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Section 1: Introduction

Every day, unforeseen circumstances threaten Pennington County. Possibilities ranging from loss of life to loss of property, or jobs can be experienced from natural, technological, and human-made hazards.

Hazard mitigation in Pennington County has become an increased priority due to an emphasis placed on preventing disasters and reducing damage prior to an actual event occurring. The stimulus of this is the Disaster Mitigation Act of 2000. The Disaster Mitigation Act of 2000 requires that units of local government (cities, townships, and counties) must have an approved mitigation plan in order to receive mitigation grant funding from disasters occurring after November 1, 2004. The purposes of the Disaster Mitigation Act were fourfold:

1. Revise sections of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
2. Govern costs of federal disaster assistance.
3. Organize a national program for pre-disaster mitigation.
4. Streamline dispensation of disaster relief.

Hazard mitigation planning is a collaborative process that jurisdictions undertake to develop a plan that outlines how they will protect themselves from hazards. FEMA requires that this planning process occurs in all counties in states across the nation. Failure to comply with these requirements will result in that county or local government unit not being eligible for certain aspects of federal mitigation funding.

Mitigation actions implemented today will reduce the disaster recovery dollars needed for tomorrow. Hazard mitigation breaks the recurring damage/loss cycle. Mitigation is currently accomplished in several ways: construction, prevention, planning, and education. It is through these mitigation methods that a balance between the constructed and natural environments is achieved.

The overall goals of the hazard mitigation plan for Pennington County are to get people, property, jobs, and natural resources out of harm's way. The plan is organized in five related, but distinct areas that the planners believe will provide Pennington County and participating jurisdictions the most flexibility to achieve the noted goals. The following sections are included:

1. **County Profile** – This chapter contains information on the County's history, demographics, physical features, infrastructure, and emergency response
2. **Hazards Profile** – This chapter identifies and profiles the various hazards addressed in the plan
3. **Risk Assessment** – This chapter provides a risk assessment for each local governmental unit covered in the plan
4. **Goals, Objectives, and Mitigation Strategies** – This chapter identifies the specific mitigation steps the participating jurisdictions have committed to achieving the goals of the plan
5. **Plan Administration** – This chapter outlines how the plan will be administered, including implementation tables for chapter four.

The plan provides guidelines for dealing with present and future hazards. More specific steps are outlined in the county emergency response plans, watershed plans, county water plans and zoning ordinances. The written plan does not replace existing operational mitigation plans currently in use, but supplements them,

helping to reinforce and/or improve present and future mitigation. The finished plan depicts a unified and continuous effort and commitment by many dedicated people in Pennington County, all participating jurisdictions, as well as Minnesota Homeland Security Emergency Management, and FEMA.

1.1 Plan Goals and Authority

The goals of the Pennington County Multi-Jurisdictional Hazard Mitigation Plan are to:

- Increase community understanding of emergency management and build support for hazard mitigation
- Develop, promote, integrate, and track mitigation strategies
- Continue to improve and enhance the county's emergency management program
- Increase the economic stability, core values, and quality of services of the county
- Increase mitigation resources to eliminate or minimize harm done to people, property, jobs, and natural resources in Pennington County by natural and manmade hazards

The Pennington County Hazard Mitigation Plan has been developed in accordance with requirements set forth in the Disaster Mitigation Act of 2000. The Disaster Mitigation Act of 2000 establishes the framework for pre-disaster hazard mitigation planning and provides the legal basis for state, local, and tribal mitigation planning requirements. The newly introduced Section 322 highlights the importance of coordinating hazard mitigation efforts among state, local, and tribal jurisdictions. Under 44 CFR §201.6 local governments must have a FEMA approved hazard mitigation plan in order to apply for and/or receive mitigation funding through existing hazard mitigation assistance program to offset the cost of mitigation activities, jurisdictions can collaborate with federal organizations and programs. The following are just a three of these programs.

1.2 Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters.

The program enables mitigation measures to be implemented during the immediate recovery from a disaster. These mitigation measures include:

- Acquisition of real property from willing sellers, and demolition or relocation of buildings to convert the property to open space use
- Retrofitting structures and facilities to minimize damages from high winds, flood, or other natural hazards
- Safe room construction.
- Elevation of flood prone structures
- Development and initial implementation of vegetative management or invasive species programs
- Minor flood reduction projects that do not duplicate the flood prevention activities of other Federal agencies

- Localized flood control projects, such as certain ring levees and floodwall systems, Emergency Manager designed specifically to protect critical facilities
- Post-disaster evaluations of potential building codes and or modifications
- Hazard mitigation planning

1.3 Pre-Disaster Mitigation (PDM)

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. These activities include:

- Voluntary acquisition of real property in flood plains and or property repeatedly damaged by flooding
- Elevation of existing public or private structures
- Construction of safe rooms for public or private structures that meet FEMA requirements
- Hydrologic and hydraulic studies/analyses
- Engineering and drainage studies for project design and feasibility
- Protective measures for utilities, water, sewer, roads and bridges, and storm water management to reduce/eliminate long-term flood risk

1.4 Flood Mitigation Assistance (FMA)

FMA implements cost-effective measures to reduce or eliminate the long-term risk of flood damage to National Flood Insurance Program (NFIP) structures. State-level agencies, tribes, and local governments are eligible sub-applicants through HSEM. Eligible projects include:

- Acquisition, structure demolition, or structure relocation with the property deed restricted for open space uses in perpetuity
- Elevation of structures
- Dry flood proofing of non-residential structures
- Minor structural flood control activities
- Repetitive flood claims
- Severe Repetitive Loss

1.5 Participation

Effective mitigation planning does not occur in a vacuum. It requires the entire community to be involved in the mitigation planning process. Thus, the planning process and its ability to identify, engage, and include the entire community is just as important as the plan itself. Throughout the mitigation planning process, Pennington County invited all of the jurisdictions to attend mitigation planning meetings, participate in workshops, and provide input and feedback in the development of the mitigation plan. The following jurisdictions were represented in updating the Pennington County All-Hazard Mitigation Plan Update:

- Goodridge, St. Hilaire, Thief River Falls, and Pennington County

In addition to the jurisdictions, efforts were made to invite the public to participate in the planning process.

Section 2: Mitigation Plan Update

Effective planning efforts result in high quality and useful plans; however, written plans are only one element in the process. The planning process is as important as the plan itself. A successful planning process forges partnerships and brings together a cross-section of government agencies, the public, and other stakeholders to reach consensus on how to achieve the desired outcome or resolve a community issue.

Applying an inclusive and transparent process adds validity to the plan. The result is a common set of community values and widespread support for directing financial, technical, and human resources to an agreed upon action. The planning process was an integral part of the Pennington County's Hazard Mitigation Plan. This section describes Pennington County's planning process and how the hazard mitigation plan evolved.

FEMA Requirements Addressed in this Section:

Requirement
§201.6(b) An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

§201.6(b) (1) (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

§201.6(b)(2) (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

§201.6(b)(3) (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

§201.6(c)(1) [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

§201.6(c)(4)(i) [The plan maintenance process shall include a] section Emergency Manager describing the method and schedule for monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

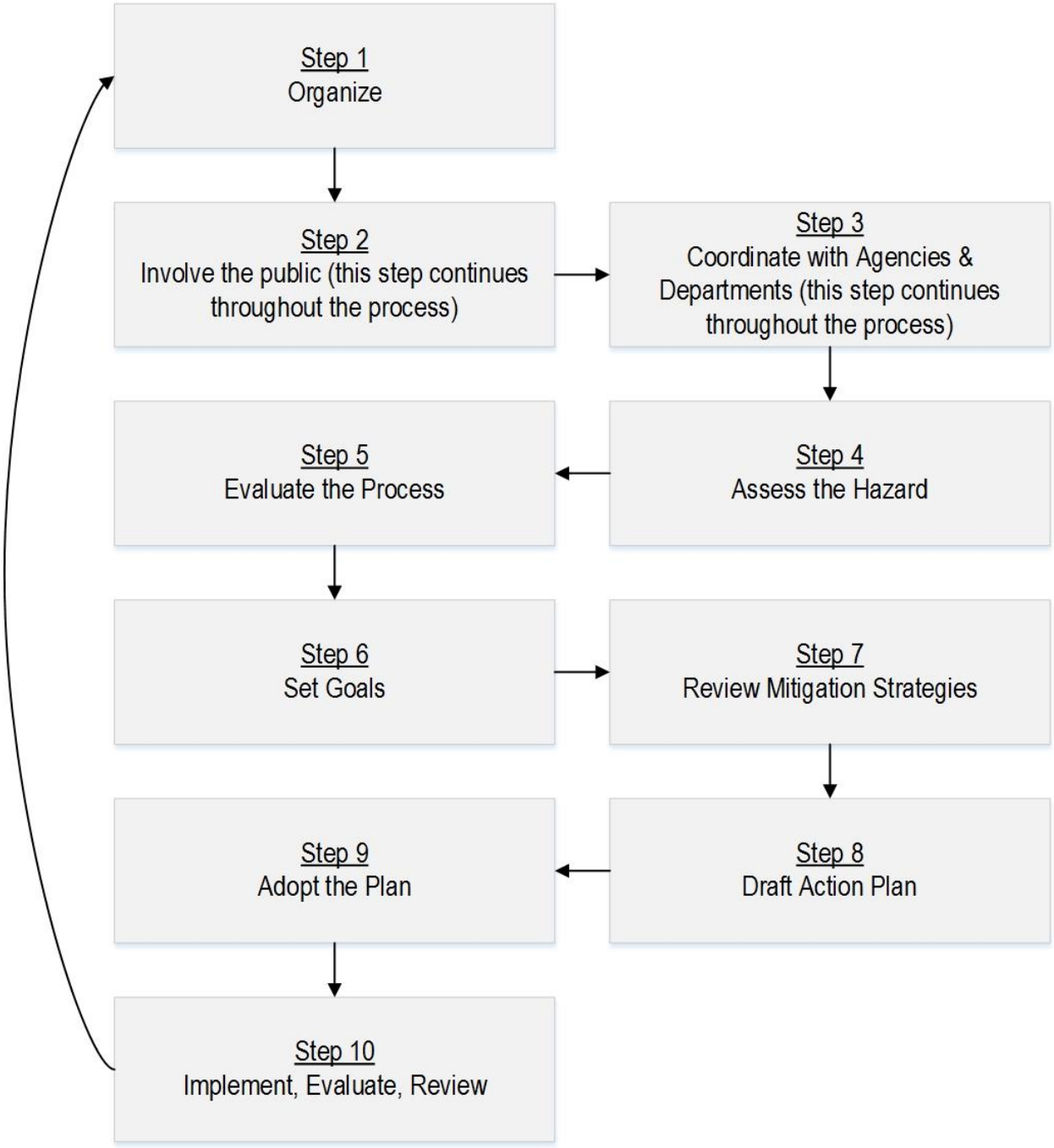
§201.6(c)(4)(iii)[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

2.1 Planning Process

To help guide the mitigation update, The Pennington County Steering Committee, and by extension, the Hazard Mitigation Planning Team followed the 10-step process listed below. The planning process is based on the FEMA guidance for mitigation planning. The following graph is a visual representation of the

aforementioned planning process used throughout the plan update cycle.

Figure 1: Planning Process



In addition to the listed process, it is important to note that several key stakeholders reviewed the hazards and their effects on people and property, identified ways to reduce and prevent damage, and recommended the most appropriate and feasible measures for implementation. The Hazard Mitigation Planning Team organized the current plan and updated procedures, reviewed existing plans and programs, and coordinated with stakeholders and the public. The Hazard Mitigation Steering Committee coordinated with key agencies and other organizations to provide insight and discussion throughout the planning

process.

2.1.1 Plan Administrators

Because mitigation planning is an all-inclusive process, the involvement of the Pennington County Emergency Manger, Hazard Mitigation Steering Committee, Hazard Mitigation Planning Team and participating jurisdictions was crucial. To accommodate this requirement, these key groups were assigned various duties and responsibilities. These responsibilities were created to ensure the mitigation plan was comprehensive, reflected the goals of Pennington County, and fulfilled the requirements of the mitigation planning process. The aforementioned groups worked closely with several key stakeholders who, in turn, helped to shape the plan.

2.1.2 Emergency Manager Role and Responsibilities

Erik Beitel, the Pennington County Emergency Manager, was ultimately responsible for completing the hazard mitigation plan update, ensuring that all identified mitigation activities were incorporated into comprehensive strategies that protect the county and its participating jurisdictions. The Pennington County Emergency Manager orchestrated the update process, led the Hazard Mitigation Steering Committee and Hazard Mitigation Planning Team, as well as consolidated and solidified stakeholders across the county. The following includes a summary of the duties and responsibilities of the Emergency Manager:

- Oversee the planning process
- Ensure the plan met the needs of the county, citizens, and complied with the code of federal regulations
- Selection of the Hazard Mitigation Steering Committee members
- Chair the Hazard Mitigation Steering Committee
- Lead the Hazard Mitigation Planning Team
- Take attendance and documenting all meetings
- Point of contact for the plan and planning process
- Ensure the plan was up to date and maintained; i.e., as outlined in the "*Maintain and Maintenance*" section of this plan
- Work within and between the participating jurisdictions and other key stakeholders to ensure the plan represented the entire county
- Ensure that participating jurisdictions were included in the planning update.
- Invite the public to participate and post all updated milestones for review and comment.

2.1.3 The Mitigation Steering Committee

A vital component of the Pennington County 5-year mitigation update effort was to identify the Hazard Mitigation Steering Committee and jurisdictional officials. Identification of this core group was important in ensuring implementation and support of the mitigation planning process. Hazard Mitigation Steering Committee members and local officials were included in the planning process for their knowledge of the county, cities, and community services.

Table 1: Hazard Mitigation Steering Committee Members and Local officials

Name	Organization	Title
Erik L Beitel	Pennington County	Emergency Manager
Donald Jensen	Pennington County	Chairperson of commission
Neil Peterson	Pennington County	Commissioner
Darryl Tveitbakk	Pennington County	Commissioner
David Brown	Goodridge,	Mayor
Brandon Kisch	St. Hilaire	Mayor
Brian Holmer	Thief River Falls	Mayor

Note: The Pennington County Emergency Management provided this list of Hazard Mitigation Steering Committee Members and Jurisdictional officials.

The Hazard Mitigation Steering Committee and local officials were responsible for ensuring the following:

- Oversee the plan and ensure its relevance to the changing situation of the county
- Monitor and evaluate the mitigation strategies
- Ensure documents reflect current hazard/risk analysis, development trends, code changes and risk perceptions of the county
- Ensure the plan was up to date and maintained as outlined within the plan
- Provided guidance to the Hazard Mitigation Planning Team
- Approve the plan update and processes used to complete the plan

2.1.4 Hazard Mitigation Planning Team

The Hazard Mitigation Planning Team provided technical guidance, documented the planning process, and wrote the mitigation plan update. The Pennington County Emergency Manager served as the coordinating entity of the Hazard Mitigation Planning Team.

The Hazard Mitigation Planning Team facilitated the overall plan development to ensure the Hazard Mitigation Plan and Pennington County met the requirements of DMA 2000. Beyond administration, content organization, and text development, the following duties summarize the Hazard Mitigation Planning Team's responsibilities.

- Organize and guide all meetings
- Review all documents provided by the Emergency Manager and participating jurisdictions
- Provide technical assistance
- Guide the plan development to adhere to DMA 2000 requirements
- Modeled disasters
- Conduct a capability assessment
- Conduct a risk assessment
- Create a hazard and community profile
- Attend and facilitate all the Hazard Mitigation Steering Committee meetings

Table 2: Hazard Mitigation Planning Team Table

Pennington County Planning Team		
5-year Update		
Member	Organization	Title
Erik Beitel	Pennington County	Emergency Manager
Michael Kemp	Integrated Solutions Consulting	Project Manager
Kimberly Pleva-Berka	Integrated Solutions Consulting	Planner

2.1.5 Participating Jurisdictions

Another important aspect of the planning administration process was the inclusion and involvement of the participating jurisdictions. The following jurisdictions participated in the planning efforts of the Pennington County Multi-Jurisdictional Hazard Mitigation Plan: Goodridge, St. Hilaire, Thief River Falls, and Pennington County.

Table 3: Participating Jurisdictions

Participating Jurisdictions
Goodridge, St. Hilaire, Thief River Falls, and Pennington County

The jurisdictions participated in the plan by providing information, attending meetings and giving substantive feedback regarding their jurisdiction and the overall mitigation plan update process. The participating jurisdictions were key participants in the general planning process, hazard identification, risk assessments, and the mitigation strategy update process.

The participating jurisdictions were responsible for the following:

- Ensure their participation in mitigating process
- Provide relevant information pertinent to their jurisdictions
- Ensure that within their own jurisdictions, the mitigation plan would be integrated into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate
- Work with the Pennington County Emergency Management and mitigation planning committee as part of the iterative planning process
- Providing information concerning past mitigation actions and creating new mitigation actions
- Provide comments and review of the plan's community profile, hazard profile, risk assessment, capability assessment, mitigation goals, and maintenance and management section

Each jurisdiction participating in the plan update acted as an official conduit between their respective jurisdictions and their citizens. The insight offered by, and provided to the Hazard Mitigation Planning Team by the jurisdictions was invaluable in ensuring the plan represented the entire county.

2.1.6 Meetings and Participation

To kick off the planning process, a series of conference calls were held between Pennington County personnel and the mitigation planner to help organize the planning process. During these meetings, goals of the planning update were created, priorities were set, responsibilities delegated, and key stakeholders and public participants were identified.

While the kickoff meeting participants discussed several issues; some of the key outcomes included the following important planning details:

- Due to concerns with time commitments and available county resources, it was communicated to the Hazard Mitigation Planning Team that correspondence would be in electronic format as much as possible (conference calls, electronic document management systems, and email)
- It was understood that the county would be responsible for ensuring participation and providing requested documents and resources needed to complete the planning process
- The Emergency Manager would take and keep all records, notes, and attendance of all meetings
- The Hazard Mitigation Planning Team would complete a community profile, hazard profile, risk assessment, capability assessment, and update mitigation actions as per their contract with Pennington County. In addition and to ensure the involvement of the county stakeholders, the planning process would be an iterative process with the planning team organizing all sections of the plan and local support providing data, reviewing and approving all sections of the plan.

At the request of the Pennington County Emergency Manager, meetings were to serve as both planning and steering meetings. It was additionally requested that the planner starts each meeting with a tutorial concerning general mitigation issues and concepts. It was a concern that those attending the meetings may have limited experience and knowledge of hazard mitigation. The agenda for the rest of the meetings included an overview of the actual planning process, updates of the planning process and comment and approval of various sections of the plan.

To ensure open communication and input, all of the noted meetings were open to the public. Invitations for the outlined meetings included announcements via the county and city websites, postings in the newspaper of record, mass emails, and direct invites. The following outlines the planning meetings.

Table 4: Five-Set Meetings Table

Meetings Meeting Number	1	2	3	4	5
Date	7/01/2014	9/11/2014	Dec.2015-May 2016	May-June 2016	July-Aug. 2016
Location	Thief River Falls MN	Thief River Falls MN	Thief River Falls MN	Thief River Falls MN	Thief River Falls MN
Meeting Focus	Kickoff Meeting/ Community Profile	Community Profile/Hazard profile/Risk Assessment	Hazard Profile/Risk Assessment	Mitigation Actions	Plan Approval

Meeting One (July 1, 2014): The focus of the meeting was to set the stage for the planning process, set expectations, and to ensure the plan would accurately represent the makeup of the county and participating jurisdictions. An invitation to this meeting was provided to all of the participating jurisdictions and city and county organizations. The Pennington County Emergency Management, using existing county contacts, sent the invitation and city list serves.

The meeting was well attended and input from those in attendance proved invaluable. The Hazard Mitigation Planning Team provided an introduction of the planning process, a general understanding of mitigation, and introduced the concept of the community profile.

The Hazard Mitigation Planning Team also provided an overview of the planning process and suggested a timeline for completion. The Hazard Mitigation Planning Team reviewed the mitigation crosswalk and noted the required elements of the plan. Finally, the team discussed the iterative process, placing an emphasis on the importance of feedback, input, and communication. As such, the team decided to organize the plan into phases.

Outcomes: The major outcome of the meeting was the understanding that the Hazard Mitigation Planning Team would provide drafts of the community profile for review. It was noted the Hazard Mitigation Planning Team and stakeholders would create the community profile (and subsequent sections of the plan) using an iterative process. The Hazard Mitigation Planning Team provided the community profile in draft form and the stakeholders provided comments and added additional county-owned information to provide additional context and accurately portray the local perspective.

It was understood that documents would be circulated for viewing and comment. Finally, it was established that the Pennington County Emergency Management would be responsible for ensuring notification and participation of those within the county and participating jurisdictions.

Other outcomes of the meeting concerned the issue of notification and participation. It was understood that several methods would be used to inform the team, stakeholders, and the public of the mitigation process. The team agreed that each jurisdiction places an announcement on their respective web pages informing the public that the mitigation update process had begun, how and where to participate, points of contact, and meeting dates. The team further advised each jurisdiction to request that the mitigation planning process and noted information be added as an item in their respective city council meetings as an official agenda item (NOTE: Council agenda items are typically reported and listed in the Pennington County's paper of record). Finally, it was suggested for those jurisdictions that have a regular newsletter, to include information about the mitigation planning projects. To ensure everyone's efforts were coordinated and recorded, it was requested that all the actions used to encourage participation be reported to the County Emergency Manager.

Meeting Two (March 12, 2015): The second meeting was the kick-off to a series of meetings held traditionally, electronically, and via phone with each of the participating jurisdiction's representatives and key stakeholders. The purpose of the second series of meetings was to present the draft findings of the community profile and enhance the profile with local input, and to approve the community profile. In addition to the community profile, the concept and methodology to be used in the completion of the risk assessment and hazard profile was introduced.

Outcomes: Outcomes of the meetings included additional data, improvements to and eventual acceptance

of the community profile. In addition to the completion of the community profile information and data concerning the hazard profile, risk assessment and capability assessment were collected and shared

This series of meetings was primarily completed by the planner meeting with the Emergency Manager and in turn the Emergency Manager meeting with the Pennington County Commissioners, Jurisdictional Mayors, and other key stakeholders.

Meeting Three (Dec. 2015-May 2016): This phase of the plan consisted of a series of meetings including a progress update on the mitigation planning process, continued discussions concerning what hazards should be included in the plan, the capability assessment, and risk assessment. In addition, it was noted that the planning team would also create a plan maintenance section to be included in the plan.

Outcomes: Outcomes of this phase included a decision on what disasters were to be included in the mitigation planning update, planning process, and approval of the capability assessment, hazard profile, and risk assessment process.

Note: This series of meetings was primarily completed with the planner meeting with the Emergency Manager and in turn the Emergency Manager meeting with the Pennington County Commissioners, Jurisdictional Mayors and other key stakeholders.

Meeting Four (May-June 2016): This phase of the plan was organized around updating and finalizing the mitigation projects to be included in this iteration of the mitigation plan update. The primary purpose of this series of meetings was an extension of the past practice of conducting a series of meetings/communications. As many participants and key stakeholders as possible were to be included in the completion of the mitigation project section of the plan.

Outcomes: All of the participating jurisdictions were participants and provided input. In addition, the Emergency Manager using the Pennington County Paper of record and the Pennington County Webpage invited the public to participate in this process and or comment on the plan in general. The result of this planning effort resulted in the creation of a list of mitigation actions, a cost-benefit analysis, and the final approval the mitigation project chapter of the Pennington County Mitigation Plan update.

Meeting Five (July-August 2016): The purpose of these meetings was to approve the final iteration of the plan. Each jurisdiction, key stakeholder and the public (via invitations on the Jurisdictional websites and the Pennington County paper of record were given a chance to review the plan and provide comment. Thus, the plan approval process lasted for approximately two months (June-August 2015).

Outcomes: With the jurisdictions approving the final iteration of the plan, the Emergency Manager deemed the plan approved. The plan was sent for in for state review.

2.1.7 Additional Meetings and Participation

Several meetings/communications were utilized to complete the aforementioned five phases of the planning process. The Pennington County Emergency Management Director was the primary facilitator and leader of these meetings and communications. These additional meetings provided the Hazard Mitigation Planning Team with additional information and insights that were vital to the plan update as well ensured every phase of the planning process was approved by each participating jurisdictions. Participants included officials from all of the county's jurisdictions, key stakeholders from various organizations, subject

matter experts, regional and state officials, and the public.

Below is a comprehensive list of all the meetings that occurred over the entire planning process. The dates, a general synopsis of what occurred, who participated and general notes are provided in the following table. Meetings occurred in both traditional formats and conference calls.

Table 5: Date and Purpose of Meetings

Meetings with Key Stakeholders, the Community and Other Interested Parties			
Date	**Purpose**	**Forum**	**Participants**
7/01/14	Pennington County Hazard Plan Update Kick-Off Meeting, Community profile	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Pennington County Commissioner
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Pennington County Planner
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Public, Pennington County Planning Office, Media
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Public Health, Red Cross
	Pennington County Hazard Mitigation Plan Update Community profile	Plenary	Public
9/11/15	Pennington County Hazard Mitigation Plan Community/Hazard Profile and Risk Assessment	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
	Pennington County Hazard Mitigation Plan Community/Hazard Profile and Risk Assessment	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
5/ 25/16	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Mitigation Planning Committee, Mitigation Steering Committee, Participating Jurisdictions and the Public
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Pennington County Commissioners , Pennington County Emergency Manager

Meetings with Key Stakeholders, the Community and Other Interested Parties			
Date	**Purpose**	**Forum**	**Participants**
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	TRF City Mayor, Pennington County Emergency Manager
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	TRF City Mayor, City Crew Foreman, Pennington County Emergency Manager
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Steering Committee, Local Emergency Planning Committee
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	TRF Mayor, Deputy Mayor Pennington County Emergency Management
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Local Emergency Planning Committee
	Pennington County Hazard Mitigation Plan Mitigation Projects	Plenary	Local Emergency Planning Committee
	Pennington County Hazard Mitigation Plan Approval	Plenary	Pennington County Planner, Pennington County Emergency Management
	Pennington County Hazard Mitigation Plan Approval	Plenary	Pennington County Deputy Planner and Pennington County Emergency Management
NOTE: Pennington County Emergency Manager was responsible for creating this table and/or any notes and signup sheets resulting from the noted meetings.			

In addition to traditional methods of public involvement and as a means to increase participation, online surveys were also offered to the public. These surveys proved to be a valuable instrument to gather data, garner local support, and ensure community participation. There were twenty-two (22) participants who completed surveys and this provided approximately 100 data points related to hazards, risk, mitigation goals strategies and expectations. The public survey consisted of residents representing all of the cities and County (less Outlook).

2.1.8 Partners and Stakeholders

Involving partners and stakeholders in the mitigation planning process will assist in obtaining a thorough and comprehensive understanding of the county's diverse programs, facilities, operations, community vulnerabilities, hazard risks, existing and planned developments and projects, and opportunities to implement mitigation strategies. To facilitate involvement in the mitigation update, the Hazard Mitigation Steering Committee and project team met with, and/or used resources provided by, a variety of local, regional, state, and federal authorities. Where appropriate, contacts were also made with regional, state and federal agencies and other external organizations to determine how their programs could support the mitigation efforts. The following is a list of those organizations that were used as resources and/or are

actively supporting Pennington County's mitigation efforts: U.S. Geological Survey, U.S. Army Corps of Engineers, U.S. Department of the Interior, National Weather Service, Federal Emergency Management Agency, Pennington County Emergency Management, Red Lake Electric Co-Op, PKM Electric Co-Op Inc., Nodak Electric Co-Op Inc., Red Lake Watershed district, Pennington County Public Schools, Pennington County Commissioners, Pennington County City/County Planner, Pennington County Superintendent of schools and the mayor and the mayors and city councils of Goodridge, St. Hilaire ,Thief River Falls.

2.1.9 Review and Incorporation of Existing Plans and Studies

These plans included, but were not limited to, mitigation plans from surrounding jurisdictions, FEMA guidance documents, emergency-services documents, contingency plans, community plans, federal, local, state regulations/ordinances, and other similar public domain documents. No copyright protections can be claimed in original US government works for this document or any of the resources used in this report.

The following table is a list of the public domain plans and other documents the Hazard Mitigation Planning Team used to guide the hazard mitigation plan update. Sources are also listed and cited within the document.

Table 6: Existing Plans and Studies Utilized in the Update

Existing Plans and Studies Utilized in the Update		
Plans/Studies/Guides	**Author**	**Plans/Studies/Guides and their use in creating this plan**
American Fact Finder Community Facts	US Census Bureau	This resource was used to inform the development Chapter 3, the Community Profile section of this document.
2012 Agricultural Census for Pennington County	US Department of Agriculture	This resource was used to inform the development Chapter 3, the Community Profile section of this document.
Draft National Climate Assessment for Minnesota	US global Change Research Program	This document was used to inform Chapter 4, the Risk Assessment section of this document.
2013 Report of the Interagency Climate Adaptation Team report "Adapting to Climate Change in Minnesota"	Climate Adaptation Team	This document was used to inform Chapter 4, the Risk Assessment section of this document.
Drinking Water Report for Communities in Pennington County	Minnesota Department of Health	This document was used to inform the Water Supply Contamination section in Chapter 4, the Risk Assessment section of this document.
2014 Minnesota Motor Vehicle Crash Facts Summary	Minnesota Department of Transportation	This document was used to inform Chapter 4, the Risk Assessment section of this document.
2013 Minnesota Department of Health Annual Summary of Communicable Diseases	Minnesota Department of Health	This document was used to inform the infectious disease section in Chapter 4, the Risk Assessment section of this document.
Fire In Minnesota Report from the State Fire Marshall for years 2007-2013	State of Minnesota Fire Marshall	This document was used to inform the structural fire section in Chapter 4, the Risk Assessment section of this document
Potential Cost Savings from the Pre-Disaster Mitigation Program	Congressional Budget Office (2007)	This document was used to inform the planning process as identified in Chapters 1,2 and 5
How-to-Guide (Series 386–1, 2, 3, 4, & 5)	FEMA	These documents were used to inform the planning process as identified in Chapters 1,2 and 5
NFIP Community Rating System	FEMA	This document was used to inform the flooding section in Chapter 4, the Risk Assessment section of this document.

Existing Plans and Studies Utilized in the Update		
Plans/Studies/Guides	**Author**	**Plans/Studies/Guides and their use in creating this plan**
National Flood Insurance Program	FEMA	This document was used to inform the flooding section in Chapter 4, the Risk Assessment section of this document.
Hazus-MH: Flood Event Report for Pennington County	Pennington County	This document was used to inform the flooding section in Chapter 4, the Risk Assessment section of this document.
Storm Events Database	National Oceanic Atmospheric Administration	This document was used to inform Chapter 4, the Risk Assessment section of this document.
The Right-to-Know Network	Center for Effective Government	This document was used to inform the hazardous material section in Chapter 4, the Risk Assessment section of this document.
2014 Minnesota All Hazard Mitigation Plan	State of Minnesota	This document was used to inform the community profile Chapter 3 and risk assessment Chapter 4 sections.
Pennington County Local Water Management Plan; 2010-2020	Pennington County	This document was used to inform community profile Chapter 3 section of this document.
Tornado History Project for Pennington County, MN	Tornado History Project	This document was used to inform the Tornado section in Chapter 4, the Risk Assessment section of this document.
2008 Pennington County Hazard Mitigation Plan	Pennington County	This document was used to inform the community profile Chapter 3, risk assessment Chapter 4 and mitigation project Chapter 6 sections.
Texas Tech University	Wind Science & Engineering Research Center	This document was used to inform the risk assessment Chapter 4 and mitigation projects in chapter 6
2010 Pennington County Land Use Analysis	Minnesota Geospatial Information Office	This document was used to inform the community profile Chapter 3.
Watershed Information	Department of Natural Resources	This document was used to inform the community profile Chapter 3.
2002 Joe River Watershed District Overall Plan	Joe River Watershed District	This document was used to inform the community profile Chapter 3.
Designation of Infested Waters and Aquatic Invasive Species Prevention Program	Department of Natural Resources	This document was used to inform the invasive species section in Chapter 4, the Risk Assessment section of this document.
Pennington County Emergency Operations Plan	Pennington County Emergency Management	This document was used to inform the Risk assessment Chapter 4 and mitigation Project section Chapter 6
Pennington County Land Use/Zoning Ordinance	Pennington County Commissioners Office	This document was used to inform the mitigation Project section Chapter 6
+Burlington Northern and Santa Fe Railroad, Emergency Action Plan	Burlington Northern Santa Fe Railroad	This document was used to inform the community profile Chapter 3 and risk assessment Chapter 4.

Note: All Plans/Studies/Guides that were indirectly and or directly used to create and or guide this plan update are listed in this table. In addition, any Plans/Studies/Guides that was directly quoted and or where information was directly taken the Plans/Studies/Guides is also properly cited within the body of this document.

2.1.10 Participation and Data Request

The success of the plan update is heavily dependent on the cooperation of the Hazard Mitigation Steering Committee, participating jurisdictions, and Hazard Mitigation Planning Team. The Hazard Mitigation Planning Team created a timeline for the plan update which included plan phases which provide direction on what would be required to complete each phase. Plan instructions included noting who should

participate, which documents should be provided to the Hazard Mitigation Planning Team for review, how to review documents, and the overall planning process. This information was shared with the Hazard Mitigation Steering Committee, participating jurisdictions, and the Hazard Mitigation Planning Team. The information was regularly maintained and updated throughout the planning process

The planning process used to complete the Pennington County plan update was an iterative process; iterative meaning, as sections of the plan was prepared the emergency manager, the Hazard Mitigation Steering Committee, and participating jurisdictions reviewed the draft and provided comments and/or suggestions for improvement. The input and feedback provided were then incorporated into the draft and finalized. The following table is a representation of the planning phases used in this iterative planning process of the Pennington County Mitigation Plan update.

Table 7: Participation Table (Data request)

		Information noted as being validated by jurisdictions						
This spreadsheet is a documentation of the involvement of participating Jurisdictions	July 2014 Community Profile	September 2014 Risk Assessment	May 2016 Mitigation Projects	July 2016 Review and Final Acceptance)	September 2015 Community Profile	May 2016 Risk Assessment)	June 2016 Mitigation Projects	August 2016 Plan Revie & Approval
Goodridge	X	X	X	X	X	X	X	X
St. Hilaire	X	X	X	X	X	X	X	X
Thief River Falls	X	X	X	X	X	X	X	X
Pennington County	X	X	X	X	X	X	X	X

Note: The above table does not represent actual meetings, but rather an iterative planning process. The table shows timeframes of when the Hazard Mitigation Planning Team requested data and/or feedback, when data was verified by the jurisdictions and which jurisdictions participated in the process. Furthermore, a signed document certifying Chapter 2, this table, and that each jurisdiction actively participated in the creation of this document and the mitigation planning update processes listed in Appendix C.

2.1.11 Summary of the Planning Process & Significant Plan Updates

The following section provides a bulleted overview of the previous Emergency Manager planning process and the major changes that occurred to this plan during the update**.** The planning update as conducted in the following phases:

- Community profile creation
- Hazard profile
    - Hazard selection
- Risk assessment conducted
    - Impact (assumptions and magnitudes)
    - Risk
    - Disaster modeling
- Mitigation strategy creation
    - Update of existing strategies
    - Creation of new strategies
    - Prioritizing strategies

- Final plan approval
    - Plan overview created
    - Plan monitoring created
    - Plan maintenance created
    - The mitigation plan was reconciled with the most current language used in planning/information/codes etc. used by the participating jurisdictions

2.2 Changes Made During this Plan Update

The update of the mitigation plan used an iterative planning process for making several changes and enhancements to the previous version of the mitigation plan. The following section provides an overview of the significant updates reflected within this plan.

- The overview of community profile sections changed to reflect the recent census data (2010) and changes within the county
- Several variables were included in the community profile that did not previously exist
- The mitigation goals were updated
- A capability assessment was conducted
- The hazard risk assessment was completed and updated to account for the disasters and changes within the community that had occurred in the past five years
- The overview of mitigation goals, objectives, and strategies were updated to reflect new goals, new objectives, and new strategies
- Processes were created to ensure governance and accountability of the plan
- A monitor and maintain section was created to ensure the plan remains updated
- Three hazard scenarios were modeled (flood, tornado, and hazard material release)
- Mitigation Strategies/Projects for each participating jurisdiction were developed, with each jurisdiction identifying at least one new action that did not exist in the previous plan.

The following sections constitute the actual mitigation update and are a culmination of all the participants' effort. The information in each section plays an integral role in the mitigation planning process and is interdependent on the entirety of the planning process. For assistance in using this document and/or becoming involved in future mitigating planning processes, please contact Pennington County's Emergency Manager.

Section 3: Community Profile

In many jurisdictions, including Pennington County, a detailed and in-depth community profile is developed as a key element of the County Hazard Mitigation Plan.

The Community Profile is an overview of the political governance, economy, geography, climate, population, community assets, future development and trends, and commercial and industrial make-up of Pennington County.

The Community Profile provides the county with a solid foundation for developing a common operational picture for the mitigation, but can also be referenced for other activities, such as THIRA, emergency training, exercises, and actual incidents.

To complete the community profile, the Emergency Manager and his representatives contacted numerous agencies, conducted research and examined several technical reports and records.

The following pages provide a broad range of information that will serve to provide a context for the subsequent sections in this plan. This information is divided into five broad categories:

1. General Historical Overview
2. Physical Characteristics of the County
3. Population and Demographics
4. Community Conditions
5. Critical Infrastructure

This information was used in a subsequent assessment section to determine the type and magnitude of the county's risks.

3.1 General Overview

Pennington County is found in Minnesota, near the northwest corner. The county has an area of 622 square miles or 398,080 acres. Dimensions of this county are approximately fifteen miles in length and forty-three miles in width. It is bordered to the east by Beltrami and Clearwater Counties. There are three cities residing in Pennington County: Thief River Falls, Goodridge and St. Hilaire. They are all participating in the hazard mitigation process and will be represented in the plan. The county seat of Pennington County is located in the town of Thief River Falls. This city is the largest in the county and is located at the intersections of U.S. 59 and State 32 and 1. The county is classified as non-metro, 2,500 to 19,999 urban population, by the Economic Research Service (ERS).

3.1.1 Historical Setting

Pennington County was formed on November 23, 1910, from sections of Red Lake County. It was named after Edmund Pennington, president of the Minneapolis, St. Paul and Sault Ste. Marie Railway.

Thief River Falls takes its name from a geographic feature, the falls of the Red Lake River at its confluence with the Thief River. The name of the river is a loose translation of the Ojibwe phrase, *Gimood-akiwi ziibi*, literally, the "Stolen-land River" or "Thieving Land River," which originated when a band of Dakota Indians occupied a secret encampment along the river, hence "stealing" the land, before being discovered and routed by the neighboring Ojibwe. In the Treaty of Old Crossing of 1863, the *Moose Dung's Indian Reservation* was established on the west bank of the Thief River, at its confluence with Red Lake River. This Indian Reservation was dissolved in 1904 and their population incorporated as part of the Red Lake Band of Chippewa.

Thief River Falls marked the limit of navigation on the Red Lake River. The eponymous town site was established in 1887 and later incorporated as a city in 1896. Thief River Falls first developed as a lumber milling town. It is located in a major agricultural area because of the rich soil left by ancient glacial Lake Agassiz. The Great Northern and the Soo Line railroads brought prosperity when Thief River Falls became a center for shipping wheat.

3.2 Physical Characteristics

The physical characteristics of a county are important to the hazard mitigation process. The physical characteristics in Polk County, such as climate, precipitation, geology and geography can have an effect on how disasters impact the land and the residents within the county. There is also a potential economic impact based upon the way the physical characteristics within the county interweave. All of this information is vital to the mitigation process to determine the areas of greater risk and hazard potential.

3.2.1 Climate and Precipitation

The climate of a region is determined by the monthly or longer weather pattern conditions that exist within a specified area. Minnesota experiences a continental climate with four climatic seasons within each calendar year. A continental climate is characterized by the annual temperature variation due to the lack of significant bodies of water with frigid winters and hot humid summers. In northern Minnesota spring characteristically lasts from early March to early May with an average temperature of 36 degrees Fahrenheit.

Summer lasts from late May to late August with an average temperature of 60 degrees Fahrenheit; with the

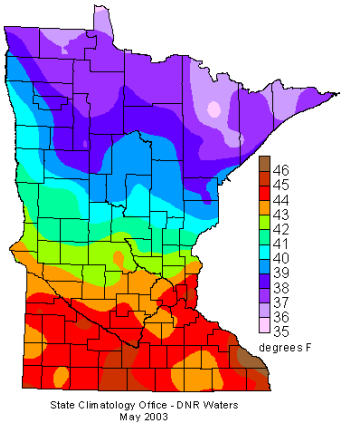
highest record temperature of 114 degrees Fahrenheit in July of 1936 in the city of Moorhead. Fall lasts from mid-September to mid-November with an average temperature of 38 degrees Fahrenheit. Winter lasts from early December to late February with an average temperature of 6 degrees Fahrenheit; with the lowest record temperature of -60 degrees Fahrenheit in February 1996 in the city of Tower.

The northern regions experience an average of 31 inches of precipitation each year; with an average 19 inches of rainfall and in the spring and summer seasons and an average 70 inches of snowfall in the fall and winter seasons; with a record season snowfall of 175 inches in 1949-1950 near the city of Grand Portage. Characteristically Minnesota experiences two blizzards annually within each winter season with a record maximum of 36 inches in January 1994 near the city of Finland. The northern regions of the Minnesota experience slight variations in climatic conditions than its southern counterparts

3.2.2 Temperature

The climate of the Pennington County is characterized as continental. During the winter months, cold, dry polar air dominates the region. Hot, dry air masses from the desert southwest, along with warm, moist maritime tropical air masses that originate over the Gulf of Mexico, are common during the summer months. The spring and fall months serve as transitional periods between the summer and winter, with alternating intrusions of air from various sources.

Figure 2*:* Average Daily Temperatures



As shown in Figure 2, the average daily temperature for the County is between 37 and 39 degrees F. The High Plains Regional Climate Center operates a climate monitoring station in Thief River Falls. The 112 year (1900-2012) average annual temperature for the station was 37.9 degrees F. The temperature extremes for this station are provided in Table 8.

The maximum one-day temperature ever recorded was 108 degrees F; this occurred on July 29, 1917. The lowest one-day temperature ever recorded was -47 degrees F; this extreme was reached on January 11, 1912.

Table 8: Temperature Extremes for Thief River Falls WS (1900-2012)

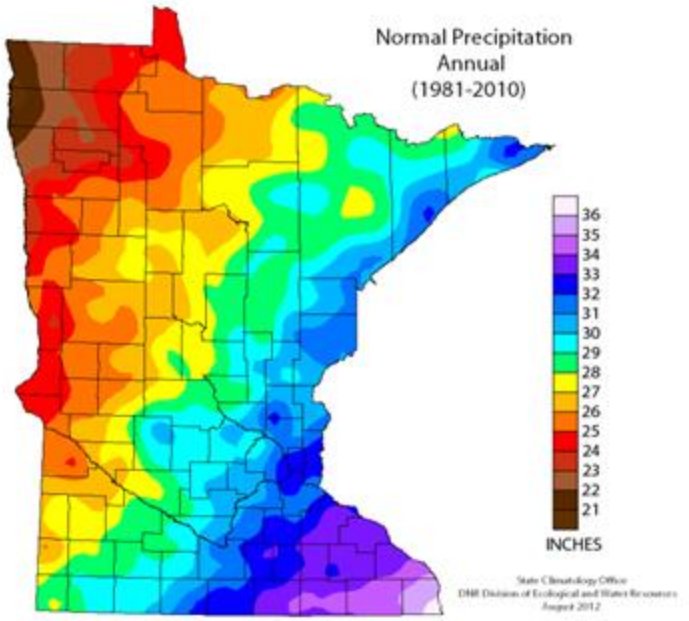
Month	Temperature (°F)					
	High Mean	Low Mean	1-Day Max	Date	1-Day Min	Date
January	11.8.	-9.5	40	01/09/1914	-47	01/11/1912
February	18.1	-3.8	53	02/25/1958	-45	02/11/1914
March	31.8	10.8	85	03/27/1946	-35	03/01/1962
April	51.1	29.0	91	04/27/1952	-12	04/01/1970
May	66.0	39.9	100	05/21/1964	13	05/03/1926
June	75.1	50.6	102	06/29/1912	26	06/01/1917
July	80.0	55.1	108	07/29/1917	34	07/15/1912
August	79.1	52.9	99	08/09/1920	30	08/26/1915
September	68.1	43.5	99	09/08/1931	15	09/18/1929
October	54.9	32.7	90	10/06/1920	-11	10/26/1919
November	34.5	17.8	71	11/300/1905	-30	11/30/1905
December	19.1	0.8	54	12/01/1962	-40	12/31/1967

Source: National Climatic Data Center

3.2.3 Precipitation

As shown in Figure 3, one can notice that the county receives on average between 23 and 24 inches of precipitation annually.

Figure 3*:* Average Annual Precipitation



The precipitation extremes for the Thief River Falls Weather Station are presented in Table 9. The maximum one-day precipitation was 7.50 inches; this occurred on June 29, 1949. Annual snowfall for the County is approximately 36.9 inches; however, this represents only a small portion of the annual precipitation due to the low moisture content of snow. The Pennington County area goes through various wet and dry cycles that can last anywhere from one year to ten. One decade can be remembered as a wet and rainy while another can be known for its crippling droughts. Flooding trouble has surfaced in recent years due to abundant precipitation in a short period of time. This coupled with ground saturation values, ice jams, land use, and the topography of the land can create major problems.

Table 9: Precipitation Extremes for Thief River Falls WS (1900-2012)

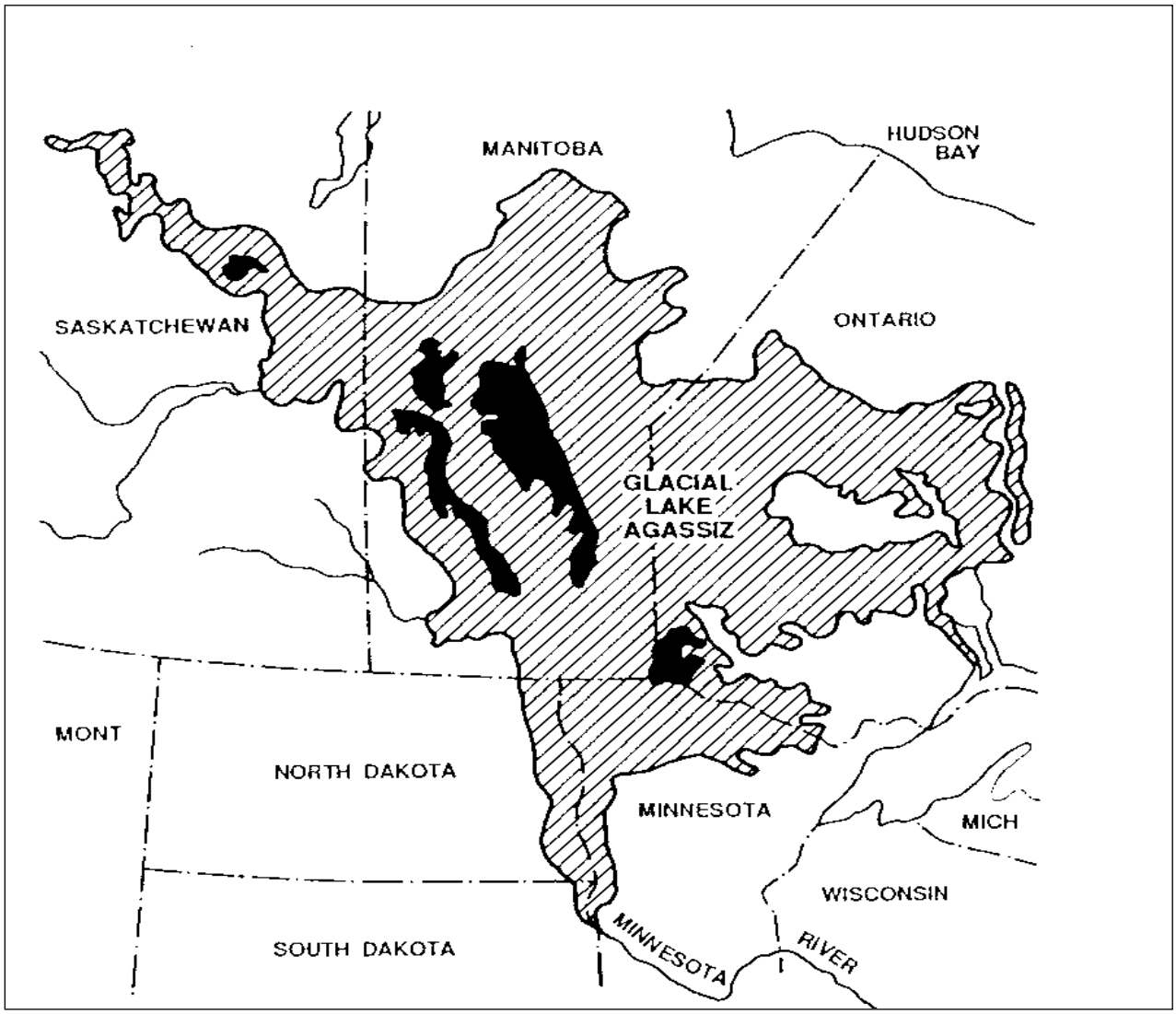
	Precipitation (in)							Snowfall (in)		
Month	**Average**	**High**	**Year**	**Low**	**Year**	**1-day max**	**Date**	**Average**	**High**	**Year**
January	0.70	2.98	1969	0.00	1906	1.22	01/13/1943	7.7	30.0	1969
February	0.50	2.44	1930	0.00	1950	1.25	02/25/1930	4.9	21.7	1930
March	0.92	3.35	1966	0.00	1969	1.50	03/20/1967	7.3	32.0	1966
April	1.83	7.48	1967	0.04	1926	2.75	04/17/1967	2.0	14.7	1964
May	2.72	13.02	1949	0.00	1901	7.50	05/29/1949	0.3	6.0	1950
June	3.37	8.45	1968	0.37	1912	2.65	06/09/1920	0.0	0.0	1944
July	3.49	7.37	1947	0.77	1967	4.29	07/02/1919	0.0	0.0	1944
August	2.85	9.63	1900	0.54	1930	2.95	08/03/1919	0.0	0.0	1933
September	2.41	6.54	1925	0.26	1948	2.65	09/26/2964	0.2	6.0	1912
October	1.48	7.11	1971	0.00	1954	3.15	10/01/1971	1.4	10.0	1916
November	1.03	3.50	1905	0.03	1960	1.25	11/27/1905	5.6	26.5	1965
December	0.74	2.55	1969	0.00	1905	0.76	12/25/1940	7.5	23.3	1964

3.2.4 Pennington County Geology

The geology of Pennington County was influenced by glaciation that occurred many years ago. This glacier blocked all north flowing rivers in the late Wisconsinan period. Glacial Lake Agassiz was formed because of this large glacier. In turn, glacial Lake Agassiz caused three distinct regions to form in Pennington County, the glacial lake plain, the beach ridge area, and the Red Lake area. All three of these could be classified under the Agassiz lacustrine plain. The landscape we see today was almost solely caused when Glacial Lake Agassiz receded approximately 8,500 years ago.

A beach ridge occurs at the edge of a lake and because Lake Agassi fluctuated greatly in terms of water content, many beach ridges were left instead of just one. The fluctuation of Lake Agassiz was due to the recession/procession of the ice sheet. The beach ridge area seen in the western portion in Pennington County includes these ancient beaches as well as the marshy, poorly drained areas that occur between the beaches. Sandbars can also be found in Pennington County from Glacial Lake Agassiz, formed from the changing of currents and eddies.

