



Multi-Hazard Mitigation Plan

Kanabec County, Minnesota

2016

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SECTION 1-INTRODUCTION

1.1 Introduction

The Federal Emergency Management Agency (FEMA) makes reducing hazards one of its primary goals. Through hazard mitigation (defined as any sustained action to reduce or eliminate long-term risk to human life and property) planning and the subsequent implementation of projects, measures and policies resulting from the planning remains a key mechanism in reaching FEMA's goal.

Hazard mitigation planning and preparedness, a valuable tool in lowering losses by reducing the impact of disasters upon people and property, affords each county to prepare as much as possible for a disaster.

The Multi-Hazard Mitigation Plan (MHMP), through the Federal Disaster Mitigation Act of 2000 (DMA 2000) requires the development of a local government plan to maintain eligibility for certain federal disaster assistance and hazard mitigation funding programs. In order for future mitigation funds, communities must adopt an MHMP.

Kanabec County's vulnerability to hazards—both natural and human caused threaten life and property within the county. This Multi-Hazard Mitigation Plan represents the efforts of local entities in Kanabec County to commit to hazard mitigation planning. Reducing the actual threat of specific hazards by limiting the impact of damages and losses remains the intent of the process and the legislation.

1.1.1 Scope

The Kanabec County Emergency Management Director and the East Central Regional Development Commission teamed up to complete the 2015 MHMP. The MHMP evaluates and ranks the major natural hazards affecting Kanabec County as determined by frequency of event, economic impact, deaths, and injuries. Mitigation recommendations come via input from state and local agencies, public input and national responses to similar efforts.

The multi-jurisdictional plan encompasses Kanabec County; its school districts, cities, townships and other entities. All participated in the development of this plan. Representatives from these entities participated in the planning process by attending working meetings, completing surveys, offering feedback and information pertinent to the process—specifically mitigation strategies, and ultimately, the review of the plan. Each jurisdiction will adopt the plan by resolution after approval by FEMA. See Appendix A for final resolutions.

Kanabec County compiled the following goals for this plan: 1) evaluate and rank the hazards impacting Kanabec County; 2) determine the extent of existing mitigation programs and policy capacities in Kanabec County; 3) create a detailed working document establishing a process for ensuring coordination of hazard mitigation efforts and to implement an ongoing and comprehensive hazard mitigation strategy; and 4) to familiarize stakeholders about comprehensive hazard mitigation in Kanabec County and obtain their support.

1.1.2 Hazard Mitigation Definition

Any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards defines hazard mitigation. Potential types of hazard mitigation measures include the following: 1) structural hazard control or protection projects; 2) retrofitting of facilities; 3) acquisition and relocation of structures; 4) development of mitigation standards, regulations, policies and programs; 5) public awareness and education programs; and 6) development or improvement of warning systems.

1.1.3 Benefits of Mitigation Planning

The benefits of hazard mitigation planning include the following: 1) saving lives, protecting the public health of the public, and reducing injuries; 2) preventing or reducing property damage; 3) reducing economic losses; 4) minimizing social dislocation and stress; 5) reducing agricultural losses; 6) maintaining critical facilities in functioning order; 7) protecting infrastructure from damage; 8) protecting mental health; and 9) reducing legal liability of government and public officials.

1.2 State Mitigation Plan Overview

The State of Minnesota currently administers three mitigation grant programs through the Department of Public Safety, Division of Homeland Security and Emergency Management (HSEM) on behalf of FEMA. They include: 1) Hazard Mitigation Grant Program (HMGP); 2) Pre-Disaster Mitigation program (PDM); and 3) Flood Mitigation Assistance (FMA) program.



SECTION 2-PUBLIC PLANNING PROCESS

2.1 Planning Team Information

The Kanabec County Emergency Preparedness Committee, led by the Kanabec County Emergency Management Director provided the foundation for input to the Multi-Hazard Mitigation Plan. Other community stakeholders participated in the planning process representing public, private and governmental sectors. Table 1 identifies the planning team and the organizations they represent.

Table 1. Multi-Hazard Mitigation Committee 2016

First Name	Last Name	Affiliation	Title
Bob	Benes	Lakes and Pines Community Action Council	Executive Director
Brian	Smith	Kanabec County Sheriff's Office	Sheriff
Chad	Gramentz	Kanabec County Highway Department	Public Works Director/County Engineer
Christine	Andres	Kanabec County Public Health	Family Health Supervisor
Chuck	Hurd	Kanabec County Family Services	Adult Services Supervisor

Cindy	Teichroew	FirstLight Health System	Infection Control
Craig	Schultz	Mora Public Schools	Superintendent
David	Schlicher	FirstLight Ambulance	Director
Ellen	Ryan	FirstLight Health System	Chief Quality Officer
Gary	Gauffin	Mora Public Schools	Activities Director/Buildings/Transportation
Hazel	Miller	American Red Cross	Volunteer
Helen	Pieper	Timber Trails Public Transit	Director
Jack	L'Heureux	St Clare Living Community of Mora	Director
James	Gilles	Kanabec County Highway Department	Highway
Jan	Lahtonen	East Central Electric	Risk Manager
Janet	Hawkinson	Mora Public Schools	School Nurse
Joanne	Nelson	Kanabec County Sheriff's Office	Jail Administrator
Joe	Heggernes	Mora Fire Department	Fire Chief
Joel	Dhein	City of Mora	City Administrator
Karen	Amundson	Mora Area Chamber	Director
Kate	Mestnik	Kanabec County Public Health	Public Health Emergency Preparedness
Kathi	Ellis	Kanabec County Board of Commissioners	Commissioner
Kathy	Belsheim	Ogilvie Public Schools	Superintendent
Kathy	Burski	Kanabec County Emergency Management	Emergency Manager
Ken	Broshofske	Amateur Radio organization representative	Volunteer
Kirsten	Faurie	Kanabec County Times	Editor
Larry	Butenhoff	St. Clare Living Community of Mora	Buildings
Mark	Sharratt	Ogilvie Fire Department	Fire Chief
Mark	Vizenor	FirstLight Health System	Operations Director
Nick	Bakke	Mora Public Schools	Assistant Principal/High School
Patrick	Christopherson	Kanabec County Coordinator	County Coordinator

Penny	Simonsen	East Central Regional Dev. Commission	Community Development Director
Randy	Ulseth	FirstLight Health System	Chief Executive Officer
Rita	Clasemann	Ministerial organization representative	Ministerial organization representative
Tony	Miller	MN Dept. of Natural Resources	Conservation Officer
Wendy	Thompson	Kanabec County Public Health	Director

Other Contributors to the Plan

- City Clerk/Mayor-Ogilvie
- City Clerk/Mayor-Quamba
- City Clerk/Mayor-Grasston
- Kanabec County Township Association
- School Principal-Mora
- School Superintendent-Ogilvie
- Soil & Water Conservation District

Throughout the plan process, these representatives were invited to offer feedback on the hazards concerning their community and the preferred mitigation actions sought to implement upon plan adoption. This list of final mitigation actions along with jurisdiction-specific mitigation action charts emerged from this broad cross-section of representation.

2.2 Review of Existing Plans

Kanabec County and its local communities utilized a variety of planning documents to direct identification of mitigation strategies and local preparedness. Section 4.4 details the review of plans and programs in place as related to each natural hazard facing Kanabec County, along with the documentation of program gaps and deficiencies. This review shaped influenced the identification of hazards, mitigation strategies and actions. Table 2 highlights additional planning documents used in this plan.

Table 2. Planning Documents used for MHMP Planning Process

Author(s)	Year	Title	Description	Where Used
Kanabec County Environmental	2012	Comprehensive Local Water	Guide for assessing, improving and maintaining lakes,	Section 3, 4.4.6, 5.1.1, and 5.1.2

Services		Management Plan	rivers and streams within the county.	
Kanabec County Emergency Services	2013	Threat and Hazard Identification Risk Analysis (THIRA)	Guide for reviewing the identification and ranking of hazards which face Kanabec County	Section 4
Kanabec County Emergency Services	2014	Emergency Operations Plan	Guide for reviewing personnel and procedures in place for emergency response by the County.	Section 4
Minnesota Division of Homeland Security and Emergency Management	2014	Minnesota All-Hazard Mitigation Plan Update	Statewide hazard mitigation plan.	Section 5.2

2.3 Planning Process Timeline and Steps

The goals of the planning process for this Multi-Hazard Mitigation Plan (MHMP) includes information from previous MHMPs, as well as more recent data documenting the critical infrastructure and hazards faced by Kanabec County, organized in a way to reflect definitions and expectations of hazards noted in the 2008 State of Minnesota Multi-Hazard Identification and Risk Assessment Plan, and correspond with current hazard mitigation priorities in Kanabec County.

This multi-jurisdictional plan covers Kanabec County, its school districts, the cities of Grasston, Ogilvie, Mora, and Quamba. In addition to these jurisdictions, the plan includes Ann Lake, Haybrook, Ford, Kroschel, Hillman, Peace, Pomroy, Knife Lake, Whited, Kanabec, Arthur, Comfort, South Fork, Brunswick and Grass Lake townships and other entities. The Kanabec County risks and mitigation activities identified in this plan incorporate the concerns and needs of those participating in this plan.

Four meetings of the Kanabec County Emergency Preparedness Committee focused on the Kanabec County MHMP. An introductory meeting held on November 3, 2014 when Minnesota HSEM staff provided an overview of the project’s purpose. On May 3, 2015 ECRDC staff laid out the ground work for the Kanabec County MHMP process, offered a timeline with a report of the draft plan’s progress, discussed the hazards facing Kanabec County and explored the roles and responsibilities of the team within the process. The team’s August 3, 2015 meeting contained extensive follow-up and review of the development of the new plan, including its new mitigation actions. The November 2, 2015 offered the committee an opportunity for final input to the plan update. Appendix A provides documentation of Emergency Preparedness Committee meeting summaries, including participant sign-in sheets.

Between the second and third meetings, team members provided feedback on plans and programs in place, identified gaps or deficiencies as they relate to hazards facing the county, and participated in the dissemination of the plan’s public education and outreach.

Two tools (Calculated Priority Risk Index (CPRI) and the STAPLE+E) helped in prioritizing the hazards and the mitigation actions included in the plan. For more information about the planning process see sections 5 and 6.

Public input came to the plan through several avenues: 1) Surveys; 2) Emergency Preparedness Team meetings; 3) Kanabec County Township Association meetings; and 4) Kanabec County Board meeting. All cities and townships completed a hazard mitigation survey in March 2015, with the results shared at the Kanabec County Township Association meeting on April 14, 2015. To reach the schools, both Mora and Ogilvie schools completed surveys in the fall of 2015. A county-wide survey (and outreach information) placed on the county’s website engaged a broader audience over the summer of 2015. The participation of the Emergency Preparedness Committee played a key role in the development of the plan. This group met on four occasions for plan-related work. The Kanabec County Township Association was provided an introduction to the process and a review of the draft plan through their regular meetings. Work with individual townships strengthened the connection to this project in this very rural county. School district input came in November 2015. The Kanabec County Board’s involvement came in the fall of 2015 in the form of a public meeting. See Appendix A: Public Participation Documents

Plan drafts placed on the county’s website provided the public opportunities for engagement in the process.

Table 3. Kanabec County Multi-Hazard Mitigation Plan Public Participation

Type	Date	Location
City and Township Survey-Mail In	March 2015	Countywide via US Mail
School Districts Survey-Mail In	September 2015	Mora, Ogilvie
Emergency Preparedness Team Meeting	May, August, November 2015	Mora
Township Association Meeting	April, October 2015	Mora
Public Review Meetings	January 11, 13, 15 and 19, 2016	Mora
Kanabec County Board	April 2016	Mora

At each phase of public participation opportunities, ECRDC staff worked with Kanabec County Emergency Service Director and the Emergency Preparedness Team to incorporate comments from the venues into the plan.



SECTION 3-KANABEC COUNTY PROFILE

This section offers a general overview of Kanabec County to provide a basic understanding of the characteristics of the community, such as the physical environment, population, and the location and distribution of services.

3.1 General County Description

Kanabec County (ka/NAY/bec), named for the Ojibwe word for “snake”, after the Snake River which runs through the county. The county organized in 1882. Located in east central Minnesota, Kanabec County sits between the Duluth, St. Cloud and Minneapolis/St. Paul metropolitan areas. No metropolitan statistical areas exist within the county. Kanabec County encompasses 522 square miles of land and 12 square miles of water, and touts a population of 31 persons per mile.

The southern half of the county contains its county seat and largest community (Mora) and the other three cities (Grasston, Ogilvie, and Quamba). Organized townships make up the northern half of the county. Its lakes, rivers, streams and timber keeps the county very rural. Minnesota state highways 23, 27, 47, 65 and 70 move recreational vehicles, workforce traffic and commerce into and through the county. One general aviation airport exists in Mora.

3.2 Environmental Characteristics

Moronic hill topography, resulting from glacial movement and glacial till plains, makes up the major landforms of Kanabec County. The dominant Mille Lacs moraine, with its average elevation of 1200 to 1300 feet slopes southward from the Mille Lacs moraine to an average elevation of about 950 feet, along the southern County boundary. Smaller moraines exist throughout the county.

Till plains or material deposited by melting of glaciers make up central Kanabec County. The southeastern part of the county contains lake clays, marsh and boggy tracts, evidence of former Glacial lake Grantsburg.

Only limited exposures of bedrock are found in Kanabec County because of the extensive deposits of glacial till which covers the area. Two major bedrock systems cover Kanabec County—one of a granitic or volcanic action, the other of a sedimentary origin. The northern parts of the county near the unincorporated area of Warman have exposure to granite of sufficient quality for use in monuments and building stone. Sand and gravel pits as found in glacial till are scattered throughout the county.

3.3 Hydrography

Kanabec County lies within the watershed of the Rum, Kettle, and Snake Rivers. The Rum River watershed includes a very small portion of northwestern and southern Kanabec County. The extreme northeastern corner of the county is in the Kettle River watershed with nearly all of the county lying in the watershed of the Snake River.

Kanabec County, described as having interrupted drainage patterns delivered by meandering streams, small pothole lakes, and bogs. Glacial landforms have blocked the original stream flow and produced the current system. Two-percent of the county's land area (6,200 acres) consist of over 100 (all or in-part) Minnesota Department of Natural Resources Protected Waters. Important water resources include both surface and ground water from aquifers, watersheds, lakes, rivers, and wetlands. Aquifers are supplemented by Kanabec County's thirty inches of rain and forty-three inches of snow.

3.3.1 Groundwater

According to the US Geological Survey, the sand-plain aquifers in parts of Carlton, Kanabec, and Pine Counties in east-central Minnesota constitute a major aquifer system. They consist predominantly of fine to medium outwash sand with a combined areal extent of nearly 500 square miles. Saturated thickness in localized areas is as much as 90 ft. depth to water generally is < 20 ft. Transmissivities range from about 100 to 25,000 sq. ft./day. Yields to properly constructed wells locally may exceed 2,000 gal/min. A reconnaissance of sandstone units underlying the outwash indicates that transmissivities of the sandstone aquifers range from 1,850 to 2,200 sq. ft./day, and specific capacities range from 9 to 12 gal/min/ft. of drawdown. Locally, wells may be capable of supplying several hundred gal/min. Regionally, the sand-plain and sandstone aquifers are poorly connected hydraulically at all locations tested except in a small localized area near Quamba in Kanabec County.

Groundwater in the sand-plain aquifers can be classified chemically, based on predominant ions, as a calcium bicarbonate type that is moderately hard. Concentrations of dissolved solids range from 30 to 610 mg/L. Except for locally high concentrations of iron and manganese, the quality of water is within State drinking water standards and is suitable for most uses. There are no major differences between the quality of water in the sand-plain and sandstone aquifers.

Groundwater flow, aquifer response, aquifer development, and drought conditions were simulated for sand-plain aquifers and are extensive enough to be hydrologically significant. Simulation of expanded groundwater development and drought in northern Pine County indicates that regional groundwater levels may be lowered as much as 12 ft. and groundwater discharge to streams may be reduced as much as 42%. Simulation of expanded development and drought in southern Pine County indicates that

regional groundwater levels may be lowered as much as 25 ft. and groundwater discharge to streams may be reduced as much as 65%. The simulations also indicate that each area, especially the northern Pine County area, will support substantial additional development without dewatering the aquifer or reducing streamflow significantly.

3.3.2 Lakes

Kanabec County’s thirty-four lakes of various sizes and classifications include the major recreation development lakes Ann, Knife, Fish and Quamba.

The County’s lakes fall within the recreational Development or natural Environment Lake Class. With the County’s rivers and streams classified as Forested, Remote, Transition or Tributary.

3.3.3 Rivers

The major rivers include the Snake, Groundhouse, Ann and Knife Rivers. Kanabec County’s rivers and streams classified as Forested, Remote, Transition or Tributary.

3.3.4 Wetlands and Shorelands

Wetlands remain one of the most efficient natural water filters, as wetland plants and soils clean the water before it goes into groundwater or rivers. After being slowed by a wetland, water moves around plants allowing suspended sediment to drop out and settle on the wetland floor. Plant roots and microorganisms in the soil often absorb nutrients from fertilizer application, manure, leaking septic systems, and municipal sewage. Wetlands also serve as a storage area for excess water during times of flooding. They may also serve as interconnections between surface water and ground water. Because of these benefits, state and federal agencies regulate wetlands.

Kanabec County’s shore lands offer value for both tourists and residents of the county. Shore land property attracts development, and development pressures do currently exist in the lakeshore areas. In particular, townships registering the largest growth have Snake River, Ann Lake, Fish Lake and Knife Lake shore land. Lake and river shore improvement associations and other similar interest groups offer valuable assistance to the county and townships in identifying land use and water management issues.

In addition to those water bodies identified on Table 4, wetlands exist and are subject to wetland management regulations consistent with the Wetland Conservation Act.

Table 4. DNR Protected Waters in Kanabec County

Natural Environment Lakes	Protected Waters ID	Recreational Development Lakes	Protected Waters ID
Beauty	33-2	Eleven	32-1
Five	33-3	Pomroy	33-9
Twelve	33-4	Mud (Quamba)	33-15

Thirteen	33-5	Spring	33-27
Featherbed	33-6	Knife	33-28
White Lily	33-8	Lewis	33-32
Peace	33-10	Devils	33-33
Rice	33-11	Fish	33-36
Grass	33-13	Ann	33-40
Unnamed	33-14	Bass (Boundary)	33-137
Spence	33-16		
Unnamed	33-17		
Sells	33-18		
Twin	33-19		
Luchts	33-21		
Full of Fish	33-24		
Pocket Knife	33-25		
Snowshoe	33-26		
Pennington	33-30		
Erickson	33-31		
Kent	33-35		
Telander	33-37		
Lindgren (Boundary)	30-144		
Long	33-44		

Remote Rivers

Snake

Legal Description

From Aitkin/Kanabec border to south section line, Sec. 2, T41N, R24W

Forested Rivers

Snake

Legal Description

From north section line, Sec. 11, T41N, R23W to south section line, Sec. 19, T40N, R23W

Groundhouse

From border of Mille Lacs and Kanabec Counties to confluence with S. Fork Groundhouse River in Sec. 7, T38N, R24W

Ann

From Ann Lake in Sec. 29, T40N, R25W to Fish Lake in Sec. 28, T39N, R24W

Transition Rivers

Legal Description

Tributary Streams

Legal Description

Snake

From north section line, Sec. 20, T40N, R23W, to border of Pine and Kanabec Counties.

All protected watercourses in Kanabec County shown on the Protected Waters Inventory Map for Kanabec County in the comprehensive plan

Groundhouse

From confluence with S. Fork Groundhouse River, Sec. 7, T38N, R24W to confluence with Snake River in Sec. 6, T38N, R23W

Ann

From outlet Fish Lake in Sec.28, T39N, R24W to confluence with Snake River in Sec. 24, T39N

South Fork of Groundhouse

From Mille Lacs County Line, Sec. 18, T39N, R25W to confluence with Groundhouse River in Sec. 7, T38N, R24W

Source: Kanabec County Shoreland Management Ordinance, subject to revisions, and the Kanabec County Comprehensive Plan.

3.4 Climate

The climate of Kanabec County is continental, characterized by severe winters and warm summers. Average rainfall is 30 inches, with 43 inches of total snowfall occurring on average. Kanabec County will have an average of 110 days per year with at least 1 inch of snow cover. The ground freezes about the first week in December and thaws during mid-April. The growing season is approximately 124 days (between frosts).

Annual average daily temperatures in Kanabec County range from 27-54 degrees Fahrenheit, with an annual average of 41 degrees Fahrenheit. Record high temperature reported July 23, 1934 (108 degrees) and record low reported on December 18, 1983 (-52 degrees) highlights the amount of temperature range in Kanabec County. Source: climate.umn.edu

Minnesota's climate, in conjunction with the lakes and forests, produce an ideal environment for recreational activities. The summer season during May-August with its warm days and cool nights attracts vacationers. The winter season with sufficient snowfall and low temps provides ideal conditions for snowmobiling and ice fishing to name a few activities.

Precipitation is measured and recorded by rainfall observers of the Minnesota Climatological Network. Administered by the Soil and Water Conservation District (SWCD), observers are required to record daily precipitation readings which are submitted to the Kanabec County SWCD on a monthly basis. Rainfall records developed by the rainfall observers are entered into a statewide database which provides information on precipitation amounts and precipitation patterns. There are approximately 14 official rainfall observers in Kanabec County.

3.5 Demographics

Kanabec County's current population characteristics are a result of early settlement patterns related to forestry, agriculture and railroad expansion. Total population of 15,996 (June 2014) is dispersed among 15 townships and the cities of Mora, Ogilvie, Grasston and Quamba (largest to smallest). The County's population increased approximately 20% in the last ten years, and up from 12,161 reported in 1980.

Within Kanabec County, older residents account for a larger percentage of the overall population compared to statewide averages. In 2010, individuals over the age of 65 made up 16.37% of Kanabec County's population versus the state's average of 12.88%. By 2030, the gap is expected to widen, with Kanabec County's 65+ population estimated at 24.21%, and Minnesota's 20.63%. The gap is noticeable, as is the increase in the percentage in both instances. The number of Kanabec County residents beyond 85 years also exceeds the statewide average (1.82% Kanabec, 2.01% statewide). Having a larger portion of the total population at an advanced age impacts the decisions related to how mitigation strategies are delivered.

Almost ninety-six percent (96%) of Kanabec County residents are white, 1.5% Hispanic and the remainder from other races. Kanabec County's median household income of \$47,058 falls well below the state average of \$60,702. Low income levels impact the ability of the county and its residents to respond adequately to hazards and disaster either on the mitigation side or the preparedness side. Kanabec's median age of 43 is older than Minnesota's 37 state-wide median.

Kanabec County residents predominately are English speaking. Language can be a significant barrier to communicating at time of emergencies. However, more than 97 percent of Kanabec County’s population speaks only English, with the remaining 3 percent speaking other languages.

Population growth trends have an important influence on the needs and demands of a variety of services such as transportation, law enforcement, and emergency response. An understanding of population trends and location of population concentrations is important for making projections regarding potential impacts in the event of a disaster.

Table 5. Kanabec County Population by Community

Community	2014 Population	Community	2014 Population
Comfort township	1,050	Ogilvie city	356
Ford township	186	Peace township	897
Grass Lake township	1,029	Pomroy township	415
Grasston city	159	Quamba city	113
Hay Brook township	237	South Fork township	785
Hillman township	430	Whited township	916
Kanabec township	937	Ann Lake township	436
Knife Lake township	1,152	Arthur township	1,815
Kroschel township	218	Brunswick township	1,312
Mora city	3,523	KANABEC COUNTY TOTAL	15,966

Source: Minnesota State Demographic Center, June 1, 2015

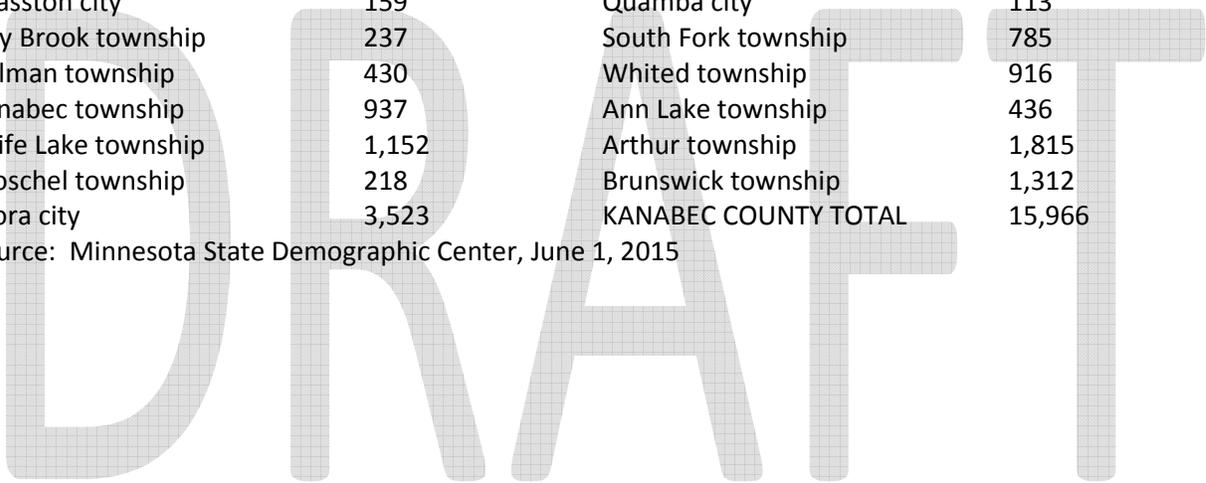
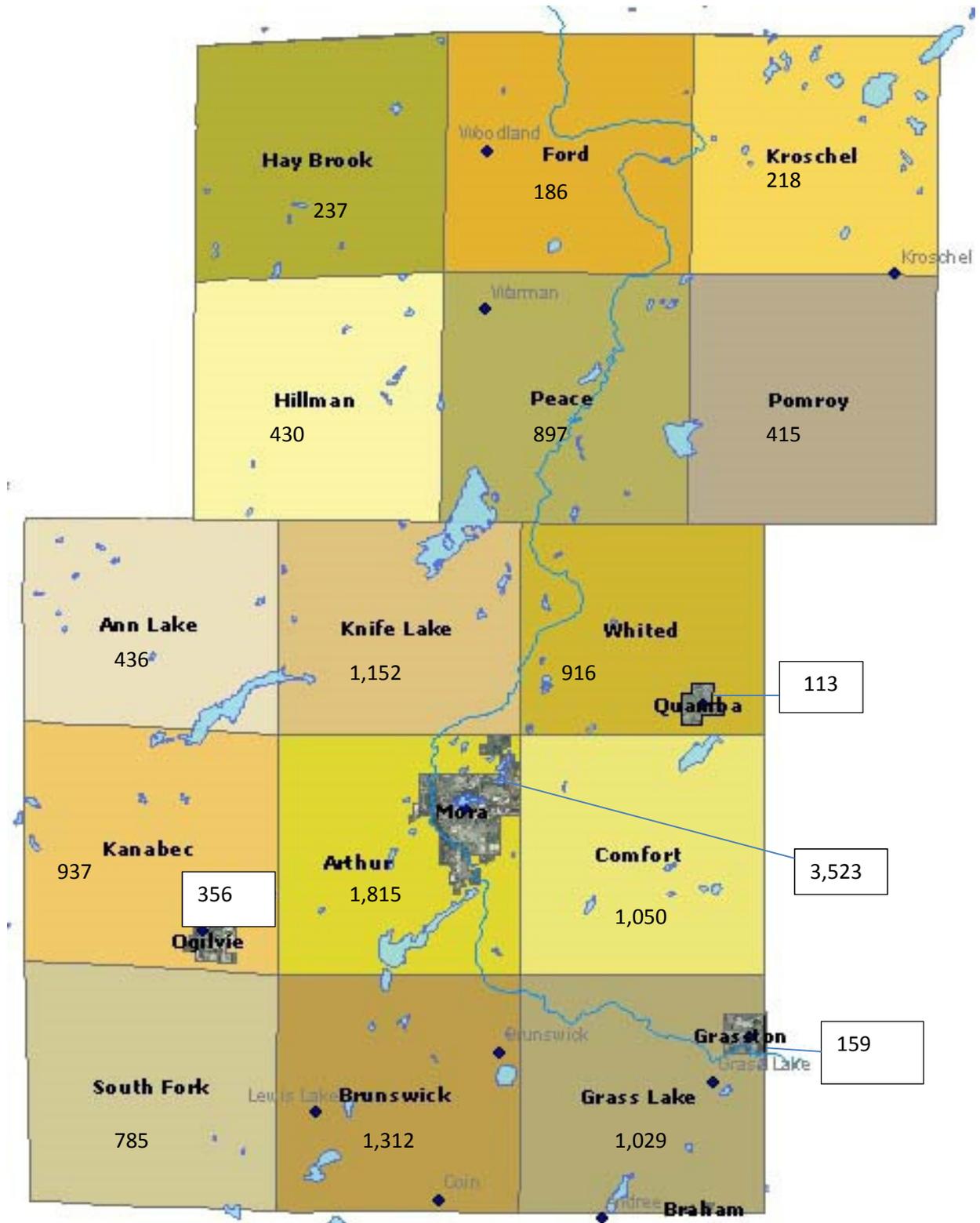


Figure 1. Kanabec County Population Map



3.6 Economy

Kanabec County in May 2015 held a 5.8% unemployment rate, down from 6.4% the previous year. Historically, Kanabec County reports a higher unemployment rate than its neighbors within east central Minnesota (Chisago 3.9, Isanti 3.9, Mille Lacs 5.2 and Pine 5.0), and well above the state’s average of 3.9% for the same time period.

