Lyon County All Hazard Mitigation Plan

June

2010

This multi-jurisdictional hazard mitigation plan includes Lyon County and the cities of Balaton, Cottonwood, Florence, Garvin, Ghent, Lynd, Marshall, Minneota, Russell, Taunton, and Tracy, Minnesota. This project was supported by Grant Award Number FEMA-1622-DR-MN 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 Lyon County Emergency Management

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LYON COUNTY
ALL-HAZARD MITIGATION PLAN

June 2010

Executive Summary

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

The Lyon County All-Hazard Mitigation Plan is intended to bring resources together to mitigate and respond to hazards, protecting public health, safety and welfare in a useful and easily understood all-hazards approach, while meeting HSEM & FEMA requirements.

This project was undertaken so that all local units of government in Lyon County that wished to participate could become eligible to adopt the plan. All cities participated in Lyon County's hazard mitigation planning process: Balaton, Cottonwood, Florence, Garvin, Ghent, Lynd, Marshall, Minneota, Russell, Taunton, and Tracy. Lyon County and the cities of Balaton, Cottonwood, Ghent, Lynd, Marshall, Minneota, Russell, and Tracy participate in the National Flood Insurance Program (NFIP). The city of Taunton also has identified Flood Hazard Areas but does not currently participate in the NFIP as there are few structures at risk. The participating cities of Florence and Garvin are not listed by FEMA in the Community Status book.

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

- Ice and Ice Storms
- Public Health and Infectious Disease
- Transportation Infrastructure

This planning process has been conducted by the Southwest Regional Development Commission (SRDC) and Lyon County Emergency Management in accordance with current guidance provided by US Federal Emergency Management Agency (FEMA) and Minnesota Homeland Security and Emergency Management (HSEM).

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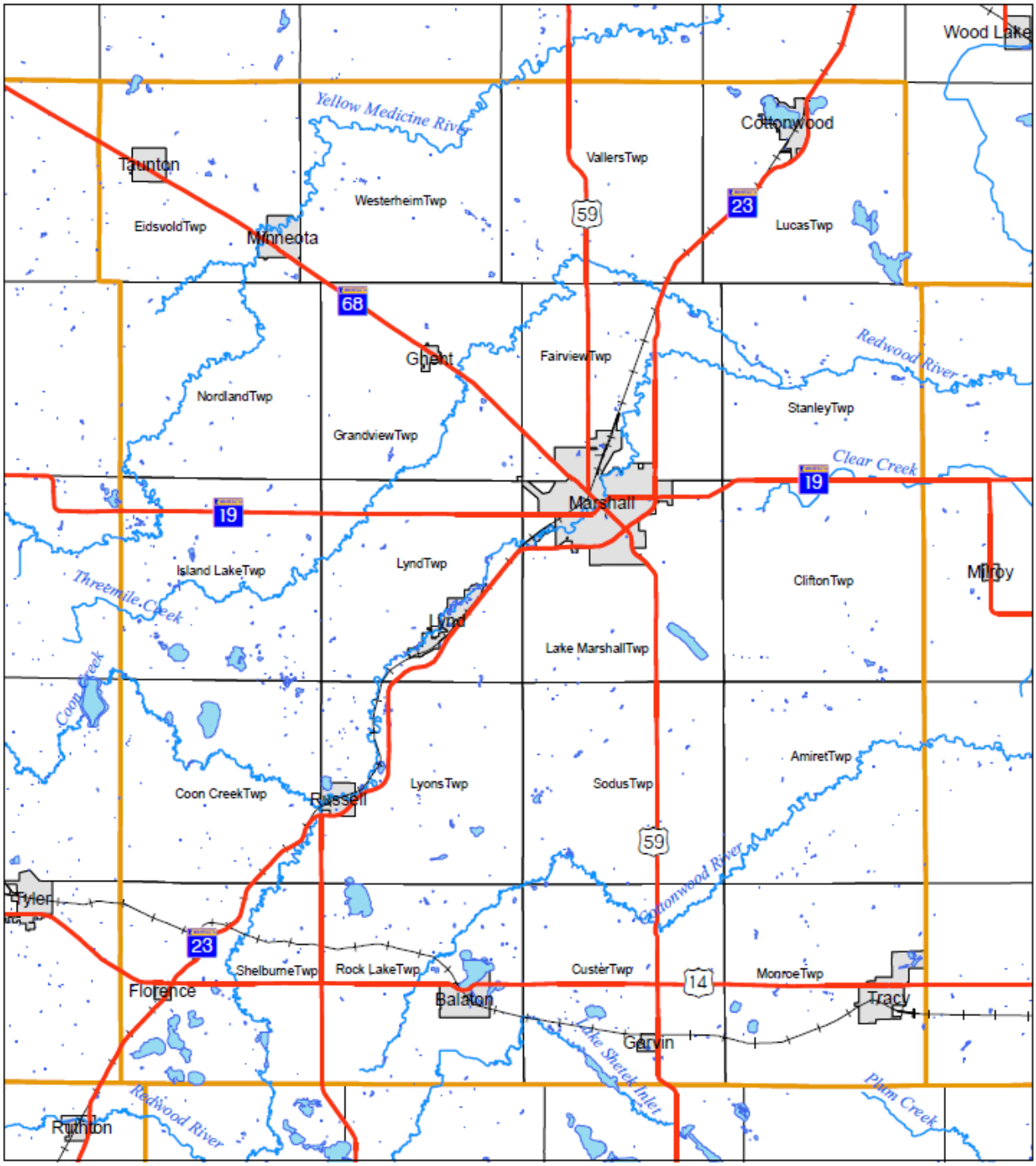


Lyon County
Local Units of Government

- Trunk Highways
- Railroad
- Lakes
- Rivers
- City
- Township
- County

Lyon County All Hazard Mitigation Plan

N

0 2 4 8 Miles

Source: Lyon County GIS, MnDOT, MnGEO, MPCA
Projection: NAD83 HARN Adj Lyon, SRDC 1.2010

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 Lyon 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 different programs that provide hazard mitigation funding. Typically grants allow a cost-share of 75 to 90 percent federal funding for eligible projects. FEMA offers five hazard mitigation assistance programs which are described in detail by HSEM in Section Two of the *Minnesota All-Hazard Mitigation Plan*. 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).

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 Lyon 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. An initial draft of this plan was reviewed by HSEM in April 2010.

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 not fully utilized in this plan due to deficiencies in the data available. It should be considered in preparing for the next plan update.

Funding for development of this plan was provided by Grant Award Number FEMA-1622-DR-MN 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

In 2007, while this planning effort was 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 universities, school districts, private nonprofit organizations, and multi-jurisdictional private nonprofit utilities (including 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 Lyon County

Lyon County was created in 1868 from Redwood County, and included the area that is now Lincoln County until 1873. The city of Marshall was founded in 1872 by the Winona and St. Peter Railroad Company. The county is named after Gen. Nathaniel Lyon who was killed in the Civil War.

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 range from an average of 14 degrees Fahrenheit in January to an average 74 degrees in July. Average precipitation has ranged between 21 and 40 inches in the last two decades; between 22 and 25 inches of precipitation were observed across the county in 2009. Lyon County normally receives 36-40 inches of snow per year.

Lyon County is approximately 150 miles west of the Minneapolis-St. Paul Metropolitan Area and 90 miles north of the Sioux Falls (South Dakota) Metropolitan Area. Lincoln County (Ivanhoe, county seat) is located to the west, Pipestone County (Pipestone) to the southwest, Murray County (Slayton) to the south, Redwood County (Redwood Falls) to the east, and Yellow Medicine County (Granite Falls) to the north.

Table 1-1
Civil Divisions in Lyon County

Cities	Townships
Balaton	Amiret
Cottonwood	Clifton
Florence	Coon Creek
Garvin	Custer
Ghent	Eidsvold
Lynd	Fairview
Marshall	Grandview
Minneota	Island Lake
Russell	Lake Marshall
Taunton	Lucas
Tracy	Lynd
	Lyons
	Monroe
	Nordland
	Rock Lake
	Shelburne
	Sodus
	Stanley
	Vallers
	Westerheim

University of Minnesota Remote Sensing and Geospatial Analysis Laboratory analysis indicates that 76% of land in Lyon County was in agricultural use in the year 2000. This accounts for over 351,000 of the 462,000 acres in the county. About 12% of land is in grass/shrub/wetland, while 7.25% is classified “urban”. The same analysis found that less than 2% (7,800 acres) of the county is considered “impervious” or developed such that water will run off rather than soak into the ground.

There are 11 incorporated cities and 20 townships in Lyon County. US Highway 59 runs north-south through the county, connecting I-90 at Worthington to I-94 near Fergus Falls. Minnesota Trunk Highway (TH) 23 runs from I-90 near the South Dakota border northeast through the county to Willmar and St. Cloud. The BNSF railroad runs parallel to TH 23. MN TH 19 runs east-west through the county, with TH 68 diverting from TH 19 in Marshall towards the northwest. US 59, TH 23, TH 19 and TH 68 all meet in the city of Marshall.

C.1 Demographics

Lyon County shares many of the opportunities and challenges common in rural Minnesota and the Midwest overall. While population in Southwest Minnesota has been generally contracting for several decades, Lyon County has held its own. In the year 2000, the U.S. Census counted 25,425 people in Lyon County. This was almost 5% more residents than in 1970. The County population peaked at 14,003 in 1950.

Table 1-2
Population in Southwest Minnesota

County	1970	1980	1990	2000	2008*
Cottonwood	14,887	14,854	12,694	12,167	11,222
Jackson	14,352	13,690	11,677	11,268	10,842
Lincoln	8,143	8,207	6,890	6,429	5,882
Lyon	**24,273**	**25,207**	**24,789**	**25,425**	**24,865**
Murray	12,508	11,507	9,660	9,165	8,526
Nobles	23,208	21,840	20,098	20,832	20,386
Pipestone	12,791	11,690	10,491	9,895	9,364
Redwood	20,024	19,341	17,254	16,815	15,680
Rock	11,346	10,703	9,806	9,721	9,459
Region 8	141,532	137,039	123,359	121,717	116,226
Minnesota					5,287,976

Source: US Census, *MN Demographic Center Estimate

Lyon County's 25,000 residents make up almost 10,000 households—about 2.5 persons per household. The City of Marshall is the county seat and largest city in the county with over 13,000 residents and 5,000 households.

Table 1-3
Estimated Population and Households in Lyon County

Minor Civil Division	2008 Population	2008 Households	Persons Per Household
Amiret township	199	82	2.43
Balaton city	600	271	2.21
Clifton township	254	85	2.99
Coon Creek township	255	92	2.77
Cottonwood city	1,160	473	2.45
Custer township	173	81	2.14
Eidsvold township	202	79	2.56
Fairview township	449	152	2.95
Florence city	45	17	2.65
Garvin city	138	51	2.71
Ghent city	355	152	2.34
Grandview township	271	88	3.08
Island Lake township	159	71	2.24
Lake Marshall township	495	181	2.73
Lucas township	221	80	2.76
Lynd city	390	151	2.58
Lynd township	438	152	2.88
Lyons township	190	70	2.71
Marshall city	13,141	5,226	2.51
Minneota city	1,384	607	2.28
Monroe township	214	83	2.58
Nordland township	211	73	2.89
Rock Lake township	230	104	2.21
Russell city	333	148	2.25
Shelburne township	138	65	2.12
Sodus township	261	98	2.66
Stanley township	218	85	2.56
Taunton city	180	65	2.77
Tracy city	2,126	896	2.37
Vallers township	203	78	2.60
Westerheim township	232	87	2.67
Lyon County	24,865	9,943	2.50

Source: MN Demographic Center

Southwest Minnesota State University, located in Marshall, provides a large pool of young people in Lyon County (if properly enumerated). However, the population of Southwest Minnesota overall has been becoming older at a faster rate than in Minnesota and the nation overall. The needs of these two demographic groups should be kept in mind when developing hazard response and recovery plans.

Table 1-4
Projected Population by Age and Gender

	Estimated		Projected											
	2005 Male	2005 Female	2010 Male	2010 Female	2015 Male	2015 Female	2020 Male	2020 Female	2025 Male	2025 Female	2030 Male	2030 Female	2035 Male	2035 Female
Lyon County														
0 to 4	754	705	840	800	910	860	930	880	900	860	880	840	860	820
5 to 9	803	726	700	660	770	740	820	780	830	800	810	770	790	760
10 to 14	859	824	780	710	710	670	770	730	810	770	810	770	790	760
15 to 19	974	1,008	860	920	790	820	750	810	800	860	810	860	820	870
20 to 24	1,298	1,249	1,060	1,220	1,010	1,170	940	1,070	950	1,100	930	1,100	960	1,130
25 to 29	820	753	970	980	850	980	810	930	750	860	750	870	750	880
30 to 34	721	662	670	710	780	890	710	890	680	850	610	780	620	800
35 to 39	751	701	710	610	670	650	760	790	710	790	680	760	620	690
40 to 44	882	887	710	650	670	580	630	600	720	720	680	720	650	690
45 to 49	919	1,013	820	860	670	650	630	580	600	600	670	700	640	700
50 to 54	842	821	900	920	810	790	660	600	620	540	600	550	670	650
55 to 59	631	614	740	730	800	820	720	710	590	550	560	490	540	500
60 to 64	483	507	570	590	670	700	720	790	650	690	540	530	510	480
65 to 69	433	403	440	450	520	520	610	620	660	700	610	610	510	480
70 to 74	287	396	380	370	390	410	470	490	560	590	610	660	570	590
75 to 79	313	381	250	360	330	340	340	380	410	460	490	550	550	630
80 to 84	210	374	220	300	180	290	240	280	260	320	320	390	390	470
85+	211	516	230	530	260	510	250	510	300	520	340	570	420	670
Gender totals	12,191	12,540	11,850	12,370	11,760	12,380	11,750	12,460	11,810	12,570	11,710	12,540	11,660	12,560
Total population		24,731		24,220		24,140		24,210		24,380		24,250		24,220

Source: Minnesota State Demographic Center, April 2007

C.2 Employment

Lyon County is part of a strong agricultural region in Southwest Minnesota. However, the county also has a long tradition of manufacturing and processing. According to the state Department of Employment and Economic Development (DEED), about 20% of jobs in Lyon County are in Goods-Producing industries. The Schwan Food Company, a global food manufacturing and sales company headquartered in the city of Marshall, is the largest employer in the county.

Recent contraction in the national economy has stressed local firms. However, the local unemployment rate of 5.3% in Lyon County and 3.7% in the city of Marshall were still below the Minnesota statewide average of 7.3% in December2009 (not seasonally adjusted), and much below the United States national rate of 9.7%.

There were 1,011 farms in Lyon County in 2007, 7% more than in 2002, according to the US Census of Agriculture. About 2/3 of farmers list farming as their primary occupation. The average size of a farm was 424 acres, and the average farm reported sales of $302,000. Most acres were planted to corn or soybeans. The County also has a significant amount of livestock, including turkeys, hogs and pigs, cattle, and sheep.

