

# NATURAL HAZARDS MITIGATION PLAN

## DOUGLAS COUNTY, WISCONSIN

Draft: January, 2016



INCLUDING THE PARTICIPATING COMMUNITIES OF  
CITY OF SUPERIOR    VILLAGE OF LAKE NEBAGAMON    VILLAGE OF POPLAR    VILLAGE OF SOLON SPRINGS

# DOUGLAS COUNTY HAZARD MITIGATION PLAN

January 2016

DRAFT

Prepared by:



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## I. INTRODUCTION AND BACKGROUND

### **Purpose**

The intent of a hazard mitigation plan is to inventory hazards of an area, providing a comprehensive reference source for planning and mitigation activities, and educate policy makers and emergency service organizations about local risks and vulnerabilities. Douglas County currently has an emergency management plan that addresses emergency action guidelines. These plans address response but do not address prevention. The purpose of a Hazard Mitigation Plan is to assess the possible hazards in Douglas County and to create hazard mitigation goals to protect the health, safety, and welfare of the public.

Mitigation is characterized as a long-term, on-going process. This plan seeks to address all natural hazards within Douglas County. It provides general guidance related to hazards within the County and incorporated communities as well as providing an overview of the mitigation efforts undertaken by the County and local units of government. In addition, the plan identifies potential problematic conditions and outlines corrective actions that the County will undertake to remedy the identified problems. Planning and implementation actions will be identified that are applicable to both pre-incident and post-incident situations.

It is the responsibility of the governments within Douglas County to protect life and property from the effects of hazardous events. Being prepared for disaster throughout the County through planning and mitigation is a continuous process. Appropriate actions must be taken to protect families, businesses, and public facilities by reducing the effects of natural disasters. Reducing the effects of natural disasters minimizes detrimental economic impacts and promotes community development and welfare.

### **Plan Scope**

The **Douglas County Hazard Mitigation Plan** is a natural hazard mitigation plan. It is intended to address natural hazards such as tornadoes, flooding, wildfires, thunderstorms, windstorms, and winter weather events. The plan does not address technological (manmade) hazards such as hazardous material incidents, nuclear power plant incidents, or terrorism. **The Douglas County Hazard Mitigation Plan** conforms to the local requirements of the **Disaster Mitigation Act of 2000 (DMA 2000)**, enacted on October 10, 2000. DMA 2000 establishes a pre-disaster hazard mitigation program and new requirements for the national Hazard Mitigation Grant Program (HMGP). Section 322 of the act specifically addresses mitigation planning at the state and local levels and establishes specific criteria for local planning.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Steering Committee**

The Douglas County Hazard Mitigation Plan was developed through the collective efforts of the Douglas County Hazard Mitigation Planning Committee, state, County and local units of government, and concerned citizens. The plan update process was facilitated by the Northwest Regional Planning Commission (NWRPC).

### **Douglas County Hazard Mitigation Planning Committee (2004)**

Mr. Keith Kesler	Douglas County Emergency Management Director
Mr. Thomas Dalbec	Douglas County Sheriff
Mr. John Robinson	County Board Supervisor
Mr. Donald Krisak	Village of Oliver President
Ms. Carol Christianson	NOAA-National Weather Service
Mr. Steve Coffin	Vacationland Fire and Emergency Association
Mr. John Zaengle	UW-Superior
Mr. Tony Guerra	American Red Cross
Mr. Keith Wiley	Douglas County Zoning Department

### **Douglas County Hazard Mitigation Planning Update Committee (2010)**

Mr. Keith Kesler	Douglas County Emergency Management Director
Mr. Thomas Dalbec	Douglas County Sheriff
Ms. Carol Christenson	NOAA-National Weather Service
Mr. Tony Guerra	American Red Cross
Mr. Jay Gallagher	Wisconsin DNR
Mr. Marty Kasinskas	Wisconsin DNR
Mr. Thomas Michalek	Vacationland Fire and Emergency Association
Mr. Keith Wiley	Douglas County Planning and Zoning Department
Mr. David Sletten	Emergency Management Planner

### **Local Representatives**

Mr. Brad Theien	Village of Solon Springs
Ms. Swan Dawson	Village of Lake Nebagamon

### **Plan Mission**

It is the mission of the Douglas County Hazard Mitigation Plan to promote sound public policy designed to protect citizens, critical facilities and infrastructure, public and private property, and the natural environment from detrimental impacts caused by natural hazards. This can be accomplished through a coordinated effort of promotion of public awareness and education initiatives, developing an understanding of the risks and probability of occurrence, and through the identification of actions that serve to reduce risk and prevent losses. **Plan Update:** The plan's mission statement was re-evaluated by the 2009 Hazard Mitigation Planning Committee and was determined to be relevant to the plan; thus was not revised.



### **Plan Goals**

The goals of the Douglas County Hazard Mitigation Plan provide the overall guidance and direction for the plan. These statements form the basis for the more specific actions and strategic implementation mechanisms design to achieve the plans goals. **Plan Update:** The plan's goals and objectives were re-evaluated by the 2009 Hazard Mitigation Planning Committee and it was determined that these statements still address current and expected conditions.

- **Protection of public health and safety**

1. Manage future development in so that the vulnerability of natural hazards is reduced.
2. Assessing the extent of our vulnerability to natural environmental hazards.

- **Public awareness and education**

3. To educate the public in hazard mitigation and steps to reduce vulnerability to natural hazards.

- **Protection of the natural environment**

4. Reducing vulnerability of infrastructure and built environment to natural and man-made environmental hazards through specific mitigation projects that will also consider the historic and environmental resources of our area.

- **Intergovernmental cooperation and coordination**

5. Form effective community-based partnerships for hazard mitigation purposes.
6. Establishing cooperative relationships between the public, private, and non-profit sectors to enhance our preparedness, response, recovery, and mitigation for hazard events.

- **Emergency services**

7. Ensure continued functionality of critical services in the event of a natural disaster or hazardous event.

### **Planning Process**

The Douglas County Hazard Mitigation Plan was developed by the Douglas County Hazard Mitigation Steering Committee, with assistance from the Northwest Regional Planning Commission (NWRPC). The plan development period was from March 2003 through January 2004. Throughout this time period, the steering committee regularly met with NWRPC, government staff and local officials. Public open houses were held on



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

October 20<sup>th</sup>, 2003 and Thursday, May 6<sup>th</sup> 2004 at the Superior Public Library. The completed draft plan, mapping and an overview of the process were presented to the public. No oral or written comments on the plan were received at either meeting. The draft plan was submitted to Wisconsin Emergency Management (WEM), for review and comment in December of 2003, with WEM comments received in March. For information and documentation of the planning process, please refer to **Appendix A**.

### **Plan Update Process**

This 2010 Plan update entailed a complete re-evaluation and update of all sections of the Plan including the original hazards, the risk assessment, mitigation goals, strategies, and mitigation priorities. The plan update is supplemented by an updated FEMA crosswalk that documents all the changes to the original hazard mitigation plan. The structure of the 2004 hazard mitigation plan was retained for the 2010 update. Development of the original plan was guided by a Hazard Mitigation Steering Committee, and the same basic process was used for the 2010 update. The 2010 Hazard Mitigation Plan Update Committee carried out most of the planning duties, with the assistance provided by the Northwest Regional Planning Commission (NWRPC) who facilitated the process and assembled the document. As with the original plan, local stakeholders (towns, villages) were invited to participate in the process (Appendix A) and were advised of their obligations to receive credit for participation. The plan update period began in January of 2010 and concluded in August of 2010. During the 8-month planning period, the Hazard Mitigation Plan Update Committee met monthly, to work through the various aspects of the revision process.

The Hazard Mitigation Plan Update Committee reviewed each section of the original HMP to determine which information needed to be updated. Statistical background data was revised to reflect demographic and land use changes that have occurred since completion of the original plan in 2004. The hazard identification and prioritization process followed the same protocol as the original plan. Natural hazards relevant to Douglas County were identified by the committee and ranked based upon current information relative to occurrences and perceived risk. Participating local units of government (villages) engaged in a similar process with their respective communities. Once a hazard priority ranking was established, statistical information about hazard occurrences and damages incurred was researched and updated to create hazard profiles. The revision process saw the inclusion of the earthquake hazard which was not part of the original hazard assessment in the 2004 plan. Upon review of the updated hazard profiles, various risk factors were analyzed to develop updated risk assessments and loss estimated for each of the profiled hazards. The plan's goals and objectives were examined and felt to be relevant to the plan update. The Committee also reviewed each of the original plan's 32 action items to identify progress toward completion, cost estimates, partnerships and participation and relevance to the updated hazard mitigation plan. Upon completion of a draft plan in August of 2010, two public meetings were held to present the revised plan to the citizens of Douglas County.



The updated HMP references existing countywide comprehensive plan, where appropriate. No other studies, reports or technical information were used in the preparation of this plan.

### **Multi-jurisdictional Participation**

The Douglas County Hazard Mitigation Plan is a multi-jurisdictional plan. FEMA does not require communities to be part of a multi-jurisdictional group, but does set standards for communities who decide to participate in a multi-jurisdictional effort. According to FEMA, in addition to meeting the standard requirements of Part 201 of the Hazard Mitigation Planning and Hazard Mitigation Grant Program Rules, a community that opts to participate in a multi-jurisdictional planning effort must meet four requirements:

1. Each community that wishes to receive credit for an approved plan must participate in the planning process.
2. Each community that wishes to receive credit for an approved plan must officially adopt the plan.
3. Each community must assess risks where they vary from the risks facing the entire community.
4. Each community must identify action items specific to the jurisdiction requesting credit for the plan.

In order for communities to continue to receive PDM grant funds, the community must either participate in and adopt the County multi-jurisdictional plan, or develop its own plan according to the FEMA guidelines.

In order for multi-jurisdictional plans to be approved, each jurisdiction that is included in the plan must have its governing body adopt the plan before submission to the State and FEMA, even when a regional agency has the authority to prepare such plans in the name of the respective jurisdictions. Townships within Douglas County do not have full land use authority. These units of government rely primarily upon the County to enforce any regulations enacted to mitigate natural hazards. According to the FEMA requirements, these units of government have the option of allowing the County to prepare and adopt the Hazard Mitigation Plan or participating in the county's process. Local units of government within Douglas County and the public were presented with several opportunities for participation in the update of the Hazard Mitigation Plan:

- ❖ The Hazard Mitigation Planning Committee was comprised of a diverse range of individuals representing local, County and private sector interests.
- ❖ Hazard Mitigation Planning Committee meetings were posted according to requirements and time was allotted at each meeting for public and/or local government comment and input. No comments from the general public or local jurisdictions were received at these meetings.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

- ❖ Each unit of government in Douglas County was contacted prior to the February 2010 meeting to advise them of the planning requirements. (Appendix A)
- ❖ In September 2010, the first of two public open houses was held at the Solon Springs Community Center in Solon Springs. The draft plan and background information was provided and comments were solicited from the public and local communities. No comments were received from the general public or local jurisdictions at this meeting.
- ❖ Copies of the draft implementation/action plan were distributed to all jurisdictions within Douglas County along with a solicitation for comments and participation.
- ❖ Copies of the draft plan were posted on the County and Northwest Regional Planning Commission web sites along with solicitation for comment and participation.
- ❖ A second public open house was held in conjunction with the City of Superior's public open house on September 30<sup>th</sup>, 2010, at the Superior Public Library. A total of 4 persons attended this meeting. Comments were solicited, with none being received.

As with the development of the original plan, villages and towns in Douglas County were invited to participate in the update of the hazard mitigation plan. The Villages of Solon Springs and Lake Nebagamon chose to participate in the plan update process. The Village of Oliver participated in the development of the original plan; however, did not participate in the plan update. The Villages of Superior and Poplar did not participate in the development of the original plan or the plan update process. This plan for Douglas County includes several local units of government within the planning area (16 towns, 2 villages, 1 city):

### **Towns**

Amnicon  
Bennett  
Brule  
Cloverland  
Dairyland  
Gordon  
Hawthorne  
Highland

Lakeside  
Maple  
Oakland  
Parkland  
Solon Springs  
Summit  
Superior  
Wascott

### **Villages**

Lake Nebagamon  
Solon Springs  
Poplar  
City of Superior  
(developing plan separately, addendum to county plan)



**Non-participating jurisdictions**

Village of Oliver (participated in original plan)

Village of Superior (did not participate in original plan)

**Federal Requirements for Risk Assessment**

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201 include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are ten hazards profiled in the mitigation plan, including floods, tornadoes, landslides, wildfires, lightning, hail, winter storms, windstorms, heat, and drought. The federal criteria for risk assessment, and information on how the Douglas County Natural Hazard Mitigation Plan meets those criteria is outlined in the table below.

<b>Section 322 Requirement</b>	<b>How This is Addressed in the Plan</b>
Identifying Hazards	Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent data are available, maps were created identifying the location of the hazard in the County.
Profiling Hazard Events	Each hazard section includes documentation of the history, and causes and characteristics of the hazard in the County.
Assessing Vulnerability: Identifying Assets	Where data is available, the vulnerability assessment for each hazard addressed in the mitigation plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas in the County in the Community Issues section. Each hazard section also identifies potential mitigation strategies.
Assessing Vulnerability: Estimating Potential Losses	The Risk Assessment Section of this mitigation plan identifies key critical facilities and lifelines in the County and includes a map of these facilities. Vulnerability assessments have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available.
Assessing Vulnerability: Analyzing Development Trends	The Douglas County Demographic and Economic Profile Section of this plan (Under Section I) provides a description of the development trends in the County, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Planning Area**

Douglas County is located in the far northwestern corner of the State of Wisconsin bordering the southwestern shores of Lake Superior. Douglas County borders Bayfield, Washburn, and Burnett Counties in Wisconsin and Pine, Carlton, and St. Louis Counties in Minnesota. Douglas County is comprised of 22 units of local government, including 16 towns, 5 villages and the City of Superior. The total land area of the County is 1,309.3 mi<sup>2</sup>, making it the 4<sup>th</sup> largest County in the State of Wisconsin. The year 2000 population of Douglas County was 43,287 (US Census), ranking the County 60<sup>th</sup> out of Wisconsin's 72 counties.

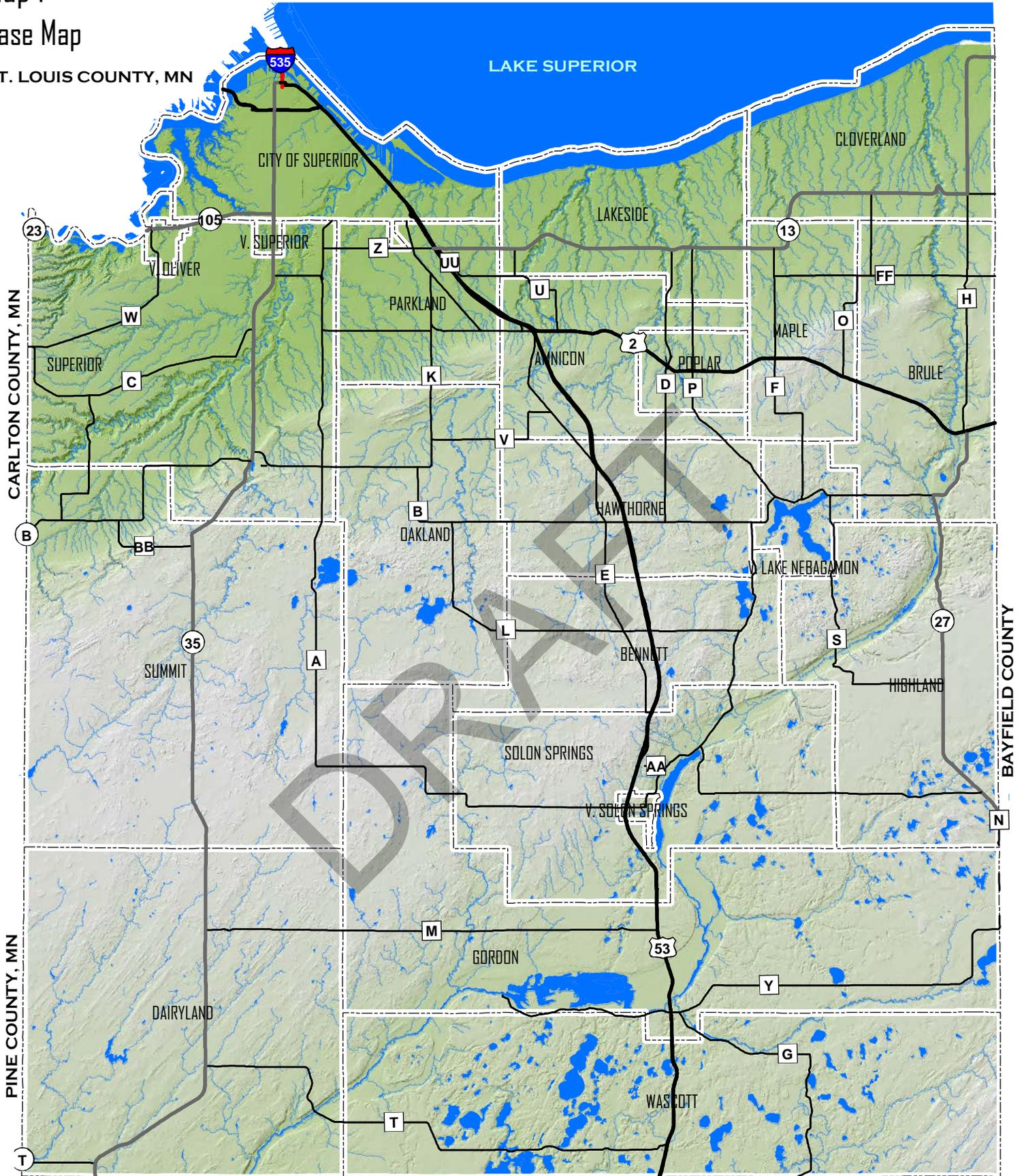
Geographical size of local units of government within the planning area:

Town of Amnicon 39.08 mi <sup>2</sup> (25,011 Acres)	Town of Parkland 35.50 mi <sup>2</sup> (22,717 Acres)
Town of Bennett 48.28 mi <sup>2</sup> (30,901 Acres)	Town of Solon Springs 84.47 mi <sup>2</sup> (54,060 Acres)
Town of Brule 55.86 mi <sup>2</sup> (35,749 Acres)	Town of Summit 147.55 mi <sup>2</sup> (94,432 Acres)
Town of Cloverland 46.17 mi <sup>2</sup> (29,550 Acres)	Town of Superior 107.74 mi <sup>2</sup> (68,953 Acres)
Town of Dairyland 140.79 mi <sup>2</sup> (90,109 Acres)	Town of Wascott 141.07 mi <sup>2</sup> (90,285 Acres)
Town of Gordon 157.35 mi <sup>2</sup> (100,703 Acres)	Village of Lake Nebagamon 14.34 mi <sup>2</sup> (9,177 Acres)
Town of Hawthorne 46.14 mi <sup>2</sup> (29,530 Acres)	Village of Oliver 14.34 mi <sup>2</sup> (1,321 Acres)
Town of Highland 78.02 mi <sup>2</sup> (49,936 Acres)	Village of Poplar 11.93 mi <sup>2</sup> (7,636 Acres)
Town of Lakeside 39.88 mi <sup>2</sup> (25,524 Acres)	Village of Superior 1.24 mi <sup>2</sup> (796 Acres)
Town of Maple 32.08 mi <sup>2</sup> (20,529 Acres)	Village of Solon Springs 2.30 mi <sup>2</sup> (1,472 Acres)
Town of Oakland 64.95 mi <sup>2</sup> (41,569 Acres)	City of Superior 42.19 mi <sup>2</sup> (27,002 Acres)

# Map I

## Base Map

ST. LOUIS COUNTY, MN



WASHBURN COUNTY

- HIGHWAYS**
- COUNTY
- INTERSTATE
- STATE
- US
- LAKES
- RIVERS
- MINOR CIVIL DIVISIONS





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Natural Features and Climate**

Over seventy-five percent of Douglas County is forested, with much of this land being either industrial forestland or County forest. The County borders Lake Superior on the north and has an extensive tributary network. The Continental Divide that separates the St. Lawrence (Lake Superior) and Mississippi River drainage systems passes through the middle of Douglas County. The major drainage streams, which lie north of the divide and empty into Lake Superior, are, from east to west, the Bois Brule, Poplar, Middle, Amnicon, Nemadi, and St. Louis Rivers. The St. Croix, Totagatic, and Upper Tamarack River's drain the southern part of the County. Streams and their 147 connecting lakes have a total direct drainage area of 1,010.37 square miles, 75.2 percent, of the County's land surface area. Of this amount, 705.73 square miles drains directly into Lake Superior. Douglas County has 431 lakes in total (154 named, 277 unnamed), which account for 14,113 total acres.