Of all job sectors, Kanabec County’s employment comes primarily from the Education and Health Services and Government. Other sectors such as Mining and Logging; Construction; Manufacturing; Trade, Transportation, and Utilities; Information, Financial, Activities, Leisure and Hospitality and Other Services fill in the remainder.

Table 6. East Central Minnesota Jobs by Sector 2014

Job Sector	Number of Jobs	Percent of Jobs
Total, All Sectors	3,702	100.0%
Agriculture, Forestry, Fishing and Hunting	422	0.9%
Mining	27	0.1%
Construction	2,063	4.4%
Manufacturing	5,408	11.5%
Utilities	259	0.6%
Wholesale Trade	718	1.5%
Retail Trade	5,617	12.0%
Transportation and Warehousing	1,033	2.2%
Information	478	1.0%
Finance and Insurance	984	2.1%
Real Estate and Rental and Leasing	269	0.6%
Professional Technical Services	795	1.7%
Management of Companies	86	0.2%
Admin Support and Waste Management Services	1,127	2.4%
Educational Services	4,978	10.6%
Health Care and Social Assistance	9,824	20.9%
Arts, Entertainment and Recreation	2,514	5.4%
Accommodation and Food Services	5,211	11.1%
Other Services	1,327	2.8%
Public Administration	3,791	8.1%

Source: Minnesota Department of Employment and Economic Development

3.7 Kanabec County Community Services and Infrastructure

The following section provides an overview on community services and infrastructure within Kanabec County. Examples of community services include healthcare and public safety, while examples of community infrastructure include power utilities, water and sewer facilities, and the transportation network. Figure 2 below shows critical facilities in the county, and photos of facilities can be found in Appendix B.

Figure 2. Kanabec County Critical Facilities

Infrastructure	Mora	Grasston	Ogilvie	Quamba	Townships
School-Fairview Elementary	x				
School-Trailview Elementary	X				
School-Mora Jr-Sr High	X				
School-Ogilvie K-12			X		
Town Hall					X
Kanabec County Jail	X				
Kanabec County Courthouse	X				
Kanabec County Public Works	X				
Kanabec County Highway Dept.	X				
Kanabec County Public Health	X				
FirstLight Health System	X				
East Central Regional Library	X				
Fire Stations	X		X		
City Hall	X	X	X	X	
Water Tower	X	X	X	X	
Sewer Collection Facilities	X	X	X		
Electric Power Generating Plant	X				
Kanabec County Fairgrounds	X				
Kanabec History Center	X				
Engineered Polymer Plastics	X				
OlymPak	X				
Post Office	X	X	X		
Police Station			X		
Airport	X				
Grocery Store	X				
Long Term Care Facility	X				

3.7.1 Health Care Providers

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 Kanabec County. The existing facilities and equipment in the county are intended to address local needs and support regional needs. Kanabec County is considered a mutual aid county and provides and receives support from adjacent counties.

FirstLight Health System’s hospital and clinic serves Kanabec County from its campus in Mora. The county has three ambulance vehicles including a Regional Disaster Response Unit (RDRU). This specially stocked medical trailer is equipped with medical and trauma equipment by the Central Minnesota

Emergency Medical Services. Stored at FirstLight Health System, the RDRU would be put to use whenever a mass casualty incident or disaster occurs in a 10-county area of central Minnesota.

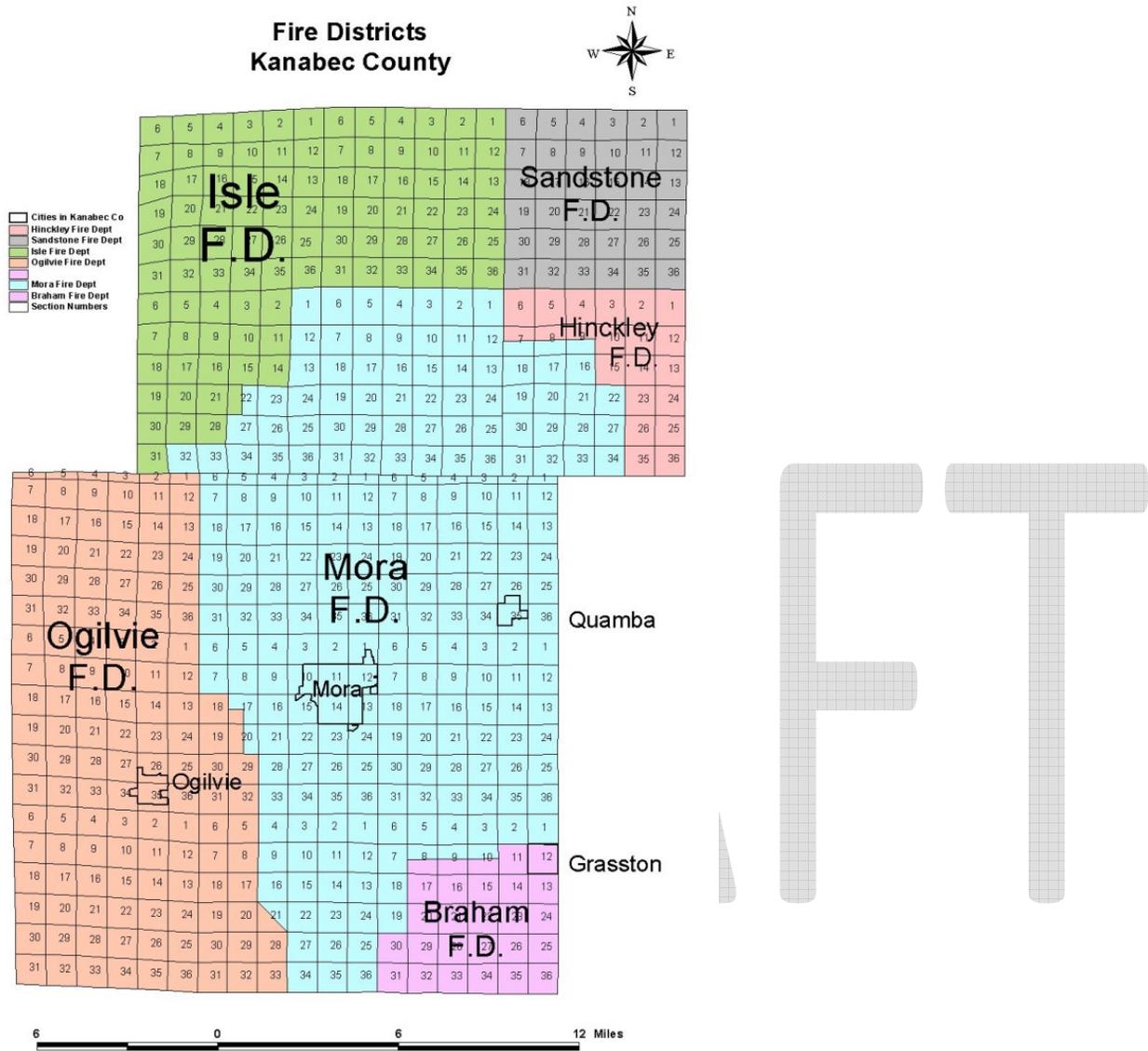
The community of Ogilvie has a team of First Responders trained and available.

3.7.2 Fire Services, Public Safety Providers and Government Services

There are no full-time fire departments in Kanabec County. All fire departments are volunteer-based with responsibilities being divided into six response zones (Braham, Isle, Hinckley, Mora, Ogilvie and Sandstone) as shown in Figure 3. All of the fire departments in Kanabec County have mutual aid agreements through the St. Croix Valley Fire Association.

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Figure 3. Fire Departments Serving Kanabec County



The Minnesota Department of Natural Resources (MN DNR) is responsible for fire protection on state forest and park land. The MN DNR works closely with local fire units for protection of these lands through contracting agreements. Both the U.S. Forest Service and the DNR work closely with local fire fighters whenever danger of woodland and urban fires is elevated.

DNR Forestry trains firefighters, monitors fire-related weather conditions, watches for fires through aerial surveillance, and develops plans for handling various wildfire situations. The 24/7 fire-fighter coverage includes three airport bases for water dropping air tankers. During fire season, helicopters with large water buckets are on alert throughout the state. Through the Minnesota Incident Command System (MNICS), an interagency partnership, the MN DNR participates in coordinated firefighting

efforts, dispatching personnel and equipment as needed. The MN DNR's Central Region office located in Cambridge is 25 miles from Mora.

Kanabec County's 911 Dispatch Center is located in the Kanabec County Law Enforcement Center

3.7.3 Utilities/Communications

East Central Energy provides electricity to most of Kanabec County. The City of Mora provides electrical service to their residences and businesses with power purchased from Southern Minnesota Municipal Power Agency (SMMPA). Mora also has a municipal electrical generation plant and is capable of providing backup electricity to the community when necessary. This plant also provides power to SMMPA's grid during periods of peak demand. Figure A-5 in Appendix A depicts Kanabec County utilities including power substations, electric transmission lines, and AM/FM radio towers.

There are three propane and natural gas services in Kanabec County: Beaudry Oil and Propane, Lakes Gas Company and Federated Propane.

The Allied Radio Matrix for Emergency Response (ARMER) Program, administered in coordination with the Minnesota Statewide Radio Board, manages the implementation of a 700/800 megahertz (MHz) shared digital trunked radio communication system. Kanabec County participates in the ARMER Program.

There are three types of wastewater treatment systems in Kanabec County, including public sewer systems (cities of Mora and Ogilvie) operated by municipalities and sanitary districts, community systems operated by homeowner associations, and individual sewage treatment systems.

The cities of Mora and Ogilvie both have municipal water systems serving their communities. The Cities of Mora, Ogilvie, and Grasston also have sanitary sewer collection and treatment systems. The residents of the City of Quamba are now connected to the Mora water supply and wastewater disposal.

Telecommunication & Internet

Cable television service is provided by US Cable. Telephone/internet/satellite companies include Century Link, AT&T, Northstar Access, Verizon, Genesis Wireless, Charter Communications, US Cable, Midcontinent, Dish, and Direct TV.

3.7.4 Transportation

Kanabec County's transportation system is composed of state highways, county roads, airports, public transit, railroads and others. This system is designed to serve all residents, businesses, agriculture, and tourism.

Roads

Kanabec County has 815 miles of roads. State trunk highways, TH23, TH65, and TH 47 traverse the county and total 98.3 miles. These are the major routes. State Trunk Hwy 65 which routes north-south through the county for about 30 miles; MN 23 routes a northeast-southwest direction for approximately 19 miles. A major traffic choke point is located at the intersections of MN 65 and MN 23 in Mora. State

Trunk Hwy 47 cuts through the county in a north-south direction for approximately 28 miles. The Minnesota Department of Transportation (MnDOT) manages these roads. In addition, Kanabec County Highway Department manages county state-aid highways totaling 211.9 miles and the mile county road system of 211.4 miles. The remaining county roadways are under the jurisdiction of cities (27.2 miles) and townships (266 miles). County roads are generally numbered 1-100, while county state-aid highways are numbered 1-30.

There are 93 bridge structures in the county including bridges maintained by MnDOT on state roadways. The remaining bridges are the direct or indirect responsibility of the County Highway Department. Most of these bridges are on the county road system. The county is responsible for the annual inspections, maintenance, administration, repair and replacement of these bridges. Safety inspections and replacement construction of bridge on town roads and city streets fall to those jurisdictions.

Rail

One rail line goes through Kanabec County on a route to Duluth. Five miles of track exist in the county near Grasston. Most of the trains going through the county are operated by BNSF. There was a 44-car derailment of iron ore on this line close to the Kanabec County border north of Grasston in 2005. No injuries were sustained.

Transit

Timber Trails Public Transit operates throughout the county. Other public transportation systems bringing riders into Kanabec County include Arrowhead Transit and Chisago-Isanti Heartland Express. Attaboy Taxi serves Kanabec County and surrounding areas.

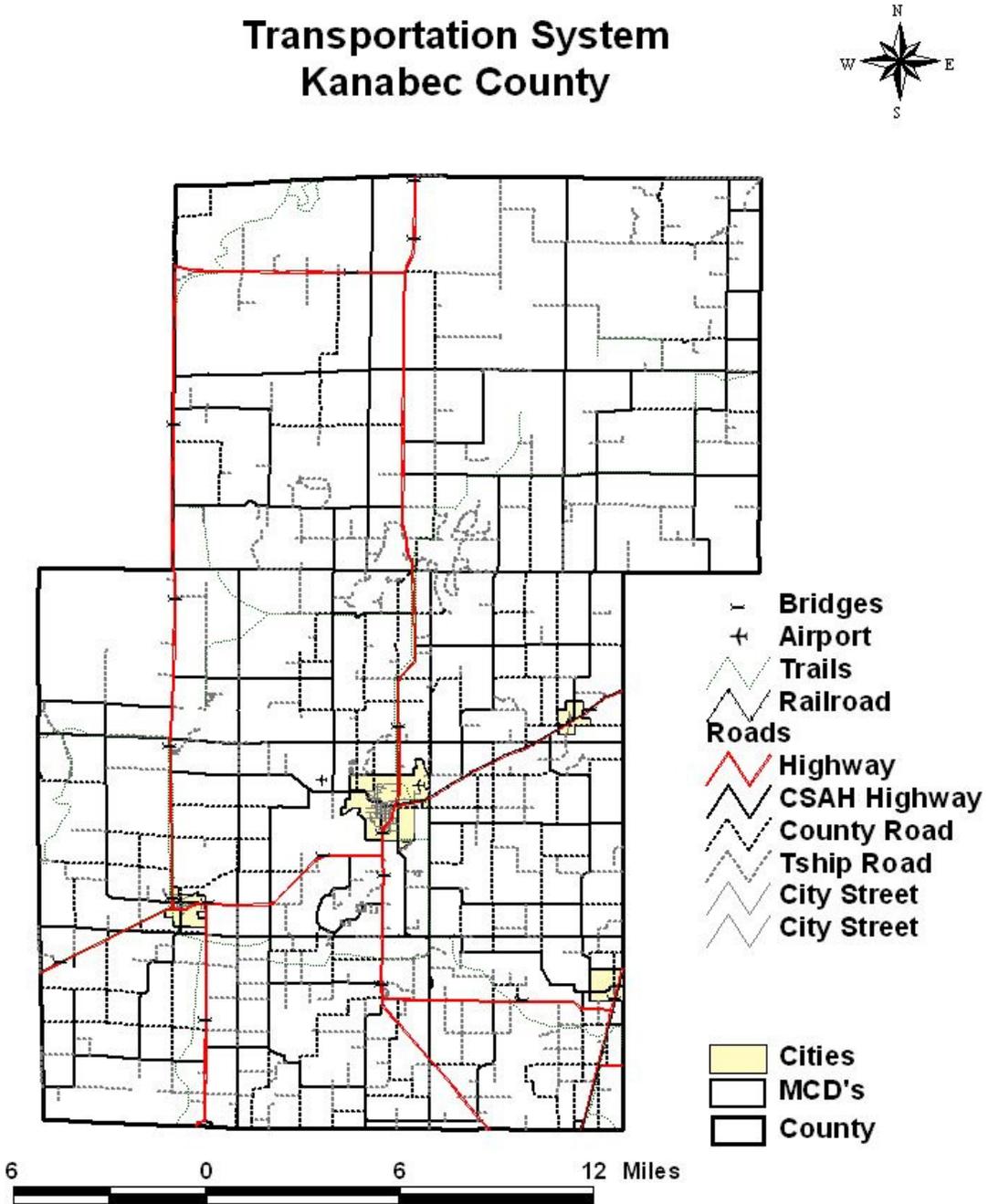
Trails

The City of Mora developed a local trail system, including a short bike trail. There are no off-road state bike trails in Kanabec County; bicyclists use county and state roads as their bicycle routes.

Air Transportation

The county's only airport—Mora Regional Airport, located on the east side of the city is adjacent to the industrial park. With a runway of 4,800 feet, it serves business and recreational flyers primarily for Kanabec County. An arrival/departure building is available for those using the airport. The airport is capable of accommodating small aircraft, including small jets. There is a fuel pump on-site, dispensing 100 octane airplane fuel and jet fuel. Figure 4 shows transportation routes in Kanabec County.

Figure 4. Kanabec County Transportation System

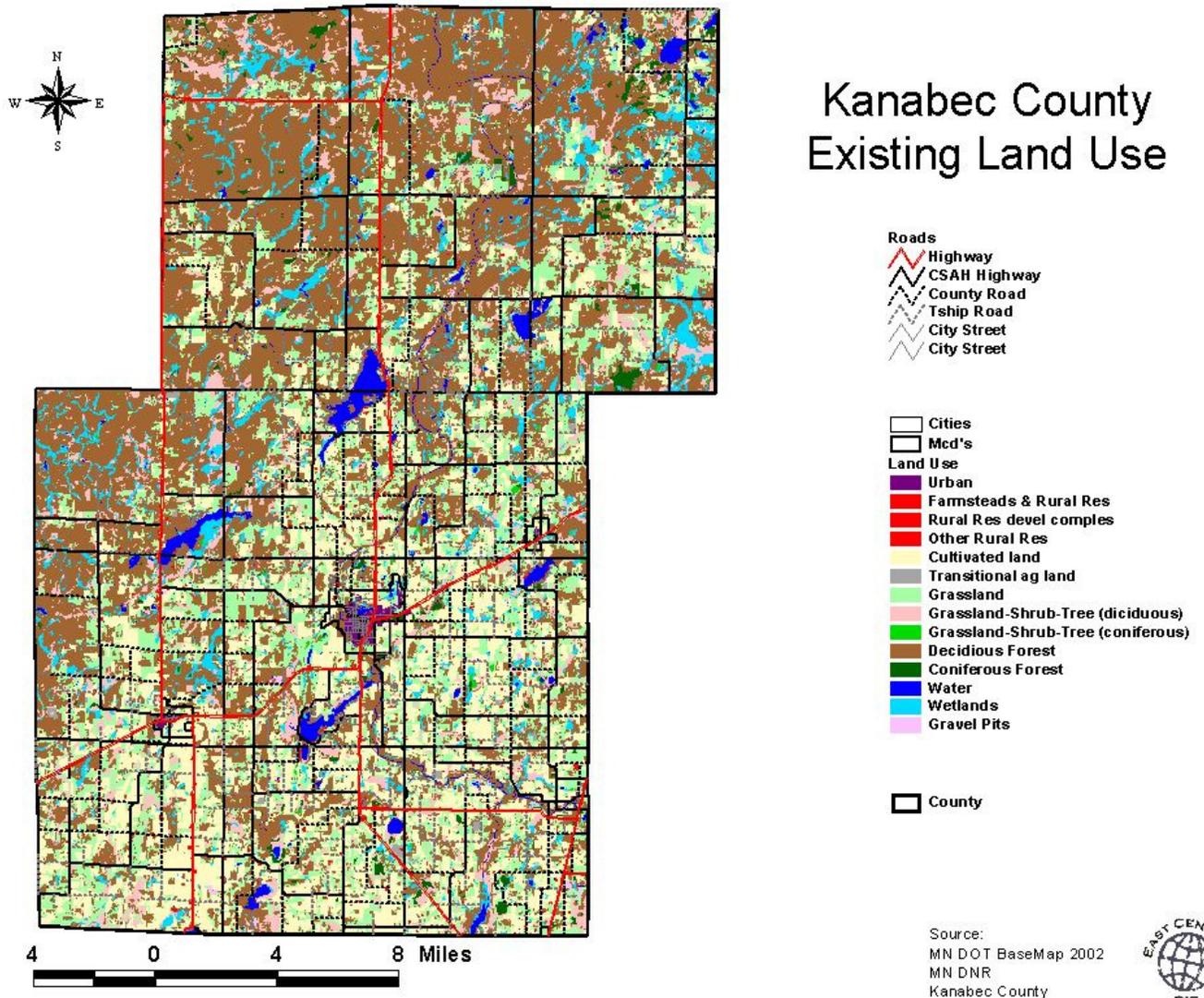


3.8 Land Use and Ownership

Kanabec County is located in east central Minnesota. Mora the county seat is located in the south central part of the County, and is approximately 60 miles north of the Minneapolis/St. Paul Metropolitan area. The County has a total of approximately 339,000 acres. Forestland, grassland and wetlands comprise Kanabec County. The entire county is considered “rural” for most program definitions.

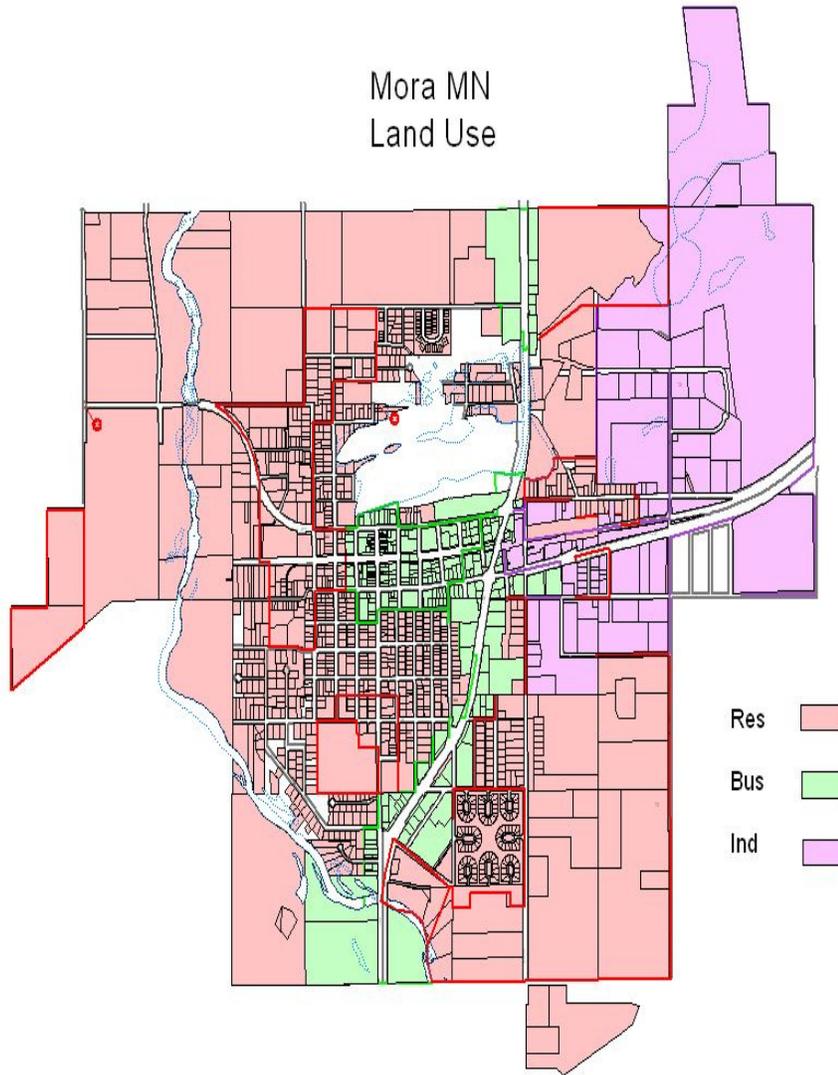
According to the 2012 U.S. Census of Agriculture 648 farms exist in the county, covering 128,790 acres. The estimated market value of land and buildings per acre is \$2,295. Total cropland is 567 acres with the remaining acres classified as woodland, pasture, or other. The total number of farms in Kanabec County continues to decrease. Figure 5 reflects current land uses in Kanabec County. Figures 6, 7, 8, and 9 depict land use in the cities of Mora, Ogilvie, Quamba, and Grasston respectively.