Table 1-5
Lyon County Employment By Industry

Industry	Number of Employees 2000	2004	2008
Total All Industries	14,608	14,297	14,881
Goods-Producing	5,230	2,908	2,941
Natural Resources	114	101	146
Construction	656	703	652
Manufacturing	4,459	2,104	2,143
Service-Producing	9,378	11,389	11,940
Trade, Transportation and Utilities	2,809	3,174	3,332
Information	204	n/a	167
Financial Activities	881	1,057	1,149
Professional and Business Services	428	n/a	1,593
Education and Health Services	2,813	3,128	3,089
Leisure and Hospitality	938	1,007	1,239
Other Services	543	502	562
Public Administration	761	757	810

n/a-not available

Source: QCEW

Table 1-6
Lyon County Major Employers 2009

Employer	NAICS	Products/Services	Number of Employees
Schwan Food Company	3119	Food Manufacturing	2,500
US Bank Corp.	5324	Commercial Leasing	450
Hy-Vee Foods	4451	Grocery Stores	400
Wal-Mart Supercenter	4521	Discount Store	400
Avera Marshall Reg Medical Ctr	6221	General Medical Hospital	385
Southwest Mn State University	6113	Colleges & Universities	375
Archer Daniels Midland Co	3112	Grain & Oilseed Milling	325
Marshall Public Schools	6111	Education	320
Norcraft Companies	3371	House & Inst Furniture Mfg	300
Turkey Valley Farms	3116	Poultry Processing	235
REM Service Inc.	6232	Res. Mental Health Svc	183
Minneota Manor Health Care	6231	Nursing Care Facilities	150
Tracy School District	6111	Education	135
North Star Companies	5241	Insurance Carriers	130

Source: DEED

C.3 Water

Lyon County lies just to the north and east of the Buffalo Ridge, draining into the Mississippi River and ultimately into the Gulf of Mexico. The majority of Lyon County is in the Minnesota River basin, which joins the Mississippi River in the Twin Cities. The Yellow Medicine River enters from Lincoln County and drains the northwest part of the county; the Redwood River enters from Pipestone and Murray Counties to the southwest and drains the central portion of the county; and the Cottonwood River drains the southeast portion of the county, all draining into the Minnesota River. The headwaters of the Des Moines River loop into Lyon County from Murray County near Balaton, draining a small area and eventually flowing into Iowa.

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.

Cottonwood Lake (at the city of the same name) is the largest lake in Lyon County. Rock Lake is the second largest lake, located between Russell and Balaton. School Grove Lake southeast of Cottonwood is the third largest, while Lake Yankton in Balaton is the fourth largest lake in the county. While none of these are as large as the resort lakes of northern Minnesota, many lakes 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.

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: Roads

Lyon County's transportation network is comprised of highways, railways, airports and trails. The system 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.

Lyon County has roads and bridges in state, county, and local jurisdictions with each entity having primary responsibility for construction and maintenance over their segments. The road network is designated by jurisdiction:

1. Trunk Highway System. Statewide routes originally established under a 1920 constitutional amendment. The routes are the responsibility of MnDOT. Lyon County is located in MnDOT's District 8, which has its primary office in Willmar. U.S. Highways 14 and 59, and State Highways 19, 23 and 64 are Trunk Highways (TH routes).

2. County State Aid Highways (CSAH). Roads or streets established and designated under county jurisdiction in accordance with Minnesota Statutes Chapter 162. The State provides funding assistance to maintain the CSAH system.

3. County Roads (CR). Roads established and maintained by the County under the sole authority of the County Board.

4. Township Roads. Roads established and maintained by township boards or reverted back to township jurisdiction by the County Board.

5. City Streets. Any street/road in a municipality not otherwise designated.

The road network is also classified according to function by MnDOT in line with US Department of Transportation Federal Highways Administration (FHWA) guidance. This Functional Classification helps understand how a route is used by the public, no matter the designation on the markers:

- Principal Arterial. Serve as statewide and interstate corridors, movements having trip lengths and travel density characteristics indicative of statewide or interstate travel. Also, serve all urbanized areas and a large majority of the small-urban areas with a population under 25,000 people. US 14, TH 23, and US 59 south of Marshall, and TH 19 east of Marshall are classified as Principal Arterials.

- Minor Arterial. Link cities, larger towns, and other traffic generators like major resort areas. Consistent with population density, and are spaced so that all developed areas of the state are within a reasonable distance of an arterial highway. US 59 north of Marshall, and TH 19 and TH 64 west of Marshall are classified as Minor Arterials.

- Major Collector. These routes provide service to the larger towns not served by higher systems and other traffic generation of equivalent intra-county importance such as consolidated schools and county parks. They also link these places with nearby large communities or with other arterials and serve as important intra-county travel corridors.

- Minor Collector. At intervals consistent with population density, these routes collect traffic from local roads and bring all developed areas within a reasonable distance to a collector road and provide service to the remaining smaller communities.

- Local Road. These routes serve as access roads to and from Minor Collectors, but they also serve as access to Collectors and Arterial roads. Most often these roads are under township or city jurisdiction. These are roads not classified as arterial or collectors, and include some county roads and most township roadways.

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.

MnDOT lists 232 bridges in Lyon County on their inventory of bridges over 20 feet. The Lyon County Engineer tracks 288 bridges, considering any structure (bridge or culvert) having a span greater than 10 feet as a bridge. Of these, 133 intersect with the mapped floodplain.

C.4.b Transportation Networks: Rail

There two railroads serving Lyon County. The Burlington Northern Santa Fe (BNSF) Railway crosses the county from the northeast to the southwest. The BNSF is a Class I railroad with 1,598 miles of track in Minnesota. Agricultural products account for the majority of rail commodities shipped in the region,

including grain, farm and chemical products. BNSF also hauls significant amounts of coal into the state on unit trains. The Marshall Subdivision, running from Willmar to the Iowa Border paralleling TH 23, sees about 14 trains a day, according to a technical memorandum for the MnDOT Statewide Rail Plan. This route is being considered for future passenger rail service. There are numerous rail crossings close to TH 23, often at skewed angles which make clear views difficult.

The Dakota, Minnesota and Eastern (DM&E) Railroad crosses the county east to west parallel to US 14. The city of Tracy has been a historical division point, back to the days of the Chicago Northwestern Railroad. The Class II DM&E, recently acquired by the Canadian Pacific Railway, has been proposed as a major coal-hauling route from the Powder River Basin of Wyoming which would significantly increase train traffic.

C.4.c Transportation Networks: Air

There are public airports located at Marshall and Tracy. Southwest Minnesota Regional Airport-Marshall (Ryan Field) is a modern municipal airport located in the northwest area of the city. There is a 7,220' primary runway to handle corporate/ commercial aircraft and possible future scheduled air service, as well as a 4,000' crosswind runway. The airport has charter flights available. Tracy Municipal Airport has one 3,100' paved runway and two sod crosswind runways (closed in winter), located northeast of the city.

The cities of Marshall and Tracy have adopted Airport Zoning regulations to protect adjacent land use from conflicts with airport traffic. MnDOT also reviews applications within a certain distance of an airport to reduce the chance of future use conflicts.

C.4.d Transportation Networks: Transit

The Community Transit Program of Western Community Action provides public transportation services for residents of Lincoln, Lyon, Redwood, Cottonwood and Jackson Counties. There is a centralized dispatch in Marshall and Jackson Dispatch Offices so each ride request can be efficiently coordinated and scheduled on a Community Transit bus or with a volunteer driver who drives their own personal vehicle.

There are a total of 16 lift accessible buses operating within in the City of Marshall and throughout Lyon, Redwood and Jackson counties. In addition nearly 100 volunteer drivers are available in all five counties to provide rides locally, when transit buses are not available, and to out of area locations such as Willmar, Mankato, Rochester, Worthington, the Metro area and Sioux Falls, SD. When individuals, family members, or service providers need transportation,

every effort is made by staff to schedule the ride or find other transportation options.

C.4.e Utilities

Xcel Energy (formerly Northern States Power Co) provides electrical service to the cities of Cottonwood and Garvin. Otter Tail Power provides electrical service to the cities of Ghent and Minneota. These two investor-owned utilities also serve some residents along distribution lines between cities.

Marshall Municipal Utilities provides electrical service within the city of Marshall. Minnesota Valley Co-Op Light & Power serves the northern townships, generally north of TH 68 and the city of Marshall. Lyon-Lincoln Electric Cooperative provides rural electric service to most of the rest of the county, as well as the cities of Russell and Lynd. There are a few service lines from neighboring rural electric co-ops Nobles REC and Redwood REC along the county lines.

Northern Border Pipeline Co. natural gas pipelines cross the county, entering from the south east of Garvin, continuing northwest past a large distribution station northwest of Garvin. This line splits, continuing northwest into Lincoln County and going north to Marshall, Cottonwood, and Yellow Medicine County. Great Plains Natural Gas Co. (MDU Resources Group) provides retail natural gas to the city of Marshall. Minnesota Energy Resources Corp provides natural gas to the cities of Cottonwood and Tracy. A Magellan Pipeline Co. petroleum products parallels the BNSF/TH 23 alignment from the southwest to the northwest, with a spur from the city of Marshall westward.

There are 18 public water supplies in the county registered with the Minnesota Department of Health (MDH). Lincoln-Pipestone Rural Water System (LPRW) provides potable water service throughout unincorporated Lyon County, as well as Lac qui Parle, Lincoln, Murray, Nobles, Pipestone, Redwood, Rock and Yellow Medicine counties. LPRW sources its water supply from well fields near Holland in Pipestone County, Verdi in Lincoln County, and Burr (west of Canby) in Yellow Medicine County. LPRW also provides water in or to the cities of Florence, Ghent, Lynd, Marshall, Minneota, Russell, and Taunton. The cities of Balaton, Cottonwood, Marshall and Tracy also operate their own wells.

Wellhead Protection Areas and Drinking Water Supply Management Areas (DWSMA) have been designated by the MDH for well fields serving Balaton and Marshall. Overall, wells registered with MDH range in depth from 31-399 feet. The Balaton wells, 2 wells at Garvin Park, and Marshall Well #20 (constructed in 1983) are indicated as highly sensitive to potential contamination, typically because of the local geological setting. The Balaton DWSMA includes all of the

city proper, so there are many potential sources of contamination with which to be concerned. More specific vulnerability mapping has been done within each DWSMA.

Table 1-7
Public Water Supplies in Lyon County

PWS Name	ID	Address	City
Balaton	1420001	City Hall	Balaton
Camden State Park	5420143	1897 County Road 6	Lynd
Cottonwood	1420002		Cottonwood
Evangelical Free Lutheran Church	5420026	2667 County Road 7	Marshall
Fairview Township Water Association	1420012		Green Valley
Florence	1420003		Florence
Garvin	1420011		Garvin
Garvin Park	5420130	2782 - 150th Street	Garvin
Ghent	1420004	Lincoln-Pipestone RWS	
Harvest States Cooperatives	5420028	2712 County Road 6	Marshall
Kingdom Hall of Jehovah's Witnesses	5420145	2865 - 269th Avenue	Marshall
Lynd	1420005	Lincoln-Pipestone RWS	
Marshall	1420006	1901 Hwy. 23 Bypass S	Marshall
Minneota	1420007	Lincoln-Pipestone RWS	
Redwood River Rest Area	5420015	Highway 23 SW	Marshall
Russell	1420008		Russell
Taunton	1420009	Lincoln-Pipestone RWS	
Tracy	1420010	Morgan Street	Tracy
Number of PWS selected	**18**		

Source: Minnesota Dept. of Health, Source Water Protection

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.

Each of the cities in Lyon County has centralized sewer treatment systems, except for the City of Florence which relies on private subsurface treatment systems (septic systems).

C.4.f Communications Networks

Incumbent landline telephone services are provided by different companies in Lyon County. Qwest Corp (formerly US West) serves the Marshall and Tracy exchanges. Frontier Communications serves the Balaton area. Citizens

Telecomm serves Cottonwood, Ghent, and Lynd exchanges, as well as the Florence area (Tyler exchange). Locally-owned Woodstock Telephone Company serves Russell and Garvin, as well as areas along the Murray/Pipestone county line (Ruthton exchange). A few sections southeast of Marshall are also served by Minnesota Valley Telephone Co. on the Milroy exchange. Knology (formerly PrairieWave) provides competitive, cable-based, telephone service in Marshall and Tracy.

Wireless telephone service is provided by Sprint, Unicel and Verizon Wireless (formerly Alltel). Unicel was recently purchased by AT&T. Lyon County is participating in the Statewide Radio Board's Allied Radio Matrix for Emergency Response (ARMER) system using existing towers, with possibly one additional tower to be constructed. A HSEM Region V communications vehicle is located at Marshall, which can provide backup PSAP (Public Safety Answering Point) for any county in the region, with extra hand-held radios and amateur radio capabilities.

NOAA (National Oceanic and Atmospheric Administration) Weather Radio is used for warning citizens of storm events. Lyon County is covered by 1,000 watt transmitter KX150 Russell, MN, at 162.500 MHz. Transmitter KXI31 Jeffers, MN, at 162.450 MHz, can also be heard, with spotty coverage from WNG702 Fulda, MN at 162.425 MHz. Lyon County's Specific Alert Message Encoding (SAME) code is 027083.

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.

C.5 Critical Community Facilities

The Lyon County Government Center, constructed in 1939 with additions in 1974 and 1994, is located on West Main in downtown Marshall, adjacent to the BNSF railroad tracks. The Lyon County Law Enforcement Center, constructed in 1978, is also at this location. The County recently constructed a new jail between the two buildings. Lyon County Public Works occupies a precast concrete building built in 2002, located at the Lyon County Fairgrounds on the west side of Marshall. Lyon County Public Works also has 5 maintenance facilities throughout the county.

Each city in the county has a city hall and most townships have township halls.

Schools are also important community facilities. Marshall School District has five sites in the city of Marshall. There are elementary and secondary schools in

Cottonwood (Lakeview District), Minneota, and Tracy, and an elementary school in Lynd. The RTR school district has a middle school at Russell, as well as facilities in Lincoln and Pipestone counties.

Southwest Minnesota State University (SMSU) campus is located on the north west corner of US 59 and TH19, providing post-secondary services as part of the Minnesota state higher education system. There are about 3,700 students enrolled at SMSU and 150 faculty employed.

Table 1-8
Public School Enrollment in Lyon County 2009

School District	Location	Enrollment
Lakeview	Cottonwood	591
Lynd (PK-8)	Lynd	114
Marshall	Marshall	2203
Minneota	Minneota	469
RTR Middle School	Russell	120

Source: MN Dept of Education

See Chapter 4, Section IX for an assessment of vulnerability of critical community facilities.

C.5.a Emergency Services

Lyon County Emergency Management and the Emergency Operations Center located in the Sherriff's Office at the Law Enforcement Center in Marshall. Lincoln-Lyon-Murray-Pipestone (LLMP) Public Health provides public health services across four counties from a central office at the County Government Center in Marshall.

Each city in the county has its own fire department, usually also serving adjacent rural areas, except that the City of Florence is covered by the Tyler Fire Department in Lincoln County. Milroy Fire Dept. serves several sections near that Redwood County city.

Ambulance service is provided out of Balaton, Cottonwood, Marshall, Minneota and Tracy. An area in Shelburne, Coon Creek and Island Lake townships adjacent to Lincoln County is served by Tyler EMS.

Avera Marshall Regional Medical Center, part of Sioux Falls-based Avera Health Systems, is a 49-bed Level III Trauma Center. Sanford Tracy Medical Center, part of Sioux Falls-based Sanford Health, is a 25-bed Level IV Trauma Center, with a clinic on-site and a satellite clinic in Balaton.

The cities of Balaton, Minneota, Marshall, and Tracy have their own police service. Lyon County Sheriff's Office provides law enforcement throughout the county, and in the cities of Cottonwood, Ghent, and Russell on contract. The County's E-911 service is also operated from the Law Enforcement Center.

Refer to the County Emergency Operations Plan (EOP) for more detailed information on emergency services resources.

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

Lyon County is located in Southwest Minnesota along the South Dakota border. With a population of nearly 25,000, Lyon County is a primarily rural, agricultural area with the county seat of Marshall a regional commercial and industrial center. 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 May 2007, the Lyon County Board of Commissioners passed Resolution #21-07 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*. The following cities passed resolutions of intention to participate in the process.

- Balaton
- Cottonwood
- Florence
- Garvin
- Ghent
- Lynd
- Marshall
- Minneota
- Russell
- Taunton
- Tracy

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, the following townships did pass formal resolutions of participation:

- Clifton
- Coon Creek
- Custer
- Eidsvold
- Fairview
- Grandview
- Island lake
- Lake Marshall
- Lucas
- Lynd
- Lyons
- Monroe
- Nordland
- Rock Lake
- Shelburne
- Sodus
- Stanley
- Vallers
- Westerheim

B. Adoption Procedure

Each jurisdiction participating in the plan must formally adopt the plan after FEMA provisionally approves the document (Section 1.B.1). 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 the County's intention (or necessarily that of any other participating jurisdiction) to adopt this plan by ordinance, it is essential that the plan is compatible with other adopted 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. This plan must be adopted within one year of provisional FEMA approval, or else be updated and re-submitted to FEMA again.

