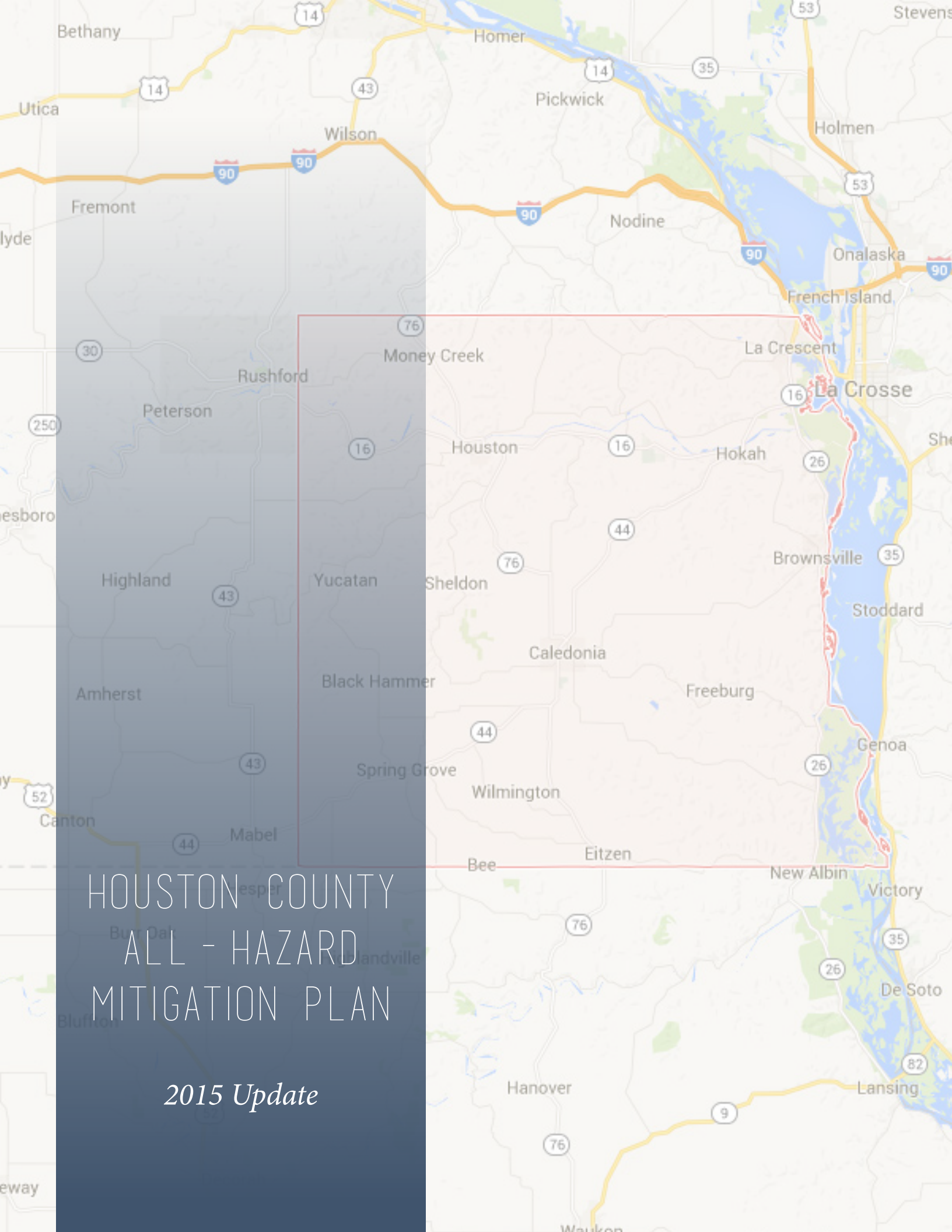

HOUSTON COUNTY ALL - HAZARD MITIGATION PLAN

2015 Update

Houston County
All-Hazard Mitigation Plan
2015 Update

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Homeland Security and Emergency Management

Minnesota Division of Homeland Security and Emergency Management

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GLOSSARY OF ACRONYMS

BFE	Base Flood Elevation
CDC	Centers for Disease Control
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CPRI	Calculated Priority Risk Index
DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
DOT	Department of Transportation
EAP	Emergency Action Plan
EMV	Estimated Market Value
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance Program
FY	Fiscal Year
GIS	Geographic Information System
H1N1	Swine Flu
H5N1	Bird Flu
HAZMAT	Hazardous Materials
HAZUS-MH	Hazards-United States-Multi Hazard
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
HMA	Hazard Mitigation Assistance Program
HMGP	Hazard Mitigation Grant Program
HSEM	Division of Homeland Security and Emergency Management
MDH	Minnesota Department of Health
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
NCDC	National Climactic Data Center
NFIA	National Flood Insurance Act of 1968
NFIF	National Flood Insurance Fund
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
NRC	National Response Center
NRHP	National Register of Historic Places
PDM	Pre-Disaster Mitigation Program
PPE	Personal Protective Equipment
RFC	Repetitive Flood Claims Program
RNDC	Region Nine Development Commission
SARS	Severe Acute Respiratory Syndrome
SRL	Severe Repetitive Loss Program
USCG	Coast Guard
VIC	Voluntary Investigation and Cleanup

SECTION 1: INTRODUCTION

1.1 HAZARD MITIGATION

Hazard mitigation is defined as any sustained action to reduce or eliminate long-term risk to human life and property from natural hazards and their effects[1]. Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The U.S. Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA) has made reducing hazards one of its main goals. The primary mechanism for achieving this goal is hazard mitigation planning and the subsequent implementation of resulting projects, measures, and policies to mitigate hazards.

1.2 MULTI-JURISDICTIONAL HAZARD MITIGATION PLANNING

The Houston County All-Hazard Mitigation Plan is a multi-jurisdictional hazard mitigation plan. A multi-jurisdictional plan is jointly prepared by more than one jurisdiction, or local government entity (county, city, township, etc.)[2]. Jurisdictions can benefit in several ways from a multi-jurisdictional planning process, such as:

- enabling a comprehensive approach to the mitigation of hazards that affect multiple jurisdictions;
- allowing for economies of scale by leveraging individual capabilities and sharing costs and resources;
- avoiding duplication of efforts; and
- imposing an external discipline on the process.

A full list of the participating jurisdictions is provided in Figure 1-1.

Figure 1-1: Participating Jurisdictions

Jurisdiction Name	
Houston County	City of Hokah
City of Brownsville	City of Houston
City of Caledonia	City of La Crescent
City of Eitzen	City of Spring Grove

1.3 LEGAL AUTHORITY & JUSTIFICATION

1.3.1 DISASTER MITIGATION ACT OF 2000

The Disaster Mitigation Act of 2000 (DMA 2000), also known as Public Law 106-390, provides the legal basis for FEMA mitigation planning requirements for state, local and tribal governments as a condition of mitigation grant assistance[3]. The DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (which had amended the Disaster Relief Act of 1974) by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for state, local, and tribal entities to closely coordinate mitigation planning and implementation efforts. Under the DMA 2000, local plans are required to

- describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan; and
- establish a strategy to implement those actions.

1.3.2 44 CFR §201.6

The Code of Federal Regulations Title 44 Chapter 201 Section 6 addresses *Local Mitigation Plans*[4]. This section requires that local governments seeking funding from four out of the five mitigation assistance programs must have a FEMA authorized local hazard mitigation plan. The only program that does not require a local mitigation plan is the Repetitive Flood Claims program (see 1.4.1.D).

1.3.2.A PLAN UPDATE REQUIREMENT

44 CFR §201.6 also requires that local jurisdictions must review and revise their plans to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to maintain eligibility for mitigation project grant funding.

1.3.3 GOVERNOR'S EXECUTIVE ORDER 11-03

The Minnesota Governor's Executive Order 11-03 clarified the roles and responsibilities of state agencies in emergencies[5]. The Department of Homeland Security and Emergency Management (HSEM) was assigned overall responsibility for coordinating the development and maintenance of the All-Hazard Minnesota Emergency Operations Plan.

1.3.4 MINNESOTA STATE STATUTES, CHAPTER 12.09

Chapter 12, Section 9, Subdivision 7 of the 2011 Minnesota State Statutes dictates that the Division of Emergency Management shall develop and maintain a comprehensive hazard mitigation plan for this state, with the plan integrated into and coordinated with the hazard mitigation plans of the federal government to the fullest possible extent[6]. The division shall coordinate the preparation of hazard mitigation plans by the political subdivisions, with the plans integrated into and coordinated with the hazard mitigation plan of the state to the fullest possible extent.

1.3.5 MINNESOTA STATE STATUTES, CHAPTER 394.21

Chapter 394, Section 21, Subdivision 1 of the 2011 Minnesota State Statutes dictates that any county in the state having less than 300,000 in population according to the 1950 Federal Census is authorized to carry on county planning and zoning activities for the purpose of promoting the health, safety, morals, and general welfare of the community[7].

1.4 FEDERAL HAZARD MITIGATION ASSISTANCE

FEMA's Hazard Mitigation Assistance (HMA) programs present an opportunity to reduce or eliminate the risk to human life and property from natural hazards, while simultaneously reducing reliance on federal disaster funds through hazard mitigation planning and project grant funding[8]. Under the DMA 2000, (see 1.3.1) local jurisdictions are required to take part in the preparation and adoption of a hazard mitigation plan as a condition for receiving the non-emergency disaster assistance offered through HMA programs. Only one of the five HMA programs does not include this requirement, the Repetitive Floods Claim Program.

At the federal level, FEMA administers the HMA programs, for which states (the applicant) apply for funding on behalf of local jurisdictions (the sub-applicant). At the state level, in Minnesota, all HMA programs are administered by the Department of Public Safety's Division of HSEM. HSEM State Hazard Mitigation Officers oversee all aspects of the programs, including: applications for funding, management of grant awards, and state approval of local mitigation plans. The Department of Natural Resources (DNR), as the agency responsible for implementation of the National Flood Insurance Program (NFIP), is also involved in mitigation efforts.

There are five HMA programs: the Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Flood Mitigation Assistance, Repetitive Flood Claims, and Severe Repetitive Loss. A summary of the various HMA programs is provided in section 1.4.1. Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent. Projects funded through an HMA

program must demonstrate a positive cost-benefit ratio (i.e. the future benefits are equal to, or greater than, the cost of the project).

1.4.1 HAZARD MITIGATION ASSISTANCE PROGRAMS

1.4.1.A HAZARD MITIGATION GRANT PROGRAM

The Hazard Mitigation Grant Program (HMGP) is designed to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the immediate reconstruction and recovery process following a disaster. HMGP is available, when authorized under a presidential major disaster declaration, in the areas of the state requested by the governor. The amount of HMGP funding available to the applicant is based upon the estimated total federal assistance to be provided by FEMA for disaster recovery under the disaster declaration. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, (as amended the Stafford Act), Title 42 United States Code (U.S.C.) 5170c.

1.4.1.B PRE-DISASTER MITIGATION PROGRAM

The Pre-Disaster Mitigation (PDM) program is designed to assist states and local jurisdictions to implement a sustained pre-disaster natural hazard mitigation program to reduce the overall risk to human life and structures from future hazard events, while also reducing reliance on federal funding from future disasters. The PDM program is authorized under Section 203 of the Stafford Act, 42 U.S.C. 5133.

1.4.1.C FLOOD MITIGATION ASSISTANCE PROGRAM

The Flood Mitigation Assistance (FMA) program is designed to reduce or eliminate the long-term risk of flood damage to properties insured under the NFIP. The FMA program is authorized under Section 1366 of the National Flood Insurance Act of 1968, as amended NFIA, 42 U.S.C. 4104c.

1.4.1.D REPETITIVE FLOOD CLAIMS PROGRAM

The Repetitive Flood Claims (RFC) program is designed to reduce flood damage to individual properties for which one or more claim payments for losses have been made under flood insurance coverage and that will result in the greatest savings to the National Flood Insurance Fund (NFIF) in the shortest period of time. The RFC program is authorized under Section 1323 of the NFIA, 42 U.S.C. 4030.

1.4.1.E SEVERE REPETITIVE LOSS PROGRAM

The Severe Repetitive Loss (SRL) pilot program is designed to reduce flood damages to residential properties that have experienced severe repetitive losses under flood insurance coverage and that will result in the greatest savings to the NFIF in the shortest period of time. The SRL is authorized under Section 1361A of the NFIA, 42 U.S.C. 4102a.

1.4.2 PROGRAM FUNDING SOURCES

The NFIF provides funding for FMA, RFC, and SRL programs. The PDM, FMA, RFC, and SRL programs are subject to the availability of appropriation funding, as well as any program specific directive or restriction made with respect to such funds.

1.4.3 COST SHARING

Under the HMA programs, the total cost to implement approved mitigation activities is generally funded by a combination of federal and non-federal sources[8]. Both the federal and the non-federal shares must be eligible costs used in direct support of approved activities under grant award. Contributions of cash, third party in-kind services or materials, or any combination thereof, may be accepted as part of the non-federal cost share. For FMA, no more than half of the non-federal contribution may be from third party in-kind contributions. In general, HMA funds may be used to pay up to 75 percent of the eligible activity costs; the remaining 25 percent of eligible activity costs are derived from non-federal resources. Exceptions to the

75/25 cost share are shown in Figure 1-2.

Figure 1-2: HMA Program Cost Share Ratios

Programs	Mitigation Activity (Percent of Federal/Non-Federal Share)
HMGP	75/25
PDM	75/25
PDM - Sub Grantee is small impoverished community	90/10
PDM - Tribal Grantee is small impoverished community	90/10
FMA	75/25
FMA - severe repetitive loss of property with Repetitive Loss Strategy	90/10

1.5 ELIGIBLE HAZARD MITIGATION ASSISTANCE PROJECTS

Projects eligible for HMA are described in the FY2011 Hazard Mitigation Assistance Unified Guidance[8]. This document consolidates the common requirements for all HMA programs and explains the unique elements of the programs in individual sections. Additionally, it provides assistance for federal, state, tribal, and local officials on how to apply for HMA funding for a proposed mitigation activity. Figure 1-3 is a summary of the eligible projects identified within the FY 2011 HMA Unified Guidance.

Figure 1-3: Hazard Mitigation Actions by Program

Eligible Activities	HMGP	PDM	FMA
Mitigation Projects	x	x	x
Property Acquisition and Structure Demolition	x	x	x
Property Acquisition and Structure Relocation	x	x	x
Structure Elevation	x	x	x
Mitigation Reconstruction			
Dry Flood proofing of Historic Residential Structures	x	x	x
Dry Flood proofing of Non-residential Structures	x	x	x
Minor Localized Flood Reduction Projects	x	x	x
Structural Retrofitting of Existing Buildings	x	x	
Non-structural Retrofitting of Existing Buildings and Facilities	x	x	
Safe Room Construction	x	x	
Infrastructure Retrofit	x	x	
Soil Stabilization	x	x	
Wildfire Mitigation	x	x	
Post-Disaster Code Enforcement	x		
5% Initiative Projects	x		
Hazard Mitigation Planning	x	x	x
Management Costs	x	x	x

1.5.1 FLOOD MITIGATION PROJECTS

1.5.1.A PROPERTY ACQUISITION & STRUCTURE DEMOLITION

Property acquisition and structure demolition projects involve the voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space through the demolition of the structure. The property must be deed-restricted indefinitely to open space uses to restore and/or conserve the natural floodplain functions.

1.5.1.B PROPERTY ACQUISITION & STRUCTURE RELOCATION

Property acquisition and structure relocation projects involve the voluntary physical relocation of an existing structure to an area outside of a hazard-prone area and, typically, the acquisition of the underlying land. Relocation must conform to all applicable state and local regulations. The property must be deed-restricted indefinitely to open space uses to restore and/or conserve the natural floodplain functions.

1.5.1.C STRUCTURE ELEVATION

Structure elevation projects involve physically raising an existing structure to the Base Flood Elevation (BFE) or higher if required by FEMA or local ordinance. Structure elevation may be achieved through a variety of methods, including elevating on continuous foundation walls; elevating on open foundations, such as piles, piers, posts, or columns; and elevating on fill. Foundations must be designed to properly address all loads and be appropriately connected to the floor structure above. Utilities must be properly elevated as well.

1.5.1.D MITIGATION RECONSTRUCTION

Mitigation reconstruction projects involve the construction of an improved, elevated building on the same site where an existing building and/or foundation has been partially or completely demolished or destroyed. Mitigation reconstruction is only permitted for structures outside of the regulatory floodway or coastal high hazard area as identified by the existing best available flood hazard data. Activities that result in the construction of new living space at or above the BFE will only be considered when consistent with the mitigation reconstruction requirements. Such activities are only eligible under SRL.

1.5.1.E DRY FLOOD PROOFING

Dry flood proofing projects involve the application of techniques designed to keep structures dry by sealing the structure to keep floodwaters out.

1.5.1.F MINOR LOCALIZED FLOOD REDUCTION PROJECTS

Minor localized flood reduction projects aim to lessen the frequency or severity of flooding and decrease predicted flood damages, such as the installation or modification of culverts and storm water management activities (e.g. creating retention and detention basins). These projects must not duplicate the flood prevention activities of other federal agencies and may not constitute a section of a larger flood control system.

1.5.2 FLOOD, EARTHQUAKE, & TORNADO MITIGATION PROJECTS

1.5.2.A STRUCTURAL RETROFITTING OF EXISTING BUILDINGS

Structural retrofitting of existing buildings projects involves modifications made to the structural elements of a building to reduce or eliminate the risk of future damage and to protect inhabitants. The structural elements of a building that are essential to protect in order to prevent damage include: foundations, load-bearing walls, beams, columns, building envelope, structural floors and roofs, and the connections between these elements.

1.5.2.B NON-STRUCTURAL RETROFITTING OF EXISTING BUILDINGS & FACILITIES

Non-structural retrofitting of existing buildings and facilities projects involves modifications made to the non-structural elements of a building or facility to reduce or eliminate the risk of future damage and to protect inhabitants. Non-structural retrofits may include bracing of building contents to prevent earthquake damage or the elevation of heating and ventilation systems.

1.5.2.C SAFE ROOM CONSTRUCTION

Safe room construction projects are designed to provide immediate life-safety protection for people in public and private structures from tornado and severe wind events. For HMA, the term “safe room”

only applies to extreme wind (combined tornado and hurricane) in residential, non-residential, and community safe rooms; tornado community safe rooms; and hurricane community safe rooms. This type of project includes retrofits of existing facilities or new safe room construction projects, and applies to both single and multi-use facilities.

1.5.2.D INFRASTRUCTURE RETROFIT

Infrastructure retrofit projects involve measures to reduce risk to existing utility systems, roads, and bridges.

1.5.2.E SOIL STABILIZATION

Soil stabilization projects aim to reduce risk to structures or infrastructure from erosion and landslides, including: installing geo-textiles and vegetative buffer strips, stabilizing sod, preserving mature vegetation, decreasing slope angles, and stabilizing with rip rap and other means of slope anchoring. These projects must not duplicate the activities of other federal agencies.

1.5.3 WILDFIRE MITIGATION PROJECTS

1.5.3.A DEFENSIBLE SPACE FOR WILDFIRE

Defensible space for wildfire projects involves the creation of perimeters around homes, structures, and critical facilities through the removal or reduction of flammable vegetation.

1.5.3.B APPLICATION OF IGNITION-RESISTANT CONSTRUCTION

Application of ignition-resistant construction projects involve the application of ignition-resistant techniques and/or non-combustible materials on new and existing homes, structures, and critical facilities.

1.5.3.C HAZARDOUS FUELS REDUCTION

Hazardous fuels reduction projects involve the removal of vegetative fuels near to the at-risk structure that, if ignited, pose significant threat to human life and property, especially critical facilities.

1.5.4 ALL-NATURAL HAZARD MITIGATION PROJECTS

1.5.4.A POST-DISASTER CODE ENFORCEMENT

Post-disaster code enforcement projects are designed to support the post-disaster rebuilding effort by ensuring that sufficient expertise is on hand to ensure appropriate codes and standards are utilized and enforced.

1.5.4.B 5% INITIATIVE PROJECTS

Five percent initiative projects provide an opportunity to fund mitigation actions that are consistent with the goals and objectives of the state and local mitigation plans and that meet all HMGP program requirements, but for which it may be difficult to conduct a standard BCA to prove cost effectiveness.

1.5.4.C HAZARD MITIGATION PLANNING

Mitigation plans are the foundation for effective hazard mitigation. A mitigation plan is a demonstration of the commitment to reduce risks from natural hazards and serves as a strategic guide for decision makers as they commit resources.

1.6 PRESIDENTIAL DISASTER DECLARATIONS

Since 1953, there have been thirteen Presidential Disaster Declarations and two Emergency Declarations that have occurred in Houston County. These declarations are displayed in Figure 1-4 and Figure 1-5. During the same time period, there have been a total of forty-eight Presidential Disaster Declarations and five Emergency Declarations in the State of Minnesota.

Figure 1-4: Houston County Major Disaster Declarations (1953-2015)[9]

Declaration Number	Date of Incident	Date of Declaration	Description	President	Assistance (Individual or Public)
DR-4131	6/20/2013	7/25/2013	Severe Storms, Straight-line Winds, Flooding	Obama	Public
DR-1921	6/17/2010	7/2/2010	Severe Storms, Tornadoes, Flooding	Obama	Public
DR-1772	6/6/2008	6/25/2008	Severe Storms, Flooding	Bush	Public
DR-1717	8/18/2007	8/23/2007	Severe Storms, Flooding	Bush	Both
DR-1370	3/23/2001	5/16/2001	Flooding	Bush	Both
DR-1333	5/17/2000	6/27/2000	Severe Storms, Flooding, Tornadoes	Clinton	Both
DR-1225	5/15/1998	6/23/1998	Severe Storms, Straight-Line Winds, Tornadoes	Clinton	Public
DR-1175	3/21/1997	4/8/1997	Severe Storms, Flooding	Clinton	Both
DR-993	5/6/1993	6/11/1993	Flooding, Severe Storm, Tornadoes	Clinton	Both
DR-560	7/8/1978	7/8/1978	Severe Storms, Tornadoes, Hail, Flooding	Carter	Both
DR-446	7/13/1974	7/13/1974	Severe Storms, Flooding	Nixon	Both
DR-255	4/18/1969	4/18/1969	Flooding	Nixon	Both
DR-188	4/11/1965	4/11/1965	Flooding	Johnson	Both

Figure 1-5: Houston Co. Emergency Declarations (1953-2015)[9]

Declaration Number	Date of Incident	Date of Declaration	Description	President	Assistance (Individual or Public)
EM-3013	6/17/1976	6/17/1976	Drought	Ford	Public

SECTION 2: PREREQUISITES

This updated plan has been prepared in accordance with the requirements of the Disaster Mitigation Act of 2000 with the intention that it be adopted by Houston County and each incorporated jurisdiction subsequent to state and federal approval. The adopting resolutions and the dates of adoption are included in the appendix.

2.1 MULTI-JURISDICTIONAL PLAN ADOPTION

After HSEM and FEMA review the plan and approve it "pending local adoption," the Houston County hazard mitigation planning team will present the plan to the county and city officials of each jurisdiction for adoption. Resolution adoptions are included in Appendix 9.1 of this plan.

2.2 JURISDICTIONAL PARTICIPATION

All incorporated jurisdictions participated in the review and update of the Houston County All-Hazard Mitigation Plan. All cities that participated in the initial 2009 plan also participated in the 2015 update, see Figure 2-1. The risk assessment and mitigation actions were reviewed and discussed at each county and public community meetings. A substantial effort was made to solicit public participation as well as various public and private entities to provide input into the plan. Comments were reviewed after the meeting for incorporation into the plan. See appendices for documentation of how communities and the public were involved and incorporated into the planning process.

- Appendix 9.1 – Adopting Resolutions
- Appendix 9.2 – Statement of Interest in All Hazard Mitigation Planning
- Appendix 9.3 – Meeting Announcements
- Appendix 9.4 – Affidavits of Publication of Meeting Announcements
- Appendix 9.5 – Meeting Agendas
- Appendix 9.6 – Meeting Sign- In Sheets
- Appendix 9.7 – Survey Materials

Figure 2-1: Jurisdiction Participation

Jurisdiction Name	Hazard Identification	Risk Assessment	Mitigation Strategies	Public Participation
Houston County	✓	✓	✓	✓
City of Brownsville	✓	✓	✓	✓
City of Caledonia	✓	✓	✓	✓
City of Eitzen	✓	✓	✓	✓
City of Hokah	✓	✓	✓	✓
City of Houston	✓	✓	✓	✓
City of La Crescent	✓	✓	✓	✓
City of Spring Grove	✓	✓	✓	✓

SECTION 3: PLANNING PROCESS

Houston County Emergency Management and Region Nine Development Commission joined efforts for the five year review of this mitigation plan. Houston County realizes that the recognition of and the protection from hazards impacting the county and its residents contribute to future community and economic development.

The planning process was organized by the planning team (see Figure 3-1) and consisted of the following tasks:

Task 1: Organize Resources
The County Emergency Manager, with support from Region Nine Development Commission, created a planning team to attend meetings, gather data and historical information, review drafts, and participate in mitigation brainstorming sessions.

Task 2: Risk Assessment
The planning team reviewed the natural and technological hazards in the existing plan and identified which hazards to include in the update. The planning team developed hazard profiles. Each profile included a hazard definition, history of previous occurrences, and a summary of the hazard's extent, location, and potential impact. The planning team then used local, state, and national resources to inventory the county's assets and estimate potential losses for each hazard.

Task 3: Develop Mitigation Strategies
The planning team met with representatives of each community to develop and prioritize mitigation strategies and action items that would reduce the costs of disaster response and recovery, protect people and infrastructure, and minimize overall disruption to the county in the event of a disaster.

Task 4: Public Involvement
The public was invited to attend a series of community meetings to discuss the draft mitigation strategies and actions. These were held at both the county level and in individual communities covered by the plan. Public notice was given for all meetings, see Appendix 9.3 and 9.4.

3.1 STAKEHOLDER TASKFORCE

A stakeholder taskforce (see Figure 3-1) was assembled to provide wider representation from the county and cities within Houston County. The responsibility of the stakeholder taskforce was to provide input and information throughout the planning process. The taskforce planning meeting was held on June 23rd, 2015.

Figure 3-1: Planning Team Members

Representing	Name	Position	Role
Houston County	Kurt Kuhlers	Emergency Manager	County Technical Expert
	Brian Pogodzinski	Engineer	County Technical Expert
	Rich Frank	Environmental Services	County Technical Expert
	Travis Lapham	Deputy Sheriff	County Technical Expert
	Mark Inglett	Sheriff	County Technical Expert
	Judy Storlie	County Commissioner	County Leadership
	Heather Myhre	Public Health Preparedness Coordinator	County Technical Expert
City of Houston	David Breault	Police Chief	City Technical Expert
	Chris Peterson	City Administration	City Technical Expert
	Randy Thesing	City Maintenance	City Technical Expert
	Audrey Hegland	Deputy Clerk	City Technical Expert
City of La Crescent	John Meyer	Fire Chief	City Technical Expert
	Doug Stavenau	Police Chief	City Technical Expert
City of Spring Grove	Paul Folz	Police Chief	City Technical Expert
	Erin Konkel	City Clerk	City Technical Expert
City of Caledonia	Ted Schoonover	City Clerk/Administrator	City Technical Expert
	Michael Gerardy	Administrative Coordinator/ Zoning	City Technical Expert
City of Eitzen	Steve Schuldt	City Clerk	City Technical Expert
City of Hokah	Rodney Blank	City Administrator	City Technical Expert
City of Brownsville	Michael Moriarity	City Clerk	City Technical Expert
Crook Creek Townships	Andy Moen	Clerk	Township Technical Expert
Yucatan Township	Deborah Dewey	Clerk	Township Technical Expert
Winnebago Township	Joyce Staggemeyer	Clerk	Township Technical Expert
La Crescent Township	Bob Cummings	Clerk	Township Technical Expert
Region Nine Development Commission	Danielle Walchuk	Regional Planner	Consultant
	Scott Reiten	Regional Emergency Management Planner	Consultant
	Jacob Thunander	Project Development Planner	Consultant
	Gabriel Appiah	Intern	Consultant

3.2 PUBLIC INVOLVEMENT

An effort was made to solicit public input during the planning process with meetings scheduled in 2015 as shown in Figure 3-2.

Figure 3-2: Public Meetings Held

Date	Location	Communities Invited
July 13th, 2015	La Crescent Community Building	Brownsville, Hokah, and La Crescent
July 14th, 2015	Houston County Emergency Operations Center	Caledonia, Eitzen, and Spring Grove
July 28th, 2015	Houston Community Center	All Communities/City of Houston
July 28th, 2015	Houston County Courthouse	Houston County

The risk assessment and mitigation actions were reviewed and discussed at each meeting. Comments were reviewed after the meeting for incorporation into the plan by Region Nine staff attending the meeting. Information from the community meetings is available in the following appendices:

- Appendix 9.1 – Adopting Resolutions
- Appendix 9.2 – Statement of Interest in All-Hazard Mitigation Planning
- Appendix 9.3 – Meeting Announcements
- Appendix 9.4 – Affidavits of Publication of Meeting Announcements
- Appendix 9.5 – Meeting Agendas
- Appendix 9.6 – Meeting Sign-In Sheets
- Appendix 9.7 – Survey Materials

3.3 COMMUNITY INVOLVEMENT

Participation by the community in the mitigation planning process has many benefits, such as:

- Expert advice on technical and program issues
- Educate the public about hazards in the community
- Input from the public on potential risks
- Identify sources of funding for potential projects
- Develop meaningful mitigation actions supported by the community

The planning team sought participation from various representatives of county government, local city governments, and community groups to participate.

3.4 REVIEW OF EXISTING PLANS, STUDIES, REPORTS & TECHNICAL INFORMATION

Information used in the preparation of this update was drawn from a variety of local, state, federal, and private resources. The existing resources used in the update process are listed in Figure 3-3.

Figure 3-3: Planning Documents Used in Planning Process

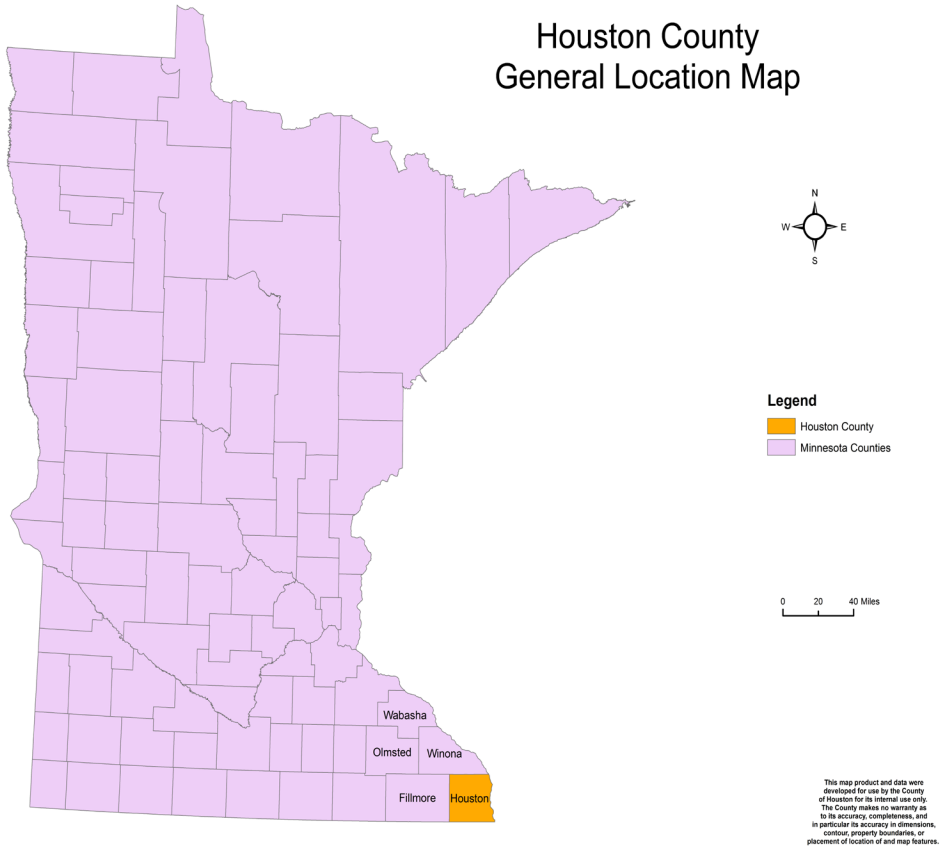
Author(s)	Year	Title	Description	Used For
Minnesota Division of Homeland Security and Emergency Management	2011	Minnesota State All-Hazard Mitigation Plan Update	Provides profile, natural resource, and hazard identification information	County profile, hazard identification, risk assessment, mitigation strategies/actions
Minnesota Division of Homeland Security and Emergency Management	2008	Minnesota State All-Hazard Mitigation Plan	Provides profile, natural resource, and hazard identification information	County profile, hazard identification, risk assessment, mitigation strategies/actions
Houston County Environmental Services	2007	Houston County Comprehensive Water Plan	Provides natural resource and development Provides profile, natural resource, and hazard identification information	County profile, hazard identification
Houston County Planning and Zoning	2008	Houston County Comprehensive Land Use Plan	Provides natural resource and development Provides profile, natural resource, and hazard identification information	County profile, hazard identification, risk assessment, mitigation strategies/actions
Houston County Soil and Water	2007	Houston County Comprehensive Water Plan	Provides natural resource and development Provides profile, natural resource, and hazard identification information	County profile, hazard identification

SECTION 4: COUNTY PROFILE

4.1 LOCATION

Houston County covers a total of 552.06 square miles of territory located in south eastern Minnesota[10]. The county lies approximately 160 miles southeast of the Minneapolis-St. Paul metropolitan area. It is bordered to the north by Winona County, to the east by La Crosse County, Wisconsin and Vernon County, Wisconsin, to the south by Allamakee County, Iowa, and to the west by Fillmore County.

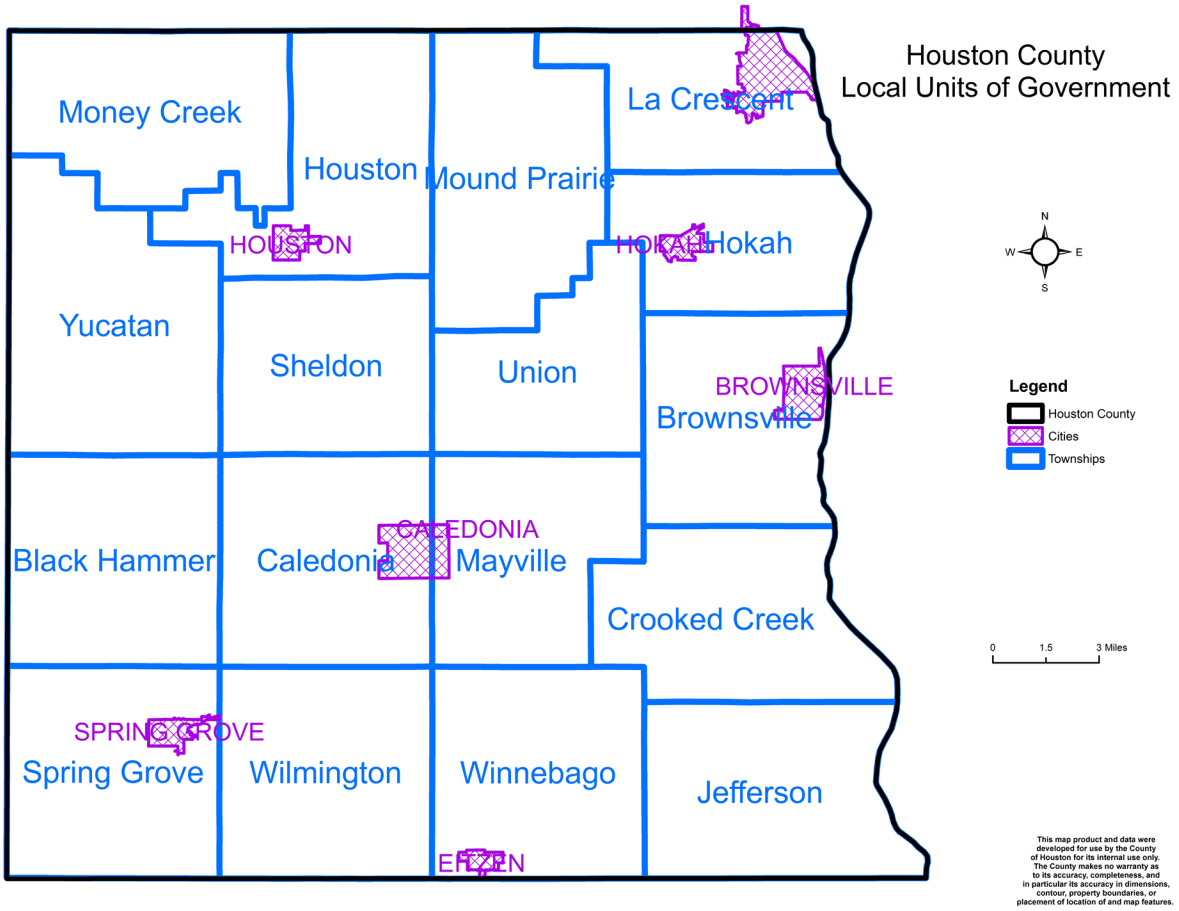
Figure 4-1: General Location Map



4.2 CITIES & TOWNSHIPS

Houston County consists of seven incorporated cities and seventeen townships. The cities include: Brownsville, Caledonia, Eitzen, Hokah, Houston La Crescent, and Spring Grove. The City of Caledonia is the county seat. The townships include: Black Hammer, Brownsville, Caledonia, Crooked Creek, Hokah, Houston, Jefferson, La Crescent, Mayville, Money Creek, Mount Prairie, Sheldon, Spring Grove, Union, Wilmington, Winnebago, and Yucatan.

Figure 4-2: Local Units of Government



4.3 LANDSCAPE

Houston County is unique because it contains some of the most rugged topography compared to any other county in southern Minnesota.[12] It is located on the western edge of the driftless region of the Upper Mississippi Valley.[12] It appears that the county was completely glaciated; however, only the patches in the northwest are preserved. Differences in elevation range from about 636 to 1,322 feet above sea level. Runoff that cannot be absorbed by the soil, drains into the many creeks in Houston County. These creeks lead to three major rivers: Root, Mississippi, or the Iowa River.

There are dozens of soil types that can be found within the county, the bulk of the soil is comprised of Lamoille-Elbaville silt loams (8.9%), Lacrescent cobbly silty clay loam (7.5%), Blackhammer-Southridge silt loams, (5.2%), and Lamoille-Dorerton silt loams (4.6%).

4.4 HYDROLOGY

The county is part of four major watersheds: Root River, Coon-Yellow, La Crosse-Pine, and Upper Iowa[13]. The Root River Watershed occupies 311 square miles, draining almost the entire county surface drainage area. The remaining 241 square miles are divided between the La Crosse-Pine Watershed (29 square miles) and the Coon-Yellow Watershed (167 square miles) and the Upper Iowa Watershed (45 square miles). The county is part of 49 minor watersheds. The two largest minor watersheds completely within the county are Crooked Creek (31.4 square miles) and Beaver Creek West (28.0 square miles).

The Root River runs generally from west to east across the entire county. The county is bordered to the east by the Mississippi River. There are 1,788 miles of streams within the county.

The county contains 29 lakes and ponds[14]. The majority of the lakes are located in the eastern part of the county. Blue Lake is the largest lake located in the county with 363 acres. The remaining lakes have a combined surface area of 538 acres. Lakes account for 901 acres of land (1.4 square miles) within the county, or about .25 percent of all land within the county.

The county contains ten wetlands, marshes, swamps and bogs. The majority of the wetlands are located in the eastern half of the county. The county's largest wetland, Minnesota Slough, covers approximately 380 acres of territory. In total, wetlands account for 572 acres of land (.89 square miles) within the county, or about .16 percent of all land within the county.

4.5 CLIMATE

Daily weather observations in Houston County occurs in the City of Caledonia. The Midwestern Regional Climate Center has maintained climate records at this site since 1892. This record includes data on soil temperature and drainage, air temperature, and precipitation. The bulk of climate data presented in this plan has been gathered by the Midwestern Regional Climate Center through each test station in Houston County and the National Climatic Data Center.

Houston County, like the rest of Minnesota, has an extreme continental climate. The county sits in the heart of the North American land mass and lies within an area where cold, dry air from Canada battles for control of the atmosphere with warm, moist air from the Gulf of Mexico[15]. The result is a variety of extreme temperature possibilities, ranging from 104°F on July 26th 1894 to -37°F on January 15th 1963. In July, daily temperatures range from the low eighties to the low sixties with an average of approximately 71°F. Daily temperatures in January range from the low twenties to the single digits, with an average of approximately 15°F. The annual average temperature is 45°F.

The typical heating season lasts from October to May and has an average of 7,762 heating degree-days. A heating degree-day is the difference between the selected base temperature (65°F) and the average daily temperature. One unit is accumulated for each degree the average daily temperature is below the base

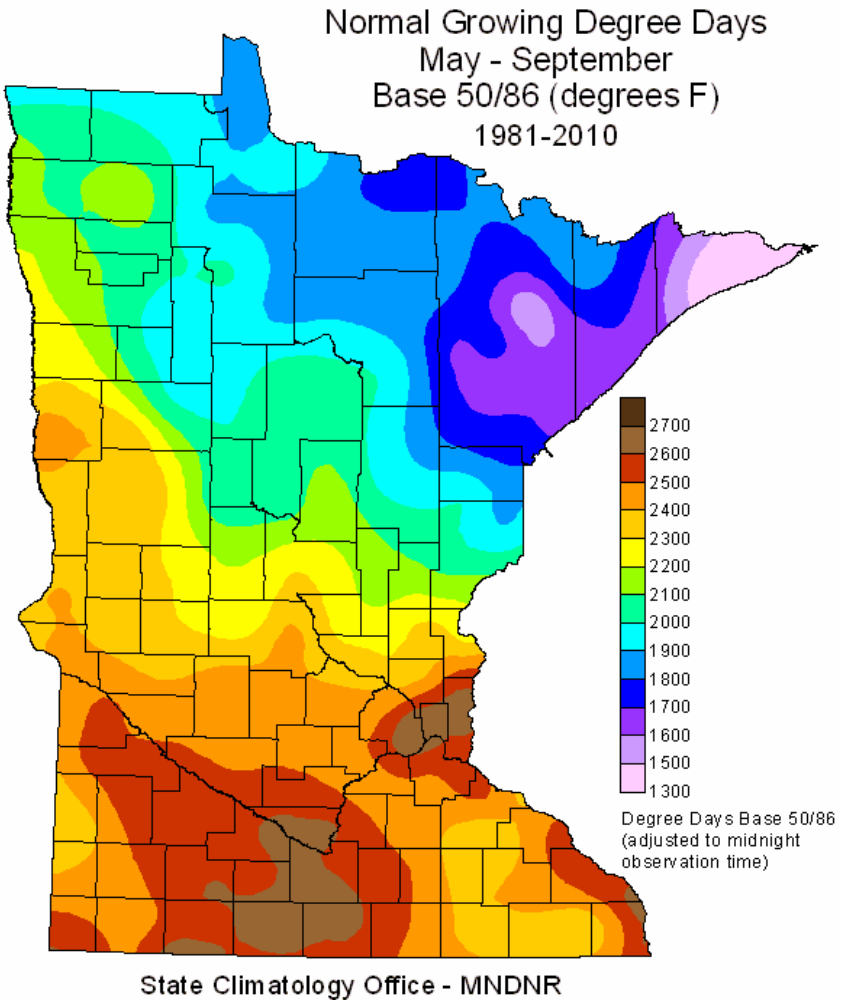
temperature (base temperature – average daily temperature = X heating degree days). The unit is designed to measure heating fuel costs for an area.

The growing season (with a base temperature of 32°F) lasts roughly 150 days. The last spring frost usually occurs in the first week of May and the first fall frost usually occurs in the last week of September. On average, the daily soil temperature normally reaches 50°F between April 15th and April 20th – this threshold is important because corn and soybeans cannot be planted until the soil temperature reaches 50°F and 55°F, respectively. Houston County averages 2,300-2,700 growing degree-days during normal growing degree days (May-September). A growing degree-day, like a heating degree-day, is the difference between the average daily temperature and the base temperature (50°F). One unit is accumulated for each degree the average daily temperature is above the base temperature (average daily temperature – base temperature = X growing degree days). The unit is designed to measure the length of the growing season.