The climate of Douglas County is considered humid-continental with long, cold winters and rather short, moderately warm summers. Annual precipitation averages 32.1 inches, with mean snowfall in inches ranging from 50 near Solon Springs to around 40 along Lake Superior. The impact of Lake Superior itself on the climate is pronounced in the coastal areas, with warmer fall and winter conditions and cooler summer conditions. The lake also contributes to increased snowfalls (lake-effect) in northern portions of Douglas County.

**Table 1: Douglas County Climate Data**

Climate Normal's	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Daily High (F°)	20.0	25.3	35.5	47.6	58.8	69.0	77.5	74.6	66.0	54.8	38.8	24.4
Avg. Daily Low (F°)	-0.1	4.5	16.8	28.8	37.8	46.2	54.4	53.7	45.8	35.5	23.1	7.4
Growing Degree Days	0	1	7	52	157	304	505	456	271	106	14	1
Heating Degree Days	1705	1403	1203	804	518	229	78	108	279	614	1020	1522
Cooling Degree Days	0	0	0	0	0	10	106	84	6	0	0	0
Avg. Precipitation (")	0.92	0.74	1.92	2.23	3.09	3.66	3.49	3.99	3.92	2.29	1.63	1.03
Avg. Snowfall (")	11.7	7.9	8.8	2.7	0.1	0.0	0.0	0.0	0.0	0.1	5.3	11.7

Data from weather station at Superior, WI



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### Demographic and Economic Profile

#### *Population*

**Table 2: Douglas County Population 1970-2010 and 2030 Projections**

	1970	1980	1990	2000	2010	2015	2020	2025	2030
US Census <sup>1</sup>	44,657	44,421	41,758	43,287	44,159	---	---	---	---
NWRPC <sup>2</sup>	---	---	---	---	---	45,532	46,281	46,793	47,062

<sup>1</sup>US Census Bureau, <sup>2</sup>Douglas County Comprehensive Plan

**Table 3: Douglas County Population & Projections, Minor Civil Divisions: 2000-2010**

MCD	2000 Population	2010 Population	Percent Change	2020 Projection	2030 Projection
Amnicon Town	1,074	1,155	7.5%	1,322	1,386
Bennett Town	622	597	-4.0%	772	811
Brule Town	591	656	11.0%	727	762
Cloverland Town	247	210	-15.0%	241	240
Dairyland Town	186	184	-1.1%	167	163
Gordon Town	645	636	-1.4%	870	927
Hawthorne Town	1,045	1,136	8.7%	1,188	1,225
Highland Town	245	311	26.9%	354	382
Lakeside Town	609	693	13.8%	695	717
Maple Town	649	744	14.6%	694	706
Oakland Town	1,144	1,136	-0.7%	1,445	1,522
Parkland Town	1,240	1,220	-1.6%	1,157	1,137
Solon Springs Town	807	910	12.8%	1,129	1,212
Summit Town	1042	1,063	2.0%	1,128	1,151
Superior Town	2,058	2,166	5.2%	2,470	2,576
Wascott Town	714	763	6.9%	1,009	1,085
Lake Nebagamom Village	1,015	1,069	5.3%	1,207	1,256
Oliver Village	358	399	11.5%	529	573
Poplar Village	552	603	9.2%	590	599
Superior Village	500	664	32.8%	585	588
Solon Springs Village	576	600	4.2%	617	647
Superior City	27,368	27,244	-0.5%	27,385	27,397
<b>County Total</b>	<b>43,287</b>	<b>44,159</b>	<b>2.0%</b>	<b>46,281</b>	<b>47,062</b>

The 2010 population for Douglas County exceeded 2000 figures by 879 people, representing a 2 percent population increase in 10 years. Over half of the overall population resides within the City of Superior on the County's northern fringe. The rural areas of Douglas County have very low population densities. The Town of Dairyland in the southwestern corner of the County has the lowest overall population density at 1.3 persons per square mile. The average population density of all unincorporated areas within the County is 14.4 persons per square mile. The impact of natural hazards on the rural parts of the County may be somewhat lessened given the large size of Douglas County and generally low population density.

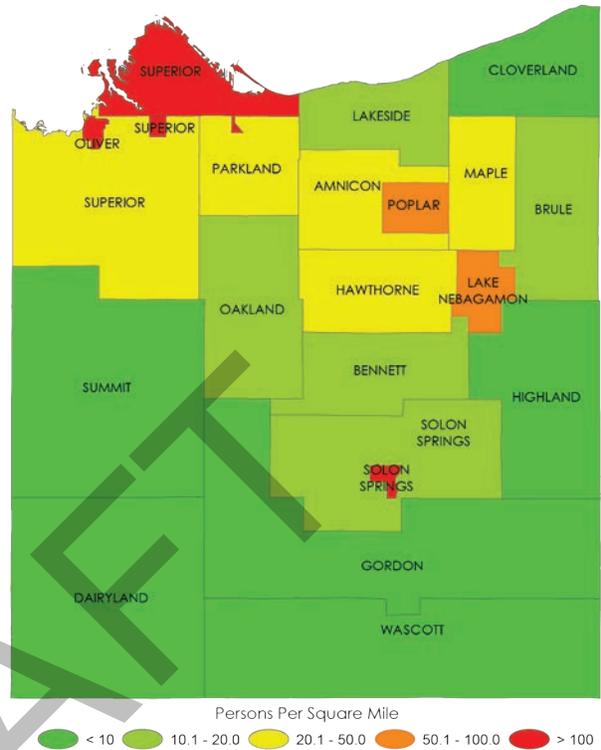


DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Table 4: Douglas County Population Density (Persons per Sq. Mi.)**

MCD	2010 Population Density
Dairyland Town	1.3
Highland Town	4.1
Gordon Town	4.2
Cloverland Town	4.6
Wascott Town	5.8
Summit Town	7.3
Solon Springs Town	11.0
Brule Town	11.8
Bennett Town	12.6
Lakeside Town	17.5
Oakland Town	17.8
Superior Town	20.5
Maple Town	23.2
Hawthorne Town	24.9
Amnicon Town	29.7
Parkland Town	34.6
Poplar Village	50.7
Lake Nebagamon Vill.	84.8
Oliver Village	193.3
Solon Springs Village	383.1
Superior Village	538.4
Superior City	737.1

**Figure 1: Douglas County 2010 Population Density**



**Housing**

The numbers of housing units and spatial distribution of housing units is a key concern for emergency managers, response personnel, and for assessing the potential losses associated with natural hazards.

Douglas County has a very high proportion of seasonal and recreational housing units. In half of the county’s 16 unincorporated towns, seasonal and recreational housing accounts for over 25 percent of the total housing units. In the Town of Wascott, nearly 70 percent of all housing units are classified as seasonal and recreational. During the warmer months, these housing units are more likely to be occupied than during the rest of the year.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Table 5: Douglas County Housing Units**

	Municipal Unit	1970	1980	1990	2000	2010	Percent Change 1970-2010	2010 Seasonal Units	2010 Percent Seasonal
Unincorporated Units of Government	T Amnicon	239	323	347	377	476	99.2%	18	3.8%
	T Bennett	262	297	322	348	341	30.2%	86	25.2%
	T Brule	286	365	403	255	363	26.9%	72	19.8%
	T Cloverland	100	125	139	109	139	135.4%	38	27.3%
	T Dairyland	175	249	269	188	329	107.7%	238	72.3%
	T Gordon	373	689	804	403	878	91.6%	532	60.6%
	T Hawthorne	221	327	422	347	459	66.3%	43	9.4%
	T Highland	167	253	287	181	320	59.2%	175	54.7%
	T Lakeside	190	244	255	272	316	74.1%	43	13.6%
	T Maple	206	267	269	305	328	41.9%	16	4.9%
	T Oakland	343	450	498	540	597	72.8%	119	19.9%
	T Parkland	382	496	470	487	542	47.0%	14	2.6%
	T Solon Springs	404	486	587	453	698	83.4%	282	40.4%
	T Summit	432	536	551	559	635	166.2%	169	26.6%
	T Superior	513	723	769	791	941	135.4%	31	3.3%
T Wascott	459	816	933	779	1,222	107.7%	842	68.9%	
	<b>Total</b>	<b>4,752</b>	<b>6,646</b>	<b>7,325</b>	<b>6,394</b>	<b>8,584</b>	<b>80.6%</b>	<b>2,718</b>	<b>31.7%</b>
Incorporated Units	V Lake Nebagamon	454	646	717	811	775	70.7%	292	37.7%
	V Oliver	68	88	102	125	167	145.6%	1	0.6%
	V Poplar	142	210	203	224	254	78.9%	8	3.1%
	V Solon Springs	340	361	384	397	408	20.0%	113	27.7%
	V Superior	129	202	195	203	309	139.5%	1	0.3%
	C Superior	10,997	11,988	11,684	12,202	12,328	12.1%	59	0.5%
	<b>Total</b>	<b>12,130</b>	<b>13,495</b>	<b>13,285</b>	<b>13,962</b>	<b>14,241</b>	<b>17.4%</b>	<b>474</b>	<b>3.3%</b>
	<b>County Total</b>	<b>16,882</b>	<b>20,141</b>	<b>20,610</b>	<b>20,356</b>	<b>22,825</b>	<b>35.2%</b>	<b>3,192</b>	<b>14.0%</b>

Source: US Census Bureau, Douglas County Comprehensive Plan



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

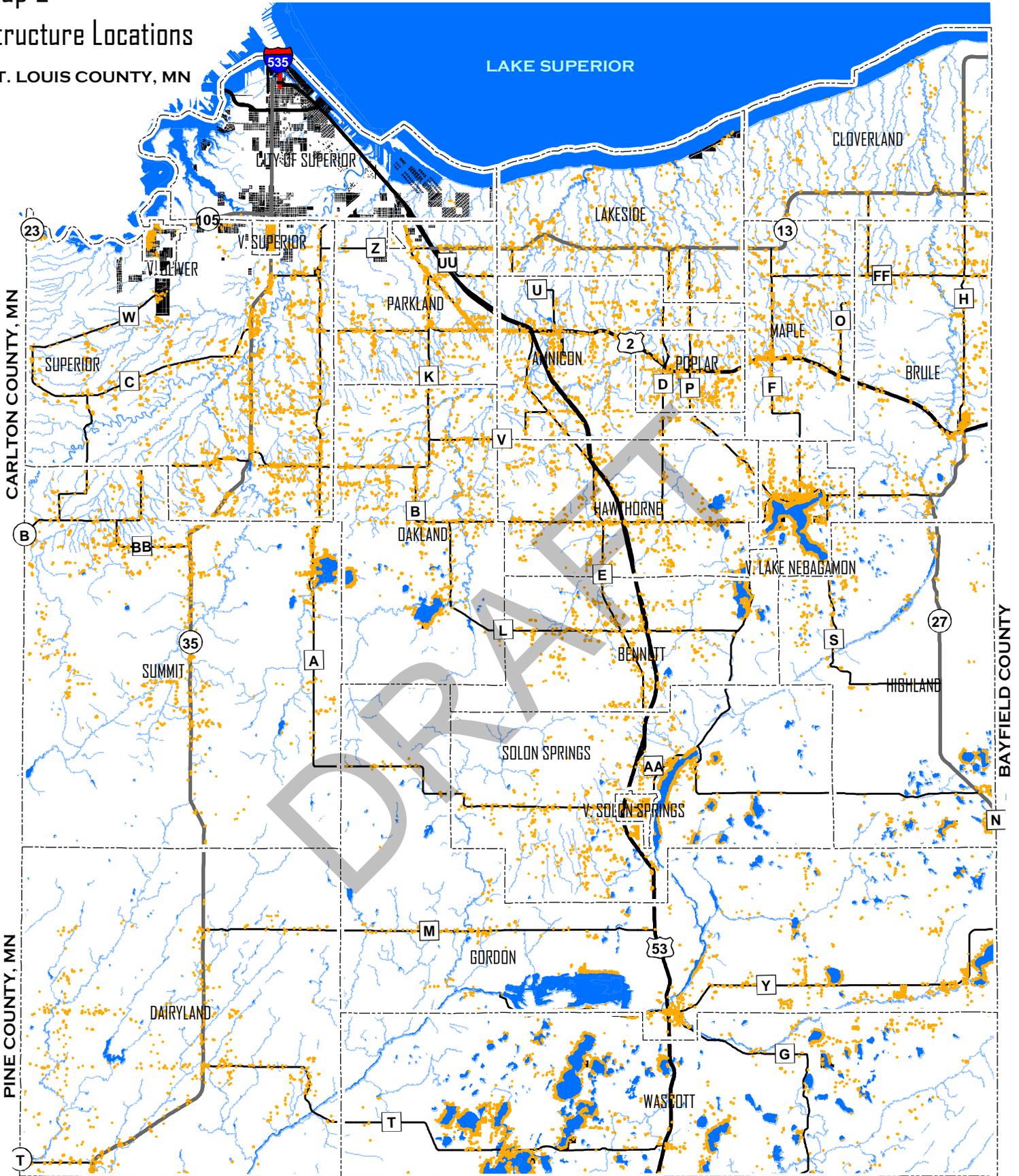
**Table 6: Douglas County Housing Unit Density**

	AREA (SQ. MI.)		TOTAL HOUSING UNITS (per square mile)					
	Total area	Land area	1980	1990	2000	2010	2020(est.)	2030(est.)
T Amnicon	39.1	39.1	8.3	8.9	9.8	12.2	14.7	17.3
T Bennett	48.3	47.5	6.2	6.8	6.3	7.1	8.1	9.2
T Brule	55.9	55.7	6.5	7.2	4.8	6.5	6.7	7.7
T Cloverland	46.2	46.2	2.7	3.0	2.4	3.0	3.4	4.0
T Dairyland	140.8	140.2	1.8	1.9	1.0	2.3	1.6	2.0
T Gordon	157.4	151.8	4.5	5.3	3.1	5.6	4.8	5.7
T Hawthorne	46.2	45.6	7.2	9.3	8.8	9.9	12.3	14.4
T Highland	78.1	76.5	3.3	3.8	2.2	4.1	3.7	4.5
T Lakeside	39.9	39.9	6.1	6.4	6.6	7.9	9.7	11.3
T Maple	32.1	32.1	8.3	8.4	9.4	10.2	12.3	13.8
T Oakland	65.0	63.9	7.0	7.8	8.5	9.2	11.6	13.3
T Parkland	35.5	35.5	14.0	13.2	13.5	15.3	16.6	18.3
T Solon Springs	84.5	83.0	5.8	7.1	5.7	8.3	8.9	10.5
T Summit	147.6	146.6	3.6	3.8	3.8	4.3	5.0	5.6
T Superior	107.8	106.2	6.8	7.2	7.5	8.7	10.3	11.7
T Wascott	141.1	133.0	6.1	7.0	6.1	8.7	8.7	10.0
Total Unincorporated	1,265.5	1,242.8	5.3	5.9	5.2	6.8	7.3	8.5
V Lake Nebagamon	14.3	12.7	50.9	56.5	58.7	54.2	74.3	85.9
V Oliver	2.1	2.0	44.0	51.0	64.0	79.5	89.0	105.5
V Poplar	11.9	11.9	17.6	17.1	18.7	21.3	22.9	26.2
V Solon Springs	2.3	1.6	225.6	240.0	243.1	177.4	266.9	290.6
V Superior	1.2	1.2	168.3	162.5	175.0	257.5	226.7	252.5
C Superior	55.4	36.9	324.8	316.6	330.5	222.5	336.0	338.2
Total Incorporated	87.2	66.3	203.5	200.4	209.5	163.3	218.6	224.1
Douglas County	1,480.0	1,309.3	15.4	15.7	15.5	15.4	18.0	19.4

