

Lincoln
County
All
Hazard
Mitigation
Plan

December

2010

This multi-jurisdictional hazard mitigation plan includes Lincoln County and the cities of Arco, Hendricks, Ivanhoe, Lake Benton, and Tyler, Minnesota.

This project was supported by Grant Award Number EMC-2007-PC-0004 awarded by the Federal Emergency Management Agency (FEMA). Points of View or opinions in this document are those of the author and do not represent endorsement by FEMA or reflect FEMA's views.

Prepared by
Southwest
Regional
Development
Commission
and Lincoln
County
Emergency
Management

Lincoln County All Hazard Mitigation Plan

December 2010

Executive Summary..... 1

CHAPTER 1: INTRODUCTION

I. Mitigation Planning..... 3
A. Purpose and Authority
B. FEMA Guidance and Plan Review
C. Profile of Lincoln County

CHAPTER 2: PREREQUISITES

II. Multi-Jurisdictional Plan Adoption 17
A. Jurisdictions Represented in this Plan
B. Adoption Procedure
C. Supporting Documentation
III. Multi-Jurisdictional Planning Participation..... 18
A. How Each Jurisdiction Participated in this Plan

CHAPTER 3: PLANNING PROCESS

IV. Documentation of the Planning Process 21
A. Description of the Planning Process
B. The All Hazard Mitigation Planning Team
C. Public Involvement
D. Other Opportunities for Involvement
E. Existing Plans, Studies, Reports and Technical Information

CHAPTER 4: RISK ASSESMENT

V. Identifying Hazards 27
A. Description of All Hazards
VI. Profiling Hazards 30
A. Natural Hazards
B. Technological Hazards
Listing for each natural and technological hazard:
a) Locations Affected by All Hazards
b) Extent of Each Hazard
c) Previous Occurrences of Each Hazard
d) Probability of Future Hazard Events
VII. Assessing Vulnerability: Overview 60
A. Summary of Vulnerability
B. Impacts of Hazards on the Community
VIII. Assessing Vulnerability: Addressing Repetitive Loss Properties..... 69
IX. Assessing Vulnerability: Identifying Structures..... 69
A. Existing Critical Facilities

X.	Assessing Vulnerability: Estimating Potential Losses.....	71
	A. Structures Vulnerable to Natural Hazards	
XI.	Assessing Vulnerability: Analyzing Development Trends	75
	A. Land Use and Development Trends	
XII.	Multi-Jurisdictional Risk Analysis	76
	A. Risk Assessment for Participating Jurisdictions	

CHAPTER 5: MITIGATION STRATEGY

XIII.	Local Hazard Mitigation Goals	77
	A. Description of Mitigation Goals and Objectives	
XIV.	Identification and Analysis of Mitigation Actions	80
	A. Mitigation Actions and Projects	
	B. Reducing the Effects of Hazards on New Buildings & Infrastructure	
	C. Reducing the Effects of Hazards on Existing Buildings and Infrastructure	
XV.	Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance	87
	A. Participation in the NFIP	
	B. Identification, Analysis and Prioritization of Actions Related to Continued Compliance in NFIP	
XVI.	Implementation of Mitigation Actions	89
	A. Action Prioritization	
	B. Action Implementation and Administration	
	C. Cost-Benefit Review	
XVII.	Multi-Jurisdictional Mitigation Actions.....	91
	A. Action Items for Each Participating Jurisdiction	

CHAPTER 6: PLAN MAINTENANCE

XVIII.	Monitoring, Evaluating, and Updating the Plan.....	93
	A. Method and Schedule for Monitoring this Plan	
	B. Method and Schedule for Evaluating this Plan	
	C. Method and Schedule for Updating the Plan	
XIX.	Incorporation into Existing Planning Mechanisms	94
	A. Local Planning Mechanisms Available for Incorporating Mitigation Requirements	
	B. Process for Incorporating Mitigation Strategies and Hazard Information in Other Plans and Ordinances	
XX.	Continued Public Involvement.....	95

APPENDIX

A.	Resolutions of Adoption	96
	(To be appended following FEMA approval and adoption by each participating jurisdiction.)	

ADDENDUMS

List of Figures

Map of Local Units of Government..... 2

1-1: Eligible Subapplicants 4

1-2: Watersheds Map..... 13

2-1: Tornado Damage, Tyler MN, 21 August 1918..... 20

4-1: The 100-Year Floodplain 41

4-2: Floodplain Map 42

4-3: TORRO Hail Scale 47

4-4: Enhanced F-Scale for Tornado Damage..... 50

4-5: Hazard Identification Worksheet..... 62

4-6: City Hazard Ranking 76

List of Tables

1-1: Civil Divisions in Lincoln County..... 8

1-2: Population in Southwest Minnesota 9

1-3: Estimated Population and Households in Lincoln County 9

1-4: Projected Population by Age and Gender 10

1-5: Lincoln County Employment By Industry..... 10

1-6: Lincoln County Major Employers..... 11

1-7: Utility Systems 15

1-8: Public Services..... 16

2-1: Multi-Jurisdictional Participation in Lincoln County AHMP Process..... 19

3-1: Lincoln County All Hazard Planning Team 23

4-1: NCDC Snow & Ice Events in Lincoln County..... 35

4-2: NCDC Flood Events in Lincoln County..... 45

4-3:	NCDC Hail Events in Lincoln County.....	48
4-4:	NCDC Tornado Events in Lincoln County	51
4-5:	Parcels Located in Flood Hazard Area, Lincoln County.....	66
4-6:	Assessing Critical Facilities in Lincoln County	70
4-7:	National Register of Historic Places.....	70
4-8:	Potential Structure Vulnerability to F4/F5 Tornado Events.....	72
4-9:	HAZUS Countywide Building-Related Economic Loss Estimates	74
5-1:	Local Partners with Interest in All Hazards Mitigation	81
5-2:	Participation in National Flood Insurance Program.....	87
5-3:	Priority Action Items for Lincoln County.....	89
5-4:	Mitigation Actions by City.....	92

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LINCOLN COUNTY

ALL-HAZARD MITIGATION PLAN

December 2010

Executive Summary

This hazard mitigation plan documents the multi-jurisdictional, multi-hazard mitigation planning process in Lincoln County, Minnesota, which is intended to meet the requirements of the federal Disaster Mitigation Act of 2000.

The Lincoln County All-Hazard Mitigation Plan is intended to prevent and minimize effects of natural and man-made hazards, and improve our ability to respond and recover.

This project was undertaken so that all local units of government in Lincoln County that wished to participate could become eligible to adopt the plan. All incorporated municipalities participated in the County's hazard mitigation planning process: Arco, Hendricks, Ivanhoe, Lake Benton, and Tyler, Minnesota.

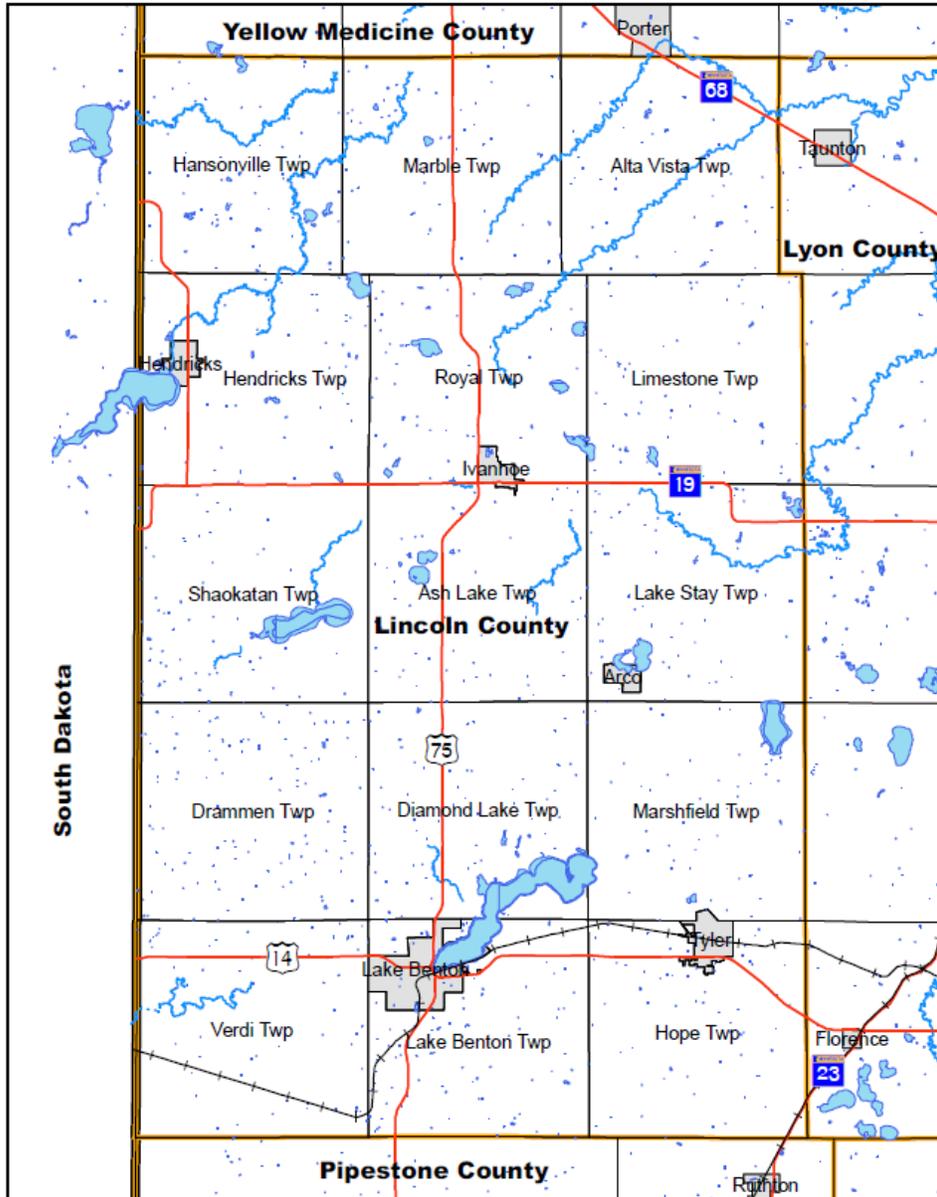
Lincoln County and the cities of Hendricks, Ivanhoe, and Tyler participate in the National Flood Insurance Program (NFIP). The cities of Arco and Lake Benton also have identified Flood Hazard Areas—although they do not currently participate in the NFIP as there are few structures at risk, they have begun discussions with Minnesota Department of Natural Resources on the process.

The Lincoln County All-Hazard Mitigation Planning Team identified the following natural and man-made hazards as High Rank Hazards for Lincoln County:

- Ice and Ice Storms
- Tornado / Windstorm
- Agricultural Disease (Animal & Crop)
- Public Health and Infectious Disease

The Planning Team considered back-up power and mass distribution of medical supplies to be priority mitigation actions.

This planning process has been conducted by the Southwest Regional Development Commission (SRDC) and Lincoln County Emergency Management in accordance with current guidance provided by US Federal Emergency Management Agency (FEMA) and Minnesota Homeland Security and Emergency Management (HSEM). *This project was supported by Grant Award Number EMC-2007-PC-0004 awarded by the Federal Emergency Management Agency (FEMA). Points of View or opinions in this document are those of the author and do not represent endorsement by FEMA or reflect FEMA's views.*



Lincoln County All Hazard Mitigation Plan

Lincoln County, MN

-  Railroad
-  Trunk Highways
-  Lakes
-  Rivers and Streams
-  City
-  Township
-  County
-  State Line



SRDC 05.10



This project was supported by Grant Award number EMC-2007-PC-0007 awarded by the Federal Emergency Management Agency (FEMA). Points of view or opinions in this document are those of the author and do not represent endorsement by FEMA or reflect FEMA views.

CHAPTER 1: INTRODUCTION

This Chapter introduces the concept of multi-hazard mitigation planning. Section I describes all-hazard mitigation programs in Minnesota and provides a profile of Lincoln County.

I. Mitigation Planning

Natural and manmade hazards present risks throughout Minnesota. Rain and snow bring threats of flooding and utility failure. At any time, we may need to respond to the impacts of fire or tornado, riot or radiation. Our local units of government, first responders and emergency managers know how to effectively respond to hazards as they occur. We can also protect our communities by planning for hazard mitigation before disaster strikes.

What is Hazard Mitigation Planning? According to the U.S. Federal Emergency Management Agency (FEMA) State and Local Mitigation Planning Fact Sheet:

Hazard mitigation planning is the process State, local, and tribal governments use to identify risks and vulnerabilities associated with natural disasters, and to develop long-term strategies for protecting people and property in future hazard events. The process results in a mitigation plan that offers a strategy for breaking the cycle of disaster damage, reconstruction, and repeated damage, and a framework for developing feasible and cost-effective mitigation projects. Under the Disaster Mitigation Act of 2000 (Public Law 106-390), State, local and tribal governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance.

The 2008 *Minnesota All-Hazard Mitigation Plan* (MAHMP) offers this definition: “Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and property from natural or human caused hazards and their effects.” James Schwab, AICP, is even more direct in *Planning Magazine*: “Hazard mitigation essentially is the art and science of reducing risks of future losses.”

Emergency management involves a cycle through which communities prepare, respond and recover from emergencies and disasters. Hazard mitigation is also part of this cycle and serves two primary purposes—to protect people and property, and to limit the costs of disaster response and recovery.

A. Purpose and Authority

The rising costs of natural and human-caused disasters at the end of the 20th century led many leaders to consider how to better protect people and their communities. Congress passed the

Disaster Mitigation Act of 2000 (DMA2K) (PL 106-390) to establish a unified national hazard mitigation program. DMA2K amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), which in turn had amended the Disaster Relief Act of 1974. DMA2K placed new emphasis on hazard mitigation planning in state and local units of government, requiring adoption of mitigation plans as a prerequisite for certain assistance programs.

A multi-hazard or “All-Hazards” approach to mitigation planning encompasses both natural and manmade hazards. Following the 2001 attacks on New York City and Washington, DC, and the subsequent reorganization of FEMA and the nation’s homeland security structure, many mitigation planning efforts explicitly incorporated technological hazards arising from human activities, both accidental and intended. While local hazard mitigation plans are only required to address natural hazards, the All-Hazards approach considers a comprehensive array of both risks and potential mitigation actions.

FEMA has implemented hazard mitigation planning requirements through federal regulations (44 CFR 201). In Minnesota, the Homeland Security and Emergency Management (HSEM) division of the Department of Public Safety (DPS) works with FEMA to implement disaster mitigation efforts. The Minnesota Department of Natural Resources (DNR) is also involved with mitigation as the agency responsible for implementation of FEMA’s National Flood Insurance Program (NFIP) and floodplain management in the state.

A.1 Federal Mitigation Funding Programs

FEMA administers several programs that provide hazard mitigation funding, for which HSEM applies for funding on behalf of local sub-applicants. Typically grants allow a cost-share of 75 to 90 percent federal funding for eligible projects. Section Two of the *Minnesota All-Hazard Mitigation Plan* describes five different FEMA hazard mitigation assistance programs. Any projects funded by these programs must demonstrate a positive cost-benefit ratio—the benefits of the mitigation action must demonstrably outweigh the costs. Programs described in the MAHMP include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and Severe Repetitive Loss (SRL).

Figure 1-1 Eligible Subapplicants

	HMGP	PDM	FMA	RFC	SRL
State agencies	√	√	√	√	√
Tribal governments	√	√	√	√	√
Local governments/communities	√	√	√	√	√
Private non-profit organizations (PNPs)	√				

Source: FEMA HMA Guidance

A.1.a Hazard Mitigation Grant Program (HMGP)

HMGP provides funds in accordance with priorities identified in hazard mitigation plans to implement mitigation measures during disaster recovery. State and local governments, certain private non-profit organizations, and tribes are eligible sub-applicants through HSEM. Examples of eligible projects include:

- Acquiring and relocating structures from hazard-prone areas
- Retrofitting structures to protect them from floods, high winds, earthquakes, or other natural hazards
- Constructing certain types of minor and localized flood control projects
- Constructing safe rooms inside schools or other buildings in tornado-prone areas
- Hazard mitigation planning

A.1.b Pre-Disaster Mitigation (PDM)

PDM provides funds for hazard mitigation planning and implementation prior to a disaster event. State-level agencies, tribes, local government, and public colleges are eligible sub-applicants through HSEM. Examples of eligible projects include:

- Voluntary acquisition of real property for open space
- Elevation of existing public or private structures
- Retrofitting existing structures to meet building codes
- Construction of safe rooms for public or private structures that meet certain FEMA requirements
- Hydrologic and hydraulic studies/analyses, engineering and drainage studies for project design and feasibility
- Vegetation management
- Protective measures for utilities, water, sewer, roads and bridges
- Storm water management to reduce/eliminate long-term flood risk

A.1.c Flood Mitigation Assistance (FMA)

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

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

A.1.d Repetitive Flood Claims (RFC)

RFC intends to reduce/eliminate long-term risk to structures with one or more NFIP claim. State-level agencies, tribes, and local government that cannot meet FMA requirements for cost-share or management capacity are eligible sub-applicants through HSEM. Project grants are available for acquisition, structure demolition, or

structure relocation of insured structures, with the property deed restricted for open space uses in perpetuity.

A.2.e Severe Repetitive Loss (SRL)

SRL Pilot Program is intended to reduce/ eliminate risk to severe repetitive loss properties. There are currently no such properties in the county.

B. FEMA Guidance and Plan Review

FEMA provides a publication, *Local Multi-Hazard Mitigation Planning Guidance* (the “Blue Book”) to provide guidance to local governments to meet the requirements of 44 CFR §201.6 *Local Mitigation Plans*. The Blue Book includes a Plan Review Crosswalk which outlines the process for review of local mitigation plans.

This All-Hazard Mitigation Plan is intended to document the process that Lincoln County and participating jurisdictions undertook to meet the *Local Multi-Hazard Mitigation Planning Guidance* and Crosswalk requirements as stated in the July 1, 2008 publication. The remainder of this document (chapters 2-6) is structured according to the outline of the Crosswalk to permit easy and accurate Federal and State review of the local process and the results thereof.

B.1 Plan Submittal and Review Procedures

Federal rules require that this plan be submitted to HSEM for initial review and coordination, with the State then forwarding the plans to FEMA’s Regional Office in Chicago for formal review and approval. HSEM provided advice throughout the mitigation planning process.

After FEMA review, the agency may require changes to meet requirements. Once FEMA judges the all-hazards mitigation plan “approvable pending adoption,” the plan will then be forwarded to participating jurisdictions for adoption. (See section II below.) The plan must be updated within 5 years of initial approval, and any changes once again reviewed and approved by FEMA, in order to continue funding eligibility (Section XVIII).

B.2 Planning Resources

In addition to the Blue Book, FEMA provides a number of other planning tools that were consulted prior to and during the local all-hazard mitigation planning process. These included:

U.S. Federal Emergency Management Agency (FEMA) *Hazard Mitigation Grant Program Fact Sheet* (June 2007)

U.S. Federal Emergency Management Agency (FEMA) *Local Multi-Hazard Mitigation Planning Guidance* (July 2008)

U.S. Federal Emergency Management Agency (FEMA) “Mitigation Ideas: Possible Mitigation Measures by Hazard Type” Region V (September 2002)

U.S. Federal Emergency Management Agency (FEMA) *Pre-Disaster Mitigation Grant Program Fact Sheet* (June 2007)

U.S. Federal Emergency Management Agency (FEMA) *State and Local Mitigation Planning Fact Sheet* (March 2007)

U.S. Federal Emergency Management Agency (FEMA) *State and Local Mitigation Planning How-To Guide* (September 2002)

U.S. Federal Emergency Management Agency (FEMA) *Using HAZUS-MH for Risk Assessment How-To Guide* (August 2004)

The HAZUS-MH (Hazards US-Multi-Hazard) GIS risk assessment software program available from FEMA was only partially utilized in this plan due to deficiencies in the data available. It should be considered in preparing for the next plan update.

This project was supported by Grant Award Number EMC-2007-PC-0004 awarded by the Federal Emergency Management Agency (FEMA). Points of View or opinions in this document are those of the author and do not represent endorsement by FEMA or reflect FEMA's views.

B.3 Flood Mitigation Planning

This project began in the fall of 2007. That year, while this planning effort was already in process, FEMA amended 44 CFR 201 to incorporate mitigation planning requirements for the FMA program (I.A.1.c above). The changes combined the local mitigation plan requirement for all hazard mitigation assistance programs include FMA as well as HMGP, PDM and SRL programs; required that jurisdictions with NFIP repetitive loss properties (I.A.1.d) address such properties in their assessment and mitigation strategies, and required that jurisdictions in NFIP include a strategy for continued compliance with the NFIP in the mitigation plan.

B.4 Multi-Jurisdictional & Other Local Organizations

For the purpose of hazard mitigation, FEMA considers a Local Government having jurisdiction as "any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments..., regional or interstate government entity, or agency or instrumentality of a local government." (44CFR§201.2)

Special considerations are given by FEMA for school districts, private nonprofit organizations, and multi-jurisdictional private nonprofit utilities (such as Rural Electric Cooperatives).

FEMA requires that ALL participating jurisdictions meet the requirements for mitigation planning in 44CFR§201.6. The Blue Book specifically requires that each participating jurisdiction address:

- Risks, where they differ from the county
- Mitigation actions (actions must be identified for each jurisdiction)

- Participation in the planning process (attending meetings, contributing research, data, or other information, commenting on drafts of the plan); and
- Adoption (each jurisdiction must formally adopt the plan).

It is intended that this plan will document how each and every one of these requirements was intended to be met by all participating jurisdictions.

C. Profile of Lincoln County

Lincoln County was created from the western portion of Lyon County in 1873, and is named in honor of United States President Abraham Lincoln. The county seat is the City of Ivanhoe, platted in 1889 and named by officers of the Chicago and North Western Railway for the hero of the Sir Walter Scott novel.

There are five incorporated municipalities and 14 townships in Lincoln County. US Highway 75 (the “King of Highways”) runs north-south through the county, connecting I-90 at Luverne to I-94 at Fargo-Moorhead. US 14 and Minnesota Trunk Highway (TH) 19 cross the county east-west, both connecting to I-29 in South Dakota. A portion of TH 68 crosses the northeast corner of the county. The Dakota, Minnesota and Eastern (DM&E) Railroad runs parallel to US 14. Pipestone County is located to the south, Lyon County (Marshall) to the east, and Yellow Medicine County to the north. Brookings and Deuel counties in South Dakota are located across the state line to the west.

C.1 Demographics

Lincoln County is a rural community with many of the opportunities and challenges common in rural Minnesota and the Midwest overall. Population in Southwest Minnesota has been generally contracting for several decades; however, most cities have been relatively stable while the population of townships declined. In the year 2000, the U.S. Census counted 6,429 people in Lincoln County.