The county receives an average of 33.05 inches of precipitation annually. December through February is the driest time of year; June through August is the wettest time of year. The wettest year on record is 2007, with a total of 52.85 inches. The driest year on record is 1910, with a total of 14.30 inches. The record for one-day maximum precipitation is 15.10 inches, which fell on August 19, 2007 in Hokah[17]. Currently, this is the state record for one-day precipitation.

The average annual snowfall for the county is 43 inches[16]. With an average of 13.3 inches, March is the snowiest month, followed by December (8.6 inches) and January (8.2 inches). The snowiest season on record is the winter of 1958-1959 when a total 91.6 inches fell.

Figure 4-3: Growing Degree Days



4.6 DEMOGRAPHY

According to the 2010 Census, the county had a total population of 19,027[17]. Fifty-nine percent of the population lives in an incorporated area, or city. The remaining forty-one percent lives in an unincorporated area, or township. During the first decade of the 21st Century, the urban and rural population of the county decreased by 2.39% and 5.09% respectively. This pattern is reflective of national and global trends of outmigration from rural areas to larger towns and cities.

Between 2000 and 2010, the county's total population decreased by 3.63 percent (691 people). The Cities of Eitzen and Spring Grove, and the townships of Caledonia and Money Creek were the only local jurisdictions to witness a population increase. All of the other jurisdictions lost population (see Figure 4-4). The rate of decline varied greatly, from -1.89 percent in La Crescent to -24.85 percent in Black Hammer Township (see Figure 4-5).

Figure 4-4: Urban Population Change[17]

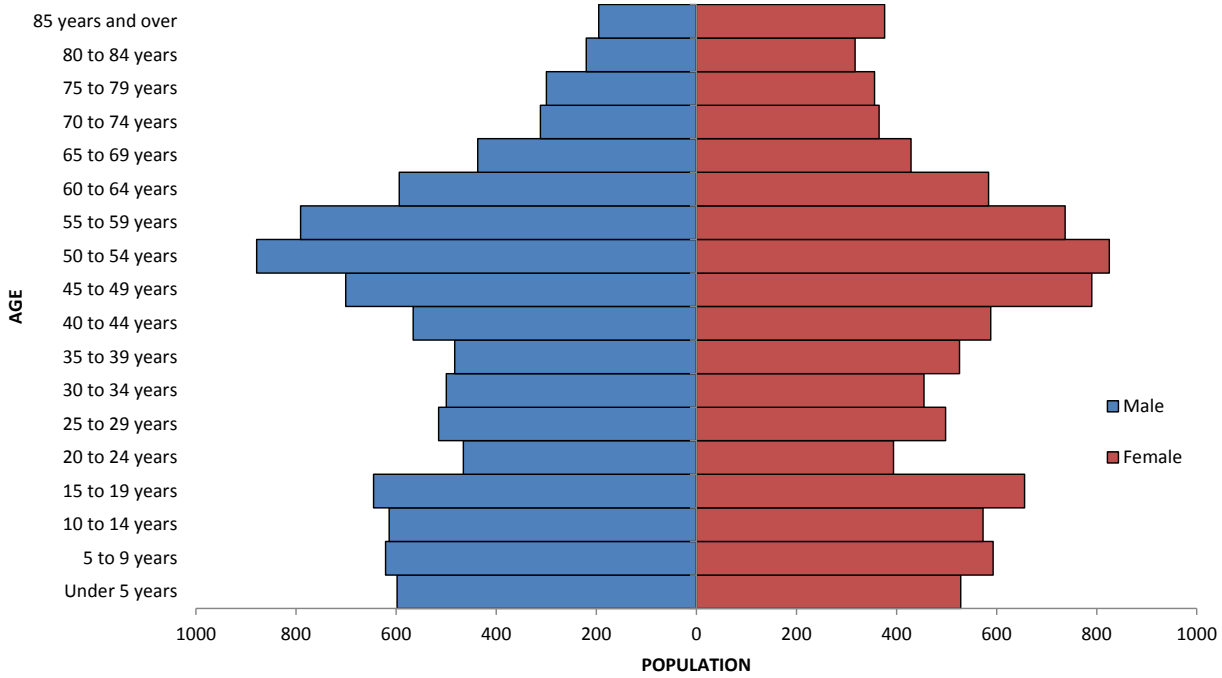
Name of Local Jurisdiction	Type of Local Jurisdiction	Population 2000	Population 2010	Population Change	% Population Change
Brownsville	City	517	466	-51	-9.86%
Caledonia	City	2,965	2,868	-97	-3.27%
Eitzen	City	229	243	14	6.11%
Hokah	City	614	580	-34	-5.54%
Houston	City	1,020	979	-41	-4.02%
La Crescent	City	4,923	4,830	-93	-1.89%
Spring Grove	City	1,304	1,330	26	1.99%
TOTAL		11,572	11,296	-276	-2.39%

Figure 4-5: Rural Population Change[17]

Name of Local Jurisdiction	Type of Local Jurisdiction	Population 2000	Population 2010	Population Change	% Population Change
Black Hammer	Township	326	245	-81	-24.85%
Brownsville	Township	462	445	-17	-3.68%
Caledonia	Township	625	641	16	2.56%
Crooked Creek	Township	323	285	-38	-11.76%
Hokah	Township	545	497	-48	-8.81%
Houston	Township	438	396	-42	-9.59%
Jefferson	Township	129	129	0	0%
La Crescent	Township	1,487	1,446	-41	-2.76%
Mayville	Township	427	409	-18	-4.22%
Money Creek	Township	547	597	50	9.14%
Mound Prairie	Township	661	606	-55	-8.32%
Sheldon	Township	289	266	-23	-7.96%
Spring Grove	Township	422	402	-20	-4.74%
Union	Township	385	370	-15	-3.90%
Wilmington	Township	472	434	-38	-8.05%
Winnebago	Township	257	240	-17	-6.61%
Yucatan	Township	351	323	-28	7.98%
TOTAL		8,146	7,731	-415	-5.09%

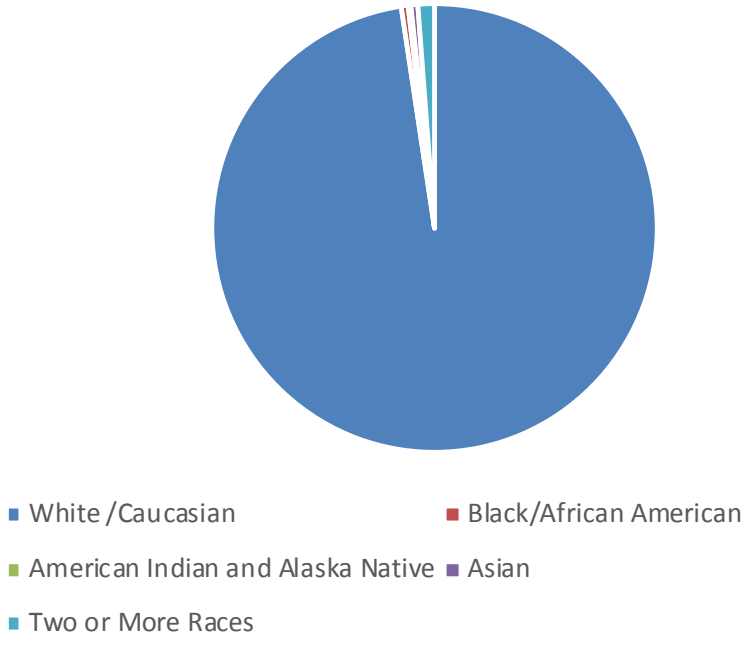
Overall, the county is 49.6 percent male and 50.40 percent female. The county's population pyramid, depicted in Figure 4-6, indicates a relatively stable population. The Baby Boomer generation is present between the ages of 51 and 70. The pyramid also indicates that the cohorts of males and females age 0-19 are approximately the same size as the Baby Boomer cohort.

Figure 4-6: Population Pyramid[17]



Racially, the county is predominantly White/Caucasian (see Figure 4-7). The second largest race is Black/African American (1.1%). The county, 97.6% White/Caucasian, is less racially diverse than the state, 85.3% White/Caucasian, and considerably less diverse than the nation, 72.4% White/Caucasian.

Figure 4-7: Race[17]



4.7 DEVELOPMENT TRENDS

The most recent projections released by the United States Census Bureau indicates the county's total population will slightly decrease over the century by approximately 25 people or -0.09 percent (109) (see Figure 4-8). The City of Houston (7.64%) and Sheldon Township (9.01%) are the only expected communities to make any significant gain in population.

The majority of land in the county is expected to remain agricultural in character. New urban development is not expected to occur. Any commercial, industrial and residential development, if it occurs, will be within all city boundaries.

Figure 4-8: Population Change 2000-2010 and 2010-2020[11]

Name of Local Jurisdiction	Type of Local Jurisdiction	Change 2000-2010	Change 2010-2020
Houston	County	-3.50%	-.09%
Caledonia	City	-1.38%	-3.33%
Brownsville	City	-8.09%	-1.75%
Eitzen	City	-4.33%	1.60%
Hokah	City	-5.84%	-.17%
Houston	City	-4.02%	7.64%
La Crescent	City	-1.13%	-2.40%
Spring Grove	City	-5.27%	1.68%
Black Hammer	Township	-12.81	-2.09
Brownsville	Township	-8.06	-1.38
Caledonia	Township	-5.74	-1.92
Crooked Creek	Township	-4.36	1.71
Hokah	Township	-6.40	-1.02
Houston	Township	-1.98	4.50
Jefferson	Township	-4.44	1.50
La Crescent	Township	-6.29	-2.21
Mayville	Township	-3.54	0.72
Money Creek	Township	-1.49	3.48
Mound Prairie	Township	-4.72	0.65
Sheldon	Township	-5.00	9.01
Spring Grove	Township	-4.51	2.16
Union	Township	-4.64	0.53
Wilmington	Township	0.93	4.08
Winnebago	Township	-4.38	1.62
Yucatan	Township	-3.58	7.07

4.8 ECONOMY

According to the 2007 Economic and Agricultural Censuses, the county witnesses approximately $260 million in economic activity annually. The most profitable segment of the economy is retail trade, which is responsible for more than half of the county's economic activity. The next most profitable segment is agriculture, followed by accommodation and food services, which when combined account for over a third of the county's economic activity (see Figure 4-9).

Figure 4-9: Economic Activity[18] [19]

Economic Segment	Economic Activity	Percent of Total
Accommodation and food services	$8,029,000	3.09%
Administrative, support, waste management & remediation services	$6,522,000	2.51%
Agriculture	$90,999,000	35.06%
Arts, entertainment, and recreation	*	*
Educational services	*	*
Health care and social assistance	*	*
Information	**	**
Manufacturing	*	*
Other services (except public administration)	*	*
Professional, scientific, and technical services	*	*
Real estate and rental and leasing	$1,539,000	0.59%
Retail trade	$152,459,000	58.74%
Wholesale trade	*	*
Total, All Segments	**$259,548,000**	**100.00%**

** Withheld to avoid disclosing data for individual companies.*
*** Not available or not comparable.*

According to the Department of Employment and Economic Development, the county had an average employment of 4,972 in 2014.[20] The education and health services industry attributed the most jobs, with 1,557. The next largest industries by employment were trade, transportation, and utilities with 1,053 employees and manufacturing with 598 employees (see Figure 4-10).

Figure 4-10: Employment by Industry[20]

Industry	Employment	Percent of Total
Natural Resources and Mining	161	3.24%
Construction	279	5.61%
Manufacturing	598	12.03%
Trade, Transportation and Utilities	1,053	21.18%
Information	188	3.78%
Financial Activities	112	2.25%
Professional and Business Services	231	4.65%
Education and Health Services	1,557	31.32%
Leisure and Hospitality	238	4.79%
Other Services	105	2.11%
Public Administration	450	9.05%
Total, All Industries	**4,972**	**100.00%**

According to the Census Bureau's 2014 American Community Survey, the county has a per capita income of $26,450 and a median household income of $49,698, compared to the state's per capita income of $30,913 and median household income of $59,836[21].

The county's unemployment rate for 2014 was 4.4 percent compared to the states unemployment rate of 4.2 percent[22]. The county poverty rate was 8.1 percent for families and 10.9 percent for individuals[21]. By comparison the state poverty rate was 7.4 percent for families and 11.5 percent for individuals[22].

4.9 LAND COVER & LAND USE

Land cover and land use are often used interchangeably. For the purposes of this plan, land cover will be defined as the vegetation, structures, or other materials that cover the surface of the Earth. Land use will be defined as the economic/societal use of the land.

The dominant land cover for the county is forest land (39.6%), cultivated land (38.4%), and hay/pasture/grasslands (16.0%). Developed land accounts for 2.3 percent of the county. Figure 4-11 depicts the breakdown of land cover by type within the county.

Figure 4-11: Land Cover Statistics[26]

Description	Acres	Percent
Urban and Rural Development	8,394	2.3
Cultivated Land	139,693	38.4
Hay/Pasture/Grassland	58,402	16.0
Brushland	1,012	0.3
Forested	144,199	39.6
Water	8,276	2.3
Bog/Marsh/Fen	3,657	1.0
Mining	276	0.1
Total	**363,908**	**100%**

SECTION 5: RISK ASSESSMENT

5.1 IDENTIFYING HAZARDS

5.1.1 HAZARD IDENTIFICATION

Hazard identification is a critical component of risk assessment and the mitigation planning process. The 2009 county plan identified 19 hazards. In the 2015 update, the original hazards were reconsidered and reorganized into nine categories. The reorganization was undertaken to simplify the categorization of hazards. The changes are depicted left-to-right in Figure 5-1. The reorganization of the hazards for the update took into consideration several documents, including FEMA's Multi-Hazard Identification and Risk Assessment A Cornerstone of the National Mitigation Strategy (MHIRA), Minnesota State 2008 All-Hazard Mitigation Plan, Minnesota State 2011 All-Hazard Mitigation Plan Update, Minnesota State 2014 All-Hazard Mitigation Plan Update and HSEM's River County Template. A number of other county hazard mitigation plans were reviewed as well.

Figure 5-1: Hazards 2009 Plan vs. 2015 Update

Hazards in 2009 Plan	Hazards in 2015 Update
Natural Hazards • Drought • Excessive Heat • Fire (Wildfire) • Flooding • Fog • Hail • Land Subsidence and Sinkholes • Landslide • Lightning • Tornado • Wind • Severe Winter Storms – Blizzard, Extreme Cold, Ice Storm **Technological Hazards** • Fire • Hazardous Materials • Infectious Disease Outbreak • Infrastructure • Nuclear Storage Facility • Terrorism • Water Supply Contamination	**Flooding** **Drought** **Land Subsidence, Landslides and Sinkholes** **Fire** • Wildfire • Structural Fire **Summer Storms** • Fog • Extreme Temperatures • Wind Events • Hail • Tornado • Lightning **Winter Storms** • Extreme Temperatures • Wind Events • Blizzards • Ice Storms **Hazardous Materials** • Fixed Events • Transportation Related Events • Nuclear Storage Facility **Essential Services Failure** • Dam/Levee Failure • Wastewater Treatment Failure • Water Supply Contamination **Human and Animal Related Hazards** • Terrorism • Infectious Disease Outbreak • Animal Disease Outbreak

Changes from the 2009 plan include:

- Addition of Structural Fire
- Addition of Summer Storms, which includes fog, extreme temperatures, wind events, hail, tornadoes, and lightning
- Change from Extreme Winter Storms to Winter Storms and addition of Wind Events
- Creating a Hazardous Materials hazard, which includes fixed events, transportation related events, and nuclear storage facility
- Addition of Essential Services Failure, which includes dam/levee failure, wastewater treatment failure, and water supply contamination
- Creation of a Human and Animal Related Hazards, which includes terrorism, infectious disease outbreak, and animal disease outbreak

5.1.2 NATIONAL CLIMATIC DATA CENTER RECORDS

The National Climatic Data Center (NCDC)[24] provided the storm event data used in this update. It should be noted that NCDC records are estimates of damage complied by the National Weather Service from local, state, and national sources. These estimates are often preliminary in nature. The estimates may not match the final assessment of the damage related to a specific weather event.

The NCDC lists 283 reported severe weather events having occurred in Houston County. The full NCDC listing is included as Appendix 9.8. The profile section of the update includes summaries of the following hazards from the NCDC listing: blizzards, extreme cold/wind chill, excessive heat, flash flood/flood, funnel cloud, hail, excessive heat, heavy rain, heavy snow, high wind, ice storm, lightning, thunderstorm, tornado, and winter storm.

5.2 VULNERABILITY ASSESSMENT

The vulnerability assessment includes an inventory of critical facilities within the county and areas of special consideration. Critical facilities are broken into five categories: essential facilities, transportation systems, lifeline utilities, high potential loss facilities, and hazardous material facilities. Special considerations include: economic elements; historic, cultural, and natural resource areas; vulnerable populations; and special considerations. The inventory includes facility type and location. Where possible, an estimated replacement value was also included. Replacement values were determined using a combination of county assessor records and data provided by individual cities.

The vulnerability assessment also includes an estimate of the county's total building exposure (public and private). Building exposure includes the number of buildings/structures in the county, along with an estimate of their improved value.

5.2.1 CRITICAL FACILITIES

5.2.2.A ESSENTIAL FACILITIES

Essential facilities are vital to the health and welfare of the whole population and are especially important following hazard events. Essential facilities include: medical care facilities (hospitals and clinics), police and fire stations, emergency operations centers, and schools[27] [26]. As part of the update process, a total of six law enforcement departments, seven fire departments and eight medical care facilities were identified in Houston County, Figure 5-2 through Figure 5-6 list these individual essential facilities, their location, and estimated replacement values, as determined by the County Assessor's Office using the most recent data available.

Figure 5-2: Essential Facilities – Law Enforcement[26]

Facility	Location	Replacement Value
Caledonia Police Department	304 E Main St., Caledonia	$130,500
Houston County Law Enforcement Center/Sheriff's Department	306 S Marshall St., Caledonia	$15,775,800
Hokah Police Department	102 Main St., Hokah	$37,300
Houston Police Department	105 W Maple St., Houston	*
La Crescent Police Department	315 Main St., La Crescent	$396,500
Spring Grove Police Department	118 1st Ave. NW, Spring Grove	$236,900

Figure 5-3: Essential Facilities – Emergency Response[26]

Facility	Location	Replacement Value
Brownsville Fire Department	408 Main St., Brownsville	*
Caledonia Ambulance Service	231 E Main St., Caledonia	$447,900
Caledonia Volunteer Fire Department	201 E Main St., Caledonia	$1,057,700
Houston County Emergency Management	306 S Marshall St., Caledonia	$15,775,800
Eitzen Fire Department	202 E Main St., Eitzen	$280,000
Hokah Fire Department	9 Mill St., Hokah	$324,600
Houston Community Ambulance	113 W Maple St., Houston	*
Houston Fire Department	110 W Gate Dr,, Houston	*
La Crescent Fire Department	336 S 1`St., La Crescent	$667,300
Spring Grove Ambulance Service	172 W Main St., Spring Grove	$900,300
Spring Grove Fire Department	172 W Main St., Spring Grove	*

Figure 5-4: Essential Facilities – Medical Care[26]

Facility	Location	Replacement Value
Caledonia Veterinary Clinic	126 W Main St., Caledonia	*
Franciscan Skemp Caledonia Clinic - Mayo Health System	701 N Sprague St., Caledonia	*
Hiawatha Valley Mental Health Center	121 S Marshall St., Caledonia	$111,200
Houston County Public Health	611 Vista Dr., Caledonia	$855,100
Richard Faivre, Dvm	10989 Carsten Corner Dr., Eitzen	$206,800
Gundersen Health System-Houston	511 E Maple St., Houston	*
Valley View Healthcare and Rehab	510 E Cedar St., Houston	$1,525,700
Franciscan Skemp La Crescent Clinic - Mayo Health System	524 N Elm St., La Crescent	$306,600
Gundersen Lutheran Clinic of La Crescent	226 N 2nd St., La Crescent	*
Gundersen Health System	123 5th Ave. SE, Spring Grove	$1,481,100
Tri - County Veterinary Services	504 E Main St., Spring Grove	*

*Unavailable

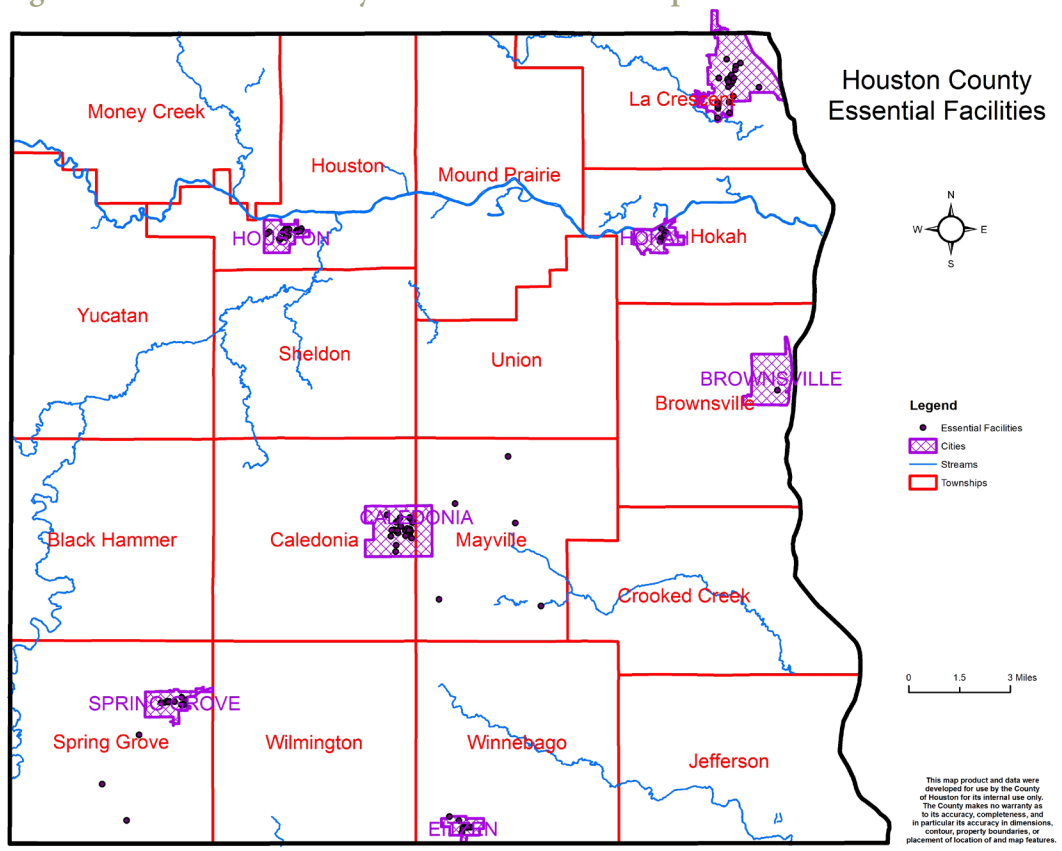
Figure 5-5: Essential Facilities – Funeral Homes[26]

Facility	Location	Replacement Value
Jandt-Fredrickson Funeral Home	518 W Main St., Caledonia	*
McCormick Funeral Home	205 Main St. E, Caledonia	$129,700
Hoff Funeral and Cremation - Houston	710 E Cedar St., Houston	*
Schumacher-Kish Funeral Home	412 S 3rd St., La Crescent	$139,400
Roble Funeral Home	225 E Main St., Spring Grove	$91,900

Figure 5-6: Essential Facilities – Schools[27] [26]

Facility	Location	Replacement Value
Caledonia Elementary School	511 W Main St., Caledonia	$2,664,700
Caledonia High/Middle School	825 N Warrior Ave., Caledonia	*
St. John's Lutheran School	720 N Marshall St., Caledonia	$1,183,900
St. Mary's Catholic School	308 E South St, Caledonia	*
St. Peter's School	34 Main St., Hokah	*
Early Childhood Family Education (ECFE)	402 S. Grant St., Houston	$46,900
Houston Elementary School	310 S Sherman St., Houston	*
Houston High School	308 W Elm St., Houston	*
Minnesota Virtual Academy	306 W Elm St., Houston	$3,373,400
Crucifixion Elementary School	420 S 2nd St., La Crescent	*
La Crescent-Hokah Elementary School	504 S Oak St., La Crescent	*
La Crescent-Hokah Middle School	1301 Lancer Blvd., La Crescent	*
La Crescent Montessori Academy	1116 S Oak St., La Crescent	$409,700
La Crescent Senior High School	1301 Lancer Blvd., La Crescent	*
Spring Grove Public School	113 2nd Ave. NW, Spring Grove	$9,700

Figure 5-7: Houston County Essential Facilities Map



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5.2.1.B TRANSPORTATION SYSTEMS

Transportation systems are essential to the social and economic needs of our society. These systems also play a critical role in the response to and recovery from hazard events. Essential transportation systems include: airway, highway, railway, waterway facilities, and infrastructure. Figure 5-7 summarizes the transportation systems identified through the update process.

Bridges

There are a total of 164 bridges in Houston County. According to the Federal Highway Administration, seventeen of these bridges are structurally deficient[30]. The classification *Structurally Deficient* is used to determine eligibility for federal bridge replacement and rehabilitation funding[29]. Bridges that are deemed to be structurally deficient are not necessarily unsafe. A structurally deficient bridge typically needs maintenance, repair, and eventual rehabilitation or replacement to address deficiencies. To remain open to traffic, structurally deficient bridges are often posted with reduced weight limits that restrict the gross weight of vehicles using the bridges. If unsafe conditions are identified during a physical inspection, the structure will be closed.

5.2.1.C LIFELINE UTILITY SYSTEMS

Lifeline utility systems are essential for the provision of basic services, such as heat, power, and potable water. These systems include the facilities and infrastructure related to: electric power, potable water, wastewater/storm water, natural gas, and oil.

Figure 5-8 through Figure 5-13 list the number and type of lifeline utility systems identified through the update process.

Figure 5-8: Transportation Systems[28] [26]

Owner	Description	Location	Replacement Value
	Houston County Airport	Caledonia	*
	CP RAIL; STR 46	La Crescent	*
	Shore Acres Railroad Bridge (Soo Line Railroad Over Mississippi River)	La Crescent	*
US	US Highway 14/61 # 288.407 miles	La Crescent	*
State of Minnesota	Trunk Highway # 26 285.910 miles	La Crescent Township	*
State of Minnesota	Trunk Highway # 44, 282.689 miles	Hokah	*
State of Minnesota	Trunk Highway 76 # 269.622 miles	Houston	*
State of Minnesota	Trunk Highway 76 # 270.509 miles	Houston Township	*

Figure 5-9: Lifeline Utility Systems – Electric Power[31]

Owner	Description	Location	Replacement Value
	Brownsville SubStation,	Brownsville	*
City of Caledonia	Caledonia Municipal Substation - Kruckow Ave.	597 Kruckow Ave., Caledonia	$282,600
	Caledonia SubStation	321 E Main St., Caledonia	*
City of Houston	Houston Substation	6369 Highway 76, Houston	*
City of La Crescent	La Crescent - Substation	La Crescent	*
City of Spring Grove	Spring Grove Substation	19444 Trunk Highway 63, Spring Grove	*
Tri-County Electric Coop.	Tri County Electric Coop - Substation #38 - Spring Grove	Spring Grove	*

**Unavailable*

Figure 5-10: Lifeline Utility Systems – Potable Water [32] [26]

Owner	Description	Location	Replacement Value
City of Brownsville		Brownsville	*
City of Caledonia	Caledonia Water Treatment Plant	Caledonia	*
	Watertower	231 E Main St., Caledonia	*
	Well # 2	Ramsey St., Caledonia	*
City of Eitzen	Well # 2	Eitzen	*
City of Hokah	Well #1	900 B St., Hokah	*
	Well # 2	Hokah	*
City of Houston	Well # 2	Houston	*
City of La Crescent	Albrecht Water Treatment Plant	La Crescent	*
	Well #2	La Crescent	*
	Well #3	La Crescent	*
	Well #4	La Crescent	*
City of Spring Grove	Water Treatment Plant	Spring Grove	*
	Wells # 4	Spring Grove	*

Figure 5-11: Lifeline Utility Systems – Wastewater/Stormwater [32] [26]

Owner	Description	Location	Replacement Value
City of Brownsville	Brownsville WWTP	402 Hamilton St., Brownsville	*
City of Caledonia	Caledonia Sewage Treatment	513 Old Highway Dr., Caledonia	*
	Miken Composites LLP	139 Bissen St., Caledonia	*
Houston County	Houston County Solid Waste	304 S Marshall St. # 202, Caledonia	*
City of Eitzen		Eitzen	*
City of Hokah	Hokah Disposal Plant	206 Railroad Trl., Hokah	*
	Hokah Waste Water Treatment	206 Railroad Trl., Hokah	*
City of Houston	Houston Disposal Plant	300 N Sheridan St., Houston	*
City of La Crescent	Brush/Debris	37 Main St., La Crescent	*
	La Crescent WWTP	517 S Chestnut St., La Crescent	*
City of Spring Grove	Disposal Plant	500 1st Ave. SW, Spring Grove	*

Figure 5-12: Lifeline Utility Systems – Natural Gas [26]

Owner	Description	Location	Replacement Value
Northern Natural Gas Company	Natural Gas Pipe Line	Diagonal between T101NR7W S and T104N R4 W	*

**Unavailable*

Figure 5-13: Lifeline Utility Systems – Oil[26]

Owner	Description	Location	Replacement Value
Adium	Gas Station	205 S Marshall St., Caledonia	$73,800
B & M Services	Gas Station	128 N Kingston St., Caledonia	$94,000
Kwik Trip	Gas Station	110 N Sunset Blvd., Caledonia	$347,300
Sinclair	Gas Station	304 S Highway 44/76, Caledonia	*
BP	Gas Station	801 E Cedar St., Houston	*
Cenex	Gas Station	103 E Cedar St., Houston	$146,500
Cenex	Gas Station	113 Main St., Hokah	*
Kwik Trip	Gas Station	477 N Mill St., Hokah	*
Kwik Trip	Gas Station	216 N 4th St., La Crescent	*
Kwik Trip	Gas Station	319 S 3rd St., La Crescent	$46,100
Sinclair	Gas Station	301 Kistler Dr., La Crescent	$513,300
BP	Gas Station	118 W Main St., Spring Grove	*
Kwik Trip	Gas Station	142 W Main St., Spring Grove	*

5.2.1.D HIGH POTENTIAL LOSS FACILITIES

High potential loss facilities are facilities that would have a potentially high loss associated with them in the event of a hazard event. Examples of these systems include dams, military installations, and nuclear power plants (see Figures 5-14 and 5-16).

Figure 5-14: High Potential Loss Facilities – Dams[25]

Dam Name	Owner	Dam Type	Location	NID Storage
Bear Creek Site 8	SWCD of Root River	Earth	*	51
Ledebuhr	Ledebuhr, Larry	Earth	*	73
Winnebago 35B	-	Earth	*	76
Wilmington 3	Stoltz, Rosie	Earth	Winnebago Creek	103
Baumgartner Group Pond	Eldor, Jack	Earth	Brush Valley Creek-Trib	27
Bennet Group Pond	Bennet, James	Earth	Root River-Trib	35
Fitting Bros Fish Pond	Fitting Bros	Earth	Root River-Offstream Trib	25
Thorson Group West	MNDNR-Forestry	Earth	Root River South Fork-Trib	104
Crooked Creek S-3	WD of Crooked Creek	Earth	Crooked Creek South Fork	288
Spring Grove Group Structure	Morken, E.	-	Iowa River Upper-Trib	75
Bear Creet Site 13	Vickerman, Curtis	Earth	Iowa River Upper-Offstream	120
Crooked Creek S1-B	WD of Crooked Creek	Earth	Crooked Creek N Fork-Trib	50
Frauenkron Detention	Frauenkron, Aryln	-	Money Creek-Trib	23
Schechs Mill	Krugmar, Ivan	Gravity	Beaver Creek East	50
Crooked Creek R-1	WD of Crooked Creek & Wohlers	Earth	Crooked Creek N Fork-Trib	307.5
Crooked Creek R-3	WD of Crooked Creek	Earth	Crooked Creek South Fork	1202
Feldmeier Detention	Feldmeier, Wayne	Earth	Root River-Off Stream	20
Crooked Creek R-2	WD of Crooked Creek	Earth	Crooked Creek-Trib	314
Bear Creek Site 3	SWCD of Root River	Earth	*	25
Bear Creek Site 17	SWCD of Root River	Earth	*	118
Thorson Group North	MNDNR-Forestry	Earth	Root River South Fork-Trib	490
Crooked Creek R-4	WD of Crooked Creek	Gravity	Crooked Creek-Trib	450

Figure 5-14: High Potential Loss Facilities – Dams[25] *(con't)*

Dam Name	Owner	Dam Type	Location	NID Storage
Pollema Pond	Pollema, James	Earth	Root River-Offstream Trib	20
Richards Group Pond	Richards, Robert	Earth	Crooked Creek-Offstream	35
Crooked Creek R-1	Crooked Creek SWCD	Earth	Tr-Crooked Creek N Fork	307.5
Rauk Detention	Rauk, Karl	Earth	Pine Creek-Trib	22

Figure 5-15: High Potential Loss Facilities - Levee

System Name	Sponsor(s)	Length (Miles)	Inspection Date	Inspection Rating
Root River - Houston	City Of Houston	2.35	5-Aug-15	Minimally Acceptable

Figure 5-16: High Potential Loss Facilities – Other

Owner	Location	Replacement Value
City Hall and Fire Station	202 E Main St., Eitzen	*
Community Center	207 E Main St., Eitzen	*
Red's IGA	MN-44, Spring Grove	*
Spring Grove Communication Coop	166 W Main St., Spring Grove	$20,000

**Unavailable*

5.2.1.E HAZARDOUS MATERIAL FACILITIES

Hazardous material facilities contain substances that are toxic and which pose a threat to human safety and the environment. These hazardous materials include: corrosives, explosives, flammable materials, radioactive materials, and toxins. The Minnesota Pollution Control Agency (MPCA) keeps a database of potentially contaminated sites and sites where pollution control permits have been issued. Figure 5-17 depicts MPCA data for Houston County, including active and inactive sites. The MPCA includes a total of 1,185 sites; 807 that are active and 378 that are inactive.

Figure 5-17: MPCA Contaminated Sites and Environmental Permits[33]

Activity	Description	Active	Inactive
Air Permit	Issued for businesses that create air pollutants typically generated through industrial activities. For example: fine particles, ozone, mercury, etc.	9	0
CERCLIS Site	The federal Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) is a database of sites that are suspected to be contaminated and are undergoing further investigation.	1	1
Construction Stormwater Permit	Issued to construction site owners/operators. Designed to prevent polluted stormwater from reaching lakes, streams and wetlands.	0	0
Construction Stormwater Site Subdivision	Sites where a construction project with an existing stormwater permit has been subdivided into smaller parcels.	51	90
Feedlot	Sites where animals are confined for feeding, breeding, or holding. Ranges from small farms to large-scale commercial livestock operations.	534	57
Hazardous Waste (Small to Minimal Quantity Generator)	Generates less than 2,200 pounds of hazardous waste, or 2.2 pounds of acutely hazardous waste, per calendar month.	78	116
Industrial Stormwater Permit	Issued to industrial site owner/operators. Designed to prevent polluted stormwater from reaching lakes, streams and wetlands. Pollutants may include: toxic metals, oil, grease, de-icing salts, etc.	21	7

Figure 5-17: MPCA Contaminated Sites and Environmental Permits[33] *(con't)*

Activity	Description	Active	Inactive
Landfill, Permitted By Rule	Landfills that have a small capacity and/or operate for a short period of time that are not required to obtain an individual solid waste permit. For example: yard waste composting facilities, recycling facilities, and energy recovery facilities.	1	2
Leak Site	Locations where a release of petroleum products has occurred from a tank system.	30	37
Tank Site	Sites with a storage tank on the premises. For example: gas stations, bus & trucking companies, factories that process sugar beets, ethanol, pulp, paper, or chemicals, etc.	66	51
Unpermitted Dump Site	Landfills that never held a valid MPCA permit. Generally these dumps existed prior to permitting requirements (pre-1967) and were old farm/municipal disposal sites.	1	11
Voluntary Investigation & Cleanup (VIC) Site	Non-petroleum brownfield sites that are part of the VIC technical assistance program.	0	2
Wastewater Discharger	Facilities that generates or treats wastewater for discharge onto land or into water. Includes: sewage treatment plants and some manufacturers.	15	4

5.2.2 SPECIAL CONSIDERATIONS

5.2.2.A ECONOMIC ELEMENTS

Economic elements are the facilities that impact the welfare and stability of the local and/or regional economy. These elements include major employers and financial institutions. Figure 5-18 and Figure 5-19 list the number and type of economic elements identified through the update process.

Figure 5-18: Financial Institutions[26]

Name	Location	Replacement Value
Bank of the West - Caledonia Branch	124 E Grove St., Caledonia	$341,300
Eitzen State Bank- Caledonia	115 N Highway 44/76, Caledonia	$143,100
Merchants Bank NA, Caledonia	115 W Washington St., Caledonia	$574,700
Eitzen State Bank- Eitzen Office	108 Iowa Ave., Eitzen	$274,700
Eastwood Bank - Houston Branch	108 E Cedar St., Houston	$155,900
Rushford State Bank Houston Office	119 E Cedar St., Houston	$189,200
Security State Bank of Lewiston - Hokah Branch	100 Main St., Hokah	$59,700
Altra Federal Credit Union	205 N Chestnut, Ste. 102, La Crescent	$498,200
Home Federal Savings Bank	208 S Walnut St., La Crescent	$332,600
Merchants Bank, NA - La Crescent	316 Main Street, La Crescent	$1,195,500
State Bank Financial - La Crescent Branch	109 S Walnut St., La Crescent	$933,100
Merchants Bank NA	126 W Main St., Spring Grove	$117,500

Figure 5-19: Major Employers[34]

Employer	Location	Industry	Employees	Annual Sales ($1,000)	Replacement Value
Caledonia Care & Rehab	425 N Badger St., Caledonia	Nursing Care Facilities (Skilled Nursing Fclts)	100 to 249	$2.5-5 Million	$1,459,200
Caledonia Elementary School	511 W Main St., Caledonia	Elementary & Secondary Schools	50 to 99		$2,664,700

**Unavailable*

Figure 5-19: Major Employers[34] *(con't)*

Employer	Location	Industry	Employees	Annual Sales ($1,000)	Replacement Value
Caledonia Haulers Inc	420 W Lincoln St., Caledonia	Specialized Freight (Exc Used Gds) Trckng Lng-Dist	100 to 249	$20-50 Million	$282,100
Caledonia Public Schools Dist	511 W Main St., Caledonia	Elementary & Secondary Schools	100 to 249	*	$2,664,700
Houston County Personnel Dept	304 S Marshall Ste. # 20, Caledonia	Legislative Bodies	100 to 249	*	$15,775,800
Miken Sports	131 Bissen St., Caledonia	All Other Miscellaneous Manufacturing	100 to 249	$10-20 Million	*
Quillin's IGA	510 Vista Dr., Caledonia	Supermarkets/ Other Grocery (Exc Convenience) Strs	50 to 99	$10-20 Million	*
Sno-Pac Foods Inc	521 Enterprise Dr., Caledonia	Fresh Fruit & Vegetable Merchant Wholesalers	50 to 99	$100-500 Million	$1,525,700
Bluff Country meats	106 W Main St., Eitzen	Butchers	1 to 4	% 500,000-$1 million	$40,100
Eitzen State Bank	108 Iowa Ave., Eitzen	State Commercial Banks	10 to 19	$2.5 to $5 million	$274,700
ESR Mods	101 Iowa Ave. S, Eitzen	Machine Shop	1 to 4	$500,000	$164,300
Fetketter Hollow Restaurant	400 E Main St., Eitzen	Food Service	*	*	$70,600
Gators Bar/Grill	300 E Main St., Eitzen	Bars	4	$120,000	$63,600
Hammel Equipment	300 Iowa Ave. S, Eitzen	Farm Equipment & Supplies	5 to 9	$10-20 million	$106,400
Wiebke Fur Co. Inc.	218 Portland Ave., Eitzen	Raw Furs	1 to 4	$ 500,000-$1 million	$196,200
Hokah Cooperative Oil Association	113 Main St., Hokah	Gasoline	*	*	*
Kwik Trip	477 N Mill St., Hokah	Gas Station	12	$2,861,000	*
Acentek	207 E Cedar St., Houston	Wired Telecommunications Carriers	50 to 99	$20-50 Million	*
Ace Telephone Assoc	207 E Cedar St., Houston	Data Processing, Hosting & Related Services	100 to 249	$10-20 Million	$1,422,300
Best Way Promotions	200 Westgate Dr., Houston	Fastener, Button, Needle & Pin Manufacturing	50 to 99	$5-10 Million	$327,300
Houston Elementary School	310 S Sherman St., Houston	Elementary & Secondary Schools	50 to 99	*	$852,300
Valley View Health Care-Rehab	510 E Cedar St., Houston	Nursing Care Facilities (Skilled Nursing Fclts)	50 to 99	$2.5-5 Million	*

**Unavailable*

Figure 5-19: Major Employers[34] *(con't)*

Employer	Location	Industry	Employees	Annual Sales ($1,000)	Replacement Value
ABLE Inc	1700 Lancer Blvd. #120, La Crescent	Other Social Advocacy Organizations	50 to 99	*	*
Crest Precast Concrete	615 S Chestnut St., La Crescent	Other Concrete Product Manufacturing	50 to 99	$5-10 Million	*
Golden Living Ctr	101 S Hill St., La Crescent	Offices-Physical, Occptnl/Speech Thrpsts/Audlgsts	50 to 99	$2.5-5 Million	$550,600
La Crescent-Hokah District 300	703 S 11th St., La Crescent	Elementary & Secondary Schools	50 to 99	*	*
La Crescent-Hokah Public School	1301 Lancer Blvd., La Crescent	Elementary & Secondary Schools	100 to 249	*	*
Truss Specialists Inc	500 Sycamore St., La Crescent	Truss Manufacturing	100 to 249	$20-50 Million	*
Wieser Brothers Gen Contr Inc	200 Twilite St., La Crescent	New Single-Family Hsng Constr (Exc For-Sale Bldrs)	50 to 99	$20-50 Million	$973,400
Northern Engraving	202 4th Ave. NE, Spring Grove	All Other Miscellaneous Manufacturing	50 to 99	$10-20 Million	$220,800
Spring Grove Elementary School	113 2nd Ave. NW, Spring Grove	Elementary & Secondary Schools	50 to 99	*	*
Spring Grove Public School	113 2nd Ave. NW, Spring Grove	Elementary & Secondary Schools	50 to 99	*	*
Tweeten Lutheran Healthcare	125 5th Ave. SE, Spring Grove	Nursing Care Facilities (Skilled Nursing Fclts)	50 to 99	$5-10 Million	$3,490,600

5.2.2.B HISTORICAL, CULTURAL, AND NATURAL RESOURCE AREAS

Community elements in this category are important for their historical and/or cultural significance and natural resources. There are a variety of parks within the county. These facilities are summarized in Figure 5-20.