Source: US Census Bureau, Douglas County Comprehensive Plan

# Map 2 Structure Locations

ST. LOUIS COUNTY, MN



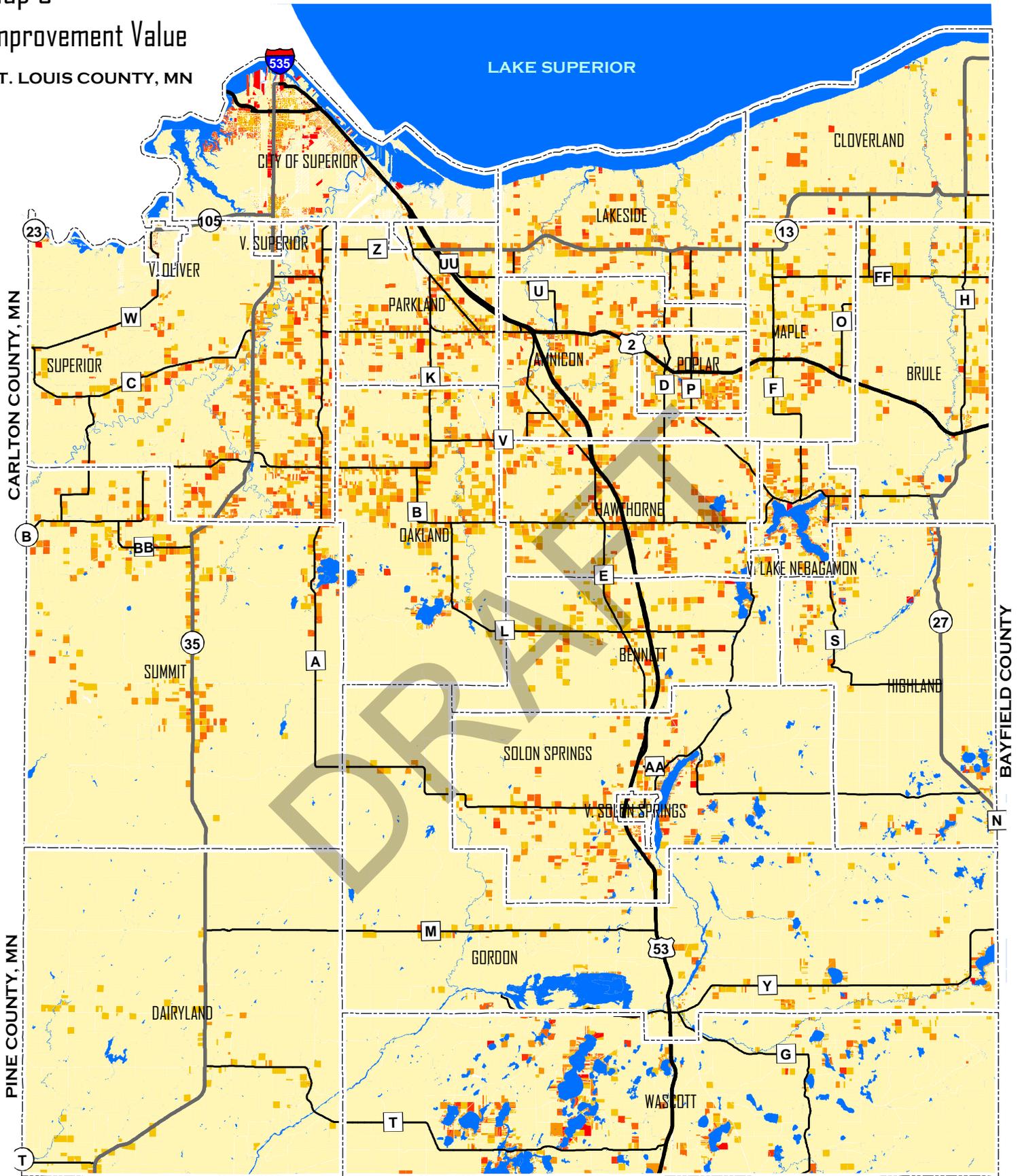
WASHBURN COUNTY

- HIGHWAYS**
- COUNTY
- INTERSTATE
- STATE
- US
- LAKES
- RIVERS
- MINOR CIVIL DIVISIONS
- PLATTED AREAS
- STRUCTURE LOCATIONS



# Map 3 Improvement Value

ST. LOUIS COUNTY, MN



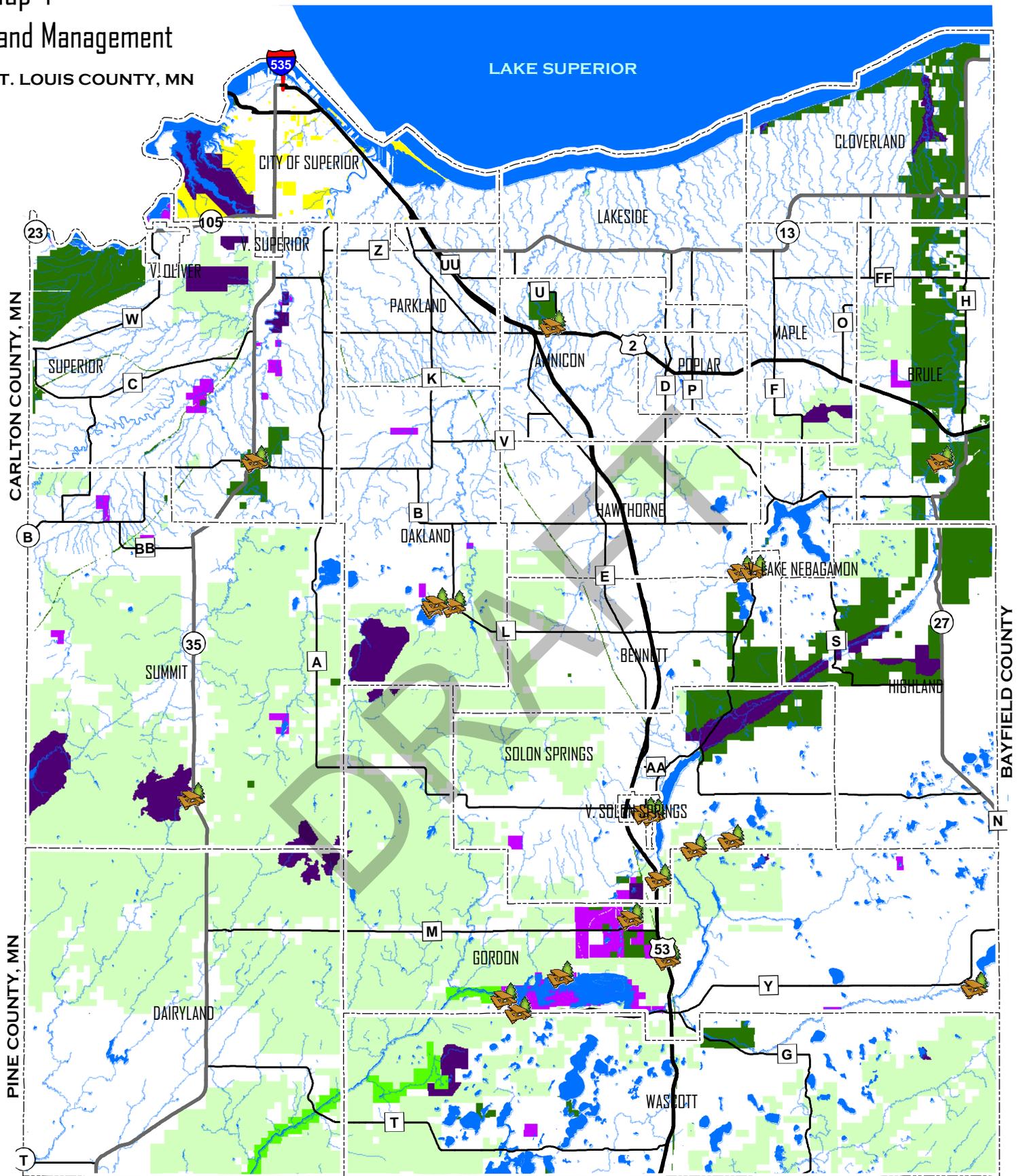
**WASHBURN COUNTY**

<b>HIGHWAYS</b>	MINOR CIVIL DIVISIONS	\$0.00 - \$50,000.00	\$150,000.01 - \$250,000.00
COUNTY	RIVERS	\$50,000.01 - \$100,000.00	\$250,000.01 - \$500,000.00
INTERSTATE	LAKES	\$100,000.01 - \$150,000.00	\$500,000.01 - \$28,537,500.00
STATE			
US			



# Map 4 Land Management

ST. LOUIS COUNTY, MN



- |                       |                  |                |
|-----------------------|------------------|----------------|
| <b>HIGHWAYS</b>       | LAKES            | <b>MANAGER</b> |
| COUNTY                | RIVERS           | COUNTY         |
| INTERSTATE            | SPECIAL USE AREA | FEDERAL        |
| STATE                 | COUNTY PARKS     | STATE          |
| US                    | CITY PARKS       | TRIBAL         |
| MINOR CIVIL DIVISIONS |                  |                |





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Employment**

**Table 7: Douglas County Employment, 2014**

<b>Crop and Animal Production</b>	<b>67</b>
<b>Mining, Quarrying, and Oil and Gas Extraction</b>	<b>&lt;10</b>
<b>Utilities</b>	<b>121</b>
<b>Construction</b>	<b>1,208</b>
<b>Manufacturing</b>	<b>1,409</b>
<b>Wholesale Trade</b>	<b>666</b>
<b>Retail Trade</b>	<b>2,055</b>
<b>Transportation and Warehousing</b>	<b>2,070</b>
<b>Information</b>	<b>85</b>
<b>Finance and Insurance</b>	<b>395</b>
<b>Real Estate and Rental and Leasing</b>	<b>133</b>
<b>Professional, Scientific, and Technical Services</b>	<b>350</b>
<b>Management of Companies and Enterprises</b>	<b>145</b>
<b>Administrative and Support and Waste Management and Remediation Services</b>	<b>504</b>
<b>Educational Services</b>	<b>56</b>
<b>Health Care and Social Assistance</b>	<b>1,885</b>
<b>Arts, Entertainment, and Recreation</b>	<b>220</b>
<b>Accommodation and Food Services</b>	<b>1,679</b>
<b>Other Services (except Public Administration)</b>	<b>1,626</b>
<b>Government</b>	<b>3,258</b>
<b>Unclassified Industry</b>	<b>0</b>
<b>Total</b>	<b>17,937</b>

Source: EMSI

The Wisconsin Department of Workforce Development identified an annual civilian labor force of 23,672 in 2014, of which 22,311 were employed and 1,361 were unemployed, yielding an unemployment rate of 5.7 percent. According to the 2010 U.S. Census, 8,570 Douglas County residents travel outside of the county for employment.

**Table 8: Douglas County Top Ten Employers (June 2010)**

<b>Company</b>	<b>Employees</b>
University of Wisconsin- Superior	250-499
Halvor Lines, Inc.	250-499
Wal-Mart	250-499
County of Douglas	250-499
City of Superior	250-499
Customer Link	100-249
St. Mary's Hospital of Superior	100-249
Minnesota Limited	100-249
School District of Superior	100-249
Jeff Foster Trucking Inc	100-249

Source: Wisconsin Department of Workforce Development



### **Douglas County Development Pattern**

Outside of the City of Superior, Douglas County is largely rural. Much of the non-urbanized area of the County is forest or agricultural land.

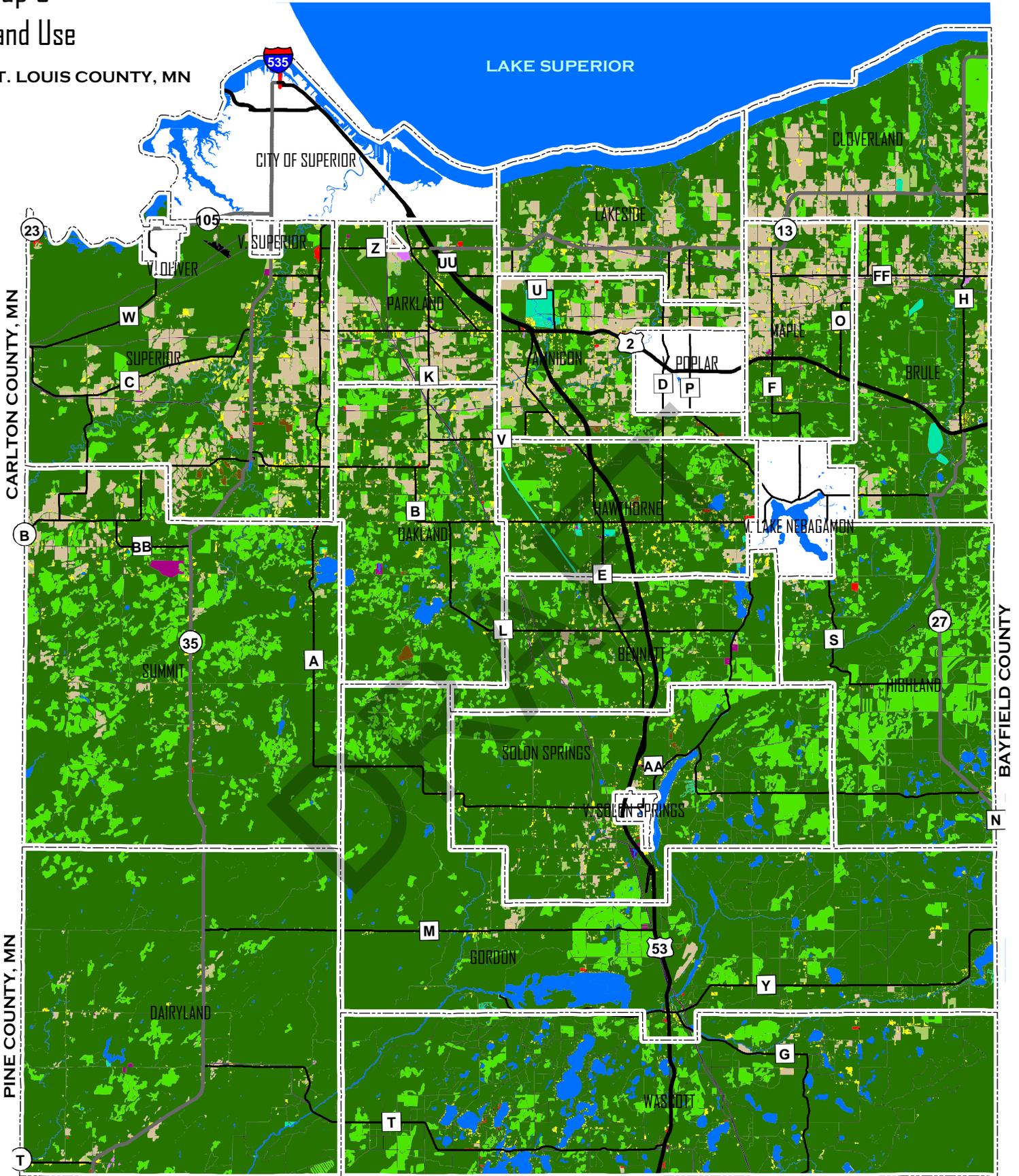
**Table 9: Douglas County Existing Land Use**

<i>LAND USE</i>	<b>ACRES</b>
<i>Agriculture</i>	43,652.7
<i>Commercial</i>	706.8
<i>Extraction</i>	798.3
<i>Forest - Harvested</i>	83,529.8
<i>Forest Roads &amp; Trails</i>	1,315.9
<i>Government/ Institutional</i>	845.6
<i>Hydrologic Feature</i>	1,642.0
<i>Impervious Surface</i>	77.6
<i>Industrial</i>	229.3
<i>Forest</i>	618,720.1
<i>Parks and Rec.</i>	1,719.2
<i>Residential</i>	11,073.8
<i>Structure</i>	690.1
<i>Transition Lands</i>	12,616.2
<i>Transport.</i>	13,414.0
<i>Transport. (Driveway)</i>	839.0
<i>Utilities</i>	2,734.0

