identify continued compliance with the program. Following are descriptions of Clinton, Graceville, Odessa, Ortonville, and Big Stone County processes for continued compliance.

Clinton

Clinton does not have any designated Special Flood Hazard Areas. However, there is one main area considered "flood-prone" as determined by city staff. This area contains seven residential properties that are likely to need flood proofing measures or sandbagging efforts to prevent flooding from occurring. This is in addition to the nursing home, which is at constant risk of flooding. Clinton is committed to working with the MN DNR and FEMA to analyze the "flood-prone" area and determine if they should be considered Flood Hazard Areas. Below are three strategies that Clinton intends to complete as methods to continue compliance with National Flood Insurance Program.

Strategies to Continue NFIP Compliance:

1. Work with the MN DNR on development applications in identified Flood Prone Areas.
2. Discourage development in "flood-prone" areas.
3. Encourage property owners to purchase flood insurance.

Graceville

The City of Graceville utilizes digital FIRM maps dated April 17, 2006, to illustrate the location of 100 and 500-year floodplain boundaries within municipal limits. In order to prevent development in the 100-year floodplain, Graceville passed a Floodplain Management Ordinance in March of 2006. The process that Graceville uses to monitor potential development in the floodplain is through tracking building permits and ensuring that all residents, whether within the 100-year

floodplain or not, have their basement or bottom floor above the 1,099 foot elevation level. The high water mark for Graceville was 1,097 feet in 1997 and any person that proposes a building must know the elevation of the bottom floor or take steps to increase the elevation level by adding fill. Further, a person must obtain a certificate of elevation to prove the new elevation of the structure, produced by a Minnesota licensed surveyor. As of 2010, no building permits have been requested for properties within the 100-year floodplain.

The City of Graceville intends to complete the following as methods to continue compliance with National Flood Insurance Program.

Strategies to Continue NFIP Compliance:

1. Work with the MN DNR to review and update the Floodplain Management Ordinance as required.
2. Work with the MN DNR on all development applications in identified Flood Hazard Areas.
3. Discourage zoning variances in Flood Hazard Areas.
4. Encourage all property owners in Flood Hazard Areas to purchase flood insurance.

Odessa

The City of Odessa also utilizes digital FIRM maps dated April 17, 2006, to illustrate the location of 100 and 500-year floodplain boundaries within municipal limits. In order to prevent development in the 100-year floodplain, Odessa passed a Floodplain Management Ordinance in March of 2006. The process that Odessa uses to monitor potential development in the floodplain is through tracking building permits. If a permit application is received by an applicant, the applicant must provide information for the Zoning Administrator to determine whether they are within the General Floodplain District. This information includes a valley cross-section showing the channel of the stream, elevation of land areas, and cross-sectional areas to be occupied by the proposed development, a surface view plan showing elevations of the ground, structure, fill, and size/location and spatial arrangement of all proposed and existing structures on site. Further, the applicant must provide photographs of existing land uses, vegetation upstream and downstream, soil types, and a profile showing the slope of the bottom of the channel for at least 500 feet in either direction of the proposed development. The applicant must also submit this information to a designated engineer or expert and have them provide a technical evaluation. This information would be presented to the City Council who could accept the evaluation, submit the documents to FEMA or the MnDNR for review and comment. Below are four strategies that the City of Odessa intends to complete as methods to continue compliance with National Flood Insurance Program.

Strategies to Continue NFIP Compliance:

1. Work with the MN DNR to review and update the Floodplain Management Ordinance as required.
2. Work with the MN DNR on all development applications in identified Flood Hazard Areas.
3. Discourage zoning variances in Flood Hazard Areas.

4. Encourage all property owners in Flood Hazard Areas to purchase flood insurance.

Ortonville

The City of Ortonville utilizes digital FIRM maps dated April 17, 2006, to illustrate the location of 100 and 500-year floodplain boundaries within municipal limits. In order to prevent development in the 100-year floodplain, Ortonville passed a Floodplain Management Ordinance in September of 1989. The process that Ortonville uses to monitor potential development in the floodplain is also through tracking building permits. An applicant must fill out a building applicant and the building official/zoning official will review the application to determine whether the property in question is located within a floodplain. Pending a building permit review and investigation the building official/zoning official will make a recommendation to the City Council. Below are four strategies that the City of Ortonville intends to complete as methods to continue compliance with National Flood Insurance Program.