Cities	Townships
Arco	Alta Vista
Hendricks	Ash Lake
Ivanhoe	Diamond Lake
Lake Benton	Drammen
Tyler	Hansonville
	Hendricks
	Hope
	Lake Benton
	Lake Stay
	Limestone
	Marble
	Marshfield
	Royal
	Shaokatan
	Verdi

County	1970	1980	1990	2000	2009*
Cottonwood	14,887	14,854	12,694	12,167	11,096
Jackson	14,352	13,690	11,677	11,268	10,775
Lincoln	8,143	8,207	6,890	6,429	5,806
Lyon	24,273	25,207	24,789	25,425	24,964
Murray	12,508	11,507	9,660	9,165	8,410
Nobles	23,208	21,840	20,098	20,832	20,402
Pipestone	12,791	11,690	10,491	9,895	9,339
Redwood	20,024	19,341	17,254	16,815	15,518
Rock	11,346	10,703	9,806	9,721	9,517
Region 8	141,532	137,039	123,359	121,717	115,827
Minnesota**					5,266,214

Source: US Census, *MN Demographic Center Estimate ** US Census Estimate

Minor Civil Division	2009		Persons Per Household
	Population	Households	
Alta Vista township	198	72	2.51
Arco city	89	42	2.12
Ash Lake township	149	66	2.26
Diamond Lake township	212	84	2.52
Drammen township	103	43	2.40
Hansonville township	99	39	2.54
Hendricks city	678	295	1.99
Hendricks township	193	85	2.27
Hope township	259	107	2.42
Ivanhoe city	596	291	1.95
Lake Benton city	655	327	1.98
Lake Benton township	196	88	2.23
Lake Stay township	118	57	2.07
Limestone township	128	56	2.29
Marble township	173	66	2.62
Marshfield township	224	83	2.70
Royal township	156	73	2.14
Shaokatan township	192	74	2.59
Tyler city	1,174	529	2.13
Verdi township	214	79	2.66
Lincoln	5,806	2,556	2.20

Source: MN Demographic Center

Table 1-4

Projected Population by Age and Gender

	Estimated		Projected		2015	2015	2020	2020	2025	2025	2030	2030	2035	2035
	2005	2005	2010	2010										
Lincoln County														
0 to 4	167	156	200	190	210	200	200	190	190	180	180	170	180	170
5 to 9	165	173	180	170	210	200	220	210	220	210	200	190	200	190
10 to 14	202	187	170	170	180	170	210	200	210	210	210	200	200	190
15 to 19	209	185	160	160	140	150	150	150	160	160	170	170	160	170
20 to 24	158	182	110	110	90	100	80	90	90	90	90	90	90	100
25 to 29	176	123	190	210	150	160	130	150	120	140	130	140	130	140
30 to 34	131	146	200	130	220	200	190	160	170	150	160	140	160	140
35 to 39	175	160	120	180	180	170	190	230	170	200	160	190	140	170
40 to 44	234	211	190	160	140	180	190	170	200	230	180	200	170	190
45 to 49	246	179	230	200	190	160	150	170	190	160	200	210	180	180
50 to 54	209	218	240	170	220	190	180	160	140	160	180	150	190	200
55 to 59	165	143	210	220	240	180	230	200	190	160	150	160	190	160
60 to 64	168	165	150	160	190	230	220	190	210	210	170	170	140	180
65 to 69	142	184	160	170	140	160	180	230	210	200	200	220	170	180
70 to 74	120	162	120	150	130	140	120	140	150	200	180	180	170	190
75 to 79	140	153	100	140	100	140	110	130	110	130	140	190	160	170
80 to 84	113	147	100	120	80	120	80	120	90	110	90	120	110	160
85+	87	226	100	200	100	180	90	180	90	180	110	190	120	210
Gender totals	3,007	3,100	2,920	3,010	2,910	3,020	2,920	3,060	2,910	3,090	2,880	3,070	2,860	3,080
Total population	6,107		5,930		5,920		5,970		6,000		5,950		5,930	

Source: Minnesota State Demographic Center, April 2007

C.2 Employment

Lincoln County is part of a strong agricultural region in Southwest Minnesota. Education and health services provide the most jobs in the county, followed by wholesale trade and transportation. The city of Marshall is a regional jobs center; about 20% of county residents in the workforce commute into Lyon County (2000 US Census), many

Table 1-5

Lincoln County Employment By Industry

Industry	Number of Employees	
	2000	2009
Total All Industries	1,772	1,676
Natural Resources	n/a	76
Construction	n/a	175
Manufacturing	n/a	14
Trade, Transportation and Utilities	420	410
Financial Activities	58	59
Professional and Business Services	n/a	54
Education and Health Services	719	590
Leisure and Hospitality	158	106
Public Administration	134	139

n/a-not available, categories do not sum due to non-disclosure

Source: QCEW

along US 14 and Trunk Highways 19 and 23. Lincoln County has also been at the forefront of wind energy production along the Buffalo Ridge of Southwest Minnesota.

Although local employment has been contracting, the local unemployment rate has paced or kept below the statewide and national averages. The 2009 Annual Average Unemployment Rate for Lincoln County was 6.1%, compared to 8% in Minnesota and 9.3% for the U.S. nationwide (not seasonally adjusted).

There were 784 farms in Lincoln County in 2007, 3% more than counted by the US Census of Agriculture in 2002. Just over half of farmers list farming as their primary occupation. The average size of a farm was 365 acres, and the average farm reported sales of \$172,000. Most acres were planted to corn or soybeans. Almost half of farm market sales were from livestock, including hogs and pigs, cattle, and sheep.

Employer	Products/Services	Number of Employees
Tyler Healthcare Center	Medical Care	186
Hendricks Community Hospital	Medical Care	160
Divine Providence Health Center	Medical Care	150
RTR Public Schools	Education	100
Lincoln County	Local Government	65
Schak Trucking	Transportation	60
Lincoln HI Public Schools	Education	55
Lake Benton Public School	Education	45
Hendricks Public Schools	Education	40

Source: DEED, City of Tyler

C.3 Natural Environment

Southwest Minnesota has a typical humid, mid-continental climate, with cold, dry continental polar air dominating in the winter and hot, dry tropical air masses from the Southwest meeting warm, moist maritime air masses from the Gulf of Mexico in the summer. Temperatures in Lincoln County (measured at Tyler) range from an average low of 5 degrees Fahrenheit in January to an average high of 83 degrees in July. Average precipitation has ranged between 21 and 39 inches in the last two decades; between 23 and 29 inches of precipitation were observed across the county in 2009. The county normally receives about 36 inches of snow per year.

The University of Minnesota Remote Sensing and Geospatial Analysis Laboratory analysis indicates that 64% of land in Lincoln County was in agricultural use in the year 2000. This accounts for over 223,000 of the 351,000 acres in the county. About 25% of land is in grass/shrub/wetland, while 6.8% is classified “urban”. The same analysis

found that less than 2% (5,500 acres) of the county is considered “impervious” or developed such that water will run off rather than soak into the ground.

Lincoln County occupies the top the Buffalo Ridge, draining into the Mississippi River to the east and the Missouri River to the west. The majority of Lincoln County is in the Minnesota River basin, which joins the Mississippi River in the Twin Cities.

The southwest corner of Lincoln County drains into the Big Sioux River basin across the state line in South Dakota and ultimately into the Missouri River. The rest of the county falls to the east. The southeast portion of the county (around Lake Benton and Tyler) drains into the Redwood River, which flows east through Lyon County. Central and northeast areas are drained by the Yellow Medicine River thru Lyon County into Yellow Medicine County. The northwest corner of the county around Hendricks is drained to the north to the Lac qui Parle basin. The Yellow Medicine River drains into the northcentral part of the county.

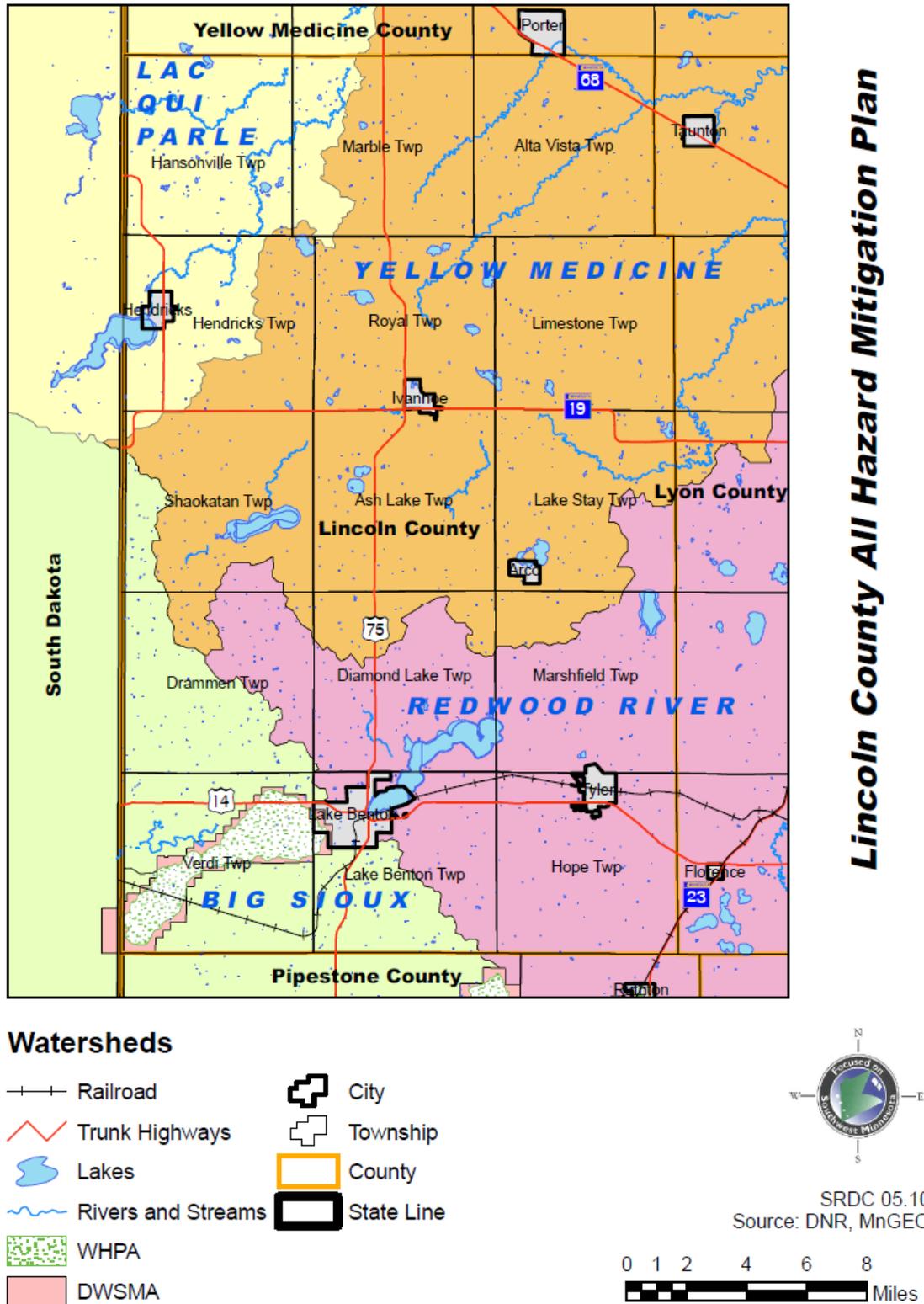
The Yellow Medicine River Watershed District (YMRW) covers parts of Yellow Medicine, Lincoln and Lyon Counties of Southwest Minnesota. The YMRW ten-year strategic plan includes goals to reduce flooding and documenting the effectiveness of flood reduction measures, as well as working on water quality issues. The Redwood-Cottonwood Rivers Control Area, a non-regulatory, joint-powers organization that includes eight counties in the Redwood and Cottonwood river basins, focuses mostly on water quality but also works to keep water on the landscape longer, reducing potential flood impacts.

Lake Benton (at the city of the same name) is the largest lake in Lincoln County. Lake Hendricks is the second largest lake, if the entire area of the lake is counted across the state line. Lake Shaokatan is the third largest. While none of these lakes are as large as the resort lakes of northern Minnesota, many shore lands in the area have attracted a fair share of seasonal and year-round use and development.

There are also many wetlands scattered across the region. According to MN DNR, “a wetland has mostly wet soil, is saturated with water either above or just below the surface and is covered with plants that have adapted to wet conditions” Wetlands provide many benefits to humans including the reduction of flooding by means of storage during high flows, filtration of pollutants and sediment, groundwater and aquifer recharge, wildlife habitat and aesthetic appeal. Much of the drainage of wetlands within the county occurred prior to the 1980s, when policies were enacted to prevent future wetland loss.

Hazards posed by flooding and potential dam failure are profiled in Section VI below.

Figure 1-2 Watersheds Map



Lincoln County All Hazard Mitigation Plan

C.4 Infrastructure

Infrastructure is the basic physical and organizational structure needed for the operation of a city or region—the skeleton and nervous system of a community. These facilities may be public, like the road system, or private, like telecommunications systems. No matter the ownership, infrastructure is characterized by long-term, capital-intensive investments that are interdependent and vulnerable to both natural and technological hazards.

C.4.a Transportation Networks

Lincoln County's transportation network is designed to serve local residents, agriculture and industry, as well as travelers and regional commerce. The Minnesota Department of Transportation (MnDOT) works with the County Engineer and municipal authorities to construct maintain and regulate a comprehensive system of roads, rail and airports for public and private use.

Functional Classification is used by the FHWA to determine eligibility for Federal emergency relief funds should roads be damaged by flooding or other natural disaster. US 14 is classified as a Principal Arterial highway, as is the small portion of Trunk Highway (TH) 23 in the extreme southeast corner of the county. US 75 and TH19 are classified as Minor Arterial highways, as is the portion of TH 68 in the northeast corner of the county.

One railroad serves Lincoln County. The Dakota, Minnesota and Eastern (DM&E) Railroad crosses the county east to west parallel to US 14 on the old Chicago Northwestern Railroad. The Class II DM&E, recently acquired by the Canadian Pacific Railway (CP), has been proposed as a major coal-hauling route from the Powder River Basin of Wyoming which would significantly increase train traffic.

There is one public airport in Tyler with a 2600' turf runway.

C.4.b Utilities

Electrical service is provided in Lincoln by two investor-owned utilities, a rural electric cooperative and a municipal service provider: Otter Tail Power, Xcel Energy, Lincoln-Lyon Rural Electric and Tyler Municipal utility. Minnesota Energy Resources Corp. and Tyler Municipal utility provide natural gas service.

Telephone service is provided by several different organizations also, including Citizens Telecomm, Century Tel, Interstate Telecommunications Cooperative (ITC), and Frontier Communications.

	Arco	Hendricks	Ivanhoe	Lake Benton	Tyler	Rural Lincoln Co.
Electricity						
Lincoln-Lyon REA	X					X
Otter Tail Power		X	X	X		X
Xcel Energy						X
Tyler Municipal					X	
Natural Gas						
Minnesota Energy		X	X			
Tyler Municipal					X	
Telephone						
Citizens Telecomm	X				X	X
CenturyTel						X
ITC		X		X		X
Frontier			X			X

NOAA (National Oceanic and Atmospheric Administration) Weather Radio is used for warning citizens of storm events. Lincoln County is covered by 1,000 watt transmitter KX150 Russell, MN, at 162.500 MHz. Lincoln County's Specific Alert Message Encoding (SAME) code is 027081.

FEMA is working to develop the Integrated Public Alert and Warning System (IPAWS) as the next-generation alert and warning network. IPAWS will expand on the Emergency Alert System (EAS) by adding new technologies to traditional audio-only radio and television alerts, including cell phone, residential phone, Internet and the capability to broadcast one message over more media to more people before, during and after a disaster.

A Wellhead Protection Area (WPA) and Drinking Water Supply Management Area (DWSMA) have been designated by the MDH for Lincoln-Pipestone Rural Water System's (LPRW) well fields in Verdi Township. LPRW is currently undertaking an expansion project in Nobles and Jackson County with water sourced from Iowa, and has been participating in the ongoing Lewis & Clark regional water project to bring Missouri River water to the Sioux Falls area and Southwestern Minnesota. These projects offer additional options for redundant water supplies by interconnections within the system and between other suppliers.

C.4.c Public Services

A critical and essential role of local government is to provide public services.

The Lincoln County Sheriff's Office provides law enforcement throughout Lincoln County. Each city in the county except Arco also has their own police force. Nine different fire districts provide fire protection in Lincoln County, with fire stations located in Hendricks, Ivanhoe, Lake Benton and Tyler.

There are two hospitals located in the county, the 26-bed Hendricks Community Hospital with a clinic in Ivanhoe and the 14-bed Tyler Healthcare Center/Avera, a Level IV trauma center with a clinic in Lake Benton. Ambulance service is provided from Hendricks, Ivanhoe and Tyler. Avera Marshall Regional Medical Center, located in Lyon County to the east, is a Level III trauma center. Level II trauma centers are located in Sioux Falls, SD.

There are six school districts in the county, four of which have facilities inside the county—Hendricks, Ivanhoe, Lake Benton and RTR.

Table 1-8 Public Services						
	Arco	Hendricks	Ivanhoe	Lake Benton	Tyler	Rural Lincoln Co.
Law Enforcement						
County Sheriff	X					X
City Police		X	X	X	X	X
Fire Stations		X	X	X	X	
Health Care						
Ambulance		X	X		X	
Hospital		X			X	
Clinic			X	X		
School Buildings		K-6	7-12	K-6	9-12	

CHAPTER 2: PREREQUISITES

This Chapter covers prerequisites for eligibility to adopt this multi-hazard mitigation plan in multiple jurisdictions. Section II describes the plan adoption process. Section III describes multi-jurisdictional participation in the planning process.

II. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Following passage of the Disaster Mitigation Act of 2000 (DMA2K), counties in southwestern Minnesota worked cooperatively with the Southwest Regional Development Commission (SRDC) to inform local units of government, agencies, businesses, education, nonprofit organizations and other local citizens about the importance of hazard mitigation. This plan is the result of that effort.

A. Jurisdictions Represented in this Plan

Lincoln County is located in Southwest Minnesota along the South Dakota border. With a population of about 6,000, the county is a primarily rural, agricultural area. It was the intent of this planning process that all local units of government in the county should be covered by the multi-jurisdictional County plan.

On 15 April 2008, the Lincoln County Board of Commissioners passed Resolution #15-2008 to formally participate in this hazard mitigation effort. The resolution stated that the Board would allow County Staff to participate in plan development, provide comments and suggestions, and consider adopting the final approved *All-Hazard Mitigation Plan*. All cities in the county passed resolutions of intention to participate in the process.

- Arco
- Hendricks
- Ivanhoe
- Lake Benton
- Tyler

Resolutions are included as Addendum A.

At the time that this planning process was begun, HSEM had encouraged townships to also be formally involved. No townships in the County have full-time staff nor do they exercise complete statutory land use control. While no longer required, *all* townships in the county did pass formal resolutions of participation.

B. Adoption Procedure

Each jurisdiction participating in the plan must formally adopt the plan after FEMA provisionally approves the document (Section 1.B.1). Typically local jurisdictions adopt the plan by resolution.

Minnesota Statutes §375.51 Subd.1 requires that a “public hearing shall be held before the enactment of any ordinance adopting or amending a comprehensive plan or official control...” While it is not necessary to adopt this plan by ordinance, it is essential that the plan is compatible with other official county and city plans and ordinances.

As stated in Section I, the County will consider formal adoption of the All-Hazard Mitigation Plan once FEMA deems this plan “approvable pending adoption.” After County approval, staff will work with each participating local unit of government to facilitate the local adoption of the plan. HSEM requires that participating jurisdictions adopt the plan within six months or less of provisional FEMA approval.

C. Supporting Documentation

Resolutions of Adoption from each participating jurisdiction that chooses to adopt this plan will be appended in Appendix A, after FEMA approval.

III. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Lincoln County undertook the all-hazard mitigation planning process with the stated intention that all communities in the county should be eligible to participate and be covered by this plan. Only the largest cities in Lincoln County have full-time staff and they all rely on County Emergency Management as a clearinghouse for intergovernmental cooperation. Lincoln County Emergency Management maintains regular communication with all local units of government in the county.

A. How Each Jurisdiction Participated in this Plan

Table 2-1 summarizes participation by each jurisdiction participating in this plan. As stated above in Section II.A, all incorporated cities in the county passed formal resolutions of intention at public meetings demonstrating their commitment to undertake this process. Ten of eleven cities had staff and/or elected officials representing them on the Lincoln County All Hazards Mitigation Planning Team (see next section). All cities except one submitted the Capabilities Worksheet required by HSEM (Section IV.E). Finally, each of the cities has at least one mitigation strategy identified for natural hazards (Chapter 5, Section XIV).

Local Unit of Government	Resolution of Participation	Representative on Planning Team	Capabilities Worksheet	Mitigation Strategy
Arco	Yes	Yes		Yes
Hendricks	Yes	Yes	Yes	Yes
Ivanhoe	Yes	Yes	Yes	Yes
Lake Benton	Yes	Yes	Yes	Yes
Tyler	Yes	Yes	Yes	Yes
Lincoln County	Yes	Yes	Yes	Yes

Cities not present at team meetings were consulted on strategies by telephone or personal visit. After the final team meetings in May 2010, SRDC staff and Lincoln County Emergency Management followed-up with each city to confirm mitigation strategies selected.

A.1 Participation Provisions Post-Approval

FEMA guidance explains a process that potential partners can follow to become part of the planning process, or “join” the mitigation plan, after FEMA approval (pp. 21-23 of the FEMA “Blue Book” referenced in Section I.B above). The plan may be required to be revised in full or by a new annex documenting additional planning work for that specific area.

Any jurisdiction wishing to modify (or join) the plan at a later date should contact Lincoln County Emergency Management.

Figure 2-1: Tornado damage, Tyler, MN 21 August 1918



Source: Minnesota Historical Society

CHAPTER 3: PLANNING PROCESS

The planning process is as important as the plan itself. This Chapter documents the process used in developing this plan. Section IV describes the planning process, the All Hazard Mitigation Planning Team, public involvement, and existing plans, studies, reports and technical information used in the planning process.

IV. Documentation of the Planning Process

Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

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

A. Description of the Planning Process

Southwest Regional Development Commission (SRDC) initiated an application to HSEM for sub-grantee funding to work with Lincoln County to complete multi-jurisdictional hazard mitigation plans for each county. Notice of approval under the Pre-Disaster Mitigation Guidance (EMC-2007-PC-0004) was received by SRDC with an effective date of 10 September 2007. An executed Sub-Grantee Agreement was approved by SRDC on 13 November 2007, at which time formal work on the project began. As noted above, the Lincoln County Board of Commissioners passed a Resolution of Intention to participate in the all-hazard mitigation process on 15 April 2008.

Development Planner John C. Shepard, AICP, has served as primary staff planner on hazard mitigation plans for SRDC since 2005. Lincoln County's Emergency Manager, Norm Van Overbeke, coordinated local logistics, including soliciting resolutions of participation, recruiting the Planning Team (next section) and providing data for analysis.

Lincoln County Emergency Management arranged all meetings and SRDC staff facilitated the meetings. Emma Volz, Lincoln County GIS manager, produced large maps for analysis throughout the project.

Overall there were six public meetings during this project:

1. The All-Hazard Mitigation Planning Team organized at the first meeting in August 2008.
2. The Planning Team met to review the community profile and hazard profiles in October 2008, identifying hazards present in the county.
3. The Planning Team ranked hazards county-wide by consensus at a meeting in March 2009.
4. A public Open House was held at the Ivanhoe Senior Center in June 2009 to present Hazard Identification results and solicit comments on goals and objectives for mitigation.
5. On 20 May 2010, members of the Planning Team discussed a comprehensive range of specific mitigation items for each participating jurisdiction.
6. On 27 May 2010, SRDC and the Emergency Manager met with staff from the County to specifically discuss the NFIP and requirements to maintain compliance, as well as potential mitigation items.

SRDC staff then drafted this plan document based on input from the Planning Team, local units of government and community stakeholders, as well as review and guidance from HSEM.

B. The All Hazard Mitigation Planning Team

At the beginning of the planning process, Lincoln County Emergency Management identified potential volunteers to serve on the All-Hazard Mitigation Planning Team. These included city council members and city staff; township board members; county commissioners, elected officials, and county staff; first responders, law enforcement, and essential services providers. Lincoln County is a rural community and few local units of government have paid full-time staff. Members of the Planning Team were recruited in an open and inclusive process to represent knowledge and views of those people who will make the plan a reality.

The County Emergency Manager called meetings of the Planning Team, and will keep this group informed of progress on the plan and future updates. Individuals listed in Table 3-1 participated in the Planning Team over the course of the planning process. Meeting notes for Planning Team meetings and the public open house, including attendees and dates of meetings, are included in Addendum E.