Source: Douglas County Comprehensive Plan

# Map 5 Land Use

ST. LOUIS COUNTY, MN



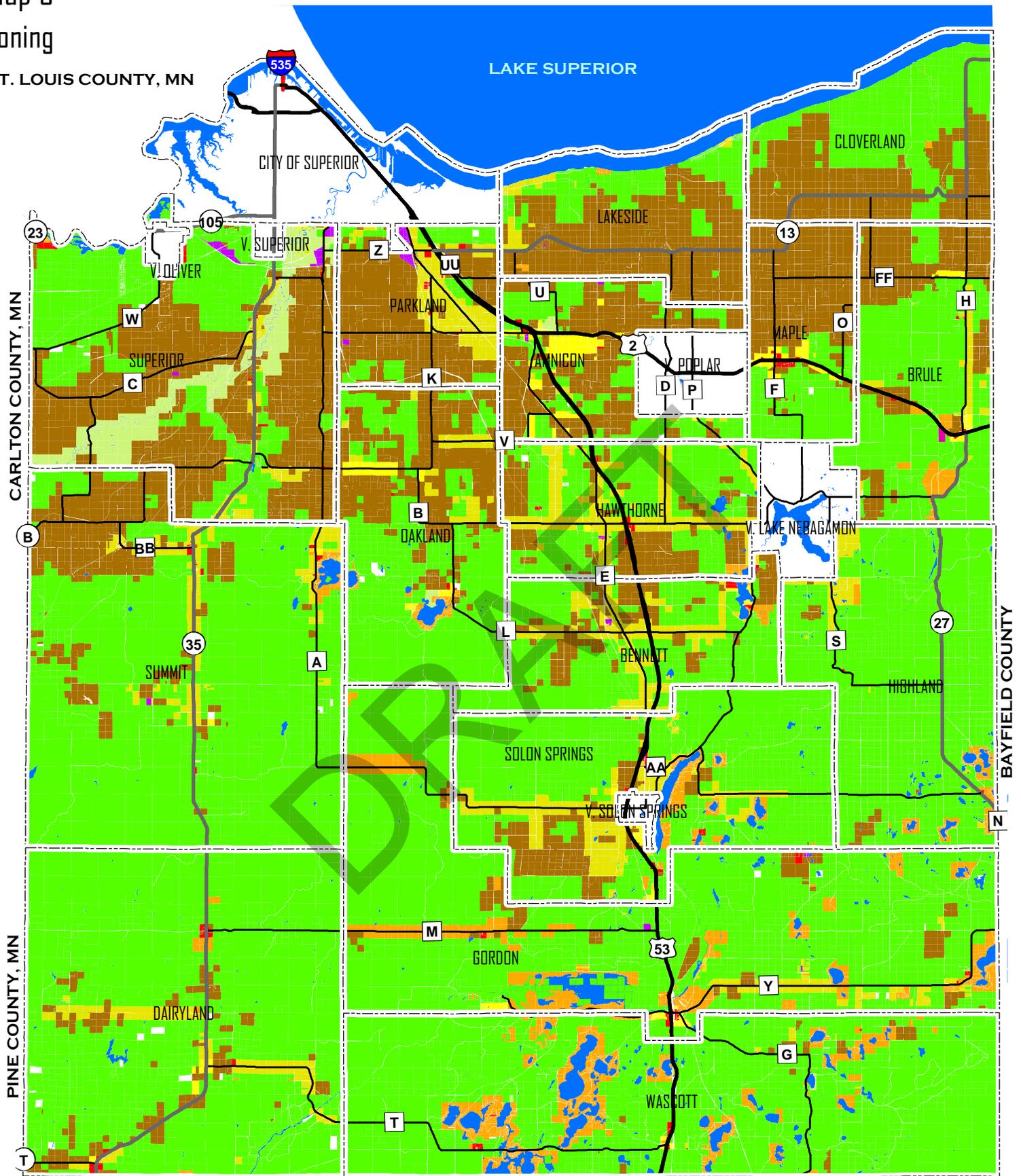
**WASHBURN COUNTY**

- |                 |                          |                    |                    |
|-----------------|--------------------------|--------------------|--------------------|
| <b>HIGHWAYS</b> | AGRICULTURE              | WATER              | STRUCTURE          |
| COUNTY          | COMMERCIAL               | INDUSTRIAL         | TRANSITIONAL LANDS |
| INTERSTATE      | EXTRACTION               | FOREST             | TRANSPORTATION     |
| STATE           | FOREST - HARVESTED       | OUTDOOR RECREATION | UTILITIES          |
| US              | GOVERNMENT/INSTITUTIONAL | RESIDENTIAL        |                    |



# Map 6 Zoning

ST. LOUIS COUNTY, MN



<b>HIGHWAYS</b>	<b>ZONING DISTRICT</b>	<b>PLANNED UNIT DEVELOPMENT</b>
— COUNTY	AGRICULTURAL	RESIDENTIAL 1
— INTERSTATE	COMMERCIAL	RESIDENTIAL 2
— STATE	FORESTRY	RESIDENTIAL RECREATION
— US	INDUSTRIAL	RESOURCE CONSERVATION





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Douglas County Zoning**

Zoning ordinances are the primary land use regulation tool used in Douglas County, and the county adopted countywide zoning by ordinance in December 1970. County zoning applies to all unincorporated areas (towns) of the county. The City of Superior and the five incorporated villages are responsible for administering their own zoning within their municipal limits. A land use permit must be issued by the county zoning office before engaging in any land use activities within the county.

### **Douglas County Floodplain Zoning Ordinance**

Section 8.3 of the Douglas County Zoning Ordinance regulates land uses within floodplains in the unincorporated portions of the county. The Douglas County Zoning Administrator administers the provisions of the countywide ordinance. Floodplain zoning encompasses three zoning districts:

***Floodway District*** (FW) "The provisions of this section apply to all areas mapped as floodway on the official floodplain zoning maps, and to those portions of the general floodplain district determined to be floodway according to the procedures in s. 5.4."

***Flood Fringe District*** (FF) "The provisions of this section apply to all areas within the flood fringe district, as shown on the official floodplain zoning maps, and to those portions of the general floodplain district that are determined to be in the flood fringe area pursuant to s. 5.4."

***General Floodplain District*** (GFD) "The provisions for this district apply to all floodplains for which "regional flood" data, as defined in Section 10.1 is not available, or where regional flood data is available but floodways have not been delineated. As adequate regional flood data becomes available and floodways are delineated for portions of this district, such portions shall be designated in the flood fringe district or floodway district, as appropriate."

### **Local Zoning Authority**

The City of Superior and the villages of Lake Nebagamon, Oliver, Solon Springs, Poplar and Superior are responsible for their own zoning enforcement and administration. Each community has its own zoning code with provisions specific to that community. These incorporated units of government also have their own zoning standards for floodplains.

The City of Superior floodplain zoning standards are found in article XXI of the City of Superior Zoning Code. Floodplain areas in the city are divided into three districts: the Floodway District (FW), Flood Fringe District (FF), and General Floodplain District (GFD).



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

The city's ordinance defines the districts as:

(FW) - The Floodway District consists of the channel of a stream and those portions of the floodplain adjoining the channel that are required to carry and discharge the flood waters or flood flows of any river or stream associated with the regional flood.

(FF)- The Flood Fringe District consists of that portion of the floodplain between the regional flood limits and the floodway area.

(GFD)-The General Floodplain District consists of the land that has been or may be hereafter covered by floodwater during the regional flood and encompasses both the Floodway and Flood Fringe Districts.

The Villages of Oliver and Poplar have adopted the county floodplain standards. The Villages of Solon Springs and Superior have local floodplain ordinances in effect. The Village of Superior is considering updating its existing ordinance to meet the county floodplain requirements. The Village of Lake Nebagamon has no floodplain zoning ordinance in effect at this time.

The National Flood Insurance Program (NFIP), is a pre-disaster flood mitigation and insurance protection program designed to reduce the increasing cost of disasters. Communities within Douglas County participating in the NFIP include:

**Table 10: Douglas County Participants in NFIP**

	<b>CID #</b>	<b>Date of Participation</b>	<b>Current Effective Map</b>
Douglas County <sup>1</sup>	550538	2/04/81	2/02/12
Village of Lake Nebagamon	550112	8/15/78	2/02/12
Village of Oliver	550113	2/02/12	2/02/12
Village of Poplar	550114	9/01/86	2/02/12 (M)
Village of Solon Springs	550115	8/15/78	2/02/12
City of Superior	550116	4/03/78	2/02/12

<sup>1</sup> Unincorporated areas only



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Development Trends and Requirements**

Most of Douglas County is categorized as rural, with forest being the dominant land use. Across the rural landscape, development density is generally very low. Higher density development is found along the shores of many County lakes and rivers. It is anticipated that the County will continue to experience waterfront/rural development pressure into the foreseeable future.

### *Trends*

#### **Agricultural land**

Between 1978 and 2014, the number of town parcels in the agricultural tax assessment class declined by 33.8 percent. Meanwhile, the total assessed acreage in the agricultural class declined 41.5 percent. This change likely reflects the conversion of agricultural lands, or fallow lands assessed as agriculture, to other tax classes such as forest or residential. This change may also be due, in part, to changes in the way that agricultural land has been assessed.

#### **Residential land**

Over the 36-year period between 1978 and 2014, the number of residential tax parcels in Douglas County increased by 41.4 percent. Total acreage in the residential tax assessment class also grew by 18.5 percent. During this period Douglas County experienced relatively rapid rural growth and a notable urban to rural population shift. The only unincorporated town to experience a decrease in residential assessment was Parkland. These residential trends confirm the trends identified in both the population and housing data presented earlier in the plan and that there remains a continued high demand for rural residential property.

The urban to rural population shift is evident in the decline in residential assessments within the incorporated communities. Between 1978 and 2014, the incorporated communities of Douglas County collectively lost 45.1 percent of their residential tax parcels. This change is likely due to residential parcels no longer being assessed as residential by conversion to other uses or reclassification and the consolidation of smaller residential parcels into larger parcels. The number of residential tax parcels in the City of Superior declined by 50.0 percent between 1978 and 2014. This figure directly corresponds to a decline in the city's population over this period.

One of the key residential growth factors within Douglas County has been marked growth in the seasonal/recreational housing sector. Within the rural towns, seasonal housing units comprise 1/5<sup>th</sup> of the total housing stock.

**Forestry lands**

Lands classified as forest are nearly exclusive to the unincorporated towns of Douglas County. This classification includes only privately-owned forestlands, as publicly-owned properties are tax-exempt. Overall, the number of parcels classified as forest increased by 20.3 percent between 1978 and 2014, while the total acreage in this class declined by 19.1 percent. In 2014, there were an additional 104,570 acres enrolled in Forest Tax Law programs such as the Forest Crop Law (FCL) and Managed Forest Law (MFL) Program. Douglas County also reported 262,508 acres of County Forest Crop lands and 63,665 acres of state forest.

**Manufacturing and mercantile lands (Commercial)**

Between 1978 to 2014, changes in manufacturing and commercial tax assessments were less dramatic than other tax classification categories; however, they do confirm the following trends; a decline in manufacturing acreages and parcels reflects the consolidation of these activities into industrial parks and the transition of these activities out of unincorporated areas and into incorporated units that have desired infrastructure capacity, as well as the overall decline in manufacturing activity in the region. Parcels assessed mercantile have increased at a modest average rate of four acres per year since 1978 and can be attributed primarily to increased nodal development along the U.S. Highway 2 and 53 corridors, as well as the commercial development in unincorporated areas immediately adjacent to developed areas of incorporated municipalities.

**Public ownership**

Transfer of land ownership from private to public ownership in Douglas County has not experienced radical change in the past 30-year period; however, the total acreage of County Forest grew from 266,272 acres in 1978 to 272,836 acres in 2014. Continued transfer of parcels from private to public ownership can be anticipated as the federal, state, and County agencies seek to acquire the lands within their identified management areas.

***Requirements*****Flooding**

Flooding will likely have an impact on most land use areas within the 22 communities in Douglas County. This hazard has the primary impact of shutting down transportation, since it is primarily the roads that are the object of flooding in the County. This could impact business, industry, commerce and schools and delay many social and emergency services. Wisconsin's Floodplain Management Program requires counties, cities and villages to zone their flood-prone areas. The state has set minimum standards for local regulation, but local governments can set more restrictive standards.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Douglas County has enacted floodplain ordinances to regulate development within flood zones of the rural communities. Local floodplain ordinances are also in effect for the City of Superior, and the Villages of Lake Nebagamon, Oliver, Poplar, Solon Springs, and Superior.

There is some existing development within designated floodplains in the county. These structures have been in place for many years and are upgraded to meet floodplain ordinances as the structures are renovated or replaced. Additionally, there are a number of seasonal/recreational structures that are within designated floodplains. Likewise, as these properties are mortgaged, they are required to be upgraded in order to meet the floodplain ordinances.

### **Wildfires**

Current development trends suggest that the county's population is increasing vulnerable to wildfire. Douglas County is very densely forested, sparsely populated, and has a high number of structures that are at risk to destruction by forest fires. Currently, neither the county, nor any local municipality has wildfire restrictions or requirements on residential development. A recent large-scale fire event has rekindled safety and preparedness concerns in the region. On the afternoon of May 14, 2013, the Germann Road Fire began in the Town of Gordon, burning into the Town of Highland and destroying 47 structures, including 17 homes. No injuries were reported as firefighters battled the largest forest fire to hit northern Wisconsin in more than 30 years.

### **Tornadoes**

Current development trends suggest that the county's population is increasing vulnerable to tornadoes. More development is exposed to this hazard, as an increasing number of structures appear on the landscape. Additionally, more concentrated development, such as that which is occurring along waterfronts provides additional exposure risk and potential for losses.

### **Thunderstorms, Lightning and Hail**

Thunderstorms, lightning and hail will likely have an impact on most land use areas within the county. Increasing development will expose more structures, people and personal property to the impacts of natural hazards.

### **Landslides and Coastal Hazards**

Potential landslide/coastal hazard areas in Douglas County coincide with lake, river and stream corridors. The Douglas County Zoning Ordinance (shoreland) or ordinances of the incorporated communities regulate development within these corridors. Along Lake Superior, building setback restrictions are based on bluff height and slope rather than the ordinary high water mark (OHWM).



# DOUGLAS COUNTY HAZARD MITIGATION PLAN

## II. HAZARD IDENTIFICATION

### Natural Hazard Identification: Flooding

Floods in Wisconsin usually are caused by thunderstorms associated with slow-moving frontal systems in the summer. Winter floods can occur when rain falls on snow causing rapid snowmelt. Ice jam floods are also a hazard in Wisconsin. The effects of flooding can be devastating and cause significant property damage and/or loss of life. Flooding in Wisconsin can occur at any time of the year but is most likely to occur in spring, summer, and early fall. Spring flooding is the most common situation, where snowfall melt water can combine with rain to produce a gradual build-up of flow and velocity in streams over a period of days. This gradual increase in water volume eventually exceeds the streams capacity and flows over the banks. The period of flooding can last from a day or two to several weeks or longer, until the waters recede back to normal flow levels. These gradual flood events can oftentimes be forecast, an ample evacuation time given to prevent loss of life. Other forms of flooding such as flash floods and ice jam floods can occur very quickly, without advance warning, presenting a much greater danger to human life.

The effects of flooding can be devastating. Structures in the path of a flood can be torn from their foundations. Bridges and infrastructure can be quickly washed away with the floodwaters. Flooding can also disrupt power supplies, disable fuel sources, make roads impassable, and greatly hinder emergency response efforts. Although the probability of serious injury and loss of life is often low, personal property damage is usually heavy due to long periods of inundation. Flooding increases the likelihood of long-term health hazards from water-borne diseases, mold, mildew, insect infestation, and contaminated drinking water. Long-term damage to the environment may also result from flooding of sites containing hazardous materials or waste.

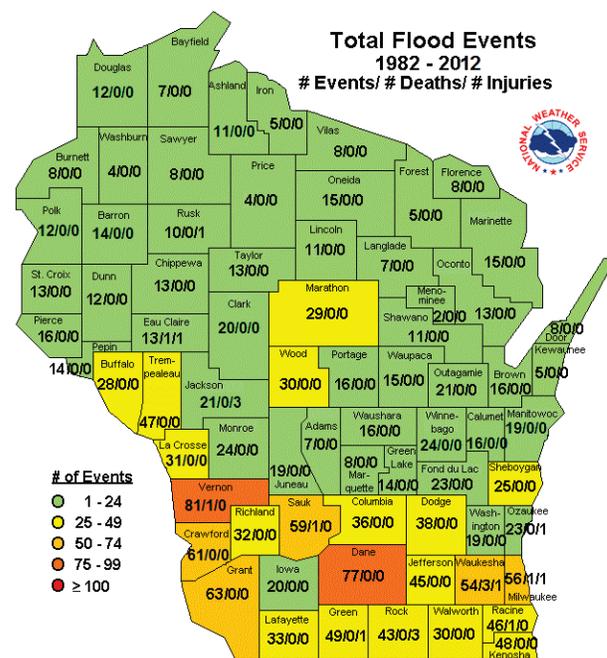
### Flood Facts

- 1) Most flood-related deaths are due to flash floods.
- 2) Fifty percent of all flash-flood fatalities are vehicle related.
- 3) Most homeowners' insurance policies do not cover floodwater damage.

### Coastal and Riverine Flooding

Flood damage can occur as a consequence of riverine flooding or coastal flooding. Riverine flooding occurs when streams and rivers overflow because of excessive rainfall

Figure 2: Wisconsin Flood Events 1982-2012





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

or snowmelt. Coastal flooding can result from large storms that cause large waves or storm surge. The damage from coastal flooding can be more severe than that from riverine flooding because of the added force of waves. Other factors that affect the severity of damage are depth of flooding, the velocity of the floodwaters, duration of flooding, and the presence of debris in the water. The location and elevation of the property with respect to the source of flooding determines the depth of flooding that can be expected. One of the major factors in assessing potential losses from inundation is the location of properties with respect to flood zones. A large portion of the losses in floods occurs to building contents. Losses in floods are higher in properties with basements since basements often contain expensive items such as water heaters, heating and air conditioning units, and many have been finished for use as extra living spaces. In some cases if there is a warning of flooding, moving valuable contents to upper floors can reduce losses. Losses to properties can be greatly reduced if buildings are raised to flood protection elevation or if floodwalls or levees protect the property from flooding. Thus it is important to understand if “flood resistant” measures have been taken. As with tornadoes, losses to vehicles, farm equipment, trains, and boats can be significant. While flood damage can be minimized if areas prone to flooding are not developed, floods can cause severe damage to vegetation and agricultural land. Therefore land use is an important characteristic in assessing potential losses.

### **Flash Flooding**

Intense periods of rainfall can cause “flash flooding”, a type of flooding most often associated with thunderstorms. These flood events can also be caused by the failure of flood control/management systems. Flash flooding is extremely dangerous due to its unpredictability, violent intensity, and oftentimes, limited warning. Flash flooding can occur very quickly, precluding evacuation to higher ground to prevent loss of life. Small and normally calm rivers and streams will rise very rapidly when surrounding soil and terrain are unable to accommodate intense precipitation.

### **Ice-Jam Floods**

Ice-jam floods occur on rivers that are totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur. Backwater upstream from the ice dam can rise rapidly and overflow the channel banks. Flooding moves downstream when the ice dam fails, and the water stored behind the dam is released. At this time, the flood takes on the characteristics of a flash flood, with the added danger of ice flows that, when driven by the energy of the floodwave, can inflict serious damage on structures.

### **Programs**

The Wisconsin Department of Natural Resources, working with local governments, is identifying special flood hazard areas in the state. Local units of government are responsible for enacting floodplain zoning ordinances that comply with state and federal regulations. State floodplain management regulations are found in Chapters 30.27, 59.971,



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

61.351, 62.231, 87.30 and 144.26, Wisconsin Statutes and Chapters NR 115, 116, 117 and 118 of the Wisconsin Administrative Code. Federal requirements for floodplain management are set forth in the National Flood Insurance Act as amended, EO 11988 and EO 11990.

