

**ALL-HAZARD
MITIGATION PLAN
FOR
YELLOW MEDICINE
COUNTY**
A MULTI – JURISDICTIONAL PLAN



ADOPTED
June 2010



Prepared by
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CHAPTERS

YELLOW MEDICINE COUNTY

CHAPTER ONE: OVERVIEW

Definitions

Hazard Mitigation

Hazard mitigation may be defined as any action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards. Potential types of hazard mitigation measures include the following:

- Structural hazard control or protection projects,
- Retrofitting of facilities,
- Acquisition and relocation of structures,
- Development of mitigation standards, regulations, policies, and programs,
- Public awareness and education programs,
- Development or improvement of warning systems.

Hazard Mitigation Plan

Hazard mitigation planning can break the cycle of disaster-repair-disaster in a community and prepare it for a more sustainable future. Developing and putting into place long-term strategies that reduce or alleviate loss of life, injuries and property resulting from natural or human caused hazards accomplish this goal. These long-term strategies must incorporate a range of community resources including planning, policies, programs and other activities that can make a community more resistant to disaster. Mitigation planning efforts should both protect people, structures, while minimizing costs of disaster response and recovery. Mitigation is the cornerstone for emergency management and should be viewed as a method for decreasing demand on scarce and valuable disaster response resources.

Disaster Mitigation Act of 2000

As a result of the Disaster Mitigation Act of 2000, FEMA requires in order to be eligible for Hazard Mitigation Grant Program (HMGP) funds, jurisdictions must first have in place a multi-hazard mitigation plan and update the plan within a five year time span. This became effective November 1, 2004. FEMA has provided states with funding to help local governments partially fund such plans.

This new legislation amended Stafford Act (42 U.S.C. 5121 et seq.) which establishes a national program for pre-disaster mitigation. The program is meant to control Federal costs of disaster assistance and streamline administration of disaster relief.

Hazard

Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.

Goal

The goal of hazard mitigation is to eliminate and reduce vulnerability to significant¹ damage and/or repetitive damage from one or more hazards.

Benefits

The benefits of hazard mitigation include the following:

- Saving lives, protecting public health, reducing injuries,
- Preventing or reducing property damage,
- Lessen economic losses,
- Minimizing social dislocation and stress,
- Decreasing agricultural losses,
- Maintaining critical facilities in functioning order,
- Protecting infrastructure from damage,
- Protecting mental health,
- Reducing legal liability of government and public officials.

Process

The process of hazard mitigation involves many steps, including the following:

- Identification and screening of major hazards,
- Analysis of the risks posed by those hazards,
- Review of existing capabilities and resources,
- Development, implementation, and maintenance of specific hazard mitigation measures.

Although most mitigation measures are implemented on a continual basis, the post-disaster period often presents special hazard mitigation opportunities. Because such mitigation opportunities are often more apparent immediately following a disaster, both public officials and the general public may be more willing to consider taking mitigation actions and seeking special funding to assist implementation efforts.

Several post-disaster mitigation activities are "automatically" implemented in the event of a Presidential Disaster Declaration. One of the state's most notable activities involves the activation of the Minnesota Recovers Disaster Task Force. The task force is comprised of both state and federal agencies², and is chaired by the Department of Homeland Security and Emergency Management. In the event of a Presidential Disaster Declaration, all or part of the task force is activated and normally meets on a weekly or monthly basis. The meetings facilitate a coordinated and timely distribution of state/federal post-disaster recovery/mitigation funds by establishing mutually agreed upon (project) priorities, identifying eligible projects, and mixing and maximizing available funds in order to implement projects.

¹ Defined as damage greater than 50% from one event.

²The state and federal agencies requested to provide a representative for the Minnesota Recovers Disaster Task Force will generally include those that typically provide personnel to serve on an Interagency Hazard Mitigation Team/Hazard Mitigation Survey Team and/or a damage survey team. These members include Minnesota Department of Public Safety's Division of Emergency Management, FEMA, Department of Natural Resources, Department of Trade and Economic Development, Housing Finance Agency, Pollution Control Agency, and the state Historic Preservation Office. In addition, other agencies that have applicable programs, regulations, and/or funding may be asked to provide a representative. The specific agencies selected will be determined by the nature of the disaster.

Another post-disaster mitigation activity involves the implementation of state and federal disaster recovery assistance and hazard mitigation programs, including the following:

1. **Federal Emergency Management Agency (FEMA) Programs**
For on-line program information, see <http://www.fema.gov/>.
2. **Other Federal and State Programs**

Related Documents

The following documents have been used in compiling information into this All-Hazard Mitigation Plan:

Documents Applicable to Hazard Mitigation in Yellow Medicine County

Name of Plan	Date Completed or Updated	Available	Relevant Information
Minnesota State All-Hazard Mitigation Plan	2008	Department of Homeland Security and Emergency Management	Risk Assessment, hazard profiles, county plan must conform to state Hazard Mitigation Plan
Yellow Medicine County Comprehensive Plan	2006	Planning and Zoning Office	Population profile, population projections, vision statement
Yellow Medicine County Zoning Ordinance	2009	Planning and Zoning Office	Land use, sewage and water supply, public roads, and recreational parks
Yellow Medicine County Emergency Operations Plan	May 2009	Emergency Manager/Veteran's Office	Emergency operation plans, responsibility, critical facilities
City of Canby Emergency Operations Plan	2005-2006	City of Canby	Emergency operation plans, responsibility, critical facilities
Granite Falls Hazard Mitigation Study	2001	City of Granite Falls	Flood mitigation
Flood Damage Reduction: Minnesota River at Granite Falls, MN: Locally Preferred Plan	2009	City of Granite Falls/UMVRDC	Flood hazard mitigation
Granite Falls Comprehensive Plan	2003	City of Granite Falls	Population profile, city land statistics, and maps
Echo Comprehensive Plan	1999	City of Echo	Population profile, city land statistics, and maps
Yellow Medicine County Local Water Management Plan	2005	Planning and Zoning Office	
All cities in Yellow Medicine County Wellhead Protection Plan	In Process	Cities	
Minnesota River Basin Plan	2001	Minnesota Pollution Control Agency	Pollution, ground water, and clarity

The Planning Process

Yellow Medicine County chose to engage in a comprehensive planning process to update its All-Hazard Mitigation Plan for several reasons: first, as a process, it helps the county determine its current state – social, economic and environmental trends in addition to the hazards that affect the county; second, it lays out a process that will guide the county on how it deals with both current and potential hazards; and third, it gives the public an opportunity to decide what projects they want the county and cities to enact in the future.

After passage of the Disaster Mitigation Act of 2000, the county board contracted with the Upper Minnesota Valley Regional Development Commission (UMVRDC) to write the original grant and plan. The Yellow Medicine County Emergency Manager, Michelle Gatz, was in charge of project coordination between the county and cities. All cities within the county participated in the original plan through adopted participation resolutions and task force delegates. Yellow Medicine County completed and adopted its initial All-Hazard Mitigation Plan, with FEMA approval, in May 2005.

An additional requirement of the Disaster Mitigation Act of 2000 requires a complete All-Hazard Mitigation Plan update within a five-year time span. To meet this requirement, Yellow Medicine County again contracted with the UMVRDC to write the plan update grant in 2008 and complete an All-Hazard Mitigation Plan update for the county by July 2010. Yellow Medicine County requested the continued participation from all cities within the county to take part in updating the All-Hazard Mitigation Plan. The chart below provides information specifying county and city and participation in the plan update process.

Yellow Medicine County & Cities Participation in All-Hazard Mitigation Plan Update

Jurisdiction	Adopted Current Plan	Participation in Update Process	Risk Assessment Surveys	Task Force Mtg. 1 (7/29/09)	Task Force Mtg. 2 (1/13/2010)	Task Force Mtg. 3 (2/24/2010)	Mitigation Surveys
YMC	x	x	2/26/2010	x	x	x	2/26/2010
Canby	x	x	12/08/2009	x	x		12/08/2009
Clarkfield	x	x	8/25/2009	x	x	x	8/25/2009
Echo	x	x	8/31/2009	x	x	x	8/31/2009
Granite Falls	x	x	9/10/2009	x	x	x	9/10/2009
Hanley Falls	x	x	10/21/2009	x	x	x	10/21/2009
Hazel Run	x	x	9/01/2009				9/01/2009
Porter	x	x	12/10/2009	x	x	x	12/10/2009
St. Leo	x	x	9/11/2009	x	x	x	9/11/2009
Wood Lake	x	x	9/14/2009	x	x	x	9/14/2009
Townships	x	x		x	x	x	

On June 17, a Regional Task Force Meeting took place to gather all Emergency Managers in the five-county region (Yellow Medicine, Big Stone, Chippewa, Swift, and Lac qui Parle), in addition to UMVRDC staff, to begin discussions of how to accomplish the county All-Hazard

Mitigation Plan updates. At this meeting, Yellow Medicine County determined to complete a comprehensive update to the Yellow Medicine County All-Hazard Mitigation Plan and improve every chapter of the plan, however focusing distinctly on Risk Assessments. Chapter: 3 Hazard Inventory was updated with hazardous event occurrences from 2003 to 2009, when data was available. The Local Task Force provided information on new hazards not included in the initial plan. The Risk Assessment Chapter was updated through a survey by Local Task Force members, which includes an updated historical account of frequency, severity, and economic/human impacts. Further this chapter is now divided into three sections; hazard prioritizations, county risk assessment, and city risk assessments. The county and city risk assessments include vulnerability assessments and hazard boundary mapping. The Goals, Objectives, and Mitigation Strategies Chapter was updated by addressing each strategy of the previous plan and determining its current status; in addition to creating city-specific mitigation strategy lists. This chapter has been divided into four new chapters; natural hazard mitigation strategies, city-specific mitigation strategies, man-made technological strategies; and a Plan Maintenance/Implementation chapter. The Plan Maintenance/Implementation Chapter was reviewed by the Local Task Force and Emergency Manager to determine necessary updates.

To accomplish the update, Yellow Medicine County created a Local Hazard Mitigation Task Force to foster coordination, provide direction to the planning process and ultimately develop the county's All-Hazard Mitigation Plan; led by Michelle Gatz – Yellow Medicine County Emergency Manager. Members appointed to the Local Task Force by the Emergency Manager included the planning and zoning director and representatives from participating cities and townships. In order to solicit other potential task force members and special interested parties, a Hazard Mitigation Educational Campaign began in July 2009. The educational campaign consisted of multiple press releases through multiple medias including radio and county-wide newspapers, which discussed the upcoming All-Hazard Mitigation Plan update process and contact information for interested persons to utilize if they wanted to become task force members.

The Local Hazard Mitigation Task Force Members include:

Ron Antony, County Board
Michelle Gatz, Yellow Medicine Emergency Manager
Randy Jackson, Yellow Medicine Zoning Administrator
Bill Flaten, Yellow Medicine County Sheriff
Isaiah Keating, City of Canby
Larry Duis, City of Canby Fire Chief
Dick Marthaler, City of Clarkfield Fire Chief
Joan Pederson, City of Echo
Marty Dirnberger, City of Echo Fire Chief
Bill Lavin, City of Granite Falls City Administrator
Russ Blue, City of Granite Falls Police Chief
Dave Beasley, City of Granite Falls Fire Chief
Mike Dahl, City of Hanley Falls/Fire Chief
Richard Dandurand, City of Hazel Run
Patrick Vlaminc, City of Porter/Fire Chief

Dan Kloos, St. Leo Fire Chief
Christopher Lee, Upper Sioux Community
Steve Reiten, City of Wood Lake
Steve Reiten, City of Wood Lake Fire Chief
Jeffrey Claeys, Burton Township Chairperson
Roland Luepke, Echo Township Chairperson
Gary Fokken, Florida Township Chairperson
Allan Winter, Fortier Township Chairperson
Mitch Brusven, Friendship Township Chairperson
Randy Jacobson, Hammer Township Chairperson
Darrel Syring, Hazel Run Township Chairperson
Charles Brock, Lisbon Township Chairperson
Wesley Erickson, Minnesota Falls Township Chairperson
Kevin Doom, Norman Township Chairperson
Gary Geihl, Normania Township Chairperson
Steven Voss, Omro Township Chairperson
Ralph Peterson, Oshkosh Township Chairperson
Dale Hinz, Posen Township Chairperson
Charles Timm, Sandnes Township Chairperson
David Peterson, Sioux Agency Township Chairperson
Mitch Kling, Stony Run Township Chairperson
James Vlaminck, Swede Prairie Township Chairperson
Stanley Homan, Tyro Township Chairperson
Wilmer Heise, Wergeland Township Chairperson
Kenneth Bahn, Wood Lake Township Chairperson

All local governments in the county (including township chairmen) were sent meeting notices and agendas of all task force meetings, in addition to the Local Task Force members. To support public input in the planning process, draft chapters of the plan were placed online at the UMVRDC website. To publicize the release of draft chapters, county newspapers were sent press releases on where to locate the draft plan and how to contact the UMVRDC staff through a toll-free telephone number, agency office telephone number, and agency email. Also, the county shared drafts of plan elements and a final plan draft with the county's local governments and libraries in order to further allow public comment on the draft plan once sent to FEMA. The comments received were addressed and discussed at the final task force meeting. Suggestions the task force felt pertinent were incorporated into the draft plan.

In addition to the Local Task Force, a technical team was created to review each chapter of the plan from a more technical perspective – availability of resources; feasibility of the plan; collaborative efforts with other entities and plans; costs; and expertise in their field of knowledge. They were asked to consider the links to other community studies or plans such as comprehensive plans and land regulatory controls. This group of individuals was also asked to consider duplication of efforts and the fact that many hazards do not stop at geographical boundaries. Many of them served on technical teams for other county all-hazard mitigation plan updates in the five-county region and compared Yellow Medicine's plan to other county-wide plans. Together they provided valuable technical assistance in developing the plan.

Members of the technical team included:

Gloria Tobias, Countryside Public Health
Linda Norland, Countryside Public Health
Ethan Jenzen, DNR
Mark Jacobs, MN Pollution Control Agency, Marshall
Jamie Thomazin, USDA NRCS
Dave Berryman, Rodeberg and Berryman, Inc.
Andy Sander, Yellow Medicine County Engineer
Cindy Potz - Yellow Medicine River Watershed District
LouAnn Nagel, SWCD District Manager

While required by the Disaster Mitigation Act of 2000, the county emphasizes public participation in the plan update as it is a key way to ensure ongoing support for the plan and there should be ample opportunity for all county residents to decide what the plan will include. The general public was invited to three meetings and notified through press releases published prior to all meetings. At these meetings, the public was invited to review and provide comments on the draft plan chapters.

The planning process occurred over a thirteen-month period. During that timeframe the Local Task Force met three times and all meetings were open to the general public. Individuals involved in the public meetings had two primary responsibilities: 1) to comment on draft stages of the plan and 2) provide input on the next stages of the plan. It was important to include long time residents of the county in the process for a historical perspective. As noted, press releases were sent out for all of our public meetings to local and neighboring newspapers and local radio stations. The RDC's toll-free telephone number was offered up as a point of contact for the public if they had questions on how or why to get involved in the mitigation process, or could not attend the meetings in person but still had input for the plan.

The first Local Task Force meeting was held on July 29, 2009 in Echo, MN to identify potential hazards and perform a hazard inventory. To publicize the meeting, press releases were issued to newspapers prior to the meeting and Local Task Force members were sent the updated hazard inventory chapter. Nineteen people attended the Local Task Force meeting and provided information on recent hazardous events and new hazards previously left unconsidered. In addition, the public was provided hazard inventory ranking information that provided a historical perspective on past hazardous events and performed a ranked hazard inventory that would be utilized in the second Local Task Force meeting. The Local Task Force team members were informed that the following meeting would occur after all cities completed individual risk assessments and reviews of the previous plan's mitigation strategies.

From August to December of 2009, all nine cities in Yellow Medicine County participated in update of the All-Hazard Mitigation Plan by completing individual land use surveys, city-specific risk assessments, and mitigation strategy surveys. The information was gathered through individual city meetings with mayors, city staff, city council members, and emergency response workers. The land use surveys provided city-specific information regarding land use changes and development trends, while the risk assessment surveys identified specific risks that

may affect a city and determined city vulnerability to hazardous events. The mitigation strategy survey identified which mitigation strategies a city had completed, actively participated in, or wished to be removed from. Finally, each city was asked to create a ranked mitigation strategy list for their municipality. This information was utilized at the second Local Task Force meeting.

The second Local Task Force meeting was held on January 13, 2009 in Porter, MN to discuss the final hazard prioritization and review mitigation strategies from the previous All-Hazard Mitigation Plan. The Local Task Force was presented with their hazard prioritization (derived from the hazard inventories completed at the first meeting) and held a discussion about the final result. The public was presented with the previous plan's hazard prioritization and information gathered from the Technical Team on how hazards could be ranked based on their opinions. It was determined through group consensus that two hazards, 100-year flood events and flash flooding, should be prioritized higher than the initial ranking. The next part of the meeting was a group participation activity, where Local Task Force members were asked to comment on the previous plan's mitigation strategies and determine (to the best of their knowledge) whether each strategy was completed, considered an recurring strategy (no end of strategy), not yet completed the strategy was still viable, or if a strategy was no longer relevant. The Local Task Force also had the opportunity to comment on individual city mitigation strategy lists. Following the meeting, Local Task Force members were electronically sent copies of the plan chapters and were asked to comment on the plan. This comment period was offered to the general public through a newspaper press release to visit the UMVRDC website to review the plan online and was provided a toll-free telephone number, agency telephone number, and agency email to offer plan comments.

The mitigation strategy information gathered at the second Local Task Force meeting was presented at a meeting on January 26, 2010 with the Yellow Medicine Emergency Manager, County Engineer, and Planning/Zoning Administrator. The purpose of this meeting was to ensure that certain strategies were completed and perform a risk assessment for the county.

The third Local Task Force meeting was held on February 24, 2010 in St. Leo, MN to complete the final mitigation strategy prioritization of noted important strategies that were heavily commented on by the Local Task Force during the second public meeting; twenty-one people attended this meeting. In addition, this particular meeting emphasized the final chapter of the All-Hazard Mitigation Plan, the Plan Maintenance/Implementation Section. Discussions occurred on how often the plan should be reviewed, updated, and identified specific parties that would take charge of implementing and actively updating the All-Hazard Mitigation Plan.

In addition to the three public Local Task Force meetings to update the All-Hazard Mitigation Plan, Yellow Medicine County hosted a two-hour public meeting in Granite Falls at the Law Enforcement Center on March 10, 2010. Residents of the County were asked to attend through press releases in two newspapers, in addition to mailings to each city in Yellow Medicine County. At this meeting, the public was invited to discuss the plan and ask questions regarding the background, hazard vulnerabilities, risk assessments, and mitigation strategies for their particular community and the entire county. The entire plan and all corresponding maps for the county and cities will be available for comment and viewing. The Yellow Medicine County Emergency Manager was on hand throughout the meeting to offer information and incorporate the public's comments into the All-Hazard Mitigation Plan.

The final (fourth) Local Task Force meeting will take place on April 21, 2010 in Clarkfield to discuss comments made from Minnesota Homeland Security and Emergency Management staff. The Local Task Force will be informed that the final version of Yellow Medicine County's All-Hazard Mitigation Plan will be sent to the Federal Emergency Management Agency (FEMA) for review and approval pending adopting from Yellow Medicine County. At this point an electronic copy of the All-Hazard Mitigation plan will be sent the Yellow Medicine County Planning Commission for review and comment.

Prior to Yellow Medicine County adoption, a public hearing will be held during a Yellow Medicine County Planning Commission meeting to discuss the plan and send a recommendation to the Yellow Medicine County Board of Commissioners for approval. Once the All-Hazard Mitigation Plan is approved by the County Board, all corresponding participating cities shall adoption the plan within one year of the County adoption. Each city will be sent an electronic copy of the plan and staff will be available at a city council meeting to answer questions and facilitate the local adoption of the county's plan. A copy of the Yellow Medicine County resolution adopting the All-Hazard Mitigation Plan and a list of the resolutions passed by the county's cities will be included in Appendix 10.

Community Profile (Summary)

Chapter 2

Yellow Medicine County encompasses 764 square miles located in southwestern Minnesota. All of Yellow Medicine County drains into the Minnesota River and later into the Mississippi River. Three major rivers flow through the county include the Lac qui Parle, Yellow Medicine and Minnesota Rivers. The Minnesota River flows in a deep valley that forms the western border of the county. Of the 488,915 acres in the county, approximately 25,260 acres are enrolled in Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Reinvest in Minnesota (RIM) – Wetland Reserve Program. Yellow Medicine County has 25 State Wildlife Management Areas which occupy approximately 3,965 acres. One state park and four county parks are located in Yellow Medicine County.