Table 3-1

Lincoln County All Hazard Planning Team

Norm Van Overbeke	Emergency Management Director	Lincoln County
Lee Amundson	County Engineer	Lincoln County
Larry Hansen	County Commissioner	Lincoln County
Joan Jagt	County Commissioner	Lincoln County
Robert Olsen	Environmental Office Director	Lincoln County
Jack Vizecky	Sheriff	Lincoln County
Tammy Guza	City Clerk	City of Arco
Elaine Dressen	Mayor	City of Arco
Dustin Hauschild	EMT and Fire Dept	City of Hendricks
Dennis Klingbile	Civil Defense	City of Ivanhoe
Craig Larson	City Council	City of Ivanhoe
Bruce Nielsen	Fire Dept. / Assessor	City of Ivanhoe
Doyle Sorensen	Mayor / Fireman	City of Ivanhoe
Rosie DeZeeuw	City Clerk	City of Lake Benton
Heather Ulrich-Glynn	Emergency Director	City of Lake Benton
Dean Beck	Public Works	City of Tyler
Dan Talsma	City Administrator	City of Tyler
Eloise Hauschild	Town Board	Limestone Township
Ron Madsen	Engineering Technician	Lincoln SWCD
Jason Overby	Water Resource Technician	Lincoln-Pipestone Rural Water
Jeff Moberg	Health Educator	LLMP Public Health
Ron Stenerson	Line Superintendent	Lyon-Lincoln REC
Martin Wilson	Lincoln County FSA	USDA

The Planning Team developed the following statement regarding their intent for this project:

The Lincoln County All-Hazard Mitigation Plan is intended to prevent and minimize effects of natural and man-made hazards, and improve our ability to respond and recover.

C. Public Involvement

In rural communities, the public cannot help but become involved in local government. Intergovernmental coordination was essential if this plan was to be more than a document gathering dust on a shelf. SRDC and Lincoln County Emergency Management provided information to all local units of government in the county about the all hazards mitigation planning process and opportunities for participation. Formal participation was solicited multiple times in 2008 and 2009. SRDC Staff met with the County Township Association at their meeting on 16 March 2009 to discuss the hazard mitigation process. No townships in the county have paid staff, and most township mitigation activities are managed by the County. . All incorporated municipalities and townships approved resolutions of participation in public meetings (Section II.A).

Public Notice of all Planning Team meetings was posted at the Courthouse according to local practice. As there are no local television or radio stations, most residents, businesses and organizations receive local news through the community newspaper. Sample copies of Public Communication are provided in Addendum D.

D. Other Opportunities for Involvement

Hazard mitigation has been a regional effort in Southwest Minnesota, with many opportunities for involvement provided for neighboring communities, agencies involved in hazard mitigation, and businesses, academia, and other relevant private and non-profit interests. SRDC has worked (or was working during plan development) with regional Minnesota counties on their hazard mitigation plans:

- Cottonwood County (in progress)
- Jackson County (2008)
- Lyon County (2010)
- Murray County (2005; update in progress)
- Nobles County (2005, update in progress)
- Pipestone County (2010)
- Redwood County (2005, update in progress)
- Rock County (2007)

D.1 Public Open House

SRDC and Lincoln County Emergency Management organized a Public Open House at the Senior Center and Library in Ivanhoe on 25 June 2009. The event was intended as an opportunity for local residents as well as neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the process. Each hazard identified by the All-Hazard Mitigation Planning Team was described with wall maps and illustrations (See Addendum E Meeting Notes for samples). Attendees were able to come and go at their convenience, review the material, rank suggested goals and objectives, and provide comments.

D.2 Public Hearing

Minnesota Statutes provide for a Comprehensive Planning process. Upon plan completion, SRDC intends to post the plan on their website. The County will make copies available to the public, local governments, and county departments. A Public Hearing is to be scheduled for public review prior to adoption, with due public notice. The adoption process for this plan is explained in Section II above.

E. Existing Plans, Studies, Reports and Technical Information

Many sources of local, state, federal and private information were used during the hazard mitigation process. The coordinated use and consideration of these diverse data sources form a sound basis for this plan and implementation activities.

The following references were specifically consulted during the planning process.

- Cambridge Systematics, Minnesota Comprehensive Statewide Freight and Passenger Rail Plan Draft. (December 2009)
- Cambridge Systematics, Minnesota Comprehensive Statewide Freight and Passenger Rail Plan Draft Technical Memorandum. (July 2009)
- Clarion Associates, Airport Land Use Compatibility Manual, Minnesota Department of Transportation Office of Aeronautics (September 2006)
- Fransen, Tanja and Olga Wilhelmi, "Increasing Societal Resilience to Winter Weather", American Meteorological Society 16th Conference on Applied Climatology (January 2007)
- Josiah, Scott and Mike Majeski, "Living Snow Fences", University of Minnesota Extension #FO-07277-GO (2002)
- Lincoln County Comprehensive Plan & Development Ordinance (2008)
- Minnesota Department of Public Safety, Fire in Minnesota (Preliminary), State Fire Marshall (2009)
- Minnesota Department of Public Safety, Minnesota Motor Vehicle Crash Facts 2008, Office of Traffic Safety (2009)
- Minnesota Department of Transportation, Living Snow Fences website: <http://www.dot.state.mn.us/environment/livingsnowfence/> Accessed most recently on 11 January 2010.
- Minnesota Department of Transportation, Minnesota Comprehensive Highway Safety Plan (December 2004).
- Minnesota Historical Society, Governor: Disaster Relief Records: Tyler tornado relief records (1918-1921), State Archives.
- Minnesota Homeland Security and Emergency Management (HSEM), Minnesota All-Hazard Mitigation Plan (April 2008)
- Murray County All Hazard Mitigation Task Force and Southwest Regional Development Commission, Murray County All Hazard Mitigation Plan (April 2005)
- RAND Drug Policy Research Center, The Economic Cost of Methamphetamine Use in the United States, 2005 (2009)
- Schwab, James. Hazard Mitigation: Integrating Best Practices into Planning PAS 560. American Planning Association (2010)
- Schwab, Jim with K.C. Topping, C.D. Eadie, R.E. Deyle, R.A. Smith, Planning for Post-Disaster Recovery and Reconstruction PAS 483/484 American Planning Association (1998)
- US Department of Homeland Security, Quadrennial Homeland Security Review Report: A Strategic Framework for a Secure Homeland, (February 2010).
- U.S. Federal Emergency Management Agency (FEMA) Taking Shelter From the Storm: Building a Safe Room for Your Home or Small Business (FEMA 320, August 2008).
- Wind Science Engineering Center (WSEC), Texas Tech University, A Recommendation for an Enhanced Fujita Scale (EF-Scale), National Weather Service (June 2004).

E.1 Capabilities Worksheets

As discussed in Section III.A above, Lincoln County and municipalities completed a Capabilities Worksheet required by HSEM, identifying planning capabilities, policies/ordinances, programs, studies and reports, staff, and community partners relevant to hazard mitigation. The Worksheet is attached as Addendum B.

Several documents were referenced extensively in the planning process, including the county comprehensive (land use) plan and development ordinance, economic development plans, transportation plans, and water management plans. Other policies and ordinances were referenced more generally in the planning process. Specific items, such as city capital improvement plans, school disaster plans, soil conservation plans, building codes and other local resources informed selection of potential mitigation measures. County and city staff were consulted by the planning team throughout the planning process.

E.2 Description of the Jurisdiction

The FEMA Blue Book gives a special consideration, that “The planning team should consider including a current description of the jurisdiction... to provide a context for understanding the mitigation actions that will be implemented to reduce the jurisdiction’s vulnerability” (Blue Book p. 27). See Chapter I, Section I.C, for a brief profile of Lincoln County.

CHAPTER 4: RISK ASSESSMENT

This Chapter profiles hazards facing the county. Section V describes identified natural and technological hazards. Section VI provides a profile of identified hazards. Section VII provides an overview of vulnerability to identified hazards. Section VIII addresses Repetitive Loss Properties. Section IX addresses risks to structures. Section X addresses estimates of potential losses. Section XI provides an analysis of development trends. Section XII addresses multi-jurisdictional risk analysis for participating jurisdictions.

V. Identifying Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type ... of all natural hazards that can affect the jurisdiction.

The 2008 *Minnesota State All-Hazard Mitigation Plan* (MAHMP) includes a detailed hazard analysis, the result of a risk and vulnerability assessment conducted state-wide. Those hazards were themselves selected by Minnesota Homeland Security and Emergency Management (HSEM) from a comprehensive list of natural hazards identified by the Federal Emergency Management Agency (FEMA) in 1997, as well as relevant human-caused hazards. The state-wide risk assessment is intended to satisfy the requirements of the federal Disaster Mitigation Act of 2000 (DMA2K).

A. Description of All Hazards

Presidential Disaster Declaration #1622 was declared in 2006 for 9 counties in Minnesota, including Lincoln County, for **Severe Winter Storms** which occurred November 27-29, 2005. These counties were eligible for Public Assistance. The following Presidential Disaster Declarations were detailed in the 2005 edition of the MAHMP:

Key: **PA** = Public Assistance Program (formerly Infrastructure Support Program)
 IA = Individual Assistance
 HM = Hazard Mitigation Grant Program

#1175 in 58 Counties
4/8/1997 Severe Flooding, High Winds, & Severe Storms
PA, IA, HM

#1158 in 40 Counties
1/16/1997 Severe Winter Storms & Blizzards, Snow Emergency Declaration
PA

#1151 in 12 Counties:
1/7/1997 Severe Ice Storm
PA, HM

#993 in 57 Counties:
6/11/1993 Severe Storms, Tornadoes & Flooding
PA, IA, HM

#255 in 70 Counties:
4/18/1969 Flooding
PA, IA

A.1 Methodology

When the project started in the winter of 2007-2008, The Lincoln County All-Hazard Mitigation Planning Team took hazards detailed in the then-current edition of the MAHMP plan as a starting point. As detailed in Section IV above, each hazard was evaluated against data on disaster incidents in the county and local knowledge of hazards experienced. Thoroughly discussing each state-wide hazard, the Team combined some hazards for ease of assessment and development of mitigation actions. To these were added local concerns for hazards posed by Agricultural Disease and Methamphetamine Laboratories. Certain state-wide hazards that the team considered of no local risk were eliminated from discussion. These included:

- Coastal Erosion—there are no coasts in Southwest Minnesota.
- Nuclear Generating Plants—none are located in or near Southwest Minnesota.

After the 2008 revision of the MAHMP was published, working categories of hazards were harmonized with those used in the current edition.

The Planning Team evaluated reports of incidents and local knowledge to evaluate location, extent, occurrences and probability of future events. Hazard events were categorized on potential frequency, potential severity, risk level and hazard rank. The details of the hazard profiles are presented in the Section VI. Results of the planning team's Hazard ranking are presented in the Section VII.

Natural Hazards affecting the jurisdiction include:

- Agricultural Disease (animal and crop)
- Blizzards and Winter Storms
- Drought
- Extreme Temperatures
- Fire—Wildfire
- Flooding
- Ice and Ice Storms

- Severe Summer Storms, Lightning and Hail
- Tornado and Straight-line Winds
- Other: Earthquake, Land Subsidence (bank erosion)

Technological Hazards affecting the jurisdiction include:

- Dam Failure (combined with flooding for analysis)
- Hazardous Materials
- Methamphetamine Labs
- Public Health and Infectious Disease
- Fire—Structure & Vehicle Fires (combined with wildfire for analysis)
- Terrorism and Civil Disturbance

Transportation, Utilities and Water Supply Infrastructure were initially identified as specific technological hazards. Utilities and transportation issues were subsequently combined and considered with the underlying hazard of winter storms, which in the team's experiences cause the most trouble with power outages and traffic fatalities. Water Supply issues were considered with drought (quantity) and hazardous materials (quality).

A.2 Locations Affected by Hazards

The topography, vegetation and development pattern of Lincoln County is fairly homogeneous across the 15 townships and 5 cities in the county. Most areas of the county are equally at risk from each of the natural and technological hazards considered in this plan, with the single exception of flooding which is highly dependent on topography.

However, different types of infrastructure and critical facilities will be affected differently by each hazard. These are addressed for each below.

VI. Profiling Hazards

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

A. Natural Hazards

This section provides information on the nature of natural hazards which are a risk in Lincoln County. These natural hazards include those caused by climatological, geological, hydrological or other events of the physical rather than man-made world. As the 2008 edition of the *Minnesota All-Hazard Mitigation Plan* (MAHMP) points out on page 66:

Natural hazards are natural events that threaten lives, property, and other assets. Often, natural hazards can be predicted. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area. Natural hazards such as flood, fire, tornado, and windstorms affect thousands of people each year.

Natural hazards considered in this plan include agricultural diseases, blizzards and winter storms, environmental problems, fire, flooding/dam failure, severe storms (including tornado and winds), and other natural hazards important to consider but unlikely to recur. Natural hazards present in Lincoln County are described below in alphabetical order for ease of reference.

Much of the data in this section is referenced from the National Climatic Data Center (NCDC) Storm Events database. According to the National Oceanic and Atmospheric Administration (NOAA) Satellite and Information Service website (<http://www.ncdc.noaa.gov>):

NCDC receives Storm Data from the National Weather Service. The National Weather service receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public.

A.1 Ag Disease (animal or crop)

Agriculture is the economic foundation of Lincoln County and Southwest Minnesota. Animal and crop-related diseases have the potential to inflict both large economic losses and logistical hazards on the community.

Formal work on the county-wide hazard mitigation plan began in the winter of 2007-2008, under the 2005 edition of the *Minnesota State All-Hazard Mitigation Plan*. That plan addressed "Infectious Disease / Environmental Outbreak" in Annex A12. The current state hazard plan addresses both animal and human diseases under Infectious Disease Outbreak (pp169-173). This plan addresses human diseases along with other Technological Hazards in the next section of this chapter.

A.1.a Locations Affected by the Hazard

Major incidents of agricultural disease are likely to occur countywide rather than in localized areas, given the rural character of Lincoln County. Based on experience within the county, the prevalence of crop agriculture and the relative ease with which crop diseases spread, the All-Hazard Mitigation Planning Team concluded that any outbreak will likely affect or have the potential to affect all trees, crop and animal agriculture within the county.

Animal Transmitted Diseases pose the greatest threat to farms and pastures. Insects, pests and disease pose a risk to both agriculture and tree-cover. A majority of land in the county is used for agriculture and is at risk for agricultural diseases.

A.1.b Extent of the Hazard

Animal Transmitted Diseases

Animal Transmitted Diseases, such as Hoof and Mouth Disease and Bovine Spongiform Encephalopathy (BSE-Mad Cow Disease), threaten animal agriculture. The United States has been free of Hoof and Mouth Disease since 1929 due to effective prevention programs initiated by the Federal Government. Essential efforts to prevent animal transmitted disease include coordination with the federal & state governments and local veterinarians. Public education and risk communication are essential strategies to assist in the response.

When an infection of foot and mouth disease or BSE is confirmed, the only effective way to control the disease is isolation and culling of an entire herd. With foot and mouth disease isolation and culling of the neighboring herds would likely be necessary. These cattle would have to be properly disposed of depending on the numbers involved. While this is not a direct threat to human health, the mental health of the families affected by the loss of their livelihood could be a significant problem, for law enforcement and the community as a whole.

The threat of bovine tuberculosis (TB) has impacted agriculture in Minnesota recently. In April, 2008, USDA downgraded Minnesota's status, requiring Minnesota cattle producers to do additional testing when shipping animals out of state. According to the Board of Animal Health website, bovine TB can be difficult to diagnose, "as cattle can be infected for a long period of time before showing any outward signs of TB."

Minnesota's Dept. of Agriculture (MDA), Board of Animal Health, Dept. of Health, and Homeland Security and Emergency Management (HSEM) are working with local agencies to effectively mitigate any and all effects of hazards on animal agriculture.

Plant Pests and Diseases

Plant diseases cause a loss of yields or damage to the infected plant. Certain tree diseases may weaken their structure and create a hazardous situation where property damage or serious bodily injury may result from falling limbs or the entire tree toppling. It is imperative that arborists, landscapers, and ground maintenance personnel recognize the signs that a particular tree may present an imminent hazard

In many cases, fungi are involved in tree diseases that result in a tree becoming a hazard. A tree with slowed growth, branch dieback, smaller than normal leaves or needles, excessive cone or seed set, premature autumn leaf coloration, or severe winter twig kill may be exhibiting early symptoms of a disease. Nothing can be done for a tree once it is infected nor is it likely that fungus can be completely eliminated from the soil or general area around the tree once the tree is removed.

A tree with fungal fruiting structures on several limbs, trunk, butt, or roots should be removed promptly if it is in a location where property damage might occur or where falling limbs or tree could strike people or animals. If most of the tree appears healthy, any single branch with fungal fruiting structures should be removed promptly, regardless of the identity of the fungus present.

Some of the more notable pests infest cornfields. Corn rootworm and European corn borer are two major pests that pose serious potential loss of income to farmers. In the last decade or so, seed companies have been able to genetically enhance corn varieties to provide some level of protection. Soybean fields are often attacked by soybean cyst nematode and soybean aphids. Recently, seed companies have begun developing hybrids that have resistance to certain types of cyst nematode, but not all. Soybean aphids became a widely-known problem during the 2003 growing season, and must be addressed with commercial spray.

MDA and University of Minnesota Extension Service provide information on a variety of insects and pests. Ash trees became a preferred quick-growing street tree and shade tree across the USA after elm trees succumbed to Dutch Elm Disease. According to the MDA, the Emerald Ash Borer is an insect that attacks and kills ash trees. The adults are small, iridescent green beetles that live outside of trees during the summer months. The larvae are grub or worm-like and live underneath the bark of ash trees. Trees are killed by the tunneling of the larvae under the tree's bark. According to a story in *Planning Magazine* ("Diversifying the Urban Forest, February 2010), Minnesota could lose all of its ash trees within 10 years.

A.1.c Previous Occurrences of the Hazard

There have not been any recent large-scale occurrences of hazardous animal transmitted disease in the area. Some occurrence of crop pests and diseases

happens each year. In 2009, Emerald Ash Borer was found in St. Paul, and will likely become an increasing concern throughout Greater Minnesota.

A.1.d Probability of Future Events of this Hazard

Agricultural Disease is likely to occur in the area. The Lincoln County All-Hazard Mitigation Planning Team considered it 10% to 100% chance to occur in the next year (see Hazard Identification Worksheet in Section VII below).

A.2 Blizzards and Winter Storms, Ice and Extreme Cold

Minnesota experiences winter weather from mid-Autumn through the winter season into early spring. Heavy snowfall and extreme cold can immobilize large regions at the same time. All types of winter storms can be accompanied by extreme cold—both absolute temperatures and wind chill. The MAHMP covers Severe Winter Storms, Blizzards, and Ice and Ice Storms in Section Four: Hazard Analysis.

Lincoln County is covered by the Sioux Falls, South Dakota, office of the National Weather Service. Since the area is in the Sioux Falls major media market, the county benefits from receiving news of impending weather events from the West.

A.2.a Locations Affected by the Hazard

Winter storms typically affect large areas at the same time. Rural homes and farms face the threat of isolation and utility failure during winter storms. Roads closed due to hazardous winter weather also may make it difficult for emergency responders to access individuals located in remote rural areas. Given the rural nature of the county, the distance between cities and the dependence on the city of Marshall as a regional center, residents of smaller communities often face similar conditions.

A.2.b Extent of the Hazard

There are several types of winter storm events typical for this area. Heavy snow events in Minnesota are considered to be 6 or more inches of snow in a 12-hour period, or 8 or more inches in a 24-hour period. Snow is considered heavy when visibilities drop below one-quarter mile regardless of wind speed. Heavy snows can lead to building collapse as well as creating a hazard to residents and travelers.

Ice storms include freezing rain, freezing drizzle and sleet (see section on Severe Storms below for information on hail storms, which more typically occur in the spring and summer seasons). Sleet forms from rain that turns to ice pellets while still in the air. Freezing rain freezes when it hits the ground, creating a coating of ice on roads, trees and power lines. Ice storms often lead to utility outages.

Ice storms combined with high winds often threaten the electrical power grid. Typical power outages are due to localized storm events and utility crews can respond and restore power within hours. A complete power outage, however, has

the potential to be a catastrophic event, due to the extensive systems that rely on remote power generation. Water and sewer service rely on electrical pumping stations. Individual home furnaces may be able to run on natural gas or propane, but usually need electricity to circulate warm air or hot water throughout a building.

Blizzards are the most violent type of winter storm. A blizzard occurs with sustained or frequent gusts to 35 miles per hour or greater and considerable amounts of falling and/or blowing snow (reducing visibility to less than a quarter mile) for three hours or longer. Temperature is not taken into consideration when the National Weather Service issues a Blizzard Warning; however, the nature of these storms typically leads to extreme cold.

Blizzards and winter storms create hazardous driving conditions for considerable amounts of time. In addition to slippery ice, drifting can close roads and block sight lines at intersections. According to MnDOT, “Drift-free roads are achievable through two mitigation strategies, proper road design and/or the use of snow fences. A suitably designed roadway will promote snow deposition in ditches rather than on the roadway and blowing snow that does reach the road will move across without drifting. Snow fences can also help maintain clear roadways by capturing blowing snow upwind of a problem area and storing that snow over the winter season.”

Extreme cold temperatures lead to direct dangers to people and animals. As NOAA points out in public education (“Dangers of Winter Weather” flyer, undated):

Infants and the elderly are most susceptible to prolonged exposure to the cold, which can cause potentially life-threatening conditions such as hypothermia and frostbite. Below freezing temperatures can damage vegetation and cause pipes to freeze and burst inside homes.

Studies by NOAA researchers (Fransen & Wilhelmi 2007) show that more deaths across the nation are attributed to winter storms rather than to cold weather events. However, different populations are more at risk to different events. Men 40-49 years old were most vulnerable to both types of events. Over half of winter-weather deaths occurred in a vehicle, and 30% occurred outdoors.

Relationship to Other Hazards—Cascading Effects

Heavy snows and rapid snow melt are primary contributors to seasonal spring flooding.

A.2.c Previous Occurrences of the Hazard

Winter storms (snow & ice events) covering all or part of Lincoln County—often a much larger area—have been documented 65 times in the National Climatic Data

Center (NCDC) Storm Events database since 1993 (Table 4-1 below). No deaths or injuries and minimal local property damage have been directly attributed to these storms.