Following the 1993 flood event in the Midwestern United States, congress authorized an appropriation of funds to assist communities in rebuilding. The Federal Emergency Management Agency (FEMA) and Wisconsin Emergency Management (WEM) created the Wisconsin Interagency Disaster Recovery Group (WIDRG) to coordinated distribution of these funds. Following a disaster, WIDRG assists local governments in their recovery effort and promotes disaster resistance during reconstruction. In addition, the Wisconsin State Hazard Mitigation Team works to develop and promote a statewide mitigation program. Both groups are led by Wisconsin Emergency Management.

The **Hazard Mitigation Grant Program** (HMGP), administered by WEM, provides funding for reducing flood-related disaster losses. WEM also administers the **Flood Mitigation Assistance Program** (FMAP), which provides funding for flood mitigation planning and for flood mitigation projects. A newly created program in 2001, the **Pre-Disaster Mitigation Program** (PDM) provides funding opportunities for local units of government and tribes to produce comprehensive hazard mitigation plans or for hazard mitigation projects. **The National Flood Insurance Program** (NFIP), is a pre-disaster flood mitigation and insurance protection program designed to reduce the increasing cost of disasters. The NFIP, which is a voluntary program that makes federally backed flood insurance available to residents and business owners in communities that agree to adopt and adhere to sound flood mitigation measures that guide development in its floodplains. The Wisconsin Department of Natural Resources is the state agency that coordinates the NFIP in Wisconsin. According to the NFIP repetitive loss database, there are no repetitive loss properties within Douglas County.

**Table 11: Douglas County National Flood Insurance Program Statistics (As of 5/14/2015)**

Policies in-Force	Insurance In-Force	Written Premium In-Force
47	\$ 8,285,100	\$ 22,221

Source: Federal Emergency Management Agency

**Table 12: Douglas County NFIP Loss Statistics (1978-2015)**

Community	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Douglas Co	4	3	0	1	\$84,971.80
Village of Solon Springs	2	0	0	2	\$0
Superior City	4	0	0	4	\$0
Oliver Village	1	0	0	1	\$0

Source: Federal Emergency Management Agency

**Table 13: Douglas County Hazard Mitigation Grants**



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Community	Type	Year	Total
Village of Oliver	Acquisition of 2 residential structures	2002	\$ 255,100
City of Superior	Acquisition and relocation of structure along Nemadji River (relocated out of floodplain)	2001	\$86,316.00
City of Superior	Construction/installation of a storm/sanitary sewer	1999	\$320,000
City of Superior	All-hazard Mitigation Plan	2001	\$ 55,000
Douglas County	Acquisition and demolition of structure in Amnicon River floodway	2001	\$93,600.00
Douglas County	All-hazard Mitigation Plan	2001	\$53,333
Head of Lakes	Burying overhead electrical lines	1999	\$164,156.00
		<b>\$562,330.00</b>	<b>\$749,772.00</b>

Source: Wisconsin Emergency Management

**Table 14: Douglas County Public Assistance Grants, 1999<sup>2</sup> and 2001<sup>3</sup>**

Applicant Name	1999			2001		
	Federal Share	State Share	Total Grant Payment	Federal Share	State Share	Total Grant Payment
<b>Local Governments</b>						
T Amnicon	\$26,222	\$4,370	\$30,592	\$14,296	\$2,383	\$16,679
T Bennett	\$34,747	\$5,791	\$40,538	\$31,601	\$5,267	\$36,867
T Brule	\$11,986	\$1,998	\$13,984	\$25,401	\$4,234	\$29,635
T Cloverland	\$25,760	\$4,293	\$30,054	\$19,259	\$3,210	\$22,468
T Dairyland	\$21,087	\$3,515	\$24,602	\$28,410	\$4,735	\$33,145
Douglas County	\$81,102	\$13,517	\$94,619	\$78,577	\$13,096	\$91,673
T Gordon	\$82,938	\$13,823	\$96,761	\$24,882	\$4,147	\$29,029
T Hawthorne	\$29,410	\$4,902	\$34,312	\$41,261	\$6,877	\$48,138
T Highland	\$8,338	\$1,390	\$9,728	\$10,508	\$1,751	\$12,260
V Lake Nebagamon	\$2,714	\$452	\$3,167	\$121,242	\$20,207	\$141,449
T Lakeside	\$19,689	\$3,282	\$22,971	\$31,601	\$5,267	\$36,868
T Maple	\$42,876	\$7,146	\$50,021	\$26,838	\$4,473	\$31,311
T Oakland	\$63,935	\$10,656	\$74,591	\$34,572	\$5,762	\$40,334
V Oliver	\$2,307	\$385	\$2,692	-	-	-
T Parkland	\$7,006	\$1,168	\$8,174	\$4,025	\$671	\$4,696
V Poplar	\$19,032	\$3,172	\$22,204	\$6,371	\$1,062	\$7,432
School District	\$3,917	\$653	\$4,569	-	-	-
Solon Springs Fire	\$1,078	\$180	\$1,258	\$0	-	-
T Solon Springs	\$119,300	\$19,883	\$139,184	\$43,927	\$7,321	\$51,248
V Solon Springs	\$21,837	\$3,640	\$25,477	\$9,796	\$1,633	\$11,428
T Summit	\$27,403	\$4,567	\$31,970	\$20,294	\$3,382	\$23,676

<sup>2</sup> July 4-31, 1999 severe storms result in severe flooding

<sup>3</sup> May 11, 2001 a major Presidential disaster declaration was declared for severe storms and floods



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

<b>C Superior</b>	\$134,840	\$22,473	\$157,314	\$25,401	\$4,234	\$29,634
<b>T Superior</b>	\$21,824	\$3,637	\$25,461	\$13,071	\$2,179	\$15,250
<b>T Wascott</b>	\$53,854	\$8,976	\$62,829	\$11,999	\$2,000	\$13,999
<b>Totals</b>	\$863,202	\$143,867	\$1,007,069	\$623,331	\$103,889	\$727,220
<b>Non-Profit Organizations</b>						
<b>Head of the Lake Electric</b>	\$347,499	\$57,917	\$405,416	\$280,256	\$46,709	\$326,965
<b>Vacationland</b>	\$2,487	\$415	\$2,902	-	-	-
<b>Totals</b>	\$349,986	\$58,331	\$408,317	\$280,255	\$46,709	\$326,965
<b>State Agencies</b>						
<b>Wisconsin Dept. Trans</b>	\$24,188	\$4,031	\$28,220	-	-	-
<b>Totals</b>	\$24,188	\$4,031	\$28,220	-	-	-
<b>Individuals and Families</b>						
<b>Grantees</b>	\$7,984	\$2,661	\$10,645	-	-	-
<b>Totals</b>	\$7,984	\$2,661	\$10,645	-	-	-

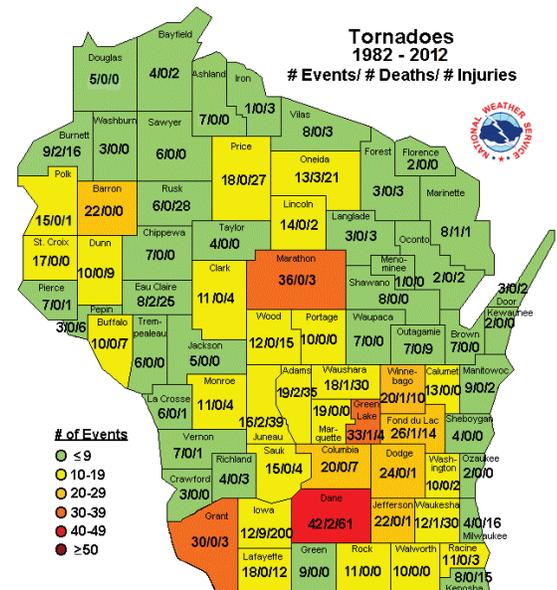
### Natural Hazard Identification: Tornadoes

Tornadoes, rapidly rotating columns of air, are found in the central, southeast, and northeast United States. Wind speeds can be in excess of 400 km/hr. Tornadoes can form over dry land or can be generated as a result of hurricanes. Tornadoes can be essentially dry accompanied by dust and debris, or they can be accompanied by rain or hail. They can occur individually or in families. Tornadoes may lift off the ground and touch down in some random pattern as they travel. They tend to cause the most damage where they touch down, and damage tends to occur in patches.

A tornado path averages four miles but may reach up to 300 miles in length. Widths average 300-400 yards, but tornadoes have cut swaths a mile or more in width, with severe tornadoes or groups of two or three funnels traveling together. On the average, tornadoes move between 25 and 45 miles per hour, but speeds over land of up to 70 mph have been reported. Tornadoes rarely last more than a couple of minutes over a spot or more than 15-20 minutes in a ten-mile area, but their short periods of existence do not limit their devastation of an area.

All Wisconsin counties recorded at least one tornado. The southern and west-central portions of the state have had the greatest number of occurrences.

**Figure 3: Wisconsin Tornadoes 1982-2012**



Source: Wisconsin Hazard Mitigation Plan

**Table 15: Wisconsin Tornadoes**

**1884-2007, Top 10 Counties**



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Rank	County	Verified Tornadoes Per County
1	Dane	63
2	Dodge, Grant	56
3	Marathon	51
4	Fond du Lac	47
5	Barron	40
6	Chippewa	37
7	Polk, Clark, Waukesha	34
8	Rock, Sauk	33
9	Jefferson	32
10	Winnebago, Columbia	31
	<b>Douglas</b>	<b>10</b>

Source: Wisconsin Hazard Mitigation Plan

The Enhanced Fujita scale (Table 16) shows the range of violence of tornadoes. An F-5 tornado produces the most violent winds on earth, approaching speeds of 300 miles per hour. In the Fujita scale, the wind speed is inferred by analyzing the damage caused by the tornado, and not measured directly.

**Table 16: The Enhanced Fujita Scale**

EF-Scale	Wind Speed	Potential Damage
EF0	105-137 km/h 65-85 mph	Light damage. Peels surface off roofs; some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; mobile homes pushed off foundations or overturned; sign boards damaged
EF1	138-179 km/h 86-109 mph	Moderate damage. Roofs torn off frame houses; windows and glass doors broken; moving autos blown off roads; mobile homes demolished; boxcars overturned.
EF2	180-217 km/h 110-137 mph	Considerable damage. Roofs torn off well-constructed homes; foundations of frame homes shifted; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	218-266 km/h 138-167 mph	Severe damage. Some walls torn off well-constructed homes; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	267-324 km/h 168-199 mph	Devastating damage. Well-constructed houses and whole frame houses completely leveled; structures with weak foundations blown away some distance; trees debarked; cars thrown and small missiles generated.
EF5	> 324 km/h >200 mph	Incredible damage. Strong frame houses leveled off foundations and swept away; with strongest winds, brick houses completely wiped off foundations; automobile-sized missiles fly through the air in excess of 100m (109 yd.); cars thrown and large missiles generated; incredible phenomena will occur.

While the overall incidence of tornados in northwestern Wisconsin is relatively few, recent occurrences in the region have caused fatalities and widespread damage. During the evening of September 2, 2002, an F-3 tornado (158-206 mph winds) struck a path of destruction through the downtown district of the City of Ladysmith, Rusk County,



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Wisconsin, that was 4 miles wide and 14 miles long. Also in Rusk County, the Towns of Grant, Grow, and Lawrence received damage from the tornado. A second notable event occurred on the evening of June 18, 2001, when an F3 tornado (158-206 mph winds) struck a path of destruction that tracked from east to west through the centers of the Towns of Grantsburg, Wood River, Daniels, Siren, Lafollette, Dewey, and Bashaw; and the Villages of Grantsburg and Siren; ending on the west edge of the City of Spooner in the counties of Burnett and Washburn. On the ground for 30-40 miles, at times up to ½ mile wide, it caused widespread devastation to farms, timber, businesses, government, and resident dwellings primarily in the Village of Siren.



July 1, 2011 Solon Springs Tornado. National Weather Service



Douglas County had ten recorded tornado occurrences between 1968 and 2014, the most dramatic being an F1 occurrence of June 27, 1994, which caused \$500,000 in damage nine miles northwest of Wascott. On July 1, 2011 an EF2 tornado occurred southwest of the Village of Solon Springs, destroying a home and outbuildings. The tornado covered 2.9 ground miles (via aerial survey), before ending near County Trunk Highway A, west of the village.

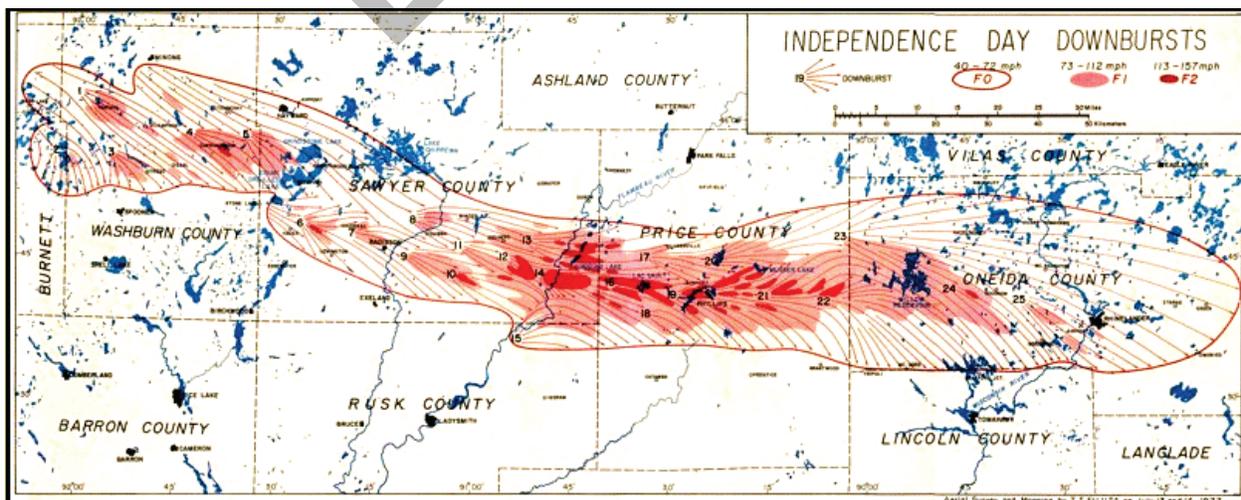


## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Natural Hazard Identification: Thunderstorms**

Thunderstorms are one of the most common and most noticeable weather products of our atmosphere. Severe thunderstorms contain multiple dangers that can threaten your safety and personal property in any part of the country and at any time of the year. Although these storms can be fairly small, averaging approximately 10 to 15 miles in diameter with average lifetime of 20 to 30 minutes, they can cause a tremendous amount of damage in this short time frame. Strong frontal systems may spawn more than one squall line composed of many individual thunderstorm cells. These fronts can often be tracked across the entire state from west to east. Thunderstorms may occur singly, in clusters, or as a portion of a large line of storms. Thus, it is possible that several thunderstorms may affect an area in the course of a few hours. Severe thunderstorms can cause injury or death and can also result in substantial property damage. Many hazardous weather events are associated with thunderstorms. Fortunately, the area affected by any one of them is fairly small, and most of the time, the damage is fairly light. Lightning is responsible for many fires around the world each year, as well as causing deaths when people are struck. Under the right conditions, rainfall from thunderstorms causes flash flooding, which can change small creeks into raging torrents in a matter of minutes washing away large boulders and most man-made structures. Hail up to the size of softballs damages cars and windows and kills wildlife caught out in the open. Strong (up to more than 120 mph) straight-line winds associated with thunderstorms knock down trees and power lines. Thunderstorms may also cause power outages, disrupt telephone service, and severely affect radio communications and surface/air transportation, which may seriously impair the emergency management capabilities of the affected jurisdictions.

One of the nation's worst thunderstorm wind events occurred on July 4, 1977, in northern Wisconsin. Winds reached more than 115 mph in a swath over 150 miles long, flattening 850,000 acres of forest, killing one and injuring 35 people. The storm also caused in excess of \$24 million in property damage across the region.



National Weather Service



Severe thunderstorms are defined as having one or more of the following:

- Winds in excess of 58 mph
- Hail at least 3/4 of an inch in diameter, approximately the size of a penny
- A tornado

Severe thunderstorms also frequently contain **heavy downpours** and **dangerous lightning**. Wisconsin sees an average of 30 days a year with thunderstorms, with most occurring during the months of May through September. Most thunderstorms also occur between the hours of 12 noon and 10 p.m.

The frequency of thunderstorms is measured in terms of **Thunderstorm Days** or days on which thunderstorm activity is observed. The average number of Thunderstorm Days in Wisconsin ranges from 30 to 50, depending upon location. The southern parts of the state generally receive more thunderstorm activity than do the northern counties.

Thunderstorms can be detected using a variety of tools. Radars depict where rain and hail are located in the storm. Doppler radars also allow us to visualize how the wind is blowing within and near the storm. Some features of thunderstorms, such as the anvil that spreads out at the top of the storm, can be seen from satellites.

### *Lightning*

Lightning is a by-product of thunderstorms. An average of 93 people are killed and another 300 injured by lightning each year in the United States. Between 1959 and 1999, lightning killed 49 people in Wisconsin (29<sup>th</sup> in the nation), and injured 230 people (19<sup>th</sup> in the nation).