Figure 5-20: Historical, Cultural, and Natural Resource Areas – Parks[35]

Owner	Park Name	Location	Replacement Value
Army Corps of Engineers	Wildcat Landing & Campground	11011 State Hwy. 26, Brownsville	*
Brownsville	Church of the Holy Comforter-Episcopal	Main St., Brownsville	*
	Soft Ball Park & Shelter	800 Bennent St., Brownsville	*
Caledonia	Caledonia Commercial Historic District	101-205 E Main St. and 101-108 S Kingston St., Caledonia	$129,700
		204 and 224 W Main St., Caledonia	$205,800
	Houston County Courthouse and Jail	304 Marshall St. S, Caledonia	$15,775,800
	Ma Cal Grove Country Club	15939 State Hwy. 76, Caledonia	*
	Schech Mill	Off County Rd. 10, Caledonia	$219,200
	Spafford Williams Hotel	East Main at North Marshall, Caledonia	*

**Unavailable*

Figure 5-20: Historical, Cultural, and Natural Resource Areas – Parks[35] *(con't)*

Owner	Park Name	Location	Replacement Value
Eitzen	Christian Bunge, Jr. Store	Iowa Avenue At Main St., Eitzen	*
	Eitzen Community Park/Community Center	Eitzen	*
	Eitzen Stone Barn	South of Eitzen	*
	Johnson Mill	County Rds. 5 and 23, Eitzen	*
	Portland Prairie Methodist Episcopal Church	Off Minnesota Hwy., Eitzen	*
Houston	Cushon's Peak Campground	18696 State Hwy. 16, Houston	*
	Houston Nature Center	215 W Plum St., Houston	*
	Money Creek Haven, Inc.	18502 County Rd. 26, Houston	$504,600
	Valley High Golf Club	9203 Mound Prairie Dr., Houston	$656,400
Houston County	Houston County Courthouse/Jail	304 S Marshall St., Caledonia	*
Hokah	Como Falls Park	Main St., Hokah	*
	Hokah Municipal Building	57 Main St., Hokah	$294,700
	Veterans Ball Park	1st St., Hokah	*
	Veterans Memorial Park	400 Ash St., Hokah	*
Jefferson Township	Jefferson Grain Warehouse	Off Minnesota Highway, Jefferson Township	*
La Crescent	Abnet Field	La Crescent	*
	Daniel Cameron House	429-435 S 7th St, La Crescent	*
	Eagles Bluff Park	Red Apple Dr., La Crescent	*
	Harris Park	County Rd. 26, La Crescent	*
	Kistler Park	S Hill St., La Crescent	*
	Old Hickory Park	1200 Jonathon Ln., La Crescent	*
	Pine Creek Golf Course	3815 N Pine Creek Rd., La Crescent	*
	Vetsch Park	N 2nd St., La Crescent	*
Minnesota Department of Natural Resources	Beaver Creek Valley State Park	15954 County Rd. 1, Caledonia	*
	Chisholm Valley Wildlife Management Area	T103 R7 S4	*
	Ferndale Ridge Wildlife Management Area	T104 R7 S32	*
	Mound Prairie Wildlife Management Area	T104 R5 S27	*
	Root River Wildlife Management Area-Main Unit	T104 R4 S31	*
	Winnebago Creek Wildlife Management Area	T101 R4 S28	*
Spring Grove	Fest building/Park	110 N Division Ave., Spring Grove	$143,400
	Roverud (Nature Park)	1st St. SW, Spring Grove	*
	Swim Center	600 Maple Dr. Spring Grove	*
	Supersaw Valley Campground	22885 County Rd. 19, Spring Grove	*
	Trollskogen (Recreation Park)	3rd Ave. SW, Spring Grove	*

**Unavailable*

The structures within the county that are listed in Figure 5-21 are on the National Register of Historic Places.

Figure 5-21: Historic Structures[35]

Name	Address	Replacement Value
Bridge No. L4013	Twp. Rd. 126 over Riceford Creek, Black Hammer Twp.	*
Yucatan Fort Site	Black Hammer Township	*
Church of the Holy Comforter--Episcopal	Main St., Brownsville	*
Caledonia Commercial Historic District	101--205 E Main St. and 101--108 S. Kingston St., Caledonia	*
Houston County Courthouse and Jail	304 S Marshall St., Caledonia	*
Sprague, David R. and Ellsworth A., Houses	204 and 224 W Main St., Caledonia	*
Williams, Spafford, Hotel	E Main St. at N Marshall St., Caledonia	*
Schech Mill	Off CR 10 in Beaver Creek Valley State Park, Caledonia Township	*
Bunge, Christian, Jr., Store	Iowa Ave. at Main St., Eitzen	*
Jefferson Grain Warehouse	Off MN 26, Jefferson Township	*
Cameron, Daniel, House	429--435 S 7th St., La Crescent	*
Bridge No. 6679	MN 76 over S Fork of Root River, Sheldon Township	*
Eitzen Stone Barn	Iowa Ave., Winnebago Township	*
Johnson Mill	CR 5 and 23, Winnebago Township	*
Portland Prairie Methodist Episcopal Church	Off MN 76, Winnebago Township	*

**Unavailable*

5.2.2.C VULNERABLE POPULATIONS

Vulnerable populations are those citizens and residents that may require special assistance after a hazard event. These populations include children, elderly, and non-English speaking persons. Figure 5-22 lists the number and type of vulnerable populations identified through the update process.

There are currently five nursing homes and five assisted living facilities in the county. These facilities are listed in Figure 5-23 and Figure 5-24.

Figure 5-22: Vulnerable Populations[21 36]

Population Type	Population Number	Percent of Total Population
Children	5,328	28.0%
Elderly*	3,307	17.04%
Non-English Speaking**	385	2.2%

**Persons age 65 and older*

***Refers to those categorized by the U.S. Census Bureau as able to speak English "less than well"*

Figure 5-23: Nursing Homes[36]

Facility Name	Number of Beds	Location	Replacement Value
Caledonia Care and Rehabilitation Center	50	425 North Badger St., Caledonia	$1,459,200
Valley View Nursing Home	45	510 East Cedar St., Houston	$1,525,700
Golden Living Center-La Crescent	45	101 South Hill St., La Crescent	$550,600
Tweeten Lutheran Health Care Center	50	125 5th Avenue Southeast, Spring Grove	$3,490,600

Figure 5-24: Assisted Living Facilities[35]

Facility Name	Location	Replacement Value
Caledonia Care and Rehab Buck	425 North Badger St., Caledonia	$1,459,200
Roseview Court Care Agency	425 North Badger St., Caledonia	*
Heritage Court	110 Henderson St. Houston	*
Claddagh House Inc.	333 South 2nd St. La Crescent	$92,700
Spring Grove Assisted Liv LLC	130 5th Avenue SE, Spring Grove	$885,700

**Unavailable*

5.2.3 REPLACEMENT COSTS

Data from the Houston County Assessor's Office indicates that there are 15,985 property parcels in the county. Of this total, 9,120 parcels are improved. The estimated market value of all land, improved and unimproved, is slightly greater than $2.4 billion. A breakdown of the property parcels and their estimated market values is provided in Figure 5-25.

Figure 5-25: Parcel Data

Total Parcels	**15,985**
Parcels with Improvements	9,120
Parcels with Mobile Homes	224
Parcels without Improvements	6,865
Total EMV* of Parcels	**$2,466,093,400**
EMV* of Land Only	$1,452,921,700
EMV* of Buildings Only	$1,013,171,700

**Estimated Market Value*

5.2.4 FUTURE ASSETS & INFRASTRUCTURE

Houston County and the participating cities will continue to utilize their respective governing policy and planning documents in order to mitigate the impact of hazards on future assets and infrastructure. State governing agencies, such as the Minnesota Department of Health, Minnesota Department of Transportation, and the Minnesota Department of Natural Resources will be contacted when appropriate.

As part of the development review process, future assets and infrastructure will be evaluated for the hazards identified in this plan in the context of the hazard's geographic location. Hazards which have no specific geographic location, as identified in the hazard profile sections of this document, will not be considered. All future assets and infrastructure will be evaluated for hazard concerns as appropriate on a case by case basis.

5.2.5 LAND USES & DEVELOPMENT TRENDS

The geographic location of hazards, as identified in the hazard profile sections, will be considered for future land use and development trends. Content from the Houston County All-Hazard Mitigation Plan will be incorporated into local governing policy and planning documents as appropriate. If the local governing policy and planning documents incorporate content from this plan, the impact of hazards on land use and development should be mitigated.

SECTION 6: HAZARD PROFILES

6.1 IDENTIFYING HAZARDS

The following sections provide insight into hazards which can potentially occur within Houston County. The hazards which are profiled were selected based upon the planning process discussed in Section 5.1. Figure 6-1 lists the hazards from the 2009 plan and those included in the 2015 update.

Each hazard profile contains the following sections:

- Definition & Background
- Previous Occurrences
- FEMA Declared Disasters
- Geographic Location
- Hazard Extent
- Vulnerability Analysis

Figure 6-1: Hazards 2009 Plan vs. 2015 Update

Hazards in 2009 Plan	Hazards in 2015 Update
Natural Hazards • Drought • Excessive Heat • Fire (Wildfire) • Flooding • Fog • Hail • Land Subsidence and Sinkholes • Landslide • Lightning • Tornado • Wind • Severe Winter Storms – Blizzard, Extreme Cold, Ice Storm **Technological Hazards** • Fire • Hazardous Materials • Infectious Disease Outbreak • Infrastructure • Nuclear Storage Facility • Terrorism • Water Supply Contamination	**Flooding** **Drought** **Land Subsidence, Landslides and Sinkholes** **Fire** • Structural Fire • Wildfire **Summer Storms** • Fog • Extreme Temperatures • Wind Events • Hail • Tornado • Lightning **Winter Storms** • Extreme Temperatures • Wind Events • Blizzards • Ice Storms **Hazardous Materials** • Fixed Events • Transportation Related Events • Nuclear Storage Facility **Essential Services Failure** • Dam/Levee Failure • Wastewater Treatment Failure • Water Supply Contamination **Human and Animal Related Hazards** • Terrorism • Infectious Disease Outbreak • Animal Disease Outbreak

6.1.1 FLOOD

6.1.1.A DEFINITION & BACKGROUND

In general, flooding occurs when land is temporarily submerged due to an excess accumulation of water. According to the Federal Interagency Floodplain Management Task Force, flooding in the United States can be divided into several categories, including: riverine floods, flash floods, alluvial fan floods, ice-jam floods, dam-break floods, local drainage floods, high groundwater floods, fluctuating lake level floods, coastal floods, debris flows, and subsidence[37]. In Minnesota, the most common types of flooding are riverine, flash, and local drainage[38].

Riverine Flooding

Riverine flooding, also known as overbank or downstream flooding, is the most common type of flood. It occurs when a stream or river overflows its banks and inundates the surrounding floodplain. These floods tend to be large scale events caused by prolonged precipitation over a wide area. Floodwaters typically move and rise slowly, and remain relatively shallow. Because it takes time for the water in the tributaries to reach a major river, there is usually time to warn those within the flood path downstream. This type of flooding is common in spring and summer and can be compounded by rapid snow melt and/or frozen ground.

Flash Flooding

Flash flooding, also known as upstream flooding, involves a rapid surge of rising floodwaters into a normally dry area. Flash floods can also occur when the water level of a stream or creek rapidly rises above a predetermined water level. These floods tend to be localized events that begin within six hours of the causative event and typically last less than one day; flash floods do not last for two or three consecutive days[39]. The Minnesota Climatology Working Group defines flash flooding as an event in which six inches of rain or more falls within a 24 hour period[40]. Flash floods are typically caused by abnormally heavy rainfall over a small area; however, flash floods can be caused by any sudden release of a large amount of water (e.g. ice dams, dam, and levee failures). In a flash flood, the floodwaters move and rise quickly, and can become dangerously deep. Due to the speed of flash flooding, there is often little to no warning time for those within the flood path. Flash floods are most common in spring and summer, but can occur at any time. Like riverine floods, flash floods can also be complicated by frozen ground.

Local Drainage Flooding

Local drainage flooding is similar to flash flooding, but is primarily the result of overwhelmed, or inadequate infrastructure. This type of flooding typically occurs away from delineated floodplains and recognized drainage channels. Rather, they are common in upstream areas that are flat and urbanized. In such areas the ground's natural ability to accommodate excess water is affected by large areas of impervious materials (e.g. parking lots, roads, sidewalks, rooftops). These impervious surfaces inhibit infiltration and increase surface runoff. When these factors are combined with heavy precipitation and inadequate facilities for storm water conveyance, a community's drainage system can become quickly overwhelmed. Excess water then begins to pond in low lying areas. These ponds then grow larger, eventually flooding the surrounding vicinity.

Between 1980 and 2011, there were 21 flood events in the United States that caused over $1 billion in damages[43]. In total, these events caused $103.7 billion in total losses and claimed 583 lives. According to the National Climatic Data Center, these events were primarily riverine floods caused by rapid snowmelt and/or heavy precipitation. Although they are relatively shallow and slow moving, riverine floods produce widespread and costly destruction. Just a few inches of floodwaters can damage homes, drown crops, and impact economic activity. On average, riverine flooding causes more than $2 billion in losses each year.

By comparison, flash floods inflict damage on a more localized scale. This tends to limit the total amount of destruction caused by any singular event. Due to the violent nature of flash floods however, the damage to the flooded area is often more severe than what may occur during a riverine flood. In areas with steep

hills or deep gullies, flash floods can produce walls of water 10 to 20 feet high or higher. The destructive force of the water can roll boulders, uproot trees, topple buildings, and wash out bridges. Flash floods tend to collect and carry large quantities of debris, which increases the floodwaters' destructive potential.

Flooding is the number two weather related killer in the United States. Flooding kills an average of 71 people per year (average from 2005-2014)[44]. Nearly half of all flood deaths are automobile-related[45]. Due to people mistakenly thinking they can drive their vehicles across a flooded portion of a roadway. The National Weather Service attributes these deaths to people underestimating the force and power of floodwaters – six inches of water can knock a grown person off their feet, two feet of water can wash away most automobiles. To aid in the prevention of flood related deaths, the National Weather Service issues flood watches and warnings (see Figure 6-2).

Figure 6-2: National Weather Service Flood Alerts[46]

Flash Flood/Flood Watch	Flash flooding or flooding is possible within the designated watch area.
Flash Flood/Flood Warning	Flash flooding or flooding has been reported or is imminent.
Urban/Small Stream Advisory	Flooding of small streams, streets, and low-lying areas (such as railroad underpasses and urban storm drains) is occurring.

Relationship to other Hazards

Flooding is usually associated with heavy precipitation during summer storms. However, it can also be caused by unusually heavy snowfall during the winter season that then melts when spring arrives. Infrastructure failure can also cause flooding, for example a dam or artificial levee failure. Wildfires can increase the speed of flooding by removing ground vegetation that would otherwise have slowed the flow of floodwaters. The danger from flooding can be compounded when floodwaters breach facilities that contain hazardous materials. Once contaminated, the floodwaters can spread the hazardous materials over large areas. Flooding also poses a risk to groundwater by potentially contaminating wells within the flooded area.

6.1.1.B PREVIOUS OCCURRENCES

NCDC records show seven flood damaging events within Houston County which resulted in costly damages to property and crops. There have been two recorded deaths due to flooding in the county (see Figure 6-3). A full listing of reported events can be found in Appendix 9.8.

Figure 6-3: Flooding & Heavy Rain Events (NCDC)[24]

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
6/22/2013	Flash Flood	0	0	$7,100,000	$700,000
6/23/2010	Flash Flood	0	0	$4,000	$0
7/16/2008	Flash Flood	0	0	$5,000	$0
6/9/2008	Flood/Flash Flood	0	0	$9,020,000	$7,025,000
8/21/2007	Flash Flood	0	0	$1,000	$0
8/19/2007	Flood/Flash Flood	32	2	$38,350,000	$2,370,000
9/13/2005	Flash Flood	0	0	$5,000	$8,000
5/1/2001	Flood	0	0	$1,400,000	$0
4/12/2001	Flood	0	0	$1,000,000	$0
4/6/2001	Flood	0	0	$50,000	$0
7/11/2000	Flood/Flash Flood	0	0	$105,000	$195,000
6/1/2000	Flash Flood	0	0	$1,230,000	$340,000
8/9/1998	Flash Flood	0	0	$35,000	$40,000
	TOTAL	32	2	$58,305,000	$10,678,000

6.1.1.C FEMA DECLARED DISASTERS

There have been twelve federally declared disasters related to flooding in Houston County (see Figure 6-4)[9].

Figure 6-4: Flood Hazard Disaster Declarations (1953-2011)

Declaration Number	Date of Incident	Date of Declaration	Disaster Dollars	Description	President	Type of Assistance
DR-4131	6/20/2013	07/25/2013	$14,074,707.38	Severe Storms, Straight-line Winds, and Flooding	Obama	Public
DR-1921	6/17/2010	7/2/2010	$13,457,306.95	Severe Storms, Tornadoes, and Flooding	Obama	Public
DR-1772	6/6/2008	6/25/2008	$6,361,368.91	Severe Storms and Flooding	Bush	Public
DR-1717	8/18/2007	8/23/2007	$31,229,991.27	Severe Storms and Flooding	Bush	Public and Individual
DR-1370	3/23/2001	5/16/2001	$36,227,572.27	Flooding	Bush	Public and Individual
DR-1333	5/17/2000	6/27/2000	$11,738,303.73	Severe Storms, Flooding and Tornadoes	Clinton	Public and Individual
DR-1175	3/21/1997	4/8/1997	*	Severe Storms/Flooding	Clinton	Public and Individual
DR-993	5/6/1993	6/11/1993	*	Flooding, Severe Storm, Tornadoes	Clinton	Public and Individual
DR-560	7/8/1978	7/8/1978	*	Severe Storms, Tornadoes, Hail, Flooding	Carter	Public and Individual
DR-446	7/13/1974	7/13/1974	*	Severe Storms, Flooding	Nixon	Public and Individual
DR-255	4/18/1969	4/18/1969	*	Flooding	Nixon	Public and Individual
DR-188	4/11/1965	4/11/1965	*	Flooding	Johnson	Public and Individual

**Not listed*

6.1.1.D GEOGRAPHIC LOCATION

The location of flooding activity is dependent on the type of flood. Sudden and extensive rainfall can create standing water in almost any location if drainage is inadequate. HAZUS-MH was used to estimate the 100 year flood boundary. The 100 year flood boundary displays the geographic location of a 100 year flood in relation to the existing land uses. According to the HAZUS-MH analysis, flooding is not prevalent in the cities, but agricultural and transportation infrastructure could potentially be impacted depending on the type of flood.

6.1.1.E HAZARD EXTENT

The extent of flooding depends upon climate (e.g. yearly precipitation levels and likelihood of heavy rainfall events), local land use characteristics, and the size and topography of the contributing watershed.

6.1.1.F VULNERABILITY ANALYSIS

Hazards USA Multi-Hazard (Hazus-MH)

As part of a county flood mitigation strategy, Region Nine recommends Houston County utilize the FEMA created software Hazards USA Multi-Hazard (Hazus-MH) to conduct a flood vulnerability analysis. The software is a disaster risk assessment tool, which HSEM has determined is an integral part of Minnesota's risk assessment process. Hazus-MH can help Houston County communities estimate losses resulting from floods and other related disasters.

According to Houston County, there have been no recorded mitigation projects with public funding.

6.1.2 DROUGHT

6.1.2.A DEFINITION & BACKGROUND

A drought is a complex natural hazard typically defined as a prolonged period of uncharacteristically dry weather that is severe enough to cause a serious hydrologic imbalance[47]. Droughts can be problematic to define precisely, because what constitutes a deficiency in precipitation varies from region to region (drought conditions in Minnesota are very different from drought conditions in Texas). Long-term regional norms in precipitation, temperature, soil moisture, stream flow, lake levels, and water consumption are compared to recent measurements in an attempt to identify and predict droughts. Additionally, the onset and termination of drought conditions can be difficult to pinpoint. Weather events like tornadoes and blizzards occur over a period of hours or days; however, a drought can last from several weeks to several decades[48].

The severity of a drought can differ wildly depending on duration, location, and intensity. Regional water supply demands also heavily influence a drought's overall environmental and economic impact. Unfortunately, droughts are often exacerbated by human activities (e.g. the overuse of water resources through agricultural, industrial, and/or residential consumption). Other weather events, such as heat waves or windstorms, can also increase the severity and impact of a drought immensely. The standard classification system for droughts is given in Figure 6-5.

Figure 6-5: Drought Classification Scheme[49]

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested.
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed.
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions.
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.

Droughts can have a variety of impacts. Some are felt in a relatively short period of time, while others may take much longer to become noticeable. For example, after a few weeks without rain vegetation may begin to show signs of stress; however, it may take months for a drought's effects on groundwater to become fully evident. Conversely, vegetation may return to health shortly after a substantial rainfall, while it takes much longer for groundwater to be replenished. Short term droughts last less than six months and can have direct impacts on agriculture and other human activities (e.g. recreation & industry). Long term droughts last longer than six months, reflect a serious hydrological imbalance, and can have severe ecological, economic, and social consequences[49].

The economic impacts of droughts can be enormous. Between 1980 and 2011 there were 16 droughts in the United States that caused over $1 billion dollars in damage each[50]. Cumulatively these 16 events cost an estimated $200.45 billion. Most of the damage was associated with crop and livestock losses. Droughts ho also significantly impact the productivity of certain water dependent industries, such as mining and chemical manufacturing. Other industries are dependent on water to transport goods and materials (e.g. the shipping of commodities via river barges). While crop insurance helps to mitigate the impacts of droughts on the economy, the economic repercussions can last for years.

Droughts can also have considerable social impacts. In the 1930's a series of severe droughts, known as the Dust Bowl, decimated much of the central Great Plains. The Dust Bowl resulted in the largest migration in United States history[51]. By 1940, approximately 2.5 million refugees (25% of the regional population) had

left the plains to seek work elsewhere. Most had either abandoned their farms or were evicted. The social upheaval that resulted from the Dust Bowl is a potent example of how droughts can impact the fabric of American society.

Relationship to other Hazards

Droughts can increase an area's susceptibility to wildfire by increasing the amount of dry vegetative fuel. Vegetation weakened by a lack of sufficient moisture may also be more susceptible to attack by diseases and invasive species. Prolonged drought can result in the loss of vegetation, thereby increasing the risk of erosion during heavy rainfall and flood events.

6.1.2.B PREVIOUS OCCURRENCES

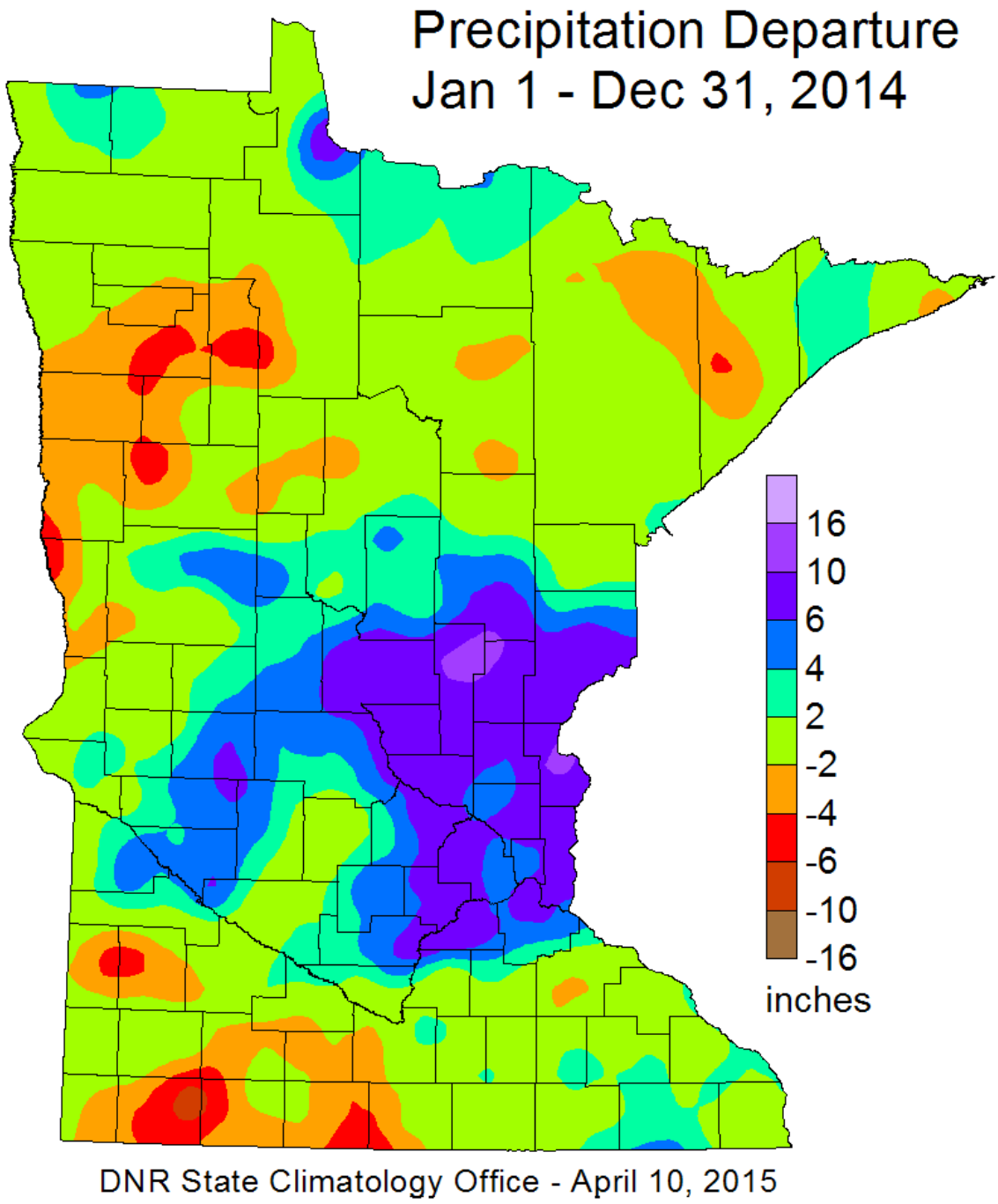
The 2011 Minnesota All-Hazard Mitigation Plan Update and the Minnesota Climatology Working Group identified the droughts in Figure 6-8 as having impacted the Houston County[52].

The DNR's Division of Ecological and Water Resources notes that between January 1st, 2014 and December of 2014, Houston County had an average departure from normal precipitation of between -2 to 6 inches (see Figure 6-6 and 6-7)[53].

Figure 6-6: Droughts Impacting Houston County[52]

Date	Location	Description
September 2011 – June 2013	Statewide	Beginning in August of 2011, Houston County had witnessed a nearly continuous departure from normal precipitation. This period was actually comprised of two drought events; dry conditions ceased briefly during the spring of 2012. From October 2011 to May 2012 the majority of the county was considered to be in a severe drought. By June 2013 conditions within the county had returned to normal.
July 2003 – October 2003	Multiple, south central, southeastern and west-central Minnesota	A persistent weather pattern resulted in extremely dry weather across Minnesota. Few widespread rain events moved through the state during the interval, and precipitation totals were less than six inches across much of Minnesota. During this three month period, rainfall totals rank among the lowest on record for many areas of south central and southeastern Minnesota, and a small portion of west central Minnesota.
1987-1989	Statewide	Established new "average low precipitation" and "average high temperature" records. Farmers lost most, if not all, of the year's crop. Drought also affected power production, the forest products industry, public water supplies and fish and wildlife dependent on adequate surface water. Mississippi River flow levels threatened to drop below the Minneapolis Water Works intake pipes.
1976-1977	Statewide	Began in 1974 in parts of south-central and western MN. Most severely affected areas were the Otter Tail and Lac Qui Parle River basins. Dry conditions caused lower water levels in wells and caused record low stream flows throughout the state. Late summer forest fires broke out and conflicts arose between domestic well owners and neighboring high capacity well owners.
1931-1942	Statewide	Intensity and duration differed locally.
1911-1914	Statewide	Intensity and duration differed locally.

Figure 6-7: Total Departure from Normal Precipitation January 1st, 2013 – December 31st, 2014[53]



6.1.2.C FEMA DECLARED DISASTERS

The only federally declared disaster for drought to be declared in Houston County was declared June 17th, 1976[9] (see Figure 6-8).

Figure 6-8: Drought Hazard Disaster Declarations (1953-2013)[9]

Declaration Number	Date of Incident	Date of Declaration	Description	President	Type of Assistance
EM-3013	6/17/1976	6/17/1976	Drought	Ford	Public

6.1.2.D GEOGRAPHIC LOCATION

The entire county is at risk from drought.

6.1.2.E HAZARD EXTENT

The extent of the damage that may be caused by drought fluctuates depending on the severity and duration of the event.

6.1.2.F VULNERABILITY ANALYSIS

Critical Facilities

Given the nature of the hazard, drought itself does not pose a significant risk to critical facilities in Houston County. However, as mentioned, extreme drought can greatly enhance the risk of wildfires.

6.1.3 LAND SUBSIDENCE, LANDSLIDES AND SINKHOLES

6.1.3.A DEFINITIONS & BACKGROUND

Land Subsidence and Sinkholes – Subsidence generally involves a gradual sinking but it also refers to instantaneous collapse. In southeastern Minnesota, erosion has removed most of this glacial cover and exposed the carbonate bedrock. Karst landforms is the primary natural cause of land subsidence. Karst landforms can be hazardous because of the sinkholes that form there and for the pollutants that can infiltrate the water supply.

Landslides - The USGS definition of landslides includes, a wide range of ground movement, such as rock falls, deep failure of slopes and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

- erosion by rivers creates over steeped slopes
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- excess weight from accumulation of rain or snow, or from man-made structures may stress weak slopes to failure and other structures

Slope materials that become saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses and cars thus blocking bridges and tributaries causing flooding along its path. Landslides occur often with or after other major disasters such as extreme storm events, flooding, seismic events, and wildfire. Debris flows also may often be a part of the event that causes landslides.

6.1.3.B PREVIOUS OCCURRENCES

There was one land subsidence or sinkhole related disaster events on record for Houston County.

6.1.3.C FEMA DECLARED DISASTERS

There was one federally declared land subsidence or sinkhole related disasters for Houston County (see Figure 6-9).

Figure 6-9: Land Subsidence, Landslides and Sinkholes Disaster Declarations

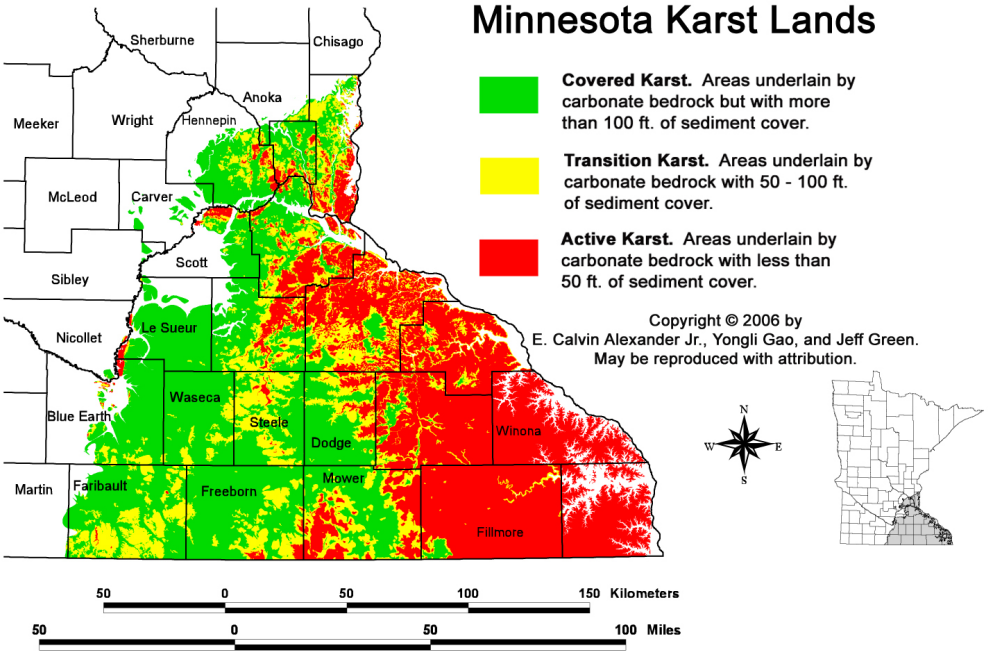
Declaration Number	Date of Incident	Date of Declaration	Description	President	Type of Assistance
1717	8/18/07	8/23/07	Flood	GW Bush	Public & Private

6.1.3.D GEOGRAPHIC LOCATION

Land Subsidence and Sinkholes

The primary natural cause of land subsidence are karst landforms. Karst landforms develop on or in limestone, dolomite or gypsum and are characterized by the presence of features such as sinkholes, underground (or internal) drainage through solution-enlarged fractures and caves. In southeastern Minnesota erosion has removed most of the glacial cover and exposed the carbonate bedrock. In Minnesota, Houston County is known for its volume of karst features (see Figure 6-10).

Figure 6-10: Map of Karst Formations



Landslides

Areas that are generally prone to landslide hazards are, on existing old landslides, on or at the base of slopes, in or at the base of minor drainage hollows, at the base or top of an old fill slope, at the base or top of a steep cut slope and developed hillsides where leach field septic systems are used. The county's transportation infrastructure is most at serious risk from landslides. All too frequently following heavy rain events the roads, highways and interstates that transect the county are closed to traffic for clean-up of soil, rock and tree debris from washouts. These on-going clean-up costs that fall to township, county and state budgets are significant.

6.1.3.E HAZARD EXTENT

The hazard extent in Houston County varies depending on the presence of infrastructure and buildings, severity of groundwater flooding, and extent of pollution.

6.1.3.F VULNERABILITY ANALYSIS

Houston County's susceptibility to the hazards of sinkholes and land subsidence can be considered to be negligible. According to Houston County, there have been no recorded mitigation projects with public funding.

6.1.4 FIRE

6.1.4.A DEFINITION & BACKGROUND

The fire hazard includes wildfire and structure fire.

Wildfire

A wildfire is a fire that primarily consumes elements of the natural environment, such as grasses, shrubs, or trees. In the State Fire Marshal's Fire in Minnesota: 2010 Annual Report, wildfires are combined with dumpster/trash fires into an *other fires* category. These other fires accounted for 36.7 percent (5,345) of all Minnesota fires in 2010. Wildfires can occur almost anywhere in the state and during any month of the year. In Minnesota, the majority of wildfires occur during spring while vegetation is still dormant[52].

The causes of wildfires are numerous. Many wildfires occur naturally as part of an ecological cycle which provides ecosystems with a means of reducing dead vegetation, stimulating new growth, and improving habitat for wildlife[54]. However, 85 percent of all wildfires in Minnesota occur as a result of human activity. The largest causes are the burning of debris (38%) and arson (28%). Only two percent of wildfires in Minnesota are the result of lightning strikes (the primary natural cause of wildfires). Nationally, 16 percent of wildfires are caused by lightning.

The magnitude and behavior of wildfires are highly variable and are determined according to three main factors, the first of which is fuel. For example, wildfires in Minnesota tend to be more prevalent in the northern portion of the state than in the southern portion (both in number and destructive potential) because the dense forest vegetation in northern Minnesota provides abundant fuel for large wildfires. In southern Minnesota, the landscape is dominated by grassland and industrial cropland. Such vegetation ignites more easily and burns more quickly than dense forest, but releases comparatively little energy. As a result, wildfires that consume grasses and crops typically pose less risk to life and property than large forest fires because they are more easily controlled. The moisture content of the fuel is also of great influence (low fuel moisture corresponds to an increased risk from fire).

Topography is the second determining factor, in which slope, aspect, and terrain all play an important role[55]. The steepness of the slope affects both the rate and direction that a fire will spread. Fires tend to move faster uphill than downhill and the steeper the slope, the faster the fire will move. Aspect refers to the direction in which the slope is oriented and can influence a wildfire in several ways. For example, south-facing slopes will normally have higher temperatures, stronger winds, a lower humidity, and lower fuel moistures, all of which increase wildfire risk. Lastly, features in the terrain impact wildfires by influencing the speed and direction of the wind. For instance, gulches effectively funnel air thereby increasing both wind speed and the rate of fire spread. Conversely, irregularities in the terrain, such as large boulders, create friction thereby producing the opposite effect.

The third and final determining factor is weather, which includes wind, temperature, and humidity[55]. The role wind plays in wildfires cannot be understated: the stronger the wind, the faster the spread of the fire. Wind essentially feeds the fire by supplying additional oxygen without which the fires could not easily spread. Wind also flattens the flames, pre-heating the fuel ahead and causing spot fires by blowing sparks and embers ahead of the main fire. In addition to wind, high temperatures help to preheat wildfire fuel as well. The temperature of the air also impacts the movement of air currents and the amount of humidity in the air. Warm air absorbs moisture and produces a lower humidity. This decreases the moisture content of fuel and increases the risk from wildfires. Precipitation too plays an important role in wildfires; drought seriously increases the possibility of wildfire.

Wildfires are normally thought of occurring in rural settings; however wildfire has the potential to impact suburban and even urban areas. The potential for property damage from wildfire has increased significantly in the last half century as exurban development has become more common. Wildfires also have the potential to severely impact regional economies, such as tourism, logging, and agriculture.

Structure Fires

A structure fire is a fire that primarily consumes elements of the built environment, such as homes, stores, or warehouses[56]. In 2010, there were 14,561 reported fires of all kind in Minnesota, or 29 fires for every ten thousand people (see Figure 6-13). Structure fires accounted for 43.5 percent (6,332) of these fires. Residential fires are by far the most common, costly, and deadly type of structural fire. Seventy-six percent of all structure fires occurred on residential property. In 2010, there was a total of $152.1 million in property losses in Minnesota. Of this total, $96.9 million were due to residential fires. Residential fires also accounted for 87 percent of total fire fatalities and 88 percent of all fire related injuries.

The top three causes of structure fires in Minnesota are cooking (49%), open flame (10%), and heating (9%). While careless smoking accounted for only 4 percent of structure fires, it caused 18 percent of all fire fatalities. Additionally, 36 percent of residential casualties were caused by improperly maintained or missing smoke alarms. Alcohol and/or drug use was an impairing factor in 36 percent of all fire deaths. The most deadly fires occurred between midnight and 6:00 a.m. (representing 49% of fire deaths) and the most deadly time of year was January through April (representing 54% of fire deaths). Residential fires are twice as likely in winter than in summer[37].

Anticipated Number of Fires & Fire Fatalities

Fire casualties and fatalities are closely correlated to population density. In Minnesota there were a total of 39 fire fatalities in 2010 – vehicle and wildfire account for the five non-residential fire deaths. This calculates to approximately 8.6 fire deaths per million people. This number is 45 percent below the Midwestern rate of 15.4 deaths per million and is 27 percent below the U.S. average of 11.8 deaths per million. Figure 6-11 depicts the estimated number of fires and the number of fire fatalities based on population.

Figure 6-11: Anticipated Number of Fires and Fire Fatalities based on Population

Population	Anticipated No. of Fires	Anticipated No. of Fire Fatalities
10,000	29 per year	1 every 12 years
20,000	58 per year	1 every 6 years
40,000	116 per year	1 every 6 years
60,000	174 per year	1 every 2 years
100,000	290 per year	1 every 13-14 months
300,000	870 per year	2.5 per year
350,000	1,050 per year	3 per year

Using this method of estimation, Houston County may expect to witness approximately 58 fires per year and one fire related fatality every six years.

Relationship to other Hazards

In many situations, fires can occur as the result of other hazards, such as tornadoes, floods, or windstorms. For example, a tornado may ignite fires by rupturing natural gas distribution systems or downing power lines. Lightning is by far the most common natural cause of both structural fires and wildfires.

Fires can also contribute to the probability of another hazard occurring. For example, wildfires can strip away vegetation from hillsides, increasing the risk of severe soil erosion, landslides, and flooding. Areas recently cleared by wildfire may also be at increased risk of invasive species. Many industries utilize hazardous materials that are also flammable. Industrial structural fires therefore must be handled with great caution to avoid the compound threat of fire with the potential for hazardous material release.

In other situations, various hazards can significantly impair a fire department's ability to fight fires. For instance, a flood may restrict the movement of emergency vehicles by damaging roads and leaving debris on streets, or it may inundate an emergency facility and impair departmental operations.

6.1.4.B PREVIOUS OCCURRENCES

According to the State Fire Marshal, between 1998 and 2013 local fire departments responded to 960 fires in Houston County[57]. This number includes structural, vehicle, and wildfires. These fires resulted in $7.8 million in damaged property and four deaths. The 15 year average calculates to approximately 60 fires, $489,324 in damages, and 0.25 deaths per year. Figure 6-12 depicts data on fires for the county; Figure 6-13 depicts city fire data.

Figure 6-12: County Fire Data[57]

	HOUSTON COUNTY					
YEAR	Total Fire Runs	Total Other Runs	Total Co. Dollar Loss	Fire Rate	Average Dollar Loss per Fire	Fire Deaths
2013	39	395	$209,800	663	$6,993	1
2012	54	420	$1,049,452	452	$23,851	0
2011	55	399	$959,200	442	$21,316	0
2010	74	392	$639,000	368	$11,833	1
2009	88	391	$346,900	326	$5,687	0
2008	37	357	$1,840,200	622	$57,506	2
2007	43	396	$319,740	622	$9,992	0
2006	41	253	$225,500	553	$6,264	0
2005	60	283	$127,600	368	$2,363	0
2004	53	331	$440,900	423	$9,381	0
2003	89	338	$158,700	318	$2,560	0
2002	64	279	$78,300	387	$1,535	0
2001	62	161	$768,499	429	$16,707	0
2000	74	222	$238,100	349	$4,492	0
1999	66	261	$241,700	343	$4,476	0
1998	61	253	$185,600	363	$3,639	0
TOTAL	960	5,130	$7,829,191	7,028	$188,595	4
AVERAGE	60	321	$489,324	439	$11,787	.25

**Data not reported to State Fire Marshal*

Figure 6-13: City Fire Data[57]

Year	Total Fire Runs	Total Other Runs	Total Co. Dollar Loss	Total Fire Runs	Total Other Runs	Total Co. Dollar Loss
	Brownsville			Caledonia		
2013	4	29	$101,000	1	5	$5,000
2012	5	37	$18,000	10	22	$507,500
2011	6	41	$0	12	25	$951,500
2010	6	2	$409,000	25	39	$124,000
2009	3	2	$0	20	31	$181,500
2008	4	41	$165,700	0	2	$0
2007	6	86	$3,000	8	20	$282,100
2006	4	25	$70,000	2	3	$0
2005	4	26	$54,000	10	14	$59,500
2004	7	36	$0	16	42	$99,400
2003	6	33	$1,000	25	42	$41,600
2002	7	18	$5,000	25	37	$59,300
2001	4	21	$4,500	23	31	$140,499
2000	9	27	$205,000	18	26	$6,100
1999	9	30	$3,000	18	23	$48,000
1998	6	29	$1,000	21	20	$78,300
TOTAL	90	483	$ 1,040,200	234	382	$ 2,584,299
AVERAGE	6	30	$ 65,013	15	24	$ 161,519
	Eitzen			Hokah		
2013	4	29	$0	9	48	$75,000
2012	11	34	$0	10	54	$11,000
2011	6	31	$0	7	43	$0
2010	9	29	$0	7	38	$0
2009	10	18	$0	13	62	$0
2008	7	22	$3,000	1	1	$0
2007	4	18	$10,500	4	0	$0
2006	*	*	*	7	0	$0
2005	4	11	$600	7	1	$0
2004	*	*	*	9	10	$0
2003	5	15	$109,600	9	6	$0
2002	*	*	*	4	5	$0
2001	*	*	*	9	3	$0
2000	*	*	*	12	4	$0
1999	*	*	*	5	3	$0
1998	*	*	*	3	2	$0
TOTAL	60	207	$123,700	116	280	$86,000
AVERAGE	4	13	$7,731	7	18	$5,375

**Data not reported to State Fire Marshal*

Figure 6-13: City Fire Data[57] *(con't)*

Year	Total Fire Runs	Total Other Runs	Total Co. Dollar Loss	Total Fire Runs	Total Other Runs	Total Co. Dollar Loss
	Houston			La Crescent		
2013	3	6	$20,000	12	272	$8,800
2012	7	9	$80,902	8	250	$432,050
2011	5	18	$0	15	230	$7,700
2010	5	18	$75,000	13	252	$31,000
2009	19	18	$115,100	13	246	$50,300
2008	7	18	$703,000	8	253	$966,500
2007	7	19	$12,140	6	234	$12,000
2006	11	12	$5,500	11	208	$150,000
2005	12	13	$0	9	211	$13,500
2004	11	18	$341,500	10	225	$0
2003	21	18	$4,000	9	217	$2,500
2002	9	12	$0	9	203	$0
2001	14	21	$606,500	3	79	$0
2000	*	*	*	19	152	$12,000
1999	14	22	$46,000	12	177	$100,200
1998	7	18	$30,500	14	171	$58,000
TOTAL	152	240	$2,040,142	171	3880	$1,844,550
AVERAGE	10	15	$127,509	11	211	$15,284
	Spring Grove					
2013	6	9	$0			
2012	3	14	$0			
2011	4	11	$0			
2010	9	14	$0			
2009	10	14	$0			
2008	10	20	$2,000			
2007	8	19	$0			
2006	6	5	$0			
2005	14	7	$0			
2004	*	*	*			
2003	14	7	$0			
2002	10	4	$14,000			
2001	9	6	$17,000			
2000	16	13	$15,000			
1999	8	6	$44,500			
1998	10	13	$17,800			
TOTAL	137	162	$			
AVERAGE	9	10	$			

**Data not reported to State Fire Marshal*

6.1.4.C FEMA DECLARED DISASTERS

There have been no federally declared disasters specific to fire in Houston County[9].