Table 4-1 NCDC Snow & Ice Events in Lincoln County							Dth: Deaths	Inj: Injuries	PrD: Property Damage
Counties	Date	Time	Type	Dth	Inj	PrD			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	4/7/2000	2:00 AM	Heavy Snow			0			
Cottonwood, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	4/16/2000	3:00 AM	Ice Storm			20K			
Lincoln, Murray, Pipestone, Rock	11/11/2000	12:00 PM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	1/29/2001	12:00 PM	Winter Storm			80K			
Lincoln, Lyon	2/7/2001	4:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	2/24/2001	2:00 PM	Winter Storm			20K			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	11/26/2001	7:00 AM	Heavy Snow			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	2/9/2002	10:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	3/14/2002	10:00 AM	Winter Storm			100K			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	4/20/2002	11:00 PM	Heavy Snow			0			
Lincoln	2/2/2003	5:00 PM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Murray	2/14/2003	2:00 PM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	11/3/2003	4:00 AM	Winter Weather/mix			0			
Cottonwood, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	11/23/2003	3:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	12/2/2003	11:00 PM	Winter Weather/mix			0			
Jackson, Lincoln	12/8/2003	11:00 PM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	12/15/2003	2:00 PM	Winter Storm			20K			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	1/25/2004	11:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	2/11/2004	6:00 AM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	12/20/2004	7:30 AM	Winter Weather/mix			0			
Cottonwood, Lincoln, Lyon, Murray, Pipestone	1/21/2005	6:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	3/18/2005	12:00 AM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	11/30/2005	2:00 PM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone	12/13/2005	9:00 PM	Winter Weather/mix			0			
Lincoln, Pipestone, Rock	12/29/2005	7:00 PM	Winter Weather/mix			0			
Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock	3/12/2006	4:00 PM	Winter Storm			0			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	12/20/2006	22:00 PM	Winter Weather			0K			
Cottonwood, Jackson, Lincoln, Murray	2/24/2007	6:00 AM	Winter Storm			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	4/10/2007	13:00 PM	Heavy Snow			0K			
Cottonwood, Lincoln, Murray, Pipestone	12/1/2007	5:00 AM	Heavy Snow			0K			
Cottonwood, Lincoln, Murray, Pipestone	12/1/2007	5:00 AM	Winter Weather			0K			
Cottonwood, Jackson, Lincoln	12/25/2007	12:00 PM	Winter Weather			0K			
Lincoln, Murray, Nobles, Pipestone	3/31/2008	4:00 AM	Heavy Snow			0K			
Lincoln, Murray, Nobles, Pipestone	3/31/2008	4:00 AM	Winter Weather			0K			
Lincoln, Pipestone	4/25/2008	6:00 AM	Heavy Snow			0K			
Lincoln, Pipestone	4/25/2008	6:00 AM	Winter Weather			0K			
Lincoln, Murray, Pipestone	11/6/2008	23:00 PM	Winter Weather			0K			
Lincoln, Lyon	12/2/2008	16:00 PM	Winter Weather			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	12/8/2008	15:00 PM	Winter Weather			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	12/14/2008	8:00 AM	Winter Weather			0K			
Lincoln, Lyon	1/3/2009	12:00 PM	Winter Weather			0K			
Lincoln	1/8/2009	18:00 PM	Winter Weather			0K			
Lincoln, Murray, Pipestone	2/16/2009	6:00 AM	Winter Weather			0K			
Cottonwood, Lincoln	12/23/2009	16:00 PM	Winter Storm			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	12/26/2009	12:00 PM	Winter Weather			0K			
Lincoln, Pipestone	1/6/2010	10:00 AM	Winter Storm			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	2/7/2010	2:00 AM	Winter Weather			0K			
Cottonwood, Jackson, Lincoln, Murray, Nobles, Pipestone	2/13/2010	4:00 AM	Winter Weather			0K			
				TOTALS:	0	0	13.315M		

Source: National Climatic Data Center

The largest amount of damage documented was \$13 million dollars for an ice storm across Southwest Minnesota on 14-18 November 1996:

An ice storm consisting of several periods of freezing rain caused widespread damage to power lines and poles, and to trees. Power lines snapped, cable wires were ripped down, and tree debris littered and blocked some roads. Thousands lost power, some for 5 days. Travel was curtailed by icy surfaces and there were numerous accidents, although no serious injuries were reported. The ice storm was described as the worst in 40 years in the Worthington area. Many small farm structures were damaged. A 600 foot radio tower in Worthington was toppled. Schools and business were forced to close. Damage continued after the ice storm ended, including some damage occurring when ice melted unequally during later milder weather.

On 29-30 January 2001, freezing rain produced ice storm conditions across Southwest Minnesota. The freezing rain was followed by 3 to 7 inches of snow, along with winds gusting to 40 mph which caused blowing and drifting snow. Travel became difficult, and many businesses and schools closed. There was \$80,000 in property damage attributed to the storm.

Another winter storm on 12 March 2001 brought freezing rain and heavy snow (8-16") to Southwest Minnesota. Ice accumulation was widespread with power line damage and outages throughout the region. Travel was extremely difficult due to ice covered roads, and also the snow that fell on top of the ice. There was \$100,000 in property damage across the area attributed to the storm.

The MAHMP describes a storm on 28 November 2005 that affected 19 counties with blizzard conditions and freezing rain causing power outages across the region. Another storm on 1 March 2007 covered 14 counties in Minnesota with 12"-15" of snow, 30-40 mph winds and numerous power outages.

The *Ivanhoe Times* reported on 31 December 2009 that a "Record Snowstorm Paralyzes Region for Christmas":

...the Ivanhoe and Hendricks areas received between 15 and 20 inches of snow, by the time the storm moved out of the area Saturday morning. On Friday, December 25, Interstate 29 from the Canadian border to the Iowa, Nebraska and South Dakota border and Interstate 90 from Sioux Falls, SD west to the South Dakota-Wyoming border were barricaded and closed.

The most recent winter storm event listed in the NCDC database occurred on 13-15 February 2010, when 2-4" of snow combined with existing deep snow cover were swept by strong northwest winds to produce blowing and drifting snow across Southwest Minnesota. Slick roads and reduced visibility led to numerous accidents

in the region. Several winter storm and blizzard warnings were issued in the fall and winter of 2009-2010, causing roads, schools and businesses to close several times.

A.2.d Probability of Future Events of this Hazard

Winter storms are highly likely in the area; they occur every year.

A.3 Drought

Drought is defined as a prolonged period of dry weather with very little or no precipitation. There are four types of drought: meteorological drought (departure from average), hydrological drought (shortfall of stream flows or groundwater), agricultural drought (soil moisture deficiencies), and socioeconomic or water management drought.

Typically, a droughty weather pattern lasts long enough to cause a serious depletion of surface and ground waters. The effects of a drought are difficult to precisely measure. They can easily be seen in rural areas as many of the crops will display drought stress. Effect on the public water supply is not as easily observed.

A.3.a Locations Affected by the Hazard

Drought patterns are typically regional, affecting large areas at the same time. Areas with well-drained soils may be more likely to experience adverse impacts to crops. Areas that rely on individual wells for drinking water supplies may also be more likely to experience shortages than areas with access to redundant municipal and rural water suppliers.

A.3.b Extent of the Hazard

Lincoln County relies heavily on agriculture, leading to ongoing concern for protecting water. Corn and soybeans can be hurt by drought conditions. Livestock operations are affected by loss of feedstocks, pasture and general forage, as well as drinking water. Reduced yield due to a drought event has an economic impact on individual farmers, secondary suppliers who buy and sell crops and livestock, tertiary retailers and local governments that rely on sales taxes.

The Minnesota Department of Health has worked with the Lincoln-Pipestone Rural Water System to develop Wellhead Protection Plans (WHP) to help protect long-term quality and quantity of drinking water, specifically for the Verdi well-field west of Lake Benton.

The Minnesota Department of Natural Resources (DNR) also has an important role in integrated planning for water conservation. The MAHMP explains the statutory process DNR undertakes to define water use priorities when water supplies are limited.

Relationship to Other Hazards—Cascading Effects

Drought will increase the risk of fires. Drought can also make animals and plants more susceptible to agricultural diseases and pests.

A.3.c Previous Occurrences of the Hazard

The U.S. Drought Monitor provides an online snapshot of drought conditions across the state and nation at <http://drought.unl.edu/dm>.

The NCDC database documents six periods of drought events for the region in 1999-2000, and 2007. No estimate of crop damage is included. Dry weather beginning in August 1999 through spring 2000 affected eight of the nine counties in the Southwest Regional Development Commission service area.

A.3.d Probability of Future Events of this Hazard

Droughts are likely to occur in the area (10%-100% chance in next year).

A.4 Fire (wildfire and structures)

Each year, reports FEMA, more than 4,000 Americans die and more than 25,000 are injured in fires, many of which could have been prevented. Direct property loss due to fires is estimated at \$8.6 billion annually. According to the Minnesota State Fire Marshall's report *Fire in Minnesota*, a fire was reported on average in Minnesota every 35 minutes. Fires can occur in any community and pose a threat year-round.

A.4.a Locations Affected by the Hazard

The risk of fire affects all locations. While wildfires typically occur in forests and grasslands, crops (cornfields for example) can also burn. Isolated rural structures can be at risk due to long response times and limited water supplies. However, there are many risks in town, such as fire in one structure spreading to adjacent properties.

A.4.b Extent of the Hazard

Wildfire

Wildfire occurs when an uncontrolled fire spreads through vegetation, posing danger and destruction of property. They often begin unnoticed, spread quickly, and can be highly unpredictable. While more typical in rugged Northern or Western forested areas these days, prairie fires were a natural part of the environment across the Great Plains prior to settlement. The State hazard plan categorizes wildfires into three types:

- Wildland fires in grasslands, brush and forests;
- Interface fires where natural landscapes meet urbanized areas
- Prescribed burns, intentionally set or natural fires that are allowed to burn for beneficial purposes

Factors such as topography, fuel and weather affect wildfire behavior. Fire intensity tends to increase during daytime heating. Large parcels of land left fallow in conservation and natural areas may be susceptible to grass fire even when properly managed. Gusty winds and low relative humidity create conditions for wildfire to

spread rapidly in dry grasses and crops. Farm fields with row crops, ditches and rights-of-way along railroad tracks are also vulnerable, in particular to the errant spark or carelessly discarded cigarette. Prolonged periods of high temperatures and/or high winds increase the risk of wildfires.

Structure and Vehicle Fires

Structure and vehicle fires are treated as technological (man-made) hazards by the State hazard plan. They are presented here with wildfires, because their sources (e.g. lightning, arson) and the responsible parties (primarily volunteer fire departments) are essentially the same. These types of non-wildfire incidents are classified by the State hazard plan into four broad types:

- Residential Structures
- Public and Mercantile Structures
- Industrial Structures
- Vehicles

Statewide, 75% of structure fires in Minnesota are residential fires. Almost half of structure fires are caused by cooking accidents (mostly from unattended cooking equipment), with heating accounting for 12% (mostly fireplace/ chimney), arson for 10% and open flames for 10% of structure fires. Careless smoking is the leading cause of fires in which people died. Smoke alarms were absent or non-operating in 1 of 4 fatal residential fires in the state.

The State Fire Marshall participates in Fire Prevention Week each October, and encourages local fire department participation.

Relationship to Other Hazards—Cascading Effects

Wildfires can destroy vegetation, which can cause erosion and worsen flooding. There is also the potential for wildfire, structure fires, or vehicle fires to ignite hazardous materials. For example, many farms have anhydrous ammonia and other agricultural chemicals, which can cause serious difficulties for emergency response.

A.4.c Previous Occurrences of the Hazard

Fires occur periodically throughout the county, in both cities and townships. For example, the Ivanhoe Times reported on 1 April 2010 that “Ivanhoe & Arco Fire Departments Respond to Grass Fire near Arco”:

An absentee landowner...was burning a wood and rubbish pile and the fire got away from him and it spread into a CRP grassland and a Minnesota Department of Natural Resources (DRN) Wildlife Management Area, according to the Lincoln County Sheriff's Office and Ivanhoe Assistant Fire Chief Shad Lipinski.

“The fire burned quite a few acres,” Lipinski said... “The fire was hard to get at. We had to walk a mile to get to the middle of the section where the fire was. The ground was soft so the trucks couldn’t get close enough to the fire.”

The State of Minnesota gathers information on fire response through the National Fire Incident Reporting System of the US Fire Administration. A new web-based reporting system is in use effective January 2009. All five of the fire departments in Lincoln County reported to the State Fire Marshall in 2008. There were no arsons (Incendiary Incidents) and 15 fire runs reported in the county. There have been 5 fire deaths in Lincoln County over the past 25 years.

The National Weather Service issues Grassland Fire Danger statements from April 1st to November 15th each year. The DNR is the lead state agency for wildfire response and prevention across the state, and offers training and other resources for local fire departments. The State hazard plan does report on one fairly recent wildfire incident indicative of risk in the area—a 300 acre grassfire in 2003 that burned some small sheds near Windom, in Cottonwood County.

A.4.d Probability of Future Events of this Hazard

There are structure fires and wildfires every year.

A.5 Flooding / Dam Failure

Floods are one of the most common hazards across the United States. Flooding can occur anytime, anywhere. Seemingly benign streams can overflow their banks from a sudden rainstorm, quick snowmelt or blockage of the channel. Lakes or reservoirs can slowly retain water or quietly creep up the shore. City sewers can back up and pour into private basements and onto public streets. Dams can break.

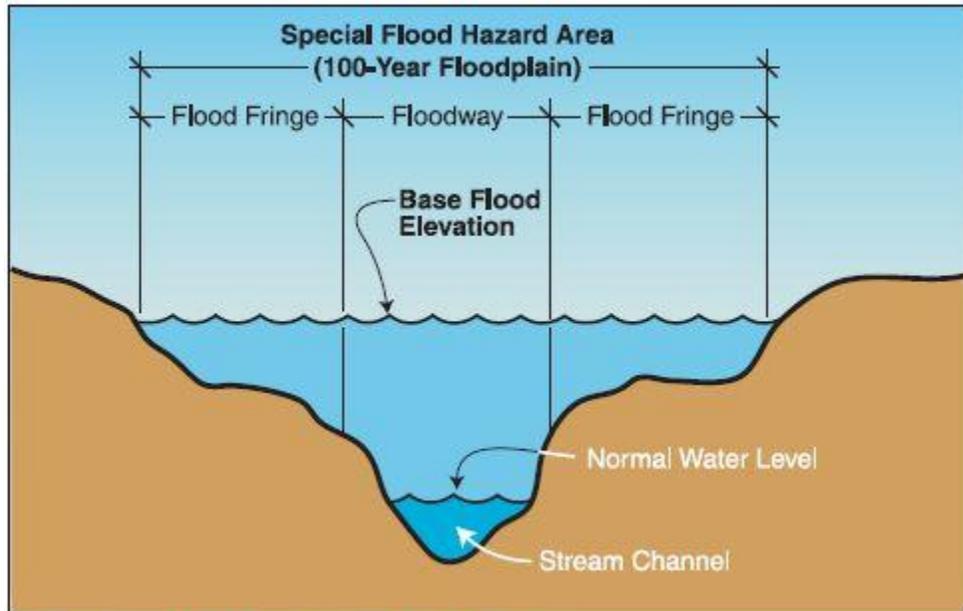
Minnesota DNR administers most state water law, including regulating work in public waters, control of appropriation and use of water, and ensuring the safety of dams. DNR classifies dam structures in three categories:

- High Hazard: any loss of life or serious hazard to public;
- Significant: possible health hazard or probable loss of high-value property;
- Low: property loss restricted to rural outbuildings and local roads.

A.5.a Locations Affected by the Hazard

The Federal Emergency Management Agency (FEMA) maps the probability of flood waters inundating floodplains. Specifically, FEMA works with local communities to map the Special Flood Hazard Area (SFHA), commonly known as the 100-year floodplain, where they calculate a 1% chance of a flood event any given year. Within the SFHA lie the floodway, in which water can be expected at any time, and the flood fringe which is vulnerable to flood events.

Figure 4-1 The 100-Year Floodplain



Source: FEMA, August 2001.

FEMA has developed Flood Insurance Rate Maps (FIRMs) for many communities across the United States. FEMA now posts these online, along with “FIRMettes”—a “a full-scale portion of a FEMA Flood Insurance Rate Map (FIRM) that you create yourself online by selecting the desired area from an image of a Flood Insurance Rate Map.” Obsolete FIRMs, many not updated since their initial production in the 1970s, make flood management decision-making difficult. Lyon County (to the east) is in the process of adopting updated digital FIRMs.

There are mapped floodplains in almost every township in Lincoln County. Many areas are narrow, following streams and creeks. Other areas are more broad, encompassing historic wetland areas.

City of Arco

A mapped floodplain extends south of Lake Stay across County Road 7, east of the developed townsite.

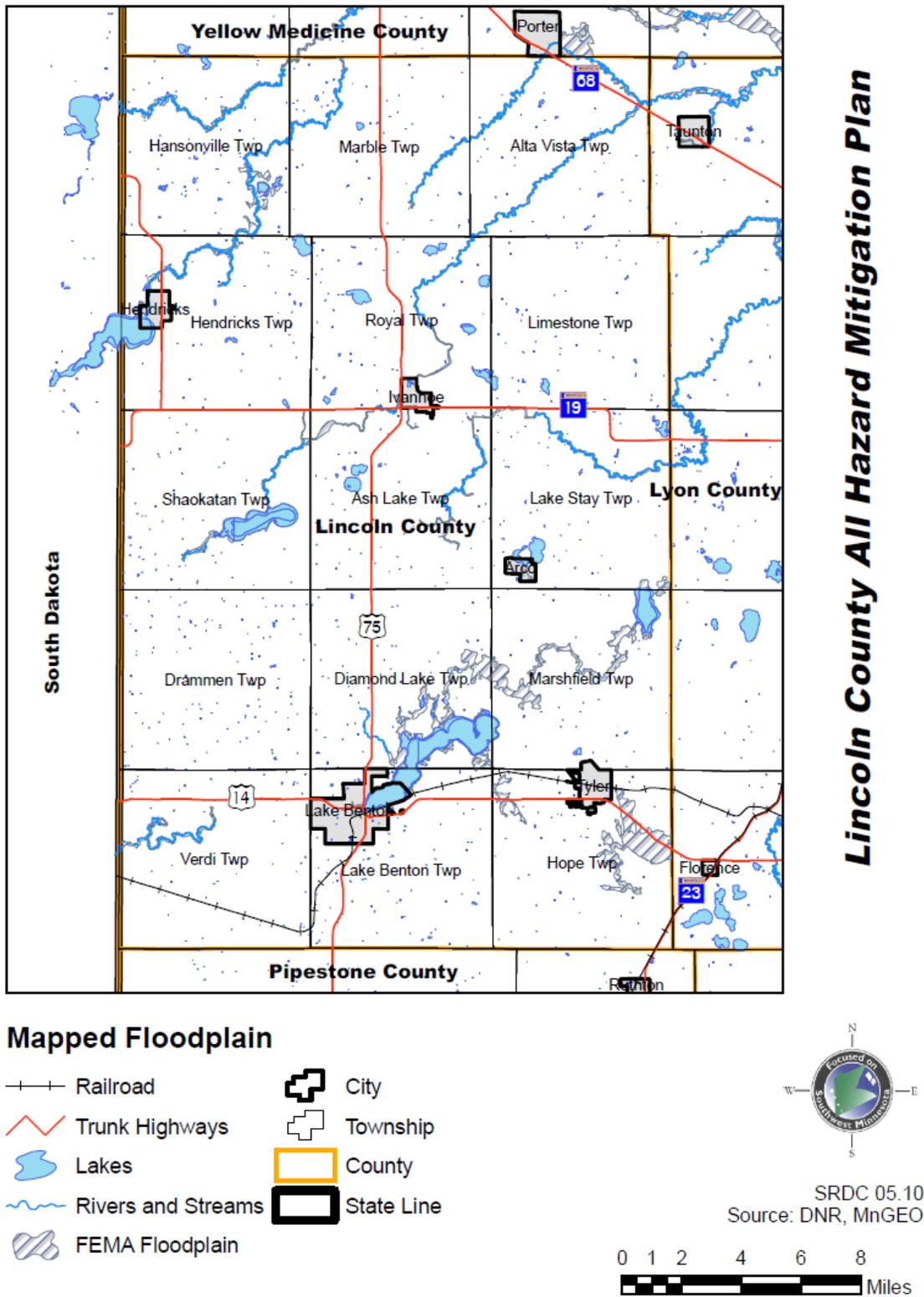
City of Hendricks

While FEMA has designated No Special Flood Hazard area in the City, there are mapped floodplains on Lake Hendricks and along the Lac qui Parle River northwest of the municipal limits.

City of Ivanhoe

While FEMA has designated No Special Flood Hazard area in the City, there are mapped floodplains along the creeks outside of the municipal limits.

Figure 4-2 Floodplain Map



City of Lake Benton

A mapped floodplain extends west of the lake for which this city is named, on a drainage and wetland along US 14. There are only one or two structures in this mostly undeveloped area.

City of Tyler

While FEMA has designated No Special Flood Hazard area in the City, there are mapped floodplains along US 14 east and southeast of the municipal limits. Flooding events have closed US 14 east and west of Tyler.

Dams

An Emergency Action Plan (EAP) is required for all High Hazard dams, implemented in the County Emergency Operations Plan (EOP). Currently there are no high hazard rated dams in Lincoln County. In addition to a number of Low-rated dams, there are three Significant-rated dams, all located on tributaries of the Yellow Medicine River in Alta Vista Township:

- Dillon-Syltie-Boulton Dam
- Miller Farm Pond
- Lincoln County Alta Vista 36 Dam

A.5.b Extent of the Hazard

Flooding occurs with the accumulation of water outside a normal water body, typically into a floodplain. FEMA defines a flood as:

“A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from:

- *Overflow of inland or tidal waters;*
- *Unusual and rapid accumulation or runoff of surface waters from any source;*
- *Mudflow; or*
- *Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.”*

Further, a “flash flood” is considered to occur with “6 inches or more rainfall within a 24 hour period... The rationale for using these criteria is that a rainfall of six inches in a 24-hour period is near the 100-year return period in Minnesota” (Minnesota Climatology Working Group).

The National Flood Insurance Program (NFIP) was created by Congress to help property owners to protect themselves financially. NFIP offers flood insurance in communities that agree to adopt and enforce ordinances to reduce the risk of

flooding. In Minnesota, the DNR administers floodplain management programs. Homeland Security and Emergency Management (HSEM) administers FEMA's flood response, recovery and mitigation programs. According to NFIP's website, <http://www.floodsmart.gov> :

"Floodplain management" refers to an overall community program of corrective and preventive measures for reducing future flood damage. These measures generally include zoning, subdivision, or building requirements, and special-purpose floodplain ordinances.

FEMA works closely with state and local officials to identify flood hazard areas and flood risks. Floodplain management requirements within high-risk areas, known as Special Flood Hazard Areas (SFHAs), are designed to prevent new development from increasing the flood threat and to protect new and existing buildings from anticipated flood events.

Communities participating in the NFIP must require permits for all development in the SFHA. Permit files must contain documentation to substantiate how buildings are actually constructed. The community must also ensure that construction materials and methods used will minimize future flood damage. In return, the federal government makes flood insurance available for almost every building and its contents within the community.

Currently, Lincoln County and the cities of Hendricks, Ivanhoe and Tyler participate in the NFIP. The cities of Arco and Lake Benton do not, as few or no structures are located in mapped floodplains, but have discussed the option with MN DNR.

A city may choose to go beyond minimum NFIP requirements to promote flood mitigation and restrict activities within the floodplain. The NFIP's Community Rating System (CRS), a voluntary incentive program, recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. CRS communities receive discounted flood insurance premium rates in recognition of reduced flood risks. No communities in Southwest Minnesota currently participate in the CRS.

Threats to transportation systems are addressed in more detail in the next section. Special issues occur with infrastructure in a flood event. Communities can mitigate the effects of flooding by asking certain questions before areas are inundated, such as:

- Are telephone switching stations vulnerable? Local phone/cable distribution lines?
- Electrical switching stations? Local power distribution?
- Are natural gas systems and meters flood-proofed?
- Are all underground fuel storage tanks inventoried and flood-proofed?
- How can homeowners be contacted to shut off and secure propane tanks, home fuel oil tanks, etc?

- To what level are public wells, water treatment, and sewage treatment plants protected from flood events?
- Is there a plan to move police, fire, public works, and city equipment, to high ground if needed?
- How will debris be managed and collected post-flood?

Relationship to Other Hazards—Cascading Effects

Flooding can interfere with emergency response to fires, as seen in Grand Forks, North Dakota, during the Red River Flood of 1997. Flooding can also create Public Health emergencies and contaminate water supplies.

A.5.c Previous Occurrences of the Hazard

Flood events are uncommon in Lincoln County. There are no official stream gauges in the county. The NCDC database (Table 4-2) records six flood events in and around the county between 1994 and 2005—three of which are classified as flash flood events.