### **Lightning Facts**

- ❑ All thunderstorms contain lightning.
- ❑ Lightning bolts can travel 20 miles before striking the ground. It is safe to say that if you hear thunder, there is at least a remote chance that you can be struck by lightning.
- ❑ Air near a lightning bolt can be heated to 50,000 degrees Fahrenheit, which is hotter than the surface of the sun.
- ❑ Most lightning deaths occur when people are caught outdoors.
- ❑ Most lightning casualties occur in the summer months and during the afternoon and early evening.
- ❑ Since the southern half of Wisconsin experiences more thunderstorms during the year, most of the lightning-related fires, deaths, and injuries occur in southern Wisconsin.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### *High Winds*

Oftentimes, thunderstorm events are accompanied by high winds. These forces are most often the cause of widespread damage associated with thunderstorms. The two main types of thunderstorms produced wind phenomena are downbursts, or straight-line winds, and derechos. A downburst is a small area of rapidly descending rain and rain-cooled air beneath a thunderstorm. Wind speeds associated with downbursts can reach 100 to 150 miles per hour or similar to that of a strong tornado. The winds produced from a downburst often occur in one direction and the worst damage is usually on the forward side of the downburst. Derecho winds are created by the merging of many thunderstorm cells into a cluster or solid line extending for many miles. The width of such a storm can range from 20 to 65 miles and the length can reach 100 miles or more. The extreme velocity winds produced by a derecho can exceed 150 miles per hour and cause extensive damage. A recent example of the impact of derecho winds was observed following the storm event of July 4, 1999, which occurred in Minnesota's Boundary Waters Canoe Area Wilderness (BWCAW). This event was one of the largest blowdowns in North American history, similar in size and severity of a category 3 or 4 hurricane, making landfall in a forested region. The storm impacted approximately 477,000 acres, when winds in excess of 90 miles per hour hit the region.

### **Wind Facts**

- ❑ One of the country's worst thunderstorm windstorms occurred on July 4, 1977, in northern Wisconsin. Winds reached more than 115 mph in a swath over 150 miles long, flattening hundreds of thousands of acres of forest.
- ❑ In 1998, thunderstorm winds were responsible for 1 death and 59 injuries in Wisconsin, mostly due to the widespread "derecho" thunderstorm wind event on May 30 and 31 across southern and central parts of the state. Maximum wind gusts ranged from 80 to 128 mph.
- ❑ In 1999, thunderstorm winds resulted in two deaths and four injuries in Wisconsin.



Wisconsin Department of Natural Resources

### **Natural Hazard Identification: Wildfire**

A forest fire is an uncontrolled fire occurring on forest or woodlands outside the limits of incorporated villages or cities. A wildfire is any instance of uncontrolled burning in brush, marshes, grasslands, or field lands. For the purpose of this analysis, both of these kinds of fires are being considered together. The causes of these fires include lightning, human carelessness, or arson. Forest fires can occur any month, but spring and fall month typically see the most wildfire activity.

The highest occurrence is in April and May after the snow has left the ground and vegetation is still in a dormant stage. Prior to modern fire suppression techniques, public education, and regulations governing burning, wildfires consumed substantial acreage each year. In the State of Wisconsin, wildfires burned nearly 40,000 acres between 1990 and 2000 (WDNR Stat.). Historically, Wisconsin has experienced several large wildfires, including the Peshtigo fire of October 8, 1871, which burned over 1.2 million acres of forestland in northeastern Wisconsin. Recent large wildfires include the Crystal Lake Fire, which burned 572 acres in Marquette and Waushara counties in the spring of 2003, and the Cottonville Fire, which burned 3,410 acres in Adams County in the spring of 2005. A recent large-scale fire event has rekindled safety and preparedness concerns in Douglas County.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Table 17: 2004-2014 Wisconsin Wildfire Statistics**

Year	Wildfires		Prescribed Fires	
	Number of Fires	Number of Acres	Number of Fires	Number of Acres
2014	613	3,268	624	40,795
2013	671	9,196	393	18,499
2012	1,536	2,880	509	31,402
2011	735	719	529	30,536
2010	1,318	2,224	687	44,650
2009	1,640	3,746	659	31,221
2008	895	1,050	625	33,849
2007	1,458	4,713	545	34,134
2006	1,702	2,287	738	30,239
2005	1,628	6,311	558	29,258
2004	1,164	2,385	524	21,816

Source: USDA Forest Service

**Table 18: Forest Fires and Wildfires Over 500 Acres in Wisconsin 1976-2013**

County	Acres	Date	Section	Town	Range	Desc	Name/Area
Juneau	3,177	May 9, 1976	28	20	4E	NWSW	New Miner I
Juneau	1,507	August 28, 1976	27	18	3E	NWSE	Necedah
Portage	1,318	September 1, 1976	27	25	8E	NENW	Dewey Marsh
Portage	2,776	October 2, 1976	7	25	8E	NWSE	Range Line
Wood	1,210	November 2, 1976	29	21	6W	SESE	Shamrock
Jackson	17,590	April 27, 1977	32	21	3W	NWNW	Brockway
Jackson	6,159	April 27, 1977	9	20	3W	NWNE	Saratoga
Jackson	3,037	April 30, 1977	9	20	4W	SWSE	Airport
Washburn	13,375	April 30, 1977	6	41	13W	SWSW	Five Mile Tower
Juneau	1,551	May 8, 1977	15	20	4E	NWNW	New Miner III
Burnett	4,654	April 21, 1980	36	40	16W	SWSW	Ekdall Church
Washburn	11,418	April 22, 1980	15	39	11W	SESE	Oak Lake
Monroe	1,028	April 22, 1980	27	18	1W	SESE	Lyndon Station
Barron	565	April 9, 1987	6	34	14W	NWNW	
Iowa	967	April 17, 1988	2	8	01E	NESE	
<b>Douglas</b>	<b>863</b>	<b>May 2, 1988</b>	<b>21</b>	<b>45</b>	<b>10W</b>	<b>SESW</b>	<b>Deer Print</b>
Juneau	911	June 25, 1988	10	14	5E	NWNE	Lyndon Station III
Dodge	1,553	October 15, 1988	19	12	16E	NESE	
Green Lake	4,261	November 20, 1989	16	17	12E	NESW	White River
Iowa	1,897	April 22, 1990	7	8	02E	NENE	
Eau Claire	553	April 23, 1994	16	26	05W	NWSE	
Fond du Lac	630	October 24, 1998	6	14	15E	SESW	
Rock	583	March 30, 1999	10	3	10E	NWNE	
Iowa	1,350	April 1, 1999	5	8	02E	NWSW	
Adams	3,410	May 5, 2005					Cottonville Fire
Douglas	7,499	May 14, 2013					Germann Road Fire

Source: Wisconsin Department of Natural Resources, Bureau of Forestry



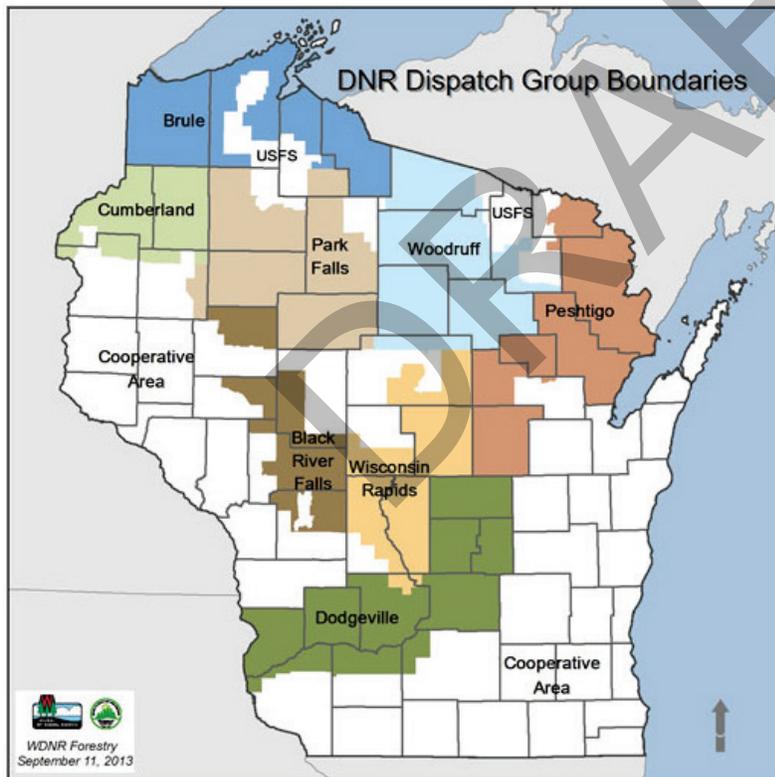
### Germann Road Fire

On the afternoon of May 14, 2013, logging operations sparked a wildfire off Germann Road near Simms Lake in the Town of Gordon. The wind-driven fire (Germann Road Fire) burned eastward across the Town of Highland before being contained on May 15<sup>th</sup> near the Bayfield County line. Over 100 buildings were destroyed, including 22 primary residences. Another 350 structures were threatened, but either survived the fire or were directly saved by firefighter assistance. No injuries were reported as firefighters battled the largest forest fire to hit northern Wisconsin in more than 30 years.

### Fire Protection

The Wisconsin Department of Natural Resources is the primary agency for wildland fire response in the state. WDNR is responsible for fire protection on 18 million acres of forest and wild lands. The USDA-Forest Service is responsible for protection on another two million acres of National Forests within the state. Local fire departments are responsible for fire suppression on the remaining wildland acreage in the state.

Figure 4: Wildland Fire Response in Wisconsin



Source: Wisconsin Department of Natural Resources, Bureau of Forestry

Douglas County is located within *intensive protection area*<sup>1</sup>, and fire response is coordinated through the Brule Dispatch Group. Fire response units for Douglas County

<sup>1</sup>**Intensive Protection Areas** are the most heavily forested and contain the most fire hazards and risk in the state.



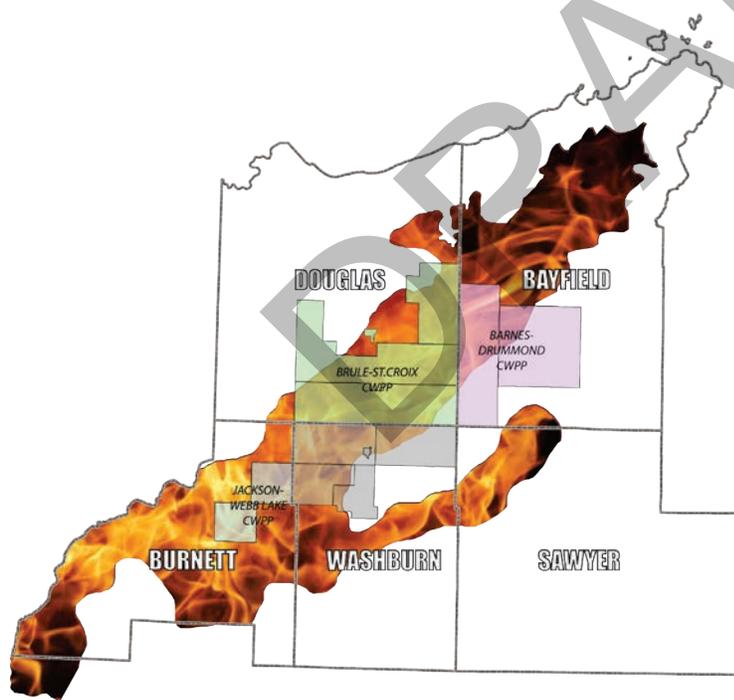
## DOUGLAS COUNTY HAZARD MITIGATION PLAN

are located at Barnes, Brule, Gordon, and Pattison State Park. Local fire departments within Douglas County also respond to wildland fire events in the County.

### Programs

The Wisconsin Department of Natural Resources provides grant opportunities to organize, train, and support County fire associations which serve the cooperative fire protection area of the state. A local match of 50 percent is required for a minimum grant award of \$1,500 (project must have at least \$3,000 in eligible project costs) up to a maximum grant award of \$5,000 (project must have at least \$10,000 in eligible project costs). The State of Wisconsin also provides a Forest Fire Protection Grant to increase forest fire protection and suppression capabilities through cooperative efforts with local fire departments. Under this program, eligible fire departments can receive a maximum grant award of \$10,000. Eligible County fire associations can receive a maximum grant award of \$25,000. A local match of 50 percent is required. The Federal Emergency Management Agency (FEMA) also provides a fire department assistance grant program, with maximum grant awards up to \$750,000. A local match, based on community population, is also required for this program.

### Community Wildfire Protection Planning (CWPP)



A Community Wildfire Protection Plan (CWPP) is a plan developed by a community in an area at-risk from wildland fire. Community Wildfire Protection Plans are authorized and defined in Title I of the Healthy Forests Restoration Act (HFRA) passed by Congress on November 21, 2003 and signed into law by President Bush on December 3, 2003. The Act places renewed emphasis on community planning by extending benefits to communities who develop a plan that meets the minimum standards of the Act. Key among these benefits is the option of establishing a localized definition and boundary for the wildland-

urban interface (WUI) and the opportunity to help shape local hazardous fuels treatment priorities. The Act establishes three minimum requirements for a CWPP.

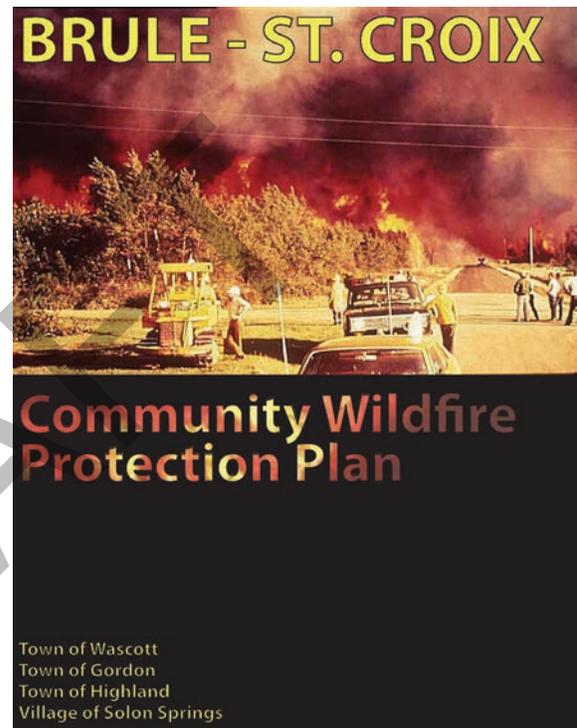
Under the Act, a CWPP must:



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

- Be developed collaboratively involving interested parties, local government; along with local, state and federal firefighting agencies.
- Identify and prioritize areas for hazardous fuels reduction treatments and recommend types and methods of treatment that will protect one or more at-risk communities and critical infrastructure.
- Recommend measures which private landowners and communities can utilize to reduce the ignitability of structures within the planning area.

Wisconsin's first CWPP was developed in 2006 for the towns of Barnes and Drummond in Bayfield County. Since that time, 15 plans have been developed for high-priority areas across the state, **including a large portion of southern Douglas County**. While there is no CWPP specific language in State Statutes or Administrative Rules, a CWPP is required for certain types of hazardous fuels reduction and educational projects funded under Wisconsin's Hazard Mitigation Program, which is administered through WDNR-Forestry.





### **Natural Hazard Identification: Hail Storms**

A hailstorm is a weather condition where atmospheric water particles form into rounded or irregular masses of ice that fall to earth. Hail is a product of strong thunderstorms that frequently move across the state. Hail normally falls near the center of the moving storm along with the heaviest rain; however, the strong winds at high altitudes can blow the hailstones away from the storm center, causing unexpected hazards at places that otherwise might not appear threatened. The threat from hail is not just human safety. Each year in the State of Wisconsin, hail causes significant property damage and agricultural crop losses.

The statewide average number of hail events is 30 per County for the 20-year period 1982-2001 (NWS Statistic). During this period, most hail events occurred in the counties of southern Wisconsin, namely Grant, LaCrosse, and Dane. Counties in the northern part of the state typically averaged significantly fewer hail events over the period. Douglas County recorded 47 hail events during the 25-year period from 1989-2014, or an average of 1.9 events per year.

### **Hail Facts**

Roughly 20 percent of all severe weather "events" in Wisconsin is hail events in which hailstones are at least 3/4 inch in diameter. Damaging, straight-line wind events make up about 72 percent of all severe weather events, while tornadoes add up to about 8 percent.

Serious hailstorms (with hail stones 1.5 inch or larger in diameter) are not common in Wisconsin; however, when they do strike the result is significant property damage. Rarely is a person injured or killed by large hail in Wisconsin.

The peak hail season is April through August, although hail has been reported with thunderstorms in every month of the year.

The southern half of Wisconsin tends to have the greatest number of hail events, with Dane and La Cross counties leading the way. However, any Wisconsin County can have a serious hailstorm. Any given location in Wisconsin will usually experience about three days with hail per year.

One of Wisconsin's worst hailstorm outbreak occurred on March 29, 1998. Central and east-central Wisconsin experienced prolific hail-producing thunderstorms resulting in damage that topped 10 million dollars. There were many reports of hail 2 to 3 inches in diameter, and hail 4 inches in diameter was reported in St. John in Calumet County.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Natural Hazard Identification: Droughts**

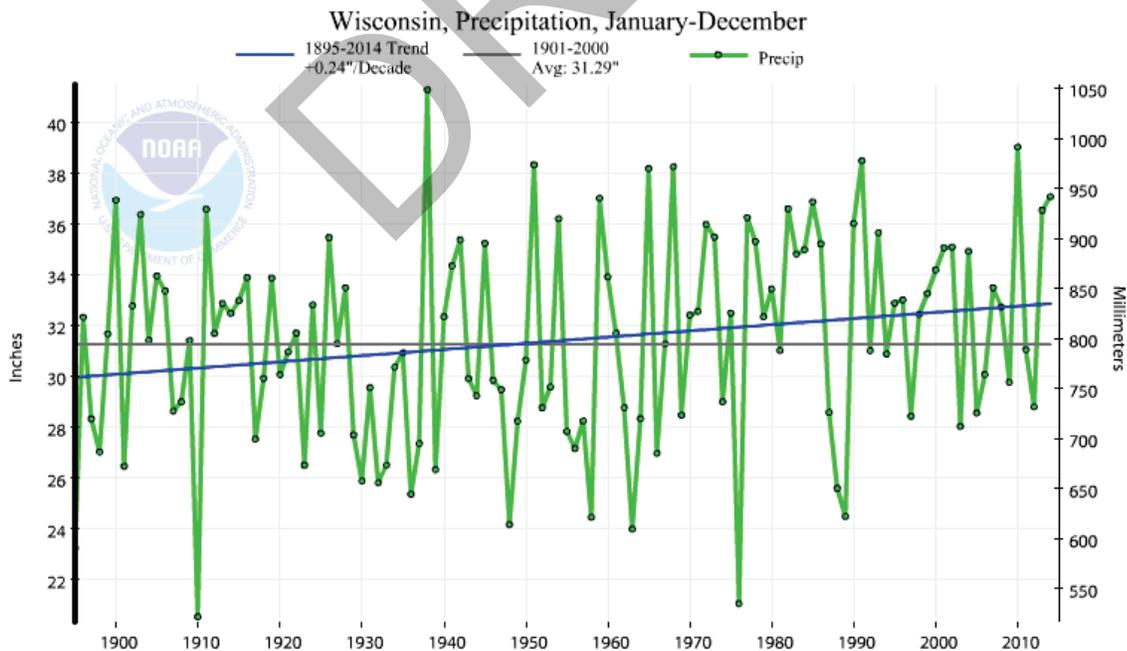
Drought is a normal, periodic feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary anomaly; it differs from aridity (desert conditions), which is restricted to low rainfall regions and is a permanent feature of climate. Droughts may be accompanied by extreme heat (in excess of 10 degrees above normal). Droughts in Wisconsin can be classified into two types, agricultural and hydrologic droughts. Agricultural drought is a dry period of sufficient length and intensity that markedly reduces crop yields. Hydrologic drought is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table.