6.1.4.D GEOGRAPHIC LOCATION

While all of Houston County is at risk from fire, the level of risk varies by type of fire and the location of the fire. The risk from structural fire is greater in the urban portions of the county, while the risk from wildfire is greater in the rural and natural areas. For example, farm fields and ditches are particularly susceptible to wildfires. The risk from vehicle fires is greatest in the urban areas and along major transportation routes.

The risk from fires is also influenced by location within the county and the proximity to available emergency responders and adequate water for fire suppression. In this sense, rural areas are at a disadvantage in that it will take firefighters longer to reach the fire and upon arrival they may have to rely on water from tanker trucks to suppress the fire. In this regard, rural areas may have a slightly higher level of risk.

6.1.4.E HAZARD EXTENT

The extent of the damage that may be caused by fires also depends on the type of fire. The damage that may result from structural fires depends on the design, use, and location of the structure, as well as the behavior of those people who may be living or working in the structure. Similarly, the potential for damage from wildfires depends on fuel availability, weather, and terrain. The relative lack of sufficient fuel for large wildfires limits the scope of the damage that is possible. The damage that may result from vehicle fires depends on the location of the fire and the type of vehicle. For example, the extent of damage from a motorcycle fire would be significantly less than that of a semi-trailer or large passenger bus.

Wildfire

Low risk areas include urbanized areas and open water. Medium risk areas include crop lands and wetlands. High risk areas include shrub lands and forested areas.

Structural Fire

Very low potential areas include croplands, wetlands, shrub lands, forested areas, and open water where structures are not typically found. Low potential areas include low density urban areas where up to 25 percent of the surface area is impervious. Medium potential areas include more densely settled urban areas where up to 50 percent of the surface area is impervious. High potential areas include very densely settled land that is covered up to 100 percent by impervious surfaces. NLCD data does not distinguish between types of structures present. Impervious structures include buildings, bridges, roadways, parking lots, and all other man-made objects.

6.1.5 SUMMER STORMS

6.1.5.A DEFINITION & BACKGROUND

Houston County experiences a variety of hazards resultant of summer storms. The category of severe summer weather includes excessive heat, hail, and lightning.

Fog

Fog results from air being cooled to the point where it can no longer hold all of the water vapor it contains. For example, rain can cool and moisten the air near the surface until fog forms. A cloudfree, humid air mass at night can lead to fog formation, where land and water surfaces that have warmed up during the summer are still evaporating a lot of water into the atmosphere – this is called 'radiation fog'[87]. Lack of wind can exacerbate and prolong fog events.

In Houston County fog may settle over open valleys, such as around Spring Grove, or among the frequent valleys formed between the hills known throughout the County. Occurrences of hazardous fog events are not frequent and fog is not included in the State Hazard Mitigation Plan.

Extreme Temperatures (Heat)

Excessive heat occurs from a combination of significantly above normal temperatures and high humidity[61]. The National Weather Service's Heat Index, shown in Figure 6-15, depicts apparent temperature. In terms of excessive heat, apparent temperature is a measure of how hot it feels when relative humidity is combined with the actual air temperature. For example, an actual temperature of 86°F and a relative humidity of 90 percent results in an apparent temperature of 105°F. The index was devised to reflect temperatures in the shade; in direct sunlight the apparent temperature may be up to 15°F higher than those shown in Figure 6-14. The effects on the human body associated with the different Heat Index categories are shown in Figure 6-15. The three National Weather Service heat alerts are shown in Figure 6-16.

Figure 6-14: NOAA's National Weather Service Heat Index[59]

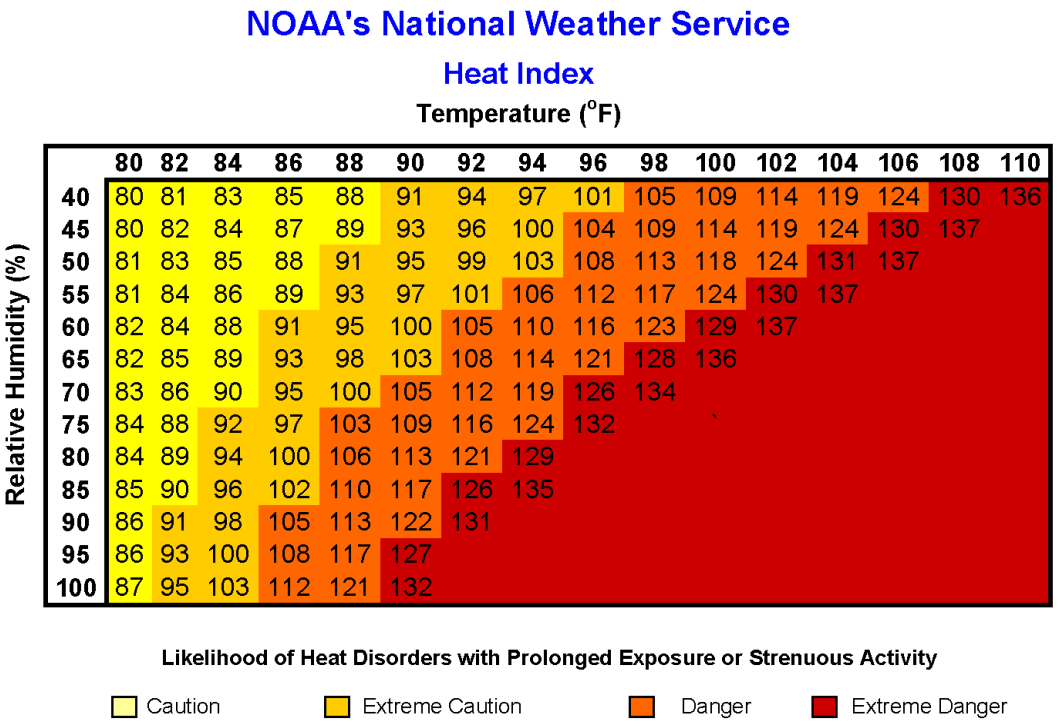


Figure 6-15: Heat Index – Effects on the Human Body[59]

Heat Index of 80° - 90°	Fatigue possible with prolonged exposure and/or physical activity.
Heat Index of 90°- 105°	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.
Heat Index of 105°- 130°	Sunstroke, heat cramps or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity.
Heat Index of >130°	Heatstroke/sunstroke highly likely with continued exposure.

Figure 6-16: National Weather Service Heat Alerts[58]

Heat Advisory	Issued within 12 hours of the onset of the following conditions: heat index of at least 105°F but less than 115°F for less than three hours per day, or nighttime lows above 80°F for two consecutive days.
Excessive Heat Watch	Issued by the National Weather Service when heat indices in excess of 105°F during the day combined with nighttime low temperatures of 80°F or higher are forecast to occur for two consecutive days.
Excessive Heat Warning	Issued within 12 hours of the onset of the following criteria: heat index of at least 105°F for more than three hours per day for two consecutive days, or heat index more than 115°F for any period of time.

Excessive heat is the number one weather related killer in the United States, resulting in more fatalities each year than floods, lightning, tornadoes, and hurricanes combined[61]. One study found that there were 59 heat attributable deaths in the Minneapolis Metropolitan Statistical Area every year, or 2.32 deaths per 100,000 people[60]. Excessive heat can result in heat cramps, heat exhaustion, and heat stroke (sunstroke). Heat becomes deadly for animals and people when it pushes a body beyond its natural ability to cool itself (typically due to over exposure, or over exercitation). People suffering from heat stroke may have a body temperature of 106°F or higher. Elderly persons, small children, chronic invalids, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to excessive heat, especially during heat waves in areas where a moderate climate usually prevails[61].

Wind Events

Windstorms can be difficult to separate from several other natural hazards. For example, high winds are a common component of hurricanes, thunderstorms, tornadoes, and even wildfires. However, windstorms can also be a significant hazard all by themselves. A windstorm may be defined as a high wind event with either sustained wind speeds of 40 miles per hour or greater lasting for one hour, or winds of 58 miles per hour or greater for any duration of time[58]. It is not unusual for wind speeds during a severe windstorm to exceed those of a hurricane and approach those of a weak to moderate tornado.

Windstorms are most commonly associated with the outflow of winds caused by a collision of a cold front into a warm air mass. To differentiate windstorm activity from tornadoes, the phrase straight-line winds is typically employed (in contrast to a tornado's rotational winds). Straight-line winds can result from gust front and downdraft activity. A gust front is the leading edge of rain-cooled air that clashes with warmer inflow air and is characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm[62]. A downdraft is a localized column of air that sinks rapidly towards the ground. Strong downdrafts are known as downbursts. A downburst can have wind speeds over 100 miles per hour and can leave a path of destruction hundreds of miles long. Concentrated downbursts, called microbursts, are normally less than 2.5 miles in diameter and last for only a few minutes. However, microbursts are capable of generating devastating winds with speeds up to 168 miles per hour[62].

The destruction resulting from severe windstorms can rival that from a moderate tornado, see Figure 6-17.

Figure 6-17: Potential Damage from High Winds[62]

Wind Speed (mph)	Potential Damage
30-44	Trees in motion. Light-weight loose objects (e.g., lawn furniture) tossed or toppled.
45-57	Large trees bend; twigs, small limbs break, and a few larger dead or weak branches may break. Old/ weak structures (e.g., sheds, barns) may sustain minor damage (roof, doors). Building partially under construction may be damaged. A few loose shingles removed from houses. Carports may be uplifted; minor cosmetic damage to mobile homes and pool lanai cages.
58-74	Large limbs break; shallow rooted trees pushed over. Semi-trucks overturned. More significant damage to old/weak structures. Shingles, awnings removed from houses; damage to chimneys and antennas; mobile homes, carports incur minor structural damage; large billboard signs may be toppled.
75-89	Widespread damage to trees with trees broken/uprooted. Mobile homes may incur more significant structural damage; be pushed off foundations or overturned. Roof may be partially peeled off industrial/commercial/ warehouse buildings. Some minor roof damage to homes. Weak structures (e.g., farm buildings, airplane hangars) may be severely damaged.
90+	Many large trees broken and uprooted. Mobile homes severely damaged; moderate roof damage to homes. Roofs partially peeled off homes and buildings. Moving automobiles pushed off dry roads. Barns, sheds demolished.

It is not unusual for damage thought to be caused by a tornado to actually have been caused by high winds. Damage from windstorms is much more common than damage from tornadoes and accounts for over half of all weather related damage reports in the lower 48 states[62]. High winds can exert positive, negative, and internal changes in air pressure. Positive air pressure (pushing walls, doors, and windows inward) and negative air pressure (pulling building components and surfaces outward) can affect the windward side of structures and objects. Changes in internal pressure can result in considerable damage to the leeward side of structures. Furthermore, debris carried by high winds can result in property damage and loss of life.

Due to the deteriorating condition of many older homes, the prevalence of manufactured and modular homes, and the lack of uniform building codes for wind resistant construction, the amount of property damage and loss of life associated with windstorms is expected to increase over time. Another factor in this trend is the cost of durable construction; while it is technically possible to build a structure capable of withstanding extremely high winds, doing so is not financially possible for the vast majority of Americans. This has led many to urge for the construction of safe rooms in residential and other structures. This approach offers increased protection for a substantially lower cost. Guidelines for wind resistant structures are based on FEMA's Wind Zone rating system. Houston County falls entirely within Wind Zone IV, where winds can reach speeds of 250 miles per hour.

Hail

A hailstorm is an outgrowth of severe thunderstorms and develops within a low-pressure front as warm air rises rapidly in to the upper atmosphere and is subsequently cooled leading to the formation of ice crystals. These are bounced about by high velocity updraft winds and accumulate into frozen droplets, falling as precipitation after developing enough weight[52]. Figure 6-18 depicts the process of hail formation[63]. Although hailstorms typically occur during summer months, they have been known to occur much later or earlier in the year.

Hailstones can vary in size from as small as a pea to larger than softballs. Hail is considered severe when it reaches a 1.00-inch diameter[64] (see Figure 6-19). Even small hailstones can severely damage crops. Damage to siding, windows, and cars often occur once stones reach a 1.5-inch diameter. Hailstones larger than three inches will cause roof damage. Hailstones can reach speeds over 100 miles per hour.

Each year hail causes approximately $1 billion in damages in the United States, mostly related to agricultural losses from damaged crops.

Figure 6-18: Hail Formation

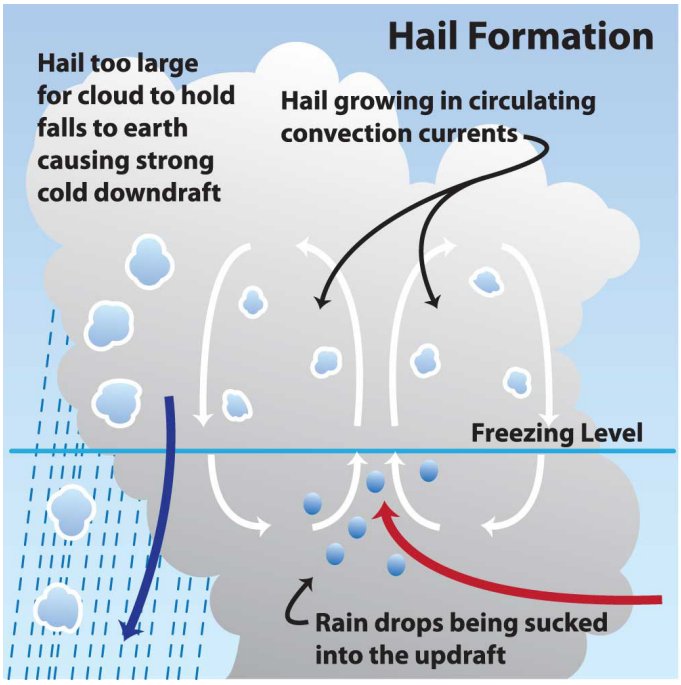


Figure 6-19: Hail Stone Size Chart

Hail Size Diameter	Size Description
0.25"	Pea
0.50""	Mothball
0.75"	Penny
0.875"	Nickel
1.00"	Quarter
1.25"	Half-Dollar
1.50"	Walnut / Ping-Pong Ball
1.75"	Golf Ball
2.00"	Hen Egg / Lime
2.50"	Tennis Ball
2.75"	Baseball
3.00"	Teacup / Apple
4.00"	Grapefruit
4.50"	Softball Size
4.75"	CD / DVD

Tornadoes

Tornadoes are one of the most violent of all storms. A tornado is essentially a rapidly rotating vortex of air that extends ground-ward from a cumulonimbus cloud[37]. Strictly speaking, a tornado is a funnel cloud until it reaches the ground. Once a funnel cloud reaches the ground it becomes a tornado. Tornadoes usually form in association with severe thunderstorms, but can also occur as a result of hurricanes or wildfires.

Minnesota lies within what is referred to as Tornado Alley. Tornado Alley is a tornado prone region that runs north from the Texas panhandle to Nebraska and northeast to southern Minnesota. This area is the site for the meteorological phenomenon known as the dryline, where cold, dry polar air moving south from Canada converges with warm, humid tropical air moving north from the Gulf of Mexico[65]. If the cold front is fast moving and the warm air is unstable, thunderstorms and tornadoes can result.

Although records only date back to the 1950 and the methodology for reporting tornadoes has changed numerous times since then, it is estimated that approximately 1,000 tornadoes occur every year in the United States. Between 1950 and 2011, there were 1,684 tornadoes in Minnesota, averaging 27 per year[66]. However, the average for 1991 to 2010 is 45 tornadoes per year in Minnesota[67]. The trend of increased tornado activity holds true for much of the rest of the United States also. Scientists are uncertain whether the actual numbers of tornadoes per year is increasing (perhaps due to climate change), or simply if more tornadoes are being reported each year due to advancements in technology.

In Minnesota, 89 percent of tornadoes occur from May to August and are most probable between 2:00 p.m. and 9:00 p.m.[66]. However, tornadoes have historically occurred as early as March and as late as November. Tornadoes can also occur at any time of day. This relative unpredictability makes tornadoes one of the most dangerous natural hazards in Minnesota.

The severity of damage resulting from a tornado is measured by the Fujita scale, which assigns tornadoes a numerical value based on wind speeds (see Figure 6-20).

Figure 6-20: Fujita Tornado Scale[37]

Fujita Number	Wind Speed	Estimated Width	Estimated Length	Probability 1953-1989 (Avg # per yr; % per yr)	Description of Potential Damage
F0 Gale	40-72 mph	6-17 yards	0.3-0.9 miles	218; 29%	Light damage: some damage to chimneys, tree branches broken, shallow-rooted trees blown over, signs damaged.
F1 Moderate	73-112 mph	18-55 yards	1-3.1 miles	301; 40%	Moderate damage: roof surfaces peeled off, mobile homes pushed off foundations or overturned, moving automobiles pushed off roads.
F2 Significant	113-157 mph	56-175 yards	3.2-9.9 miles	175; 23%	Considerable damage: roofs torn off of buildings, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted, light-object missiles generated.
F3 Severe	158-206 mph	176-566 yards	10-31 miles	43; 6%	Severe damage: roofs and walls torn from well-constructed homes, trains overturned, most trees uprooted, heavy vehicles lifted off roads and thrown.
F4 Devastating	207-260 mph	0.3-0.9 miles	32-99 miles	10; 1%	Devastating damage: well-constructed houses leveled, structures with weak foundations blown off some distance, cars thrown, large missiles generated.
F5 Incredible	261-318 mph	1-3.1 miles	100-315 miles	1; 0.002%	Incredible damage: strong frame houses lifted off foundations and carried considerable distances to disintegrate, automobile sized missiles fly through air in excess of 100 yards, and trees debarked.

Lightning

Lightning is one of the oldest observed natural phenomena on earth and is most commonly associated with strong summer thunderstorms[62]. However, lightning can result from snowstorms, hurricanes, forest fires, volcanic eruptions, and surface nuclear detonations. Lightning from thunderstorms occurs when there is a sudden movement of electrons between oppositely charged parts of a cumulonimbus cloud, or between the cloud and the ground. A series of these sudden discharges produces flashes of light, or lightning. Basically, lightning can be thought of as being similar to the electrostatic discharge a person may feel after shuffling across a carpet in socks and then touching something metallic. The National Oceanic and Atmospheric Administration approximates that in the continental United States there are an average of 20 million cloud-to-ground flashes and between 100 and 200 million cloud-to-cloud flashes annually[52].

Lightning is one of the most deadly weather related killers in the United States. Each year it kills an estimated 60 people and injures another 300. The precise number of lightning related injuries and deaths is unknown due to the suspected underreporting of lightning related casualties. The majority of these casualties are the result of inappropriate behavior during thunderstorms and people caught outdoors during recreational or sports activities[62]. Lightning can also cause significant property damage and can result in the ignition of wildfires and structural fires.

Relationship to other Hazards

Excessive heat can weaken immune systems and increase susceptibility to infectious disease, increase the likelihood of wildfire outbreaks, intensify the severity of drought events, and contribute to infrastructure failure. Additionally, extreme heat can hinder response and recovery efforts by causing heat related illnesses among the responders.

Lightning is the primary cause of wildfire and can also trigger structural fires. Lightning can also contribute to infrastructure failure by damaging utility equipment. Strong winds can cause severe damage to property via fallen trees and power lines. Destruction from tornadoes can trigger secondary hazards such as ruptured gas lines, hazardous materials release, fires, and flooding.

Most hail damage occurs to vehicles in the form of broken glass and dents. However, hail can also knock down trees and cause damage to power lines, resulting in a power failure.

6.1.5.B PREVIOUS OCCURRENCES

Fog

NCDC records no summer fog events occurring in Houston County.

Extreme Temperatures

NCDC records show one damaging instance of extreme temperature within Houston County (see Figure 6-21), which resulted in $12,000 in property damage. No injuries or deaths can be attributed to the reported extreme temperature events. A full listing of reported events can be found in Appendix 9.8.

Figure 6-21: Extreme Temperature Events (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
7/17/2011	Excessive Heat	$12,000	$0
	TOTAL	$12,000	$0

Wind Events

NCDC records report 37 damaging wind events in Houston County, which resulted in $424,000 in property damage and $81,000 in crop damage (see Figure 6-22). No injuries or deaths can be attributed to the reported wind events. A full listing of reported events can be found in Appendix 9.8.

Figure 6-22: Previous Wind Events (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
10/25/2012	Thunderstorm Wind	$10,000	$0
9/5/2012	Thunderstorm Wind	$95,000	$0
8/2/2012	Thunderstorm Wind	$500	$0
5/3/2012	Thunderstorm Wind	$5,000	$0
3/19/2012	Thunderstorm Wind	$10,000	$0
9/2/2011	Thunderstorm Wind	$8,000	$0
7/23/2011	Thunderstorm Wind	$2,500	$0
7/1/2011	Thunderstorm Wind	$7,000	$0
5/22/2011	Thunderstorm Wind	$5,000	$0
4/10/2011	Thunderstorm Wind	$5,000	$0
4/10/2011	Thunderstorm Wind	$127,000	$0
10/26/2010	High Wind	$3,000	$0
8/20/2010	Thunderstorm Wind	$250	$0
7/17/2010	Thunderstorm Wind	$2,000	$0
7/14/2010	Thunderstorm Wind	$1,000	$0
6/26/2010	Thunderstorm Wind	$4,000	$0
6/17/2010	Thunderstorm Wind	$1,000	$0
4/30/2010	Thunderstorm Wind	$5,000	$0
6/7/2008	Thunderstorm Wind	$5,000	$3,000
5/30/2008	Thunderstorm Wind	$500	$0
9/21/2007	Thunderstorm Wind	$5,000	$0
6/7/2007	Thunderstorm Wind	$500	$0
5/14/2007	Thunderstorm Wind	$14,500	$0
9/13/2005	Thunderstorm Wind	$1,500	$0
7/25/2005	Thunderstorm Wind	$500	$0
7/4/2003	Thunderstorm Wind	$4,250	$2,000
4/7/2001	High Wind	$2,000	$0
6/1/2000	Thunderstorm Wind	$250	$0
11/10/1998	High Wind	$150,000	$0
8/9/1998	Thunderstorm Wind	$56,000	$250
6/27/1998	Thunderstorm Wind	$126,000	$32,900
6/20/1998	Thunderstorm Wind	$12,000	$0
6/18/1998	Thunderstorm Wind	$19,000	$28,000
5/30/1998	Thunderstorm Wind	$0	$20,000
8/23/1997	Thunderstorm Wind	$15,000	$0
6/28/1997	Thunderstorm Wind	$1,000	$0
6/15/1997	Thunderstorm Wind	$13,000	$0
8/7/1996	Thunderstorm Wind	$300	$0
	TOTAL	**$424,550**	**$81,150**

Hail

NCDC records report 21 damaging hail events (see Figure 6-23), which resulted in over $1.7 million in property damage and $754,000 in crop damage in Houston County[24]. Two injuries occurred because of hail events. A full listing of reported events can be found in Appendix 9.8.

Figure 6-23: Hail Events (NCDC)[24]

Date	Type	Injuries	Deaths	Property Damage	Crop Damage
4/10/2011	Hail	0	0	$581,000	$0
6/28/2008	Hail	0	0	$0	$1,000
8/24/2006	Hail	0	0	$0	$3,500
5/27/2006	Hail	0	0	$300	$0
7/25/2005	Hail	0	0	$0	$2,000
7/19/2004	Hail	0	0	$85,000	$18,000
6/23/2004	Hail	0	0	$0	$5,000
8/25/2003	Hail	0	0	$0	$1,500
6/11/2001	Hail	0	0	$500	$0
8/26/2000	Hail	0	0	$5,000	$10,000
8/1/2000	Hail	0	0	$5,000	$15,000
5/11/2000	Hail	0	0	$12,000	$0
8/9/1999	Hail	0	0	$0	$3,000
7/8/1999	Hail	0	0	$500	$0
6/8/1999	Hail	0	0	$2,000	$0
6/20/1998	Hail	0	0	$25,000	$45,000
5/18/1998	Hail	0	0	$0	$40,000
8/3/1997	Hail	0	0	$30,000	$100,000
6/19/1997	Hail	0	0	$20,000	$10,000
5/18/1996	Hail	2	0	$0	$500,000
6/19/1990	Hail	0	0	$1,000,000	$0
	TOTAL	2	0	$1,761,300	$754,000

Tornadoes

NCDC records report seven damaging tornadoes within Houston County (see Figure 6-24), which resulted in over $2.8 million in property damage and $25,000 in crop damage[24]. No injuries or deaths can be attributed to the reported tornadoes. A full listing of reported events can be found in Appendix 9.8.

Figure 6-24: Tornado Events (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
5/22/2011	Tornado	$240,000	$0
8/23/1997	Tornado	$80,000	$25,000
4/8/1991	Tornado	$25,000	$0
5/29/1978	Tornado	$2,500	$0
8/25/1965	Tornado	$25,000	$0
5/5/1965	Tornado	$2,500,000	$0
6/10/1960	Tornado	$30	$0
	TOTAL	$2,872,530	$25,000

Lightning

There are five NCDC records of lightning events in Houston County (see Figure 6-25), one of which cost 1.5 million dollars in damages. No injuries or deaths can be attributed to the reported lightning events. A full listing of reported events can be found in Appendix 9.8.

Figure 6-25: Previous Lightning Events (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
8/4/2014	Lightning	$1,500,000	$0
7/13/2012	Lightning	$5,000	$0
8/23/2011	Lightning	$10,000	$0
07/02/2000	Lightning	$25,000	$0
05/30/2000	Lightning	$30,000	$0
	TOTAL	$1,570,000	$0

6.1.5.C DECLARED DISASTERS

There have been no federally declared disasters specific to lightning, hail, or excessive heat in Houston County[9].

6.1.5.D GEOGRAPHIC LOCATION

All of Houston County is at risk from severe summer weather.

6.1.5.E HAZARD EXTENT

The extent of the damage that may be caused by severe summer weather fluctuates depending on the timing, physical location, and magnitude of the event.

6.1.5.F VULNERABILITY ANALYSIS

Critical Facilities

All critical facilities in Houston County are vulnerable to the negative effects of this hazard. However, some facilities will be more susceptible than others. Buildings without air conditioning will be especially impacted by extreme heat. Taller buildings will be more likely to be damaged by lightning than their shorter neighbors. Finally, buildings with tin roofs or that are pre-fabricated will likely suffer a disproportionate amount of damage from a hail event.

6.1.6 WINTER STORMS

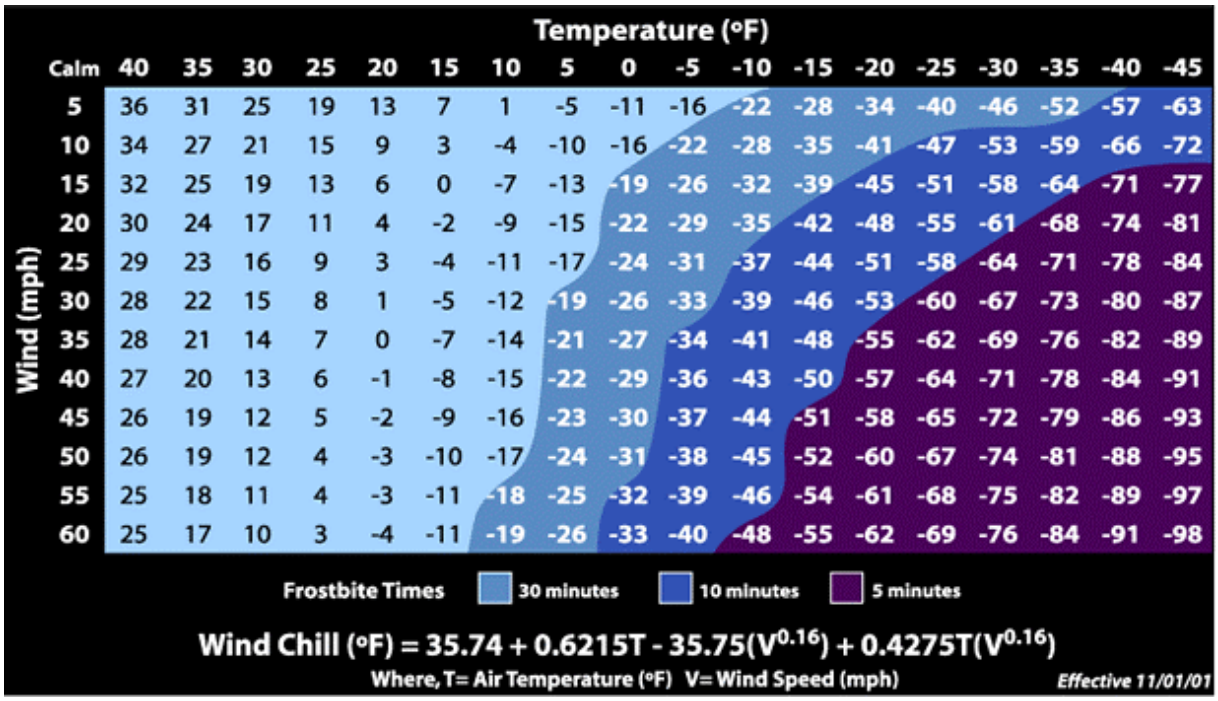
6.1.6.A DEFINITION & BACKGROUND

Houston County experiences a variety of hazards resultant of winter storms. The category of winter storms includes: extreme temperatures, ice storms, blizzards, and wind events.

Extreme Temperatures

Extreme cold occurs from a combination of low temperatures and strong winds. The National Weather Service's Wind Chill Index, show in Figure 6-26, depicts apparent temperatures. In terms of extreme cold, apparent temperature is a measure of how cold it feels when wind speed is combined with the actual air temperature. For example, an actual air temperature of 5°F and a wind speed of 30 miles per hour results in an apparent temperature of -19°F. At this temperature it takes approximately 30 minutes for human skin to freeze. The index assumes there is no impact from the sun (i.e. a clear night sky); in direct sunlight the apparent temperatures may be warmer than those shown in Figure 6-26[71].

Figure 6-26: National Weather Service Wind Chill Chart[68]



The Wind Chill Index has a calm wind threshold of three mph; below three mph conditions are considered to be calm and wind chill is not applicable. In the past, the National Weather Service's Weather Forecasting Offices had no means of issuing an alert for dangerously cold conditions with little or no wind. In 2011, the National Weather Service in Minnesota, North Dakota, and South Dakota initiated an experimental procedure whereby an Extreme Cold Warning may be issued during situations where actual temperatures reach Wind Chill Warning criteria under calm conditions[69]. In Minnesota an Extreme Cold Warning may be issued when actual air temperature reaches -30°F or lower[70].

Two of the greatest threats related to extreme cold are frostbite and hypothermia. Frostbite is damage to tissue as a result of exposure to intense cold. Frostbite typically occurs when the body cools to the point of needing to restrict blood circulation to its core in order to protect its vital organs. This results in less blood flowing to the body's extremities. Prolonged exposure can lead to severe tissue damage. The most frostbite prone areas of the body include toes, fingers, nose, and ears. Hypothermia occurs when the human body temperature drops below 95°F (normal body temperature is 98.6°F). The condition is a result of the body losing heat faster than it can produce it. Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. Hypothermia is most likely at very cold temperatures, but it can occur even at cool temperatures (above 40°F) if a person becomes chilled from rain, sweat, or submersion in cold water[71]. Severe hypothermia can result in heart and/or respiratory failure and eventual death. Frostbite and hypothermia are not only dangerous to humans, but also pets and livestock.

Wind Events

A windstorm may be defined as a high wind event with either sustained wind speeds of 40 miles per hour or greater lasting for one hour, or winds of 58 miles per hour or greater for any duration of time[58]. No matter the season, wind events can occur at any time during the year. Damage from wind events can vary depending on the strength of the wind and the time of year.

Windstorms are most commonly associated with the outflow of winds caused by a collision of a cold front into a warm air mass. To differentiate windstorm activity, the phrase straight-line winds is typically employed. Straight-line winds can result from gust front and downdraft activity. A gust front is the leading edge of rain-cooled air that clashes with warmer inflow air and is characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm[62]. A downdraft is a localized column of

air that sinks rapidly towards the ground. Strong downdrafts are known as downbursts. A downburst can have wind speeds over 100 miles per hour and can leave a path of destruction hundreds of miles long. Concentrated downbursts, called microbursts, are normally less than 2.5 miles in diameter and last for only a few minutes. However, microbursts are capable of generating devastating winds with speeds up to 168 miles per hour[62].

High winds can exert positive, negative, and internal changes in air pressure. Positive air pressure (pushing walls, doors, and windows inward) and negative air pressure (pulling building components and surfaces outward) can affect the windward side of structures and objects. Changes in internal pressure can result in considerable damage to the leeward side of structures. Furthermore, debris carried by high winds can result in property damage and loss of life (see Figure 6-27).

Figure 6-27: Potential Damage from High Winds[62]

Wind Speed (mph)	Potential Damage
30-44	Trees in motion. Light-weight loose objects (e.g., lawn furniture) tossed or toppled.
45-57	Large trees bend; twigs, small limbs break, and a few larger dead or weak branches may break. Old/ weak structures (e.g., sheds, barns) may sustain minor damage (roof, doors). Building partially under construction may be damaged. A few loose shingles removed from houses. Carports may be uplifted; minor cosmetic damage to mobile homes and pool lanai cages.
58-74	Large limbs break; shallow rooted trees pushed over. Semi-trucks overturned. More significant damage to old/weak structures. Shingles, awnings removed from houses; damage to chimneys and antennas; mobile homes, carports incur minor structural damage; large billboard signs may be toppled.
75-89	Widespread damage to trees with trees broken/uprooted. Mobile homes may incur more significant structural damage; be pushed off foundations or overturned. Roof may be partially peeled off industrial/ commercial/ warehouse buildings. Some minor roof damage to homes. Weak structures (e.g., farm buildings, airplane hangars) may be severely damaged.
90+	Many large trees broken and uprooted. Mobile homes severely damaged; moderate roof damage to homes. Roofs partially peeled off homes and buildings. Moving automobiles pushed off dry roads. Barns, sheds demolished.

Due to the deteriorating condition of many older homes, the prevalence of manufactured and modular homes, and the lack of uniform building codes for wind resistant construction, the amount of property damage and loss of life associated with windstorms is expected to increase over time. Another factor in this trend is the cost of durable construction; while it is technically possible to build a structure capable of withstanding extremely high winds, doing so is not financially possible for the vast majority of Americans. This has led many to urge for the construction of safe rooms in residential and other structures. This approach offers increased protection for a substantially lower cost. Guidelines for wind resistant structures are based on FEMA's Wind Zone rating system.

Houston County falls entirely within Wind Zone IV, where winds can reach speeds of 250 miles per hour.

Blizzards

The National Weather Service defines a blizzard as a storm which contains large amounts of snow, with winds in excess of 35 mph and visibilities of less than 1/4 mile for at least three hours[72]. Heavy snowfall is commonly associated with blizzards; however, blizzards can result from blowing snow, or the movement of snow that has already fallen to the ground. The movement of snow (falling or blowing) and the decreased visibility can result in *whiteout* conditions. Blizzards are most dangerous when the air is dry and the snow is powdery or fluffy.

Another threat associated with blizzards is drifting snow. Snow drifts can seriously impede travel during and after a blizzard. Additionally, it is not uncommon for blizzards to be accompanied by extreme cold. For these reasons travel during a blizzard is extremely dangerous and is not recommended unless absolutely necessary.

Ice Storms

The term ice storm is used by the National Weather Service to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. This accumulation of ice makes walking and driving extremely dangerous. In Minnesota, an Ice Storm Warning is issued for ice accumulation of greater than 0.25 inches[70].

Relationship to other Hazards

Heavy precipitation during the winter season can contribute to spring flooding and infrastructure failure. Additionally, severe winter weather can cause major disruption to lifeline utilities. For example, ice storms can knock down power lines and blizzards can impede the delivery of home heating fuels. Heavy snow can cause roof collapse. Extreme cold can hinder response and recover efforts following a major hazard event.

6.1.6.B PREVIOUS OCCURRENCES

Extreme Temperatures

The NCDC reported no damaging extreme temperature events in Houston County. None of the reported extreme temperature events resulted in the loss of life or damages[24]. A full listing of reported events can be found in Appendix 9.8.

Wind Events

The NCDC reported one damaging wind event in Houston County that resulted in a total of $2,000 in property damage (see Figure 6-28). No injuries or deaths can be attributed to the reported wind events. A full listing of reported events can be found in Appendix 9.8.

Figure 6-28: Wind Events (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
04/07/2001	High Wind	$2,000	$0
	TOTAL	$2,000	$0

Ice Storms

The NCDC reported one damaging ice storm in Houston County (see Figure 6-29), which resulted in $15,000 in property damage[24]. No injuries or deaths can be attributed to the reported ice storms. A full listing of reported events can be found in Appendix 9.8.

Figure 6-29: Ice Storms (NCDC)[24]

Start Date	Type	Property Damage	Crop Damage
01/04/1998	Ice Storm	$15,000	$0
	TOTAL	$15,000	$0

Blizzards

The NCDC reported no damaging blizzards in Houston County. No injuries or deaths can be attributed to the reported blizzards. A full listing of reported events can be found in Appendix 9.8.

6.1.6.C FEMA DECLARED DISASTERS

There have been no federally declared disasters related to winter storms in Houston County.

6.1.6.D GEOGRAPHIC LOCATION

All of Houston County is at risk from winter storms. Transportation infrastructures such as roadways are especially vulnerable to winter weather. Ice storms and blizzards may create extremely dangerous road conditions. Aboveground power lines are also vulnerable to high winds and the accumulation of ice.

6.1.6.E HAZARD EXTENT

The extent of the damage that may be caused by severe winter weather fluctuates depending on the timing, physical location, and magnitude of the event.

6.1.6.F VULNERABILITY ANALYSIS

Critical Facilities

Similar to infectious disease, the greatest risk to critical facilities from severe winter weather is how the hazard can impact response times and recovery from other hazard events. For example, if a fire, hazardous material release, or other significant hazard occurred in the midst of a blizzard or ice storm, emergency response time would be greatly increased and the damage from the event would be much higher.

6.1.7 HAZARDOUS MATERIAL RELEASE

6.1.7.A DEFINITION & BACKGROUND

Hazardous materials (HAZMAT) may be defined as any chemical substance that poses a short-term or long-term toxicological threat to humans and the environment[37]. HAZMAT can be a solid, gas, or liquid. The United States Environmental Protection Agency sorts HAZMAT into the following categories: toxic agents (irritants, asphyxiates, anesthetics, narcotics, sensitizers); other types of toxic agents (hepatotoxic and nephrotoxic agents, carcinogens, mutagens); hazardous waste; hazardous substances; toxic pollutants; and extremely toxic substances. HAZMAT can affect people through inhalation, ingestion, or direct contact with skin.

HAZMAT incidents are usually unintentional. However, they may be the result of criminal or terrorist activity. HAZMAT release can happen at a fixed location, during transportation, or at nuclear storage facilities.

Fixed Events

Fixed events accounts for the 3.9 percent of HAZMAT incidents[37]. HAZMAT is stored, processed, and handled at a variety of different facilities. These facilities range from small to large, including: refineries, chemical plants, storage terminals, manufacturing plants, laboratories, greenhouses, automotive stores, etc. The fixed-site release of HAZMAT may result from different types of leaks or equipment failures, human errors, fire-induced releases, or from natural causes (e.g. tornado, floods).

The fixed events category also includes HAZMAT release from pipelines. Despite improved standards for new pipeline construction, pipeline incidents have not declined in recent years. This is largely due to failures involving older pipelines that are suffering from erosion and age-related deterioration. Other common causes of pipeline incidents are damage from agricultural and construction activities, structural and mechanical failures, and natural hazards.

The impact of a HAZMAT incident can vary drastically, and range from inconvenient to catastrophic. A number of variables influence the potential impact to the public and the environment, including: the type of material(s) released, the amount released, the location of the release, and the circumstances surrounding of the release. A small incident may force the evacuation of a portion of a specific facility; a large incident may cause the evacuation of an entire community. Likewise, a minor release may be cleaned up in a few days, while a major release may take weeks, months, years, or – in extreme and rare situations – prove impossible to decontaminate within our lifetime using existing technology.

Transportation Related Events

Release during transportation accounts for 96.1 percent of HAZMAT incidents. Of the total incidents, 81.4 percent occur as part of highway transportation and 14.7 percent occur as part of railroad transportation. Seventy percent of railroad-related HAZMAT incidents occur during collisions or derailments, or as a result of leaks and defective equipment.[38] Despite the fact that total rail traffic has been increasing, the number of railroad accidents has been decreasing due to the use of improved safety measures.

Nuclear Storage Facility Events

The closest nuclear storage facility, La Crosse Boiling Water Reactor, is located in Genoa, Wisconsin (30 miles east of Houston County) that sits on the eastern bank of the Mississippi River. It was shut down on April 30, 1987 and a decommissioning plan was approved on August 7, 1991.[66] Negotiations are currently taking place to expedite the decommissioning process in 2016[66].

The effects of radiation exposure depend on the intensity and length of time the population was exposed to radiation. Low exposure, comparable to chest x-rays, may slightly increase the risk of cancer. Much higher exposures can cause radiation sickness or death[52].

There is no risk of a nuclear explosion with the associated physical mass destruction, because nuclear storage facilities do not explode like nuclear detonation devices since the fuel is of low enrichment[52].

Relationship to Other Hazards

Other hazards, either natural- or human-caused, can result in HAZMAT release. Floods, heavy rain, snow, ice, and high winds can all potentially cause traffic accidents leading to HAZMAT release. Natural hazards, such as high winds and flooding, can also increase the spread of HAZMAT following an incident. Additionally, other hazards can impact the response to HAZMAT incidents by restricting access to release sites, damaging critical response facilities and equipment, and lowering the number of personnel available to respond.

6.1.7.B PREVIOUS OCCURRENCES

There is no record of a major hazardous material spill or accident in Houston County to date. However, minor incidents have occurred at fixed sites and during transportation (see Figure 6-30). These incidents have had an insignificant impact on the community at large. The likelihood of a major hazardous event is considered to be marginal, but isolated minor incidents are a constant hazard.

Figure 6-30: Fixed Events, 1990-2013[73]

NRC Report #	Incident Date	Type Of Incident	Incident Cause	Location	Material Name
1053183	07/09/13	Fixed	Equipment Failure	509 N Chesnut St	Oil
1007548	04/02/12	Mobile	Equipment Failure	Milepost 161	Hydrologic Oil
983843	07/25/11	Vessel	Vessel Sinking	Mile 688 on Upper Mississippi River	Gasoline: Automotive (Unleaded)
950977	08/14/10	Fixed	Unknown	Milepost 160	Unknown
935063	03/25/10	Railroad	Equipment Failure	Shelhornn Dr./St. Hwy 26	Hydrologic Oil
892711	12/17/08	Railroad	Derailment	On the Line, La Crescent	Nitro Fertilizer, Oil-Diesel, Oil Misc.-Motor
878801	07/29/08	Railroad	Derailment	Mile Post 142.5, Reno	Ethanol Alcohol, Residue Phosphoric Acid
853482	11/02/07	Railroad	Unknown	Milepost 284.7, Tomah Subdivision, La Crescent	Oil - Diesel
819291	11/26/06	Unknown Sheen	Unknown	628 Shore Acres Rd., La Crescent	Unknown Oil
756021	04/17/05	Railroad	Equipment Failure	River Junction, MP-205, La Crescent	Oil, Fuel- 2-D
736785	09/29/04	Pipeline	Other	S of State Hwy 76, Houston	Natural Gas
531509	06/09/00	Unknown Sheen	Unknown	Unknown Sheen Incident, Locking Dam 7, La Crescent	*
526585	04/19/00	Railroad	Equipment Failure	Main Line	*
526416	04/17/00	Mobile	Other	Intersection of Hwy 61 and S Chesnut St., La Crescent	*

**Not listed*

Figure 6-30: Fixed Events, 1990-2013[73] *(con't)*

NRC Report #	Incident Date	Type Of Incident	Incident Cause	Location	Material Name
470106	01/09/99	Railroad Non-Release	Unknown	Gravel Pit Crossing, La Crescent	*
389903	06/04/97	Railroad	Unknown	New Albin	*
378082	02/26/97	Railroad	Unknown	Debuque Sub. La Crescent	*
362807	09/29/96	Railroad Non-Release	Unknown	DOT Number UNK/Park Rd.	*
293511	05/30/95	Mobile	Other	POB 775	Prowl (Herbicide)
108309	02/26/92	Pipeline	Operator Error	La Crescent	Natural Gas
61676	03/01/91	Mobile	Equipment Failure	Hwy 16 near La Crescent	Hydraulic Oil

**Not listed*

The U.S. Department of Transportation (DOT) keeps a record of incidents that are related to the transportation of hazardous material. Figure 6-31 depicts the three events that appear in the database for Houston County. None of the events resulted in fatalities or significant property damage.