Figure 4: Geology of Pennington County



Source: Joe River Watershed District Overall Plan, 2002

3.2.5 Hydrology

Hydrology is the study of the movement, distribution, and quality of water throughout Earth. The hydrology of Minnesota is a system of ground water (aquifers), lakes, watersheds, wetlands, and a network of rivers and streams. Aquifers are areas of rock below the ground surface that can produce sufficient amounts of water to efficiently supply the communities within the region. There are three different types of aquifers; unconfined, is where the water table is able to move freely without interference due to the lack of aquitard, a non-permeable formation, semi-confined, is where the water table is partially confined due to semi-permeable formations, and confined, is where the water table is completely confined by non-permeable formations above and below the body of water. The amount of groundwater available is dependent on the amount of precipitation the region receives each year. Minnesota's ground water system supplies approximately 75 percent of the state's drinking water and approximately 90 percent of the agricultural irrigation. Minnesota's ground water system is comprised of a system of six provinces of different aquifers;

the Cambrian-Ordovician Aquifer system, Lower Cretaceous Aquifers, Paleozoic Aquifers, Sand and Gravel Aquifers, and the Upper Carbonate Aquifer. The provinces include the Metro Province, the South-Central Province, the Southeastern Province, the Central Province, the Western Province, and the Arrowhead Province.

Rivers

The Red Lake River is one of the two major rivers both in Pennington County and the Red Lake Watershed. The Red Lake River originates in lower Red Lake at a dam and flows in a westward direction until it meets the Red River at East Grand forks, Minnesota. In Pennington County, the Red Lake River enters near the southeast corner and exits south of a town called St. Hilaire.

One of the main tributaries to the Red Lake River is the Thief River. This river originates from Thief Lake and meets the Red Lake River at the town of Thief River Falls. The only other rivers to cross Pennington County are the Black River running through the southwest corner, and the Clearwater River. This river, although one of the main tributaries of the Red Lake River, is not one of the major rivers in Pennington County. It makes an appearance just crossing into and exiting the county briefly in the southeastern corner.

The rivers above need to be watched for possible floods because of the difference in water flows that occurs seasonally. Depending on the winter precipitation, a high flow period could occur in late winter / early spring when the snow melts. High flow is also seen when the late spring or summer rains start to fall. A flood could occur if a particularly heavy spring rains occurs too soon after a moisture-laden snow melt or an ice jam. A low flow period is seen in the late summer or early fall months and again in the winter when the rivers and lakes are frozen over.

Lakes

Pennington County does not have any lakes within its borders due to a lack of a moraine region. The DNR lists one lake for Pennington County, the Red Lake River reservoir. It is 135 acres and resides near Thief River Falls. Lakes are commonly found in the glacial moraine region of the watershed.

3.2.6 Pennington County Watersheds

A watershed is a physical area where water from streams, rivers, lakes, and wetlands drain into the surrounding land. Minnesota has 8 water basins, 81 major watersheds, and 5,600 minor watersheds. Minnesota also has 11,842 lakes (over 10 acres), 6,964 rivers and streams (69,200 miles), 9.3 million acres of wetlands, and borders Lake Superior, which is the world's largest freshwater body.

Pennington County is almost completely encompassed by the Red Lake Watershed. A more detailed description of this main watershed in the county can be seen below. The description was provided by the Department of Natural Resources. This watershed is up to 140 miles wide and up to 80 miles tall. It encompasses 5,990 square miles in 10 counties in northwest Minnesota. The Red River sub-watershed contains the greatest percentage of cropland acreage. The Clearwater sub-watershed contains the greatest percentage of pastureland acreage, and the Red Lake River sub-watershed contains the greatest percentage of forest acreage.

The Red Lake Watershed: The Red Lake sub-basin is part of

the Red River Basin in northwestern Minnesota. The watershed occurs in the Glacial Lake Agassiz Plain and Northern Minnesota Wetlands Level III Ecoregions. The greater Red River basin characteristically has a poorly defined floodplain and low gradient that combine with extensive drainage, widespread conversion of tallgrass prairie to farmland, and urban/suburban development to leave the basin subject to frequent floods that affect urban and rural infrastructure and agricultural production. The main resource cons in the watershed are wind and water erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat. Many of the resource concerns relate directly to flooding and increased sediment and pollutant loading to surface waters.

3.2.7 Wetlands

Wetlands are commonly found in the glacial moraine region of the watershed. There is not a glacial moraine region found in Pennington County. The lack of a glacial moraine region in Pennington County means there are few if any wetlands within the county. In spite of the lack of glacial moraine regions, Pennington County does have some wetlands usually positioned on the east side of the county between beach ridges. There are eight types of wetlands found in Minnesota.

1. Type 1 (seasonally flooded basin) wetlands are often found in upland depressions or forests that are found in the floodplain. Looks can be deceiving as this swamp only floods during certain seasonal periods, leaving it well drained other times of the year. Vegetation varies greatly depending on the continuity and time of the flood. Varieties of herbaceous plants to hardwood trees can be seen.

2. Type 2 (wet meadow) wetlands are often found in shallow basins or sloughs. The soil is waterlogged a few inches below the surface. Grasses, rushes, sedges, and various broadleaf plants inhabit this type of wetland. This type is the most prevalent in Pennington County.

3. Type 3 (shallow marsh) wetlands are found in shallow lake basins or sloughs. The soil is waterlogged and is covered by six inches of water or more. Grass, rushes, cattails, arrowheads, smartweed, and pickerelweed is often found populating this wetland. This type is the second most prevalent in Pennington County.

4. Type 4 (deep marsh) wetlands are found in depressions like shallow lake basins, potholes, and sloughs. Six inches to three feet of water often covers the soil. Cattails, rushes, reeds, and wild rice are found here, as well as pondweeds, nalads, coontail, watermilfoils, waterweeds, duckweeds, and water lilies.

5. Type 5 (shallow open water) wetlands are found in shallow lake basins. Water less than ten feet deep covers the surface of the soil. The vegetation is similar to the vegetation in Type 4 wetlands.

6. Type 6 (shrub swamp) wetlands are located along slow streams, drainage depressions, and flood plains. Water up to six inches covers the ground. This is because the water table is located at or near the surface. Vegetation residing here include alders, willows, dogwoods, buttonbush, and swamp privet.

7. Type 7 (wooded swamp) wetlands are found in ancient shallow lake basins, oxbows, slow streams, and on flat uplands. Up to one foot of water covers the ground. This is because the

water table is located at or near the surface. Hardwood and coniferous vegetation such as black spruce, tamarack, balsam, red maple, and black ash are found residing in these swamps, as well as deciduous duckweed and smartweed.

8. Type 8 (bog) wetlands are found in shallow glacial lake basins and depressions, flat uplands, and slow streams. The soil is usually waterlogged because the water table is at or near the surface. Woody and herbaceous varieties of vegetation grow here, as well as moss.

The following table lists the acreage of each type of wetland:

Table 10: Wetland Acreage

County	T1	T2	T3	T4	T5	T6	T7	T8
Pennington	**1,726**	**15,299**	**3,778**	**76**	**0**	**6,059**	**1,861**	**276**
Becker	2,207	10,564	60,004	3,642	13,701	26,904	8,304	23,026
Kittson	2,938	42,356	5,112	827	193	17,505	2,290	211
Marshall	5,319	52,328	41,201	5,244	2,596	56,192	22,985	8,446
Norman	2,275	4,032	6,857	217	0	1,921	2,932	216
Polk	3,763	27,237	26,617	440	2,462	14,800	7,228	1,437
Red Lake	1,187	5,106	2,156	65	0	2,202	1,903	259
Roseau	8,235	119,160	4,149	2,815	1,682	110,511	69,323	49,251

Source: Minnesota Department of Natural Resources

Wetlands serve an important function in the region. They are integral in their usage as wildlife habitats. Many wetlands serve both as nesting grounds and as stops for migrating birds. Wetlands are also valued because they slow down surface water runoff. The dense plant growth can store vast quantities of water, which helps in flood control or in times of immense precipitation or snow melt. The sediments that are found in wetlands can also be used as a natural filter for pollutants.

3.2.8 Drainage Ditches

The county has an extensive network of legal drainage ditches which began in 1911. Due to the flat topography, adequate drainage is imperative to economically sustain agriculture. These drainages serve as an outlet for private field ditches, they typically have a low gradient and low velocities except during spring thaw and in high storm/rain events when significant and fast flow can be observed. Potential problems with the systems include sedimentation, erosion, and flooding. Increasing ditch capacity, maintaining and improving ditches using BMPs will help improve water quality by decreasing sediment and associated nutrients from entering the river.

Source: Pennington County Local Water Management Plan; 2010-2020

3.2.9 Floodplains

The State of Minnesota, through the Floodplain Management Act, requires local governments to adopt a floodplain ordinance compliant with minimum State and Federal standards. This ordinance stresses the reduction of flood damages through nonstructural controls, such as wise land use, in addition to structural controls, and encourages a community floodplain management program with preventive actions to reduce flood risk.

Pennington County is located in the Red River Basin which is prone to flooding. Historically, many parts of the valley experience significant problems with spring and summer floods. Although the County doesn't flood as bad as other parts of the valley, they still experience detrimental damage to property both public and private.

Flooding problems result from the flat topography and hydrological nature of the County and the complexity in containment by natural and artificial drainage systems. Since the spring flood of 1997, Flood Damage Reduction (FDR) has received a lot of publicity. Cooperation between government entities and landowners has resulted in reducing flood damage. Improvements have been made by communities and resource agencies to deal with flood damage and reduction; however, there is room for improvement.

Natural drainage is uncommon in the County, resulting in the extensive drainage systems which were constructed in the early 1900's. These ditches are typically oriented perpendicular to the Thief and Red Lake Rivers. This drainage infrastructure is the economic base providing for agriculture, industry, residential development, streets, roads, airports and railroads throughout the County.

There have been a lot of land use changes that affect flooding potential and the extent it will occur. The native landscape consisted of wetlands and prairie grasses. These ecosystems absorbed and stored water. Today the development of ditches, channelized river sections, crop production, poor land use decisions, floodplain encroachment, storm water issues, urban drainage, and the increase of impervious surfaces all affect the degree of flooding.

Flooding occurs due to runoff timing and volume. It can take place by two different means; overland and overbank. Overland flooding occurs most often in the spring in this region when water runs off fields. After the accelerated snowmelt when the soils are frozen and unable to absorb water, ditches and culverts are commonly plugged with snow, ice or debris. Thus, ditches fill and water makes it way overland crossing roads and or the next field, causing damage such as washouts, gullies, soil loss etc.

Flooding and flood-related damages have, and will continue to plague the valley. Factors that affect the degree of flooding include topography, land use, soil type, weather, installed flood reduction projects, natural enhancement efforts, etc. Common Flood Damage Reduction practices in the valley include establishing impoundments, levees, dikes, restoring wetlands, and waterways. Participation in conservation practices or Best Management Practices (BMPs) include increasing crop residues, planting trees and native grasses, installing side water inlets, grade stabilization projects, restoring and preserving wetlands, buffering rivers and ditches, etc.

Pennington County does not have any impoundments but does have many BMPs established. There is an established RIM contract, grassed waterways, side water inlets and approximately 70,000 acres of conservations. Wetlands that once covered the landscape provided the opportunity to absorb water. This plan promotes no net loss of the remaining wetlands and encourages wetland restorations for the benefit of

increasing water storage, providing filtration of sediment and pollutants, and increasing wildlife habitat.

The use of tile drainage has just begun in the county. Research by the University of Minnesota found tiling reduces flooding because water infiltrates the tile instead of running off the fields. Tile removes excess soil moisture creating a buffer for excessive rains that doesn't exist on non-tiled soils. The County Highway Department issues permits for discharging tiles into judicial and county road ditches.

It is a priority to focus on flood damage reduction by working with landowners and government entities and by maintaining adequate drainage systems.

3.2.10 Aquifers

Groundwater is obtained through aquifers. An aquifer is any rock formation that can be used to store or transmit water. It is usually a porous material such as sandstone or gravel that is confined by a less porous material. It is not depicted as a void beneath the ground. The aquifers of Pennington County are found in two places, glacial drift, and the underlying bedrock. Pennington County is characterized by clay-rich glacial drift overlying Cretaceous bedrock. Both the bedrock and the glacial drift contain limited sand and sandstone aquifers.

Surficial aquifers are described as both the most widespread aquifers and also as the uppermost. It consists mainly of glacial deposits. Depending on where the glacier and its lobes were coming from determined what properties the deposits had. In Pennington County, the depth to bedrock is 100 feet at a minimum. Buried sand and gravel aquifers are very apt to exist. These can occur from ice deposits (moraines) or water deposits (outwash, lake sand, kames, and eskers). In some cases, water will move down to recharge bedrock aquifers, or move from bedrock aquifers up to the surficial aquifers for discharge into a nearby stream or river. Wells often take water from this type of aquifer.

Crystalline-rock aquifers are one of the most common in Pennington County. Precambrian rocks are the main constituent of the crystalline rock aquifers. Granite, gabbro, gneiss, schist and slate are all common lithologies. Water collects by following faults, joints, and fractures within the rock. The quality of the water collected is broad, ranging from salty to fresh.

The Cretaceous aquifer can be seen in a small region of Pennington County. This aquifer is not one of the most common in the area. It is defined by sandstone beds, ranging from thick to thin, overlain by beds of limestone or shale. The limestone and shale have a confining property upon the aquifer. The Cretaceous aquifer is also overlain by glacial deposits. Overall, the total thickness drifts from ninety feet to about 170, depending on the area. Water from this aquifer tends to contain concentrations of dissolved solids.

Table 11: Aquifer Withdrawal Rates

County	Glacial/Surficial Aquifer	Other Aquifers
Pennington	**0.06**	**0.02**
Becker	6.52	0.71
Kittson	0.6	0.56
Marshall	0.31	0.28
Norman	0.22	0.18
Polk	0.67	0.48
Red Lake	0.87	0.15
Roseau	0.66	0.25

Figures are MG/D (million gallons per day)
Source: United States Geological Survey

Thief River Falls obtains its water from the Red Lake River. Other cities in the county and rural residents use between one and three wells, depending on population and the degree of industrial use.

3.2.11 Presettlement Vegetation

The DNR has inventoried the original vegetation of the State through its Presettlement Vegetation Database. Pre-settlement vegetation was determined by analyzing the detailed maps and records of early surveyors (circa 1895). The purpose of this database was to enable analysis of pre-settlement vegetation patterns for determining natural community potential and patterns of disturbance.

Prior to settlement, Pennington County was predominately covered with brush prairie and prairie vegetation. The brush prairie was more dominant in the northern part of the county and more of the prairie vegetation in the southern half of the county. There was one area of river bottom forest in the southwest corner of the county. Patches of wet prairie were dispersed throughout the county. Smaller areas of aspen-birch, aspen-oak and oak openings/barrens were also present.

3.2.12 Ecology

The ecology of Minnesota is a relationship between organisms and their environments. The Minnesota Department of Natural Resources and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota following the National Hierarchical Framework of Ecological Units . Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. ECS mapping enables resource managers to consider ecological patterns for areas as large as North America or as small as a single timber stand and identify areas with similar management opportunities or constraints relative to that scale. There are eight levels of ECS units in the United States. Map units for six of these levels occur in Minnesota: Provinces, Sections, Subsections, Land Type Associations, Land Types, and Land Type Phases.

Table 6: Minnesota Ecology

Classification	Criteria
Provinces	Provinces are units of land defined using major climate zones, native vegetation, and biomes such as prairies, deciduous forests, or boreal forests. There are 4 Provinces in Minnesota.
Sections	Sections are units within Provinces that are defined by the origin of glacial deposits, regional elevation, distribution of plants, and regional climate. Minnesota has 10 sections.
Subsections	Subsections are units within Sections that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief, and the distribution of plants, especially trees. Minnesota has 26 subsections.
Land Type Associations	Land Type Associations are units within Subsections that are defined using glacial landforms, bedrock types, topographic roughness, lake and stream distributions, wetland patterns, depth to ground water table, soil parent material, and pre-European settlement vegetation. Minnesota has 291 land type associations.
Land Types	Land Types are units within Land Type Associations that are defined using pre-European settlement vegetation, historic disturbance regime, associations of native plant communities, wetland distribution, and soil types.
Land Type Phases	Land Type Phases are units within Land Types that are defined using a native plant community class, soil type, and topography.

3.2.13 Soil

As an agricultural county, soils are one of Pennington County's most valuable resources. Soils develop from the breakdown of rock minerals, intermixed with plant and animal remains. The formation of a soil is an extremely long process, taking place over hundreds of thousands of years. Pennington County's soils were formed from deposits originally left by glaciers more than 10,000 years ago. The County has a wide variety of soil types due to the wide variety of parent material from which they were formed. Also important in the formation of the County's soils are factors such as climate, vegetation, and topography.

The soil seen in Pennington County varies depending on what part of the area it is found in. Most of the middle of the county is in the Agassiz Red River Valley area. Soils found are usually either clay or clay loam soils. Pennington County is highly productive agriculturally; the majority of the ground can be seen cultivated at certain times of the year.

The western part of Pennington County is in the Agassiz Inter-Beach area. The soil is usually mixed loam, sand or peat. A low permeability is one trait that identifies this region, along with high water-holding capability. Sandy soils (often associated with beach ridges) drain quickly and the marsh areas retain water. Productivity is not as high as the central portion of the county.

The eastern part of Pennington County is in the Agassiz Red Lake area. Common soils seen in this area include peat and peat/loam. Before settlement of the area, this region was the only part of Pennington County in which the forest cover could be found.

Cretaceous sediments overlie the bedrock in parts of Pennington County. It is made up of main shale; however, thin layers of sand can be seen. This sand can vary from fine to coarse in nature. The thickness of the stratum is highly inconsistent. Wells can be developed in this strata, but the water will be hard.

Glacial deposits can be found to almost entirely cover Pennington County. The drift was deposited by the

glaciers that went through this area, also referred to as till. Till consists of various sizes of material from the very fine clay or silt up to the very coarse pebble or boulder. The till is unsorted and has a very non-stratified bedding. Some of the soil that covers Minnesota originates from the drift that the glacier left behind.

The bedrock of Pennington County is made up of a variety of rocks and minerals instead of one homologous type. Faults can also be seen crossing the bedrock. Some displacement of the bedrock can be seen.

Pennington County shows different size bands of bedrock having the same orientation. This trend is a southwest-northeast direction. Five bedrock types display this banding trend. They are all formed in the late Archean Eon.

1. The first type is made up of granitic and granodioritic rocks. They can vary from syntectonic to pretectonic and are closely associated with the Vermillion granitic complex, the Giants Range, and the Bemidji batholiths. It is found in the western part of the county.

2. The second type is a metavolcanics type. Variable quantities of felsic volcanogenic and volcaniclastic rocks can be found composing this type, as well as iron. This type is often described in a number of volcanic sequences varying from mafic to felsic. It is found in the central part of the county.

3. The third type of bedrock is a mafic metavolcanic type. Concentrations of iron formations are almost always found scattered throughout the basalt, as well as thin sedimentary units. This bedrock is also found in the central part of the county.

4. The fourth type of bedrock is a metasedimentary type. It is composed of shale, graywacke, slate, arenite as well as volcaniclastic and volcanogenic rocks. A conglomerate can also be viewed. There are also iron formations found within this bedrock. This bedrock can be viewed in the southeast part of the county.

5. The fifth type is part of the Vermilion Granitic Complex. It is made up of granitic gneiss, paragneiss, schist, and migmatite. This bedrock is found on the western side of the county.

Concentrations of bedrock are found in spots across Pennington County and do not band. The first is made up of gabbro, peridotite and pyroxenite type rocks. This type of bedrock often carries a distinct magnetic signature. The second type is made up of granodiorite, syenite, diorite, and a monzonite that can be rich in hornblende, pyroxene or biotite. Both the first and second types of bedrock were formed in the late Archean. The third type was formed in the Mesozoic. This is made up of rocks from the Dakota, Graneros, Greenhorn, Carlile, Niobrara and Pierre formations.

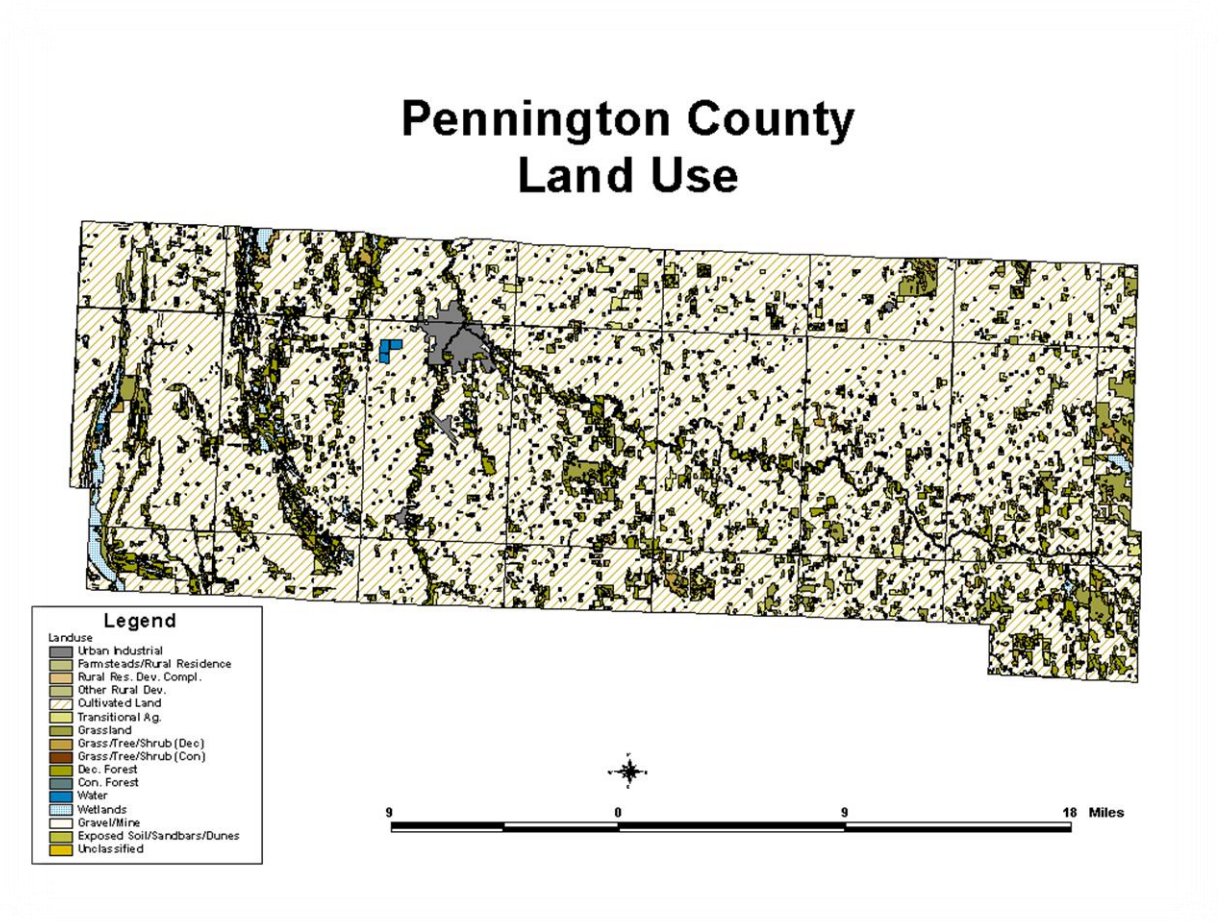
3.2.14 Topography

The topography of Pennington County can be aptly described as flat, with slopes of less than two percent. This is due to the presence of Lake Agassiz and glacial activity in the region. The highest point in the county is at an elevation of 1198 feet about sea level and the lowest point is at an elevation of 941 feet above sea level.

3.2.15 Land Use

The high percentage of cultivated land indicates that the dominant use of land is for agriculture. Cropland is a valuable resource for Pennington County and should be protected from future hazards, as it is a way of life for many people. The small amounts of forest and water resources also are indicative of the prairie environment that covers the area.

Figure 5: Pennington County Land Use



The University of Minnesota, Remote Sensing, and Geospatial Analysis Laboratory developed the *Minnesota 2000 Level 1 Landsat Landcover Classification*, which offers the most recent land use data for the County. The land cover type was derived via multitemporal, multispectral supervised image classification of satellite imagery acquired by the Landsat TM and Landsat ETM+ satellites. A seven-category classification scheme was developed to categorize data. The following describes the types of land uses found in each category.

- ***Agriculture*** - An area where the primary cover type during the growing season is an agricultural cover type, including row crops, forage crops, and small grains. Examples: corn,

soybeans, alfalfa, oats, wheat, and barley.

- ***Forest*** - An upland area of land covered with woody perennial plants, the tree reaching a mature height of at least 6 feet tall with a definite crown. Examples: white pine, red pine, oak, mixed conifer, and mixed deciduous.

- ***Grassland*** - An upland area covered by cultivated or non-cultivated herbaceous vegetation predominated by grasses, grass-like plants, and forbs. Includes non-agricultural upland vegetation dominated by short manicured grasses and forbs, as well as non-cultivated herbaceous upland vegetation dominated by native grasses and forbs. Examples: golf courses, lawns, athletic fields, dry prairies, and pastures.

- ***Shrubland*** - An upland or lowland area with vegetation that has a persistent woody stem, generally with several basal shoots, low growth of fewer than 20 feet in height. Examples: alder, willow, buckthorn, hazel, sumac, and scrub oak.

- ***Urban/Developed*** - An area containing any amount of impervious cover of man-made solid materials or compacted soils, including areas with interspersed vegetation. Examples: parking lots, shopping malls, warehouses, industrial parks, highways, sparse development, single family residential developments, single lane roads, and mines.

- ***Water*** - An area of open water with none or very little above surface vegetation. Examples: lakes, streams, rivers, and open wetlands.

- ***Wetland*** - A lowland area with a cover of persistent and non-persistent herbaceous plants standing above the surface of wet soil or water. Examples: cattails, marsh grass, sedges, and peat.

According to Table 13, agricultural land is the predominant land use in the County, comprising more than three-quarters of its area (81.26%). Other land uses are relatively minor, with the next largest being grass/shrub/wetland (8.93%). The urban land use is only a small use of the counties land, at just over four percent (4.04%).

Table 13: Pennington County Land Use Analysis (2010)

Land Use	Area (ac)	County (%)
Agriculture	321,509	81.26
Grass/Shrub/Wetland	35,321	8.93
Forest	22,169	5.6
Water	657	0.17
Urban	15,974	4.04
Total	**395,630**	**100.0**

Source: Minnesota Geospatial Information Office

3.2.16 Public Land Ownership

The majority of land in the County is privately owned. Based on available data from the state, table 14 shows that 1,551 acres in the county are considered state wildlife management areas.

Table 14: State Wildlife Management Areas in Pennington County

State Wildlife Management Area	Acreage
Higinbotham	967
Reiner	120
Jacksnipe	150
Oriniak	314

3.3 Population and Demographics

3.3.1 Historic Population

The population of Pennington County is an important factor in the services it can give and receive from the people living within it. The greater number of people living within a community demands a greater number of services than a smaller community. Consequently, a hazard will have a greater effect on an area with a greater population. More mitigation efforts might need to be concentrated on larger areas of population.

Pennington County's population data since 1970 is presented in Table 15 and is broken down by the township. Notice that the County had a peak in the population total in 1980 at a number almost 2,000 more than the current population of the county.

Since 1980, the County has experienced population increases, if you were to remove the outlier, which is the population for 1980. Based on the information provided in Table 15, the population of Pennington County has increased about 300 people per decade since 1990. This trend is expected to continue into the future because Pennington County is in a state of population increase. The city of Thief River falls and the businesses within it are attracting new people to the area. Part of the townships' decline is attributed to farmers leaving the region. The cities in Pennington County have experienced growth, partially accounting for the outward migration of the rural area.

Table 15: Population of Pennington County Cities since 1970 (U.S. Census)

County	*1970*	*1980*	*1990*	*1995*	*2000*	*2010*
Pennington	13,266	15,258	13,306	13,391	13,584	13,930
Goodridge	144	191	61	109	98	132
St. Hilaire	337	338	330	301	272	279
Thief River Falls	8,618	9,105	8,010	8,053	8,410	8,573

3.3.2 Comparable Growth

One of the best ways to compare the County's rate of population growth is to examine the growth rates of neighboring counties. Table 16 accomplishes this by including demographic information for the following counties: Beltrami, Clearwater, Marshall, Polk and Red Lake.

Table 16: Neighboring County Area Population Change since 1970 (U.S. Census)

County	Year				
	1970	1980	1990	2000	2010
Beltrami	26,373	30,982	34,384	39,650	44,442
Clearwater	8,013	8,761	8,309	8,423	8,695
Marshall	13,060	13,027	10,993	10,155	9,439
Pennington	***13,266***	***15,258***	***13,306***	***13,584***	***13,930***
Polk	34,435	34,844	32,498	31,369	31,600
Red Lake	5,388	5,471	4,525	4,299	4,089

The statistics that appear in Table 16 indicate that Pennington County has experienced small population growth in the past decade. However, 2 of the 5 neighboring counties have experienced population decreases, so the fact that Pennington County's population is still increasing and the projected population also shows an increase is a positive sign.

3.3.3 Population by Age Groups

Table 17 shows the breakdown of Pennington County's population by age categories for the years 1970 to 2010. The population distribution chart confirms the fact that the population in Pennington County is increasing after a drastic population reduction in the 1980's. A good portion of the population in Pennington County is young. The twenty-five to forty-four age group has the most people. The forty-five to fifty-four age group ranks third in population. These are the years that people typically start a family. The fact that people aged five to seventeen are the second highest population testify to the fact that many people are settling in Pennington County. It is a bonus to the economic status of Pennington County if it can draw and keep young families in the area.

While Pennington County's total population has witnessed steady growth in recent years, the rate of population growth among the elderly (65 and older) has been increasing, specifically the population of elderly 85 and older, which has almost doubled. In 1970, the county's elderly population 85 and older was 191 persons. By 2010, this population grew by over 50% percent to 405 persons.

The State Demographic Center projects the percent increase in elderly population will continue to grow at a larger rate than that of the total population over the next 30 years *(Minnesota's Changing Counties: The Next 30 Years)*. It is during this time frame that the "baby boomers" will reach their retirement age. This is a strong indicator of the increasing need for many senior-related services, including senior housing and transit services.

Table 17: Pennington County's Population by Age Groups 1970 - 2010

Year	1970	1980	1990	2000	2010
Total Population	**13,266**	**15,258**	**13,306**	**13,584**	**13,930**
Under 5 Years	1,039	1,258	900	824	946
5 to 17 Years	3,565	3,219	2,662	2,506	2,365
18 to 20 Years	871	1,029	737	755	--
21 to 24 Years	619	1,115	639	649	--
25 to 44 Years	2,626	3,839	3,706	3,596	3,387
45 to 54 Years	1,395	1,305	1,311	1,846	2,053
55 to 59 Years	671	632	551	694	853
60 to 64 Years	644	658	551	569	767
65 to 74 Years	1,008	1,177	1,070	954	984
75 to 84 Years	637	743	825	824	728
85 Years & Over	191	283	354	367	405

3.3.4 Population and Household Projections

The Minnesota State Demographic Center has published population and household projections for Pennington County in five or ten-year increments between 2015 and 2060. These projections are presented in Table 18. However, population and household projections should only be viewed as educated estimates based on historical data.

There are a number of variables that directly and indirectly influence population levels including in-migration, out-migration, net births/deaths, and economic conditions. For this reason, the population, and household projections should only be used for general planning purposes.

Pennington County is experiencing a shift in age. As the baby boomer generation is reaching retirement age, the elderly population will continue to grow. As the elderly population is compared to younger age groups, it is growing very rapidly in a relationship. The 60+-year-old age groups have doubled in size while some of the middle age groups are declining. This will present many challenges for Pennington in considering mitigating with an elderly population in mind. The projections show in 2030, almost 36% of Pennington County's population will be over 60.

While the quality of life has increased for our retirees in today's world, this still presents challenges when considering families are moving further apart geographically and it will be up to the community to account for its citizens without much family help.

The shift in the age demographic also presents issues when it comes to everyday life, as well. As a higher level of the population shifts from working to retired, there will be less available workers to provide the labor and services necessary to attain sound regional financial growth. The labor force will have to become fluid and creative to meet the needs of the region without plans for outside recruitment.

As of the year 2010, Pennington County had a population of 13,930 people. As visualized from the population projection, there is an expected growth in years to come, following a small factor of decline. Some people theorize that this future growth is partially due to the rivers flowing through the county. People like to live near water, no matter what hazards are associated with it. As soon as there is no more

housing space available near lakes, people will start moving near rivers. This combined with the quiet atmosphere and recreational opportunities make Pennington County an ideal place to live. This idea could be marketed in future years to draw population to the area, but hazards such as subsidence and flooding would have to be taken into account. The rise in population along the river's edge could cause many hazards. Digi-Key and Arctic Cat are two major businesses that also help attract people to Pennington County by being successful and hiring workers.

Table 18: Pennington County Population Projections

Year	2015	2020	2025	2030	2035	2040	2045
0-4	854	875	890	891	886	878	886
5-9	875	841	861	876	881	880	877
10-14	888	875	841	861	878	888	891
15-19	962	934	920	886	908	931	946
20-24	922	955	924	911	879	907	934
25-29	896	923	954	925	924	887	921
30-34	863	855	882	913	887	880	859
35-39	812	849	842	868	903	881	880
40-44	709	814	851	843	871	911	894
45-49	952	712	814	850	846	880	924
50-54	980	938	699	803	840	840	879
55-59	1,101	977	935	697	802	844	848
60-64	880	1,090	966	925	690	799	847
65-69	805	868	1,077	954	916	688	801
70-74	641	799	862	1,062	949	916	693
75-79	405	634	786	847	1,049	940	915
80-84	382	400	623	768	830	1,031	931
85+	445	425	426	535	651	734	873
Total	14,372	14,764	15,153	15,415	15,580	15,715	15,799

Source: U.S. Census Bureau, Population Division

3.3.5 Households

Table 19 shows exactly how the number of households has increased as Pennington County has gained population since 1990. Although knowing the total number of people and households is important, these numbers allow an average County household size to be established (the average number of people living in each household). Notice that since 1990, the average household size in Pennington County has stayed relatively stable, from 2.5 in 1990, to 2.5 in 2010.

Table 19: Population, Households, and Average Household size of Pennington County since 1990 (U.S. Census)

Characteristic	Year		
	1990	2000	2010
Population	13,306	13,584	13,930
Households	5,173	5,525	5,836
Average Household Size	2.5	2.38	2.49

3.3.6 Special Populations

Special population is a term used to express a disadvantaged group, for example populations with disabilities, minors, and the elderly. Special populations often require accommodations for physical, mental or emotional differences. Emergency service providers must carefully consider special populations. The following tables illustrate five subgroups of special populations in Pennington County; children, elderly, female, individuals with a disability, and individuals institutionalized.

Table 20 outlines the number of households with children. The factor that make this table noteworthy is the small number of single parent households.

Table 20: Special Populations: Children

Subject	2010 Census Data (US Census Bureau)
Family households with children	3,653
Married couples with children	2,777
Single mothers with children	582
Single fathers with children	196

Table 21 is a recap of earlier stated county population data of just the population aged 65 years old and older. Currently, the number of people 65 and older make up 15.9% of the total county population, but this number will increase exponentially as the baby boomers age.

Table 21: Special Populations: Elderly

Subject	2010 Census Data (US Census Bureau)	Percent
65 to 69 years old	625	4.5
70 to 74 years old	454	3.3
75 to 79 years old	381	2.7
80 to 84 years old	347	2.5
85 years and older	405	2.9
Total	**2,212**	**15.9**

Table 22 represents the number of females in the county.

Table 22: Special Populations: Females

Subject	2010 Census Data (US Census Bureau)	Percent of Population
Female Population	7,060	50.7
Under 18 years old	1,627	11.7
18 years and older	5,433	39.0
65 years and older	1,286	9.2

Table 23 outlines the population with a disability in Pennington County. The table is an overview of the total of those with a disability condition recognized in the 2010 Census.

Table 23: Individual's With a Disability within the Population

DISABILITY STATUS OF THE CIVILIAN NONINSTITUTIONALIZED POPULATION	Number of People	Percent
Population 5 to 20 years	3,206	100.0
With a disability	216	6.7
Population 21 to 64 years	7,316	100.0
With a disability	1,215	16.6
Percent employed	66.5	(X)
No disability	6,101	83.4
Percent employed	80.9	(X)
Population 65 years and over	1,999	100.0
With a disability	863	43.2

According to the US Census Bureau, 3.2% of Pennington County's population lives in group quarters, with 1.6% of the population being identified as institutionalized.

Table 24: Institutionalized Population

Subject	2010 Census Data (US Census Bureau)	Percentage
Total in group quarters	452	3.2%
Institutionalized	233	1.6%
Non- institutionalized	219	1.6%

3.4 Community Conditions

The state of Minnesota has a rich cultural history dating back over 5,000 years ago with inhabitation of the region following the last Ice Age. The state's first inhabitants were Native Americans with the dominant tribes being the Dakota and Ojibwa (also called Chippewa or Anishinabe) Indians. The early Native American presence is recorded by petroglyphs, which are ancient cave drawings and burial mounds. The areas with petroglyphs and ancient burial mounds can found throughout the state and are often state parks.

The first European explorers came to the Minnesota region in the early 1600's. Groseilliers and Radisson, are generally regarded as the first explorers of the region during the years 1654 to 1660. These first

explorations ultimately resulted in French sovereignty over Lake Superior. Fort Snelling was the first permanent European settlement in Minnesota in 1825. The earliest settlers were primarily from the East Coast with most immigration from Germans and Scandinavians by the late 1860's.

Minnesota became the 32nd state in the union in 1858. On October 27, 1849, nine large Minnesota counties were created. Among them were Benton, Dahkotah, Itasca, Ramsey, Mahkahta, Pembina, Wabasha, Washington, and Wahnata. Of those Benton, Dakota, Itasca, Ramsey, Wabasha, and Washington hold original names. With the creation of Kittson County on March 9, 1878, Pembina County no longer existed. When Minnesota was organized as a state, 57 of the present 87 counties were established. The last county to be established was Lake of the Woods County in 1923.

3.4.1 Race and Ethnicity

There is little racial diversity based on race within Pennington County, with 93.8 percent of the County identified as White by the 2010 U.S. Census.

Table 25: Population of Pennington County by Race

Total Population	13,930	Percentage
One Race Total	13,681	98.2
White	13,067	93.8
Black or African American	192	1.3
American Indian or Alaska Native	213	1.5
Asian	87	0.06
Hispanic or Latino	380	2.7
Native Hawaiian or Pacific Islander	1	Too small to report
Some Other Race	121	0.08
Two or More Races	249	

Table 26 illustrates the distinct majority of English speaking homes in Pennington County, with 96% of residents speaking only English at home and 1.4% of residents speaking Spanish.

Table 26: Language Spoken at Home in Pennington County

LANGUAGE SPOKEN AT HOME	Number of People	Percent
Population 5 years and over	12,747	100.0
English only	12,241	96.0
Language other than English	506	4.0
Speak English less than 'very well	157	1.2
Spanish	173	1.4
Speak English less than "very well"	47	0.4
Other Indo-European languages	279	2.2
Speak English less than "very well"	75	0.6
Asian and Pacific Island languages	45	0.4
Speak English less than "very well"	34	0.3

3.4.2 Level of Education

The next table indicates the level of education of the residents of Pennington County. Of the population 25 and older the majority have graduated from high school and have attended some college.

Table 27: Level of Education for Pennington County

School Enrollment	Number	Percent
Population 3 years and over enrolled in school	3,589	100.0
Nursery school, preschool	238	6.6
Kindergarten	194	5.4
Elementary school (grades 1-8)	1,447	40.3
High school (grades 9-12)	915	25.5
College or graduate school	795	22.2

Source: U.S. Census 2010

3.4.3 Socioeconomic Conditions: Income

The income per household in Pennington County as of 2012 can tell a lot about the County as a whole. There are 5,783 households in the county. Over half of the households, in Pennington County have lower to mid middle class incomes. Most households in Pennington County have an income range between $50,000 to 74,999, the second most common household income range is $75,000 to $99,999.

Table 28: Income and Benefits per Household in 2012 Pennington County

Income and Benefits	Number of Households
Less than $10,000	382
$10,000-$14,999	395
$15,000-$24,999	803
$25,000-$34,000	635
$35,000-$49,999	813
$50,000-$74,999	1,176
$75,000-$99,999	905
$100,000-$199,000	132
$200,00 or more	61
Mean Household Income	**$57,108**

The following table groups by age in Pennington County who earn incomes below the state poverty line. It is estimated that 10.6% of the population of Pennington County lives below the poverty line.

Table 29: Pennington County Poverty

Subject	American Community Survey Data
All ages below poverty	1,441 (10.6%)
Under 18 years	384 (11.7%)
65 and older below poverty	239 (11.8%)

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

3.4.4 Employment Status

Table 30 illustrates the Employment Status in Pennington County. Notably, the unemployment rate of 5.5% in Pennington County is lower than the national average of 6.9%.

Table 30: Employment Status in Pennington County Estimates from 2008-2012

Employment Status	Total Number of People
Civilian Labor Force 16 years and under	7,818
Employed	7,405
Male Employed	3,836
Female Employed	3,569
Unemployed	413
Male Unemployed	292
Female Unemployed	121

Source: U.S. Census Bureau

3.4.5 Occupation

Table 31 shows the majority of people in Pennington County are employed within Management, Business, Science and Arts or Sales and Office positions, in fact, more than 50% of the population hold such positions.

Table 31: Occupations in Pennington County (estimates from 2008-2012)

Occupation Type	Number of People
Management, Business, Science and Arts	2,161
Service	1,086
Sales and Office	2,325
Natural Resources, Construction and Maintenance	538
Production, Transportation, and Material Moving	1,376

3.4.6 Faith Based Community

In Pennington County, the faith-based community is strong with nearly 75% of the population participating in their religion of choice. The county is predominantly Lutheran, with Catholicism ranking a distant second.

Many churches offer services which can supplement the plans and recovery efforts of a community. Faith-based communities have had a long history of providing a communication and reaction conduit for those expressing an interest in disseminating information.

Table 32: Religious Bodies

Religious Bodies	Congregations	Adherents	Adherence Rate
Assemblies of God	1	80	0.8%
Associations of Free Lutheran Congregations	4	538	5.2%
Baptist General Conference	1	128	1.2%
Catholic Church	2	3,014	29%
Evangelical Covenant Church	1	157	1.5%
Evangelical Free Church of America	1	238	3.8%

Religious Bodies	Congregations	Adherents	Adherence Rate
Evangelical Lutheran Church in America	11	5,695	54.8%
Seventh-Day Adventist Church	2	175	1.7%
United Methodist Church	1	313	3%
Other	2	16	0.2%
Total	26	10,399	

3.4.7 Farm Profile

Table 33 outlines the farm profile for Pennington County as well as the changes from 2007 to 2012. The number of farms and land used for farming has decreased. This is critical due to the importance of the agricultural industry to Pennington County.

Table 33: Pennington County Farm Profile

	2012	2007	Percent Change
Number of Farms	515	630	-18
Land in Farms (acres)	271,737	325,292	-16
Size of Farm	528	516	+2

Source: U.S. Census of Agriculture

3.4.8 Economic Trends for the Region

Current economic trends for the region (Kittson, Marshall, Norman, Polk, Pennington, Red Lake and Roseau Counties) are as follows:

1. Aspects of agriculture have plummeted in recent years. Counties in the region with the greatest population loss are often the most agriculturally dependent. Declining population is a critical issue in many counties.
2. Employment in the region has increased since 1990, but growth is not even. The gain is not enough to prevent population loss. Large losses in employment are seen in the agricultural sector and among those who are self-employment.
3. Recent growth in the service and retail portions of the workforce is related to outside visitors coming to the region and surrounding areas for recreational purposes.
4. Agricultural lands and natural areas make up a majority of the landscape in the region. This environment appeals to the rural population.

3.4.9 Economic Conditions

Table 34 indicates the most common industries in Pennington County with a breakdown by gender.

Table 34: Industry by Gender

Industry	Percent Male	Percent Female
Transportation Equipment	13	7
Construction	9	--
Agriculture, Forestry, Fishing and Hunting	8	--

Industry	Percent Male	Percent Female
No Educational Services	7	13
Accommodations and Food Service	4	10
Public Administration	4	4
Repair and Maintenance	3	--
Healthcare	--	16
Radio, TV and Computer Stores	--	8
Social Assistance	--	6

3.4.10 Commercial Trends

The total number of manufacturers in Pennington County has fluctuated over the past 17 years. The following table illustrates the trends in manufacturing in Pennington County. There has been a decrease in the number of manufacturing establishments, as well as the number of firms and wholesale trade establishments.

Table 35: Manufactures in Pennington County

Year	1997	2002	2007
Total Number of Establishments	16	24	20
Retail Trade: General Merchandise Stores	4	4	5
Total Number of Firms	Unknown	1,189	1,005
Wholesale Trade Total	19	21	--

3.4.11 Crime

The following table outlines type of crime by number in Pennington County in 2008.

Table 36: Known Crimes in 2008 in Pennington County

Type of Crime	Number of Known Crimes
Violent Crimes	12
Murders	0
Rapes	0
Robberies	2
Aggravated Assault	10
Property Crimes	267
Motor Vehicle Theft	15

3.5 Critical Infrastructure

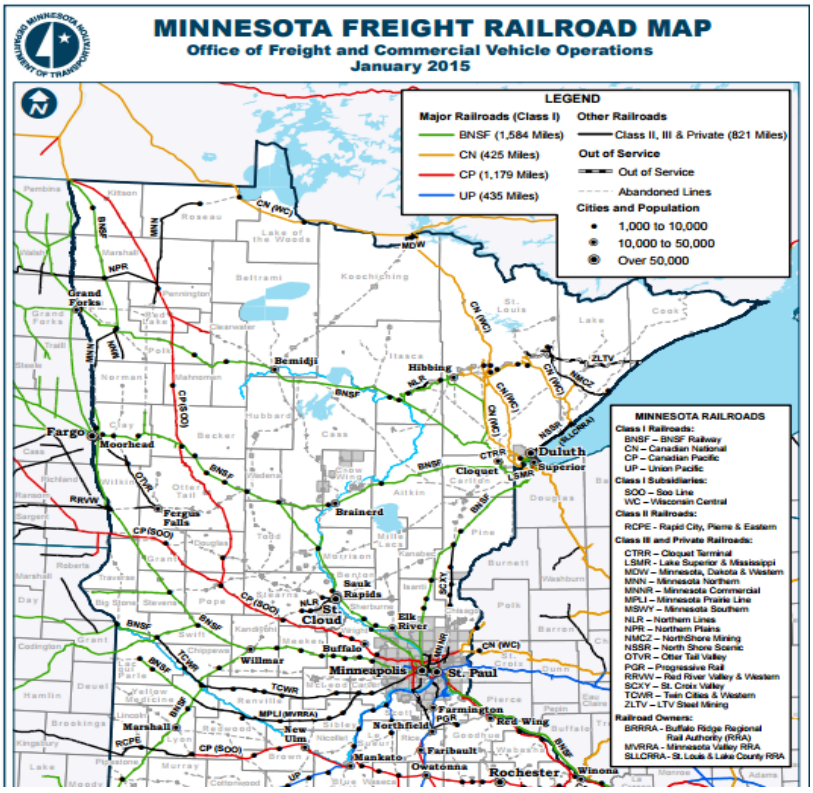
The critical infrastructure within a county are the assets, systems, and networks, whether physical or virtual, so vital to the county that their incapacitation or destruction would have a debilitating effect on the county. The county's infrastructure and facilities are important for its normal functioning and the health, safety, and general welfare of its residents. This section identifies Pennington County's important critical infrastructure and facilities, including subsections on transportation, and key resources.

3.5.1 Freight Rail

The Minnesota Northern Railroad (MNNH) services Pennington County. This company has 241 miles of railroad running through Minnesota. The railway enters near Thief River Falls and exits near St. Hilaire, connecting the two towns. The line hauls mainly agriculture-related commodities, but various other items are carried such as chemicals, clay, glass, and stone.

The Canadian Pacific Railway (CPR) also runs though Pennington County. This railway also runs through Thief River Falls, but continues its journey in a southeastern direction, heading towards the town of Plummer in Red Lake County. The Canadian Pacific Railway runs across 14,000 miles of land, connecting many cities in the U.S. and Canada. Products of many industries are delivered by CPR. The main commodities include grain, lumber, cars, coal, food, potash, and furniture. Railroads are important to Pennington County because they connect products produced in the region to other markets while at the same time providing valuable commodities to an area that might not receive them otherwise.

Figure 6: Minnesota Freight Railroad Map



3.5.2 Air Transportation

The Thief River Falls regional airport is the main airport in the county, as well as the only instrument controlled airport in NW Minnesota. It is located three miles south of Thief River Falls, Minnesota. It consists of two asphalt runways, one 6,503 feet in length by 150 feet in width that is lit from dusk to dawn and another cross-wind runway that is 5,000 feet long. There are twenty-eight aircraft based on this field, mostly single-engine airplanes, but there are a couple of multi-engine airplanes and ultra-light aircraft. On average, this airport sees 102 planes a day. Fifty-four percent of the total planes are local aviation, forty percent are transient aviation, and the remainder consist of air carriers, commuters, and military.

The Willis Airport is a private airport located four miles northeast of Thief River Falls. It consists of one turf runway 3,500 feet long by one hundred feet wide. Permission is required before landing. This airport is closed during the winter months due to no snow removal.

The Swanson Private Airport is located three miles southeast of Goodridge, Minnesota. It is a private airport; permission is required before landing. It consists of a turf runway 2,500 feet long by seventy feet wide. Two single engine aircraft are based at this field.

3.5.3 Pipelines

The energy transportation network of the United States consists of over 2.5 million miles of pipelines. That's enough to circle the earth about 100 times. These pipelines are operated by approximately 3,000 companies, large and small. Based on data generated from annual reports to PHMSA from pipeline operators, the network includes approximately:

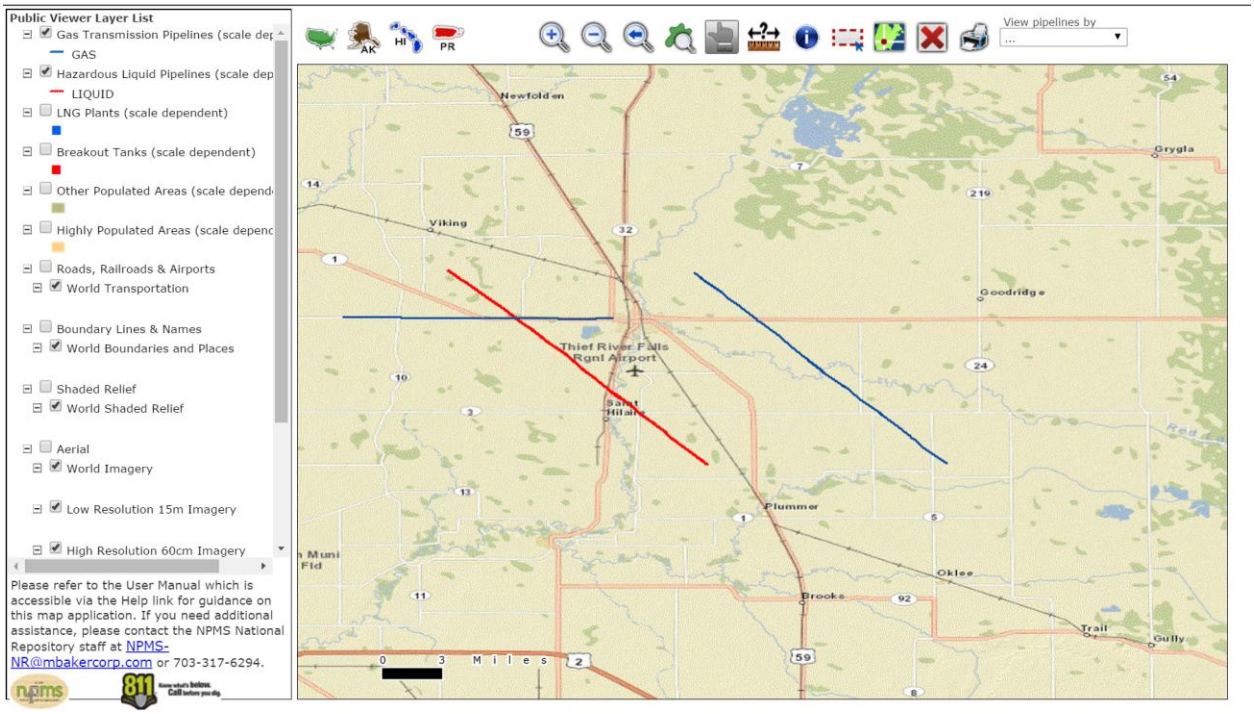
- 175,000 miles of onshore and offshore Hazardous Liquid pipeline;
- 321,000 miles of onshore and offshore Gas Transmission and Gathering pipelines;
- 2,066,000 miles of Gas Distribution mains and service pipelines;
- 114 active LNG Plants connected to our gas transmission and distribution systems; and
- Propane Distribution System pipelines.