Yellow Medicine County has lost residents over every decade since 1940. In the year 2000, the county's population was 11,080. The U.S. Census Bureau produced an population estimate for Yellow Medicine County of 9,958 as of July of 2008³. The biggest employer in Yellow Medicine County is Prairie's Edge Casino and Resort with 312 employees. Other major employers are Granite Falls Hospital & Manor, Yellow Medicine East Schools, and Yellow Medicine County.

Yellow Medicine County is currently served by two hospitals, three clinics, and has six ambulances for county-wide use. No full-time fire departments exist in Yellow Medicine County; rather there are 8 volunteer fire departments with mutual-aid agreements in place that serve the county. The Department of Natural Resources is responsible for fire protection on state forest and park land. Police stations are located in the cities of Granite Falls, Echo, Clarkfield, and Canby. Countryside Public Health Service acts as the County Department of Health for Chippewa, Swift, Lac qui Parle, Big Stone and Yellow Medicine Counties.

Land uses are regulated in Yellow Medicine County through the county ordinances. Throughout all townships within Yellow Medicine, the dominant land use is agricultural land. Cities in Yellow Medicine County have zoning ordinances that regulate the building construction and location of manufactured home parks. Granite Falls has adopted the universal building code and one manufactured home park is located in Canby, regulated by city code. Yellow Medicine County has a floodplain ordinance which regulates permitted uses and development in the 100-year floodplain. The cities of Granite Falls and Canby also created floodplain ordinances.

³ Table 1: Annual Estimates of the Resident Population for Counties of Minnesota: April 1, 2000 to July 1, 2008 (CO-EST2008-01-27). Source: Population Division, U.S. Census Bureau. Release Date: March 19, 2009.

Overall Hazard Priority Levels (Summary)

Chapter 4

Table 52. Yellow Medicine County Overall Hazard Priority Levels

Hazard	Yellow Medicine County	Special Areas of Concern
Tornado	Moderate	County
Summer Weather Thunderstorm, lightning, hail, wind (excluding tornado), extreme heat	Moderate	County
Structure Fire	Moderate	County
Winter Weather Blizzard, ice storms, heavy snow, extreme cold	Moderate/Low	County
100-Year Flood Event	Moderate/Low	Granite Falls/Canby
Hazardous Materials	Low	County
Water Supply Contamination	Low	County
Wastewater Treatment System Failure	Low	County
Flash Flood/Other Flooding	Low	Granite Falls/ Hanley Falls/County
Wildfire	Low	County
Civil Disturbance/ Terrorism	Low	County
Drought	Low	County
Infectious Diseases	Low	County
Dam Failure	Low	Canby / Granite Falls

Vulnerable Areas of Yellow Medicine County (Summary)

Chapter 4

The purpose of this section is to identify vulnerable areas in relation to Chapter 3 (Hazard Inventory), which provides detailed information on each potential hazard that may impact Yellow Medicine County and/or Yellow Medicine cities. In addition to the information supplied, this particular section identifies vulnerable areas of the county and highlights specific events that have occurred throughout the county, as they pertain to five types of hazardous events. These hazards include tornados, floods, wildfires, hazardous material spills/transportation of hazardous materials, and infectious diseases.

County-wide Risk Assessment Maps

The risk assessment maps for Yellow Medicine County identify areas that may be more prone to hazardous events. At least one map is available for each hazard, which are located and discussed in this chapter section.

Tornados

According to the Storm Database, the county has experienced 19 tornados since 1965 as well as three funnel clouds. Of the sixteen tornados, nine were classified as F0, six were classified as F1, one was classified as F2, two classified as F3 and one classified as F4. Significant damage was done to Clarkfield from an F3 tornado and to Granite Falls from a F4 tornado. See Figure 4 (Chapter 4 - pg. 17) for a visual representation of tornado paths in Yellow Medicine County. Many of the tornados occurred in rural areas and did little damage; however some of the destructive tornados destroyed farm buildings and downed trees. In order to predict estimated damage caused by an F4/F5 tornado, individual assessments of all cities in Yellow Medicine County were completed to determine the maximum damage amount for the county as a whole, assuming a 90% destructive rate. The estimated destructive rate was provided by the National Weather Service for small rural communities in a phone interview with Todd Krause, Data Management Manager out of the Twin Cities/Chanhasen Station. Table 53 below highlights this information, providing the number of parcels damaged and estimated damage value by city, with a final damage amount of \$348,244,290 dollars impacting 3,811 parcels of residences, commercial/industrial buildings, schools, churches, and government-owned properties.

Table 53. YMC Estimated potential by an F4/F5 Tornado

Geographic Area	Number of Parcels	Value of Parcels
Canby	963	\$80,300,160
Clarkfield	492	\$33,209,280
Echo	182	\$8,755,020
Granite Falls	1,490	\$191,697,660
Hanley Falls	166	\$7,106,940.0
Hazel Run	59	\$2,894,130
Porter	148	\$7,850,070
St. Leo	67	\$3,459,780
Wood Lake	244	\$12,971,250
Total (Yellow Medicine County)	3,811	\$348,244,290

Source: Yellow Medicine County Assessor, 2009

In addition to the information provided by Table 53, the two major tornados that financially impacted Yellow Medicine County took place in Granite Falls in 2000 and Clarkfield in 1997 provide case-study information that estimate total damage of two communities impacted by F3 and F4 tornados. On July 25, 2008 a tornado struck the city of Granite Falls, where one person was killed, over a dozen injured, and an estimated \$20 million dollars of damage was done to residences, businesses, and public facilities. The tornado lifted before exiting Granite Falls, leaving the most concentrated damage path two miles long, and 500 feet wide, through a primarily residential area of Granite Falls. Most of the damage in Granite Falls was caused by F2 to F3 wind speeds. However, this tornado was classified as a minimal F4 tornado, based on the twisted wreckage of an overturned railroad car near the intersection of 9th Ave. and 14th St. in Granite Falls.

On June 16, 1992, an F3 tornado hit the south part of Clarkfield turning one house completely upside down and ripping siding off many homes. Late afternoon on the 16th spotters were called out to watch for tornadoes and they called in to report a tornado touchdown west of Clarkfield. This tornado damaged several buildings south and west of Clarkfield. The damage included several destroyed barns and buildings, and a house turned upside down and was set back on the foundation. A majority of the homes and businesses in the city were damaged and emergency workers estimated \$7 million worth of damage was inflicted on the community. During the remainder of 1992 and in 1993, \$2,350,000 worth of building permits were issued in the city of Clarkfield as residents worked to recover from the tornado damage.

Floods

Flooding in the county occurs primarily in the spring during periods of peak conditions (rainfall and snowmelt) and in areas where the soil has low permeability qualities. Damages are mainly confined to the Yellow Medicine and Lac qui Parle watersheds. According to estimates by the US Army Corp of Engineers and Soil Conservation Service, there are approximately 23,601 acres (see Table 54 following page) in the 100-year floodplain within the Lac qui Parle and Yellow Medicine watersheds. Within the Lac qui Parle watershed, average annual damages resulting from flooding amount to about \$390,030. In the Yellow Medicine River watershed annual damages amount to about \$471,080. These figures were determined using 1985 cost benefit figures. Therefore, the damage figures given are underestimated in today's economy. See Figure 5 (Chapter 4 - page 20) for a visual representation of 100 and 500-year floodplains in Yellow Medicine County. Table 54 below identifies the number of floodplain acres throughout Yellow Medicine County. It is important to note that these acreages were found utilizing digital Flood Insurance Rate Maps from 1978 and may not be completely accurate due to flood mitigation projects throughout the county. Therefore, for the following All-Hazard Mitigation Plan update, Yellow Medicine County intends to use updated digital FIRM maps to adjust acreage values accordingly.

Table 54. YMC & Cities - Number of Floodplain Acres

Location	Total acres	Acres in 100-Year Floodplain	Acres in 500-Year Floodplain	Total Acres in 100 & 500-Year Floodplain	Percent of city in 100 & 500-year Floodplains
Yellow Medicine County	488,915	24,248	7,499	31,747	6.5%
Canby	1,373	266	14	280	20.4%
Granite Falls	2,235	397	276	395	30.1%
Porter	1,283	14	-	14	1.09%
Hanley Falls	161	1.1	-	1.1	0.68%
Wood Lake	489	12.7	-	12.7	7.78%

In order to predict an estimated damage value if all 100-year floodplains were flooded throughout the county at a given time; all structures (or parcels when data was unavailable) were identified on individual city basis, in addition to the number of rural housing/farmsteads throughout the county. Table 55, provides the number of structures and their associated values within 100-year floodplains in all cities and Yellow Medicine County. This data was gathered through city-specific inventories and are detailed further in the City Risk Assessment section of this chapter.

Table 55. Number of Structures/Parcels in 100-year Floodplain

Geographic Area	Number of Critical Facilities	Value of Critical Facilities	Total Number of Parcels	Total Value of Parcels
Canby	1*	\$189,000	147**	\$9,724,993
Granite Falls	0	\$0	87***	\$6,040,060
Hanley Falls	0	\$0	0	\$0
Porter	0	\$0	0	\$0
Wood Lake	0	\$0	0	\$0
Total	1	\$189,000	234	\$15,765,053

*Canby Fire Hall

**Residential, Commercial, Industrial, Church, Government-owned structure/utility, Hazardous Facility, Critical Facility (See Table 60 (Chapter 4 – pg. 32) for specific breakdown of facility type)

*** Residential and Commercial Parcels (See Table 76 (Chapter 4 – pg. 51) for specific breakdown of facility type)

Two major flood events took place in Yellow Medicine County in 1997 and 2001, causing major damage to the county and Granite Falls in particular. In 1997, Yellow Medicine County spent \$2.2 million for flood fighting efforts and cleanup; compared to \$420,305 for flood fighting efforts and cleanup in 2001 (Yellow Medicine County Assessor 2002). In Granite Falls during the 1997 flood, the city spent \$852,086 for flood fighting efforts and cleanup (cost figures provided by city staff). Over \$175,000 was spent by the US Corps of Engineers in construction contracts to fight the floods in 1997 and an estimated \$3.1 million was prevented from damage from the 1997 flood due to flood fighting activities. In 2001, the city spent \$437,115 for flood

fighting efforts and cleanup (cost figures provided by city staff). The US Corps of Engineers awarded temporary levee construction contracts in 2001 totaling \$112,250 for Granite Falls. In summary, flood fighting efforts as a result of flooding over the past four years has cost hundreds of thousands of dollars, extensive property damages, economic hardship, and has carried a significant risk for the volunteers involved in the flood fighting efforts (see Table 56 below). In 1997 and 2001, Granite Falls experienced floods, residential property damage and the forced evacuation of people from their homes. The total private property damages for the 2001 floods, based on estimates by the county assessor's office, were in excess of \$150,000.00. Damage to public structures amounted to \$1.5 million.

Table 56. Summary of Expenses to Fight Flooding

Geographic Area	1997 Flood	2001 Flood	Total
Yellow Medicine County	\$2,200,000	\$420,305	\$2,620,305
Granite Falls	\$852,086	\$437,115	\$1,289,201
Total	\$3,052,086	\$857,420	\$3,909,506

Repetitive Loss Structures.

Repetitive loss structures are those structures which have sustained damages on two separate occasions of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within a ten-year time span for which the cost of repairs at the time of the flood meets or exceeds 25 percent of the market value of the structure before the damage occurred. Currently, within Yellow Medicine County, there are five repetitive loss structures all located within Granite Falls, Minnesota. Included in these properties are two residential properties, two government-owned buildings, and one business. The two residential properties are located in the 500-year floodplain and the two government structures are located in the 100-year floodplain. One of the government structures will be moved in the next 18 months. The business is not located in either the 100-year or 500-year floodplains. The address, ownership and location of all repetitive structures are identified by the Yellow Medicine County Planning and Zoning Department, although their specific location will not be identified in this plan. See Figure 6 (Chapter 4 – pg. 22) for a visual representation of the general location of Repetitive Loss Properties in Yellow Medicine County.

The general land use trend within the repetitive loss property area is a combination of residential properties and parks/green space in Granite Falls. Unique natural features found in the 100-year floodplain in Granite Falls include the Minnesota River, granite rock outcroppings, parks, and natural prairie wetlands areas. Granite Falls has a floodplain ordinance passed in 1991 that prohibits future development opportunities within the 100-year floodplain. There are currently no development limits in the 500-year floodplain. Granite Falls has actively pursued flood acquisition funding from both FEMA and the MN DNR. The most recent acquisitions have been eight residential properties that were previous repetitive loss properties.

Wildfires

Wildfires occur throughout the state of Minnesota. According to the Minnesota State Fire Marshal, there are more than 2,000 annual wildfires with an estimated loss of more than \$13 million dollars statewide. Yearly occurrences are wildfires started along the railroads and farmland. Two other potential wildfire hazards are along power lines and utility structures and timber bridges. Farm equipments' hot exhaust can also start fields on fire.

Yellow Medicine County currently has 17,540 acres enrolled in CREP, RIM, CRP and the Wetland Reserve Program. These areas are left for wildlife habitat and are not burned on a regular basis. As a result, years of dead grasses accumulate on these lands and are a good fuel for any fire that may start. The Minnesota River Valley and the Wildlife Management Areas also provide an abundance of fuel for wildfires. Wildlife Management Areas occupy approximately 12,000 acres in Yellow Medicine County. Yellow Medicine County currently has 33,070 acres of grasslands and 16,085 acres of forests. Figure 7 (Chapter 4 – pg. 24), identifies five areas across the county which contain large patches of grasslands (3,998 acres) and forests (4,274 acres). Also, located within the five areas are 147 farmsteads and an additional 87 farmsteads found within a ½ mile of the areas. The general locations are west and south of Canby, between Porter and St. Leo, and northeast and southeast of Granite Falls.

Table 57. YMC General Wildfire Information

Acres:	Grasslands	Forests
Acres in “Five Large Patch Areas”	3,998	4,274
Total Acres in County	33,070	16,085
Farmsteads located within:	Large Patch Areas	½ Mile of Large Patch Areas
Number of Farmsteads	147	234

Overall Priority Mitigation Strategies

Chapter 5

Table 111. YMC Prioritized Strategies (Natural Hazards)

Ranked	Hazard	Strategy	Affected Participating Jurisdiction
1	Violent Storms & Extreme Temperatures	Inventory and assess adequacy of county civil defense siren system. Look for funding to replace malfunctioning sirens, add sirens, and provide backup power to sirens throughout the county.	County, Canby, Clarkfield, Echo, Hanley Falls, Hazel Run, Porter, St. Leo, Wood Lake
1	Violent Storms & Extreme Temperatures	Obtain additional funding for the Incident Command System (ICS) to work on regional projects.	County
2	Flooding	Install permanent pumping station in Granite Falls.	Granite Falls
2	Flooding	Relocate the existing sanitary sewer lift station in Granite Falls.	Granite Falls
2	Flooding	Move the Granite Falls fire hall out of the floodplain.	Granite Falls
2	Flooding	Relocate Yellow Medicine County Museum from the 100-year floodplain.	Granite Falls
3	Wildfire	Do an inventory of wildfire equipment available. Look for grants for additional and updated equipment if necessary (grass rigs, etc.).	County, Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, Hazel Run, Porter, St. Leo, Wood Lake
3	Wildfire	Purchase equipment that is needed such as new fire trucks and PTE equipment.	Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, Hazel Run, Porter, St. Leo, Wood Lake
3	Wildfire	Update communication equipment such as pagers to communicate with dispatch and other fire departments.	County, Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, Hazel Run, Porter, St. Leo, Wood Lake

YELLOW MEDICINE COUNTY

CHAPTER TWO: COMMUNITY PROFILE

Related Documents

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

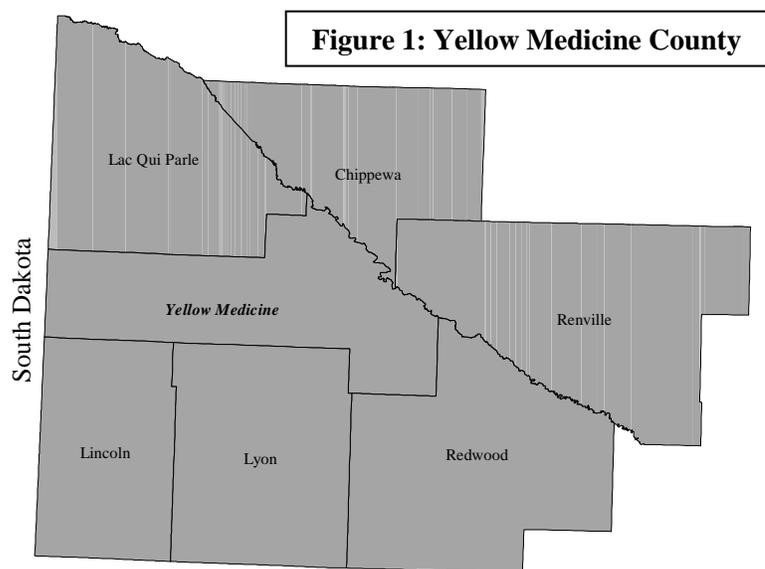
To create this Community Profile, other plans and documents were utilized from Yellow Medicine County (YMC).

- Yellow Medicine County Comprehensive Plan
- Yellow Medicine County Water Plan
- Yellow Medicine County Land Use and Zoning Ordinance
- Yellow Medicine County Emergency Operations Plan
- FEMA Regulations

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

General County Information

Yellow Medicine County encompasses 764 square miles located in three geographic regions: southwestern Minnesota, northern Great Plains, and the western Corn Belt. Yellow Medicine County lies approximately 168 miles west of Minneapolis-St. Paul Metropolitan Statistical Area and 141 miles southwest of the city of St. Cloud. Yellow Medicine County is bordered by Lac qui Parle County to the north, Chippewa County to the northeast, Renville County to the east, Redwood County to the southeast and south, Lyon County to the south, Lincoln County to the south and South Dakota to the west. The Minnesota River forms the angled northeast border and trees, rolling hills, and vast agricultural land characterize the remainder of the county. Yellow Medicine County has nine cities and 21 townships. **Figure 1(right)**



Historical Setting

For more information, please refer to the Yellow Medicine County Comprehensive Plan or contact the Yellow Medicine County Historical Society.

Prior to the middle of the 19th century this area that would later become Yellow Medicine County was extensively used by the Dakota people to hunt game animals and cultivate crops. The Dakota population in the area was never large and by design, left few permanent imprints upon the landscape. The onrush of settlers of European origin in the period following the Civil War permanently changed the landscape of the county.

Yellow Medicine County became a county on March 6, 1871. From 1878-1879 it was proposed to change the county name to Canby. Yellow Medicine votes were in favor, but since the new county line would extend into Lincoln County, Lincoln would also have to approve and the County did not approve this change.

The City of Canby was platted in 1876 and later incorporated in 1879 three years after the building of the Chicago and North Western Railway. The City of Granite Falls was platted in 1872 and incorporated as a city in 1889. The name came from the granite and gneiss outcroppings of the Minnesota River. The city also had a station on the Great Northern Railway. The City of Hanley Falls was platted and founded in 1884 by the Minneapolis and St. Louis Railroad Company. The City of Hazel Run was platted in 1884 and had a station on the Minneapolis and St. Louis Railroad. The City of Porter was platted in 1881 and incorporated in 1898. It had a station on the Chicago and North Western Railway. The City of Wood Lake was platted in 1884 and was incorporated in 1891. Lastly, the City of St. Leo was incorporated in 1940.

Source: Yellow Medicine County Historical Society and Minnesota Place and Names by Warren Upham

Physical Characteristics

Climate and Precipitation

A wide range of seasonal temperatures, including extreme temperatures, characterizes Yellow Medicine County. The hottest day recorded in Yellow Medicine County was 111 degrees Fahrenheit (F) in 1936. The coldest day was -33 degrees F in 1936, according to the Midwestern Regional Climate Center. In 1949 the county experienced a record high of 90 degrees F in January. Two separate websites indicated this reading was correct (weather.com and Midwestern Regional Climate Center). Table 1 (following page) depicts average monthly temperatures from 1971 to 2000, as well as record high and low temperatures in Yellow Medicine County from 1939 – 2000.

Total annual precipitation is approximately 26 inches, 60 percent of which primarily falls in the growing season between May through September. The sun shines 65 percent of the time in summer and 45 percent in winter. Prevailing winds are commonly from the south. Table 2 (following page) indicates average monthly precipitation and snowfall in Yellow Medicine County from 1971 – 2000.