Strategies to Continue NFIP Compliance:

1. Work with the MN DNR to review and update the Floodplain Management Ordinance as required.
2. Work with the MN DNR on all development applications in identified Flood Hazard Areas.
3. Discourage zoning variances in Flood Hazard Areas.
4. Encourage all property owners in Flood Hazard Areas to purchase flood insurance.

Big Stone County

Big Stone County utilizes digital FIRM maps dated April 17, 2006 to illustrate the location of 100 and 500-year floodplain boundaries within the unincorporated areas of the county. To prevent future development in the 100-year floodplain, Big Stone County passed a Floodplain Management Ordinance on March 7, 2006 that is actively updated as the MN DNR instructs. The permitting process for properties in the floodplain is very dependent on elevations in Big Stone County. The building permit application has a section devoted to the floodplain and a person must fill out that section that specifies elevation levels of the property. If a person does not know whether a property is in the floodplain, the Zoning Administrator will make a determination and have the person fill out the floodplain section of the permit. The Zoning Administrator reviews the entire building application and allows development if the applicant uses specific filling technique and fill to raise the elevation of the property to meet the Floodplain Ordinance guidelines. Once the project is complete, Big Stone County requires a Certificate of Elevation to determine the new elevation, which must be completed by a Minnesota licensed surveyor on FEMA floodplain forms. Once the Certificate of Elevation is received and approved, Big Stone County completes a Certificate of Occupancy and presents it to the applicant. In addition to a Floodplain Management Ordinance, Big Stone County prepared the Big Stone County Plan that identifies flood-related strategies such as creating an incentive to establish buffers in priority area. Below are four strategies that Big Stone County has committed to in order to continue with NFIP compliance.

Strategies to Continue NFIP Compliance:

1. Work with the MN DNR to review and update the Floodplain Management Ordinance as required.
2. Work with the MN DNR on all development applications in identified Flood Hazard Areas.
3. Discourage zoning variances in Flood Hazard Areas.
4. Encourage all property owners in Flood Hazard Areas to purchase flood insurance.

PRIORITIZING STRATEGIES

Members of the Big Stone County Hazard Mitigation Task Force completed an online/print survey in order to indicate which strategies they felt were the most important in each hazard category. Using these survey results, the Emergency Manager and RDC staff created a preliminary "Prioritized Hazards List" for natural hazards. At the fourth Task Force Meeting in Clinton on May 21st, 2015, the Local Task Force solidified their priorities by discussing the strategies that were included on the list, and those that were not. Strategies that were a high priority for the Local Task Force contained mitigation measures for violent storms and extreme temperatures, flooding, and wildfire. Based on the "Hazard Priority Levels" in chapter 4, violent storms and extreme temperatures (i.e. summer weather, winter weather, and tornados) and flooding were determined to be moderate hazards in Big Stone County. Wildfire was determined to be a low risk within the county. Any steps taken to minimize the impacts of these types of disasters could prevent a sizeable amount of damage and save lives.

The Local Task Force and the Big Stone County Emergency Manager used the following criteria to prioritize strategies according to need and feasibility. Although some hazards may be a high risk for the county, it did not guarantee a strategy addressing said hazard would also rank high or take priority.

- Current strategies – Could a current strategy be supplemented or enhanced?
- Costs – What is affordable at this time? Are there current funds addressing the hazard or strategy? Does it make sense to delay or does it only postpone higher costs and create other costs? Will it ever be affordable?
- Available resources – At this time, what funds are available? Will there be additional funds in the future? Are there other projects that take a higher priority?
- Length of project – Some projects could be addressed quickly and require minimal investment in time even though it may be fiscally costly.
- Compatibility with other plans – Is the project a high priority in other plans? Could the project be addressed collaboratively for efficiencies in resources? Would there be unnecessary duplication?
- Available information – Can a good decision be made with the current information? Is more research needed or does it make sense to wait for a current study or development for more information before making a decision?
- Impact – Some hazards can be impacted more by mitigation than others (i.e. using strategies to reduce flooding rather than strategies to reduce tornadoes).

Table 5.6 BSC Prioritized Strategies (Natural Hazards)

Ranked	Hazard	Strategy	Affected Participating Jurisdiction

CHAPTER 6: GOALS, OBJECTIVES, AND STRATEGIES FOR MANMADE/TECHNOLOGICAL HAZARDS

OVERVIEW

The following table outlines the goals, objectives and mitigation strategies for man-made technological hazards important to Big Stone County. The goals are used as a framework for the objectives and mitigation strategies, which in turn, provide specific information on how mitigation decisions should be made. The goals, objectives, and strategies are based on the issues identified by the task force and the risk assessment in this plan.