In Douglas County, drought events pose significant environmental hazards. Extended dry periods greatly increase the risk of forest fires and wildfires because of the extreme dryness. In addition, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions.

### **Drought Incidence in Wisconsin**

Typically, droughts occur in Wisconsin on average about once every 10-12 years. The state's longest recorded period of drought occurred during the "dust bowl" years of the 1930's, when the state had eight consecutive years of below average precipitation. The most recent significant drought period in northern Wisconsin occurred in 1987-1988.

**Figure 5: 1895-2014 Precipitation, State of Wisconsin**



Source: National Oceanic and Atmospheric Administration



### **Natural Hazard Identification: Winter Weather Events**

Winter storms that affect Wisconsin develop over southeast Colorado, northwest Canada, and over the southern Plains. These storms move toward the Midwest and use both the southward plunge of cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow over the region. Winter storms can vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death. The northern portions of Douglas County can receive “lake effect” snowfall, caused when cold air masses move over the relatively warmer waters of Lake Superior. The squalls can be especially heavy, causing whiteout conditions and substantial accumulations.

Winter storms include a variety of weather phenomena. Wisconsin residents are most familiar with heavy snowstorms, blizzards, sleet, and ice storms. The winter storm season generally runs from November to March in Wisconsin. A snowfall and accumulation of four or more inches in a 12- hour period is considered a heavy snowfall. The majority of Wisconsin snowfalls are between one and three inches per occurrence. However, heavy snowfalls, which produce at least ten inches, may occur four or five times per season.

A storm with sustained wind speeds in excess of 30 miles per hour accompanied by heavy snow or large amounts of blowing or drifting snow is classified as a blizzard. Northwestern Wisconsin encounters more blizzards than southeastern portions of the state.

An ice storm occurs when rain, falling out of the warm and moist upper layers of the atmosphere, comes into contact with a cold and dry layer near the ground. The rain freezes on contact with the ground and accumulates on exposed surfaces. A half-inch of rain freezing on trees and utility wires can cause extensive damage, especially if accompanied by high winds. In contrast, a sleet storm involves frozen raindrops of pellets, which do not cling to surfaces. An accumulation of these pellets can make driving hazardous.

Winter weather events come in many forms. The National Weather Service classifications for winter weather events include:

**Heavy snowfall** - the accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period.

**Blizzard** - the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.

**Ice storm** - an occurrence where rainfalls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.



**Freezing drizzle/freezing rain** - the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32 degrees Fahrenheit or below.

**Sleet** - solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.

**Wind chill** - an apparent temperature that describes the combined effect of wind and low air temperatures on exposed skin.

**Table 19: Winter Weather Alerts**

<b>Winter weather advisory</b>	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
<b>Winter storm watch</b>	Severe winter weather conditions may affect your area (freezing rain, sleet or heavy snow may occur separately or in combination).
<b>Winter storm warning</b>	Severe winter weather conditions are imminent.
<b>Freezing rain or freezing drizzle</b>	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
<b>Sleet</b>	Small particles of ice, usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
<b>Blizzard warning</b>	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
<b>Frost/freeze warning</b>	Below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.
<b>Wind chill</b>	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill.



**Natural Hazard Identification: Excessive Heat**

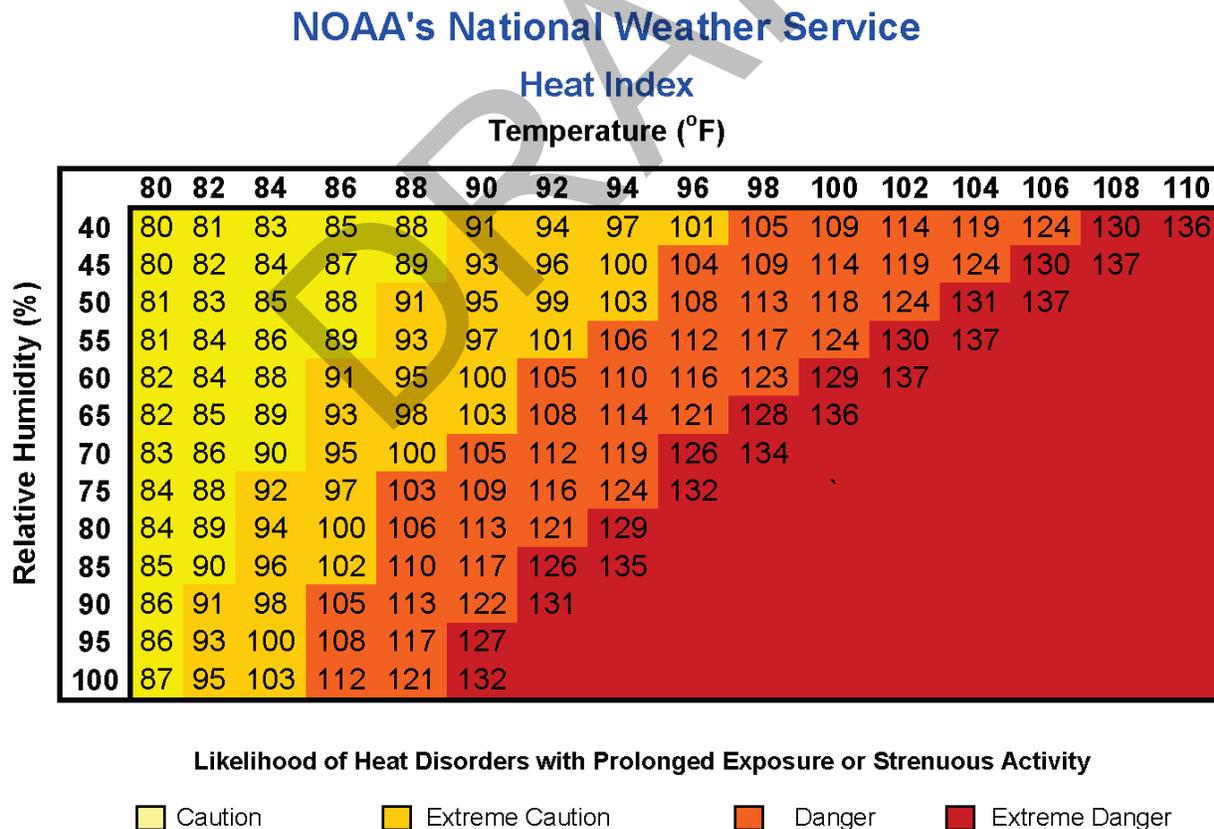
Heat waves are defined as prolonged periods of very high temperatures or high temperatures combined with high humidity. Excessive heat poses a risk to human health, particularly to the young, elderly, and those with health problems. Risks from excessive heat include: heatstroke/sunstroke, heat cramps, and heat exhaustion. The problems associated with excessive heat can be exacerbated by power outages resulting from the high electric consumption for air conditioning.

Heat waves have resulted in more deaths than any other weather-related hazard affecting Wisconsin. During the summer of 1995, two killer heat waves alone resulted in 154 heat-related deaths and as many as 300 to 400 heat-related illnesses.

**Heat Index**

Based on the latest research findings, the National Weather Service has devised the "Heat Index" (HI), (sometimes referred to as the "apparent temperature"). The HI, given in degrees Fahrenheit, is an accurate measure of how hot it really feels when the relative humidity (RH) is added to the actual air temperature.

Figure 6: Heat Index Chart



Source: National Oceanic and Atmospheric Administration



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

The National Weather Service issues **Heat Advisories** when daytime heat indices equal or exceed 105°F for three hours or more while nighttime heat indices equal or exceed 80 °F (75 °F for South-central and Southeast Wisconsin), for any 24-hour period. The NWS issues Excessive **Heat Warnings** when it expects daytime heat indices to equal or exceed 115 °F (110 °F for South-central and Southeast Wisconsin) for three hours or more while nighttime heat indices equal or exceed 80 °F for any 24-hour period. The NWS may issue an "Excessive Heat Watch" 8 to 24 hours in advance of heat wave conditions.

### Heat Wave Safety

**Slow down.** Strenuous activities should be reduced, eliminated, or rescheduled to the coolest time of the day. Individuals at risk should stay in the coolest available place, not necessarily indoors.

**Dress for summer.** Lightweight, light-colored clothing reflects heat and sunlight and helps your body maintain normal temperatures.

**Put less fuel on your inner fires.** Foods (like proteins) that increase metabolic heat production also increase water loss.

**Drink plenty of water or other nonalcoholic fluids.** Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. Persons who (1) have epilepsy or heart, kidney, or liver disease; (2) are on fluid restrictive diets; or (3) have a problem with fluid retention should consult a physician before increasing their consumption of fluids.

**Do not drink alcoholic beverages.**

**Do not take salt tablets unless specified by a physician.** Persons on salt restrictive diets should consult a physician before increasing their salt intake.

**Spend more time in air-conditioned places.** Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, spending some time each day (during hot weather) in an air-conditioned environment affords some protection.

**Don't get too much sun.** Sunburn makes the job of heat dissipation that much more difficult.



### **Natural Hazard Identification: Coastal Hazards**

Humans have had a long relationship with Wisconsin's coasts, and a number of the state's largest cities are located in coastal areas. The attractiveness of the coastline has led to increased development, particularly residential, and increased recreational use. Development and other use activities in coastal areas are subject to numerous natural processes and hazards.

### **Coastal Hazards**

Erosion/Sedimentation– Highly erodible sand and red clay soils are characteristic of much of the southern Lake Superior basin and are responsible for the greatest impact to water quality within the Lake Superior Watershed. Land use practices within the basin that increase peak flows of water off the landscape increase instream erosion through channel incising and slumping of destabilized streambanks, resulting in bank erosion and downstream sedimentation. Disturbed soils coupled with high volume and velocity of water flowing off the landscape creates a severe instream erosion hazard, especially following major rainfall events and in the spring snowmelt. Native plant and animal life is threatened by instream sedimentation, as well as sediment accumulation in Lake Superior. As the sediment builds up in the basin, it impedes the natural function of the system inhibiting fish spawning and restricting plant growth.



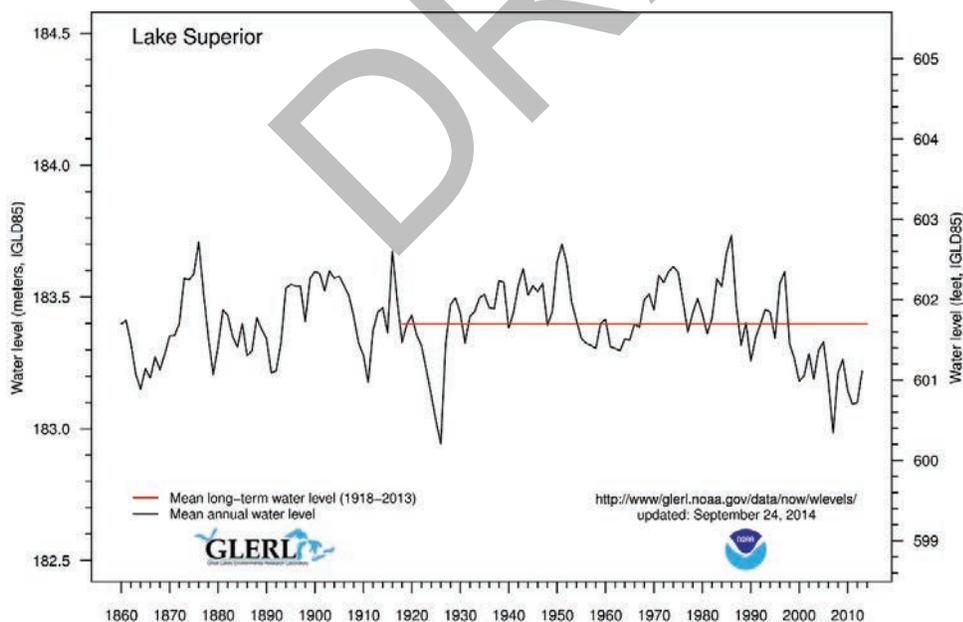
## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Coastal Bluff Erosion/Shoreline Recession - The Wisconsin Coastal Management Program has identified the erosion of coastal bluffs, banks, and beaches as one of three primary types of natural hazards affecting Wisconsin's great lakes shores. Temporary fluctuations in water levels due to storm events or storm-induced surges producing elevated wave activity are the principal causes of coastal bluff erosion. Along the Lake Superior coast, the high clay bluffs extending from Bark Point, Bayfield County, westward toward Wisconsin Point, Douglas County, are the most vulnerable shoreline to this type of erosion (Springman and Born 1979).

Coastal Flooding - Several factors can contribute to coastal flood risk. Lake water levels, wind set-up, and wave run-up all contribute to coastal flood susceptibility. Wind set-up increases the level of the lake against which a steady wind is blowing. Wave run-up may be caused by wind and beach profile. The 2002-2007 Needs Assessment and Multi-Year Strategy of the Wisconsin Coastal Management Program (WCMP) identified the City of Superior as being a "high risk" area for flooding from high lake levels and/or storm surge (WCMP April 2001).

Lake Level Fluctuations - Water level change is both a seasonal and long-term phenomena affecting the Great Lakes. During the dry winter months, lake levels are usually at their lowest points of the year. Water levels typically rise during the spring and summer months, due to precipitation and snowmelt.

**Figure 7: Historic Lake Superior Water Levels**



Source: National Oceanic and Atmospheric Administration, Great Lakes Environmental Research Laboratory

Water level fluctuations can pose environmental and economic hazards for coastal communities. In addition to the added risks of coastal flooding and erosion associated



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

with high lake levels, low water levels can expose coastal hazards and impact major resting and feeding areas and nesting areas for migrating ducks, geese, swans, and other water birds. Low water levels also impact critical fish and wetland habitats in the shallow shoreline areas.

Low lake levels significantly impact the profitability of the commercial shipping industry. Low lake levels reduce cargo loads, which can be transported by ship due to reduced draft (clearance) in the shipping channels. A 1,000-foot long vessel must sacrifice 270 tons of cargo for each one-inch reduction in draft.

### **Programs**

Wisconsin's Shoreland Management Program is a partnership between state and local government that requires the adoption of County shoreland zoning ordinances to regulate development near navigable lakes and streams in compliance with statewide minimum standards. These minimum statewide standards found in Chapter NR115, Wisconsin Administrative Code seek to create a balance between private rights and public responsibilities of landowners. In brief, the four major aspects of NR115 aim to: (1) control the density of development; (2) create a protective buffer of vegetation along public waterways; (3) minimize disturbances to water resources; and (4) protect wetlands which are located near lakes and streams by prohibiting most filling or draining and by placing limits on what can be done in those special areas.

Section 309 of the Coastal Zone Management Act established the Coastal Zone Enhancement Program to provide incentives to states and territories to periodically assess and address the following nine potentially significant areas: wetlands protection, coastal hazards, cumulative and secondary impacts of development, public access to the coast, special area management planning, marine debris, ocean (lake) resources, energy and government facility siting, and aquaculture.