Table 1. YMC Average Monthly Temperature from 1971 – 2000 & Record Highs and Lows from 1939-2000

Month	Average High	Average Low	Mean	Record High	Record Low
January	24° F	3° F	14° F	90° F (1949)	-33° F (1936)
February	30° F	11° F	21° F	67° F (1981)	-32° F (1936)
March	41° F	22° F	31° F	84° F (1939)	-28° F (1962)
April	57° F	34° F	46° F	98° F (1980)	0° F (1952)
May	71° F	47° F	59° F	98° F (1959)	10° F (1951)
June	81° F	56° F	69° F	107° F (1988)	33° F (1946)
July	85° F	61° F	73° F	111° F (1936)	38° F (1967)
August	83° F	59° F	71° F	108° F (1988)	35° F (1950)
September	74° F	49° F	62° F	99° F (1978)	22° F (1974)
October	62° F	36° F	49° F	94° F (1993)	12° F (1991)
November	42° F	23° F	32° F	82° F (1999)	-16° F (1964)
December	29° F	9° F	19° F	72° F (1941)	-17° F (1983)

Source: State Climatologist (www.climate.umn.edu) & Midwestern Regional Climate Center (www.mcc.sws.uiuc.edu). Data pertains to Canby station. 2000

Table 2. YMC Average Monthly Precipitation and Snowfall from 1971 – 2000

Month	Precipitation in Inches	Snowfall in Inches
January	0.88	8.5
February	0.75	6.3
March	1.78	9.1
April	2.27	3.1
May	2.92	0
June	4.09	0
July	3.35	0
August	2.78	0
September	2.38	0
October	2.12	0.6
November	1.66	8.1
December	0.70	6.5
Annual	25.68	42.2

Source: State Climatologist (www.climate.umn.edu) & Midwestern Regional Climate Center (www.mcc.sws.uiuc.edu). Data pertains to Canby station. 2000

Geology and Topography

Yellow Medicine County contains 488,915 acres of land and water, all influenced by glaciation. The majority of Yellow Medicine County is covered by nearly level to rolling ground moraine deposits of clay, sand, and rocks deposited by the melting glacial sheet. Relatively flat, glacial lake deposits are found in the east and central part of the county, as well as a large sandy outwash delta that covers the northeast corner of the county.

The Minnesota River flows in a deep valley that forms the eastern border of the county. The valley was cut by melted water draining from Glacial Lake Agassiz, which at one time covered most of the Red River Valley. The ancient River Warren channel of the Minnesota River Valley was created by the torrent flow of melting ice water during a period of glaciations that occurred approximately 12,000 to 13,000 years ago.

Major landscapes in the area are Coteau des Prairies and the Minnesota River Valley were formed by glacial activities of water erosion and sediment deposition. Wet prairie region is the predominant landscape feature within the county; however, many of these potholes and lakes have been lost due to artificial drainage for agriculture purposes.

Soils

Most soils in the watershed are of the Barnes-Aastad soil association. They are medium to fine texture, native prairie soils formed on calcareous glacial till. Soils were developed on glacial till under prairie conditions and have deep, dark topsoil. Generally the soils are dark colored, have high inherent fertility for crop production and are very good agriculture soils due to a relatively high moisture-holding capacity.

Land Use and Land Cover

The pre-settlement vegetation of Yellow Medicine County has undergone significant change since settlement began in the 1870s. Before it was settled, Yellow Medicine County was predominately covered with prairie, wet prairie, and river bottom forest vegetation along the Chippewa and Minnesota Rivers. Fire played a main role in limiting the woody vegetation of Yellow Medicine County, while allowing the prairie to flourish. The forests were restricted to areas where natural firebreaks (such as rivers, lakes and rough topography) prevented the spread of fire from adjacent prairie lands.

Today, land use in Yellow Medicine County is divided into four general categories: agricultural, woodland, water and wetlands, and other which includes urban uses. Agriculture is the most important use composing approximately 92 percent of the county land, with woodlands at three percent, and water and wetlands at two percent. Other uses compose of three percent of land. Table 3 (following page) details all land covers and land uses within Yellow Medicine County.

Table 3. YMC Land Cover & Land Use

Description	Acreage	Percent of Total
Urban and rural development	8,349	1.7
Cultivated land	424,547	86.9
Hay/pasture/grassland	32,852	6.7
Brush land	664	0.1
Forested	15,749	3.2
Water	3,921	0.8
Bog/marsh/fen	2,308	0.5
Mining	272	0.1
Total	488,662	100

Source: 1989 Minnesota Land Use/Land Cover data

Agriculture.

Agricultural land is the dominant use in every township. Farms in Yellow Medicine County have steadily increased in size from 402 acres in 1970 to 474 in 1997, and fell to 453 acres in 2002 (Minnesota Department of Agriculture). As the size of farms increased, the number of farms decreased. In 1987 there were 1,027 farms in Yellow Medicine County. Fifteen years later, (2002), only 989 farms remain (Minnesota Department of Agriculture).

The county developed rapidly due to rich agricultural resources and opportunities. The climate, soil, topography and vegetation together all create a productive agricultural environment in Yellow Medicine County. Table 4 below outlines the changes in corn, wheat and oats that took place in the last century in Yellow Medicine County:

Table 4. YMC Agricultural Changes in the Last 100 Years

	Corn-1919	Corn-1997	Wheat-1919	Wheat-1997	Oats -1919	Oats -1997
Acres	56,668	156,331	66,184	12,873	60,945	641
Bushels per Acre	27.2	119.74	14	35.14	24.9	53.36

Source: Agriculture Census for Yellow Medicine County and Yellow Medicine County Historical Society Book (1993)

Nearly seventy-five percent of the land in Yellow Medicine County is considered to be prime farmland with almost all prime farmland used for crops. Corn, soybeans and sugar beets are the main crops grown. Organic farming includes smaller crops such as vegetables, beef, dairy, and other niche markets, has grown significantly in the past fifteen years.

A recent trend in land use in some parts of the county has resulted in the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are less productive because they are more erodible, subject to drought or difficult to cultivate. Table 5 below depicts comparisons regarding farm land in Yellow Medicine County. Government programs such as Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) have been established to keep marginal land out of production and helped prevent erosion and improved water quality in the region.

Table 5. YMC Farm Comparisons from 1987-1997

Farm Information	1987	1992	1997	2002
Farms (number)	1,027	923	876	989
Land in farms (acres)	412,568	407,953	415,269	424,547
Land in farms, average size of farm, (acres)	402	442	474	453

Source: National Agricultural Statistics Service

(CRP), (CREP) and Other Governmental Programs.

The Conservation Reserve Program (CRP) is the federal government’s single largest environmental improvement program and one of its most productive and cost-efficient. Currently, 9,601.2 acres in Yellow Medicine County enrolled in CRP as of February 2009 (Minnesota Board of Soil and Water Resources 2009).

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

The Reinvest in Minnesota (RIM) Program protects water quality, reduces soil erosion, and enhances fish and wildlife habitat through retiring marginal lands from agricultural production and restoring previously drained wetlands. The program pays landowners a percentage of the value of their land to enroll it in a conservation easement. Types of land eligible for the program include drained wetlands (for restoration), highly erodible cropland, riparian agricultural land, pastured hillsides and sensitive ground water areas. The state legislature created the RIM Program in 1986 as a response to the concern of a coalition of environmental, conservation, and agricultural groups. As of February 2009, Yellow Medicine County has 1,889 acres enrolled in the RIM program (Minnesota Board of Soil and Water Resources 2009). The Yellow Medicine Soil and Water Conservation District promotes and administers the RIM Program.

One way the county has been able to address pollution issues are with the Minnesota River Conservation Reserve Easement Program (CREP). CREP gives landowners an opportunity to voluntarily enroll marginal cropland in a conservation easement program with fifteen annual payments and a one-time bonus payment. Yellow Medicine County has of 5,452.9 acres of CREP land as of February 2009 (Minnesota Board of Soil and Water Resources 2009). With this program, landowners in the Minnesota River Basin are paid to remove cropland from production to improve water quality and wildlife habitat.

CREP combines the federal Conservation Reserve Program (CRP) with the State RIM Program. The program's goal is to protect and enhance up to 100,000 acres of environmentally sensitive land in the 37-county Minnesota River Basin; presently as of February 2009 Minnesota has 106,435.3 acres involved in the program. The Minnesota River CREP ended in September 2002.

The Wetlands Reserve Program (WRP) is the federal government's wetlands restoration program. It is a voluntary program that offers landowners the means and opportunity to protect, restore and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) manages the program as well as provides technical and financial support to collaborate with landowners who participate in WRP. In all cases, the landowner retains ownership and responsibility for the land, including any property taxes based on its reassessed value as wetland or nonagricultural land. The landowner controls access to the land; has the right to hunt, fish, trap, and pursue other appropriate recreational uses; and may sell or lease land enrolled in WRP. Yellow Medicine County has 596.9 acres in permanent easement through the Wetland Reserve Program (Minnesota Board of Soil and Water Resources 2009).

Wildlife Management Areas.

Wildlife Management Areas are state-owned lands preserved for wildlife habitat. Yellow Medicine County has 65 State Wildlife Management Areas that occupy about 6,429 acres (Minnesota DNR Data Deli). Consistent with the primary goal is a responsibility to provide public use of the area. The area is to be developed to accommodate activities which are directly oriented towards wildlife and fishing. Public hunting, trapping and fishing receive priority as sportsmen's tax monies were used to finance nearly all development and management, as well as much of the land acquisitions on the area. Public use is limited to levels that prevent excessive interference among users and will not endanger wildlife and fish populations.

State Wildlife Management Areas serve multiple uses in the county. In addition to their value as wildlife habitat and nesting areas, they serve to increase nutrient, sediment and chemical retention, floodwater storage, and ground water recharge. Further, the county possesses one Scientific and Natural Area in the southern tip of the county.

Hydrology

Yellow Medicine County's lakes, streams and ground water are some of its most significant resources. They are vulnerable to pollution from a wide variety of human activities and/or disasters. Water quality has become one of the most important environmental issues facing the county and state. Water is used for domestic and residential purposes, industry, agricultural and recreation. The health, safety and welfare of the public are directly linked to the county's water supply.

Groundwater.

Groundwater movement in the county is to the northeast, ultimately discharging into the Minnesota River. Alternating zones of groundwater recharge and discharge occur along both the Yellow Medicine and Lac qui Parle Rivers. Most supplies of water within the county have been found at depths of less than 200 feet. Groundwater throughout the Yellow Medicine watershed is normally found less than 100 feet below the land surface. Deeper wells are located on the upland plain along the Coteau slope, lowland plains and the Minnesota River floodplain.

Wellhead Protection.

Taken from Source Water Protection (SWP) materials.

Wellhead protection is a means of protecting public water supply wells by preventing contaminants from entering an area that contributes water to the well or well field over a period of time. The wellhead protection area is determined by using geologic and hydrologic criteria, such as physical characteristics of aquifers and the effects that pumping has on the rate and direction of groundwater movement. A management plan was developed for the wellhead protection area that includes inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants, managing existing and future lands, and water uses that pose a threat to ground water quality. The goals of wellhead protection are to reduce use of costly treatment facilities, avoid drilling of new wells, and to avoid the need to clean up contaminated ground water. Canby and Granite Falls are currently creating city-specific wellhead protection plans. Clarkfield, Wood Lake, and Hanley Falls will complete their plans in the next five to ten years.

The number and condition of abandoned wells in the county has been difficult to determine. In 1991, the county developed a well sealing cost share program to assist landowners with 50 percent of the cost, not to exceed \$300, to seal a well. Since this, the program provided cost share for over 600 wells.

Surface Water.

For additional information on Yellow Medicine County surface water, refer to the Yellow Medicine County Water Plan 2005 and the Comprehensive Plan 2006.

Yellow Medicine County is extremely limited in surface water supplies related to lakes and wetlands. According to 1969 land use data, less than one percent of the county's land surface was covered by water and according to the 1989 land use data, approximately 1.7 of the county's land surface was covered by water. Currently, Yellow Medicine has 3,921 acres of water, approximately .08 percent of county land. The western one-third of the county (Lac qui Parle watershed) is particularly lacking in surface water resources.

The steep elevation of the Coteau and poorly defined drainage patterns in the lowlands combine to affect present stream flow conditions throughout the county. Streams flowing down the escarpment of the Coteau exhibit a very unique pattern of nearly straight, parallel channels. This pattern has significant hydrologic and sedimentation implications in that it creates flash flooding threats to lowland areas. The slope on the Yellow Medicine River escarpment, for example, drops approximately 300 feet in six miles contributing to frequent spring flooding in the central portion of the county.

Watersheds. Three major watersheds are found in Yellow Medicine County. These follow along the Lac qui Parle, Yellow Medicine, and Redwood Rivers. As a whole, all of Yellow Medicine County drains into the Minnesota River.

Yellow Medicine County runs from the South Dakota border on the west to the Minnesota River on the east. All streams and rivers within the county eventually discharge into the Minnesota River. The western third of the county is drained by the Lac qui Parle River, the central portion by the Yellow Medicine River, the extreme southeastern by the Redwood River and remaining lands drain directly in the Minnesota River.

The county receives approximately 26 inches of precipitation each year, 60 percent of which usually falls in the growing season between May and September. The surface water bodies receive all runoff and act as temporary reservoirs.

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

Originally, wetlands were located throughout the entire county. With the advent of intensive agriculture practices and the application of land drainage techniques, many of the wetlands located on lands that were flat and suited to agricultural use have been drained. Because of this, relatively few wetlands exist in the flat till plain areas of the county. Most of the remaining wetlands are found in the moraine areas of the northern half of the county where wetlands have either been preserved or where drainage is not economically feasible. The Yellow Medicine County Board has designated the entire county as high priority wetland preservation area.

Rivers. All of Yellow Medicine County drains into the Minnesota River, which then drain to the Mississippi River. The three major rivers that flow throughout the county are the Lac qui Parle, Yellow Medicine and the Minnesota Rivers.

Lakes. Lakes in southwestern Minnesota are typically large, shallow and nutrient rich. According to the MPCA assessments, none of the county's natural lakes support swimming. Two man-made lakes, Del Clark Lake southeast of Canby and Lake John in the central part of the county do support swimming along with other recreational activities. Del Clarke Lake and the area surrounding are owned and maintained by the Lac qui Parle – Yellow Bank Watershed District.

Pollution. As the surface waters in Yellow Medicine County are limited, it becomes very important to preserve and protect those water resources. The need to establish lake water quality criteria or standards have been recognized at the state, provincial and federal levels of government. The Minnesota Pollution Control Agency (MPCA) is the primary agency charged with pollution monitoring, control and abatement. The MPCA develops water quality standards

for all water bodies in the state and sets effluent limits for each discharger that will maintain the appropriate standards.

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

Public Drainage Systems. Expansive amounts of public and private capital have been invested in draining water from the landscape. This infrastructure radically improves the drainage efficiency of the landscape in order to benefit agricultural production activities. This drainage efficiency has had negative impacts on hydrology in Yellow Medicine County in recent years. As water storage on the landscape is reduced, peak stream flows come faster and higher in response to rain events and run off. Another issue is the recent explosion of pattern tiling which has accelerated these conditions. Older drainage infrastructure and receiving waters are often not capable of meeting new peak flows generated by pattern tiling. As water flows into tiles and ditches, streams and rivers exceed capacity of receiving waters, causing water to back up and flood other lands within the drainage system causing great economic damage.

Yellow Medicine County has an elaborate system of public ditches as well as many private ditches that drain into the legal drain system. The county is in charge of approximately 365 miles of ditches, including both open and tiled and the Yellow Medicine and Lac Qui Parle Watershed districts control ditches as well. In addition, the Yellow Medicine Watershed district controls some open ditches and privately-owned ditches are found throughout the county and are not monitored by the county.

As the landscape hydrology has been altered, higher peak flows are carving out larger channels. Unfortunately, this often results in riverbank destabilization.

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

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

Socioeconomic

Population Trends

Yellow Medicine County.

Yellow Medicine County has lost residents over every decade since 1940. In the year 2000, the county's population was 11,080. According to the Minnesota Department of Administration, Yellow Medicine County is estimated to have a population of 11,448, an increase in population. Table 6 below provides county-wide population and household predictions for Yellow Medicine County.

Table 6. YMC Population and Households

	2000 Population	2025 Projected Population	Change	2000 Households	2025 Projected Households	Change
Yellow Medicine County	11,080	9,710	-1,370	4,439	3,830	-609

Sources: Department of Administration and Land Management Information Center & Minnesota Household Projections: 2005-2035. Minnesota State Demographic Center, August 2007.

Yellow Medicine County is composed of nine small cities and twenty-one townships. Following is a brief city-specific discussion of population and number of households. Table 7 further breaks down population and household populations from 1970 to 2008. Table 8 provides a breakdown between township and city populations in the county, while Table 9 depicts a detailed representation of the county's population.

Granite Falls.

The city of Granite Falls is located on the Minnesota River in northern Yellow Medicine County in Stony Run Township. Granite Falls is located in both Yellow Medicine and Chippewa Counties. The city is situated along Highway 23 and US Highway 212. Granite Falls has a population of 2,908 and 1,336 households making it the largest city in the county and the county seat. The population of the city is growing faster in the Yellow Medicine side than the Chippewa side. More information on this can be found in the Granite Falls Comprehensive Plan.

Canby.

The city of Canby is located in the western part of the county and is the most western city in the county. The city's 1,710 people and 831 households make this the second largest city in the county. Canby is located on Highway 75 and is partly in Norman Township and partly in Hammer Township.

Clarkfield.

The city of Clarkfield is located in Friendship Township on Highway 59 and MN Highway 67. The city's 846 people and 372 households make it the third largest city in the county.

Wood Lake.

The city of Wood Lake is located in Wood Lake Township and has a population of 381 people and 175 households. Wood Lake is also known for its lake which bears the same name.

Hanley Falls.

The city of Hanley Falls is located in Sandnes Township with a population of 285 and 110 households. Highway 23 runs on the eastern side of the city and also touches Hanley Falls in the southeastern corner.

Echo.

The city of Echo is located in Echo Township and is the southern most city in the county. The city has a population of 242 and 107 households. Highway 67 runs along the western side of Echo.

St. Leo.

The city of St. Leo is the second smallest city in the county with 91 people and 49 households. St. Leo is located in the Townships of Omro and Tyro.

Hazel Run.

The city of Hazel Run is the smallest city in the county with 55 people and 26 households. Hazel Run is located in Hazel Run Township.

Porter.

The city of Porter is located in Wergeland Township with 163 people and 78 households.

Table 7. YMC Population and Household (HH) Information from 1970-2008

City	1970		1980		1990		2000		2005 (est.)		2008 (est.)	
	Pop.	HH	Pop.	HH	Pop.	HH	Pop.	HH	Pop.	HH	Pop.	HH (2007)
Canby	2,147	--	2,143	897	1,826	805	1,903	842	1,758	821	1,710	831
Clarkfield	1,084	--	1,171	456	924	411	944	371	879	372	846	372
Echo	356	--	334	152	304	135	278	119	252	109	242	107
Granite Falls	3225	--	3,451	1,339	3,083	1,308	3,070	1,344	3,002	1,345	2,908	1,336
Hanley Falls	265	--	265	117	246	111	323	115	295	110	285	110
Hazel Run	115	--	93	33	81	32	64	27	57	26	55	26
Porter	207	--	211	88	210	90	190	88	171	78	163	78
St. Leo	153	--	147	57	111	53	106	54	95	49	91	49
Wood Lake	418	--	420	178	406	171	436	182	398	177	381	175

Source: Annual Estimates of the Resident Population for Incorporated Places in Minnesota. Population Division: July 2009, U.S. Census Bureau 2000.

As shown in Table 8 below, the distribution of population within Yellow Medicine County has significantly changed from 1970 to 2007. Notably, the main trend shows an increase of people living in cities versus rural townships. The greatest change occurred from 2000 to 2007, with 5 percent increase in population of the cities, leaving a final population distribution of townships (39 percent) to cities (61 percent).

Table 8. YMC Distribution of Population Between Cities and Rural Areas from 1970 - 2007

	1970		1980		1990		2000		2007 (est.)	
Townships	7,222	50%	6,261	46%	5,262	45%	5,014	44%	4,417	39%
Cities	7,327	50%	7,450	54%	6,454	55%	6,269	56%	7,031	61%
Total	14,549	100%	13,711	100%	11,716	100%	11,283	100%	11,448	100%

Source: Department of Administration, MN Population and Household Estimates, Census Bureau 2000.

In general, the population of Yellow Medicine County has declined since 1970 illustrated in Table 9. Almost all aspects of the county profile show a negative trend including number of housing units available, number of households, and amount of people per household. The one consistent increase Yellow Medicine observed was the number of persons in group quarters. This may be due to the increased aging population within the county.

Table 9. YMC Population Profile

	1970	1980	1990	2000	1990-2000 Change	
					Actual	Percent
Population	14,523	13,653	11,684	11,080	-604	-5.17
Land Area (sq. mile)	753	753	757.9	757.96	0.06	0.01
Density (persons per sq. mile)	19.29	18.13	15.42	14.62	-0.8	-5.18
Housing Units	5,032	5,386	4,983	4,873	-110	-2.21
Households (HH)	--	4991	4607	4439	-168	-3.65
Persons Per HH	--	2.74	2.54	2.42	-0.12	-4.58
	2000	2001 Estimate	2000-2001 Change			
			Actual	Percent		
Population	11,080	11,016	-64	-0.58		
Households (HH)	4,439	4,431	-8	-0.18		
Persons Per HH	2.42	2.41	-0.01	-0.41		

Source: US Census Bureau 2000

Household characteristics have a direct impact on land use, housing needs, social services, and educational expenses. Changes in household size have a direct and proportional effect on demand exerted and types of housing necessary for communities illustrated in Table 10. As household sizes decrease the demand for housing units will increase. Only 8.4 percent of the county's housing units were vacant at the time of the 2000 Census shown in Table 11. The conditions, type and variety of housing offered by a community directly influence the sustainability and vitality of the entire county.