DEFINITIONS

Goals are general statements. **Objectives** are action statements and start with an action verb. **Strategies** support the action of the objective.

The **Time Frame** was determined by the task force and the County Emergency Manager as an estimated timeline in which to complete the strategy.

The **Time Frame – Recurring** is a strategy type that does not have a specific length of time. Once the strategy has been completed, the responsible entity will re-start the strategy.

Responsible Entity is the entity in charge of initiating and completing the strategy identified. This was determined by the task force and County Emergency Manager as the most likely entity to complete the strategy.

The **Estimated Cost** was an educated guess of the cost of each strategy. Some strategies would not cost extra and were denoted "--". Some costs were not known and denoted as "unknown".

The **Funding Partner** is a potential partner for the county/city to obtain funding from in order to complete a strategy.

GENERAL MITIGATION VISION

"The county will strive to work with surrounding communities and local emergency responders to create and implement a proactive and results-oriented all-hazard mitigation plan that will make the county and region a safer and more sustainable place to live by protecting and enhancing the resources of the county as they relate to hazards that may have an impact in the future."

DEVELOPMENT OF STRATEGIES

To determine strategies for each hazard identified in the risk assessment (Chapter 4) small group problem-solving techniques were used. Once the hazards most likely to affect Big Stone County were identified and prioritized, the task force assembled to review these hazards and their rankings and identify strategies to address mitigation for each hazard. Past hazard activities in the county influenced strategy development and strategy ranking (i.e.1997 and 2001 flooding). In many cases, as the hazards were identified for the inventory, strategies were also discussed, providing a good starting point for the discussion.

The following outlines the plan's strategy development process. 1) Working toward group consensus, each hazard was reviewed individually. 2) Participants offered suggestions and input which stimulated a lively discussion as part of the planning process. All suggestions were considered and recorded by the facilitator. 3) A limited amount of time was set on each hazard by the facilitator to move the group forward. 4) Debate followed before the group was asked to decide if it should be part of the plan – group consensus was needed. 5) The group noted they could not be totally inclusive – some strategies may not even be considered and others may not be feasible.

General Criteria

1. History
2. Successful Strategies
3. Need
4. Risks
5. Effectiveness
6. Building on what already exists
7. Legal Authority
8. Environmental Impact

Cost/Benefit Criteria

1. Costs/Efficiencies
2. Economic Impact
3. Budget Requirements
4. Overall Impact
5. Resources Needed (Social & Fiscal)
6. Benefits Provided by Project (Social & Fiscal)

Identifying costs that would be attached to each strategy was the most difficult part of the process. Due to limited time and resources to develop the plan it wasn't feasible to spend a lot of time on estimating the costs. It is critical for the Board to constantly be evaluating the costs as part of implementation and maintenance for the All-Hazard Mitigation Plan. Strategies that dealt with rural areas seemed harder to include in the plan – more costly, harder to regulate, and would need population buy-in. Many strategies are costly, labor intensive, time consuming and it is difficult to identify the lead for the strategy. It was determined that the Emergency Manager will perform a cost-benefit review for all potential future project applications. Participants in the planning process agreed that to implement an ordinance or regulation was not the difficult part of certain strategies – would it be possible and feasible to follow-through? Participants started with strategies that were manageable to see notable progress – "baby steps". It was reasonable to include strategies that have been started, but not yet completed.

Completed Strategies

Table 6.1 BSC & Cities Completed Strategies in Past 10 Years for Manmade/Technological Hazards