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.

Lyon 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 Lyon County have full-time staff and they all rely on Lyon County Emergency Management as a clearinghouse for intergovernmental cooperation. Lyon 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 Lyon County All Hazards Mitigation Planning Team. Activities of the team are described in Chapter 3, Section IV.B below. All cities 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).

Table 2-1
Multi-Jurisdictional Participation in Lyon County AHMP Process
2007-2010

Local Unit of Government	Resolution of Participation	Representative on Planning Team	Capabilities Worksheet	Mitigation Strategy
Balaton	Yes	Yes	Yes	Yes
Cottonwood	Yes	Yes	Yes	Yes
Florence	Yes		Yes	Yes
Garvin	Yes	Yes	Yes	Yes
Ghent	Yes	Yes	Yes	Yes
Lynd	Yes	Yes	Yes	Yes
Marshall	Yes	Yes	Yes	Yes
Minneota	Yes	Yes	Yes	Yes
Russell	Yes	Yes	Yes	Yes
Taunton	Yes	Yes	Yes	Yes
Tracy	Yes	Yes	Yes	Yes
Lyon County	Yes	Yes	Yes	Yes

Cities not present on the Planning Team (or missing team meetings) were consulted on strategies by telephone or personal visit. For example, cities were consulted prior to the

final strategies meetings (Chapter 3, Section IV.A. below). On 5 February 2010, SRDC staff consulted the city clerk of Balaton by telephone. On 8 February staff consulted with clerk/administrators at Cottonwood, Lynd, Minneota, Russell and Tracy, and the City Engineer's office at Marshall. On 9 February staff consulted with city clerks at Garvin, Ghent and Taunton, and followed-up on questions with Balaton and Lynd. After meetings on 10 February and 16 February, SRDC staff and Lyon County Emergency Management followed-up with each city not in attendance 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. Any jurisdiction wishing to modify or join the plan at a later date should contact Lyon County Emergency Management.

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 Pipestone County and Lyon County to complete multi-jurisdictional hazard mitigation plans for each county. Notice of approval under DR-1622 was received by SRDC with an effective date of 26 January 2007. An executed Sub-Grantee Agreement was received by SRDC on 30 March 2007, at which time formal work on the project began. In May 2007, Lyon County passed a Resolution of Intention to participate in the all-hazard mitigation process.

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

Lyon County Emergency Management arranged all meetings and SRDC staff facilitated the meetings. Lyon County GIS 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 November 2007.
2. The Planning Team met to review the community profile and hazard profiles in January 2008, identifying hazards present in the county.
3. The Planning Team ranked hazards county-wide by consensus at a meeting in March 2008.
4. A public Open House was held at the Law Enforcement Center in June 2008 to present Hazard Identification results and solicit comments on goals and objectives for mitigation.

During plan development, FEMA was in the process of developing Digital Flood Insurance Rate Maps (dFIRMS) for Lyon County. FEMA also revised requirements for local multi-hazard mitigation (*Local Multi-Hazard Mitigation Planning Guidance*, 1 July 2008) which required the re-assessment of several work items. The mapping process was supposed to be finished in late 2008, then late 2009. Hoping that new maps would be finished for flood hazard mitigation, progress slowed while SRDC and staff used the time to perform further research regarding items identified at the open house, such as more in-depth analysis on requirements of the National Flood Insurance Program (NFIP).

When dFIRM maps had not been approved by the start of 2010, the Planning Team reconvened to review and comment on specific mitigation actions to meet goals, objectives and strategies.

5. On 10 February 2010, members of the Planning Team discussed a comprehensive range of specific mitigation items for each participating jurisdiction.
6. On 16 February 2010, representatives of cities participating in NFIP, and those with identified floodplains on the draft dFIRMS, met with staff from the County and Minnesota DNR Waters Division to 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, Lyon 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. Lyon 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 be essential to make the plan turn into 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

Lyon County All Hazard Planning Team

Tammy VanOverbeke	Lyon County Emergency Management
Joel Dahl	Lyon County Sheriff (2007-2008)
Mark Mather	Lyon County Sheriff (2008-2010)
Ryan Wendt	Lyon County GIS
John Biren	Lyon County Planning & Zoning
Del Rutz	City of Balaton Mayor (2007-08)
Darrell Crumrine	City of Balaton Fire Dept.
Greg Isaackson	City of Cottonwood Administrator
George Mason	City of Garvin Civil Defense
Ron Sussner	City of Ghent Mayor
Jim Andries	City of Lynd Council
Bob Byrnes	City of Marshall Mayor
Shane Waterman	City of Marshall Ast. Engineer
Dan Canton	City of Minneota Administrator
Jim Kerkaert	City of Russell Mayor
Mike Breyfogle	City of Taunton Mayor
Bryan Hillger	City of Tracy Police Chief
Terry Schrieber	Eidsvold Twp Chair / Township Association
Troy Wendland	Rock Lake Twp. Chair / Balaton Fire Dept.
Jeff Moberg	Lincoln-Lyon-Murray-Pipestone Public Health
Mike Munford	SMSU Public Safety

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

The Lyon County All-Hazard Mitigation Plan is intended to bring resources together to mitigate and respond to hazards, protecting public health, safety and welfare in a useful and easily understood all-hazards approach, while meeting HSEM & FEMA requirements.

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 Lyon 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 2007 and 2008. All incorporated municipalities approved resolutions of participation in public meetings (Section II.A).

SRDC Staff and the Lyon County Emergency Manager met with the County Township Association at their meeting on 26 March 2008 to discuss the hazard mitigation process. No townships in the county have paid staff, and most township mitigation activities are managed by the County. Nineteen of twenty townships supported the program with resolutions (Section II.A also).

Public Notice of all Planning Team meetings was posted at the Courthouse according to local practice. As there are no local television 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 neighboring Minnesota counties on their hazard mitigation plans:

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

D.1 Public Open House

SRDC and Lyon County Emergency Management organized a Public Open House at the Lyon County Law Enforcement Center on 19 June 2008. 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.

The event was advertised twice in the official county newspaper (the *Marshall Independent*), a flyer was provided to local units of government and regional agencies, and a press release distributed to media in the region, which was picked up by the daily Marshall Independent. Participants in addition to Planning Team members included local residents and representatives of major employer Schwans, Avera Marshall Hospital, Southwest Minnesota State University, the City of Marshall, and County government.

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)

Dahlgren, Sharlow & Uban, Inc, City of Marshall 1996 Comprehensive Plan.

Dahlgren, Sharlow & Uban, Inc, Lyon County Comprehensive Plan (July 2002)

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)

Lyon County Local Comprehensive Water Management Plan, Lyon County Environmental Office (December 2008).

Lyon County Zoning Ordinance (February 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 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, Jim with K.C. Topping, C.D. Eadie, R.E. Deyle, R.A. Smith, Planning for Post-Disaster Recovery and Reconstruction PAS 483/484 (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, Lyon County and all 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 city and county comprehensive (land use) plans, economic development plans, transportation plans, 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). This is a recommendation ("should"), not a requirement. This profile is included in Chapter I as Section I.C.

CHAPTER 4: RISK ASSESMENT

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

No Presidential Disaster Declarations have been declared for Lyon County in the last 10 years. 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:
Anoka, Becker, Beltrami, Benton, Big Stone, Blue Earth, Brown, Carver, Cass, Chippewa, Clay, Clearwater, Dakota, Douglas, Goodhue, Grant, Hennepin, Houston, Hubbard, Kandiyohi, Kittson, Lac Qui Parle, Lake of the Woods, Le Sueur, Lincoln, Lyon, Mahnomen, Marshall, McLeod, Morrison, Murray, Nicollet, Norman, Otter Tail, Pennington, Polk, Pope, Ramsey, Red Lake, Redwood, Renville, Roseau, Scott, Sherburne, Sibley, St. Louis, Stearns, Stevens, Swift, Todd, Traverse, Wabasha, Wadena, Washington, Wilkin, Winona, Wright, Yellow Medicine
4/8/1997 Severe Flooding, High Winds, & Severe Storms
PA, IA, HM

#1158 in 40 Counties:
Blue Earth, Brown, Chippewa, Clay, Clearwater, Cottonwood, Douglas, Faribault, Grant, Jackson, Kandiyohi, Kittson, Lac Qui Parle, Lincoln, Lyon, Mahnomen, Marshall, Martin, Murray, Nicollet, Nobles, Norman, Otter Tail, Pennington, Pipestone, Polk, Pope, Red Lake, Redwood, Renville, Rock, Roseau, Stevens, Swift, Traverse, Watonwan, Wilkin, Yellow Medicine
1/16/1997 Severe Winter Storms & Blizzards, Snow Emergency Declaration
PA

#1151 in 12 Counties:
Cottonwood, Faribault, Freeborn, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Rock, Waseca, Yellow Medicine
1/7/1997 Severe Ice Storm
PA, HM

#993 in 57 Counties:
Aitkin, Becker, Big Stone, Blue Earth, Brown, Carver, Chippewa, Clay, Cottonwood, Dakota, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Grant, Houston, Jackson, Kandiyohi, Kittson, Lac Qui Parle, Le Sueur, Lincoln, Lyon, Mahnomen, Marshall, Martin, McLeod, Meeker, Mower, Murray, Nicollet, Nobles, Norman, Otter Tail, Pipestone, Polk, Pope, Ramsey, Redwood, Renville, Rice, Rock, Roseau, Scott, Sibley, Steele, Stevens, Swift, Traverse, Wabasha, Waseca, Washington, Watonwan, Winona, Wright, Yellow Medicine
6/11/1993 Severe Storms, Tornadoes & Flooding
PA, IA, HM

#946 in 10 Counties:
Chippewa, Kandiyohi, Lac Qui Parle, Lyon, Murray, Nobles, Redwood, Renville, Wright, Yellow Medicine
6/26/1992 Severe Storms, Tornadoes & Flooding
PA, IA, HM

#255 in 70 Counties:
Aitkin, Anoka, Becker, Beltrami, Benton, Big Stone, Blue Earth, Brown, Carver, Chippewa, Chisago, Clay, Cottonwood, Crow Wing, Dakota, Douglas, Faribault, Fillmore, Goodhue, Grant, Hennepin, Houston, Isanti, Jackson, Kanabec, Kandiyohi, Kittson, Lac Qui Parle, Lake of the Woods, Le Sueur, Lincoln, Lyon, Mahnomen, Marshall, Martin, McLeod, Meeker, Mille Lacs, Morrison, Murray, Nicollet, Nobles, Norman, Otter Tail, Pennington, Pine, Pipestone, Polk, Pope, Ramsey, Red Lake, Redwood, Renville, Rock, Roseau, Scott, Sherburne, Sibley, Stearns, Stevens, Swift, Traverse, Wabasha, Wadena, Washington, Watonwan, Wilkin, Winona, Wright, Yellow Medicine
4/18/1969 Flooding
PA, IA

A.1 Methodology

When the project started in 2007, The Lyon 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.A and B 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 were eliminated from discussion since the team judged local risk inconsequential. 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 or 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

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 Infrastructure

Utility Failure and Water Supply Infrastructure were initially identified as technological hazard. Utilities 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. Water Supply issues were considered with drought (quantity) and hazardous materials (quality).

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 Lyon 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 Lyon 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 Lyon 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 2007, 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 Lyon County. It is the judgment of the All-Hazard Mitigation Planning Team based on experience within the county, the prevalence of crop agriculture and the relative ease with which crop diseases spread, 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 attached 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. The Planning Team identified a concern with the Forest Tent Caterpillar defoliating trees in the Redwood River valley. These insects favor broadleaf trees such as poplar and oaks, and do not feed on red maple and most conifers.

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 Lyon 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.

Lyon 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 does benefit from receiving news of impending weather events from the West.

A.2.a Locations Affected by the Hazard

All locations in Lyon County are equally exposed to this hazard. Roads throughout the county are at risk from ice or blowing and drifting snow. 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 may face similar conditions. City residents are also at risk for utility failure. Attempting to travel between communities would expose city dwellers to higher levels of risk commensurate with their rural counterparts.

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.

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. Winter storms often lead to hazardous conditions for transportation infrastructure.

A.2.c Previous Occurrences of the Hazard

Winter storms (snow & ice events) covering all or part of Lyon County—often a much larger area—have been documented 48 times in the National Climatic Data Center (NCDC) Storm Events database since 1993. No deaths or injuries and minimal local property damage have been directly attributed to these storms.

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 15-16 December 2003, freezing rain produced icy roads across Southwest Minnesota. Snowfall of 3-6 inches followed with wind gusts over 40 mph, causing visibilities to drop to less than a quarter mile. The combination of freezing precipitation, snow and strong winds brought down electrical lines (mostly in Murray and Nobles counties).