Table 10. YMC Housing Characteristics in 2000

Total Housing Units	Total Structures Built	Owner Occupied	Renter Occupied	Total Occupied	Vacant
1999 to March 2000	37	26	6	32	5
1995 to 1998	100	73	21	94	6
1990 to 1994	79	66	11	77	2
1980 to 1989	255	151	55	206	49
1970 to 1979	765	496	216	712	53
1960 to 1969	515	395	101	496	19
1940 to 1959	1,127	854	223	1,077	127
1939 or earlier	1,995	1,461	284	1,745	250
Total	4,873	3,522	917	4,439	511

Source: US Census Bureau 2000

Table 11. YMC Vacancy Status in 2000

Status of Vacant Housing Units	
For rent	102
For sale only	99
Rented or sold, not occupied	25
For seasonal, recreational, or occasional use	27
For migrant workers	2
Other vacant	179
Total:	434

Source: US Census Bureau 2000

Age and Sex Characteristics

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

Tables 12 and 13 show the age and sex characteristics. When evaluating data, each of the cities within Yellow Medicine County had very similar percentages to the county as a whole. The entire county has a much larger percentage of seniors compared to the state.

Table 12. YMC Age Characteristics in 2000

	Under 18	18 and older	Under 40	40 and older	Under 65	65 and over
Minnesota	26%	74%	58%	42%	88%	12%
Yellow Medicine County	26%	74%	49%	51%	80%	20%
Canby	21%	79%	43%	57%	69%	31%
Clarkfield	19%	81%	42%	58%	72%	28%
Echo	27%	73%	50%	50%	77%	23%
Granite Falls	23%	77%	47%	53%	77%	23%
Hanley Falls	33%	67%	66%	34%	87%	13%
Hazel Run	30%	70%	53%	47%	89%	11%
Porter	21%	79%	48%	52%	83%	17%
St. Leo	12%	88%	37%	63%	63%	37%
Wood Lake	26%	74%	52%	48%	81%	19%

Source: U.S. Census 2000

Table 13. YMC Sex Characteristics in 2007

	Male	Female
Minnesota	50%	50%
Yellow Medicine County	50%	50%

Source: Missouri Census Data Center, 2007

Economic Synopsis

The biggest employer in Yellow Medicine County is the Prairie's Edge Casino and Resort with 312 employees, shown in Table 14. The second largest is Sioux Valley Hospital – Canby Campus with 280 employees, followed by Granite Falls Hospital & Manor with 235 employees. Other major employers are Yellow Medicine East Schools with 210 employees, Hoffco, Inc. with 150 employees, and both REM Inc. and Canby Public School District with 140 employees.

Table 14. YMC Major Employers

Employers	Number of Employees
Prairie's Edge Casino and Resort	312
Sioux Valley Hospital – Canby Campus	280
Granite Falls Hospital & Manor	235
Yellow Medicine East Schools	210
Hoffco, Inc. – Wood Lake	150
REM, Inc. – Canby	140
Canby Public School District	140
Yellow Medicine County	122
MN West Community & Tech College – Granite Falls & Canby Campuses	105
Fagen, Inc	100
Clarkfield Care Center	95
Project Turnabout Treatment Center	80
SMI & Hydraulics – Porter	50
Sun Source	45
Blackjack Express Trucking – Wood Lake	40
Total	980

Source: Minnesota DEED Community Profiles – 2004; Phone Survey with City Officials – 2005.

Tables 15 and 16 provide an in-depth breakdown of labor statistics and occupations by business and industry types in Yellow Medicine County from 2000. In short, approximately 60 percent of the population was employed and likely in the Retail/Sales/Support industries, services occupations, or manufacturing/production industry.

Table 15. YMC Labor Statistics in 2000

Employment Status - Population 16 Years and Older	Number	Percent
In labor force	5,519	64%
Civilian labor force	5,514	64%
Employed	5,208	60%
Unemployed	306	4%
Percent of civilian labor force	5.9	(X)
Armed Forces	5	0%
Not in labor force	3,123	36%
Commuting to Work	5,165	100%
Car, truck, or van -- drove alone	3,875	75%
Car, truck, or van -- carpooled	509	10%
Public transportation (including taxicab)	4	0%
Walked	292	6%
Other means	25	0%
Worked at home	460	9%
Average travel time to work (minutes)	16.8	(X)

Source: US Census Bureau 2000

Table 16. YMC Occupations by Industry Type in 2000

Yellow Medicine County	
Farming/Forestry/Fishing/Mining	572
Construction	270
Manufacturing/Production	690
Transportation	396
Maintenance/Repair	270
Retail/Sales/Support	1,011
Business, Finance, Management	404
Services Occupation	721
Educational and Health	508
Professional Occupations	366
Total	5,208

Source: Minnesota Department of Administration, Yellow Medicine Comprehensive Plan 2006

As shown in Table 17 below, the highest percentages of households (40 percent) and families (51 percent) fall into the income range of \$35,000 to \$74,999 in Yellow Medicine County. The median household income for Yellow Medicine County in 2000 was \$34,393. This amount is slightly higher than the estimated Regional Income Estimate found in Table 18 below, with Yellow Medicine County's estimate income of \$30,059 for 2006.

Table 17. YMC Income in 1999

	Households		Families	
	Number	Percentage	Number	Percentage
Less than \$10,000	511	12%	141	5%
\$10,000 to \$14,999	339	8%	123	4%
\$15,000 to \$24,999	727	16%	379	13%
\$25,000 to \$34,999	685	15%	469	16%
\$35,000 to \$49,999	877	20%	734	25%
\$50,000 to \$74,999	889	20%	769	26%
\$75,000 to \$99,999	243	5%	216	7%
\$100,000 to \$149,999	115	3%	113	4%
\$150,000 to \$199,999	17	0%	15	1%
\$200,000 or more	38	1%	34	1%
Total	4,441	100%	2,993	100%
Median household or family income	\$34,393	-	\$42,002	-

Note: Household count contains both families and persons living alone.

Source: US Census Bureau 2000

Table 18. YMC Regional Income Estimates from 1996 – 2006

Region	1996	2001	2005	2006	% Change: 1996 – 2006
Minnesota	25,716	32,619	34,757	36,714	18.6%
Yellow Medicine	20,752	22,712	29,383	30,059	13.2%
Big Stone	18,962	23,298	28,614	30,091	24.0%
Swift	18,971	20,677	25,677	24,017	-1.1%
Chippewa	21,883	26,156	29,223	30,168	7.7%
Lac qui Parle	21,427	23,573	29,479	30,050	9.6%

Note: Data provided in dollars.

Source: Minnesota Department of Administration 2006.

Tables 19 and 20 compare monthly housing expenses for renter-occupied units and owner-occupied units. In 2000, 73 percent of renters had rent lower than \$499 dollars a month, while the majority of mortgage holding owner-occupied units (39 percent) spent between \$300 and \$999 dollars.

Table 19. YMC Renter-Occupied Unit Monthly Housing Expenses in 2000

Monthly rent	Number	Percent
Less than \$200	118	14%
\$200 to \$299	144	17%
\$300 to \$499	345	42%
\$500 to \$749	88	11%
\$750 to \$999	20	2%
\$1,000 to \$1,499	0	0%
\$1,500 or more	0	0%
No cash rent	108	13%
Total	823	100%

Source: US Census Bureau 2000

Table 20. YMC Owner-Occupied Monthly Housing Expenses in 2000

Monthly payments	Number	Percent
With a mortgage	1,151	47%
Less than \$300	28	1%
\$300 to \$499	292	12%
\$500 to \$699	385	16%
\$700 to \$999	279	11%
\$1,000 to \$1,499	137	6%
\$1,500 to \$1,999	26	1%
\$2,000 or more	4	0%
<i>Median of mortgaged units</i>	<i>\$618</i>	<i>X</i>
Not mortgaged	1,303	53%
<i>Median of not mortgaged units</i>	<i>\$226</i>	<i>X</i>
Total	2,454	100

Source: US Census Bureau 2000

Community Infrastructure

Community infrastructure catalogs Yellow Medicine’s assets in identifying schools, public facilities, parks and natural resources, and available modes of transportation offering transit, airport facilities, roads, and a multitude of trail opportunities. Further, a complete listing of telecommunication and power facilities has been provided, as well as city-specific water and sewer systems currently in place throughout the county.

Schools

Yellow Medicine County consists of five schools districts with eight different schools shown in Table 21. Yellow Medicine County also has technical colleges located in Granite Falls and Canby.

Table 21. YMC Schools and Locations

Yellow Medicine County Schools	Addresses	City
Area Learning Center	885 Prentice Street	Granite Falls
Bert Ramey Elementary	555 7 th Avenue	Granite Falls
Yellow Medicine East Junior High School	450 9 th Avenue	Granite Falls
Yellow Medicine East Senior High School	450 9 th Avenue	Granite Falls
Clarkfield Area Charter School	2649 Highway 59	Clarkfield
Echo Charter School	101 Rocket Avenue	Echo
Canby Elementary	601 4 th Street	Canby
Canby Secondary School	106 Ring Avenue	Canby
MN Community Tech College	1593 11 th Avenue	Granite Falls
MN Community Tech College	1011 W First Street	Canby

Important Public Facilities

Public Facilities for each community are mapped in Chapter 4 in the Community Risk Assessment Section as “Community Assets”. Important public facilities may include city and town halls, county courthouse, libraries, community centers, parks, churches and historic resources, found in Table 22. These places provide both public services and create an important sense of community character and are located in cities. Parks and wildlife management areas are located throughout the county.

Table 22. YMC City Facilities

Granite Falls	Addresses
Kilowatt Community Center	600 Kilowatt Drive
Prairie's Edge Casino	5616 Prairies Edge
Western Fest	W Hwy. 212
Memorial Park	E Hwy. 67
Upper Sioux State Park	E Hwy. 67 (1,280 Acres and 18 mile of trails)
Yellow Medicine County Court House	415 9 th Avenue
Project Turnabout	660 18th Street
City Hall	641 Prentice Street
Canby	Addresses
Canby Community Center	110 Oscar Street North
Canby Stock Car Races	Lac Qui Parle Road
Canby Swimming Pool	202 Division Street West
Yellow Medicine Fairgrounds	305 Fairgrounds Street West
Clarkfield	Addresses
City Hall/Community Center	904 10 th Avenue
Emergency Medical Services (Fire/EMT)	1250 15 th Avenue
Clarkfield Community Library	812 10 th Avenue
Clarkfield Swimming Pool	15 th Avenue
Echo	Address
Echo Community Center/City Offices	342 2nd Avenue West
Hazel Run	Address
City Hall	431 1 st Street North
St. Leo	Address
St. Leo Community Center	100 Washington Street North
Wood Lake	Address
Wood Lake Community Center	88 2nd Avenue

State Park, County Parks, Lakes and Historic Resources

One state park and two county parks are located in Yellow Medicine County. Within Sioux Agency Township, the Upper Sioux Agency State Park's northern boundary is bordered by the Minnesota River. The Yellow Medicine River and Trunk Highway 67 bisect portions of the park. This area is well endowed with natural prairie and is known for its location as the focal point for distributing food and supplies to the Dakota Indians prior to the Sioux Uprising of 1862. The park is located approximately seven miles southeast of Granite Falls.

Oraas County Park is located seven miles south of Clarkfield within Normania Township along US Highway 59. Oraas Park consists of 28 acres, and, because of its location next to a major highway, many motorists use this park and its facilities for picnicking and outdoor activities. Spring Creek flows through the park, which offers an aesthetic value, along with a woodlot and natural prairie vegetation.

Timm County Park is located approximately 4.5 miles north of the city of Wood Lake on the north shore of Wood Lake within Wood Lake Township. This park consists of 17 acres of heavily wooded terrain. When combined with the setting of the lake, this park provides a pleasurable scenic attraction for recreational enjoyment.

Del Clark Lake is two miles southwest of Canby in Norman Township. This man-made lake, formed by the largest earthen dam ever built by Soil Conservation Service in the state of Minnesota, is 155 acres in size. The recreation area includes a boat landing, bathhouse, picnic area, beach, camping area, hiking trails and fishing. In 1994, the lake was drained and a slurry trench was dug to prevent seepage through the dam. This was done to extend the life of the structure. The work was completed in 1994 and the lake was refilled in 1995.

Lake John is a man-made lake formed by Yellow Medicine River Watershed Flood Control Dam No. 8 located on a tributary of Mud Creek. The lake is located one mile north and three miles west of Porter within Norman Township. It is 20 acres in size. The lake is stocked with bass, crappies, northerns and blue gills. Lake John was the first recreation area in Yellow Medicine County with a sandy swimming beach, a wildlife area and an arboretum.

The Yellow Medicine County Historical Society Museum is located in Granite Falls at the junction of Hwys. 23 and 67, just south of Hwy. 212. It has been flooded in both major floods, necessitating all the objects to be removed. The Yellow Medicine County Machinery Museum is located in Hanley Falls along Hwy 23.

Transportation

Roads

Yellow Medicine is well served by an extensive roadway network that connects the county with the rest of the region and Minnesota. State, county, township, and city roadways are all included in the roadway network. It is the primary means of transportation for both goods and person within and out of the county.

For Additional information on roads refer to *Annual Surveillance Monitoring Reports for Transportation (2003)*.

Trunk Highway System. Yellow Medicine County has three Minnesota State trunk highways: 67, 68, and 23 and three US trunk highways including 75, 212 and 59. The total mileage of the State and US trunk highways are found in Table 23 below. These roads are constructed and maintained by the Minnesota Department of Transportation (MnDOT).

Table 23. YMC Highways

Miles of State and US Highways	
US Highways	MN Highways
42.4 (Just Hwy 212)	92.9

County Roads. These roads are established, constructed and improved by the county board. They are under the sole authority of the county board. There are 510.3 miles of county roads in Yellow Medicine County.

Township Roads. A township road is established by and under the authority of the township board or reverted to township jurisdiction by the county board. These roads are constructed and maintained by township boards. Township roads stretch to 799.3 miles.

City Streets. These roads serve as direct access from residential properties and/or commercial establishments and are classified as any street under the jurisdiction of a municipality not otherwise designated as a trunk highway, county state aid street, highway or county highway. City streets stretch 54.9 miles.

Trails.

Yellow Medicine County has a variety of trails available to the public located throughout the entire county. Table 24 below identifies all major trail systems and their particular uses including snowmobiling, walking, and horse trails.

Table 24. YMC Trails

Trail Name	County	Location/Descriptions	Length	Surface	Use
Upper Sioux Agency State Park	Yellow Medicine	In State Park	50 miles	Natural	Walk-18 Snowmobile-16 Horse-16
Snowdrifters Snowmobile Trail	Chippewa, Lac qui Parle, Yellow Medicine	Routes throughout counties	103 miles	Snow	Snowmobile
Canby Trail	Yellow Medicine	City to Del Clark Lake Park	2 miles	Paved	Walk, Bike, Inline Skate
Minnesota River Canoe Route	All Counties	Minnesota River	Unknown	Water	Canoeing

Source: UMRDC Trail Planning Guide 2002

Transit.

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

Yellow Medicine County has two large mass transit providers. Granite Falls Heartland Express serves the Granite Falls area. The buses run from approximately 6:00 a.m. until dark, Monday through Friday. Granite Falls Heartland Express operates one vehicle (small bus) carrying 27,796 riders driving 30,142 miles. Prairie Five Rides services Canby and Porter. The buses run from approximately 7:00 a.m. to 5:00 p.m., Monday through Friday. In 2007, Prairie Five RIDES gave 76,851 rides driving 407,018 miles, compared to 2008 where they provided 83,405 rides and drove 399,071 miles. See Table 25 below for a breakdown of transit options available to cities in Yellow Medicine.

Airport.

The Yellow Medicine County has two airports located in the cities of Canby and Granite Falls. The Canby Municipal Airport supports 2,560 ft. of paved runway that is 75 ft. wide. The Canby airport expanded its runway to 4,000 – 4,400 ft. and 75 ft. wide and is able to accommodate a large class of business aircraft. The Granite Falls Municipal Airport has a 3,700 ft. paved runway and is 75 ft. wide. It is estimated that the Granite Falls Municipal Airport lands six planes per day. See Table 25 below for a breakdown of available airports.

Railroads.

Two active rail lines operate in Yellow Medicine County. The Burlington Northern Santa Fe (BNSF) line has 21 miles of tracks in the county. BNSF runs parallel to Hwy 23 through Hanley Falls and Granite Falls. The BNSF rail line owns approximately 1,626 miles of line, or about 35 percent of the total rail mileage in the state. BNSF runs 16 trains a day at 49 miles per hour. The second line is the Minnesota Prairie Line which has 15 miles of track in the county. The MN Prairie Line runs through the cities of Clarkfield, Hazel Run, Hanley Falls, Wood Lake, and Echo. Rail systems are mainly for agriculture purposes and run by grain elevators. See Table 25 below for a division of railroads running through cities.

Table 25. YMC City Breakdown of Available Infrastructure

City	Transit	Airports	Railroads
Canby	Prairie Five RIDES & Canby RIDES	Yes (Paved)	No
Clarkfield	Prairie Five RIDES	No	Burlington Northern Santa Fe
Echo	Prairie Five RIDES	No	Minnesota Prairie Line
Granite Falls	Prairie Five RIDES & Heartland Express	Yes (Paved)	Burlington Northern Santa Fe & Twin Cities and Western
Hanley Falls	Prairie Five RIDES	No	Burlington Northern Santa Fe & Minnesota Prairie Line
Hazel Run	Prairie Five RIDES	No	Burlington Northern Santa Fe
Porter	Prairie Five RIDES	No	No
St. Leo	Prairie Five RIDES	No	No
Wood Lake	Prairie Five RIDES	No	Minnesota Prairie Line
Upper Sioux Community	Prairie Five RIDES	No	No

Telecommunication and Power Facilities

Internet, Electric, Gas and Phone.

Table 26 below indicates the telecommunication and power facilities within Yellow Medicine County.

Table 26. YMC Telecommunication and Power Facilities

City	Internet	Cellular	Cable	Electric	Gas	Phone
Echo	Redwood County Telephone Co./ MVTV Wireless	--	M-Tek Cable Systems	Xcel	Great Plains Natural Gas	Redwood County Telephone Co.
Hazel Run	--	--	--	Xcel	--	Frontier
Granite Falls	MVTV Wireless/ Kilowatt Computer Service	Midwest Wireless	MediaCom	CMMPA / City of Granite Falls	Great Plains Natural Gas	Sprint
Clarkfield	MVTV Wireless/ Minnesota Network Solutions/ Frontier	Verizon/ All-Tell	U.S. Cable	Xcel	Great Plains Natural Gas	Frontier
Canby	Frontier Charter Communications Farmer's Coop Association	Midwest Wireless Hammer Communications	Charter Communications	Ottertail	Aquila	Frontier
Wood Lake	Redwood County Telephone Co. / MVTV Wireless	Midwest Cell One	M-Tek	Xcel	Great Plains Natural Gas	Redwood Telephone Co.
St. Leo	MediaCom	--	MediaCom	Xcel	--	Frontier
Hanley Falls	MVTV Wireless Red Red, Frontier	Internet 2000 and Cell One	Project Services	Xcel	--	Frontier

Radio

Yellow Medicine County has one radio station located in Granite Falls. The station identification is KKRC and KOLV. This station serves as a resource during bad weather for information on closings and travel information.

Sewer and Water Systems

Lincoln Pipestone Rural Water receives a water supply from the Burr Treatment Plant and provides it to the cities of Echo, Hazel Run, Porter and St. Leo. Lincoln Pipestone interconnects with the cities of Canby and Marshall to service each other in emergency situations. Marshall and Canby have their own wells and water treatment system. All other cities in Yellow Medicine County have municipal water system from their own wells.

Eight cities in Yellow Medicine County have permits to discharge wastewater. These cities include Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, St. Leo, Wood Lake and Porter.

Hazel Run has private septic systems. Table 27 lists the drainage systems for all cities in Yellow Medicine County.