Although pipelines exist in all fifty states, most of us are unaware that this vast network even exists. This is due to the strong safety record of pipelines and the fact that most of them are located underground. Installing pipelines underground protect them from damage and helps protect our communities as well.

Most hazardous liquid and gas transmission pipelines are located underground in rights-of-way (ROW). A ROW consists of consecutive property easements acquired by, or granted to, the pipeline company. The ROW provides sufficient space to perform pipeline maintenance and inspections, as well as a clear zone where encroachments can be monitored and prevented.

Figure 7 shows that in Pennington County, there are three pipeline sites. Two of which are gas transmission pipelines and the other one is a hazardous liquid pipeline.

Figure 7: Pipeline Map for Pennington County



Pipelines depicted on this map represent gas transmission and hazardous liquid lines only. Gas gathering and gas distribution systems are not represented.

Pipeline operators are required to post brightly-colored markers along their ROW to indicate the presence of – but not necessarily the *exact* location of – their underground pipelines. Markers come in a variety of shapes and sizes. They contain information about the nearby pipeline as well as emergency contact information for the company that operates it.

Gas distribution systems consist of distribution main lines and service lines. Distribution main lines are generally installed in underground utility easements alongside streets and highways. Distribution service lines run from the distribution main line into homes or businesses. Distribution main and service lines are not generally indicated by above-ground markers.

Pipelines play a vital role in our daily lives. Cooking and cleaning, the daily commute, air travel and the heating of homes and businesses are all made possible by the readily available fuels delivered through pipelines.

These routine activities really add up, in terms of energy use. Natural gas provides for fully 24% of our country's total *energy consumption*, and petroleum provides for another 39%.
Because such huge volumes of hazardous liquids and gas must be transported, the only feasible way to do so is through pipelines. Pipelines do not crowd our highways and waterways as trucks and barges would,

nor do they contribute to traffic congestion or highway accidents. (U.S. Department of Transportation)

3.5.4 Solid Waste Facilities

There are 2 solid waste facilities in Pennington County. There is one landfill facility which collects and stores waste for the region and a household hazardous waste collection site.

Mar/Kit Sanitary Landfill

The Mar/Kit Sanitary Landfill is a landfill located near Hallock, Minnesota. The landfill is operated as a regional collection facility. The landfill generally services Kittson and Marshall Counties, however waste is also received from the Minnesota counties of Koochiching, Lake of the Woods, Pennington, Red Lake, Roseau, the Red Lake Indian Reservation, and the northeast counties of North Dakota, including parts of Cavalier, Pembina, Ramsey, and Walsh Counties.

Household Hazardous Waste Collection Site

Minnesota's program for household hazardous waste (HHW) is a partnership involving the Minnesota Pollution Control Agency and the counties. Together they provide education about HHW use, storage, and disposal, as well as maintain a network of regional, local and mobile facilities to collect household hazardous waste statewide. In addition, many counties offer temporary collection sites, including one-day events. The only household hazardous waste (HHW) collection site for Pennington County is located at 1345 Barzen Ave S. Thief River Falls, MN.

3.5.5 Transportation Systems

The primary purpose of any transportation system is to move goods and people both safely and efficiently. An efficient and balanced transportation system includes highways, railroads, mass transit, and aeronautics. While the most influential mode of transportation is the automobile, the other types of transportation play an important role in the overall network.

Pennington County's transportation system is made up of the township, county, and state roads, railways, airports, trails, and public transportation. Through these pathways come materials and services needed to sustain the area. Agriculture, businesses, tourism, government, and residents are all dependent on the transportation system.

3.5.6 Transit

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

School buses are used by schools in Pennington County, aid both rural and municipal children in getting to and from school.

The Tri-Valley Opportunity Council (TVOC) is a private, non-profit organization with a goal to help many individuals through several diverse programs. Its motto pledges to improve life for people and communities. One of the programs that TVOC runs is the Tri-Valley Heartland Express Bus or THE Bus. All community members are invited to ride and the fare is kept as low as possible. Destinations can include towns and cities in Norman, Red Lake, Polk, Pennington, and Marshall County.

3.5.7 Roadways

The state of Minnesota has 132,250 miles of road within the state. 116,232 miles are classified as rural and 16,018 are classified as urban. Roads can be categorized into state, county, township or municipal types. Table 37 outlines all the roadways in Pennington County and the number of miles per roadway within the County limits.

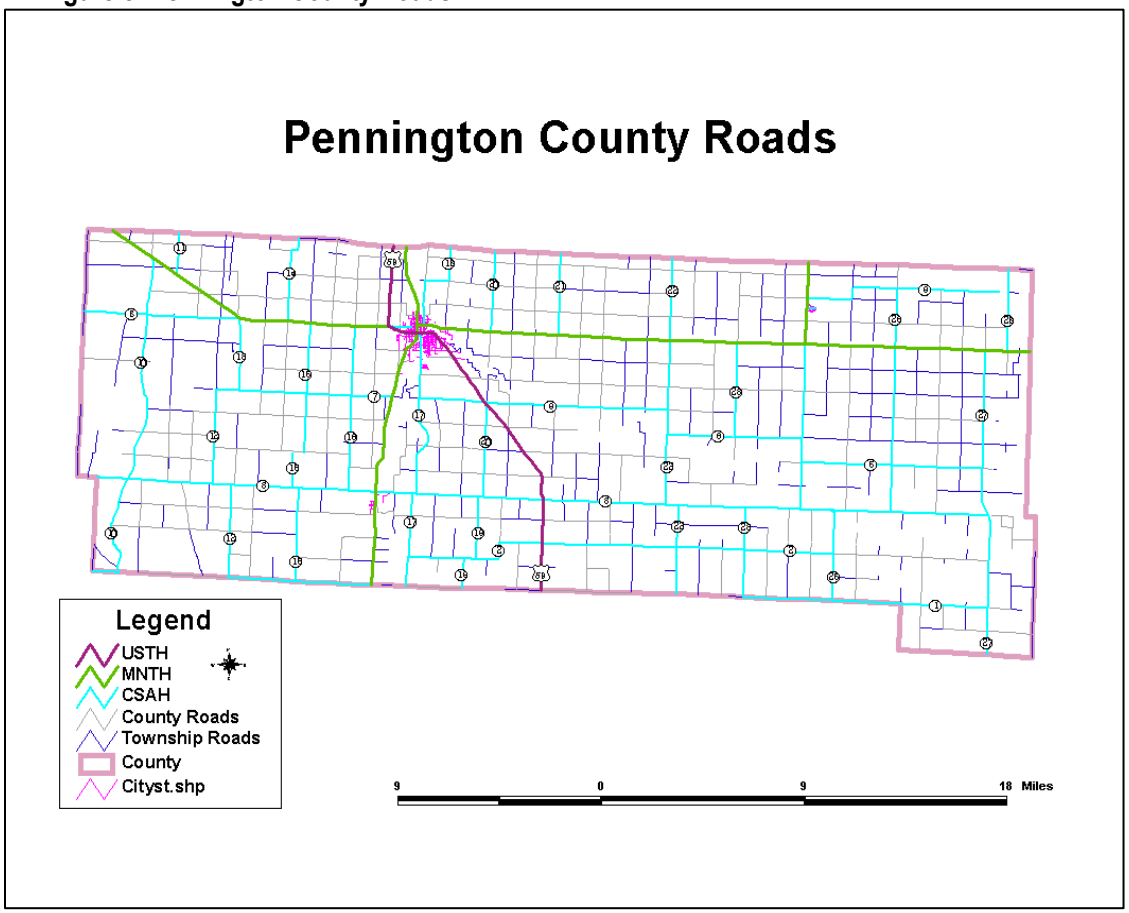
Table 37: Pennington County Roadways

COUNTY	ROADWAY	MILES
PENNINGTON	USTH	17
PENNINGTON	MNTH	60
PENNINGTON	CSAH	256
PENNINGTON	MUN. STATE AID	14
PENNINGTON	COUNTY	388
PENNINGTON	TOWNSHIP	355
PENNINGTON	CITY STREETS	48
COUNTY TOTAL		1,138

The Minnesota Department of Transportation is responsible for the Minnesota Trunk Highway Systems (MNTH) and the United States Trunk Highway System (USTH). The County State Aid Highway (CSAH) and the county roads are the responsibility of Pennington County. All remaining roadways are the responsibility of the township or city that they are located in. Small roadways can cause problems for emergency vehicles. A small country lane that is aesthetically pleasing may cause trouble because a fire truck or ambulance might not be able to access the road.

Pennington County has a highway department whose mission is to construct and maintain a system of highways and bridges while facilitating the safe and efficient movement of people and goods throughout the county. Pennington County Highway Department is responsible for the survey, design, construction, inspection, maintenance, and repair of the Pennington County road and bridge systems which consist of 258.35 County State Aid Highway miles, 1.69 County State Aid Municipal miles, and 397.17 County Road miles. This department is also responsible for the county's signage, which includes all highway regulatory safety and informational signing.

Figure 8: Pennington County Roads



3.5.8 Bridges

There are three bridges in Pennington County. The average daily traffic is 33,979 vehicles on these bridges. The table below shows the statistics reported for Pennington County by The National Bridge Inventory (NBI).

Table 38: Bridges in Pennington County

Bridges in Pennington County	Totals
Number of Bridges	3
Total Length	24 meters (79feet)
Total Average Daily Traffic	33, 979
Total Average Daily Truck Traffic	1,681

For more information: http://www.city-data.com/city/Thief-River-FallsMinnesota.html#ixzz 34qxdjBSa

3.5.9 Highways

The current highway network in Pennington County was built in response to an ever- increasing public demand for improved mobility. The local units of government and MN/DOT are responsible for ensuring that the highway system operates properly and that the roads owned by the different levels of government are integrated into the overall highway system. Pennington County is well served by an extensive roadway network which connects the county with the rest of the region and the state.

The Functional Classification System is a method used to describe the main function each road performs

in the highway network. It is essentially a hierarchy of roads using criteria that describe the function that a particular road performs in a highway network, typically access and mobility. There is general agreement that the responsibility for the most important roads should be assigned to the highest level of government. In this fashion, the greatest resources for road maintenance and construction are devoted to the most heavily traveled roads. It follows that less traveled roads become the responsibility of local levels of government. Definitions for each of the road types in the Functional Classification System are provided below:

- **Principal Arterial –** These highways provide an integrated network of routes, which carry the highest traffic volumes, serve the longest trip movements, and provide for statewide or interstate travel. They serve all major urbanized areas and population centers. Principal arterial routes provide for through movement with minimum interference.

- **Minor Arterial –** These highways link cities, larger towns, and other major traffic generators, such as major resort areas, to each other and to principal arterial routes. They form an integrated network which provides for movement within the state and between counties.

- **Major Collectors –** These routes provide service to the county seat and to the larger cities not served by principal or minor arterials. They predominately serve trips within the county and link locally important traffic generators with their service areas and other nearby larger cities with higher order routes.

- **Minor Collectors –** These routes link smaller cities and locally important traffic generators and provide developed areas with reasonable access to a higher functioning roadway.

- **Local Roads –** The rural local roads primarily service relatively low traffic volumes and short distance trips.

A breakdown of the functional class mileage from the Minnesota Department of Transportation can be found in Table 39.

Table 39: Functional Class Mileage for Pennington County, MN

Route System: Code, Abbreviation, and Name	Functional Class: Code and Name	2011 Centerline Mileage	2011 Lane Mileage
02 - USTH U.S. TRUNK	02 - PRNCPL ART - OTHER RURAL	11.430	22.860
02 - USTH U.S. TRUNK	06 - MINOR ARTERIAL - RURAL	3.417	6.834
02 - USTH U.S. TRUNK	14 - OTHER PRNCPL ART URBAN	1.992	4.818
03 - MNTH MINNESOTA TRUNK	02 - PRNCPL ART - OTHER RURAL	2.899	5.798
03 - MNTH MINNESOTA TRUNK	06 - MINOR ARTERIAL - RURAL	41.817	83.634
03 - MNTH MINNESOTA TRUNK	07 - MAJOR COLLECTOR - RURAL	9.955	19.910
03 - MNTH MINNESOTA TRUNK	14 - OTHER PRNCPL ART URBAN	5.743	11.486
04 - CSAH COUNTY STATE AID	06 - MINOR ARTERIAL - RURAL	44.804	89.608
04 - CSAH COUNTY STATE AID	07 - MAJOR COLLECTOR - RURAL	91.748	183.496
04 - CSAH COUNTY STATE AID	08 - MINOR COLLECTOR	93.980	187.960

Route System: Code, Abbreviation, and Name	Functional Class: Code and Name	2011 Centerline Mileage	2011 Lane Mileage
04 - CSAH COUNTY STATE AID	09 - LOCAL	27.220	54.440
04 - CSAH COUNTY STATE AID	16 - MINOR ARTERIALS - URBAN	1.269	2.538
05 - MSAS MUNIC. STATE AID	16 - MINOR ARTERIALS - URBAN	3.585	7.170
05 - MSAS MUNIC. STATE AID	17 - COLLECTOR - URBAN	7.451	14.902
05 - MSAS MUNIC. STATE AID	19 - LOCAL - URBAN	4.364	8.728
07 - CNTY COUNTY	06 - MINOR ARTERIAL - RURAL	0.156	0.312
07 - CNTY COUNTY	09 - LOCAL	382.542	765.084
07 - CNTY COUNTY	16 - MINOR ARTERIALS - URBAN	0.854	1.708
07 - CNTY COUNTY	19 - LOCAL - URBAN	0.390	0.780
08 - TWNS TOWNSHIP	07 - MAJOR COLLECTOR - RURAL	0.777	1.554
08 - TWNS TOWNSHIP	09 - LOCAL	306.286	612.572
08 - TWNS TOWNSHIP	19 - LOCAL - URBAN	0.135	0.270
10 - MUN MUNICIPAL STREETS	09 - LOCAL	6.167	12.334
10 - MUN MUNICIPAL STREETS	16 - MINOR ARTERIALS - URBAN	0.640	1.280
10 - MUN MUNICIPAL STREETS	17 - COLLECTOR - URBAN	0.540	1.080
10 - MUN MUNICIPAL STREETS	19 - LOCAL - URBAN	46.282	92.564

In order to protect the integrity and prolong the lifespan of the roads, weight restrictions are imposed on the paved roads in Pennington County. Spring weight restrictions are intended to restrict weights on roads when they are most vulnerable to damage (spring is a critical period for roads because the soils and aggregate materials are weak as the frost leaves the road). By state law, all county and township roads are automatically reduced to five-ton per-axle weight limit, unless posted otherwise, at the same time as spring road restrictions are placed on state highways.

3.5.10 Water Control Structures

Table 40 lists the 1 water control structure that has been classified as dams by the DNR, and has been assigned a hazard potential. A dam's hazard potential is rated 1 to 3; the lower the rating a dam receives, the higher the risk for structural, economic, and human life loss if it were to fail. According to the Table, the only dam in the County has been classified as having a hazard potential rating of 3, the safest rating.

Table 40: Pennington County Dam

DNR ID	Name	Section	Township	Range	Hazard Potential
MN00502	Thief River Falls	33	154N	43W	3

3.5.11 Water/Wastewater Treatment

The Saint Hilaire Wastewater Treatment Facility, constructed in 1939 is a municipal sanitary sewer system plant. The plant's drainage basin is Red Lake and the final disposal is on the Red Lake River. It has the following treatment units: comminutor, primary settling tank, low rate trickling filter, chlorination, digester, and open sludge bed.

3.5.12 Water Pollution Control Revolving Fund

The Federal Clean Water Act authorizes a Clean Water State Revolving Fund program, to provide funds to finance water pollution control projects. Under the Act, the U.S. Environmental Protection Agency (EPA) awards annual capitalization grants to each state to capitalize a State Revolving Fund (SRF), which the State can then use to provide loans for both point source (wastewater) and nonpoint source water pollution control projects. As part of its capitalization grant application, each State must annually prepare an Intended Use Plan (IUP) that describes the intended use of the available funds.

The Minnesota Legislature has established the Water Pollution Control Revolving Fund under Minn. Statutes Section 446A.07 to receive the Federal capitalization grants and State matching funds. The Minnesota Public Facilities Authority is responsible for managing the funds and its assets. The Authority is also responsible for the financial administration of the point source (wastewater) loan program, including reviewing applicants and setting the rates, terms and conditions of the loans.

The Minnesota Pollution Control Agency (MPCA) is responsible for preparing the annual IUP and for setting wastewater project priorities and reviewing wastewater projects to ensure they meet technical and environmental requirements. Nonpoint source loan programs are administered by the MPCA, the Minnesota Department of Agriculture and the Minnesota Department of Trade and Economic Development.

The 2002 IUP identifies projects and activities that are expected to be funded through the Water Pollution Control Revolving Fund in 2002. In Pennington County, the city of St. Hilaire requested the "Intent to Reissue NPDES/SDS Permit to St. Hilaire Wastewater Treatment Facility, St. Hilaire" in 2013.
Sources: The Minnesota Department of Natural Resources and the Division of Waters Minnesota Pollution Control Agency

3.5.13 Public Water Accesses

The Minnesota Department of Natural Resources (DNR), through its Public Water Access Program, manages over 1,500 trailers and carry-in boat accesses on Minnesota's lakes and rivers. These accesses usually remain open 24 hours a day unless posted and are patrolled by conservation officers. There is no fee for their use. However, accesses located within a State Park require a daily or annual State Park sticker. The Public Water Access Program also provides other water access amenities such as fishing piers and shore fishing sites for those who may not have a boat. Fishing piers and shoreline enhancements are barrier free and are generally operated and maintained by local units of government.

The goal of the Public Water Access Program is to provide free access to Minnesota's lakes and rivers. The program strives to meet the increasing demand on the state's water resources for all boating activities. The Public Water Access Program works year round on acquisition, development, and maintenance of water access sites. Funds to provide public accesses are derived through boat license fees and a portion of gas tax revenues attributed to motorboats. In addition, funding is periodically provided through the Legislative Commission on Minnesota Resources (LCMR) and the State Bonding Program.

Table 41 provides information on the 11 public water accesses that are located in Pennington County, as well as fishing piers within the County.

Table 41: Public Water Accesses

Type of Access	Location
Boat	SE of the 8th Street Bridge
Boat	NE of the 3rd Street bridge
Canoe Only	SE of the power dam on the Red h River
Fishing Pier/Platform	Confluence of the Thief and Red Lake Rivers
Fishing Pier/Platform	Below power dam on the Red Lake River
Highlanding bridge	Red Lake River
Neptune bridge	Red Lake River
Kratka bridge	Red Lake River
St. Hilaire	Red Lake River
River Valley bridge	Red Lake River
Smiley Bridge	Red Lake River

Source: Pennington County 2010-2020 Comprehensive Local Water Management Plan

3.5.14 Emergency Services

Fire Services

Thief River Falls, Goodridge, and St. Hilaire all have a fire department that protect specified areas from a fire hazard. While each department has a specific zone that they are responsible for, they additionally have mutual aid agreements with the other departments in the event that there is a large fire. The majority of the firefighters are volunteer, but the Thief River Falls Fire Department has seven full-time firefighters.

Police Services

Pennington County has a Sheriff's Department, State Patrol, Police Department, and Law Enforcement Centers, which are all located in Thief River Falls.

Ambulance Services

Pennington County residents have access to ambulance services through Thief River Falls Ambulance Service.

Emergency Operations Center

The Emergency Operations Center (EOC) is located at the Pennington County Law Enforcement Center in Thief River Falls. The government of Pennington County maintains emergency support services during any emergency. It can be partially or fully activated depending on the severity of the hazard.

The warning point for Pennington County is located at the sheriff's office in Thief River Falls. The warning point supervisor is the Pennington County Sheriff who is responsible for notifying people upon receiving an emergency notification. People notified include those living in affected cities, people in private/public facilities, and rural residents. The warning point also is responsible for notifying the Emergency Broadcast System. The municipal warning points are responsible for activating the outdoor sirens.

Emergency Notification System

Pennington County has a community notification system called Code Red. Citizens of the county enroll online and the Code Red system notifies them in the event of an emergency situation or critical community alert. Examples include evacuation notices, bio-terrorism alerts, boil water notices, and missing child reports.

3.5.15 Power Facilities

The Northern Municipal Power Agency was founded in 1976 and is the energy supplier for 12 municipal utilities in eastern North Dakota and northwestern Minnesota. Each of the participants has a representative on the NMPA board of directors. The Agency owns a 30 percent share of the 427,000-kilowatt Coyote Station located near Beulah in western North Dakota. NMPA headquarters is located in Thief River Falls, MN.

Minnkota Power Co-op also supplies energy to the residents in Pennington County. This power agency owns and operates two wind turbines

Minnesota has two nuclear power plants. These power plants are not located in Pennington County or any of the surrounding counties. Although a nuclear release event from these plants would affect Pennington County, it is not a hazard that is directly dealt with in this plan. The Pennington County EOP has a detailed section about what to do in the event of a nuclear or radiologic exposure.

Due to homeland security concerns individual plants and substations are detailed nor mapped in this plan. Please see the emergency management staff for more information about this topic.

3.5.16 Energy Sector

The Minnesota State Energy Sector Partnership was created in 2009 by the Governor's Workforce Development Council and is a statewide initiative to forge an integrated and demand-driven system of education, training, and support services in energy efficiency, and renewable energy industries. MSESP is funded by a three-year, $6 million U.S. Department of Labor grant.

The following table outlines the most common heating fuel for houses and condos in Pennington County.

Table 42: Heating Fuel for Households in Pennington County

Type of Fuel	Percentage
Utility Gas	43.5%
Electricity	28.9%
Bottle, Tank or LP Gas	12.2%
Fuel oil, kerosene, etc.	11.2%
Wood	4.1%

Read more: http://www.city-data.com/county/Pennington_County-MN.html#ixzz3685Miy8N

Telecommunication

A NOAA tower in Thief River Falls provides coverage to the whole of Pennington County as well as neighboring counties. The issue now becomes getting the public to buy a NOAA weather alert radio.

The media broadcasts severe weather alerts for the county, as well as the surrounding area. By using

multiple media sources, Pennington County ensures that the maximum amount of people are warned about the upcoming severe weather.

Television Stations:

Local cable channel in Thief River Falls

Radio Stations:

KKAQ (1460 AM) Thief River Falls
KKDQ (99.3 FM) Thief River Falls
KSRQ (90.1 FM) Thief River Falls
KTRF Thief River Falls

3.5.17 Healthcare

The only medical centers are located in Pennington County are in Thief River Falls. The Pennington County's lone hospital, Sanford Thief River Falls Medical Center, is located in Thief River Falls. There is an emergency room as part of the Sanford Medical Center in Thief River Falls. Residents are also served by Sanford Thief River Falls Behavioral Health Hospital, along with the Sanford Clinic and Behavioral Health Outpatient Clinic which are both located in Thief River Falls.

Public Health for the County

Public health for Pennington County is managed by Inter-County Nursing, which has an office in Thief River Falls, as well as an office in the courthouse in Red Lake County. Several focuses exist, including programs that make necessary medical and personal care available to elderly, disabled, ill or convalescing individuals in their own homes, outreach to mothers and children, immunizations, and programs that promote community health and education.

3.5.18 Schools

There are two school districts that provide knowledge to the residents of Pennington County: Goodridge school district #561 and Thief River Falls school district #564. There is also the Region 1 & 2 Northwest Service Co-op and a school from the Crookston Diocese. In addition, there is a public alternative school serving students aged 16-20. These schools provide education to community members that are enrolled in kindergarten through twelfth grade.

Table 43: Schools in Pennington County

Name of School	District #	Grades	Type
Northwest Area Learning Center	564	Ages 16-20	Public-Alternative
Reg. 1 & 2 NW Service Co-op		K - 12	Public
Goodridge Secondary School	561	7 - 12	Public
Goodridge Elementary School	561	K - 6	Public
Lincoln High School	564	9 - 12	Public
Franklin Middle School	564	4 - 8	Public
St. Bernard's School (Thief River Falls)	C. Diocese	K - 6	Catholic
Challenger Elementary School	564	K - 6	Public

According to the Economic Development Authority, Minnesota ranks second in the nation with a high school graduation rate of 89.1%, the national average is 71.1%. This might be due to the fact that Minnesota has an open enrollment policy that lets children go to school in a district that they do not live in.

College Students

Northland Community & Technical College is located in Thief River Falls. It is the county's only post-secondary educational institution. Northland College is a community and technical college focused on getting students ready for entry-level employment in two years or less. A degree, diploma or certificate is offered.

Table 44: College Enrollment

Subject	Northland Factbook FY2012
College Enrollment Full-time	3,363
College Enrollment Part-time	5,330

3.5.19 Special Event Area

The Pennington County fair is held every year at the fairgrounds in Thief River Falls. It is managed by a fair board. There is a grandstand upon the property, as well as bathrooms, electricity, and many buildings/barns.

The Ralph Engelstad Arena is in Thief River Falls. This 1 million square foot area cost 11.6 million dollars to build. Most of the money was donated by Ralph Engelstad, a man that was born in Thief River Falls. Some specifics to the arena include training/weight room, eight locker rooms, multiple bathroom and concession facilities, media booths, hall of fame area, official's rooms, coach's rooms, equipment rooms, and a walking track. The Imperial Room in this facility is a 5,100 sq. ft. reception and conference facility that could be utilized as an emergency shelter during hazardous situations. There are 1,000 parking spots on site. Concerts and sports games can be held at this arena, as well as a multitude of other event activities. For more information, please visit http://www.reatrf.com/.

3.5.20 County and State Parks and Natural Areas

Pennington County does not have any state/national parks housed within its borders, but it does have some city parks in most municipal areas.

Natural areas include a number of fens which are located throughout the county. A fen is as a peat-producing wetland with groundwater inflows. Grassy vegetation such as aquatic plants or coarse/sedge type grasses is found growing at the fen. Water partially or totally covers the fen, a kind of transition between land and water. As of December 2003, Pennington County has eighteen seepage and transition fens varying between shrub, calcareous, prairie and sedge subtypes.

Section 4: Risk Assessment

A risk assessment is critical to mitigation and comprehensive emergency management because it allows communities to measure and better understand the potential impact of hazards on their communities. Conducting a risk analysis is a multi-step process. The risk assessment process includes identifying hazards, profiling hazard events, determining how frequent hazards occur, and determining both the type and magnitude of hazard impact. A risk assessment provides the means for emergency managers and community leaders to develop mitigation actions, to prioritize resource needed to address operational activities, and to ultimately help a community become more resilient (Schwab, Eschelbach, and Brower, 2007).

FEMA Requirements Addressed in this Section:

§201.6(c)(2)(i): The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

§201.6(c)(2)(ii): The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008, must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

§201.6(c)(2)(ii)(A): The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

§201.6(c)(2)(ii)(B): An estimate of the potential dollar losses to vulnerable structures identified in this section and a description of the methodology used to prepare the estimate.

§201.6(c)(2)(ii)(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

§201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

4.1 Hazard Profile

The first step in conducting risk analyses is to identify which hazards are the most probable to impact one's community. With regard to Pennington County's mitigation plan update, an all-inclusive list of hazards was considered for inclusion in the plan update. The Hazard Mitigation Planning Team reviewed several sources to include Pennington County's previous hazard mitigation plan, hazards identified by FEMA (Multi-Hazard Identification and Risk Assessment), the Region's Threat Hazard Risk Analysis (THIRA), the Minnesota State Multi-Hazard Mitigation Plan, and mitigation plans of other neighboring counties. In addition to reviewing the region's mitigation plans, the Hazard Mitigation Planning Team analyzed past declared disasters and spoke to local experts and residents.

While this iteration of the plan evaluated a wide variety of hazards, after careful analyses, receiving feedback from the public and approval of the steering committee, it was decided that this update would need some alterations. The following changes were made:

1. The risk assessment process would be updated to better align with the current standards.
2. Flashfloods was incorporated into the hazard of general flooding
3. Flood control structures were reclassified as Dam/Levee failure
4. The hazards of terrorism were eliminated from the plan. Pennington County has other plans in place (such as the THIRA) which serve as the primary planning documents to address non-natural and political hazards.
5. Issues of blizzard, extreme precipitation blizzard, snow storms and ice storms were incorporated into severe winter storms
6. Thunderstorms were eliminated as issues of wind and lightning, both included hazards, accounted for this hazard
7. Earthquake was not profiled as it was decided the frequency and impact of an event on Pennington County and the participating jurisdictions were negligible
8. The hazard of Fires was added to the plan.
9. The hazard of Invasive Species was added to the plan.

Table 45: Summary of Final Hazards Included

Natural Hazards	Natural Hazards	Technological Hazards
Flooding (riverine and flash flood)	Erosion	Hazardous Material Release
Dam / Levee Failure	Land Subsidence	Invasive Species
Wildfire	Drought	Infectious Diseases
Windstorms	Extreme Heat	Fires (Structures and Vehicles)
Tornadoes		Transportation Incidents
Hail		Ground and Surface Water Supply Contamination
Lightning		
Winter Storms		

4.1.1 Risk Assessment Process

At the most fundamental level, both DHS and FEMA recognize that risk is equal to frequency X consequence (R = FC) of a hazard. More specifically, the risk is based on the premise that in order to have a certain level of risk there must be a probability or likelihood of a hazardous event to occur. Likewise, if the event does occur, it must have an impact or consequence. The following section outlines the methodology used to determine Pennington County's risk.

To assess hazards and determine risk, the planning team proposed that a methodology based on probability and impact be utilized. First, each hazard was researched, documented, and assessed for frequency and impact. Then, the hazard frequency and impacts were compiled for all of the individual hazard assessments. Once this data was compiled, the frequency and impact calculations were tabulated to obtain a matrix of risk scores. The risk methodology as highlighted above was presented to the steering committee during the December 10, 2014, steering/planning meeting.

4.1.2 Probability of Future Occurrences

The probability of future occurrences is commonly determined by using the frequency of past events to gauge the likelihood of future occurrences. In the case of Pennington County, the hazard analyses and update was based on the County's historical data, the written record and information provided by citizens of Pennington County, and input from participating jurisdictions. When possible, a 50-year period was used to determine the probability (note, not all hazards report 50 years of data). The data used for all the hazard probabilities can be found in Appendix B.

The method used in the Pennington County's plan for standardizing the scale of probability values was based on the probability as shown below. The metrics for these classifications have been modified to reflect the 50-year reoccurrence interval used for this risk assessment and properly reflect the scale for the probabilities that was analyzed.

Table 46: Frequency/Probability

Frequency/Probability		
Level ID	**Description Index Value**	**Index Value**
Unlikely	Rare with no documented history of occurrences or events. Annual probability of less than 0.001	.5
Possible	Rare occurrences of at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001	1
Likely	Likely occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01	2
Highly Likely	Highly Likely Frequent events with a well-documented history of occurrence. The annual probability that is greater than 0.1.	3

One issue to note is that hazard data is often reported regionally versus being isolated to a single community. When determining risk, regional reporting can present a challenge in that multiple communities are noted as being impacted versus individual cities or counties. For example, NOAA might report that a severe storm affecting the Southcentral part of Pennington County while not directly indicating the city of St Hilaire as being affected. As such, to ensure each jurisdiction (or in the example-St. Hilaire) is accounted for a quadrant system was used.

The quadrant used in the Risk Analyses simply arranged Pennington County and its cities into the regional reporting categories (Central Pennington, Southcentral Pennington, Northcentral Pennington, Northwestern Pennington, Southwestern Pennington, Northeastern Pennington, and Southeastern Pennington). For tabulating hazards frequency, the following Regional Classification Table demonstrates which cities are associated with each jurisdiction.

Table 47: Regional Classification

Regional Classification	
Central	Unincorporated Pennington County
Southcentral	St. Hilaire, Unincorporated Pennington County
Northcentral	Thief River Falls, Unincorporated Pennington County
East central	Unincorporated Pennington County
West central	Unincorporated Pennington County
Northwestern	Unincorporated Pennington County

Regional Classification	
Southwestern	Unincorporated Pennington County
Northeastern	Goodridge, Unincorporated Pennington County
Southeastern	Unincorporated Pennington County

Note: The quadrant system was only used when the Hazard data used regional indications and did not directly indicate a community.

4.1.3 Hazard Impact

When conducting a risk analysis creating a probability of a hazard occurrence is just one of several steps one must take to determine risk. To determine risk one must also take in account both impact assumption and impact magnitude.

Impact assumptions describe how hazards impact the county and or its cities. The specific set of impact assumptions listed below were selected for Pennington County's hazard risk analyses. The listed impact assumptions were chosen as they 1) can be caused by several different hazard events; 2) are mostly independent of each other; 3) each can be (to certain degrees) mitigated; 4) are often cited in the disaster literature (Center Comprehensive Emergency Management Research. 2015). And 5) are commonly used in disaster planning.

Table 78: Impact Assumptions

Impact Assumptions	
Casualties/Trauma	Non-Critical injuries that require medical attention.
Communication, Lack thereof	Disruption of communication including mobile and wired phone, radio, television, and satellite.
Continuity of Government	Disruption of county government normal operations.
Debris	Dry, wet, hazardous, organic or inorganic materials that need to be cleared and properly disposed of.
Emergency Services Disrupted/Limited	Fire, Rescue, and Medical services are either overwhelmed or unable to respond normally.
Evacuation Needs	Hazardous conditions require the evacuation from either a specific site or larger area within the county.
Fatalities	Death due to the hazard.
Hazardous Material Release	Hazard event causes a hazard material release as a secondary hazard.
Overwhelm of First Responders	First responders are overwhelmed or unable to respond.
Mass Care Needs	Hazard event requires emergency sheltering of citizens.
Physical Damage / Asset Destruction	Loss or damage to the built environment.
Power, Disruption/Outages	Inability to supply power to end users or lack of enough power.
Transportation, Disruption/Failure	County roads, sidewalks, and public transit are obstructed or unable to function normally.
Economic Loss	Hazard causes loss or disruption to economic assets.

4.1.4 Impact Magnitudes

Disaster is loosely determined by when a jurisdiction's capacity is exceeded or when the jurisdiction no longer has the capacity to cope with the hazard. To quantify impact assumptions, it is necessary to determine the magnitude that hazard might have on a jurisdiction. The metric for impact magnitude consisted of a number of descriptors that are normally associated with a jurisdiction's capability and

capacity to respond to, mitigate, and or recover from hazed events. A full list of these magnitude ratings is presented in the Impact Magnitude Rating table below.

Table 49: Impact Magnitude Ratings Descriptors

Impact Magnitude Ratings	
Rating	**Descriptors**
0	Hazard has no foreseeable effect specific to the impact assumption (rare).
1	The impact is present but is extremely light having relatively no notable adverse effect on the jurisdiction.
2	The impact has an effect on the Jurisdiction but does not always require next level government intervention.
3	Impact necessitates a county response or deployment of resources, impact disrupts normal/planned community functions.
4	Impact requires EOC operations or other coordinated response efforts.
5	The cost of impact exceeds a threshold of being unusually detrimental or disruptive to the Jurisdiction.
6	The impact is taxing on county's resources and has a widespread effect on the greater community.
7	The impact has an extended response / short-term recovery duration exceeding 36 hours and some long-term recovery needs.
8	Impact exceeds county and municipal response capabilities/capacities.
9	Long-term recovery planning needed, State or Federal resources needed to aid response and recovery from the impact.
10	The impact is so great it disrupts basic county function for an extended period of time and causes secondary hazards.

The final steps in calculating consequence (impact score) is to provide a magnitude of each impact. Once each impact is assigned a magnitude rating, the sums of each impact are added together and divided by 14 (the number of impact assumptions). The maximum impact score for each event could be 10 while the minimal score could be 0.

As noted by the steering committee, the challenge with using this model is to quantify hazard impacts so that they use similar scales and are easily interpreted without inserting bias.

To account for bias, it was decided that once the data was calculated, it would be provided for review and comment by the steering committee, participating jurisdictions, and public. The emergency manager was responsible for informing the public, steering committee and participating jurisdictions that the information was available for review and to provide comment. In instances where the findings provided by the jurisdictions were inconsistent with the written record, the average of the two data sets was used to determine the County's hazard frequencies.

Table 50: Impact Descriptors

Impact		
Level ID	**Description Index Value**	**Index Value**
No Impact	No action required.	0
Low (Less than 3.33)	Minimal action required.	1
Moderate (3.34-7.45)	Action required with present resources.	2
High (7.5-10)	County resources are overloaded and additional help is required.	3

4.2 Risk

This section is a summary of risks and the factors that contributed to the overall risk score for each hazard. Data was derived from Pennington County's past mitigation plan, readily available data (internet searches, disaster database), and records provided by Pennington county and the participating jurisdictions. The individual hazard profiles were the basis that informed the hazard risk analysis process. The probability, impact and risk hazard event data was analyzed for each of the listed hazards and for each of the participating jurisdictions in the county.

To satisfy the risk equation proved earlier (i.e. Risk = Frequency X Consequence), a final risk score for each jurisdiction was generated. The risk was determined by multiplying the probability index number by the hazards consequence index number (i.e. Consequence = Impact Assumption X Impact Magnitude / 14). Risk scores range from 0-9 and are categorized as Little to No Risk (score of 0 to 3.23), Low Risk (score of 3.24 to 5.49), Moderate Risk (score of 5.5 to 7.74) and High Risk (score of 7.5 or higher). The table to the right summarizes the risk-scoring key.

To assist the reader in understanding how risk was determined an example is provided.

EXAMPLE: Over the past 50 years, hazard X occurred 40 times. From this information, it can be determined that this hazard is highly likely to reoccur and is recorded with a probability index score is equal to 3. Additionally, the hazard impact assessment suggests the hazard will have a moderate impact on the jurisdiction (70/14= 5) and as such the hazard's impact index score is equivalent to 2. The hazard risk score is calculated based on the probability (3) multiplied by the impact (2), to give an overall risk score of 6 or Moderate Risk.

It should be noted that because some select hazards were grouped, there might be inflation with regard to probability and impact. For example, severe summer storms include instances of hail, thunderstorms, and severe winds. Thus, the number of events and impact will rise causing the risk to also rise.

Another consideration is this model uses both the written record and record as reported by Pennington County citizens. Therefore, there may be ambiguity with regard to occurrence and impacts provided in written record. Additionally, while some hazard events technically occur outside of the legal boundaries of a jurisdiction, the effect of these hazards are still felt by those living in the jurisdiction. Thus, it is common for participants to note hazards such as wildfire and or invasive species as having an impact on their respective jurisdictions regardless of that hazard technically occurring outside the boundaries of their legal jurisdiction. Finally, one must also consider the influence of perception when assessing a hazard's magnitude. For

Risk Scoring Key	
0 – 3.23	Little To No Risk
3.24 - 5.49	Low Risk
5.5 - 7.74	Moderate Risk
7.75 - 9	High Risk

example, one might say an event was worse or less severe than officially reported. Such as the perception that a severe storm generated an actual tornado; however, in reality, the event generated severe, straight-line winds.

It should be noted that considerations such as these occur in all data analyses. However, such incommodes do not influence the overall purpose of mitigation or diminish the analyses. Matter of fact, It can be argued that including both qualitative and quantitative data has made the model more accurate as it accommodates for risk perceptions and expertise of those living in Pennington County.

4.3 Flood

Flood was identified in the prior hazard mitigation plan from January 2008 for Pennington County and was identified as one of the hazards to be included in Pennington County Hazard Mitigation Plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what flooding is, the history of it within Pennington County and the potential it has to impact residents. A definition of flooding is provided prior to taking a closer look at the effect flooding has on Pennington County in order to provide the reader with a knowledge of the hazard.

Flooding is the accumulation of water within a water body (e.g., stream, river, lake, or reservoir) and the overflow of excess water onto adjacent floodplains. Floodplains are lowlands, adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories (FEMA, 1997). There are a number of categories of floods in the U.S., including the following:

- Riverine flooding, including overflow from a river channel
- Flash Floods
- Fluctuating lake levels
- Coastal flooding on the North Shore of Lake Superior
- Debris flow

While there is no sharp distinction between riverine floods, flash floods, ice jam floods, and dam-break floods, these types of floods are widely recognized and may be helpful in considering the range of flood risk and appropriate responses. The most common type of flooding event is riverine flooding, also known as overbank flooding. Riverine floodplains range from narrow, confined channels in the steep valleys of mountainous and hilly regions, to wide flat areas in plains and coastal regions. The amount of water in the floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land use characteristics. In steep valleys, flooding is usually rapid and deep, but of short duration, while flooding in flat areas is typically slow, relatively shallow, and may last for long periods. The cause of flooding in large rivers is typically prolonged periods of rainfall from weather systems covering large areas. These systems may saturate the ground and overload the rivers and reservoirs in numerous smaller basins that drain into larger rivers. Localized weather systems (i.e., thunderstorms) may cause intense rainfall over smaller areas, leading to flooding in smaller rivers and streams. Annual spring floods, due to the melting of snowpack, may affect both large and small rivers and areas.

A flash flood is defined as a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. (National Weather Service, 2012).

The definition of a flash flood per the Minnesota Climatology Working Group is “the occurrence of 6 inches or more rainfall within a 24 hour period.” The size of a flash flood is measured via area in square miles over which a 4-inch or more rainfall occurs. The rationale for using this criterion is that a rainfall of six inches in a 24-hour period will produce a river flow in equivalent to that in a 100-year return period in Minnesota and that 4-inch and greater rainfall generally leads to reports of increased erosion or other economic damages. Ice jam floods usually occur in the spring and are most likely to occur where the

channel slope naturally decreases, when culverts freeze solid, in reservoir headwaters, near natural channel constructions (e.g., bends and bridges), and along shallows.

4.3.1 Flood Risk in Pennington Count

The overall probability of flooding occurring each year in Pennington County is Highly Likely and its relative impact is Moderate, and thus the overall risk for Pennington County is Moderate. The risk of flooding for each of the cities is different and was determined based upon the specific data collected and outlined in the history section of this hazard profile. In assessing flood data for the 2015 update, data from 2009 to 2014 was used to determine the risk for each of the cities and Pennington County as a whole. Most notable are the cities of St. Hilaire and Thief River Falls because they are at a high risk of flooding due to an extensive history of problematic flooding. The table provided below provides the name of each of the cities in the County, the probability that flooding will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 51: Flood Hazard Risk Assessment

Flood			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Possible**	**Low**	**Little to no**
St. Hilaire	**Highly Likely**	**Moderate**	**Moderate**
Thief River Falls	**Highly Likely**	**Moderate**	**Moderate**
County	**Likely**	**Moderate**	**Moderate**
Total	**Highly Likely**	**Moderate**	**Moderate**

*The probability is based upon data available from 1996-2014

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents little change from the previous plan, as the overall risk was Moderate for the 2015 update. Similarly, the last plan update was done in January 2008 and indicated that flood had the potential to have a substantial impact on Pennington County and a significant threat is posed. This meant that the hazard was found to occur once every 5 years and could have a substantial impact on large areas of Pennington County.

4.3.2 Flood History in Pennington County

Previous Problems

The previous Hazard Mitigation Plan for Pennington County was done in January 2008 and listed some of the problems present in Pennington County, as well as strategies that are used for mitigation. Runoff was listed as a problem in Pennington County. The previous Hazard Mitigation Plan stated that an excess of impermeable surfaces in a small area (paved roads, buildings) can increase runoff in Pennington County. A saturated soil will also increase runoff, as no water is able to be absorbed. Overland flooding was listed as a concern for Goodridge. Ditch 20 in Pennington County is uncontrolled and poses an overland flooding threat to parts of Pennington County.

The following overland flooding problems were listed for Pennington County:

- Thief River Falls has flooding problems in the southeast portion of the city due to County Ditch #1 & Highway 59 drainage. The northwest portion of the city floods due to drainage from County Ditch #70.
- The Red Lake River Subwatershed in the Red Lake Watershed lists agricultural flooding as a high ranking problem.
- Storm water management is a potential issue for Pennington County. The effects of a large rainstorm can be widespread and severe, causing erosion and water quality issues as well as damages to farms, roads, and culverts.
- A heavy rainstorm could affect all of Pennington County.

4.3.3 Major Declared Disasters for Flood

Of the aforementioned floods, there have been two floods in years since the last migitation plan update. Both of these floods have been declared a disaster by FEMA. These disasters were all major declared disasters, which is when the President believes an event has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. The beginning and ending date of the incident are included for these declared disasters, as well as information on the type of assistance program that was provided.

Table 52: Declared Disasters for Flood in Pennington County

IH Program Declared	IA Program Declared	PA Program Declared	HM Program Declared	Declaration Date	Incident Type	Title	Incident Begin Date	Incident End Date	Disaster Close Out Date
No	No	Yes	Yes	4/19/2010	Flood	FLOODING	3/1/2010	4/26/2010	
Yes	No	Yes	Yes	4/9/2009	Severe Storm(s)	SEVERE STORMS AND FLOODING	3/16/2009	5/22/2009	
No	Yes	Yes	Yes	6/14/2002	Severe Storm(s)	SEVERE STORMS, FLOODING, AND TORNADOES	6/9/2002	6/28/2002	4/25/2012
No	No	Yes	Yes	8/26/1999	Severe Ice Storm	SEVERE ICE STORM AND FLOODING	3/1/1999	5/30/1999	4/29/2014
No	Yes	Yes	Yes	4/8/1997	Flood	SEVERE FLOODING, HIGH WINDS,SEVERE STORMS	3/21/1997	5/24/1997	6/7/2010
No	No	Yes	Yes	6/1/1996	Flood	FLOODING AND SEVERE STORMS	3/14/1996	6/17/1996	3/9/2005
No	Yes	Yes	Yes	5/8/1989	Flood	FLOODING	3/29/1989	5/8/1989	3/1/1999
No	Yes	Yes	Yes	4/22/1978	Flood	STORMS, ICE JAMS, SNOWMELT & FLOODING	4/22/1978	4/22/1978	7/6/1984
No	Yes	Yes	Yes	7/17/1975	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING	7/17/1975	7/17/1975	11/6/1981
No	Yes	Yes	Yes	6/10/1974	Flood	HEAVY RAINS &	6/10/1974	6/10/1974	4/18/1977

IH Program Declared	IA Program Declared	PA Program Declared	HM Program Declared	Declaration Date	Incident Type	Title	Incident Begin Date	Incident End Date	Disaster Close Out Date
						FLOODING			
No	Yes	Yes	Yes	7/22/1970	Flood	HEAVY RAINS & FLOODING	7/22/1970	7/22/1970	5/15/1973
No	Yes	Yes	Yes	4/18/1969	Flood	FLOODING	4/18/1969	4/18/1969	4/15/1974
No	Yes	Yes	Yes	3/22/1966	Flood	FLOODING	3/22/1966	3/22/1966	6/5/1969

4.3.4 Mitigation Actions in the Past Five Years in Pennington County

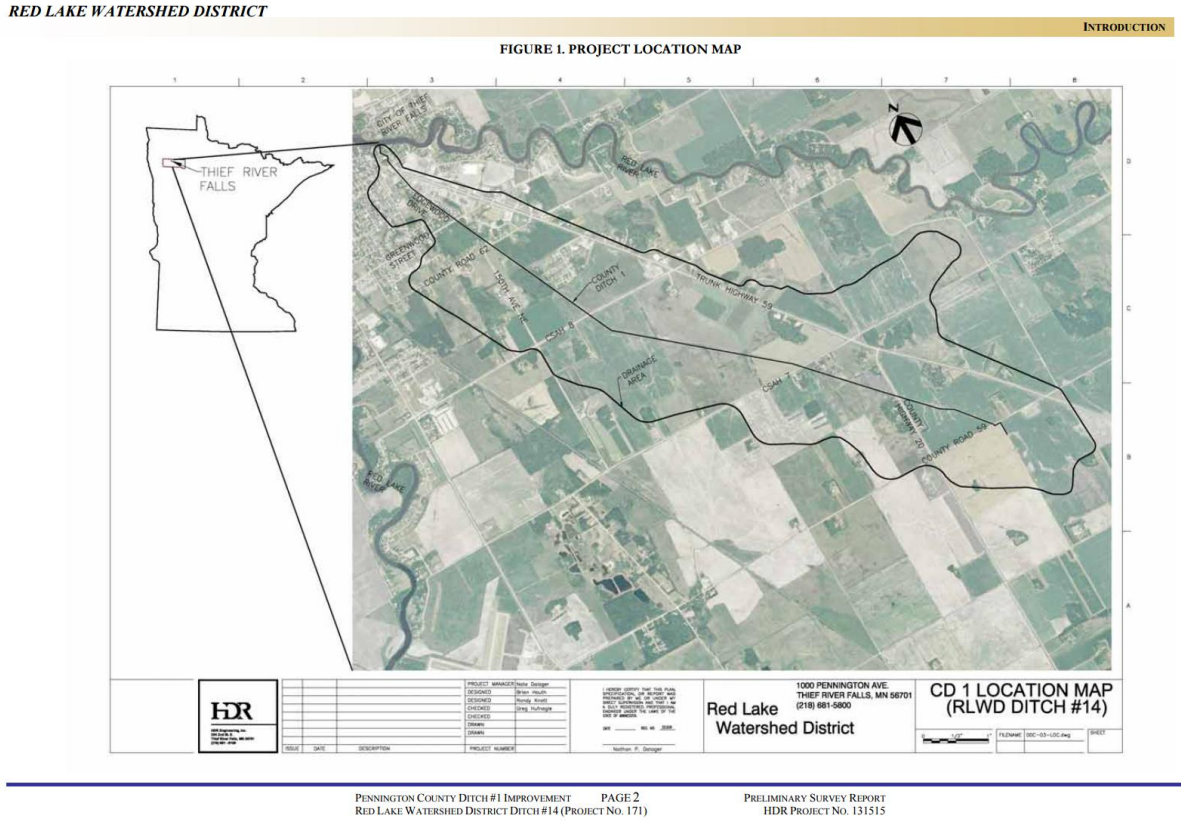
Mitigation actions for flooding from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation actions for flooding were to reduce repetitive damage to roads by protecting roads from flooding and heavy rain. The county also indicated they would prevent agricultural flooding damage by diminishing crop damage from standing water. Another mitigation action was to address flooding damage by identifying at-risk structures, investigating local drainage systems and decreasing flood damage in the 100-year floodplain.

The Red Lake Watershed District 2012 Annual Report was reviewed and the following projects were slated to be completed in the report for Pennington County.

- Arveson Ditch (RLWD Project #109) Mowing of the ditch and its right-of-ways were completed. Spraying for cattails was not needed in this ditch system. With the dry weather the mower was able to mow the bottom of this ditch.
- Challenger Ditch (RLWD Project #122) Mowing of the ditch and its right-of-way was completed in July. The cattails were cleaned out of this ditch system as part of the construction of RLWD Ditch 14 project. A new drop structure, trash rack, and outlet ditch were also added to this ditch system as part of the construction of RLWD Ditch 14.
- RLWD Ditch 13 (RLWD Project #170A) Mowing of the ditch and its right-of-way was completed in late July. There were no cattails in this system and the mower was able to mow the bottom of this system. This ditch system was new in 2011. With no runoff to speak of this spring and with a very good catch of grass, there were no signs of any erosion so no maintenance was needed in this system.