Figure 5. Kanabec County Land Use



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Figure 6. Mora Existing Land Use



Source: Mora Comprehensive Plan

Figure 7. Ogilvie Existing Land Use

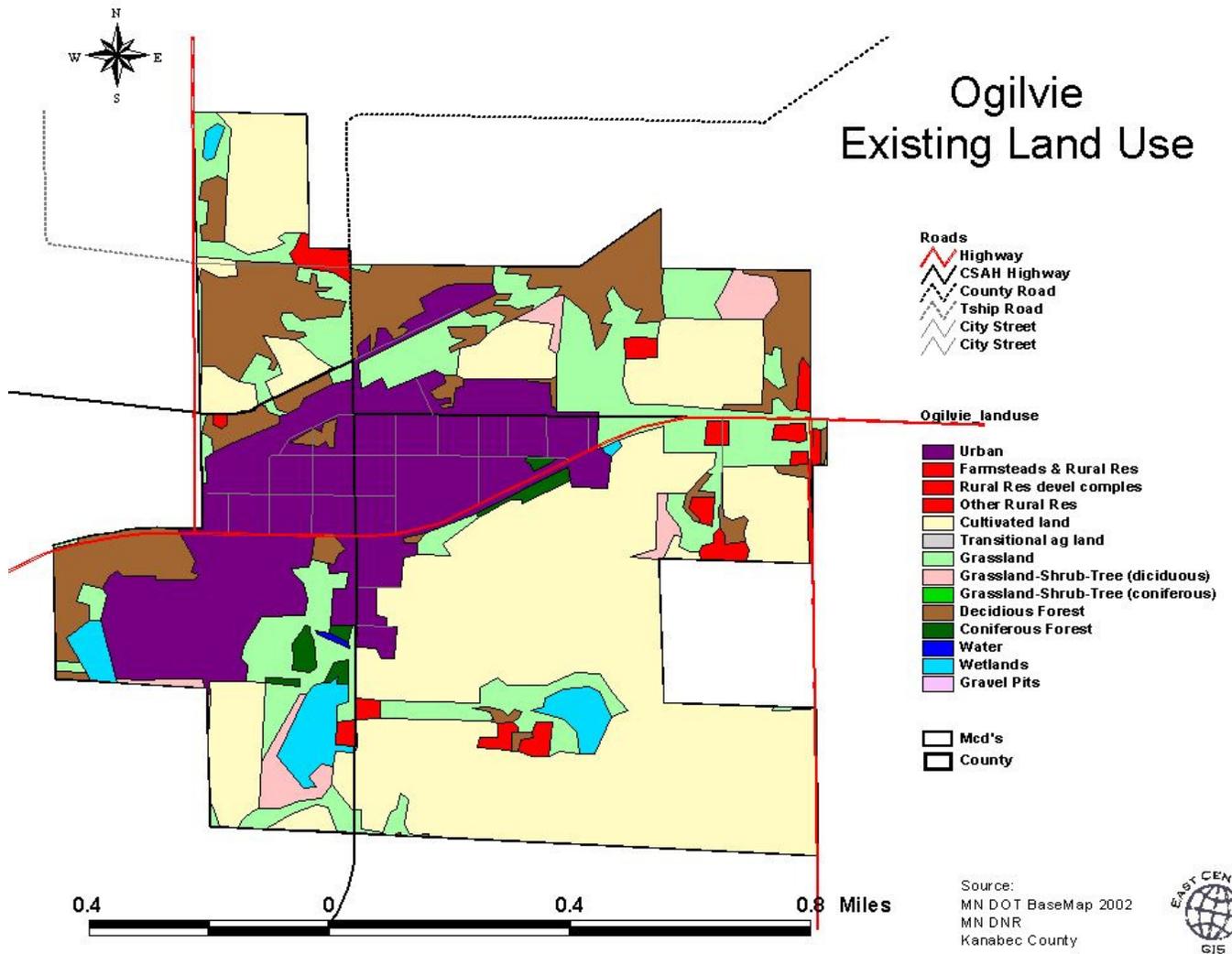


Figure 8. Quamba Existing Land Use

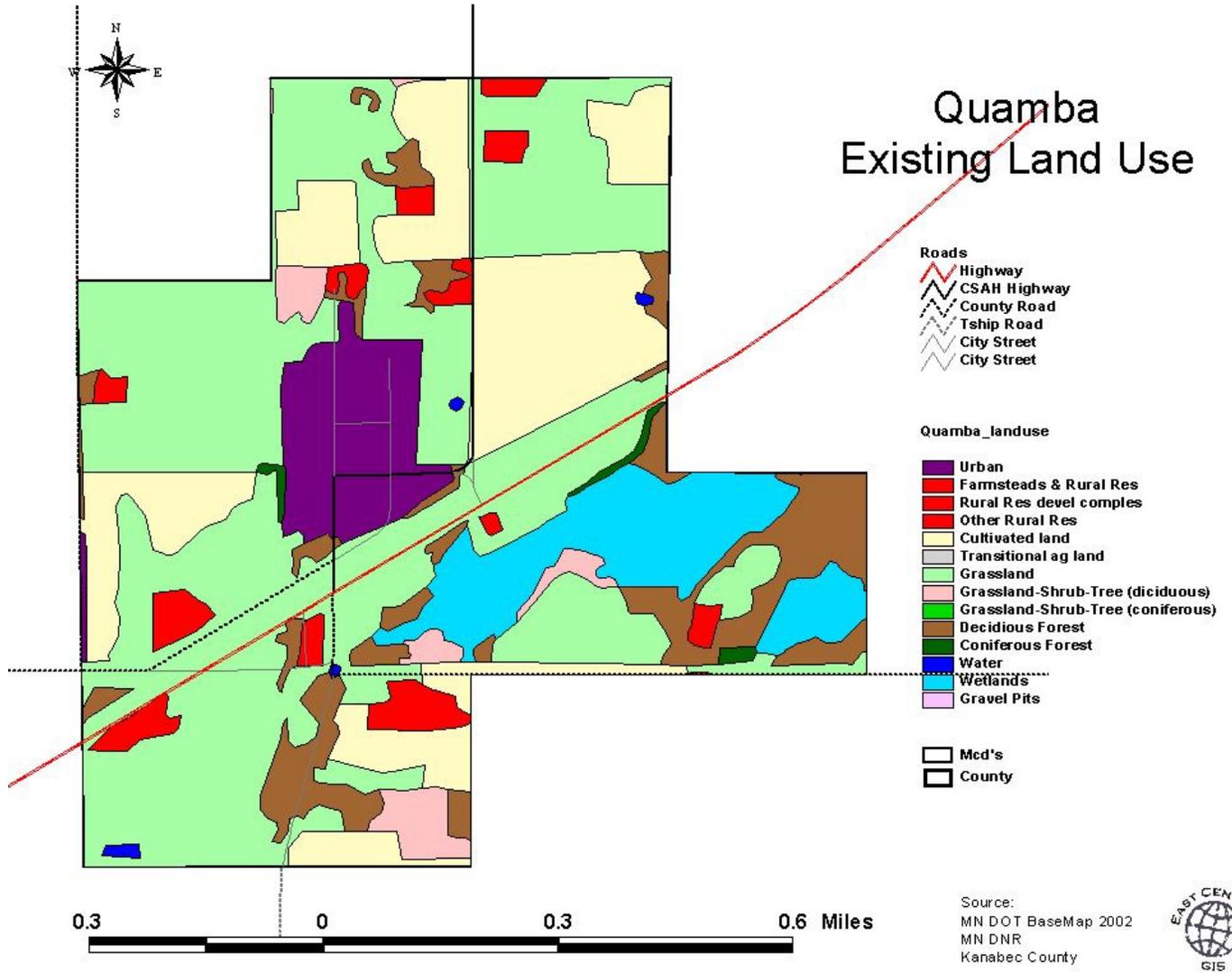
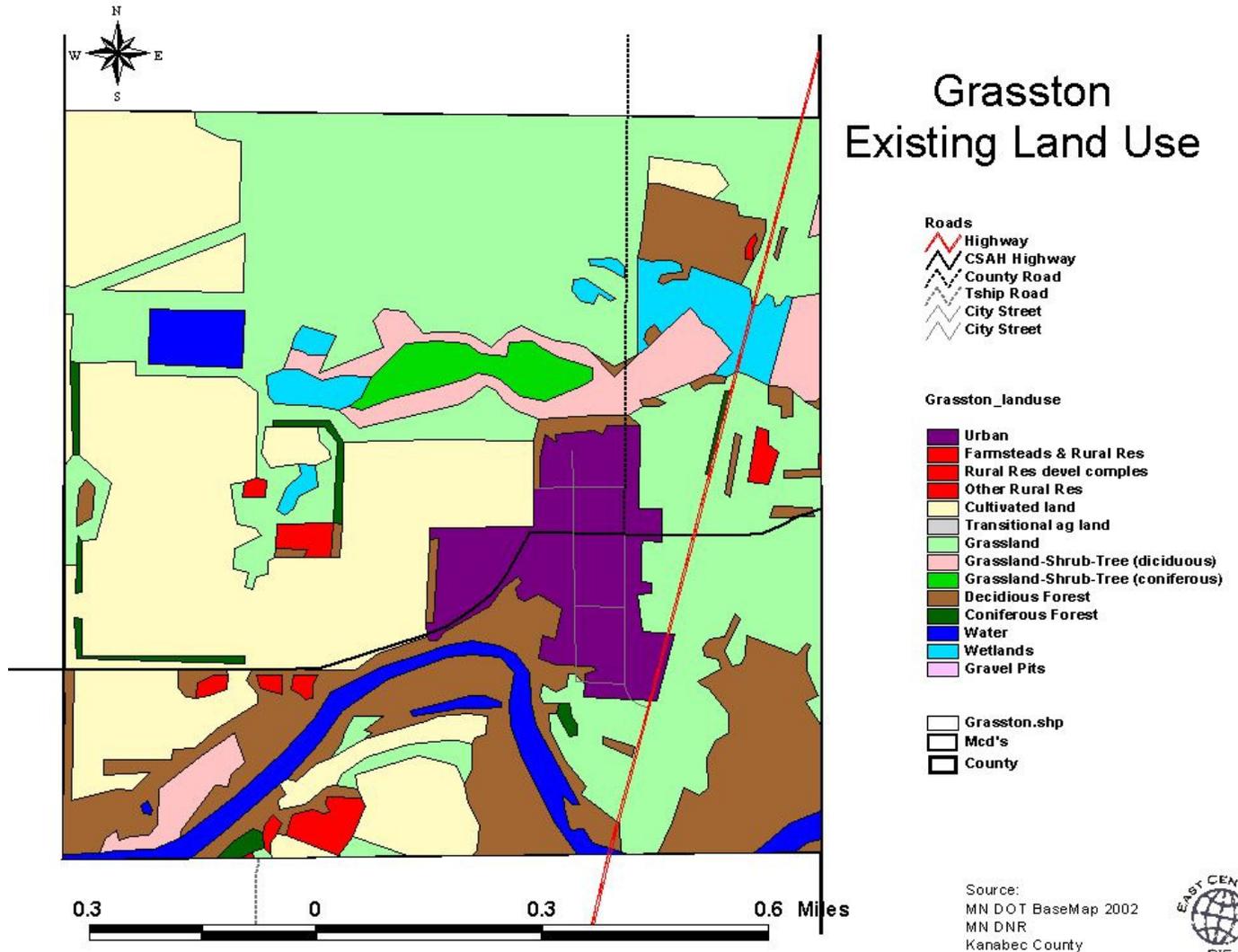


Figure 9. Grasston Existing Land Use





SECTION 4-RISK ASSESSMENT

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.

Basing risk assessments on the best information available is important in developing effective mitigation actions that benefit communities. Geographic Information System (GIS) tools are not only helpful in producing maps but they also show structures at risk and may determine damage estimates for potential hazard scenarios. MN Homeland Security and Emergency Management (HSEM) mitigation staff encourages the use of GIS tools in risk assessments because they produce good information to be used in the risk assessment process.

4.1 Hazard Identification/Profile

4.1.1 Hazard Identification

The cornerstone of the risk assessment is identification of the hazards that affect the jurisdictions. To facilitate the planning process, several sources were used to ensure that natural hazards were identified prior to assessment.

The County maintenance of the plan includes continual updates of the hazards identified in the initial plan. The mitigation planning team compared the hazards in the initial plan to the current publications to determine if new hazards should be considered or if some should be deleted.

Natural hazards are identified in the FEMA publication “Multi-Hazard Identification and Risk Assessment—A Cornerstone of the National Mitigation Strategy” also known as MHIRA. FEMA developed a Region V list based on state plans in the region. The list was divided into natural (Table 7) and other hazards (Table 8) as was done in the 2014 Minnesota State Hazard Mitigation Plan.

Table 7. FEMA MHIRA Natural Hazards-2014 Minnesota State Hazard Mitigation Plan

Flooding	Hail	Drought
Dam/Levee Failure	Lightning	Extreme Heat
Wildfire*	Winter Storms	Extreme Cold
Wind Storms	Erosion	Earthquakes
Tornadoes	Land Subsidence (Sinkholes, Karst)	

*Addressed in the State Mitigation Plan because Minnesota is a heavily forested state compared to other states in Region V.

For the purpose of this plan, FEMA defines other hazards or “man-made hazards” as technological hazards and terrorism. These are distinct from natural hazards primarily in that they originate from human activity. In contrast, while the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human-induced. The term “technological hazards” refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. This guidance assumes that technological emergencies are accidental and that their aftermath are unintended. The term “terrorism” refers to intentional, criminal, and malicious acts. There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. For the purposes of this plan, FEMA refers to “terrorism” as the use of Weapons of Mass Destruction (WMD), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and “cyber terrorism”.

Table 8. FEMA MHIRA Other Hazards-2014 Minnesota State Hazard Mitigation Plan

Terrorism	Nuclear Generating Plant Incidents
Infectious Disease Outbreak	Hazardous Materials Incidents
Transportation Incidents	Fires (Structures and Vehicles)
Ground and Surface Water Supply Contamination*	

*Addressed in the State Hazard Mitigation Plan because Minnesota has made a high investment in its water resources.

4.1.2 Vulnerability Assessment

The committee met several times to review and update the hazards faced by residents of Kanabec County, update the existing mitigation actions included in the previous Hazard Mitigation Plan, and propose new mitigation actions.

To engage in this process the committee drew on a number of resources. First, they examined the hazards identified in the previous Kanabec County Hazard Mitigation Plan (Table 9), and then the existing mitigation actions were discussed and adjusted to reflect the definitions of natural hazards used in the State of Minnesota 2014 Multi-Hazard Identification and Risk Assessment list of natural hazards (Table 10). This was done in order to assure that the risks faced by Kanabec County were categorized the same way as the priority hazards established by the State of Minnesota.

Table 9. Hazards identified in the 2008 Kanabec County Multi-Hazard Mitigation Plan

Natural	Wildfire, Flood, Violent Storms, Extreme Temperatures, Drought, Infectious Disease
Non-Natural	Fire, Hazardous Materials, Water Supply Contamination, Terrorism

While the MHMP mainly deals with natural hazards, this planning took place with the understanding that many non-natural hazards could occur as a result of natural disasters (i.e. disruption in electrical service due to freezing rain causing problems for both utility corporations and those vulnerable populations dependent on electricity for heat).

Based on the comparison of these sets of hazards, a list of hazards faced by Kanabec County was developed for the purpose of this plan that will focus primarily on natural hazards because there are other plans in place by Kanabec County (such as THIRA—see Table 10) which serve as the primary planning documents to address non-natural hazards. The THIRA results and its prioritization of the natural hazards are used in the plan. The THIRA ranked hazards based on a Calculated Priority Risk Index, or CPRI.

Table 10. Kanabec County Natural Hazards as defined by FEMA MHIRA

Severe Winter Storms	Tornadoes	Dam Failure	Thunderstorms
Extreme Cold	Drought	Lightning	Extreme Heat
Hailstorms	Flash Flood	Windstorms	River Flood

4.1.3 Calculated Priority Risk Index

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends and intersecting them with the hazard profiles to assess the potential amount of damage that could be caused by each hazard event. This concept is illustrated in Figure 10. Along with a summary of Calculated Priority Risk Index (CPRI) Categories and Risk Levels shown in Table 11.

Figure 10. CPRI Vulnerability Analysis

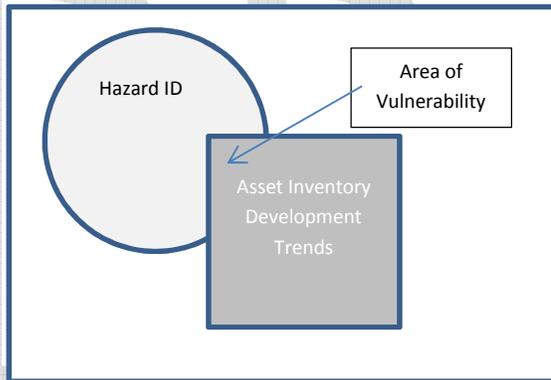


Table 11. Summary of Calculated Priority Risk Index (CPRI) Definitions, Categories and Risk Levels

Probability A guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.

Magnitude/Severity Indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability assessment gives information that is helpful in making this determination for each community.

Warning Time Plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.

Duration Relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

CPRI Category	Level ID	Degree of Risk Description	Index Value	Assigned Weighting Factor
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001.	1	45%
	Possible	Rare occurrences with at least one documented or anecdotal history event. Annual probability at is between 0.01 and 0.001.	2	
	Likely	Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability that is greater than 0.1	4	
Magnitude/ Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (Greater than 5% and less than 25% of critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	

	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hrs	Self-explanatory.	4	15%
	6-12 hrs	Self-explanatory.	3	
	12-24 hrs	Self-explanatory.	2	
	More than 24 hrs	Self-explanatory.	1	
Duration	Less than 6 hrs	Self-Explanatory.	1	10%
	Less than 24 hrs	Self-Explanatory.	2	
	Less than 1 wk	Self-Explanatory.	3	
	More than 1 wk	Self-Explanatory.	4	

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In 2011 President Obama issued Presidential Policy Directive Eight on the subject of national preparedness. The directive aimed at strengthening the security and resilience of the United States through a systematic preparation for the threats that pose the greatest risk to the security of the nation.

Through the “Threat and Hazard Identification and Risk Assessment” or THIRA, Kanabec County undertook a process by which they gained knowledge of the risks facing the county, allowing Kanabec County to make informed decisions about how to manage risk and develop needed capabilities. Components of the THIRA exist in this plan where appropriate. The following prioritized list of hazards is presented in Table 12 and is based on the ranking of hazards in the Kanabec County THIRA.

Table 12. THIRA Priorities of Risks Faced by Kanabec County

Severe Risk	High Risk	Moderate Risk	Low Risk
None	Tornado	Extreme Temperature Variance (Hot/Cold)	Solar Storm
	Straight-line Winds	Major Winter Storm	
		Flash Flood	
		Ice Storm	
		Dam/Levee Failure	
		Wildfire	
		Drought	
		Slow Flood	
		Water Contamination	
		Earthquake	

4.1.4 Hazard Profiling Concept of Planning

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment contains three components—hazard identification, risk profile, and vulnerability profile. The last step is the risk ranking for each jurisdiction. All jurisdictions in Kanabec County used the same ranking of hazards.

4.1.5 National Climatic Data Center (NCDC) Records

Historical storm event data was compiled from the National Climatic Data Center (NCDC). NCDC records are estimates of damage reported to the National Weather Service (NWS) from various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

The NCDC data included 230 reported events in Kanabec County between June 10, 1968 and July 31, 2015. A summary table of events related to each hazard type is included in the hazard profile sections that follow. A full table listing all events, including additional details, is included in Appendix C. NCDC hazard categories used in this plan are listed in Table 13.

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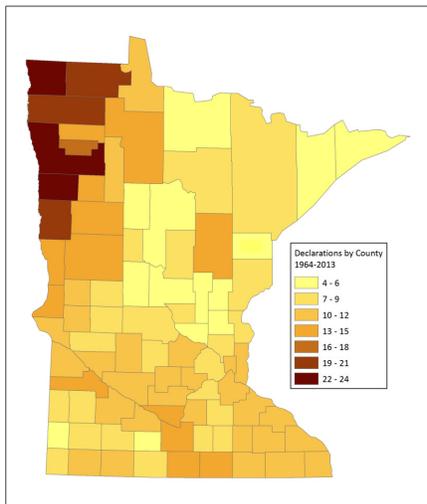
Table 13. National Climatic Data Center Historical Hazards

Tornadoes	Lightning	Thunderstorm Wind	Hail	Flood/Flash Flood
Blizzard	Extreme/Cold/Wind Chill	Heavy Snow	High/Strong Wind	Winter Storm
Funnel Cloud	Heat	Dense Fog	Heavy Rain	Frost/Freeze

4.1.6 FEMA Declared Disasters

Another historical perspective is derived from FEMA-declared disasters. Since 1957, FEMA has issued 53 major disaster declarations in the State of Minnesota. Four federal declarations in Kanabec County have been made since 1957, shown in Figure 11.

Figure 11. FEMA Major Declarations by County 1964-2015



Tables 13-16 show the details of the disasters events and property damage as a way of assessing risk.

Table 14. Kanabec County Risk Estimation for Flood

Flood Loss Estimation

Pre-FIRM Residential	Governmental	Commercial	% Flood-Prone (Residential)	Total Pre-FIRM Residential Units (Including Mobile Homes)	Average Residential Home Value	Total Estimated Loss (2' Flood Depth)
376	0	5	5%	5,369	\$99,880	\$7,508,139

Manufactured Housing		Non-Engineered Wood Frame		Combined	
Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk
\$197,224	\$2,447,552	\$1,411,145	\$17,512,304	\$1,608,369	\$19,959,857

Table 15. Kanabec County Risk Estimation for Tornado

Tornado Loss Estimation

Manufactured Housing		Non-Engineered Wood Frame		Combined			
Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk		
\$2,416	\$29,982	\$28,295	\$351,141	\$30,711	\$381,123		
# of Tornadoes	Total Damages	Average Damage per Tornado	Annual Probability	Estimated Future Annual Loss			
10	\$325,000	\$32,500	.1764	\$5,701			
# Injuries	Annual Probability of an Injury	Estimated Annual Loss (Injury)	# Deaths	Annual Probability of a death	Estimated Annual Loss (Death)	Estimated Annual Loss (Property Damage)	Estimated Annual Loss Total (Injury, Death, & Property)
2	.035	\$262	1	.0175	\$52,500	\$5,701	\$58,463

Table 16. Kanabec County Risk Estimation for Windstorm

Windstorm Loss Estimation

Manufactured Housing		Non-Engineered Wood Frame		Combined	
Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk
\$345,241	\$4,284,440	\$2,822,338	\$35,025,220	\$3,167,579	\$39,309,660
# of Wind Events	Total Damages	Avg Damage/Event	Annual Probability	Estimated Annual Loss	

30	\$0	\$0	0.53		\$0	
# Injuries	Annual Probability of an Injury	Estimate of Annual Loss (Injury)	# Deaths	Estimate of Annual Loss (Death)	Estimate of Annual Loss (Property)	Estimated Annual Loss (Injury+Death+Property) Damage
1	0.0175	\$131	0	\$0	\$0	\$131

Table 17. Kanabec County Risk Estimation for Wildfire

Wildfire Risk Estimation

Manufactured Housing		Non-Engineered Wood Frame		Combined	
Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk	Total Annual Damage	Total Future Risk
\$6,137	\$76,152	\$87,811	\$1,089,738	\$93,948	\$1,165,890

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4.2 Vulnerability Assessment

4.2.1 Asset Inventory

Critical facilities are defined by the Department of Homeland Security in the Automated Critical Asset Management System (ACAMS). Kanabec County has used the 18 sectors included in ACAMS to identify their critical infrastructure and key resources. Names and photographs of Kanabec County's critical facilities are found in Appendix B. Figure 12 below maps the critical facilities in Mora, while Figure 13 depicts critical facilities in Ogilvie. Figure 14 maps infrastructure of Kanabec County.