Table 27. YMC Public Drainage System

City	Drainage Source
Canby	Canby Creek
Clarkfield	County Ditch #9
Echo	County Ditch #1
Granite Falls	Minnesota River
Hanley Falls	County Ditch #41
St. Leo	Ditch to Spring Creek
Porter	Ditch to Mud Creek
Wood Lake	Wood Lake Creek

Emergency Response

A county’s ability to respond to an emergency situation or event is based on service areas, facilities and equipment. An understanding of response times and abilities is critical in protecting the citizens of Yellow Medicine County. The existing facilities and equipment in the county are intended to address local needs and support regional needs. Yellow Medicine County is considered a mutual aid county and provides and receives support from adjacent counties.

Medical Facilities

Yellow Medicine County is served by two hospitals and three clinics (Table 28). There are six ambulances in the county with two located in each city of Granite Falls, Clarkfield and Canby.

Table 28. YMC Hospitals and Clinics

Hospitals and Clinics	Address	City
Affiliated Community Medical Center	295 10th Ave.	Granite Falls
Granite Falls Hospital	345 10th Ave.	Granite Falls
Clarkfield Medical Clinic	812 10th Ave.	Clarkfield
Canby Community Hospice	119 First St. W	Canby
Sioux Valley Medical Campus	112 S. St. Olaf Ave	Canby

Fire Services

There are no full-time fire departments in Yellow Medicine County. All fire departments are volunteer-based with responsibilities being divided into four response zones. The Department of Natural Resources is responsible for fire protection on state forest and parkland. The DNR works closely with local fire units for protection of these lands through contracting agreements. Both the US Forest Service and the DNR cooperate with local fire fighters whenever danger of woodland and urban fires is elevated. Additionally, all volunteer fire departments have mutual aid agreements. Fire departments and resources are noted below in Table 29.

Table 29. YMC Fire Capabilities

City	Pumpers	Tankers	Grass Rigs	Aerial/Ladders	Air Packs	Number of Firemen
Canby	4	3	1	0		23
Clarkfield	2	2	2	0	10	28
Echo	2	2	1	0		20
Granite Falls	2	2	1	0		35
Hanley Falls	2	1		0		24
Hazel Run						
Porter	3	1		0		25
St. Leo	3	1		0	3	17
Wood Lake	4	2		0	8	19

Source: Yellow Medicine County, City Surveys 2009

Other equipment not noted in the above table include boats, thermal imaging camera, air fill stations, new fire hall or additions to existing fire halls, dry hydrants, Jaws of Life, extraction tools, hoses and nozzles, generators, transfer pumps, First Responder Vehicles, van, water augers and a Cascade System. All of this additional equipment is spread throughout Yellow Medicine County. Canby, Clarkfield, Echo, Granite Falls, Hanley Falls, Porter, St. Leo and Wood Lake Fire Departments are members of the West Central Firefighters Association. These community fire departments agreed to be of help to other communities in the West Central Firefighters Association in case of emergency.

Public Safety

Emergency Operations Center.

Located in Yellow Medicine County Courthouse in Granite Falls, the center provides a point for strategic command for all events in Yellow Medicine County.

Emergency Warning Systems.

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

The Marshall NAWAS Warning Point is responsible for disseminating all watches and warnings to the Yellow Medicine County warning point, except warnings for conditions generated within

the county itself. All cities in Yellow Medicine County have emergency sirens that are in working condition, but some are in need of updating. Back-up power is needed for most of the sirens.

Police Stations.

Law enforcement capabilities are spread throughout Yellow Medicine County. Of the nine communities, four are able to sustain city law enforcement, shown in Table 30 below. The remaining cities of Porter, St. Leo, Hazel Run, Hanley Falls, and Wood Lake are serviced by the Yellow Medicine County Sheriff Department.

Table 30. YMC Law Enforcement Capabilities

City	Officers	Squads
Granite Falls	5 Full-Time 6 Part-Time	2
Echo	1 Full-Time	1
Clarkfield	2 Full-Time 2 Part-time	1
Canby	3 Full-Time 4 Part-time	2
Yellow Medicine Sheriff	8 Full-Time 11 Part-Time	7

Source: City Surveys 2009

Countryside Public Health.

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

County Highway Department

The County Highway Department has equipment that can be used in case of an emergency from tornados to floods.

<p>Granite Falls: 11 Vehicles for wide range of uses 3 Tractors and 9 Trailers 1 Bituminous Distributor 1 Loader, Backhoe, Grader, Dozer 4 FW Drive Pickups 1 Ford Expedition 4x4</p>	<p>Canby: 5 Dump Trucks 2 Tractors 1 Skid Loader, Loader, Backhoe, Excavator 3 Pickups – 2 4W Drive</p>
	<p>Porter: 1 Grader, Dump Truck</p>
<p>Clarkfield: 1 Dump truck, Loader 2 Graders</p>	<p>Wood Lake: 1 Grader, Dump Truck 1 4W Drive Pickup</p>

Property

Land Uses

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

Manufactured Home Parks

There is one manufactured home park located in Canby, which is regulated by city code. Manufactured home parks located outside of cities are allowed as a conditional use and must follow guidelines as set forth in the Yellow Medicine County Ordinance Code.

Current Codes

Yellow Medicine County currently has a floodplain ordinance. The floodplain ordinance regulates permitted uses and development in the 100-year floodplain. Granite Falls and Canby also have floodplain ordinances.

Granite Falls adopted the universal building code. Construction of new buildings in Granite Falls requires the use of tie-downs in the foundation in order to withstand high wind conditions. Other cities and the county do not regulate the use of tie-downs.

YELLOW MEDICINE COUNTY

CHAPTER THREE: HAZARD INVENTORY

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

Definition – Natural Hazard

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

Definition – Technological Hazards

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

Natural Hazards – Presented by the Physical World

Introduction

Source: Minnesota State Hazard Mitigation Plan:

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

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

- | | |
|-------------------------------------------------------------------------|---------------------------------|
| 1. Violent Storms | 2. Extreme Temperatures |
| a. Winter Storms | <i>Summer Heat, Winter Cold</i> |
| <i>Blizzards, Ice Storms, Sleet Storms,
Heavy Snow or Snowstorm</i> | 3. Floods |
| b. Summer Storms | 4. Drought |
| <i>Thunderstorms, Lightning, Tornados,
Hailstorms, Windstorms</i> | 5. Wildfire |
| | 6. Dam Failure |

Hazard: Violent Storms

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

Winter Storms

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

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

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

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

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

History of Winter Storms in Yellow Medicine County

Yellow Medicine County usually experiences at least one occurrence of each of the above types of winter storms annually, often the same type more than once shown in Tables 31 and 32 below.

Table 31. YMC Winter Storms from 1993 – 2002

Winter of:	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Events:	5	4	10	9	1	4	1	7	3	2
Events include: blizzards, winter storm, heavy snow, blowing snow, ice storm, glaze, low and extreme wind chills										

Source: National Climatic Data Center – Event Query 2009

Table 32. YMC Winter Storms from 2003 – 2008

Winter of:	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
Events:	4	2	3	1	3	7
Events include: blizzards, winter storm, heavy snow, blowing snow, ice storm, glaze, frost/freeze, low and extreme wind chills						

Source: National Climatic Data Center – Event Query 2009

Blizzards are relatively common in Yellow Medicine County. From November 1993 until January 2009, the National Climatic Data Center has reported thirteen blizzards. In that same time period, a total of 69 instances of winter weather were reported to the National Climatic Data Center.

The winters of 1995–1996 and 1996–1997 were exceptionally extreme. In the season of 1995-1996, four blizzards were reported. Three blizzards were reported in 1996-1997. In addition, heavy snow, high wind and winter storms made these two winters difficult for Yellow Medicine County. There were many school cancellations and high costs to remove snow. The winter of 1996-1997 was declared a Presidential Disaster because of the snow emergency. Snow removal was extremely expensive because of the large amounts of snow, which damaged and destroyed buildings. In Echo, the community center roof collapsed after the snow load in 1997.

The two weather stations used in and near Yellow Medicine County are located in Canby and Montevideo. Table 33 and 34 shows the snowfall extremes for these two weather stations. Canby had a record season of 70.4 inches of snowfall in 1996-1997. The blizzard of January 17 and 18 in 1996 dropped record amounts of snow on both Canby and Montevideo.

Table 33. Greatest Snowfalls (by Month) in Canby and Montevideo from 1951 - 1997

Monthly High	Canby		Montevideo	
	High (in.)	Year	High (in.)	Year
January	29	1979	33	1982
February	23.5	1969	28	1962
March	36	1951	44	1951
April	17.3	1995	10	1957
May	1.5	1954	1	1954
June - Sept	0	-	0	-
October	6	1976	5	1959
November	25.5	1975	25	1985
December	26	1968	23.5	1968
Season (Jul-Jun)	70.4	1996-1997	79.3	1983-1984

Source: Midwest Regional Climate Center 2009

Table 34. Largest 1-Day Maximum Snowfall in Canby and Montevideo from 1951 - 1997

Daily High	Canby		Montevideo	
	1-Day Max (in.)	Date	1-Day Max (in.)	Date
January	9	1/18/1996	12	1/18/1996
February	11	2/20/1953	11	2/20/1952
March	14	3/4/1985	14	3/3/1989
April	12	4/2/1960	8	4/13/1996
May	1	5/2/1954	1	5/2/1954
June - September	-	-	-	-
October	4	10/24/1995	5	10/24/1995
November	16	11/20/1975	16	11/21/1975
December	14	12/1/1981	10	12/28/1982
Season (Jul-Jun)	16	11/20/1975	16	11/21/1975

Source: Midwest Regional Climate Center 2009

Relationship to Other Hazards - Cascading Effects

As much of Yellow Medicine County is relatively flat, dangerous winter conditions are created when the wind blows causing drifting, whiteouts and wind chills. Drifting and blizzard conditions can occur even if there are no new snow accumulations. During the winter of 1996-1997, drifts were higher than most street vehicles.

Flooding. The winter of 1996-1997 also contributed to record spring flooding. This event is discussed in the flood section.

Utility Failures. Minnesota Valley Cooperative Light and Power Association currently have 720 miles of power lines that are exposed to weather event. This company experiences on average 57 power outages due to weather event annually in their region, with approximately 11 outages in Yellow Medicine County.

Summer Storms

Summer storms affecting Yellow Medicine County include thunderstorms, tornadoes, hailstorms and windstorms.

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

Lightning. While windstorms and tornadoes are significant hazards associated with severe thunderstorms, lightning is probably the most frequent hazard associated with thunderstorms and the hazard that causes the largest 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.

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

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

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

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

Most hail in Minnesota ranges in size from pea-size to golf-ball sized hail. Larger hailstones have been reported but 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 southern Minnesota can expect some hail during the summer months most hail is not large enough to cause significant crop or property damage.

Windstorms. Windstorms can and do occur in all months of the year; 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 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.

Strong winds combined with saturated soils can lead to wide spread loss of trees. This becomes a problem in communities when downed trees injure people, damage property, knock out power lines or impede traffic. Downed power lines are a concern because of power outages as well presenting a risk of electrocution or fire. Risks associated with storms toppling trees can be managed through proper tree selection and proper maintenance programs. Some communities desire the look and feel of tree-shaded roads. This desire may lead the community to encourage the planting of trees that are too large for the narrow green strip between the street and sidewalk.

History of Summer Storms in Yellow Medicine County

At one time or another Yellow Medicine County has experienced all of the summer storms described above. Thunderstorms, lightning, hail, and windstorms are relatively common and can topple trees, and cause destruction to homes as well as destroy agriculture crops. Table 35 identifies the frequency of summer storms in Yellow Medicine County.

Table 35. YMC Summer Storms

	Thunder Storms 1957-2008	Lightning 1997 has Only Report	Tornados 1981-2008	Hailstorms 1957 - 2008	Windstorms 1994-2008
Events	45	1	24	72	9
Years	52	--	46	52	14
Average per year	.87	--	.52	1.38	.64

Note: * Wind and thunderstorms of over 60 kts.
Source: National Climatic Data Center – Event Query 2009

According to the Storm Database, the county has experienced 19 tornados since 1965, as well as three funnel clouds. Of the nineteen tornados, nine were classified as F0, six were classified as F1, one was classified as F2, two classified as F3 and one classified as F4. Significant damage was done to Clarkfield from an F3 tornado and to Granite Falls from a F4 tornado. Many of the tornados occurred in rural areas and did little damage; however some of the destructive tornados destroyed farm buildings and downed trees.

Granite Falls Tornado. A destructive and deadly tornado struck the city of Granite Falls (Yellow Medicine County) on July 25, 2000. One person was killed, over a dozen injured, and millions of dollars of damage was done to residences, businesses, and public facilities.

The tornado first touched down in rural Yellow Medicine County, eight miles west, and three miles north of Granite Falls. The tornado lifted before exiting Granite Falls, leaving the most concentrated damage path two miles long, and 500 feet wide, through a primarily residential area of Granite Falls. Most of the damage in Granite Falls was caused by F2 to F3 wind speeds. However, this tornado was classified as a minimal F4 tornado, based on the twisted wreckage of an overturned railroad car near the intersection of 9th Ave. and 14th St. in Granite Falls.

Clarkfield Tornado.

On June 16, 1992, an F3 tornado hit the south part of Clarkfield turning one house completely upside down and ripping siding off many homes. Late afternoon on the 16th spotters were called out to watch for tornadoes and they called in to report a tornado touch down west of Clarkfield. This tornado damaged several buildings south and west of Clarkfield. The damage included several destroyed barns and buildings and was set back on the foundation.

Police Chief Hill had received notice that a second cell of activity could be approaching the city and should be expected around 11:00 p.m. The fire department was prepared to return to their spotting locations and watch for dangerous activity later that evening. While waiting for that cell to arrive, another cell of activity developed without warning. At 9:33 p.m. a tornado struck the city of Clarkfield. There had been no advance notice that anything was in the area and warnings had not been issued. The Police Chief immediately radioed for assistance and at that time, there was not a relay system to set off the sirens in Clarkfield. A firefighter tried to get to city hall to set off the alarms but the power went out. Without an emergency back-up system, the siren was useless.

A flurry of activity began as power companies arrived to cut power to the downed lines. Neighboring fire departments arrived to assist the local fire department with their house-to-house search to make sure residents were safe. Emergency crews were surprised to find no one was seriously injured. Deputy Blackwelder arrived to assist with setting up an emergency center at city hall. When daylight arrived the next morning, the city was a flurry of activity as people were finally able to view the devastation and begin the cleanup.

A majority of the homes and businesses in the city were damaged and emergency workers estimated \$7 million worth of damage was inflicted on the community. During the remainder of 1992 and in 1993, \$2,350,000 worth of building permits were issued in the city of Clarkfield as residents worked to recover from the tornado damage.

Relationship to Other Hazards – Cascading Effects

Flooding. Heavy snows, snow melt, and thunderstorms can cause flooding which disrupt emergency response, transportation and communication.

Transportation, Emergency Services, and Utility Disruption. Violent storms of all types can cause property damage, loss of life, personal injury, disrupt transportation and communication

and emergency services and threaten public health and safety and be significant threats to essential public infrastructure and services such as power, water supply systems and sanitary systems. The storms listed above could down power lines, which may lead to fires.

Utility Failures. Minnesota Valley Cooperative Light and Power Association currently have 720 miles of power lines that are exposed to weather event. This company experiences on average 57 power outages due to weather event annually in their region, with approximately 11 outages in Yellow Medicine County.

Plans and Programs for Severe Storms

Severe Storm Spotters Network. This program, sponsored by the National Weather Service (NWS), enlists the help of trained volunteers to spot severe storm conditions and report information to the NWS. No tornado warning is given unless the storm has been spotted by someone or is confirmed by NWS radar reports. Yellow Medicine County has trained all fire departments, law enforcement and emergency management personnel in severe weather conditions. An additional 60 civilian severe weather spotters are trained and recertified each year and report directly to the NWS and the local dispatch when severe weather is observed.

Severe Weather Awareness Week. Each spring Yellow Medicine County emergency management personnel conduct a severe weather training workshop for all fire departments, law enforcement and private citizens.

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

Live Weather Conditions. All schools in the county have computer access to online weather radar.

Severe Weather Warning System. The county's cities have emergency sirens to warn residents in the event of severe weather. Yellow Medicine County dispatch center has its own radar to track weather. The system is very old and may need to be updated. Yellow Medicine County will apply for a grant from the National Oceanic and Atmospheric Administration to obtain new and updated sirens for all communities.

Publication "The Right Tree". Minnesota Power has published The Right Tree. This handbook can be useful in selecting proper trees - especially around power lines. Proper maintenance of trees can also prevent problems. DNR forestry staffs, as well as private consultants, are available to work with communities to develop community forestry programs.

Gaps and Deficiencies for Severe Storms

- There are homes in the county that lack basements that would provide shelter in the event of a tornado or damaging winds from a severe thunderstorm. Moreover, some of the county's

nursing homes do not have basement shelters or other suitable shelter for residents. In the event of a violent storm residents are moved to an interior hall away from windows.

- There are schools and nursing homes in the county that do not have weather radios.
- The manufactured home park in Canby does not have a safety shelter on-site. They do have an evacuation plan, but the city has not approved the plan. In Yellow Medicine County there is no city that requires an on-site shelter for mobile home park residents in case of severe weather. The county is recommending that communities require shelters for mobile home park residents or provide information on evacuation routes to safe shelters elsewhere.
- There may be areas beyond the broadcast range of the weather radio. It should be determined if additional towers are needed so that rural residents are not outside the range of the severe weather warning system sirens.
- While police radios currently work, it is uncertain what will happen after the state switches from UHF to VHF (800 MHz) in 2006 – 2007. The current radios will not work with 800 MHz towers and new radios are extremely expensive. It is also not clear whether the new system will work in rural areas.
- Local radio stations do provide warnings but are effective only if tuned into by residents.
- Most power lines in the county are above ground and subject to damage from ice storms, wind and falling tree limbs. There are few community requirements that discourage the planting of large trees near power lines.
- In many communities, the local city hall is the emergency operations center. However, most are not able to access a backup power source.

Hazard: Extreme Temperatures

Located in the center of the continent, Minnesota and Yellow Medicine County experiences the extremes of summer heat and winter cold. Summer temperatures in Yellow Medicine County have exceeded 110° F on several occasions, while winter temperatures have been as cold as 42° F below zero. Both heat and cold pose risks for people, animals, equipment and infrastructure.

History of Extreme Temperatures in Yellow Medicine County

The average July maximum temperature in most of Yellow Medicine County is about 85° F. July is the warmest month. On average the county experiences 23 days of 90 degrees or higher during a summer. The all time recorded high is 111° F in Canby, which occurred in 1936 (Table 36).

Table 36. YMC Highest Temperatures and Dates

	Highest Temp	Date
Canby	111	7/12/1936
Wood Lake	109	1988
Montevideo	110	July 31, 1988

Source: Midwest Regional Climate Center 2009

While summers are typically warm but pleasant in Yellow Medicine County, it is not uncommon to get extended warm spells with high dew points and temperatures in the 90s for several days in a row. Extended periods of warm, humid weather can create significant risks for people,

particularly seniors who may lack air conditioning or proper insulation or ventilation in their homes. Animals are also at risk during extended periods of heat and humidity.

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

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

Winter Cold History in Yellow Medicine County

On average, January is the coldest month, with daytime highs of averaging 24° F and nighttime lows of 5° F. Table 37 describes the lowest temperatures reached in Yellow Medicine County. However, these averages do not tell the entire story. Maximum temperatures in January have been as high as 67 degrees and minimums as low as minus -30 ° F below in Yellow Medicine County. The winter months on average produce about 34 days of 0° F or lower.

Table 37. YMC Lowest Temperatures and Dates

	Lowest Temp	Date
Canby	-33	January 22, 1936
Wood Lake	-30	1970
Montevideo	-39	February 16, 1936

Source: Midwest Regional Climate Center 2009

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

Relationship to Other Hazards – Cascading Effects

Violent Storms. Temperature extremes can be associated with weather extremes, such as snow storms and blizzards.

Drought. Extended high temperature extremes can phase into drought.

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

Collapse of Structures. As structures age, structural weaknesses develop from building material failure, settling, or other factors. Tornadoes, floods, high winds, snow, heavy rainfall, may result in major damage to structures.

Plans and Programs for Extreme Temperatures

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

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

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

Wind Chill Warnings. The local radio and TV media collaborate with the National Weather Service issues a wind chill warning when temperatures are minus -30° F or lower. Severe wind chill warnings are provided when conditions warrant and when severe risk and safety is a factor.

Hourly Data. Granite Falls Airport has an AWAS system in place as of October 2003.

Program Gaps or Deficiencies for Extreme Temperatures

- None of the schools in the district have an automated weather station providing current weather conditions. Additional stations at schools throughout the county would provide more current information and quicker response to dangerous and changing weather conditions.
- Emergency management personnel do not have an automated weather station. Having this system would greatly enhance the offices ability to react to serve weather. Personnel have access to computer programs to identify weather trends.

Hazard: Floods

A flood is defined as an overflowing of water onto an area of land that is normally dry. For floodplain management purposes, the Federal Emergency Management Agency (FEMA) uses the following definition of "100-year flood." Other water hazards considered in this section include flash floods and washouts.