The Thief River Falls Flood Damage Reduction Project and Improvement to Pennington County Ditch #1 report were reviewed as part of the mitigation update process. The Pennington County Ditch #1 (CD 1) has been a source of agricultural and urban flooding problems for years. Since its construction 100 or more years ago, the ditch has routinely flooded out of its banks in spite of cleanouts and culvert replacements. In 2005, the Pennington County Board of Commissioners and Thief River Falls City Council requested that HDR Engineering conducts a drainage study and provide a report of findings. Due to funding limitations and procedural uncertainties relating to Minnesota ditch law, no entity was able to advance the project forward until a landowner petition was received by the Red Lake Watershed District (RLWD) in 2009. A Preliminary

Figure 9: Red Lake Watershed District Project Map



National Flood Insurance Program (NFIP):

While several of the mitigation strategies include elements of the NFIP, the county and participating jurisdictions' participation in the program is considered an action in and of its self. Thus, the following narrative describes the county's participating jurisdictions' involvement and future commitment to the program.

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

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer-funded disaster relief for flood victims and the increasing amount of damage caused by floods. The Federal Emergency Management Agency (FEMA) manages the NFIP and oversees the floodplain management and mapping components of the Program. Nearly 20,000 communities across the United States and its territories participate in the NFIP by adopting and enforcing floodplain management

ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities.

The communities in Pennington County, which participate in the NFIP are the City of St. Hilaire, the City of Thief River Falls, and unincorporated sections of Pennington County. According to the 2014 Minnesota All-Hazard Mitigation Plan, the NFIP policy for Pennington County has 31 policies, a total of $7.5 million in coverage, 17 total claims and have paid $31,521 since 1978.

Pennington County is the official flood map repository for the area and maintains a full, hardcopy set of the most current Flood Insurance Rate Maps and the Flood Insurance Study (FIS). The county also maintains GIS data layers that utilize the current FEMA Special Flood Hazard Area (SFHA) data that can be overlaid on recent aerial photography to better define the extent of the floodplain and its impact on individual properties. Prior to, and during flood events, the county will put flood preparedness information on the county website. That information ranges from reminders to buy flood insurance early (30-day wait to activate), methods of sandbag dike construction, sources of sandbags, suppliers of aggregate materials, and contact numbers for emergency services, relief services (Salvation Army, Red Cross), and other local support agencies.

The Minnesota Extension Service provides information on how to prepare, recover, and clean up from a flood, and how to cope with the physical and mental stress brought on by flooding. Pennington County Environmental Services provides information concerning mold and mildew issues, as well as information concerning how to disinfect wells impacted by floodwaters. In addition, the county GIS Division provides up to date road closure data and other real-time GIS data on the county website and to the MN/DOT and the Minnesota National Guard to assist in flood-fighting efforts.

4.3.5 Vulnerability

Much vulnerability exists in Pennington County concerning flood hazards. Structures and populations that lie within the floodplain in Pennington County are at an increased risk of damage or loss of property because of flooding. Anyone living near a waterway, such as the Red Lake River, is also at an increased risk especially in the springtime when there is the potential for heavy rain and sudden snowmelt. Any properties with improperly maintained flood control structures or property located in low elevations are also at an increased risk.

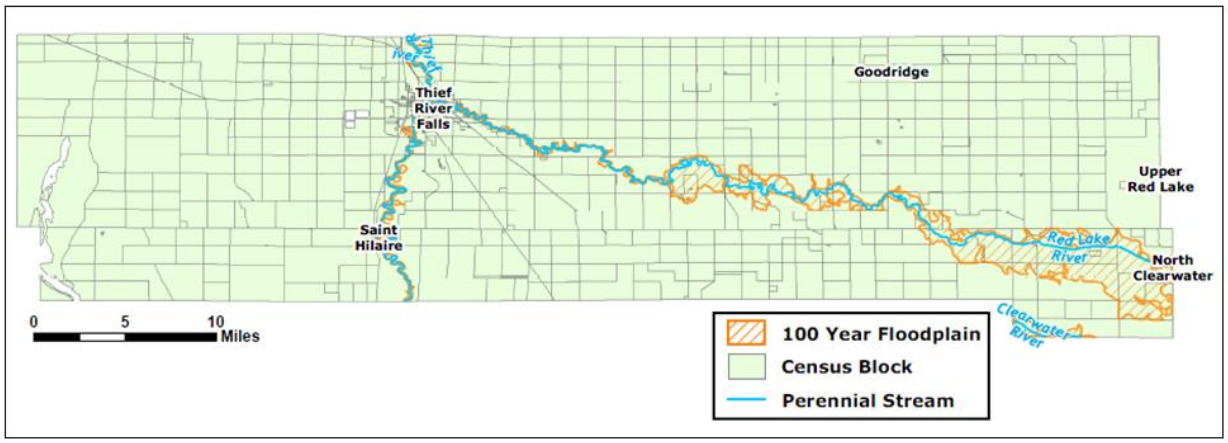
There are two sources of flooding problems in Pennington County. First, the high stage on the Red Lake River overflow onto the gently sloping banks, destroying crops and damaging structures located in the low-lying areas and second is the very tight soil of the old lakebed precludes rapid infiltration of water from rainfall or snowmelt. The local road network acts as a grid of low dams that impede local runoff because of the flat terrain. During heavy rainstorms or rapid snowmelt, ponding occurs behind roadways to such an extent in some areas that it is difficult to determine if the flooding is a result of high stages on the Red Lake River or caused by local runoff.

Pennington County is also susceptible to flooding due to the close proximity of the Red River. Recently the Red River has experienced regular flooding. A few reasons for this phenomena include the propensity of the area to have heavy fall rains and late-season blizzards. In addition, the Red River of the North flows north. The area to which the Red River flows often thaws last, causing water to back-up and flood. Another reason is the area's topography. The land around the Red River is ancient glacial lakebed that is extremely flat. Flood effects from the Red River can be felt for many miles simply for this reason. The flooding of the

Red River and its tributaries have been affecting local societies for centuries.

The following map is the Pennington County HAZUS-MH Analysis 100-year Flood Boundary Map. This map was created by the Polis Center as part of the Flood Analysis for Pennington County as part of the Minnesota Pre-Disaster Mitigation Plan. The flood analysis for Pennington County was released in August 2009 and HAZUS-MH was used to generate the flood depth grid for a 100-year return period.

Figure 10: Pennington County HAZUS-MH Analysis (100-Year Flood) Map



The following information is provided from the Minnesota All Hazard Mitigation Plan from 2014 and outlines the vulnerabilities to Pennington County from flooding.

The Minnesota All Hazard Mitigation Plan from 2014 identified the flood vulnerability of schools, hospitals, fire stations, and police stations. The updated state data was used in the 100-yr HAZUS flood analysis. 6,089 structures were in the database with 180 of these structures to be found in the in the 100-year floodplain. Approximately 3% of the profiled structures were found to be in the floodplain. The analysis might be an over or underestimation since it did not take into account elevation and data errors. Pennington County data was included and is provided below. The total facilities in Minnesota for schools, hospitals, fire stations and police stations were 23.

Table 53: Flood Vulnerability for Facilities in Pennington County

County	Total Facilities	Facilities in 100-year Floodplain	Total Exposure of Facilities
Pennington	23	1	$173,375,000

The Minnesota All Hazard Mitigation Plan from 2014 also outlined the county flood vulnerability of structures by building class. Occupancy class aggregates the estimated building loss for all counties. These losses are calculated from the General Building Stock inventory. The General Building Stock inventory provided with the HAZUS-MH tool did not change from 2010 to 2013 when the analysis was run. In summary, 10,678 structures or 0.5 of the total building stock in the state were found to be a potentially damaged because of the new analysis. The estimated total building loss is estimated to be $3,360,275,000 or 0.8% of the total building value in the state. The following outlines the estimated total damaged buildings, exposure, economic and building loss for Pennington County. The Minnesota All Hazard Mitigation Plan

analyzed the data and ranked the highest counties vulnerable to floods based on building loss.

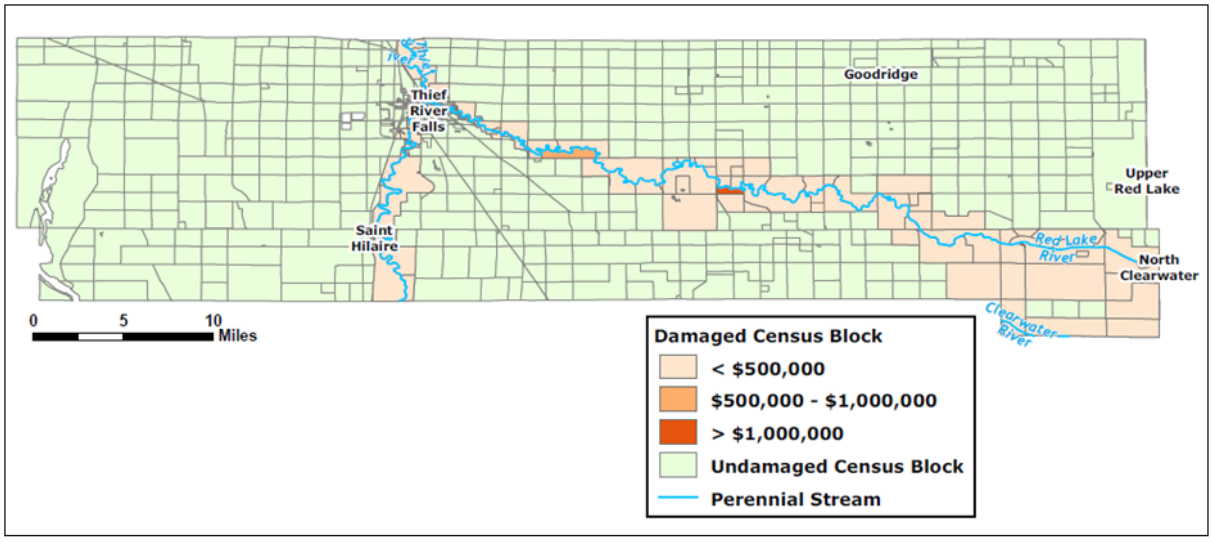
Table 54: Building Loss and Exposure in Pennington County

County	Estimated Total Buildings	Total Damaged Buildings	Total Building Exposure X $1000	Total Economic Loss X $1000	Building Loss X$1000
Pennington	7439	3	$1,010,049	$10,673	$4,336

The indemnity claims for a flood on crops from 2000-2013 was also reported in the Minnesota All Hazard Mitigation Plan from 2014. According to this, Pennington County had a total of $181,771 in claims for crop flooding.

Flood Analysis for Pennington County:
Included from the report by the Polis Center was a 100-year flood map including the Pennington County Total Economic Loss. This map shows the census blocks and the total economic loss. HAZUS-MH estimates two census blocks with losses exceeding one million dollars.

Figure 11: Pennington County HAZUS-MH Total Economic Loss Map



The Minnesota Pre-Disaster Mitigation Plan also included a a HAZUS-MH Shelter Requirement Analysis for flooding disasters. The Shelter Requirement Analysis estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation also estimated are those displaced people that may require accommodations in temporary public shelters. The model estimates 126 households may be displaced due to the flood of which 51 people may seek temporary shelter in public shelters following a flood. Displacement includes households evacuated from within or very near to the inundated are

The National Oceanic and Atmospheric Administration (NOAA) Advanced Hydrologic Prediction Service provides information from gauge locations at points along various rivers across the United States. For Pennington County, data is provided for one point: Red Lake River at High Landing.

Figure 12: Stream Gauge Location for Red Lake River at High Landing

4.3.6 Flood and Climate Change

The Minnesota All Hazard Mitigation plan stated that as Minnesota's climate changes, the quantity, and character of precipitation is changing. Average precipitation has increased in the Midwest since 1900, with more increases in recent years. According to the Draft National Climate Assessment (NCA), the Midwest has seen a 45% increase in very heavy precipitation (defined as the heaviest 1% of all daily events) from 1958 to 2011. This precipitation change has led to increased magnitude of flooding. Particularly in Pennington County, there have been five flood events in the past 5 years.

4.3.7 Relationship to Other Hazards

Flooding is related to various other hazards such as severe storms because severe and/or slow moving thunderstorms and spring snowmelt can contribute to flooding and under the right conditions can cause flash flooding. Late season rainstorms that saturate the ground and late season blizzards can also cause flooding in Pennington County. Flooding can also be related to dam failure because flood events have the potential to compromise the structural integrity of dams, which could lead to more severe flood events. Additionally, flooding can be related to infectious disease because wastewater spills are a possible consequence of flooding. Public health can be affected because the incidence of infectious diseases can increase with wastewater spills.

4.4 Tornado

Tornado was identified in the prior hazard mitigation plan from January 2008 for Pennington County but was included as part of the Summer Weather hazard profile. For the 2015 update, the tornado was identified as a separate hazard to determine the impact potential it has in Pennington County. Included in this hazard profile for a tornado is analysis to provide a more in-depth look at what a tornado is, the history of tornadoes in Pennington County, and the potential they have to impact the county residents. A definition of tornadoes is provided prior to taking a closer look at the effect tornadoes have on Pennington County in order to provide the reader with knowledge of the hazard.

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

Figure 13: Average Annual Number of Tornadoes per Year/Month in Minnesota

Minnesota Tornado Statistics

1950 - 2012	Totals	Annual Average
Tornadoes	1721	27
Tornado Deaths	99	
Tornado Injuries	1981	

Tornado Totals and Averages by Month (1950 - 2010)

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Totals	19	71	244	605	415	195	76	27	1	1653
Average	0.3	1.2	4.0	9.9	6.8	3.2	1.2	0.4	0.02	27
Percent	1	4	15	37	25	12	4	2	0	100

Greatest Number of Tornadoes in Minnesota (1950-2015)

One Year	113 in 2010
One Month	71 in June 2010
One Day	48 on June 17, 2010

4.4.1 Enhanced Fujita (EF) Scale

On February 1, 2007, the National Weather Service adopted "Enhanced Fujita (EF) Scale". The EF Scale evaluates and categorizes tornado events by intensity. Both the original Fujita Scale and the EF Scale estimate the intensity of a tornado (3-second gust speed) based on the magnitude of damage.

The original scale had a lack of damage indicators and with the increasing standards for buildings; tornado ratings were becoming inconsistent. The EF Scale evaluates tornado damage with a set of 28 indicators (see NOAA website). Each indicator is a structure with a typical damage description for each magnitude of a tornado. The Fujita Scale Table is both a breakdown of the Fujita Scale and a comparison to the Enhanced Fujita Scale.

Table 55: Fujita scale

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-206	162-209	3	138-167	**3**	**136-165**
4	207-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

Tornadoes can be from twenty feet in width to larger than a mile on the ground and are transparent until the vortex fills with water vapor, dust, dirt, or debris. Uniquely dangerous are rain-wrapped tornadoes. If there is heavy rainfall near a tornado, a tornado can become masked or wrapped in the rainfall and become hidden. During a possible tornado event, the National Weather Service issues warning to the public to take shelter even if no tornado is visible because it may be rain-wrapped or not coming from a west, southwest direction unlike the majority of storms in the Midwest.

According to the National Oceanic Atmospheric Administration (NOAA) National Severe Storms Laboratory, thunderstorms develop in warm, moist air in advance of eastward-moving cold fronts. These thunderstorms often produce large hail, strong winds, and tornadoes. Tornadoes in the winter and early spring are often associated with strong, frontal systems that form in the Central States and move east.

4.4.2 Tornado Risk in Pennington County

The overall probability that tornadoes will occur each year in Pennington County is Likely, its relative impact is High, and thus the overall risk for Pennington County is Moderate. The risk for tornadoes for each of the cities is different and was determined based upon the specific data collected and outlined in the history section of this hazard profile. In assessing tornado data for the 2015 update, data from 2009 to 2014 was used to determine the risk for each of the cities and Pennington County as a whole. Most notable is the city of Goodridge because it is at a high risk for tornadoes each year and has an extensive history of tornadoes. The table provided below provides the name of each of the cities in the County, the probability that tornadoes will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 56: Tornado Risk by City in Pennington County

Tornado Storms			
City	Probability	Impact	Risk
Goodridge	Highly Likely	High	High
St. Hilaire	Possible	High	Little to No
Thief River Falls	Likely	High	Moderate
County	Likely	High	Moderate
Total	Likely	High	Moderate

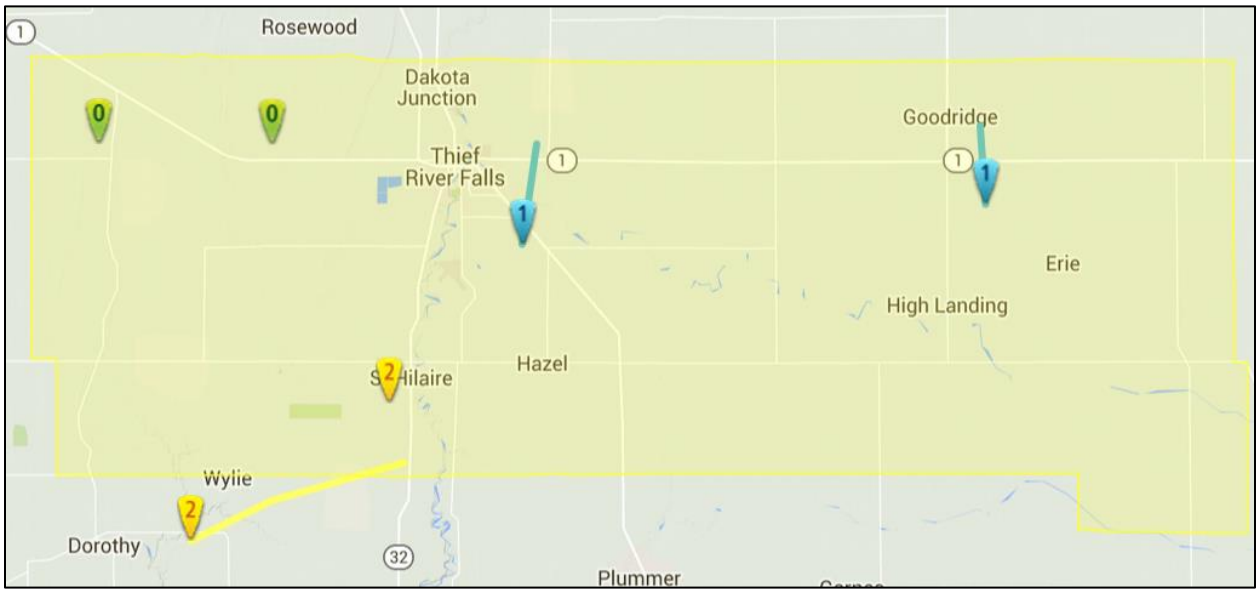
4.4.3 Tornado History in Pennington County

Tornadoes in Pennington County peak in the months of June and July. The typical time of day for tornadoes in Minnesota ranges between 4:00 P.M. and 7:00 P.M. Most of these are less powerful tornadoes, with wind speeds under 125 miles per hour. A typical Minnesota tornado lasts approximately ten minutes, has a path length of five to six miles, is nearly as wide as a football field, and has a forward speed of about thirty-five miles an hour and affects less than 0.1% of the county warned. National Oceanic Atmospheric Administration (NOAA) provided the history of tornado events in Pennington County. From 2009 to 2014, there has been one recorded event of a tornado in Pennington County. A comprehensive list of the last 50 years of data can be found in Appendix B.

According to records, the most recent tornado in Pennington County was on June 17, 2010, at 4:10 pm. This tornado was an EF1 and was two miles in length and 30 yards wide. This tornado affected the city of Goodridge and the tornado tracked northward intermittently for roughly 2 miles. The tornado knocked down several large tree limbs and snapped off some smaller trees. Heavy farm machinery was moved around by the winds. Peak winds were estimated at 90 mph. There were no reported deaths, injuries, and property or crop damage from this tornado.

The following image shows the tornado track for the tornadoes that have occurred in the county from 1968 to 2014. There have been seven tornadoes in Pennington County during this timeframe, with zero fatalities and zero injuries. The numbers on the map correspond to the Fujita Scale number for each tornado that is a scale from zero-five, with zero being the least severe and five being the most severe.

Figure 14: Tornado Track for Pennington County



Source: Tornado History Project for Pennington County, MN

Previous Problems

The previous Hazard Mitigation Plan from January 2008 for Pennington County included problems related to shelter in the event of a tornado. Specifically, it was stated that Thief River Falls needs more tornado shelters to protect its residents. Buildings need to have a basement and not be constructed on a slab to qualify. In addition, available tornado shelters in Thief River Falls should be more publicly known.

Disaster Declarations

Of the aforementioned severe summer storms, there have been two tornado or severe storm incidences, which have been declared a disaster by FEMA in the last 50 years in Pennington County. These disasters were all major declared disasters, which is when the President believes an event has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. The beginning and ending date of the incident are included for these declared disasters, as well as information on the type of assistance program that was provided.

Table 57: Major Declared Disasters for Tornado (Disaster declared for Pennington County)

IH Program Declared	IA Program Declared	PA Program Declared	HM Program Declared	Declaration Date	Incident Type	Title	Incident Begin Date	Incident End Date	Disaster Close Out Date
No	Yes	Yes	Yes	6/14/2002	Severe Storm(s)	SEVERE STORMS, FLOODING, AND TORNADOES	6/9/2002	6/28/2002	4/25/2012
No	Yes	Yes	Yes	7/17/1975	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING	7/17/1975	7/17/1975	11/6/1981

4.4.4 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for tornadoes from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for tornadoes was to improve shelter opportunities by providing unprotected residents a shelter, annually preparing chosen shelter sites, and directing people and resources.

4.4.5 Vulnerability in Pennington County

The most active "tornado month" in Minnesota is June (33% of all occurrences), with July next (28% of all occurrences, and then May (17% of all occurrences). During these three months, over 75 percent of all tornadoes occur when many people may be enjoying outdoor activities. Tornadoes have never been reported in the Pennington County during December, January, and February.

Schools, hospitals, fire departments, police departments, and other critical facilities are also at increased vulnerability because they may sustain damage during a tornado. The county would need to rely on other facilities within the county or surrounding counties depending upon the amount of damage. Trailer parks, mobile homes, and other areas where there are limited sheltering options are also at an increased risk.

4.4.6 Tornado and Climate Change

According to the National Center for Atmospheric Research, the main climate change connection to tornadoes is via the basic instability of the low-level air that creates the convection and thunderstorms in the first place. Warmer and moister conditions are the keys for unstable air and the oceans are warmer because of climate change. However, some studies state that trends in severe storms including the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds are uncertain. Since the impact of more frequent or intense storms can be larger than the impact of average temperature, climate scientists are actively researching the connections between climate change and severe storms (National Climate Assessment Development Advisory Committee, 2013).

4.4.7 Relationship to Other Hazards in Pennington County

Tornadoes are related to numerous other hazards. Structural fires have the potential to be related to tornados as the strong winds from tornadoes may ignite a structural fire. Flooding, lightning strikes, and high winds may also cause structural fires in their aftermath. Downed power lines, natural gas leaks or other sources of ignition initiated by tornadoes may spark a fire in structures. Routes to structures may be restricted due to flooding or debris from storms. Hail can also occur as part of thunderstorms and can cause damage depending on the size and duration.

4.5 Winter Storms

Winter storms were identified in the January 2008 hazard mitigation plan from for Pennington County and continue to be a priority and are included plan update. Analysis is included in the Pennington County Hazard Mitigation Plan update to include a more in-depth look at what winter storms are, the history of winter storms within Pennington County, and the potential they have to impact Pennington County residents. A definition of winter storms is provided prior to taking a closer look at the effect winter storms have in Pennington County to provide the reader with knowledge of the hazard.

Severe winter storms vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injuries such as frostbite and death. In the Midwest, Canadian and Arctic cold fronts that push snow and ice deep into the interior region of the United States cause severe winter storms. Severe winter storms can shut down highways, down power lines, take down trees and tree limbs, create hazardous driving conditions, hypothermia, fires from personal heating units such as heated blankets, flooding, and deaths to the young and elderly who may be exposed to the severe weather for prolonged periods of time. Blizzards are the most severe form of winter storms and are associated with large amounts of falling or blowing snow with wind gusts in excess of 35 mph. When these types of conditions exist, the National Weather Service may issue a “Blizzard Warning”, or if such a storm is expected, they may issue a “Winter Storm Watch”.

Severe winter storm occurrences tend to be very disruptive to transportation and commerce. Trees, cars, roads, and other surfaces develop a coating or glaze of ice, making even small accumulations of ice extremely hazardous to motorists, bicyclists, and pedestrians. The most prevalent impacts of heavy accumulations of ice are slippery roads and walkways that lead to vehicle and pedestrian accidents; collapsed roofs from fallen trees and limbs, and heavy ice and snow loads. Blizzards may also result in felled trees, telephone poles, and lines, electrical wires, and communication towers. Severe storms can cause the disruption of telecommunications and power for days. Heavy snow or accumulated ice can also isolate people from assistance or services. The National Weather Service issues a Wind Chill Advisory for Minnesota when widespread wind chills of -40°F or lower with winds of at least ten miles per hour (mph) expected. In some parts of southern Minnesota, the threshold may be -35°F. A Wind Chill Warning is issued when widespread wind chills of -40°F in northern Minnesota and -35°F in southern with winds greater than ten mph are expected.

The National Weather Service can be credited with providing at least 48 hours forewarning of a Severe Storm. This can give time for residents and governments to prepare for the storm such as stockpiling resources, prepping snow-moving equipment, and making plans. The NWS Warning Terminology Table breaks down the different types of advisories, watches, and warnings and when they are used.

Table 58: NWS Warning Terminology Table

National Weather Service Warning Terminology	
Winter Weather Advisory	Alert for ice, cold weather, or snow that can range from 2 - 6 inches.
Winter Storm Watch	Alert for severe winter weather with a high possibility in the next few days resulting in high accumulations of snow or ice.
Winter Storm Warning	Severe weather (ice, snow, cold) are about to begin or have already started.
Blizzard Warning	Snow condition resulting in high winds, snowdrifts, lack of visibility, and threatening conditions when traveling and to those exposed to the weather.
Ice Storm Warning	High accumulations of ice that will cause dangerous travel and problems to power infrastructure.
Heavy Storm Warning	Snow accumulation of 6 or more inches.

The wind chill temperature is how cold people and animals feel when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. Therefore, the wind makes it feel much colder. If the temperature is zero degrees Fahrenheit and the wind are blowing at 15 miles-per-hour (MPH), the wind chill is -19 F. At this wind chill temperature, exposed skin can freeze in 30 minutes. The National Weather Service issues a Wind Chill Advisory for Minnesota when widespread wind chills of -40 F or lower with winds at least ten mph are expected.

4.5.1 Winter Storms Risk in Pennington County

The overall probability that severe winter storms will occur each year in Pennington County is Highly Likely, its relative impact is Moderate, and thus the overall risk for Pennington County is Moderate. The risk for severe winter storms for each of the cities is the same because data was not available by individual city. In assessing severe winter storm data for the 2015 update, data from 2009 to 2014 was used to determine the risk for each of the cities and the county as a whole. Each of the cities in Pennington County shown below including Goodridge, St. Hilaire, Thief River Falls and the unincorporated areas of Pennington County are all at a Moderate risk of winter storms. The table provided below provides the name of each of the cities in the County, the probability that winter storms will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 59: Winter Storms Risk by City in Pennington County

Winter Storms			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Highly Likely**	**Moderate**	**Moderate**
St. Hilaire	**Highly Likely**	**Moderate**	**Moderate**
Thief River Falls	**Highly Likely**	**Moderate**	**Moderate**
County	**Highly Likely**	**Moderate**	**Moderate**
Total	**Highly Likely**	**Moderate**	**Moderate**

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents a change from the previous Pennington County Hazard Mitigation Plan. The 2015 update

indicated winter storms have a Moderate impact and Moderate risk potential for Pennington County. Whereas, the last Pennington County Hazard Mitigation Plan update done in January 2008 indicated that winter storms had the potential to have a limited impact on Pennington County and a significant threat is posed meaning that the hazard was found to occur every year but would have a limited impact on the overall county.

4.5.2 Winter Storms History in Pennington County

Severe winter storms occur each winter season in Pennington County. The types of severe winter storm events that are reported for Pennington County include blizzard, severe cold, heavy snow, and severe winter storms. Some of the most notable severe winter storms in Pennington County occurred in 2014. In January of 2014 in Pennington County, there were three blizzards recorded during a ten day span. Blizzards occurred on January 16, 22, and 26 in 2014.

National Oceanic Atmospheric Administration (NOAA) provided the history of severe winter storm events in Pennington County. From 2009 to 2014, there have been over 40-recorded events of severe winter storms in Pennington County. A comprehensive list of the last 50 years of data can be found in Appendix B.

Previous Problems

The previous Hazard Mitigation Plan from January 2008 indicated that stranded residents were a problem in Pennington County during winter storms. During winter storms, every concession is made to rescue stranded people. There is a point where officer's lives are put on the line going out into a blizzard attempting to rescue another person. Liability issues arise when people other than emergency personnel (ex. a snowmobile club) is called on to rescue stranded travelers. Local schools have over two thousand students to transport home if a blizzard starts to affect transportation. Cold weather might affect a busload of stranded children. Parents leaving work to care for children might also be stranded if notification is not given prior to storm arriving. An additional problem noted was generator hookup. Goodridge has a stationary generator, but not all of the buildings are equipped for its use. More buildings being equipped could result in additional shelters for individuals as well as additional resources during a hazard. Ice storms and power loss have multiple effects upon the county and are considered a normal part of the winter season. Effects from power loss that threaten a fast mitigation response such as lessened communication and slower alert/response times need to be eliminated.

Disaster Declarations

There has been one severe winter storm in the last 50 years in Pennington County that has been declared a disasters by FEMA. This was a major declared disaster such that the President believes an event has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work.

Table 60: Major Declared Disasters for severe winter Storms

IH Program Declared	IA Program Declared	PA Program Declared	HM Program Declared	Declaration Date	Incident Type	Title	Incident Begin Date	Incident End Date	Disaster Close Out Date
No	No	Yes	Yes	1/16/1997	Severe Storm(s)	SEVERE WINTER STORMS	1/3/1997	2/3/1997	3/21/2000

4.5.3 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for severe winter storms from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for severe winter storms was to deter long-term electrical disruptions by assessing the infrastructure power concerns, working with local power companies, co-ops and utilities and reducing east/west power line vulnerability.

4.5.4 Vulnerability in Pennington County

According to the 2014 Minnesota All Hazard Mitigation Plan, the topography, land-use characteristics and severe winter climate of western and southern Minnesota cause this area to be particularly vulnerable to blowing and drifting snow. For an average severe winter season, taxpayers in Minnesota spend approximately $100 million in snow removal costs, with Minnesota Department of Transportation expending $41 million. In the event of a severe winter season with anomalously high snowfall and exceedingly strong winds, as was the case for much of the state during the winter of 1996-97, the cost of snow removal can soar to $215 million.

Transportation systems, electrical distribution systems, and structures are vulnerable to severe winter storms throughout the entire state. These vulnerabilities impact human safety, disrupt distribution of government services, cause economic disruptions and damage structures.

Transportation systems in Pennington County that have the potential to be impacted by severe winter weather are airports and roadways. There are airports in Pennington County that could potentially be impacted and prevent flights from coming in or going out in the event of a severe winter storm at one of the two airports in Pennington County, Thief River Falls Regional Airport, and Willis Airport. Roadways can be treacherous or impassable during severe winter storms making it difficult for individuals to get essential items such as food and medical care. It can also make it difficult for emergency vehicles to get to those people who are experiencing some type of emergency during a severe winter storm.

Severe ice or snowstorms can disrupt telecommunications and power for days. Such storms can also cause exceptionally heavy snowfall that persists for days, resulting in heavy flooding. The most prevalent impacts of heavy accumulations of ice or snow are slippery roads and walkways that lead to vehicle and pedestrian accidents. In addition, heavy snow loads can cause roofs to collapse trees and limbs to break as well as damaged telephone poles and lines, electrical wires, and communication towers. Children and the elderly are also at an increased risk when there is extreme cold. Children who need to walk to school or stand outside at a bus stop are at an increased risk of frostbite due to the potential of additional time outside in the cold. The elderly and those living in poverty may not have the resources to pay higher electrical bills in the winter months to keep their homes warm. If power is lost during the winter months, it can also cause dangerously cold temperatures inside and those with limited resources may find themselves with no place warm to go. Slippery roads and walkways also pose a threat to the safety of people,

especially the elderly, who are more prone to falls. Individuals who live in rural or isolated areas are also at an increased risk for severe winter storms.

4.5.5 Winter Storms and Climate Change

Severe winter storms are a yearly occurrence in Pennington County. The current climate change which is occurring within the Midwest region has the potential to increase the severe winter storm frequency within the Midwest, including Minnesota. Severe winter storms can have a large impact on public safety in Minnesota. This will continue, with a possible increase in snowstorm frequency and annual total snowfall. Severe winter weather is often a cause of power outages. Pressures on energy use, reduced reliability of services, potential outages and a potential rise in household costs for energy are major climate change risks to public health.

4.5.6 Relationship to other Hazards

Severe winter storms have relationships to other hazards such as flooding and structural fires. Snowmelt from heavy snows can cause localized flooding which can cause dangerous conditions for residents and motorists. It can also destroy property and infrastructure such as roads. In addition, heavy winter snowstorms can cause power outages that may cause residents to use alternative heating methods which can increase the risk of structural fires. Blizzards or strong snowstorms late in the season can also cause flooding during the springtime.

4.6 Hail

Hailstorms were not identified in the prior hazard mitigation plan from January 2008 for Pennington County as a separate hazard but were included as part of the "Summer Storms" risk profile. Hailstorms were identified as one of the hazards to be included in this 2015 plan update. Additionally, the analysis is included in this 2015 plan update to include an in-depth look at what hail is, the history of it within Pennington County and the potential it has to impact the county residents. A definition of hail is provided prior to taking a closer look at the effect hail may have on Pennington County in order to provide the reader with an understanding of the hazard.

A hailstorm is an outgrowth of severe thunderstorms and develops within an unstable air mass. Warm moist air rises rapidly into the upper atmosphere and subsequently cools, leading to the formation of ice crystals. These are bounced about by high-velocity updraft (or strong) winds and accumulate into frozen droplets, falling as precipitation after developing enough weight (FEMA, 1997).

Hailstorms cause millions in property, livestock, and crop damage each year. Severe hailstorms cause considerable damage to buildings, automobiles, and airplanes. Significant property damage does not occur until hailstone size reaches about 1.5 inches in diameter. This size will cause damage to cars, windows, and siding. When hailstones get larger and approach three inches in diameter, roofs start to experience major damage. Combined property and crop damage annual totals for recent years in Minnesota were $2.4 million (2012), $817,000 (2011), and $11.5 million (2010) (NCDC).

The National Weather Service (NWS) defines severe thunderstorms as those with downdraft winds in excess of 58 miles an hour and/or hail 1 inch in diameter or greater. While only about 10% of thunderstorms are classified as severe, all thunderstorms are dangerous because they produce numerous dangerous conditions, including one or more of the following: hail, strong winds, lightning, tornadoes, and flash flooding. The land area affected by individual hail events, an average of 15 miles in diameter around the center of the storm, is similar to the area affected by the parent thunderstorm. Hail risk at a point or over an area is a function of the target at risk (property or crop) and the hailing frequency, intensity, and size.

The size of hailstones varies and is a direct consequence of the severity of the thunderstorm. Hail quarter size (1 inch in diameter) or larger is considered severe. Hailstorms occur most frequently during the late spring and early summer when the jet stream moves northward across the Great Plains. During this period, extreme temperature changes occur from the surface up to the jet stream, resulting in the strong updrafts required for hail formation.

4.6.1 Hail Risk in Pennington County

The overall probability that hail will occur each year in Pennington County is Highly Likely and its relative impact is Moderate and thus the overall risk for Pennington County is Moderate. The risk for hail for each of the cities is different based on the data available by individual city. In assessing hail data for the 2015 update, data from 2009 to 2015 was used to determine the risk. The table provided below provides the name of each of the cities in the County, the probability that hail will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings. Most notable are the cities of St. Hilaire, Thief River Falls, and the unincorporated area of Pennington County which all have a Highly Likely probability that hail events will occur each year.

Table 61: Hail Hazard Risk Assessment

Hail			
City	Probability	Impact	Risk
Goodridge	Possible	No Impact	Little to No
St. Hilaire	Highly Likely	Moderate	Moderate
Thief River Falls	Highly Likely	Moderate	Moderate
County	Highly Likely	Moderate	Moderate
Total	Highly Likely	Moderate	Moderate

4.6.2 Hail History in Pennington County

According to the 2014 Minnesota All-Hazard Mitigation Plan, in Minnesota, between 2008 and 2012 the month with the most hail was July, with August next. During these three months, 81% of the hail occurred; May had 32%, July had 28%, and June had 21%. The size of the hail reported is generally in the pea to the dime-sized category, with several reports annually of baseball-size and larger.

The National Oceanic Atmospheric Administration (NOAA) provided the history of hail events in Pennington County. From 2009 to 2015, there have been 12 recorded events of severe hail events in Pennington County, which can be seen in the table below. Of these 12 hail events, the city which has had the most occurrences of hail from 2009-2015 was Thief River Falls with five events, St. Hilaire was next with three hail events. The largest reported hail size was 1.75 inches was reported in St. Hilaire on 8/14/2009.

Table 62: Hail History in Pennington County from 2009-2015 from NOAA

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	07/23/2009	20:41	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	08/14/2009	10:00	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	08/14/2009	10:40	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/22/2010	22:25	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	05/24/2010	18:25	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	06/24/2010	14:33	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	06/24/2010	14:39	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	08/17/2010	17:50	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/28/2011	19:00	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
DAKOTA JCT	PENNINGTON CO.	MN	07/24/2013	15:00	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/18/2013	20:38	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/12/2015	20:30	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

4.6.3 Mitigation Actions in the Past Five Years in Pennington County

There were no mitigation actions specified for hail in the January 2008 Hazard Mitigation Plan for Pennington County and beyond basic education no new projects are immediately anticipated.

4.6.4 Vulnerability of Jurisdictions within Pennington County

Pennington County has outdoor recreational opportunities, such forests and wildlife refuges, which draw large groups of people, who may not be residents in the county, especially in the summer months.

Individuals in agriculture may be unprotected in the fields when a hailstorm could hit, making them potentially more vulnerable.

4.6.5 Hail and Climate Change in Pennington County

According to the Draft National Climate Assessment (NCA), winter storms have increased slightly in frequency and intensity, and their tracks have shifted northward over the U.S. Other trends in severe storms, including the numbers of hurricanes and the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds are uncertain (NCA, 2013, p. 26). Since the impact of more frequent or intense storms can be larger than the impact of average temperature, climate scientists are actively researching the connections between climate change and severe storms (NCA, 2013, p. 59). The occurrence of very heavy precipitation has increased in Minnesota in recent decades and future projections also indicate this will continue (Interagency Climate Adaptation Team, 2013, p. 14). While it is unknown if this precipitation will occur during severe storms that produce hail, the possibility has not been ruled out.

4.6.6 Relationship to Other Hazards

Hail has a higher likelihood of occurring in summer months and is related to summer storms. Flooding, tornadoes, and wind damages can also be present or in conjunction with a hail event. Hail can cause damage to crops and property. If there is not adequate shelter during a hail storm individuals involved in outdoor recreational activities could be impacted.

4.7 Erosion

Erosion was not identified in the prior hazard mitigation plan from January 2008 for Pennington County but was identified as one of the hazards to be included in this 2015 plan update. Additionally, the analysis is included in this 2015 plan update to include an in-depth look at what erosion is, the history of it within Pennington County and the potential has to impact the county residents. A definition of erosion is provided prior to taking a closer look at the effect erosion has on Pennington County in order to provide the reader with knowledge of the hazard.

Erosion is defined by Section 577 of National Flood Insurance Reform Act (NIFRA): “Erosion hazard area means, based on erosion rate information and other historic data available, an area of erosion or avulsion is likely to result in damage or loss of property or infrastructure within a 60 year period.”

Stream banks are the portions of the river or stream channel which restrict lateral movement of water. Streambank erosion is a natural process, but the acceleration of this natural process leads to land loss, stream channel instability, increased sediment, habitat loss, and other adverse effects. EPA Stream Channel Erosion EPA, WARSSS, Channel Processes:

> Bluffs are tall steep features distinguished from stream banks based on height. Bluffs are defined as features with greater than 10 feet of relief in 20 foot by 30-foot area. The vertical nature of bluffs makes them susceptible to sudden and catastrophic failure. (Day, Stephanie, 2013, Special Hazard Mitigation Risk Assessment of Near Channel Riverine Erosion Hazards in Blue Earth County – Streambanks, Bluffs, and Ravines) During periods of moderate and high flow, bluffs are eroded by the river in deeply incised channels lacking a floodplain. Bluffs also fail due to landslides and mass wasting. The river removes the soils deposited by mass wasting and landslides. As a result of the eroded, nearly vertical slope cannot stabilize and re-establish itself with vegetation.

Streambank Erosion/Channel Enlargement

Bank erosion takes place by two processes, channel migration, and channel widening (Day, 2013): Enlargement of channels can be caused by combined processes of the incision, bank erosion, and direct modification by construction activities. Lateral erosion may occur in stable streams, but the point bar follows at the same rate, thus the stream does not get wider over time. This contrasts with enlargement, where the width of the stream gets wider over time due to lateral erosion, often concurrently on both banks. The results of enlargement are increased erosion from the stream bed and banks, increased deposition due to decreased shear stress and stream power, loss of habitat, increased water temperatures, and a shift in the evolutionary state of morphological stream types. Increased flows due to watershed changes, storm drains from urban runoff, power generation due to "ramping flows" from reservoir releases, and contraction scour below culverts and bridges can all contribute to channel enlargement. Combined processes of the incision, degradation, aggradation, and lateral accretion can be associated with enlargement. EPA, Channel Processes: Channel Enlargement

4.7.1 Erosion Risk in Pennington County

The overall probability that erosion will occur each year in Pennington County is Highly Likely and its relative impact is Moderate and thus the overall risk for Pennington County is Moderate. The risk for erosion for each of the cities is different based on the data available by individual city. In assessing erosion data for the 2015 update, data from 2009 to 2014 was used to determine the risk. The table provided below

provides the name of each of the cities in the county, the probability that erosion will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings. The most notable cities are St. Hilaire and Thief River Falls which have a higher likelihood and a history of erosion.

Table 63: Erosion Hazard Risk Assessment

Erosion			
City	Probability	Impact	Risk
Goodridge	Likely	Low	Little to No
St. Hilaire	Highly Likely	Moderate	Moderate
Thief River Falls	Highly Likely	Moderate	Moderate
County	Likely	Low	Little to No
Total	Highly Likely	Moderate	Moderate

4.7.2 Erosion History in Pennington County

According to the January 2008 Pennington County Hazard Mitigation Plan, sedimentation, the deposition of eroded matter into ditches, rivers, and streams, is a potential problem in Pennington County. Over time, this process will cause the volume flowing through a particular channel to increase. The channel also may narrow or become shallower as sediment is deposited. This causes flooding if left unchecked for too long. This process also renders dikes and levees endangered if they are not heightened and expanded on a regular basis. Removing sediment from a channel or ditch will help protect against flooding, but care must be taken. If the grass is not lining the sides of the waterway, erosion will increase, causing the sediment to settle somewhere else. Because grasses grow slowly, people line the ditches with bales of straw. This is a good idea to slow down both the water flow and the erosion process, but if the bales are still there when winter comes, it becomes a hazard for snowmobiles. There are permits required before removing sediment out of certain places. The process can get extremely difficult and expensive at times.

The Red Lake River causes much subsidence in Pennington County. Rural areas grow increasingly more affected, including both farmland and homes. A graveyard is also in danger of subsidence. There is erosion in the Red Lake River Subwatershed in the Red Lake Watershed. Ditches out letting into natural streams fill the outlet streams with sediment. This is a widespread problem for the subwatershed and is ranked as a high problem.

Previous Problems

A previous problem stated from the January 2008 Hazard Mitigation Plan for Pennington County was overland flooding. Overland flooding is a concern for Goodridge. Ditch 20 in Pennington County is uncontrolled and poses an overland flooding threat to parts of Pennington County. Additionally, storm water management is a potential issue for Pennington County. The effects of a large rainstorm can be widespread and severe, causing erosion and water quality issues as well as damages to farms, roads, and culverts.

4.7.3 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions related to erosion from the January 2008 Pennington County Mitigation Plan includes CREP (conservation reserve enhancement program), which was started to reduce flooding in 51,000 acres in the Red River Valley. This program lets farmers and ranchers take land that is near a body of water, frequently flooded, and generally unproductive, and set it aside. Farmers receive an easement for a period of years for participating in this program. By doing this, neighboring land not in the CREP program may also see a reduction in flooding damage and reap additional benefits, including increased water quality and erosion control, reduced pollution levels improved wildlife habitat. Wetland restorations are a large part of this program, 24,000 acres are targeted for restoration in the Red River Valley. Since farmland rehabilitation after a flooding event can be expensive, CREP is a method to help the farmer with additional expenses. The CREP program pays farmers to take land near rivers out of crop production and back into wetlands or grasslands. This program will reduce erosion, control water flows, and work to lessen pollution.

Another mitigation action related to Pennington County was stabilizing a shoreline as well as the Red River Basin Riparian Project. This is a project that allows landowners in the Red River Basin in Minnesota and North Dakota to restore riparian corridors. Best Management Practices (BMPs) are used to accomplish this goal including native timber management, riparian forest buffer, grazing management and floodplain function restoration. Benefits of the project include flood damage reduction, sediment removal, erosion control, an increase in biologic diversity and water quality improvement.

4.7.4 Vulnerability of Jurisdictions to Erosion

Erosion is a problem for parts of Pennington County. The Red Lake River, which runs through St. Hilaire and Thief River Falls, is one source of erosion in Pennington County. Overland flooding is also a source of erosion in the county.

4.7.5 Erosion and Climate Change in Pennington County

Changes in climate have the potential to impact erosion in Pennington County. Natural and human-caused changes in hydrology play a critical role in the failure of stream banks, bluffs, and ravines, as more water is entering ravines and rivers. Land use changes have increased runoff to rivers from urban and agricultural land uses while infiltration and evapotranspiration have been reduced. Vegetation changes, such as conversion of native prairie, pastures, and wetlands to row crops and removing trees and vegetated buffers, reduce soil stability, reduce evapotranspiration and increase runoff. Drainage of surface and subsurface soils for crop production alter hydrology by increasing runoff. Climate and changing summer storm intensity also result in increased runoff and higher flows which worsening near channel erosion.

4.7.6 Relationship to Other Hazards in Pennington County

Wildfires have the potential to be related to erosion. An uncontrolled wildfire can have many long-lasting effects that scar the land. The burned and smoldered land may take years to gain back the habitat and vegetation that once was a representation of it. This bare land is very prone to erosion. The addition of water to this naked landscape can cause landslides, flash floods, and mudflows to occur.

Erosion can also be related to other hazards such as summer storms, because they can cause excessive or prolonged periods of rain which can cause the ground to become susceptible to volumetric change. Drought also has the potential to be related to erosion, because periods of drought can cause shrinkage of soils, which can impact erosion. Flooding can cause erosion.

4.8 Drought

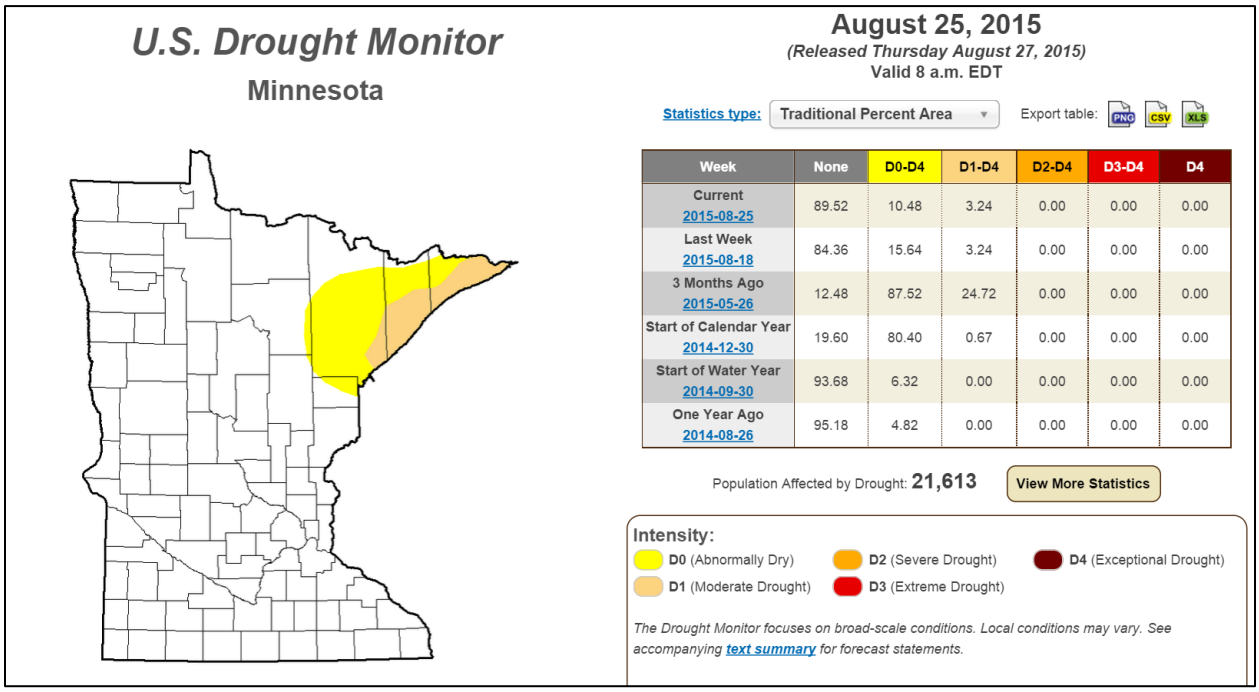
Drought was identified in the prior hazard mitigation plan from January 2008 for Pennington County and was identified as one of the hazards to be included in this 2015 plan update. Included in this 2015 plan update a more in-depth look at drought history of Pennington County and the potential it has to affect the residents. A definition of drought from the Minnesota Department of Natural Resources (DNR) is provided prior to taking a closer look at the effect drought has on Pennington County in order to provide the reader with a knowledge of the hazard.

Drought is defined as a period of abnormally dry and/or unusually hot weather sufficiently prolonged for the corresponding deficiency of water to cause a *serious hydrologic imbalance*.

Drought affects Pennington County in several ways: 1) when a serious hydrologic imbalance occurs, 2) soil moisture reserves, 3) groundwater supplies, 4) lake levels and 5) stream flows are reduced. Water-dependent industries including agriculture, public utilities, forestry, and tourism are often severely impacted.

The figure below depicts the drought intensity for Pennington County as of August 25, 2015. The drought intensity status of Pennington County at the time of this drought monitor was none.

Figure 15: U.S. Drought Monitor for Minnesota



4.8.1 Drought Risk

While the probability for drought is likely, its relative impact is low and thus the overall risk for drought in Pennington County is little to no risk. The risk for drought for each of the cities is the equal. In assessing drought for the 2015 update, data from 2009 to 2014 was used to determine the risk for Pennington County. While the relative risk for a drought is low, drought is still a concern in Pennington County because of the impact a period of drought may have on agriculture. The table provided below provides the name of each of the cities in the County, the probability that drought will have an impact on that jurisdiction, the

impact potential, as well as the overall risk calculated by the determine probability and impact ratings. The risk rating for all the jurisdictions, Goodridge, St. Hilaire, Thief River Falls and unincorporated Pennington County is all Little to No.