Figure 12. Critical Facilities Map-Mora

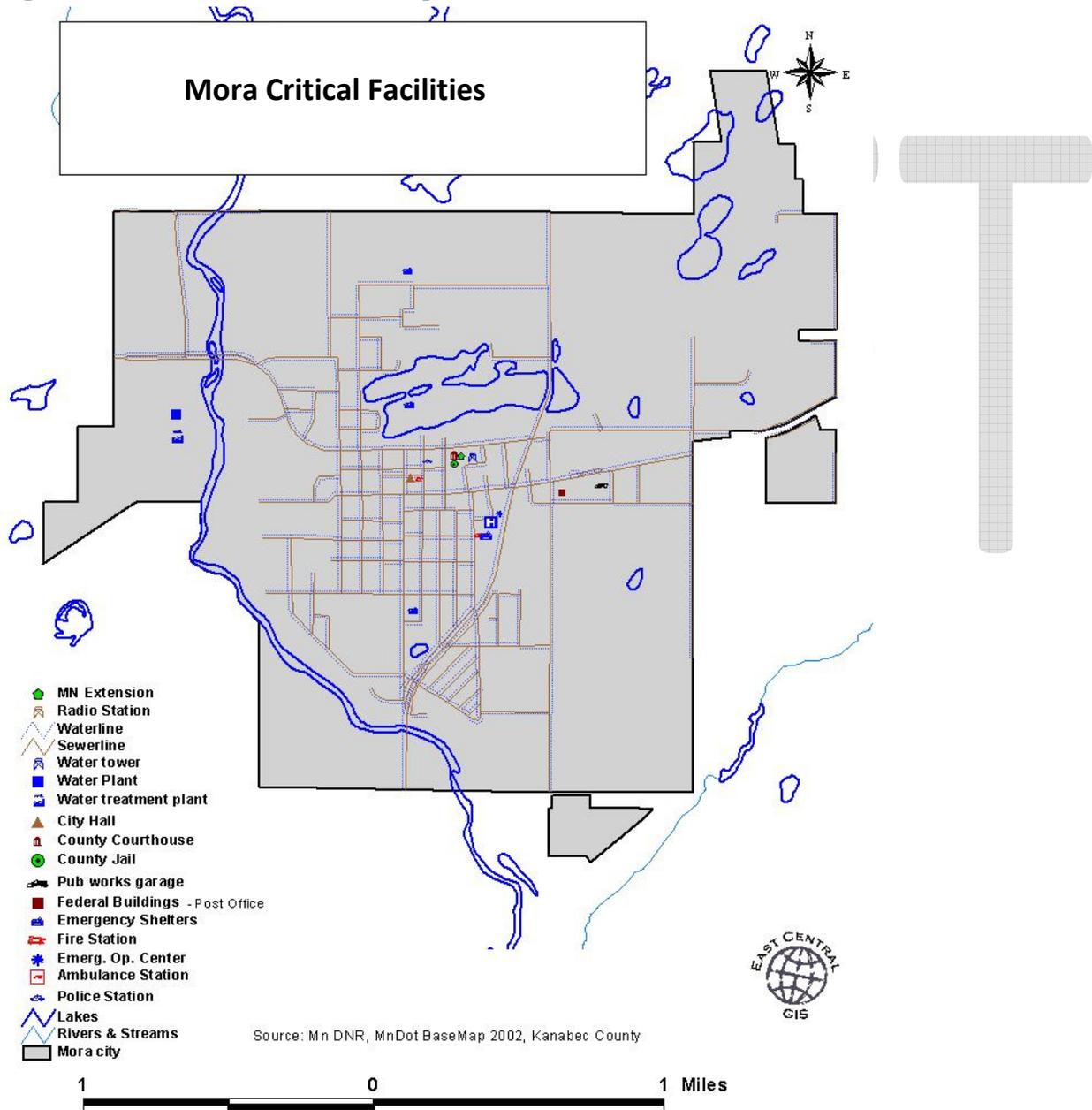


Figure 13. Critical Facilities Map-Ogilvie

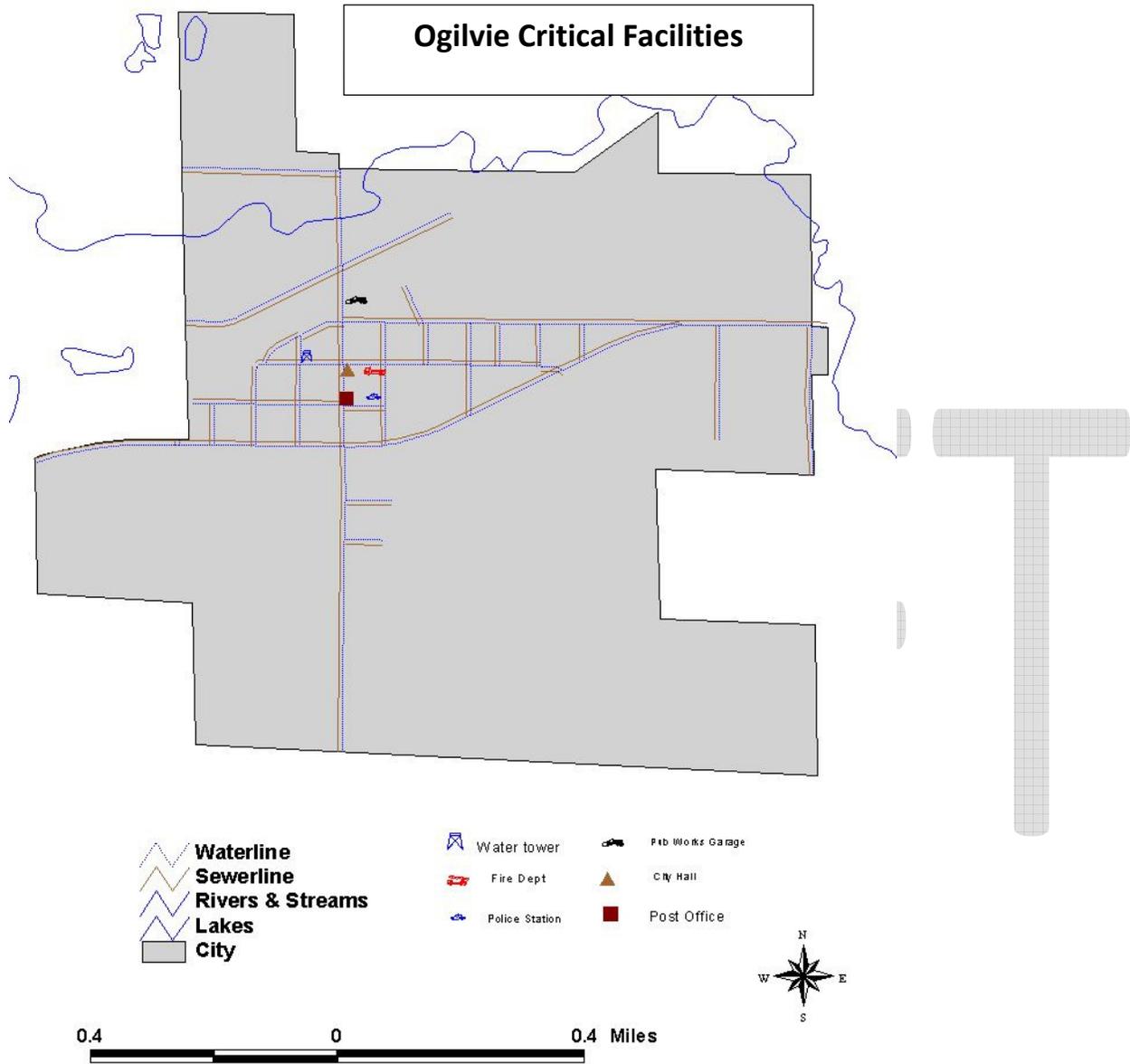
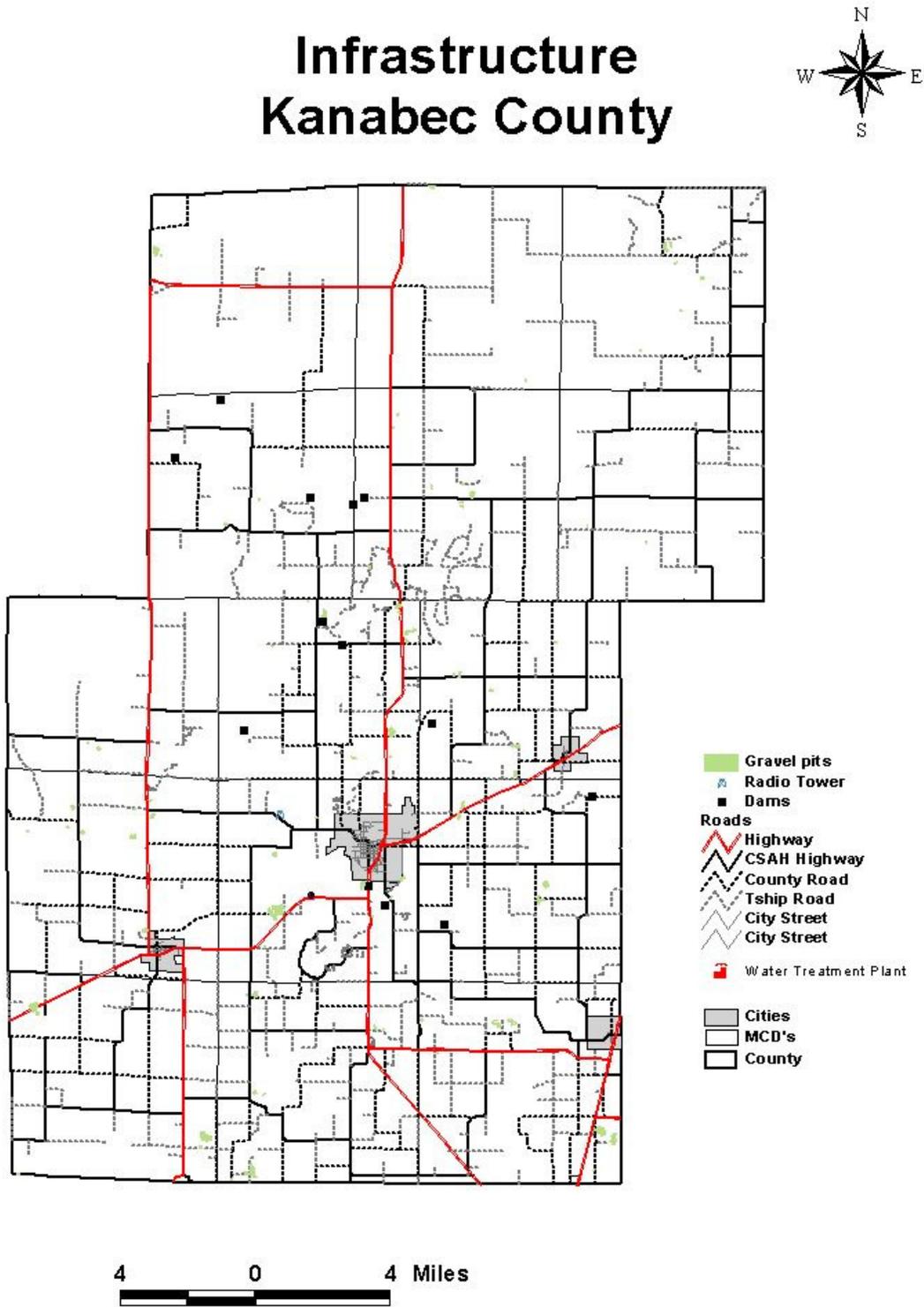


Figure 14. Kanabec County Infrastructure



4.3 Future Development

Because Kanabec County is vulnerable to a variety of natural and technological hazards, the county government, in partnership with state government, must make a commitment to prepare for the management of these types of events. Kanabec County is committed to ensuring that county elected and appointed officials become informed leaders regarding community hazards so that they are better prepared to set and direct policies for emergency management and county response.

The Kanabec County Emergency Manager will work to keep the jurisdictions covered by the Multi-Hazard Mitigation Plan engaged and informed during the plan's 5 year planning cycle. By keeping jurisdictional leaders actively involved in the monitoring, evaluation and update of the MHMP, they will keep their local governments aware of the hazards that face their communities and how to mitigate those hazards through planning and project implementation. Each jurisdiction has identified mitigation strategies that they will seek to implement in their communities (see Appendix H: Mitigation Actions by Jurisdiction). Jurisdictions will include considerations for hazard mitigation in relation to future development when updating local comprehensive plans or other plans that may influence such development.

4.4 Hazard Profiles

4.4.1 Wildfire

A wildfire is an uncontrolled fire spreading 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. Information on current wildfire conditions and burning restrictions can be found at <http://www.dnr.state.mn.us/forestry/fire>

While some wildfires start by natural causes like lightning, humans cause four out of every five wildfires. Debris burns, arson or 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 main danger from wildfires is the destruction of timber, property, wildlife and injury/loss of life to people living in the affected area or using the area for recreational facilities.

Wildfires pose a risk in the entire county, due to the vast open areas and forested land. However, several townships have a higher probability. Topography is also important in determining wildfire potential, because it affects the movement of air and fire over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. Kanabec County is relatively flat.

Wildfire and Climate

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.

Temperatures are predicted to rise in the state, which could lead to more extreme heat events and associated wildfire risks. As Minnesota's climate changes, weather fluctuations between drought and extreme rain events and increasing temperatures will result in changes to forest composition and/or

distribution. The northern boreal forest may give way to more deciduous forests or grassland, with a period of dying or diseased trees during the transition. This weather fluctuation can lead to dry conditions that may cause increased fire risk in both grassland and forest environments.

Wildfire History in Kanabec County

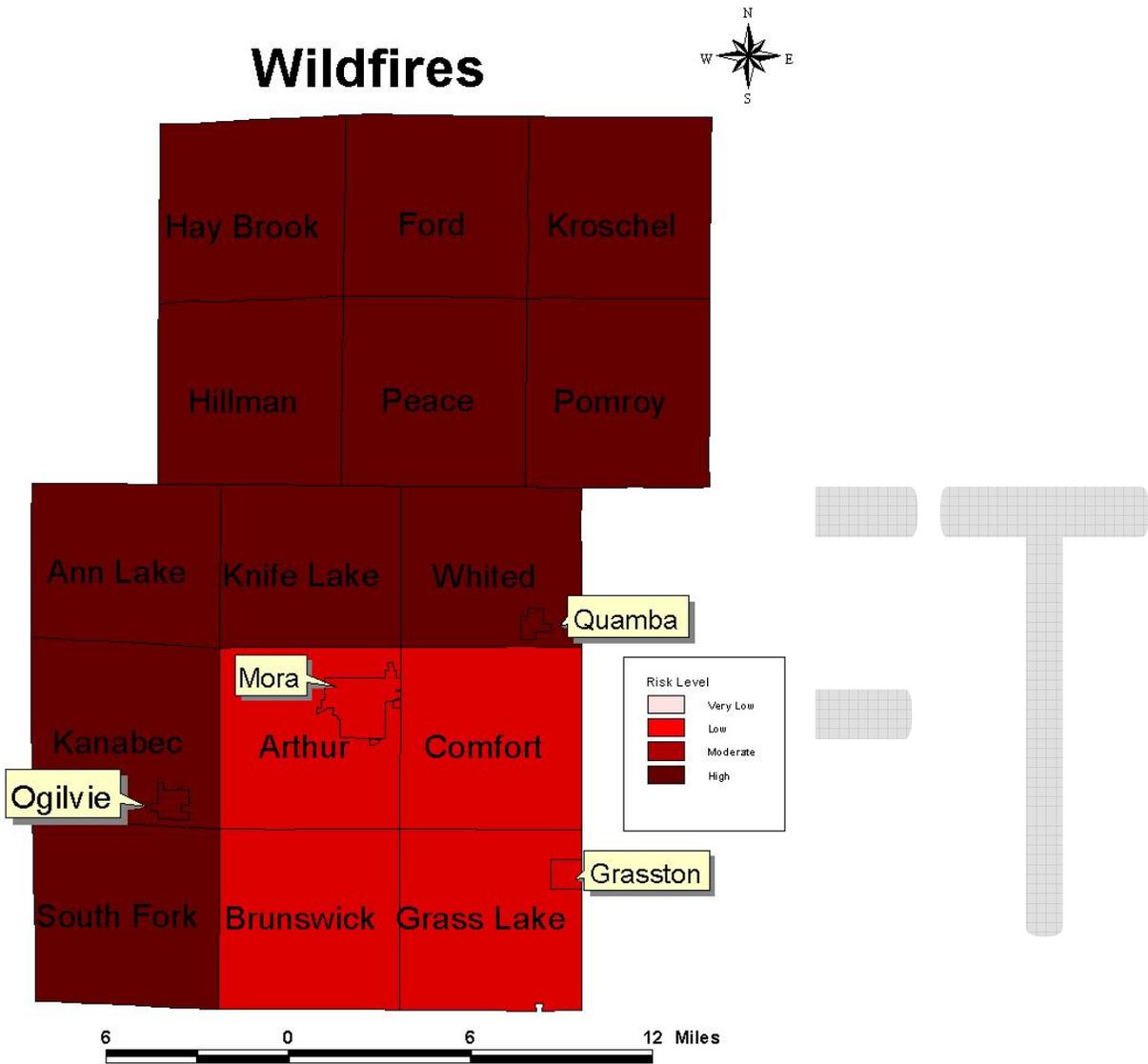
Wildfires can occur at random throughout the entire county, so most of the county's rural population is potentially at risk from wildfire. Most wildfires in the county have been small to moderately sized, and have caused minimal damage to housing. All townships within Kanabec County are served by local fire departments that are trained on fighting wildfire on a regular basis.

The impacts on commercial structures with Kanabec County are minimal in the rural townships. Most of the commercial structures throughout the county are located within cities, which have adequate fire departments for suppressing wildfires before they would impact the city. Past wildfires have had minimal impact on infrastructure, and current effects are also minimal.

According to the Minnesota State Fire Marshall fire incidents and dollar losses for Kanabec County are as follows for the years 2013 and 2014: total number of fire runs – 96; total other runs – 106; total dollar loss—\$3,199,408; average dollar loss per fire--\$41,135. Ten (10) civilian deaths due to fire in Kanabec County occurred from 1990 to 2014.

The Minnesota DNR reports that approximately 1,600 wildfires occurred in the state each year on average from 1976-2014 (DNR). Wildfires occur throughout the spring, summer, and fall, however, most wildfires in Minnesota take place in March, April, and May. During this period, much of the existing vegetation has been killed due to winter temperatures and is dead, brown, and combustible. Also, there is little green vegetation to serve as a barrier for a moving wildfire. Figure 15 reflects wildfire risk levels typical of Kanabec County.

Figure 15. Kanabec County Wildfire Risk Levels



Vulnerability

Although wildfires could occur anywhere throughout Kanabec County, there are several areas with a higher risk potential due to the amount of forest cover. While the probability of a wildfire occurring in certain areas is greater, there still is a relatively low concern because of the sparse population and lack of infrastructure in this area. The cities like Mora, Ogilvie, Grasston and Quamba have higher populations, larger housing stocks, and essential utilities. However, they also have fire departments which would minimize any damages caused by wildfires before they reach the city.

Relationship to other Hazards

Public Health – Air quality is adversely affected by wildfires. Wildfires can have adverse health impacts on people due to the associated smoke and air quality issues. People with respiratory problems are at risk.

Floods/Erosion – Floods combined with landslides or severe erosion in areas with steep terrain could occur if a large fire is followed by significant rainfall.

Plans and Programs in Place

Townships and cities have ordinances regulating driveways and access roads. Adequate space for access roads is critical for emergency response vehicles to be able to access a property to address issues related to wildfire.

Each year each fire department must do a self-assessment for the Insurance Service Organization (ISO) covering a wide review of department's assets and practices.

The MN DNR has primary fire responsibility for state-owned lands within Kanabec County. The MN DNR also contracts with most fire districts in the County to respond to wildfire.

Regulation of open burning and the use of burning permits has been an important tool in preventing wildfire in Minnesota. Burning permits are required by the MN DNR when the ground is not snow covered. Permits can be obtained from the MN DNR Forestry offices, fire wardens or purchased online. When risk of wildfire is very high, burning is not permitted.

Kanabec County is served by local fire districts and fire departments (Isle Fire Department, Sandstone Fire Department, Hinckley Fire Department, Ogilvie Fire Department, Braham Fire Department, and Mora Fire Department). Each district is responsible for wildfires within their district boundaries. These departments often work together on larger fires, including wildfires.

The Minnesota DNR participates in coordinated firefighting efforts, dispatching personnel and equipment as needed. There is a Central Region DNR Area Office located in Cambridge, Minnesota about 25 miles south of Mora, the Kanabec County Seat. In addition, local firefighters participate in annual wildfire training classes offered by the Minnesota Department of Natural Resources (DNR) Forestry Department. The DNR also works with local firefighters in promoting fire prevention programs involving local public schools. In addition, burning permits are issued DNR Fire Wardens. This system is used to regulate the hours and whether residents are allowed to burn or have a campfire.

The USDA Forest Service maintains the national Fire Plan that is updated annually for effective use of national resources to combat wildfires in the United States. Further information in the National Fire Plan can be found at www.fireplan.gov.

Wildfire conditions are monitored through the MN DNR Division of Forestry that collects weather data on a daily basis. The U.S. Forest Service' National Fire Danger Rating System combined with fire weather forecasts from the National Weather Service (NWS) are used to develop short-range guidelines for scheduling detection, equipment, and personnel.

The Minnesota Interagency Fire Center (MIFC), located in Grand Rapids, MN has the purpose to increase the efficiency and effectiveness of wildfire management by facilitating interagency exchange of fire resources, providing a common point for the collection and dissemination of fire intelligence and streamlining dispatch procedures. These responsibilities include assigning state firefighting crews, tracking resource orders and their distribution, and dispatching air tankers and helicopters to needed areas. Partners include the MN DNR, USFS, US Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs and the MN Department of Public Safety—Division of Homeland Security and Emergency Management. While firefighting is under local control of the ground crews and local DNR or Forest Service field command, the status of a fire is monitored constantly by the MIFC. If local resources do not contain the fire, the MIFC calls in more help from other stations in the region.

Program Gaps or Deficiencies

The Kanabec County Comprehensive Plan addresses growth management issues, but stops short by not having county wide zoning standards. Zoning happens at the township level. Approving zoning ordinances countywide could establish standardized building inspections, and could regulate the development of new housing. The department could be in charge of enforcing safety restrictions countywide including setbacks, lot coverage, depth, and structure height. With countywide subdivision standards it could regulate the size of driveways and access roads. Adequate space for access roads is critical for emergency response vehicles. This could assist in further protection against this hazard.

Vegetation in close proximity to a residence and heavy brush or dead wood can increase the risk of a structure being impacted if a wildfire moves through the area. Currently, vegetation management is the responsibility of the residents and is not required countywide. Additionally, many properties in the county are seasonal and are used for recreation or conservation. However, wildfire danger has not been considered in managing these properties. Management plans providing maintenance of these properties (including cutting tall grass, thinning trees, prescribe burning and removal of low-hanging branches around structures) are lacking. Some properties dependent on a private well may not have an adequate supply of water for fire-fighting needs. Limited access to water in certain areas for fire-fighting is a concern for Kanabec County.

The national program called Fire Wise targets educating residents in wildfire risk areas on how to make their structures safer from wildfire. Funding is available for local fire departments to inspect properties and give advice to residents on what they can do to further reduce risks. Funding and available personnel for Fire Wise efforts remains very limited.

Radio Warning Systems provide limited effectiveness. Responsibility of the listener requires them to know when and how to tune in for the information and how to act upon the information received. Ongoing education (especially for visitors, new, and seasonal residents) is important to successful radio warning systems.

4.4.2 Severe Winter Storms—Blizzards, Ice Storms

Blizzards are storms that contain heavy snowfall, strong winds, and cold temperatures. The combination of these elements creates blinding snow with near zero visibility, deep snowdrifts, and life-threatening wind chill temperatures. Blizzards are the most dramatic and destructive of all winter storms that occur within Kanabec County, and are generally characterized as storms bearing large amounts of snow accompanied by strong winds. They have the ability to completely immobilize travel in large areas and can be life-threatening to humans and animals in their path. According to the National Weather service (NWS), there is no fixed temperature requirement for blizzard conditions, but the life-threatening nature of low temperatures in combination with blowing snow and poor visibility increases dramatically when temperatures fall below 20° F. Blizzards typically occur between October and April; however, they occur most frequently from early November to late March.

Ice storms, and freezing rain (probably the most serious of the ice storms) occurs during a precipitation event when warm air aloft exceeds 32° F 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 forms when precipitation originating as rain falls through a rather large layer of the atmosphere that has below freezing temperatures, allowing the rain drops to freeze before reaching the ground. Sleet is also referred to as ice pellets. Sleet storms are usually of shorter duration than freezing rain and generally create fewer problems and typically occur from October through April.

Heavy snow or snowstorms in Minnesota are defined by 6 or more inches of snow in a 12-hour period and 8 or more inches of snow in a 24-hour period. Snow is considered heavy when visibilities drop below one-quarter mile regardless of wind speed.

Severe Winter Storms History in Kanabec County

An overview of some of the most notable winter storm events in Kanabec County can be found in Table 17 below. Two deaths have been reported in connection with these winter storm events.

Table 18. Kanabec County Snow and Ice Events 1993-2014

Date	Type	Date	Type
11/4/93	Heavy Snow	3/7/02	Winter Storm
11/12/93	Ice Storm and Snow	3/8/02	Winter Storm Description: 6-7" near Mora
11/24/93	Heavy Snow	3/14/02	Winter Storm Description: 18" at Mora
1/5/94	Heavy Snow	11/22/03	Winter Storm
1/15/94	Extreme Cold	1/24/04	Winter Storm
3/23/94	Heavy Snow and Ice	2/1/04	Winter Storm
4/28/94	Heavy Snow and Ice	1/1/05	Winter Storm
11/27/94	Heavy/Blowing Snow	1/12/05	Winter Storm Description: 7.5" at Mora
3/4/95	Heavy/Blowing Snow	1/21/05	Winter Storm
3/27/95	Heavy Snow	12/29/05	Heavy Snow
12/8/95	Heavy Snow	1/19/06	Heavy Snow
12/13/95	Heavy Snow	2/24/07	Winter Storm
1/18/96	Extreme Windchill	3/1/07	Winter Storm
1/31/96	Extreme Cold	12/1/07	Winter Storm
2/1/96	Extreme Cold	3/31/08	Winter Storm
2/26/96	Heavy Snow	1/14/09	Cold Windchill
3/23/96	Heavy Snow	11/13/10	Winter Storm
4/12/96	Heavy Snow Description: 7" at Mora	11/29/10	Winter Storm
12/23/96	Winter Storm	12/11/10	Winter Storm
1/3/97	Winter Storm	3/22/11	Winter Storm
1/15/97	Extreme Windchill	11/19/11	Heavy Snow
3/13/97	Winter Storm	2/28/12	Winter Storm
3/8/99	Winter Storm	12/9/12	Winter Storm
12/28/2000	Winter Storm	2/10/13	Winter Storm

1/29/01	Winter Storm	3/4/13	Winter Storm
2/24/01	Winter Storm	4/11/13	Winter Storm
11/26/01	Winter Storm	4/18/13	Winter Storm
	Description: One car/semi-truck accident claimed 2 lives near Mora		
02/24/02	Winter Storm	12/2/13	Winter Storm
	Description: 8" at Mora		
		12/31/13	Extreme Cold Wind chill
		1/5,23,27/14	Extreme Cold Wind chill
		2/20/14	Winter Storm
		2/27/14	Extreme Cold Windchill
		3/18/14	Winter Storm
		4/3/14	Winter Storm
		4/16/14	Winter Storm
		11/10/14	Winter Storm
		1/7/15	Extreme Cold Windchill

Source: National Climatic Data Center

Vulnerability

Winter storms affect Kanabec County every year, so there is a 100% probability that the County and its jurisdictions will be affected annually. The amount of snow and ice, the number of blizzard conditions, and days of sub-zero temperatures each year are unpredictable. Citizens living in Kanabec County climates must always be prepared for situations that put their lives or property at risk. It is not always the size of the storm or the depth of the cold, but an unprepared individual with a vehicle breakdown or an unmaintained home that are at risk. Rural citizens are more vulnerable to issues with deep snow or ice because of the distance between them and critical services.

One of the greatest threats to people from these storms is the loss of power, sometimes for fairly long periods of time and the much colder temperatures which typically follow a winter storm. People are at some risk to severe cold particularly if they live in remote areas that have experienced power outages that may be difficult to get to because of impassable roads. Older adults or those with conditions that leave them more vulnerable with temperature extremes are at most risk. Communications and power can be disrupted for days while utility companies work to repair extensive damage.

The risk to livestock in Kanabec County is viewed as fairly modest due in part to most farm operations having adequate animal shelter. The greatest risk to animals is related to the potential loss of power due to downed power lines.

Damages from blizzards can range from human and livestock deaths to significant snow removal costs. Stranded drivers can make uninformed decisions such as leaving the car to walk in conditions that put them at risk. Because of the blinding potential of heavy snowstorms, drivers are also at risk of collisions with snowplows or other road traffic. Further, drivers and homeowners without emergency plans are vulnerable to the life threatening effects of heavy snow storms such as power outages, cold weather and inability to travel, communicate, obtain goods or reach their destinations. Heavy snow loads can cause structural damage, particularly in areas where there are no building codes. The frequency of structural fires increases during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents. The economic costs of winter storms are generally not recorded by the National Climatic Data Center.

Relationship to other Hazards

Flooding—Melting from heavy snows can cause localized flooding which can impact property and infrastructure such as roads.