The term "100-year flood" is the flood elevation that has a one percent chance of being equaled or exceeded each year. Thus, a 100-year flood could occur more than once in a relatively short

period of time. The 100-year flood, which is the standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. A structure located within a special flood hazard area shown on a map has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage. One-hundred year floodplains have been identified, mapped and used for further analysis using the county's Geographic Information Systems (GIS).

Floods generally occur from natural causes, usually weather-related, such as a sudden snowmelt, often in conjunction with a wet or rainy spring or with sudden and very heavy rain falls. Floods can, however, result from human causes such as a dam impoundment bursting. Other water-related hazards include wash-outs and ice freezes that affect dams and culverts. In the spring of 2009, a great amount of water overflowed roads, causing a major washout and road closures throughout the county.

History of Flooding in Yellow Medicine County

Flooding in the county occurs primarily in the spring during periods of peak conditions (rainfall and snowmelt) and in areas where the soil has low permeability qualities. Damages are mainly confined to the Yellow Medicine and Lac qui Parle watersheds. According to estimates by the US Army Corp of Engineers and Soil Conservation Service, there are approximately 27,657 acres in the 100-year floodplain within the Lac qui Parle and Yellow Medicine watersheds. Within the Lac qui Parle watershed, average annual damages resulting from flooding amount to about \$390,030. In the Yellow Medicine River watershed annual damages amount to about \$471,080. These figures were determined using 1985 cost benefit figures. Therefore, the damage figures given are underestimated in today's economy.

In Yellow Medicine County, there are large flood plains associated with the confluence of Canby and Lazarus Creeks, and the confluence of Spring Creek and the Yellow Medicine River. It would be appropriate to evaluate flood risk for these areas. The MnDNR strongly encourages relocation of homes and retirement of farmland within the floodplain.

Granite Falls Flood History.

Source: Granite Falls Flood Mitigation Plan 2001

Floods on the Minnesota River at Granite Falls occur mostly in the spring from snowmelt runoff. Low level flooding (considered as events with estimated frequency between 10 and 25 years) impact areas directly adjacent to the main river channel. Flood fighting for low level events is based more on individual efforts than on community-wide efforts. At flood stage (approximately 25-year frequency event), river flows are split between the main river channel and a secondary river channel along the westerly and southerly edge of the city.

The flood of record on the Minnesota River at Granite Falls occurred in April 1997. This flood had a peak discharge of approximately 53,000 cubic feet per second (cfs) at Granite Falls. This was measured at the Minnesota Falls Dam, located on the Minnesota River approximately 2.7 miles below the confluence of the secondary channel and the main river channel (Reference 1). Distribution of flows were estimated at 40,000 cfs in the main channel and 13,000 cfs in the secondary channel (Reference 2). A similar event occurred in the spring of 2001. While not reaching the same levels as the 1997 event, the magnitude on flows and impact to the community were similar.

Flood fighting efforts in the Granite Falls area during the last two floods consisted of hundreds of volunteers filling hundreds of thousands of sandbags and building sandbag levees around homes and businesses. Many agencies were involved in the previous two flood fights including the US Army Corps of Engineers, Minnesota National Guard, National Weather Service, US Geological Service (USGS), Minnesota Department of Transportation (MnDOT), and state, county and local officials. Flood fighting itself carries significant risks for the volunteers. Levee heights reach as high as ten feet. Volunteers worked day and night adjacent to the flooded Minnesota River, flowing at dangerous levels, with very fast velocities of eight to ten feet per second (12 to 15 miles per hour), and at a water temperature just above freezing. In 2001, a total of 620,000 sandbags were filled and placed with volunteer labor, with 550,000 sandbags used to construct levees.

In 1997, the city spent \$852,086 for flood fighting efforts and cleanup (cost figures provided by city staff). Over \$175,000 was spent by the US Corps of Engineers in construction contracts to fight the floods in 1997 (Reference 6). An estimated \$3.1 million was prevented from damage from the 1997 flood due to flood fighting activities (Reference 6). In 2001, the city spent \$437,115 for flood fighting efforts and cleanup (cost figures provided by city staff). The US Corps of Engineers awarded temporary levee construction contracts in 2001 totaling \$112,250 for Granite Falls. Other large floods occurred in April 1952 (25,300 cfs), April 1969 (43,000 cfs), and April 2001 (cfs uncertain but likely between 34,600 and 43,000). Significant flood events occurred in June 1919, April 1951, April 1965, and March 1994. It should be noted that ice flow or frazzle ice have exacerbated flooding impacts in the city on some occasions during spring flows.

In summary, flood fighting efforts as a result of flooding over the past four years has cost hundreds of thousands of dollars, extensive property damages, economic hardship, and has carried a significant risk for the volunteers involved in the flood fighting efforts. In 1997 and 2001, Granite Falls experienced floods, residential property damage and the forced evacuation of people from their homes. The total private property damages for the 2001 floods, based on estimates by the county assessor's office, were in excess of \$150,000.00. Damage to public structures amounted to \$1.5 million.

Figure 2. NCDC & DNR Flood Summaries

Flooding Reports from the National Climatic Data Center (NCDC) Storm Event Database

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Flash Flood, August 20, 2002

Nearly seven inches of rain fell in extreme northeastern Yellow Medicine County, on the southern outskirts of Montevideo. Three roads were flooded with two to three feet of water, and a few basements were flooded.

DNR Waters Summary on Climatic Conditions that led to the 1997 and 2001 flooding

See Appendixes 3 & 4 for complete report

1997 Flood Factors

- 1) Heavy autumn precipitation
- 2) Extraordinary winter snowfall
- 3) Less than ideal snowmelt scenario
- 4) Heavy early spring Precipitation

2001 Flood Factors

- 1) Significant autumn precipitation
- 2) Heavy Winter snowfall
- 3) Less than ideal snowmelt scenario
- 4) Record-breaking April precipitation

Figure 3. NCDC 1997 & 2001 Flood Reports

**Flooding Reports from the National Climatic Data Center (NCDC)
Storm Event Database**

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

100-year flood in 1997

Above normal temperatures during the last week of March began melting a deep snow cover across much of west central into parts of central Minnesota. Snow depth rank was in the 80 to 90th percentile over the area as measured on 3/20/97. The snow cover had a high moisture content. In addition, several storms deposited additional rain and snow over the area on 3/24/97 and 4/5/97. The flooding resulted in severe losses to both public and private property. Damage was extensive to roads, bridges, culverts, agricultural drainage areas, homes and businesses. Drainage ditches and culverts plugged with snow and ice resulted in sporadic flooding. Scattered road closures were a result of the spring thaw as well. Many smaller rivers also overflowed their banks resulting in road closures and structural flooding.

The river remained above flood stage until mid May. Flood stage of the river in Montevideo was 14 feet which was reached on 4/2/97. The river crested at 23.9 feet on 4/7/97 establishing a new record crest in Montevideo. Other monitoring points along the Minnesota River reached crests that were at 3rd or 4th all time record levels, including Mankato, Henderson, Jordan, Shakopee and Savage.

Minnesota River flooding resulted in severe losses to public and private property. An early spring storm brought heavy rain, snow and high winds to the area on 4/5-6/97 at the peak of the flooding, severely aggravating the situation. Many roads were closed in the Montevideo and Granite Falls areas. Firefly Creek Casino closed due to lack of road access. Yellow Medicine County museum flooded on 4/5/97. Sanitary sewer lift station failed in Montevideo causing sewage backup into homes. Four hundred residents were evacuated. Up to 150 homes in Montevideo reported flooding to some degree. Sewer backups also reported in Watson and Clarkfield. Highway 212 bridge collapsed west of Granite Falls.

More than 60 homes evacuated in Granite Falls. Flood waters knocked out Granite Falls water treatment plant, forcing water rationing. Schools were closed in districts close to the Minnesota River. At one point, only one bridge (Highway 4 in Fairfax) spanning the Minnesota River was still open between Mankato and the South Dakota border.

The Minnesota River remained in flood stage through mid May. The river first went above flood stage in late March. Peak crests of the river were reached during the first two weeks of April. The crest at Montevideo reached 23.9 feet on 4/7/97 which set a new record crest. Minnesota River flooding resulted in severe losses to public and private property.

100-year flood in 2001

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 mainstream rivers during mid-day April 1. Heavy rain April 7-8 over much of central Minnesota prolonged the high water and also added one or two feet to many crests during mid-April. Another period of heavy rain April 22-23 caused rivers to crest again in late April and early May; in some cases the crest was higher than the first. Many rivers remained well above flood stage into mid-May. The crest at Montevideo on the Minnesota River was the second highest ever, only 1.3 feet lower than in 1997.

Numerous roads and bridges were closed millions of sandbags used, and approximately 200 homes and businesses were partially submerged with flood waters. About 100 homes and businesses were damaged beyond repair.

Snowmelt flooding that began April 1 continued into early May on the major rivers: the Minnesota, St. Croix, Crow River, South Fork of the Crow River, and the Mississippi River below its confluence with the Minnesota River. The last of the river levels finally went below warning criteria on May 8.

Issues:

- Roads damaged from hauling of sand, etc.
- Flooded county and township roads, bridges and culverts.
- Flooded county ditches.
- High groundwater all over.
- Flooding all over county – streams, creeks and wetlands as well as major rivers and lakes.
- Many roads closed.
- Lives at risk, especially in 1997.
- In 1997 only, septic tanks backed up into homes (many rural septic systems have been updated since).
- In Yellow Medicine County, there are large floodplains associated with the confluence of Canby and Lazarus Creeks, and the confluence of Spring Creek and the Yellow Medicine River.
- Rural flooding is also an issue of concern. Rural flooding can impact structures as well as agricultural lands. Flooding of township roads cause enormous amounts of damage, but generally go unnoticed by the public.
- Lost many machine sheds.
- Saturated soils.

*Granite Falls.***Issues:**

- 1997 record flood (23.9 feet).
- Dangerous for volunteers filling hundreds of thousands of sandbags and building sandbag levees around homes and businesses in both 1997 and 2001.
- Residential property damaged and people were forced to evacuate their homes.
- A sanitary lift station on the south side of MN Avenue was in jeopardy of undermining in both 1997 and 2001. Dangerous sandbagging by volunteers protected the lift station.
- In 1997, treated water from the water treatment plant is stored in “clear wells”. These clear wells are located in the floodplain and it was unclear if the water was contaminated. The city had to ask everyone to boil their water and hauled in truckloads of bottled water for the residents.
- Electrical lines were undersized and the power pull platform was threatened by floodwaters and undermining in the 1997 floods. This would have affected power service to 2/3 of the city.
- A water line that crossed the river was broken up by debris and floodwaters.
- Eight single-family homes were lost and two apartments were lost displacing 20 families in 1997. No homes were lost in 2001.
- One business was lost in 1997 flood.
- Many homes along MN Avenue, 15th Avenue and throughout the city sustained damaged from floodwaters in 1997 and 2001.
- The integrity of the levee was a concern throughout the flooding of 1997 and 2001.
- Internal drainage was a problem for areas of the city in 1997.
- The Yellow Medicine County Museum flooded in both 1997 and 2001. The contents had to be removed and the building was damaged.

Changes Made:

- Utilities crossing the river were moved or rebuilt to withstand future high water.
- Utilities behind Main Street were buried and covered with concrete.
- The water line and sanitary sewer line that crossed the river was raised and replaced.
- Twenty-eight homes removed from floodplain.
- One business was removed from floodplain.

- Concrete walls were built around clear wells to protect the treated water, preventing contamination in 2001.
- Transformer was moved and put onto larger posts and distribution lines were increased, preventing future threats to the electrical lines.
- Temporary pumping stations were used in 2001 to equalize the storm sewer pressure with the floodwaters. This mitigated the internal drainage problem.

Future Issues:

- After mitigation is complete, no homes will remain in the current floodplain. If the floodplain changes after FEMA reevaluates the floodplain, homes to the south of city hall on Prentice Street may be located in the floodplain.
- The homes along Prentice Street do not have a levee footprint to provide and accessible and prepared foundation for future flood fighting efforts.
- Main street businesses remain in floodplain; however, they will be flood-proofed and should be able to withstand floodwaters.
- Need to consider that there is less chance that future floods will cause a “disaster designation” and some entities will not receive the help needed.
- The temporary pumping stations to equalize pressure are less reliable than permanent pumping stations.
- The levee’s integrity is questioned.
- The water treatment plant is very close to the floodplain.
- Sanitary sewer line needs replacement. Infiltration occurs annually due to spring flooding.
- The lift station at the south end of MN Avenue will continue to be in jeopardy in future flood events.
- The removal of the county museum is an issue that needs addressing in the future. The museums operational expenses are shared with the county and city of Granite Falls. The museum is located on the river front edge. In both floods, the museum experienced damage. It has been recommended by DNR and FEMA that this facility be relocated.
- The Granite Falls Fire Hall is located down town and on the river front edge. During both floods the hall had water in the cooling and heating system because of the rise in the ground water at that location. In the future moving the fire hall out the flood area should be considered.

Relationship with Other Hazards – Cascading Effects

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

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

Transportation, Emergency Services, and Utility Disruption. Violent storms of all types can cause property damage, loss of life, personal injury, disrupt transportation and communication and emergency services and threaten public health and safety and be significant threats to essential public infrastructure and services such as power, water supply systems and sanitary systems.

Landslide and Debris Flow. There were issues with debris flow and bridge damage in the floods of 1997 and 2001. It was difficult to keep the rivers and drainage ditches clear and therefore backup of floodwaters occurred.

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

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

Plans and Programs for Flooding

County Flood Area Map and Controls. The current county Flood Insurance Rate Maps (FIRM) to identify the 100-year flood areas as shown in Figure 5 (Chapter 4 pg. 20). The county zoning ordinance controls the permitted land uses in these areas which describes what can be built and how [refer to Yellow Medicine County Land and Related Resource Management Ordinance].

Granite Falls Flood Map and Control. Granite Falls has identified 100-year flood areas on its official land use map and adopted in its zoning ordinance a floodplain ordinance which identifies appropriate zoning and land use controls governing these areas as shown in Figure 20 (Chapter 4 pg. 62-63).

Operations Center. The emergency operations center for the county has been moved to the basement of the new Law Enforcement Center located in Granite Falls, MN.

Program Gaps or Deficiencies for Flooding

- DNR forestry staff suggest that the costs and hazard associated with downed trees as debris flow might be mitigated through improved “sanitation cutting” in the floodplain. There are provisions within the Reinvest in Minnesota (RIM) set aside program that allows limited timber cutting on lands enrolled in the program. However, the cutting must be allowed in a timber management plan prepared by a DNR Forester. Soil and Water Conservation Districts and landowners have not been utilizing this aspect of the RIM program.

Hazard: Drought

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

History of Drought in Yellow Medicine County

Yellow Medicine County has experienced prolonged periods without rainfall. The most severe in climatic records occurred during the 1930s. None so prolonged has been experienced since.

Record low precipitation for the summer in Canby was 2.95 inches in 1950 and in Montevideo, 3.46 inches in 1976. Record low for the month of July in Canby was .13 in 1947 and in Montevideo, 0.12 inches in 1936. Annual record low rainfall for both Canby and Montevideo was in 1976 and was 9.01 and 13.08 respectively.

Granite Falls receives its drinking water supply from the Minnesota River. In 1988, Granite Falls requested to hold back more water in order to prevent a shortage. This request was denied. Individual shallow wells in the Granite Falls area have occasionally failed, requiring the affected parties to re-drill to reliable aquifers. The wells for the city of Granite Falls are not adequate and new sources are being explored.

Drought also gives way to insect infestation. Grasshoppers were abundant during the 1988 drought.

Drought of 1920-30.

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

Drought of 1974-77.

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

Drought of 1987-89.

The warm, dry winter of 1986-87 was the beginning of this period of little rainfall and extreme dryness. Drought conditions became very serious in mid-June 1988 when Mississippi River flow levels threatened to drop below the Minneapolis Water Works intake pipes at the city of Fridley. Below normal precipitation coupled with declining lake levels, ground water levels, and stream flow created statewide concern. To facilitate coordination of drought response actions a State Drought Task Force was convened by the director of the Division of Waters. The State Drought

Task Force brought together local, state, and federal officials to share information and coordinate drought response strategies. Several actions were taken following the summer of 1988 to better prepare the state for the next drought. The Governor appointed a "Twin Cities Water Supply Task Force" specifically to make recommendations on how to meet future water demands in the event of low flow conditions on the Mississippi River. The Corps of Engineers initiated review of its operating plans for the Mississippi River headwaters reservoirs, and the 1989 legislature charged the Metropolitan Council with preparing water use and supply plans for the metropolitan area. In the summer of 1988, rains finally came in August, but not soon enough to save agriculture crops.

Drought of 2003.

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

Yellow Medicine County traditionally sees "Abnormally Dry" weather with pre-drought conditions annually from May to September from 2000 to January of 2010. During that time span, three droughts occurred countywide. The first took place from September 2003 to June of 2004 categorized as a "Moderate Drought", followed by another "Moderate Drought" from the end of July 2006 to end of August 2006. The final drought occurrence varied between a "Moderate Drought/Severe Drought" from the end of July 2007 to mid-September 2007.

Relationship with Other Hazards – Cascading Effects

Wildfires. Drought stressed woods, brush land and non-cultivated fields significantly increases the risks of wildfire.

Plans and Programs for Drought

Water Plan. The current Yellow Medicine County Comprehensive Water Plan identifies the major and minor aquifers serving the county.

Water Consumption Use. Semiannual or annual water consumption by various major consumers, urban residential, industrial/commercial or agricultural, is documented through water meters.

Water Conservation. Water conservation provisions and use restrictions in times of drought are included in city ordinances and is possible in the Lincoln-Pipestone Rural Water (LPRW) system.

Program Gaps and Deficiencies for Drought

- County has no estimates of annual recharge rates or the capacities of the various aquifers.

- Semiannual or annual water consumption by various major consumers, urban residential, industrial/commercial or agricultural, is not documented or known.
- Water conservation provisions and use restrictions in times of drought are not included in the county ordinance or in all city ordinances.
- The current county water plan recommends wellhead protection standards for adoption via ordinance by Yellow Medicine County, but has yet to be implemented.

Hazard: Wildfire

A wildfire is an uncontrolled fire spread through vegetative fuels, posing danger and destruction to property. Wildfires can occur in undeveloped areas and spread to urban areas where structures and other human development are more concentrated.

While some wildfires start by natural causes such as 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 predominate danger from wildfires is the destruction of timber, property and wildlife, and injury or loss of life to people living in the affected area or using the area for recreational facilities.

Wildfire risks are not limited to public lands. There are extensive tracts of privately owned grasslands as well. These include both conservation program lands (CRP, RIM, CREP, etc.) and “rough ground” that has been hayed, pastured or left wild. These private lands particularly in combination with public lands (such as WMA, SNA, State Parks, WPA, etc.) can combine to create substantial blocks of grasslands. Fire danger grows when cedar trees encroach into grasslands as evergreens can add a considerable amount of fuel load.

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

History of Wildfires in Yellow Medicine County

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

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

Wildfire behavior is based on three primary factors: fuel, topography and weather. When dry weather mixes with windy conditions, areas with fuel have the potential for a wildfire to spread out of control as it did in the 2003 fire near Milan. Yellow Medicine County currently has 17,540 acres enrolled in CREP, RIM, CRP and the Wetland Reserve Program. These areas are left for wildlife habitat and are not burned on a regular basis. As a result, years of dead grasses

accumulate on these lands and are a good fuel for any fire that may start. The Minnesota River Valley and the Wildlife Management Areas also provide an abundance of fuel for wildfires. Wildlife Management Areas occupy approximately 12,000 acres in Yellow Medicine County. Starting in 2003 all new CRP contracts require mid-management either a prescribed burn, mowing, etc. once during the life of the contract. With CRP and/or CREP, landowners can request a firebreak between their CRP field and the landowner's farmstead.

Topography is important in determining wildfire potential, as 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 and the majority of Yellow Medicine County is relatively flat. The Yellow Medicine River Valley has some defined slope, while the Minnesota River Valley is wide around Lac qui Parle Lake and has a more defined slope below the Lac qui Parle Dam.

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

Relationship with Other Hazards – Cascading Effects

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

Hazardous Materials. Risk of fires spreading to anhydrous ammonia tanks or fuel tanks on rural farm sites is an issue. Some chemical companies store tanks in rural areas. While most tanks can be moved quickly, fire departments and response teams may not be aware of their presence.

Plans and Programs for Wildfire

Fire Districts and Departments. Fire Departments respond to any structure fires that are in their own fire district and will also help when needed in other districts (West Central Firefighters Association). However, they often work together on larger fires. All the fire departments in the county are on the city level and are part of the West Central Firefighters Association (including 9 surrounding counties and 44 fire departments).