Table 64: Drought Hazard Risk Assessment

Drought			
	Probability	**Impact**	**Risk**
Goodridge	**Likely**	**Low**	**Little to No**
St. Hilaire	**Likely**	**Low**	**Little to No**
Thief River Falls	**Likely**	**Low**	**Little to No**
County	**Likely**	**Low**	**Little to No**
Total	**Likely**	**Low**	**Little to No**

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents a significant change from the previous plan. The last plan update was done in January 2008 and indicated that drought had the potential to have a limited substantial impact on Pennington County and no significant threat is posed. This meant that the hazard was found to occur once every 10 years and could have a limited substantial impact on a large area in Pennington County. The 2015 update indicated drought has a likely probability and a Low impact and Little to No risk in Pennington County.

4.8.2 Drought History in Pennington County

The most recent drought events in Pennington County were reported in April and early May of 2015. The most significant drought history took place in September 2012. A report from the U. S. Department of Agriculture indicated there were 23 counties designated in Minnesota as primary disaster areas due to damages and losses caused by the drought that occurred in 2012. Pennington County was one of these 23 counties in the state of Minnesota affected by this drought. A report provided by the U.S. Department of Agriculture (USDA) in September 2012.

Drought history in Pennington County National Climatic Data Center records shows droughts in Pennington County in the years of 2006, 2007, 2012 and 2015. In 2006, the drought spanned from July to December. In 2007, the drought lasted from January until April. Drought events in 2012 spanned from July to October and the most recent events in 2015 took place in late April and early May. A comprehensive history of the drought events in Pennington County can be seen in Appendix B.

Disaster Declarations

The only drought in the last 50 years in Pennington County to be declared a disaster by FEMA, was in June 1976. This was an emergency declaration, which is more limited in scope and without the long-term federal recovery programs of a Major Disaster Declaration. This drought incident began in June 1976 and the disaster close out was in 1979. Public assistance and hazard mitigation programs were declared for this incident.

Table 65: Emergency Declared Disasters Drought

IH Program Declared	IA Program Declared	PA Program Declared	HM Program Declared	Declaration Date	Incident Type	Title	Incident Begin Date	Incident End Date	Disaster Close Out Date
No	No	Yes	Yes	6/17/1976	Drought	DROUGHT	6/17/1976	6/17/1976	3/14/1979

4.8.3 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for drought from Pennington County's January 2008 All Hazard Mitigation Plan noted that the mitigation action for drought was to educate residents about fire prevention, and protect people from drought-related damage.

Red River Basin Drought Planning Tool

The Regional Drought Decision Support System (RDDSS) has created a tool to analyze data relating to drought in the Red River Valley. There are many different access points that can be chosen to analyze water drainage throughout a given timeframe. This information can be used to make decisions involving droughts in the future. Drought is an economic problem that has major implications in Northern Minnesota. A tool such as this can be used to help minimize the effects of a drought if it can be predicted early.

Livestock Disaster Programs

The 2014 Farm Bill, formally known as the Agricultural Act of 2014, made the Livestock Forage Program (LFP) and Livestock Indemnity Program (LIP) permanent programs and provided retroactive authority to cover eligible losses back to Oct. 1, 2011. LFP provides compensation to eligible producers who suffered grazing losses due to drought and fire. Pennington County was only eligible for 2012 benefits under LFP for pasture losses caused by drought.

LIP provided compensation to livestock producers who suffered livestock death losses in excess of normal mortality due to adverse weather and attacks by animals reintroduced into the wild by the Federal Government or protected by Federal law, including wolves and avian predators.

4.8.4 Vulnerability of Jurisdictions in Pennington County

Drought presents vulnerabilities to the residents in Pennington County. Individuals whose livelihoods rely on water, such as farmers who need water to produce crops, can be heavily impacted by drought. Financial-related stress due to drought conditions can lead to mental health illness including depression and thoughts of suicide. Drought can also have a significant impact on the economy due to the destruction of major crops such as spring wheat, barley, and oats. The drying effect of drought on vegetation also increases the risk of wildfire and the vulnerability of structures located in wildland interface areas.

Those living in poverty in Pennington County, 10.6 percent of the population, are also at an increased risk due to drought conditions. Individuals living in poverty may not be able to afford increasing prices during drought conditions, making it possible for individuals to suffer health problems because of the lack of healthy food and possible contamination of good water. Children and the elderly, which make up 39 percent of the population within Pennington County, are also at increased risks of illness related to drought conditions. The Centers for Disease Control and Prevention indicated acute respiratory and gastrointestinal illnesses could be more easily spread during drought conditions. E.coli and Salmonella are bacteria that can more readily contaminate food during drought conditions.

4.8.5 Drought and Climate Change

The 2014 Minnesota All Hazard Mitigation Plan states that Minnesota's climate is changing in ways that will affect the environment, economy, and everyday life. Climate change is occurring and has the potential to affect the frequency of drought in Pennington County. According to the 2014 National Climate Assessment from the U.S. Global Change Research Program, for the Midwest region, temperatures above 95°F are expected to increase in frequency by mid-century. Higher temperatures are associated with negative human health impacts and suppressed agricultural yields. In addition, the 2014 National Climate Assessment indicated the frequency of days with very heavy precipitation (the wettest 2% of days) is also projected to increase, raising the risk of floods and nutrient pollution. Direct effects of climate change will include increased heat stress, flooding, drought, and late spring freezes.

The 2014 National Climate Assessment indicated that in the next few decades, longer growing seasons and rising carbon dioxide levels will increase yields of some crops, though those benefits may be offset by extreme weather events. It was determined through an assessment that in the long term, the combined stresses associated with climate change are expected to decrease agricultural productivity. Since agriculture is an important industry in Pennington County, the agricultural productivity is important. The 2014 National Climate Assessment indicated that while there was no apparent change in drought duration in the Midwest region as a whole over the past century, the average number of days without precipitation is projected to increase in the future. This could lead to agricultural drought and suppressed crop yields.

4.8.6 Relationship to Other Hazards

There are three hazards that are related to drought wildfires, subsidence, and extreme heat.

The first is wildfires because drought conditions can significantly increase the risks of wildfire. Wildfires can ignite very easily under very dry conditions and can spread quickly. Lightning strikes can be a cause for the start of a wildfire, especially under such dry conditions. Under drought conditions, not enough precipitation falls to relieve the land from drought and wildfires can become out of hand. Burn bans may be put into effect in an effort to stop the wildfires from developing and easily spreading.

The second hazard associated with droughts is subsidence because periods of drought can cause shrinkage of soils, which can impact subsidence.

The third hazard associated with droughts is extreme heat because extreme heat and drought conditions often coexist with each other. The presence of one may cause the other to appear, the main difference is that drought conditions can last for months. There are many health related dangers when it comes to extreme heat. There are also increased loads placed on electrical grids to run air conditioning units, which can cause loss of power to residents in the county. Loss of power can lead to extended periods that more vulnerable individuals, such as those living in poverty, the elderly and children, may spend in extreme heat. The Community Profile section of this plan details the number of elderly, children and individuals in poverty within Pennington County. Specifically, the Community Profile section indicated the elderly population is increasing with a 50 percent increase from 1970 to 2010. In addition, extreme heat means more electrical demands on air conditioning units for residents. This can increase electrical bills, which can impact those who are living in poverty.

4.9 Infectious Disease

Infectious Disease was identified in the prior hazard mitigation plan from January 2008 for Pennington County and was identified as one of the hazards to be included in this 2015 plan update. An analysis is included in this 2015 plan update to include a more in-depth look at what infectious disease is, the history of it within Pennington County, and the potential it has to impact the county residents. A definition of infectious disease is provided prior to taking a closer look at the effect infectious disease has on Pennington County in order to provide the reader with a knowledge of the hazard.

Infectious diseases are disorders caused by organisms, such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. They are normally harmless or even helpful, but under certain conditions, some organisms may cause disease. Some infectious diseases can be passed from person to person. Some are transmitted by bites from insects or animals, and others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment.

Signs and symptoms vary depending on the organism causing the infection but often include fever and fatigue. Mild complaints may respond to rest and home remedies, while some life-threatening infections may require hospitalization. Vaccines can prevent many infectious diseases, such as measles and chickenpox. Frequent and thorough hand washing also helps protect you from infectious diseases.
The following hazard analysis includes relevant national, state, and county level (if available) disease outbreak information. It is important to note that Minnesota is divided into eight regions that house local public health agencies in Minnesota.

4.9.1 Definitions of Infectious Diseases

The following are definitions of common infectious diseases.

Campylobacteriosis is an infection by the Campylobacter bacterium, most commonly C. jejuni. It is among the most common bacterial infections of humans, often a foodborne illness. It produces an inflammatory, sometimes bloody, diarrhea or dysentery syndrome, mostly including cramps, fever, and pain. Animals farmed for meat are the primary source of campylobaceriosis.

Cryptosporidium is a microscopic parasite that causes the diarrheal disease cryptosporidiosis. Both the parasite and the disease are commonly known as "Crypto." There are many species of *Cryptosporidium* that infect animals, some of which also infect humans. The parasite is protected by an outer shell that allows it to survive outside the body for long periods and makes it very tolerant to chlorine disinfection. While this parasite can be spread in several different ways, water (drinking water and recreational water) is the most common way to spread the parasite. *Cryptosporidium* is a leading cause of waterborne disease among humans in the United States.

West Nile virus (WNV) is most commonly transmitted to humans by mosquitoes. You can reduce your risk of being infected with WNV by using insect repellent and wearing protective clothing to prevent mosquito bites. There are no medications to treat or vaccines to prevent WNV infection. Fortunately, most people infected with WNV will have no symptoms. About one in five people who are infected will develop a fever with other symptoms. Less than 1% of infected people develop a serious, sometimes fatal, neurologic illness.

Giardiasis is a diarrheal disease caused by the microscopic parasite *Giardia*. A parasite is an organism that feeds off another to survive. Once a person or animal (for example, cats, dogs, cattle, deer, and beavers) has been infected with *Giardia*, the parasite lives in the intestines and is passed in feces (poop). Once outside the body, *Giardia* can sometimes survive for weeks or months. *Giardia* can be found in every region of the U.S. and around the world.

Escherichia coli (abbreviated as *E. coli*) are bacteria found in the environment, foods, and intestines of people and animals. *E. coli* are a large and diverse group of bacteria. Although most strains of *E. coli* are harmless, others can make you sick. Some kinds of *E. coli* can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses.

Haemophilus influenza (including Hib) is a bacterium that can cause a severe infection, occurring mostly in infants and children younger than five years of age. In spite of its name, *Haemophilus influenza* does not cause influenza (the "flu"). It can cause lifelong disability and be deadly.

There are six identifiable types of *Haemophilus influenza* bacteria (a through f) and other non-identifiable types (called nontypeable). The one that most people are familiar with is *Haemophilus influenza* type b or Hib. A vaccine can prevent disease caused by Hib, but not the other types of *Haemophilus influenza*.

HIV is a virus spread through body fluids that affect specific cells of the immune system, called CD4 cells, or T-cells. Over time, HIV can destroy so many of the cells that the body cannot fight off infections and disease. When this happens, HIV infection leads to AIDS.

Lyme disease is caused by the bacterium *Borrelia burgdorferi* and is transmitted to humans through the bite of infected black legged ticks. The black legged ticks are mostly found in the forested areas of north and east central Minnesota. The black legged tick may also be found in forested areas outside of Central Minnesota. The tick while camping or hiking typically bites those infected with Lyme disease. Typical symptoms include fever, headache, fatigue, and a characteristic skin rash called erythema migrans. If left untreated, the infection can spread to joints, the heart, and the nervous system. Lyme disease is diagnosed based on symptoms, physical findings (e.g., rash), and the possibility of exposure to infected ticks. Laboratory testing is helpful if used correctly and performed with validated methods. Most cases of Lyme disease can be treated successfully with a few weeks of antibiotics. Steps to prevent Lyme disease include using insect repellent, removing ticks promptly, applying pesticides, and reducing tick habitat. The ticks that transmit Lyme disease can occasionally transmit other tickborne diseases as well.

Anaplasmosis is a vector-borne bacterial disease caused by a bite from a black legged tick. For Anaplasmosis bacteria to transfer to humans, the tick must be attached for 12 to 24 hours. As with Lyme disease, the black legged tick is found in forested areas in north central and east central Minnesota. Symptoms of Anaplasmosis include fever (over 102° F), severe headache, muscle aches and chills with shaking. Other symptoms may include nausea, vomiting, abdominal pain, diarrhea and change in mental status. Tetracycline antibiotics are typically prescribed for the infection.

Meningococcal disease can refer to any illness that is caused by the type of bacteria called *Neisseria meningitidis*. Meningococcal disease is a contagious infection spread by close

contact with an infected person, such as living together or kissing. Quick medical attention is extremely important if meningococcal disease is suspected.

Pertussis, also known as a whooping cough, is a highly contagious respiratory disease. It is caused by the bacterium *Bordetella pertussis*. Pertussis is known for uncontrollable, violent coughing which often makes it hard to breathe. After fits of many coughs, someone with pertussis often needs to take deep breaths, which result in a "whooping" sound. Pertussis most commonly affects infants and young children and can be fatal, especially in babies less than one year of age. The best way to protect against pertussis is immunization.

Salmonellosis is an infection with bacteria called *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts four to seven days, and most persons recover without treatment. However, in some persons, diarrhea may be so severe that the patient needs to be hospitalized. In these patients, the *Salmonella* infection may spread from the intestines to the bloodstream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness.

Chlamydia is a common STD that can infect both men and women. It can cause serious, permanent damage to a woman's reproductive system, making it difficult or impossible for her to get pregnant later on. Chlamydia can also cause a potentially fatal ectopic pregnancy (a pregnancy that occurs outside the womb).

Gonorrhea is a sexually transmitted disease (STD) that can infect both men and women. It can cause infections in the genitals, rectum, and throat. It is a very common infection, especially among young people ages 15-24 years.

Streptococcus pneumonia bacteria, or pneumococcus, can cause many types of illnesses. Some of these illnesses can be life threatening. Pneumonia, which is an infection of the lungs, can be caused by many different bacteria, viruses, and even fungi. Pneumococcus is one of the most common causes of severe pneumonia. Besides pneumonia, pneumococcus can cause other types of infections too, such as ear infections, sinus infections, meningitis, and bacteremia. Some of these infections are considered “invasive.” **Invasive disease** means that germs invade parts of the body that are normally free from germs. For example, pneumococcal bacteria can invade the bloodstream, causing bacteremia, and the tissues and fluids surrounding the brain and spinal cord, causing meningitis. When this happens, the disease is usually very severe, causing hospitalization or even death.

Tuberculosis (TB) is caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but TB bacteria can attack any part of the body such as the kidney, spine, and brain. If not treated properly, TB disease can be fatal. TB is spread through the air from one person to another. The TB bacteria are put into the air when a person with TB disease of the lungs or throat coughs, sneezes, speaks, or sings. People nearby may breathe in these bacteria and become infected.

4.9.2 Infectious Disease Risk in Pennington County

While the probability of infectious diseases is Highly Likely in Pennington County, its relative impact is Low and thus the overall risk for infectious diseases in Pennington County is Little to No. The risk for infectious diseases for each of the cities is the same because data was not available by individual city. In assessing

infectious diseases for 2015 updated, data from 2013 for the Northwestern Region was used to determine this risk. The Northwestern Region used occurrences from the following counties: Beltrami, Clearwater, Hubbard, Roseau, Lake of the Woods, Pennington, Pennington, Roseau, Red Lake, and Roseau. The reader must take into account that risk is determined on a regional level versus county our city level. The table provided below provides the name of each of the cities in the County, the probability that infectious disease will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 66: Infectious Disease Risk by City in Pennington County

Infectious Disease			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Highly Likely**	**Low**	**Little to No**
St. Hilaire	**Highly Likely**	**Low**	**Little to No**
Thief River Falls	**Highly Likely**	**Low**	**Little to No**
County	**Highly Likely**	**Low**	**Little to No**
Total	**Highly Likely**	**Low**	**Little to No**

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents a significant change from the previous plan. This update indicated the overall risk for Pennington County is Little to No. The last mitigation plan indicated that infectious disease had the potential to have a substantial major impact on Pennington County and no significant threat was posed. This meant that the hazard was found to occur and dependent on the type, could have a substantial major impact on large areas of Pennington County.

4.9.3 Infectious Disease History in Pennington County

The following data represents communicable diseases that have been reported to the Minnesota Department of Health in 2013 for the Northwestern Region. The Northwestern Region where occurrences developed is classified as the following counties: Beltrami, Clearwater, Hubbard, Kittson, Lake of the Woods, Pennington, Pennington, Polk, Red Lake, and Roseau.

The infectious disease occurrences, which are the highest in the Northwestern Region, are Sexually Transmitted Diseases (STD), Chlamydia Trachomatis and Gonorrhea. This STD is made up 480 cases in 2013. The other infectious diseases which have a high number of occurrences are Anaplasmosis and Lyme disease, which are vector-borne bacterial diseases caused by a bite from a black legged tick. The black legged tick is found in forested areas in north central and east central Minnesota. Mosquitoes are also a source of infectious disease in the county and have accounted for nine cases of West Nile Virus in the Northwestern Region of Minnesota in 2013.

Table 67: Communicable Disease and Number of Occurrences

Communicable Disease	Number of Occurrences
Anaplasmosis	95
Campylobacterosis	18
Cryptosporidiosis	5
West Nile	9
Escherichai Coli	3
Giardiasis	3
Haemophilus Influenzae invasive disease	7
HIV (non-AIDS)	1
AIDS	2
Lyme disease	54
Meningococcal Disease	0
Pertussis	4
Salmonellosis	12
Chlamydia Trachomatis (STD)	424
Gonorrhea (STD)	56
Streptococcus Pneumoniae invasive disease	14
Streptococcal invasive disease - Group A	6
Streptococcal invasive disease - Group B	12
Tuberculosis	2
Viral Hepatitis, Type A	0
Viral Hepatitis, Type B	0
Viral Hepatitis, Type C	3

Source: Minnesota Department of Health Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2013

Previous Problems

The previous Hazard Mitigation Plan from January 2008 listed problems related to infectious disease in Pennington County. One was mosquito eradication. The plan stated that due to a small budget, some towns in Pennington County have only enough money to pay for so many applications of mosquito spray. Some residents worry about West Nile disease when mosquito populations get large and the town is unable to spray. This is particularly a problem for Goodridge. In addition to requiring additional funding for particularly bad seasons, the conservation near Goodridge causes increased populations. The conservation owners, in essence, create small dikes in their drainage ditches, causing standing water to appear. This is a breeding ground for mosquitos. Thief River Falls also only buys enough spray for a certain number of applications.

Another problem listed was deceased animal contamination. Many diseases including Avian Flu, Anthrax, and West Nile can be passed through the bodies of deceased wild and domesticated animals. An increase in certain infectious diseases can be seen if bodies are not either picked up or buried according to the regulations (so many feet above the water table). Also, a dead animals that contains some sort of infectious disease from one farm can be transported to another area when a company transports the dead animals or stops to pick up additional animal remains. A potential disease could be spread this way. It is up

to the owner to dispose of dead animals. It is a concern that improper disposal could lead to either increased sickness or contamination. Chronic Wasting Disease (CWD) is a concern for moose & deer in Pennington County. The public should always beware of animals that do not have normal reactions, health, or behavior.

4.9.4 Presidential Declared Disasters for Infectious Disease

No presidential declared disasters for infectious disease in the past 5 years.

4.9.5 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for infectious disease from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for infectious disease was to continue surveillance and attentiveness to keep problems from occurring and to bring unknown problems to the attention of the proper authorities.

4.9.6 Vulnerability in Pennington County

In Pennington County, there are certain populations of people who are more susceptible to infectious disease. The elderly, which makes up 15 percent of the total population, and children, which make up 24 percent of the total population, are at an increased risk of becoming infected with airborne diseases because of weakened immune systems and spending more time in crowded settings, which more easily spread airborne diseases such as schools and nursing homes. There is also increased risk of tick and mosquito-transmitted diseases, such as Lyme disease, Anaplasmosis, and West Nile Virus because of possible exposure in forested areas of the county. Individuals who spend time outside or in these forested areas are at an increased risk. Agriculture is also a big industry in Pennington County and individuals working on agricultural land spend more time outside, which can increase their risk.

4.9.7 Infectious Disease and Climate Change

According to the World Health Organization, changes in infectious disease transmission patterns are a likely major consequence of climate change. There are three categories of research into the linkages between climatic conditions and infectious disease transmission. The first examines evidence from the recent past of associations between climate, variability, and infectious disease occurrence. The second looks at early indicators of already-emerging infectious disease impacts of long-term climate change. The third uses the above evidence to create predictive models to estimate the future burden of the infectious disease under projected climate change scenarios.

Types of diseases, which are impacted by climate change, are vector-borne and water-borne diseases. Important determinants of vector-borne disease transmission include vector survival and reproduction, the vector is the biting rate, and the pathogen's incubation rate within the vector organism. Vectors, pathogens, and hosts each survive and reproduce within a range of optimal climatic conditions: temperature and precipitation are the most important, while sea level elevation, the wind, and daylight duration are also important. Human exposure to waterborne infections occurs by contact with contaminated drinking water, recreational water, or food. This may result from human actions, such as improper disposal of sewage wastes, or be due to weather events. Rainfall can influence the transport and dissemination of infectious agents, while temperature affects their growth and survival.

Source: World Health Organization

4.9.8 Relationship to other Hazards

Flood and drought conditions are associated with infectious disease because food and waterborne disease outbreaks can be sparked by flood and drought conditions. Food and water can become contaminated during flood and drought conditions, which can negatively impact the public's health. Norovirus, Salmonella, and E. coli are also associated with waterborne illness outbreaks, which are usually caused by drinking water contaminated by animal or human waste. Additionally, standing water from flooding can cause the mosquito population to increase, making West Nile Virus infections more likely to occur.

4.10 Invasive Species

Invasive Species was a new hazard identified to be included in the 2015 plan update for Pennington County. The prior plan from January 2008 for Pennington County did not include invasive species. Since invasive species is a new hazard, a definition is provided in order to orient the reader with a background of what invasive species are, what history they have in Pennington County and the potential invasive species have on the residents of Pennington County.

Invasive species are non-native organisms that pose a threat to an ecosystem, to the environment, to the economy, or to human health. They may be animals, plants, or microorganisms that usurp the habitats of native life forms, causing them to decline in population or to disappear from their natural environment. Human beings or their activities introduce these organisms either accidentally or intentionally. Not all introduced species are invasive; however, an organism that is beneficial in one place may become a nuisance in another. Species described as "introduced" are not considered a threat to their new environment, whereas invasive species are regarded as pests.

4.10.1 Invasive Species Program

To address the problems caused by invasive species, the 1991 Minnesota Legislature directed the Minnesota Department of Natural Resources (DNR) to establish the Invasive Species Program. The program is designed to implement actions to prevent the spread of invasive species and manage invasive aquatic plants and wild animals (Minnesota Statutes 84D). Most of the invasive species prevention and management activities are conducted or directed by staff from DNR's Division of Ecological and Water Resources – Invasive Species Program. In addition, the program hires approximately 150 seasonal staff during the summer to inspect boats at public water accesses and help implement management activities. In total, the equivalent of more than 25 full-time positions is focused on invasive species work. The DNR's Invasive Species Program addresses many species that are present in Minnesota, such as Eurasian watermilfoil, purple loosestrife, zebra mussels, and spiny water fleas. The program also attempts to prevent the introduction of invasive species that have the potential to move into Minnesota, for example, hydrilla and water chestnut. To do so, the program identifies potentially invasive species in other areas of North America and the world, predicts pathways of spread, and develops and implements solutions that reduce the potential for introduction and spread. Prevention activities are often undertaken in collaboration with other states, agencies, and partners with similar concerns. Prevention efforts today not only reduce the spread of invasive species but also buy the critical time needed for research and management that may provide long-term control solutions.

4.10.2 Factors that Make a Species Invasive

In most cases, invasive species are very competitive, highly adaptive, and extremely successful at reproducing. Factors relating to the new environment, however, are also important. For example, an organism may have been held in check in its place of origin by predators; if its new environment lacks predators, there may be nothing to stop it spreading uncontrollably. A predatory animal in its natural environment may be part of a stable ecosystem, as prey animals have adapted to deal with it. In a new environment, where potential prey lacks these adaptations, it may threaten other species with extinction.

4.10.3 Invasive Species Risk in Pennington County

The overall probability for invasive species within Pennington County is unlikely, its relative impact is No Impact and thus the overall risk for invasive species within Pennington County is Little to No. The risk for

invasive species in Pennington County is different for each city and was determined based upon the specific data collected and outlined in the history section of this hazard profile. In assessing invasive species for the 2015 update, data from 2009-2014 was used to determine the risk for Pennington County, including each of the cities and Pennington County as a whole. The table provided below provides the name of each of the cities in the county, the probability that invasive species will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 68: Invasive Species Risk by City in Pennington County

Invasive Species			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Unlikely**	**No Impact**	**Little to No**
St. Hilaire	**Unlikely**	**No Impact**	**Little to No**
Thief River Falls	**Unlikely**	**No Impact**	**Little to No**
County	**Unlikely**	**No Impact**	**Little to No**
Total	**Unlikely**	**No Impact**	**Little to No**

4.10.4 Invasive Species History in Pennington County

According to the Department of Natural Resources (DNR), Minnesota's natural resources are threatened by a number of invasive species such as Zebra Mussels, Eurasian Watermilfoil, Common Buckthorn, and Emerald Ash Borer. Invasive species in Minnesota occur on land or in the water. The MN DNR works to help prevent the spread and promote the management of invasive species. According to the Department of Natural Resources Designation of Infested Waters published on July 29, 2015, Pennington County, Minnesota has no designated infested waters. Pennington County is one of the counties in Minnesota with the least number of invasive plant species reported, with 78 species. The top county in Minnesota has 312 invasive plant species.

4.10.5 Presidential Declared Disasters for Invasive Species

There have not been any presidentially declared disasters for invasive species for Pennington County.

4.10.6 Mitigation Actions in the Past Five Years in Pennington County

No mitigation actions for invasive species were listed in Pennington County's January 2008 All Hazard Mitigation Plan, although the Minnesota Department of Natural Resources has efforts in place to prevent and control invasive species. Efforts to prevent invasive species from becoming established in new areas focus on tighter import controls, checks on imported goods, and, where practical, subjecting goods and materials to treatment with insecticides or sterilization procedures. Control of species that have already become established can be difficult. The methods used can include pesticides for plants and insects, physical removal of large plants, culling of animal pests, and the introduction of natural predators for plants and small animals.

Aquatic Invasive Species (AIS) Prevention

The Aquatic Invasive Species Prevention is a Minnesota State Department of Natural Resources program created to prevent introductions of new invasive species into Minnesota. Another goal of this program is to prevent the spread of invasive species within Minnesota and reduce the impacts caused by invasive species

in Minnesota's ecology, society and economy. The amount designated for each county is based on the number of watercraft trailer launches as well as the number of watercraft parking spaces within each county. Pennington County was allocated $9,772 for 2014 and $7,154 for 2015 and years following.

Aquatic Invasive Species Laws

Laws regarding Aquatic Invasive Species are in place to prevent the spread of aquatic invasive species. The laws are as follows:

- 21 days - When moving equipment from a lake or river, all visible zebra mussels, facet snails and aquatic plants must be removed whether dead or alive. Equipment must be dry for at least 21 days and AIS free before placing in another waterbody.
- Pull the Plug - All water draining devices must be removed or set to "open" when on public roads - including live wells.
- Bait Disposal - Dispose of all unwanted bait in the trash, dumping unused bait on land or in the water is illegal.

4.10.7 Vulnerability in Pennington County

A vulnerability with invasive species is how new invasive species are introduced to an area. Organisms can spread outside their native habitats through international trade and travel. Insects, fungi, and microorganisms can arrive on imported fruit and vegetables, on garden and houseplants, and in soil carried with these items. In some cases, imported garden plants themselves have become invasive. People can unwittingly carry microorganisms and even plant seeds from one country to another. Ships can carry a whole host of potentially harmful life forms, from marine organisms clinging to the sides or in ballast water to small mammals, such as rats and mice, inside the ship itself.

Many invasive species have been introduced deliberately. Animals kept as pets can if allowed to breed in the wild outside their original environment, become a major threat to an ecosystem. Animals and plants have sometimes been brought to new environments for agricultural or other commercial purposes, only to become a major pest. Some organisms have been imported in an attempt to control other invasive species.

4.10.8 Invasive Species and Climate Change

According to the Minnesota All Hazard Mitigation Plan from 2014, climate change will exacerbate a range of risks to the Great Lakes region, including changes in the range and distribution of important commercial and recreational fish species, increased invasive species, declining beach health, and harmful blooms of algae. Declines in ice cover will continue to lengthen the commercial navigation season (but also lead to increased danger in ice-based recreation activities.)

4.10.9 Relationship to Other Hazards

Applicability is unknown.

4.11 Subsidence

Subsidence was identified in the prior hazard mitigation plan from January 2008 for Pennington County and was identified as one of the hazards to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what subsidence is, the history of it within Pennington County, and the potential it has to impact the residents. A definition of subsidence from the 2014 Minnesota State Hazard Mitigation Plan is provided prior to taking a closer look at the effect subsidence has on Pennington County in order to provide the reader with knowledge of the hazard. According to the 2014 Minnesota State Hazard Mitigation Plan, there are three types of potential problems associated with the existence or formation of sinkholes: subsidence, flooding, and pollution. Subsidence commonly involves a gradual sinking, but it could also result in an instantaneous or catastrophic collapse. In Minnesota, subsidence can occur in areas of the state where limestone and dolostone are present, including the northwestern corner of the state.

The change in the local environment affecting the soil mass causing subsidence and sinkholes collapse is called a triggering mechanism. Water is the main factor affecting the local environment that causes subsidence. The main triggering mechanisms for subsidence are water level decline, changes in groundwater flow, increased loading, and deterioration (abandoned coal mines). Water level decline can happen naturally or be human induced. Factors in water decline are pumping water from wells, localized drainage from construction, dewatering, and drought. Changes in the groundwater flow include an increase in the velocity of groundwater movement, increase in the frequency of water table fluctuations, and increased or reduced recharge. Increased loading causes pressure in the soil leading to failure of underground cavities and spaces. Vibrations caused by an earthquake, vibrating machinery and blasting can cause structural collapse followed by surface settlement.

Sinkholes and subsidence are also common in those areas of the state underlain by old abandoned coal and iron mines. Pillows left for roof support in the mines generally deteriorate over time and eventually collapse, removing roof support. This is particularly a problem where mines underlie more recently developed residential areas and roads.

4.11.1 Subsidence Risk in Pennington County

The overall probability for subsidence within Pennington County is Likely, its relative impact is Low, and thus the overall risk for subsidence within Pennington County is Little to No. The risk for subsidence in Pennington County is different for each city and was determined based upon the specific data collected and outlined in the history section of this hazard profile. In assessing subsidence for the 2015 update, data from 2009-2014 was used to determine the risk for Pennington County, including each of the cities and Pennington County as a whole. Most notable are the cities of St. Hilaire, Thief River Falls and the unincorporated areas of Pennington County. The table provided below provides the name of each of the cities in the county, the probability that subsidence will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 69: Subsidence Risk by City in Pennington County

Subsidence			
City	Probability	Impact	Risk
Goodridge	Unlikely	No Impact	Little to No
St. Hilaire	Likely	Low	Little to No
Thief River Falls	Likely	Low	Little to No
County	Likely	Low	Little to No
Total	Likely	Low	Little to No

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents little change from the previous plan. The 2015 update indicate Little to No risk for subsidence in Pennington County. Similarly, the last plan update done in January 2008 indicated that subsidence had the potential to have a limited impact on Pennington County and no significant threat is posed. This meant that the hazard was not found to have occurred and could have limited impact on single sites in Pennington County.

4.11.2 Subsidence History in Pennington County

According to the 2008 Pennington County Hazard Mitigation Plan, the Red Lake River causes much subsidence in Pennington County. Rural areas grow increasingly more affected, including both farmland and homes. A graveyard is also in danger of subsidence. Pennington County also has a monitoring system for the use and management of soils.

Previous Problems

The previous Hazard Mitigation Plan for Pennington County from January 2008 indicated that subsidence is a documented problem in Pennington County. Action needs to be done to prohibit future populations from being endangered by the river, as many strive to live near it. Further development may increase the subsidence problem. The plan indicated that a moderately ranked problem by the Red Lake Watershed is that there is tributary bank instability at outlets into rivers in the whole Red Lake River Subwatershed. Sedimentation is also a problem. As the sediment collects, the capacity of local waterways is diminished. A high flow may have more of an effect on an area because of the shallow ditch and river systems. There is erosion in the Red Lake River Subwatershed in the Red Lake Watershed. Ditches out letting into natural streams fill the outlet streams with sediment. This is a widespread problem for the subwatershed and is ranked as a high problem.

4.11.3 Presidential Declared Disasters for Subsidence

There were no declared disasters related to subsidence in Pennington County.

4.11.4 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for subsidence from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for subsidence was to control new structure placement and population growth by reducing current subsidence events. As such, Pennington County in partnership with the USDA and NRC continue to utilize the county specific soil management survey to inform current and future land use decisions.

Information from the Pennington County Soil Survey is used to plan the use and management of soils for crops and pasture; as forest land; sites for buildings, highways and other transportation systems, parks and other recreational facilities; as well as wildlife habitat. In addition, the Pennington County Soil survey is used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties. Planners and others using soil survey information can and will continue to evaluate the effect of specific land uses on productivity and on the environment within Pennington County.

4.11.5 Vulnerability in Pennington County

Any residential land, which lies in the cities St. Hilaire or Thief River Falls or lies along the Red River, has the potential to be affected by subsidence. Houses or businesses located near a body of water or waterway and anything located on the top of a considerable slope are also more vulnerable. As such, subsidence continues to be a priority concerning the Pennington County Hazard Mitigation Update.

4.11.6 Subsidence and Climate Change

Changes in climate have the potential to impact subsidence in Pennington County. Periods of excessive and prolonged rainfall can cause ground water levels to rise and swell prone soils, particularly cohesive soils with a high clay content (and to a lesser extent silt), which are particularly susceptible to volumetric change. Conversely, excessive and prolonged dry periods cause shrinkage. In severe winter weather, the waterlogged ground can move further by frost heave.

4.11.7 Relationship to other Hazards

Subsidence can be related to other hazards such as severe summer storms, because they can cause excessive or prolonged periods of rain, which can cause the ground to become susceptible to volumetric change. Drought also has the potential to be related to subsidence because periods of drought can cause shrinkage of soils, which can impact subsidence. Additionally, flooding can cause excessive water on the ground that can cause volumetric changes.

4.12 Windstorms

Windstorms were not identified in the prior hazard mitigation plan from January 2008 for Pennington County as a separate hazard but were included as part of the "Summer Storms" risk profile. Windstorms were identified as one of the hazards to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include an in-depth look at what windstorms are, the history of them within Pennington County, and the potential they have to impact the county residents. A definition of windstorms is provided prior to taking a closer look at the effect hail has on Pennington County in order to provide the reader with knowledge of the hazard.

FEMA defines winds in excess of 58 miles per hour, excluding tornadoes, as windstorms. Straight-line winds and windstorms are used interchangeably in the Plan. This hazard is treated as a different category than Tornadoes (which may also include high winds). Windstorms are among the nation's most severe natural hazards in terms of both lives lost and property damaged.

Severe winds can damage and destroy roofs, toss manufactured homes off their pier foundations, and tear light-framed homes apart. There are several different types of windstorms. A "downburst" is defined as a strong downdraft with an outrush of damaging winds on or near the earth's surface. When people experience property damage from a downburst, they often do not believe that "just wind" could have caused the damage, and they assume that they were hit by a tornado. Downbursts may have wind gusts up to 130 mph and are capable of the same damage as a medium-sized tornado. A "gust front" is the leading edge of the thunderstorm downdraft air. It is most prominent near the rain-free cloud base and on the leading edge of an approaching thunderstorm and is usually marked by gusty, cool winds and sometimes by blowing dust. The gust front often precedes the thunderstorm precipitation by several minutes. Straight-line winds, when associated with a thunderstorm, are most frequently found with the gust front. These winds originate as downdraft air reaches the ground and rapidly spreads out, becoming a strong horizontal flow.

Table 70: Effects of Wind Speed

Speed	Effects
25-31 mph	Large branches in motion, whistling in telephone wires
32-38 mph	Whole trees in motion
39-54 mph	Twigs break off of trees, the wind impedes walking
55-72 mph	Damage to chimneys and TV antennas pushes over shallow-rooted trees
73-112 mph	Roof surfaces peel off, windows break, trailer houses overturn
113+ mph	Roofs torn off houses, weak buildings and trailer houses destroyed, large trees uprooted

4.12.1 Windstorm Risk in Pennington County

The overall probability that windstorms will occur each year in Pennington County is Highly Likely and its relative impact is Moderate and thus the overall risk for Pennington County is Moderate. The risk for windstorms for each of the cities is the same because data was not available by individual city. In assessing windstorm data for the 2015 update, data from 2009 to 2015 for Pennington County was used to determine the overall risk of windstorms. The table provided below provides the name of each of the cities in the County, the probability that windstorms will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table71: Windstorm Hazard Risk Assessment

Windstorm			
City	Probability	Impact	Risk
Goodridge	Highly Likely	Moderate	Moderate
St. Hilaire	Highly Likely	Moderate	Moderate
Thief River Falls	Highly Likely	Moderate	Moderate
County	Highly Likely	Moderate	Moderate
Total	Highly Likely	Moderate	Moderate

4.12.2 Windstorm History in Pennington County

Windstorm history in Pennington County was obtained from the National Climatic Data Center. Records show high wind events in Pennington County in 2011, 2014 and 2015. A comprehensive list of the last 50 years of data can be found in Appendix B. There have been eight high wind events reported in Pennington County in the past 50 years.

According to the National Oceanic Atmospheric Administration, the most recent report of high wind in Pennington County was on October 12, 2015. It was reported that for most of northwest Minnesota, Sunday, October 11th, was a hot day with steady south winds. However, a cold front pushed through the Red River Valley by early evening. Just ahead of the front, winds took on a bit of a southwest to west direction, which is a good warming wind. Temperatures along the Red River Valley from Grand Forks southward surged into the 90s. Fargo hit 97 degrees, which was its warmest temperature of the year. Behind the front, temperatures would quickly fall with strong northwest winds. These strong winds caused several wildfires, elsewhere, freshly plowed fields and the wind resulted in areas of blowing dust and low visibilities. These strong winds dropped off a little overnight but quickly picked up again Monday morning. There was no reported damage, injuries or deaths as a result of this event.

Table 72: Windstorms in Pennington County from 2009-2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/07/2011	16:00	CST-6	High Wind	35 kts. MS	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	07/21/2014	23:00	CST-6	High Wind	40 kts. ES	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/12/2015	11:30	CST-6	High Wind	35 kts. MS	0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

Damages to crops from windstorms are another data point that can help determine the vulnerability of a county to windstorms. Included in the 2014 Minnesota All-Hazard Mitigation Plan was the indemnity claims for wind on crops from 2000-2013. Pennington County had $1,326,009 in claims during this timeframe.

4.12.3 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions relating to windstorms in the January 2008 Hazard Mitigation Plan for Pennington County included improving communication equipment within the county, assessing the current city sirens and increasing GIS utilization.

4.12.4 Vulnerability of Jurisdictions within Pennington County

Pennington County attracts many people during the summer months because of the recreational activities on the Red Lake River. This is important information to keep in mind because it means there is a larger population of people who are potentially vulnerable during the summer months to windstorms. Thus, the added population may require more space, resources or protection.

According to the 2014 Minnesota All-Hazard Mitigation Plan, there is a high probability of a high wind event in Minnesota is at least annually. Most high wind events occur during the months of April through September. This recurrence is expected to remain relatively stable, although there will be year-to-year fluctuations. Long-term changes in weather patterns may also influence the number of windstorms that occur. The state hazard mitigation plan determined a vulnerability ranking for each county in Minnesota. Pennington County was ranked among about a third of the counties in the state with a Low overall ranking. A Low ranking according to the state plan indicated this ranking reflects less vulnerability based on, in general, less than one wind event per year and compared to building exposure. It was indicated that Pennington County has 0.71 events per year greater than 65 knots. The building exposure was listed as $1.0 billion.

In addition, windstorms have a higher likelihood of occurring in the summer months, so individuals partaking in outdoor recreational activities or working in fields in agricultural jobs would be at an increased risk to windstorms.

4.12.5 Windstorm and Climate Change in Pennington County

According to the Federal Advisory Committee Draft National Climate Assessment (NCA), winter storms have increased slightly in frequency and intensity, and their tracks have shifted northward over the U.S. Lack of high-quality long-term data sets make an assessment of changes in wind speeds very difficult (Kunkel, K.E. et al, 2013). One analysis generally found no evidence of significant changes in wind speed distribution. Other trends in severe storms, including the numbers of hurricanes and the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds are uncertain (NCA, page 26). Since the

impact of more frequent or intense storms can be larger than the impact of average temperature, “climate scientists are actively researching the connections between climate change and severe storms” (NCA, page 59).

4.12.6 Relationship to Other Hazards in Pennington County

Windstorms are related to summer storms and tornadoes, which both are highly likely to occur in Pennington County and there is an extensive history of summer storms and tornadoes occurring each year in Pennington County. Drought is also related to windstorms as drought conditions could cause problematic dust during a windstorm.

4.13 Extreme Heat

Extreme heat was not identified as a separate hazard in the prior hazard mitigation plan from January 2008 for Pennington County but was included in the "Drought and Extreme Heat" category. It was identified as a separate hazard to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what extreme heat is, the history of it within Pennington County and the potential it has to impact the county residents. A definition of extreme heat is provided prior to taking a closer look at the effect extreme heat has on Pennington County in order to provide the reader with knowledge of the hazard.

Extreme summer heat is the combination of very high temperatures and exceptionally humid conditions. If such conditions persist for an extended period of time, it is called a heat wave (FEMA, 1997). Heat stress can be indexed by combining the effects of temperature and humidity. The index estimates the relationship between dry bulb temperatures (at different humidity) and the skin's resistance to heat and moisture transfer - the higher the temperature or humidity, the higher the "feels like" temperature. The major human risks associated with extreme heat are as follows:

- Heatstroke: Considered a medical emergency, heatstroke is often fatal. It occurs when the body's responses to heat stress are insufficient to prevent a substantial rise in the body's core temperature. While no standard diagnosis exists, a medical heatstroke condition is usually diagnosed when the body's temperature exceeds 105°F due to environmental temperatures. Rapid cooling is necessary to prevent death, with an average fatality rate of 15%, even with treatment.
- Heat Exhaustion: While much less serious than heat stroke, heat exhaustion victims may complain of dizziness, weakness, or fatigue. Body temperatures may be normal or slightly to moderately elevated. The prognosis is usually good with fluid treatment.
- Heat Syncope: This refers to the sudden loss of consciousness and is typically associated with people exercising who are not acclimated to warm temperatures. Causes little or no harm to the individual.
- Heat Cramps: May occur in people unaccustomed to exercising in the heat and generally ceases to be a problem after acclimatization.

In addition to affecting people, severe heat places significant stress on plants and animals. The effects of severe heat on agricultural products may include reduced yields and even loss of crops.

Table 73: Heat Index and Disorders

Danger Category	Heat Disorders	Apparent Temperatures °F
Extreme Danger	**Heatstroke or sunstroke imminent.**	**>130**
Danger	**Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.**	**105-130**
Extreme Caution	**Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.**	**90-105**
Caution	**Fatigue possible with prolonged exposure and physical activity.**	**89-90**

4.13.1 Extreme Heat Risk in Pennington County

The overall probability that extreme heat will occur each year in Pennington County is possible and its relative impact is No Impact and thus the overall risk for Pennington County is Little to No. The risk for extreme heat for each of the cities is the same because there has not been any history of the excessive head in the past 50 years in Pennington County. The table provided below provides the name of each of the cities in the County, the probability that extreme heat will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determined probability and impact ratings.

Table 74: Extreme Heat Hazard Risk Assessment

Extreme Heat			
City	Probability	Impact	Risk
Goodridge	Possible	No Impact	Little to No
St. Hilaire	Possible	No Impact	Little to No
Thief River Falls	Possible	No Impact	Little to No
County	Possible	No Impact	Little to No
Total	Possible	Low	Little to No

4.13.2 Extreme Heat History in Pennington County

The National Oceanic and Atmospheric Administration Storm Events Database indicated there have not been any excessive heat events in the past 50 years in Pennington County.

4.13.3 Mitigation Actions in the Past Five Years in Pennington County

There were no mitigation actions stated in the previous Hazard Mitigation Plan from January 2008 for extreme heat. However, Pennington County does have an aging population and the elderly are more susceptible to extreme heat, so there should be some mitigation planning in place.

4.13.4 Vulnerability in Pennington County

Pennington County has outdoor recreational opportunities, such as rivers, forests and wildlife refuges in the county, which draw large groups of people who are may not be residents of the county, throughout the summer months. These recreational opportunities increase the number of people vulnerable to an excessive heat event in Pennington County.

4.13.5 Extreme Heat and Climate Change in Pennington County

Minnesota's average temperature has increased more than 1.5 degrees F since record keeping began in 1895, with increased warming happening in recent decades (Interagency Climate Adaptation Team, p. 4). Annual temperatures in the Midwest have generally been well above the 1901-1960 average since the late 1990s, with the decade of the 2000s being the warmest on record (Kunkel, K.E. et al, 2013). The Midwest has experienced major heat waves and their frequency has increased over the last six decades (Perera et al. 2012). For the U.S., mortality increases 4% during heat waves compared with non-heat wave days (Anderson and Bell 2011). During July 2011, 132 million people across the U.S. were under a heat alert – and on July 20 the majority of the Midwest experienced temperatures in excess of 100°F. Heat stress is

projected to increase as a result of both increased summer temperatures and humidity (Schoof 2012).

4.13.6 Relationship to Other Hazards

Excessive heat spanning over weeks or months could lead to drought conditions within the county, which could have the potential to impact the agricultural industry. As noted in the Community Profile section of this plan, agriculture is a big industry within Pennington County and a large amount of the land within the county is used for agricultural purposes. Excessive heat conditions within the county could also have the potential to impact the health of the residents within the county. The elderly and children are the most vulnerable to heat-related illnesses and may not stay adequately hydrated.

4.14 Lightning

Lightning was not identified as a separate hazard in the prior hazard mitigation plan from January 2008 for Pennington County but was included in the "Summer Weather" category. It was identified as a separate hazard to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what lightning is, the history of it within Pennington County and the potential it has to impact the county residents. A definition of lightning is provided prior to taking a closer look at the effect extreme heat has on Pennington County in order to provide the reader with knowledge of the hazard.

Lightning typically occurs as a by-product of a thunderstorm. In only a few millionths of a second, the air near a lightning strike is heated to 50,000°F, a temperature hotter than the surface of the sun.
The hazard posed by lightning is significant. High winds, rainfall, and a darkening cloud cover are the warning signs for possible cloud-to-ground lightning strikes. While many lightning casualties happen at the beginning of an approaching storm, more than half of lightning deaths occur after a thunderstorm has passed. Lightning has been known to strike more than 10 miles from the storm in an area with clear sky above.

According to the National Oceanic and Atmospheric Administration (NOAA), 30 million points on the ground are struck on average each year in the U.S. (NOAA, Severe Weather 101).

Lightning is the most dangerous and frequently encountered weather hazard that most people in the United States experience annually. Lightning is the second most frequent killer in the U.S., behind floods and flash floods, with nearly 100 deaths and 500 injuries annually. The lightning current can branch off to strike a person from a tree, fence, pole, or another tall object. In addition, an electrical current may be conducted through the ground to a person after lightning strikes a nearby tree, antenna, or another tall object. The current may also travel through power lines, telephone lines, or plumbing pipes to damage property or fires.

4.14.1 Lightning Risk for Pennington County

The overall probability that lightning will occur each year in Pennington County is possible and its relative impact is No Impact and thus the overall risk for Pennington County is Little to No. The risk for lightning for each of the cities is the same because there have not been lightning events in the past 50 years according to the National Oceanic Atmospheric Administration Storm Events Database. The table provided below provides the name of each of the cities in the County, the probability that lightning will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determined probability and impact ratings.

Table 75: Lightning Hazard Risk Assessment

Lightning			
City	Probability	Impact	Risk
Goodridge	Possible	No Impact	Little to No
St. Hilaire	Possible	No Impact	Little to No
Thief River Falls	Possible	No Impact	Little to No
County	Possible	No Impact	Little to No
Total	Possible	No Impact	Little to No

4.14.2 History of Lightning in Pennington County

The National Oceanic and Atmospheric Administration Storm Events Database indicated there have not been any lightning events in the past 50 years in Pennington County.

4.14.3 Mitigation Actions in the Past Five Years in Pennington County

There were no mitigation actions listed in the previous Hazard Mitigation Plan from January 2008 for lightning. As lightning continues to be a low priority this update will limit its focus on lightning incidents.

4.14.4 Vulnerability of Jurisdictions for Lightning

All humans and structures in the state are vulnerable to damage from lightning. Individuals who partake in outdoor recreational activities, or those who work outside, especially during the summer months when lightning is more likely, are at an increased risk. Pennington County has numerous outdoor recreational opportunities throughout the summer months which draw large groups of people who may not be residents in the county.

4.14.5 Lightning and Climate Change

According to the Draft National Climate Assessment (NCA), the projected possible intensity and frequency of tornadoes, hail, and damaging thunderstorm winds, the conditions likely associated with lightning are uncertain (NCA, 2013, p. 26). Severe rain events are becoming more common and may include an additional risk of lightning.

4.14.6 Relationship to Other Hazards

Lightning has the ability to create forest fires as well as local and large-scale power outages that can be damaging or disruptive to communication systems and electrical systems. These effects of lightning can result in millions of dollars in damage each year. In the Midwest alone costs to repair power and communication systems amount up to $65 million annually (Changnon and Kunkel, 2006).

4.15 Wildfires

Wildfires were identified and included in the prior hazard mitigation plan from January 2008 for Pennington County under the "Fire" hazard category. Wildfires were also identified as one of the hazards to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what wildfires are, the history of wildfires within Pennington County, and the potential they have to impact the county residents. A definition of wildfires from the Minnesota All Hazard Mitigation Plan from 2014 is provided prior to taking a closer look at the effect wildfires have in Pennington County in order to provide the reader with knowledge of the hazard.

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing, and possibly consuming structures. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. Wildfires can be caused by humans through acts such as arson or campfires, or can be caused by natural events such as lightning. Wildfires can be categorized into four types. The first type is wildfires that are fueled primarily by natural vegetation in grasslands, brushlands, and forests. The second type is firestorms, which occur during extreme weather (e.g., high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted. The third type is interface or intermix fires that occur in areas where both vegetation and structures provide fuel. The fourth and final type are prescribed fires and prescribed natural fires which are intentionally set or natural fires that are allowed to burn for beneficial purposes.

4.15.1 Wildfire Risk in Pennington County

The overall probability that wildfire will occur each year in Pennington County is possible and its relative impact is Low and thus the overall risk for Pennington County is Little to No. The risk for wildfire for each of the cities is different based on the data available by individual city. In assessing wildfire data for the 2015 update, data from 2003 to 2013 was used to determine the risk. The table provided below provides the name of each of the cities in the County, the probability that wildfires will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determined probability and impact ratings.

Table 76: Wildfire Risk by City in Pennington County

Wildfire			
City	Probability	Impact	Risk
Goodridge	Possible	Low	Little to No
St. Hilaire	Possible	Low	Little to No
Thief River Falls	Possible	Low	Little to No
County	Possible	Low	Little to No
Total	Possible	Low	Little to No

4.15.3 History of Wildfires in Pennington County
The National Oceanic Atmospheric Administration did not have any record of wildfires in Pennington County from January 1, 1964, to September 30, 2015.

4.15.4 Presidential Declared Disasters for Wildfire
There are no reported presidential declared disasters related to fire in Pennington County.