Table 4-1

NCDC Snow & Ice Events in Lyon County

Dth: Deaths
Inj: Injuries
PrD: Property Damage

Location or County	Date	Time	Type	Dth	Inj	PrD
1 MNZ002 - 003 - 011 - 012 - 016>048 - 054>057 - 064 - 065 - 071>073 - 080 - 081 - 089 - 090 - 097 - 098	11/12/1993	1600	Ice Storm And Snow	0	0	0
2 MNZ001>003 - 012 - 015>020 - 022>067 - 071>075 - 080>083 - 089>092 - 097 - 098	11/24/1993	800	Heavy Snow	0	0	0
3 MNZ011 - 012 - 018>021 - 025 - 026 - 032>038 - 040>096	4/28/1994	400	Heavy Snow And Ice	0	0	0
4 MNZ020 - 021 - 029>098	11/27/1994	500	Heavy Snow/ice	0	0	0
5 MNZ003>020 - 029>059 - 064>067 - 071>075 - 080>083 - 089>091 - 097 - 098	3/4/1995	1200	Heavy Snow Andblowing Snow	0	0	0
6 MNZ038 - 049>052 - 054>060 - 064>068 - 072 - 073 - 079 - 084>088 - 091>096	3/6/1995	0	Heavy Snow	0	0	0
7 Southwest Mn	4/9/1995	1600	Heavy Snow	0	0	0
8 MNZ039 - 040 - 046>048 - 054>057 - 064 - 065 - 071>073 - 080	4/11/1995	1700	Heavy Snow/ice	0	0	0
9 MNZ071>072 - 080>081 - 089>090 - 097>098	11/14/1996	4:00 PM	Ice Storm	0	0	13.0M
10 MNZ071>072 - 080>081 - 089>090 - 097>098	12/14/1996	6:00 AM	Heavy Snow	0	0	0
11 MNZ071>072 - 080>081 - 089>090 - 097	1/3/1997	5:00 PM	Ice Storm	0	0	0
12 MNZ071>072 - 080>081 - 089>090 - 097>098	3/13/1997	1:00 AM	Ice Storm	0	0	40K
13 MNZ071>072 - 097>098	3/31/1998	8:00 AM	Heavy Snow	0	0	0
14 MNZ071>072 - 080>081 - 089>090 - 097>098	1/1/1999	8:00 AM	Winter Storm	0	0	0
15 MNZ071>072 - 080>081 - 089>090 - 097>098	3/8/1999	3:00 AM	Winter Storm	0	0	0
16 MNZ071>072 - 080>081 - 089>090 - 097	10/1/1999	8:00 AM	Heavy Snow	0	0	35K
17 MNZ072 - 080>081 - 089>090	1/19/2000	7:00 AM	Winter Storm	0	0	0
18 MNZ071>072 - 080>081 - 089>090 - 097>098	4/7/2000	2:00 AM	Heavy Snow	0	0	0
19 MNZ071>072 - 080>081 - 089 - 097>098	4/16/2000	3:00 AM	Ice Storm	0	0	20K
20 MNZ071>072 - 080>081 - 089>090 - 097>098	1/29/2001	12:00 PM	Winter Storm	0	0	80K
21 MNZ071>072	2/7/2001	4:00 AM	Winter Storm	0	0	0
22 MNZ071>072 - 080>081 - 089>090 - 097>098	2/24/2001	2:00 PM	Winter Storm	0	0	20K
23 MNZ072 - 080>081 - 089>090	3/11/2001	6:00 PM	Winter Storm	0	0	0
24 MNZ071>072 - 080>081 - 089>090 - 097>098	11/26/2001	7:00 AM	Heavy Snow	0	0	0
25 MNZ071>072 - 080>081 - 089>090 - 097>098	2/9/2002	10:00 AM	Winter Storm	0	0	0
26 MNZ071>072 - 080>081 - 089>090 - 097>098	3/14/2002	10:00 AM	Winter Storm	0	0	100K
27 MNZ071>072 - 080>081 - 089>090 - 097>098	4/20/2002	11:00 PM	Heavy Snow	0	0	0
28 MNZ072 - 089 - 097>098	2/14/2003	2:00 PM	Winter Storm	0	0	0
29 MNZ071>072 - 080>081 - 089>090 - 097>098	11/3/2003	4:00 AM	Winter Weather/mix	0	0	0
30 MNZ071>072 - 080>081 - 089 - 097>098	11/23/2003	3:00 AM	Winter Storm	0	0	0
31 MNZ071>072 - 080>081 - 089>090 - 097>098	12/2/2003	11:00 PM	Winter Weather/mix	0	0	0
32 MNZ072 - 080>081 - 089 - 097>098	12/8/2003	11:00 PM	Winter Storm	0	0	0
33 MNZ071>072 - 080>081 - 089>090 - 097>098	12/15/2003	2:00 PM	Winter Storm	0	0	20K
34 MNZ071>072 - 080>081 - 089>090 - 097>098	1/25/2004	11:00 AM	Winter Storm	0	0	0
35 MNZ071>072 - 080>081 - 089>090 - 097>098	2/11/2004	6:00 AM	Winter Weather/mix	0	0	0
36 MNZ071>072 - 080>081 - 089>090 - 097>098	12/20/2004	7:30 AM	Winter Weather/mix	0	0	0
37 MNZ071>072 - 080>081 - 097	1/21/2005	6:00 AM	Winter Storm	0	0	0
38 MNZ071>072 - 080>081 - 089>090 - 097>098	3/18/2005	12:00 AM	Winter Storm	0	0	0
39 MNZ071>072 - 080>081 - 089>090 - 097>098	11/30/2005	2:00 PM	Winter Weather/mix	0	0	0
40 MNZ071>072 - 080>081 - 089>090 - 097	12/13/2005	9:00 PM	Winter Weather/mix	0	0	0
41 MNZ071>072 - 080>081 - 089>090 - 097>098	3/12/2006	4:00 PM	Winter Storm	0	0	0
42 MNZ072 - 080 - 097 - 098	1/14/2007	13:00 PM	Winter Weather	0	0	0K
43 MNZ072 - 089 - 090	1/20/2008	16:00 PM	Winter Weather	0	0	0K
44 MNZ072 - 089 - 098	2/4/2008	6:00 AM	Winter Weather	0	0	0K
45 MNZ071 - 072	12/2/2008	16:00 PM	Winter Weather	0	0	0K
46 MNZ071 - 072	1/3/2009	12:00 PM	Winter Weather	0	0	0K
47 MNZ072 - 080 - 089	1/8/2009	19:00 PM	Winter Weather	0	0	0K
48 MNZ072 - 080 - 098	1/12/2009	14:00 PM	Winter Weather	0	0	0K
			TOTALS:	0	0	13.315M

Source: National Climatic Data Center

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 most recent winter storm event listed in the NCDC database occurred on 4-12 January 2009, when 1”-2” of snow fell across Lyon, Murray, and Rock counties accompanied by strong north to northeast winds gusting over 50 mph, producing visibilities near zero. Several winter storm and blizzard warnings (not yet in the NCDC database) were issued while this plan was being drafted 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

The entire county is equally at risk for drought compared to the region overall; however, areas within the county may be affected differently by drought conditions. 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 are more likely to experience shortages than areas with access to municipal and rural water suppliers. Once again, the rural nature of the county may provide different levels of impact within the county, but the small size of the county and interdependence of the residents will result in any drought event having a significant impact on the entire county.

A.3.b Extent of the Hazard

Lyon County’s economic base relies heavily on agriculture, leading to ongoing concern in the county 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 majority of drinking water in Lyon County comes from groundwater, either from individual wells or through municipal and rural water systems. While not as susceptible to drought as surface water supplies, even short-term changes in aquifer levels matching variable precipitation have been documented in the region. The Minnesota Department of Health has worked with the cities of Balaton and Marshall to develop Wellhead Protection Plans to help protect long-term quality and quantity of drinking water.

The MAHMP describes the Minnesota Department of Natural Resources (DNR) Division of Waters role in integrated planning for water conservation:

> *In terms of water conservation the DNR implements a state statute, M.S. 103G.261, that defines water use priorities for use when water supplies are limited. Similarly, M.S. 103G.291 has several subdivisions related to public water suppliers. For example, Subp.3 requires public water suppliers serving more than 1,000 people to have a "water emergency and conservation plan" approved by the DNR. Approximately 320 plans have been submitted. DNR has guidelines for developing plans and other materials that identify methods for reducing water use. Plans must include local water allocation priorities consistent with the priorities in M.S. 103G.261 along with triggers for implementing measures…for protection of higher priority essential water uses. Communities applying for projects under the State Drinking Water Revolving Fund must have and implement a DNR approved water emergency and conservation plan.*

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 five periods of a drought event for the region in 1999 -2000. 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 occur occasionally in the area (1%-10% 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

All locations in Lyon County are at risk for this hazard. Wildfire can start in grasslands or in crops (cornfields for example). Although rural areas are typically at greater risk for wildfire, more structures are at risk along the rural-urban interface. The planning team expressed some concern with the risk of wildfire on conservation lands, such as CRP acres.

Incidents of structure fires tend to be controlled to one or two buildings, rather than spreading widely. 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. 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 of the fire departments in Lyon County reported to the State Fire Marshall in 2008. There were 8 arsons (Incendiary Incidents) and 107 fire runs reported in the county. There have been 8 fire deaths in Lyon 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. DNR reported in the MAHMP an average

of 20 acres burned per year (1997-2007). 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 every year, and wildfires are almost as likely to occur. The All Hazard Mitigation Planning team considered the risk of structures fires average, and wildfire limited.

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

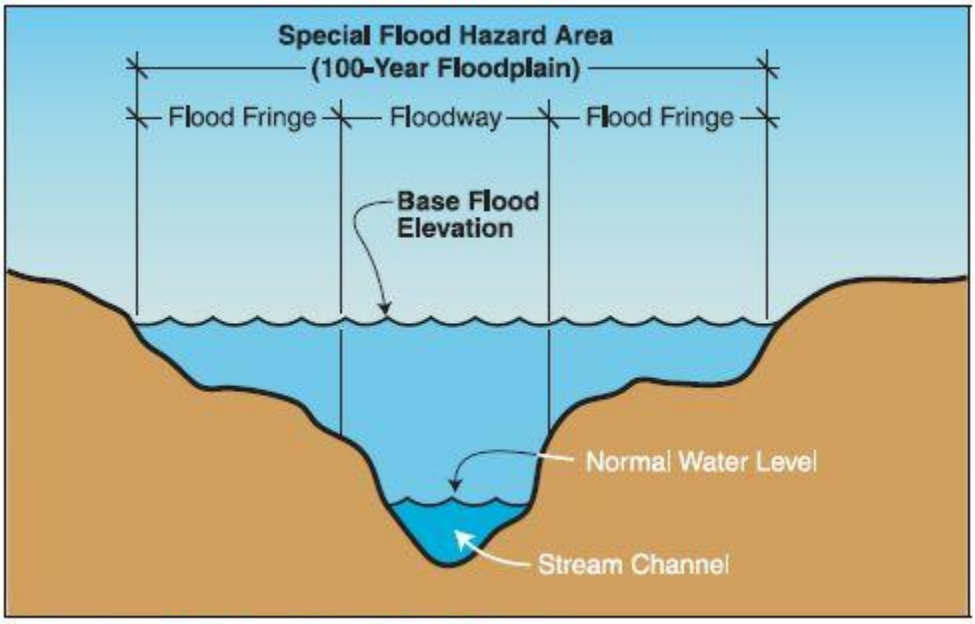
The Federal Emergency Management Agency (FEMA) maps the probability of flood waters inundating floodplains. Specifically, FEMA works with local communities to map the Special Flood Hazard Area (SFHA), commonly known as the 100-year floodplain, where they calculate a 1% chance of a flood event any given 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. In some areas, a 0.2% annual probability area (500-year floodplain) is also mapped.

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 has been working with FEMA to engineer, review and adopt digital floodplain maps, or

dFIRMs. Draft dFIRM maps were used in this plan to estimate flood hazard areas.

Figure 4-1 The 100-Year Floodplain



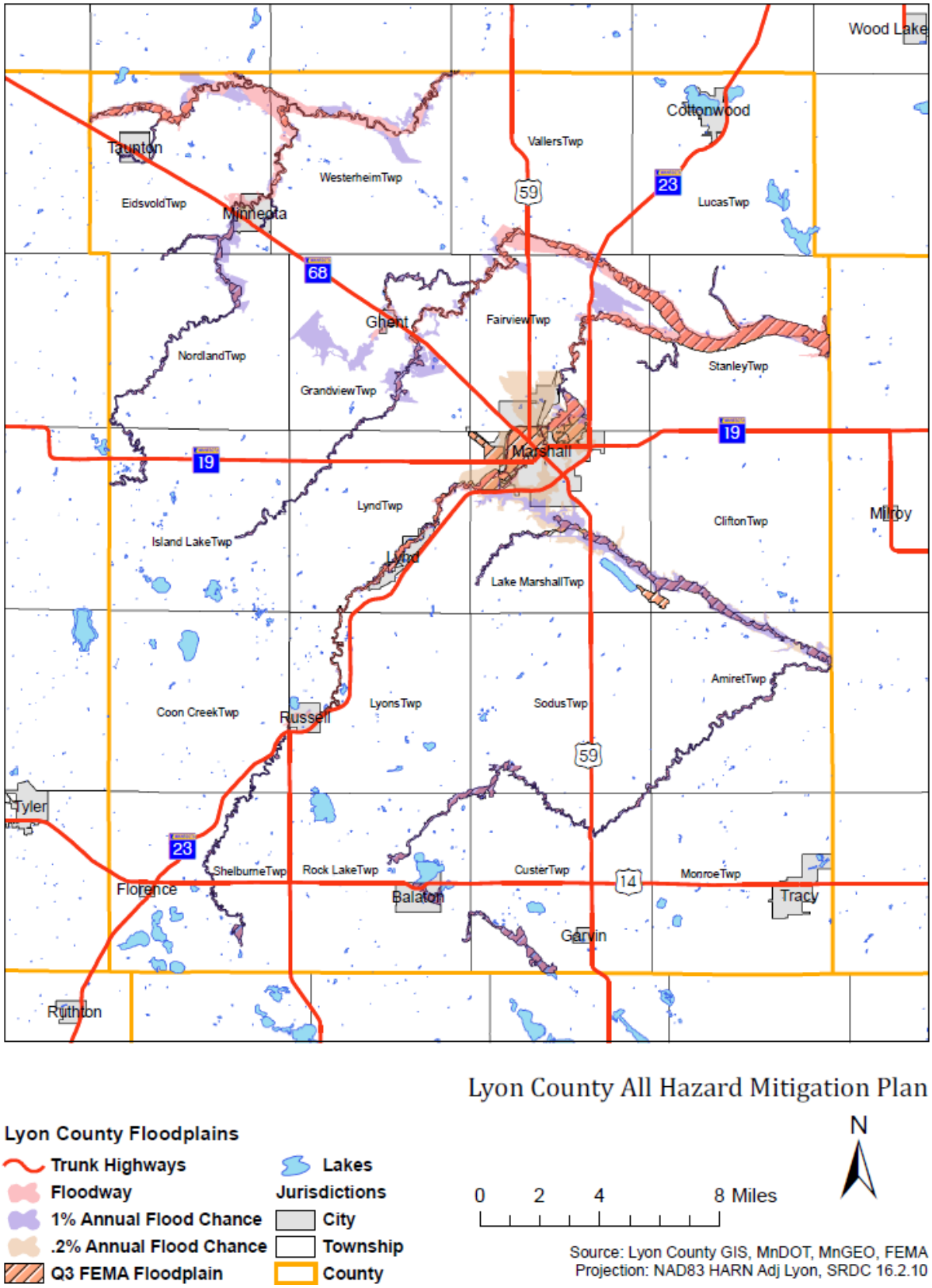
Source: FEMA, August 2001.

Every township in Lyon County has open water and/or flood hazard areas. About 1,450 parcels are intersected by the 1% Annual Flood Chance (100-year floodplain) or Floodway draft dFIRM flood hazard areas across the county. These areas tend to follow the Cottonwood River across Rock Lake, Custer and Amiret townships; the Redwood River from Shelburne Twp in the southwest through the cities of Russell, Lynd and Marshall to Stanley Twp in the northeast part of the county; Threemile Creek from Island Lake Twp in the west through Grandview, Fairview and Vallers Twp on the way to the Redwood River; and the Yellow Medicine River across Nordland Twp, the City of Minneota, and Westerheim Twp.

City of Balaton

Lake Yankton graces the City of Yankton at the top of the North Fork of the West Des Moines watershed in southern Lyon County. There are 53 parcels in the city in the draft 100-year floodplain. However, these are lake-side, rather than river parcels, that have not been subject to seasonal flooding. The City is currently disputing the dFIRM elevations.

Figure 4-2 Floodplain Map



Lyon County All Hazard Mitigation Plan

Lyon County Floodplains

- Trunk Highways
- Floodway
- 1% Annual Flood Chance
- .2% Annual Flood Chance
- Q3 FEMA Floodplain
- Lakes

Jurisdictions

- City
- Township
- County

N

0 2 4 8 Miles

Source: Lyon County GIS, MnDOT, MnGEO, FEMA
Projection: NAD83 HARN Adj Lyon, SRDC 16.2.10

City of Cottonwood

Although there is no mapped floodplain in Cottonwood, the City chose to participate in the NFIP after heavy snow and rains in 1996-1997 prompted concerns with potential overland flooding. There is an unnamed stream draining the eastern part of the community along TH 23 into Cottonwood Lake that can cause nuisance flooding.

City of Ghent

The City of Ghent is located between Marshall and Minneota on TH 68. Ghent was previously designated as having No Special Flood Hazard Area and was not covered by a FIRM map. However, there are now over 90 parcels in the city in the draft dFIRM 100-year floodplain. The previous floodplain map stopped downstream from the city, where the unnamed tributary to Threemile Creek becomes an intermittent stream.

The new digital floodplain map is extending the floodway thru Ghent, including a newly developed area of single family homes. The City will be working with DNR upon publication of final dFIRM maps to assure all property owners and residents understand the new designations and take appropriate action.

City of Lynd

The City of Lynd is located on TH 23 between Marshall and Camden State Park. There are 78 parcels in the city in the draft dFIRM 100-year floodplain. The greatest area of concern is “Old Lynd” in the historic heart of the community, in particular along Redwood Street and Redwood Ct (a cul-de-sac).

The Floodway was drawn widely through Lynd, and there is some concern that elevation data utilized may not have been precise. At least one parcel indicated as Floodway had previously been awarded a Letter of Map Revision (LOMR) to remove the developed portion of the property from the 100-year floodplain. On a positive note, a new golf course development recently built in the northern part of the community kept almost all of its developed area outside of the dFIRM flood hazard area. The developers worked closely with DNR to accomplish this.