Table 4-2 NCDC Flood Events in Lincoln County			
Location	Date	Time	Type
Ivanhoe	6/17/1994	1:00 PM	Flash Flood
Southwest Minnesota	3/25/1997	7:00 AM	Flood
Southwest Minnesota	4/1/1997	12:00 AM	Flood
Lake Benton	5/8/2002	1:00 PM	Flood
NE of Ivanhoe	8/23/2004	10:00 PM	Flash Flood
SE of Hendricks	6/20/2005	8:00 PM	Flash Flood
Source: National Climatic Data Center			

As in much of Minnesota, seasonal spring flooding from snowmelt is a common occurrence in late winter and early spring. The NCDC database has general event information, but does not record local property damage as a result of these events. For example:

Snowmelt flooding began in late March [1997] and continued through the end of the month. River flooding occurred on the Redwood, Rock, and on the upper West Fork Des Moines Rivers. Lowlands including farmland, roads, basements, and a few homes were flooded. The worst flooding occurred along the Rock River in Luverne and elsewhere in Rock County with many roads flooded, and considerable park and tree damage. Flood damage was roughly estimated to be in the hundreds of thousands of dollars at the end of March, and this did not include damage from farmland flooding which could not even be estimated until later in the year. Also, any damage estimates could not be complete because the flooding was continuing into the next month.

“Flash flood” events are often caused by heavy spring rains in late spring and summer. In June 1994, 3-4” of rain in less than an hour flooded basements and washed out roads in the Ivanhoe area, and in August 2004, an 8” rain storm flooded roads and fields north east of Ivanhoe. These events are often highly localized, affecting roads more than structures.

In September 2010, as this plan was being finalized, rains throughout the month saturated soils in the region. The week of 21 September, widespread heavy rains caused flash flooding across Eastern South Dakota, Southern Minnesota, and Western Wisconsin, leading the Governor of Minnesota to declare a State of Emergency, including Lincoln County.

There have been no recent incidents of dam failure in the county.

A.5.d Probability of Future Events of this Hazard

Flooding is likely to occur each year. The Lincoln County All-Hazard Mitigation Planning Team considered dam failures unlikely.

A.6 Severe Summer Storms, Hail, Lightning, Extreme Heat

During the spring, summer and autumn, severe thunderstorms, lightning and hail can be commonplace. The *Minnesota All-Hazard Mitigation Plan* covers lightning, hail, windstorms, and extreme heat temperatures. (Windstorms and Tornado events are addressed below.)

A.6.a Locations Affected by the Hazard

Summer storms typically affect large areas at the same time. Hail can be extremely damaging to crops in rural areas, as well as vehicles and building roofs.

A.6.b Extent of the Hazard

Thunderstorms, which occur most frequently from mid-May through mid-July, are the most common type of severe summer storm. Thunderstorms are usually localized, produced by cumulonimbus clouds, accompanied by lightning, and have strong wind gusts, heavy rains, and sometimes hail or tornados.

Lightning occurs to balance the difference between positive and negative discharges within a cloud, between two clouds, and between the cloud and ground. For example, a negative charge at the base of the cloud is attracted to a positive charge on the ground. A lightning bolt happens when the difference between the charges is great enough. The charge is usually strongest on tall buildings, trees, and other objects protruding from the surface. Consequently, these objects are more likely to be struck than lower objects.

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

lightning occurs within the cloud, from cloud to cloud, or from the ground to the cloud. The most common type of lightning is lightning occurring within a cloud.

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

The Tornado and Storm Research Organisation in the UK has developed a scale to measure increments of intensity or damage potential related to hail size and characteristics. The TORRO Hailstorm Intensity Scale ranges from H0 (hard hail causing no damage) to H10 (super hailstorms with hail >100mm diameter causing extensive structural damage and the risk of sever or fatal injuries to people caught in the open). See <http://www.torro.org.uk> for more detailed information on the scale.

Figure 4-3 TORRO Hail Scale

Hail size and diameter in relation to TORRO Hailstorm Intensity Scale.

Size code	Maximum Diameter mm	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

Source: TORRO

In Minnesota, most hail ranges in size from pea-size (1/4 of an inch) to golf-ball size (1 3/4 of an inch). Larger hailstones occur less frequently. Strong updrafts are necessary within the cloud to form hail, and are usually associated with severe

thunderstorms. Coverage areas for individual hailstorms are highly variable and spotty due to the changing nature of the cumulonimbus cloud. While almost all areas of southern Minnesota can expect some hail during the summer months, most hail is not large enough to cause significant crop damage or property damage.

Extreme heat temperatures often accompany severe summer storms. The combination of high temperatures and exceptionally humid conditions can prove deadly. Heat stress can lead to heat cramps, heat exhaustion and heatstroke, and death. According to the US Centers for Disease Control (CDC), more than 300 Americans die annually from excessive heat exposure—during 1979-2003, more people in the US died from extreme heat than from hurricanes, lightning, tornadoes, flood and earthquakes combined.

Relationship to Other Hazards—Cascading Effects

Heavy rain can cause flash flood events, and may threaten transportation infrastructure. Lightning often starts structure and wildfires. Extreme heat can lead to public health emergencies.

Table 4-3
NCDC Hail Events in Lincoln County
 Sorted by Magnitude, Golf Ball Size +

Mag: Magnitude
PrD: Property Damage
CrD: Crop Damage

Location or County	Date	Time	Mag	PrD	CrD
3 LINCOLN	7/28/1986	1600	4.50 in.	0	0
18 Wilno	7/25/2000	5:10 PM	2.75 in.	0	500K
39 Tyler	7/28/2002	2:23 PM	2.75 in.	0	0
41 Wilno	8/3/2002	4:15 PM	2.75 in.	0	0
48 Lake Benton	4/18/2004	12:20 AM	2.75 in.	100K	0
1 LINCOLN	6/24/1980	1315	1.75 in.	0	0
2 LINCOLN	5/1/1981	1945	1.75 in.	0	0
4 LINCOLN	7/11/1987	2050	1.75 in.	0	0
6 LINCOLN	7/5/1991	1735	1.75 in.	0	0
7 LINCOLN	6/18/1992	2130	1.75 in.	0	0
9 Hendricks	7/18/1994	1440	1.75 in.	0	0
11 Lake Benton	6/22/1997	4:45 PM	1.75 in.	100K	15.0M
30 Lake Benton	8/29/2001	6:24 PM	1.75 in.	0	0
34 Arco	5/5/2002	5:05 PM	1.75 in.	0	0
38 Lake Benton	7/28/2002	2:13 PM	1.75 in.	100K	0
45 Lake Benton	4/17/2004	11:33 PM	1.75 in.	0	0
TOTALS:				105K	4.500M

Source: National Climatic Data Center

A.6.c *Previous Occurrences of the Hazard*

The NCDC database lists 71 hail events in Lincoln County from 1980 to 2010 (Table 4-3). These events ranged from near melon-sized hail in 1986 to many incidents of penny-sized hail, which is considered to be severe.

One storm in 1997 with golf ball-sized hail resulted in \$15 million in reported crop damage and \$100,000 in property damage across 180,000 acres in the Lake Benton-Tyler area. However, dollar-cost damage is not consistently reported in the database.

The MAHMP documents a July 1995 extreme heat event which included Lincoln County in a large affected area. Dewpoints in the 70s and 80s combined with temperatures in the 90s and low 100s caused two deaths across Minnesota from a combination of heat exhaustion and dehydration.

A.6.d *Probability of Future Events of this Hazard*

Severe Summer Storms are highly likely to take place every year, including lightning and hail. Extreme heat is a likely event, though not every year. Individuals can and should mitigate their individual exposure to these hazards.

A.7 *Tornado and Straight-line Winds*

Tornados are the most violent of all storm types experienced in Minnesota. A tornado is a rapidly rotating column of air that is spawned from a cumulonimbus cloud. When it drops to the ground, it can create significant property damage and loss of life. While not as damaging as a tornado, windstorms can and do produce substantial damage over wider areas at one time.

A.7.a *Locations Affected by the Hazard*

A tornado or straight-line wind can hit anyplace, anytime. When an extreme wind event hits a populated area, potential damage ranges anywhere from minor inconvenience to total devastation. FEMA places Southern Minnesota in Wind Zone IV, subject to winds of up to 250 mph (consistent with ASCE 7-05 criteria).

A.7.b *Extent of the Hazard*

The most severe windstorms usually occur (and do the most damage) during severe thunderstorms in the spring and summer months. These include tornados, downbursts, or straight line winds. Straight-line winds have similar effects to tornadoes without the rotational damage pattern. Downbursts are created by a column of sinking air, capable of producing straight-line winds in excess of 150 mph.

Winds of greater than 60 mph are also associated with intense spring and fall low-pressure systems. These winds can inflict damage to buildings and overturn high profile vehicles.

Tornados are most likely to occur during warm humid spells during May, June, July, and August but have occurred as early as March and as late as November in Minnesota. They are sometimes referred to as cold air funnels after the passage of a cold front when the air is much less humid, but the air aloft is very cold creating enough instability to make funnel clouds. Tornados occur during the warmest part of the day (late afternoon or early evening) and over 80 percent of tornados occur between noon and midnight.

The severity of tornadic damage is measured by the Fujita Tornado Scale, with a sliding scale from F0 to F5 depending on wind speed. An F5, the most damaging type of tornado, has winds of over 261 miles per hour and can disintegrate strong frame buildings. Beginning in 2007, the 'Enhanced F Scale' is now being used to estimate the scale of a tornado (See page 86 of the MAHMP). The EF Scale relies on 28 damage indicators to typical structures from small outbuildings and schools, to trees and towers.

Figure 4-4 Enhanced F-Scale for Tornado Damage

An update to the the original F-scale by a team of meteorologists and wind engineers, to be implemented in the U.S. on 1 February 2007.

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

*** **IMPORTANT NOTE ABOUT ENHANCED F-SCALE WINDS:** *The Enhanced F-scale still is a set of wind estimates (not measurements) based on damage.* Its uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to the 28 indicators listed below. These estimates vary with height and exposure. **Important:** The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, "one minute mile" speed.

Source: NOAA

A tornado's path typically ranges from 250 feet to a quarter of a mile in width. The speed a tornado travels varies but commonly is between 20 mph and 30 mph. Most tornados stay on the ground for less than five minutes. Tornados frequently move

The NCDC database lists 47 general thunderstorm and high wind events reported for Lincoln County from 1979 to 2009. There are 16 tornado events listed from 1955 through 2007, from F0 to F2, (Table 4-4). There were three tornado events recorded from the 1950s, two in the 1960 and two more in the 1970s. In April of 1955, an F2 tornado 80 yards wide traveled 9.2 miles, causing estimated \$250,000 property damage (\$2.0 million in 2010 dollars). One injury was attributed to a July 1955 F1 event.

Three F1 tornadoes have been recorded in the county in the last decade. Five twisters were observed on 13 June 2001, including one F1 near the unincorporated town of Verdi and another west of Lake Benton, both destroying farm buildings. On 12 June 2004, an F1 tornado in Marble Township near the unincorporated community of Wilno destroyed several farm buildings, killing hogs at one farm.

A.7.d Probability of Future Events of this Hazard

Straight-line Wind events are highly likely to take place in any year. The *Minnesota All-Hazard Mitigation Plan* calculates a 28% annual probability of a tornado event in Lincoln County.

A.8 Other Natural Hazards

Geologic maps also show Lincoln County to be located outside areas prone to sinkholes and Karst land subsidence. There are minimal problems with stream bank erosion causing subsidence, most closely related to flooding events.

Based on maps showing seismic activity in the United States, the potential for an earthquake of any significant magnitude is minimal over 50 years.

B. Technological Hazards

This section provides information on the nature of technological hazards—those caused by humans rather than nature—which are a risk in Lincoln County. These hazards are primarily caused directly by people or in the case of disease spread person to person, rather than by natural events. The nature of this hazard covers acts both intentional and accidental. As FEMA explained in their 2003 planning guide, *Integrating Manmade Hazards Into Mitigation Planning*:

The term “technological hazards” refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials.

The Disaster Mitigation Act of 2000 (DMA2K) encourages local jurisdictions to address all likely hazards facing the community. Although FEMA does not typically fund mitigation efforts to address man-made threats, it is essential to consider all hazards to assure public health, safety and welfare.

Man-made hazards considered in this plan include public violence (domestic preparedness and international-based terrorism), hazardous materials, public health emergencies and risks to transportation infrastructure. Technological hazards present in Lincoln County are described below in alphabetical order for ease of reference.

B.1 Civil Disturbance and Terrorism

Several large-scale man-made disasters have highlighted the need to address technological hazards along with natural hazards. The 1995 destruction of the federal building in Oklahoma City and the 2001 World Trade Center and Pentagon attacks demonstrate the need to protect our citizens, in large cities and small.

FEMA's *Integrating Manmade Hazards Into Mitigation Planning* guide explains:

The term “terrorism” refers to intentional, criminal, malicious acts. There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as “...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.” (28 CFR, Section 0.85). The Federal Bureau of Investigation (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization; however, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences.

For the purposes of this guide, “terrorism” refers to the use of Weapons of Mass Destruction (WMD), including biological, chemical, nuclear, and radiological weapons; arson, incendiary explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and “cyberterrorism.” Within these general categories, however, there are many variations. Particularly in the area of biological and chemical weapons, there are a wide variety of agents and ways for them to be disseminated.

Violence in public places can erupt anywhere, anytime. Specific hazards in this category may include:

- Conventional bomb/explosive device
- Biological, chemical or radiological agent (see also Hazardous Materials hazard below)
- Arson/incendiary attack (see also Fire hazard above)
- Armed attack
- Cyber-terrorism
- Agri-terrorism

B.1.a Locations Affected by the Hazard

Public buildings and facilities, such as the Courthouse, schools and utilities, are potential targets for domestic or international terrorists. Agricultural chemical

depots may also be targets. Isolated rural farmsteads may also be inviting staging grounds for terroristic groups or individuals, away from watchful eye of law enforcement.

B.1.b Extent of the Hazard

Domestic Concerns

The MAHMP defines domestic terrorism as involving groups or individual whose unlawful activities are directed at elements of our government or population without foreign direction. Domestic Preparedness focuses on mitigating these activities without foreign direction.

The US Department of Homeland Security (DHS) and the FBI classify domestic threats in four broad categories—special interest, rightwing, leftwing, and lone wolf. While current monitoring is typically classified at the Law Enforcement Sensitive (LES) level, the MAHMP notes that there are specific areas of concern within Minnesota. Two examples specifically cited in that plan (p.168):

- Both lone gunmen and small organized cells have planned and carried out attacks in public places, such as the school shootings at Red Lake (2005).
- Minnesota’s growing migrant worker populations, including East African, South East Asian, and other ethnic groups, have numerous documented affiliations with criminal/gang-related activity. As well, the American Nazi Party has been active within the state.

International Concerns

Threats from abroad are typically addressed at the federal level. The state Mitigation Plan defines international terrorism as involving groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside of the United States or whose activities transcend national boundaries. The state plan notes:

The local FBI Joint Terrorism Task Force (JTTF) is among the most active in the nation, addressing the issue of overseas financial transfers and groups such as Al Qaeda, Hizballah, Hamas, Al-Ittihad al-Islami and Islamic Jihad. These cases provide examples that the threat of terrorism warrants attention and consideration.

Relationship to Other Hazards—Cascading Effects

The nature of domestic or international terrorism is inherently unpredictable. Cascading effects depend on the specifics of the event. Release of anthrax or other biological agents could lead to animal and crop disaster. Destruction of a dam could lead to flooding. Destruction of an industrial or farm chemical site could lead to a hazardous material crisis. Destruction of any structure would also likely lead to fires.

B.1.c Previous Occurrences of the Hazard

Lincoln County has been fortunate not to have experienced many incidents that could be classified as terrorism. The All-Hazard Mitigation Planning Team identified no recent events within the county.

B.1.d Probability of Future Events of this Hazard

While there have been no recent events of this type, the Lincoln County All-Hazard Mitigation Planning Team identified this hazard as a risk of occasional frequency (1-10% chance to occur in any year).

B.2 Hazardous Materials and Meth Labs

Hazardous materials are found everywhere, from farm to home. A hazardous material is any item which has the potential to cause harm to humans, animals, or the environment, by itself or through interaction with other factors. Spilled material can be costly to clean up and may render the area of the spill unusable for an extended period of time. Water supplies become contaminated by the introduction of point and non-point source pollutants into public ground water and/or surface water supplies.

B.2.a Locations Affected by the Hazard

Hazardous materials may be passing through Lincoln County at any time on highways or by rail. Agricultural chemicals are distributed from the cities and used on farms every day. Methamphetamine has been a particular concern in rural communities.

B.2.b Extent of the Hazard

Federal law defines certain hazardous chemicals, and requirements for emergency planning for facilities at which hazardous substances are present. According to the MAHMP, about 6,000 facilities across the state report under the Federal Emergency Planning and Community Right-To-Know Act (<http://www.epcra.state.mn.us/>) to the Minnesota Department of Public Safety (DPS) and US Environmental Protection Agency (EPA). There are currently no facilities in Lincoln County reporting to the EPA Toxic Release Inventory.

Chemicals

Chemicals used in agriculture, such as anhydrous ammonia, are a particular concern, whether in fixed site storage or in transit by rail, truck or tractor. There are also hazards associated with the use of radiological materials and equipment at the hospitals, although the Planning Team did not consider these greater than typical in any other community.

Land use activities and farming practices can have significant impacts on vulnerable aquifers. The State hazard plan notes the threat:

The hazards come in the form of contamination [from] current industry and EPA Superfund projects, runoff with oil and other chemicals from paved surfaces, traces of pharmaceuticals found in waterways, topsoil washed from farm fields and construction sites, and wastewater that was not thoroughly treated.

Aquifers in the region are often shallow and have a high potential of contamination from nitrate leaching. Deeper aquifers may not be suitable for water supplies due to naturally occurring contaminants, such as sulfur, or because of slow well recharge. Nitrates have found to be a specific problem in the region.

Pipelines

The State Fire Marshall's Pipeline Safety Team (SFMPST) oversees pipeline operations in Minnesota. The National Pipeline Mapping System identifies a portion of Magellan Pipeline Company's highly volatile liquid pipeline traversing the county northwest of and parallel to TH 23 in southeast Lincoln County. A branch of the Magellan line runs from Marshall, crossing the northern tier of townships. Northern Border Pipeline's cross-country natural gas line (with a compression station near Garvin in Lyon County) runs through the center of the county on a southeast to northwest diagonal.

Meth

Methamphetamine laboratories have posed problems to rural communities for a number of years. Methamphetamine (commonly referred to as "meth") is a powerful stimulant drug that is similar to a family of drugs called amphetamines. According to the Rand Drug Policy Research Center, amphetamines are the most widely used illicit drug worldwide, after marijuana, and "regional data systems, law-enforcement agencies, and county hospitals indicate that meth is the most significant problem facing the populations they serve."

Meth is a synthetic or man-made drug. The drug is often manufactured in clandestine labs in locations including houses, apartments, motels, vehicles, or wooded areas. Recipes for meth are available on the internet. Meth production starts with over-the-counter medications that include pseudoephedrine or ephedrine in their contents and is often made using anhydrous ammonia. The hazardous chemicals used in meth production usually leave the manufacturing site uninhabitable with very expensive cleanup required by property owners or the public.

Response

Local response agencies maintain equipment for immediate action, and rely on state resources for HAZMAT assessment and cleanup. According to the HSEM website:

The Hazardous Materials Regional Response Team Program consists of ten Chemical Assessment Teams and four Emergency Response Teams under contract with the Department of Public Safety. The teams are strategically located throughout the state to provide an immediate response to hazardous materials emergencies threatening public safety.

Chemical Assessment Teams assist local authorities by providing technical assistance, air monitoring and decontamination. Emergency Response Teams provide local authorities with spill mitigation assistance.

Local authorities may request a team response by contacting the Minnesota Duty Officer.

A Chemical Assessment Team is located in Marshall.

Relationship to Other Hazards—Cascading Effects

Hazardous materials incidents may cause or occur in conjunction with a fire. An incident on the roads, rail or in the air can lead to a transportation infrastructure crisis. Hazardous materials facilities may also become a target for vandalism or terrorist activity.

B.2.c Previous Occurrences of the Hazard

Hazardous material incidents can occur in different locations:

- Fixed site facilities
- Highway and rail transportation
- Air transportation
- Pipeline transportation

Recent hazardous material events included the discovery of underground storage tanks and other minor incidents. With the trunk highways and Class I railroads crossing the county, hazardous materials may be traveling through the area at any time. Marine transportation is not a concern in Southwest Minnesota. Recent changes in state law regulating the sale of ingredients used in the manufacture of methamphetamine has reduced incidents; however, meth labs are still a concern in the region.

Almost all water for public consumption in Southwest Minnesota is sourced from underground aquifers, rather than surface waters. Wellhead Protection Plans are in place to address threats to some public water supplies. As discussed above regarding the hazard from drought, MDH has worked with rural water suppliers to develop these plans to protect vulnerable aquifers. Wellhead Protection activities

prevent well contamination by managing potential contaminant sources in the land area that contributes water to the well.

There is often a direct flow relationship between surface waters and aquifers, especially shallow aquifers. The federal Clean Water Act requires states to adopt water-quality standards to protect these waters from pollution. A number of waterways in the county are listed as impaired by the Minnesota Pollution Control Agency (MPCA), including the Laq qui Parle and Yellow Medicine rivers, several tributaries and several lakes.

B.2.d Probability of Future Events of this Hazard

The Lincoln County All-Hazard Mitigation Planning Team identified hazardous materials events as likely to occur in the county (10-100% chance in any year). Many aquifers are already polluted and further pollution is likely to occur if not carefully protected.

B.3 Public Health and Infectious Disease

Local government has been increasingly concerned with public health since the 19th century. Cities first installed public sewers to safely dispose of waste that threatened public health. Laws regulated building types and quality to assure light and fresh air, toilets and running water. Public health services today face new challenges to counter ever-evolving infectious disease.

The Minnesota Department of Health (MDH) works with DPS and other agencies to prepare for large-scale emergencies of many types. Infectious diseases can present wide threats to many people, or very narrow threats to highly susceptible populations. An “epidemic” is a disease that occurs suddenly in numbers clearly in excess of normally expected rates. A “pandemic” is an epidemic that spreads across a large region. The state mitigation plan notes:

If an epidemic event were to occur, deaths could be in the many hundreds of thousands across the nation. If the health of the general public is perceived to be threatened on a large scale, riots or states of lawlessness are a possibility.

B.3.a Locations Affected by the Hazard

People throughout the county are potentially affected by this hazard.

B.3.b Extent of the Hazard

Many infectious diseases are preventable and controllable. Standard procedures involve collection of accurate assessment data, outbreak detection and investigation, and development of appropriate control strategies based on specific epidemiological data. These activities require close collaboration between health care providers, clinical laboratories, state and local health departments, and federal agencies.

Certain infectious diseases are considered more likely to present a public health emergency hazard in rural Minnesota.

Influenza virus has three distinct antigenic types (A, B, and C). Epidemic disease can be caused by types A and B with type C causing little to no disease. Illness caused by type B influenza virus will primarily affect humans while illness caused by type A influenza virus can affect both humans and many animal species including birds and swine. The flu is different from a cold. The flu usually comes on suddenly and may include these symptoms: fever, headache, tiredness (can be extreme), dry cough, sore throat, nasal congestion, and body aches. The flu season in the United States is from October to April and on average 10 to 20 percent of the population will be infected with about 36,000 deaths and 114,000 hospitalizations every year. Persons over the age of 65 years, people of any age with chronic medical conditions, and very young children are most likely to have complications from influenza infection.