4.15.5 Mitigation Actions in the Past Five Years in Pennington County
Mitigation actions for fire from Pennington County's January 2008 Hazard Mitigation Plan stated the mitigation action for wildfire was to prevent wildfires by minimizing the amount of fuel in fire-prone areas.

The Minnesota Department of Natural Resources (DNR) has also adopted the Firewise Program. As more people build homes in the forests and fields of Minnesota, firefighters are less able to protect people's assets while combating a wildfire. The main view of this program is to protect homes from fire by having the communities resolve potential problems before these problems become fire hazards. Such mitigation activities include thinning of trees, road improvement, and the introduction of additional fire hydrants to deficient areas.

4.15.6 Vulnerability of Jurisdictions within Pennington County
The following factors contribute significantly to wildfire behavior: topography and weather. As slope increases, the rate of wildfire spread increases. South facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildfire behavior. Ridge tops may however mark the end of wildfire spread, since fire spreads more slowly or may even be unable to spread downhill.

The most variable factor affecting wildfire behavior is the weather. Important weather variables are temperature, humidity, the wind, and lightning. Weather events ranging in scale from localized thunderstorms to large fronts can have major effects on wildfire occurrence and behavior. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signal reduced wildfire occurrence and easier containment. In addition, structures in jurisdictions that mix with forests, peat bogs, and prairies are vulnerable to damages to wildfires.

Wildfires have the potential to cause extensive damage and dollar loss to critical infrastructure within the county. Citizens who are elderly, are at an increased risk because if there is a fire, they may have difficulty getting out of their residence or evacuating due to a wildfire without assistance. As noted in the community profile, the elderly population within Pennington County was 2,117 in 2010 and continues to grow.

4.15.7 Wildfire and Climate Change in Pennington County
According to the 2014 National Climate Assessment, temperatures are predicted to rise in the state of Minnesota into mid-century and this could lead to more extreme heat events. The increase in a number of extreme heat events could increase loads on electrical grids, causing increasing possibility of structural fires due to overloaded electrical grids. In addition, lightning strikes can cause structural fires and several types of extreme weather events have already increased in frequency and/or intensity due to climate change, and further increases are projected, according to the 2014 National Climate Assessment.

According to the Minnesota, All Hazard Mitigation Plan from 2014 and information provided by local representatives, droughts and associated fires have been happening throughout Minnesota's history. While

there was no apparent change in drought duration in the Midwest over the past century (Dai 2010), the average number of days without precipitation is projected to increase in the future (Kunkel, K.E. et al, 2013). Temperatures are predicted to rise, which could lead to more extreme heat events and associated wildfire risks.

As Minnesota's climate changes, weather fluctuations between drought and extreme rain events and increasing temperatures will lead to changes in forest composition and/or distribution. The northern boreal forest may give way to more deciduous forests or grassland, with a period of dying or diseased trees during the transition. This weather fluctuation can lead to dry conditions that may cause increased fire risk in both grassland and forest environments. National and global studies agree that wildfire risk will increase in the region, but few studies have specifically looked at wildfire potential in the assessment area. At a global scale, the scientific consensus is that fire risk will increase by 10 to 30 percent due to higher summer temperatures (IPCC 2007).

4.15.8 Relationship to other Hazards in Pennington County

Wildfires and structural fires are associated with other hazards such as summer storms, drought, flood and winter storms. 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 the state and national forest lands. Drought is an associated hazard because drought conditions cause high temperatures and dry conditions, which can increase the risk of fires. Drought risk potential is equally as likely in all of the cities throughout the county.

4.16 Hazardous Material

Hazardous Material was identified in the prior hazard mitigation plan from January 2008 for Pennington County and was identified as one of the hazards to be included in this 2015 plan update. Analyses are included in this 2015 plan update to include a more in-depth look at what hazardous material is, the history of it within Pennington County, and the potential it has to impact residents. A definition of hazardous material is provided prior to taking a closer look at the effect hazardous material has on Pennington County in order to provide the reader with a knowledge of the hazard.

Hazardous materials are materials that if released, can pose a threat to human health or the environment. Hazardous material releases can cause long/short term health effects, damage to property, expensive cleanup/contractor costs, serious injury, and even death. Hazardous materials are stored and transported throughout Pennington County and the nation in various quantities. Hazardous materials are transported by various methods such as railcars, barges, air cargo and trucks. Hazardous material incidents can occur in two ways: (1) a release from a bulk storage unit at a fixed facility, and (2) the accidental release of a hazardous material during handling. The handling of a hazardous material includes the transportation, off-loading, and physical handling of the hazardous material.

The release of a hazardous material during handling would most likely be the initial responsibility of the facility or carrier. If the facility or carrier could not contain the release, then resources would need to be mobilized to remediate the release. Once a hazardous material release is recognized, immediate action must be taken to respond to the release to preserve health and safety and reduce the impact to the neighboring community and the environment. Hazardous material releases in highly populated areas could result in either evacuation or "shelter-in-place" situations. A hazardous material release may be a rare occurrence, but one major release could have a significant impact on a region.

Fixed Facilities:

Hazardous materials being used or stored at industrial facilities and in buildings is defined as a *fixed facility* hazardous material release hazard. Fixed facilities include industrial facilities that store hazardous materials required for their processing or facilities that store hazardous materials that result from an industrial process. An uncontrolled release or mishandling of hazardous materials from a fixed facility may result in possible injury or fatality, severe financial loss or liability, contamination, and disruption of critical infrastructure.

Transport:

A hazardous material is a substance or material, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. Transported hazardous materials are classified into one of nine hazard classes. The hazard class is the category of a hazard assigned to a hazardous material according to 49 CFR 173 and the HMT. If a material falls into any of the following classes, it is considered a hazardous material:

- Class 1 – Explosives
- Class 2 -- Gases
- Class 3 -- Flammable Liquids (and Combustible Liquids)
- Class 4 -- Flammable Solids; Spontaneously Combustible Materials; Dangerous when Wet Materials
- Class 5 -- Oxidizers and Organic Peroxides
- Class 6 -- Toxic Materials and Infectious Substances

- Class 7 -- Radioactive Materials
- Class 8 -- Corrosive Materials
- Class 9 -- Miscellaneous Dangerous Goods

In Minnesota, of the various modes of transporting hazardous materials, rail and truck are by far the most common means of shipment. Interstate freight movement is distributed among rail, truck, and water modes.

Although rail transports larger gross tonnage of hazardous materials, the number of truck traffic counts carrying hazardous materials shipments is greater. This is due to the larger volumes involved in a single rail shipment. The majority of hazardous materials transport is conducted on Federal or State highways.

4.16.1 Hazardous Materials Risk in Pennington County

While the probability for hazardous material releases is highly likely within Pennington County, its relative impact is Moderate, and thus the overall risk for hazardous material releases in Pennington County is Moderate. The risk for hazardous material release was determined based on specific data collected and outlined in the history section of this hazard profile. In assessing hazardous material releases for the 2015 update, data from 2009-2014 for Pennington County was available by cities that have been affected. Most notable is the City of Thief River Falls because of the recent history of hazardous material releases in the city. The table provided below provides the name of each of the cities in the County, the probability that hazardous material will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 77: Hazardous Materials Risk by City for Pennington County

HAZARDOUS MATERIALS			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Likely**	**Low**	**Little to no**
St. Hilaire	**Likely**	**Low**	**Little to no**
Thief River Falls	**Highly Likely**	**Moderate**	**Moderate**
County	**Likely**	**Low**	**Little to No**
Total	**Highly Likely**	**Moderate**	**Moderate**

*Note frequency data was only available from 1982-2014

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents little change from the previous plan. The 2015 update indicated there is a Moderate overall risk for Pennington County for hazardous material. Similarly, the last plan update done in January 2008, indicated that hazardous materials have the potential to have a substantial major impact on Pennington County and a significant threat is posed. This meant that the hazard was found to occur once in five years and could have a substantial major impact on single sites in Pennington County.

4.16.2 Hazardous Material History in Pennington County

The data from Pennington County for hazardous material incidence from the Right to Know Network for the years of 2009-2014 was gathered as part of this report. During those years, there were nine hazardous material incidents resulting in two hospitalizations and two reported injuries. There were no reported fatalities, but there was a need for the evacuation of 60 people. No property damage was reported. These nine incidents took place in the cities of Thief River Falls, Richfield and Deep River Falls. Seven of the nine incidents took place in Thief River Falls. More recently in 2014, there were no hazardous material incidents in Pennington County.

Source: The Right to Know Network provides data from the Emergency Response Notification System (ERNS) database reported to the National Response Center.

Previous Problems

The previous Hazard Mitigation Plan for Pennington County from January 2008 listed some problems for Pennington County related to the hazardous material. Floodplain management was listed as a problem and the previous plan stated that it becomes increasingly hard to completely eradicate hazardous materials from the floodplain due to the presence of agriculture in the region. Agriculture makes use of many hazardous materials. A gasoline tank may occur on the property as fuel for the machines. A propane tank may be used for heating a structure such as a home or a workshop. Any pesticides, fertilizer, or herbicides may also be stored somewhere on the property for future use. These materials are usually properly stored and not abused, but they are a presence and should be remembered.

4.16.3 Presidential Declared Disasters for Hazardous Material

There have not been any reported presidential declared disasters related to hazardous material for Pennington County.

4.16.4 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for hazardous material and contamination from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for hazardous material and contamination was to decrease transportation contamination and spill potential by addressing access and visibility issues caused by long or frequent railroad traffic. They also indicated they would alleviate dense traffic patterns. In addition, the county indicated reducing contamination and hazardous material spill occurrences by addressing problems related to meth, containing contaminants and assuring backup supplies of water.

The Emergency Planning and Community Right-to-Know Act (EPCRA), also known as SARA Title III, was enacted in November 1986 to enable state and local governments to adequately prepare and plan for chemical emergencies. Facilities that have spilled hazardous substances, or that store, use, or release certain chemicals are subject to various reporting requirements. Common EPCRA topics include emergency planning; hazardous chemical inventory reporting; chemical information; toxic chemical release reporting; risk management plans, and the toxics release inventory (TRI) database. The TRI database includes facilities that manufacture (including importing), process, or otherwise use a listed toxic chemical above threshold quantities. Facilities covered by EPCRA must submit an emergency and hazardous chemical inventory form to the Local Emergency Planning Committee (LEPC), the State Emergency Response Commission (SERC) and the local fire department annually. This report also called a Tier I or Tier II, includes basic information including facility identification; employee contact information for emergencies and non-emergencies; and site specific information including facility description, chemical types and descriptions, releases or incidents, and chemical storage capacity, capabilities, and locations.

4.16.5 Vulnerability in Pennington County

Within Pennington County, there are areas, which are more susceptible to hazardous material spills. Transportation routes, such as roadways and railways within Pennington County are more vulnerable. There are two railways, which run lines through Pennington County, Minnesota Northern Railroad, and Canadian Pacific Railway. Trains and trucks can carry various hazardous material, which if there was a derailment or crash could pose a threat to those motorists or residents within the area. The areas within the county surrounding pipelines are also vulnerable. Land used for agricultural purposes is a high percentage in Pennington County and can be seen on the map in the Community Profile that outlines land use. Agricultural land has the potential to be more vulnerable because of hazardous material that may be used to treat the land.

4.16.6 Hazardous Material Release and Climate Change

There is no documented link between hazardous material and climate change.

4.16.7 Relationship to Other Hazards

Hazardous material incidences can have an impact on public health. Any hazardous material release or spill has the potential to have an impact on public health or safety.

4.17 Structural Fires

Structural fires were identified and included in the prior hazard mitigation plan from January 2008 and was also identified as one of the hazards to be included in this 2015 plan update. Analyses is included in this 2015 plan update to include a more in-depth look at what structural fires are, the history of structural fires within Pennington County, and the potential they have to impact residents. A definition of structural fires is provided by the 2014 Minnesota All Hazard Mitigation Plan is provided prior to taking a closer look at the effect structural fires have on Pennington County in order to provide the reader with a knowledge of the hazard.

According to the 2014 Minnesota All Hazard Mitigation Plan, structural fires have many causes: cooking, heating, open flame, and arson are the typical leading causes each year. Other causes include careless smoking, misuse of materials, improper storage, equipment / appliance malfunctions, improper building wiring, industrial mishaps, and instances such as train derailments or transportation collisions.

4.17.1 Structural Fire Risk

While the probability of structural fires in Pennington County is highly likely, its relative impact is Moderate, and thus the overall risk for fires in Pennington County is Low. The risk for fires for each of the cities is different and was determined based upon the specific data collected and outlined in the history section of this hazard profile. In assessing fires for the 2015 update, data from 2009 to 2014 was used to determine the risk for Pennington County including each of the cities and Pennington County as a whole. Most notable is the city of Thief River Falls and the unincorporated areas of Pennington County, as they are at moderate risk of fire because of the history of structural fires, which have caused extensive damage to these cities. The table provided below provides the name of each of the cities in the County, the probability that fire will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings.

Table 78: Structural Fire Hazard Risk Assessment

Fires			
City	Probability	Impact	Risk
Goodridge	Likely	Low	Little to No
St. Hilaire	Likely	Low	Little to No
Thief River Falls	Highly Likely	Moderate	Moderate
County	Highly Likely	Moderate	Low
Total	Likely	Moderate	Low

The 2015 update utilized the frequency X consequence (R = FC) formula and each jurisdiction has its own unique risk score based on the 28 points of data analyzed. The risk determined for the 2015 update represents little change from the previous plan. The last plan update was done in January 2008 and indicated that fire had the potential to have a limited impact on Pennington County and no significant threat is posed. This meant that the hazard was found to occur once a year or more and could have limited impact on single or multiple sites in Pennington County. The 2015 update indicated Fire has a Highly Likely

probability and a Moderate Impact and Low risk in Pennington County.

4.17.2 Fire History in Pennington County

The table below outlines the historical structural fires, which have taken place in Pennington County from the Minnesota Department of Public Safety. The data was provided by the annual Fire in Minnesota Report and is based on numbers provided by Minnesota fire departments. The report includes information on fire causes, fatalities, and trends. More information is below that was provided from the 2013 Fire in Minnesota Report.

Causes

The report states that in the past five years, cooking caused the largest percentage of structure fires, 48 percent, with heating and open flame as the second and third leading causes. Cooking, heating, and open flame accounted for 68 percent of total structure fires with known causes. Fires in residential spaces represent 76 percent of all structure fires and 94 percent of fire deaths in structures. Civilian injuries occurred in residential fires 74 percent of the time.

Fatalities

Historically, Minnesotans have been at greatest risk of fire death and injury in their own homes. In 2013, 73 percent of fire deaths and 74 percent of civilian injuries occurred in residential settings. Of all the structural fire deaths 94 percent were in residential properties. The presence or absence of working smoke alarms is often a factor in fire fatalities. In 12 percent of fire deaths occurring in dwellings, smoke alarms were not present or not working. In 58 percent of residential deaths, it was not known whether alarms were present or functioning.

The total dollar loss for structural fires appeared to be on an upward trend with the highest dollar losses in the past 3 years. 2011 had a total dollar loss of $1,547,900 and 2013 had a total dollar loss of $794,050.

Table 79: Structural Fire Data for Pennington County from 2007 to 2013

Year	Fire Runs	Other Runs	Total Loss	Fire Rate	Average Loss per Fire	Fire Deaths
2013	86	157	$794,050	167	$9,803	1
2012	103	166	$216,900	149	$2,384	1
2011	71	151	$1,547,900	208	$23,814	0
2010	68	151	$236,000	205	$3,576	0
2009	40	152	$495,700	356	$10,676	0
2008	63	158	$273,350	226	$4,556	0
2007	64	166	$651,300	218	$10,505	0

Source: Fire In Minnesota Report from the State Fire Pennington for years 2007-2013

The table below provides the data by Fire Department within Pennington County as well as the number of fires, non-fires and dollar loss per fire department. One can see the Thief River Falls Fire Department responded to the most fires with a total of 53. Thief River Falls Fire Department also had the most non-fire, with 146 and had the largest dollar loss, with $677,550 in losses from fires and non-fires.

Table 80: Fire Department Responses and Dollar Loss as Reported Via Minnesota Fire Incident Reporting System (MFIRS)

Fire Department	County	Fires	Non-Fires	Dollar Loss
Goodridge	Pennington	19	0	$8,000
St. Hilaire	Pennington	14	12	$108,500
Thief River Falls	Pennington	53	146	$677,550

Source: Fire in Minnesota Report from the State Fire Pennington for 2013

4.17.3 Presidential Declared Disasters for Structural Fire

There are no reported presidential declared disasters related to fire in Pennington County.

4.17.4 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for fire from Pennington County's January 2008 All Hazard Mitigation Plan stated the mitigation action for fire was to search for available funding to avoid fire damage.

4.17.5 Vulnerability in Pennington County

Structural failures, such as inadequate design, older homes, poor maintenance, natural gas explosion or human factors (neglect or human error); can lead to increased vulnerability to fires. Most structural failures occur within residential homes and low-occupancy buildings where there are fewer people around to notice serious issues that could lead to a collapse or fire. There have been some structural collapses involved in commercial and industrial facilities that have caused numerous fatalities and injuries, but such incidents are rare and are usually due to overloading or design flaws. However, the majority of fatalities due to structure collapse involve residential structures.

Structural fires have the potential to cause extensive damage and dollar loss to critical infrastructure within the county. Citizens, who are elderly, are at an increased risk because if there is a fire, they may have difficulty getting out of their residence without assistance. As noted in the community profile, the elderly population within Pennington County has doubled in the past 50 years and continues to grow.

4.17.6 Fire and Climate Change

According to the 2014 National Climate Assessment, temperatures are predicted to rise in the state of Minnesota into mid-century and this could lead to more extreme heat events. The increase in the number of extreme heat events could increase loads on electrical grids, causing increasing possibility of structural fires due to overloaded electrical grids. In addition, lightning strikes can cause structural fires and several types of extreme weather events have already increased in frequency and/or intensity due to climate change, and further increases are projected, according to the 2014 National Climate Assessment.

4.17.7 Relationship to Other Hazards

Structural fires are associated with other hazards such as summer storms, flood and winter storms. Summer storms are related because lighting strikes may ignite a structural fire. Windstorms that result in structural damage to structures increases the fuel load, which may escalate the risk of a structural fire. Flood, tornado, and high winds may also cause structural fires in their aftermath. Downed power lines, natural gas leaks or other sources of ignition initiated by natural hazards may spark a fire in structures. Routes to structures may be restricted due to flooding or debris from storms.

Winter storms, such as blizzards or ice storms, may impair the movement of response vehicles and decrease response time to structural fires. The reduced response time could potentially increase the

amount of damage. The entire county of Pennington is equally as likely to be moderately impacted by winter storms each year.

4.18 Dam / Levee Failure

Dam/Levee failure, identified as Flood Control Structure Failure in the January 2008 for Pennington County mitigation plan was also identified as one of the hazards to be included in this 2015 plan update. Analyses are included in this 2015 plan update to include a more in-depth look at what dam/levee failure is, the history of it within Pennington County, and the potential it has to impact the county residents. A definition of dam/levee failure is provided prior to taking a closer look at the effect dam/levee failure has on Pennington County in order to provide the reader with knowledge of the hazard.

Dams and levees are an important part of the infrastructure of Minnesota. Dams maintain lake levels and impound water for flood control, power production, and water supply. Levees are used to increase cultivation in agriculture and to protect population and structures from floods. Both structures are artificial barriers that have the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or the control of water. The concern of profiling dams and levees as part of the flooding section is the damage that may result due to a failed structure or overtopping. There are many factors that affect the impact of a failure such as how much liquid is being impounded, the location of structures and critical facilities, intended purpose, and type of construction of the dam or levee. Failure may occur for one or a combination of the following reasons:

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Improper operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway that release water to a downstream dam;
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments that can weaken entire structures.

Dams are complicated structures, and it can be difficult to predict how a structure will respond to distress. The modes and causes of failure are varied, multiple, and often complex and interrelated, i.e., often the triggering cause may not have resulted in failure had the dam not had a secondary weakness. These causes illustrate the need for careful, critical review of all facets of a dam. (National Research Council, 1983).

A levee is any artificial barrier that will divert or restrain the flow of a stream or other body of water for the purpose of protecting an area from inundation by flood waters. Generally, a levee is subjected to water loading for a few days or weeks in a given year; unlike a dam that is retaining water most days in the same year.

A levee breach results when a portion of the levee breaks away, providing an opening for water to flood the landward side of the structure. Such breaches can be caused by surface erosion due to water velocities, or they can be the result of subsurface actions. Subsurface actions usually involve sand boils whereby the

upward pressure of water flowing through porous soil under the levee exceeds the static pressure of the soil weight above it (i.e., under seepage). These boils can indicate instability of the levee foundation given the liquefied substrate below it, leading way to breaching. Levee overtopping is similar to dam overtopping in that the flood waters simply exceed the design capacity of the structure, thus flowing over the lowest crest of the system. Such overtopping can lead to erosion on the landward side which may then lead to breaching. In order to prevent this type landward erosion, many levees are reinforced or armored with rocks or concrete. The concern with levees is that they may fail when exposed to floodwaters for an unusually long period of time. The prolonged hydraulic forces may weaken the structure to the point of failure unless monitoring and reinforcement measures are being taken.

4.18.1 Dam/Levee Failure Risk in Pennington County

The overall probability that dam/levee failure will occur each year in Pennington County is possible and its relative impact is Low and thus the overall risk for Pennington County is Low. The risk for dam/levee failure for each of the cities is different based on the data available by individual city and their proximity to dams with higher hazard potential. In assessing dam/levee failure data for the 2015 update, data from 2009 to 2014 Pennington County was used to determine the overall risk of dam/levee failure. The table provided below provides the name of each of the cities in the County, the probability that dam/levee failure will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determine probability and impact ratings. Most notable is the city of Thief River Falls because of its proximity to the Thief River Falls Dam with a higher hazard potential.

Table 81: Dam/Levee Failure Hazard Risk Assessment

Dam/Levee Failure			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Unlikely**	**No Impact**	**Little to No**
St. Hilaire	**Unlikely**	**No Impact**	**Little to No**
Thief River Falls	**Highly Likely**	**Moderate**	**Moderate**
County	**Unlikely**	**No Impact**	**Little to No**
Total	**Possible**	**Low**	**Low**

4.18.2 Dam/Levee Failure History in Pennington County

There was no record of dam or levee failure in Pennington County in the past five years. There is only one dam listed in Pennington County and this dam has a significant hazard rating. The dam in Pennington County is the Thief River Falls Dam. The Thief River Falls Dam is not under state jurisdiction and is owned by the City of Thief River Falls. This dam is located in Thief River Falls on the Red Lake River. This is a municipal dam which creates a reservoir of 135 acres. The reservoir is used for water supply, hydropower generation, and recreation.

4.18.3 Mitigation Actions in the Past Five Years in Pennington County

There were no mitigation actions specific to dam/levee failure in the Pennington County January 2008 Hazard Mitigation Plan.

4.18.3 Vulnerability of Jurisdictions within Pennington County

Residents residing or participating in recreation activities near the Thief River Falls Dam could be at an increased risk due to these two dams having a significant hazard rating. However, dam and levee failure is sometimes unpredictable and any people within proximity to a dam would be potentially vulnerable.

4.18.4 Dam/Levee Failure and Climate Change in Pennington County

Dams are designed based on assumptions about a river's annual flow behavior that will determine the volume of water behind the dam and flow through the dam at any one time. Changes in weather patterns due to climate change may change the hydrograph, or expected flow pattern. Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events are a mechanism that also results in increased discharges downstream. It is conceivable that bigger rainfalls at earlier times in the year could threaten a dam's designed margin of safety, causing dam operators to release greater volumes of water earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. While climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures. Climate change is adding a new level of uncertainty that needs to be considered with respect to assumptions made during the dam construction.

4.18.5 Relationship to Other Hazards in Pennington County

Dam or levee failures can have a greater environmental impact than that associated with a flood event. Large amounts of sediment from erosion would alter the landscape changing the ecosystem. Hazardous materials are carried away from flooded out properties and distributed throughout the floodplain. Industrial and agricultural chemicals and wastes, solid wastes, raw sewage, and common household chemicals comprise the majority of hazardous materials spread by flood waters along the flood zone, polluting the environment and contaminating everything they come in contact with, including the community's water supply. The soil loss from erosion and scouring would be significantly greater because of a large amount of fast moving water affecting a small localized area, which would likely change the ecosystem.

4.19 Water Supply Contamination

Water Supply Contamination was identified as a hazard in the prior hazard mitigation plan from January 2008 for Pennington County. It was identified to be included in this 2015 plan update. Additionally, analyses are included in this 2015 plan update to include a more in-depth look at what water supply contamination is, the history of it within Pennington County and the potential it has to impact the county residents. A definition of water supply contamination is provided prior to taking a closer look at the effect water supply contamination has on Pennington County in order to provide the reader with knowledge of the hazard.

Water supply contamination is the introduction of point and non-point source pollutants into public groundwater and/or surface water supplies. Microbiological and chemical contaminants can enter water supplies. Chemicals can leach through soils from leaking underground storage tanks, feedlots, improperly cased and managed wells and waste disposal sites. Pesticides from farm fields, manure from feedlots, and contaminants from wastewater treatment plants can also be carried to lakes and streams during heavy rains or snow melt.

4.19.1 Water Contamination Risk in Pennington County

The overall probability that water contamination will occur each year in Pennington County is likely and its relative impact is Moderate and thus the overall risk for Pennington County is Low. The risk for water contamination for each of the cities is different based on the data available by individual city. In assessing water contamination data for the 2015 update, data from 2009 to 2014 was used to determine the risk. The table provided below provides the name of each of the cities in the County, the probability that water contamination will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determined probability and impact ratings. Most notable are the cities of St. Hilaire and Thief River Falls because of their proximity to potential contamination risks and history of contamination.

Table 82: Water Contamination Risk by City in Pennington County

Water Contamination			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Possible**	**Low**	**Little to No**
St. Hilaire	**Likely**	**Moderate**	**Low**
Thief River Falls	**Likely**	**Moderate**	**Low**
County	**Likely**	**Moderate**	**Low**
Total	**Likely**	**Moderate**	**Low**

4.19.2 Water Supply Contamination History in Pennington County:

The following information was provided in the January 2008 Hazard Mitigation Plan for Pennington County. There are certain lakes and rivers have mercury warnings posted. Fish that come from these waters may be toxic to eat because they contain high levels of mercury. There are questions on whether animals that eat amounts of these fish become contaminated too. Mercury poisoning might occur from ingestion of the

contaminated meat. Other items monitored in rivers, ditches and lakes include ammonia, biota types, chloride, fecal coliform, low oxygen, pH, turbidity, temperature and PCB's. The Red Lake River is listed as impaired water in Pennington County from the Minnesota Pollution Control Agency because it is threatened by mercury.

The Minnesota Department of Health has a source water assessment done for every public water supply in Minnesota. A source water assessment provides information to people about where the water comes from, assessment of well construction, well and aquifer sensitivity, source water susceptibility, and contaminants of concern. The following chart illustrates the public water supplies localities for Pennington County.

Table 83: Public Water Supplies in Pennington County

Source Water Assessment Location	Identification	Source	City
Aaseby Court	Municipal	Ground	Thief River Falls
Basswood Mobile Home Park	Municipal	Ground	Thief River Falls
Carpenter's Corner	Non-Community	Ground	Thief River Falls
Community Church and School	Non-Community	Ground	Thief River Falls
Goodridge City Hall	Municipal	Ground	Goodridge
Kruse Inn	Non-Community	Ground	St. Hilaire
Saint Hilaire	Municipal	Ground	St. Hilaire
St. Pauli Lutheran Church	Non-Community	Ground	Hazel
Thief River Falls	Municipal	Source	Thief River Falls
Thief River Golf Club	Non-Community	Ground	Thief River Falls

A wellhead protection plan is also written for areas of Pennington County. Although the Minnesota Department of Health is involved, a wellhead protection plan is primarily written by either the water system or another appointed local party. The focus of the plan is to prevent drinking water from becoming contaminated by managing contamination sources. Specific requirements for the report vary, depending on the type of system, use, and community. The Minnesota Department of Health has a goal that by 2006, all groundwater based community and non-transient non-community public water systems will have, at a minimum, begun the wellhead protection planning process. In Pennington County, the city of St. Hilaire has a completed wellhead protection plan.

Drinking Water Reports by City in Pennington County

City of Thief River Falls

The City of Thief River Falls issued the results of monitoring done on its drinking water for the period from January 1 to December 31, 2013. The information was from the 2013 Drinking Water Report for the City of Thief River Falls, which provides drinking water to its residents from a surface water source: Red Lake River. The Minnesota Department of Health has determined that the source used to supply the drinking water is not particularly susceptible to contamination. No contaminants were detected at levels that violated federal drinking water standards. However, some contaminants were detected in trace amounts that were below legal limits. There were trace amounts of halo acetic acids, nitrate, TTHM, total coliform bacteria, fluoride, chlorine, copper, and lead.

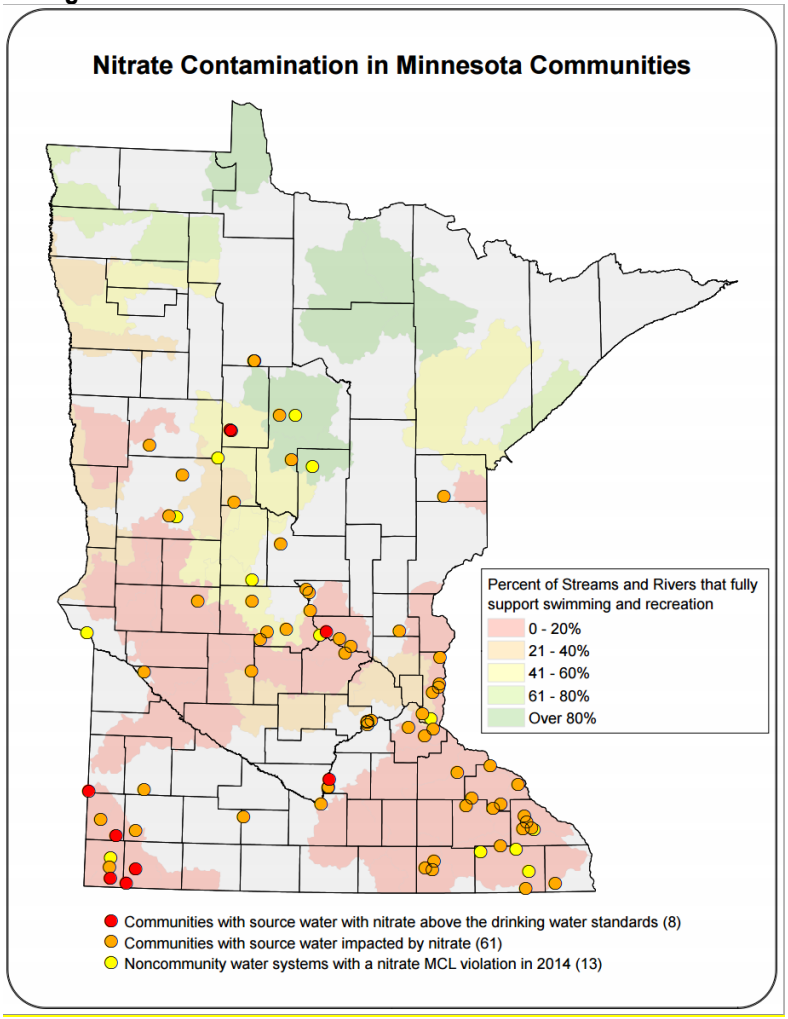
Nitrate Levels in Minnesota Drinking Water

May 6, 2015, Governor Mark Dayton and Health Commissioner Dr. Ed Ehlinger released the findings of the state's annual drinking water report, which show nitrate levels in drinking water supplies are of increasing concern in Minnesota. Elevated levels of nitrate – which can lead to Blue Baby Syndrome in infants and other adverse human health effects – have caused an increasing number of Minnesota communities to install expensive nitrate treatment systems to ensure their water supplies are safe to drink. Some communities have resorted to temporarily distributing bottled water to their residents after detecting unsafe levels of nitrates in their drinking water.

The report also shows that as much as 10 percent of small ("non-community") drinking water systems in the state have source water with elevated levels of nitrate – which is a significant cause of concern for human health. The following figure shows that there are no communities with source water impacted by nitrate in Pennington County. There are also no communities with source water with nitrate above the drinking water standards. There are also no non-community water systems with nitrate maximum contaminant level (MCL) violations in 2014 in Pennington County.

The Minnesota Department of Health indicated that it is often difficult to pinpoint where the nitrate in drinking water comes from because there are so many possibilities. The source of nitrate and nitrogen may be from runoff or seepage from fertilized soil, municipal or industrial wastewater, landfills, animal feedlots, septic systems, urban drainage, or decaying plant material. The Minnesota Department of Health also states that federal law requires that public water systems be tested for nitrates, but testing is not required for residential wells. It is recommended that property owners with wells have their water tested for nitrates by either a private laboratories or through the local health department.

Figure 16: Nitrate Contamination in Minnesota Communities



4.19.3 Mitigation Actions in the Past Five Years in Pennington County

Mitigation actions for hazardous material and contamination from Pennington County's January 2008 Hazard Mitigation Plan stated the mitigation action for hazardous material and contamination was to decrease transportation contamination and spill potential by addressing access and visibility issues caused by long or frequent railroad traffic, and removing railroad and vehicle traffic threats. Additionally, another mitigation action was to reduce contamination and hazardous material spill occurrences by addressing meth-related problems and reducing lake contamination potential.

It was stated that a law became effective on January 1, 2004, which prohibits the amount of phosphorus fertilizer that is applied to lawns. The main reason for this law is to reduce the amount of phosphorus runoff into lakes, rivers, and streams, reducing water contamination. This law is not a ban, but simply a reminder to fertilize only when necessary, and exemptions do exist.

Statewide Mitigation Actions

According to the Minnesota Department of Health website, there are a number of programs and services in place in the state of Minnesota to protect groundwater from contamination and to keep drinking water

supplies safe for human consumption.

Programs in state and local government agencies are responsible for protecting groundwater from contamination so that drinking water supplies are safe for human consumption. The Minnesota Department of Health (MDH) has many roles in this effort including protecting water, ensuring that drinking water from wells is tested and is safe, and recommending cleanup of contaminated sites. Other state agencies also have diverse and important roles in ensuring that the drinking water from wells is safe for human consumption.

4.19.4 Vulnerability to Jurisdictions within Pennington County

Within Pennington County, all residents are potentially vulnerable to water supply contamination, especially those who live near the Red Lake River which is impaired because it is threatened by mercury. Locations where ground water meets surface water and aquifers also have the potential to be vulnerable to water supply contamination.

4.19.5 Water Supply Contamination and Climate Change

According to the Environmental Protection Agency, climate change can have a variety of impacts on surface water, drinking water, and ground water quality. Higher water temperatures and changes in the timing, intensity, and duration of precipitation can affect water quality. Higher air temperatures (particularly in the summer), earlier snowmelt, and potential decreases in summer precipitation could increase the risk of drought. The frequency and intensity of floods could also increase. In addition, sea level rise may affect freshwater quality by increasing the salinity of coastal rivers and bays and causing saltwater intrusion—the movement of saline water into fresh ground water resources in coastal regions.

4.19.6 Relationships with Other Hazards

Water supply contamination can be linked to various other hazards. Private wells and community water supplies can become contaminated by human and animal waste from infectious disease. In addition, lakes, streams, pools or water parks could also become contaminated by infectious disease from humans and/or animals. A spill or release of hazardous waste could also have an impact on a surrounding area's water supply. Lastly, wastewater treatment plant failure can occur if facilities are not adequately protected from flooding or protection is compromised. Water supplies can become contaminated by the untreated waste. Sewer back-up and flood waters can contaminate wells through well cap or vent.

4.20 Transportation Incidents

The following information was provided in the Community Profile Section of this plan and the portions which relate to the Transportation Incidents Hazard Profile are included below.

Roadways
The state of Minnesota has 132,250 miles of roads within the state. 116,232 miles are classified as rural roads and 16,018 are classified as urban. Roads can be categorized into state, county, township or municipal types. Table 84 outlines all the roadways in Pennington County and the number of miles per roadway within the county.

Table 84: Pennington County Roadways

COUNTY	ROADWAY	MILES
PENNINGTON	USTH	17
PENNINGTON	MNTH	60
PENNINGTON	CSAH	256
PENNINGTON	MUN. STATE AID	14
PENNINGTON	COUNTY	388
PENNINGTON	TOWNSHIP	355
PENNINGTON	CITY STREETS	48
COUNTY TOTAL		1138

The Minnesota Department of Transportation is responsible for the Minnesota Trunk Highway Systems (MNTH) and the United States trunk highway system (USTH). The county state aid highway (CSAH) and the county roads are the responsibility of Pennington County. All remaining roadways are the responsibility of the township or city that they are located in. Small roadways can cause problems for emergency vehicles. A small country lane that is aesthetically pleasing may cause trouble because a fire truck or ambulance might not be able to fit down the road. Damage might be done to the road and the homeowner (if applicable) might have to end up either fixing the road, abandoning it or widening it.

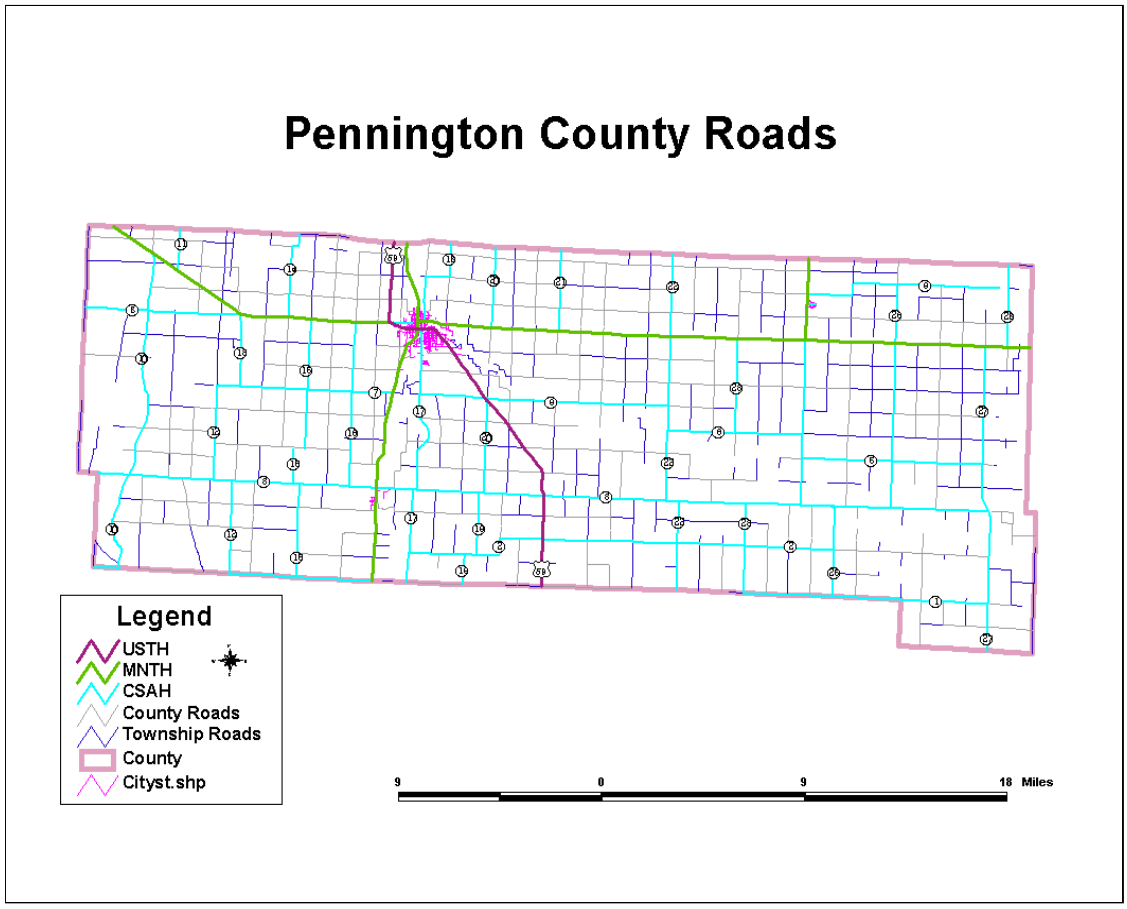
Pennington County has a highway department and their mission is to construct and maintain a system of highways, bridges while facilitating the safe and efficient movement of people and goods throughout the county. Pennington County Highway Department is responsible for the survey, design, construction, inspection, maintenance, and repair of the Pennington County road and bridge systems which consist of 258.35 County State Aid Highway miles, 1.69 County State Aid Municipal miles, and 397.17 County Road miles. This department is also responsible for the county's signage, which includes all highway regulatory safety and informational signing.

The National Bridge Inventory (NBI) reported the following statistics for Pennington County.

Table 85: Bridges in Pennington County

Number of Bridges	3
Total Length	24 meters(79feet)
Total Average Daily Traffic	33, 979
Total Average Daily Truck Traffic	1,681

Figure 17: Roads in Pennington County



Highways

The current highway network in Pennington County has been built in response to an ever-increasing public demand for improved mobility. The local units of government and MN/DOT are all responsible for assuring that the total highway system operates properly and the roads owned by the different levels of government are integrated into the overall highway system. Pennington County is well served by an extensive roadway network, which connects the county with the rest of the region and the state.

The Functional Classification System is a method used to describe the main function each road performs in the highway network. It is essentially a hierarchy of roads using criteria that describe the function that a particular road performs in a highway network (typically access and mobility). There is a general agreement among the public that the responsibility for the most important roads should be assigned to the highest level of government. In this fashion, the greatest resources for road maintenance and construction are devoted to the most heavily traveled roads. It follows that less traveled roads become the responsibility of local levels of government. Definitions for each of the road types in the Functional Classification System are provided below:

- **Principal Arterial –** These highways provide an integrated network of routes, which carry the highest traffic volumes, serve the longest trip movements, and provide for statewide or interstate travel. They serve all major urbanized areas and population centers. Principal arterial routes provide for through movement with minimum interference.

- **Minor Arterial –** These highways link cities, larger towns, and other major traffic generators, such as major resort areas, to each other and to principal arterial routes. They form an integrated network which provides for movement within the State and between counties.
- **Major Collectors –** These routes provide service to the county seat and to the larger cities not served by principal or minor arterials. They predominately serve trips within the County and link locally important traffic generators with their service areas and other nearby larger cities with higher order routes.

- **Minor Collectors –** These routes link smaller cities and locally important traffic generators and provide developed areas with reasonable access to a higher functioning roadway.

- **Local Roads –** The rural local roads primarily service relatively low traffic volumes and short distance trips.

A breakdown of the functional class mileage from the Minnesota Department of Transportation can be found in Table 86.

Table 86: Functional Class Mileage for Pennington County, MN

Route System: Code, Abbreviation, and Name	Functional Class: Code and Name	2011 Centerline Mileage	2011 Lane Mileage
02 - USTH U.S. TRUNK	02 - PRNCPL ART - OTHER RURAL	11.430	22.860
02 - USTH U.S. TRUNK	06 - MINOR ARTERIAL - RURAL	3.417	6.834
02 - USTH U.S. TRUNK	14 - OTHER PRNCPL ART URBAN	1.992	4.818
03 - MNTH MINNESOTA TRUNK	02 - PRNCPL ART - OTHER RURAL	2.899	5.798
03 - MNTH MINNESOTA TRUNK	06 - MINOR ARTERIAL - RURAL	41.817	83.634
03 - MNTH MINNESOTA TRUNK	07 - MAJOR COLLECTOR - RURAL	9.955	19.910
03 - MNTH MINNESOTA TRUNK	14 - OTHER PRNCPL ART URBAN	5.743	11.486
04 - CSAH COUNTY STATE AID	06 - MINOR ARTERIAL - RURAL	44.804	89.608
04 - CSAH COUNTY STATE AID	07 - MAJOR COLLECTOR - RURAL	91.748	183.496

Route System: Code, Abbreviation, and Name	Functional Class: Code and Name	2011 Centerline Mileage	2011 Lane Mileage
04 - CSAH COUNTY STATE AID	08 - MINOR COLLECTOR	93.980	187.960
04 - CSAH COUNTY STATE AID	09 - LOCAL	27.220	54.440
04 - CSAH COUNTY STATE AID	16 - MINOR ARTERIALS - URBAN	1.269	2.538
04 - CSAH COUNTY STATE AID	17 - COLLECTOR - URBAN	0.471	0.942
05 - MSAS MUNIC. STATE AID	16 - MINOR ARTERIALS - URBAN	3.585	7.170
05 - MSAS MUNIC. STATE AID	17 - COLLECTOR - URBAN	7.451	14.902
05 - MSAS MUNIC. STATE AID	19 - LOCAL - URBAN	4.364	8.728
07 - CNTY COUNTY	06 - MINOR ARTERIAL - RURAL	0.156	0.312
07 - CNTY COUNTY	09 - LOCAL	382.542	765.084
07 - CNTY COUNTY	16 - MINOR ARTERIALS - URBAN	0.854	1.708
07 - CNTY COUNTY	19 - LOCAL - URBAN	0.390	0.780
08 - TWNS TOWNSHIP	07 - MAJOR COLLECTOR - RURAL	0.777	1.554
08 - TWNS TOWNSHIP	09 - LOCAL	306.286	612.572
08 - TWNS TOWNSHIP	19 - LOCAL - URBAN	0.135	0.270
10 - MUN MUNICIPAL STREETS	09 - LOCAL	6.167	12.334
10 - MUN MUNICIPAL STREETS	16 - MINOR ARTERIALS - URBAN	0.640	1.280
10 - MUN MUNICIPAL STREETS	17 - COLLECTOR - URBAN	0.540	1.080
10 - MUN MUNICIPAL STREETS	19 - LOCAL - URBAN	46.282	92.564

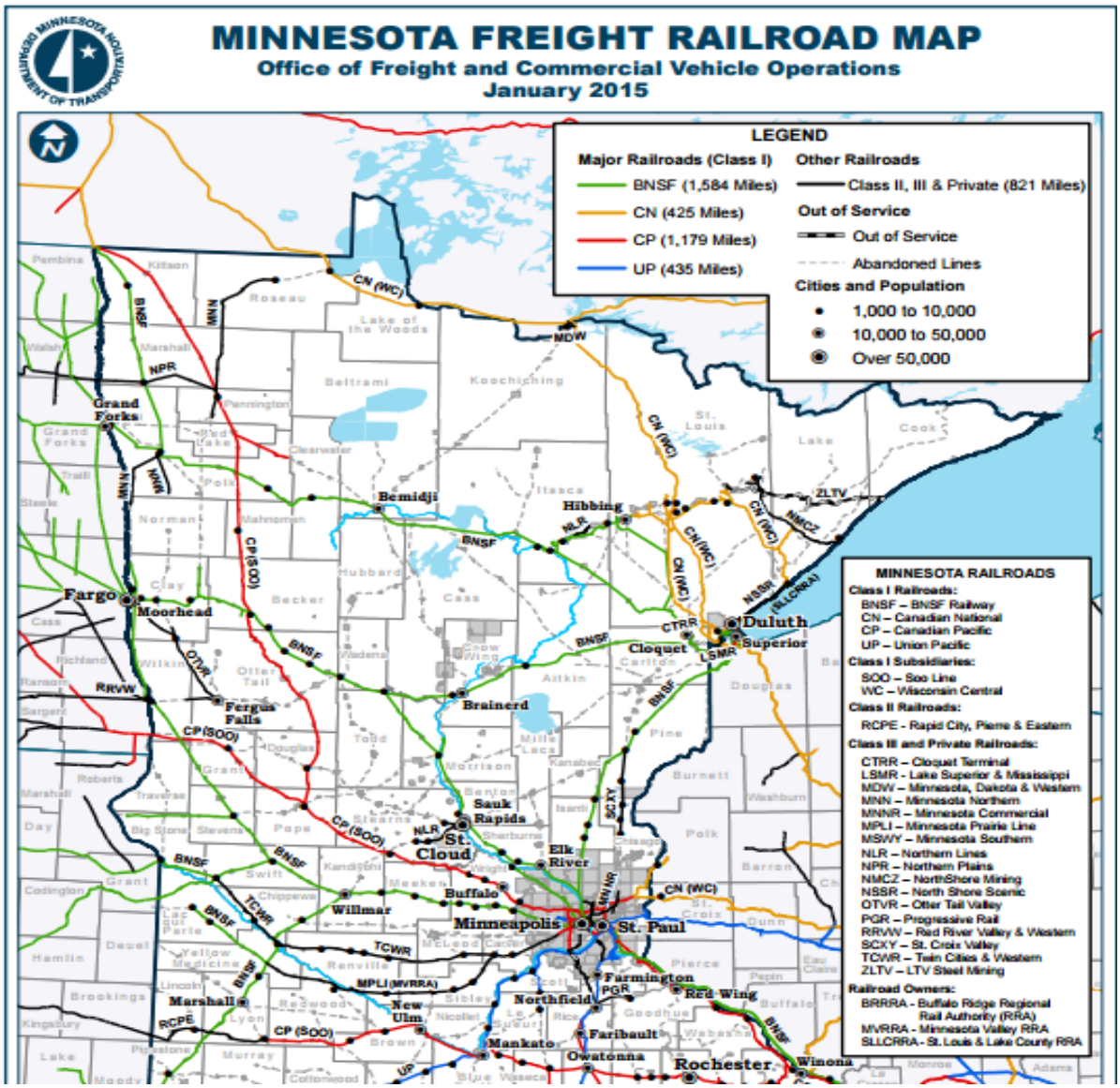
In order to protect the integrity and prolong the lifespan of the roads, weight restrictions are imposed on the paved roads in Pennington County. Spring weight restrictions are intended to restrict weights on roads when they are most vulnerable to damage (spring is a critical period for roads because the soils and aggregate materials are weak while the frost leaves the road). By State law, all County and Township roads are automatically reduced to five-ton per-axle weight limit (unless posted otherwise) at the same time as spring road restrictions are placed on state highways.

Railways

The Minnesota Northern Railroad (MNNH) services Pennington County. This company has 241 miles total running through Minnesota. The railway enters near Thief River Falls and exits near St. Hilaire, connecting the two towns. The line hauls mainly agriculture-related commodities, but other items are carried such as various chemicals, clay, glass, and stone.

The other railroad that runs through Pennington County is the Canadian Pacific Railway (CPR). This railway also runs through Thief River Falls, but continues its journey in a southeastern direction, heading towards the town of Plummer in Red Lake County. The Canadian Pacific Railway runs across 14,000 miles of land, connecting many cities in the U.S. and Canada. Products of many industries are delivered by CPR. The main commodities include grain, lumber, cars, coal, food, potash, and furniture. Railroads are an important part of Pennington County because they connect products produced in the region to other markets while at the same time providing valuable commodities to an area that might not receive them otherwise.

Figure 18: Minnesota Freight Railroad Map



Aeronautics

The National Transport Safety Board makes statistics available on a national basis in regards to flight safety. Minnesota specific information was not available. However, the national data indicates that the level of risk for flying is less than land travel in terms of fatalities per 100,000 miles. The impact of an incident involving a large aircraft may be large and involve an integrated response between Fire, EMS, Law Enforcement plus other agencies. Aircraft parked on the tarmac at airports are vulnerable to damage during high wind or hail storm events.

Air Transportation

The Thief River Falls regional airport is the main airport in the county, as well as the only instrument

controlled airport in NW Minnesota. It is located three miles south of Thief River Falls, Minnesota. It consists of two asphalt runways, one 6,503 feet in length by 150 feet in width that is lit from dusk to dawn and another cross-wind runway that is 5,000 feet long. There are twenty-eight aircraft based on this field, mostly single-engine airplanes, but there are a few other types including multi-engine airplanes and ultra-light aircraft. On average, this airport sees 102 planes a day. Fifty-four percent of the total planes are local aviation, forty percent are transient aviation, and the remaining percentage consists of air carriers, commuters, and military.