City of Marshall

The Redwood River enters Marshall under the BNSF railroad tracks at the extreme southwestern corner of the city. There are about 240 parcels in the city in the draft 100-year floodplain. The river crosses the county fairgrounds, a golf course and city park before snaking through a residential neighborhood and downtown Marshall. The river exits the city northeast of the ADM corn sugar and ethanol plant.

The Corp of Engineers (COE) started a Flood Control and Diversion Project in 1963-64, with the construction of a few earth dikes for flood protection just southwest of the City. At this time they also constructed the diversion channel around the west and northwest portion of the city. Following the flooding events in the Spring of 1993 the COE completed Phase I of improvements to the diversion channel. This work was done in 1996-97 and included the removal of sediments in the diversion channel. Phase II was completed in 1999-2000 and included extensive construction of new additional dikes along the diversion channel. The work also included a control structure at the south end of the city to control the flow of water through the original river channel. It also included a high water diversion structure at Wayside Park under TH23; this allows the water to flow into a county ditch on the south side of TH23 and ultimately into the Cottonwood River drainage basin.

In 1994, the City of Marshall installed large capacity pumps and a large forcemain pipe to drain the Tiger Lake stormwater pond in the middle of town. In 1997, the City dredged the pond to remove the sediment from the bottom and improve water quality of the discharge.

In 1997, the City also designed and constructed improvements to Ditch 62 which flows through a portion of eastern Marshall. The project included large diameter storm sewer pipe and a stormwater detention pond in the northeast corner of the city near the campus of SMSU. This same summer the City constructed a sister project to the Ditch 62 Project. This project installed a large diameter storm sewer main down Birch Street which ultimately discharges into the improved Ditch 62 system. In 1999, the City further extended the Birch Street storm sewer main to the west and north along Minnesota Street to further mitigate localized flooding in the north central portion of the city.

The City now has provisions for new developments which include the construction of stormwater ponds for detention of the 1% events in local on-site ponds.

City of Minneota

Northwest of Marshall on TH68, Minneota is nestled into the South Branch of the Yellow Medicine River. There are 69 parcels in the city in the draft flood hazard area. Minneota is protected by levees beginning at CSAH 10 in the southwest corner of town north across TH68 and along CSAH 3, and then east along the north edge of the developed area of town. The City is currently in the process of re-certifying the levee system. The City is also undertaking a $2.3 million storm and sanitary sewer infrastructure replacement project to prevent sewage from entering the Yellow Medicine River.

City of Russell

Located on TH 23 just south of Camden State Park, the City of Russell has a stream monitoring gauge on the Redwood River. There are 20 parcels in the draft DFIRM, although only 1 or 2 structures appear to be located in the actual floodplain based on aerial imagery.

City of Taunton

The City of Taunton is located on TH 68 northwest of Minneota. While there are 13 parcels in the city in the draft dFIRM 100-year floodplain, there appears to be only one residence in the 1% floodplain that follows an unnamed intermittent tributary to the Yellow Medicine River. The City does not participate in NFIP.

City of Tracy

While there is no mapped floodplain near Tracy in the southeast part of the county, the City participates in the NFIP to give landowners the opportunity to purchase flood insurance.

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 Lyon County. In addition to a number of low-rated dams, there are three Significant-rated dams:

- City of Marshall Redwood River Dam
- Kass-Morgan Group Farm Pond (Monroe Twp)
- Yellow Medicine River Watershed District Sonstegard-Telste Dam (Nordland Twp)

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 this 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.*

Debris in rivers and drainage ditches can also add to flooding issues. Downed trees have caused problems at bridges forming logjams and closing the bridges to traffic. This hazard is all the more acute when combined with ice jams during the spring snowmelt.

Measures to mitigate flood risk include acquisition of property in the floodplain, flood proofing, relocation, and flood warning systems. Presently, floodplain ordinances have been adopted by the municipalities of Balaton, Cottonwood, Ghent, Lynd, Marshall, Minneota, and Russell. Personal flood insurance to protect against property loss is an option for residents of most cities, and township residents outside municipalities, in Lyon County.

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 have occurred periodically in Lyon County. There are two stream gauges on the Redwood River. The highest crest recorded by the National Weather Service on the Redwood River at Marshall is 17.0 feet on 9 May 1993. The NCDC database (Table 4-2) records eight events in and around the county between 1997 and 2007—three of which are classified as flash flood events.

The NCDC database has general event information, but does not record property damage as a result of any 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.

In April 2001, heavy rains caused flooding along the Redwood River with a crest 2-4 feet above flood stage (the 4th highest historical crest at Marshall). In March 2007, warm temperatures caused rapid snowmelt bringing the Redwood River and 16.3 feet at Marshall on 13 March and to 15.8 feet at Russell on 14 March.

Table 4-2
NCDC Flood Events in Lyon County

Location	Date	Time	Type
Southwest Minnesota	3/25/1997	7:00 AM	Flood
Southwest Minnesota	4/1/1997	12:00 AM	Flood
Redwood River	4/22/2001	6:00 AM	Flood
Balaton area	5/8/2002	1:30 PM	Flood
Minneota area	6/21/2002	1:50 PM	Flash Flood
Tracy/Southern Lyon Co	5/29/2004	9:20 PM	Flash Flood
Tracy area	6/20/2005	8:00 PM	Flash Flood
Marshall area	3/12/2007	7:00 AM	Flood

Source: National Climatic Data Center

Preparations for spring flooding were taking place as this plan was being drafted in the winter of 2009-2010. The Redwood River reached flood stage of 14' at Russell and Marshall on 18 March 2010. On the same day, approximately 800 feet of US 14 west of Florence outside of the mapped floodplain was covered by overland flooding caused by a blocked drainage ditch. The Redwood crested at15.65' at Marshall on 19 March (tied for 4th highest historical crest) and 16.76 at Russell (2nd highest crest).

While overland flooding has been linked to snowmelt in March and April, flash flood events were caused by heavy spring rains in May and June. For example, in June 2002, heavy rain caused flooding of township roads northeast of Minneota, and in May 2004, 2-5" of rain flooded roads, fields and basements in the Tracy area. While the MAHMP considers Lyon County at high risk of flash flooding, these events do not typically cause noticeable damage.

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

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

Flooding is highly likely to occur each year. The Lyon 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

All locations in Lyon County are at risk to be affected by this hazard. Typically, given the rural agricultural nature of the county, the likelihood is greatest that crops would experience the most damage from a hail event.; however, hail can also do a great amount of damage to vehicles and roofs of individual structures. The chance of significant property damage is likely to be higher within the cities as there are simply more buildings and vehicles clustered in a small area to be potentially damaged.

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.

In Minnesota, most hail ranges in size from pea-size (1/4 of an inch) to golf-ball size (1 ¾ of an inch). Larger hailstones have been reported, but 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.

Figure 4-3 TORRO Hail Scale

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

Size code	Maxmimum 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

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.

A.6.c Previous Occurrences of the Hazard

The NCDC database lists three lightning events reported for Lyon County. On 7 August 2000, lightning struck an electrical pole in Tracy, causing about $5,000 in damage to a car dealership and grocery store. On 3 August 2004, lightning struck the Lyon County Law Enforcement Center in Marshall, knocking out power and damaging communications equipment.

On 12 September 2005, lightning struck a transformer at a food store in Tracy, causing a 10-hour electrical outage. Volunteers moved perishable refrigerated and frozen food into ice trucks and a freezer trailer, avoiding spoilage of over $100,000 worth of food.

Hail is much more likely to be reported, with 131 hail events in the NCDC database from 1962 to 2009 (Table 4-3). These events ranged from near grapefruit-sized hail in 1963 to many incidents of penny-sized hail, which is considered to be severe. One storm in 1997 with golf ball-sized hail resulted in $4 million in reported crop damage and $100,000 in property damage across 63,000 acres in the Minneota area. However, dollar-cost damage is not typically reported in the database.

The MAHMP documents a July1995 extreme heat event which included Lyon 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 lighting and hail. The All-Hazard Mitigation Planning Team identified the risk of extreme heat to elderly residents as a particular concern.. Individuals can and should mitigate their individual exposure to these hazards.

Table 4-3

NCDC Hail Events in Lyon County

Magnitude Golf Ball Size and Larger

Mag: Magnitude
PrD: Property Damage
CrD: Crop Damage

Location or County	Date	Time	Type	Mag	PrD	CrD
3 LYON	7/18/1963	1430	Hail	3.50 in.	0	0
26 LYON	5/28/1991	1920	Hail	3.25 in.	0	0
8 LYON	6/18/1974	1800	Hail	3.00 in.	0	0
5 LYON	6/15/1967	1800	Hail	2.75 in.	0	0
27 LYON	5/28/1991	1922	Hail	2.75 in.	0	0
29 LYON	6/16/1992	1930	Hail	2.75 in.	0	0
32 Taunton	7/18/1994	1340	Hail	2.75 in.	0	0
64 Florence	7/28/2002	2:19 PM	Hail	2.75 in.	0	0
115 Russell	6/10/2007	13:15 PM	Hail	2.75 in.	0	0
23 LYON	7/30/1986	12:53 AM	Hail	2.50 in.	0	0
59 Amiret	5/5/2002	5:55 PM	Hail	2.50 in.	0	0
4 LYON	8/10/1964	1800	Hail	2.00 in.	0	0
7 LYON	6/18/1974	1715	Hail	1.75 in.	0	0
9 LYON	8/10/1976	2030	Hail	1.75 in.	0	0
10 LYON	8/9/1977	1400	Hail	1.75 in.	0	0
12 LYON	7/20/1979	1740	Hail	1.75 in.	0	0
17 LYON	9/3/1980	1755	Hail	1.75 in.	0	0
18 LYON	7/6/1982	1545	Hail	1.75 in.	0	0
19 LYON	4/26/1984	1634	Hail	1.75 in.	0	0
20 LYON	6/22/1984	1140	Hail	1.75 in.	0	0
30 Balaton	5/7/1993	1715	Hail	1.75 in.	0	0
33 Minneota	7/18/1994	1344	Hail	1.75 in.	0	0
36 Florence	6/5/1996	5:30 PM	Hail	1.75 in.	0	0
38 Minneota	6/22/1997	4:55 PM	Hail	1.75 in.	100K	4.0M
43 Balaton	7/13/1999	7:53 PM	Hail	1.75 in.	0	0
44 Tracy	7/13/1999	8:04 PM	Hail	1.75 in.	5K	0
45 Minneota	7/25/2000	5:20 PM	Hail	1.75 in.	0	500K
58 Amiret	5/5/2002	5:49 PM	Hail	1.75 in.	0	0
65 Balaton	7/28/2002	2:28 PM	Hail	1.75 in.	0	0
67 Tracy	7/28/2002	2:55 PM	Hail	1.75 in.	0	0
72 Ghent	6/24/2003	7:08 PM	Hail	1.75 in.	0	0
73 Cottonwood	6/24/2003	7:23 PM	Hail	1.75 in.	0	0
77 Marshall	4/18/2004	12:44 AM	Hail	1.75 in.	0	0
85 Lynd	7/31/2004	9:13 PM	Hail	1.75 in.	0	0
86 Marshall	7/31/2004	9:13 PM	Hail	1.75 in.	0	0
128 Marshall	8/2/2009	20:08 PM	Hail	1.75 in.	0	0
				TOTALS:	105K	4.500M

Source: National Climatic Data Center

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

All locations in Lyon County are at risk of high-wind activity. Since the county is primarily rural and agricultural in nature, the chances are greatest that an area hit by a tornado or straight-line wind will be in one of these areas and little damage will occur. However, should a tornado hit a populated area, the potential for 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. Downburts 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

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 from the southwest to the northeast but this also varies and cannot be counted on in all instances.

Relationship to Other Hazards—Cascading Effects

Severe winds, as noted, typically accompany thunderstorms and hail events. Hail may also accompany a tornado or severe wind event. A tornado event, and many straight-line wind storms, can lead to total destruction of buildings and wide-scale casualties. There are often fires, disruptions of transportation infrastructure, and potential public health emergencies. Catastrophic events such as these may also create the potential for civil unrest, leading to the need to activate Domestic Preparedness plans.

A.7.c Previous Occurrences of the Hazard

The NCDC database lists 76 general thunderstorm and high wind events reported for Lyon County from 1960 to 2008. There are 23 tornado events listed from 1955 through 2007, from F0 to one F5, (Table 4-4).

Table 4-4
NCDC Tornado Events in Lyon County

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property

Location or County	Date	Time	Mag	Dth	Inj	PrD
1 LYON	7/7/1955	1500	F4	1	13	2.5M
2 LYON	6/19/1962	1255	F0	0	0	0K
3 LYON	6/19/1962	1255	F0	0	0	0K
4 LYON	6/19/1962	1255	F0	0	0	0K
5 LYON	6/13/1968	1800	F5	9	150	2.5M
6 LYON	5/30/1974	1300	F1	0	2	25K
7 LYON	7/15/1980	1545	F0	0	0	0K
8 LYON	4/21/1985	1857	F1	0	0	250K
9 LYON	4/21/1985	1908	F1	0	0	250K
10 LYON	5/28/1991	1915	F1	0	0	0K
11 LYON	6/16/1992	1718	F2	0	0	0K
12 LYON	6/16/1992	1722	F3	0	0	0K
13 Florence	5/6/1993	1347	F1	0	0	0
14 Marshall	5/7/1993	1737	F1	0	0	0
15 Balaton	5/7/1993	1740	F1	0	0	0
16 Cottonwood	5/7/1993	1820	F1	0	4	0
17 Garvin	5/7/2000	9:53 PM	F0	0	0	0
18 Marshall	7/25/2000	5:25 PM	F0	0	0	0
19 Cottonwood	6/10/2001	12:23 AM	F0	0	0	0
20 Minneota	6/11/2004	1:59 PM	F0	0	0	0
21 Minneota	6/12/2004	8:15 PM	F0	0	0	0
22 Marshall	6/29/2005	4:51 PM	F0	0	0	0
23 Tracy	6/2/2007	17:35 PM	F0	0	0	0K
			TOTALS:	10	169	5.525M

Source: National Climatic Data Center

On 6 August 1996, a thunderstorm with 60 knot winds caused widespread damage to trees and power lines between Marshall and Russell. About $300,000 in property damage was recorded, including damage to buildings and vehicles caused by falling trees. The most recent thunderstorm event with damage recorded occurred on 8 June 2005 in the northern part of Lyon County, when 61 knot winds blew open the roof of a mobile home and falling power lines caused a small fire in Cottonwood, a total of $20,000 property damage.

There have been only two F5 tornados in Minnesota since 1950, both in Southwest Minnesota. On 13 June 1968, an F5 tornado struck the community of Tracy about supper time. It tore a 6.8 mile path 150 yards wide, causing 9 fatalities, 150 injuries and approximately $2.5 million ($15.6 million in 2010 inflation-adjusted dollars) property damage thru pats of Murray, Lyon and Redwood counties. According to press reports of the time, about half of the buildings in Tracy were damaged and two boxcars were lifted from the railroad tracks and dropped three blocks away.

There has been one other fatal tornado in Lyon County. On 7 July 1955, an F4 tornado traveled 30 miles, causing 1 fatality, 13 injuries and about $2.5 million property damage. According to the Minnesota State Climatology Office, hail accompanying this storm caused one million in damage ($8 million in 2010 dollars).

On 16 June 1992, an F3 tornado left a path 3 miles long and 80 yards wide, but no injuries or damage were recorded in the database. Two F1 tornadoes have caused injuries—one in 1974 and another in 1993. Most recently, on 2 June 2007, an early evening thunderstorm produced a short-lived F0 tornado about 100 yards wide, between Marshall and Tracy.

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

Straight-line Wind events are likely to take place in any year. The *Minnesota All-Hazard Mitigation Plan* calculates a 38% annual probability of a tornado event in Lyon County.

A.8 Other Natural Hazards

Geologic maps also show Lyon 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.

Historically Lyon County has no earthquakes recorded. 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 Lyon 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 Lyon County are described below in alphabetical order for ease of reference.