Figure 6-31: Transportation-Related Incidents, 1972-2012[74]

Report Number	Location	Date	Hazardous Class	Fatalities	Damages	Transport Mode
I-1975060341	Houston	05/24/75	Gasoline	0	0	Highway
I-1972100339	Houston	10/09/72	Gasoline	0	0	Highway
I-1996070235	La Crescent	06/17/96	Hydrochloric Acid	0	0	Highway
TOTAL				0	0	

The U.S. Coast Guard's (USCG) National Response Center (NRC) reports that between 1990 and 2013 there have been 17 fixed event HAZMAT releases within Houston County, seven of which have occurred within the past five years. The NRC database does not contain information regarding deaths, injuries, or property damage resultant of HAZMAT releases.

6.1.7.C FEMA DECLARED DISASTERS

There have been no federally declared disasters specific to hazardous material release in Houston County[9].

6.1.7.D GEOGRAPHIC LOCATION

All of Houston County is to some degree at risk from HAZMAT release. The degree of risk varies upon location. However, properties adjacent to highways, railroads, and fixed-site facilities and pipelines are at the greatest risk.

6.1.7.E HAZARD EXTENT

The hazard extent can vary drastically depending on the toxicity of the material(s) released, the amount released, and the location of the incident.

6.1.7.F VULNERABILITY ANALYSIS

The maps depict the vulnerability of critical facilities to hazardous material release. It is presumed that any release will have an impact area radius of a half mile.

6.1.8 ESSENTIAL SERVICES FAILURE

6.1.8.A DEFINITION & BACKGROUND

Dam/Levee Failure

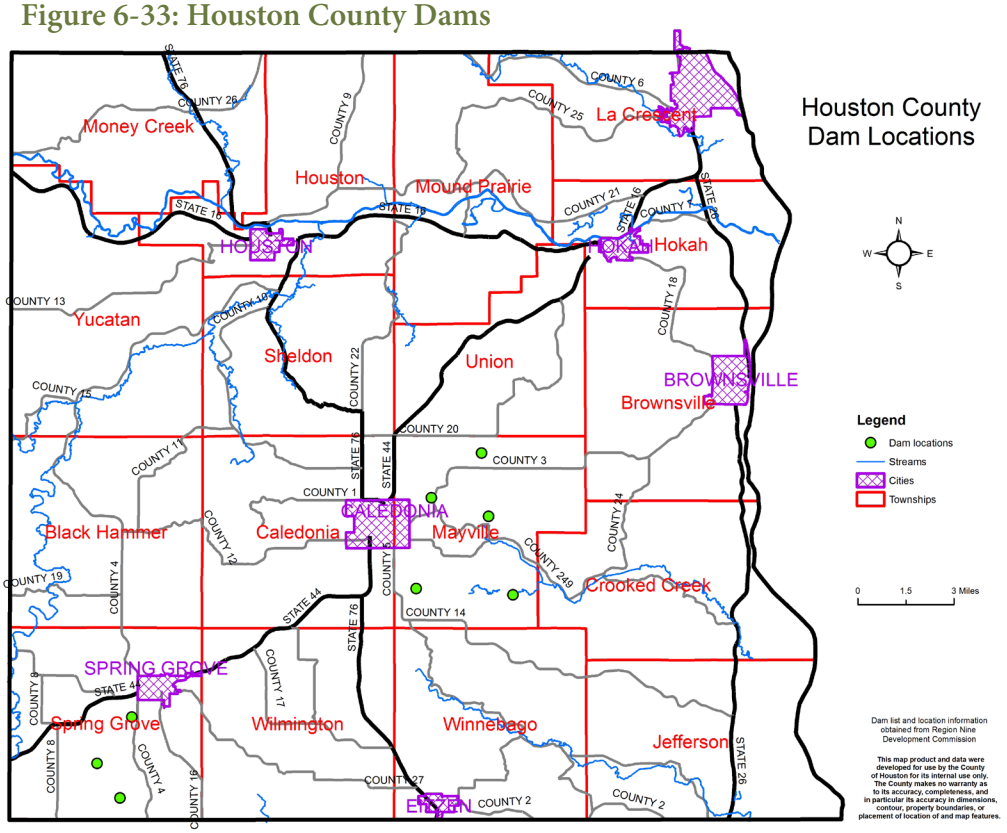
Dams may fail due to heavy flooding, inadequate design, improper operation, or a lack of maintenance. Dam failures can result in flash flooding with the possibility of significant damage to property and loss of life[41]. In order to help prevent dam failures, the Minnesota Department of Natural Resources (DNR) operates its Dam Safety Program. Under this program, dams are classified based on the danger to the public in the event of a failure. The DNR dam classification is outlined in Figure 6-32.

Figure 6-32: Dam Classification[42]

Class	Hazard Description
I	**High Hazard** - Any loss of life or serious hazard, damage to health, main highways, high-value industrial or commercial properties, major public utilities, or serious direct or indirect economic loss to the public.
II	**Significant Hazard** - Possible health hazard or probable loss of high-value property, damage to secondary highways, railroads or other public utilities, or limited direct or indirect economic loss to the public other than that described in Class III.
III	**Low Hazard** - Property losses restricted mainly to rural buildings and local county and township roads which are an essential part of the rural transportation system serving the area involved.

Owners of Class I dams are required to have an Emergency Action Plan (EAP) on file with the DNR. These dams are required to be inspected annually by DNR engineers, the Army Corps of Engineers, the Natural Resource Conservation Service, the Federal Energy Regulatory Commission, or other local units of government. Class II and Class III dams are inspected less frequently. There have been no previous occurrences of any dam failures in Houston County. (See Figure 6-33).

Figure 6-33: Houston County Dams



There are 26 dams in the county, 14 of those dams are privately owned and 12 are publicly owned.

Figure 6-34: Houston County Dams

Dam Name	Inspection Date	Owner Type	NID Height (Ft.)	Primary Purpose	Dam Type
Bear Creek Site 8	5/3/2012	Local Government	27	-	Earth
Ledebuhr	9/5/2007	Private	30	-	Earth
Winnebago 35B	-	Private	21	-	Earth
Wilmington 3	5/3/2012	Private	18	Flood Control	Earth
Baumgartner Group Pond	6/10/2009	Private	32	Flood Control	Earth
Bennet Group Pond	6/10/2009	Private	29	Flood Control	Earth
Fitting Bros Fish Pond	6/10/2009	Private	28	Flood Control	Earth
Thorson Group West	5/4/2011	State	31	Flood Control	Earth
Crooked Creek S-3	5/3/2012	Local Government	44	Flood Control	Earth
Spring Grove Group Structure	6/9/2009	Private	30	-	-
Bear Creet Site 13	6/9/2009	Private	43	Flood Control	Earth
Crooked Creek S1-B	10/21/2011	Local Government	24	Flood Control	Earth
Frauenkron Detention	6/11/2009	Private	33	-	-
Schechs Mill	6/9/2009	Private	10	Hydroelectric	Gravity
Crooked Creek R-1	10/21/2011	Local Government	56	Flood Control	Earth
Crooked Creek R-3	10/21/2011	Local Government	60	Flood Control	Earth
Feldmeier Detention	6/24/2010	Private	29	Flood Control	Earth
Crooked Creek R-2	10/21/2011	Local Government	52	Flood Control	Earth
Bear Creek Site 3	5/3/2012	Local Government	31	-	Earth
Bear Creek Site 17	6/9/2009	Local Government	35	Flood Control	Earth
Thorson Group North	5/4/2011	State	30	Flood Control	Earth
Crooked Creek R-4	10/21/2011	Local Government	54	Flood Control	Gravity
Pollema Pond	6/10/2009	Private	36	Debris Control	Earth
Richards Group Pond	6/10/2009	Private	27	Flood Control	Earth
Crooked Creek R-1	11/18/2005	Local Government	44	Flood Control	Earth
Rauk Detention	6/10/2009	Private	27	Flood Control	Earth

Figure 6-35: Houston County Levee

System Name	Sponsor(s)	Length (Miles)	Inspection Date	Inspection Rating
Root River - Houston	City Of Houston	2.35	5-Aug-15	Minimally Acceptable

Wastewater Treatment Failure

Wastewater treatment systems are an essential element of our modern lifestyle that we often take for granted. Municipal systems efficiently transport sewage to treatment plants, where microbes are introduced into the sewage in order to break down the Volatile Organic Compounds (VOCs) within it. This process usually occurs in large holding tanks or sewage lagoons. Once the amount of VOCs in the sewage has been reduced to acceptable levels, it is considered safe to discharge the material into surface water bodies such as lakes and rivers, where it poses little threat to the environment. Wastewater treatment systems can fail in one of six ways: hydraulic overload, organic overload, mechanical failure, physical/structural component failure, change of use, or introduction of incompatible materials[75].

<u>Hydraulic Overload</u>

Hydraulic overload occurs when the amount of water entering the system exceeds the capacity of the system to process and discharge the water. This is often attributable to leaky pipes, leaky plumbing fixtures, or surface water runoff into the system. The result of this is a backflow of effluent.

Organic Overload

Organic overload occurs when the level of VOCs in the waste stream is too high for the system to filter. The waste stream becomes a thick sludge, clogging the treatment filters and causing a backflow of effluent.

Mechanical Failure

Mechanical failure happens when a moving part of the treatment facility ceases to function properly, such as a pump station, float, or blower. Hydraulic and organic overloads can often be triggered by a mechanical failure in the system.

Physical/Structural Component Failure

Some examples of physical or structural component failure include a broken pipe, uneven settling of tanks and distribution boxes, or the collapse of other system components.

Change of Use

A change of use occurs when the usage patterns that a system was designed to handle are altered. For example, a system designed to support a summer vacation cabin may quickly become overtaxed if the cabin is converted to a permanent year-round residence. Alternatively, a large new subdivision or industrial land user that hooks into a small municipal system may cause that system to become overtaxed, eventually leading to a mechanical failure and/or hydraulic or organic overload.

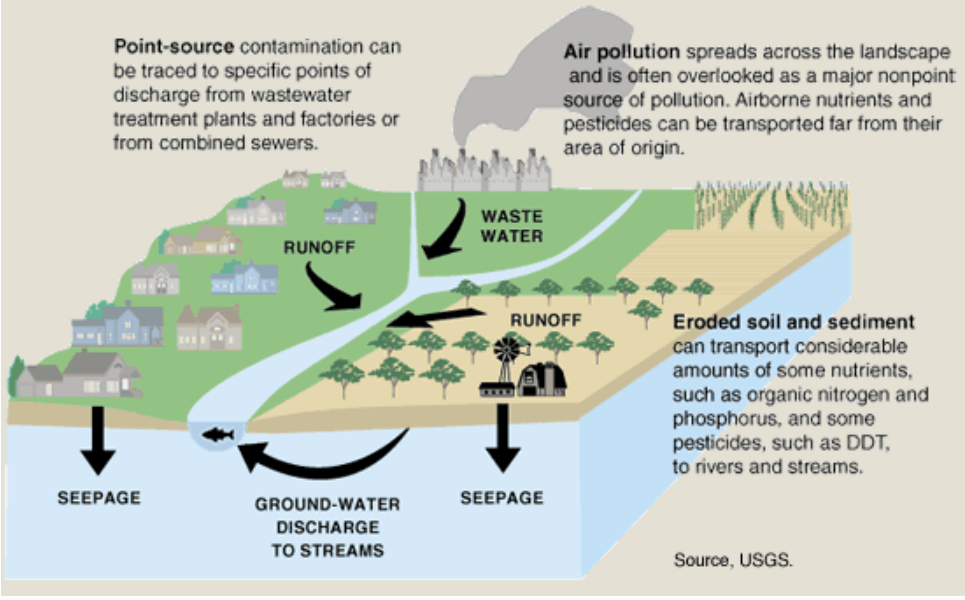
Introduction of Incompatible Materials

The introduction of chemicals or organic compounds into the system, which disrupt the microbial treatment process, can result in an organic overload. Common incompatible materials include household cleaning chemicals, lawn care chemicals, and agricultural chemicals. Industrial chemicals are also a potential source of failure.

Water Supply Contamination

Water supply contamination is the introduction of pollutants into groundwater and surface water supplies. Contaminants can enter the water supply due to point or non-point source pollution. Point source pollution has its source in a well-defined location, such as the pipe through which a sewage treatment plant or a factory discharges waste into a body of water[76]. Non-point source pollution has its source over a large area. An example of non-point source pollution is agricultural runoff that flows into the county ditch system and leaches into the groundwater. Figure 6-36 depicts the various sources of water supply contamination.

Figure 6-36: Groundwater Contamination Sources[77]



Water supply contamination may result from a variety of point and non-point sources, including: wastewater treatment failure, agricultural runoff, industrial pollution, hazardous material releases, dam failure, and the improper disposal of household chemicals. Categories of contaminants include microbial life forms, inorganic and VOCs, and pesticides and herbicides.

Contamination due to wastewater treatment systems failure is an ongoing concern. These systems are vital to our model of civilization, but they also pose a potential risk to public health. The improper treatment or release of untreated sewage could result in surface and groundwater pollution, as well as outbreaks of infectious disease. The scale of damage differs depending on the size of the system. For example, a failure of an individual septic system would be minor compared to the failure of a municipal treatment facility.

Another likely source of contamination is the application of agricultural fertilizers. Phosphorus is an essential nutrient for all plants to grow. When excess amounts enter surface water bodies they enable large algal blooms to occur. These blooms deplete the oxygen supply within the water, killing fish and other species and making the water unsafe for consumption.

Manure runoff from feedlots is also a concern. Heavy rainfall can cause feedlot sewage lagoons to overflow and contaminate nearby surface water bodies or ground water wells. Feedlot manure contains high amounts of E. coli and antibiotic drugs, which can result in infectious disease outbreaks.

Relationship to other Hazards

Dam/Levee Failure

Infrastructure failure can cause flooding, which is usually associated with heavy precipitation during summer storms or unusually heavy snowfall during the winter season, which then melts when spring arrives. Wildfires can increase the speed of flooding by removing ground vegetation that would otherwise have slowed the flow of floodwaters. The danger from flooding can be compounded when floodwaters breach facilities that contain hazardous materials. Once contaminated, the floodwaters can spread the hazardous materials over large areas. Flooding also poses a risk to groundwater by potentially contaminating wells within the flooded area.

Wastewater Treatment Failure

A physical or structural component failure in the system can cause raw sewage to seep into the ground and contaminate soil or ground water. A backflow of effluent resulting from a hydraulic or organic overload can result in the release of raw sewage into city streets, rendering the area uninhabitable. This can also contribute to the spread of disease and the contamination of surface water bodies.

Water Supply Contamination

Biological pollutants can contribute to the spread of infectious diseases. Chemical pollutants can impact public health and have the potential to damage wastewater treatment infrastructure. Fire is a possible secondary hazard in the event of contamination if the substance is flammable.

6.1.8.B PREVIOUS OCCURRENCES

Dam/Levee Failure

There have been no previous occurrences of dam/levee failure in Houston County.

Wastewater Treatment Failure

There have been no previous occurrences of wastewater treatment failure within Houston County.

Water Supply Contamination

There have been no previous occurrences of water supply contamination in Houston County.

6.1.8.C FEMA DECLARED DISASTERS

There have been no federally declared disasters specific to dam/levee failure, wastewater treatment failure, or water supply contamination in Houston County[9].

6.1.8.D GEOGRAPHIC LOCATION

Wastewater Treatment Failure

All of Houston County is at risk for wastewater treatment failure.

Water Supply Contamination

All of Houston County is at risk for water supply contamination.

Dam/Levee Failure

All areas either surrounding or nearby dams/levees are at risk for failure. Flooding increases the risk of failure on dams/levees.

6.1.8.E HAZARD EXTENT

Wastewater Treatment Failure

The extent of wastewater treatment failure depends heavily on the size of the system, the magnitude of the failure, and the speed at which the system can be restored. A septic system failure may have limited impact on the county, whereas a municipal system failure could impact an entire city.

Water Supply Contamination

The extent of water supply contamination depends on: the amount and type of pollutant that is introduced into the water supply, the point of entry, the speed at which it can spread, and the speed at which it can be decontaminated. A spill of toxic chemicals into a lake may impact a limited area and be easier to remediate, whereas seepage of pollutants into the groundwater supply could take decades to remediate and impact a much wider area.

Dam/Levee Failure

The extent of dam/levee failure depends heavily on the size of the system, the magnitude of the failure, and the speed at which the system can be restored. According to Houston County, there have been no recorded mitigation projects with public funding.

6.1.8.F VULNERABILITY ANALYSIS

The Figure 6-37 depicts the groundwater vulnerability of the county. The Minnesota DNR classifies vulnerability to groundwater contamination from surface sources and wells based on the makeup and depth of the layers of rock, till, and soil found above aquifers. Low vulnerability areas are not easily contaminated from surface land uses. Medium vulnerability areas are more susceptible to seepage of surface pollutants into groundwater aquifers. High vulnerability areas can be easily contaminated by surface land use activities. It is important to note that all areas can be easily contaminated if surface pollutants are transported below ground via open wells. Land uses in areas of high vulnerability and near open wells should be restricted to activities that will not leech pollutants into the ground.

Critical Facilities

There are 40 critical facilities that could be threatened by water supply contamination. The majority of these are located in the cities of Caledonia and Spring Grove. A full list of these facilities can be found in Figure 6-38.

Figure 6-37: Vulnerability of Houston County to Water Supply Contamination

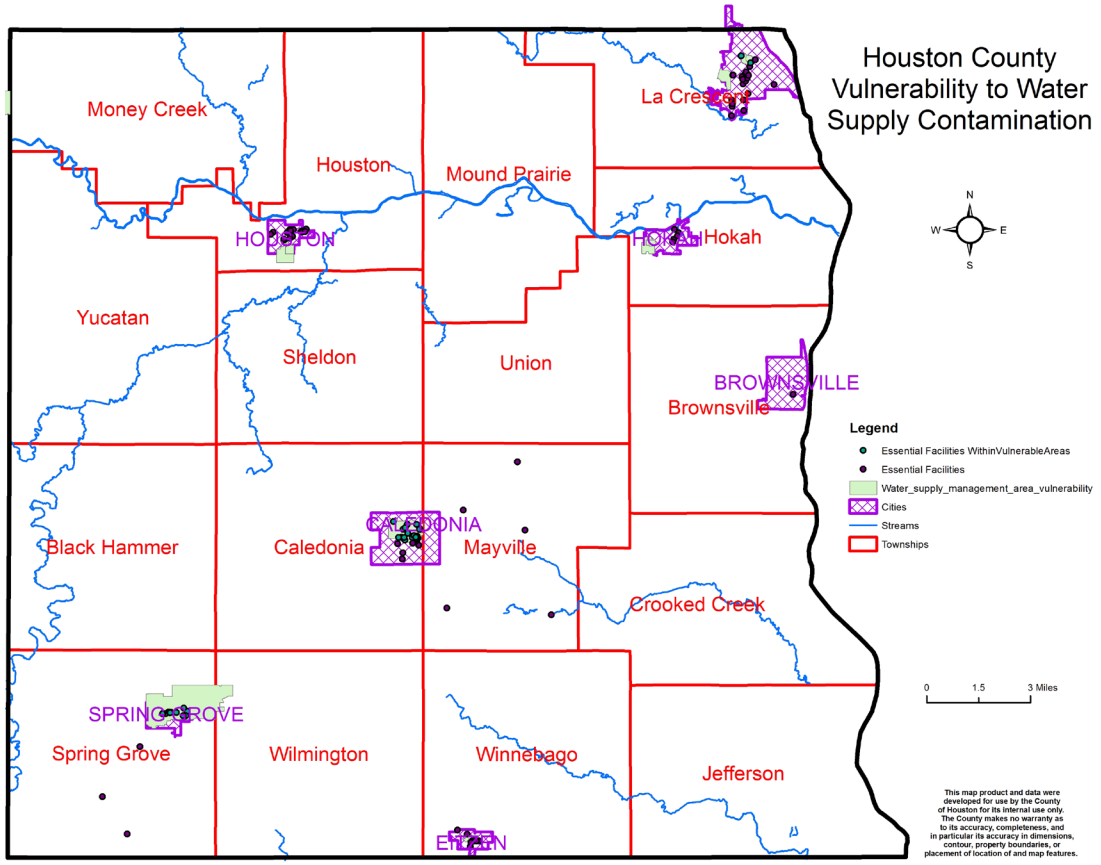


Figure 6-38: Vulnerability Essential Facilities in Houston County to Water Supply Contamination

Vulnerable Essential Facilities in Houston County to Water Supply Contamination	
Facility:	**Address:**
Spring Grove Police Department	118 1st Ave. Nw. Spring Grove, MN
Spring Grove Fire Department	118 Firs Avenue N. W. MN
Caledonia Volunteer Fire Department	201 East Main St., Caledonia, MN
Caledonia Ambulance Service	231 East Main Street, Caledonia, MN
Spring Grove Ambulance Service	172 West Main, Spring Grove, MN
Franciscan Skemp Caledonia Clinic - Mayo Health System	701 North Sprague St., Caledonia, MN
Franciscan Skemp La Crescent Clinic - Mayo Health System	524 North Elm St., La Crescent, MN
Houston County Public Health	611 Vista Drive, Caledonia, MN
Tri - County Veterinary Services	504 East Main Street, Spring Grove, MN
Hiawatha Valley Mental Health Center	121 South Marshall St. Caledonia, MN
Gundersen Health System	123 5th Ave SE, Spring Grove, MN
Caledonia Veterinary Clinic	126 W Main Caledonia, MN
Caledonia Elementary School	511 West Main St., Caledonia, MN
Caledonia High/Middle School	825 North Warrior Ave., Caledonia, MN
Spring Grove School	113 2nd Ave. NW, Spring Grove, MN
St. John's Lutheran School	720 N Marshall Street, Caledonia, MN
B & M Services	128 N Kingston, St. Caledonia
Kwik Trip	110 N Sunset Blvd, Caledonia, MN
BP	118 W Main St, Spring Grove, MN
Kwik Trip	142 W Main St, Spring Grove, MN
Kwik Trip	216 N 4th St, La Crescent, MN

Figure 6-38: Vulnerability Essential Facilities in Houston County to Water Supply Contamination *(con't)*

Facility:	Address:
Caledonia Care & Rehab	425 N Badger St, Caledonia, MN
Caledonia Elementary School	511 W Main St, Caledonia, MN
Caledonia Public Schools Dist	511 W Main St, Caledonia, MN
Caledonia Haulers Inc	420 W Lincoln St, Caledonia, MN
Quillin's IGA	510 Vista Dr, Caledonia, MN
Northern Engraving	202 4th Ave NE, Spring Grove, MN
Spring Grove Elementary School	113 2nd Ave NW, Spring Grove, MN
Spring Grove Public School	113 2nd Ave NW, Spring Grove, MN
Tweeten Lutheran Healthcare	125 5th Ave SE, Spring Grove, MN
Caledonia Care and Rehabilitation Center	425 North Badger St., Caledonia, MN
Tweeten Lutheran Health Care Center	125 5th Avenue Southeast, Spring Grove, MN
Caledonia Care and Rehab Buck	425 North Badger St., Caledonia, MN
Roseview Court Care Agency	425 North Badger St., Caledonia, MN
Spring Grove Assisted Liv LLC	130 5th Avenue SE, Spring Grove, MN
Eitzen State Bank- Caledonia	115 North Highway 44/76, Caledonia, MN
Merchants Bank, NA	126 West Main Street, Spring Grove, MN
Jandt-Fredrickson Funeral Home	518 West Main St., Caledonia, MN
McCormick Funeral Home	205 Main Street East, Caledonia, MN
Roble Funeral Home	225 East Main St., Spring Grove, MN

6.1.9 HUMAN AND ANIMAL RELATED HAZARDS

6.1.9.A DEFINITION & BACKGROUND

Terrorism

Terrorism is the unlawful use of force or violence against people or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.[78] Most terrorism events are at a national or international level. Initially, domestic or local events will be perceived as a criminal act and not immediately recognized as terrorism.[78] Hazards can result from the use of arson, armed attacks, and weapons of mass destruction, which include: biological, chemical, nuclear and radiological weapons.

Terrorism often involves areas where high numbers of civilians congregate, such as airports, train stations, hotels, shopping malls, schools, and government buildings. Terrorism can also include the deliberate sabotage of transportation systems, power plants, or industrial equipment.

Infectious Disease

Infectious diseases are one of the leading causes of illness and death throughout the world. They are disorders caused by organisms (e.g. bacteria, viruses, fungi, parasites) which are transmitted from a source into a host and proceed to cause illness. Figure 6-39 provides examples of commonly known infectious diseases. Infectious diseases can be transmitted person to person, via bites from insects or animals, by ingesting contaminated food or water, or through various other exposures in the environment[79]. Infectious diseases can affect humans, plants, or animals.

Throughout the 19th and 20th centuries, advancements in medicine and technology and improvements in hygiene and sanitation greatly decreased the threat from infectious diseases. As a result, between 1900 and 1999 the average life expectancy in the United States increased by 29 years[80]. However, many diseases once thought to be in decline or eradicated, have re-emerged in recent decades. Examples of these diseases include: pertussis (whooping cough), tuberculosis, measles, mumps, cholera and smallpox. In

Figure 6-39: Examples of Bacterial, Viral, and Parasitic Diseases[79]

Bacterial	Viral	Parasitic
Anthrax	AIDS	Malaria
Botulism	Chickenpox	Scabies
Cholera	Common cold	
Diphtheria	Dengue fever	
Gonorrhea	Ebola	
Leprosy	Hepatitis	
Lyme disease	Herpes	
Plague	Influenza	
Scarlet fever	Measles	
Syphilis	Mumps	
Tetanus	Rabies	
Tuberculosis	Rubella	
Typhoid fever	Smallpox	
Typhus	Viral meningitis	
	West Nile	
	Yellow fever	

addition to these resurgent diseases, recent decades have witnessed the emergence of deadly new diseases, such as HIV/AIDS, SARS, H1N1 (swine flu), H5N1 (bird flu), West Nile Virus, Mad Cow Disease, and Ebola. Important factors influencing emergence include changes in human demographics and behavior, technology and industry, economic development and land use, globalization, microbial adaptation and evolution, and the breakdown of public health measures[81]. Due to the disturbing trend of disease resurgence and emergence, the complacency of the late 20th century has given way to a renewed focus on public health.

An epidemic occurs when there is a rapid outbreak of a specific disease, where the number of cases exceeds normal expectancy. If an epidemic spreads across a wide geographic area, it becomes a pandemic. Pandemics can cause, or contribute to, major societal disturbances and economic distress. The most well-known pandemic of the 20th century started in 1918. In less than two years the Spanish Flu killed between 30 and 50 million people, including 675,000 Americans[82]. Two additional global flu pandemics occurred in 1957 (Asian flu; 2 million dead globally; 70,000 Americans dead) and in 1968 (Hong Kong flu; 1 million dead globally; 33,000 Americans dead).

In 2005, the World Health Organization published guidance defining the six phases of a pandemic. These phases are depicted in Figure 6-40.

Figure 6-40: Six Phases of a Pandemic[83]

Inter-pandemic Period	
Phase 1	No new influenza virus subtypes have been detected in humans. An influenza virus subtype that has caused human infection may be present in animals. If present in animals, the risk of human infection or disease is considered to be low.
Phase 2	No new influenza virus subtypes have been detected in humans. However, a circulating animal influenza virus subtype poses a substantial risk of human disease.
Pandemic Alert Period	
Phase 3	Human infection(s) with a new subtype but no human-to-human spread or at most rare instances of spread to a close contact.
Phase 4	Small cluster(s) with limited human-to-human transmission but spread is highly localized, suggesting that the virus is not well adapted to humans.
Phase 5	Larger cluster(s) but human-to-human spread is still localized, suggesting that the virus is becoming increasingly better adapted to humans but may not yet be fully transmissible (substantial pandemic risk).
Pandemic Period	
Phase 6	Pandemic phase: increased and sustained transmission in the general population.
Post-pandemic Period	
Return to Inter-pandemic Period (Phase 1).	

Animal Disease Outbreak

An animal disease outbreak can be highly contagious, infectious, or economically devastating. The introduction of new strains, reintroduced strains, or foreign animal disease strains (introduced intentionally or accidentally) are also included. Animal diseases can affect large numbers of livestock in a particular time frame, which will cause serious economic implications. Contagious animal diseases that are zoonotic (spread from animals to humans) could have serious public health concerns. Figure 6-41 identifies common zoonotic illnesses associated with animal contact and Figure 6-42 lists positive disease test results from Minnesota animals. The Minnesota Board of Animal Health has been established to monitor animal health, eradicate animal diseases, and conduct emergency planning exercises. They coordinate with federal government, state government, local government, industries and livestock producers to ensure rapid response times to outbreaks and oversees management practices.

Figure 6-41: Common Illnesses Associated with Animal Contact

Rabies
Brucellosis
Blastomycosis
Plague
Psittacosis
Intestinal Illness (E.coli, Cryptosporidium parvum, Campylobacter, Salmonella)

Figure 6-42: Animal Diseases

Foreign Animal Disease	Anthrax	Avian Chlamydiosis
Avian Encephalomyelitis	Avian Metapneumovirus	Blastomycosis
Bovine Spongiform Encephalopathy	Brucellosis	Chronic Wasting Disease
Equine Encephalitis	Equine Herpes Myeloencephalopathy	Equine Infectious Anemia
Equine Piroplasmosis	Infectious Laryngotracheitis	Influenza
Johne's Disease, Paratuberculosis	Mycoplamsa gallisepticum	Mycoplasma meleagridis
Mycolplasma synoviae	Plague	Pseudorabies
Pullorum-Typhoid Disease	Q-Fever	Rabies
Salmonella enteritidis	Scrapie	Tuberculosis
Tularemia	West Nile Virus	Vector-borne diseases of Public Health Significance
Zoonotic diseases of Public Health Significance	Chemical Toxicity or Contamination of Public Health Significance	

Relationship to Other Hazards

Terrorism

Depending on the mode of attack and magnitude of destruction, terrorism may have direct influence on other hazards such as fires, hazardous material releases, essential services failure, and human/animal related hazards.

Infectious Disease

Infectious disease outbreaks may occur following a major hazard event, such as drought or water supply contamination event. Alternatively, an outbreak of infectious disease may impact a community's response to, and recovery from, another hazard event. For example, if a tornado was to occur during a major flu outbreak the number of available emergency responders may be much lower than normal. Additionally, medical facilities may be at capacity and unable to accommodate additional wounded persons.

Animal Disease Outbreak

Animal disease outbreaks may occur following a major hazard event, such as drought, hazardous material releases, or water supply contamination event.

6.1.9.B PREVIOUS OCCURRENCES

Terrorism

There have been no previous incidents of terrorism in Houston County.

Infectious Disease Outbreak

Houston County has not seen any significant outbreaks of infectious diseases in recent years. Figure 6-43 shows the recorded incidences of infectious diseases in Houston County from 2005 to 2014. Also shown is the median level of occurrence for the state.

Figure 6-43: Infectious Disease Statistics 2005-2012[84]

Infectious Diseases	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN	HOUSTON	MEDIAN
	2005		2006		2007		2008		2009		2010		2011		2012	
Campylobacteriosis	12	4	8	3	3	3	9	4	8	5	12	7	11	7	9	6
Chlamydia	19	21	26	23	17	24	35	31	23	30	22	38	13	45	28	58
Giardiasis	2	2	2	2	2	2	1	3	1	2	5	2	0	2	0	3
Gonorrhea	2	2	0	2	4	2	0	3	0	2	2	2	2	3	1	3
HIV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lyme Disease	26	2	22	2	17	2	1	3	17	2	11	4	9	4	19	3
Salmonellosis	3	3	3	2	5	2	3	3	5	2	1	4	2	3	1	4
Syphilis - All Stages	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Tuberculosis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
West Nile	*	*	*	*	0	0	0	0	0	0	0	0	0	0	0	0

**Information not available*

Animal Disease Outbreak

Houston County has not seen any significant outbreaks of animal diseases in recent years.

6.1.9.C FEMA DECLARED DISASTERS

There have been no federally declared disasters specific to terrorism, infectious disease, or animal disease[9].

6.1.9.D GEOGRAPHIC LOCATION

Terrorism

Terrorism is most likely to occur in populated public areas or near major transportation hubs. Terrorism is highly unlikely to occur in a rural area where few people work or live.

Infectious Disease Outbreak

All of Houston County is at risk from infectious diseases.

Animal Disease Outbreak

All of Houston County is at risk from animal diseases.

6.1.9.E HAZARD EXTENT

Terrorism

The extent of the hazard posed by terrorism can vary drastically based off the type of terrorist act. A hostage situation could involve a school or business, whereas a nuclear blast could destroy the entire county.

Infectious Disease Outbreak

The hazard extent varies depending on the overall health of the community, the specific characteristics of the disease, and the ability of modern medicine to treat and control the disease.

Animal Disease Outbreak

The hazard extent varies depending on the overall health of the animal population, the specific characteristics of the disease, and the ability of modern medicine to treat and control the disease.

6.1.9.F VULNERABILITY ANALYSIS

Critical Facilities

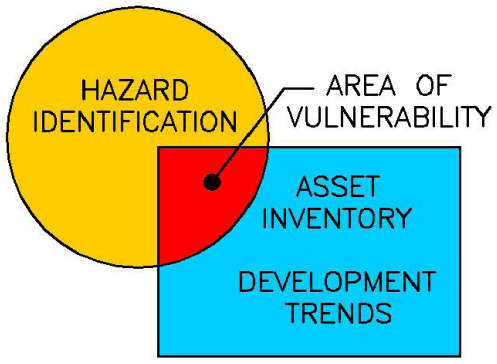
As discussed above, the risk of terrorism, infectious disease, and animal disease poses to critical facilities is related to how it can impact response times and recovery from other hazard events. Given the nature of the hazard it does not pose a significant risk on its own.

6.2 VULNERABILITY ASSESSMENT

The Calculated Priority Risk Index (CPRI) is a tool used to assess hazards based on an indexing system that considers probability, magnitude/severity, warning time, and duration. The CPRI value is obtained by assigning varying degrees of risk to each of the four categories for each hazard, and then calculating an index value based on a weighting model. For this update, the mitigation team evaluated the updated hazards and developed new CPRI values.

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends and intersecting them with the hazard profiles to assess the potential amount of damage that could be caused by each hazard event. This concept is generally illustrated by Figure 6-44.

Figure 6-44: Conceptual Depiction of a Vulnerability Analysis



6.2.1 DEFINITIONS OF CPRI CATEGORIES

Probability

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

Magnitude/Severity

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

Warning Time

Plays a factor in the ability to prepare for a potential disaster and to warn the public. More warning time should allow for more emergency preparations and public information.

Duration

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

6.2.2 CPRI RATINGS

The following ratings are provided as a tool for local governments to analyze their risks. However, the CPRI ratings should not be construed as a precise way for determining risk. The ratings are a way to quantify and summarize the information from the risk and vulnerability assessment. Local input is also part of the rating since they are done as part of the mitigation team. The CPRI Ratings are coded by color to act as one of the components to prioritize mitigation actions (see Figure 6-45).

Figure 6-45: CPRI Ratings

CPRI Rating Range	Priority
3.00 – 4.00	High
2.00 – 2.99	Medium
1.00 – 1.99	Low
0.00 – 0.99	Negligible

6.2.3 PROBABILITY AND IMPACT RATING

Ratings were determined using methodology provided by HSEM and with input from local jurisdictions. Input for the unincorporated areas was provided by the county, which was combined with input from each of the seven cities to create the county total CPRI rating (see Figure 6-46).

Figure 6-46: Houston County CPRI Hazard Rankings

HAZARD	Probability		Magnitude / Severity		Warning Time / Duration	
	County	Average*	County	Average*	Warning Time	Duration
Flooding	3.46	2.57	2.92	2.52	> 1 Month	Up to several years
Drought	3.54	3.04	2.69	2.43	< 1 Hour	Up to several weeks
Land Subsidence/ Landslides/Sinkholes	3.38	2.94	2.46	2.39	<1 Hour	Up to several weeks
Fire	2.67	1.80	2.08	1.68	<1 Hour	Up to a week
Summer Storms	2.08	2.09	2.23	1.83	< 1 Hour	Up to several weeks
Winter Storms	2.33	2.14	2.15	2.31	< 1 Hour	Up to a day
Hazardous Materials	2.17	1.94	2.67	2.19	< 1 Day	Up to several weeks
Essential Services Failure	2.23	2.23	2.46	2.49	<1 Week	Up to a day
Human and Animal Related Hazards	2.15	2.11	2.38	2.55	< 1 Week	Up to several weeks

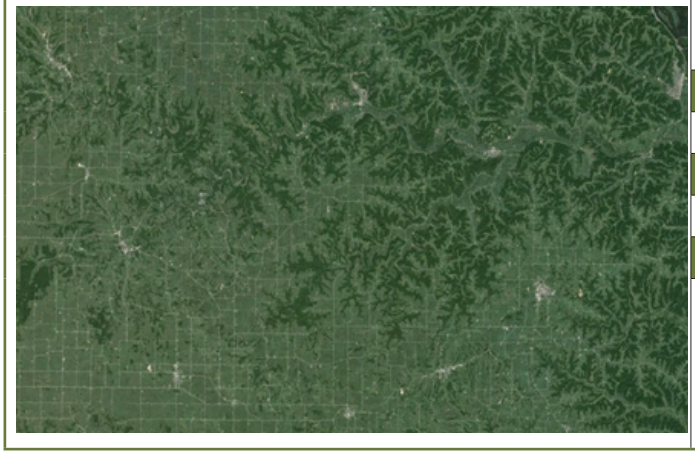
**Combined average score of all participating jurisdictions including Houston County.*

6.2.4 VULNERABILITY ASSESSMENT BY JURISDICTION

Each individual jurisdiction within the county was asked to rate their vulnerability to each of the hazards identified in the plan. Jurisdictions were asked to both assess the probability that a hazard might affect their jurisdiction as well as the severity or impact that the hazard could have. The overall ratings for each hazard were averaged out to give a county wide total.

The following tables show the rating given by each city for probability, impact and the overall county average. The scale given for probability was highly likely, likely, possibly and unlikely; while impact was rated on a scale of catastrophic, critical, limited, and negligible. Hazards highlighted in green are those that represented a lower rating than the county wide average, while those in red represent a higher rating.

6.2.4.A HOUSTON COUNTY

Satellite Photo of Houston County	County Emergency Management
	306 S. Marshall Street Caledonia, MN 55921
	Phone
	(507) 725-5834
	E-Mail
	kurt.kuhlers@co.houston.mn.us
	2010 Population
	19,027

HAZARD	Probability		Magnitude / Severity	
	Houston County	Average of All	Houston County	Average of All Cities
Flooding	3.46	2.57	2.92	2.52
Drought	2.08	2.09	2.23	1.83
Land Subsidence/ Landslides/Sinkholes	2.67	1.80	2.08	1.68
Fire	2.33	2.14	2.15	2.31
Summer Storms	3.54	3.04	2.69	2.43
Winter Storms	3.38	2.94	2.46	2.39
Hazardous Materials	2.15	2.11	2.38	2.55
Essential Services Failure	2.23	2.23	2.46	2.49
Human and Animal Related Hazards	2.17	1.94	2.67	2.19
All Hazards:	**2.67**	**2.32**	**2.45**	**2.26**

6.2.4.B CITY OF BROWNSVILLE

Satellite Photo of Brownsville	City Hall
	104 North 6th Street P.O. Box 138 Brownsville, MN 55919
	Phone
	(507) 482-6732
	E-Mail
	brownsvi@acegroup.cc
	2010 Population
	466

HAZARD	Probability		Magnitude / Severity	
	Brownsville	Average of All	Brownsville	Average of All Cities
Flooding	2.00	2.44	2.00	2.46
Drought	2.00	2.10	2.00	1.78
Land Subsidence/ Landslides/Sinkholes	2.00	1.67	2.00	1.62
Summer Storms	3.00	2.97	2.00	2.39
Fire	2.00	2.11	3.00	2.33
Summer Storms	3.00	2.97	2.00	2.39
Winter Storms	3.00	2.87	2.00	2.38
Hazardous Materials	2.00	2.10	3.00	2.58
Essential Services Failure	2.00	2.23	3.00	2.49
Human and Animal Related Hazards	2.00	1.91	3.00	2.12
All Hazards:	**2.22**	**2.27**	**2.44**	**2.24**

6.2.4.C CITY OF CALEDONIA

Satellite Photo of Caledonia	City Hall
	231 E. Main Street P.O. Box 232 Caledonia, MN 55921
	Phone
	(507) 725-3450
	E-Mail
	cityhall@caledoniamn.gov
	2010 Population
	2,868

HAZARD	Probability		Magnitude / Severity	
	Caledonia	Average of All	Caledonia	Average of All Cities
Flooding	3.50	2.44	3.50	2.46
Drought	2.00	2.10	1.50	1.78
Land Subsidence/ Landslides/Sinkholes	1.50	1.67	1.50	1.62
Fire	2.00	2.11	2.00	2.33
Summer Storms	3.50	2.97	3.00	2.39
Winter Storms	3.50	2.87	3.00	2.38
Hazardous Materials	2.00	2.10	2.50	2.58
Essential Services Failure	2.00	2.23	2.00	2.49
Human and Animal Related Hazards	1.50	1.91	1.50	2.12
All Hazards:	**2.39**	**2.27**	**2.28**	**2.24**

6.2.4.D CITY OF EITZEN

Satellite Photo of Eitzen	City Hall
	202 East Main Eitzen, MN 55931
	Phone
	(507) 495-3017
	E-Mail
	contact@eitzenmn.com
	2010 Population
	243

HAZARD	Probability		Magnitude / Severity	
	Eitzen	Average of All	Eitzen	Average of All Cities
Flooding	2.33	2.44	2.00	2.46
Drought	2.00	2.10	2.33	1.78
Land Subsidence/ Landslides/Sinkholes	2.00	1.67	1.33	1.62
Fire	1.67	2.11	2.33	2.33
Summer Storms	3.00	2.97	2.33	2.39
Winter Storms	2.33	2.87	2.33	2.38
Hazardous Materials	2.00	2.10	2.33	2.58
Essential Services Failure	1.33	2.23	1.67	2.49
Human and Animal Related Hazards	2.00	1.91	2.33	2.12
All Hazards:	**2.07**	**2.27**	**2.11**	**2.24**

6.2.4.D CITY OF HOKAH

Satellite Photo of Hokah	City Hall
	102 Main Street P.O. Box 311 Hokah, MN 55941
	Phone
	(507) 894-4990
	E-Mail
	rblank@acegroup.cc
	2010 Population
	580

HAZARD	Probability		Magnitude / Severity	
	Hokah	Average of All	Hokah	Average of All Cities
Flooding	3.00	2.44	2.50	2.46
Drought	3.00	2.10	2.00	1.78
Land Subsidence/ Landslides/Sinkholes	2.00	1.67	2.50	1.62
Fire	2.00	2.11	2.00	2.33
Summer Storms	3.00	2.97	2.25	2.39
Winter Storms	3.00	2.87	2.50	2.38
Hazardous Materials	2.00	2.10	2.00	2.58
Essential Services Failure	2.50	2.23	2.50	2.49
Human and Animal Related Hazards	2.00	1.91	2.00	2.12
All Hazards:	**2.50**	**2.27**	**2.25**	**2.24**

6.2.4.E CITY OF HOUSTON

Satellite Photo of Houston	City Hall
	PO Box 667 105 W. Maple Street Houston, MN 55943
	Phone
	(507) 896-4033
	E-Mail
	houstonplanning@ acegroup.cc
	2010 Population
	979

HAZARD	Probability		Magnitude / Severity	
	Houston	Average of All	Houston	Average of All Cities
Flooding	1.60	2.44	3.20	2.46
Drought	2.00	2.10	1.60	1.78
Land Subsidence/ Landslides/Sinkholes	1.20	1.67	1.00	1.62
Fire	1.80	2.11	2.00	2.33
Summer Storms	2.60	2.97	1.80	2.39
Winter Storms	2.60	2.87	1.80	2.38
Hazardous Materials	1.40	2.10	2.20	2.58
Essential Services Failure	1.80	2.23	2.60	2.49
Human-Related Hazards	1.20	1.91	2.00	2.12
All Hazards:	**1.80**	**2.27**	**2.02**	**2.24**

6.2.4.F CITY OF LA CRESCENT

Satellite Photo of La Crescent	City Hall
	315 Main Street La Crescent, MN 55947
	Phone
	(507) 895-2595
	E-Mail
	houstonplanning@ acegroup.cc
	2010 Population
	4,830

HAZARD	Probability		Magnitude / Severity	
	La Crescent	Average of All	La Crescent	Average of All Cities
Flooding	3.67	2.44	3.00	2.46
Drought	2.67	2.10	2.00	1.78
Land Subsidence/ Landslides/Sinkhole	2.00	1.67	2.00	1.62
Fire	3.33	2.11	3.00	2.33
Summer Storms	3.67	2.97	3.33	2.39
Winter Storms	3.67	2.87	3.00	2.38
Hazardous Materials	2.33	2.10	3.00	2.58
Essential Services Failure	3.00	2.23	2.67	2.49
Human and Animal Related Hazards	2.67	1.91	2.00	2.12
All Hazards:	**3.00**	**2.27**	**2.67**	**2.24**

6.2.4.G CITY OF SPRING GROVE

Satellite Photo of Spring Grove	City Hall
	P O Box 218 Spring Grove, MN 55974
	Phone
	(507) 498-5221
	E-Mail
	cityofsg@springgrove.coop
	2010 Population
	1,330

HAZARD	Probability		Magnitude / Severity	
	Spring Grove	Average of All	Spring Grove	Average of All Cities
Flooding	1.00	2.44	1.00	2.46
Drought	1.00	2.10	1.00	1.78
Land Subsidence/ Landslides/Sinkholes				
Fire	2.00	2.11	2.00	2.33
Summer Storms	2.00	2.97	2.00	2.39
Winter Storms	2.00	2.87	2.00	2.38
Hazardous Materials	3.00	2.10	3.00	2.58
Essential Services Failure	3.00	2.23	3.00	2.49
Human and Animal Related Hazards	2.00	1.91	2.00	2.12
All Hazards:	**1.89**	**2.27**	**1.89**	**2.24**

SECTION 7: MITIGATION STRATEGIES

The goal of mitigation is to minimize the impact from hazard events on Houston County. This applies to property damage, loss of life, and the economic disruption that can accompany the most serious of disasters. Identifying which hazards are the most likely to adversely impact the county and quantifying the risk they pose is only part of the picture of hazard mitigation. The next step is identifying specific mitigation goals and strategies that can be pursued at the county and city levels in order to achieve the goal of disaster resistant communities.