Willis Airport is a private airport located four miles northeast of Thief River Falls. It consists of one turf runway 3,500 feet long by one hundred feet wide. Permission is required before landing. This airport is closed during the winter months due to no snow removal.

The Swanson Private Airport is located three miles southeast of Goodridge, Minnesota. It is a private airport and permission is required before landing. It consists of a turf runway 2,500 feet long by seventy feet wide. Two single engine aircraft are based at this field.

4.20.1 Transportation Incidents History in Pennington County

Vehicle Crash History

2014 Minnesota Motor Vehicle Crash Facts summary provides information on the crashes, deaths, and injuries that occurred on Minnesota roadways during 2014. Data for Pennington County indicated that there was one fatal crash in 2014. There were 39 crashes which resulted in injury during 2014 in Pennington County and 51 crashes which resulted in property damage. The total number of crashes in 2014 in Pennington County was 91, which was a slight decrease from the total of 113 which occurred in 2013.

Crashes in 2014 are reported for cities over 2,500 or more population as part of the 2014 Minnesota Motor Vehicle Crash Facts Summary. Thief River Falls is the only city in Pennington County with a population over 2,500 people. In 2014 the City of Thief River Falls had a total of 59 crashes, with no fatalities, 25 injuries, and 34 crashes which were property damage only.

The Minnesota Office of Traffic Safety also provides County-Specific Fact Sheets and the following information was provided by the 2010-2014 Minnesota Crash Statistics for Pennington County. In total, there were 560 crashes during this time frame and a total of seven deaths. Of these seven deaths, two were alcohol related, and two were due to unbelted motor vehicle incidents. There was a total of 406 instances of Driving While Impaired (DWI) in Pennington County.

In 2014, Minnesota recorded 91 impaired-related traffic deaths, accounting for 25 percent of all traffic deaths, about the same as in the recent past. Impaired-related crashes, injuries, and fatalities continue to be a serious problem in Minnesota. Overall, males and young adults are overrepresented in impaired-related crashes and account for a disproportionate share of fatalities. More than 600,000 Minnesotans with driver license records have a DWI.

Other Transportation Incidents

There was no other record of railway or airplane accidents in Pennington County during the 2009-2014 timeframe.

4.20.2 Transportation Incident Risk in Pennington County

The overall probability that a transportation incident will occur each year in Pennington County is highly likely and its relative impact is Low and thus the overall risk for Pennington County is Little to No. The risk for a transportation incident for each of the cities is the same because data was only available on the county-wide level. In assessing transportation incident data for the 2015 update, data from 2009 to 2014 was used to determine the risk. The table provided below provides the name of each of the cities in the County, the probability that a transportation incident will have an impact on that jurisdiction, the impact potential, as well as the overall risk calculated by the determined probability and impact ratings.

Table 87: Transportation Incident Hazard Risk Assessment

Transportation Incidents			
City	**Probability**	**Impact**	**Risk**
Goodridge	**Highly Likely**	**Low**	**Little to No**
St. Hilaire	**Highly Likely**	**Low**	**Little to No**
Thief River Falls	**Highly Likely**	**Low**	**Little to No**
County	**Highly Likely**	**Low**	**Little to No**
Total	**Highly Likely**	**Low**	**Little to No**

4.20.3 Mitigation Actions in the Past Five Years in Pennington County

There are no mitigation actions specific to transportation incidents in the previous Pennington County plan from January 2008. General information and public education remain a priority. Specifically, winter travel conditions and severe summer weather travel conditions.

4.20.4 Vulnerability to Residents in Pennington County

Any resident who uses the various transportation methods in Pennington County including highway, railway, and air are potentially vulnerable to a transportation incident. In addition, residents who live closer to a roadway have the potential to be the victim of someone driving while impaired and potentially driving off the road. Residents who reside near a railway, such as in the cities of St. Hilaire and Thief River Falls, are at an increased risk.

4.20.5 Transportation Incidents and Climate Change

According to the 2013 report "Adapting to Climate Change in Minnesota," the impacts of climate change on the Department of Transportation (MnDOT) are significant. Minnesota's multimodal transportation system, "is flexible and nimble enough to adapt to changes in society, technology, the environment, and the economy." Climate issues will affect many functional groups within MnDOT, including Bridge Hydraulics, Water Resources, Maintenance, Design, Construction, Materials, and Freight, Rail, and Waterways.

The predictions for increased frequency and intensity of rainfall events, extreme heat events resulting in decreased air quality, and an increased number of freeze/thaw cycles will affect the way MnDOT designs, builds and maintains the state's multi-modal transportation infrastructure. It will also compel MnDOT to inventory all transportation assets, assess which ones are most vulnerable to the impacts of climate

change, and determine a cost-effective method to mitigate and minimize those impacts. Emergency preparedness plans will be updated to reflect those lessons learned as a result of recent flash flooding events.

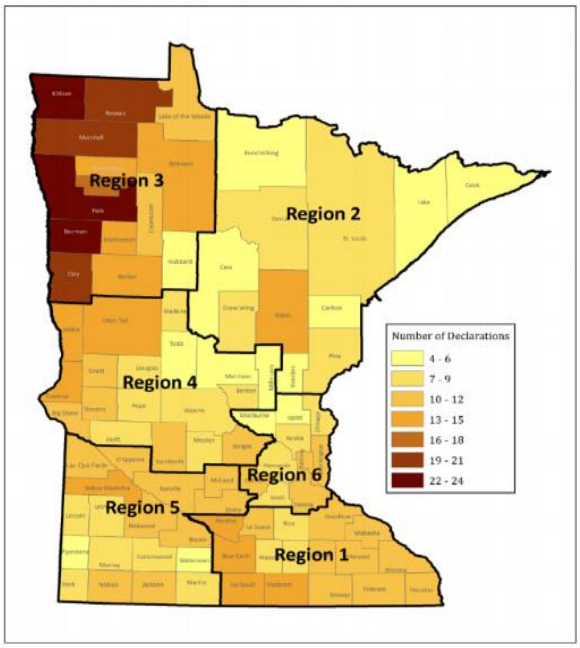
4.20.6 Relationship to Other Hazards

Hazardous material incidences are generally associated with transportation accidents or accidents at fixed facilities. All highways and railroads associated with transport and anywhere that hazardous material is used or stored are susceptible to a spill. In addition, tornadoes, windstorms and winter storms all have the potential to cause high winds or damage to infrastructure which could make roadways impassable. Winter storms also have the potential to make roadways slippery with snow and icy conditions. Whiteout conditions are also a possibility during winter storms which could lead to increased transportation incidents. These natural hazards, such as tornadoes, windstorms, winter storms, hail and lightning also could cause an increase in railroad or air accidents because of conditions which make it difficult to navigate or cause hazardous conditions.

4.21 Risk Assessment Summary

While the jurisdictional risk remained consistent from the past plan, one fact remains; Pennington County is still at risk despite its efforts to mitigate natural hazards. According to the most recent Minnesota state mitigation plan, Pennington County lies within the region in Minnesota that has the highest number of disaster declarations in the entire state. The hazards that have had the highest number of disaster declarations for Pennington County have been flooding and summer storms. Flooding and summer storms also have had the greatest number of mitigation actions, so one can recognize that Pennington County is taking steps towards mitigating the impact and risk of flooding and summer storms on the county.

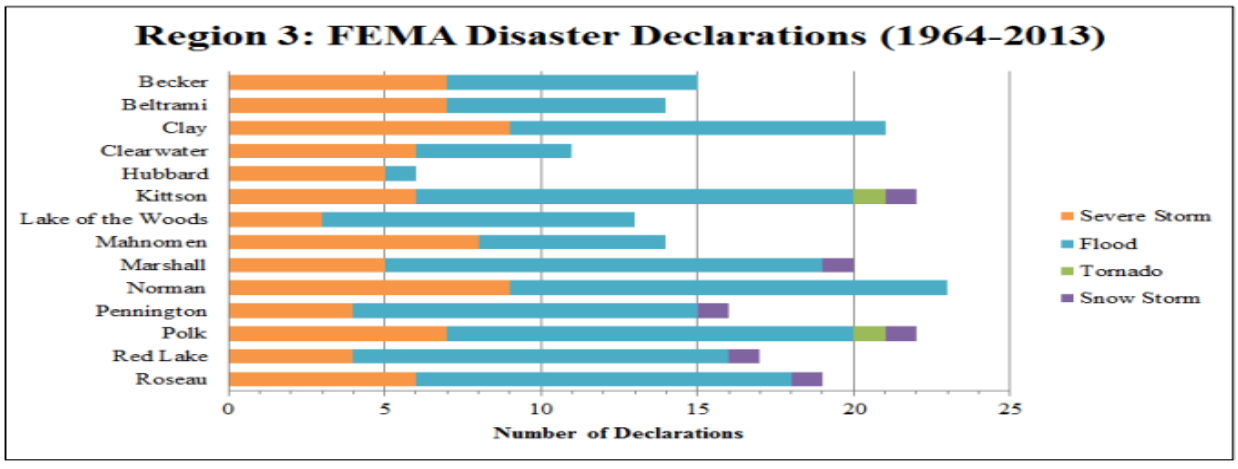
Figure 19: Disaster Declarations by Region in Minnesota



A summary of FEMA Disaster Declarations by County is shown in the following figures

While the past plan evaluated 12 hazards, this update identified 18 hazards as having a potential impact on the community. In taking a more in-depth look at each of the hazards and determining the frequency with which they occur in Pennington County and calculating the impact and risk potential on the community, mitigation actions can be identified and prioritized accordingly. Of the 18 hazards in Pennington County, the hazards with the highest impact potential are flood, tornado, winter storms, and windstorms. These hazards are highly likely to occur in Pennington County each year and have a high or moderate risk potential for the community. Other hazards, such as infectious disease, structural fire, and transportation incidents have a highly likely probability of occurring each year, but their impact on the community is not as significant and there is less risk potential related to these hazards.

Figure 20: Disaster Declarations by County



According to Pennington County's risk analysis, it was determined that the city of Thief River Falls has the highest number of moderate impact and risk analysis ratings compared to other cities in the county. Thief River Falls has a moderate impact and risk analysis for Structural Fire, Flood, Hazardous Material, Tornado, Winter Storms, Windstorm, Erosion, Hail, and Dam/Levee Failure. This is important information for mitigation actions and prioritizing Thief River Falls among the other cities in the county. A more detailed look at the jurisdictions and which hazards were at the High, Moderate, and Low-level prioritization can be seen in tables 88-92 below.

Within Pennington County, Tornado is the hazard with the highest risk potential but it is limited to one jurisdiction. Other hazards such as winter storms, windstorms, and flood are seen in multiple cities and assessed to have moderate risk potential. Thief River Falls, St. Hilaire, Goodridge, as well as the unincorporated areas of Pennington County all show a moderate risk potential for these hazards.

Table 88 shows the hazard prioritization for Pennington County as a whole while Tables 89 through 92 show the hazard prioritization for the unincorporated areas Pennington County and the cities of Goodridge, St. Hilaire, and Thief River Falls.

Table 88: Pennington County Hazard Prioritization

Pennington County Hazard Prioritization	
Level	**Hazard**
High	• None
Moderate	• Flood • Hazardous Material • Tornado • Winter Storms • Hail • Erosion
Low	• Drought • Structural Fire • Infectious Disease • Invasive Species • Subsidence • Dam/Levee Failure • Windstorm • Extreme Heat • Lightning • Water Supply Contamination • Transportation Incidents • Wildfire

Table 89: City of Goodridge Hazard Prioritization

City Goodridge Hazard Prioritization	
Level	**Hazard**
High	• Tornado
Moderate	• Winter Storms • Windstorm
Low	• Drought • Structural Fire • Flood • Hazardous Material • Infectious Disease • Invasive Species • Subsidence • Dam/Levee Failure • Hail • Erosion • Tornado • Extreme Heat • Lightning • Water Supply Contamination • Transportation Incidents • Wildfire

Table 90: the City of St. Hilaire Hazard Prioritization

City St. Hilaire Hazard Prioritization	
Level	**Hazard**
High	• None
Moderate	• Flood • Winter Storms • Windstorm • Hail • Erosion
Low	• Drought • Structural Fire • Hazardous Material • Infectious Disease • Invasive Species • Subsidence • Tornado • Dam/Levee Failure • Extreme Heat • Lightning • Water Supply Contamination • Transportation Incidents • Wildfire

Table 91: City of Thief River Falls Hazard Prioritization

City of Thief River Falls Hazard Prioritization	
Level	**Hazard**
High	• None
Moderate	• Structural Fire • Flood • Hazardous Material • Tornado • Winter Storms • Windstorm • Erosion • Hail • Dam/Levee Failure
Low	• Drought • Infectious Disease • Invasive Species • Subsidence • Extreme Heat • Lightning • Water Supply Contamination • Transportation Incidents • Wildfire

Table 92: Unincorporated Hazard Prioritizations for Pennington County

Unincorporated Hazard Prioritizations for Pennington County	
Level	**Hazard**
High	• None
Moderate	• Flood • Tornado • Winter Storms • Windstorm • Hail • Wildfire
Low	• Drought • Structural Fire • Hazardous Material • Infectious Disease • Invasive Species • Subsidence • Dam/Levee Failure • Erosion • Extreme Heat • Lightning • Water Supply Contamination • Transportation Incidents

The hazard prioritization was determined using the best possible information concerning risks and vulnerabilities. The following factors were considered when prioritizing the hazards: probability or frequency of a "disastrous" event and impacts of casualties/trauma, communication/lack thereof, continuity of government, debris, emergency services disruptions/limitations, evacuation needs, fatalities, hazardous material release, capacity of First Responders, mass care needs, physical damage / asset destruction, power disruption/outages, transportation disruption/failure, and economic loss. For more information on these determinations see the risk assessment methodology and individual hazard profiles.

As with any assessment involving natural or human-caused hazards, not all potential events may be represented here and an actual incident may occur in a vastly different way than described. This assessment, however, will be used, where possible, to minimize damages from these events in the future. Every type of event is different, ranging from population to property to economic impacts. Incidents also have different probabilities and magnitudes even within hazards. For example, a light snowstorm will be different from a blizzard and a moderate flood will be different from both of those. Some hazards have estimates of dollar losses and population impacts whereas others are more qualitatively assessed based on the information available during the risk assessment process.

Section 5: Capability Assessment

5.1 What Is a Capability Assessment?

The purpose of conducting a capability assessment is to determine the ability of a given jurisdiction to implement mitigation strategies. More specifically, the capability assessment helps to determine which mitigation actions are likely to be successfully implemented given the fiscal, technical, administrative and political framework of a jurisdiction. A capability assessment also provides an opportunity to assess existing plans, policies and current processes already in place. A capability assessment is required for plan approval. This chapter outlines how the mitigation capabilities of Pennington County and the jurisdictions participating were assessed, the results of the assessment and recommendations to improve.

5.1.1 Conducting the Capability Assessment

To yield insight into the jurisdiction's capability to mitigate hazards, the Hazard Mitigation Planning Team administered a multi-part self-assessment that consisted of two surveys. The first survey collected information regarding existing local plans, policies, programs, and ordinances. Additionally, the survey asked the participants to assess how much influence various mitigation elements (plans, policies, programs and ordinances) had on the governance of their jurisdictions. The second survey consisted of questions regarding the fiscal, technical, administrative and political will of the participating jurisdiction. Participants were asked to determine their capability with regard to the various administrative categories. Representatives from Pennington County and the jurisdictions identified as participating in the plan update were invited to participate.

5.1.2 Hazard Mitigation Plans, Policies, Programs and Ordinances

An evaluation of existing plans, programs, and policies was conducted as a means to provide insight into how mitigation activities were achieved in the past and how they might be achieved in the future. An assessment was conducted to determine if and/or what plans exist, and if they were utilized in the governance of the jurisdiction's mitigation activities. Finally, participants were asked to rank their capability with regard to mitigation and how comprehensive (interconnected) the identified local plans, policies, programs, and ordinances were. The following is the result of the self-assessment.

Table 93: Relevant Plans and Programs in Place

Relevant Plans and Programs in Place	
• HMP: Hazard Mitigation Plan • DRP: Disaster Recovery Plan • CLUP: Comprehensive Land Use Plan • FMP: Floodplain Management Plan • SMP: Stormwater Management Plan • EOP: Emergency Operations Plan • COOP: Continuity of Operations Plan • SARA: SARA Title III Emergency Response Plan • TRANS: Transportation Plan	• CIP: Capital Improvements Plan (that regulates infrastructure in hazard areas) • COMP: comprehensive PLAN • REG-PL: Regional Planning • HPP: Historic Preservation Plan • ZO: Zoning Ordinance • FDPO: Flood Damage Prevention Ordinance • NFIP: National Flood Insurance Program • BC: Building Codes

Jurisdiction	HMP	DRP	CULP	FMP	SMP	EOP	COOP	SARA	TRANS	CIP	COMP	REG-PL	HPP	ZO	FDPO	NFIP	BC	Score
Goodridge	X			X			X	X				X		X		X	X	L
St Hilaire	X			X	X		X	X				X		X		X	X	L
Thief River Falls	X	X	X	X	X	X	X	X			X	X		X		X	X	M
Pennington County	X			X		X	X	X			X	X		X		X	X	M

Note: The inclusion of many of these plans into the Hazard Mitigation process will be a high priority over the next five years. The planning team completed with the oversight of the participating jurisdictions.

The first part of the capability assessment survey indicated that there is generally moderate to a low degree of existing plans, policies, and ordinances used to conduct mitigation. However, the survey results indicated that jurisdictions did not associate the hazard mitigation plan, and/or the actions listed in it with the actual mitigation that had occurred. Due to the lack of comprehensive mitigation programs, many of the participating jurisdictions indicated that they have minimum capabilities with regard to the use of local plans, policies, programs, and ordinances used to mitigate hazards. It was further suggested that the level of communication between and within agencies only occurred during the last mitigation plan update or after a significant event, like a winter storm or flood. All indications suggest that Pennington County should institute actions that will enhance its ability to support a comprehensive mitigation program.

5.1.3 Recommendations

As cities have engaged in buyouts, participated in the National Flood Insurance Program, and have requested assistance for mitigation projects, it is obvious that mitigation actions are occurring across Pennington County and within the participating jurisdictions. Unfortunately, these activities seem to be occurring independently with little to no regard to the last iteration of the hazard mitigation plan. Actions seem to be fragmented across several local plans, policies, programs, and ordinances. As such, it is recommended that efforts should be made to unify Pennington County and participating jurisdictions so that mitigation efforts are coordinated and reporting of these activities is centralized. Furthermore, Pennington County and jurisdictions should agree on a management process and establish a governance committee to oversee the mitigation planning process, evaluate mitigation actions, reporting of mitigation actions for the inclusion of plan updates, and other activities that will help to support a comprehensive mitigation plan

program. Finally, this update should reflect the noted recommendations by including a management strategy to strengthen capabilities and ensure the county's mitigation program is a treated and managed as a true existing program.

5.2 Fiscal, Technical, Administrative and Political Capabilities

As part of the capability assessment, each jurisdiction self-assessed their unique technical, fiscal, administrative, and political will to conduct mitigation projects. The Assessment of Local Capability Table provides an overview of each jurisdiction's rankings. An "L" indicates Low capability; an "M" indicated Moderate capability, and an "H" indicates High capability. The results of the self-assessment are listed below.

Table 94: Assessment of Local Capability

Assessment of Local Capability— multi Jurisdictional Hazard Mitigation Plan				
An "L" indicates low capability; an "M" indicated moderate capability; and an "H" indicates high capability.				
Jurisdiction	**Technical Capability**	**Fiscal Capability**	**Administrative Capability**	**Political Capability**
Goodridge	L	L	L	L
St Hilaire	L	L	L	L
Thief River Falls	M	M	M	M
Pennington County	M	M	M	M

NOTE: The planning team completed with the oversight of the participating jurisdictions.

5.2.1 Technical Capability

Technical capability can be defined as possessing the skills and tools needed to improve decision-making, including the development of sound mitigation actions. Technical capability can be measured across three primary elements: 1) geographic information systems (GIS) and database management; 2) grants management, and 3) hazard mitigation planning. Measuring the degree to which each element was present throughout the jurisdictions was determined by using a survey, discussions with jurisdictional staff and professional assessment.

The analysis of the responses to the Capability Assessment indicated that there is generally low to moderate technical capability. The result of the technical capability assessment highlights the notion that the existing capability of the Jurisdictions can be improved.

5.2.2 Recommendations

Local Mitigation Action Plans should be developed that strengthen technical capabilities. While there is a wide range of technical resources across the county and municipal governments, the development of a systematic protocol for sharing resources could significantly increase the level of technical capability to analyze natural hazards and develop meaningful actions to reduce their impact. The development of regional mitigation actions could also be used to assist in this effort. Furthermore, the capability of both Goodridge and St. Hilaire should be considered when selection and or planning strategies. Both Goodridge and St. Hilaire will require more outside assistance in ensuring the successful completion of mitigation actions.

5.2.3 Administrative/ Institutional Capability

The administrative and institutional capability was evaluated by reviewing both the County's and participating jurisdiction's staffing abilities, and the existing organizational structures needed to implement mitigation strategies. The analysis of the responses to the Capability Assessment indicated that there is low to moderate administrative capability throughout the county. Thus, the results of the administrative capability assessment demonstrate that the County and Thief River Falls possess a stronger administrative capability than both Goodridge and St. Hilaire.

Recommendations: The enhancement of administrative capability may be achieved through county/ municipal training, outreach and mentoring of smaller rural jurisdictions as well as the sharing of resources, when appropriate.

5.2.4 Fiscal Capability

The ability to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of grants, state, and/or locally based revenue. The costs associated with policy and project implementation vary widely. In some cases, policies are tied primarily to staff costs associated with the creation and monitoring of a given program. Other times, the cost are associated with physical aspects of a project. The analysis of the responses to the Capability Assessment indicated that there is a both moderate to low fiscal capability at the county and municipal levels respectively.

Recommendations: The factors used in the capability assessment should be used as a general guide to help craft mitigation actions that are achievable. When considering the effect of fiscal capability on the implementation of policies and projects, jurisdictions should ask several basic questions:

- Does the action require a monetary commitment or staff resources?
- Can jurisdictions combine resources with other counties or municipalities to address identified problems?
- Is the jurisdiction willing to commit local revenue on a sustained or one-time basis?

In order to implement mitigation projects and policies, some monetary commitment or staff resources will be required. This may take the form of a non-federal match requirement or the costs associated with staff time devoted to policy development and implementation. The identification of eligible Pre-Disaster Mitigation (PDM) projects, as well as other federal funding sources are identified in Appendix A of this plan. Pennington County and its incorporated cities should consider, whenever possible, combining financial and staff resources to address hazards, most of which tend to impact regions rather than individual jurisdictions. This is especially true for the cities of Goodridge and St. Hilaire.

Finally, if local governments have access to an ongoing source of revenue, a more comprehensive and sustained effort can be achieved. Examples include the development of a stormwater management fee or the development of a budgetary line item that specifically addresses hazard mitigation.

5.2.5 Political Capability

One of the most difficult and sensitive capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects. According to the results of the assessment and due to competing priorities, perceptions of risk and available resources, Pennington County, and its participating jurisdictions has contrasting levels of political capability to enact meaningful and proactive mitigation policies. Observations concerning the county and municipal government officials show that while there is an interest

in disaster mitigation activities, there appears to be a lack of local commitment to take the steps necessary to implement mitigation activities.

Recommendations: Political support from elected officials can prove critically important. When possible, local governments who have implemented hazard mitigation projects should attempt to assess their effectiveness following future events. The ability to document mitigation projects and policies that work is a high priority among FEMA officials. Therefore, local government staff should work with MN HSEM and FEMA officials following disasters to evaluate past mitigation projects. The results should be presented to locally elected officials in order to provide real-world examples of how mitigation can protect lives and property.

5.2.6 Conclusions on Local Capability

The political capability of Pennington County to implement mitigation actions varies greatly from jurisdiction to jurisdiction. Pennington County and the city of Thief River Falls scored higher than Goodridge and St. Hilaire. Considering the nature of a Rural Minnesota and that Pennington County is the driving force for most of the incorporated areas within its boundaries creation of regional comprehensive planning organization or group could assist in implementing a variety of projects.

Much like the County's Comprehensive Plan, the Pennington Multi-Jurisdictional Hazard Mitigation Plan provides the vehicle to begin the regional planning process. In order to succeed, it will require clearly articulating the benefits of participating in and sustaining the mitigation planning process from each of the jurisdictions. One of the best ways to obtain local buy-in and long-term success is to education and the identification and implementation of achievable mitigation actions.

5.3 Linking the Capability Assessment, the Risk Assessment, and the Mitigation Strategy

The conclusions of the Capability Assessment and Risk Assessment serves as the foundation for a meaningful hazard mitigation strategy. During the process of identifying the goals and mitigation actions, each jurisdiction must consider not only their level of hazard risk but also their existing capability to minimize or eliminate that risk. In jurisdictions where the overall hazard risk is considered to be Moderate and local capability is considered Limited, then specific mitigation actions that account for these conditions should be considered. This may include less costly actions, such as minor ordinance revisions or public awareness activities. If necessary, specific capabilities may need to be improved in order to better address recurring threats. Similarly, in cases where the hazard vulnerability is Low and overall capability is Moderate, more emphasis can be placed on actions that may affect future vulnerability such as guiding development away from known hazard areas.

Section 6: Mitigation Goals, Objectives, & Strategies

The Mitigation Goals, Objectives, and Strategy section describe how Pennington County intends to reduce or eliminate potential losses and provides a framework for the county and participating jurisdictions to mitigate the effects of natural hazard events on their population, economy, and property. The mitigation strategy is the coordinated effort of agencies and partners to develop and implement a comprehensive range of inventive and effective natural hazard mitigation actions.

Mitigation Strategy Approach

- Establish mitigation goals and objectives that aim to reduce or eliminate long-term vulnerability to natural hazard events
- Identify and analyze a comprehensive range of hazard-specific mitigation strategies that aim to achieve the goals and objectives of the mitigation strategy
- Describe how Pennington and participating jurisdictions will prioritize, implement, and administer mitigation strategies

The Mitigation Goals, Objectives, and Strategy section is an extension of the previous sections of this report and incorporates the findings of the hazards risk assessment to assist in prioritizing mitigation actions. In addition, the Mitigation Goals, Objectives, and Strategies section provides consideration of the findings of the capability assessment to identify mitigation actions that are manageable and address potential capability gaps. Finally, a maintenance and management section describes how the strategies are to be managed and accounted for in future updates.

FEMA Requirements Addressed in this Section

The Hazard Mitigation Planning Team developed the mitigation strategy consistent with the process and steps presented in the Federal Emergency Management Agency's (FEMA) How-To-Guide: Developing the Mitigation Plan (FEMA 386-3).

§201.6(c)(3) [The plan shall include the following:] A *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.

§201.6(c)(3)(i) [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

§201.6(c)(3)(ii) [The hazard mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and ongoing compliance with NFIP requirements, as appropriate.

§201.6(c)(3)(iii) [The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

§201.6(c)(3)(iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

6.1 Mitigation Goals, Objectives, & Development

While Pennington County and its cities have engaged in several mitigation actions over the past five years, the area remains at risk. Hazards posing the most risk due to frequency and impact include flood and severe winter/summer storms. While this plan still focuses on those priorities, new to this plan iteration is the emphasis placed on hazardous material incidents. Another area new to this iteration of the Pennington County's Hazard Mitigation Plan is its focus on comprehensive practices. Many of the projects were created with an emphasis on incorporating plans and projects from multiple agencies/jurisdictions. Finally, this plan and its projects are a reflection of both existing and future development. Many of the projects of this plan were created to ensure Pennington County and participating jurisdictions are infusing resilience and sustainability into their future endeavors.

The update of the Pennington County's Hazard Mitigation Plan includes the creation of five new all-encompassing mitigation goals versus the four hazard specific goals that were listed in the previous plan. In addition, this update eliminates completed projects, reassesses the validity of past projects, as well as adds new projects. The mitigation projects were derived from the updated community profile, hazard profile, a robust 28-point risk assessment and with the input from the local governments and citizens.

6.2 Strategies/Projects

The process of creating new mitigation projects officially commenced on May 2016 with the planning team meeting with each of the jurisdictions. Based on the concepts found in FEMA Publication 386-3, these meetings included an overview of what mitigation projects are, how to identify potential projects, a review of the past mitigation plan and an overview of the purpose of the mitigation plan. These parameters were set by FEMA, the State of Minnesota, and the Mitigation Steering Committee. Attendees were instructed to review the existing mitigation goals, objectives, and strategies of the previous plan to determine what had been accomplished over the past five years, what projects were currently relevant, and what new projects should be added to the update. The Mitigation Steering Committee, key stakeholders, and public attendees discussed the current mitigation goals, objectives, and strategies and provided feedback on where modifications to the goals, objectives, and projects were needed.

In the evaluation of mitigation strategies, stakeholders were instructed to consider the following criteria:

- Funding Options & Cost
- Staff Time
- Feasibility
- Population Benefit
- Property Benefit
- Values Benefit
- Maintenance
- Hazard Rating

In the evaluation and creation of projects, stakeholders were asked to assess each potential project in terms of eliminating risk and probability of success. Stakeholders were also requested to consider and provide direct and indirect costs and benefits with indirect costs and benefits being defined as intangible things such as social effects.

Upon completion of the mitigation project creation/evaluation process, the stakeholders provided a comprehensive list of desired strategies to the Hazard Mitigation Planning Team. The desired strategies were organized into common themes and evaluated and prioritized. Once arranged, the actionable projects and mitigation strategies were shared with stakeholders for approval and adoption.

The Hazard Mitigation Planning Team, further refined the list by eliminating duplication, providing succinctness, and generally organizing the strategies into a comprehensive and workable format, and shared the list with the participating jurisdictions and stakeholders for additional comment. After all of the comments were received and incorporated, a final list of strategies was made public for review and comment. The final comment and review section lasted approximately one month, ending at the end of June 2016.

The following is a summary of the mitigation update planning process:

1) New goals
2) Prioritization Criteria
3) Implementation Process
4) Projects
5) Mitigation Strategy Implementation and Administration

For this update, the mitigation goals were reorganized to be more general and all encompassing. The goals were also increased from four to five. The mitigation goals were chosen and created by the Mitigation Steering Committee with input from those wishing to participate.

Mitigation Goals:

- Increase community understanding of emergency management and build support for hazard mitigation.
- Develop, promote, integrate and track mitigation strategies.
- Enhance and improve the county's emergency management program.
- Increase the economic stability, core values, and quality of services of the participating jurisdictions.

- Increase mitigation resources to eliminate or minimize the harm done to people, property, jobs, and natural resources in Pennington County by the identified hazards.

6.3 Hazard/Project Relationship

The hazard project relationship table establishes that each of the hazards has at least one project assigned to it. Most hazards have multiple projects assigned to them.

Table 95: Hazards Mitigated by Each Proposed Project

Projects	Flooding (riverine and flash flood)	Dam / Levee Failure	Wildfire	Windstorms	Tornadoes	Hail	Lightning	Winter Storms	Erosion	Land Subsidence	Drought	Extreme Heat	Hazardous Material Release	Invasive Species	Infectious Disease	Fires (Structures and Vehicles)	Transportation Incidents	Water Supply Contamination
Incorporate mitigation based into city and county planning.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Enforce any set fire or burning bans.			X													X		
Promote the weather radio for homes and businesses.	X			X	X	X	X	X										
Encourage no/limited travel during severe weather conditions.				X	X	X	X	X										
Incorporate the watershed's water management plans concerning roads, drainage, culverts, bridges and dams and similar to prevent flooding.	X																	
Educate the public on multiple hazards so individuals take responsibility for the actions of themselves and their neighbors/families.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Continue to improve emergency response times.	X	X	X		X								X			X	X	
Continue to monitor, develop, enhance & enforce current floodplain, building and other mitigation related ordinances.	X																	
Continue working with the National Weather Service to improve storm warning and awareness.				X	X	X	X	X										
Continue to monitor, develop and enhance a comprehensive shelter Plan.					X													

Projects	Flooding (riverine and flash flood)	Dam / Levee Failure	Wildfire	Windstorms	Tornadoes	Hail	Lightning	Winter Storms	Erosion	Land Subsidence	Drought	Extreme Heat	Hazardous Material Release	Invasive Species	Infectious Disease	Fires (Structures and Vehicles)	Transportation Incidents	Water Supply Contamination
Incorporate mitigation based on municipal electrical cooperatives and other power company plans.	X			X				X										
Maintain an awareness of new technologies for citizen alert, such as emergency/telephonic alert.	X	X	X	X	X	X	X	X					X			X	X	
Continue to monitor, develop, enhance & enforce current building codes and land ordinances.	X	X							X	X								
Concerning issues of subsidence, incorporate watershed management plans.										X								
Encourage individuals to have a shelter in place plan.				X	X													
Encourage the placement of adequate signage on all railroad crossings																	X	
Continue security and monitoring measures of existing potable water sources																		X
Test and monitor potable water for toxins and impurities														X				
Concerning backup power and other means of operations, continue to monitor, develop and enhance critical infrastructure plan				X	X	X	X	X										
Update/create and incorporate storm plans for nursing homes, hospitals, public events and schools into multi-jurisdictional plans				X	X	X	X	X										
Continue to monitor, develop, enhance & stabilize eroding river banks									X									
Continue to monitor, develop, enhance, replace & purchase first responder equipment					X											X	X	
Continue to encourage securing anhydrous ammonia sources.													X					
Complete, update and exercise storm/crowd emergency planning for large population gathering events				X	X	X	X	X										
Create and maintain a mosquito control														X	X			

Projects	Flooding (riverine and flash flood)	Dam / Levee Failure	Wildfire	Windstorms	Tornadoes	Hail	Lightning	Winter Storms	Erosion	Land Subsidence	Drought	Extreme Heat	Hazardous Material Release	Invasive Species	Infectious Disease	Fires (Structures and Vehicles)	Transportation Incidents	Water Supply Contamination
program to include application and maintenance/purchase of mosquito spraying equipment																		
Find methods to provide increased, cost-effective security to CIKR resources				X	X	X	X	X										
Continue to identify and protect structures that are repeatedly damaged by natural hazards	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Continue to mitigate at risk power lines	X	X	X	X	X	X	X	X										
Look at constructing more bridges in Thief River Falls, as high traffic or emergencies could cause bottlenecking	X	X	X	X	X	X	X	X					X			X	X	
Concerning the creation and maintenance of emergency routes and roadways ongoing to study, monitor, develop, and enhance road plans	X	X	X	X	X	X	X	X					X			X	X	
Continue to monitor, maintain and upgrade city drainage	X																	
Continue to monitor treat and rehabilitate sludge ponds															X			

6.4 Project Prioritization

To ensure continuity from the previous iteration of the mitigation plan, the Mitigation Steering Committee decided that the action prioritization methodology would remain the same. Thus, the philosophy and methodology remained intact. As such, it is noted that each of the proposed projects has value but time and financial constraints do not permit all of the proposed actions to be implemented immediately. By prioritizing the actions, the most critical and cost effective projects can be achieved in the short term. The prioritization of the projects serves as a guide for choosing and funding projects, however, depending on the funding sources, some actions may be best achieved outside the priorities established here.

To ensure that community goals and other factors are taken into account when prioritizing projects, a prioritization model that uses the following factors was again used: cost, staff time, feasibility, population benefit, property benefit, values benefit, maintenance, and hazard rating.

- **Cost** considers the direct expenses associated with the project such as material and contractor expenses.
- **Staff time** evaluates the amount of time needed by a local government employees to complete or coordinate the project.
- **Feasibility** assesses the political, social, and/or environmental ramifications of the project and the likelihood such a project would proceed through permitting, public review processes, and/or private business implementation.
- **Population benefit** considers the possible prevention of deaths and injuries through the project's implementation.
- **Property benefit** estimates the reduction of property losses, including structures and infrastructure, from the hazard being mitigated.
- **Values benefit** considers the economic, ecologic, historic, and social benefits of the project.
- **Maintenance** rates the amount of work required to keep the mitigation measure effective and useful.
- **Hazard rating** is based on the results of the risk assessment and is a measure of the history, probability, severity, and vulnerabilities of the hazard.

Each of the factors was ranked qualitatively for each of the projects. The methods used to assign a category and the associated score is defined in Table 96. The highest possible score is 30. Some factors have a greater range than others, thus indicating a higher weighting. These weightings allow for appropriate prioritization of the project. More specifically, 11 of 30 points account for benefits (population benefit, property benefit, and values benefit), 11 of 30 points account for direct and indirect costs (cost, staff time, and maintenance), 5 of 30 points account for the hazard rating (incorporates hazard probability and impacts; see Section 4.5), and 3 of 30 points account for project feasibility.

Table 96: Prioritization Criteria

Factor	Threshold	Rating	Score
Cost (Range: 1-5)	Little to no direct expenses	Low	5
	Less than $5,000	Low-Moderate	4
	$5,000-$25,000	Moderate	3
	$25,001-$100,000	Moderate-High	2
	Greater than $100,000	High	1
Staff Time (Range: 1-3)	Less than 10 hours of staff time	Low	3
	10-40 hours of staff time	Moderate	2
	Greater than 40 hours of staff time	High	1
Feasibility (Range: 1-3)	Positive support for the project	High	3
	Neutral support for the project	Moderate	2
	Negative support for the project	Low	1
Population Benefit (Range: 1-4)	Potential to reduce more than 20 casualties	Very High	4
	Potential to reduce 6-20 casualties	High	3
	Potential to reduce 1-5 casualties	Moderate	2
	No potential to reduce casualties	Low	1
Property Benefit (Range: 1-4)	Potential to reduce losses to more than 20 buildings or severe damages to infrastructure	Very High	4
	Potential to reduce losses to 6-20 buildings or substantial damages to infrastructure	High	3
	Potential to reduce losses to 1-5 buildings or slight damages to infrastructure	Moderate	2
	No potential to reduce property losses	Low	1
Values Benefit (Range: 1-3)	Provides significant benefits to economic, ecologic, historic, or social values	High	3
	Provides some benefits to economic, ecologic, historic, or social values	Moderate	2
	No, or very little benefit to economic, ecologic, historic, or social values	Low	1
Maintenance (Range: 1-3)	Requires very little or no maintenance	Low	3
	Requires less than 10 hours per year	Moderate	2
	Requires more than 10 hours per year	High	1
Hazard Rating (Range: 1-5)	See Hazard Risk (Chapter Three)	High	3
	See Hazard Risk (Chapter Three)	Moderate	2
	See Hazard Risk (Chapter Three)	Low	1

The following table provided an overview of all of the projects and priority scorecard. The scorecard allows one to determine the feasibility of a project and to prioritize projects.

Table 97: Project Score Card

Affected Areas	Strategies	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	TOTAL SCORE
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Educate on multiple hazards so that individuals take on the responsibility for the actions of themselves and their neighbors/families.	5	2	3	4	4	1	3	3	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue working with the National Weather Service to improve storm warning and awareness.	5	2	3	4	1	1	3	3	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Promote the weather radio for homes and businesses.	5	3	3	4	1	1	3	3	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage no/limited travel during severe weather conditions.	5	3	3	4	1	1	3	3	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Maintain an awareness of new technologies for citizen alert, such emergency/telephonic alert.	4	2	3	4	4	1	2	3	23
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Incorporate the watershed's water management plans concerning roads, drainage, culverts, bridges and dams etc.	5	2	3	4	4	2	3	3	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Incorporate mitigation based on municipal electrical cooperatives and other power company plans. Municipal Electrical Cooperatives.	4	2	3	4	4	2	2	3	24
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Incorporate mitigation based on city and county planning.	5	2	3	4	4	3	3	3	27
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Update/create and incorporate storm plans for nursing homes, hospitals, public events and schools into multi-jurisdictional plans.	5	1	3	4	1	1	3	3	21
The cities of Goodridge, St. Hilaire & Thief River Falls	Create on-site shelters or an evacuation plan to a nearby shelter for trailer courts.	5	2	3	4	1	1	3	3	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop and enhance a comprehensive shelter plan.	5	3	3	4	1	2	3	3	24
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Concerning backup power and other means of operations, continue to monitor, develop and enhance critical infrastructure plan.	4	3	3	1	4	2	2	3	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to Mitigate at risk power lines.	3	2	3	1	4	2	2	3	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Concerning the creation and maintenance of emergency routes and roadways, continue to study, monitor, develop and enhance road plans.	1	1	3	4	4	2	1	3	19

Affected Areas	Strategies	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	TOTAL SCORE
The cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, maintain and upgrade city drainage.	2	1	3	1	4	2	1	3	17
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & enforce current floodplain, building and other mitigation related ordinances.	4	2	3	4	4	2	3	3	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to identify and protect structures that are repeatedly damaged by natural hazards.	3	2	3	1	4	2	2	3	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & enforce current building codes and land ordinances.	4	2	3	1	4	3	3	3	23
Pennington County and St. Hilaire & Thief River Falls	Concerning issues of subsidence, incorporate watershed management plans.	5	2	3	1	4	3	3	2	23
Pennington County and St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & Stabilize eroding riverbanks.	4	2	3	1	4	2	3	2	21
Pennington County and St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance, replace & purchase first responder equipment.	2	2	3	4	4	1	2	3	21
Pennington County and St. Hilaire & Thief River Falls	Enforce any set fire or burning bans.	5	2	3	4	4	2	3	3	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage the placement of adequate signage on all railroad crossings.	5	3	3	4	1	1	3	2	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to improve emergency response times.	4	2	3	4	4	2	3	3	25
Pennington County Thief River Falls	Look at constructing more bridges in Thief River Falls, as high traffic or emergencies could cause bottlenecking.	1	1	3	4	4	3	1	3	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to encourage securing anhydrous ammonia sources.	5	3	3	4	1	1	3	1	21
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue security and monitoring measures of existing potable water sources.	4	3	3	4	1	3	3	1	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Test and monitor potable water for toxins and impurities.	4	3	3	4	1	3	3	1	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor treat and rehabilitate sludge ponds.	3	2	3	1	1	3	2	1	16
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Create and maintain a mosquito control program to include application and maintenance/purchase of mosquito spraying equipment.	3	1	3	4	1	3	3	2	20

Affected Areas	Strategies	Cost	Staff Time	Feasibility	Population Benefit	Property Benefit	Values Benefit	Maintenance	Hazard Rating	TOTAL SCORE
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage individuals to have a shelter in place plan.	5	3	3	4	1	1	3	3	23
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Complete, update and exercise storm/crowd emergency planning for large population gathering events.	4	2	3	4	1	2	3	2	21
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Find methods to provide increased, cost-effective security to CI/KR resources.	4	2	3	1	1	3	3	3	20

6.5 Implementation Process

A critical component of any mitigation program is the implementation of the mitigation projects. The proposed and prioritized projects are shown in Table 98 with the associated responsible stakeholders, resources needed, and goal timeframes for the projects. The timeframes are defined as follows:

- Near Term: Within 0-3 years
- Mid Term: Within 3-6 years
- Long Term: Within 7-10 years
- Ongoing: Initiated in the near, mid, or long term and continuing

Note: Some projects may be best achieved outside of the goal timeframes depending on the funding and staff resources available. Others may not be feasible in the goal timeframe due to financial, staff, or political limitations. This prioritized list, however, allows the county, city, and towns to focus on the projects with the greatest benefits. The following is a table of complete actions in order of their priority score. The table also illustrates the jurisdiction(s) owning the project, coordinating agency, resources, and the goal of each project.

6.6 Mitigation Projects

Mitigation strategies are the foundation of a truly effective emergency management program.

- Mitigation creates safer communities by reducing losses of life and property.
- Mitigation enables individuals and communities to recover more rapidly from disasters.
- Mitigation lessens the financial impact of disasters on individuals, the Treasury, state, local and tribal communities.

The county and participating jurisdictions recognize the importance of incorporating mitigation into: emergency management functions (prepare, respond, recovery), existing local and state building codes, zoning ordinances, and various plans (land use, community development, water improvement development, etc.). For this reason, the comprehensive all-hazard mitigation strategies also identified strategies that will improve the county's and participating jurisdiction’s emergency management capabilities, while creating communities that are resilient in the face of disaster.

Table 98: Mitigation Projects

Affected Areas	Strategies	Coordinating Agencies	Resources Needed	Time Frame	TOTAL SCORE
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Incorporate mitigation based on city and county planning.	County and Cities	Staff Time	Ongoing	27
Pennington County and St. Hilaire & Thief River Falls	Enforce any set fire or burning bans.	County, Cities and Fire Departments	Involved Party Budgets & Staff Time	Ongoing	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Promote the use of weather radio for homes and businesses.	County & NWS	Staff Time	Ongoing	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage no/limited travel during severe weather conditions.	County & MnDot	Involved Party Budgets, Staff Time & State	Ongoing	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Incorporate the watershed's water management plans concerning roads, drainage, culverts, bridges and dams etc.	County, Cities & Watersheds	Involved Party Budgets & Staff Time	Near-term	26
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Create a multi-hazard education plan that encourages individuals to take on individual responsibility.	County and Cities	Staff Time	Ongoing	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to improve emergency response times.	County, Cities & all First response agencies	Involved Party Budgets & Staff Time	Ongoing	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & enforce current floodplain, building and other mitigation related ordinances.	County, Cities & Watersheds	Staff Time	Ongoing	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue working with the National Weather Service to improve storm warning and awareness.	County, Cities & NWS	Staff Time	Ongoing	25
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop and enhance a comprehensive shelter plan.	County and Cities	Staff Time		24
Pennington County and the cities of Goodridge,	Incorporate mitigation based on municipal electrical	County, Cities electrical	Involved Party Budgets &,	Near Term	24

Affected Areas	Strategies	Coordinating Agencies	Resources Needed	Time Frame	TOTAL SCORE
St. Hilaire & Thief River Falls	cooperatives and other power company plans. Municipal. Electrical cooperatives.	cooperatives & power companies	Staff Time,		
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Maintain an awareness of new technologies for citizen alert, such as emergency/telephonic alert.	County and Cities	Involved Party Budgets & Staff Time	Near Term	23
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & enforce current building and shore land ordinances.	County and Cities	Staff Time	Ongoing	23
Pennington County and St. Hilaire & Thief River Falls	Concerning issues of subsidence, incorporate watershed management plans.	County, Cities & Watersheds	Staff Time	Near Term	23
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage individuals to have a shelter in place plan.	County and Cities	Staff Time	Long-term	23
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Encourage the placement of adequate signage on all railroad crossings.	County, Cities & Railroad Companies	Staff Time and Railroad Budget	Long-term	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue security and monitoring measures of existing potable water sources.	County and Cities	Staff time	Ongoing	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Test and monitor potable water for toxins and impurities.	County and Cities	Staff Time	Ongoing	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Concerning backup power, continue to monitor, develop and enhance critical infrastructure plan.	County and Cities	Involved Party Budgets, Staff Time & HMGP	Ongoing	22
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Update/create and incorporate storm plans for nursing homes, hospitals, public events and schools. into multi-jurisdictional plans.	County, Cities and private entities	Involved Party Budgets, Staff Time,	Near Term	21
Pennington County and St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance & stabilize eroding river banks.	County, Cities, and Watershed	Involved Party Budgets, Staff Time, HMGP	Ongoing	21

Affected Areas	Strategies	Coordinating Agencies	Resources Needed	Time Frame	TOTAL SCORE
Pennington County and St. Hilaire & Thief River Falls	Continue to monitor, develop, enhance, replace & purchase first responder equipment.	County, Cities & First Response Agencies	Involved Party Budgets	Ongoing	21
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to encourage securing anhydrous ammonia sources.	County, Cities & Townships	Involved Party Budgets, Staff Time,	Ongoing	21
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Complete, update and exercise storm/crowd emergency planning for large population gathering events.	County, Cities & Event organizers	Involved Party Budgets, Staff Time,	Near Term	21
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Create and maintain a mosquito control program to include application and maintenance/purchase of mosquito spraying equipment.	County, Cities & Public Health	Involved Party Budgets, Staff Time,	Ongoing	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Find methods to provide increased, cost-effective security to CI/KR resources.	County and Cities	Involved Party Budgets, Staff Time, HMGP, State	Long-Term	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to Identify and protect structures that are repeatedly damaged by natural hazards.	County and Cities	Involved Party Budgets, Staff Time, HMGP, State & FEMA	Ongoing	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Continue to Mitigate at risk power lines.	County, Cities & Electrical Cooperatives	Involved Party Budgets, Staff Time, HMGP, State	Ongoing	20
Pennington County Thief River Falls	Look at constructing more bridges in Thief River Falls, as high traffic or emergencies could cause bottlenecking.	County, Cities & MnDot	Involved Party Budgets, Staff Time, & State	Long-term	20
Pennington County and the cities of Goodridge, St. Hilaire & Thief River Falls	Concerning the creation and maintenance of emergency routes and roadways Continue to study, monitor, develop and enhance road plans.	County and Cities	Involved Party Budgets, Staff Time,	Ongoing	19
The cities of Goodridge, St. Hilaire & Thief River Falls	Continue to monitor, maintain and upgrade city drainage.	County and Cities	Involved Party Budgets, Staff Time,	Ongoing	17
Pennington County and	Continue to monitor treat	County and Cities	Involved Party	Ongoing	16

Affected Areas	Strategies	Coordinating Agencies	Resources Needed	Time Frame	TOTAL SCORE
the cities of Goodridge, St. Hilaire & Thief River Falls	and rehabilitate sludge ponds.		Budgets, Staff Time,		

The development of this plan has provided Pennington County and its participants with a unique opportunity to assess current capabilities, identify gaps, and evaluate the strategies needed to improve the ability to protect the county and participating jurisdictions.

6.7 Existing and New Plan Implementation

Pennington County and participating jurisdictions feel that it is imperative to make mitigation a way of life for its participating jurisdictions, agencies, and general community. In order to implement sustainable and resilient strategies, it is essential to integrate mitigation into other community planning initiatives. As such, existing planning mechanisms were used to assist the Mitigation Steering Committee and local jurisdictions in identifying areas where hazard mitigation information and/or actions may be incorporated.

During the planning process, the county and participating jurisdictions were asked to investigate opportunities to incorporate mitigation measures that would meet the goals and objectives of the Pennington County Hazard Mitigation Plan. In addition, the county and participating jurisdictions were asked to ensure the implementation and alignment of the Pennington County Hazard Mitigation Plan into existing programs/policies as outlined in Table 99 shown below.

Table 99: Programs/Policies/Plans

Programs/Policies/Plans	Mitigation Integration/ Alignment Required	Represented Jurisdictions
Disaster Recovery Plan	Ongoing	Thief River Falls
Land Use plan	Ongoing	Thief River Falls
Storm Management Plan	Ongoing	Thief River Falls & St. Hilaire
Continuity of Operations Plan	Ongoing	All Participating Jurisdictions
Comprehensive plan	Ongoing	All Participating Jurisdictions
Pennington Emergency Operations	Ongoing	All Participating Jurisdictions
Flood Management Plan	Ongoing	Pennington County and the cities of Goodridge, St Hilaire, & Thief River Falls
Pennington Zoning Ordinances	Ongoing	All Participating Jurisdictions
NFIP	Ongoing	Pennington County and the cities of Goodridge, St Hilaire, & Thief River Falls
Minnesota State Multi-Hazard Mitigation Plan	Yes I/A	All Participating Jurisdictions
Minnesota State Building Code	Yes I/A	All Participating Jurisdictions

NOTE: This table represents areas where the Pennington County Hazard Mitigation Plan update may be incorporated. The actual implementation process is outlined below.

One of the implementation steps of the Pennington County Hazard Mitigation Plan is to revise all of the plans to incorporate the mitigation actions identified in this document. To accomplish the integration of mitigation actions the Pennington County Emergency Manager will contact the individuals responsible for the above-listed plans and request that those documents incorporate or reference relevant portions of the Pennington County Hazard Mitigation Plan when and where appropriate.

Revisions to these documents will follow the revision or amendment guidelines established for each plan. In addition, the Pennington County Emergency Manager will send a letter to the pertinent organizations to ensure the incorporation with the Pennington County Hazard Mitigation Plan.