B.1 Domestic Preparedness 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 anyplace, anytime. Specific hazards in this category may include:

- Conventional bomb/explosive devise

- 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

All locations in Lyon County are at risk from this hazard. Cities are vulnerable to mob action, while also presenting many targets for public violence. The University campus presents security challenges unique in the region. However, isolated rural farmsteads may also be inviting staging grounds for terroristic groups or individuals. These places may be inviting targets 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 a bridge would lead to a crisis with transportation infrastructure. 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

Lyon County has been fortunate not to have experienced many incidents that could be classified as domestic unrest or terrorism. The All-Hazard Mitigation Planning Team identified no recent events within the county; however, the team did discuss instances in other similar communities in Minnesota and across the rural Midwest. Local law enforcement trains for prevention and response to this risk and participates in regional collaborations to meet the threat.

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

While there have been no recent events of this type, the Lyon 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

All locations in Lyon County are affected by this hazard. The larger cities have manufacturing plants in or near city limits, yet many chemicals are used daily in agriculture, putting farms and rural homes at risk. Manufacturers of methamphetamine have also targeted isolated rural homes and abandoned

farm sites for illegal drug labs. However, these individuals are as likely now to set up labs in their car or basement in town.

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). ADM and Marshall Asphalt Terminal in Marshall, and Mid-Continent Cabinetry in Cottonwood, reported chemical use 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) also oversees pipeline operations in Minnesota. The National Pipeline Mapping System identifies Magellan Pipeline Company's highly volatile liquid pipeline traversing the county northwest of and parallel to TH 23, with a branch running northwest from Marshall about half way between TH 19 and TH68. Northern Border Pipeline's cross-country natural gas line crosses the county from southeast of Garvin, past the southwest corner of Russell on into Lincoln County, with a compression station near Garvin. Natural gas lines branch off north of Balaton to serve ADM

and the cities of Lynd, Marshall and Cottonwood. The City of Tracy is served by a natural gas line along US 14 from Redwood County to the east.

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 Cottonwood, Redwood, West Branch Des Moines, and Yellow Medicine rivers. several tributaries and several lakes. Impairments include chloride, fecal coliform, nutrients, mercury and turbidity.

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

The Lyon County All-Hazard Mitigation Planning Team identified hazardous materials events as highly likely to occur in the county (100% chance in any year). Methamphetamine lab incidents were identified as occasional events (1-10% chance in next year). Many aquifers are already polluted and further pollution is likely to occur if not carefully protected.

B.3 Public Health Emergencies

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 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 Lyon County are 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 Lyon 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 Lyon County All-Hazard Mitigation Planning Team identified the risk for Public Health Emergencies as likely to occur in any year.

B.4 Transportation Infrastructure

Minnesotans move goods and people on a variety of transportation networks. This infrastructure includes roads and bridges, rail, air and transit. In the wake of the Interstate 35W bridge collapse, the 2008 update of the *Minnesota All Hazard Mitigation Plan* focused attention on the status of bridges across Minnesota.

B.4.a Locations Affected by the Hazard

Many locations in Lyon County have the potential to be affected by Transportation Infrastructure hazards. Due to the prevailing wind patterns in the area, east-west roads, such as US 14 and TH 19, do tend to be more affected by blowing winter snow. Ice, combined with blowing and drifting snow, can make traversing the distance between communities treacherous at best.

While the DM&E railroad has fairly low traffic, the BNSF Railway parallels TH 23 through the county, with many local intersections at skewed angles. There are two public airports in the county, in Marshall and Tracy.

B.4.b Extent of the Hazard

Traffic accidents are the primary hazard to people and property related to transportation infrastructure. The Minnesota Department of Transportation (MnDOT) and Minnesota Department of Public Safety (DPS) developed a *Comprehensive Highway Safety Plan* in 2004. The plan was intended to examine the underlying causes of traffic deaths and serious injuries, determine strategies to mitigate those causes, and implement the most promising strategies in the "Toward Zero Deaths" program. This program continues today. This study found the most frequent crash types and contributing factors included:

- Lane and roadway departure crashes
- Intersection related crashes
- Unbelted vehicle occupants
- Impaired drivers
- Young drivers
- Aggressive drivers

Blizzards and winter storms create hazardous driving conditions for considerable amounts of time (see Section A.2 above). 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."

MnDOT maintains *Bridge Inspection and Inventory Reports* on the State Trunk Highway System, which in Lyon County includes US 14, US59, TH19, TH23 and TH68. As of June 2009, there are 10 bridges in Lyon County on MnDOT's list of local highway bridges that are Structurally Deficient and/or Functionally Obsolete. There is also one located on Trunk Highway 59 in the city of Marshall. All are open for traffic. According to MnDOT:

> *Bridges are classified as "structurally deficient" if they have a general [poor]condition rating for the deck, superstructure, substructure or culvert or if the road approaches regularly overtop due to flooding… The fact that a bridge is structurally deficient does not imply that it is unsafe… If unsafe conditions are identified during a physical inspection, the structure will be closed.*

There is a great amount of concern in the county for railroad crossing safety. According to MnDOT, the chance of death or serious injury from a vehicle/train crash is 11 times greater than other traffic collisions. The County Engineer continues to work with townships, cities and the railroad to improve safety at these crossings whenever possible.

Relationship to Other Hazards—Cascading Effects

Fire fighters are often (usually) called out to respond to transportation accidents. As noted above, winter storms create hazardous conditions for travel, as do floods, heavy rains and other natural disasters. Hazardous materials incidents on the roads, rails or in the air pose distinct challenges.

B.4.c Previous Occurrences of the Hazard

According to Minnesota DPS Office of Traffic Safety (OTS), there were 455 traffic deaths statewide in 2008. Preliminary figures indicate only 403 deaths in 2009. This is the lowest annual death count since 1945. There were 163 alcohol-related deaths in Minnesota in 2008, and 35,736 motorists arrested for DWI (Driving While Intoxicated). 150 of the 325 vehicle occupant deaths were not wearing their seatbelts. 72 traffic deaths were motorcyclists, the highest number of such deaths since 1985. Despite what we might think, the majority of fatal crashes occurred in clear weather conditions. Unsafe speed was the leading contributing factor in single-vehicle crashes, while driver inattention was the leading factor in multiple-vehicle crashes.

Table 4-5
Traffic Accidents In Area Counties, 2008

	2008 Crashes				Total Crashes
County	Fatal	Injury	Damage	Total	in 2007
Lincoln	2	21	56	79	91
Lyon	**4**	**97**	**203**	**304**	**333**
Murray	0	29	41	70	74
Pipestone	0	47	49	96	139
Redwood	2	47	85	134	154
Yellow Medicine	3	36	70	109	83

Source: MN DPS OTS

There were three traffic fatalities reported in Lyon County in 2009. There were 304 crashes reported in 2008, 97 with injuries to 158 people. The Minnesota Department of Health (MDH) Injury and Violence Protection Unit has data on 97 motor vehicle-related injuries in 2008 (latest year available) that required hospitalization. These included 82 occupants of vehicles, 7 motorcyclists, and 3 bicyclists. There were 15 people between the ages of 15-19, and 17 between the ages of 20-24, hospitalized for vehicle-related injuries. In February 2008, a van crossed the BNSF railroad tracks in clear weather and pulled off a County Road onto TH 23, crashing into a school bus carrying children home from Lakeview School in Cottonwood. The incident killed four students.

There have been no specific bridge-related incidents recently in the county, nor have there been recent fatal rail- or air-related incidences. At dusk on 18 February 2010, a UPS delivery driver slid on an icy gravel road west of Balaton into the path of an oncoming DM&E train; while the truck was destroyed, the driver was able to walk away from the crash with minor injuries. MN OTS found that there were 40 motor vehicle/train crashes statewide in 2008, 17 of which were injury crashes and 3 were fatal. Nine crashes occurred at crossings with a RR Crossbuck control device, seven at RR Crossing Stop Signs and six with RR

Flashing Lights. Failure to yield the right of way was a contributing factor in 40% of motor vehicle/train accidents.

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

Incidents with Transportation Infrastructure were identified as a highly likely in Lyon County, with several state trunk highways and two railroads traversing the county.

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.*

Local critical community facilities (described in the community profile in Section 1) are for the most-part located outside specific hazard areas.

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 $238,000 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.

Minimal data availability and the lack of analysis software during plan development limited the scope of detailed risk assessment in this plan. Future updates should include data needs in work plans, including specific application of HAZUS-MH GIS software if possible.

A.1 Hazard Ranking Worksheet

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. For example, agricultural diseases would largely be confined to those areas in agricultural production and structure fires would have a greater impact in the built up areas of communities.

Results of the Planning Team's ranking are presented in Figure 4-6. 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.

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.

Ice and ice storms, public health emergencies, and transportation infrastructure were considered the highest rank hazards for Lyon County.

Figure 4-5 Lyon 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	High	**High**
Agricultural Disease (Animal & Crop)	Likely	Countywide / Local	Major	Average	**Moderate**
Blizzards / Winter Storms	Highly Likely	Countywide	Major	Average	**Moderate**
Drought	Occasional	Local	Minor	Average	**Moderate**
Extreme Temperatures	Likely	Countywide	Major	High	**Moderate**
Flooding	Highly Likely	Local	Minor	High	**Moderate**
Tornado / Straight-line Wind	Highly Likely	Local	Major	Average	**Moderate**
Wildfire	Likely	Local	Limited	Limited	**Moderate**
Earthquake	Unlikely	Countywide	Limited	Limited	Low
Land Subsidence	Unlikely	Local	Limited	Limited	Low
Summer Storms, Lightning / Hail	Highly Likely	Local	Minor	Average	Low
Technological Hazards					
Public Health and Infectious Disease	Likely	Countywide	Minor	Average	**High**
Transportation Infrastructure	Highly Likely	Local	Minor	Average	**High**
Hazardous Materials	Highly Likely	Local	Minor	High	**Moderate**
Structure Fires	Highly Likely	Local	Minor	Average	**Moderate**
Dam Failure	Unlikely	Local	Limited	Limited	Low
Meth Lab	Occasional	Local	Major	Limited	Low
Terrorism and Civil Distrubance	Occasional	Local	Limited	Limited	Low
Hazard	**Potential Frequency**	**Spatial Extent**	**Potential Severity**	**Risk Level**	**Hazard Rank**
	Highly Likely *Likely* *Occasional* *Unlikely*	*Countywide* *Local*	*Substantial* *Major* *Minor* *Limited*	*Very High* *High* *Average* *Limited*	*High* *Moderate* *Low*

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

B. Impacts of Hazards on the Community

The Lyon 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. Only the cities of Ghent, Marshall and Tracy responded that they have adopted the Building Code. There is no local provision to enforce construction standards in other communities or rural areas of 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

- Lyon Soil & Water Conservation District (SWCD) and the City of Marshall have in the past promoted natural snow fences to protect highways against drifting snow.
- 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. Some schools will not run bus service when wind chills fall below -40°F.
- 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.
- Individual homeowners should be encouraged to plan ahead for inevitable seasonal outages.

Existing Mitigation Efforts

Much work has already been completed 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 $238,650 in fire-related losses reported in Lyon County in 2008, for $3,459 average dollar loss per fire. The MAHMP also reports Wildfire Indemnity Claims; however, the data tables are inconsistent.

Plans and Programs

- Lyon County is served by local volunteer departments.
- Lyon County and some of the cities regulate the development of new housing through zoning. The cities of Ghent, Marshall and Tracy enforce the Building Code. 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

The Planning Team felt that local fire response rates are above average for a rural community.

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, all townships in Lyon County have open water and/or riverine floodplains. The *Lyon County Local Comprehensive Water Management Plan* identifies concerns with respect to flooding of agricultural lands, and encourages local jurisdictions to maintain existing flood control structures, from farm ponds to roadside impoundments. Floodplain areas for each city are described in Section VI.A.5.a.

Analysis by Lyon County GIS staff of the draft county-wide dFIRM indicates that the newly-designated floodway, 1% annual flood chance (100-year) and .2% annual flood chance (500-year) will cover about 26,000 acres in the county. This is about 5.75% of the county's land and water area. The Flood Hazard Area within the floodway and 1% floodplain covers almost 22,000 acres or 34 square miles (4.7% of the county).

For purposes of this analysis, staff selected parcels of land within the 100-year Flood Hazard Area, which is the area typically subject to floodplain zoning regulations (Table 4-7). The dFIRM Flood Hazard Area covers at least a part of 1,447 parcels in the county. The largest number of parcels with the greatest

property value are classified as Agricultural by the Lyon 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.

Residential property represents the second largest number of parcels in the Flood Hazard Area, and the third largest share of property value. In Table 1-3 in Chapter 1, we saw that there are on average 2.5 people in each household in Lyon County. Assuming all of the 474 residential parcels have (or will have) single-family homes, there could be approximately 1,185 people at risk, or about 4.7% of all Lyon County residents.

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. All of Camden State Park, including buildings located high above the Redwood River, is also in this category.

Table 4-6
Parcels Located in Flood Hazard Area, Lyon County
Estimated Market Value 2009

	No. of Parcels		Share in	Value of Parcels		Share in
Land Use	dFIRM*	County	Floodplain	dFIRM*	County	Floodplain
Agricultural	756	4844	15.6%	$ 234,058,600	$ 1,322,065,400	17.7%
Commercial	47	1194	3.9%	$ 13,569,600	$ 234,437,500	5.8%
Exempt/Charitable	10	158	6.3%	$ 1,738,100	$ 40,863,400	4.3%
Public	150	821	18.3%	$ 33,599,000	$ 355,405,400	9.5%
Residential	474	8558	5.5%	$ 57,141,700	$ 954,012,300	6.0%
TOTAL	1447	15787	9.2%	$ 477,457,000	$ 2,985,878,300	16.0%

* dFIRM Floodway + 1% Chance Flood Hazard Area
Source: Lyon County GIS

Staff and elected officials from cities met to review the GIS analysis. Staff used a projector to display the dFIRM with interactive ArcMap layers, including public and proprietary aerial photography. Starting at a county-wide perspective, each city with concerns about flooding was examined in detail.

Lyon County received $18,261 in federal and state flooding-related public assistance for federal Disaster #946, $1,094,774 for Disaster #993, and $288,543 for Disaster #1175. While not directly related to structural vulnerability, Table 37 in the MAHMP reported that the county experienced over $1,800,000 in agricultural losses from water-related insurance claims from 1994-2006. This is less than any of Lyon County's neighbors. Overall, the MAHMP calculates Lyon County to have an $88,183 Annual Estimated Loss from flooding (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. Building permits/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.
- The *Lyon County Local Comprehensive Water Management Plan* identifies priority concerns and programs regarding water.
- 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.

Existing Mitigation Measures

The City of Marshall has been working on flood management for many years. In 1995, the City of Marshall received $2,269,200 in mitigation funding (DR 993.19) for drainage improvement. The project on Ditch 62 included the construction of the stormwater pond north of the SMSU campus, installation of a 54" storm sewer pipe under T.H. 23, ditch cleaning downstream of TH 23 and up stream of the pond, and the installation of large diameter storm sewer pipes from Birch Street to Bruce Street. It was a large project which made several improvements to alleviate flooding, provide retention and improve water quality of the stormwater discharge.

Other recent attempts to reduce flood damages include the installation of road retention projects which consist of downsizing culverts. This technology reverses the trend of replacing culverts with larger sized culverts, which only transfer additional water downstream.

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 plan calculated a 0.3860 annual probability of a Tornado in Lyon County, with an average of $251,000 damage per event (Table 40). The plan calculated a 0.84 annual probability of a Windstorm event, with $21,000 damage per event (Table 43). This amounts to about $115,000 Estimated Annual Loss from tornados and windstorms. The MAHMP also lists over $3 million in indemnity claims for hail damage in Lyon County (third highest in Minnesota over 1994-2006) but does not analyze these loses in greater detail.

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. The County has several trained severe weather spotters who report directly to the NWS when severe weather is observed.
- 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. Transportation accidents, aside from the collapse of major pieces of infrastructure, are typically defined by their costs in human life and injury.