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

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

DNR Training. County firefighters participate in wildfire training classes offered by the Minnesota Department of Natural Resources-Forestry Department. The majority of firefighters have been trained in fighting wildfires. The DNR also works with local firefighters in promoting their Fire Smart program, which is a fire prevention program involving local public schools.

State Land Management. The DNR operates and regulates all state lands within the county. The park currently is managed predominantly for recreational activities. Wildfires are minimized by thinning brush and vegetation around the park, particularly around the campground areas.

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

Education and Outreach. Education is available through existing resources and channels such as the Extension Service and Soil and Water Conservation Districts. Countryside Public Health assists lead agency DNR to provide health information for the public.

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

Program Gaps or Deficiencies for Wildfire

- Currently the county zoning lacks regulations regarding vegetation on property. One of the problems with past fires is the undergrowth and overhanging trees near residential structures. Although aesthetically appealing, vegetation around homes has destroyed numerous dwellings in past fires.
- There is currently no program to ensure that fire is considered when planning conservation plantings that include woody cover. Firebreaks should be included to protect homes and woody cover as well as allowing the use of fire as a management tool. (If a tree and shrub planting is placed in the middle of a prairie planting, it may be difficult to accomplish a prescribed management burn of that property without damaging or destroying the woody component. It may also be impossible to protect that planting in the event of a wildfire.)
- Communications between DNR and local fire departments needs to be more organized.
 - A plan should be in place regarding proper radio channels between DNR, state patrol, local fire departments and local police. The smoke associated with wildfires can present a major hazard on roadways. Without direct contact with law enforcement, traffic control can be compromised. A plan is currently in process to create an armor system.
 - Updated gear and a plan to use it in cooperation with other departments is necessary. The DNR should have an up-to-date list of equipment available to them in the event of wildfires.
- Because of the rough terrain and location of wildfires, many of the fire departments do not have adequate equipment to fight wildfires. Fire vehicles are not able to access these areas. More grass rigs and off-road vehicles are needed to address the problem of wild land and grass fires.

Hazard: Dam Failure

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

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

The Lac qui Parle Dam is a "Low Head Dam" which means that if it failed, it is not life threatening to Granite Falls or Montevideo. A dam failure model for the "Probable Maximum Flood" showed travel time from the dam to Montevideo to be approximately six to seven hours. A dam failure during an event this large would only raise water stages in Montevideo by less than half a foot. For a "Normal High Pool" failure, the impact at Montevideo would be about five feet. The impacts at Granite Falls are very similar.

The Granite Falls Dam is a "High Hazard Dam", which means there is potential for loss of human life if failure of the dam should occur. A dam break analysis was performed and was filed with the appropriate state and federal regulatory agencies. Maximum "Sunny Day Failure" was 5.2 feet with a stage increase of one foot or more between Granite Falls Dam and Minnesota Falls Dam. For a dam break at a 15-year event, stage increases were 2.0 feet or less.

The Del Clarke Dam near Canby is owned and maintained by the Lac qui Parle – Yellow Bank Watershed District and has a spillway for flood events. The Watershed works with the US Army Corps of Engineers and the DNR to comply with all regulations and permits. An emergency contingency plan is in place and is updated annually.

Lazarus Creek, a tributary to the Lac qui Parle River, drains into the Minnesota River and is home to the Lazarus Creek Floodwater Control Project completed in 2005. The purpose of the project was to control runoff from a 21.2 square mile drainage area west of Canby, Minnesota by creating an earthen dam at 62 feet in height and 1,350 feet in length. The site also includes a vegetated earthen emergency spillway to prevent dam overtopping, thus creating a "dry dam" that can store approximately 1,950 acre-feet of runoff from 100-year storm events.

History of Dam Failure in Yellow Medicine County

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

Relationship with Other Hazards – Cascading Effects

Flood. Dam failure, although the risk is minimal, has the potential to be devastating to the areas within the floodplain and around the stream directly below the dam in Canby and Granite Falls.

Dam failure would cause immediate flash flooding, destruction of property, erosion of crops and the potential destruction of infrastructure.

Plans and Programs for Dam Failure

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

Infrastructure Plan. The county infrastructure plan prohibits further development on the properties adjacent to the dam, including property directly below the dam. Yellow Medicine County has dedicated land adjacent and below the dam as public open space.

Dam Inspection. The Minnesota Department of Natural Resources regulates nearly 900 of the numerous dams in the state. The DNR and US Army Corps of Engineers regularly inspect the dam and reservoir capabilities for flooding and dam failure. Their report indicates that the size of the dam is adequate for any major floods or spring runoff. Del Clarke Dam and other dams constructed by federal government and Lac qui Parle Watershed District are inspected annually by the NRCS, Lac qui Parle Watershed District, Yellow Medicine SWCD and Area II. All large dams constructed by the federal government and the Yellow Medicine Watershed District are also inspected annually.

Monitoring. The county does some monitoring of tributaries emptying into the Minnesota River to help identify large volumes of water in times of flooding. This is done by the watershed projects.

Evacuation Plan. The county has identified evacuation plans for the cities in Yellow Medicine County.

Contingency Plan. There is a contingency plan in place in case of dam failure for both the dam in Granite Falls and the Del Clarke Dam near Canby.

Program Gaps or Deficiencies for Dam Failure

- Property around the Granite Falls dam is owned by the city of Granite Falls and is easily accessible by the public. The Del Clarke Dam is owned by the Lac qui Parle – Yellow Bank Watershed District and is also accessible to the public.
- Emergency plans for dam safety have been created by the US Army Corps of Engineers or the NRSC, but have a tendency to become out of date when not used; however the Yellow Medicine Emergency Plan has been recently updated. The US Army Corps Engineers does not regularly work with local emergency managers to ensure that information is up-to-date and in the event of a disaster, plans can be implemented.

Manmade / Technological Hazards

Definition

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

Source: Minnesota State Hazard Mitigation Plan

Introduction

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

From a hazard mitigation perspective, the existence of technological hazards in the community poses a risk to life, health, or property. The use of hazardous materials in manufacturing and transportation can be extremely harmful if an unwanted release occurs, and the use of nuclear materials in the presence of a community creates risks that must be managed. Dams can have a catastrophic impact on those downstream, when a failure does occur. Further, the furnishings in our homes make a pleasant living environment, but are often flammable and produce toxic gases when ignited.

Source: Minnesota State Hazard Mitigation Plan

For the purposes of this plan, Manmade/Technological Hazards identified are organized into these groups:

1. **Infectious Diseases**
2. **Fire**
3. **Hazardous Materials**
4. **Water Supply Contamination**
5. **Wastewater Treatment System Failure**
6. **Civil Disturbance/Terrorism**

Hazard: Infectious Diseases

An infectious disease is defined as an organism or matter that has the potential to spread or affect a population in adverse ways. Infectious diseases have the potential to affect any form of life at any time based on local conditions, living standards, basic hygiene, pasteurization and water treatment. Despite 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, older adults, and hospitalized and institutionalized patients are at an increased 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 roles in emerging infections.

Many infectious diseases are preventable and 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) are based on specific epidemiological 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.

History of Infectious Diseases in Yellow Medicine County

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

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

By and large infectious diseases would have no effect on physical property. A negative impact on the economy would occur, however, if a widespread outbreak happened and businesses were forced to shut down for an extended period of time. Yellow Medicine County's entire population is susceptible to exposure from infectious diseases due to the random nature of diseases. Infection rates and exposure risk will vary based on the disease, sanitation habits of individuals and personal choices. Large population concentrations and sites with large numbers of people are especially at risk in the event of an outbreak.

The following is a list of the primary infectious diseases identified in the county that could be considered a health risk and disaster if an outbreak were to occur.

Human Health

H1N1Influenza. H1N1 Influenza, otherwise commonly known as Swine Flu, was first detected in April 2009. From April 15, 2009 to July 24, 2009, states reported a total of 43,771 cases of H1N1 flu throughout the country (Minnesota Department of Health 2009). Of the reported cases, 5,011 people were hospitalized and 302 people died. H1N1 is likely to be transmitted through human-to-human spread of disease by coughing or sneezing of infected persons.

Symptoms of H1N1 flu are similar to standard influenza including fever, cough, sore throat, body aches, chills, headaches, and fatigue. Some hospitalized patients claimed nausea, vomiting, and/or diarrhea as additional symptoms. One major concern with an H1N1 flu outbreak in Yellow Medicine County is the lack of vaccines available for the county population. The government created a tiered allocation for vaccines by first protecting those who are essential to handle the outbreak response and care providers, second those who maintain essential community services, third children and workers at greatest risk of infection due to job nature and lastly those who maintain homeland and national security (flu.gov). To date, there have been no known occurrences of H1N1 flu in Yellow Medicine County. Vaccines are readily available to the general public through hospitals, clinics, and some big-box stores. Visit countrysidepublichealth.org, CDC.gov, flu.gov for more information.

Smallpox. Smallpox has not been an issue in the United States for more than 50 years, but with the threat of terrorism this disease has been thrust to the forefront of public concern. Small pox has not been found within Yellow Medicine County from 2003 – 2008 (Minnesota Department of Health 2009). Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox, and the only prevention is vaccination. A smallpox vaccine is available, however not recommended for public use. The name *smallpox* is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person.

There are two clinical forms of smallpox. Variola major is the severest and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90 percent or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of approximately 30 percent; however, flat and hemorrhagic smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1 percent or less.

Tuberculosis. Yellow Medicine County has experienced no active cases of tuberculosis (TB) from 2003 – 2008, however each year a few cases of latent TB are identified on an annual basis (Department of Health 2000). Follow-up and treatment is provided by the State Health Department. TB is a disease spread from person to person through air. TB usually affects the lungs, but can also affect other parts of the body, such as the brain, kidneys or spine. TB germs enter air when a person with TB of the lungs or throat coughs or sneezes. When a person inhales air that contains TB germs, he or she may become infected. People with TB infection do not feel sick and do not have any symptoms; however, they may develop TB at some time in the future. The general symptoms of TB include feeling sick or weak, weight loss, fever and night sweats. The symptoms of TB of the lungs include coughing, chest pain and coughing up blood. Other symptoms depend on the part of the body that is affected. TB occurred in active one case in 1990, 1998 and 2000 in Yellow Medicine County (Department of Health 2009).

Hepatitis A. Hepatitis A is an enterically transmitted viral disease that causes fever, malaise, anorexia, nausea, and abdominal discomfort, followed within a few days by jaundice. The disease ranges in clinical severity from no symptoms to a mild illness lasting one and two weeks to a severely disabling disease lasting several months. In developing countries, hepatitis A virus

is usually acquired during childhood, most frequently as a symptomatic or mild infection. Transmission can occur by direct person-to-person contact; exposure to contaminated water, ice or shellfish harvested from sewage-contaminated water; or from fruits, vegetables, or foods eaten uncooked, which can become contaminated during harvesting or subsequent handling. Hepatitis A has not been reported in Yellow Medicine County since 1995 (Minnesota Department of Health 2009).

Influenza (Flu). Influenza is a contagious disease caused by the influenza virus. It attacks the respiratory tract in humans (nose, throat and lungs). The flu usually comes on suddenly and may include these symptoms: fever, headache, tiredness (can be extreme), dry cough, sore throat, nasal congestion and body aches.

Influenza types A or B viruses cause epidemics of disease almost every winter, however not all cases are reported. In the United States, these winter influenza epidemics can cause illness in 10 to 20 percent of people and are associated with an average of 20,000 deaths and 114,000 hospitalizations per year. Getting a flu shot can prevent illness from types A and B influenza. Influenza type C infections cause a mild respiratory illness and are not thought to cause epidemics. The flu shot does not protect against type C influenza. There was a flu outbreak in a long-term care facility in 2002 – 2003; otherwise there was no recording of flu outbreaks within group quarters. Yellow Medicine County had no reported cases of influenza from 2003 – 2008; however, it is important to note that physicians are not mandated to report this information and not all persons receive treatment for influenza (Minnesota Department of Health 2009).

West Nile Virus (WNV). The virus made its first appearance in Minnesota in July 2002. In the fall of 2003, the first West Nile death in Minnesota was reported. As of July 2009, Minnesota has reported 259 human cases of West Nile and a total of seven deaths. Yellow Medicine County has experienced five cases of West Nile Virus from 2002 to 2008 (Minnesota Department of Health 2009).

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

Minnesota Department of Health encourages citizens to protect themselves from West Nile virus by:

- Use a good mosquito repellent, containing no more than 30 percent of the active ingredient DEET.
- Wear long-sleeve shirts and long pants if you have to spend time in an area where mosquitoes are biting.
- Avoid outdoor activities at dusk or dawn, when mosquitoes are feeding.

- Eliminate possible mosquito-breeding sites on and around your property – including items like old tires, buckets, clogged rain gutters, cans and other containers, and anything else that can hold a small amount of water. Change the water in birdbaths and horse troughs at least weekly.

A vaccine has been developed for horses and veterinarians encourage horse-owners to vaccinate their animals. A human vaccine against the virus is currently in development.

Source: Minnesota Department of Health

Monkey Pox. Monkey pox is a rare viral disease that occurs mostly in central and western Africa. It is called “monkey pox” because it was first found in 1958 in laboratory monkeys. Monkey pox was reported in humans for the first time in 1970. In early June 2003, monkey pox was reported among several people in the United States. Most of these people got sick after having contact with pet prairie dogs that were sick with monkey pox. This is the first time that there has been an outbreak of monkey pox in the United States and Yellow Medicine County was not affected (Minnesota Department of Health 2009).

In humans, the signs and symptoms of monkey pox are like those of smallpox, but usually they are milder. Another difference is that monkey pox causes the lymph nodes to swell. About 12 days after people are infected with the virus, they will get a fever, headache, muscle aches, and backache; their lymph nodes will swell; and they will feel tired. One to three days (or longer) after the fever starts, they will get a rash. The rash develops into raised bumps filled with fluid and often starts on the face and spreads, but it can start on other parts of the body too. The bumps go through several stages before they get crusty, scab over, and fall off. The illness usually lasts for two to four weeks.

People can get monkey pox from an animal with monkey pox if they are bitten or if they touch the animal’s blood, body fluids, or its rash. The disease also can spread from person to person through large respiratory droplets during long periods of face-to-face contact or by touching body fluids of a sick person or objects such as bedding or clothing contaminated with the virus.

Source: Center for Disease Control 2009

La Crosse Encephalitis. La Crosse encephalitis is a viral illness transmitted to people through the bite of an infected mosquito. Most people infected with this virus will have either no symptoms, or a mild flu-like illness. A small percentage of people (especially children) may develop encephalitis (inflammation of the brain). Approximately one to three percent of these encephalitis cases are fatal, and another 15 percent of patients have long-term nervous system problems.

Most of the severe cases start with headache, fever, nausea, and lethargy. The illness may rapidly progress into disorientation, seizures, and coma. There is no treatment for the illness other than supportive care until the illness is over. Severe cases occur primarily in children; the average case age is six years old, and no cases have been reported in Yellow Medicine County (Minnesota Department of Health 2009).

SARS. Severe acute respiratory syndrome (SARS) is a viral respiratory illness that first emerged in China in November 2002, and later spread through international travel to 29 countries. On

October 1, 2003, the Centers for Disease Control and Prevention (CDC), reported that there were 164 probable and suspect SARS cases in the United States, of which only eight had laboratory evidence of SARS. There were no deaths due to SARS in the U.S. Most of the U.S. SARS cases were among travelers returning from other parts of the world with SARS. There were 11 suspect and probable SARS cases investigated by the Minnesota Department of Health; many of these individuals had an alternative diagnosis that could explain their symptoms. Yellow Medicine County has not reported any SARS cases.

In general, SARS begins with a high fever (temperature greater than 100.4° F. (38.0° C.). Other symptoms may include headache, an overall feeling of discomfort, and body aches. Some people also have mild respiratory symptoms at the outset.

Doctors suspect SARS if a patient has a fever of 38.0° C. or 100.4° F., respiratory symptoms and history of travel to a SARS affected area or close contact with a known SARS patient within 10 days before the fever or respiratory symptoms started. Since the initial symptoms of SARS are similar to influenza or other respiratory illnesses, a high level of suspicion and an accurate history is needed to differentiate SARS from other illnesses.

E. coli. *E. coli* O157:H7 is one of hundreds of strains of the bacterium *Escherichia coli* and three cases were reported in 2004 and no other cases from 2005 – 2008 (Minnesota Department of Health 2009). Although most strains are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness. *E. coli* spreads during slaughter and organisms can be thoroughly mixed into beef when it is ground. Bacteria present on the cow's udders or on equipment may get into raw milk. Among other known sources of infection are consumption of sprouts, lettuce, salami, unpasteurized milk and juice, and swimming in or drinking sewage-contaminated water. Bacteria in diarrhea stools of infected persons can be passed from one person to another if hygiene or hands washing habits are inadequate.

E. coli O157:H7 infection often causes severe bloody diarrhea and abdominal cramps; sometimes the infection causes non-bloody diarrhea or no symptoms. Usually little or no fever is present, and the illness resolves in five to 10 days. In two to seven percent of people, particularly children under five years of age and seniors, the infection can lead to kidney failure. Of the two to seven percent, a small percentage is life threatening or can lead to lifelong consequences.

Prevention includes cooking all beef and taking care to keep from ingesting bacteria from raw meat which includes washing hands and surface areas that are touched by raw meat. For additional information on preventative measures, visit the Minnesota Department of Health website.

Pertussis. Pertussis, or whooping cough, is a contagious respiratory disease caused by the *B. Pertussis* bacterium, spread by coughing or sneezing. Thick mucus builds up in the lungs and clogs air passages, triggering violent coughing spells. It can be quite serious, especially for young infants with tiny air passages. The fatality rate is highest in infants under six months of age. The effects of toxins in the *B. Pertussis* bacteria can produce high fever, convulsions, brain

damage and death. Permanent damage can include continuing seizure conditions, mental retardation, learning disabilities, and chronic illness.

Severe cases of whooping cough may require hospitalization, respiratory support, and nutritional and rehydration therapy. There is no medicine to cure whooping cough but antibiotics are often used to reduce the spread of the disease to others as well as treat secondary infections such as pneumonia, bronchitis, and otitis media (inner ear infections). In the past, these secondary infections often caused many of the deaths, which occurred after a child had whooping cough. Pertussis causes about nine deaths per year in the United States. Pertussis vaccine is now available for children up to adults age 65, this vaccine does lose its effectiveness over time and booster doses are necessary to continue prevention. While most adults handle whooping cough as another cold, this can be a difficult disease for those who are at high risk such as those with asthma. Yellow Medicine County reported three people were infected with Pertussis in 2004, one case in 2005, and one case in 2008 (Minnesota Department of Health).

Animal Health

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

Mad Cow Disease (Bovine Spongiform Encephalopathy, BSE). Mad Cow Disease is the layperson's name for Bovine Spongiform Encephalopathy (BSE), a transmissible, slowly progressive, degenerative, fatal disease affecting the central nervous system of adult cattle. According to the FDA the only way to transmit BSE is if the animal has contact with meat processed food; they cannot transmit it cow to cow.

BSE is a disease that affects cattle. However, there is a disease similar to BSE called variant Creutzfeldt-Jakob Disease (vCJD), or vCJD, which is found in humans. There have been a small number of cases of vCJD reported, primarily in the United Kingdom, occurring in people who consumed beef that may have been contaminated. (As of June 2008, there have been a total of approximately 208 cases of vCJD worldwide.) There is strong scientific evidence (epidemiological and laboratory) that the agent that causes BSE in cattle is the agent that causes vCJD in people.

BSE has been of great concern since 1986, when it was first reported among cattle in the United Kingdom. At its peak, in January 1993, almost 1,000 new cases per week were identified. The outbreak in the United Kingdom may have started from the feeding of scrapie-contaminated sheep meat-and-bone meal to cattle. Scrapie is a disease of sheep that is related to BSE in cattle. There is strong evidence that the outbreak in cattle was amplified to common treatments, such as heat, to reduce or eliminate its infectivity or presence. According to the FDA, milk and milk products from cows are not believed to pose any in the United Kingdom by feeding rendered bovine meat-and-bone meal to young calves.

The federal government in 2002 aggressively surveyed 20,000 animals for BSE. The first case of BSE was reported in December of 2003, in a sick animal that came from a farm in Mabton, Washington, about 40 miles southeast of Yakima. It was a so-called "downer" animal, meaning

it was unable to walk when it reached the slaughterhouse, which under USDA rules triggers automatic testing. The FDA is taking several steps to eradicate this disease from cattle and prevent vCJD in people.

Foot-and-Mouth. Foot-and-mouth disease is a severe, highly contagious viral disease of wild and domestic animals. It primarily affects cattle and pigs, but infections can also occur in sheep, deer, and other cloven-hooved animals. A rule of thumb is sheep are carriers, pigs are amplifiers, and cows are indicators.

Infections in humans are extremely rare. The disease has not been reported in the United States since 1929. However, an outbreak of foot-and-mouth disease is occurring in the United Kingdom and has received considerable attention in the media recently.