Hazard	Strategy	Responsible Entity
Hazardous Materials	Develop Mass Evacuation Procedures for a hazardous materials incident.	Yellow Medicine County Emergency Manager
Hazardous Materials	Develop a plan/policy to contend with meth labs in the county. Promote and enforce building bodes that improve protection from hazardous events.	Yellow Medicine County Law Enforcement, Granite Falls, Clarkfield
Hazardous Materials	Developed a City Evacuation Plan and practice the plan in event of ammonia leaks.	Wood Lake
Hazardous Materials	Continue to participate in regional exercises that test local plans and interaction between local agencies. Participate in "High Angle Rescue" Team – a countywide organization for emergency response situations.	Wood Lake
Water Supply Contamination	Build a new Water Treatment Plant and dig a new well due to arsenic found in water supply.	Hanley Falls
Water Supply Contamination	Establish a program to install backflow protection at the water meter service which would not allow anything to go back into water system.	Lincoln Pipestone Rural Water
Civil Disturbance/Terrorism	Install backflow protection at the water meter service which would not allow anything to get back into the water system.	Granite Falls
Civil Disturbance/Terrorism	Develop security for county and all high profile cases.	Yellow Medicine County Law Enforcement
Civil Disturbance/Terrorism	Televise City Council Meetings.	Canby
Civil Disturbance/Terrorism	Develop response plan for agro-terrorism.	Yellow Medicine Zoning Administrator
All Hazards	All homes are easily identifiable with visible house numbers and street signs.	Canby, Clarkfield, Granite Falls, Hanley Falls, St. Leo, Wood Lake

MANMADE / TECHNOLOGICAL STRATEGIES: NO LONGER RELEVANT

Table 6.2 BSC & Cities: Manmade / Technological Strategies – No Longer Relevant

Hazard	Strategy	Responsible Entity
Fire	Continue Fire Education Programs.	Fire
Reasoning: Redundant strategy.		
Hazardous Materials	Adopt an ordinance for landlords to clean up meth labs before residence is occupied again. Educate business owners and employees to be aware of possible meth purchases.	Hazardous Materials
Reasoning: The County and cities are covered for meth labs under hazardous wastes that fall under the Environmental Protection Agency jurisdiction.		
Civil Disturbance / Terrorism	Continue to review standoff vehicle distances.	Civil Disturbance / Terrorism
Reasoning: Issue has been addressed.		
Civil Disturbance / Terrorism	Continue to monitor actives that would need restriction. (Restricting vehicle access to the County Courthouse and City Halls)	Civil Disturbance / Terrorism
Reasoning: Issue has been addressed.		
Civil Disturbance / Terrorism	Continue review of facilities and make changes as needed. (Increase level of security with landscape design and lighting.)	Civil Disturbance / Terrorism
Reasoning: Threat level has been removed.		

Infectious Disease

Goal 1: Reduce the threat of infectious diseases through education and awareness.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Support and maintain programs that keep the county healthy and safe from infectious diseases.	A. Continue to support Countryside Public Health programs.	Recurring	Countryside Public Health (CPH) & County	--	--
	B. Work to make sure mass transportation and mobile community can address infectious disease outbreak.	Recurring	CPH	--	--
	C. Work with state on quarantine and isolation strategies.	Recurring	CPH	--	--
2. Educate the public.	A. Get uniform, accurate and up-to-date information out to the public through the risk communication service.	Recurring	CPH	--	--
	B. Continue cooperation with County Emergency Management Director, Countryside Public Health and hospitals and clinic staff.	Recurring	CPH, County EM, Hospital/Clinic Staff	--	--

Goal 2: Improve the effectiveness and quality of the various efforts addressing infectious diseases that have the potential to impact the county.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Maintain and update material, plans, and agreements for addressing infectious diseases.	A. Continue cooperation between Countryside Public Health and County Emergency Management Director.	Recurring	CPH, County EM	--	--

Fire

Goal 1: Protect structures from fire.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Provide residents with adequate knowledge of fire safety.	A. Continue fire education programs.	Recurring	Beardsley, Clinton, Correll, Graceville, Odessa, Ortonville FDs, County EM	--	--
2. Ensure that Fire Departments have adequate equipment to fight fires.	A. Have an annual assessment of equipment and personnel needs.	Recurring	Beardsley, Clinton, Correll, Graceville, Odessa, Ortonville FDs, County EM	--	--
	B. Purchase needed equipment and secure funding sources.	Recurring	Beardsley, Clinton, Correll, Graceville, Odessa, Ortonville FDs, County EM	Moderate	FEMA/ MnDNR
	C. Actively seek funds to offer training to firefighters. ***New Strategy**	Recurring	Beardsley, Clinton, Correll, Graceville, Odessa, Ortonville FDs, County EM	Moderate	FEMA/ MnDNR

Fire

Goal 2: Reduce building hazards.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Manage abandoned buildings.	A. Inspect abandoned buildings and remove as needed.	Recurring	All Cities	$4,000-$10,000	--
2. Provide residents with adequate knowledge of fire safety.	A. Encourage public safety day and work with ongoing programs to promote fire safety such as National Night Out and Fire Prevention Week.	Recurring	All Cities	$2,000	--