More detailed analysis of vulnerability to man-made disasters should be undertaken should technological hazards be 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 must constantly monitor any need to update 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.
- The County Engineer and local cities are working closely with MnDOT to improve local transportation infrastructure.

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.
- Many people commute long distances to work, increasing exposure to transportation hazards.

B.2.c Existing Mitigation Measures

Lyon County has taken measures to address certain technological hazards, such as hazards to transportation infrastructure.

Following the winter of 1996-97, Lyon County SWCD and the City of Marshall undertook a living snow fence hazard mitigation project related both to winter storm events and transportation infrastructure (DR 1175.53/55). Living snow fences are designed plantings of trees and/or shrubs and native grasses located along roads or around buildings, which create a vegetative trap to control blowing and drifting snow. The University of Minnesota Extension Service states that "reduced snow removal costs alone in an average snowfall year (32 inches) would generate benefit/cost ratios ranging from 9:1 to 46:1" (Josiah and Majeski 2002). Transportation engineers can also use road design to substantially reduce hazards from blowing and drifting snow.

The City of Marshall Community Services Department installed trees along Channel Parkway on the northwest side of the city. Many of the trees survived and provide a wind break on the west side of the diversion channel. This forces the wind to drop the snow into the channel rather than on the street along the east side of the channel.

The SWCD combined FEMA mitigation funding with the Federal Conservation Reserve Program (CRP). A recent evaluation by SWCD found the program to be very successful. Twenty-three sites were selected from problem areas identified by MnDOT, Lyon County Highway Dept, and local townships.

SWCD staff drew up plans for the areas that had been identified and contacted landowners, discussing the area that would be needed for a successful snow fence and options for compensation. According to the SWCD, "The winning combination was that the landowner did not have any out of pocket costs, there were compensated for the land that was in trees and for the fetch area by incentive payments."

Projects were completed in 2001. SWCD met with several of the landowners that have the plantings late this winter. The only comment made was that it would be helpful if there was some follow-up for maintenance. All landowners were still supportive of the way the program was handled and the road authorities are also happy with the results. SWCD continues to work with MnDOT to establish Living Snowfence projects in the county.

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.

A. Repetitive Loss Properties

As of December 2009, there was one repetitive loss property identified in the county. However, there are no local records matching the state database information.

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 Lyon 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.

No particular critical facilities in Lyon County are uniquely at risk from identified hazards. Bridges located in the flood plain were identified by GIS analysis using the draft dFIRM floodway and 1% chance Flood Hazard Area.

Table 4-7
Asessing Critical Facilities in Lyon County
HSEM Required Data

Name or Description of Asset	Critical Facilities (#)	In Flood Plain (#)
Court House	1	
County Offices	1	
City Offices	10	
Police Stations	3	
Fire Stations	10	
Hospitals	2	
Long-term Care Facilities	10	
Schools	16	
Colleges	1	
Community Centers	10	
Emergency Operations Centers	11	
Bridges	232	133
Transportation Dept. Facilities	3	
Public Works Facilities	9	
Emergency Shelter	10	

Source: Lyon County, SRDC

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 … .

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

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 Lyon 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 almost 12,000 buildings

worth $1,790 million in the county. Over half of these buildings are residential occupancy, 30% commercial occupancy, and 6% agricultural occupancy.

The model estimates that 23 buildings in the county would be at least moderately damaged (1 commercial, the rest residential), only 3% of total buildings in the scenario run. The model estimates that two buildings would be completely destroyed, and a total of 1,338 tons of debris would be generated, requiring 54 truckloads to remove. One Fire Station would be at least moderately damaged, but no other essential facilities were expected to be damaged. Over 350 households would be displaced, with 417 people seeking temporary shelter in public shelters. The total economic loss estimated is $35.14 million, with building-related losses of $33.89 million (Table 4-8).

Table 4-8
HAZUS Countywide Building-Related Economic Loss Estimates
Scenerio: 100-year Return Period Flood Event

		(Millions of dollars)				
Category		Residential	Commercial	Industrial	Others	Total
Building Loss						
Building		5.14	3.47	0.64	1.02	10.26
Content		4.29	11.75	1.49	5.07	22.61
Inventory		0.00	0.47	0.31	0.25	1.02
	Subtotal	**9.44**	**15.68**	**2.43**	**6.34**	**33.89**
Business Interuption						
Income		0.00	0.08	0.00	0.02	0.09
Relocation		0.01	0.03	0.00	0.00	0.04
Rental Income		0.00	0.02	0.00	0.00	0.02
Wage		0.00	0.11	0.00	0.31	0.42
	Subtotal	**0.01**	**0.22**	**0.00**	**0.33**	**0.57**
ALL	**Total**	**9.45**	**15.91**	**2.43**	**6.67**	**34.46**

Source: HAZUS-MH Flood Event Summary Report, Run 9March2010

The HAZUS-generated 100-year return period polygon was compared visually with the draft dFIRM geography in ArcMap GIS. HAZUS identifies certain riverine areas at risk that are not covered by the dFIRM, such as the drainage in the city of Cottonwood identified in the flood hazard profile (Section VI.A.5.a) above. Other areas covered by the dFIRM are not identified by HAZUS, such as a large portion of land south of the City of Marshall. This may be due to the size of drainage basins specified for the scenario, or due to limitations of the elevation dataset. Where HAZUS (at a Level 1 analysis) utilizes national-scale elevation data from USGS, dFIRM maps should be more accurate, based on in-the-field observations and surveys.

There are some other concerns with using the national-scale data provided with HAZUS. Some of the incongruities are similar to those noted above regarding the coincidence of the flood hazard area and large parcels. 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.

Southwest Minnesota has a strong foundation in agriculture and manufacturing. A full profile of Lyon County is provided in Chapter 1.

A. Land Uses and Development Trends

As seen in the profile above, three-quarters of land in Lyon County is used for active agriculture. About 12% is grass/shrub/wetland, while only 7% is classified as urban. The Minnesota State Demographic Center projects a population of 24,250 in the county by 2030, slightly less than the current estimated population.

The City of Marshall is a regional employment and shopping center, with the international headquarters of Schwan's Foods, offices of US Bank Corp, an ADM corn processing plant and Turkey Valley Farms food processing plant. Marshall is also home to about 3,500 students and 150 faculty members at Southwest Minnesota State University. The City of Cottonwood has a busy industrial area along TH 23, with Norcraft's cabinetry plant among other manufacturers. The cities of Minneota and Tracy also have a number of manufacturing facilities.

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. 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.

Lyon County and the cities of Balaton, Cottonwood, and Marshall have comprehensive plans to guide future development. Lyon County and all cities except Florence have at least a basic zoning ordinance, which can protect property from future development in hazard areas. Only the cities of Ghent, Marshall and Tracy enforce the Building Code.

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 Lyon 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 Lyon County. Locations at risk are identified in Section VI. Section VII.B above assesses vulnerability of local jurisdictions to these hazards.

CHAPTER 5: MITIGATION STRATEGY

This Chapter documents goals, objectives and mitigation strategies that the Lyon 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 bring resources together to mitigate and respond to hazards, protecting public health, safety and welfare in a useful and easily understood all-hazards approach, while meeting HSEM & FEMA requirements***. Goals are general guidelines that explain what local jurisdictions in Lyon County want to achieve. Objectives define strategies or implementation steps for each participating jurisdiction to achieve those goals.

All local units of government in the 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). The Planning team concentrated on developing strategies to meet objectives ranked higher at the Open House. 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.

Goal: Minimize negative impacts caused by severe ice storms.

Objective:

- County residents are educated on the importance and need to take responsibility for themselves and their families/neighbors in a severe storm event.
- Critical facilities have redundant service in case of utility failure.
- Current weather warning/travel advisory systems are regularly tested/exercised.
- Storm shelters are designated in each community for residents and travelers.
- Electrical utilities harden power lines where possible to prevent storm outages.
- Property owners construct new facilities to building code.

A.1.b Hazard: Public Health & Infectious Disease.

Goal: Reduce the threat of infectious diseases.

Objective:

- Public is informed on effective measures to prevent the spread of infectious disease.

A.1.c Hazard: Transportation Infrastructure

Goal: Improve effectiveness of local agencies in preventing and responding to accidents.

Objective:

- Emergency personnel have equipment and training to respond
- MnDOT and local road authorities improve hazardous intersections
- BNSF/DM&E improve railroad crossings
- Airport safety zones adjacent to airports are protected

A.2 Moderate Rank Hazards

A.2.a Hazard: Agricultural Disease (animal or plant).

Goal: Preserve and protect the quantity and quality of the county's public water resources.

Objective:

- Public is informed on animal/crop diseases and pests/insects prevalent in the region.
- A response plan clearly sets forth procedures for an outbreak of crop or animal disease or a major ag disaster.

A.2.b Hazard: Blizzards & Winter Storms.

Goal: Minimize negative impacts caused by severe winter weather.

Objective:

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

A.2.c Hazard: Drought / Extreme Temperatures.

Goal: Preserve and protect the county's public water resources, and minimize negative impacts caused by extreme temperatures.

Objective:

- Wellhead protection plans are complete/maintained for all public water suppliers.
- An emergency supply of clean drinking water is available.
- Prevent utility failure during extreme temperature events
- Protect vulnerable populations during extreme heat events

A.2.d Hazard: Fires (Structures and Wildfires).

Goal: Minimize impacts of natural and human-caused fires.

Objective:

- Public is informed on fire prevention and safety.
- Fire fighters/first responders have adequate resources.

A.2.e Hazard: Flooding (moderate hazard) / Dam Failure (low-rank hazard).

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

Objective:

- New development is located outside of 1% (100-year) flood plain.
- FEMA flood plain maps are improved for Lyon County.

A.2.f Hazard: Hazardous Materials (moderate hazard) /Meth Labs (low rank).

Goal: Improve effectiveness of local agencies in preventing and responding to hazardous material incidents, including illegal methamphetamine labs.

Objective:

- Public is educated on sheltering in place during Haz Mat event.
- HAZMAT/emergency management personnel are properly trained.
- Fire fighters/first responders have adequate training and equipment for hazardous material response.
- Public is informed about warning signs of meth and potential dangers of the drug.

A.2.g Hazard: Tornado & Windstorms (moderate hazard) / Lightning & Hail (low rank).

Goal: Minimize negative impacts caused by severe spring/summer storm events.

Objective:

- Residents are educated on the importance and need to take responsibility for themselves and their families/neighbors in a severe storm event.
- Weather warning systems are regularly tested and exercised.
- Storm shelters are designated in each community.

A.3 Low Rank Hazards

A.3.a Hazard: Civil Disturbance & Terrorism / Other

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

Objective:

- Provide safe public facilities

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.

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

Table 5-1
Local Partners with Interest in All Hazards Mitigation
Lyon County, Minnesota

Local Units of Government		Other Parties	
LCEM	Lyon County Emergency Management	EMS	Ambulance\First Responders
LCPW	Lyon County Public Works	Fire	Fire Districts
LCZA	Lyon County Planning & Zoning / Floodplain Administrator	Hosp	Hospitals and Clinics
		Sch	Local School Districts
LCSO	Lyon County Sheriff's Office	RWS	Rural Water Systems
SWCD	Lyon County Soil & Water Conservation Dist.	BWSR	MN Board of Water & Soil Resources
LLMP	Lincoln Lyon Murray Pipestone Public Health	MDA	MN Dept of Agriculture
CiB	City of Balaton	MDH	MN Dept of Health
CiC	City of Cottonwood	DNR	MN Dept of Natural Resources
CiF	City of Florence	MnDOT	MN Dept of Transportation
CiGa	City of Garvin	HSEM	MN Division of Homeland Security & Emergency Management
CiGh	City of Ghent		
CiL	City of Lynd	SMSU	Southwest Minnesota State University
CiMa	City of Marshall	Ext	University of Minnesota Extension Service
CiMi	City of Minneota	FSA	US Farm Service Agency
CiR	City of Russell	FEMA	US Federal Emergency Management Agency
CiTa	City of Taunton		
CiTr	City of Tracy	ALL	All Parties Listed
TWP	Townships		

A.1 High Rank Hazards

A.1.a Hazard: Ice and Ice Storms.

Strategies

1. Encourage all residents to have and use NOAA All Hazards Public Alert weather radios, preferably with Specific Alert Message Encoding (SAME) capability.
   Who: LCEM, CiB, CiC, CiF, CiGa, CiGh, CiL, CiMa, CiMi, CiR, CiTa, CiTr — Type: Awareness
   Benefit: General, Lives — Cost: Low

2. Maintain Storm Ready Communities status; bring other communities into the program.
   Who: LCEM, CiMa, CiTr — Type: Awareness
   Benefit: General — Cost: Low

3. Evaluate zoning and building code provisions to protect structures from severe storms.
   Who: LCZA, CiB, CiC, CiGa, CiGh, CiL, CiMa, CiMi, CiTa, CiTr — Type: Prevention
   Benefit: General — Cost: Medium

4. Work with critical facilities such as hospitals and rural water suppliers to assure access to back-up power generators.
   Who: Utilities, LCEM, LLMP, Hosp, RWS — Type: Protection
   Benefit: Property, Lives — Cost: Medium

5. Work with utility providers to have power lines buried and/or hardened against hazards.
   Who: LCEM, LCZA, Utilities — Type: Protection
   Benefit: Property — Cost: High

6. Encourage property owners to maintain landscaping distances to overhead power lines.
   Who: LCEM, LCZA, Utilities — Type: Prevention
   Benefit: Property — Cost: Low

7. Support amateur radio operators in emergency preparedness and response.
   Who: LCEM — Type: Awareness
   Benefit: General — Cost: Low

A.1.b Hazard: Public Health & Infectious Disease.

Strategies

1. 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 — Type: Awareness
   Benefit: General — Cost: Low

2. Ensure that citizens dependent on oxygen or respiration assistance in their homes have access to back-up power or alternative life support.
   Who: LLMP, Utilities — Type: Protection
   Benefit: Lives — Cost: Medium

A.1.c Hazard: Transportation Infrastructure

Strategies

1. Work with MnDOT / local road authorities to identify and improve hazardous intersections and bridges.
   Who: LCPW, LCZA, Twp, railroads — Type: Prevention
   Benefit: Property, Lives — Cost: High

2. Increase training of emergency personnel to respond to a variety of transportation accidents.
   Who: LCEM, LCPW, EMS, Fire — Type: Emerg Svcs
   Benefit: General, Lives — Cost: Medium

3. Use road design and living snow fences to help control snow on roadways.
   Who: LCPW, LCZA, SWCD, Twp, MnDOT — Type: Prevention
   Benefit: General — Cost: Medium

4. Encourage township road authorities to work with farmers to prevent cropping in road ROW.
   Who: LCPW, LCZA, Twp — Type: Prevention
   Benefit: General — Cost: Low

5. County, townships and cities with airports review airport improvement plans and zoning.
   Who: LCZA, CiMa, CiTr, Twp — Type: Prevention
   Benefit: Property — Cost: Medium

A.2 Moderate Rank Hazards

A.2.a Hazard: Agricultural Disease (animal or plant).

Strategies

1. Provide information on agricultural disease and prevention to producers and residents.
   Who: LCZA, SWCD, Ext, FSA — Type: Awareness
   Benefit: General — 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, LCZA, MPCA, Ext, FSA — Type: Emerg Svcs
   Benefit: General — Cost: Medium

3. Monitor invasive insect species, including emerald ash borer and forest tent caterpillar.
   Who: LCPW, CiL, Ext, FSA, Camden — Type: Prevention
   Benefit: General — Cost: Medium

A.2.b Hazard: Blizzards & Winter Storms.

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 — Type: Emerg Svcs
   Benefit: General — Cost: Medium

2. Educate residents on snow load provisions of Minnesota Uniform Building Code.
   Who: CiGh, CiMa, CiTr — Type: Prevention
   Benefit: General — Cost: Low

A.2.c Hazard: Drought / Extreme Temperatures.