7.1 COMMUNITY CAPABILITY ASSESSMENT

The capability assessment identifies the policies, regulations, procedures, programs, and projects that contribute to decreasing damages. Since the previous plan, there have been several instances where the local jurisdictions have implemented mitigation actions into local processes and procedures. All of the mitigation actions, whether they were a policy, a regulation, a procedure, a program or a project, their results have improved the safety of those that live within Houston County. Some of these actions include ARMER radio system, and CodeRED.

Within the first responder community, Houston County has upgraded to the ARMER Radio system. This upgrade provides an improved communications system within each department, to first responders and for those in neighboring communities.

There have been updates to the current siren system due to the new ARMER radio system. The county has added an alert notification system called CodeRED. Houston County now has the ability to communicate with all residents on where to go for assistance during a disaster. Along with the notification system, Houston County has also added the CodeRED weather notification system. This ensures residents are notified during the time of a tornado, flooding, severe thunderstorm warning, and winter storm warning. This system is location specific, so residents know that the information they receive is relevant to them and allows them time to protect their families and themselves. These projects and initiatives have helped decrease damages during the time of a disaster.

The capability assessment also provides an evaluation of capabilities to determine whether the activities can be improved in order to more effectively reduce the impact of future hazards. The following sections identify existing plans and mitigation capabilities within all of the communities listed in Section 3.0 of this plan.

7.1.1 NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

Houston County and the cities of Brownsville, Caledonia, Hokah, Houston, La Crescent, and Spring Grove participate in the National Flood Insurance Program. The cities of Eitzen and Spring Grove do not participate in the program. The National Flood Insurance Program lists no Repetitive Loss or Severe Repetitive Loss properties in Houston County or its jurisdictions. The latest Flood Insurance Rate Map (FIRM) that was completed for the county was in 2001[85]. There is also Digital Flood Rate Insurance Map (DFIRM) information available for Houston County. The county and participating cities will continue to enforce the floodplain ordinances.

Given that most individuals in the county live within a high risk flooding area, it is unsurprising that there is high participation in the NFIP. As of November 2015, there were a total of 86 policies in force in Houston County, insuring a total of $19,009,000[86]. Figure 7-1 identifies each community and the date each participant joined the NFIP.

Figure 7-1: Additional Information on Communities Participating in the NFIP[85]

Community	Participation	Initial FIRM	Current Eff. Map Date	Entry Date
Houston County	Yes	01/06/82	06/06/01	01/06/82
City of Brownsville	Yes	02/15/84	02/15/84	02/15/84
City of Caledonia	Yes	-	10/13/78	05/21/01(E)
City of Eitzen	No	N/A	N/A	N/A
City of Hokah	Yes	03/15/82	03/15/82	03/15/82
City of Houston	Yes	07/16/79	08/23/00	07/16/79
City of La Crescent	Yes	07/20/73	05/02/83	07/20/73
City of Spring Grove	No	N/A	N/A	N/A

7.1.2 PLANS AND ORDINANCES

Houston County and the seven communities it contains have a variety of plans and ordinances currently in place that work towards mitigating hazards. Figures 7-2, 7-3, and 7-4 list some of the plans.

Figure 7-2: Existing Plans for Houston County Communities

Community	Houston County	Brownsville	Caledonia	Eitzen	Hokah	Houston	La Crescent	Spring Grove
Local Comprehensive Plan	X		X		X	X	X	X
General Land Use Plan		X	X				X	
Sustainability Plan								
Capital Improvements Plan	X	X				X	X	X
Redevelopment Plan								
Post-Disaster Redevelopment / Recovery Plan								
Regional Development Plan							X	
Watershed Protection / Enhancement Plan	X		X				X	
Open Space Plan							X	
Flood Mitigation Plan	X		X		X		X	
College Campus Plan								
Comprehensive Emergency Management Plan			X			X		
Evacuation Plan							X	

Figure 7-3: Existing Codes, Regulations, and Procedures for Houston County Communities

Community	Houston County	Brownsville	Caledonia	Eitzen	Hokah	Houston	La Crescent	Spring Grove
Zoning Ordinance	X	X	X		X	X	X	X
Subdivision Regulations	X		X			X	X	X
Building Code / Permitting		X			X	X	X	X
Landscape Code	X				X			
Solid Waste and Hazardous Materials Waste Regulations	X	X	X		X	X	X	X
Property Deed Restrictions								
Tree Protection Ordinance					X	X	X	
Site Plan Review							X	
Architectural / Design Review	X						X	
Storm Water Management			X		X		X	
Floodplain Ordinance								
Soil Erosion Ordinance	X		X		X		X	

Figure 7-4: Existing Programs for Houston County Communities

Community	Houston County	Brownsville	Caledonia	Eitzen	Hokah	Houston	La Crescent	Spring Grove
Historic Preservation Program	X	X	X		X	X	X	X
Construction / Retrofit Program	X		X			X	X	X
Transportation Improvement / Retrofit Program		X			X	X	X	X
School District Facilities Program	X				X			
Environmentally Sensitive Purchase / Protection Program	X	X	X		X	X	X	X
Long-Range Recreation Facilities Program								
Economic Development Authority					X	X	X	
Land Buyout Program							X	
Downtown Redevelopment Authority	X						X	
Local and/or Regional Evacuation Program			X		X		X	
Firewise or other Fire Mitigation Program								
Fire Rescue Long-Range Program		X			X		X	
Mutual Aid Agreement	X	X	X		X	X	X	X
Temporary Animal Relocation Program							X	

7.2 MITIGATION GOALS

Section 6.0 of this plan identified numerous hazards that Houston County is at risk from. The original goals and objectives from the 2009 Hazard Mitigation Plan have been completely revised and updated in order to mirror those found in the State of Minnesota All-Hazard Mitigation Plan. This will allow the two plans to work together and assist the state in developing strategies that will better reflect local conditions.

The goals and objectives are categorized by the six mitigation measure categories from the FEMA State and

Local Mitigation Planning How to Guides. These are:

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

The State All-Hazard Mitigation Plan contained the hazards shown in Figure 7-5.

Figure 7-5: Natural Hazard Mitigation Goals, Strategies, and Objectives

Goal 1 – Flooding: Reduce deaths, injuries, property loss and economic disruption due to all types of flooding (riverine, flash flooding).	
Mitigation Strategy	**Objectives**
Prevention:	Planning, technical studies, training, adoption of ordinances and legislation, acquisition and use of equipment, establishing shelters, and encouraging participation in NFIP and CRS will be used to prevent or reduce risks to lives and property from flooding.
Property Protection:	Acquisition, repair, or retrofitting of property and acquisition and use of equipment will be used to prevent or reduce risks to property from flooding.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from flooding in order to prevent or reduce those risks.
Natural Resource Protection:	Stream corridor protection projects and restoration and soil erosion control projects will be used to prevent or reduce risks and increase the protection of natural resources from flooding.
Emergency Services:	Technological improvements, warning systems, responder training, emergency response services, acquisition and use of equipment, and planning will provide emergency services to prevent or reduce the risks to lives and property from flooding.
Structural Improvements:	Construction and maintenance of drains, sewer drainage and separation projects, floodwalls, dams, culverts, levees, roads, bridges, and general flood protection projects will be used to prevent or reduce damages from flooding, loss of services to critical equipment, and the risks they pose to lives, property, and the natural environment.
Goal 2 – Drought: Reduce economic, agricultural, and natural resource disruption due to drought.	
Mitigation Strategy	**Objectives**
Prevention:	Planning, acquisition and use of equipment, and technical studies will be used to prevent or reduce risks from drought.
Property Protection:	Water treatment measures will be used to prevent or reduce risks to property from drought.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from drought in order to prevent or reduce those risks.

Natural Resource Protection:	Planning and implementing watershed plans will be used to prevent or reduce risks from drought.
Structural Improvements:	Technological improvements and acquisition of equipment for structural projects will be used to prevent or reduce risks from drought.
Goal 3 – Winter Storms: Reduce deaths, injuries, property loss, and economic disruption due to severe winter storms.	
Mitigation Strategy	**Objectives**
Prevention:	Acquisition and use of equipment, adoption and enforcement of ordinances and legislation, planning, and technical studies will be used to prevent or reduce risk to the protection of lives, property, and economic activity from the risks from severe winter storms.
Property Protection:	Acquisition and use of equipment and vegetation management will be used to prevent or reduce risks to property from the risks from severe winter storms.
Public Education and Awareness:	Public education, warning systems, access to information, and outreach projects will be used to raise public awareness of the risks from severe winter storms in order to reduce those risks.
Emergency Services:	Acquisition and use of equipment, emergency response services, warning systems, technological improvements, planning, and responder training will provide emergency services to prevent or reduce risks from severe winter storms.
Structural Improvements:	Structural projects will be implemented and maintained to prevent or reduce risks from severe winter storms.

The hazards in Figure 7-6 were not found in the State All-Hazard Mitigation Plan and were developed by the Houston County planning team.

Figure 7-6: Hazard Mitigation Goals, Strategies, and Objectives for Other Hazards

Goal 4 – Land Subsidence, Landslides and Sinkholes: Reduce deaths, injuries, property loss and economic disruption due to land subsidence, landslides and sinkholes.	
Mitigation Strategy	**Objectives**
Prevention:	Planning, technical studies, and building/development regulations will be used to prevent or reduce risks from sinkholes.
Property Protection:	Outreach efforts, public education and access to information will be employed to raise public awareness in order to reduce financial loss and risks to lives and property from sinkholes.
Public Education and Awareness:	Measures to reduce the volume of water passing into a sinkhole will be used in order to reduce financial loss, property damage, and threats to the public health and safety.
Prevention:	Planning, technical studies, and building/development regulations will be used to prevent or reduce risks from sinkholes.
Goal 5 – Fires: Reduce deaths, injuries, property loss and economic disruption due to structural and wildfires.	
Mitigation Strategy	**Objectives**
Prevention:	Planning, technical studies, training, adoption of ordinances and legislation and acquisition and use of equipment will be used to prevent or reduce risks to lives and property from fires.
Property Protection:	Adopt state fire codes and inspect structure per local ordinance.
Public Education and Awareness:	Public education and access to information will be used to raise public awareness of risks from fires in order to prevent or reduce those risks.
Emergency Services:	Technological improvements, warning systems, responder training, emergency response services, acquisition and use of equipment, and planning will provide emergency services to prevent or reduce the risks to lives and property from fires.
Goal 6 – Summer Storms: Reduce deaths, injuries, property loss, and economic disruption due to severe summer storms.	
Mitigation Strategy	**Objectives**
Prevention:	Acquisition and use of equipment, adoption and enforcement of ordinances and legislation, planning, and technical studies will be used to prevent or reduce risk to the protection of lives, property, and economic activity from the risks from severe summer storms.

Property Protection:	Acquisition and use of equipment and vegetation management will be used to prevent or reduce risks to property from severe summer storms.
Public Education and Awareness:	Public education, warning systems, access to information, and outreach projects will be used to raise public awareness of the risks from severe summer storms in order to reduce those risks.
Emergency Services:	Acquisition and use of equipment, emergency response services, warning systems, technological improvements, planning, and responder training will provide emergency services to prevent or reduce risks from severe summer storms.
Structural Improvements:	Structural projects will be implemented and maintained to prevent or reduce risks from severe summer storms.
Goal 7 – Hazardous Materials: Limit property damage, loss of life, economic loss, and disruptions in commercial and industrial activities due to a hazardous material release.	
Mitigation Strategy	**Objectives**
Prevention:	Proper regulations and licensing will be utilized to reduce the risk from hazardous materials.
Property Protection:	Outfit structures with warning measures and protective features to mitigate the damages from the release of hazardous materials.
Public Education and Awareness:	Increase public awareness of what to do in the event of a hazardous material release and the hazardous material risk present in the community.
Emergency Services:	Increase capability of community fire departments and first responder's capability to respond to release incidents.
Goal 8 – Essential Services Failure: Limit loss of life, economic loss, and disruptions in residential, commercial and industrial activities due to wastewater treatment failure, water supply contamination and power failure.	
Mitigation Strategy	**Objectives**
Prevention:	Planning, technical studies, and inspections will be used to prevent or reduce risks from essential services failures.
Property Protection:	Ensure public facilities in the county have appropriate security measures in place to reduce their risk to essential services failures.
Public Education and Awareness:	Increase public education and awareness of what to do in the event of any essential services failures.
Emergency Services:	Planning, responders training, warning systems, emergency response services, technological improvements, and acquisition and use of equipment will provide emergency services to prevent or reduce risks from essential services failures.
Goal 9 – Human and Animal Related Hazards: Ensure Houston County public facilities are prepared for a threat and that first responder personnel are prepared in how to respond to such a threat.	
Mitigation Strategy	**Objectives**
Property Protection:	Ensure public facilities in the county have appropriate security measures in place to reduce their risk. Proper regulations and licensing will be utilized to reduce the risk from infectious disease.
Public Education and Awareness:	Ensure appropriate communication measures are in place to effectively communicate with the public in the event of a threatening situation. Increase public awareness of what to do in the event of an infectious disease outbreak.
Emergency Services:	Ensure first responders have appropriate training to deal with a wide variety of threats (terrorism, airplane crashes, and train derailments). Increase capability of community response personnel to effectively respond to an infectious disease outbreak.

7.3 HAZARD MITIGATION ACTIONS

Individual communities in Houston County, as well as key stakeholders at the county level, were approached to evaluate the current actions listed in the existing plan as well as to suggest and develop new actions for the 2015 update. See Appendix 9.10 for a table that includes the status of previous jurisdictional hazard mitigation actions that were in the previous 2009 plan.

The two main factors that stakeholders were asked to evaluate were cost and funding. A benefit cost analysis was completed for the individual actions. The participants in the community meetings were asked to rank the actions in terms of funding availability and cost to complete. These rankings were combined with the rankings for the severity and probability of the hazards addressed and resulted in a priority score. Figure 7-7 details the specific rationale behind each rating.

Figure 7-7: Mitigation Action Ranking Rubric

Cost	Funding
3 = Less than $5,000	3 = Existing funding sources; Available staff time
2 = $5,000 to $25,000	2 = Identified potential funding sources and staff time
1 = More than $25,000	1 = No identified funding sources or staff time
Probability	**Severity**
4 = Highly Likely	4 = Catastrophic
3 = Likely	3 = Critical
2 = Possible	2 = Limited
1 = Unlikely	1 = Negligible

This scale was designed so that in all categories higher numbers represent a higher priority for the plan. In the monetary categories of Cost and Funding, higher numbers represent easier projects to complete from a fiscal standpoint; in the hazard categories of Probability and Severity, higher numbers represent more dangerous hazards which should receive higher priority in the plan. The decision was made so that the hazard categories had a larger point scale than the monetary categories, with the rationale being that the potential effects of the hazards deserved a slightly higher consideration than the funding possibilities.

These four ratings were combined into a composite score for each hazard, and an example of which is shown below in Figure 7-8. For mitigation actions that were identified as impacting all hazards, the average Probability and Severity score for all other hazards was used.

Figure 7-8: Example Hazard Score

Jurisdiction	Mitigation Action	Hazard	Priority / Status	Cost	Funding	Probability	Magnitude	Total
All Townships	Purchase and supply portable electric generators for township use	All Hazards	Medium/ New	1	1	2.32	2.33	6.65

The composite score was utilized to create a priority rank for each hazard, as shown in Figure 7-9. In this way, even though a comprehensive benefit cost analysis was not completed for each individual mitigation action, the rankings present in the plan a strong consideration by all jurisdictions involved of cost, benefit, and the potential impact the action would have on the community.

Figure 7-9: Mitigation Action Priority Ranking

Score	Priority
6-7	Low
7-8	Medium
>8	High

In addition, Actions were categorized into three main areas:

- **New** – Actions new to this update.
- **In Progress** – Actions that are currently being worked on.
- **Ongoing** – Actions that require ongoing maintenance and involvement.

Figure 7-10 shows which mitigation strategy is utilized by each action.

The following subsections outline the mitigation actions that have been identified as priorities at the county, city and township levels. The first step towards mitigation action implementation is to complete a prioritization analysis of the actions. Different planning factors can help with the prioritization and analysis processes. STAPLE(E) created by FEMA is an acronym for a set of criteria that can help

Figure 7-10: Mitigation Strategy Legend

Strategy	Code
Prevention	P
Property Protection	PP
Public Education	PE
Natural Resources Protection	NR
Emergency Services	ES
Structural Improvements	SI

participants consider several factors in the analysis and prioritization processes.

S – Social: Is the hazard mitigation strategy socially acceptable?
T – Technical: Is the proposed action technically feasible, and cost effective, and does it provide the appropriate level of protection?
A – Administrative: Does the community have the capability to implement the action and is the lead agency capable of carrying out oversight of the project?
P – Political: Is the hazard mitigation action politically acceptable?
L – Legal: Does the community have the authority to implement the proposed action?
E – Economic: Do the economic base, projected growth and opportunity costs justify the hazard mitigation project?
E – Environmental: Does the proposed action meet statutory considerations and public desire for sustainable and environmentally healthy communities?

The actions listed include those taken by county staff as well as those undertaken by city and township boards across the county. Each action listed identifies a department that is responsible for implementation. Actions that are identified as county-wide indicate that this is a project with no sole departmental oversight, but rather a number of departments and entities throughout the county are responsible for its implementation. A list of county departments involved in hazard mitigation activities and their contact information is listed in Figure 7-11. County specific mitigation actions are listed in Figures 7-12 through 7-19.

To support in the collection and tracking of local hazard mitigation actions, FEMA has developed a national web-based collection tool known as the Mitigation Action Tracker. The tool can serve as a single source to capture and organize mitigation actions at any stage from proposed actions to funded projects. For more information on the Mitigation Action Tracker or to register, visit https://mat.msc.fema.gov/About.aspx.

The complete cost/benefit analysis of jurisdictional hazard mitigation actions can be found in the Appendix.

Figure 7-11: County Departments Involved in Hazard Mitigation

Department	Contact
Public Health	(507) 725-5811
Public Health	(507) 725-5810
Emergency Management	(507) 725-5834
Zoning & Planning	(507) 725-5800
County Sheriff	(507) 725-3379
Assessor's Office	(507) 725-5801
Recorder's Office	(507) 725-5813
County Highway Department	(507) 725-5417

7.3.1 HOUSTON COUNTY MITIGATION ACTIONS

Figure 7-12: Houston County Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Townships	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration/ Public Works	Medium/ New
Houston County	Increase security measures for IT infrastructure	Terrorism	PP	Information Technology	Medium/ Ongoing
Houston County	Construct new recycling center	All Hazards	PP	Public Works	Medium/ Ongoing
Houston County	Overtime compensation for Emergency Services	All Hazards	ES	Administration	Medium/ Ongoing
Houston County	Create township service agreements for essential services	All Hazards	P, ES	Administration	High/ Ongoing
Houston County	Install updated receiver boxes into county vehicles	All Hazards	ES	Administration	Medium/ Ongoing
Houston County	Construct a storm shelter at Wildcat Park	All Hazards	PP	Public Works	High/Ongoing
Houston County	Purchase a sandbag machine	Flood	ES	Public Works	Medium/ Ongoing
Houston County	Purchase disposable boxes for medication or vaccination waste	All Hazards	ES	Public Health	Medium/ Ongoing
Houston County	Purchase portable electric generator	All Hazards	ES	Public Works/ Emergency Services	High/Ongoing
Houston County	Hire a consultant to develop the county's COOP plan	All Hazards	ES	Administration	High/Ongoing
Houston County	Re-construct a new county highway department building	Flood	PP	Administration/ Public Works	High/Ongoing
Houston County	Update the e-dispatch and paging system for emergency services	All Hazards	NR	Emergency Services	High/Ongoing
Houston County	Construct a backup Communications Center (current location is La Crescent Fire Department)	All Hazards	PP	Administration / Emergency Services	Medium/ Ongoing
Houston County	Purchase an off-road county vehicle (e.g. a Mule)	All Hazards	ES	Emergency Services	Medium/ Ongoing

7.3.2 CITY OF BROWNSVILLE MITIGATION ACTIONS

Figure 7-13: City of Brownsville Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Brownsville	Construct new fire barn	Fire	PP	Fire	High/ Ongoing
Brownsville	Hillside stabilization	Land Subsidence	NR	Administration/ Public Works	High/ Ongoing
Brownsville	Purchase equipment and training for emergency responders	All Hazards	ES	Administration/ Fire	Medium/ Ongoing

7.3.3 CITY OF CALEDONIA MITIGATION ACTIONS

Figure 7-14: City of Caledonia Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Caledonia	Re-routing or increasing the capacity of a storm drainage system on the west side of town	Flood	SI	Public Works	High/ Ongoing
Caledonia	Construct a larger culvert at Old Highway Drive and Highway 44	Flood	SI	Public Works	High/ Ongoing
Caledonia	Purchase light towers	All Hazards	ES	Public Works	Medium/ Ongoing
Caledonia	Construct building for equipment storage	All Hazards	PP	Public Works	Medium/ Ongoing
Caledonia	Re-routing the storm drainage system on the west side of town	Flood	ES	County and City Public Works	High/ Ongoing

7.3.4 CITY OF EITZEN MITIGATION ACTIONS

Figure 7-15: City of Eitzen Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Eitzen	Construct larger culvert on Cabbage Ridge	Flood	SI	Public Works	Medium/ Ongoing
Eitzen	Construct larger culvert on Quarry Road	Flood	SI	Public Works	Medium/ Ongoing
Eitzen	Construct larger culvert on Valentine Road	Flood	SI	Public Works	Medium/ Ongoing
Eitzen	Purchase additional ARMER radios	All Hazards	ES	Emergency Services	Medium/ Ongoing
Eitzen	Purchase security cameras	All Hazards	ES	Emergency Services	Medium/ Ongoing
Eitzen	Purchase new plow truck	Winter Storms	ES	Public Works	Medium/ Ongoing

7.3.5 CITY OF HOKAH MITIGATION ACTIONS

Figure 7-16: City of Hokah Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Hokah	Increase existing levee height	Flood	SI	Public Works	High/ Ongoing
Hokah	Purchase electric generator for 102 Main Street	All Hazards	ES	Public Works	Medium/ Ongoing
Hokah	Purchase electric generator for 9 Mill Street	All Hazards	ES	Public Works	Medium/ Ongoing
Hokah	Purchase electric generator for wastewater treatment facility and railroad tracks	All Hazards	ES	Public Works	Medium/ Ongoing
Hokah	Construct storm shelter	All Hazards	PP	Public Works/ Emergency Services	Medium/ Ongoing
Hokah	Upgrade siren system	All Hazards	ES	Emergency Services	High/ Ongoing
Hokah	Remove the levee on the north side of Root River	Flood	SI	Public Works	High/ Ongoing

7.3.6 CITY OF HOUSTON MITIGATION ACTIONS

Figure 7-17: City of Houston Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Houston	Acquire land for levee setbacks	Flood	PP	Administration	High/ Ongoing
Houston	Increase levee height	Flood	SI	Public Works	High/ Ongoing
Houston	Construct storm shelter on eastern part of city	All Hazards	PP	Administration	High/ Ongoing
Houston	Highway 9 grade raise	Flood	SI	Public Works	High/ Ongoing
Houston	Increase the capacity of the Wastewater Treatment Facility	Flood	SI	Public Works	High/ Ongoing
Houston	Purchase back up electric generators	All Hazards	ES	Public Works	Medium/ Ongoing
Houston	Purchase new squad patrol vehicle	All Hazards	ES	Emergency Services	High/ Ongoing
Houston	Construct new storage facility for electric generators	All Hazards	PP	Public Works	Medium/ Ongoing
Houston	Lower radium levels in city water	Water Contamination	NR	Public Works	High/ Ongoing

7.3.7 CITY OF LA CRESCENT MITIGATION ACTIONS

Figure 7-18: City of La Crescent Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
La Crescent	Purchase electric generator to provide for the Fire Department, City Hall, Police Department	All Hazards	ES	Administration	High/ Ongoing
La Crescent	Construct a secondary emergency access point for maintenance building	All Hazards	ES, PP	Public Works	High/ Ongoing
La Crescent	Purchase a temperature control system for emergency equipment storage	All Hazards	ES	Public Works/ Emergency Services	New/ Ongoing
La Crescent	Construct new City Hall to also include a public storm shelter	All Hazards	PP	Administration	High/ Ongoing
La Crescent	Update equipment for Communications Center	All Hazards	ES	City and County Administration	High/ Ongoing
La Crescent	Purchase an emergency flat bottom emergency rescue boat	All Hazards	ES	Administration/ Emergency Services	High/ Ongoing
La Crescent	Construct new La Crescent Township building	All Hazards	PP	Administration	High/ Ongoing
La Crescent	Purchase new PPE for first responders	All Hazards	ES	Emergency Services	High/ Ongoing
La Crescent	Continued education for first responders related to all hazards	Hazardous Materials	PE	Emergency Services	High/ Ongoing
La Crescent	Increase security around wells and wastewater treatment plant	Water Contamination	ES	Public Works	New/ Ongoing
La Crescent	Absorbent booms for hazardous spills	Hazardous Materials	ES	Fire	New/ Ongoing

7.3.8 CITY OF SPRING GROVE MITIGATION ACTIONS

Figure 7-19: City of Spring Grove Mitigation Actions

Jurisdiction	Mitigation Action	Hazard	Mitigation Type	Implementation	Priority
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	PE	Administration	High/ Ongoing
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	P, ES	Public Works	Low/ Ongoing
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	ES, PE	Fire	High/ Ongoing
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	P, PE	Administration	Medium/ Ongoing
Spring Grove	Purchase electric generators	All Hazards	ES	Public Works	High/New
Spring Grove	Construct and/or designate local public shelters	All Hazards	PP	Administration/ Public Works	Medium/ Ongoing
Spring Grove	Storm proof public facilities	All Hazards	PP	Public Works	Medium/ Ongoing
Spring Grove	Upgrade water treatment facility	All Hazards	SI	Public Works	Medium/ Ongoing

SECTION 8: PLAN MAINTENANCE

8.1 MONITORING, EVALUATING, & UPDATING THE PLAN

Over the course of the next five-year cycle the Houston County Emergency Management Department will work with the Region Nine Development Commission to continually monitor and review the current plan content and make revisions and amendments as needed. The emergency management director will be responsible for maintaining contact with the stakeholder taskforce and responding to questions that may arise about plan specifics.

The county Emergency Management Department will hold an annual review meeting of the stakeholder taskforce. In addition to task force notification, this meeting will be posted at city halls, county courthouse, and websites to notify the public of the meeting. At this meeting, members will discuss in more detail the development of mitigating hazards, action steps that have been taken over the 12 month period, and specific ways the current plan is succeeding or falling short. Initial ideas will be included in a progress report prepared by Region Nine Development Commission to review and revise criteria of mitigating hazards, which would be forwarded back to all jurisdictions within the county.

In addition to the annual review meeting, other meetings will be convened as needed or in response to funding opportunities that can provide resources for mitigation activities. The stakeholder taskforce will monitor mitigation actions throughout the county and help coordinate any local partnerships to strengthen communication and cooperation across the communities.

Each entity's regulating authorities will consider adoption of plan revisions made at the review meeting. Cities will have reviews and conduct revisions with their planning commissions and city council. The Houston County Emergency Management Director and Administrator (or equivalent staff position) would forward plan revisions to appropriate departments (i.e., Public Works, Sheriffs and Public Health). Ultimately, the county board will consider final revisions to the plan.

Applicable plans such as zoning ordinances, lakeshore ordinances, building codes, staff development plans, waste water treatment policies, comprehensive plans, floodplain ordinances, capital improvement plans and budgets will be amended to incorporated related changes. These amendments will be handled by local government entities (city council, planning commissions) at the city level. Houston County officials, as well as city-level officials within the county, will be responsible for the integration of this All-Hazard Mitigation Plan into other applicable plans or planning mechanisms that they may already maintain or may be currently undertaking

Additionally, the stakeholder taskforce will be reconvened for a special meeting in the event of a major disaster or significant development in a particular hazard in Houston County. This meeting will determine if the plan needs to be updated immediately in order to take advantage of grant opportunities that may arise due to the new circumstances. If so, an amendment to the plan will be drafted at the meeting and distributed to the appropriate parties for adoption immediately.

Houston County Emergency Management Department will begin seeking funding prior to 2020 for the next five-year update to be completed by Region Nine Development Commission or in house.

8.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

The recommended actions and mitigation strategies detailed in this plan will be incorporated into the individual planning documents of the appropriate departments and communities at the county and city level. In the course of regularly scheduled updates to zoning plans and ordinances the county and cities will consult with the Hazard Mitigation Plan and see if their existing practices are in line with what has been determined to be the best way to reduce the risk and damage from hazards.

Each participating community will work with the Houston County's Emergency Manager and other entities that can aid in the implementation of mitigation actions. There are several implementation tools that are

available to help mitigate future hazards. See following for a list of suggestions, however, there still needs to be review and discussion amongst stakeholders to ensure the proper tool is selected and implemented successfully.

Education - Education of residents has been identified as one of the most effective mitigation strategies. Activities will be planned to educate, train and exercise individuals, businesses, community members and first responders, through events such as severe weather week and winter awareness week.

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

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

Coordination - Responsibilities for mitigation strategies run across various county departments, local fire and ambulance departments, city and township governments, and host of state and federal agencies. Ongoing coordination is an important tool to ensure resources are used efficiently. The mitigation plan review process can function as a tool to have an ongoing discussion of roles, responsibilities and opportunities for coordination.

Regional Cooperation - Counties and public safety services providers throughout the southeast region of Minnesota often share similar challenges and concerns. In some cases a regional approach may be warranted as a mitigation strategy in order to save resources. Organizations such as Region V Emergency Management and HSEM through the Regional Program Coordinator can offer tools and resources to assist in these cooperative efforts.

Regulation - Regulation is an important factor for land use, access to structures and the protection of water resources and public health. Houston County and its cities have planning and zoning departments which provide local regulations for adopting and enforcing building codes and standards. The regulations are also aligned with state and federal standards.

8.3 CONTINUED PUBLIC INVOLVEMENT

Ensuring that the public is actively involved has been a major priority of the planning process and this focus will continue after the plan is finalized and put into use. The full plan will be available in digital form on both the Houston County Emergency Management website link and the Region Nine Development Commission website link. Education events held for specific hazards throughout the county will make mention of the plan and inform the public of its purpose. Public notice will be given for all annual review meetings and stakeholder taskforce members will be encouraged to bring interested parties with them to these meetings. By continuing to engage communities, partner organizations and the public will only increase transparency, strengthen partnerships and build local buy-in.

SECTION 9: APPENDICES

9.1 ADOPTING RESOLUTIONS

RESOLUTION NO. 17-12
ADOPTION OF THE
HOUSTON COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, Houston County has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000, and

WHEREAS, the Act establishes a framework for the development of a County Hazard Mitigation Plan; and

WHEREAS, the Act as part of the planning process requires public involvement and local coordination among neighboring local units of government and businesses; and

WHEREAS, the Houston County Plan includes a risk assessment including past hazards, hazards that threaten the County, an estimate of structures at risk, a general description of land uses and development trends; and

WHEREAS, the Houston County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Houston County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Houston County will maintain public participation and coordination; and

WHEREAS, the Plan has been shared with the Minnesota Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for review and comment; and

WHEREAS, the Houston County All-Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, this is a multi-jurisdictional Plan and cities that participated in the planning process may choose to also adopt the County Plan.

NOW THEREFORE BE IT RESOLVED that Houston County supports the hazard mitigation planning effort and wishes to adopt the Houston County All-Hazard Mitigation Plan.

*****CERTIFICATION*****

STATE OF MINNESOTA

COUNTY OF HOUSTON

I, Charlene Meiners, Houston County Auditor, do hereby certify that the above is a true and correct copy of a resolution adopted by the Houston County Board of Commissioners at a special session dated February 28, 2017.

WITNESS my hand and the seal of my office this 28th day of February, 2017.

(SEAL)

Charlene Meiners

Charlene Meiners, Houston County Auditor

RESOLUTION 2017-22

Adopting the Houston County Hazard Mitigation Plan 2017

WHEREAS, the city of Houston, Minnesota has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the city of Houston; and

WHEREAS, the Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the city of Houston has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED that the city of Houston, Minnesota supports the hazard mitigation planning effort and wishes to adopt the Houston County, Minnesota Hazard Mitigation Plan.

Adopted by the city council on December 11, 2017.

Mayor

Attest:

City Administrator

City of Brownsville

104 North 6th Street

Brownsville, MN 55919

Resolution to Adopt the Houston County Hazard Mitigation Plan 2017

WHEREAS, the **City of Brownsville** has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the City of Brownsville; and

WHEREAS, the Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the City of Brownsville has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED that the **City of Brownsville** supports the hazard mitigation planning effort and wishes to adopt the Houston County Hazard Mitigation Plan.

THIS RESOLUTION approved and adopted by the Brownsville City Council on this date, December 6, 2017.

Signed: 12-6-17

Timothy P. Serres, Mayor Date: 12/6/2017

Attested: 12-6-17

Michael J. Moriarty, City Clerk Date: 12/6/2017

CITY OF CALEDONIA, MINNESOTA

RESOLUTION 2018-006

A RESOLUTION ADOPTING
THE
HOUSTON COUNTY ALL-HAZARD MITIGATION PLAN 2015 UPDATE

WHEREAS, the City of Caledonia ("City") has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the City of Caledonia; and

WHEREAS, the Hazard Mitigation Plan will make Houston County and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the City of Caledonia has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED by the Caledonia City Council that the City supports the hazard mitigation planning effort and hereby adopts the Houston County Hazard Mitigation Plan 2015 Update.

ADOPTED by the Caledonia City Council this 12th day of February, 2018.

DeWayne "Tank" Schroeder, Mayor

ATTEST:

Adam G. Swann, Clerk-Administrator

Resolution to Adopt the Houston County Hazard Mitigation Plan 2017

WHEREAS, the city of Eitzen has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the city of Eitzen; and

WHEREAS, the Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the city of Eitzen has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED that the city of Eitzen supports the hazard mitigation planning effort and wishes to adopt the Houston County Hazard Mitigation Plan.

Adopted this 12th day of September, 2017

By: _____
Jeffrey P. Adamson, Mayor

Attest: _____
Steve Schuldt, City Clerk

RESOLUTION 2018-03

Resolution to Adopt the Houston County Hazard Mitigation Plan 2015 Update

****

WHEREAS, the city of Hokah has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the city of Hokah; and

WHEREAS, the Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the city of Hokah has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED that the city of Hokah supports the hazard mitigation planning effort and wishes to adopt the Houston County Hazard Mitigation Plan.

ADOPTED this 6th day of March, 2018.

CITY OF HOKAH HOUSTON COUNTY SEAL MINNESOTA

Mike Walsh, Mayor

ATTEST:

Eric M. Leitzen
City Clerk/Treasurer

La Crescent City Council Meeting
8/14/17

ITEM 3.5 – HOUSTON COUNTY HAZARD MITIGATION PLAN

Olivia Niday, Houston County Emergency Management Director, reviewed with City Council the updated Houston County All-Hazard Mitigation Plan. As the City is a participant in the multi-jurisdictional plan, it will have the effect of prioritizing potential projects and expedite any State or Federal monetary allocations if a man-made or natural disaster should occur. It was recommended to City Council to adopt the Houston County All-Hazard Mitigation Plan and further encourage multi-jurisdictional cooperation with the Houston County Emergency Management Office with the program. Following discussion, Member Buehler made a motion, seconded by Member Hutchinson, as follows:

MOTION TO ADOPT THE HOUSTON COUNTY ALL-HAZARD MITIGATION PLAN AND FURTHER ENCOURAGE MULTI-JURISDICTIONAL COOPERATION WITH THE HOUSTON COUNTY EMERGENCY MANAGEMENT OFFICE WITH THE PROGRAM.

Upon a roll call vote taken and tallied by the City Administrator, all Members present voted in favor thereof, viz;

Bernie Buehler	Yes
Ryan Hutchinson	Yes
Brian Krenz	Yes
Dale Williams	Yes
Mike Poellinger	Yes

and none voted against the same. The motion was declared duly carried.

Spring Grove City Council

Resolution 17-49
Adopting the Houston County Hazard Mitigation Plan 2017

WHEREAS, the city of Spring Grove has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000; and

WHEREAS, the Hazard Mitigation Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects for the city of Spring Grove; and

WHEREAS, the Hazard Mitigation Plan will make the county and participating jurisdictions eligible to receive FEMA hazard mitigation assistance grants; and

WHEREAS, the city of Spring Grove has the choice to adopt the plan.

NOW THEREFORE BE IT RESOLVED that the city of Spring Grove supports the hazard mitigation planning effort and wishes to adopt the Houston County Hazard Mitigation Plan.

Adopted by the council this 19th day of December 2017.

Sarah Schroeder
Mayor

Attest:

Erin Konkel
City Clerk/Treasurer

9.2 STATEMENT OF INTEREST IN ALL-HAZARD MITIGATION PLANNING

City of Brownsville

From: "Kurt Kuhlers" <Kurt.Kuhlers@co.houston.mn.us>
Date: Tuesday, May 20, 2014 10:02 AM
To: <brownsvi@acegroup.cc>
Subject: Statement of Interest

Statement of Interest in All-Hazard Mitigation Planning
City of Brownsville

As a potential participant in the Hazard Mitigation Assistance Program, the City of Brownsville, Minnesota hereby states their interest in participating in the multi-jurisdictional (County Name) Houston All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of Brownsville, Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Timothy P Bern
Signature of Authorized Representative

6-4-14
Date

Mayor
Title

EMERGENCY MANAGEMENT
HOUSTON COUNTY

Deputy Kurt A Kuhlers, Director
306 S Marshall, Suite 2008, Caledonia MN
(507) 725-5834 Office
(507) 258-0609 Cell

City of Caledonia

231 East Main Street, P.O. Box 232
Caledonia, Minnesota 55921
Fax 507-725-5258
Email: cityhall@caledoniamn.com

Statement of Interest in All-Hazard Mitigation Planning
City of Caledonia, Minnesota

As a potential participant in the Hazard Mitigation Assistance Program, the City of Caledonia, Minnesota hereby states their interest in participating in the multi-jurisdictional Houston County All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of Caledonia, Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Robert H Burns — 5-27-14

Signature of Authorized Representative — Date

Mayor, City of Caledonia
Title

City of Hokah Minnesota
cityofhokah-mn.gov
Home of Como Falls

Statement of Interest in All-Hazard Mitigation Planning
City of Hokah, Minnesota

As a potential participant in the Hazard Mitigation Assistance Program, the City of Hokah, Minnesota hereby states their interest in participating in the multi-jurisdictional Houston County All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of Hokah, Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Signature of Authorized Representative

06-03-2014
Date

ADMINISTRATOR
Title

CITY OF HOUSTON

COUNTY OF HOUSTON

STATE OF MINNESOTA

RESOLUTION NO. 2014-7

Statement of Interest in All-Hazard Mitigation Planning
City of Houston, MN

As a potential participant in the Hazard Mitigation Assistance Program, the City of Houston, Minnesota hereby states their interest in participating in the multi-jurisdictional Houston County All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of Houston, Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Adopted this 9th day of June, 2014 by the City Council of the City of Houston.

CITY OF HOUSTON, MINNESOTA

Connie Edwards, Mayor

ATTEST:

Christina Peterson, City Administrator

Bill Waller

EMERGENCY MANAGEMENT
HOUSTON COUNTY
Deputy Kurt A Kuhlers, Director
306 S Marshall, Suite 2008, Caledonia MN
(507)725-5894 Office
(507)259-0609 Cell

Sent: Kurt Kuhlers <Kurt.Kuhlers@co.houston.mn.us>
To: Friday, May 23, 2014 9:06 AM
Subject: Bill Waller
Statement of Interest

Bill,
If you could return an electronic signed copy that would be great.
Thanks
Kurt

Statement of Interest in All-Hazard Mitigation Planning
City of La Crescent

As a potential participant in the Hazard Mitigation Assistance Program, the City of La Crescent Minnesota hereby states their interest in participating in the multi-jurisdictional Houston All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of La Crescent Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Bill Waller
Signature of Authorized Representative

June 10, 2014
Date

City Administrator
Title

Statement of Interest in All-Hazard Mitigation Planning
City of Spring Grove

As a potential participant in the Hazard Mitigation Assistance Program, the City of Spring Grove, Minnesota hereby states their interest in participating in the multi-jurisdictional Houston Country All-Hazard Mitigation Plan.

After FEMA funding approval and during the planning implementation, the City of Spring Grove, Minnesota agrees to participate in the hazard mitigation planning process.

As signed, we understand this is a voluntary program and our participation may benefit our jurisdiction by identifying hazards and prioritizing potential projects to mitigate the effects of natural hazards.

Glen K Kunkel
Signature of Authorized Representative

6/3/14
Date

City Clerk/Treasurer
Title

9.3 MEETING ANNOUNCEMENTS

Houston County's 2015 Hazard Mitigation Plan

Brownsville, Hokah and La Crescent Community Meeting

For: Residents, elected officials and city staff of Brownsville, Hokah, La Crescent and surrounding townships
By: Kurt Kuhlers, Emergency Management Director
and
Scott Reiten, Region Nine Development Commission
Re: Houston County Hazard Mitigation Plan Community Meeting
Date: Monday, July 13th, 2015
Time: 4:30 p.m. to 6:00 p.m.
Place: La Crescent Community Building
336 South 1st Street, La Crescent

Houston County is in the process of updating their Hazard Mitigation Plan and is requesting your participation in a meeting to evaluate Brownsville's, Hokah's, La Crescent's and surrounding township's community risks and mitigation actions.

What is Mitigation Planning?
Hazard Mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation Plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.

Why should I attend?
Public involvement builds support and ensures a strong base for future mitigation activities. The value of public involvement lies in sharing responsibility with those who will strongly influence the success or failure of mitigation efforts. Involving a broad cross-section of interested individuals and organizations is a way of collecting good ideas and suggestions and ensuring that the community will view hazard mitigation as relevant to their needs.