Foot-and-mouth Disease (FMD) is considered the most costly of all animal diseases. It is often necessary to conduct wholesale slaughter of animals wherever there is an outbreak. Second, no animals from an area not declared free of the disease may be moved to other locations or used in trade except as processed food subjected to high temperatures. It is also one of the most contagious animal diseases. The virus is spread not only animal to animal through the air, it can attach to truck tires and clothing and equipment in mechanical transmittal.

In cattle, the first symptoms include dullness, refusal to feed and a fall in milk production. From there the symptoms expand to blisters on tongue, gums, muzzle, nostrils, teats and the spaces between the hoof segments, sometimes crippling the animals. In other animals there may be fewer signs of the disease and, in some cases, animals die without showing any symptoms.

For additional information on Foot (Hove) and Mouth disease, look on the web at www.fas.org/ahead/disease/fmd/.

Chronic Wasting Disease, CWD. Chronic wasting disease, CWD, is another wildlife disease that has received much attention in Minnesota and Wisconsin in the past few years. This is a degenerative brain disease similar to “mad cow disease” that affects elk and deer. It can be spread to wild herds from captive herds or vice versa. At this point there is no recorded occurrence of CWD in wild deer in Minnesota. However, one of the most important means of ensuring that the disease is not spread is to ensure all captive cervidae (elk and deer) farms are registered with and licensed by the Minnesota Department of Agriculture.

Rabies. Rabies is a disease that has been identified particularly in the southwest and western Minnesota and can be found in numerous animals. Occasionally human exposure occurs due to interaction with infected animals.

Brucellosis. Brucellosis is a bacterial disease found in animals and predominately affects farm workers, veterinarians, and others that work often with animals. A case was reported in 2007 and 2008 in Yellow Medicine County.

Relationship to Other Hazards – Cascading Effects

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

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

Plans and Programs for Infectious Diseases

Emergency Operations Plan. Yellow Medicine County currently has an emergency operations plan known as the Yellow Medicine 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 Countryside Public Health and the Emergency Manager for Yellow Medicine County. Public education lies with public health as well. Much of the information is coordinated with the Center for Disease Control and Prevention and the Minnesota Department of Health.

Cooperation with State Health Department. Countryside Public Health (CPH) works with the Minnesota Department of Health (MDH) to address infectious diseases that are listed in Chapter 4605.7040 Disease and Reports (such as Encephalitis, Hepatitis, Influenza, Lyme disease, Tuberculosis and Syphilis). If any of these or other listed diseases should appear in Yellow Medicine County, the county collaborates with the State Health Department and the Center for Disease Control and Prevention.

Education to the Public. The county does provide information to the public about infectious diseases that may be of concern in the future. Much of this information can be obtained through the Center for Disease Control, the MDH, and the Countryside Public Health website.

Web Monitoring. MDH notifies CPH of infectious disease and other related issues in the county. The Health Alert Network can do this notification. CPH will notify doctors, city, county officials and other appropriate parties. This program is a 24-hour seven days a week. MDH works directly with regional media and CPH supplements that information locally.

Environmental Health Regulations and Policies. Countryside Public Health has worked to develop environmental health regulations and a County Safety Procedures and Policy Guide. These documents are cross-departmental plans that deal with hazardous material, infectious disease and food-borne illnesses. They provide guidelines to protect the citizens of the county. The Countryside Environmental Health Program provides licensure for food, beverage, and lodging, inspection of swimming pools, and investigation of nuisance (garbage) homes.

Notification. Communication between Countryside Public Health, the Minnesota Department of Health and the Center for Disease Control operates 24 hours, seven days a week depending on where an outbreak first occurs. Countryside Public Health, Yellow Medicine County Answering Point and the County Emergency Manager receive health alerts via email and fax with

instruction with how to proceed. Hospitals, clinics, city administrators, emergency managers and county commissioners are notified by both Countryside Public Health and the Minnesota Department of Health.

Vaccination Program. Minnesota Vaccine for Children (MVFC) is a program that is set up for children in lower income families that do not have insurance. This covers the children so that they can be vaccinated for infectious diseases. MNVFC is also available at local clinics. The program is designed to assist families of need in protecting their children from infectious diseases.

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

Program Gaps or Deficiencies of Infectious Disease

- None.

Hazard: Fire

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

History of Fire in Yellow Medicine County

According to the State Fire Marshal Division through the fire reporting system updated in 2007, Yellow Medicine County had reported that they lost ten civilian lives in a 24-year period to fires.

Fires have occurred throughout the entire county (see Table 38 on following page). However, fires are more probable in the cities due to the density and number of both residential and commercial structures. Cooking, electrical failure and chimneys cause many of the residential fires, in Yellow Medicine County.

**Table 38. YMC and Community Breakdowns
of Fire-related Information in 2007**

City	Total Fire Runs	Total Other Runs	Dollar Loss
Yellow Medicine County	52	32	\$452,000
Canby	13	7	\$342,000
Clarkfield	7	5	\$15,000
Echo	3	0	\$0
Granite Falls	13	12	\$0
Hanley Falls	7	1	\$26,000
Hazel Run	*	*	*
Porter	4	7	\$0
St. Leo	3	0	\$40,000
Wood Lake	2	0	\$40,000
*Hazel Run has combined with Clarkfield for Fire Services. Hazel Run currently maintains a Fire Barn in cooperation with the Clarkfield Fire Department.			

Source: Fire in Minnesota “Fire Reporting System” 2007

Relationship with Other Hazards – Cascading Effects

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

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

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

Plans and Programs for Fire

Fire Districts and Departments. Local fire departments work within their own district to serve structure fires. Each district is responsible for fires within their district boundaries; however, they often work together on larger fires. All the fire departments in the county are on the city level and are a part of the West Central Firefighters Association (also includes fire departments in the surrounding counties).

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

Zoning. The Yellow Medicine County Zoning Department controls development of new construction, including the enforcement of safety restrictions like setbacks, coverage, depth, and

structure height requirements. The county building inspector is responsible for all new construction.

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

Program Gaps or Deficiencies for Fire

- Currently, the only evacuation plans exist in the county emergency operations plan. Cities in the county do not have plans readily available for local residents in the event of large fires.
- Currently, some local roads and alleys are not adequate to handle fire trucks. Those roads should be identified and widened in the future to provide adequate protection to every property in the county.

Hazard: Hazardous Materials

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

A hazardous material spill or release poses risks to life, health and property. An incident can force the evacuation of a few people, a section of a facility or an entire neighborhood or community, resulting in significant economic impact and possible property damage. Spilled material 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.

Transportation

Hazardous materials are conveyed by road, rail, aircraft and pipeline, each presenting differing levels 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.

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

Rail transportation of hazardous material will affect the county along the western border and southeast portion of the county. Approximately 11 percent of all statewide transportation incidents involving hazardous material in 2002 were from rail transport, according to Mn/DOT statistics. Valve leakage and safety valve releases can be sources of material spills on pressurized and general service tank cars or other hazardous materials containers such as covered hoppers, inter-modal trailers/containers or portable tanks. These leaks can manifest themselves as odors or vaporous clouds from tanker top valves; spraying or splashing from tanker top valves; wetness on the side of the car; or drainage from the bottom outlet valve. Depending on the type of rail car involved, a leak or spill could result in hundreds to thousands of gallons/pounds of a substance being released along the Zoom Rail Corridor.

Yellow Medicine County has two small municipally-run airports that operate 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 that may be brought into the facility for transport.

Yellow Medicine County's pipeline supplies pressurized flammable liquids transmission. A liquid release in the Williams line would put the city of Maynard at risk; the population at risk would be 500. The rest of the rural area is at slight risk and in the event of a leak in either the Alliance or Dome Pipeline it would require additional personnel to inform each farm place to evacuate the public.

Fixed Facilities

A variety of hazardous materials exist in fixed facilities throughout Yellow Medicine County. They range from flammable liquids stored or used to fuel vehicles through exotic substances to radioactive materials and biological agents. Some materials are particularly lethal even in small amounts, while others require strong concentrations with prolonged exposure periods in order to cause harm.

Facilities storing or using hazardous materials above minimum amounts have developed and filed a Risk Management Plan with the Local Emergency Planning Committee, State Emergency Response Commission and the Environmental Protection Agency. Each plan identifies the significant hazards for the facility, the likely release scenario for the hazards, the estimated population impacted by the release, and the specific steps to take in the event of a release to protect that population from harm.

Pipelines

Currently, over 78,000 miles of pipelines are located within the state of Minnesota. Two pipelines run throughout Yellow Medicine County carrying liquid gasoline and natural gas are owned by Magellan Pipeline Company LP and Northern Natural Gas Company. From 2000 to 2009, two pipeline breaks occurred in Yellow Medicine County. The first break took place on July 25, 2000 when a tornado devastated Granite Falls. The entire Great Plains Natural Gas distribution system in the area was affected by the tornado, impacting 200-300 customers. The second event took place in 2005 when a contractor excavated an area, hitting a 1.5-inch natural

gas pipeline two times. Table 39 identifies the type of commodity carried and length of pipelines by their respective owners.

Table 39. YMC Pipeline Report

Operator Name	Commodity Carried	Mileage
Magellan Pipeline Company LP	Gasoline Product	17.58 Miles
Northern Natural Gas Company	Natural Gas	64.84 Miles

Source: National Pipeline Mapping System, 2009

Methamphetamine and Clandestine Drug Labs

A clandestine drug lab (or clan lab) is a collection of materials and ingredients used to manufacture illegal drugs. Methamphetamine (meth) is the drug most commonly made in Minnesota labs. The Minnesota Department of Health surveyed all 87 counties twice in 2005 from January to June and July to December to track the number of meth lab discoveries and received information from 75 counties. A total of 128 labs were found throughout all counties, 95 from January to June and 33 from July to December. The number of meth lab discoveries declined in 2006 with 73 found throughout Minnesota (Minnesota Department of Health 2006, 2007), and none found in Yellow Medicine in the past seven years. The majority of the labs found in Minnesota were located away from large population centers in rural/semi-rural areas.

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

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

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

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

History of Hazardous Materials in Yellow Medicine County

Hazardous materials exist as part of everyday life in Yellow Medicine County. These materials make life easier and more comfortable for residents throughout the county. The challenge is to use, store and transport hazardous materials in a safe way that minimizes harm to the community and prepare an effective response to unwanted releases of hazardous materials if they occur. A hazardous materials accident can occur anywhere at any time.

Yellow Medicine County has not experienced a major hazardous materials spill or accident to date. Minor incidents have occurred, but these have had little or no impact on the community at large. The likelihood of a major event is considered to be marginal, but an isolated minor accident is a constant concern.

Meth labs are most often located in rural or semi-rural areas. Yellow Medicine County is a rural area and could be a potential area for meth lab hazards. Methamphetamine drugs have been found in the county with evidence that they were manufactured locally.

Vulnerability from hazardous materials during unwanted release is considered great. The specific hazards created by a release are dependent on the hazardous characteristics of the material, amount released, location where the release occurs, and weather and topographic conditions in the area. Identifying specific materials and those involved in transportation can provide a more specific assessment of the vulnerability.

The major concern for hazardous materials events for fixed facilities is primarily in the cities of Wood Lake, Clarkfield, Canby, Hanley Falls and Granite Falls. These towns have high concentration of hazardous materials at the chemical plants. The transport of hazardous materials in Yellow Medicine County is highly unpredictable. People and property on or immediately adjacent to transportation corridors throughout the county are at higher risk than those located one mile or more from a major county corridor. Yellow Medicine County assumes that the highest risk of an incident would be to areas in proximity to both rail lines and major roads and from large quantities of hazardous materials moving into and out of Yellow Medicine County. The airport facility also provides further concern based on the possibility of an aircraft or site incident involving some sort of hazardous material.

According to the Minnesota Pollution Control Agency (see Table 41 next page), 26 spills have occurred in Yellow Medicine County from July 2002 to July 2009. Five of the 26 hazardous material events had spills totaling over 1,000 gallons of material. Of the 26 spills, 14 took place in Granite Falls. Three communities, Hanley Falls, Hazel Run, and Porter, had no reported spills during the time frame, and St. Leo had a single event in 2008 concerning 30 spilt gallons of light fuel oil and diesel. For a complete list of all hazardous spill events and amount of product released, see Appendix 5.

Table 40. YMC Hazardous Spills from 2002 - 2009

City	Number of Spills	Product Type
Canby	4	Light fuel oil & diesel, Asphalt, Sewage/Wastewater, Mineral Oil
Clarkfield	3	Pesticide, Fertilizer, Manure
Echo	2	Light fuel oil & diesel, Hydraulic Fluid
Granite Falls	14	Food, Mineral Oil, Light fuel oil & diesel, Paint, Sewage/Wastewater, Fertilizer, Acid/Base Chemicals, Unknown
Hanley Falls	0	N/A
Hazel Run	0	N/A
Porter	0	N/A
St. Leo	1	Light fuel oil & diesel
Wood Lake	2	Mineral Oil, Manure
Total	26	

Source: Minnesota Pollution Control Agency, 2009

Relationship to Other Hazards – Cascading Effects

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

Wastewater Treatment System Failure. System failure would have direct impact on humans and endanger human health and life.

Plans and Programs of Hazardous Materials

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

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

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

Environmental Health Regulations. Yellow Medicine County has worked to develop environmental health regulations and a County Safety Procedures and Policy Guide. These documents are cross-departmental plans that deal with hazardous materials, infectious diseases and food-borne illnesses. They serve to provide guidelines to protect the citizens of the county.

Training of Emergency Personnel. The Emergency Medical Services and hospitals/ER staff train annually for decontamination due to hazardous materials. All emergency personnel are trained to at least the minimum Hazardous Materials Awareness level and all first responder groups conduct the required Occupational Health and Safety Administration training on a yearly basis.

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

Program Gaps or Deficiencies of Hazardous Materials

- The Yellow Medicine County Water Plan only addresses ground water contamination based on fertilizer or pesticide use from residential and agricultural uses. Additional detail for other hazardous substances impacting the county's ground water would provide more detailed findings regarding the overall quality and potential risks if a hazardous materials event happens.
- Local radio and television stations do not provide a dependable service for tests of the Emergency Warning System in Yellow Medicine County. Tests are often ignored or played hours after the test was scheduled.
- A county-wide warning system for a disaster is not currently in place. Many residents would be left without warning in the event of a major catastrophe.
- The county and the incorporated cities do not require that commercial/industrial establishments report hazardous materials to the county emergency center and to the respective cities' fire departments.
- Plans, policies and/or procedures are not in place to deal with a meth lab incident in the county.
- Lack of information and awareness have left the county susceptible to an accident that could impact a large area.
- Ordinances are not in place to require the landlord to be ultimately responsible for clean up in a meth lab incident. This should happen at the city and county level.
- Education by the public, business owners and landlords could prevent and deter meth labs. Posters should be distributed to local vendors to watch for patterns of meth lab purchases.
- The county has not adopted the environmental health regulations or the County Safety Procedures and Policy Guide.

Hazard: Water Supply Contamination

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

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

History of Water Supply Contamination in Yellow Medicine County

Drinking water in Yellow Medicine County comes from ground water.

Lincoln Pipestone Rural Water provides (or is in process of providing) the water supply from the Burr Treatment Plant to the cities of Echo, Hazel Run, Porter and St. Leo. All other cities in Yellow Medicine County have municipal water systems from their own wells.

All water plants are in good working condition, and undergo annual inspections by their municipal employees. The water plant in Granite Falls is very close to the floodplain and the lift station is in jeopardy during flood events. Individual wells provide drinking water for the remaining cities and rural residences within Yellow Medicine County.

The cities in Yellow Medicine County that will be required to develop a wellhead protection plan are: Wood Lake, Porter, Canby, Echo, Granite Falls, Clarkfield and Hanley Falls. The city of Cottonwood, whose well is located in Yellow Medicine County, and the city of Hanley Falls will both be voluntarily doing their wellhead protection plans in the next five to ten years.

Relationship with Other Hazards – Cascading Effects

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

Plans and Programs of Water Supply Contamination

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

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

Wellhead Protection Program. Yellow Medicine County is in its first stage of setting up a wellhead protection plan that is required by the state of Minnesota. The cities in the county will complete wellhead protection plans that will comply with the state and federal guidelines that are set up for wellheads in the next five to ten years.

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

Feedlot Pollution Prevention. Several steps are being taken to protect ground water sources from feedlot runoff. County ordinances require that all feedlots within the county participate in the state's feedlot programs and county extension services promote best management practices to minimize runoff from feedlots into rivers. County zoning ordinances limit feedlot locations; however, expansion of existing feedlots is allowed with specific limitations. Dollars are available to assist landowners to bring their nonconforming feedlots into compliance utilizing federal and/or state cost share dollars; as well as a low interest loan through the Agriculture Best Management Loan Program administered by the Yellow Medicine SWCD.

Lincoln Pipestone Rural Water. Lincoln Pipestone Rural Water (LPRW) has separated their water supply into three parts to keep contamination contained and has an agreement with Marshall to supply half of their water supply, if deemed necessary. LPRW is interconnected to Canby and is working with the city of Dawson to obtain an additional supply of water.

Sealed Wells. The Yellow Medicine County Comprehensive Water Plan sets aside cost share dollars to seal abandoned wells and over 600 homeowners have utilized the funds to seal unused wells in Yellow Medicine County.

Program Gaps and Deficiencies for Water Supply Contamination

- Some feedlots with fewer than 1,000 animal units are not in compliance with MPCA rules, and operators have not been informed of some standards.
- Some Level II feedlots with fewer than 1,000 animal units have not been put into a GIS database.
- Well houses are often not locked.

Hazard: Wastewater Treatment Facility Failure

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

History of Wastewater Treatment System Failure in Yellow Medicine County

Wastewater systems typically pose higher risks of failure during the spring when melting snow and runoff can cause flooding.

Relationships with Other Hazards – Cascading Effects

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

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

Plans and Programs for Wastewater Treatment System Failure

Certified Operators and Inspections. The Minnesota Pollution Control Agency (MPCA) requires routine inspection of all public wastewater systems and these operators are required to take state training to maintain their certified operator status. All emergency plans for facilities are located at each office and a copy is maintained at the Yellow Medicine County Emergency Management office.

State Permit Enforcement. The MPCA regulates wastewater systems and staff in the water-quality point-source program issue permits, monitor compliance through data review and inspections, and enforce permit conditions.

Program Gaps or Deficiencies for Wastewater Treatment System Failure

- The effects severe flooding would have on wastewater plants have not been determined.
- Yellow Medicine County does not have an ordinance requiring periodic inspection of individual septic tank systems; rather the county inspects systems at time of residence sale.

Human-caused Hazard: Civil Disturbance / Terrorism

Human-caused terrorism is the 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. Finally, these acts can be 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.

History of Terrorism in Yellow Medicine County

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

School Violence.

Violence in schools has become an increasingly important topic among teachers, students, and police; focusing on bullying, school shootings, vandalism, and overall safety. Regardless of the availability of drugs, alcohol, and weapons to youth, it appears as though school incidences are decreasing. This fact is demonstrated in the Minnesota Student Surveys completed in 2004 and 2007 in Yellow Medicine County. The majority of students “strongly agree or agree” to feeling safe walking to and from school and at school. From surveys completed in 2004 to 2007, a greater majority of students shifted up from “agree” to “strongly agree” concerning these topics.

In general, surveyed students in 6th, 9th, and 12th grade had fewer people threatened (greatly from on average 25.5% to 15.5% percent) and pushed/shoved/grabbed in the previous 12 months from 2004 to 2007. Other notable decreases in incidences occurred in the categories of kicked/bitten/hit for high school students, with a slight increase in number of events among 6th graders, and the number of people stabbed or had a gun fired at them from when surveyed in 2004 and 2007.

From 2004 to 2007, the numbers remained consistent with how often (number of days) students brought a gun onto school property with all students reporting at least 95% at never bringing guns to schools. Also noted, were fewer number of days that students brought non-gun weapons to school, with increases in the never brought weapons to school category from 2004 to 2007.

Relationship to Other Hazards – Cascading Effects

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

Utility Failure/Water Supply Contamination. Minnesota Valley Cooperative Light and Power Association currently has the Burr Treatment Plant located just outside Canby. Increasing security at this site is very important as it is currently staffed only 40 hours a week and severe damage could occur if further security measures are not instilled.

Plans and Programs of Terrorism

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

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

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

Program Gaps and Deficiencies for Terrorism

- Design and operations of facilities in the county were not developed with terrorism prevention in mind.
- Recreation facilities developed around the Del Clark Dam provide easy, unmonitored access to the structure.
- Yellow Medicine County government buildings, including the county courthouse and all city halls, have unrestricted pedestrian access.
- All of the counties' city halls and the Yellow Medicine County courthouse do not have fire suppression systems and are not blast resistant.
- School emergencies should be addressed and drills practiced.