Wildland or Structural Fire—Heavy storms that result in large amounts of downed timber can result in an increase of dead or dying trees left standing, thus providing an increased fuel for a wildfire. There is an additional risk of increased frequency of structural fires during heavy snow events, primarily due to utility disruptions and the use of alternative heating methods by residents.

Public Safety—Drivers stranded in snowstorms may make uninformed decisions that can put them at risk; residents who are unprepared or vulnerable may not be able to obtain goods or reach their destinations. EMS providers may be slowed by road conditions to respond to emergencies. Ice storms may result in power outages due to downed power lines, putting people at risk for cold temperature exposure and reducing the ability to spread emergency messages to the public via television, radio or computer.

Plans and Programs in Place

Snow Removal—The Kanabec County Highway Department has capabilities for snow removal and highway treatment in order to maintain safe winter driving conditions. Generally the Department carries out snow removal and ice control operations with a priority system, ensuring that roadways in the county remain open to the public. Local city jurisdictions have their own equipment and personnel for snow removal or contract the work out if needed.

Backup Power— The Kanabec County Jail, FirstLight Health System have a variety of backup systems.

Burying Power Lines—Burying power lines helps to eliminate loss of power due to snow and ice storms. Utilities that serve the County work to accommodate requests for installation of underground power lines to residents or businesses receiving connection of new power in areas where it is feasible and makes sense to do so.

School Closings—Both school districts (Mora and Ogilvie) have a school closing policy and communications plan in place if inclement weather or temperatures create a hazardous situation for students or staff. Schools have notification systems which allow them to notify all families who are registered in the school system with up-to-date information.

Public Warning and Notification—The National Weather Service delivers storm warnings and key information during severe winter weather events over its radio towers. Kanabec County promotes the

use of NOAA weather radios by critical facilities and the public to receive information broadcasts from the National Weather Service. KBEK radio in Braham provides information to the public in Kanabec County.

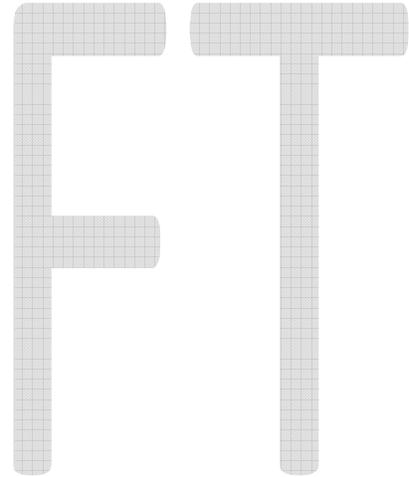
Public Education and Awareness—Kanabec County Public Health and Emergency Management promotes personal and family preparedness through www.ready.gov through a variety of events throughout the year.

Program Gaps or Deficiencies

Burying Power Lines—Burying power lines helps eliminate loss of power due to snow and ice storms. Kanabec County and its jurisdictions should continue working with energy utility companies to bury power lines where needed.

Increase the amount of generator capabilities with more generators and more locations within a system with increased use flexibility.

Figure 16. Kanabec County Winter Storm Photo



4.4.3 Severe Summer Storms—Thunderstorms, Lightning, Hailstorms, Windstorms and Tornadoes

Summer storms, including thunderstorms, hailstorms, and windstorms affect Kanabec County on an annual basis. Thunderstorms are the most common summer storm in the county, occurring primarily during the months of May through August. Thunderstorms are usually locally produced by cumulonimbus clouds, always accompanied by lightning, and often having strong wind gusts, heavy rain and sometimes hail and tornadoes.

Lightning

While windstorms and tornadoes are also a significant hazard associated with severe thunderstorms, lightning is probably the most frequent hazard associated with thunderstorms and the hazard that causes the most 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 and 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 with in-cloud lightning being the most common.

Lightning History in Kanabec County

According to the National Climatic Data Center (NCDC) there have been two severe lightning events reported in Kanabec County, Minnesota between 1950 and 2015. The first, September 13, 2004 resulted in an injury of a 22 year old male when his pick-up truck was struck by lightning six miles north of Mora. He was shaken, but quickly recovered. The second on June 27, 2008, a 47 year old male was struck by lightning in his backyard. The victim was unconscious for several hours, admitted to Hennepin County Medical Center, but recovered suffering no serious injuries.

Hailstorms

Hail is ice and a product of a severe thunderstorm. It 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 size. Larger hailstones have been reported but occur much less frequently. Strong updrafts are necessary within the cloud to form hail. Strong updrafts are usually associated with severe thunderstorms. Area coverage of individual hailstorms is highly variable and spotty because of the changing nature of the cumulonimbus cloud. While, almost all areas of Minnesota can expect some hail during the summer months most hail is not large enough to cause significant crop or property damage. Although hailstorms rarely cause injury or loss of life, they can cause damage to property.

Hailstorm History in Kanabec County

From 1950 to 2008 there were 43 hail events reported in Kanabec County. Table 18 shows storms producing hail events in Kanabec County from 2009-2015. No deaths or injuries have occurred in relation to hail events.

Table 19. Kanabec County Hailstorms 2009-2015

6/18/09

7/1/11

7/30/11

5/28/12

7/1/12

6/20/13 (five events)

8/6/13 (two events)

7/21/14 (two events)

7/26/14 (four events)

9/4/14 (two events)

Windstorms and Tornadoes

Windstorms can and do occur in all months of the year; however, 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 can also 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 at or near the surface. 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.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms to the ground, with wind speeds between 40-300 mph. They develop under three scenarios: 1) along a squall line; 2) in connections with thunderstorm squall lines during hot, humid weather; and 3) in the outer portion of a tropical cyclone. Funnel clouds are rotating columns of air not in contact with the ground; however, the column of air can reach the ground very quickly and become a tornado.

Since 2007, tornado strength in the United States is ranked based on the Enhanced Fujita Scale (EF Scale), replacing the Fujita Scale introduced in 1971. The EF Scale uses similar principles to the Fujita Scale, with six categories from 0-5, based on wind estimates and damage caused by the tornado. The EF Scale is used exclusively by the National Weather Service (NWS) in investigating tornadoes. All tornadoes are now assigned an EF Scale number, by which engineers correlate damage to buildings and techniques with different wind speeds caused by tornadoes. To see a comparative table of F and EF Scales, see <http://www.spc.noaa.gov/fag/tornado/ef-scale.html>.

In Minnesota, the peak months of tornado occurrence are June and July. The typical Minnesota tornado strikes between 4-7pm and logs wind speeds less than 125 mph with a forward speed of 35 miles an hour and affects less than 1/10th of one-percent of the county warned.

Tornado and Windstorm History in Kanabec County

According to the National Climatic Center (NCDC) there were 10 tornado events reported in Kanabec County, Minnesota between 1950 and 2015. Table 19 highlights the tornado and windstorm events.

Figure 17. Kanabec County Summer Severe Weather Photo



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Table 20. Kanabec County Tornado and Windstorm Events 1950-2015

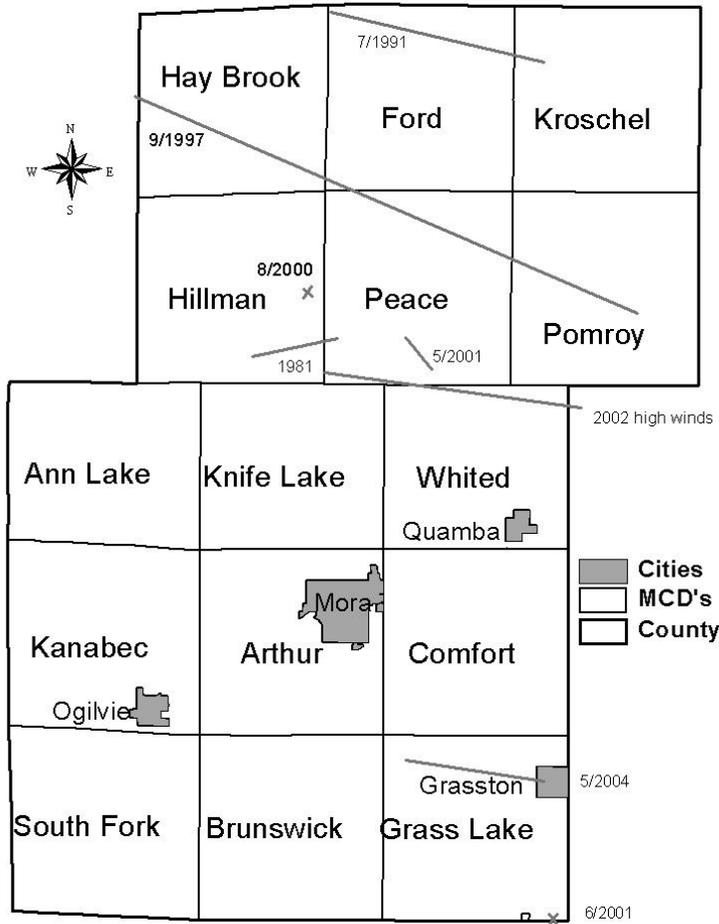
Date	Type	Deaths	Injuries	Property Damage
9/16/55	Tornado F1	0	0	250K
6/10/68	Tornado F1	1	2	25K
6/28/81	Tornado F1	0	0	25K
7/3/85	Tornado F1	0	3	25K
7/5/91	Tornado F1	0	0	0
6/14/94	Tornado F1	0	0	0
9/18/97	Tornado F2	0	0	0
8/14/2000	Tornado F0	0	0	0
5/9/01	Tornado F0	0	0	0
6/18/01	Tornado F1	0	0	0
8/2/83	Tstm/Wind	0	0	0
4/27/84	Tstm/Wind	0	0	0
4/21/85 (2 events)	Tstm/Wind	0	0	0
9/17/85	Tstm/Wind	0	0	0
7/11/87	Tstm/Wind	0	0	0
8/4/89	Tstm/Wind	0	0	0
4/29/91	Tstm/Wind	0	0	0
6/28/91	Tstm/Wind	0	0	0
7/5/91	Tstm/Wind	0	0	0
8/25/91	Tstm/Wind	0	0	0
6/14/94	Tstm/Wind	0	0	0
10/29/96	High wind	0	0	0
6/28/97	Tstm/Wind	0	0	0
9/25/98 (2 events)	Tstm/Wind	0	0	0
5/6/99	Tstm/Wind	0	0	0
6/6/99	Tstm/Wind	0	0	0
7/23/99	Tstm/Wind	0	0	0
7/30/99 (3 events)	Tstm/Wind	0	0	0

7/8/2000	Tstm/Wind	0	0	0
7/25/00	Tstm/Wind	0	0	0
7/17/01	Tstm/Wind	0	0	0
7/27/02	Tstm/Wind	0	0	0
9/1/02	Tstm/Wind	0	0	0
7/4/03	Tstm/Wind	0	0	0
6/5/04	Tstm/Wind	0	0	0
7/13/04	Tstm/Wind	0	0	0
8/8/04	Tstm/Wind	0	0	0
9/23/04	Tstm/Wind	0	0	0
12/12/04	Strong Wind	0	0	0
6/13/05	Tstm/Wind	0	0	0
8/9/05 (2 events)	Tstm/Wind	0	0	0
7/25/06	Tstm/Wind	0	0	0
7/29/06 (2 events)	Tstm/Wind	0	0	0
7/31/06	Tstm/Wind	0	0	0
7/26/07	Tstm/Wind	0	0	0
8/13/07	Tstm/Wind	0	0	0
9/20/07	Tstm/Wind	0	0	0
7/11/08 (2 events)	Tstm/Wind	0	0	0
7/27/10	Tstm/Wind	0	0	0
8/13/10	Tstm/Wind	0	0	0
7/1/11	Tstm/Wind	0	0	0
6/20/12(2 events)	Tstm/Wind	0	0	0
7/26/14 (2 events)	Tstm/Wind	0	0	0
9/3/14	Tstm/Wind	0	0	0
7/12/15	Tstm/Wind	0	0	0

Source: National Climatic Data Center, National Weather Service.

Figure 18. Tornado Locations in Kanabec County

Kanabec County Tornado Locations



Vulnerability

Summer storms affect Kanabec County each year. There is a 100% probability that the County and its jurisdictions will be affected. The County has experienced 10 tornadoes since 1955. The magnitude of windstorms is unpredictable and within Kanabec County the vulnerability of jurisdictions to summer storms does not vary geographically. The vulnerability of each jurisdiction to severe summer storms has not changed due to any development in the last five years.

Relationship to other Hazards

Flooding - Thunderstorms with heavy amounts of rainfall can cause localized flooding, which can impact property and infrastructure such as roads.

Public Health – Public health can be impacted as a result of wastewater spills due to flooding.

Wildland Fire – Lightning strikes may ignite a wildland fire. Windstorms that result in downed timber increase the fuel load in a forest that may increase the risk of wildfire.

Structural Fire – Lighting strikes may ignite a wildland or structural fire.

Plans and Programs in Place

SKYWARN Program – The National Weather Service (NWS) has a program offering training to volunteers in Kanabec County. A network of trained SKYWARN spotters help keep their local communities safe by providing timely and accurate reports of severe weather to their local National Weather Service office.

Kanabec-Pine Public Health and Human Services – In conjunction with Kanabec County Emergency Management completed a shelter plan and subsequent training that addresses the roles, responsibilities and procedures of the County and partner agencies in the event of needing to provide emergency sheltering and mass care for residents as a result of a natural or man-made disaster.

Storm Shelters – The Minnesota Department of Health requires mobile home park owners to meet specific requirements for the provision of an approved storm shelter or an approved evacuation plan for the residents of the park in times of high winds or tornadoes. Requirements vary based on number of manufactured homes and date of licensing (<http://www.health.state.mn.us/eh/mhprca/mhpgenreg.html>).

Tornado Drills in Public Schools – Kanabec County school superintendents report that they practice tornado drills on an annual basis in order to exercise correct safety procedures for students in the event of a tornado. See Table 20.

Table 21. Kanabec County Public Schools Survey on Safe Rooms and Sheltering

Name of School District	The following questions were asked: 1) Do you have designated safe rooms? 2) Are schools community partners for mass sheltering? And 3) Do you exercise tornado drills for students and staff?	Information regarding any gaps in the school’s capabilities.
Mora Public School	<ol style="list-style-type: none"> 1) Safe rooms and off-site evacuation locations are confidential, for student’s safety. 2) American Red Cross mass shelter at Trailview Elementary and the High School. 3) Once a year. 	
Ogilvie Public School	<ol style="list-style-type: none"> 1) No current safe rooms or plans to construct. 2) No formal agreement to provide mass sheltering, but would do so. 	<p>Would consider constructing safe rooms.</p> <p>Willingness to formalize mass sheltering agreement.</p>

3) Multiple drills held yearly.

911 Dispatch Center- Located in Mora in the Kanabec County Law Enforcement Center provides a point for strategic command for all events in Kanabec County. The dispatchers answer 911 calls in Kanabec County 24/7. They organize the delivery of all the county's available emergency services (sheriff deputies, ambulance services, first responders, volunteer fire departments and emergency helicopters).

The Kanabec County Dispatch Center has received multiple grants to acquire emergency medical dispatch software and related training, plus equipment for emergency management personnel use.

In addition to the Kanabec County Sheriff, the Minnesota Department of Natural Resources and Minnesota State Patrol maintain a law enforcement presence in Kanabec County.

Warning Systems – The NOAA Weather Radio warns citizens of storm events. The county also has tower mounted emergency service antennas which are part of the county 911 system. The WeatherBug system has a weather monitoring device in Mora, Warning sirens are located in Mora and Ogilvie.

Mutual Aid Agreements - Cities in Kanabec County maintain “mutual aid agreements” with surrounding jurisdictions to provide police and fire protection and other emergency services. These agreements with communities in adjacent counties include Braham (Isanti County), Isle and Milaca (Mille Lacs County), and Sandstone, Pine City and Hinckley (Pine County).

Backup Power – The Kanabec County Law Enforcement Center and FirstLight Health Care Center have emergency generators for dispatch, jail requirements and the provision of health care.

Burying Power Lines – Burying power lines helps eliminate loss of power due to severe summer storms. Utilities that serve the County work to accommodate requests for installation of underground power lines to residents or businesses receiving connection of new power in areas where it is feasible and makes sense to do so.

School Closings – All school districts in Kanabec County have a school closing policy and communications plan in place if inclement weather or temperatures create a hazardous situation for students or staff. Schools have notification systems which allow them to notify all families who are registered in the school system with up-to-date information.

Public Education – Kanabec County Emergency Management and the county's schools promotes the national Weather Service's “Severe Weather Awareness Week” held in April of each year. The event seeks to educate residents on the dangers of severe summer storm events and highlights the importance of preparing for severe weather before it strikes. Kanabec County Emergency Management and Public Health encourage personal and family preparedness through www.ready.gov and other resources.

Program Gaps or Deficiencies

Backup Power – Expansion of battery life for current battery backup systems in both the law enforcement center and hospital in the event of a major power outage so critical county information is not lost. Limited generator capacity in critical facilities remains an area in need of expansion.

Burying Power Lines – Burying power lines is the preferred solution to help eliminate loss of power due to the effects of high winds and heavy winds associated with severe summer storms. Kanabec County, its local jurisdictions and hospital system continue to work with energy companies to bury lines where needed.

Safe Rooms – each of the schools within Kanabec County were surveyed in an effort to gather information on the existence of or need for safe rooms in schools and the role of the schools to assist with mass sheltering in the event of disaster. The survey reflected that while schools work to exercise for tornado drills with students, there is modest interest in construction of safe rooms within schools to better protect students during severe events. Table 22 provides an overview of responses from Kanabec County schools participating in the survey.

Tree/Vegetation Management – Kanabec County and its local government jurisdictions should continue to manage trees and vegetation along roadways to reduce the amount of debris that falls on roads during a severe summer storm.

Too few methods of public notification available or utilized, such as sirens, weather radios and apps for phones.

4.4.4 Extreme Cold

Wintertime in Kanabec County can be a brutal time, especially dangerous for vulnerable residents and outdoor workers. Record temperature lows and arctic-like wind chill factors can cause cold-related injuries such as frostbite and hypothermia, which can be deadly. Hypothermia is the greatest and most life-threatening cold weather danger.

In Kanabec County cold winter weather can have severe or fatal impacts. Hypothermia occurs when core body temperature drops below 96°F. Anyone who is exposed to severe cold without enough protection can develop hypothermia. Frostbite occurs when skin tissue and blood vessels are damaged from exposure to temperatures below 32°F. It most commonly affects the toes, fingers, earlobes, chin, cheeks, nose, and other body parts that are often left uncovered in cold temperatures. The NWS issues “Extreme Cold” warnings when it feels like -30°F or colder across a wide area for several hours. Extreme cold watches are issued a day or two before the conditions are expected.

Extreme Cold History in Kanabec County

Below zero temperatures occur almost every almost every winter for a period of time. January is the coldest month, with daytime highs averaging 20°F and nighttime lows averaging 1°F. However, the averages do not reflect the wide variation in temperatures that can occur. Maximum Kanabec County temperatures in January can range from the low 50s to mid-40s below zero.

Extreme cold temperatures affect the county nearly every year. Extremely cold air can settle over the area and remain entrenched for days at a stretch. In 1996, Tower Minnesota reached a new record low of -60°F. As recently as the winter of 2013-2014, it was recorded as the second coldest winter on record, with an average temperature of 3.9° for the months of December, January, and February (National Weather Forecast Office, 2014). Home heating fuel was in high demand and costly, putting residents at risk of not having enough fuel (wood, propane or fuel oil) to maintain their households or to be able to afford to heat their homes. Kanabec County offices and local agencies were stretched for available resources. Schools were closed by order of the Governor on multiple occasions.

Vulnerability

The amount of snow and ice, number of blizzard conditions, and days of sub-zero temperatures each year are unpredictable and within Kanabec County the vulnerability of jurisdictions to extreme cold does not vary geographically. Citizens living in climates such as these must always be prepared for situations that put their lives or property at risk. It is not always the depth of the cold, but an unprepared individual with a vehicle breakdown or unmaintained garage that are at risk. Rural citizens not connected to city gas lines are vulnerable to issues with extreme cold. The vulnerability of each jurisdiction to extreme cold has not changed due to any development in the last five years, since the initial Kanabec County Multi-Hazard Mitigation Plan.

Relationship to other Hazards

Wildfire – Extreme cold directly impacts firefighting, making fire suppression more difficult and increasing the likelihood of equipment damage.

Public Health – Frozen septic systems can lead to the increased levels of untreated wastewater into the environment.

Public Safety – Anyone exposed to extremely cold temperatures can develop frostbite and hypothermia. The elderly, children and those who engage in outdoor work or recreation may be most susceptible to the danger of extremely cold temperatures.

Plans and Programs in Place

Kanabec County Public Health and Family Services have multiple hazard planning documents in place to help assist in health-related emergencies during any weather event. A mass sheltering plan is also in place should the need arise to provide mass care.

School Closings – All school districts in Kanabec County have a school closing policy and communications plan in place if inclement weather or temperatures create a hazardous situation for students or staff. Schools have notification systems which allow them to notify all families who are registered in the school system with up-to-date information.

Public Warning and Notification – in the event of emergencies or hazardous conditions that require timely and targeted communication to the public Kanabec County utilizes internet-based and traditional local news media. Kanabec County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcasts from the National Weather Service. The National Weather Service (NWS) issues warnings and advisories in advance of and during cases of excessive periods of cold.

Public Education and Awareness – Kanabec County emergency management and Public Health encourage personal and family preparedness through www.ready.gov in addition to promoting events such as the National Weather Services’ “Winter Hazard Awareness Week” each November.

Highway Treatment – Kanabec County along with the county’s cities and townships and MnDOT all have capabilities for snow removal and highway treatment in order to maintain safe winter driving conditions.

Program Gaps or Deficiencies

Emergency service personnel have recommended another radio transmitter is needed for the northeast portion of Kanabec County, in an effort to ensure more effective countywide EMS communications.

Above ground power lines are subject to damage as a result of ice and windstorms. Locating lines underground where it is feasible and cost effective can reduce this problem. In cooperation with its cities and electric utilities, the county can identify areas of the county and its communities that are most likely to experience damage to power lines.

Kanabec County does not have a written policy on snow or ice removal and has no plans to implement one.

4.4.5 Extreme Heat

Humans need to maintain a constant body temperature if they are to stay healthy. Working in high temperatures induces heat stress when more heat is absorbed into the body than can be dissipated out. Heat illness such as prickly heat, fainting from heat exhaustion, or heat cramps are visible signs that people are working in unbearable heat. In the most severe cases, the body temperature control system breaks down altogether and body temperature rises rapidly. This is a heat stroke, which can be fatal. The NWS issues a heat advisory when, during a 24-hour period, the temperature ranges from 105° F to 114° F during the day, and remains at or above 80° F at night.

Extreme Heat History in Kanabec County

On July 6, 1936 many counties in Minnesota experienced record high temperatures. Kanabec County registered a temperature over 100° F on that day. The average high temperature of 83° F typically is reported in Kanabec County during July, the warmest month. According to the national Climatic Data Center (NCDC) there were 8 Excessive Heat Temperature incidents reported in Kanabec County, Minnesota between 01/01/1950 and 10/31/15.

Vulnerability

Jurisdictions in Kanabec County do not vary in their vulnerability to extreme heat. The vulnerability of each jurisdiction to extreme heat has not changed due to any development in the last five years.

Relationship to other Hazards

Drought and Wildfire—Dry, hot conditions can reduce the protective moisture of woodlands and increase the risk of wildfire. Much of northern Kanabec County is heavily wooded.

Public Safety—Anyone who is exposed to extreme heat can develop heat exhaustion and heat stroke. The elderly, children and those who engage in outdoor work or recreation may be most susceptible to the danger of extreme heat.

Public Health—Blue-Green Algae bloom in shallow lakes release toxins that can make humans and pets ill. It has been fatal to dogs.

Plans and Programs in Place

Kanabec County Public Health and Family Services—Kanabec County has All Hazards planning in place to help assist in health-related emergencies during any weather event. A mass sheltering plan is also in place should the need arise to provide mass care.

School Closings—Mora and Ogilvie school districts have a school closing policy and communications plan in place if inclement weather or temperatures create a hazardous situation for students or staff. Schools have notification systems which allow them to notify all families who are registered in the school system with up-to-date information.

Public Warning and Notification—In the event of emergencies or hazardous conditions that require timely and targeted communication to the public, Kanabec County utilizes websites, social media outlets as well as local news media. Kanabec County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcasts from the National Weather Service. The National Weather Service (NWS) issues warnings and advisories in advance of and during cases of excessive periods of heat.

Public Education and Awareness—Kanabec County Emergency Management and Public Health encourage personal and family preparedness through www.ready.gov. The agency also posts lakes for Blue-Green Algae when needed.

Program Gaps or Deficiencies

Public warning systems. Not all households have weather radios.

4.4.6 Flash Flood and Riverine Flood

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe. Urban flooding is a type of upstream flood, which involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Minnesota, but they are most common in the spring and summer.

Downstream floods, sometimes called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and the flood peak is much longer for downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

Flood History in Kanabec County

Most of the county's population is safe from flooding, although some housing units are within the 100-year floodplain. Flood effects on commercial structures are minimal for Kanabec County. Future

commercial buildings have been prohibited under Mora Zoning regulations. Properties along the Snake River in Kanabec County are at the greatest risk of flooding.

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Table 22. Kanabec County Flood Events between 01/01/1950 and 10/31/2015

Date	Type	Deaths	Injuries	Property Damage	Crop Damage
03/26/1997	Flood	0	0	0	0
Description: Above normal temperatures during the last week of March, began melting a deep snow cover across much of west central into central Minnesota. The snow cover had high moisture content. In addition, a spring storm deposited a mixture of rain and fresh snow over the area on 3/2/97, immediately preceding the warm temperatures.					
04/01/1997	Flood	0	0	0	0
Description: Above normal temperatures during the last week of March began melting a deep snow cover across much of west central into central Minnesota. The snow cover had high moisture content. In addition, a spring storm deposited a mixture of rain and fresh snow over the area on 3/24/97, immediately preceding the warm temperatures.					
04/01/2001	Flood	0	0	\$498,680	0
Description: Heavy snowfall during winter remained on the ground through the end of March and then rapidly melted, resulting in river stages close to record levels. Water began to gush through drainage ditches, streams and into the main rivers during midday April 1. 18 homes were affected and 1 business.					
07/08/2002	Flash Flood	0	0	0	0
Description: Five to six inches of rain in the pre-dawn hours washed out several township roads.					
07/09/2002	Flash Flood	0	0	\$15,000	0
Description: The Snake River and tributaries overflowed their banks in the wake of heavy rain early on July 8. Several county and township roads were flooded, sandbagging was necessary along Riverside Avenue in Mora, and Peninsula drive collapsed near the east side of Knife Lake.					
07/10/2002	Flash Flood	0	0	\$25,000	0
Description: Five to ten inches fell across central Kanabec County, prompting the closure of County Road 17 east of Mora. Several township roads were closed, and a number of basements flooded.					
10/04/2005	Flash Flood	0	0	0	0
Description: Water was crossing several roads, especially around Mora, where 6.11 inches of rain fell.					
10/05/2005	Flash Flood	0	0	0	0
Description: In Kanabec County, water was over the road on County Road 11 at 153 rd Avenue, and County Road 11 was barricaded in the City of Mora. County Road 47 was barricaded near Lewis Lake. Water was also over the roads in the southern portion of Kanabec County, but did not warrant barricades.					