Hazardous Materials

Goal 1: Continue the effective efforts addressing hazardous material that may impact the county.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Maintain and update material, plans, and agreements for addressing hazardous material.	A. Review and update the Big Stone County Emergency Operations Plan that outlines procedures for dealing with hazardous material on an annual basis.	Recurring	County EM	--	DHSEM

Goal 2: Address inconsistencies and county shortcomings in dealing with a hazardous materials event.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Implement procedures or programs that address gaps or deficiencies in dealing with hazardous materials.	A. Work to educate farmers and fertilizer plants to secure ammonia tanks.	Recurring	Law Enforcement	--	--
2. Work with county and cities to address cleanup of meth labs.	A. Educate the public on the dangers of meth labs.	Recurring	Law Enforcement	--	--

Hazardous Materials

Goal 3: Improve overall preparedness and equipment for handling hazardous events.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Adopt new technology and obtain training to improve the county's ability to respond to a disaster. ***New Goal, Objectives, and Strategies**	A. Need proper personal protection equipment to respond to hazardous materials disasters for Fire Departments, Law Enforcement, and Ambulance/EMT Departments as applicable to each city.	2 years	County and all Cities	$5,000	FEMA
	B. Continue to participate in regional exercises that test local plans and interaction between local agencies.	Recurring	County and all Cities	$4,000/year	--
	C. Continued training in the use of the Nation Incident Management System for all hazard materials incidents that may occur in the county.	Recurring	County	$3,500	Fire Grant/ Dept. of Justice
	D. Ensure that all Emergency Responders participate in Rail Car Incident Response Training.	Recurring	County Emergency Manager, All City Fire Departments	--	Railroad officials, FEMA
	E. Encourage that emergency responder groups, fire department, and emergency managers are trained to at least the Hazardous Materials Awareness level.	Recurring	County	$4,000	HSEM/ Dept. of Justice
	F. Ensure that the first responder groups conduct the required terrorism and hazardous materials training and maintains current records on all completed training.	Recurring	County	$10,000	HSEM/ Dept. of Justice
	G. Create Standard Operating Procedures for how to handle hazardous events.	1 year	County	--	--
	H. Purchase sensor to detect anhydrous ammonia leaks.	3 years	County	$500	--

Water Supply Contamination

Goal 1: Protect the quality of the county's ground water resources.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Reduce contamination from feedlots.	A. Enforce MN Rules 7020 and local ordinances.	Recurring	County Environmental Services (ES)	$7,500/year	--
2. Reduce contamination of private wells.	A. Implement wellhead protection plans.	Recurring	Odessa, Ortonville, County ES	Low	--
3. Minimize contamination of ground water from unused/abandoned wells.	A. Enforce Minnesota Department of Health rules and sealing requirement.	Recurring	County ES	Low	--

Goal 2: Protect residents from contaminated ground water.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Provide adequate drinking water in the event of ground water contamination.	A. Continue to identify in the Emergency Operations Plan.	Recurring	County EM	Low	--
2. Test private wells.	A. Continue school programs for testing private wells. Educate the public.	Recurring	CPH, Schools	--	--

Water Supply Contamination

Goal 3: Focus on efforts in areas more prone to ground water contamination.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Implement Wellhead Protection Program.	A. Continue to monitor feedlot locations and adopt prohibited land uses.	Recurring	County ES	$5,000	--

Wastewater Treatment Facility Failure

Goal 1: Protect the quality of the county's ground water resources.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Protect the Ortonville Wastewater Treatment Plant from flooding.	A. Continue to monitor levee protection at the Ortonville Wastewater Treatment Plant.	Recurring	Ortonville	--	FEMA
	B. Lower water table.	2-10 years	UMRWD	--	FEMA

Goal 2: Protect the health of residents.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Ensure that all public facilities are working properly.	A. Continue updating sanitary sewer systems and securing funding to make these updates.	Recurring	All Cities	Moderate	USDA Rural Water

Civil Disturbance / Terrorism

Goal 1: Protect critical infrastructure.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Install security measures at the city water treatment plant.	A. Install security alarms/make infrastructure secure.	2-5 years	All Cities	Moderate	--