Severe acute respiratory syndrome (SARS) is a viral respiratory illness that was recognized as a global threat in 2003. The illness usually begins with a high fever (greater than 100.4 degrees F). Other symptoms may include headache, an overall feeling of discomfort, body aches, and diarrhea. After 2-7 days, SARS patients may develop a dry, nonproductive cough and a majority of the patients develop pneumonia. SARS is caused by a previously unrecognized coronavirus, spread by close person-to-person contact, and is thought to be spread by respiratory droplets produced when an infected person coughs or sneezes. People are contagious when they have symptoms and most contagious when they develop a fever and cough.

In 2002, West Nile Virus (an arboviral encephalitis) was identified in Minnesota for the first time. Mosquitoes transmit both Western Equine Encephalitis and West Nile viruses. Both diseases can cause debilitating encephalitis in people and horses.

Vaccine-preventable diseases such as Measles, Rubella, Polio and Smallpox are no longer commonplace in the United States. Due to the threat of terrorism, there has been public concern and fear regarding Smallpox. Smallpox is a serious, contagious, and sometimes fatal infectious disease. The only prevention for Smallpox is vaccination. Variola major is the most severe and most common form of Smallpox, with an extensive rash and high fever.

Relationship to Other Hazards—Cascading Effects

A public health emergency will affect the ability to respond and recover from any other natural or technological hazard incident. Plans need to be in place to control the potential for civil disturbance in a severe public health event.

B.3.c Previous Occurrences of the Hazard

There have been no major public health emergencies in Lincoln County in recent years. Influenza is a common seasonal occurrence. Influenza type A virus has

caused three pandemics in the past century worldwide with significant loss of life. Pandemics occur because the type A influenza virus is very unstable, and new subtypes can appear through genetic drifts or shifting. Outbreaks of influenza in avian populations have increased with bird to human transmission occurring frequently. Currently, the only effective method of controlling avian influenza is the culling of affected animals.

According to the US Centers for Disease Control and Prevention (CDC), “2009 H1N1 (sometimes called “swine flu”) is a new influenza virus causing illness in people. This new virus was first detected in people in the United States in April 2009. This virus is spreading from person-to-person worldwide, probably in much the same way that regular seasonal influenza viruses spread.” The MDH tracked early widespread influenza-like activity in Minnesota for 10 weeks starting in September 2009.

A public health emergency has the potential to tax human infrastructure responsible for critical community services. Local government, businesses and organizations must plan for redundancy and succession of responsibility in response to any of the hazards in this plan, from a potential pandemic to a long blizzard that can keep people from their normal duties for an extended period of time.

B.3.d Probability of Future Events of this Hazard

People contract seasonal influenza every year. The Lincoln County All-Hazard Mitigation Planning Team identified the risk for Public Health emergencies as occasional incidents (1-10% chance in any year).

VII. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Hazards are a fact of life. They are going to occur. The All-Hazards Mitigation approach seeks to reduce the chances of hazards occurring, and when they do occur to minimize their effects on people and property. While we are all at some risk from hazards, through this process we can reduce our vulnerability to the effects of hazards.

A. Summary of Vulnerability

The Minnesota All-Hazard Mitigation Plan (MAHMP) offers an explanation of the concept of vulnerability in the context of hazard mitigation:

Vulnerability is the extent to which something is damaged by a hazard. Value is how much something is worth. Although the concept may generate disagreement, it is possible to assign a value to many community “assets” including physical components such as buildings and infrastructure, functional ones such as government or business operations, and even injuries and casualties.

The MAHMP includes a detailed risk assessment on hazards with the highest probability of affecting the State, which also have the greatest potential for mitigation. The four such hazards in the 2008 edition of the MAHMP included:

- Flood
- Tornado
- Windstorms (thunderstorms & straight-line winds)
- Wildfire

Figures from state-level analysis give a broad idea of local vulnerability to these hazards (see impacts below). Over \$125,000 in fire-related losses were reported for the county in 2008. The MAHMP calculates about \$97,000 annual estimated loss from tornadoes, \$88,000 annually from flooding, and almost \$18,000 from other windstorms.

A.1 Hazard Ranking Worksheets

As detailed in Section IV.A and B, as well as Section V.A above, the local All Hazard Mitigation Planning Team met to assess hazards using worksheets developed by the former Minnesota Planning agency. For each hazard, the team evaluated potential frequency, spatial extent, potential severity, risk level, and hazard rank.

The team considered locations throughout the entire county (except local flood hazard areas) at equal risk for each hazard; however, potential impacts of each hazard vary by the type of hazard as described in the individual hazard profile sections.

Results of the Planning Team’s ranking are presented in Figure 4-5. Hazards were ranked for the entire county—one place is as likely to be stuck by a blizzard, tornado, public health emergency or infrastructure collapse as any other. The one unique risk is flooding and dam failure which was considered for mapped floodplains and known dam locations.

As shown in the worksheet, frequency criteria included: Unlikely=<1% chance in the next 100 years, Occasional= 1% and 10% in next year, Likely=between 10% and 100% in next year, Highly Likely 100% chance. Extent: Minor=<10% area affected, Limited=10% to 25% area affected, Major=25% to 50% area affected, Substantial=>50% area affected.

Figure 4-5 Lincoln County Hazard Identification Worksheet

Hazard	Potential Frequency	Spatial Extent	Potential Severity	Risk Level	Hazard Rank
Natural Hazards					
Ice and Ice Storms	Highly Likely	Local	Major	Very High	High
Tornado / Windstorm	Highly Likely	Local	Substantial	Very High	High
Agricultural Disease (Animal & Crop)	Likely	Local	Major	High	Moderate / High
Blizzards / Winter Storms	Highly Likely	Countywide	Limited	Very High	Moderate
Flooding	Likely	Local	Major	High	Moderate
Drought	Likely	Local	Minor	High	Low
Earthquake	Unlikely	Countywide	Limited	Limited	Low
Extreme Temperatures	Likely	Countywide	Limited	Average	Low
Land Subsidence (bank erosion)	Occasional	Local	Limited	Limited	Low
Summer Storms, Lightning / Hail	Highly Likely	Countywide	Major	Very High	Low
Wildfire	Highly Likely	Local	Minor	Average	Low
Technological Hazards					
Public Health Infectious Disease	Occasional	Local	Major	High	High / Moderate
Fires (Structures)	Highly Likely	Local	Substantial	High	Moderate
Hazardous Materials / Meth Labs	Likely	Local	Major	Average	Moderate
Terrorism and Civil Disturbance	Occasional	Local	Minor	Limited	Moderate
Dam Failure	Unlikely	Local	Limited	Limited	Low
Hazard	Potential Frequency	Spatial Extent	Potential Severity	Risk Level	Hazard Rank
	<i>Highly Likely</i>		<i>Substantial</i>	<i>Very High</i>	
	<i>Likely</i>	<i>Countywide</i>	<i>Major</i>	<i>High</i>	<i>High</i>
	<i>Occasional</i>	<i>Local</i>	<i>Minor</i>	<i>Average</i>	<i>Moderate</i>
	<i>Unlikely</i>		<i>Limited</i>	<i>Limited</i>	<i>Low</i>

For Potential Frequency, *Unlikely* if <1% chance in the next 100 years, *Occasional* = 1% and 10% in next year, *Likely* = between 10% and 100% in next year, *Highly Likely* = 100% in next year.

For Potential Severity, *Limited* = <10% area affected destroyed, *Minor* = 10% to 25% area affected, *Major* = 25% to 50% area affected, *Substantial* = >50% area affected.

Risk Level is subjective ranking by Task Force members based on previous categories.

SRDC, adapted from Minnesota Planning

The Team considered the County's subjective Risk Level, based on data compiled, as typically minimal, limited, high, and very high. The overall Hazard Ranks were then set as Low, Moderate, and High based on the Team's evaluation of this plan's data and public input.

B. Impacts of Hazards on the Community

The Lincoln County All-Hazard Mitigation Planning Team considered the county and each participating jurisdiction at equal risk for all hazards, aside from the risk of flooding/dam failure. However, certain hazards are likely to cause greater impacts to the community. Ag Disease and Drought, for example, have the potential to greatly impact the local economy, but neither typically poses a threat to buildings, infrastructure nor critical public facilities.

B.1 Natural Hazards

Because the unpredictable nature of natural hazards to which the jurisdictions are vulnerable (other than floods) make one area as vulnerable as any other area, all buildings and facilities are considered to have equal vulnerability to potential loss.

B.1.a Blizzards and Winter Storms

Severe winter weather is common in Minnesota and this is considered a High Rank hazard by the local Mitigation Planning Team. Winter storms have immediate impacts on local communities, including the potential for injuries, need to clear snow and ice from public streets, recover from utility failure and possibly provide emergency shelters for travelers and dislocated residents. Winter storms can also cause lost productivity and disruptions in the local workforce, with public and private employees unable to work regular hours.

The accumulated effects of winter storms and blizzard conditions also pose a risk to structures from snow load on roofs. No cities have adopted the Building Code, so there is no local provision to enforce construction standards in the county. Vulnerable structures can easily collapse under the weight of heavy snow and/or high winds.

Analysis of specific infrastructure and structure dollar-cost vulnerability is not possible since winter storms can (and do) impact any portion of the study area. Based on currently available data, modeling future losses would only be possible for total losses with excessive margins of error. Future storm events could be tracked specifically as they occur and used to model local vulnerability to winter storms in future updates.

Plans and Programs

- Soil & Water Conservation Districts (SWCD) and MnDOT have promoted natural snow fences to protect highways against drifting snow.

- The County Engineer and local cities are working closely with MnDOT to improve the safety of transportation in all weather.
- Real-time weather monitoring stations can provide current temperatures, dew point, wind speed, wind direction, and barometric pressure.
- Wind chill warnings and advisories are issued by the National Weather Service according to local criteria.
- Electric utility providers identify and clean up areas of the county and communities that are most likely to experience damage to power lines from falling tree limbs.

Gaps and Deficiencies

- The effective range of warning systems is limited. Weather radios should be more widely used.
- Local radio stations provide warnings, but are increasingly feature non-local satellite programming.
- Many local residents are resistant to zoning and building codes that could assure higher standards for new construction.
- Many people commute long distances to work, increasing exposure to winter weather hazards, especially ice and ice storms.
- There is limited federal/state funding for back-up power generators, which could provide redundant electrical supply.
- Individual homeowners should be encouraged to plan ahead for inevitable seasonal outages.

Existing Mitigation Efforts

Much work has already been completed in adjacent counties to harden electric utilities against winter storms. Redundancies in utility systems can further reduce outages resulting from storms.

B.1.b Fires

The State Fire Marshall reports that there were \$125,000 in fire-related losses reported in Lincoln County in 2008, for \$11,364 average dollar loss per fire.

Plans and Programs

- Lincoln County is served by local volunteer departments.
- Lincoln County and some of the cities regulate the development of new building through zoning. . The state electrical inspectors inspect commercial structures for potential fire hazards.
- Firefighters participate in mandatory fire fighting training classes offered by the State.
- Firefighters are offered the opportunity to participate in wildfire training classes offered by the Minnesota Department of Natural Resources-Forestry Department.

- Prescribed (or controlled) burns in the right locations (and in the right weather conditions) reduce fuel load, while also benefiting native prairie restoration.
- The County and cities can enact both burning bans to decrease the potential for structure fires and wildfires.

Gaps and Deficiencies

- An increasing number of properties are used for recreation or conservation. Management plans providing maintenance of these properties (including cutting tall grass, thinning trees, prescribed burning, and removal of low-hanging branches around structures) can mitigate the risk of wildfire.

Existing Mitigation Measures

In a discussion on the future perspectives for fire mitigation, the MAHMP notes on page 174:

Funding for fire suppression and education for non-wildfire programs... do not normally come through FEMA. However, there may be a situation in the future where a water system needs protected or a special education program will be needed.

B.1.c Flooding

As we saw in Section VI.A.5 (Flooding/Dam Failure) above, most of the townships and several cities in the county have mapped floodplains.

Lincoln County GIS and SRDC staff analyzed the Flood Hazard Areas from digitized FIRM maps (Q3 layers) across the county. Mapped floodplains cover about 14,000 acres in the county, including the surface area of several lakes. This is less than 4% of the county area.

The Q3 Special Flood Hazard Area covers at least a part of 816 parcels in the county, worth \$165 million. The largest number of parcels (with the greatest property value) are classified as Agriculture by the Lincoln County Assessor's Office. Over 15% of agricultural parcels in the county are located in the Flood Hazard Area, representing over 17% of the market value of agricultural land.

The analysis found 66 residential properties at risk, the second largest number of parcels in the Flood Hazard Area, with an estimated 71 residents. These residential locations represent 4% of all E911 address points in the county, and 4% of all residential parcels. However, these parcels only account for 2.5% of the value of all parcels in the county. Closer examination of these locations shows many are along recreational lakes such as Lake Benton, Lake Shaokotan and Lake Hendricks, which are likely more vulnerable to long term changes in lake levels than short-term seasonal or flash flooding.

Table 4-5 Parcels Located in Flood Hazard Area, Lincoln County Estimated Market Value 2009									
Land Use	No. E911 Points			No. Parcels			Value of Parcels		Share in Floodplain
	SFHA*	County	Floodplain	SFHA*	County	Floodplain	SFHA*	County	
Agriculture	0	18	0.0%	670	2351	28.5%	\$ 147,179,100	\$ 407,864,200	36.1%
Commercial	2	84	2.4%	28	65	43.1%	\$ 6,792,800	\$ 10,726,800	63.3%
Industrial	0	21	0.0%	1	19	5.3%	\$ 74,800	\$ 4,350,000	1.7%
Public/Semi-Public	0	10	0.0%	44	61	72.1%	\$ 391,900	\$ 504,900	77.6%
Residential	66	1586	4.2%	66	1676	3.9%	\$ 10,333,300	\$ 408,679,700	2.5%
TOTAL	66	1719	3.8%	816	4172	19.6%	\$ 164,771,900	\$ 832,125,600	19.8%

* Special Flood Hazard Area from Q3 digitized FIRM
Source: Lincoln County GIS

The Flood Hazard Area also covers a large amount of public property. This should be expected, as public agencies such as DNR have focused on protecting wildlife and natural areas that tend to be located along waterways.

In the recent past, Lincoln County received \$835,000 in federal and state flooding-related public assistance for federal Disaster #993, and \$435,000 for Disaster #1175. While not directly related to structural vulnerability, Table 37 in the MAHMP reported that the county experienced over \$2,600,000 in agricultural losses from water-related insurance claims from 1994-2006. This is slightly more than Pipestone County to the south.

Overall, the MAHMP calculates Lincoln County to have an Annual Estimated Loss from flooding of \$77,225 (Public Assistance Damage, Table 49).

Plans and Programs

- The county and identified cities have official FIRM maps identifying flood hazard areas. Local zoning ordinances can control permitted land uses in these areas, what can be built, and how. Land use permits could contain a check-box for property owners to indicate if a parcel is located in a mapped floodplain.
- FEMA's National Flood Insurance Program (NFIP) provides an option for local property owners to protect their structures in communities that participate.
- On-site stormwater detention can slow runoff, slowing potential flash flood events and improving the quality of runoff.

Gaps and Deficiencies

- Many local residents are resistant to leaving stream-side property, even if it is located in a designated floodplain.

- Local match for mitigation projects (such as acquisition of property) will likely become even more difficult to fund as local government assistance is further cut back.

B.1.d Tornado and Straight-line Winds / Severe Summer Storms

Severe wind events cause impacts from the minor debris to structural failure and full-scale devastation. Residents and travelers must be warned of impending danger immediately before and during a Tornado or severe Straight-line Wind event. Local units of government in many places provide safe rooms in emergency shelters for travelers and dislocated residents.

Severe summer storms also put great stress on utilities and structures. Lightning can cause fires and personal injury, even death. While hail can certainly damage buildings the greater impact is felt locally from damage to agricultural crops.

In addition to direct damage from these hazards, the community is vulnerable to cascading effects such as fires, storm-related flash floods, hazardous materials incidents, and infrastructure failure (particularly utility failure). Clean-up from a severe wind event will impact community resources including solid waste disposal.

The MAHMP calculated a 0.2807 annual probability of a Tornado in Lincoln County, with an average of \$46,000 damage per event (Table 40). The plan calculated a 0.67 annual probability of a Windstorm event, with \$21,000 damage per event (Table 43). The MAHMP also lists over \$3.4 million in indemnity claims for hail damage in Lincoln County (highest in Minnesota over 1994-2006) but does not analyze these losses in greater detail.

This amounts to about \$30,000 Estimated Annual Loss from tornados and windstorms.

Plans and Programs

- The severe storm spotters network, sponsored by the National Weather Services (NWS), enlists the help of trained volunteers to spot severe storm conditions and report this information to the NWS. No tornado warnings are given unless the storm has been spotted by someone or is confirmed by NWS radar reports.
- Most of the county's cities have emergency sirens that can be activated to warn residents in the event of a tornado. NOAA's Public Alert weather radios provide warnings indoors.
- Heat advisories are issued by the National Weather Service when the heat index exceeds 95 degrees and the relative humidity is at least 50 percent.
- Wastewater treatment plants are required to test discharges after major rains events to determine whether or not discharges meet PCA guidelines for acceptable levels of waste.

Gaps and Deficiencies

- The effective range of warning systems is limited. Weather radios should be more widely used. Local radio stations provide warnings, but increasingly feature non-local satellite programming.
- Many local emergency siren systems must be replaced soon as they wear out and technology standards improve.
- Local match for construction projects (such as safe rooms) will likely become even more difficult to fund as local government assistance is further cut back.
- Many local residents are resistant to zoning and building codes that could assure higher standards for new construction.

B.2 Technological Hazards

Human-caused hazards tend to pose a risk to individuals and groups of people more than to distinct structures. Public Health Emergencies, by their very nature, are focused on people. Perpetrators of Domestic or International Terrorism incidents may target any public or private structure in the county. Hazardous Materials (including methamphetamine) pose a danger to any buildings and transportation routes used in their manufacture, use or transportation.

More detailed analysis of vulnerability to man-made disasters should be undertaken if technological hazards are included in future updates to this plan.

B.2.a Plans and Programs

- The County Emergency Operations Plan is the go-to source for responding to both natural and man-made hazards. The County and each city should constantly monitor updates for the EOP.
- County Emergency Management is working closely with Lincoln-Lyon-Murray-Pipestone Public Health to mitigate and effectively respond to potential Public Health Emergencies.

B.2.b Gaps and Deficiencies

- The County is currently in the process of updating radio equipment and networks to be compliant with federal regulations.
- An aging population puts the county at greater risk of Public Health Emergencies. As more citizens dependent on life-support are living in their own homes rather than care facilities, they may be vulnerable to utility outages.
- Emergency responders are in need of specialized equipment to deal with hazardous materials. This equipment is often expensive, single use items.

VIII. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Repetitive loss properties are defined by FEMA as having two or more losses of at least \$1,000 each paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. A Severe Repetitive Loss (SRL) property is defined by FEMA as a residential property covered under NFIP that has at least four NFIP claim payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000. An SRL property may also be one for which at least two separate NFIP payments have been made with the cumulative amount of the building portion of these claims exceeding the market value of the building.

As of December 2009, there was no repetitive loss property identified in the county. See Chapter 5, Section XV for more information on NFIP activities in the county.

IX. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area

This initial edition of the Lincoln County All-Hazard Mitigation Plan has focused on getting the hazard mitigation approach off the ground in the participating jurisdictions. Future updates should perform additional data collection and analysis to identify vulnerable structures in greater detail. An analysis should also be done on future planned buildings, infrastructure and critical facilities.

A. Existing Critical Facilities

No particular critical facilities in Lincoln County are uniquely at risk from identified hazards. The Lincoln County Courthouse was recently rehabilitated to improve energy efficiency. Bridges located in the flood plain were identified by the Lincoln County Engineer. Section I.C.4 above includes brief profiles of local utility and public service providers.

Special consideration may be necessary in time of natural or man-made disasters for historic and locally significant structures and places. Seven locations in Lincoln County are listed on the National Register of Historic Places (Table 4-8), including the Lincoln County Courthouse. The Emergency Operations Center is activated at the Courthouse when needed. The *Lincoln County Comprehensive Plan* also states that four locations in the county should be considered for

nomination to this National Register, including the Ivanhoe Creamery building, Lake Benton Hotel, Tyler Commercial Historic District, and US Hwy 14 State Line Marker (Verdi Township).

Table 4-6 Assessing Critical Facilities in Lincoln County HSEM Required Data		
Name or Description of Asset		
	Critical Facilities (#)	In Flood Plain (#)
Court House	1	
County Offices	15	
City Offices	5	
Police Stations	4	
Fire Stations	4	
Hospitals	2	
Long-term Care Facilities	4	
Schools	4	
Colleges	0	n/a
Community Centers	5	
Emergency Operations Centers	1	
Bridges	165	65
Transportation Dept. Facilities	2	
Public Works Facilities	5	
Emergency Shelter	0	

Source: Lincoln County, SRDC

Table 4-8 National Register of Historic Places				
Location		Building Date	Style	Architect/Builder
Drammen Twp.	Drammen Farmers' Club	1921	Craftsman	Alfred Anderson
Ivanhoe	Lincoln County Courthouse and Jail	1919, 1904	Classic Revival, Queen Anne	C. Howard Parsons (Courthouse), A.J. Van Duesen (Jail)
Lake Benton	Lake Benton Opera House and Kimball Building	1896		
Lake Benton	Osbeck House	1896-97	Queen Anne	John & Peter Anderson
Tyler	Danebod Complex	1889, 1893, 1904		
Tyler	Lincoln County Fairgrounds	1895+		
Tyler	Tyler School	1903	Renaissance Revival, Romanesque	A.J. Van Deusen

Source: Lincoln County Comprehensive Plan

X. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate

In Section VII above this plan discussed vulnerability of the county to hazards in general terms. It can be useful to describe vulnerability in terms of dollar losses, to provide a common framework for local, State and Federal agencies to measure the risk of hazards to structures.

A. Structures Vulnerable to Natural Hazards

To better understand local risks, the All Hazard Mitigation Planning Team took a closer look at two natural hazards, tornadoes and flooding. The results of this analysis are presented below.

Future updates of this plan should carefully consider the need to collect additional data to enable a full range of monetary estimates of potential losses from hazard events. This would include structure, contents and function losses to present a full picture of the potential total loss for each asset.

A.1 Tornado Hazard Analysis

The wind blows on the Buffalo Ridge of Southwest Minnesota, making this area prime territory for development of wind energy conversion systems. The region is also, as we saw in Section VI.A.7 of this chapter, vulnerable to tornado and straight-line wind events.

Large tornadoes have left paths of destruction ¼-mile wide, which on the right course would destroy most if not all of any one of the cities in this county. The National Weather Service has suggested that vulnerability of small towns to an EF4 or EF5 scale tornado might be estimated by looking at the recent experience of Greensburg, Kansas (population 1,500). Approximately 95% of that city was destroyed.

The Lincoln County Assessor supplied the estimated market value for structures by type of occupancy in each city in the county. (Structure value was used, rather than the value of the entire parcel, assuming that land would retain value for rebuilding after an extreme storm event.) If we assume a 90% destruction rate from an EF4 or EF5 tornado event, we see in Table 4-9 the potential for extreme amounts of damage in each city.