Source: National Climatic Data Center

Repetitive Flood Claims Information

Repetitive loss structures are those structures which have sustained damages on two or more separate occasions within a ten-year time span for which the cost of repairs at the time of the flood meets or exceeds 25% of the market value of the structure before the damage occurred. There have been no repetitive flood claims in Kanabec County.

Relationship to other Hazards

Severe Storms and Blizzards—Slow moving thunderstorms and snow melt can contribute to flooding and under the right circumstances flash flooding.

Dam Failure—Floods can compromise the structural integrity of dams.

Public Health—Public health can be affected as a result of wastewater spills due to flooding or power failures. Hazardous materials can also get into floodways, causing health concerns and polluted water supplies.

Water Main Breaks—Surges in water as a result of water pumps starting after power outages can lead to water main breaks.

Fire—Fire can break out as a result of dysfunctional electrical goods in times of flooding.

Plans and Programs in Place

Floodplain Ordinances—The Kanabec County official land use map identifies the 100-year flood areas. Flood Plain management provisions do cover the 100-year flood areas. In addition, the cities of Mora and Ogilvie have identified their 100 year flood areas on land use maps and have adopted appropriate zoning and land use controls governing these areas.

Stream Gaging Program—Kanabec County currently has a stream gaging program in place. The location is on the Knife River near Mora. Cooperative Stream Gaging is a program of the Minnesota Department of Natural Resources (DNR). The DNR website (<http://www.dnr.state.mn.us/waters/csg/index.html>) provides access to near real-time preliminary and historical stream level and/or quantity data from around the state. Users can select gaging sites in several ways and once a site is selected, a variety of information is available, including hydrographs, cross sections, maps, river condition photos and downloadable data.

National Flood Insurance Program (NFIP)—The NFIP is a federal program created by Congress to mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances and to provide access to affordable, federally-backed flood insurance protection for property owners. The NFIP is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the Federal Government at states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHAs).

The Federal Government will make flood insurance available within the community as a financial protection against flood losses. Kanabec County and the cities of Grasston, Mora, and Ogilvie are members of the National Flood Insurance Program.

Road Infrastructure and Drainage—Public works staff at the county, city and township levels work on culvert and ditch maintenance to prevent road flooding. Ice dams in culverts are monitored and addressed to reduce road flooding during spring thaws.

Public Warning and Notification—In the event of emergencies or hazardous conditions that require timely and targeted communication to the public Kanabec County utilizes the Kanabec County’s website, social media and local news media. Kanabec County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcasts from the National Weather Service. The National Weather Service delivers flood warnings and key information during flood events.

Public Education and Awareness—Kanabec County Emergency Management and Public Health encourage personal and family preparedness through www.ready.gov website.

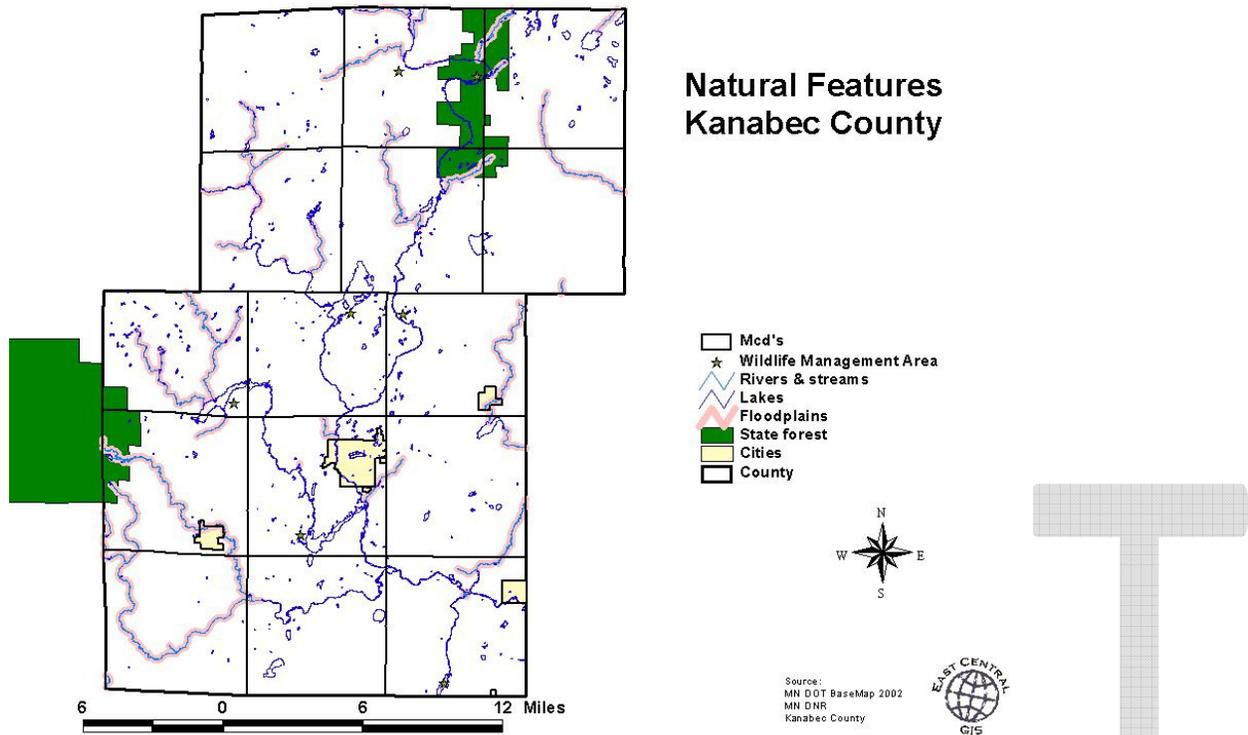
Program Gaps or Deficiencies

Develop high resolution digital elevation model (DEM) and floodplain mapping program.

The purchase and relocation of structures that are continually damaged by flooding are identified as a necessary mitigation strategy under the NFIP. Participating communities should pursue this strategy for any future Repetitive Loss Structures (no RLS currently exist). Figure 19 shows Kanabec County’s general natural features, including floodplains.

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Figure 19. Natural Features in Kanabec County



4.4.7 Dam Failure

Dams are structures that retain or detain water behind a large barrier. When full or partially full, the difference in elevation between the water above the dam and below creates large amounts of potential energy, allowing the chance for failure. Dams can fail due to either 1) water heights or flows above the capacity for which the structure was designed; or 2) deficiencies in the structure such that it cannot hold back the potential energy of the water. If a dam fails, issues of primary concern include loss of human life/injury, downstream property damage, lifeline disruption (transportation routes and utility lines required to maintain or protect life), and environmental damage. Dams require constant monitoring and regular maintenance to assure their integrity.

Kanabec County has one dam at Knife Lake, in Knife Lake Township which has been improved upon in recent years. There are smaller numerous earthen dams, which are privately owned and permitted by the DNR.

Dam Failure History in Kanabec County

The County Board of Commissioners noted two dam failures in the community. On July 26, 1972 the dam located on the left bank 400 ft. upstream from bridge on County Highway 77, 1.1 mi upstream from mouth and 2.5 mi north of Mora (Lat 45°55'12", long 93°18'26", in SW1/4SW1/4 sec. 26, T.40 N., R.24 W., Kanabec County, Hydrologic Unit 07030004) failed as the result of a collapsed bridge.

In 2001, widespread flooding led to a FEMA Disaster Declaration (FEMA-1370-DR) which included Kanabec County. A dam failed and affected parts of Whited and Comfort townships.

Vulnerability

The vulnerability of each jurisdiction to dam failure has not changed due to any development in the last five years.

Relationship to other Hazards

Flooding—In the event of dam failure, flooding of communities and transportation corridors can occur. Kanabec County Public Health cites ground water contamination as a concern related to dam failure.

Plans and Programs in Place

Emergency Action Plans—All of Minnesota Power’s hydroelectric dams have Emergency Action Plans (EAPs)

Federal Emergency Management Agency (FEMA) National Dam Safety Program—For 30 years, the federal government has used the National Dam Safety Program (NDSP) to protect Americans from dam failure. The NDSP is a partnership of states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. The NDSP is intended to help states bring the necessary resources to bear on inspection, classification, and emergency planning for dam safety.

Federal Energy Regulatory Commission (FERC) Division of Dam Safety and Inspection (D2SI)—Hydropower is one of the project types in which FERC regulates both the construction and operational phase of a project. Dam safety is a critical part of the Commission’s hydropower program and receives top priority. Before projects are constructed, the Commission staff reviews and approves the designs, plans, and specifications of dams, powerhouses, and other structures. During construction, Commission staff engineers frequently inspect a project, and once construction is complete, Commission engineers continue to inspect it on a regular basis. The dams owned by MN Power and Sappi are regulated by FERC because they used to generate electricity. The DNR Dam Safety Program defers to FERC on MN Power projects.

National Inventory of Dams (NID)—The NID is a database managed by the Army Corps of Engineers, used to track information on the nation’s water control infrastructure. Information for the NID is used in the development of water resource management, land use management, flood plain management, risk management, and emergency action planning.

Minnesota Department of Natural resources, Division of Waters—Dam Safety Program—The MN DNR Dam safety Program and current dam safety regulations require the safe design, construction, operation, and maintenance of dams in Minnesota. The state program includes review of design plans and plans for proposed dams, safety inspections of existing dams, and dam repair. The Dam Safety Program keeps a file on all dams that are subject to state dam safety regulations or have had information or reports generated on them for another purpose. A typical file contains construction plans, photos, inspection reports, and correspondence.

Public Warning and Notification—In the event of emergencies or hazardous conditions that require timely and targeted communication to the public, Kanabec County utilizes the Kanabec County website, social media as well as local news media. Kanabec County promotes the use of NOAA weather radios by critical facilities and the public to receive information broadcasts from the National Weather Service.

Program Gaps or Deficiencies

None identified.

4.4.8 Drought

A drought refers to an extended period of deficient rainfall relative to the statistical mean of the region. Drought can be defined according to meteorological, hydrological, socioeconomic, and agricultural criteria. Meteorological drought is qualified by any significant deficit of precipitation. Hydrological drought is manifest in noticeably reduced river and stream flow and critically low ground water tables. The term agricultural drought indicates an extended dry period that results in crop stress and harvest reduction. Socioeconomic drought refers to the situation that occurs when water shortages begin to affect people and their lives. It associates economic goods with the elements of meteorological, agricultural, and hydrological drought. Many supplies of economic goods (e.g., water, food grains, and hydroelectric power) are greatly dependent on the weather. Due to natural variations in climate, water supplies are high in some years but low in others. Fluctuating long-term climate variations make drought difficult to predict.

Drought History in Kanabec County

Droughts have impacted Kanabec County during different periods over the last century. The most notable drought periods were 1987-1989, 1976-1977, 1954-1961, and 1934. In 2002 and 2003 Kanabec County had record low snow falls; this had an impact on lake levels and increased fire danger and resulted in a County-wide Agricultural Disaster declaration by USDA. According to the National Climatic Center (NCDC) there were 0 drought incidents reported in Kanabec County, Minnesota since 01/01/1950.

Vulnerability

Drought poses only a minimal risk to the cities of Kanabec County—houses and the persons residing there. Trees, shrubs and other plants are at some risk during extended dry periods but because of the municipal water system this risk is minimal since most properties can be irrigated at this time.

The water supply for rural residents is at some risk during extended dry periods when annual rainfall is below normal for several years. In these instances some shallow wells have failed. The most affected by drought is agriculture. However, seldom is drought severe enough to significantly reduce agricultural production. Also, severe drought could lower water levels in aquifers, posing some risk to municipal water supplies.

According to the Land Management Information Center (LMIC) the total tillable land in Kanabec County is 69,483 acres or 20% of land area. Another 19% of Kanabec County's land use is pasture/hay. Every year at least some portion of the county can expect a dry spell which may stress grass and other plants but seldom is severe enough to significantly reduce agricultural production. Hay production may be more impacted from these more regular dry spells than crops such as corn and soybeans. While complete crop failure is unlikely, a significant reduction in production could result depending on the timing and severity of the drought.

Livestock watering ponds could be impacted by dry conditions but most agricultural operations also have other sources of water for animals.

All cities tap the aquifers for their water supply so the depletion of surface water during dry spells is usually not an issue. However, some concern has been expressed that with a severe drought or an

extended period of dry years declining water levels in the aquifer could pose some risk for the municipal water supply and for those businesses that tap the aquifer for their own water supply.

In addition, during severe droughts water volumes in the Snake River could reach volumes low enough to cause overloading and pollution because of discharge from wastewater treatment facilities.

Very minimal impact to industries is anticipated but during a severe drought there could be some supply risk for commercial and industrial wells that are relatively shallow.

Relationship to other Hazards

Wildfires—A drought situation can significantly increase the risk of wildfire.

Plans and Programs in Place

Public Education and Awareness—Kanabec County Emergency Management and Public Health encourage personal and family preparedness through www.ready.gov website.

Program Gaps or Deficiencies

No program gaps or deficiencies were identified.

4.5 Other Hazards

4.5.1 Infectious Disease Outbreak

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 medical breakthroughs and technology, infectious diseases continue to pose an important public health problem. Today, the issue of emerging and re-emerging infectious diseases is at the forefront of public health concern. The very young, people with chronic diseases, older adults, and hospitalized/institutionalized patients are at risk for many infectious diseases. Changes in demographics, lifestyle, technology, land use practices, food production and distribution methods, and child care practices as well as increasing poverty, have a role in emerging infections.

Many infectious diseases are preventable and are controllable. Prevention and control of infectious diseases involve collection of accurate assessment data (such as surveillance data for specific conditions), outbreak detection and investigation, and development of appropriate control strategies (both short and long term) based on specific epidemiologic data. These activities require close collaboration between 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 industry (particularly food producers and food-service industries), health-care students and providers, along with research to improve immunizations, diagnostic methods, and therapeutic modalities. Thus, the prevention of infectious diseases requires multidisciplinary interventions involving public health professionals, medical practitioners, researchers, community-based organizations, volunteer and private groups, industrial representatives, and educational systems.

After World War II many life threatening infectious diseases were cured using antibiotics or could be prevented through vaccination. However, new diseases continue to emerge. New strains of influenza require yearly updates of vaccinations, and have a greater resistance to antibiotics. The recent surfacing of diseases for which there is no cure or vaccination underscores the need for a good public health system for early detection of new diseases in order to prevent a large scale epidemic. Examples of infectious diseases, such as Acquired Immunodeficiency Syndrome (AIDS) and 1997's avian strain of influenza (H5N1) are reminders that diseases can constantly emerge, and underscores the need for a strong and vigilant public health system. Infectious disease in domestic livestock has significant impacts to human populations that rely on their animals as a source of food or work.

Two diseases, Human Immunodeficiency Virus (HIV) and West Nile Virus (WNV) are identified in the Minnesota All-Hazard Mitigation Plan 2014. HIV can spread from person to person through the exchange of bodily fluids or from mother to child during pregnancy, childbirth or breast feeding. From 1982, 2,772 deaths have occurred in Minnesota because of HIV.

West Nile Virus (WNV) disease is transmitted to people and horses through the bite of infected mosquitoes. The virus is maintained in a transmission cycle involving several species of mosquitoes and birds. WNV was historically found in Africa and southern Europe. The virus was first reported in the United States in 1999. With our abundant mosquito and bird populations, WNV rapidly became established in Minnesota, and will likely continue to cause sporadic disease outbreaks in humans and horses.

The ever-emerging nature of diseases such as Ebola or Zika is predicted to become increasingly significant as people and goods move more easily around the world, organisms become resistant to treatment and control methods, and livestock and people encroach on natural habitats.

Vulnerability

There have been no great infectious disease incidences that have taken place or been recorded in Kanabec County history. Kanabec County's entire population is susceptible to exposure from an infectious disease because of the random nature of diseases. However, the risk is considered very low throughout the county because of good prevention programs and quality health care. Certain groups of people such as older adults, young children, those with chronic diseases, and hospitalized/institutionalized people are at greater risk than the general public. Even for these people the risk is considered low to very low. The greatest risk would be in Kanabec County cities where population densities are greater, such as Mora with its regional hospital, three schools and a nursing home.

In regard to risks associated with infectious diseases related to agriculture such as "Mad Cow" or "Hoof and Mouth" disease, the county's feedlots pose a moderate risk to livestock in those areas, as these types of outbreaks are highly contagious. Avian Flu outbreaks in 2015 caused substantial financial losses in Central Minnesota, with minimal impact to Kanabec County. However, risks in Kanabec County are still considered low, as no outbreaks have occurred in the past.

Little effect would be felt in the industrial/commercial infrastructure. A negative impact on the economy could take place if the outbreak is widespread and prolonged.

Relationship to other Hazards

Infectious disease outbreaks can occur as primary events themselves, or they may be secondary events to another disaster or emergency such as acts of terrorism or a natural disaster.

Plans and Programs in Place

Kanabec County Emergency Operations Plan—this plan outlines procedures for county and local governments for contacting appropriate state and federal agencies and provides guidelines and strategies for dealing with infectious diseases and command structures with the County Public Health Department and Emergency Manager for Kanabec County.

Media Outreach—the Kanabec County Public Health Department works with local papers and radio station to alert the public in the event of an infectious disease outbreak.

Vaccination Program—developed by the Kanabec County Public Health Department assists individuals with accessing vaccines.

Pandemic Influenza Plans—Kanabec County’s Public Health Department works with the Minnesota Department of Health to address influenza; outlining the roles and responsibilities of the various local/state/federal agencies in the event of pandemic flu by having their own Pandemic Influenza Plan, in addition to Minnesota’s Pandemic Influenza Plan. This is one example of the level of cooperation between Kanabec County Public Health and the Minnesota Department of Health related to infectious disease outbreaks.

Program Gaps or Deficiencies

In past plans it was mentioned that more practice responding to incidents could be provided. Since previous plans, multiple opportunities were developed, delivered, and well attended for emergency response entities.

4.5.2 Fire (Structures and Vehicles)

Fires addressed here relate to property that is not considered a wildfire. The two types of property fires are: 1) Structure Fires in residential dwellings, public facilities, or industrial/manufacturing sites; and 2) Vehicle Fires associated with mobile property such as automobiles, trucks, trains, buses, boats or aircraft.

Fires have many causes--cooking, heating, open flame and arson are the typical leading causes each year. Other causes include careless smoking, misuse of materials, improper storage, equipment/appliance malfunctions, improper building wiring, industrial mishaps, and instances such as train derailments or transportation collisions.

Historical Data

Minnesota State Fire Marshal’s Fire in Minnesota Report cites data collected from the fire departments responding to fires in Kanabec County. In some instances, the Minnesota Fire Incident Reporting System (MFIRS) reflects the reporting of fire departments that go beyond the county boundary (but was responded to in Kanabec County) and the incident is recorded within the fire department’s home county.

Table 23. Fire Department Runs, Dollar Losses, and Deaths—Kanabec County

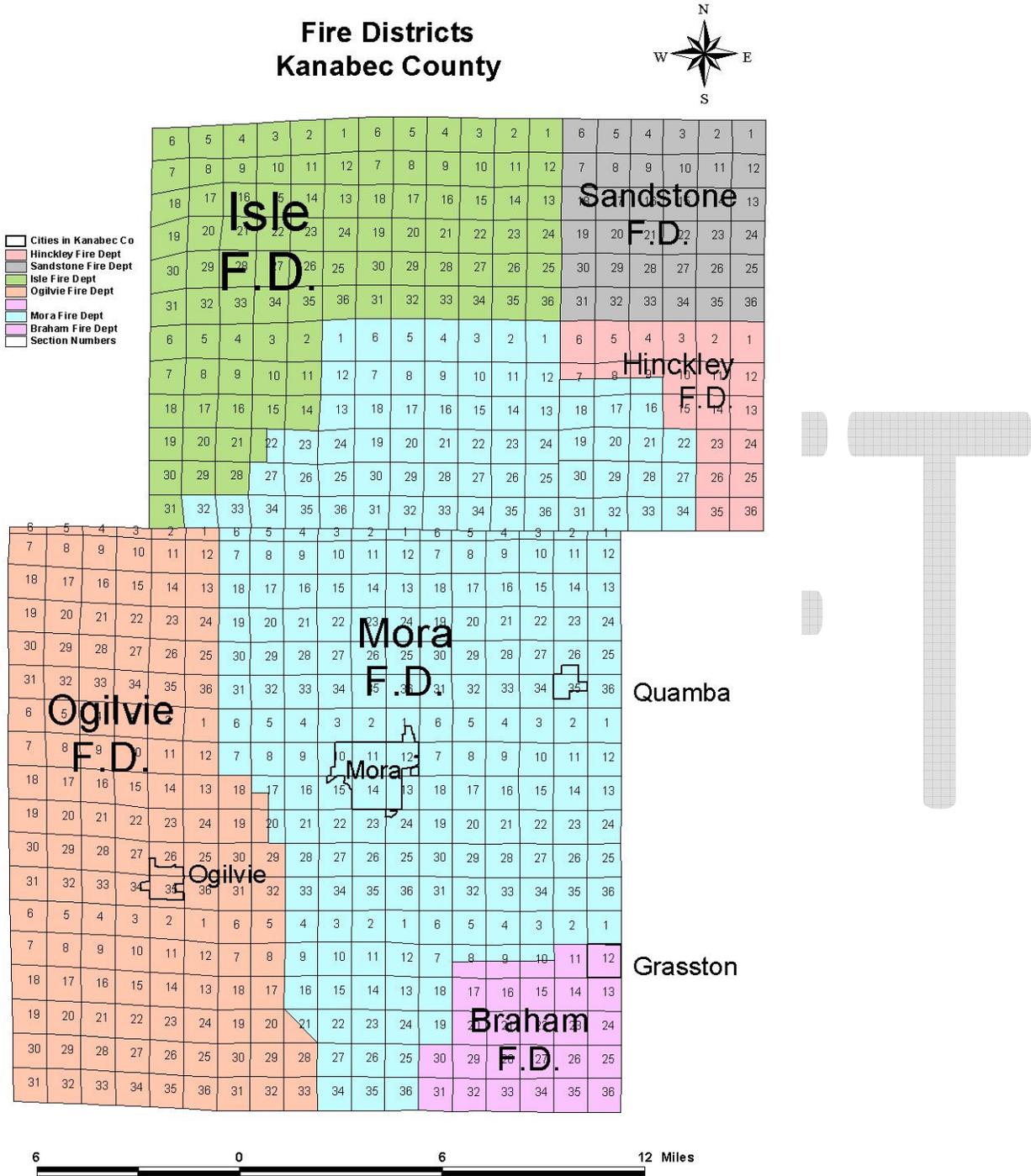
Year	Fire Runs	Other Runs	Total Dollar Loss	Fire Deaths
2013	48	57	\$1,663,102	0
2012	66	40	\$2,490,700	0
2011	54	45	\$392,300	3
2010	49	40	\$1,147,145	0

Incendiary Fires—refers to any fire that has been deliberately set. While it is most often used to refer to crimes of arson, it is also technically correct to use it for any fire which was deliberately started. Per capita data is calculated at a standard rate of incendiary fires per 100,000 people.

Table 24. Incendiary Fires—Kanabec County

Year	Incendiary Incidents	Fires per 100K People	Dollar Loss
2013	3	20	\$0
2012	1	7	\$1,500
2011	7	27	\$0
2010	4	27	\$6,000

Figure 14. Kanabec County Fire Districts



Relationship to Other Hazards

Service disruptions—caused by major fires when the structures (partially or completely destroyed) are essential public facilities can impact the general public.

Health risks—occur when damage is done to essential infrastructure such as water and or wastewater facilities.

Hazardous materials—are a public health risk when they are part of a fire.

Terrorism—fires may be deliberately set as part of a terroristic act.

Plans and Programs in Place

Fire districts and fire departments--structure fires are served by local fire districts and fire departments. Each district is responsible for fires within their district boundaries. However, they often work together on larger fires. These fire departments provide educational programs throughout the county.

Zoning—helps control development of new construction, including the enforcement of safety restrictions such as setbacks, coverage, depth, and structure height requirements. Portions of the zoning regulations are intended to improve fire safety, such as setbacks, and road width to allow for easy emergency vehicle access.

State training—firefighters and fire departments participate in ongoing fire-fighting training offered by the state.

Program Gaps or Deficiencies

- Some local roadways are not adequate to handle fire trucks.
- Most of the narrow/overgrown roads exist in the more rural areas of the county. This fact plus the distance of some structures/properties from fire departments causes longer response times. Continued public awareness of the limitations is a priority.
- Adequate staff of fire departments, including the retention and recruitment of volunteer firefighters and associated equipment can be a challenge.
- Strategic planning for fire departments could assist with determining future needs such as training and equipment.

4.5.3 Hazardous Material

Hazardous materials are generally chemical substances, which if released or misused can pose a threat to the environment or health of a community. These chemicals are used in industry, agriculture, medicine, research and consumer goods throughout Kanabec County. Hazardous materials come in the form of explosives, flammable and combustible substances, corrosives, poisons and radioactive materials.

Major trucking and transport activity of hazardous materials travel along State Highway 65 and State Highway 23. Both are common routes between the Twin Cities to the south of Kanabec County and the Iron Range to the north. Many trucks travel this route daily, some of which may haul hazardous materials. Minnesota Department of Transportation finds that more than half of the accidents involving hazardous materials have occurred on the state's roadways.

A hazardous material spill or release can pose a risk 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 can be 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.

Hazardous materials are transported by road, rail, aircraft and pipeline; each presenting a different level of risk of unwanted release of the hazardous materials. Transported products include hazardous materials moving from producers to users, moving between storage and use facilities, and hazardous waste moving from generators to treatment and disposal facilities.

Hazardous Waste History in Kanabec County

Rail transportation risks from hazardous materials are somewhat minimized because there are only five miles served by rail in the county. However, approximately 11% of all statewide transportation incidents involving hazardous material are from rail transport, according to MnDOT statistics. In 2005, a near-derailment on the BNSF railway line occurred close to the Kanabec County border. No one was injured when the train carrying palletized iron ore (taconite) derailed 44 cars of a 145 car train north of Grasston. There were no hazardous materials involved in the incident.