EMERGENCY MANAGEMENT HOUSTON COUNTY

R9 REGION NINE DEVELOPMENT COMMISSION

Any questions please contact Kurt Kuhlers, Houston County's Emergency Management Director — phone: 507-725-5834
or
Scott Reiten, Region Nine Development Commission — phone: 507-389-8880

Houston County's 2015 Hazard Mitigation Plan
Houston Community Meeting

For: Residents, elected officials and city staff of the City of Houston and surrounding townships
By: Kurt Kuhlers, Emergency Management Director
and
Scott Reiten, Region Nine Development Commission
Re: Houston County Hazard Mitigation Plan Community Meeting
Date: Tuesday, July 28th, 2015
Time: 5:00 p.m. to 6:30 p.m.
Place: Houston Community Center
109 W. Maple Street, Houston

Houston County is in the process of updating their Hazard Mitigation Plan and is requesting your participation in a meeting to evaluate Houston's and surrounding township's community risks and mitigation actions.

What is Mitigation Planning?
Hazard Mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation Plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.

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EMERGENCY MANAGEMENT HOUSTON COUNTY

R9 REGION NINE DEVELOPMENT COMMISSION

Any questions please contact Kurt Kuhlers, Houston County's Emergency Management Director — phone: 507-725-5834
or
Scott Reiten, Region Nine Development Commission — phone: 507-389-8880

Houston County's 2015 Hazard Mitigation Plan
Caledonia, Eitzen and Spring Grove Community Meeting

For: Residents, elected officials and city staff of Caledonia, Eitzen, Spring Grove and surrounding townships
By: Kurt Kuhlers, Emergency Management Director
and
Scott Reiten, Region Nine Development Commission
Re: Houston County Hazard Mitigation Plan Community Meeting
Date: Tuesday, July 14th, 2015
Time: 5:30 p.m. to 7:00 p.m.
Place: Houston County Emergency Operations Center
306 South Marshall Street, Caledonia

Houston County is in the process of updating their Hazard Mitigation Plan and is requesting your participation in a meeting to evaluate Caledonia's, Eitzen's, Spring Grove's and surrounding township's community risks and mitigation actions.

What is Mitigation Planning?
Hazard Mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation Plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.

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EMERGENCY MANAGEMENT HOUSTON COUNTY

R9 REGION NINE DEVELOPMENT COMMISSION

Any questions please contact Kurt Kuhlers, Houston County's Emergency Management Director — phone: 507-725-5834
or
Scott Reiten, Region Nine Development Commission — phone: 507-389-8880

9.4 AFFIDAVITS OF PUBLICATION OF MEETING ANNOUNCEMENTS

houstoncounty

0001
WI PUBLIC NOTICES

NOTICE OF PUBLIC HEARING
Houston County Hazard Mitigation Plan Update

Notice is given that the Houston County Emergency Management Department, County of Houston MN and Region Nine Development Commission will be hosting a public hearing. The first community meeting will be held on Monday, July 13th, 2015, from 4:30-6:00pm. In the La Crescent Community Center, 336 S 1st St. (Fire Station) in La Crescent. The communities of La Crescent Township, City of Hokah, City of Brownsville and surrounding Townships are invited to assess community risks and discuss and update the Houston County All hazard Mitigation Plan. Public involvement in hazard mitigation issues and decision making is all important element in the development of the County's Hazard Mitigation Plan. Attendees will be encouraged to review and comment on the current plan and the proposed mitigation strategies.

All interested parties are encouraged to attend one of these hearings and provide comments either orally or in writing on community risks and the current plan. If you are unable to attend the public hearing, you may submit written comments to the Houston County Emergency Management, Hazard Mitigation Plan Update, C/O Houston County Emergency Management Department, 306 S. Marshall St, Suite 2006, Caledonia, MN, 55921 prior to the hearing. The full version of the 2009 Hazard Mitigation Plan is available for review at the Emergency Management Office.

Questions regarding the proposed Houston County Hazard Mitigation Plan can be directed to Deputy Kurt A. Kuhlers, Houston County Emergency Management Office at 507-725-5834.

Dated this July 30th, 2015
Deputy Kurt A Kuhlers
Houston County Emergency Management Director
7/9 30379269

0002

Actbus July 8, 2015

Houston County's 2015 Hazard Mitigation Plan
Caledonia, Eitzen and Spring Grove Community Meeting

For: Residents, elected officials and city staff of Caledonia, Eitzen, Spring Grove and surrounding townships

By: Kurt Kuhlers, Emergency Management Director and Scott Reiten, Region Nine Development Commission

Re: Houston County Hazard Mitigation Plan Community Meeting

Date: Tuesday, July 14, 2015

Time: 5:30pm–7:00pm

Place: Houston County Emergency Operations Center
306 South Marshall Street, Caledonia

Houston County is in the process of updating their Hazard Mitigation Plan and is requesting your participation in a meeting to evaluate Caledonia's, Eitzen's, Spring Grove's and surrounding township's community risks and mitigation actions.

What is Mitigation Planning?
Hazard Mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation Plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce dam-ages to lives, property, and the economy from future disasters.

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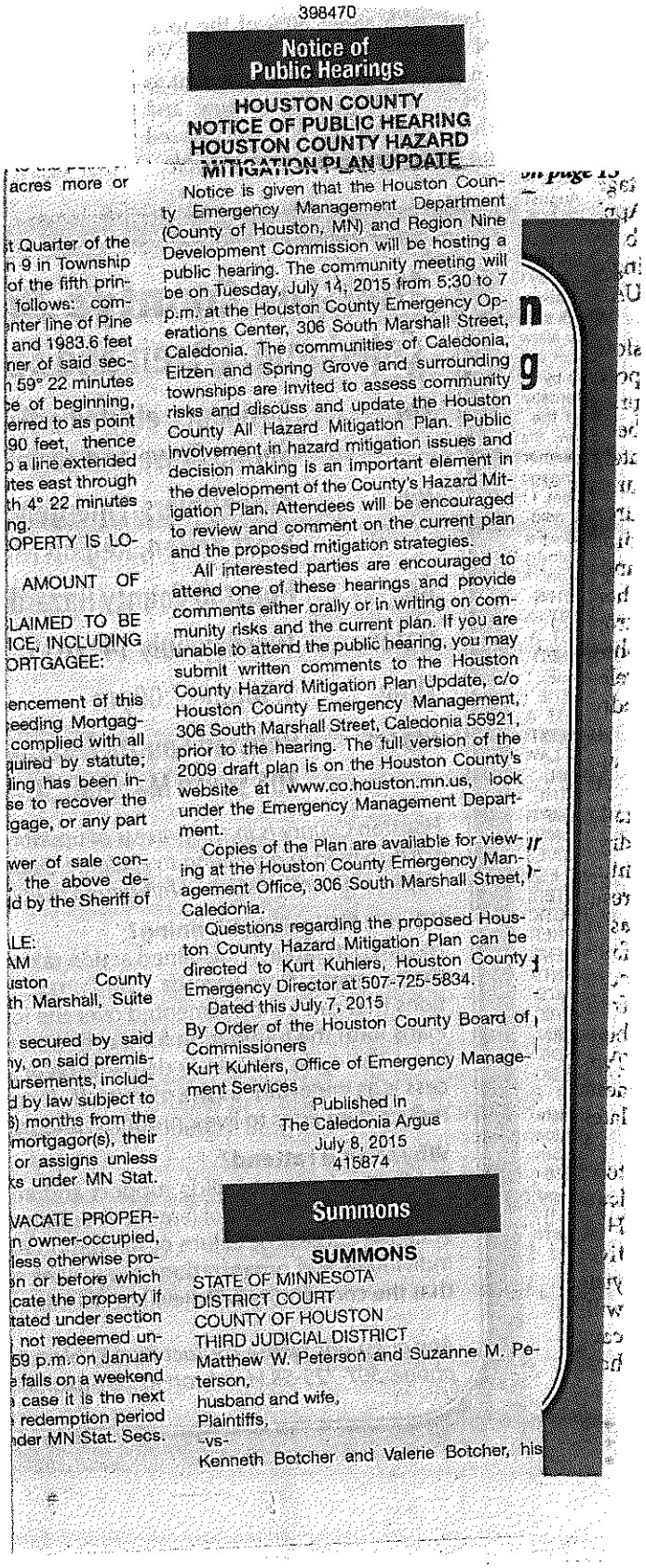
Public involvement builds support and ensures a strong base for future mitigation activities. The value of public involvement lies in sharing responsibility with those who will strongly influence the success or failure of mitigation efforts. Involving a broad cross-section of interested individuals and organizations is a way of collecting good ideas and suggestions and ensuring that the community will view hazard mitigation as relevant to their needs.

Any questions please contact Kurt Kuhlers, Houston County's Emergency Management Director – phone: 507-725-5834 or Scott Reiten, Regional Development Commission – phone: 507-389-8880



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Notice of Public Hearings

HOUSTON COUNTY
NOTICE OF PUBLIC HEARING
HOUSTON COUNTY HAZARD MITIGATION PLAN UPDATE

Notice is given that the Houston County Emergency Management Department (County of Houston, MN) and Region Nine Development Commission will be hosting a public hearing. The community meeting will be on Tuesday, July 14, 2015 from 5:30 to 7 p.m. at the Houston County Emergency Operations Center, 306 South Marshall Street, Caledonia. The communities of Caledonia, Eitzen and Spring Grove and surrounding townships are invited to assess community risks and discuss and update the Houston County All Hazard Mitigation Plan. Public involvement in hazard mitigation issues and decision making is an important element in the development of the County's Hazard Mitigation Plan. Attendees will be encouraged to review and comment on the current plan and the proposed mitigation strategies.

All interested parties are encouraged to attend one of these hearings and provide comments either orally or in writing on community risks and the current plan. If you are unable to attend the public hearing, you may submit written comments to the Houston County Hazard Mitigation Plan Update, c/o Houston County Emergency Management, 306 South Marshall Street, Caledonia 55921, prior to the hearing. The full version of the 2009 draft plan is on the Houston County's website at www.co.houston.mn.us, look under the Emergency Management Department.

Copies of the Plan are available for viewing at the Houston County Emergency Management Office, 306 South Marshall Street, Caledonia.

Questions regarding the proposed Houston County Hazard Mitigation Plan can be directed to Kurt Kuhlers, Houston County Emergency Director at 507-725-5834.

Dated this July 7, 2015

By Order of the Houston County Board of Commissioners
Kurt Kuhlers, Office of Emergency Management Services

Published in
The Caledonia Argus
July 8, 2015
415874

Summons

SUMMONS

STATE OF MINNESOTA
DISTRICT COURT
COUNTY OF HOUSTON
THIRD JUDICIAL DISTRICT

Matthew W. Peterson and Suzanne M. Peterson,
husband and wife,
Plaintiffs,
-vs-
Kenneth Botcher and Valerie Botcher, his

CLASSIFIED ADS

HELP WANTED

PART- & full-time CNA/Direct Care Professionals. Sign-on bonus. Will train. Please stop in, call or email to inquire.

Valley View Healthcare & Rehab
Valerie Heintz, RN/DON
510 E. Cedar St.
Houston, MN 55943
507-896-3125
vheintzrn@acegroup.cc
EOE w49-50

SERVICES

Edwards Lawn Care & Snow Removal
Weed whacking • Lawn mowing (can be bagged) • Leaf raking • Snow shoveling
507-896-2386 • 507-458-9183
Trent Edwards w49

BE COOL!!
Get Your AC System Checked & Charged!
$39.95*
(includes up to 1 lb. of freon)
Call DDP Auto Services
896-4902 w49

BANNER NOTES

OUR weekly deadline for news and ads is Saturday at 12 noon.
The Houston Banner
205 S. Ellsworth, PO Box 326
Houston, MN 55943
507-896-2107
banner@acegroup.cc

Planning to Move?
Please give us a week or two advance notice so you won't miss a single issue! Email *banner@acegroup.cc,* call 507-896-2107, stop by 205 S. Ellsworth, or drop us a line at P.O. Box 326, Houston, Mn 55943.

SUBSCRIBE TODAY!
Receive The Banner in your mail each week. It makes a great gift, too, for students away at college! Drop off or mail your order, family birthday listing, and $33 for addresses in 55943 zip, $38 outside 55943 zip: The Banner, 205 S. Ellsworth, PO Box 326, Houston, Mn 55943.

BANNER RENEW CODE
V16#49, V16#50, V16#51, V16#52, V17#01 or V17#02

Houston County's 2015 Hazard Mitigation Plan
Houston Community Meeting

For: **Residents, elected officials and city staff of the City of Houston and surrounding townships**
By: **Kurt Kuhlers, Emergency Management Director, and Scott Reiten, Region Nine Development Commission**
Re: **Houston County Hazard Mitigation Plan Community Meeting**
Date: **Tuesday, July 28, 2015**
Time: **5:00 p.m. to 6:30 p.m.**
Place: **Houston Community Center, 109 W. Maple Street, Houston**

Houston County is in the process of updating their Hazard Mitigation Plan and is requesting your participation in a meeting to evaluate Houston's and surrounding township's community risks and mitigation actions.

What is Mitigation Planning? Hazard Mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards. The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation Plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.

Why should I attend? Public involvement builds support and ensures a strong base for future mitigation activities. The value of public involvement lies in sharing responsibility with those who will strongly influence the success or failure of mitigation efforts. Involving a broad cross-section of interested individuals and organizations is a way of collecting good ideas and suggestions and ensuring that the community will view hazard mitigation as relevant to their needs.

Any questions, please contact Kurt Kuhlers, Houston County's Emergency Management Director, phone: 507-725-5834; or Scott Reiten, Region Nine Development Commission, phone: 507-389-8880.

Prayer Promise of the Week – Psalm 105:4
"Seek the Lord and his strength; seek his presence continually!"

* * * * * * * *

Serving Our Community Through Prayer
You're invited to call our Prayer Line to have your words of praise or prayer request included in our prayers on Sunday morning.
You are not required to give your name.

* * * * * * * *

Houston Baptist Church
202 S. Sherman St., Houston
507-896-3430, opt. 3 • www.hbcmn.org

NOTICE OF PUBLIC HEARING
Houston County Hazard Mitigation Plan Update

Notice is given that the Houston County Emergency Management Department, County of Houston MN and Region Nine Development Commission will be hosting a public hearing. The first community meeting will be held on Tuesday, July 28, 2015, from 5:00-6:30pm at the Houston Community Center, 109 W Maple St, Houston Minnesota. The community of Houston and surrounding townships are invited to assess community risks and discuss and update the Houston County All hazard Mitigation Plan. Public involvement in hazard mitigation issues and decision making is all important element in the development of the County's Hazard Mitigation Plan. Attendees will be encouraged to review and comment on the current plan and the proposed mitigation strategies.

All interested parties are encouraged to attend one of these hearings and provide comments either orally or in writing on community risks and the current plan. If you are unable to attend the public hearing, you may submit written comments to the Houston County Emergency Management, Hazard Mitigation Plan Update, C/O Houston County Emergency Management Department, 306 S. Marshall St, Suite 2006, Caledonia, MN, 55921 prior to the hearing. The full version of the 2009 Hazard Mitigation Plan is available for review at the Emergency Management Office.

Questions regarding the proposed Houston County Hazard Mitigation Plan can be directed to Deputy Kurt A. Kuhlers, Houston County Emergency Management Office at 507-725-5834.

Dated this July 7th, 2015.
Deputy Kurt A Kuhlers
Houston County Emergency Management Director

9.5 MEETING AGENDAS

HOUSTON COUNTY
EMERGENCY MANAGEMENT
306 South Marshall Street, ◆ Caledonia, MN 55921

Deputy Kurt Kuhlers
Director
Phone: 507.725.5834
kurt.kuhlers@co.houston.mn.us

Steering Committee Meeting
Houston County Hazard Mitigation Plan Update
11:00 A.M. Tuesday, June 23rd, 2015
Houston County Emergency Operations Center

AGENDA

1. Welcome and Introductions (Kurt Kuhlers)
2. Hazard Mitigation Presentation (Region Nine Team)
    a. What is hazard mitigation and hazard mitigation planning
    b. What is included in a Hazard Mitigation Plan
    c. Reasons for hazard mitigation
    d. Steering Committee's role in the planning process
    e. Community meeting discussion
    f. Contact information
3. Risk Assessment (Region Nine Team)
    a. Hazard Identification
        i. Handout - hazard definitions
        ii. Review hazards/discussion
4. Houston's Hazard Mitigation Plan Timeline and Closing Remarks (Kurt Kuhlers)

HOUSTON COUNTY
EMERGENCY MANAGEMENT
306 South Marshall Street, ◆ Caledonia, MN 55921

Deputy Kurt Kuhlers
Director
Phone: 507.725.5834
kurt.kuhlers@co.houston.mn.us

Brownsville, Hokah and La Crescent Community Meeting
Houston County Hazard Mitigation Plan Update
4:30 P.M. Monday, July 13th, 2015
La Crescent Community Building

AGENDA

1. Welcome and Introductions (Kurt Kuhlers)

2. Hazard Mitigation Presentation (Danielle Walchuk and Scott Reiten)
    a. Terminology
    b. Why Mitigate Hazards?
    c. Plan Background
    d. Contact Information

3. Community Group Activity
    a. Community Existing Plans and Policies
    b. National Flood Insurance Program
    c. Essential Facilities (handout)
    d. Hazard Rankings (handout)
    e. Mitigation Strategies Discussion (handout)

4. Houston's Hazard Mitigation Plan Timeline and Closing Remarks (Kurt Kuhlers)

HOUSTON COUNTY
EMERGENCY MANAGEMENT
306 South Marshall Street, ◆ Caledonia, MN 55921

Deputy Kurt Kuhlers
Director
Phone: 507.725.5834
kurt.kuhlers@co.houston.mn.us

Caledonia, Eitzen and Spring Grove Community Meeting
Houston County Hazard Mitigation Plan Update
5:30 P.M. Tuesday, July 14th, 2015
Houston County Emergency Operations Center

AGENDA

1. Welcome and Introductions (Kurt Kuhlers)

2. Hazard Mitigation Presentation (Danielle Walchuk and Scott Reiten)
    a. Terminology
    b. Why Mitigate Hazards?
    c. Plan Background
    d. Contact Information

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    a. Community Existing Plans and Policies
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    d. Hazard Rankings (handout)
    e. Mitigation Strategies Discussion (handout)

4. Houston's Hazard Mitigation Plan Timeline and Closing Remarks (Kurt Kuhlers)

HOUSTON COUNTY
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Deputy Kurt Kuhlers
Director
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kurt.kuhlers@co.houston.mn.us

Houston County Meeting
Houston County Hazard Mitigation Plan Update
1:00 P.M. Tuesday, July 28th, 2015

AGENDA

1. Welcome and Introductions (Kurt Kuhlers)

2. Hazard Mitigation Presentation (Danielle Walchuk and Scott Reiten)
    a. Terminology
    b. Why Mitigate Hazards?
    c. Plan Background
    d. Contact Information

3. Community Group Activity
    a. Community Existing Plans and Policies
    b. National Flood Insurance Program
    c. Essential Facilities (handout)
    d. Hazard Rankings (handout)
    e. Mitigation Strategies Discussion (handout)

4. Houston's Hazard Mitigation Plan Timeline and Closing Remarks (Kurt Kuhlers)

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Houston Community Meeting
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4. Houston's Hazard Mitigation Plan Timeline and Closing Remarks (Kurt Kuhlers)

9.6 MEETING SIGN-IN SHEETS

HOUSTON COUNTY
EMERGENCY MANAGEMENT
306 South Marshall Street, ◆ Caledonia, MN 55921

Deputy Kurt Kuhlers
Director
Phone: 507.725.5834
kurt.kuhlers@co.houston.mn.us

Steering Committee Meeting
Houston County Hazard Mitigation Plan Update
11:00 A.M. Tuesday, June 23rd, 2015
Houston County Emergency Operations Center

SIGN IN SHEET

Name:	Title:	E-mail:
Kurt Kuhlers	Houston Emg Mgr	KURT.KUHLERS@CO.HOUSTON.MN.US
Judy Storlie	Houston Co. Commissioner	judy.storlie@Co.houston.mn.us
Rick Frank	Environmental Service	rick.frank@co.houston.MN.us
John E Meyer	Fire Chief	lacfire@city of lacrescent-mn.gov
Paul J. Fok	Police Chief	chief.city of sg@springgrove.coop
Mike Gerardy	Admin Coord	mikegcalcity@acegroup.cc
Andy Moen	Clerk-Crook Creek	Amoen@mid-citysteel.com
Brian Pogodzinski	Houston County Engineer	BRIAN.POGODZINSKI@CO.HOUSTON.MN.US
David Breault	Police Chief/Houston	hpdchief@acegroup.cc
Doug Stavenau	La Crescent PD	dstavenau@c.city of lacrescent-mn.gov
Deborah Dewey	Clerk Yucatan Township	dewdrop@acegroup.cc
Bob Cummings	LA Crescent Twp	cummings@goACENTek.NET
MARK INGLETT	HCSO	Mark.inglett@co.houston.mn.us
Travis Lapham	HCSO	travis.lapham@co.houston.mn.us

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Brownsville, Hokah and La Crescent Community Meeting
Houston County Hazard Mitigation Plan Update
4:30 P.M. Monday, July 13th, 2015
La Crescent Community Building

SIGN IN SHEET

Name:	Title:	E-mail:
Kurt Kuhlers	Houston Co EMD	Kurt.Kuhlers@co.houston.mn.us
Doug Stavenau	La Crescent PD	dstavenau@cityoflacrescent-mn.gov
John Meyer	La Crescent F.D.	lacfire@cityoflacrescent-mn.gov
MARK INGLETT	Houston County SO	mark.inglett@co.houston.mn.us
Bob Cummings	LA Crescent Twp	cummings@goacentek.net

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Caledonia, Eitzen and Spring Grove Community Meeting
Houston County Hazard Mitigation Plan Update
5:30 P.M. Tuesday, July 14th, 2015
Houston County Emergency Operations Center

SIGN IN SHEET

Name:	Title:	E-mail:
Kurt Kuhlers	Houston Co EM	Kurt.Kuhlers@co.houston.mn.us
Jaye Staggemeyer	Winnebago Twp Clerk (Lower Case "L")	lstagg@acegroup.cc
Heather Myhre	Public Health Preparedness Coordinator	heather.myhre@co.houston.mn.us
Russell Kruse	winnebago chairman	

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Houston Community Meeting
Houston County Hazard Mitigation Plan Update
5:00 P.M. Tuesday, July 28th, 2015
Houston Community Center

SIGN IN SHEET

Name:	Title:	E-mail:
Heather Myhre	Public Health E.P. Coord.	heather.myhre@co.houston.mn.us
Chris Peterson	City Administrator	houstonplanning@acegroup.cc
Randy Thesing	City Maint.	WWTP@acegroup.cc
Audrey Hegland	Deputy Clerk	hegland@acegroup.cc

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Houston County Meeting
Houston County Hazard Mitigation Plan Update
1:00 P.M. Tuesday, July 28th, 2015

SIGN IN SHEET

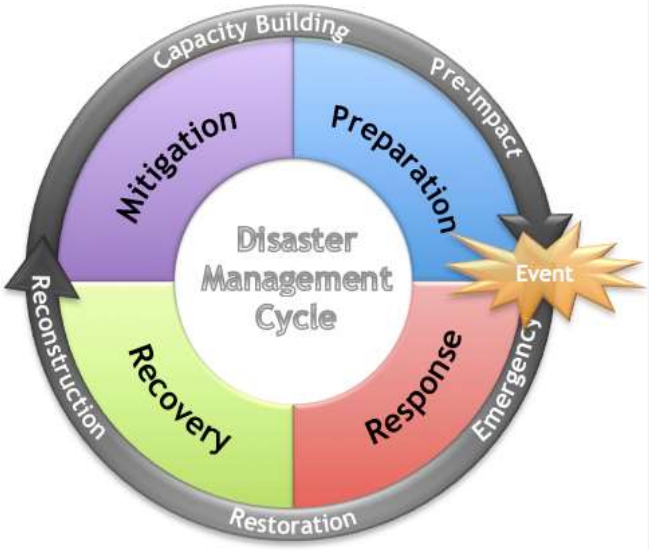
Name:	Title:	E-mail:
Kurt Kuhlers	Houston Co EMD	Kurt.Kuhlers@Co.houston.mn.us
Carol Lapham	Houston Co Finance Director	Carol.Lapham@co.houston.mn.us
Char Meiners	Auditor	char.meiners@co.houston.mn.us
Rick Frank	Environmental Services	rick.frank@co.houston.mn.us
Linda Bahr	Human Services	Linda.bahr@co.Houston.mn.us
Bev Bauer	Recorder	bev.bauer@co.houston.mn.us
Donna Trehus	Treasurer	donna.trehus@cohoustonmn.us
Steve Schuldt	Commissioner	steve.schuldt@co.houston.mn.us
Andy Milde	IT Director	Andrew.Milde@co.houston.mn.us
MARK INGLETT	HCSO	markinglett@co.houston.mn.us
Sam Jandt	HC Atty	samuel.jandt@co.—
BRIAN POGOZINSKI	Houston County Engineer	BRIAN.POGOZINSKI@CO.HOUSTON.MN.US
Jess Krueger	HRD	THERESSA.ARRICK-KRUEGER@CO.HOUSTON.MN.US

9.7 SURVEY MATERIALS

What is Hazard Mitigation?

Hazard Mitigation isn't exactly a phrase that gets thrown around a lot in day to day conversation, but for the Emergency Management community, it's become a very important concept. The formal, FEMA-approved definition states that hazard mitigation is "any sustained action taken to reduce or eliminate long-term risk to life and property from natural hazards." In short, hazard mitigation's focus is on preventing the negative impacts from hazards before they happen. It can be a little easier to wrap your head around what this means by looking at how mitigation fits into the disaster management cycle.

- ***Mitigation*** activities are actions that will prevent, reduce or eliminate losses. Mitigation can reduce or eliminate the need for an emergency response and greatly decrease recovery.
- ***Preparation*** activities are the emergency plans, training, drills, and exercises that individuals, communities and first responders do to get



- ***Response*** is the short-term, emergency actions taken to address the immediate impacts of a hazard. These actions should be covered by the Emergency Operations Plan.
- ***Recovery*** is the longer-term process of restoring the community back to normal or pre-disaster conditions. This includes rebuilding

The Houston County Plan

The Houston County Hazard Mitigation Plan is being developed by Houston County with assistance from Region Nine Development Commission. The majority of the background research and mapping has been completed and we are now at a stage where we want to hear input from the individual communities covered by the plan. This is a critical step that allows us to write the plan so that it reflects the specific needs of each community, rather than simply presenting a high-level analysis of the county as a whole. The main items we will be looking to cover today include:

- ☒ Ranking the probability and impact of the hazards that threaten your community
- ☒ Cataloging existing hazard mitigation resources
- ☒ Developing mitigation actions that your community can undertake to reduce the threat of the hazards
- ☒ Analyzing the benefits and costs of these actions

Hazard Rankings

Jurisdiction Name:_____

Hazard	Probability	Magnitude/Severity
	How likely is this hazard to occur?	*What impact will it have?*
Flooding	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Summer Storms	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Winter Storms	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Land Subsidence and Sinkholes	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Drought	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Fire	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Human/Technological Related Hazards	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Essential Services Failures	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic
Hazardous Materials	Unlikely / Possible / Likely / Highly Likely	Negligible / Limited / Critical / Catastrophic

Probability	**Unlikely**	**Possible**
	• Extremely rare with no documented history of occurrences or events.	• Rare occurrences with at least one documented or anecdotal historic event.
	Likely	**Highly Likely**
	• Occasional occurrences with at least two or more documented historic events.	• Frequent events with a well documented history of occurrence.
Magnitude/ Severity	**Negligible**	**Limited**
	• Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). • Injuries or illnesses are treatable with first aid and there are no deaths. • Negligible quality of life lost. • Shutdown of critical facilities for less than 24 hours.	• Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). • Injuries or illnesses do not resulting permanent disability and there are no deaths. • Moderate quality of life lost. • Shut down of critical facilities for more than 1 day and less than 1 week.
	Critical	**Catastrophic**
	• Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). • Injuries or illnesses result in permanent disability and at least one death. • Shut down of critical facilities for more than 1 week and less than 1 month.	• Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure) • Injuries or illnesses result in permanent disability and multiple deaths. • Shut down of critical facilities for more than 1 month.

Mitigation Action Categories

- **Prevention:** Government, administrative, or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses.
  Examples: planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.

- **Property Protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from the hazard area.
  Examples: acquisition, elevation, structural retrofits, storm shutters, and shatter-resistant glass.

- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. *Examples: outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.*

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems.
  Examples: sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

- **Emergency Services:** Actions that protect people and property during and immediately after a disaster or hazard event.
  Examples: warning systems, emergency response services, and protection of critical facilities.

- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard.
  Examples: dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

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Jurisdiction: _____

Plans:

___ - Local Comprehensive Plan
___ - General Land Use Plan
___ - Sustainability Plan
___ - Capital Improvements Plan
___ - Redevelopment Plan
___ - Post-Disaster Redevelopment / Recovery Plan
___ - Regional Development Plans
___ - Watershed Protection/Enhancement Plan
___ - Open Space Plan
___ - Flood Mitigation Plan
___ - College Campus Plans
___ - Comprehensive Emergency Management Plan
___ - Evacuation Plan

Codes, Regulations, & Procedures:

___ - Zoning Ordinance
___ - Subdivision Regulations
___ - Building Code / Permitting
___ - Landscape Code
___ - Solid Waste & Hazardous Materials Waste Regulations
___ - Property Deed Restrictions
___ - Tree Protection Ordinance
___ - Site Plan Review
___ - Architectural/Design Review
___ - Storm Water Management
___ - Soil Erosion Ordinance

Programs:

___ - Historic Preservation Program
___ - Construction/Retrofit Program
___ - Transportation Improvement/Retrofit Program
___ - School District Facilities Plan
___ - Environmentally Sensitive Purchase / Protection Program
___ - Long-Range Recreation Facilities Program
___ - Economic Development Authority
___ - Land Buyout Program
___ - Downtown Redevelopment Authority
___ - Local and/or Regional Evacuation Programs
___ - "Firewise" and other Fire Mitigation
___ - Fire Rescue Long-Range Programs
___ - Mutual Aid Agreement
___ - Temporary Animal Relocation Program

9.8 NCDC DATA (UNEDITED)[25]

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
3/22/2015	Heavy Snow	0	0	$0	$0
8/4/2014	Lightning	0	0	$1,500,000	$0
7/7/2014	Hail	0	0	$0	$0
4/12/2014	Thunderstorm Wind	0	0	$0	$0
1/27/2014	Extreme Cold/wind Chill	0	0	$0	$0
1/26/2014	Winter Storm	0	0	$0	$0
1/5/2014	Extreme Cold/wind Chill	0	0	$0	$0
10/5/2013	Flood	0	0	$0	$0
10/4/2013	Heavy Rain	0	0	$0	$0
10/4/2013	Heavy Rain	0	0	$0	$0
10/1/2013	Drought	0	0	$0	$0
9/10/2013	Drought	0	0	$0	$0
7/25/2013	Hail	0	0	$0	$0
7/22/2013	Hail	0	0	$0	$0
6/22/2013	Heavy Rain	0	0	$7,100,000	$0
6/22/2013	Heavy Rain	0	0	$0	$0
6/22/2013	Flash Flood	0	0	$0	$700,000
5/29/2013	Heavy Rain	0	0	$0	$0
5/29/2013	Flash Flood	0	0	$0	$0
5/21/2013	Flood	0	0	$0	$0
4/9/2013	Heavy Rain	0	0	$0	$0
4/9/2013	Heavy Rain	0	0	$0	$0
4/9/2013	Hail	0	0	$0	$0
3/4/2013	Heavy Snow	0	0	$0	$0
1/27/2013	Winter Storm	0	0	$0	$0
12/19/2012	Winter Storm	0	0	$0	$0
12/9/2012	Winter Storm	0	0	$0	$0
10/25/2012	Thunderstorm Wind	0	0	$10,000	$0
10/1/2012	Drought	0	0	$0	$0
9/5/2012	Thunderstorm Wind	0	0	$95,000	$0
9/4/2012	Hail	0	0	$0	$0
9/4/2012	Hail	0	0	$0	$0
9/4/2012	Hail	0	0	$0	$0
9/4/2012	Hail	0	0	$0	$0
9/1/2012	Drought	0	0	$0	$0
8/2/2012	Hail	0	0	$500	$0
8/2/2012	Thunderstorm Wind	0	0	$0	$0
8/1/2012	Drought	0	0	$0	$0
7/17/2012	Drought	0	0	$0	$0
7/13/2012	Lightning	0	0	$5,000	$0
7/2/2012	Heat	0	0	$0	$0

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
5/3/2012	Thunderstorm Wind	0	0	$5,000	$0
4/10/2012	Frost/freeze	0	0	$0	$0
3/19/2012	Thunderstorm Wind	0	0	$10,000	$0
9/2/2011	Thunderstorm Wind	0	0	$4,000	$0
9/2/2011	Thunderstorm Wind	0	0	$2,000	$0
9/2/2011	Thunderstorm Wind	0	0	$2,000	$0
8/23/2011	Lightning	0	0	$10,000	$0
7/23/2011	Thunderstorm Wind	0	0	$2,500	$0
7/17/2011	Excessive Heat	0	0	$12,000	$0
7/1/2011	Thunderstorm Wind	0	0	$5,000	$0
7/1/2011	Thunderstorm Wind	0	0	$2,000	$0
7/1/2011	Thunderstorm Wind	0	0	$0	$0
6/18/2011	Heavy Rain	0	0	$0	$0
6/18/2011	Flash Flood	0	0	$0	$0
5/22/2011	Thunderstorm Wind	0	0	$0	$0
5/22/2011	Tornado	0	0	$240,000	$0
5/22/2011	Hail	0	0	$5,000	$0
4/19/2011	Winter Storm	0	0	$0	$0
4/10/2011	Thunderstorm Wind	0	0	$1,000	$0
4/10/2011	Hail	0	0	$0	$0
4/10/2011	Thunderstorm Wind	0	0	$2,000	$0
4/10/2011	Hail	0	0	$330,000	$0
4/10/2011	Thunderstorm Wind	0	0	$250,000	$0
4/10/2011	Hail	0	0	$125,000	$0
4/10/2011	Hail	0	0	$0	$0
4/10/2011	Hail	0	0	$5,000	$0
2/20/2011	Winter Storm	0	0	$0	$0
12/31/2010	Winter Weather	0	0	$0	$0
12/29/2010	Dense Fog	0	0	$0	$0
12/20/2010	Winter Weather	0	0	$0	$0
12/11/2010	Winter Storm	0	0	$0	$0
12/11/2010	Blizzard	0	0	$0	$0
12/3/2010	Heavy Snow	0	0	$0	$0
11/24/2010	Winter Weather	0	0	$0	$0
10/26/2010	High Wind	0	0	$3,000	$0
9/25/2010	Flood	0	0	$0	$0
9/22/2010	Heavy Rain	0	0	$0	$0
9/15/2010	Hail	0	0	$0	$0
8/20/2010	Thunderstorm Wind	0	0	$250	$0
7/17/2010	Hail	0	0	$2,000	$0
7/17/2010	Hail	0	0	$0	$0
7/17/2010	Hail	0	0	$0	$0
7/17/2010	Hail	0	0	$0	$0
7/17/2010	Thunderstorm Wind	0	0	$0	$0

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
7/14/2010	Thunderstorm Wind	0	0	$0	$0
7/14/2010	Thunderstorm Wind	0	0	$1000	$0
6/26/2010	Thunderstorm Wind	0	0	$2,000	$0
6/26/2010	Thunderstorm Wind	0	0	$2,000	$0
6/23/2010	Flash Flood	0	0	$4,000	$0
6/17/2010	Thunderstorm Wind	0	0	$1,000	$0
4/30/2010	Hail	0	0	$5,000	$0
4/30/2010	Thunderstorm Wind	0	0	$0	$0
3/13/2010	Flood	0	0	$0	$0
2/7/2010	Winter Storm	0	0	$0	$0
1/1/2010	Cold/wind Chill	0	0	$0	$0
12/23/2009	Winter Storm	0	0	$0	$0
12/10/2009	Cold/wind Chill	0	0	$0	$0
12/8/2009	Winter Storm	0	0	$0	$0
2/26/2009	Winter Storm	0	0	$0	$0
1/14/2009	Extreme Cold/wind Chill	0	0	$0	$0
1/3/2009	Winter Weather	0	0	$0	$0
12/21/2008	Cold/wind Chill	0	0	$0	$0
12/20/2008	Winter Storm	0	0	$0	$0
12/19/2008	Winter Storm	0	0	$0	$0
12/14/2008	Cold/wind Chill	0	0	$0	$0
12/8/2008	Winter Storm	0	0	$0	$0
7/16/2008	Flash Flood	0	0	$5,000	$0
7/10/2008	Thunderstorm Wind	0	0	$0	$0
6/28/2008	Hail	0	0	$0	$0
6/28/2008	Hail	0	0	$0	$1,000
6/9/2008	Flood	0	0	$20,000	$25,000
6/8/2008	Flood	0	0	$6,500,000	$5,500,000
6/7/2008	Tornado	0	0	$2,500,000	$0
6/7/2008	Thunderstorm Wind	0	0	$5,000	$3,000
6/7/2008	Flash Flood	0	0	$0	$1,500,000
5/30/2008	Thunderstorm Wind	0	0	$500	$0
2/17/2008	Winter Storm	0	0	$0	$0
2/14/2008	Heavy Snow	0	0	$0	$0
2/10/2008	Extreme Cold/wind Chill	0	0	$0	$0
1/29/2008	Extreme Cold/wind Chill	0	0	$0	$0
1/21/2008	Heavy Snow	0	0	$0	$0
12/22/2007	Winter Storm	0	0	$0	$0
12/1/2007	Winter Storm	0	0	$0	$0
9/21/2007	Thunderstorm Wind	0	0	$5,000	$0
8/21/2007	Flash Flood	0	0	$1,000	$0
8/19/2007	Flood	0	0	$1,000,000	$500,000
8/19/2007	Flood	0	0	$750,000	$500,000
8/18/2007	Heavy Rain	0	0	$3,000,000	$5,000

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
8/18/2007	Flash Flood	0	0	$600,000	$300,000
8/18/2007	Flash Flood	30	0	$27,000,000	$750,000
8/18/2007	Flash Flood	2	1	$6,000,000	$250,000
8/18/2007	Flash Flood	0	1	$15,000	$70,000
6/7/2007	Thunderstorm Wind	0	0	$500	$0
5/14/2007	Thunderstorm Wind	0	0	$1,000	$0
5/14/2007	Thunderstorm Wind	0	0	$2,500	$0
5/14/2007	Thunderstorm Wind	0	0	$10,000	$0
5/14/2007	Thunderstorm Wind	0	0	$1,000	$0
4/10/2007	Winter Storm	0	0	$0	$0
3/1/2007	Winter Storm	0	0	$0	$0
2/28/2007	Winter Storm	0	0	$0	$0
2/24/2007	Blizzard	0	0	$0	$0
2/23/2007	Winter Storm	0	0	$0	$0
8/24/2006	Hail	0	0	$0	$3,500
8/24/2006	Hail	0	0	$0	$0
5/27/2006	Hail	0	0	$300	$0
5/27/2006	Hail	0	0	$0	$0
5/8/2006	Hail	0	0	$0	$0
3/5/2006	Heavy Snow	0	0	$0	$0
2/15/2006	Winter Storm	0	0	$0	$0
12/14/2005	Heavy Snow	0	0	$0	$0
9/13/2005	Flash Flood	0	0	$1,500	$8,000
9/13/2005	Thunderstorm Wind	0	0	$5,000	$0
7/25/2005	Hail	0	0	$500	$2,000
7/25/2005	Thunderstorm Wind	0	0	$0	$0
3/30/2005	Hail	0	0	$0	$0
3/17/2005	Winter Storm	0	0	$0	$0
1/21/2005	Winter Storm	0	0	$0	$0
1/1/2005	Ice Storm	0	0	$0	$0
12/20/2004	Winter Storm	0	0	$0	$0
9/14/2004	Hail	0	0	$0	$0
7/19/2004	Hail	0	0	$75,000	$8,000
7/19/2004	Hail	0	0	$10,000	$0
7/19/2004	Hail	0	0	$0	$10,000
6/23/2004	Hail	0	0	$0	$5,000
6/16/2004	Hail	0	0	$0	$0
1/26/2004	Winter Storm	0	0	$0	$0
8/28/2003	Thunderstorm Wind	0	0	$0	$0
8/25/2003	Hail	0	0	$0	$1,500
7/4/2003	Thunderstorm Wind	0	0	$2,000	$750
7/4/2003	Thunderstorm Wind	0	0	$1,000	$750
7/4/2003	Thunderstorm Wind	0	0	$1,250	$500
5/10/2003	Hail	0	0	$0	$0

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
4/7/2003	Winter Storm	0	0	$0	$0
2/2/2003	Winter Storm	0	0	$0	$0
4/18/2002	Hail	0	0	$0	$0
3/9/2002	Blizzard	0	0	$0	$0
10/25/2001	High Wind	0	0	$0	$0
8/1/2001	Heat	0	0	$0	$0
7/31/2001	Heat	0	0	$0	$0
6/11/2001	Hail	0	0	$500	$0
5/1/2001	Flood	0	0	$1,400,000	$0
4/12/2001	Flood	0	0	$1,000,000	$0
4/7/2001	High Wind	0	0	$2,000	$0
4/6/2001	Flood	0	0	$50,000	$0
3/11/2001	Winter Storm	0	0	$0	$0
2/24/2001	Ice Storm	0	0	$0	$0
2/8/2001	Winter Storm	0	0	$0	$0
1/29/2001	Ice Storm	0	0	$0	$0
12/28/2000	Winter Storm	0	0	$0	$0
12/18/2000	Winter Storm	0	0	$0	$0
12/11/2000	Winter Storm	0	0	$0	$0
8/26/2000	Hail	0	0	$5,000	$10,000
8/1/2000	Hail	0	0	$12,000	$15,000
7/11/2000	Flood	0	0	$80,000	$175,000
7/10/2000	Flash Flood	0	0	$25,000	$20,000
7/2/2000	Lightning	0	0	$25,000	$0
6/13/2000	Thunderstorm Wind	0	0	$0	$0
6/1/2000	Flash Flood	0	0	$250	$300,000
6/1/2000	Flood	0	0	$30,000	$40,000
6/1/2000	Thunderstorm Wind	0	0	$1,200,000	$0
5/30/2000	Lightning	0	0	$30,000	$0
5/11/2000	Hail	0	0	$0	$0
8/9/1999	Hail	0	0	$500	3,000
7/28/1999	Heat	0	0	$0	$0
7/23/1999	Heat	0	0	$0	$0
7/8/1999	Hail	0	0	$2,000	$0
7/4/1999	Heat	0	0	$0	$0
6/8/1999	Hail	0	0	$15,000	$0
1/24/1999	Heavy Snow	0	0	$0	$0
1/1/1999	Winter Storm	0	0	$0	$0
11/10/1998	High Wind	0	0	$150,000	$0
8/9/1998	Thunderstorm Wind	0	0	$35,000	$0
8/9/1998	Thunderstorm Wind	0	0	$6,000	250
8/9/1998	Flash Flood	0	0	$50,000	$40,000
6/27/1998	Thunderstorm Wind	0	0	$46,000	$5,000
6/27/1998	Thunderstorm Wind	0	0	$10,000	$900