Table 4-8 Potential Structure Vulnerability to F4/F5 Tornado Events Estimated Market Value 2009				
	No.	Value of	At-Risk	
	Structures	Structures	Structures	Value
City of Arco				
Agricultural	4	\$ 12,200	4	\$ 10,980
Commercial	3	\$ 401,200	3	\$ 361,080
Education	0	\$ -	0	\$ -
Government	2	\$ 180,000	2	\$ 162,000
Industrial	8	\$ 74,600	7	\$ 67,140
Non-Profit	2	\$ 55,000	2	\$ 49,500
Residential	54	\$ 868,900	49	\$ 782,010
Utilities	3	\$ 17,700	3	\$ 15,930
Vulnerable Structures			68	\$ 1,448,640
City of Hendricks				
Agricultural	3	\$ 455,500	3	\$ 409,950
Commercial	69	\$ 1,121,600	62	\$ 1,009,440
Education	1	\$ 4,000,000	1	\$ 3,600,000
Government	5	\$ 892,700	5	\$ 803,430
Industrial	12	\$ 874,100	11	\$ 786,690
Non-Profit	10	\$ 6,345,100	9	\$ 5,710,590
Residential	343	\$ 12,294,900	309	\$ 11,065,410
Utilities	4	\$ 51,200	4	\$ 46,080
Vulnerable Structures			402	\$ 23,431,590
City of Ivanhoe				
Agricultural	2	\$ 131,300	2	\$ 118,170
Commercial	49	\$ 1,190,000	44	\$ 1,071,000
Education	2	\$ 4,000,000	2	\$ 3,600,000
Government	8	\$ 7,355,100	7	\$ 6,619,590
Industrial	3	\$ 109,500	3	\$ 98,550
Non-Profit	3	\$ 6,338,400	3	\$ 5,704,560
Residential	278	\$ 11,962,800	250	\$ 10,766,520
Utilities	4	\$ 112,600	4	\$ 101,340
Vulnerable Structures			314	\$ 28,079,730
City of Lake Benton				
Agricultural	12	\$ 649,200	11	\$ 584,280
Commercial	58	\$ 91,400	52	\$ 82,260
Education	1	\$ 7,604,100	1	\$ 6,843,690
Government	7	\$ 966,100	6	\$ 869,490
Industrial	2	\$ 92,500	2	\$ 83,250
Non-Profit	6	\$ 1,713,900	5	\$ 1,542,510
Residential	331	\$ 15,935,300	298	\$ 14,341,770
Utilities	4	\$ 214,900	4	\$ 193,410
Vulnerable Structures			379	\$ 24,540,660
City of Tyler				
Agricultural	9	\$ 426,900	8	\$ 384,210
Commercial	91	\$ 3,353,800	82	\$ 3,018,420
Education	3	\$ 5,437,500	3	\$ 4,893,750
Government	8	\$ 1,289,200	7	\$ 1,160,280
Industrial	3	\$ 227,700	3	\$ 204,930
Non-Profit	10	\$ 8,927,400	9	\$ 8,034,660
Residential	518	\$ 29,103,400	466	\$ 26,193,060
Utilities	4	\$ 441,700	4	\$ 397,530
Vulnerable Structures			581	\$ 44,286,840
* Assuming a 90% destruction rate per National Weather Service Source: Lincoln County Assessor				

A.2 Flood Hazard Analysis

Late in the project, SRDC acquired FEMA's HAZUS-MH extension for ArcGIS, through FEMA funding of Murray County's AHMP update. HAZUS is a regional multi-hazard loss estimation model developed by FEMA and the National Institute of Building Sciences (NIBS). While analysis is conducted at the Census Tract and Census Block level, according to the documentation the primary purpose of HAZUS is to develop multi-hazard losses at a regional scale.

SRDC applied a **Level 1 Flood Hazard analysis** to the county (an "out-of-the-box" approach with data supplied by FEMA and USGS). A stream network was developed for basins greater than 10 square miles, and a Countywide Scenario generated for a typical 100-year return flood event (1% chance flood). HAZUS found potential building exposure of 4,500 buildings worth \$379 million in the county. Ninety-five percent of these buildings are residential occupancy.

At this scale, the model estimated that no buildings in the county would be at least moderately damaged. The model estimated that 214 tons of debris would be generated, requiring 9 truckloads to remove. About 40 households would be displaced, with 1 person seeking temporary shelter in public shelters. The total economic loss was estimated at \$1.15 million, with building-related losses of \$1.14 million.

The HAZUS-generated 100-year return period polygon was compared visually with the FIRM geography in ArcMap GIS. HAZUS identifies certain areas at risk that are not covered by the FIRM. Other areas covered by the FIRM are not identified by HAZUS. This may be due to the size of drainage basins specified for the scenario. To check the effect of basin size, a second scenario was developed with 5 square mile basins.

This second scenario, which required much more computing time to complete, resulted in the model finding 1 residential property moderately damaged; however, only 184 tons of debris would be generated, requiring 7 truckloads to remove. About 60 households would be displaced, with 11 people seeking public shelter. The total economic loss was estimated at \$1.98 million, with building-related losses of \$1.82 million (Table 4-9).

Table 4-9 HAZUS Countywide Building-Related Economic Loss Estimates Scenario: 100-year Return Period Flood Event, Lincoln County						
Category	(Millions of dollars)				Total	
	Residential	Commercial	Industrial	Others		
Building Loss						
Building	0.62	0.07	0.00	0.08	0.77	
Content	0.36	0.26	0.00	0.42	1.04	
Inventory	0.00	0.00	0.00	0.01	0.01	
Subtotal	0.98	0.33	0.00	0.51	1.82	
Business Interruption						
Income	0.00	0.00	0.00	0.01	0.01	
Relocation	0.00	0.00	0.00	0.00	0.00	
Rental Income	0.00	0.00	0.00	0.00	0.00	
Wage	0.00	0.00	0.00	0.02	0.02	
Subtotal	0.00	0.01	0.00	0.03	0.04	
ALL	Total	0.98	0.34	0.00	0.53	1.86

Source: HAZUS-MH Flood Event Summary Report, 5 sqmi Basins Run 1July2010

Inconsistencies in results may also be due to limitations of the elevation dataset. Where HAZUS (at a Level 1 analysis) utilizes national-scale elevation data from USGS, new LiDAR-based elevation data under development in Minnesota could improve results. There are some other concerns with using the national-scale data provided with HAZUS. As with any model, HAZUS produces an approximation of the “real world”. The software is intended to be a tool for regional analysis, and needs additional time and effort to be used at a city or township-scale. Even so, local jurisdictions should more closely consider flood hazard risks in areas identified by HAZUS to better understand vulnerability and potential losses. Future updates should provide for local data collection to support further refinement, preferably a Level 2 HAZUS analysis.

XI. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

A. Land Uses and Development Trends

As seen in the profile in the first chapter above, about two-thirds of land in Lincoln County is used for active agriculture. About a quarter is grass/shrub/wetland, while only 7% is classified as urban. The Minnesota State Demographic Center projects a population of 6,000 in the county in 2025, about the same as the current estimated population.

Like much of Southwest Minnesota and the rural Midwest, the county's population has become increasingly older and concentrated in cities as farms increase in size. The County has proportionately fewer younger individuals and proportionately greater percentages of elderly residents. While population may vary year to year, cities with employment opportunities have very low vacancy rates and are likely to continue attracting people looking for a high quality of life in Greater Minnesota.

Lincoln County and the cities of Lake Benton and Tyler have comprehensive plans to guide future development. Lincoln County and all cities except Arco have at least a basic zoning ordinance, which can protect property from future development in hazard areas.

Wind energy development poses specific challenges for public safety, in particular for emergency medical services and fire fighting in tall wind turbines. The *Lincoln County Comprehensive Plan* also specifically notes concerns with ice storms and ice accumulation on turbine blades. Potential hazards from this "ice throw" have been mitigated by allowing sufficient setbacks from roads and structures.

XII. Multi-Jurisdictional Risk Analysis

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

A. Risk Assessment for Participating Jurisdictions

The Lincoln County All-Hazard Mitigation Planning Team's consensus was that risks of identified hazards do not vary significantly across the planning area, with the exception of flooding. However, some hazards are more likely to affect the entire county at one time, and others are more likely to have localized affects.

Section V of this chapter identifies hazards that pose a risk to jurisdictions in Lincoln County. Locations at risk are identified in Section VI. Section VII above assesses vulnerability of local jurisdictions to these hazards.

Ice and ice storms, tornadoes, public health emergencies, and agricultural disease were considered the highest rank hazards for Lincoln County. Representatives of cities also ranked priority hazards for their cities.

Figure 4-6 City Hazard Ranking

	City of Ivanhoe	City of Lake Benton	City of Tyler
1	Severe Winter Storms/Blizzards	Hail	Ice and Ice Storms
2	Hail	Ice and Ice Storms	Severe Winter Storms/Blizzards
3	Ice and Ice Storms	Severe Winter Storms/Blizzards	Tornadoes
4	Tornadoes	Tomadoes	Thunderstorm and Lightening
5	Windstorms	Windstorms	Hail
6	Water Supply Contamination	Water Supply Contamination	Extreme Tempreture
7	Thunderstorm and Lightening	Thunderstorm and Lightening	Animal/Crop/Plant Disease
8	Structural Fire	Structural Fire	Human Disease Pandemic
9	Flash Flood	Grass or Wildland Fires	Fixed Hazardous Materials
10	Terrorism	Animal/Crop/Plant Disease	Drought

CHAPTER 5: MITIGATION STRATEGY

This Chapter documents goals, objectives and mitigation strategies that the Lincoln County All-Hazard Mitigation Planning Team developed through the all-hazard mitigation planning process. Section XIII describes mitigation goals and objectives. Section XIV describes the comprehensive range of specific mitigation actions identified. Section XV addresses NFIP compliance. Section XVI describes implementation of mitigation actions. Section XVII addresses the multi-jurisdictional nature of mitigation actions.

XIII. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

A. Description of Mitigation Goals and Objectives

Hazard mitigation is intended to protect our communities by reducing or eliminating long-term risk to people and property before a disaster strikes. Emergency management involves a cycle through which communities prepare, respond and recover from emergencies and disasters.

In selecting local mitigation goals, the All-Hazard Mitigation Planning Team considered the overall goal of this planning process (Chapter 3, Section IV.B) **to prevent and minimize effects of natural and man-made hazards, and improve our ability to respond and recover**. Goals are general guidelines that explain what local jurisdictions in the county want to achieve. Objectives define strategies or implementation steps for each participating jurisdiction to achieve those goals.

All local units of government in Lincoln County were invited to review and comment on mitigation goals, objectives and strategies. Communities not represented in person were provided information individually. Goals and objectives were developed to address the different hazards. Potential objectives were ranked by the public at the Open House (Chapter 3, Section IV.D.1) and in a survey distributed to the All-Hazard Mitigation Planning Team, local elected officials and others in the county. Top-rated objectives included:

- Fire fighters/first responders have adequate resources.
- Fire fighters/first responders have adequate training and equipment for hazardous material response.
- Medications and medical supplies are available for distribution in the case of emergency.
- Electrical utilities bury power lines where possible to prevent storm-related outages.
- Wellhead protection plans are complete/maintained for all public water suppliers.

The Planning team concentrated on developing strategies to meet objectives ranked higher at the Open House and in the survey. Proposed strategies are listed in the next section, each classified by type, with local partners likely to be involved in implementation.

It should be noted that not every hazard identified within the risk assessment has a goal outlined below. Goals were combined for certain hazards with similar mitigation measures. For example, severe summer storms and tornados both require similar awareness, prevention and structural measures. The main benefit of the actions listed is the improved health, safety and welfare of the community and residents. The highest ranking hazards are listed first, followed by moderate rank hazards and finally low rank hazards.

As the communities in the county achieve the outlined objectives, new objectives and implementation strategies will be identified in future All Hazard Planning updates.

A.1 High Rank Hazards

A.1.a Hazard: Ice and Ice Storms / Tornado and Straight-line Winds

Goal: Protect people and infrastructure from the impacts of severe weather.

Objectives:

- Electrical utilities bury power lines where possible to prevent storm-related outages.
- Critical facilities have redundant service in case of utility failure.
- A comprehensive media plan provides factual information about emergencies.
- Weather warning systems are regularly tested and exercised.
- Storm shelters and safe rooms are available to the public where needed

A.1.b Hazard: Agricultural Disease (animal and plant)

Goal: Reduce risks to the county's agriculture & amenities from disease and pest.

Objectives:

- Lincoln County farmers and property owners understand and follow federal, state, and local guidelines to prevent ag disease and pests.
- A response plan clearly sets forth procedures for major ag disaster.

A.1.c Hazard: Public Health and Infectious Disease

Goal: Reduce the threat and impact of infectious diseases through education and awareness.

Objectives:

- Medications and medical supplies are available for distribution in the case of emergency.
- Public is informed on effective measures to prevent the spread of infectious disease.

- An effective quarantine plan is in place to limit highly contagious diseases.

A.2 Moderate Rank Hazards

A.2.a Hazard: Severe Winter Storms—Blizzards & Extreme Cold

Goal: Minimize the impacts of severe winter weather.

Objectives:

- County residents are educated on the importance and need to take responsibility for themselves and their families/neighbors in a severe storm event.

A.2.b Hazard: Flooding & Dam Failure / Landslide (bank erosion)

Goal: Minimize the impacts of seasonal and storm-event flooding.

Objectives:

- New development is located outside of flood plains.

A.2.c Hazard: Fires—Structures and Wildfires

Goal: Eliminate or minimize impacts of natural and human-caused fires.

Objectives:

- Fire fighters/first responders have adequate resources.

A.2.d Hazard: Hazardous Materials

Goal: Improve effectiveness of local agencies in preventing and responding to hazardous material incidents.

Objectives:

- Fire fighters/first responders have adequate training and equipment for hazardous material response.
- Public is informed about the warning signs of meth and potential dangers of the drug

A.2.e Hazard: Terrorism and Civil Disturbance

Goal: Protect residents and critical infrastructure from domestic or foreign threats.

Objectives:

- Law enforcement and emergency management maintain active information networks on potential threats.

A.3 Low Rank Hazards

A.3.a Hazard: Drought / Extreme Heat

Goal: Minimize negative impacts caused by lack of precipitation and extreme heat.

Objectives:

- Wellhead protection plans are complete / maintained for all public water suppliers.

A.3.b Hazard: Severe Summer Storms—Lightning & Hail / Earthquake

Goal: Minimize the impacts of severe summer weather or potential geologic events.

Objectives:

- Raise public awareness of dangers of summer storms and earthquakes.

A.4 Other Goals and Objectives

A.4.a Mitigation Plan Maintenance

Goal: Maintain the all-hazard mitigation plan in accordance with federal and state statute, rules and regulations.

Objectives:

- Update the plan as necessary and required.

XIV. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

A. Mitigation Actions and Projects

The All-Hazard Mitigation Planning Team discussed a wide range of potential mitigation measures based on their knowledge of the planning area and assessment of risks to the county. Strategies in place in other counties in the region formed the basis for discussion. Information provided by HSEM such as the FEMA Region V handout “Mitigation Ideas: Possible Mitigation Measures by Hazard Type” were also used to suggest possible action items.

Mitigation measures described in the State Hazard Mitigation Plan are classified by type:

- Prevention
- Property & Natural Resources Protection
- Public Education & Awareness

- Structural Projects
- Emergency Services

These categories provide a framework to develop local mitigation strategies. Particular mitigation action items were chosen by consensus of the Planning Team. The Team also considered certain other Emergency Services measures supporting preparedness, response and recover actions. While these actions may not be eligible for FEMA mitigation funding, they help understand the overall context of reducing and eliminating natural and technological hazards affecting the jurisdictions.

The Planning Team considered High Rank Hazards as top priorities for action. Prioritization of individual actions and projects will depend on local funding and personnel availability. Mitigation actions listed in this plan should be considered a priority for implementation by each and every participating jurisdiction. While an official cost benefit review was not conducted for any of the strategies, the estimated costs were discussed (See Section XVI below). Overall benefits to each jurisdiction were considered when selecting strategies to be included in the plan. A formal cost-benefit review would have to be completed prior to implementation of mitigation projects.

Table 5-1 Local Partners with Interest in All Hazards Mitigation Lincoln County, Minnesota			
Local Units of Government		Other Parties	
LCEM	Lincoln County Emergency Management	EMS	Ambulance\First Responders
LCEO	Lincoln County Environmental Office / Floodplain Administrator	Fire	Fire Districts
LCHWY	Lincoln County Highway Dept	LE	Local Law Enforcement
PARKS	Lincoln County Parks Dept	Hosp	Hospital and Clinics
LCSD	Lincoln County Sheriff's Office	Sch	Local School Districts
SWCD	Lincoln Co Soil & Water Conservation Dist.	RWS	Rural Water Systems
LLMP	Lincoln Lyon Murray Pipestone Public Health	BWSR	MN Board of Water & Soil Resources
CiA	City of Arco	MDA	MN Dept of Agriculture
CiH	City of Hendricks	MDH	MN Dept of Health
CiI	City of Ivanhoe	DNR	MN Dept of Natural Resources
CiLB	City of Lake Benton	MnDOT	MN Dept of Transportation
CiT	City of Tyler	HSEM	MN Division of Homeland Security & Emergency Management
TWP	Townships	Ext	University of Minnesota Extension Service
		FSA	US Farm Service Agency
ALL	All Parties Listed	FEMA	US Federal Emergency Management Agency

Benefit:

- General: Mitigates hazards in general
- Property: Mitigates hazards to property
- Lives: Mitigates hazards to lives

Cost Estimates:

- Low: In-kind services/projects with existing staff, typically part of ongoing workplan
- Medium: Special projects, contracted services and/or cost-share involved
- High: Major capital costs involved

A.1 High Rank Hazards

A.1.a Hazard: Ice and Ice Storms / Tornado and Straight-line Winds

Strategies

1. Work with critical facilities such as hospitals and rural water suppliers to assure access to back-up power generation.
Who: Utilities, LCEM, LLMP, Hosp, RWS, MDH
Benefit: Property, Lives
Type: Protection
Cost: Medium
2. Work with utility providers to have power lines buried and/or hardened against hazards.
Who: LCEM, LCEO, CiA, CiH, CiI, CiLB, CiT, Utilities
Benefit: Property
Type: Protection
Cost: High
3. Develop a comprehensive media plan to provide public information about all-hazard events.
Who: LCEM, HSEM, FEMA
Benefit: General
Type: Awareness
Cost: Low
4. Encourage all residents to have and use NOAA All Hazards Public Alert weather radios, preferably with Specific Alert Message Encoding (SAME) capability.
Who: LCEM, CiA, CiH, CiI, CiLB, CiT, TWP
Benefit: General, Lives
Type: Awareness
Cost: Low
5. Improve the weather warning system in all communities within five years.
Who: LCEM, LCSO, CiA, CiH, CiI, CiLB, CiT, Parks
Benefit: Lives
Type: Structural
Cost: High
6. Educate public about benefit of safe rooms and funding sources available.
Who: LCEM, LCEO, CiA, CiH, CiI, CiLB, CiT
Benefit: Lives
Type: Awareness
Cost: Low
7. Encourage construction of safe rooms in public facilities and parks.
Who: LCEM, LCEO, Parks, Sch
Benefit: Lives
Type: Structural
Cost: High
8. Encourage property owners to maintain landscaping distances to overhead power lines.
Who: LCEO, CiT, Utilities
Benefit: Property
Type: Prevention
Cost: Low

A.1.b Hazard: Agricultural Disease (animal and plant)

Strategies

1. Provide information on ag disease and prevention to producers & residents.
Who: LCEO, SWCD, Ext, FSA
Benefit: General
Type: Awareness
Cost: Low
2. Review the Emergency Operations Plan for response and care of animals, including disposal, in an outbreak of disease or a major hazard event.
Who: LCEM, LCEO, MDA, MPCA, Ext, FSA
Benefit: General
Type: Emerg Svcs
Cost: Medium

A.1.c Hazard: Public Health and Infectious Disease

Strategies

1. Encourage Lincoln Lyon Murray Pipestone (LLMP) Public Health to continue work with Minnesota Dept. of Health for the mass distribution of needed medicines and supplies for public health emergencies.
Who: LLMP, MDH, PCSO, EMS, Fire, Hosp, PCEM
Benefit: Lives
Type: Emerg Svcs
Cost: Low
2. Provide information to public and private employers, schools and hospitals about potential infectious disease threats and prevention measures.
Who: LLMP, MDH, Sch, SMSU, Hosp, LCEM
Benefit: General
Type: Awareness
Cost: Low
3. Raise awareness of the County quarantine plan, in coordination with local doctors and other health professionals in the county.
Who: LLMP, LCSO, EMS, Fire, Hosp, LCEM
Benefit: Lives
Type: Awareness
Cost: Low

A.2 Moderate Rank Hazards

A.2.a Hazard: Severe Winter Storms—Blizzards & Extreme Cold.

Strategies

1. Work with communities to review and/or complete Continuity of Operations Planning, and encourage private businesses and families to prepare for all-hazard events.
Who: LCEM
Benefit: General
Type: Emerg Svcs
Cost: Medium
2. Consider adopting building code for new construction.
Who: CiH, CiI, CiT
Benefit: General, Property
Type: Prevention
Cost: Medium
3. Encourage residents to use licensed contractors.
Who: CiH, CiI, CiT
Benefit: Property
Type: Prevention
Cost: Low

4. Work with MnDOT / local road authorities to identify and improve hazardous intersections and bridges.
Who: LCHWY, CiA, CiH, CiI, CiLB, CiT, Twp, railroad
Benefit: Property, Lives
Type: Prevention
Cost: High
5. Use road design and living snow fences to help control snow on roadways.
Who: LCHWY, LCEO, SWCD, Twp, MnDOT
Benefit: General
Type: Prevention
Cost: Medium
6. Encourage road authorities to work with farmers to prevent cropping in road ROW.
Who: LCHWY, Twp
Benefit: General
Type: Prevention
Cost: Low

A.2.b Hazard: Flooding and Dam Failure / Landslide (bank erosion).

Strategies: See Section XV (NFIP Compliance).

A.2.c Hazard: Fires—Structures and Wildfires.

Strategies

1. Work with First Responders and Fire Departments on long-range capital improvements planning (CIP) for facilities and equipment.
Who: LCEM, EMS, Fire
Benefit: General, Property
Type: Prevention
Cost: Medium
2. Continue fire education, including the nationally coordinated “Firewise” program.
Who: Fire
Benefit: General
Type: Awareness
Cost: Low
3. Train property owners on the proper use of controlled burns and firebreaks.
Who: Fire, LCSO, SWCD, Twp, DNR
Benefit: General, Property
Type: Awareness
Cost: Low
4. Continue to expand the use of mutual aid agreements and memoranda of understanding to improve coordination between state, local, and federal agencies, and appropriate private sector representatives.
Who: ALL
Benefit: General
Type: Emerg Svcs
Cost: Low

A.2.d Hazard: Hazardous Materials.

Strategies

1. Work with state and federal agencies to address hazardous materials that have the potential to impact the county and region.
Who: LCEM, LCSO, LCEO, EMS, Fire, DPS, MPCA
Benefit: General
Type: Prevention
Cost: Low
2. Increase education of school officials, health care workers, and the general public about the warning signs of meth.
Who: LLMP, LCSO, Sch
Benefit: General, Lives
Type: Awareness
Cost: Low

3. Enforce ordinances that deal with responsibility for cleanup of a meth lab.
 Who: LLMP, LCEO, LCSO
 Benefit: General, Property
 Type: Protection
 Cost: Medium
4. Consider maximum application loads for commercial application of nutrients in Wellhead Protection Areas.
 Who: LCEO, SWCD, RWS
 Benefit: General
 Type: Prevention
 Cost: Low

A.2.e Hazard: Terrorism and Civil Disturbance.

Strategies

1. Local governments complete and maintain thorough community risk and threat assessments.
 Who: LCEM, LCSO, LE
 Benefit: General, Property, Lives
 Type: Prevention
 Cost: Low
2. Consider zoning provisions protecting public facilities from terrorist attack.
 Who: LCEO, LCEM, LCSO, LE
 Benefit: General, Property, Lives
 Type: Prevention
 Cost: Low

A.3 Low Rank Hazards

A.3.a Hazard: Drought / Extreme Heat.