The Minnesota Department of Health's Hazardous Substance Emergency Events Surveillance (HSEES) reports from 1999-2009 (when the program ended) actively collected information describing the public health consequences of acute releases of hazardous substances. No incidents were ever reported for Kanabec County related to the release of substances, number of victims, number and types of injuries, and number of evacuations.

The Minnesota Pollution Control Agency (MPCA) Superfund Program identifies, investigates and determines appropriate cleanup plans for abandoned or uncontrolled hazardous waste sites where a release or potential release of a hazardous substance poses a risk to human health or the environment. The MPCA Superfund report shows no Kanabec County sites.

Vulnerability

Hazardous materials exist as part of everyday life in Kanabec County. The challenge is to use, store and transport hazardous materials in a safe way that does not harm the community and prepare an effective response to unwanted releases of hazardous materials when they occur. A hazardous materials accident can occur at any time.

Hazardous materials spills might cause the short term or long term evacuation of an affected area. Depending on the nature of the spill and local weather conditions, residences, businesses, hospitals, schools, nursing homes, and roadways may be evacuated or closed to traffic until cleanup can be achieved.

A variety of hazardous materials exist as fixed facilities throughout Kanabec County. Some materials are particularly lethal even in small amounts, while others require strong concentrations with prolonged exposure periods to cause harm.

Kanabec County has one municipally-run airport that operated 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, the risk of an incident is further increased by any hazardous cargo brought into the facility for transport.

The road system in Kanabec County provides a network to transport both hazardous and non-hazardous material throughout the region and between local communities. Risk of hazardous materials events vary based on the classification of the road and its proximity to people and property. However, property directly adjacent to State Highways 65, and 23 are more vulnerable due to the sheer volume of traffic on these two highways.

The pipeline in Kanabec County supplies pressurized flammable liquids transmission. A liquid release from this transmission line would create significant damage. People, homes, and other structures directly surrounding the pipeline could be affected by a pipeline explosion.

The specific hazards created by a release are dependent on the hazardous characteristics of the material, the amount released, the location where the release occurs, and the weather and topographic conditions in the area. The highest vulnerability areas are in Mora, and Ogilvie. These cities contain the majority of the county's population. Future populations will be equally vulnerable to hazardous waste spills. However, the county township, and cities' zoning regulations minimize this impact by prohibiting any residential development in industrial areas. Development along the major transportation corridors throughout the county are at higher risk than those located one mile or more from a major county corridor.

Hazardous materials spills impact some areas more than others in Kanabec County. The risk of an event is most possible in the higher populated portions of the county in and near the cities of Mora and Ogilvie in the southeast corner of the county. These cities also have most of the fixed facilities within the county. Hazardous waste spills are also possible along State highways, with risk raised when they are within the cities of Mora and Ogilvie.

Relationships to other Hazards

Water supply contamination – If spilled, hazardous materials can infiltrate rivers and private wells and fisheries. This would have serious health effects on residents of the community. There is also a chance of wastewater contamination. Kanabec County Public Health also monitors for air quality at spill sites.

Plans and Programs in Place

County-wide warning system—A county-wide warning system for a disaster is in place and is monitored by radio stations, nursing homes, the hospital and each of the schools.

State agency cooperation—Kanabec County works directly with the appropriate state agencies to address needs for responding to and mitigating the impacts of a hazardous event. This includes the reporting of hazardous materials to the county emergency center. There is a procedure for the commercial/industrial/chemical user, the Sheriff's office and County Emergency Manager.

Emergency Operations Plan—Kanabec County's current plan outlines procedures for dealing with hazardous material accidents, spills, and releases.

Hazardous chemicals location identification—Kanabec County's Emergency Manager works with the Department of Public Safety and other entities to assist in the identification of hazardous chemicals existing at facilities throughout Kanabec County so that local emergency officials can prepare for incidents.

Nuclear Contingency Plan—The Monticello Power Plant works with an adjacent county (Isanti) to annually review and update the Nuclear Contingency Plan, address evacuation procedures, address land use issues for adjacent parcels and update mutual aid agreements with surrounding communities.

Radiological Ingestion Zone Plan—Kanabec County’s Radiological Ingestion Zone Plan identifies and defines the primary actions, responsibilities and necessary county-state coordination that must take place in the 50 mile ingestion pathway zone.

Water Plan—Kanabec 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.

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 (OSHA) training on a yearly basis.

Methamphetamine Lab Identification—Various agencies and organizations take part in multiple education and enforcement venues that address lab identification and cleanup. Plans, policies and procedures were established in relation to meth lab incidents in the county. These efforts of information and awareness lessen susceptibility to an accident that could impact large areas.

Program Gaps or Deficiencies

Kanabec County does not require commercial/industrial establishments to report hazardous materials to the county Emergency Center and to the respective cities’ fire departments.

4.5.4 Water Supply Contamination

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

The causes of water contamination are numerous and range from failing septic systems, leaking underground tanks, to improper use of household chemicals. It is important to test water every year if the well is not used continuously. Residences near lakes and rivers often have wells that use shallow ground water that is particularly at risk for contamination. Seasonal homes or cottages may have older wells that need repair or replacement, but are a lower priority than the primary residence. In some instances surface water can be used for the household water supply. Surface water presents a different set of risks and problems; information about special consideration and testing for surface water is available from the Minnesota Department of Health (MDH).

The most obvious concern about an unsafe water supply is the health risk to family or guests. Wastewater contamination serves as a source of bacteria, viruses, and parasites that can cause gastrointestinal problems or transmit contagious diseases.

Vulnerability

Most of the drinking water in Kanabec County comes from aquifers. Thick glacial till is found throughout the majority of Kanabec County, which reduces the effect contamination might have on the water

supply. The sand-plain aquifer area has the highest potential for ground water contamination, according to the MPCA Division of Water Quality.

Hazardous waste spills are a minor risk for water supply contamination in Kanabec County. Although no known spills have occurred, risks are higher along State Highways 65 and 23 because of the number of waste transporters traveling on these particular highways. Ground water contamination risks are also higher in the cities of Mora and Ogilvie because of the amount of commercial and industrial activity.

Water supply contamination will remain a risk in the future. However, measures are being taken to reduce the potential for risk in the future. The county is registered in the Minnesota Pollution Control Agency's County Feedlot Program, giving the county the responsibility to implement feedlot rules and regulations. This results in better relationships between local feedlot owners and county staff who implement the program. This program allows local officials to increase the amount of education given to county feedlot owners.

Risk from water supply contamination has been minimal in Kanabec County. Mora and Ogilvie are the only municipal water supply systems in the county. Many rural residents within townships have private wells, although contamination through these wells would be minimal.

Water Contamination History in Kanabec County

The Minnesota Department of Health Section of Drinking Water Protection provides Drinking Water Annual Reports. This report has been issued each year since 1995 to provide Minnesotans with basic information about the world's most important resource—drinking water. Source water protection efforts are a vital part of providing safe drinking water. It's much easier to keep contamination out of surface and groundwater supplies than it is to remove it. However, sometimes water utilities must deal with contaminated sources. Although the Minnesota Pollution Control Agency takes the lead in the clean-up of these sites, the Minnesota Department of Health's drinking water program works with affected communities to ensure the continuation of a safe supply of drinking water. On average, Kanabec County reports two public water supply violations each year.

In the State of Minnesota public water supply systems include all systems that serve 25 or more people on a regular basis, or that have 15 or more service connections. There are over 7,000 such systems in Minnesota, including almost 1,000 community systems (700+ municipal systems and over 6,000 non-community systems) which provide water to consumers in their homes, factories, schools, restaurants, and highway rest stops as examples.

Relationships to Other Hazards

Infectious diseases—Polluted human water sources can cause illness and epidemics in both humans and animals.

Plans and Programs in Place

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 these federal drinking water standards, or more stringent ones established by the state, are met by each public water supplier.

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. Also, the EPA requires all local suppliers to promptly inform the public if their supply becomes contaminated.

Wellhead protection program—Kanabec County has set up a wellhead protection program, as promoted by the Minnesota Department of Health. In Kanabec County all public water suppliers are required to manage an inner-wellhead management zone, a 20-foot radius surrounding a public water supply. In addition, owners and operators of such wells must prepare a wellhead protection plan.

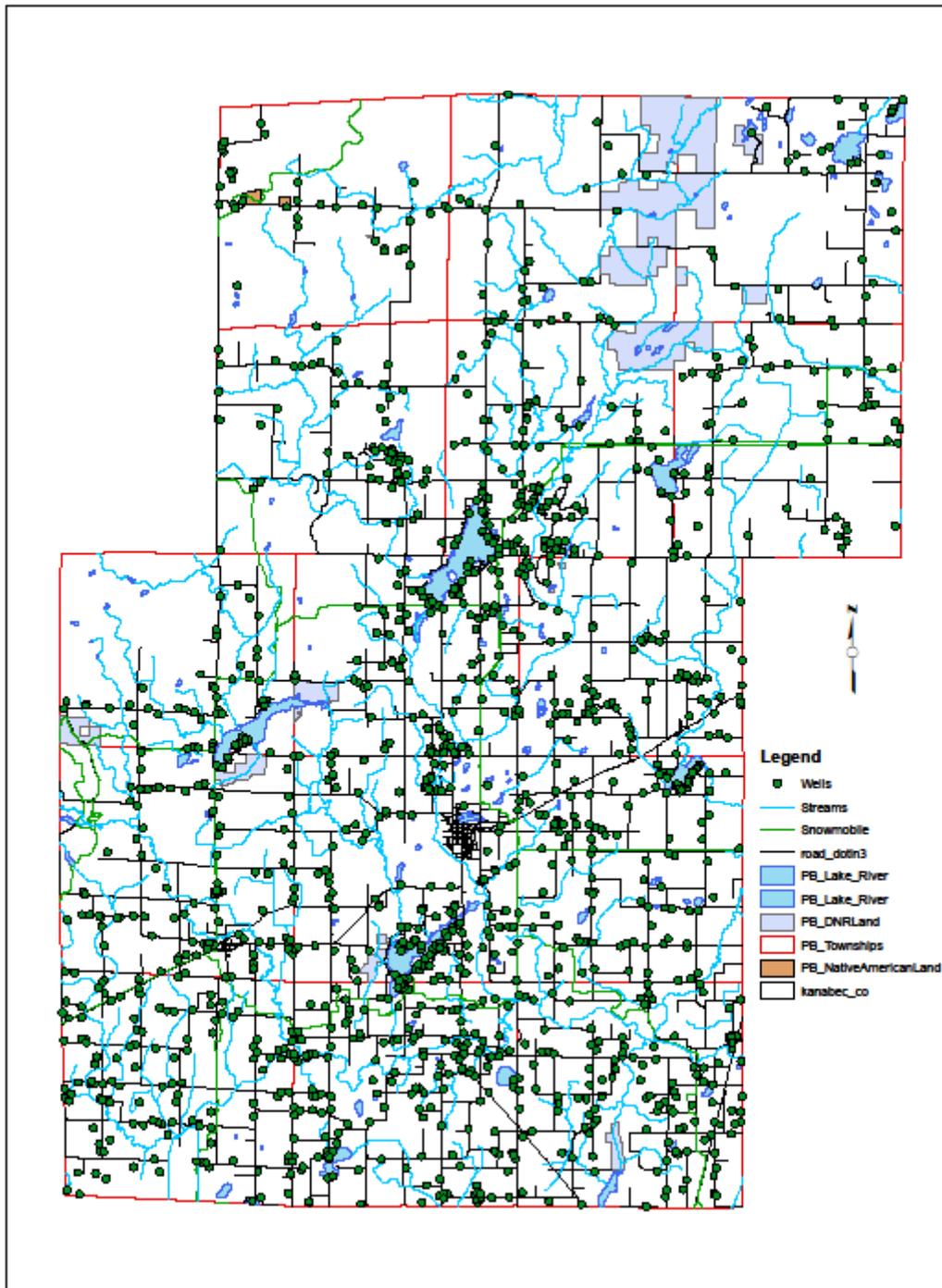
Well construction and testing—Since 1974, all water wells constructed in Minnesota must meet the location and construction requirements of the Minnesota Well Code. These requirements pertain to private wells, also. The county recommends that private wells be tested annually for contamination. However, private wells are maintained by the owner and inspections are not required. The Kanabec County Health Department is an access point for a private testing company that tests for bacteria and nitrates on private wells at a nominal cost.

Feedlot pollution prevention—Several steps are being taken to protect ground water sources from feedlot runoff. County ordinances require all feedlots within the county participate in the state’s feedlot programs. Also, county extension services promote best management practices to minimize runoff from feedlots into rivers. Feedlot locations are also limited by county zoning ordinances. Existing feedlots are allowed, but are considered a nonconforming use and cannot be expanded.

Program Gaps or Deficiencies

Residents in Kanabec County carry personal responsibility to test their well water on a regular basis to ensure their water supply is safe. If residents do not take on this responsibility, there is no mechanism in place to protect their drinking water. Figure 21 shows the locations of wells in Kanabec County.

Figure 21. Well Locations in Kanabec County



4.5.5 Terrorism

Human caused hazards are 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. Or they can be acts of individuals perpetrated for personal reasons. 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.

Terrorism History in Kanabec County

Kanabec County has no history of terrorist activity or individual acts 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.

Relationships with Other Hazards

Cascading effects of an intentional human-caused disaster are highly dependent on the specific mode used and asset targeted. Impacts could include spread of infectious disease, fires, and secondary explosions are possible with explosive attacks and fires from arson attacks can extend beyond intended targets such as forest fires.

Plans and Programs in Place

Kanabec County officials working through the county's Emergency Preparedness Committee conduct training and exercises related to terrorism. The sheriff's office and other Kanabec County officials meet regularly with their regional counterparts to discuss and plan terrorism response and prevention issues.

Program Gaps or Deficiencies

Kanabec County residents take the view that terrorism won't happen here, and consequently, the county remains relatively unprepared, due in part to the lack of urgency by its citizens.

4.5.6 Nuclear/Radiological

Kanabec County is located within 50 miles of the Monticello Nuclear Generating Plant and required, as such, to have an Ingestion Pathway Zone Plan. This document identifies and defines the primary issues, actions, responsibilities and the necessary county-state coordination that must take place following a nuclear plant incident in the 50-mile Ingestion Pathway Zone (IPZ).

The State of Minnesota, Homeland Security, and Emergency Division through the State Emergency Operations Center (SEOC) is responsible for overall direction and control, protective action decision making, and incident coordination as outlined in Minnesota Statute Chapter 12 and the Minnesota Emergency Operations Plan (MEOP) for nuclear generating plant emergencies. This role differs from the State's usual role as primarily support in nature for incidents like floods and tornados.

The counties within a 50-mile radius of a nuclear generating plant are considered Ingestion Counties and would be asked to support the response actions necessary to protect the food supply from low-level

radiological material contamination and to protect population from long-term low-level exposure of radioactive contamination, if necessary. Ingestion Counties may also be asked to support relocation activities for populations exposed to low-level long-term contamination, should it become necessary.

Nuclear/Radiologic Event History in Kanabec County

None

Relationships with Other Hazards

A release from a nuclear generating plant will disperse as it travels downwind, leaving higher concentrations of contaminated material closer to the plant and lower levels further away. The lower concentrations that are deposited further downwind present potential issues for low-level contamination, which will affect the counties within the 50-mile Ingestion Planning Zone.

The issues affecting Ingestion Counties, as in the case of Kanabec, become prominent in the later Ingestion Phase of the incident (day two). During this period, the focus is on:

- Defining the area/boundaries of the low-level contamination
- Implementing Protective Action Decisions protecting food supply from contamination
- Restricting the movement of contaminated animals and food products (especially milk and dairy products)
- Implementing Protective Action Decisions protecting the public from long-term low-level radiation exposure (relocation if needed)
- Decontaminating areas of critical importance (water treatment facilities, major roads/bridges, etc.)

Plans and Programs in Place

Kanabec County has an Ingestion Zone Plan and will be conducting an exercise in 2016 to increase responder's awareness and knowledge.

Program Gaps or Deficiencies

A nuclear/radiological event is thought of as unlikely and therefore not much has been done to prepare.



SECTION 5—MITIGATION STRATEGY

The goal of mitigation is to protect lives and reduce the future impacts of hazards including property damage, disruption to local and regional economies, the amount of public and private funds spent to assist with recovery, and to build disaster-resistant communities. Mitigation actions and projects should be based on a well-constructed risk assessment, provided in Section 4 of this plan. Mitigation should be an ongoing process adapting over time to accommodate a community's needs.

5.1 Community Capability Assessment

The capability assessment identifies current activities used to mitigate hazards. The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to the lessening of disaster damages. The assessment also provides an evaluation of these capabilities to determine whether the activities can be improved in order to more effectively reduce the impact of future hazards. The following sections identify existing plans and mitigation capabilities within all of the communities.

5.1.1 National Flood Insurance Program (NFIP)

The NFIP is a federal program created by the U.S. Congress to mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances and to provide access to affordable, federally-backed flood insurance protection for property owners. The NFIP is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHAs), the federal government will make flood insurance available within the community as a financial protection against flood losses.

Kanabec County and the cities of Mora, Ogilvie and Quamba are members of the National Flood Insurance Program.

5.1.2 Plans and Ordinances

Kanabec County and its incorporated communities have a number of plans and ordinances in place to ensure the safety of residents and the effective operation of communities. In Section 4.4 of this plan (Hazard Profiles) a review of the plans and programs in place as well as any identified program gaps or deficiencies was included as related to each of the natural hazards addressed in the plan. Information was collected through a wide-variety of data searches, public documents, and surveys of units of government, schools, and other key stakeholders. The review of this information was used to inform the development of mitigation strategies for this plan update. The Kanabec County Emergency Management office is responsible for the maintenance and update of the Kanabec County All-Hazard Mitigation Plan.

5.2 Mitigation Goals

In Section 4.0 of this plan, it was identified that Kanabec County is prone to a number of natural and technological hazards. Although hazards cannot be eliminated altogether, Kanabec County can work toward building toward building disaster-resistant communities.

The goals, strategies and objectives listed in the 2014 Minnesota State Hazard Mitigation Plan were adopted for use in the Kanabec County All Hazard Mitigation Plan (Table 24). This framework will allow for integration of the mitigation actions that are listed by Kanabec County and its jurisdictions into the state plan. The state will then be able to develop a statewide strategy that will benefit all of Minnesota. In addition, Kanabec County retained the goals and objectives summary from the 2008 plan, which are shown in Table 25.

Table 25. Goals, Strategies, and Objectives from the 2014 Minnesota State Hazard Mitigation Plan

Flooding Goal: Reduce deaths, injuries, property loss and economic disruption due to all types of flooding (riverine, flash flooding, dam/levee failure)

Mitigation Strategy	Objectives
Prevention:	Planning, technical studies, training, adoption of ordinances and legislation, acquisition and use of equipment, establishing shelters, and encouraging participation in NFIP and CRS will be used to prevent or reduce risks to lives and property from flooding.
Property Protection:	Acquisition, repair, or retrofitting of property and acquisition and use of equipment will be used to prevent or reduce risks to property from flooding.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from flooding in order to prevent or reduce those risks.
Natural Resource Protection:	Stream corridor protection projects and restoration and soil erosion control projects will be used to prevent or reduce risks and increase the protection of natural resources from flooding.
Emergency Services:	Technological improvements, warning systems, responder training, emergency response services, acquisition and use of equipment, and planning will provide emergency services to prevent or reduce the risks to lives and property from flooding.
Structural Improvements:	Construction and maintenance of drains, sewer drainage and separation projects, floodwalls, dams, culverts, levees, roads, bridges, and general flood protection projects will be used to prevent or reduce damages from flooding, loss of services to critical equipment, and the risks they pose to lives, property, and the natural environment.

Wildfire Goal: Reduce deaths, injuries, property loss, natural resource and economic disruption due to wildfire.

Mitigation Strategy	Objectives
Prevention:	Enforcement of regulations, adoption of ordinances, technical studies, and planning will be used to prevent or reduce wild land fires and the risks they pose to lives, property, and the natural environment.
Property Protection:	Vegetation management, defensible space, and water treatment measures (for example, sprinklers) will be used to prevent or reduce the risk of wild land fires.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from wild land fires in order to prevent or reduce those risks, specifically the Firewise program.
Emergency Services:	Planning, responder training, acquisition and use of equipment, evacuations, warning systems, technological improvements, and emergency response services will provide emergency services to prevent or reduce risks to lives and property from wild land fires.
Structural Improvements:	New or retrofit construction utilizing fire resistant building materials and installation and maintenance of sprinkler and warning systems will be used to prevent or reduce the risk of wild land fires.

Windstorm Goal: Reduce deaths, injuries, property loss, and economic disruption due to windstorms.

Mitigation Strategy	Objectives
Prevention:	Planning, training, technical studies, acquisition and use of equipment, adoption of ordinances and legislation, and construction of new or retrofitting safe rooms

will be used to prevent or reduce risks from windstorms to lives, property, and economic activity.

Property Protection: Constructing safe rooms and storm shelters, retrofitting and vegetation management will be used to prevent or reduce risks to the protection of property from windstorms.

Public Education and Awareness: Public education, warning systems, and access to information will be used to raise public awareness of risks from windstorms in order to prevent or reduce those risks.

Emergency Services: Warning systems, responder training, emergency response services, technological improvements, and response and recovery planning will provide emergency services to prevent or reduce risks from windstorms.

Structural Improvements: Construction of storm shelters and safe rooms and maintenance of other structural projects will be used to prevent or reduce risks from windstorms.

Severe Winter Storms Goal: Reduce deaths, injuries, property loss, and economic disruption due to severe winter storms.

Mitigation Strategy Objectives
Prevention: Acquisition and use of equipment, adoption and enforcement of ordinances and legislation, planning, training, and technical studies will be used to prevent or reduce risk to the protection of lives, property, and economic activity from the risks from severe winter storms.

Property Protection: Acquisition and use of equipment and vegetation management will be used to prevent or reduce risks to property from severe winter storms.

Public Education and Awareness: Public education, warning systems, access to information, and outreach projects will be used to raise public awareness of the risks from severe winter storms in order to reduce those risks.

Emergency Services: Acquisition and use of equipment, emergency response services, warning systems, technological improvements, planning, and responder training will provide emergency services to prevent or reduce risks from severe winter storms.

Structural Improvements: Structural projects for critical infrastructure will be implemented and maintained to prevent or reduce risks from severe winter storms.

Lightning Goal: Reduce deaths, injuries, property losses, loss of services, and economic disruption due to lightning.

Mitigation Strategy Objectives
Prevention: Planning, technical studies, acquisition and use of equipment, adoption of ordinances and legislation, and establishing shelters will be utilized to prevent or reduce the risks from lightning.

Property Protection: Retrofits and construction of safe rooms and storm shelters will be used to prevent or reduce the risks to property from lightning.

Public Education and Awareness: Public education, outreach projects, and access to information will be used to raise public awareness of risks from lightning in order to prevent or reduce those risks.

Emergency Services: Responder training, warning systems, emergency response services, planning, acquisition and use of equipment, and technological improvements will provide emergency services to prevent or reduce risks to lives and property from lightning.

Tornado Goal: Reduce deaths, injuries, property loss, and economic disruption due to tornadoes.

Mitigation Strategy Objectives

Prevention:	Adoption of ordinances and legislation, acquisition and use of equipment, planning, conducting technical training, studies, and retrofit or construction of safe rooms will be used to prevent or reduce risks to lives, property, and economic activity from tornadoes.
Property Protection:	Constructing safe rooms and storm shelters, and retrofits will be used to prevent or reduce risks to property from tornadoes.
Public Education and Awareness:	Warning systems, IPAWS, public education, and access to information will be used to raise public awareness of risks from tornadoes in order to prevent or reduce those risks.
Emergency Services:	Warning systems, technological improvements, responder training, planning, emergency response services, and acquisition and use of equipment will provide emergency services to prevent or reduce risks from tornadoes.
Structural Improvements:	Construction of storm shelter and safe rooms and maintenance of other structural projects will be used to prevent or reduce risks from tornadoes.
Drought Goal:	Reduce economic loss and environmental impacts due to drought.
Mitigation Strategy	Objectives
Prevention:	Planning, acquisition and use of equipment, and technical studies will be used to prevent or reduce risks from drought.
Property Protection:	Water treatment measures will be used to prevent or reduce risks to property from drought.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from drought in order to prevent or reduce those risks.
Natural Resource Protection:	Planning and implementing watershed plans will be used to prevent or reduce risks from drought.
Structural Improvements:	Technological improvements and acquisition of equipment for structural projects will be used to prevent or reduce risks from drought.
Extreme Heat Goal:	Reduce deaths, injuries, and economic disruption due to extreme heat.
Mitigation Strategy	Objectives
Prevention:	Planning and acquisition and use of equipment will be used to prevent or reduce risks from extreme heat.
Property Protection:	Acquisition and use of equipment will be used to prevent or reduce risks to property and economic disruption from extreme heat.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of the risks from extreme heat in order to prevent or reduce those risks.
Structural Improvements:	Planning, responder training, warning systems, establishing shelters, and technological improvements will provide emergency services to prevent or reduce risks from extreme heat.
Extreme Cold Goal:	Reduce deaths, injuries, property loss, and economic disruption due to extreme cold.
Mitigation Strategy	Objective
Prevention:	Planning and the acquisition and use of equipment will be used to prevent or reduce risks from extreme cold.
Property Protection:	Acquisition and use of equipment will be used to prevent or reduce risks to property and economic disruption from extreme cold.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of the risks from extreme cold in order to prevent or reduce those risks.

Structural Improvements: Planning, responder training, warning systems, establishing shelters, and technological improvements will provide emergency services to prevent or reduce risks from extreme cold.

5.3 Mitigation Actions and Projects

5.3.1 Overview

The Kanabec County All-Hazard Mitigation Plan uses six mitigation measure categories from the FEMA State and Local Mitigation Planning How to Guides. The list of Mitigation Actions by Strategy approved by HSEM was used in identifying mitigation action strategies. The measures are listed as follows:

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses; preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and the protection of critical facilities.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

5.3.2 STAPLE+E Evaluation Criteria

In the review of selected mitigation strategies and actions were ranked by implementation priority. Guidance for ranking mitigation activities is drawn from FEMA evaluation criteria. The evaluation criteria: Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE+E) involved the following categories and questions.

Social:

- Will the proposed action adversely affect one segment of the population?
- Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Technical:

- How effective is the action in avoiding or reducing future losses?
- Will it create more problems than it solves?
- Does it solve the problem or only a symptom?
- Does the mitigation strategy address continued compliance with the NFIP?

Administrative:

- Does the jurisdiction have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained?
- Can the community provide the necessary maintenance?
- Can it be accomplished in a timely manner?