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
6/27/1998	Thunderstorm Wind	0	0	$30,000	$20,000
6/27/1998	Thunderstorm Wind	0	0	$40,000	7,000
6/20/1998	Thunderstorm Wind	0	0	$10,000	$0
6/20/1998	Hail	0	0	$0	$25,000
6/20/1998	Hail	0	0	$12,000	$20,000
6/18/1998	Thunderstorm Wind	0	0	$35,000	$0
6/18/1998	Thunderstorm Wind	0	0	$4,000	$0
6/18/1998	Thunderstorm Wind	0	0	$12,000	$28,000
6/16/1998	Hail	0	0	$0	$0
5/30/1998	Thunderstorm Wind	0	0	$0	$20,000
5/18/1998	Hail	0	0	$30,000	$40,000
1/4/1998	Ice Storm	0	0	$15,000	$0
8/23/1997	Tornado	0	0	$15,000	$25,000
8/23/1997	Thunderstorm Wind	0	0	$80,000	$0
8/3/1997	Hail	0	0	$20,000	$100,000
6/28/1997	Thunderstorm Wind	0	0	$1,000	$0
6/28/1997	Thunderstorm Wind	0	0	$0	$0
6/19/1997	Hail	0	0	$0	$10,000
6/15/1997	Thunderstorm Wind	0	0	$8,000	$0
6/15/1997	Thunderstorm Wind	0	0	$5,000	$0
6/5/1997	Hail	0	0	$0	$0
4/5/1997	Thunderstorm Wind	0	0	$0	$0
4/3/1997	Flood	0	0	$0	$0
3/12/1997	Winter Storm	0	0	$0	$0
2/4/1997	Winter Storm	0	0	$0	$0
1/16/1997	Cold/wind Chill	0	0	$0	$0
1/15/1997	Winter Storm	0	0	$0	$0
8/7/1996	Thunderstorm Wind	0	0	$300	$0
6/29/1996	Thunderstorm Wind	0	0	$0	$0
5/18/1996	Hail	2	0	$1,000,000	$500,000
2/10/1996	High Wind	0	0	$0	$0
2/1/1996	Cold/wind Chill	0	0	$0	$0
1/31/1996	Cold/wind Chill	0	0	$0	$0
1/28/1996	Blizzard	0	0	$0	$0
1/26/1996	Blizzard	0	0	$0	$0
1/25/1996	Heavy Snow	0	0	$0	$0
1/17/1996	Heavy Snow	0	0	$0	$0
7/19/1994	Thunderstorm Wind	0	0	$0	$0
4/8/1991	Tornado	0	0	$25,000	$0
10/3/1990	Thunderstorm Wind	0	0	$0	$0
8/26/1990	Thunderstorm Wind	0	0	$0	$0
6/19/1990	Hail	0	0	$0	$0
4/24/1989	Hail	0	0	$0	$0
4/24/1989	Hail	0	0	$0	$0

Start Date	Type	Injuries	Deaths	Property Damage	Crop Damage
4/25/1986	Hail	0	0	$0	$0
5/24/1983	Thunderstorm Wind	0	0	$0	$0
5/24/1983	Thunderstorm Wind	0	0	$0	$0
5/17/1982	Thunderstorm Wind	0	0	$0	$0
4/3/1981	Hail	0	0	$0	$0
8/7/1980	Thunderstorm Wind	0	0	$0	$0
8/4/1979	Thunderstorm Wind	0	0	$0	$0
5/29/1978	Tornado	0	0	$2,500	$0
7/14/1977	Thunderstorm Wind	0	0	$0	$0
6/27/1977	Tornado	0	0	$0	$0
6/13/1976	Thunderstorm Wind	0	0	$0	$0
6/20/1974	Thunderstorm Wind	0	0	$0	$0
6/20/1974	Hail	0	0	$0	$0
5/21/1974	Thunderstorm Wind	0	0	$0	$0
10/3/1973	Hail	0	0	$0	$0
4/30/1967	Hail	0	0	$0	$0
8/25/1965	Tornado	0	0	$25,000	$0
5/5/1965	Tornado	0	0	$2,500,000	$0
6/10/1960	Tornado	0	0	$30	$0
7/31/1955	Thunderstorm Wind	0	0	$0	$0
7/30/1955	Thunderstorm Wind	0	0	$0	$0
5/3/1955	Thunderstorm Wind	0	0	$0	$0
	TOTAL	**0**	**0**	**$65.300,000**	**$11,548,150**

9.9 HOUSTON COUNTY DAMS

Dam Name	Inspection Date	Owner Type	Owner Name	NID Height (Ft.)	NID Storage	Primary Purpose	All Purposes	Dam Type	River	Permitting Authority	Inspection Authority	Enforcement Authority	Eap Last Rev Date
BEAR CREEK SITE 8	5/3/2012	Local Gov't	SWCD OF ROOT RIVER	27	51	-	-	Earth	-	N	N	N	-
LEDEBUHR	9/5/2007	Private	LEDEBUHR, LARRY	30	73	-	-	Earth	-	Y	Y	Y	-
WINNEBAGO 35B	-	Private	-	21	76	-	-	Earth	-	N	N	N	-
WILMINGTON 3	5/3/2012	Private	STOLTZ, ROSIE	18	103	Flood Control	Flood Control	Earth	WINNEBAGO CREEK	N	N	N	-
BAUMGARTNER GROUP POND	6/10/2009	Private	ELDOR, JACK	32	27	Flood Control	Flood Control, Other	Earth	BRUSH VALLEY CREEK - TRIB	Y	Y	Y	-
BENNET GROUP POND	6/10/2009	Private	BENNET, JAMES	29	35	Flood Control	Flood Control, Debris Control	Earth	ROOT RIVER - TRIB	Y	Y	Y	-
FITTING BROS FISH POND	6/10/2009	Private	FITTING BROS	28	25	Flood Control	Flood Control, Fire Protection, Stock, Or Small Fish Pond	Earth	ROOT RIVER - OFFSTREAM TRIB	Y	Y	Y	-
THORSON GROUP WEST	5/4/2011	State	MNDNR-FORESTRY	31	104	Flood Control	Flood Control, Debris Control	Earth	ROOT RIVER SOUTH FORK - TRIB	Y	Y	Y	-
CROOKED CREEK S-3	5/3/2012	Local Gov't	WD OF CROOKED CREEK	44	288	Flood Control	Flood Control, Fire Protection, Stock, Or Small Fish Pond	Earth	CROOKED CREEK SOUTH FORK	Y	Y	Y	-

SPRING GROVE GROUP STRUCTURE	6/9/2009	Private	MORKEN, E.	30	75	-	-	-	IOWA RIVER UPPER - TRIB	Y	Y	Y	-
BEAR CREEK SITE 13	6/9/2009	Private	VICKERMAN, CURTIS	43	120	Flood Control	Flood Control	Earth	IOWA RIVER UPPER - OFFSTREAM	Y	Y	Y	-
CROOKED CREEK S1-B	10/21/2011	Local Gov't	WD OF CROOKED CREEK	24	50	Flood Control	Flood Control, Fire Protection, Stock, Or Small Fish Pond	Earth	CROOKED CREEK N FORK - TRIB	Y	Y	Y	-
FRAUENKRON DETENTION	6/11/2009	Private	FRAUENKRON, ARYLN	33	23	-	-	-	MONEY CREEK - TRIB	Y	Y	Y	-
SCHECHS MILL	6/9/2009	Private	KRUGMAR, IVAN	10	50	Hydro-electric	Hydro-electric, Recreation	Gravity	BEAVER CREEK EAST	Y	Y	Y	-
CROOKED CREEK R-1	10/21/2011	Local Gov't	WD OF CROOKED CREEK & WOHLERS	56	307.5	Flood Control	Flood Control, Other	Earth	CROOKED CREEK N FORK - TRIB	Y	Y	Y	-
CROOKED CREEK R-3	10/21/2011	Local Gov't	WD OF CROOKED CREEK	60	1202	Flood Control	Flood Control	Earth	CROOKED CREEK SOUTH FORK	Y	Y	Y	-
FELDMEIER DETENTION	6/24/2010	Private	FELDMEIER, WAYNE	29	20	Flood Control	Flood Control	Earth	ROOT RIVER - OFFSTREAM	Y	Y	Y	-
CROOKED CREEK R-2	10/21/2011	Local Gov't	WD OF CROOKED CREEK	52	314	Flood Control	Flood Control	Earth	CROOKED CREEK - TRIB	Y	Y	Y	-
BEAR CREEK SITE 3	5/3/2012	Local Gov't	SWCD OF ROOT RIVER	31	25	-	-	Earth	-	N	N	N	-
BEAR CREEK SITE 17	6/9/2009	Local Gov't	SWCD OF ROOT RIVER	35	118	Flood Control	Flood Control	Earth	-	Y	Y	Y	-
THORSON GROUP NORTH	5/4/2011	State	MNDNR-FORESTRY	30	490	Flood Control	Flood Control, Debris Control	Earth	ROOT RIVER SOUTH FORK - TRIB	Y	Y	Y	-

Dam Name	Inspection Date	Owner Type	Owner Name	NID Height (Ft.)	NID Storage	Primary Purpose	All Purposes	Dam Type	River	Permitting Authority	Inspection Authority	Enforcement Authority	Eap Last Rev Date
CROOKED CREEK R-4	10/21/2011	Local Gov't	WD OF CROOKED CREEK	54	450	Flood Control	Flood Control, Other	Gravity	CROOKED CREEK - TRIB	Y	Y	Y	-
POLLEMA POND	6/10/2009	Private	POLLEMA, JAMES	36	20	Debris Control	Fire Protection, Stock, Or Small Fish Pond, Debris Control	Earth	ROOT RIVER - OFFSTREAM TRIB	Y	Y	Y	-
RICHARDS GROUP POND	6/10/2009	Private	RICHARDS, ROBERT	27	35	Flood Control	Flood Control, Fire Protection, Stock, Or Small Fish Pond	Earth	CROOKED CREEK - OFFSTREAM	Y	Y	Y	-
CROOKED CREEK R-1	11/18/2005	Local Gov't	CROOKED CREEK SWCD	44	307.5	Flood Control	Flood Control	Earth	TR-CROOKED CREEK N FORK	N	N	N	-
RAUK DETENTION	6/10/2009	Private	Rauk, Karl	27	22	Flood Control	Flood Control, Fire Protection, Stock, Or Small Fish Pond	Earth	PINE CREEK-TRIB	Y	Y	Y	-

9.10 HOUSTON COUNTY LEVEES

FEMA Region(s)	County(ies)	System Name	Segment(s)	Sponsor(s)	Length (Miles)	Inspection Type	Inspection Date	Inspection Rating	Authorization Category	Corps Program Levee	Risk Assignment	Leveed Area Type	Leveed Area Acreage
Region 5	Houston County	Root River - Houston	1	City Of Houston	2.35	Routine	5-Aug-15	MINIMALLY ACCEPTABLE	USACE Federally constructed, turned over to public sponsor operations and maintenance	Yes	No	Urban	434.58

9.11 COST/BENEFIT ANALYSIS OF MITIGATION ACTIONS BY JURISDICTION

Jurisdiction	Mitigation Action	Hazard	Priority / Status	Implementation	Cost	Funding	Probability	Magnitude	Total
All Cities	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	High/ Ongoing	Administration	3	2	2.27	2.24	9.51
All Cities	Ensure that city infrastructure has redundancies in place in the case of power outages during a hazard event	All Hazards	Low/ Ongoing	Public Works	1	1	2.27	2.24	6.51
All Cities	Train all fire department personnel and other first responders in proper hazardous material procedures	Hazardous Materials	High/ Ongoing	Fire	2	2	2.1	2.58	8.68
All Cities	Ensure infrastructure and procedures are in place to provide adequate warning of severe weather events to residents	All Hazards	Medium/ Ongoing	Administration	1	2	2.27	2.24	7.51
All Townships	Create a staff transition plan to ensure that knowledge and expertise of existing staff is carried on to successors	All Hazards	Medium/ New	Administration / Public Works	3	2	2.67	2.45	10.12
Brownsville	Construct new fire barn	Fire	High/ Ongoing	Fire	1	1	2.00	3.00	7.00
Brownsville	Hillside stabilization	Land Subsidence	High/ Ongoing	Administration/ Public Works	1	1	2.00	2.00	6.00
Brownsville	Purchase equipment and training for emergency responders	All Hazards	Medium/ Ongoing	Administration/ Fire	1	1	2.22	2.44	6.67
Caledonia	Re-routing or increasing the capacity of a storm drainage system on the west side of town	Flood	High/ Ongoing	Public Works	1	1	3.50	3.50	9.00
Caledonia	Construct a larger culvert at Old Highway Drive and Highway 44	Flood	High/ Ongoing	Public Works	1	1	3.50	3.50	9.00
Caledonia	Purchase light towers	All Hazards	Medium/ Ongoing	Public Works	2	1	2.39	2.28	7.67
Caledonia	Construct building for equipment storage	All Hazards	Medium/ Ongoing	Public Works	1	1	2.39	2.28	6.67
Caledonia	Re-routing the storm drainage system on the west side of town	Flood	High/ Ongoing	County and City Public Works	1	1	3.50	3.50	9.00
Hokah	Increase existing levee height	Flood	High/ Ongoing	Public Works	1	1	3.00	2.50	7.50

Hokah	Purchase electric generator for 102 Main	All Hazards	Medium/ Ongoing	Public Works	2	1	2.50	2.25	7.75
Hokah	Purchase electric generator for 9 Mill St.	All Hazards	Medium/ Ongoing	Public Works	2	1	2.50	2.25	7.75
Hokah	Purchase electric generator for wastewater treatment facility and railroad tracks	All Hazards	Medium/ Ongoing	Public Works	2	1	2.50	2.25	7.75
Hokah	Construct storm shelter	All Hazards	Medium/ Ongoing	Public Works/ Emergency Services	1	1	2.50	2.25	6.75
Hokah	Upgrade siren system	All Hazards	High/ Ongoing	Emergency Services	1	1	2.50	2.25	6.75
Hokah	Remove the levee on the north side of Root River	Flood	High/ Ongoing	Public Works	1	1	3.00	2.50	7.50
Houston	Acquire land for levee setbacks	Flood	High/ Ongoing	Administration	1	1	1.60	3.20	6.80
Houston	Increase levee height	Flood	High/ Ongoing	Public Works	1	1	1.60	3.20	6.80
Houston	Construct storm shelter on eastern part of city	All Hazards	High/ Ongoing	Administration	1	1	1.80	2.02	5.82
Houston	Highway 9 grade raise	Flood	High/ Ongoing	Public Works	1	1	1.60	3.20	6.80
Houston	Increase the capacity of the Wastewater Treatment Facility	Flood	High/ Ongoing	Public Works	1	1	1.60	3.20	6.80
Houston	Purchase back up electric generators	All Hazards	Medium/ Ongoing	Public Works	2	1	1.80	2.02	6.82
Houston	Purchase new squad patrol vehicle	All Hazards	High/ Ongoing	Emergency Services	1	1	1.80	2.02	5.82
Houston	Construct new storage facility for electric generators	All Hazards	Medium/ Ongoing	Public Works	1	1	1.80	2.02	5.82
Houston	Lower radium levels in city water	Water Contamination	High/ Ongoing	Public Works	1	1	1.80	2.60	6.40
La Crescent	Purchase electric generator to provide for the Fire Department, City Hall, Police Department	All Hazards	High/ Ongoing	Administration	1	1	3.00	2.67	7.67
La Crescent	Construct a secondary emergency access point for maintenance building	All Hazards	High/ Ongoing	Public Works	1	1	3.00	2.67	7.67

Jurisdiction	Mitigation Action	Hazard	Priority / Status	Implementation	Cost	Funding	Probability	Magnitude	Total
La Crescent	Purchase a temperature control system for emergency equipment storage	All Hazards	New/ Ongoing	Public Works/ Emergency Services	1	1	3.00	2.67	7.67
La Crescent	Construct new City Hall to also include a public storm shelter	All Hazards	High/ Ongoing	Administration	1	1	3.00	2.67	7.67
La Crescent	Update equipment for Communications Center	All Hazards	High/ Ongoing	City and County Administration	1	1	3.00	2.67	7.67
La Crescent	Purchase an emergency flat bottom emergency rescue boat	All Hazards	High/ Ongoing	Administration/ Emergency Services	2	1	3.00	2.67	8.67
La Crescent	Construct new La Crescent Township building	All Hazards	High/ Ongoing	Administration	1	1	3.00	2.67	7.67
La Crescent	Purchase new PPE for first responders	All Hazards	High/ Ongoing	Emergency Services	2	2	3.00	2.67	9.67
La Crescent	Continued education for first responders related to all hazards	Hazardous Materials	High/ Ongoing	Emergency Services	2	1	2.33	3.00	8.33
La Crescent	Increase security around wells and wastewater treatment plant	Water Contamination	New/ Ongoing	Public Works	2	1	3.00	2.67	8.67
La Crescent	Absorbent booms for hazardous spills	Hazardous Materials	New/ Ongoing	Fire	2	1	2.33	3.00	8.33
Spring Grove	Purchase electric generators	All Hazards	High/ New	Public Works	2	1	1.89	1.89	6.78
Spring Grove	Construct and/or designate local public shelters	All Hazards	Medium/ Ongoing	Administration/ Public Works	1	1	1.89	1.89	5.78
Spring Grove	Storm proof public facilities	All Hazards	Medium/ Ongoing	Public Works	2	1	1.89	1.89	6.78
Spring Grove	Upgrade water treatment facility	All Hazards	Medium/ Ongoing	Public Works	1	1	1.89	1.89	5.78

9.12 STATUS OF HAZARD MITIGATION ACTIONS

2009 Action	Included in 2015 Update	Status	Progress
Communicate strategies to individual homeowners and commercial property owners for preventing damage from lightning strikes.	Not Included		No longer relevant
Complete countywide FEMA floodplain restudy.	Not Included	Complete	
Review, adopt or amend shore land/floodplain ordinances to recognize new Flood Insurance Study.	Included	In process	Ongoing
Review current floodplain zoning ordinances for noncompliance with state and federal regulations with respect to nonconforming structures and adopt as needed.	Included		
Complete a countywide flood mitigation plan that includes the identification of flood prone and repetitive loss structures and identification of flood mitigation projects.	Included		
Test and replace private septic systems.	Not Included		No longer relevant
Identify, relocate, flood proof or tear down all repetitive loss structures and critical facilities.	Not Included		No longer relevant
Review the county floodplain ordinance and update as needed.	Not Included		No longer relevant
Require that all LP tanks and other hazardous material tanks be anchored or tied down.	Not Included		No longer relevant
Evaluate the locations and numbers of stream monitoring stations throughout the county, and coordinate and/or purchase additional monitoring equipment if necessary.			
Reestablish flood plan to reduce turbidity, provide flood storage, and reduce pressure on dikes. Provide/construct additional flood storage, impoundment or flood flow reductionsites throughout the entire watershed (county). Stop or mitigate activities that would otherwise increase peak flow downstream. Consider the implementation of a USACE Feasibility Study for a multiple purpose project that reduces flood damages.	Not Included		No longer relevant
Coordinate water flow and retention projects with neighboring counties and area watersheds.		In process	
Study areas that have continual basement flooding and determine the appropriate mitigation strategies including but not limited to: drain tile to adjacent rivers, drawdown and flood attenuation areas, and culvert or backflow prevention devices in culverts, re-grading drainage ditches to flow away from residential areas.	Not Included		No longer relevant
Adopt or update bluff land ordinances as needed.		Complete	
Work with the Minnesota DNR to include prescribed burning on all county lands and parks.	Not Included	Complete	
Create a wildfire susceptibility model to determine areas which are more prone to wildfires.	Not Included		
Require burning permits for large fires.	Not Included	Complete	
Evaluate and recommend speed reductions along routes used to transport hazardous materials where there is a potential for roll-overs.	Not Included		
Enhance security of wells reservoirs, and treatment facilities through education.	Included	N/A	N/A

Remove or relocate all structures in Floodplain	Not Included		
Install backup generators to water wells.			
Improve condition of Waste Water System by installing power generators on lift stations.	Included		
Design mitigation improvements to minimize flash flooding damage.	Not Included		
Design/implement a comprehensive campaign of community education on disaster preparedness, including: strategies for communications without power, outdoor warning sirens, maintenance of weather alert radios, severe weather awareness week, design/ construction methods to mitigate building damage, protection from lightning, protection from flash flooding and sewer backups, evacuation routes and disaster recovery plans (businesses and family).	Included		
Inform all residents and visitors of safe shelter locations through media campaigns, maps, websites, newsletters and other sources.	Included	Complete	Code Red notification System
Promote the use of weather radios and purchase additional radios for vulnerable populations.	Included	N/A	N/A
Provide critical facilities including schools, and nursing homes in the county access to severe weather notification and observation.		Complete	Code Red notification System
Identify ways to increase access to emergency information for campgrounds, cities, and townships and provide the information in a timely manner.	Included	Complete	Code Red notification System
Work with local power companies to inform residents of the importance of keeping power lines clear of branches or other items that can damage lines.		N/A	N/A
Encourage continued compliance with the NFIP and encourage nonparticipating cities and townships to apply.	Not Included	Complete	
Encourage and explain the benefits of residue management, best management practices and grassed waterways regarding reduced runoff and diminishing the effects of flooding.	Not Included	Complete	
Inform and educate the citizenry on flood insurance to cover the effects of landslides.	Not Included		
Educate residents about the role vegetation plays in preventing landslides.	Not Included		
Increase awareness and education on Karst/sinkholes in schools and in the public at large.	Not Included	N/A	
Develop a systematic information and education program that provides useful and factual information to the public about radon gas exposure and testing.	Not Included	N/A	
Investigate increasing public education campaigns on water conservation and funding for campaigns.	Not Included	N/A	
Provide educational material to all campers entering local parks and campgrounds.	Not Included	N/A	
Increase fire risk awareness in campgrounds with updated signs that display the potential risk of wildfires.			
Educate the public on wildfire dangers and prevention of wildfires during dry seasons.	Not Included		

2009 Action	Included in 2015 Update	Status	Progress
Develop a systematic information and education program that provides useful and factual information to the public about infectious diseases, vaccinations, and prevention.	Not Included		
Provide information on the recognition, testing, treating, and reporting of infectious diseases to healthcare providers in clinics, and other healthcare settings.	Not Included		
Increase public education through more school visits, and a county-wide program to increase education in schools. Provide school programs to youth, focusing on stoves, smoke detectors, fire safety and evacuation.			
Increase education on fire safety through the local cable channel and through radio.			
Work with township, city, state, federal agencies and private industries to share information on types and locations of hazardous material that have the potential to affect the county and region.	Not Included		
Develop a local education campaign to educate citizens about the various hazardous materials/waste that are in the county.	Not Included		
Develop and distribute debris management guidelines.	Included	Complete	Need to update again
Communicate risk of water contamination to residents downstream of a wastewater treatment plant in case of flood or other plant problem.	Not Included		
Provide well disinfection brochures to potentially impacted well owners and materials on monitoring private wells.	Not Included		
Encourage local jurisdictions to evaluate and test their ability to isolate contaminants in their water distribution systems and develop groundwater protection plans.	Not Included		
Prepare and distribute pamphlets and other informational material outlining steps to maintain minimum electrical power or other action to prevent frozen pipes and maintain critical operations	Not Included		
Develop and implement stormwater management plans and coordinate with bordering counties and DNR or other agencies to have a stormwater management plan completed for the watershed.			
Develop a GIS layer for public drainage systems showing watershed boundaries, open ditches, tile lines, etc.		In Process	
Prevent damage from critical flood events while enhancing base flows: Define, restore, and/or create hydrologic areas that are critical for contributing to or sustaining base flows. Restore wetlands in critical areas in ways that augment base flows.		N/A	N/A
Consider environmental enhancement for all flood control projects.	Not Included		
Target flood prone areas with sandy soils and encourage no-till or low-till farming practices and conservation programs such as CRP on those lands to help reduce runoff.	Not Included		

Educate farmers and citizens about the benefits of "buffer plantings" along river corridors.	Not Included		
Create overlay districts, land use regulations, or Karst-related ordinances to protect the area's Karst.	Not Included		
Continue to update mapping of sinkholes, springs spring sheds and other Karst features.			
Establish a comprehensive and ongoing water-monitoring program.			
Coordinate efforts of monitoring the public water supply with the DNR and MDH.			
Estimate the annual recharge rates or the capacities of the various aquifers in the county.			
Continue to develop new capabilities to predict the direction and velocity of groundwater flow, surface water runoff, and windborne transport. Integrate these results in the county GIS system and share these results with appropriate users.	Not Included		
Review and update the county policies and environmental plans that address hazardous material/waste storage and transportation in Houston County.	Not Included		
Continue to regulate well construction and sealing through a permitting process that includes inspection, and the annual registration of monitoring and remedial wells.	Not Included		
Continue to enforce Minnesota Rules Chapter 7020 and inspect feedlots regularly, enforcing violations.		Complete	Complete
Provide a well-testing service for private well owners.	Not Included		
Continue to enforce Minnesota Rules Chapter 7080 for all newly installed septic systems.		Complete	Complete
Encourage the cleanup of sinkhole dumps and research funding sources to cleanup these sites.	Not Included	Complete	Complete
Increase awareness and education on sinkholes in schools and in the public at large.		N/A	N/A
Use state and federal resources to continue to build and improve public health emergency response capacity in the county	Not Included	N/A	N/A
Utilize GIS technology and database management to identify vulnerable populations in the community and update as needed.	Not Included	Complete	Complete
Maintain an up-to-date Health Alert Network (HAN) system to keep clinics, hospitals, other health care providers, public safety agencies, schools, local governments, etc. informed of urgent public health emergency events		N/A	N/A
Collaborate with local partners especially Houston County Social Services and the American Red Cross to coordinate emergency and temporary shelter for displaced residents.	Not Included	Complete	Complete
Identify and map community shelters that could be used by residents that need a safe shelter and identify evacuation routes for residents that must seek safe shelter off-site.			
Determine if additional shelters are needed for "at-risk" populations and construct them.	Included	Complete	Complete
Identify a list of local vendors of mobile power generators and develop good Samaritan/ mutual aid agreements for their use.	Not Included		

2009 Action	Included in 2015 Update	Status	Progress
Communicate and coordinate with planning agencies regarding the development of standard requirements for safe shelters in dwellings without basements.			
Consider requiring campgrounds to have an evacuation and emergency shelter plan in place.	Not Included		
Maintain communications with voluntary agencies regarding shelters.	Not Included	In Process	
Create a multi-jurisdictional task force (county, cities, townships, others) to coordinate the implementation of strategies to reduce the impact of violent storms and extreme temperatures.			
Inventory, assess, and upgrade the warning system equipment and replace malfunctioning or old warning sirens as necessary.	Included	Complete	10 Sirens
Discuss with Emergency Managers options to ensure that mobile home parks, vulnerable populations, campgrounds, and other high risk areas receive early notification and implement best strategy.		Complete	Complete
Ensure an adequate number of sandbags and sand is on hand for flood prone structures in the county.	Include	Complete	Stockpiled
Develop a plan for preparing and distributing sandbags when needed.			
Firefighters need to receive proper training to fight wildfires as well as organized and regular communications between the DNR, U.S. Fish and Wildlife Service and local fire departments on fighting wildfires.	Included	Complete	Monthly Trainings
Increase the public health work force for emergencies by enrolling and training volunteers through the Minnesota Responds – Medical Reserve Corp or CERT programs.	Not Included		
Supply all cities and townships with contact information for maintenance personnel.			
Continue to use city and county GIS to map and update locations of fixed facilities using hazardous materials/waste and associated transportation corridors in a timely manner.	Not Included		
Create a mutual aid agreement between all police departments countywide.	Not Included	In Process	
Assess the need for proper personal protection equipment to respond to hazardous materials disasters and purchase as needed.		Complete	Complete
Incorporate the use of the National Incident Management System for all hazard materials incidents that may occur in the county.	Included	Complete	Stockpiled
Participate in regional exercises that test local plans and interaction between local agencies.		Complete	
Encourage attendance/training at the Hazardous Materials Awareness and Weapons of Mass Destruction (CBRNE) level training for the ten Office of Domestic Preparedness disciplines as appropriate.		Complete	

Continue to expand the use of mutual aid agreements and memoranda of understanding to improve response coordination between local, state, and federal agencies and appropriate private sectors.		N/A	N/A
Establish procedures to assist cities and the State Health Department in public notification and coordination in the event of a municipal well contamination incident.	Included	Complete	Mutual Aid Agreements
Encourage adequate funding in maintaining emergency communications for purposes of emergency response situations and to provide a reliable, up to date interoperable system in which all disciplines (municipalities, public works, police, fire, ambulance and local governments) can communicate with each other during significant events.	Not Included		
Provide a mobile command and communications center in a secure, on scene trailer equipped with proper and necessary radio communications, computer connectivity, emergency lighting, generator power, maps and conference room capabilities for incident command staff.			
Purchase Radios and Cell Phones for Firefighters throughout the county.			
Acquire backup power generators to prevent impairments to essential services in case of prolonged power outages.	Included	Complete	Generator
Encourage campgrounds to remove debris and dead vegetation around camping areas on an annual basis.	Not Included		
Develop, maintain and update materials, plans and agreements for addressing infectious disease.	Not Included		
Continue providing and increase funding for socio/economically challenged populations for vaccinations.	Not Included		
Ensure availability of proper equipment/supplies (drugs and medication) to address infectious disease outbreaks (isolation, quarantine, and mass dispensing).	Not Included		
Utilize state, federal and local resources to prevent and control infectious disease in the county.	Not Included		
Work with clinics and hospitals to improve infectious disease reporting.	Not Included		
Continue to work with local/regional hospitals and clinics in developing plans and roles in infectious disease response, including quarantine.	Not Included		
Investigate free recycling or reduce fees for recycling tires, a mosquito breeding ground.	Not Included	Complete	County offers this
Coordinate and facilitate discussion on policies related to hazardous materials/waste storage and transportation.	Not Included		
Identify sources for obtaining bottled water for unincorporated areas of the county, including bottled water distributors and local grocery stores.	Not Included		
Maintain and review copies of Wellhead Protection Plans as they are developed by Public Water Supply Well owners and submitted to the Minnesota Department of Health.	Not Included		

2009 Action	Included in 2015 Update	Status	Progress
Investigate and evaluate human health risk Associated with all public health impacts. Mitigate and control environmental exposures associated with all hazard events to people through development of public health and capacity in collaboration with state and local agencies.	Not Included		
Enhance communications with public safety officials, transportation departments and Minnesota Department of Transportation to limit travel on major transportation routes during hazardous driving conditions.	Included		
If there is a "Cooperative Agreement", then continue to maintain cooperative arrangements with cities and townships to make the most efficient and effective use of road maintenance equipment.	Not Included		
Evaluate burying of existing power lines.			
Identify and improve roads and streets that are repeatedly flooded and washed away with improvements, including modifying and raising roads/streets, providing improved drainage and stormwater removal, rip rapping where needed and creating buffers and vegetation strips.	Included	In Process	Ongoing
Redesign bridges that contribute to flooding by improving the flow of water and ice under/through the bridge.	Not Included		
Upgrade, redesign, or replace culverts and bridges for improved drainage and flow to prevent washouts and flooding.	Included	In Process	Ongoing
Conduct an inventory of existing culverts and their respective drainage areas.	Not Included		
Involve road authorities in development of culvert sizing criteria.	Not Included		
Analyze the ditch systems in the county and surrounding counties and make ditch improvements where needed.	Not Included		
Encourage and complete flood flow reduction projects within the county and in surrounding counties and watersheds.	Not Included		
Identify and complete flood protection and prevention projects for cities.	Included	Complete	Levee
Study the possibility of creating flood diversion channels and determine the proper location for such channels and implement where appropriate.	Not Included		
Study the susceptibility for landslides near roads and structures, and use mitigation measures such as slope stabilization where feasible.			
Encourage adequate funding to repair and maintain dams, levees, and other similar water retention structures.	Not Included		
Bury overhead power lines.			
Stabilize slopes throughout County to prevent landslides.	Not Included		

Storm Sewer Collection Systems throughout County; improved new curb and gutter as well as storm drains and pipes.	Not Included		
Dredge river channels, as needed.	Not Included		
Improve and raise flood dike, as needed.	Included	In Process	Ongoing
Remove dikes to prevent flow impairments on rivers and tributaries, as needed.	Not Included		
Locate and inspect all flood water retention structures (dams, ponds, etc.) on public and private land. Have responsible agencies and landowners repair, as necessary. Identify assistance, cost or other resources, to perform those repairs. Establish periodic inspection.			
Build ponds to slow rainwater runoff	Included	In Process	Ongoing
Improve, update, and expand past and future water systems, to accommodate population growth.	Not Included		
Flood proof grinder pumps used to provide sanitary sewer service to Shore Acres.	Not Included		
Raise sections of Shore Acres Road that are impacted by flood waters that restrict access to properties on Shore Acres	Not Included		
Construct stormwater improvements to the Veterans Park/West Bank stormwater infrastructure.	Not Included		
Install a culvert on the old Monte Carlo Road on Shore Acres to allow flood waters to equalize.	Not Included		
Flood mitigation in Winnebago Watershed.	Not Included		
Bridge Replacement on South Prairie Drive.	Not Included		
Improve Dam along South Prairie Drive.	Not Included		
Improve Flood Control along Root River.	Not Included		
Reduce Stormwater Runoff.	Not Included		
Identify and catalog sinkholes.	Not Included		
Crooked Creek Watershed Dam and Pond Construction.	Not Included		
Improve Snow Removal along Roads.	Not Included		
Push up Ponds.	Included	In Process	Ongoing
Roadside washout reduction.	Not Included		
Bee/Duck Creek Watersheds.	Not Included		

SECTION 10: BIBLIOGRAPHY

1. **Federal Emergency Management Agency.** Local Mitigation Plan Review Guide. 2011.
2. **Federal Emergency Management Agency.** Multi-Jurisdictional Mitigation Planning. 2006.
3. **Federal Emergency Management Agency.** Disaster Mitigation Act of 2000. 2000.
4. **Legal Information Institute.** Code of Federal Regulations, Title 44, Section 201.6, Local Mitigation Plans. s.l. : Cornell University Law School.
5. **Governor Mark Dayton.** Executive Order 11-03 Assigning Emergency Responsibilities To State Agencies, Rescinding Executive Order 10-06. s.l. : Minnesota Legislative Reference Library, 2011.
6. **Minnesota Office of the Revisor of Statutes.** Minnesota Statutes, Chapter 12, Section 9, Subdivision 7. 2011.
7. **Minnesota Office of the Revisor of Statutes.** Minnesota Statutes, Chapter 394, Section 21. 2011.
8. **Federal Emergency Management Agency.** Hazard Mitigation Assistance Unified Guidance. 2011.
9. **Federal Emergency Management Agency.** Disaster Declarations. [Online] 2013. http://www.fema.gov/disasters.
10. **U.S. Census Bureau. State & County QuickFacts.** [Online] 2010. http://quickfacts.census.gov/qfd/states/27/27055.html.
11. **U.S. Census Bureau, Census 2010 Summary File.** Esri forecasts for 2015 and 2020.
12. **United States Department of Agriculture.** Soil Survey of Houston County, Minnesota. 1984.
13. **Minnesota Department of Natural Resources.** Data Deli. Hydrography Data File Series. [Online] http:/deli.dnr.state.mn.us/data_search.html.
14. **Minnesota Department of Natural Resources.** Lake Finder. [Online] 2015. http://www.dnr.state.mn.us/lakefind/index.html.
15. **Hart, John Fraser and Ziegler, Susy Svatek.** Landscapes of Minnesota: A Geography. St. Paul : s.n., 2008.
16. **NOAA/National Weather Service.** La Crosse, WI. Natural Hazards Assessment Houston County, MN. [Online] 2013. http://www.weather.gov/media/arx/nathaz/HOUhazards.pdf.
17. **U.S. Census Bureau. Decennial Census.** [Online] 2000 & 2010. http://factfinder2.census.gov/.
18. **U.S. Census Bureau. Decennial Census**. Economic Census. 2007.
19. **U.S. Department of Agriculture.** Census of Agriculture. 2007.
20. **Minnesota Department of Employment and Economic Development.** Quarterly Census of Employment and Wages. 2014.
21. **U.S. Census Bureau. American Community Survey.** [Online] 2014. http://factfinder2.census.gov/.
22. **Minnesota Department of Employment and Economic Development.** Minnesota Unemployment Statistics Local Area Unemployment Statistics (LAUS) Data. 2014. [Online] https://apps.deed.state.mn.us/lmi/laus/Results.aspx?geog=2704000045&adjusted=0&periodtype=03&resultset=3&startyear=2007&endyear=2016.
23. **Minnesota Geospatial Information Office.** Minnesota Land Use/Cover: Recent (1969-Present). [Online] http://www.mngeo.state.mn.us/chouse/land_use_recent.html.
24. **National Climatic Data Center.** Storm Events Database. [Online] National Oceanographic and Atmospheric Administration, 2000-2015. http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms.
25. **Minnesota Geospatial Commons.** Inventory of Dams in Minnesota. 2015. https://gisdata.mn.gov/dataset/loc-mn-dams-inventory-pub.
26. **Houston County.** Critical Infrastructure and Key Resources (CIKR). As set. Listing. 2015.

27. **Minnesota Department of Education.** Minnesota Department of Education Data Center. [Online] 2015. http://education.state.mn.us/MDEAnalytics/Maps.jsp.
28. **Minnesota Department of Transportation.** Statewide Miles and Lane Mileage. 2014.
29. **Federal Highway Administration.** Bridges by State and County. 2009.
30. **Minnesota Department of Transportation.** Bridge and Structure Inspection Program Manual. 2014.
31. **U.S. Energy Information Administration.** Plant Data. Form EIA-860. 2015.
32. **Environmental Protection Agency.** Facility Registry Service (FRS). 2015.
33. **Minnesota Pollution Control Agency.** Whats in My Neighborhood? [Online] 2013. http://www.pca.state.mn.us/index.php/data/wimn-whats-in-my-neighborhood/whats-in-my-neighborhood.html.
34. **Minnesota Department of Employment and Economic Development.** Employer Search. [Online] 2015. http://www.positivelyminnesota.com/apps/lmi/employers/login/.
35. **National Park Service.** National Register of Historic Places. [Online] 2013. http://www.nps.gov/nr/.
36. **Minnesota Department of Health.** Facility & Provider Search[Online] 2015. http://www.health.state.mn.us/divs/fpc/directory/showprovideroutput.cfm.
37. **Federal Emergency Management Agency.** Multi-Hazard Identification and Risk Assessment: Part I. 1997. p. 40.
38. **Minnesota Department of Homeland Security and Emergency Management.** Minnesota All-Hazard Mitigation Plan Update. 2014.
39. **National Weather Service.** Instruction 10-1605. 2007.
40. **Minnesota Department of Natural Resources.** Minnesota Flash Floods. [Online] 1970-2012. http://www.dnr.state.mn.us/climate/summaries_and_publications/flash_floods.html.
41. **Minnesota Department of Natural Resources.** Dams and Dam Safety in Minnesota. 2012.
42. **Minnesota Office of the Reviser of Statutes.** Minnesota Statutes, Chapter 6115. 2013.
43. **National Climatic Data Center.** Billion Dollar U.S. Weather/Climate Disasters. 1980-2015. [Online] 2015. http://www.ncdc.noaa.gov/billions/events.pdf.
44. **National Weather Service.** 2016 Severe Weather Awareness Campaign Kickoff March 6-12. [Online] http://www.srh.noaa.gov/sjt/?n=svrwx_awareness.
45. **National Weather Service.** Flood Awareness. [Online] http://www.weather.gov/cae/flood.html.
46. **National Severe Storms Laboratory.** Severe Weather 101-Floods. [Online] http://www.nssl.noaa.gov/education/svrwx101/floods/.
47. **Minnesota Department of Natural Resources.** Drought in Minnesota. [Online] 2013. http://www.dnr.state.mn.us/climate/drought/index.html.
48. **National Drought Mitigation Center.** Predicting Drought. [Online] 2013. http://drought.unl.edu/DroughtBasics/PredictingDrought.aspx.
49. **United States Drought Monitor.** Drought Severity Classification. [Online] 2016. http://drought.unl.edu/DroughtBasics/PredictingDrought.aspx
50. **National Climatic Data Center.** Billion-Dollar U.S. Weather/Climate Disasters 1980-2012. [Online] 2012. http://www.ncdc.noaa.gov/billions/events.pdf.
51. **Corporation for Public Broadcasting.** Mass Exodus From the Plains. [Online] http://www.pbs.org/wgbh/americanexperience/features/general-article/dustbowl-mass-exodus-plains/.
52. **Minnesota Division of Homeland Security and Emergency Management.** Minnesota All-Hazard Mitigation Plan Update. St. Paul: s.n., 2014.
53. **Minnesota Climatology Working Group.** Annual Precipitation Maps. [Online] 2014. http://climate.umn.edu/doc/annual_pre_maps.html.

54. **National Park Service.** Benefits of Natural Fire. [Online] https://www.nps.gov/fire/wildland-fire/resources/documents/benefits-of-fire.pdf.

55. **British Columbia Wildfire Management Branch.** Fire Behavior. [Online] 2013. http://bcwildfire.ca/FightingWildfire/behaviour.htm.

56. **United States Nuclear Regulatory Commission.** La Crosse Boiling Water Reactor. [Online] http://www.nrc.gov/info-finder/decommissioning/power-reactor/lacrosse-boiling-water-reactor.html.

57. **Minnesota Department of Public Safety.** Fire in Minnesota: Annual Report. 1998-2013.

58. **National Weather Service.** National Weather Service Glossary. [Online] 2013. http://forecast.weather.gov/glossary.php?letter=h.

59. **National Weather Service.** What is the Heat Index. [Online] http://srh.noaa.gov/ama/?n=heatindex.

60. **Environmental Protection Agency.** Excessive Heat Events Guidebook. 2006.

61. **National Weather Service.** Heat Wave: A Major Summer Killer. [Online] 2005. http://www.nws.noaa.gov/om/brochures/heat_wave.shtml.

62. **National Oceanographic and Atmospheric Administration.** Severe Weather 101. National Severe Storms Labratory. [Online] 2013. http://www.nssl.noaa.gov/primer/wind/wind_basics.html.

63. **National Aeronautics and Space Administration.** Sci-Jinks. [Online] http://scijinks.jpl.nasa.gov/rain.

64. **National Weather Service Forecast Office.** One Inch Hail. [Online] http://www.nws.noaa.gov/oneinchhail/.

65. **National Oceanographic and Atmospheric Administration.** Severe Weather 101. [Online] http://www.nssl.noaa.gov/education/svrwx101/.

66. **Minnesota Climatology Working Group.** Minnesota Tornado History and Statistics. [Online] University of Minnesota, 2013. http://climate.umn.edu/doc/historical/tornadic.htm.

67. **National Oceanographic and Atmospheric Administration.** U.S. Tornado Climatology. [Online] 2012. http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html.

68. **National Weather Service.** NWS Wind Chill Chart. [Online] http://www.nws.noaa.gov/om/winter/windchill.shtml.

69. **National Oceanic and Atmospheric Administration.** Experimental Extreme Cold Warning Products. [Online] http://www.nws.noaa.gov/infoservicechanges/Exp_Extreme_Cold_u1.pdf.

70. **National Weather Service, Twin Cities Minnesota, Weather Forecast Office.** Warnings, Watches and Advisories. [Online] 2013. http://www.crh.noaa.gov/mpx/?n=wwadef.

71. **Center for Disease Control and Prevention.** Hypothermia, Emergency Preparedness and Response. [Online] http://emergency.cdc.gov/disasters/winter/staysafe/hypothermia.asp.

72. **National Weather Service.** Blizzards. [Online] http://www.wrh.noaa.gov/fgz/science/blizzard.php?wfo=fgz.

73. **U.S. Coast Guard. National Response Center.** [Online] 2014. http://www.nrc.uscg.mil/default.aspx.

74. **U.S. Department of Transportation Pipeline & Hazardous Materials Safety Administration.** Hazmat Intelligence Portal. [Online] 2015. https://portal.phmsa.dot.gov.

75. **ProudGreenHome.** Six Common Causes of Wastewater Treatment System Failure. [Online] http://www.proudgreenhome.com/blogs/6-common-causes-of-wastewater-treatment-failure/.

76. **Chiras, Daniel D, Reginald, John P and Owen, Oliver S.** Natural Resource Conservation: Management for a Sustainable Future. 1998. p. 249-250.

77. **United States Geological Survey.** Learn More About Groundwater. [Online] 2008. http://wi.water.usgs.gov/gwcomp/learn/index.html.

78. **Minnesota Department of Public Safety.** Terrorism. [Online] https://dps.mn.gov/divisions/hsem/mn-school-safety-center/documents/terrorism.pdf.

79. **Mayo Clinic.** Infectious Diseases. [Online] 2015. http://www.mayoclinic.org/departments-centers/infectious-diseases/overview.

80. **Center for Disease Control.** Achievements in Public Health 1900-1999 - Control of Infectious Diseases. 1999.

81. **Cohen, Mitchell L.** Resurgent and Emergent Disease in a Changing World. 1998. Vol. 54, pp. 523-532.

82. **U.S. Department of Health and Human Services.** The Great Pandemic. [Online] http://www.flu.gov/pandemic/history/1918/the_pandemic/legacypendemic/index.html.

83. **World Health Organization.** Global Influenza Preparedness Plan. 2005.

84. **Minnesota Department of Health.** Minnesota County Health Tables, Morbidity and Utilization. 2004-2012.

85. **Minnesota Department of Natural Resources.** Which Minnesota Communities Participate in the National Flood Insurance Program (NFIP). 2013.

86. **Minnesota Department of Natural Resources.** FEMA NFIP Insurance Report. 2015.

87. **National Weather Service.** How Fog Forms. [Online] http://www.weather.gov/lmk/fog_tutorial.