Strategies

1. Work with MDH to complete and implement Wellhead Protection Plans.
 Who: LCEO, RWS, MDH
 Benefit: General
 Type: Prevention
 Cost: Medium
2. Educate the public on the importance of wellhead protection and water conservation.
 Who: LCEO, SWCD, RWS, BWSR
 Benefit: General
 Type: Prevention
 Cost: Low

A.3.b Hazard: Severe Summer Storms—Lightning & Hail / Earthquake

Strategies

1. Participate in “Severe Weather Awareness Week” each spring.
 Who: LCEM, CiA, CiH, CiI, CiLB, CiT
 Benefit: General
 Type: Awareness
 Cost: Low

A.4 Other Strategies

A.4.a Mitigation Plan Maintenance

Strategies

1. Budget to perform additional data collection and analysis to identify vulnerable structures in specific detail in next plan update.
Who: LCEM, LCEO
Benefit: General
Type: Prevention
Cost: Medium
2. Budget to perform estimates of potential monetary losses to structures, contents and functions in specific detail in next plan update.
Who: LCEM
Benefit: General
Type: Prevention
Cost: Medium

B. Reducing the Effects of Hazards on New Buildings & Infrastructure

It is easier to do something right the first time than to fix it later on. Several strategies specifically address mitigating effects of hazards on new buildings and infrastructure.

For example, the strategy for Ice Storm/ Tornado (A.1.a) to “Require new local electrical distribution lines to be buried where feasible” would most likely be implemented with new construction. The strategy to construct safe rooms could address new construction or retrofitting existing structures.

The flooding-related strategy in the next section, “Work closely with DNR on all development applications in identified flood hazard areas; discourage zoning variances in identified flood hazard areas” specifically addresses new buildings and infrastructure. Improving floodplain maps also mitigates the effects of flooding and dam failure on any new buildings and infrastructure as well as existing structures.

C. Reducing the Effects of Hazards on Existing Buildings and Infrastructure

The majority of strategies identified in this section are concerned with protecting people, more so than property. Property can be replaced—people cannot. However, many strategies do address mitigating effects of natural and technological hazards on existing buildings and infrastructure.

An example is Wellhead Protection Plans (A.3.a Drought) which protect existing aquifers and mitigate the need for new infrastructure. The strategy for Winter Storms (A.2.a) to “Use road design and living snow fences to help control snow on roadways” would most likely be used to improve existing roads and highways.

XV. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate

A. Participation in the NFIP

FEMA's National Flood Insurance Program (NFIP) is intended to provide flood insurance, assist with floodplain management and complete flood hazard mapping (See Chapter 4, Section VI.A.5 above). According to FEMA, nearly 20,000 communities across the United States participate in the voluntary program.

All of the participating jurisdictions in the county are listed in FEMA's *Community Status Book* (<http://www.fema.gov/fema/csb.shtm>). Lincoln County and the cities of Hendricks, Ivanhoe, and Tyler are currently participating in NFP, even though the three cities do not have currently designated floodplains. (See Table 5-2.)

FEMA's *Local Multi-Hazard Mitigation Planning Guidance* (the Blue Book) states that **"Jurisdictions that are currently not participating in the NFIP may meet this requirement by describing the reasons why the community does not participate..."** (p.61). The cities of Arco and Lake Benton do not participate in the NFIP (as of July 2010); they were sanctioned for non-participation in 1978. As noted in Section VI.A.5.a, there are few structures located in the mapped floodplain in Lake Benton and none in Arco.

The Lake Benton City Council met with MN DNR's Area Hydrologist as this plan was being drafted on adopting floodplain regulations. Both Arco and Lake Benton recognize that they are not currently eligible for certain FEMA mitigation funding without participating in NFIP. However, by participating on the Planning Team, the cities have demonstrated a desire to cooperate with their neighbors in Lincoln County and to be eligible to adopt the plan.

Jurisdiction	NFIP Status	Initial FHBM	Initial FIRM	Current Effective Map Date	Joined Program (or Sanctioned)	Policies In Force#	Total Losses	Total Payments
Lincoln County	Participating	1977	1985	1985	1985	14	0	\$0
City of Arco	Not Participating	1977		1977	1978	n/a	0	\$0
City of Hendricks	Participating	1974		NSFHA*	1985	0	0	\$0
City of Ivanhoe	Participating	1974		NSFHA*	1984	0	0	\$0
City of Lake Benton	Not Participating	1977		1978	1978	n/a	0	\$0
City of Tyler	Participating	1974		NSFHA*	1983	0	0	\$0
* NSFHA-No Special Flood Hazard Area								
# Policies In Force, Total Losses, and Total Payments as of 26 July 2010								
Source: FEMA Community Status Book 12.09, NFIP Insurance Statistics								

B. Identification, Analysis and Prioritization of Actions Related to Continued Compliance in NFIP

The following strategies were identified based on the analysis of the Flooding and Dam Failure hazards in Chapter 4, Section VI.A.5, to meet the goals and objectives in Chapter 5, Section XIII.A.2 (Moderate Rank Hazards) above. Landslide or bank erosion hazards were addressed as part of this hazard, since property damage typically only occurs in a flood event.

Individual strategies were selected by consensus and do not appear in rank order. The Planning Team discussed property acquisition, relocation and elevation; however, there have been no local flood insurance losses recorded and there is no current indication of public support to spend public funds on these activities. Prioritization of individual actions and projects will depend on local funding and personnel availability. A formal cost-benefit review would have to be completed prior to implementation of mitigation projects.

B.1 Hazard: Flooding and Dam Failure / Landslide (bank erosion).

B.1.a Strategies

1. Work with DNR and FEMA to modernize floodplain maps.
Who: LCEO, CiA, CiH, CiI, CiLB, CiT
Benefit: General, Property
Type: Prevention
Cost: Medium
2. Work with DNR to review and update floodplain protection in zoning ordinance.
Who: LCEO, CiH, CiI, CiT
Benefit: General, Property
Type: Prevention
Cost: Low
3. Work closely with DNR on all development applications in identified flood hazard areas; add check box on building/zoning permit forms indicating flood hazard areas; discourage zoning variances in flood hazard areas.
Who: LCEO
Benefit: General, Property
Type: Prevention
Cost: Low
4. Encourage all property owners in flood hazard areas to purchase flood insurance.
Who: LCEO
Benefit: Property
Type: Awareness
Cost: Low
5. Jurisdictions not currently participating in the National Flood Insurance Program (NFIP) will review their flood hazard areas & consider participation.
Who: DNR, CiA, CiLB
Benefit: General, Property
Type: Prevention
Cost: Medium
6. Promote buffer system along creeks and streams that are prone to flooding (e.g. grass strips, CRP).
Who: SWCD, BWSR, Watershed Districts
Benefit: General, Property
Type: Natural Resources
Cost: Medium

XVI. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

In this initial all-hazard mitigation plan, the All-Hazard Mitigation Planning Team concentrated on understanding the hazards present in the community and the wide range of potential mitigation strategies to address these hazards. Implementation of individual actions and projects will depend on local funding and personnel availability.

A. Action Prioritization

Throughout this process, staff and the Planning Team strove to achieve consensus. At the Public Open House, attendees indicated preferences for a wide range of objectives (Chapter 3, Section IV.D.1). The Planning Team then concentrated on selecting action items to meet the highest rank objectives.

The highest rank hazards identified by the Planning Team—Ice and Ice Storms, Tornado/Windstorm—received the majority of the Planning Team’s attention. It is intended that strategies to mitigate the highest rank hazards receive the top priority for implementation, followed by moderate rank hazards.

As stated in Section XIV above, Planning Team members considered a wide range of potential mitigation measures, including actions in place in other counties in the region, estimated costs and benefits of projects, and funding available. Individual strategies were selected by consensus of the Team.

A.1 Priority Action Items

Planning Team members were asked to prioritize individual mitigation action items in an online survey, considering benefits that would result from actions versus the cost of those actions. A scale of 1-5 was used, from low to high priority. The top results for strategies are listed in Table 5-3.

Mitigation Strategy	Survey Score
A.1.a.1 Critical facility back-up power	4.4
A.1.c.1 Mass distribution of medical supplies	4.2
A.1.a.4 NOAA All-Hazards Radios	4.1
A.1.a.2 Bury/harden power lines	4.1
A.2.c.1 CIP for EMS/Fire facilities	4.1
A.1.a.5 Improve weather warning systems	4.1

Source: All-Hazard Mitigation Planning Team

B. Action Implementation and Administration

Lincoln County Emergency Management is the primary agency responsible for implementation and administration of this plan. The County will implement mitigation strategies within the next five years, and will seek appropriate funding to do so.

Local jurisdictions with comprehensive plans and land use controls will be strongly encouraged to incorporate applicable goals, objectives, and policies into their local plans upon their next update. Transmittal of the final plan will include a letter from the County Emergency Manager requesting that each participating jurisdiction 1) adopt this Hazard Mitigation Plan as a primary policy document, and 2) review and incorporate all applicable policies of this document into the community's existing plans by inclusion or by reference.

Upon adoption of this plan, the County and participating cities should also at the same time evaluate development and management controls, such as zoning and floodplain ordinances, to maintain consistency with this plan.

C. Cost-Benefit Review

As explained in Section XIV above, formal cost benefit review is beyond the scope of this plan and was not conducted for strategies during this mitigation planning process. Page 63 of the *Local Multi-Hazard Mitigation Planning Guidance* ("Blue Book", July 1, 2008) states:

"Note that the mitigation planning regulation **does not** require plans to include a benefit cost analysis for projects. However, an economic evaluation is essential for selecting one or more actions from among many competing ones." [emphasis in original]

The overall cost and funding available to implement strategies played a significant role in selection of proposed mitigation action items. A formal cost-benefit review would have to be completed prior to implementation of specific mitigation projects.

C.1 Sources of Funding

Certain mitigation actions lend themselves to specific funding sources. The following FEMA mitigation programs summarized in Chapter 1, Section I.A.1 should be considered for identified mitigation projects.

- HMGP: A.1.a.5, A.1.a.7, A.4.a.1, A.4.a.2
- PDM: A.1.a.2, A.1.a.5, A.1.a.7, A.4.a.1, A.4.a.2

Mitigation actions for Public Health Emergencies are typically led by Public Health Services, with funding through the Minnesota Department of Health and other

sources. The Minnesota Department of Natural Resources (DNR) assistance may be available for back-up power supply.

Mitigation funds may be available to address weather-related hazards to transportation systems through MnDOT/Federal Highway Administration (FHWA), County State Aid, and other County/Township/City-funded projects. MnDOT may pay \$500-\$700 per acre, per year for living snow fence projects in priority locations, which is often supplemented by the Conservation Reserve Program (CRP) through USDA Farm Service Agency and SWCD.

Mitigation action items for Drought may find funding from DNR, the Minnesota Board of Water and Soil Resources (BWSR), Minnesota Pollution Control Agency (MPCA), US Environmental Protection Agency (EPA) and US Department of Agriculture (USDA). Mitigation actions for flooding/dam failure beyond property acquisition, relocation and elevation may be fundable through DNR, BWSR, and local Soil & Water Conservation District sources. MPCA's Project Priority List (PPL) is a conduit to water and sewer project funding.

Mitigation actions for Fires (both structure/vehicle fires and wildfires) may be fundable by local fire departments through FEMA's Assistance to Firefighters Grants (AFG), Staffing for Adequate Fire and Emergency Response Grants (SAFER), Fire Prevention and Safety Grants (FP&S), Assistance to Firefighters Fire Station Construction Grants (SCG) programs. The DNR also works with local fire departments to conduct wildfire training programs.

USDA-Rural Development also offers grants and low-interest loans to public agencies and certain other organizations for public purposes. USDA-RD has recently funded requests such as fire halls and equipment, water and sewer systems, and tornado sirens in the region. Other actions would have to be funded from general tax levies, ongoing program budgets, and by private citizens.

XVII. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

As explained in Chapter 2, Section III, Lincoln County is a rural community with few full-time paid public staff. Jurisdictions in the county rely on Lincoln County Emergency Management as a

clearinghouse for intergovernmental cooperation. Lincoln County Emergency Management maintains regular communication with all local units of government in the county.

A. Action Items for Each Participating Jurisdiction

Action items are identified for each participating jurisdiction. These items were selected by the All Hazards Mitigation Planning Team with advice and consent by each participating jurisdiction—cities not in attendance at the Team meeting were consulted by telephone by the Emergency Management Director.

Mitigation Strategy	Arco	Hendricks	Ivanhoe	Lake Benton	Tyler
<i>A.1.a Hazard: Ice and Ice Storms / Tornado and Straight-line Winds</i>					
A.1.a.2	X	X	X	X	X
A.1.a.4	X	X	X	X	X
A.1.a.5	X	X	X	X	X
A.1.a.6	X	X	X	X	X
A.1.a.8					X
<i>A.2.a Hazard: Severe Winter Storms—Blizzards & Extreme Cold</i>					
A.2.a.2		X	X		X
A.2.a.3		X	X		X
A.2.a.4	X	X	X	X	X
<i>A.3.b Hazard: Severe Summer Storms—Lightning & Hail / Earthquake</i>					
A.3.b.1	X	X	X	X	X
<i>B.1 Hazard: Flooding and Dam Failure / Landslide (bank erosion)</i>					
B.1.a.1	X	X	X	X	X
B.1.a.2		X	X		X
B.1.a.5	X			X	

Each participating jurisdiction is responsible for selecting their mitigation action items, as well as funding and staffing implementation. The following contact information is current as of January 2010:

- Arco City Clerk, PO Box 73, Arco, MN 56113
- Hendricks City Clerk/Administrator, PO Box 87, Hendricks, MN 56136
- Ivanhoe City Clerk, PO Box 54, Ivanhoe, MN 56142
- Lake Benton City Clerk, PO Box 206, Lake Benton, MN 56149
- Tyler City Clerk/Administrator, 230 N. Tyler St, Tyler, MN 56178
- Lincoln County Emergency Management, c/o DSI, P.O. Box 48, Ivanhoe, MN 56142

Chapter II, Section II.A.1 describes how a jurisdiction may modify or join this plan after FEMA approval.

CHAPTER 6: PLAN MAINTENANCE

This Chapter documents procedures for long-term plan maintenance. Section XVIII describes monitoring, evaluating and updating the plan. Section XIX addresses incorporation of this plan into existing planning mechanisms. Section XX addresses the need for continued public involvement.

XVIII. Monitoring, Evaluating, and Updating the Plan

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

A. Method and Schedule for Monitoring this Plan

This *All Hazard Mitigation Plan* will be monitored continuously by the County Emergency Management Director as part of his annual work plan. Lincoln County Emergency Management maintains regular contact with all jurisdictions in the county.

B. Method and Schedule for Evaluating this Plan

FEMA requires that plans be reviewed, updated and re-approved within five years of initial adoption. Given the length of the planning cycle, the County Emergency Management Director should review and formally evaluate the plan within two and a half (2.5) years of adoption, as well after every disaster event, to adequately prepare for the plan update.

C. Method and Schedule for Updating the Plan

Within three (3) years of adoption, the Emergency Management Director will formulate a work plan and seek input from All-Hazard Mitigation Planning Team members, local units of government and local residents and property owners to update plan content, goals and strategies. At that time, hazard-related items from local plans and projects will be incorporated into this plan. Emergency Management will also extend an invitation to non-participating jurisdictions to join the planning process for the update.

Any revisions to this plan will be forwarded to the State of Minnesota's HSEM and FEMA as required in the original adoption process.

XIX. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

A. Local Planning Mechanisms Available for Incorporating Mitigation Requirements

During the course of this hazard mitigation planning process, the following relevant planning mechanisms were identified:

Comprehensive Plan	Lincoln County, Lake Benton, Tyler
Capital Improvement Plan:	Hendricks, Ivanhoe, Tyler
Local Emergency Plan:	Hendricks, Ivanhoe, Lake Benton, Tyler
Economic Development Plan:	Ivanhoe, Lake Benton, Tyler
Land-use Plan:	Lincoln County, Ivanhoe, Lake Benton
School Disaster Plan:	Ivanhoe
Watershed Plan:	Lake Benton
Firewise Plan:	Lake Benton
Soil Conservation Plan:	Lincoln County, Lake Benton
Regional Development Plans:	Southwest Regional Development Commission, including representatives from Lincoln County, all townships and cities
Zoning Ordinance:	Lincoln County, Hendricks, Ivanhoe, Lake Benton, Tyler
Fire Code:	Ivanhoe, Lake Benton, Tyler
Floodplain Ordinance:	Lincoln County, Hendricks
Subdivision Ordinance:	Lincoln County, Hendricks, Lake Benton, Tyler

B. Process for Incorporating Mitigation Strategies and Hazard Information in Other Plans and Ordinances

As discussed in Chapter 5, Section XVI.B above, upon adoption each participating jurisdictions should evaluate their existing plans and ordinances to incorporate goals, objectives and strategies of the All-Hazard Mitigation Plan. For Lincoln County, the Emergency Management Director will work with elected officials and other departments in this process.

XX. Continued Public Involvement

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

Continued public participation in hazard mitigation will be solicited through the ongoing work of Lincoln County Emergency Management. Comments from the public on the AHMP will be received by County Emergency Management and forwarded to the All Hazard Mitigation Planning Team for discussion. Once adopted, a copy of the plan will be made available to public libraries in the county, and posted to the SRDC website.

APPENDIX

A. Resolutions of Adoption

To be appended following FEMA approval and adoption by each participating jurisdiction.



Homeland Security and Emergency Management

444 Cedar Street • Suite 223 • Saint Paul, Minnesota 55101-6223

Phone: 651.201.7400 • Fax: 651.296.0459 • TTY: 651.282.6555

www.dps.state.mn.us

Alcohol and Gambling Enforcement

Bureau of Criminal Apprehension

Driver and Vehicle Services

Emergency Communication Networks

Homeland Security and Emergency Management

Minnesota State Patrol

Office of Communications

Office of Justice Programs

Office of Traffic Safety

State Fire Marshal and Pipeline Safety

January 14, 2011

Norman Van Overbeke
Lincoln Emergency Management
PO Box 133
Ivanhoe, MN 56258

Dear Mr. Van Overbeke,

I am happy to inform you that Lincoln County, All Hazard Mitigation Plan, has been approved by the Federal Emergency Management Agency (FEMA), *pending plan adoptions* (see note below). The plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. Therefore, the county and participating jurisdictions are eligible to apply for mitigation project funding under Hazard Mitigation Assistance Programs.

Over the next five years, we encourage Lincoln County to follow the plan's schedule for monitoring and updating the plan and continue the efforts to implement the mitigation measures. The plan must be reviewed, revised as appropriate, and resubmitted for approval within five years in order to continue project grant eligibility.

Please forward the signed copies of the resolutions used to adopt the plan via email or mail. We urge you to have the plan adopted by participating jurisdictions within 90 days of this letter. If you have any questions, please contact me at 651-201-7455.

Sincerely,

Jim McClosky
Hazard Mitigation Planner



RESOLUTION OF LINCOLN COUNTY
10-2011
ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN 2010

WHEREAS, Lincoln County has participated in the hazard mitigation planning process as established under the Disaster Mitigation Act of 2000, and the March, 2008 planning crosswalk; 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Lincoln County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Lincoln 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 Lincoln 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 Lincoln County supports the hazard mitigation planning effort and wishes to adopt the Lincoln County All-Hazard Mitigation Plan.

This Resolution was declared duly passed and adopted and was signed by the
Board Chair and attested to by the Deputy Auditor this 8th
day of February, 2011.

Donald Evers

Attest:

Chuck SeBates

RESOLUTION OF THE CITY OF Arco

ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, the City of Arco 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 multi-jurisdictional 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

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

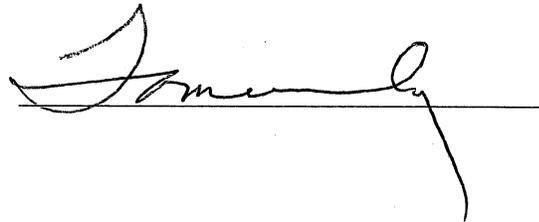
WHEREAS, the Plan has been shared with the Minnesota Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for review and comment; and

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

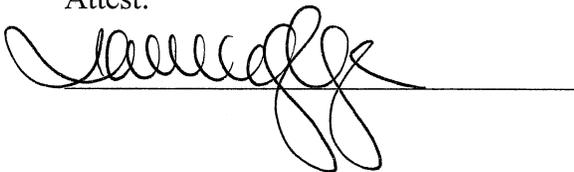
WHEREAS, this is a multi-jurisdictional Plan and cities that participated in the planning process may choose to also adopt the County Plan.

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

This Resolution was declared duly passed and adopted and was signed by the Mayor and attested to by the City Clerk/Treas. this 8th day of March, 2011.



Attest:



RESOLUTION OF THE CITY OF Hendricks

ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, the City of Hendricks 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 multi-jurisdictional 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Lincoln County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Lincoln 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 Lincoln 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 the City of Hendricks supports the hazard mitigation planning effort and wishes to adopt the Lincoln County All-Hazard Mitigation Plan.

This Resolution was declared duly passed and adopted and was signed by the Mayor and attested to by the City Administrator this 7 day of March, 2011.

Richard J. James

Attest:

D. M. Blee

RESOLUTION OF THE CITY OF 041111

ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, the City of IVANHOE 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 multi-jurisdictional 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Lincoln County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Lincoln 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 Lincoln 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 the City of IVANHOE supports the hazard mitigation planning effort and wishes to adopt the Lincoln County All-Hazard Mitigation Plan.

This Resolution was declared duly passed and adopted and was signed by the MAYOR and attested to by the CITY CLERK this 11 day of APRIL, 2011.

Daphne Lorenson

Attest:

Warren Say

RESOLUTION OF THE CITY OF LAKE BENTON

ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, the City of Lake Benton 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 multi-jurisdictional 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

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

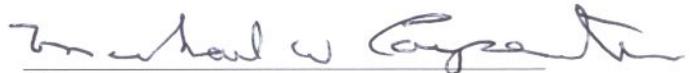
WHEREAS, the Plan has been shared with the Minnesota Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for review and comment; and

WHEREAS, the Lincoln 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 the City of Lake Benton supports the hazard mitigation planning effort and wishes to adopt the Lincoln County All-Hazard Mitigation Plan.

This Resolution was declared duly passed and adopted and was signed by the Mayor and attested to by the City Clerk this 12 day of April, 2011.



Mayor

Attest:



City Clerk

11-4

RESOLUTION OF THE CITY OF Tyler

ADOPTION OF THE
LINCOLN COUNTY ALL-HAZARD MITIGATION PLAN

WHEREAS, the City of Tyler 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 multi-jurisdictional 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 Lincoln 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 Lincoln County Plan includes a mitigation strategy including goals and objectives and an action plan identifying specific mitigation projects and costs; and

WHEREAS, the Lincoln County Plan includes a maintenance or implementation process including plan updates, integration of the plan into other planning documents and how Lincoln 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 Lincoln 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 the City of Tyler supports the hazard mitigation planning effort and wishes to adopt the Lincoln County All-Hazard Mitigation Plan.

This Resolution was declared duly passed and adopted and was signed by the Mayor and attested to by the City Clerk this 7th day of March, 2011.


Kurt Thomsen, Mayor

Attest:


Daniel Tolsma, City Clerk

Addendums

Addendums to the Lincoln County All Hazard Mitigation Plan are available separately.

A. Resolutions of Participation by Jurisdiction

Lincoln County
City of Arco
City of Hendricks
City of Ivanhoe
City of Lake Benton
City of Tyler

Alta Vista Township
Ash Lake Township
Diamond Lake Township
Drammen Township
Hansonville Township
Hope Township
Lake Benton Township
Lake Stay Township

Limestone Township
Lincoln Township
Marble Township
Marshfield Township
Royal Township
Shaokatan Township
Verdi Township

B. Capabilities Assessment

C. All Hazards Mitigation List of Acronyms

D. Sample of Public Communication

E. Meeting Notes

F. HAZUS-MH Flood Scenario Report