Goal 2: Decrease vulnerability of regional and state resources in county.					
OBJECTIVES	**STRATEGIES**	**Time Frame**	**Responsible Entity**	**Estimated Cost**	**Funding Partner**
1. Work with state and federal agencies engaged in the statewide domestic preparedness strategy to identify further options for the county.	A. Schedule discussions with school leaders, hospital administrators, law enforcement and local units of government to address performance in response to terrorism (such as active shooters, bombs, chemical, cyber-attacks, etc.) focusing on schools, local government, and hospitals.	Recurring	County EM, Law Enforcement	$5,000	--

PRIORITIZING STRATEGIES

Members of the Big Stone County Hazard Mitigation Task Force completed an online/print survey in order to indicate which strategies they felt were the most important in each hazard category. Using these survey results, the Emergency Manager and RDC staff created a preliminary "Prioritized Hazards List" for manmade/technological hazards. At the fourth Task Force Meeting in Clinton on May 21st, 2015, the Local Task Force solidified their priorities by discussing the strategies that were included on the list, and those that were not. Strategies that were a high priority for the Local Task Force contained mitigation measures for hazardous materials, water contamination, and structure fire. These three hazards were determined to be moderate hazards in Big Stone County, indicating greater risk than some of the other hazards. Additionally, any steps taken to minimize the risks of these types of disasters could have a sizeable impact. Although Big Stone County does not have control over what types/amounts of hazardous materials are traveling through the county, they can complete strategies that would minimize risk to communities and citizens in the event of a spill.

The Local Task Force and the Big Stone County Emergency Manager used the following criteria to prioritize strategies according to need and feasibility. Although some hazards may be a high risk for the county, it did not guarantee a strategy addressing said hazard would also rank high or take priority.

- Current strategies – Could a current strategy be supplemented or enhanced?
- Costs – What is affordable at this time? Are there current funds addressing the hazard or strategy? Does it make sense to delay or does it only postpone higher costs and create other costs? Will it ever be affordable?
- Available resources – At this time, what funds are available? Will there be additional funds in the future? Are there other projects that take a higher priority?
- Length of project – Some projects could be addressed quickly and require minimal investment in time even though it may be fiscally costly.
- Compatibility with other plans – Is the project a high priority in other plans? Could the project be addressed collaboratively for efficiencies in resources? Would there be unnecessary duplication?
- Available information – Can a good decision be made with the current information? Is more research needed or does it make sense to wait for a current study or development for more information before making a decision?
- Impact – Some hazards can be impacted more by mitigation than others (i.e. using strategies to reduce flooding rather than strategies to reduce tornadoes).

Table 6.3 BSC Prioritized Strategies (Manmade/Technological Hazards)

Ranked	Hazard	Strategy	Affected Participating Jurisdiction

CHAPTER 7: PLAN IMPLEMENTATION & MAINTENANCE

Implementation & Maintenance

The Big Stone County All-Hazard Mitigation Plan is intended to serve as a guide for dealing with the impact of both current and future hazards for all county people and institutions. As such, it is not a static document but must be modified to reflect changing conditions if it is to be an effective plan. The goals, objectives, and mitigation strategies will serve as the action plan. Even though individual strategies have a responsible party assigned to it to ensure implementation; overall responsibility, oversight and general monitoring of the action plan has been assigned to the Big Stone County Emergency Manager. It will be their responsibility to gather a Local Task Force to update the All-Hazard Mitigation Plan on a routine basis. Every two years, the County Emergency Manager will call a meeting to review the plan, mitigation strategies and the estimated costs attached to each strategy. All participating parties of the original Local Task Force and cities will be invited to this meeting. Responsible parties will report on the status of their projects. Committee responsibility will be to evaluate the plan to determine whether:

- Goals and objectives are relevant.
- Risks have changed.
- Resources are adequate or appropriate.
- The plan as written has implementation problems or issues.
- Strategies have happened as expected.
- Partners participating in the plan need to change (new and old).
- Strategies are effective.
- Any changes have taken place that may affect priorities.
- Any strategies should be changed.

In addition to the information generated at the Local Task Force meetings, the County Emergency Manager will also annually evaluate the All-Hazard Mitigation Plan and update the plan in the event of a hazardous occurrence. Two-year updates are due on the anniversary of the plan approval date.