Strategies

1. Work with MDH to complete and implement Wellhead Protection Plans.
   Who: LCZA, RWS, CiB, CiMa — Type: Prevention
   Benefit: General — Cost: Medium

2. Educate the public on the importance of wellhead protection and water conservation in times of low rainfall.
   Who: LCZA, BWSR, RWS — Type: Prevention
   Benefit: General — Cost: Low

3. Identify the location of adequate amounts of bottled water in case of prolonged utility outage.
   Who: LCEM, RWS — Type: Prevention
   Benefit: General — Cost: Low

4. Educate the public on the importance of utility conservation during extreme heat events.
   Who: LCZA, BWSR, RWS, CiMa — Type: Awareness
   Benefit: General — Cost: Low

5. Recruit volunteers to supplement emergency staff in summer weather emergency response.
   Who: LCEM — Type: Emerg Svcs
   Benefit: General — Cost: Low

A.2.d Hazard: Fires (Structures and Wildfires).

Strategies

1. Continue fire education, including the nationally coordinated “Firewise” program.
   Who: Fire — Type: Awareness
   Benefit: General — Cost: Low

2. Ensure property owners construct new facilities to MN Uniform Building Code.
   Who: CiGh, CiMa, CiTr — Type: Prevention
   Benefit: General, Property — Cost: Low

3. Consider adopting building code for new construction.
   Who: LCZA, CiB, CiC, CiGa, CiL, CiMi, CiR, CiTa — Type: Prevention
   Benefit: General, Property — Cost: Medium

4. Work with First Responders and Fire Departments on long-range capital improvements planning (CIP) for facilities and equipment.
   Who: LCEM, EMS, Fire — Type: Prevention
   Benefit: General, Property — Cost: Medium

5. Train property owners on the proper use of controlled burns and firebreaks.
   Who: LCSO, Fire, Twp, DNR — Type: Awareness
   Benefit: General, Property — Cost: Low

6. 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 — Type: Emerg Svcs
   Benefit: General — Cost: Low

A.2.e Hazard: Flooding (moderate hazard) / Dam Failure (low-rank hazard).

Strategies: See Section XV (NFIP Compliance)

A.2.e Hazard: Hazardous Materials (moderate hazard) /Meth Labs (low rank).

Strategies

1. Work with state and federal agencies to address hazardous materials and delivery systems (e.g. pipelines) that have the potential to impact the county and region.
   Who: LCEM, LCZA, Fire, DPS, MPCA — Type: Emerg Svcs
   Benefit: General — Cost: Low

2. Increase education of school officials, health care workers, employers, and the general public about response to hazardous materials events.
   Who: LCEM, LLMP, Fire, Sch — Type: Awareness
   Benefit: General, Lives — Cost: Low

3. Enforce ordinances that deal with responsibility for cleanup of a meth lab.
   Who: LLMP, LCSO — Type: Protection
   Benefit: General, Property — Cost: Medium

A.2.g Hazard: Tornado & Windstorms (moderate hazard) / Lightning & Hail (low rank).

Strategies

1. Each spring, educate local schools, hospitals, nursing homes, and others on the importance of doing a "Severe Weather Awareness Week" workshop for their staff, including identifying evacuation routes, safe rooms and shelters.
   Who: LCEM, Sch, Hosp, SMSU — Type: Awareness
   Benefit: General — Cost: Low

2. Conduct a study to determine areas that are deficient in safety shelters and/or not covered by warning systems; construct at least one new safe room or improve warning system in one community each year.
   Who: LCEM, LCSO, CiB, CiC, CiF, CiGa, CiGh, CiL, CiMa, CiMi, CiR, CiTa, CiTr Type: Structural
   Benefit: Lives Cost: High

3. Work with fire and ambulance volunteers to develop a safe shelter plan for the county including shelters, shelter capacity, and transportation routes.
   Who: LCEM, LCSO, EMS, Fire Type: Prevention
   Benefit: Lives Cost: Medium

4. Encourage construction of safe rooms in public facilities and manufactured home parks.
   Who: LCEM, LCZA, Sch, SMSU Type: Structural
   Benefit: Lives Cost: Medium

5. Encourage residents to use licensed contractors.
   Who: LCZA, CiB, CiC,CiGa, CiGh, CiL, CiMa, CiMi, CiR, CiTa, CiTr Type: Prevention
   Benefit: Property Cost: Low

A.3 Low Rank Hazards

A.3.a Hazard: Civil Disturbance & Terrorism / Earthquake / Land Subsidence

Strategies

1. Local governments complete and maintain thorough community risk and threat assessment.
   Who: LCEM, LCSO, LE Type: Prevention
   Benefit: General, Property, Lives Cost: Low

2. Consider zoning and building code provisions to protect facilities from natural disasters and terroristic attack.
   Who: LCEM, LCSO, LE Type: Prevention
   Benefit: General, Property, Lives Cost: Low

3. Plan for potential loss of essential services in the event of a regional catastrophe.
   Who: LCEM Type: Prevention
   Benefit: General 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 — Type: Prevention
   Benefit: General — Cost: Medium

2. Budget to perform estimates of potential monetary loses to structures, contents and functions in specific detail in next plan update.
   Who: LCEM — Type: Prevention
   Benefit: General — 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, under Hazard: Ice and Ice Storms, Strategy A.1.a.3 "Evaluate zoning and building code provisions to protect structures from severe storms." Most such provisions are enforceable primarily on new building construction.

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.

The strategies for Tornado & Windstorms (A.2.g) to construct safe rooms could address new construction or retrofitting existing structures. Improving floodplain maps (next section) 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.

For example, the strategy related to Hazardous Materials "Enforce ordinances that deal with responsibility for cleanup of a meth lab" is directly concerned with the problem of hazards to existing structures.

Another example is Wellhead Protection Plans (A.2.c Drought) which protect existing aquifers and mitigate the need for new infrastructure. The strategy for Transportation Infrastructure (A.1.c.3, related to winter storms) 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. Nine of the jurisdictions in the county are listed in FEMA's *Community Status Book*—the cities of Florence and Garvin are not listed (http://www.fema.gov/fema/csb.shtm). Lyon County and the cities of Balaton, Cottonwood, Ghent, Lynd, Marshall, Minneota, Russell, and Tracy are currently participating in NFP. 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 City of Taunton does not participate in the NFIP (as of December 2009); they were sanctioned for non-participation in 1975. As noted in Section VI.A.5.a, there appears to be possibly one residence located in the mapped floodplain.

The City of Taunton recognizes that they are not currently eligible for certain FEMA mitigation funding without participating in NFIP. However, by participating on the Planning Team, the City has demonstrated a desire to cooperate with their neighbors in Lyon County and to be eligible to adopt the plan.

Table 5-2
Participation in National Flood Insurance Program
Lyon County, Minnesota

Jurisdiction	NFIP Status	Initial FHBM	Initial FIRM	Current** Effective Map Date	Joined Program (or *Sanctioned*)	Ordinance Last Updated	Policies In Force#	Total Losses	Total Payments
Lyon County	Participating	1974	1998	1998	1998	2007	4	8	$42,828
City of Balaton	Participating	1975	1895	1985	1985		1		
City of Cottonwood	Participating	(Lyon County FIRM)			1997	1997	0		
City of Ghent	Participating	1974		NSFHA*	1984		1		
City of Lynd	Participating	1975	1985	1985	1985		1		
City of Marshall	Participating	1973	1977	1979	1977		21	39	$43,000
City of Minneota	Participating	1974	2000	2000	2000	2000	0		
City of Russell	Participating	1974		NSFHA*	1984	1984	0		
City of Taunton	Not Participating	1974		1975	*1975*				
City of Tracy	Participating	n/a			1997	n/a	0		
City of Florence	Not Listed	n/a							
City of Garvin	Not Listed	n/a							

* NSFHA-No Special Flood Hazard Area
** Draft Digital Flood Insurance Rate Map not yet approved by FEMA as of 1 February 2010
# Policies In Force, Total Losses, and Total Payments as of 30 November 2009

Source: FEMA Community Status Book 12.09, NFIP Insurance Statistics, SRDC files

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, SectionVI.A.5, to meet the goals and objectives in Chapter 5, Section XIII.A.2 above. Individual strategies were selected by consensus and do not appear in rank order. 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 [moderate rank]/Dam Failure [low rank].

B.1.a Strategies

1. Work with DNR and FEMA to adopt digital floodplain maps and update ordinances.
   Who: LCZA, CiB, CiC, CiGh, CiL, CiMa, CiMi, CiR, CiTa, CiTr — Type: Prevention
   Benefit: General, Property — Cost: Medium

2. Continue to work with DNR and FEMA to ensure floodplain map accuracy.
   Who: LCZA, CiB, CiC, CiGh, CiL, CiMa, CiMi, CiR, CiTa, CiTr — Type: Prevention
   Benefit: General, Property — Cost: Medium

3. Jurisdictions not currently participating in the National Flood Insurance Program (NFIP) will review their flood hazard areas and consider participation.
   Who: DNR, CiTa — Type: Prevention
   Benefit: General, Property — Cost: Medium

4. Add check box on building/zoning permit forms indicating flood hazard areas.
   Who: LCZA, CiGh, CiL, CiMi — Type: Prevention
   Benefit: Property — Cost: Low

5. Work closely with DNR on all development applications in identified flood hazard areas; discourage zoning variances in identified flood hazard areas.
   Who: LCZA, CiB, CiGh, CiL, CiMa, CiMi, CiR, CiTa — Type: Prevention
   Benefit: General, Property — Cost: Low

6. Educate and encourage property owners and insurance agents on purchasing flood insurance.
   Who: LCZA, CiB, CiC, CiGh, CiL, CiMa, CiMi, CiR, CiTr — Type: Awareness
   Benefit: General, Property — Cost: Low

7. Develop a program to voluntarily acquire, relocate or elevate at-risk structures in floodplains.
   Who: LCZA, CiGh, CiL, LCEM — Type: Protection
   Benefit: Property — Cost: High

8. Continue to utilize road maintenance & construction methods to reduce flood flows
   Who: LCPW — Type: Protection
   Benefit: General — Cost: Medium

9. Monitor and remove obstructions from rivers and drainage ditches.
   Who: LCPW, Watershed Districts, Ditch Authority — Type: Protection
   Benefit: General, Property — Cost: Medium

10. Promote buffer system along creeks and streams that are prone to flooding (e.g. grass strips, CRP).
    Who: LCPW, BWSR, SWCD, Watershed Districts — Type: Natural Resources
    Benefit: General, Property — Cost: Medium

11. Prepare Public Service Announcements for local media to use during flood hazard events.
    Who: DNR, LLMP, LCEM, CiMa — Type: Awareness
    Benefit: General — Cost: Low

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, Public Health & Infectious Disease, Transportation Infrastructure—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

Following HSEM comments, Planning Team members were asked to prioritize individual mitigation action items, 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. Representatives of Marshall Ambulance and Avera Marshall Hospital also responded, in addition to Planning Team members.

Table 5-3
Priority Action Items for Lyon County

Mitigation Strategy		Survey Score
A.1.a.4	Critical facility back-up power	4.5
A.2.d.4	CIP for EMS/Fire facilities	4.4
A.1.a.3	Zoning/Building Code protections	4.3
A.2.d.2	Construct bldgs to Building Code	4.3
A.1.a.5	Bury/harden power lines	4.1
B.1.a.5	No zoning variances in floodplain	4.1
A.1.a.1	NOAA Weather Radios	4.1
A.3.a.3	Plan for regional catastrophe	4.0

Source: All-Hazard Mitigation Planning Team

B. Action Implementation and Administration

Lyon 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. For example, Lyon County and the cities of Balaton, Cottonwood, and Marshall identified that they have a Comprehensive Plan to guide local growth policies. The County and these cities should evaluate the goals and objectives of this plan and incorporate them into their land use plans and policies. Other cities should also consider the goals and objectives of this plan as a basis to develop land use plans and policies for their areas.

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 onr 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.2.g.2, A.2.g.4, A.4.a.1, A.4.a.2, B.1.a.7

PDM: A.1.a.5, A.2.g.2, A.2.g.4, A.4.a.1, A.4.a.2, B.1.a.7

FMA: B.1.a.7

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 actions for Transportation Infrastructure will likely be accomplished in conjunction with 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.

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 Firefights Fire Station Construction Grants (SCG) programs. The DNR also works with local fire departments to conduct wildfire training programs.

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, Lyon County is a rural community with few full-time paid public staff. Jurisdictions in the county rely on Lyon County Emergency Management as a clearinghouse for intergovernmental cooperation. Lyon 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. Specifically refer to Section XIV.A.1.a.1 (Encourage all residents to have and use NOAA All Hazards Public Alert weather radios, with Specific Alert Message Encoding (SAME) capability.) and XIV.A.2.g.2 (Conduct a study to determine areas that are deficient in safe rooms and/or not covered by warning systems; construct at least one new safe room or improve the warning system in one community each year.). Regarding NFIP compliance, see Section XV.B.1.a.1 (Work with DNR and FEMA to adopt digital floodplain maps and update ordinances.) and XV.B.1.a.2 (Continue to work with DNR and FEMA to ensure floodplain map accuracy) for cities with identified flood hazard areas.

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:

Balaton City Clerk, PO Box 388, Balaton, MN 56115
Cottonwood City Administrator, PO Box 106, Cottonwood, MN 56229
Florence City Clerk, 1764 St. Hwy 23, Russell, MN 56169
Garvin City Clerk, 125 Sherman St, Garvin, MN 56132
Ghent City Clerk, PO Box 97, Ghent, MN 56239
Lynd City Clerk, PO Box 86, Lynd, MN 56167
Marshall City Administrator, 344 W. Main, Marshall, MN 56258
Minneota City Administrator, PO Box 307, Minneota, MN 56264
Russell City Clerk, PO Box 357, Russell, MN 56169
Taunton City Clerk, PO Box 337, Taunton, MN 56291
Tracy City Administrator, 336 Morgan St, Tracy MN 56175
Lyon County Emergency Management, Lyon County Law Enforcement Center
611 West Main Street, Marshall, MN 56258

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 their annual work plan. Lyon 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	Lyon County, Balaton, Cottonwood, Marshall
Capital Improvement Plan:	Balaton, Cottonwood, Minneota, Russell, Tracy
Redevelopment Plan:	Garvin
Local Emergency Plan:	Balaton, Cottonwood, Garvin, Ghent, Marshall, Minneota, Russell, Taunton, Tracy
Economic Development Plan:	Garvin, Ghent, Marshall, Minneota
Land-use Plan:	Cottonwood, Garvin, Marshall, Tracy
Transportation Plan:	Cottonwood, Marshall
School Disaster Plan:	Lyon County
Watershed Plan:	Lyon County
Soil Conservation Plan:	Lyon County
Regional Development Plans:	Southwest Regional Development Commission, including representatives from Lyon County, all townships and cities
Zoning Ordinance:	Lyon County, Balaton, Cottonwood, Florence, Garvin, Ghent, Marshall, Minneota, Russell, Tracy
Building and Fire Code:	Ghent, Marshall, Tracy
Floodplain Ordinance:	Lyon County, Balaton, Cottonwood, Ghent, Lynd, Marshall, Minneota, Russell
Subdivision Ordinance:	Cottonwood, Minneota

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 Lyon 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 Lyon County Emergency Management. Comments from the public on the AHMP will be received by Lyon 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.

Addendums

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

A. Resolutions of Participation by Jurisdiction

City of Balaton
City of Cottonwood
City of Florence
City of Garvin
City of Ghent
City of Lynd
City of Marshall
City of Minneota
City of Russell
City of Taunton
City of Tracy
Clifton Township
Coon Creek Township
Custer Township
Eidsvold Township
Fairview Township
Grandview Township
Island Lake Township
Lake Marshall Township
Lucas Township
Lynd Township
Lyons Township
Monroe Township
Nordland Township
Rock Lake Township
Shelburne Township
Sodus Township
Stanley Township
Vallers Township
Westerheim 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