Political:

- Is there political support to implement and maintain this action?
- Is there a local champion willing to help see the action to completion?
- Is there enough public support to ensure the success of the action?
- How can the mitigation objectives be accomplished at the lowest cost to the public?

Legal:

- Does the community have the authority to implement the proposed action?
- Are the proper laws, ordinances, and resolution in place to implement the action?
- Are there any potential legal consequences?
- Is there any potential community liability?
- Is the action likely to be challenged by those who may be negatively affected?
- Does the mitigation strategy address continued compliance with the NFIP?

Economic:

- Are there currently sources of funds that can be used to implement the action?
- What benefits will the action provide?
- Does the cost seem reasonable for the size of the problem and likely benefits?
- What burden will be placed on the tax base or local economy to implement this action?
- Does the action contribute to other community economic goals such as capital improvements or economic development?
- What proposed actions should be considered or be “tabled” for implementation until outside sources of funding are available?

Environmental:

- How will this action affect the environment (land, water, endangered species)?
- Will this action comply with local, state, and federal environmental laws and regulations?
- Is the action consistent with community environmental goals?

Implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based on many factors, which action will be undertaken first. In

order to pursue the top priority first, an analysis and prioritization of the actions is important. In addition to the use of STAPLE+E, the following criteria for mitigation potential ranking was used.

5.3.3 Criteria for Mitigation Potential Ranking

High Priority—Criteria includes: 1) methods for reducing risk from the hazard are technically reliable; 2) the County has experience in implementing mitigation measures; 3) mitigation measures are eligible under federal grant programs; 4) there are multiple mitigation measures for the hazard; 5) the mitigation measures are known to be cost effective; and 6) the mitigation measures protect lives and property for a long period of time, or are permanent risk reduction solutions.

Moderate Priority—Criteria includes: 1) mitigation methods are established; 2) the County has limited experience with the kinds of measures that may be appropriate to mitigate the hazard; 3) some mitigation measures are eligible for federal grants; 4) there is limited range of effective mitigation measures for the hazard; 5) mitigation measures are cost-effective only in limited circumstances; and 6) mitigation measures are effective for a reasonable period of time.

Low Priority—Criteria includes: 1) Methods for reducing risk from the hazard are not well-established, are not proven reliable, or are experimental; 2) the State or Counties have little or no experience in implementing mitigation measures, and/or no technical knowledge of them; 3) mitigation measures are ineligible under federal grant programs; 4) there is a very limited range of mitigation measures for the hazard, usually only one feasible alternative; 5) the mitigation measure(s) have not been proven cost effective and are likely to be very expensive compared to the magnitude of the hazard; and 6) the long-term effectiveness of the measure is not known, or is known to be relatively poor.

5.3.4 Mitigation Action Status and Types

There are six status designations for each mitigation action. They include: 1) new, actions have not started yet; 2) ongoing, actions require continuing application; 3) in-progress, actions are currently being acted upon; 4) complete, the action is complete; 5) deferred, no progress has been made; and 6) deleted, the action is no longer relevant.

The types of mitigation action are defined by: P=Prevention, PP=Property Protection, PE=Public Education, NRP=Natural Resource Protection, ES=Emergency Services, SI=Structural Improvement.

5.3.5 Hazard Mitigation Actions

Kanabec County and its included municipalities share a common Multi-Hazard Mitigation Plan and worked closely to develop it. Townships, cities along with Kanabec County Emergency Manager worked together to assure that the hazards and mitigation actions included in this plan are accurate and addressed in their jurisdictions.

The mitigation chart provides a description of how Kanabec County and its jurisdictions will work to implement and fund the implementation of the action. In the future, Kanabec County and its jurisdictions may seek to incorporate mitigation actions as appropriate into other local plans as they are either developed or updated. By doing so, the County and its jurisdictions will help to ensure sustained action for mitigation. Jurisdictions will continue to be part of an ongoing discussion with Kanabec County as together they look for opportunities for plan implementation.

Table 26. Kanabec County 2008 Hazard Mitigation Summary Update

HAZARDS	PRIORITY	ACTIONS
Wildfire	Low to Moderate	<ul style="list-style-type: none"> • Reduce wildfire risk. • Protect structures from wildfire. • Safety of residents by minimizing wildfire impact in residential areas Minimize impact to new buildings.
Flood	Moderate to High	<ul style="list-style-type: none"> • Elimination of any nonconforming structures in 100 year floodplain along the Snake River. • Continue to improve communications for county emergency responders Continue to comply with NFIP and produce high-resolution digital elevation model floodplain mapping.
Storms and Extreme Temperatures	High	<ul style="list-style-type: none"> • Safe and accessible shelter. • Adequate severe storm warning systems. • Infrastructure protected Support and relief to people affected by extreme temperatures.
Drought	Low	Protect ground water supplies
Fire	Moderate	<ul style="list-style-type: none"> • Protect structures from fire. • Educated and informed public continue to improve communications for county emergency responders.
Hazardous Materials	Moderate to High	<ul style="list-style-type: none"> • Emergency personnel and others affected continue to be informed about materials in and transported through the County Trained and equipped hazardous materials County response team in place.
Water Supply Contamination	Low	Quality ground water resources to ensure safe drinking water.
Domestic Preparedness Terrorism	Moderate	Protection of critical infrastructure. Safe and secure public gathering places.

IMPLEMENTATION STRATEGIES

Action	Priority	Responsible Agency	Funding/Staff/Timeframe	Location	Type/Status
Wildfire risks reduced by minimizing fuel in areas, within parks	Low to Moderate	<ul style="list-style-type: none"> • County Emergency Manager • Other partners: 	<ul style="list-style-type: none"> • \$1,000 educational materials • Existing staff 	<ul style="list-style-type: none"> • County-wide • Northeastern Kanabec County in 	<p>PP=Property Protection</p> <p>PP=Public</p>

systems and using multiple jurisdictions to prevent spread.

MN DNR, HSEM

- 12 months from date of plan adoption

forested areas

Education

NRP=Natural Resource Protection

Ongoing

Structures protected from wildfires

Low to Moderate

- Planning and zoning administrators for Kanabec County, City of Mora, and City of Ogilvie

- No funding amount given
- No staff assignment

- County-wide
- Northeastern Kanabec County in forested areas

PP=Property Protection

Ongoing

The safety of residents by wildfire education

Low to Moderate

- County Emergency Manager
- Other partners: Sheriff's department, selected non-government local groups (not defined) and local media, newspapers, and MN DNR

- \$5,000 Educational materials
- Existing staff

- County-wide
- Northeastern Kanabec County in forested areas

PE=Public Education

Ongoing

Elimination of nonconforming structures in the identified 100 year floodplain

Moderate to High

- Kanabec County Planning and Zoning Directors, County Administrator, and County Assessor
- Other Partners: county planning and zoning

- Minimal cost for zoning ordinance amendments
- Buyouts based upon the county assessor's current values to be determined after new NFIP

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

P=Prevention

Ongoing

Amend zoning ordinances.

Buyout

<p>Improved EMS communications element of county emergency response programs regarding flooding. This refers to emergency ratio repeater/transmitter in northeast corner of the county.</p>	<p>Moderate to High</p>	<ul style="list-style-type: none"> • commissions, county board, Grasston and Quamba, Mora and Ogilvie planning and zoning commissions, city councils • Kanabec County Planning and Zoning • Other partners: county water planner, Mora and Ogilvie planning offices, planning and zoning commission, city councils, township boards, DNR, HSEM, FEMA 	<p>flood maps are completed and consider buyout of repetitive loss flood damaged properties</p> <ul style="list-style-type: none"> • No staff assigned • \$90,000 • No staff assigned 	<p>Countywide</p> <p>City of Mora</p> <p>City of Ogilvie</p> <p>City of Grasston</p> <p>City of Quamba</p>	<p>process may take more than 10 years.</p> <p>SI=Structural Improvement</p> <p>In Progress</p>
<p>100 year flood risks addressed by high-resolution digital elevation model (DEM) floodplain mapping for all jurisdictions</p>	<p>Moderate to High</p>	<ul style="list-style-type: none"> • Kanabec County Planning and Zoning • Other partners: county water planning offices, planning and zoning commission, city councils, township boards, DNR, HSEM, FEMA 	<ul style="list-style-type: none"> • No estimated costs • No staff assigned • Three years 	<p>Countywide</p> <p>City of Mora</p> <p>City of Ogilvie</p> <p>City of Grasston</p> <p>City of Quamba</p>	<p>PP=Property Protection</p> <p>SI=Structural Improvement</p> <p>In Progress</p>
<p>Safe and accessible shelter from violent storms</p>	<p>High</p>	<ul style="list-style-type: none"> • Kanabec County Planning and Zoning • Other partners: 	<ul style="list-style-type: none"> • No cost estimates • No staff assigned 	<ul style="list-style-type: none"> • Ford Township • Kroschel Township • Peace Township 	<p>SI=Structural Improvement</p>



<p>Adequate severe storm warning system for all county residents by ensuring they are aware of National Weather Service (NWS) warning systems especially in townships</p>	<p>High</p>	<p>County Emergency Management Personnel, County Board, Planning and Zoning Office, NWS, city planning and zoning commissions, city councils, township boards, HSEM, FEMA</p> <ul style="list-style-type: none"> • Kanabec County Emergency Manager • County board, township board, NWS storm spotters network, county law enforcement center ham radio club, local TV and radio stations, HSEM, FEMA 	<ul style="list-style-type: none"> • \$5,000 staff time • \$20,000 equipment upgrades • No staff assigned 	<ul style="list-style-type: none"> • Countywide • City of Mora • City of Ogilvie • City of Grasston • City of Quamba • Brunswick Township • Ford Township • Kroschel Township • Peace Township 	<p>Ongoing</p> <p>SI=Structural Improvement</p> <p>ES=Emergency Services</p> <p>In Progress</p>
<p>Improved EMS communication elements of county emergency response programs regarding severe weather, specifically the emergency radio repeater/transmitter in northeast corner</p>	<p>Moderate to High</p>	<ul style="list-style-type: none"> • County emergency manager • Other partners: County Sheriff's Office, emergency responders, HSEM and FEMA 	<ul style="list-style-type: none"> • \$90,000 • No staff assigned 	<ul style="list-style-type: none"> • Countywide • City of Mora • City of Ogilvie • City of Grasston • City of Quamba • Brunswick Twp 	<p>ES=Emergency Services</p> <p>SI=Structural Improvement</p> <p>In Progress</p>

of the county

Ford Twp

Kroschel Twp

Peace Twp

Infrastructure is protected and wisely used in regard to storms and temperature extremes

High

- Kanabec County Planning and Zoning
- Other partners: county and city planning commissions, city and county planning staff, county emergency manager, local telephone and electric distribution systems. HSEM, FEMA

- Cost unknown
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba
- Brunswick Township
- Ford Township
- Kroschel Township
- Peace Township

PP=Property Protection

Ongoing

Providing support and relief to people affected by temperature extremes

High

- Kanabec County emergency manager
- Other partners: sheriff's department, local emergency manager, sheriff's department, local hospitals and clinics, county health department, county highway department, nursing homes

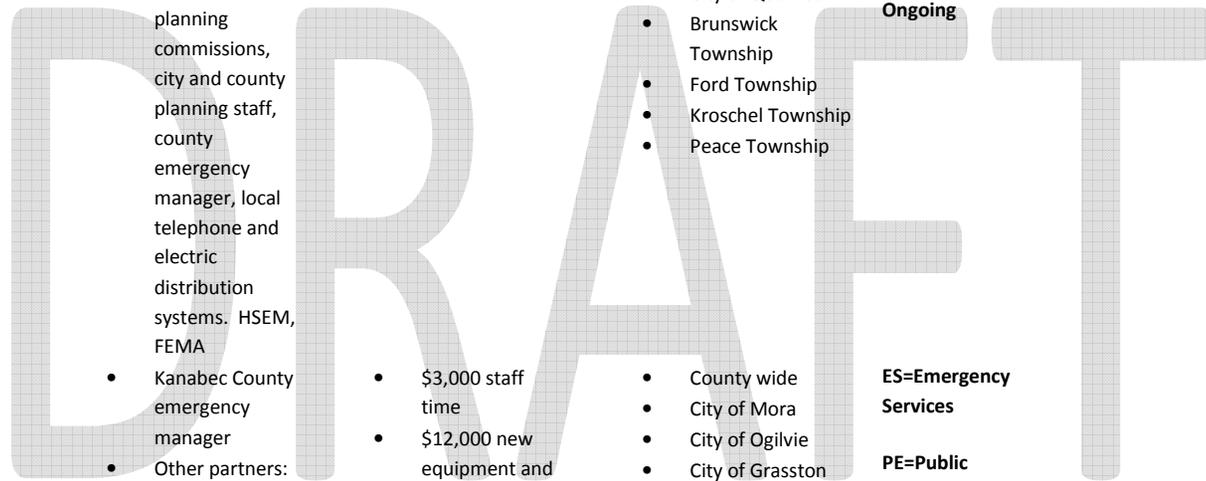
- \$3,000 staff time
- \$12,000 new equipment and upgrades
- No staff assigned

- County wide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

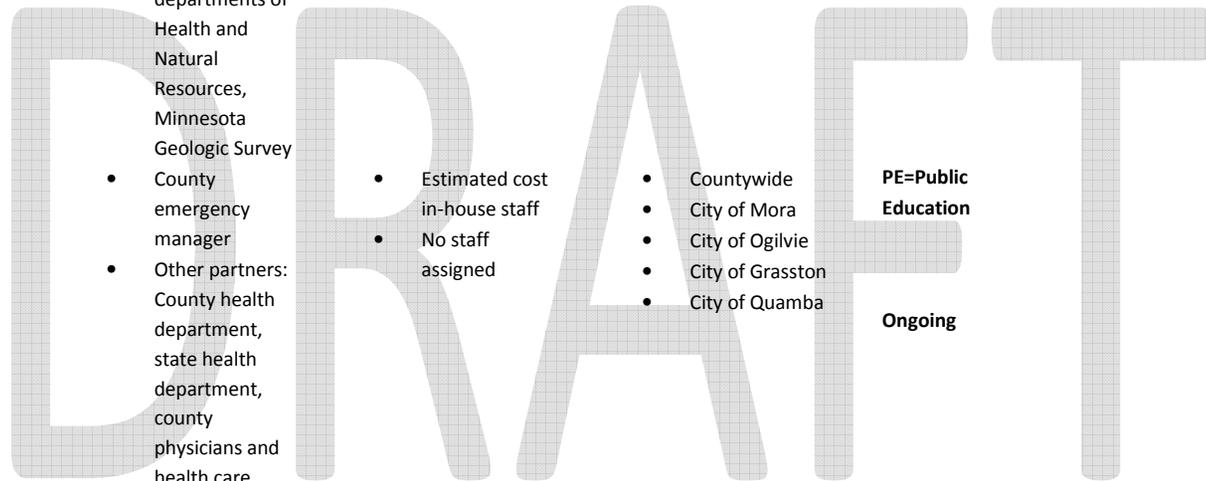
ES=Emergency Services

PE=Public Education

Ongoing



Ample and high-quality ground water supplies per drought	Low	<ul style="list-style-type: none"> County water planner Other partners: County planning and zoning, county engineer, county public health, county board, departments of Health and Natural Resources, Minnesota Geologic Survey 	<ul style="list-style-type: none"> \$45,000 No staff assigned 	<ul style="list-style-type: none"> Countywide 	<p>ES=Emergency Services</p> <p>Ongoing</p>
An educated, informed and responsive public in regard to infectious disease	Low	<ul style="list-style-type: none"> County emergency manager Other partners: County health department, state health department, county physicians and health care providers, hospital and clinics, county school systems, nursing homes 	<ul style="list-style-type: none"> Estimated cost in-house staff No staff assigned 	<ul style="list-style-type: none"> Countywide City of Mora City of Ogilvie City of Grasston City of Quamba 	<p>PE=Public Education</p> <p>Ongoing</p>
Continued quality and effective program addressing infectious diseases that could potentially impact the county	Low	<ul style="list-style-type: none"> County emergency manager Other partners: board of commissioners, water planner, county health director, city 	<ul style="list-style-type: none"> Estimated cost in-house staff time No staff assigned 	<ul style="list-style-type: none"> Countywide City of Mora City of Ogilvie City of Grasston City of Quamba 	<p>PE=Public Education</p> <p>Ongoing</p>



mayors,
township
boards, state
health
department,
county
physicians and
health care
provider,
hospital and
clinics, county
school systems,
and county
attorney

Structures protected
from fire as much as
possible

Moderate

- County planning and zoning
- Other partners: county board, city planning and zoning commissions, city councils, township boards, and various fire departments

- Estimated cost in-house staff time
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

P=Prevention

PP=Property Protection

Ongoing

An educated and
informed public
regarding fire safety

Moderate

- County emergency manager
- Other partners: school systems, county fire departments, county news media, and non-profit organizations

- Estimated cost in-house staff time
- No staff assigned
- Ongoing

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

PE=Public Education

Ongoing

Improved EMS
communication
elements of county
emergency response

Moderate

- County emergency manager
- Other partners:

- \$90,000
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston

SI=Structural Improvement

programs re: fire.
This refers to
emergency radio
repeater/transmitter
in northeast corner
of the county

county sheriff's
office and
emergency
responders

- City of Quamba

In Progress

Continued trained
and equipped
hazardous materials
county response
team in place

Moderate
to High

- County emergency manager
- Other partners: county zoning department, health department, and administrator, local news media, chambers of commerce, county sheriff, local fire and police services

- Estimated cost in-house training
- \$25,000 equipment and training
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

ES=Emergency Services

Ongoing

Safe drinking water
for all county
residents at all times

Low

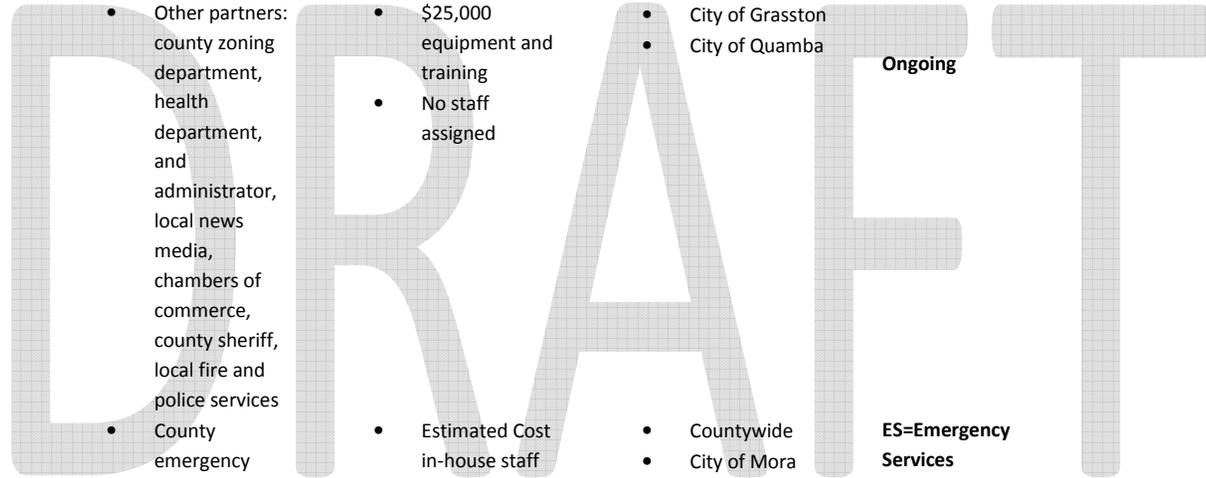
- County emergency management director
- Other partners: county and state health departments, county and city planning and zoning departments, county board, city councils and neighboring jurisdictions.

- Estimated Cost in-house staff time
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie
- City of Grasston
- City of Quamba

ES=Emergency Services

Ongoing



Protections (in regard to terrorism) of critical infrastructure, both public and private within Kanabec County

Moderate

- County emergency management director
- Other partners, county engineer, sheriff's department and various city law enforcement units, critical infrastructure plant managers, various community health facility managers, county and township boards, and city councils, HSEM, FEMA

- Estimated cost in-house staff time
- \$1,000,000 possible physical installation and corrective action costs
- No staff assigned

- Countywide
- City of Mora
- City of Ogilvie

PP=Property Protection

Ongoing

Conduct a critical infrastructure analysis of the at-risk infrastructure and identify an action plan for each

Safe and secure public gathering places

Moderate

- County emergency management director
- Other partners: sheriff's department, critical infrastructure plant managers, county fair board, school board, county board, city councils, HSEM, FEMA

- Estimated cost in-house staff time
- \$5,000 equipment
- No staff assigned

- Countywide
- City of Mora
- City of Quamba
- City of Grasston
- City of Quamba

SI=Structural Improvement

In Progress

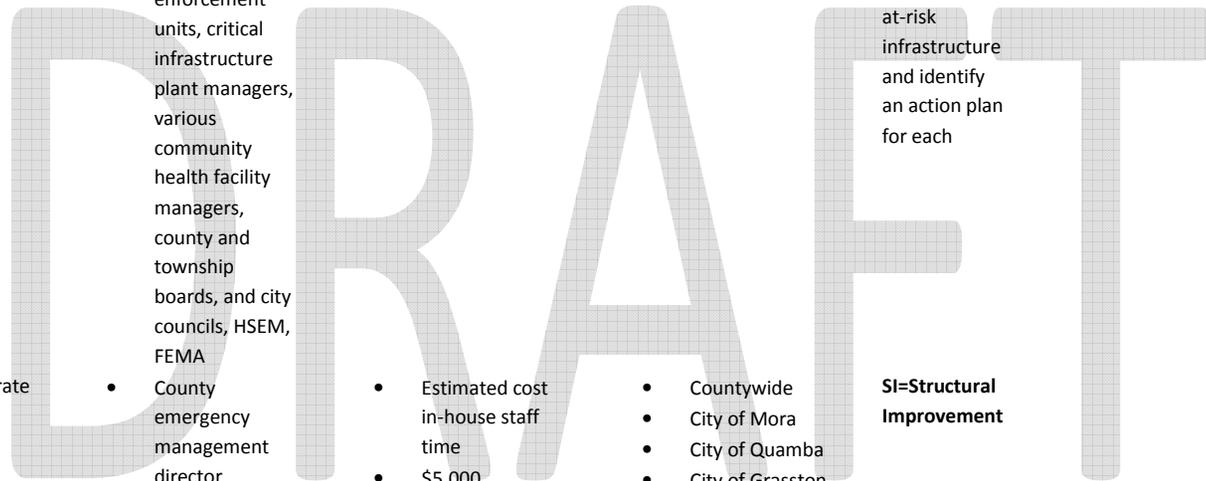
Adopt alternate power sources or

Moderate

- County emergency

- Estimated costs unknown

*Countywide



bury utility lines to critical facilities, to reduce loss of life and services.

- management director
- Other partners
Facilities managers, utility managers, county engineer, State officials, HSEM, FEMA

- No staff assigned

SI=Structural Improvement

New

Other

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SECTION 6—PLAN MAINTENANCE

6.1 Monitoring, Evaluation, and Updating the Plan

The Kanabec County Multi-Hazard Mitigation Plan (MHMP) should be considered and reviewed at minimum of every five years. The guidance in this section will function as the primary tool when reviewing progress on the implementation of the Kanabec County MHMP.

In order to monitor, evaluate, and update the MHMP during the five-year planning cycle, the Kanabec County Emergency Manager will continue the practice of a merged MHMP Steering Committee with the Kanabec County Emergency Preparedness Committee. This committee meets quarterly during the year, and the agenda routinely includes a regular discussion of the monitoring and evaluation of several planning documents, including the Kanabec County MHMP. This discussion leads to regular updates of the MHMP as needed. Meeting minutes are shared via email. The membership and staff seek public participation by bringing information from their communities or constituencies to the meetings and in return shares information garnered at the meeting with their communities and constituencies.

Additional stakeholders are added to the committee based on need. The Kanabec County Emergency Manager convenes the committee and its sub-groups to monitor plan implementation progress, and reassess needs. Additionally, if there is a need for a special meeting or training due to new developments or a declared disaster occurring in the county, the committee meets. Depending on the circumstances, mitigation projects may be implemented independently by individual communities or through local partnerships.

The committee reviews the MHMP goals and objectives to determine their relevance to changing situations within the county. Additionally, state and federal policies are reviewed to ensure compliance. The committee reviews the risk assessment and implementation actions and their processes.

Updates or modifications to the MHMP during the five-year planning process require a public notice and a meeting prior to submitting revisions to the individual jurisdictions for approval. The plan will be updated via written changes, submissions as the committee deems appropriate and necessary, and as approved by the county commissioners.

Data used to prepare the plan was obtained from existing public sources. As newer data becomes available, the updated data will be used for future assessments and analyses.

6.2 Implementation

Kanabec County and its jurisdictions share a common Multi-Hazard Mitigation Plan and work together to develop, revise, and implement it. Section 5.3.1 reflects the identified specific mitigation strategies and the jurisdictions that will implement them.

Some of the implementation methods that may be considered are:

Education: Educating residents remains one of the most effective mitigation strategies.

Capital Investment: Fire and ambulance equipment, sprinkler systems, and dry hydrants are tools that can limit risks and impacts of natural and man-made hazards.

Data Collection and Needs Assessment: Can aid in gaining a better understanding of threats and allow planning for mitigation strategies accordingly. As resources are limited for this part of the planning process, additional data collection is likely to be an ongoing activity as resources become available.

Coordination: Responsibilities for mitigation strategies stretch across various county departments, local fire and ambulance departments, city and township governments, and a host of state and federal agencies. Ongoing coordination is an important tool to ensure resources are used efficiently. Coordination can also avoid duplication of efforts or prevent gaps that are created because of unclear roles and responsibilities. The mitigation plan review process can function as a tool to have an ongoing discussion of roles, responsibilities, and opportunities for coordination. Mutual aid agreements are a tool already in use for a number of services.

Regulation: Is an important mitigation tool for the county. It plays a particularly important role for land use, access to structures and the protection of water resources and public health.

6.3 Continued Public Participation

Continued public involvement is critical to the successful implementation of the Kanabec County Multi-Hazard Mitigation Plan. Through continued engagement of new public stakeholders in planning discussions and project implementation, the Kanabec County Emergency Preparedness Committee, and the various jurisdictions within the county will work to keep its local government and residents aware of implementation efforts, and be invited to participate in those efforts.

Jurisdictions will use a wide variety of methods of public outreach to engage residents, new stakeholders and existing champions; including sharing information at city council meetings, special events, working with local schools and partner organizations, and posting information on relevant local or social media outlets as a way to inform and engage the public. As local mitigation projects are implemented, jurisdictions will work to keep the public updated and engaged in these local efforts of hazard mitigation.

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