After the second update meeting (four years will have passed), the Big Stone County Emergency Manager will finalize a new Local Task Force to begin the required five-year update process. This will be accomplished in coordination with cities and the entire All-Hazard Mitigation Plan shall be updated and submitted to FEMA for approval (within 5 years of plan adoption). These revisions will include public participation by requiring a public hearing and published notice, in addition to multiple Local Task Force meetings to make detailed updates to the plan.

Public participation for updates is as critical as in the initial plan. Public participation methods that were used in the initial writing will be duplicated for future update processes – direct mailing list of interested parties, public meetings, press releases, questionnaires, and resolutions of participation and involvement. Additional methods of getting public input and involvement are

encouraged such as placing copies of the plan in the Big Stone County Emergency Manager's Office and city offices, in addition to placing the plan on the Big Stone County and UMVRDC websites. Further, cities will be encouraged to place a notice on their websites stating the plan is available for review at the city offices. Notifications of these methods could be placed in chamber newsletters, the UMVRDC newsletter and newspapers. Committee responsibilities will be the same as with updates.

Chapters 5 and 6 focus on mitigation strategies for natural hazards and man-made/technological hazards, and man-made/technological hazards. Appendix 2 focuses on city-specific mitigation strategies for both natural and manmade/technological hazards. The All-Hazard Mitigation Plan proposes a number of strategies, some of which will require outside funding in order to implement. If outside funding is not available, the strategy will be set aside until sources of funding can be identified. In these situations, Big Stone County and cities will consider other funding options such as the county's/cities' general funds, bonding and other sources. Based on the availability of funds and the risk assessment of that hazard, the county will determine which strategies should be continued and which should be set aside. Consequently, the action plan and the risk assessment serves as a guide to spending priorities but will be adjusted annually to reflect current needs and financial resources.

This last step requires an evaluation of the strategies identified in the goals and policies framework, selecting preferred strategies based on the risk assessment, prioritizing the strategy list, identifying the entity responsible for carrying out the strategy, and the timeframe and costs of strategy completion. Big Stone County and cities have incorporated the preferred strategies including identification of the responsible party to implement, the timeframe and the cost of the activity with the goals and policies framework.

This plan will be integrated into other Big Stone County plans such as the County Comprehensive Plan, County Water Plan, County Transportation Plan, and the Emergency Operations Plan. Chapter 1 will serve as an executive summary to the All-Hazard Mitigation to be attached to those plans as necessary. The County Board and Emergency Manager will encourage cities to implement their city-specific mitigation strategies in their comprehensive plans, land use regulations, zoning ordinances, capital improvement plans and/or building codes by including mitigation strategies in their plans as listed in Table 7.1 on the following page. Further, as each land use mechanism is updated, mitigation strategies will be evaluated to determine whether they can implement or include them at that time. This evaluation will consist of basic cost-benefit analyses, much like what was used to create the mitigation strategies.

Table 7.1 YMC & Cities - Local Planning Mechanisms

Planning Mechanisms	Jurisdictions
Comprehensive Plan	Yellow Medicine County, Canby, Granite Falls, Echo
Emergency Operations Plan	Yellow Medicine County, Canby
Capital Improvement Plan	Clarkfield, Granite Falls, Canby
Local Water Management Plan	Yellow Medicine County,
Watershed Plan	Yellow Medicine County
Land Use Plan	Yellow Medicine County, Echo
Flood Damage Reduction: Minnesota River at Granite Falls, MN: Locally Preferred Plan	Granite Falls
Zoning Ordinance	Yellow Medicine County, Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, Hazel Run, Porter, St. Leo, Wood Lake
Building Code	Clarkfield, Granite Falls, Stony Run Township
Floodplain Ordinance	Yellow Medicine County, Canby, Granite Falls
Shoreland Ordinance	Yellow Medicine County

Many of these plans or policies can help implement the goals, objectives, and strategies in Big Stone County's All-Hazard Mitigation Plan. The Big Stone County Emergency Manager is responsible for meeting with each city within the County two times throughout the next five years. During these meetings, the Emergency Manager will review all Local Planning Mechanisms and collaborate with the cities to ensure the All-Hazard Mitigation Plan is becoming as integrated into local plans as possible. As adopted versions of Big Stone County's All-Hazard Mitigation Plan will be available at all city offices, during these meetings the Emergency Manager will solicit and collect any public comments relevant to the plan and make a record for the upcoming update process to be discussed at a Local Task Force meeting. These Local Planning Mechanisms are meant to work cooperatively together in order to ensure the health, safety, and welfare of Big Stone County and its cities.