Table 100: Jurisdictional Process for Mitigation Incorporation

Jurisdiction	Form of Governance	Point of Contact
Pennington County	Don Jensen	Commissioner
Goodridge	Davis Brown	Mayor
St Hilaire	Brandon Kisch	Mayor
Thief River Falls	Brian Holmer	Mayor

As Pennington County and its Cities develop new plans and when existing plans are updated, the new plans and updates will utilize the hazard information and projects identified in the Pennington County Hazard Mitigation Plan for consideration and inclusion. Given that limited planning mechanisms exist in the county and jurisdictions, the information in the Pennington County Hazard Mitigation Plan will be useful for future planning efforts. Table 101 shows examples of projects and how they can be incorporated into existing and future planning documents.

Table 101: Mitigation Strategies

Existing or Anticipated Plan	Mitigation Strategies	Estimated Revision or Creation Timeframe
Building Codes	Adopt building codes that require disaster resistance to hazards such as severe thunderstorms, the wind, tornadoes, floods, wildfire, winter storms, terrorism, and earthquakes.	Near Term*
Capital Improvement Plans	When developed, consider and include projects related to hazard mitigation, such as transportation and public utility infrastructure improvements, in the capital improvements schedule.	Long Term*
Ordinances	Adopt ordinances that create disaster resistance such as mowing and fire reduction ordinances and flood ordinances.	Mid Term
Zoning	Update or create zoning ordinances to limit development in high hazard areas.	Near Term*
Pennington Community Wildfire Protection Plan	Create a plan that meets federal standards and identifies hazards and mitigation measures specific to wildfire.	Mid Term
Pennington Emergency Operations Plan	Integrate the operational, response, training, and preparedness needs that are not directly tied to mitigation into the county's emergency operation plan	Mid Term
Pennington Growth Policy	Incorporate elements of the risk assessment and mitigation strategy into the county's growth policy, considering sustainability and disaster resistance a top priority.	Near Term
Pennington Subdivision Regulations	Include elements of the risk assessment and mitigation strategy in the county's subdivision regulations, considering sustainability and disaster resistance a top priority.	Near Term

Note: Some activities such as building codes and land use regulations are more easily implemented by some communities than others because of the community, planning, and enforcement resources available.

Section 7: Monitor and Maintain the Mitigation Plan

The Plan Maintenance section of Pennington Hazard Mitigation Plan describes the formal process that will ensure the mitigation plan remains an effective and relevant document. This section establishes the method and schedule for monitoring, evaluating, and updating the plan during a five-year plan update cycle. It also establishes how the community will be maintain involvement in the planning process.

Maintenance Approach

- Incorporate hazard mitigation actions into existing planning mechanisms
- Determine how mitigation projects and actions will be monitored
- Establish indicators of effectiveness or success
- Develop an evaluation and revision schedule to ensure the Pennington Hazard Mitigation Plan is up-to-date at the end of the five-year-cycle
- Establish a process for public input and community involvement during the planning cycle

FEMA Requirements Addressed in this Section

The Hazard Mitigation Planning Team created the Pennington Hazard Mitigation Plan maintenance strategy consistent with the process and steps presented in the Federal Emergency Management Agency's (FEMA) How-To Guide: Bringing the Plan to Life (FEMA 386-4). The following FEMA requirements are addressed in this section:

- ✓ Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a section describing the method and schedule for monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
- ✓ Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans where appropriate.
- ✓ Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

7.1 Development and Acceptance

Maintaining the Pennington Mitigation Plan is crucial if Pennington is to have a comprehensive mitigation program. As such, this section creates a maintenance timeline, assigning accountability, and creating oversight and governance.

The Hazard Mitigation Planning Team created to monitor and maintain a section of the Pennington Hazard Mitigation Plan. The section was presented to the Pennington Emergency Manager for comment and buy in. Upon some very slight modifications, the section was presented to the Mitigation Steering Committee, participating jurisdictions and the public for comment and approval.

7.2 Process

During the five-year planning cycle, the Pennington Emergency Manager will undertake the following initiatives:

- Collect annual information from the agencies involved in implementing mitigation projects or activities identified in the Mitigation Strategy section of the Pennington Hazard Mitigation Plan
- Maintain and update the mitigation action table
- Conduct site visits and obtain reports of completed or initiated mitigation actions to incorporate in the Pennington Hazard Mitigation Plan revision as needed
- Research and document new natural disaster information pertaining to Pennington during the planning cycle and incorporate into a revised risk assessment section as needed
- Organize (at a minimum) annual meetings with each of the participating jurisdictions and county commissioners to discuss relevant hazard mitigation issues, provide status updates, and discuss available grant opportunities
- Organize biannual meetings with mitigation steering committee members to discuss relevant hazard mitigation issues, provide status updates, and discuss available grant opportunities
- Coordinate, compile, and disseminate hazard mitigation funding information and applications
- Convene a meeting of the Mitigation Steering Committee within a timely period following a natural disaster, when funding is announced to prioritize and submit potential mitigation actions for funding and/or at the direction of the Disaster and Emergency Services Coordinator

The above activities outline plan maintenance during the four years leading up to the fifth year of the planning cycle (2016-2021). Beginning in August 2017, the Pennington Emergency Manager will reconvene the Planning Committee to discuss and update the status of the hazard mitigation actions listed in the Pennington Hazard Mitigation Plan. The Pennington Emergency Manager will be responsible for ensuring the compilation, documentation, and incorporation of all changes derived from the activities listed above into a revised plan document.

7.3 Evaluation

The Pennington Hazard Mitigation Plan will be evaluated annually to determine the effectiveness of its projects, programs, and policies. The Pennington Emergency Manager will be responsible for scheduling and organizing the planning meetings, collecting and analyzing annual reports for incorporation, and providing revised drafts to the Mitigation Steering Committee. Each year, the Mitigation Steering Committee members will assess the current version of the Pennington Hazard Mitigation Plan and determine the improvements necessary for the plan update. The Pennington Emergency Manager will evaluate the Pennington Hazard Mitigation Plan to determine if other agencies should be added.

A thorough examination of the Pennington Hazard Mitigation Plan will take place during the fifth year of the process to ensure Pennington has an updated hazard mitigation plan at the end of the planning cycle. The Mitigation Steering Committee will review the goals and action items to determine their relevance to changing situations within the county, as well as changes in state or federal policy, and to ensure they are addressing current and expected conditions. The Mitigation Steering Committee will look at any changes in county resources that may influence the plan implementation, such as funding, and program changes to determine the need for reassignment. The Mitigation Steering Committee will review all portions of the

Pennington Hazard Mitigation Plan to determine if this information should be updated or modified given any newly available data. The evaluation should include the following criteria

- Are the mitigation actions effective?
- Are there any changes in land development that affect mitigation priorities?
- Do the goals, objectives, and action items meet social, technical, administrative, political, legal, economic, and environmental criteria as defined in FEMA's STAPLEE analysis?
- Are the goals, objectives, and mitigation actions relevant given any changes in Red Lake County?
- Are the goals, objectives, and mitigation actions relevant given any changes to state or federal regulations or policy?
- Is there any new data that affects the Risk Assessment portion of the Pennington Hazard Mitigation Plan?

7.5 Update

The Pennington Emergency Manager will ensure the Mitigation Steering Committee updates the Hazard Mitigation Plan every five years to reflect the results of the annual reports and on-going plan evaluation. Throughout the planning cycle, the Pennington Emergency Manager will ensure that new information is compiled and incorporated into the Pennington Hazard Mitigation Plan. The Pennington Emergency Manager will also incorporate recommended comments expressed by FEMA in the initial review into the Pennington Hazard Mitigation Plan revision. At the end of the planning cycle, the Mitigation Steering Committee will submit the updated Pennington Hazard Mitigation Plan to the State Emergency Management Office and FEMA for review. After FEMA has approved the Pennington Hazard Mitigation Plan, the county will again formally adopt the Pennington Hazard Mitigation Plan. The following table is an outline of how the Pennington Hazard Mitigation Plan will be updated upon FEMA-approval:

Table 102: Pennington Hazard Mitigation Plan Update Schedule

Timeframe	Participant	Outcome
First Quarter 2017	Mitigation Steering Committee Participating Jurisdictions	Reconvene Planning Committee to discuss mitigation action progress and possible plan improvements.
First Quarter 2018	Mitigation Steering Committee Participating Jurisdictions	Reconvene Planning Committee to discuss mitigation action progress and possible plan improvements.
First Quarter 2019	Mitigation Steering Committee Participating Jurisdictions	Reconvene Planning Committee to discuss mitigation action progress and possible plan improvements.
Fourth Quarter 2019	Mitigation Steering Committee Participating Jurisdictions County Commissioners	Apply for plan update grant funding
First Quarter 2020	Mitigation Steering Committee Participating Jurisdictions	Reconvene Planning Committee to discuss mitigation action progress and possible plan improvements.

Timeframe	Participant	Outcome
Fourth Quarter 2020	Mitigation Steering Committee Participating Jurisdictions MN HSEM	Reconvene Hazard Mitigation Planning Team and begin plan update. Coordinate monthly meetings with Hazard Mitigation Steering Committee.
First Quarter 2021	Mitigation Steering Committee Participating Jurisdictions MN HSEM	Continue plan update.
Fourth Quarter 2021	Mitigation Steering Committee Participating Jurisdictions MN HSEM	Submit plan to FEMA for final approval

7.6 Incorporation into Existing Planning Mechanisms

As part of the local capability assessment conducted during the planning process, the Mitigation Steering Committee identified current plans, programs, policies/ordinances, and studies/reports that will augment or help support mitigation planning efforts. The Mitigation Steering Committee will meet on an annual basis, and will be the mechanism for ensuring the county integrates hazard mitigation into its future planning activities. Following plan approval and adoption, the Mitigation Steering Committee and participating jurisdictions will work to incorporate, where applicable, the Pennington Hazard Mitigation Plan into the planning mechanisms identified in the mitigation action section.

Throughout the plan maintenance cycle, the Pennington Emergency Manager will work with the county and participate jurisdictions to integrate hazard mitigation goals and actions into the general operations of key agencies. The Pennington Emergency Manager will work with agencies to identify opportunities as outlined below:

Update work plans, policies, or procedures to include hazard mitigation concepts

- Identify potential mitigation funding within capital and operational budgets
- Issue plans, policies, executive orders, regulations, or other directives to carry out mitigation actions
- Add hazard mitigation elements to redevelopment plans

7.7 Continued Public Involvement

Pennington County is dedicated to continued public involvement in the hazard mitigation planning and review process. During all phases of plan maintenance, the public will have the opportunity to provide feedback. The Pennington Hazard Mitigation Plan will be maintained and available for review on the county website. Individuals will have an opportunity to submit comments for the Pennington Hazard Mitigation Plan update at any time. The Pennington Emergency Manager will compile all comments and present them at the annual Mitigation Steering Committee meetings, where members will consider them for incorporation into the revision. To help publicize the revised Pennington Hazard Mitigation Plan six months prior to the submission of the 2021 Pennington Hazard Mitigation Plan update, Pennington will post a notice in the

Pennington paper of record requesting feedback on an updated draft plan. The Hazard Mitigation Planning Team will hold community involvement meetings with representatives from academic institutions, the private sector, community groups, and neighboring jurisdictions. This will provide the public an opportunity to express their concerns, opinions, or ideas about any updates/changes that are proposed to the Pennington Hazard Mitigation Plan.

7.8 The Hazard Mitigation Steering Committee

The Mitigation Steering Committee oversees changes and modifications to the Pennington Hazard Mitigation Plan and will regularly review each goal and objective to determine its relevance to the changing situation of the county. The Mitigation Steering Committee will also monitor and evaluate the mitigation strategies in the current iteration of the Pennington Hazard Mitigation Plan to ensure that the document reflects current hazard/risk analysis, development trends, code changes, and risk perceptions.
The Mitigation Steering Committee and the participating jurisdictions agree that outreach and input will be solicited throughout the Pennington Hazard Mitigation Plan's lifecycle through workshops, presentations, meetings, the internet, and other public information and education campaigns.

To ensure the Pennington Hazard Mitigation Plan is up to date and relevant the Mitigation Steering Committee will meet as per their mandate and/or at the direction of the Pennington County Emergency Manager.

7.9 Participating Jurisdictions

Participating jurisdictions are key stakeholders within the Pennington Mitigation Plan, and have agreed to be an active participant in the mitigation process. Participating jurisdictions maybe but are not required to be active Mitigation Steering Committee members.

Participating jurisdictions are welcome to attend mitigation-planning meetings and or review the minutes of the meetings.

The participating jurisdictions have agreed to ensure the Pennington Hazard Mitigation Plan is current and relevant. Participating jurisdictions agree to provide updates of appropriate activities occurring within their jurisdictions on a regular basis, and/or at the direction of the Pennington County Emergency Manager.

Participating jurisdictions have agreed to ensure that within their own jurisdictions the mitigation planning is integrated into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate. Jurisdictions also agree to work with the Pennington Emergency Manager to identify areas of plan integration, as well as provide regular progress reports of the integration of the mitigation plan into existing and or new plans. Conversely, the Pennington Emergency Manager agrees to ensure participating jurisdictions are included in the planning process, particularly when plan updates will affect the participating jurisdictions, and when or if changes are made to the Pennington Hazard Mitigation Plan. Furthermore, the participating jurisdictions agree to work with the Pennington Emergency Manager and Mitigation Steering Committee when requested.

Appendix A: Inventory of Hazard Mitigation Programs, Policies, and Funding

Federal Agencies and Programs
U.S. Department of Homeland Security

Federal Emergency Management Agency (FEMA)
General information on mitigation planning, hazards, disaster assistance programs, current disasters, etc.

Hazard Mitigation Grant Program (HMGP)
HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities.

Pre-Disaster Mitigation (PDM)
PDM provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The goal of the PDM program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations.

Flood Mitigation Assistance (FMA)
FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate the risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP).

National Flood Insurance Plan
Detailed information on the National Flood Insurance Program and other mitigation activities

Hazard Mitigation Funding Under Section 406 (Public Assistance)
Section 406 provides discretionary authority to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities.

U.S. Department of Agriculture (USDA)

Natural Resources Conservation Service (NRCS)
To provide leadership in a partnership effort to help conserve, improve, and sustain our natural resources and environment

Community Facility Grants
Assistance for the development of essential community facilities. Grant funds can be used to construct, enlarge, or improve community facilities for health care, public safety, and community and public services.

Emergency Watershed Protection (EWP)
Program is for emergency measures, including the purchase of flood plain easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a

sudden impairment of the watershed.

Environmental Quality Incentives Program (EQIP)
Provides technical assistance, cost-share payments, and incentive payments to assist crop, livestock, and other agricultural producers with environmental and conservation improvements to their operations.

Wetlands Reserve Program
A voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Provides technical and financial support to help landowners.

Conservation Easements
In cooperation with Minnesota BWSR funding for conservation easements on frequently flooded lands is available. One of many Reinvest in Minnesota (RIM) - NRCS partnerships.

Farm Service Agency (FSA)
Disaster Assistance Programs available, include:
Conservation Loans
Conservation Reserve Program
Emergency Conservation Program
Non-Insured Crop Disaster Assistance Program
Emergency Farm Loans

U.S. Department of Commerce (DOC)

Economic Development Administration (EDA)
To generate jobs, help retain existing jobs, and stimulate industrial and commercial growth in economically distressed areas of the U.S.

U.S. Census Bureau
Profile of Minnesota and each Minnesota County

National Oceanic and Atmospheric Administration (NOAA)

NOAA, Coasts
Provides detailed information on coastal water issues, including the Great Lakes

NOAA, National Climatic Data Center
Current and historical archive of climatic data and information

NOAA, Drought Information Center
Updated drought conditions including monitors and outlooks

NOAA, National Severe Storms Laboratory
Comprehensive information on severe weather research

NOAA, National Weather Service (NWS)
Provides all available weather information including warning updates

Advanced Hydrologic Prediction Service (AHPS)
A program designed to provide improved river and flood forecasting and water information. AHPS provides a suite of graphical and numeric products over the Internet to assist community leaders and Emergency Managers in making a better life- and cost-saving decisions about evacuations and movement of the property before flooding occurs.

Flood Inundation Mapping
This interactive web page shows the spatial extent of possible or expected flooding in a given area. It can be used to show if roadways and structures will be impacted by floodwaters. At the limited number of forecast locations where inundation maps are currently available, this web page is accessed by clicking on the inundation mapping tab on the hydrograph webpage. In collaboration with partners, this product will be expanded to new locations.

Flash Flood Guidance
The North Central River Forecast Centers issues Flash Flood Guidance throughout the day for every county in their area. The river forecast centers determine 1, 3 and 6-hour flash flood guidance values for all counties and 12 and 24-hour values for parts of the eastern United States. Flash Flood Guidance estimates the average number of inches of rainfall for given durations required to produce flash flooding in the indicated county.

North Central River Forecast Center
Contains a variety of seasonal products including the Spring Hydrologic Outlook

U.S. Army Corps of Engineers (USACE)
Planning programs include Flood Risk Management, Planning Assistance to States, Flood Plain Management Services, and Silver Jackets.

Planning Assistance to States (PAS)
Funded annually by Congress. Federal allotments for each State or Tribe from the nation-wide appropriation are limited to $2,000,0000 annually, but typically are much less. Individual studies, of which there may be more than one per State or Tribe per year, generally cost $25,000 to $75,000. The studies may be phased over several years and cover a wide range of water resource planning activities. PAS studies are cost shared on a 50 percent Federal-50 percent non-Federal basis. The entire local sponsor contribution may be work in kind, and WRDA 2007, Section 2013 provided authority for 100 percent Federal funded PAS studies for hydrologic, economic, and environmental data and analyses.

Floodplain Management Services
A full range of technical services and planning guidance on flood and floodplain issues is provided upon request. These services are generally made available to other federal, state, and local agencies, but some may also be used by nongovernmental organizations and individuals and are 100 percent federally funded.

Regional Flood Risk Management Team
This Regional Flood Risk Management Team (RFRMT) will integrate pre-flood mitigation with a long-term strategy to plan and implement pre- and post-flood emergency actions, while developing promising nonstructural alternatives and other flood risk mitigation actions recognized to reduce future flood risk within the region.

Cold Regions Research and Engineering Laboratory (CRREL)
Engineering and technology for use in cold regions

Flood Damage Reduction Studies & Projects
Flood damage reduction is one of the primary missions of the U.S. Army Corps of Engineers. As such, the Corps of Engineers may undertake studies and build projects to reduce and/or minimize flood damages. The Corps of Engineers may investigate flooding problems and opportunities in response to directives, called authorizations, from the Congress. Congressional authorizations are contained in public laws and in resolutions of either the House Public Works and Transportation Committee or the Senate Environment and Public Works Committee.

Continuing Authorities Program
Under the Continuing Authorities Program (CAP) legislation authorizes the Corps of Engineers to plan, design, and construct certain types of water resource and ecosystem restoration projects without additional and specific congressional authorization. The purpose is to implement projects of limited scope and complexity. Each authority has specific implementation guidelines, total program, and per-project funding limits.

Funding: Studies are cost shared 50/50 during feasibility. Most projects are cost shared 65 percent Federal and 35 percent local during implementation unless otherwise noted.

Small Flood Control Projects authorized by Section 205 of the 1948 Flood Control Act. Per-project: Federal funding limit of $7 million. Designed to implement projects that reduce overland flood damages. Projects must be engineering sound, economically justified, and environmentally acceptable.

Emergency Streambank Protection Projects authorized by Section 14 of the 1946 Flood Control Act. Per-project Federal funding limit of $1.5 million. Designed to protect essential public facilities threatened by flood-induced erosion.

Aquatic Ecosystem Restoration authorized by Section 206 of the 1996 Water Resources Development Act. Per-project Federal funding limit of $5 million. Designed to develop aquatic ecosystem restoration and protection projects that improve the quality of the environment, are in the public interest, and are cost effective.

Project Modifications for the Improvement of the Environment authorized by Section 1135 of the 1986 Water Resources Development Act. Federal funding limit of $5 million. Designed to modify existing Corps projects for the purpose of improving environmental quality.

Section 524 of the Water Resources Development Act of 2000: Minnesota Dams
Provides for inventory, inspection, modification and/or rehabilitation of dams originally constructed by the Civilian Conservation Corps, Works Progress Administration, and Works Projects Administration (WPA) in Minnesota. Oversight of 361 of the original 417 WPA dams falls to the Minnesota Department of Natural Resources (DNR) through the office of the State Dam Safety Engineer. The rest are owned and operated by individual counties and the National Park Service.

Federal Energy Regulatory Commission (FERC)
Regulates dams that generate electric hydropower.

U.S. Geologic Survey (USGS)
Excellent source of natural disaster information (earthquakes, drought, floods, etc.).

Real-Time Data for Minnesota Streamflow
Users can select data from multiple sites using a broad set of filters, such as by state, county, watershed and a latitude/longitude box. This new web service can benefit users with programs that download tab-delimited real-time data from 138 gages. This data is also available in coordination with NWS-AHPS and the Corps of Engineers websites, although USGS quality assures and maintains the data.

Water Watch
The site displays maps, graphs, and tables describing real-time, recent, and past streamflow conditions for the United States. The real-time information generally is updated on an hourly basis. The stream gage-based maps show conditions for real-time, average daily, and 7-day average stream flow. The real-time streamflow maps highlight flood and high flow conditions. Water Watch also includes tables of current streamflow information and locations of flooding.

Flood Watch
In coordination with USGS's Water Watch, Website the state map shows the location of stream gages where the water level is above flood or at high flow. High flow conditions are expressed as percentiles that compare the current (i.e., within the past several hours) instantaneous flow value to historical daily mean flow values for all days of the year.

Water Alert
The U.S. Geological Survey WaterAlert service sends e-mail or text messages when certain parameters measured by a USGS data-collection station exceed user-definable thresholds.

StreamStats
A Web-based Geographic Information System (GIS) that provides users with access to an assortment of analytical tools that are useful for water-resources planning and management, and for engineering design applications.

USGS Programs in Minnesota
Details USGS activities in Minnesota.

Earthquake Hazards Program
Up- to-date information on world seismicity.

U.S. Department of Housing and Urban Development (HUD)

Community Development Block Grants
Disaster grants are used to rebuild resilient communities after a disaster.

Disaster Recovery Assistance
Disaster relief and recovery assistance in the form of special mortgage financing for rehabilitation of

impacted homes.

Neighborhood Stabilization Program
Funding for the purchase and rehabilitation of foreclosed and vacant property in order to renew neighborhoods devastated by the economic crisis.

U.S. Department of Transportation (DOT)

Federal Highway Administration (FHWA)
Provides funding for mitigation activities such as snow fences and living snow fences as part of construction funding

U.S. Small Business Administration (SBA)
Provides training and advocacy for small firms.

Another valuable resource is the *Catalog of Federal Domestic Assistance (CFDA)*. It provides a full listing of all federal programs available to state and local governments; federally recognized Indian tribal governments; domestic public, quasi- public, and private profit and nonprofit organizations and institutions; specialized groups; and individuals.

State Agencies and Programs

This section is an inventory of state programs that are important to mitigation efforts statewide. Additional information for agencies with programs that may assist in mitigation efforts are listed with applicable programs and funding the program may offer. The following also lists programs utilized by the state of Minnesota to assist with implementation of mitigation actions. A brief description of each program follows, as does funding information.

Minnesota Department of Administration (ADMIN)
Provides services to government agencies: information technology, facilities and property management, graphic and geographic information systems data and software.

Minnesota Department of Agriculture (MDA)
Responsible for the regulation of pesticides, fertilizers, food safety and feed including emergency response, state Superfund authority and financial assistance for agricultural entities.

Minnesota Board of Water and Soil Resources (BWSR)
Assist local governments to manage and conserve water and soil resources.

Program: *Reinvest In Minnesota (RIM)*
Funding: Minnesota's premier conservation easement program on privately owned lands.

Program: *Reinvest In Minnesota -Wetlands Reserve Program, RIM-WRP*
Funding: Administered by the USDA Natural Resources Conservation Service (NRCS). The RIM-WRP partnership is implemented by local Soil and Water Conservation Districts. Conservation easements on frequently flooded lands.

Minnesota Department of Commerce (COMM)
The Market Assurance Division in the Department of Commerce regulates insurance companies & agents, banks, and real estate.

The Office of Energy Security within the Department of Commerce manages energy assistance funds and provides information and assistance to consumers and businesses on home improvements, financial assistance, renewable technologies, and utility regulations.

Program: *Consumer Response Team (CRT)*
The Minnesota Department of Commerce Consumer Response Team (CRT) is comprised of investigators who respond to consumer phone calls specifically about insurance. The CRT attempts to resolve disputes between consumers and the insurance industry informally. In the Twin Cities, metro area calls (651) 296-2488 or statewide toll-free at 800-657-3602.

Program: *Weatherization Assistance Program (WAP)*
Assists income eligible households with emergency repair and replacement services. The Weatherization Assistance Program (WAP) uses energy conservation techniques to reduce the cost of home energy. Correcting health and safety hazards and potentially life-threatening conditions is the first consideration in WAP activities. Households where one or more members have received TANF (Temporary Assistance for Needy Families) or SSI (Supplemental Security Income) within the last 12 months.

Households at or below 200% of Federal Poverty Income Guidelines are income eligible for WAP.
Homeowners and renters may be income eligible for WAP.

Priority is given to households with at least one elderly or disabled member and to customers with the highest heating costs.

Funding: Federally funded through the U.S. Department of Energy and the Department of Health and Human Services.

Program: *Energy Assistance Program (EAP)*
The Energy Assistance Program (EAP) helps pay home heating costs. Households with the lowest incomes and highest energy costs receive the greatest benefit.

Households who are at or below 50 percent of the state median income are eligible
Size of grant is based on household size, income, fuel type, and energy usage
Households with the lowest income and highest fuel costs receive the highest grants
Funds are available for renters or homeowners

Funding: Federally funded through the U.S. Federally funded through U.S. Department of Human Services

Program: *Office of Energy Security (OES)*
The OES works to communicate the preparedness actions of utilities that serve areas affected by disasters. The OES and Public Utilities Commission (PUC) coordinate responses from utilities with regard to restoration activities and typically work through single points of contact at utilities and utility associations.

The OES makes information available through its Energy Information Center on energy conservation measures that homeowners may pursue in the event of an emergency that affects the supply or distribution of energy to an area of the state.

Minnesota Emergency Medical Services Regulatory Board (EMSRB)
Provides leadership for emergency medical care for the people of Minnesota.

Minnesota Department of Employment and Economic Development (DEED)
To advance the economic vitality of Minnesota through trade and economic development, including the provision of employer and labor market information.

Program: *Public Facilities Authority (PFA)* The authority administers and oversees the financial management of three revolving loan funds and other programs that help local units of government construct facilities for clean water (including wastewater, stormwater, and drinking water) and other kinds of essential public infrastructure projects.

Funding: Provides municipal financing programs and expertise to help communities build public infrastructure that preserves the environment, protects public health, and promotes economic growth.

Program: *Small Cities Development Program*
The purpose is to provide decent housing, a suitable living environment and expanding economic opportunities, principally for persons of low-and-moderate income to cities and townships with populations under 50,000 and counties with populations under 200,000.

Funding: Provides federal grants from the U.S. Department of Housing and Urban Development (HUD) to local units of government. State program rules subdivide grant funds into three general categories: Housing Grants, Project Facility Grants, and Comprehensive Grants. Public Facility Grants could include projects involving storm sewer projects and flood control projects.

Program: *Greater Minnesota Business Development Public Infrastructure Grant Program*
The purpose is to stimulate new economic development, create or retain jobs in Greater Minnesota, through public infrastructure investments.

Funding: Provides grants to cities of up to 50% of the capital costs of the public infrastructure necessary, which expand or retain jobs in the area, increase the tax base, or which expand or create new economic development. Eligible projects include, but not limited to wastewater collection and treatment, drinking water, storm sewers, utility extensions, and streets.

Program: *Minnesota Redevelopment Grant Program*
The purpose is to provide grants to assist development authorities with costs related to redeveloping blighted industrial, residential or commercial properties.

Funding: Grants pay up to 50% of eligible redevelopment costs for a qualifying site, with a 50% local match. Grants can pay for land acquisition, demolition, infrastructure improvements, stabilizing unstable soils, ponding, environmental infrastructure, building construction, design and engineering and adaptive reuse of buildings.

Minnesota Management & Budget (MMB)
Expedite fiscal management during a state disaster. Assist with funding issues when federal assistance is not provided.

Minnesota Department of Health (MDH)
Detailed information on services and current events affecting the citizens of Minnesota.

Minnesota's State Historic Preservation Office (SHPO)
Review and Compliance: The SHPO consults with federal and state government agencies to identify historic properties in government project areas and advise on ways to avoid or reduce adverse effects on those properties.

Minnesota Housing Finance Agency (MHFA)
Provides low- and moderate-income housing and resources.

Minnesota Department of Human Services (DHS)
Provides health care, economic assistance, and other services for those in need.

Minnesota Department of Labor & Industry (DLI)
Assist with investigations when workers are injured, and detect air contaminants caused by chemical or geological agents, and assessing hazards. Statewide building codes and construction planning and inspection.

Metropolitan Council
Provides information on economic development and planning for anticipated growth in the seven-county metro areas –Anoka, Carver, Dakota, Ramsey, Scott, and Washington Counties.

Program: *Livable Communities Grant Program*
The Council awards grants to participating communities in the seven-county area to help them, among other things, create development or redevelopment that demonstrates the efficient and cost-effective use of land and infrastructure, a range of housing types and costs, commercial and community uses, walkable neighborhoods and easy access to transit and open space.
Funding: Four different accounts to enable communities through the region to carry out their development plans, and leverage millions of dollars in private and public investment while providing jobs and business growth.

Minnesota Department of Military Affairs - National Guard (DMA)
Information on the capabilities of the Minnesota National Guard.

Minnesota Department of Natural Resources (MN DNR)
The Financial Assistance Directory provides summary level information on all of the Department of Natural Resources' financial assistance programs. The department offers a wide variety of financial assistance programs to cities, counties, townships, non-profits, schools, private individuals and others. See MN DNR website. Categories include:

- Aquatic Invasive Species

- Enforcement (snowmobile & OHV safety)
- Fire Protection Programs
- Forest management
- Gifts and donations
- Habitat improvement
- Land conservation
- Recreation (general, trails, and water)
- Road Improvements
- Water

MN DNR Division of Ecological and Water Resources
The conservation of natural systems and the maintenance of biodiversity. Water education information is available on and discusses floodplain management, flood mitigation, drought/water supply, dam safety, flood warning, climatology, and lake and stream gaging.

Program: *Flood Hazard Mitigation Grant Assistance: Flood Damage Reduction (FDR) Program*
To provide technical and financial assistance to local governmental units for conducting flood damage reduction studies and for planning and implementing flood damage reduction measures.
Funding: A maximum of 50% of total eligible project costs up to $150,000 with grants more than $150,000 requiring approval by the Legislature.

Program: *Dam Safety Grants*
To improve the safety and condition of publicly owned dams and water level control structures.
Funding: Reimbursement of costs, up to 50% for repairs, up to 100% for removals. Grants ranged from $25,000 to $1,000,000

Program: *Wetland Tax Exemption Program*
To provide a financial incentive to maintain wetlands in their natural state and to promote an awareness of wetland values.
Funding: Qualifying areas are exempt from property taxes that remain in effect as long as wetland meets the requirements set forth in the statutes.

Program: *FireWise in Minnesota*
The Minnesota FireWise Project is working with local communities by passing federal Fire Plan funds through to local communities as grants for various "on-the-ground" activities including homeowner, mitigation education, home site assessment, access improvement, and dry hydrants. It involves community groups including fire and emergency services, local schools, city staff (i.e. foresters, planners), and local interest groups.

Funding: Grant request for 50:50 cost-share funding for assessment & planning, education & mitigation activities. Initial grant request may be for a small amount ($15,000) until FireWise Action Plan is developed. Second grants are available to implement additional actions.

Program: *Forest Stewardship Program*
To provide technical advice and long-range forest management planning to interested landowners. All aspects of the program are voluntary. Plans are designed to meet landowner goals while maintaining the sustainability of the land. The entire property except active farming.
Funding: For the state's cost share program to help defer the costs of implementation of forest management activities. Must enroll forested lands into the Sustainable Forestry Incentive Act or 2c Managed Forest Land to be eligible for property tax relief programs

Program: *Minnesota State Climatology Office*
The State Climatology Office workgroups exist to study and describe the climate of Minnesota. Each of its members concentrates its efforts on specific topical areas in which climate plays a significant role.

Minnesota Pollution Control Agency (PCA)
Provides pollution control information for Minnesota.

Program: *Stormwater Program*
Minnesota Pollution Control Agency (MPCA) is the delegated permitting authority for Minnesota of the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES). Permits are required for most construction activities designed to limit polluted discharges and implement the best management practices.

Funding: The Clean Water Revolving Fund, also known as the Clean Water State Revolving Fund or simply SRF, is established under the Federal Clean Water Act and state law to make loans to for both point source (wastewater and stormwater) and nonpoint source water pollution control projects. The PFA prepares an annual Intended Use Plan (IUP) based on a Project Priority List developed by the MPCA. The IUP describes the projects and activities eligible for funding during the state fiscal year.

Program: *Interagency Climate Adaptation Team*
A collaboration of state agencies with the purpose of addressing climate change issues in the state.
Other MPCA work related to mitigation:
Preparing for homes and businesses for floods
Preparing wastewater treatment plants for floods
Preparing feedlots for floods
Minnesota Department of Public Safety (DPS)
State Fire Marshal, Office of Communications, Office of Pipeline Safety Team, State Patrol, Office of Justice Programs, Bureau of Criminal Apprehension, Alcohol and Gambling, Enforcement and Office of Traffic Safety.

MN DPS Homeland Security and Emergency Management (HSEM)
This site contains information on Emergency Management.

Program: *Minnesota Recovers Task Force: Minnesota's Official Disaster Information Center*

Minnesota Recovers is the state's clearinghouse for all information about floods, tornadoes and other natural disasters that strike Minnesota communities. Information about federal, state and local government disaster assistance efforts is available on this website.

Funding: Application for community financial assistance is available. Depending upon disaster, different types of funding become available. Flood-Control Grants, Small Cities Development Program, and Public Facilities Authority funding information is available here.

Minnesota Office of the State Archaeologist
Conduct research into the prehistoric and historic archaeology of Minnesota.

Minnesota State Colleges and Universities (MNSCU)
Provide information about Higher education in Minnesota.

Minnesota Department of Transportation (DOT)
Comprehensive transportation issues in Minnesota.

University of Minnesota
University of Minnesota's mission of education, research, and public engagement; our academic scope; and our statewide presence are marks of distinction and position us well to address the critical problems of this new century.

Other Organizations
The following is a list of associations and organizations that may fund, educate or in some way assist mitigation in the state. The list is a resource for local mitigation planners and has been utilized by the state in the update of this plan.

American Red Cross
Provide relief to victims of disasters and help people prevent, prepare for, and respond to emergencies.

American Water Works Association
Information on safe water resources.

League of Minnesota Cities
A membership organization dedicated to promoting excellence in local government. The League serves its more than 800 member cities through advocacy, education and training, policy development, risk management, and other services.

Association of Minnesota Counties
A broad range of services to its members, including education, communications, and intergovernmental relations. AMC works closely with the legislative and administrative branches of government in seeing that legislation and policies favorable to counties are enacted.

Association of State Dam Safety Officials
General Information about dams and dam safety in the US.

Mid-America Earthquake Center (MAE)

One of three national earthquake engineering research centers established by the National Science Foundation.

Minnesota Geological Survey (MGS)
The University outreach center for the science and technology of earth resources in Minnesota.

Minnesota Association of Watershed Districts (MAWD)
Provides educational opportunities, information and training for watershed district managers and staff through yearly tours, meetings and quarterly newsletters.

Minnesota Association of Soil and Water Conservation Districts (MASWCD)
Provide voluntary, incentive-driven approaches to landowners for better soil and cleaner water. Provide private landowners with technical assistance to implement a wide variety of conservation practices.

Minnesota Independent Insurance Agents
See calendar for NFIP training.

National Association of Counties (NACO)
NACO is the only nation-wide organization representing county governments.

Minnesota Natural Resource Conservation Service
Locally based NRCS staff work directly with farmers, ranchers, and others, to provide technical and financial conservation assistance.

National Drought Mitigation Center
Information on drought preparation and risk management.

National Emergency Management Association (NEMA)
NEMA is the professional association of state, pacific, and Caribbean insular state emergency management directors.

Natural Hazard Mitigation Association
NHMA is an association for those in the hazard mitigation profession by offering a workshop and bringing expertise and experience to organizations, communities or regions with mitigation planning, training, outreach and implementation.

Association of Minnesota Emergency Managers (AMEM)
AMEM is the professional association of Emergency Managers in Minnesota.

National Energy Foundation
This is the site for kids, parents, and teachers, with a focus on water conservation in the home.

National Fire Protection Association (NFPA)
Provides scientifically based fire codes and standards, research, training, and education.

National Lightning Safety Institute
Independent, non-profit consulting, education and research organization focusing on lightning safety.

Natural Hazards Center at the University of Colorado
Clearinghouse for natural hazards information. Publishes the Natural Hazards Observer.

WeatherREADY
The goal of Weather Ready is to raise national awareness of the need to prepare for severe weather. Sponsored by the Weather Channel

Societal Aspects of Weather-Injury and Damage Statistics
Contains societal impact data for weather-related disasters.

The Disaster Center
Provides news and information on current disasters, and the emergency management field.

The Disaster Research Center (University of Delaware)
Research center for the preparation and mitigation of natural and technological disaster for groups, organizations and communities.

The Tornado Project
Offers tornado books, posters, and videos.

United Nations International Strategy for Disaster Reduction
Increase public awareness of hazard and risk issues for the reduction of disasters in modern societies, motivate public administration policies and measures to reduce risks, and improve access to science and technology for risk reduction in local communities.

University of Wisconsin Disaster Management Center
The center's goal is to help improve the emergency management performance of non-governmental organizations, local and national governments, and international organizations, through a comprehensive professional development program in disaster management.

Appendix B: Historical Hazard Event Data

B.1 Drought Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	07/18/2006	07:00	CST	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	08/01/2006	00:00	CST	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	09/01/2006	00:00	CST	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/01/2006	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/01/2006	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/01/2006	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/01/2007	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/01/2007	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/01/2007	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/01/2007	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	07/17/2012	05:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	08/01/2012	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	09/01/2012	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/01/2012	00:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/28/2015	06:00	CST-6	Drought		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	05/01/2015	00:00	CST-6	Drought		0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

B.2 Structural Fire Data for Pennington County

Year	Fire Runs	Other Runs	Total Loss	Fire Rate	Average Loss per Fire	Fire Deaths
2013	86	157	$794,050	167	$9,803	1
2012	103	166	$216,900	149	$2,384	1
2011	71	151	$1,547,900	208	$23,814	0
2010	68	151	$236,000	205	$3,576	0
2009	40	152	$495,700	356	$10,676	0
2008	63	158	$273,350	226	$4,556	0
2007	64	166	$651,300	218	$10,505	0

Fire Department	County	Fires	Non-Fires	Dollar Loss
Goodridge	Pennington	19	0	$8,000
St. Hilaire	Pennington	14	12	$108,500
Thief River Falls	Pennington	53	146	$677,550

B.3 Flood Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	50.00K	50.00K
GOODRIDGE	PENNINGTON CO.	MN	06/20/2000	01:00	CST	Flash Flood		0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	07/07/2000	12:00	CST	Flash Flood		0	0	5.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/31/2001	18:15	CST	Flash Flood		0	0	10.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	06/09/2002	12:00	CST	Flash Flood		0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	06/09/2002	15:00	CST	Flash Flood		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	06/12/2002	00:00	CST	Flood		0	0	0.00K	0.00K
COUNTYWIDE	PENNINGTON CO.	MN	03/30/2006	00:00	CST	Flood		0	0	0.00K	0.00K
COUNTYWIDE	PENNINGTON CO.	MN	04/01/2006	00:00	CST	Flood		0	0	0.00K	0.00K
DAKOTA JCT	PENNINGTON CO.	MN	03/22/2009	11:15	CST-6	Flood		0	0	5.00K	0.00K
DAKOTA JCT	PENNINGTON CO.	MN	04/10/2009	10:08	CST-6	Flood		0	0	5.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	05/24/2010	19:30	CST-6	Flash Flood		0	0	5.00K	25.00K
HIGH LNDG	PENNINGTON CO.	MN	05/25/2010	06:00	CST-6	Flash Flood		0	0	10.00K	25.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/21/2014	22:00	CST-6	Flash Flood		0	0	10.00K	0.00K
Totals:								0	0	50.00K	50.00K

B.4 Hail Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/31/1975	16:12	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/31/1975	16:50	CST	Hail	1.00 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	05/18/1977	15:46	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/21/1981	05:00	CST	Hail	1.00 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/21/1982	17:21	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/08/1984	15:22	CST	Hail	1.25 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	05/08/1985	17:45	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/03/1989	17:31	CST	Hail	1.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	06/12/1991	21:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/20/1992	16:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K
GULLY	PENNINGTON CO.	MN	06/27/1997	21:45	CST	Hail	0.75 in.	0	0	0.00K	0.00K

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
HIGH LNDG	PENNINGTON CO.	MN	06/04/1999	15:47	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	06/09/2000	01:30	CST	Hail	0.75 in.	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	07/07/2000	11:10	CST	Hail	1.00 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	07/07/2000	11:30	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/05/2000	19:25	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	05/15/2001	15:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	05/15/2001	15:05	CST	Hail	2.00 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	05/15/2001	15:35	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/18/2001	22:15	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/31/2001	11:23	CST	Hail	0.75 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	07/31/2001	11:45	CST	Hail	0.75 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	07/31/2001	19:25	CST	Hail	0.75 in.	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	07/31/2001	20:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/14/2001	16:48	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/17/2001	13:55	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/26/2001	16:50	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	09/06/2001	14:30	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	04/23/2002	19:30	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	04/23/2002	19:50	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	08/26/2002	15:10	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	08/26/2002	15:15	CST	Hail	0.88 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	08/26/2002	15:40	CST	Hail	0.75 in.	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	05/11/2004	17:15	CST	Hail	0.88 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/11/2004	17:20	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/11/2004	19:20	CST	Hail	0.88 in.	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	05/11/2004	19:30	CST	Hail	0.88 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	05/19/2004	21:05	CST	Hail	0.88 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	08/08/2004	16:05	CST	Hail	0.88 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	05/08/2005	18:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	05/08/2005	18:50	CST	Hail	0.75 in.	0	0	0.00K	0.00K
HIGH LNDG	PENNINGTON CO.	MN	05/08/2005	20:30	CST	Hail	0.75 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/08/2005	20:45	CST	Hail	0.75 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	05/08/2005	20:55	CST	Hail	0.75 in.	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	06/23/2005	17:25	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/03/2005	03:00	CST	Hail	0.75 in.	0	0	0.00K	0.00K

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/19/2005	21:40	CST	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/27/2006	17:29	CST	Hail	0.88 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	05/18/2007	16:50	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	05/21/2007	18:56	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	06/06/2007	21:35	CST-6	Hail	0.88 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	06/09/2007	15:50	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	06/09/2007	16:15	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	09/20/2007	09:52	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	09/20/2007	10:14	CST-6	Hail	0.88 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	05/31/2008	13:30	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	07/23/2009	20:41	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	08/14/2009	10:00	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	08/14/2009	10:40	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/22/2010	22:25	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	05/24/2010	18:25	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	06/24/2010	14:33	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
ST HILAIRE	PENNINGTON CO.	MN	06/24/2010	14:39	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	08/17/2010	17:50	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/28/2011	19:00	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
DAKOTA JCT	PENNINGTON CO.	MN	07/24/2013	15:00	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/18/2013	20:38	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

B.5 Infectious Disease Data for Northwestern Region

Communicable Disease	Number of Occurrences
Anaplasmosis	95
Campylobacterosis	18
Cryptosporidiosis	5
West Nile	9
Escherichai Coli	3
Giardiasis	3
Haemophilus Influenzae invasive disease	7
HIV (non-AIDS)	1
AIDS	2
Lyme disease	54
Meningococcal Disease	0

Communicable Disease	Number of Occurrences
Pertussis	4
Salmonellosis	12
Chlamydia Trachomatis (STD)	424
Gonorrhea (STD)	56
Streptococcus Pneumoniae invasive disease	14
Streptococcal invasive disease - Group A	6
Streptococcal invasive disease - Group B	12
Tuberculosis	2
Viral Hepatitis, Type A	0
Viral Hepatitis, Type B	0
Viral Hepatitis, Type C	3

B.6 Summer Storm Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	76.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	06/02/1973	16:45	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	07/13/1973	14:30	CST	Thunderstorm Wind	61 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	06/19/1975	09:00	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	07/04/1975	21:20	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/31/1975	16:12	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	05/18/1977	15:46	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	05/28/1980	21:03	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	07/04/1982	22:45	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	05/07/1988	16:40	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
Thief River Falls	PENNINGTON CO.	MN	07/22/1994	21:50	CST	Thunderstorm Wind	0 kts.	0	0	50.00K	0.00K
High Landing	PENNINGTON CO.	MN	08/22/1995	19:30	CST	Thunderstorm Wind	0 kts.	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/25/1999	11:45	CST	Thunderstorm Wind		0	0	1.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/18/2001	22:25	CST	Thunderstorm Wind		0	0	2.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/31/2001	11:20	CST	Thunderstorm Wind	63 kts. M	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	07/31/2001	11:35	CST	Thunderstorm Wind		0	0	0.50K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/31/2001	12:35	CST	Thunderstorm Wind		0	0	0.50K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/08/2001	20:00	CST	Thunderstorm Wind		0	0	2.00K	0.00K
THIEF RIVER FALLS AR	PENNINGTON CO.	MN	08/08/2001	20:15	CST	Thunderstorm Wind	57 kts. M	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/31/2002	23:45	CST	Thunderstorm Wind		0	0	20.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/31/2002	23:55	CST	Thunderstorm Wind	61 kts. E	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	06/21/2003	21:30	CST	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	05/11/2004	18:50	CST	Thunderstorm Wind	61 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/11/2004	20:40	CST	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS AR	PENNINGTON CO.	MN	05/11/2004	23:15	CST	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
GOODRIDGE	PENNINGTON CO.	MN	05/12/2004	00:00	CST	Thunderstorm Wind	61 kts. EG	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	06/23/2005	17:15	CST	Thunderstorm Wind	61 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	06/27/2005	01:05	CST	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	06/17/2007	23:50	CST-6	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	06/18/2007	00:00	CST-6	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	06/18/2007	00:00	CST-6	Thunderstorm Wind	74 kts. EG	0	0	0.00K	0.00K
DAKOTA JCT	PENNINGTON CO.	MN	08/10/2007	16:00	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	08/26/2007	22:00	CST-6	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	08/26/2007	22:00	CST-6	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	05/30/2011	21:38	CST-6	Thunderstorm Wind	55 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/12/2013	17:00	CST-6	Thunderstorm Wind	70 kts. EG	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	07/12/2013	17:05	CST-6	Thunderstorm Wind	87 kts. EG	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	07/12/2013	17:10	CST-6	Thunderstorm Wind	105 kts. EG	0	0	0.00K	0.00K
HAZEL	PENNINGTON CO.	MN	07/12/2013	17:15	CST-6	Thunderstorm Wind	100 kts. EG	0	0	0.00K	0.00K
MAVIE	PENNINGTON CO.	MN	07/12/2013	17:20	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/21/2014	20:35	CST-6	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
(TVF)THIEF RVR FALLS	PENNINGTON CO.	MN	07/21/2014	20:35	CST-6	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
ERIE	PENNINGTON CO.	MN	07/21/2014	20:55	CST-6	Thunderstorm Wind	60 kts. EG	0	0	0.00K	0.00K
Totals:								0	0	76.00K	0.00K

B.7 Tornado Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	2.550M	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/15/1968	17:22	CST	Tornado	F1	0	0	25.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/15/1968	17:30	CST	Tornado	F1	0	0	0.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	07/17/1978	23:00	CST	Tornado	F0	0	0	25.00K	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	07/11/1980	17:25	CST	Tornado	F2	0	0	2.500M	0.00K
PENNINGTON CO.	PENNINGTON CO.	MN	08/25/1983	22:00	CST	Tornado	F2	0	0	0.25K	0.00K
THIEF RIVER FALLS	PENNINGTON CO.	MN	07/18/1998	16:18	CST	Tornado	F0	0	0	0.00K	0.00K
GOODRIDGE	PENNINGTON CO.	MN	06/17/2010	16:10	CST-6	Tornado	EF1	0	0	0.00K	0.00K
Totals:								0	0	2.550M	0.00K

B.8 Winter Storm Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/17/1996	15:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/10/1996	10:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/27/1996	10:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/23/1996	19:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/16/1996	16:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/17/1996	01:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/09/1997	14:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/15/1997	09:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/21/1997	22:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/03/1997	02:00	CST	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/13/1998	09:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/10/1998	06:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/18/1998	06:00	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/13/1999	11:00	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/17/1999	09:00	CST	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/12/1999	03:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/17/1999	08:00	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/16/2000	09:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/20/2000	08:30	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/24/2001	10:00	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/05/2001	09:00	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/08/2002	15:35	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/11/2003	09:55	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/15/2003	11:05	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/02/2004	10:25	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/24/2004	15:25	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/11/2004	21:20	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/29/2004	15:30	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/31/2004	15:35	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/01/2005	00:00	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/21/2005	14:56	CST	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/27/2005	12:29	CST	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/24/2007	09:30	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/28/2007	04:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/01/2007	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/15/2007	11:41	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/01/2007	08:55	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/04/2007	10:30	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/17/2008	21:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/29/2008	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/09/2008	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/19/2008	10:13	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/25/2008	20:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/13/2008	04:03	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/15/2008	04:01	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/19/2008	14:20	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/02/2009	15:43	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/04/2009	06:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/09/2009	14:56	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/24/2009	18:16	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/23/2009	04:10	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/22/2010	11:54	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/25/2010	04:19	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/29/2010	12:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/30/2010	14:30	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/31/2010	04:20	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/01/2011	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/21/2011	00:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/01/2011	21:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/08/2011	03:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/11/2011	22:00	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/18/2012	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/10/2012	02:45	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/11/2012	00:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/26/2012	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/04/2012	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/11/2013	18:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/20/2013	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/10/2013	06:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/17/2013	15:39	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/03/2013	21:00	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/17/2013	16:00	CST-6	Winter Storm		0	0	0.00K	0.00K

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/14/2013	12:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/03/2013	04:54	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/06/2013	15:29	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	12/28/2013	21:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/04/2014	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/16/2014	00:00	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/22/2014	04:13	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/22/2014	15:38	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/26/2014	06:00	CST-6	Blizzard		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/26/2014	22:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/26/2014	21:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/28/2014	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/01/2014	00:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/21/2014	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	03/31/2014	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/01/2014	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/02/2015	18:00	CST-6	Heavy Snow		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/03/2015	14:49	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	01/06/2015	18:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/21/2015	21:00	CST-6	Extreme Cold/wind Chill		0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

B.9 Windstorm Data for Pennington County from NCDC for 1/1/1964-5/31/2015

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/01/1999	03:00	CST	High Wind	60 kts.	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	02/11/2002	12:00	CST	High Wind	56 kts. M	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	04/06/2002	08:45	CST	High Wind	51 kts. M	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/29/2002	04:15	CST	High Wind	50 kts. M	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	11/08/2005	23:21	CST	High Wind	40 kts. MS	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/07/2011	16:00	CST-6	High Wind	35 kts. MS	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	07/21/2014	23:00	CST-6	High Wind	40 kts. ES	0	0	0.00K	0.00K
PENNINGTON (ZONE)	PENNINGTON (ZONE)	MN	10/12/2015	11:30	CST-6	High Wind	35 kts. MS	0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

Saved for Appendix C