The Wisconsin Coastal Management Program works to protect, preserve, and enhance Wisconsin's coastal areas and to promote the wise use of coastal resources. The WCMP provides grant-funding opportunities to encourage the management and protection of Wisconsin's coastal resources and to increase public access to the Great Lakes. The 2004 coastal grant categories include:

- ❑ Coastal land acquisition
- ❑ Coastal wetland protection and habitat restoration
- ❑ Nonpoint source pollution control
- ❑ Coastal resources and community planning
- ❑ Great Lakes education
- ❑ Public access and historic preservation

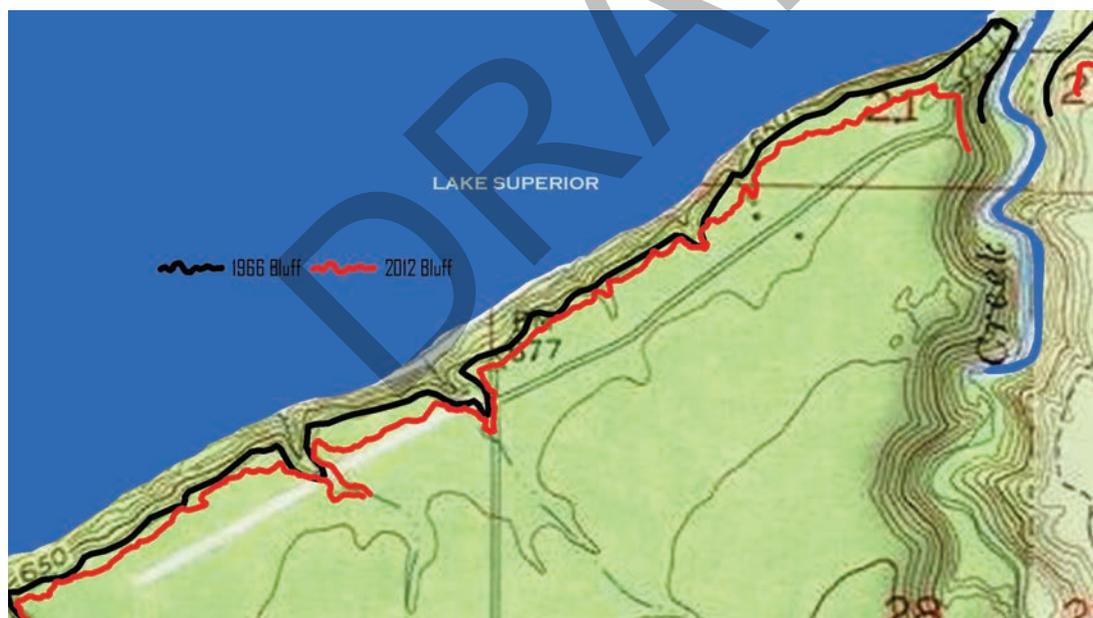


## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Douglas County Shoreline Recession Rate Study**

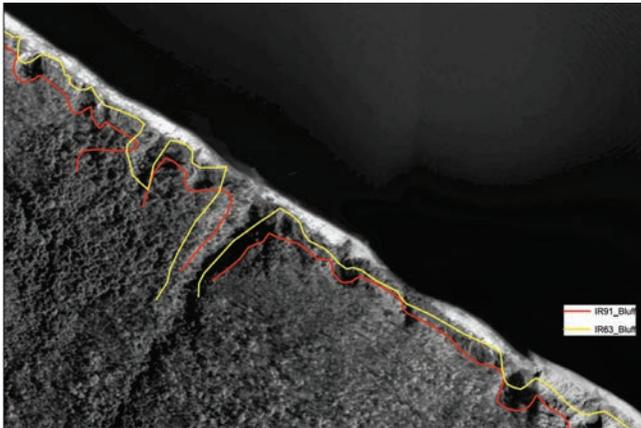
The study of erosion along the Lake Superior shoreline began in the 1970s with an analysis of bluff materials, shoreline recession rates, and additional information collected in a survey published by the Wisconsin Coastal Management Program (Need, et al., 1976). The study covered the shoreline from the City of Superior to Bark Point in Bayfield County. A follow-up to this study was conducted in 2001 and 2002 (Anderson, 2003). The purpose of the Anderson study was to evaluate the changes that had taken place since the 1970s, describe the condition of the bluff and beach, and update the description of sediments contained in the bluff. In 2005, UW-Madison professor Dave Mickelson started working with the Bayfield County Planning and Zoning staff to develop setback rules for new construction that would be more defensible and realistic than the standard 75 feet required by state law. The final result of a series of studies was a safe setback line based on the knowledge of geology, engineering properties of materials, recession rate, bluff height, and bluff angle for all of the bluff shoreline in Bayfield County.

In 2010 and 2011, Northwest Regional Planning Commission and Mickelson began a project to create a similar safe setback line in Iron and Douglas Counties. This line is based on characteristics of the bluff and recession rates, as well as slope height and angle calculated from recently acquired LIDAR (Light Detection and Ranging) data.

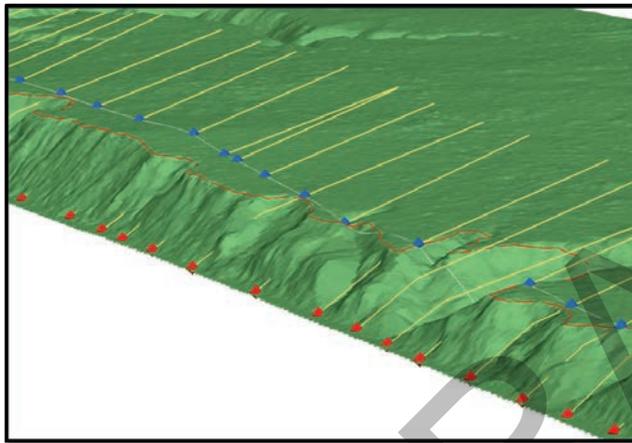




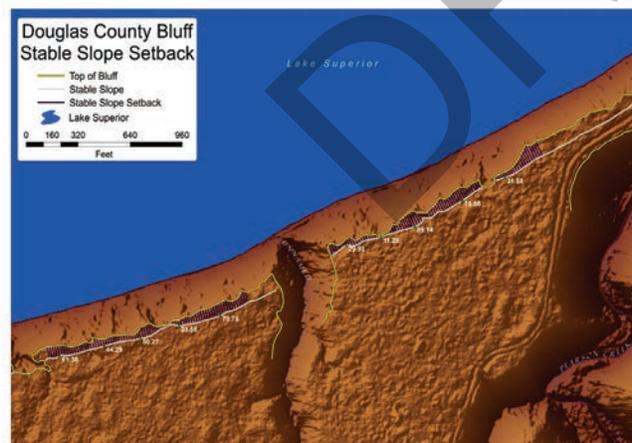
## DOUGLAS COUNTY HAZARD MITIGATION PLAN



The recession rate study was intended to accomplish five principal objectives. The first objective was to **determine shoreline recession rates by comparison of orthophotos taken at two different times in the past**. This was accomplished by examining the bluff position in rectified aerial photos from 1963 and 1991, and measuring the relative distances between the top of the bluff.



The next objective was to **determine stable slope angle based on bluff materials present**. Field evaluation was used to determine the bluff composition in Douglas County and stable slope angles were calculated based on measurements derived from artificial and natural slopes on red clay (Douglas and Hansen Creek tills) in northern Wisconsin. Field data collected was then used to **identify appropriate building setbacks based on recession rate and stable slope angle**. Building setbacks were calculated for the Douglas County coastline in a GIS and digital representations of the setback lines were created which allow for the visualization of setbacks at many areas along the coast. Some sites will still need to be field inspected, especially properties with large gullies. Another objective was to **promote public awareness of bluff erosion**. Several presentations were provided at both the county and regional scale to increase hazard awareness and to highlight the



study. The final, and arguably the most important objective, was to **provide the framework for the future development of legally-defensible shoreline setback standard**. The recession rate study provides scientifically reliable and legally defensible data upon which could form the basis for setback decision-making.

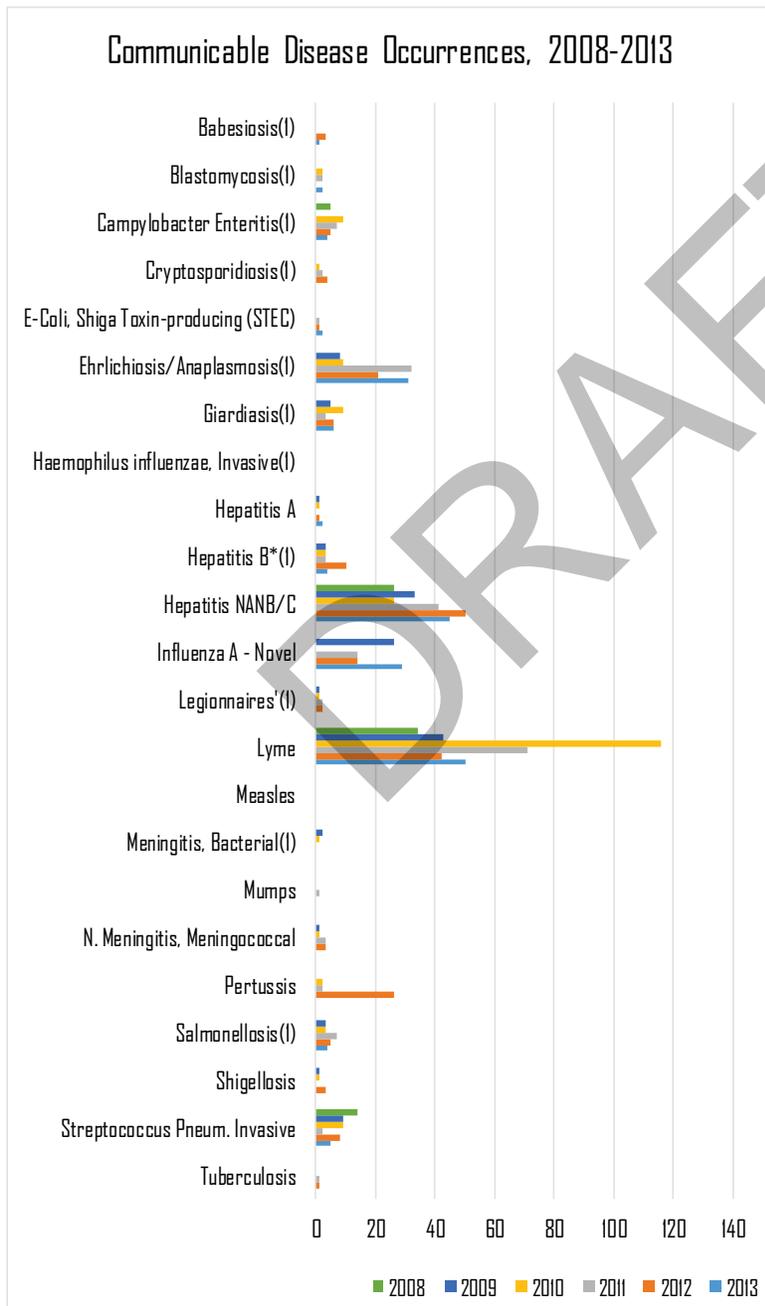


**Natural Hazard Identification: Public Health**

Public health issues include epidemics, pandemics and human disease outbreaks. The Douglas County Health Department monitors for and investigates communicable disease outbreaks affecting the county’s population.

**Occurrence Data**

**Figure 8: Communicable Disease Occurrences 2008-2013**



The communicable disease occurrence data was reported to the Wisconsin Department of Health Services (DHS) for the years 2008-2013.

In terms of number of reported cases, tick-bourne illnesses including Lyme disease and Ehrlichiosis/Anaplasmosis were notably prevalent.

Hepatitis, a highly infectious blood-borne illness that attacks the liver, also occurred at a general higher frequency than other reported diseases.

Other bacterial and viral infections which were prevalent before vaccines, including measles, mumps and meningitis, were reported at a relatively low frequency in Douglas County between 2008 and 2012.

In 2012, Douglas County experienced a pertussis (whooping cough) outbreak.



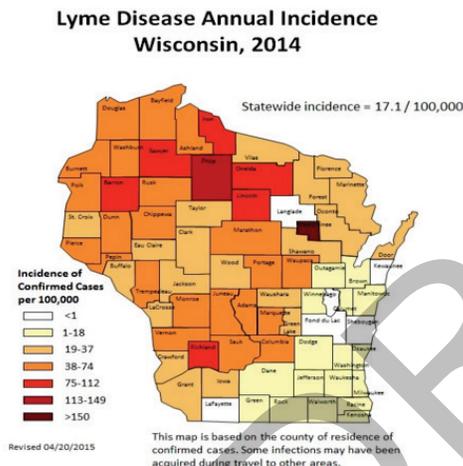
## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### Preparedness

In collaboration with the Western Region Partnership for Public Health Preparedness (WRPPHP), Douglas County has adopted and localized a Public Health Emergency Plan (PHEP). The PHEP provides guidance and instructions for all employees involved in a Public Health emergency response. The plan takes an “All Hazards” approach and includes guidance for public health staff to respond to many different types of emergencies including infectious disease outbreaks, bioterrorism, environmental health dangers, or severe weather. The PHEP is a work in progress and is continually updated with new information.

### Vector-Borne Diseases

Figure 9: Lyme Disease Annual Incidence Wisconsin, 2014



The incidence of vector-borne diseases, particularly tick-borne disease, is increasing in Wisconsin. Residents in rural areas of the county may be at a slightly higher risk to vector-borne diseases, but ultimately, all county residents will be at some risk to these diseases. Vector-borne pathogens are most prevalent during the spring through fall seasons when disease carrying agents, such as mosquitos and ticks, are active. As shown in the graphic developed by the Wisconsin Division of Public Health, the incidence of confirmed cases of Lyme Disease in Douglas County were more than double the statewide rate in 2014.



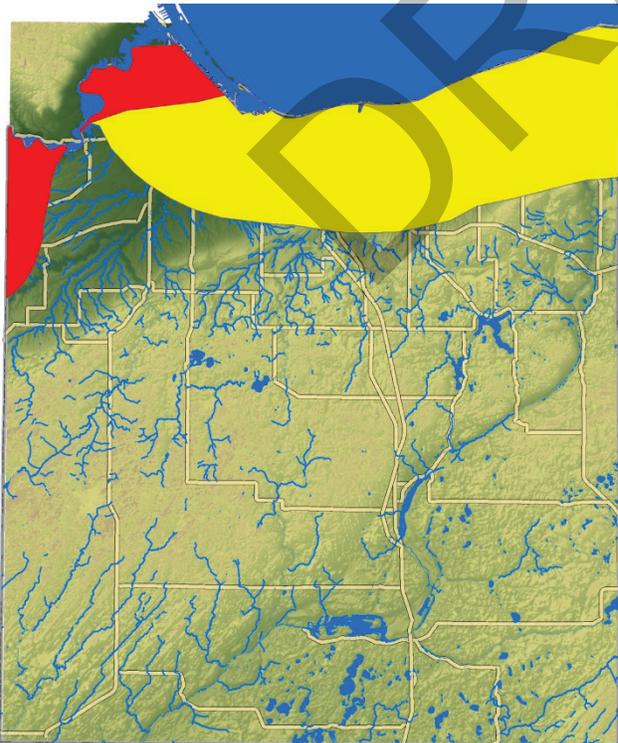
### **Natural Hazard Identification: Landslides**

Landslides are downhill movements of rock, debris, or soil mass. The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil; the length, width, and depth of the area affected; frequency of occurrence; and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure and their composition and characteristics.

### **Landslide Conditions**

Landslides are typically triggered by periods of heavy rainfall or rapid snowmelt. Excavations may also trigger landslides. Certain geologic formations are more susceptible to landslides than others. Human activities, including locating development near steep slopes, can increase susceptibility to landslide events. Landslides on steep slopes are more dangerous because movements can be rapid. Although landslides are a natural geologic process, the incidence of landslides and their impacts on people can be exacerbated by human activities. Grading for road construction and development can increase slope steepness. Grading and construction can decrease the stability of a hillslope by adding weight to the top of the slope, removing support at the base of the slope, and increasing water content. Other human activities effecting landslides include: excavation, drainage and groundwater alterations, and changes in vegetation.

**Figure 10: Landslide Susceptibilities**





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### Properties Acquired

Under the Hazard Mitigation Grant Program, the City of Superior acquired one property and the Village of Oliver acquired three properties due to imminent threats of landslide. See table 14 for detailed descriptions of HMGP projects in Douglas County.

### Natural Hazard Identification: Earthquakes

An earthquake is the term used to describe the abrupt shaking or trembling of the earth resulting from radiated seismic energy. The majority of earthquakes occur along tectonic plate boundaries, such as the San Andreas fault line in southern California, which separates the Pacific and North American Plates. Fault lines are cracks in the earth along which the tectonic plates shift and move. The ground on one side of the fault may move in any direction relative to the other, up, down, sideways or even towards or away from the other. As one side slides against the other it tends to stick, accumulating stress until the resistance can be overcome and suddenly it releases and moves, resulting in an earthquake.

Earthquake activity in the U.S. is most common in the western states and Alaska. The most notable major fault near Wisconsin is the New Madrid fault system in the central Mississippi Valley. The New Madrid fault system was responsible for four of the largest North American earthquakes in recorded history (1811-1212) and may have the potential to produce large earthquakes in the future.

### *Earthquake Incidence in Wisconsin*

Table 20: Wisconsin Earthquake Events

Year	Date	Location	Magnitude	Intensity
1905	March 13	Marinette	unknown	unknown
1906	April 22	Milwaukee	unknown	III
1906	April 24	Milwaukee	unknown	III
1907	January 10	Marinette	4.2	V
1907	November 20	SW Green County	3.8	IV
1907	November 28	SW Green County	3.8	IV
1909	May 26	Beloit	5.3	VIII
1914	October 7	Madison	3.8	IV
1916	May 31	Madison	3.0	II
1922	July 7	Fond du Lac	4.2	V
1931	October 18	Madison	3.2	III
1933	December 6	SE Dane County	3.8	IV
1938	November 7	Extreme SW Corner	?	?
1943	February 9	Athelstane	3.2	III
1947	May 6	West Allis	4.2	V
1948	January 15	Sauk City	4.0	V
1956	July 18	Lake Church	3.8	IV
1957	January 8	Waupun	3.8	IV

Source: U.S. Geological Survey

Historically, there have been few recorded earthquakes in Wisconsin. Historical records indicate that there have been 19 events in Wisconsin since the early 1900's. The absence of any recent events indicates that the data record may not be entirely accurate. It's possible that some of these events were the result of human activities, such as blasting. Numerous events occurring outside of Wisconsin have been felt at locations in the state. The most recent occurrence was a magnitude 4.3 earthquake centered in northern Illinois was felt across many parts of southern Wisconsin.



### Earthquake Intensity

The intensity of earthquakes is measured by the Richter magnitude scale which assigns a single number to quantify the amount of seismic energy released by an earthquake. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs.

**Table 21: Typical Effects of Earthquakes Based on Magnitude**

Richter magnitudes	Description	Earthquake effects	Frequency of occurrence
Less than 2.0	Micro	Microearthquakes, not felt.	About 8,000 per day
2.0-2.9	Minor	Generally not felt, but recorded.	About 1,000 per day
3.0-3.9		Often felt, but rarely causes damage.	49,000 per year (est.)
4.0-4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 per year (est.)
5.0-5.9	Moderate	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800 per year
6.0-6.9	Strong	Can be destructive in areas up to about 160 kilometers (100 mi) across in populated areas.	120 per year
7.0-7.9	Major	Can cause serious damage over larger areas.	18 per year
8.0-8.9	Great	Can cause serious damage in areas several hundred miles across.	1 per year
9.0-9.9		Devastating in areas several thousand miles across.	1 per 20 years
10.0+	Epic	Never recorded	Extremely rare (Unknown)



### III. RISK AND VULNERABILITY ASSESSMENT

#### Douglas County

Table 22: Douglas County Hazard Priority Matrix

Hazard Identification	Hazard Frequency	Hazard Probability	Health & Public Safety	Home Damage	Business Disruption	Public Expenditures	Magnitude of Population At Risk	Magnitude of Homes At Risk	Magnitude of Businesses At Risk	Risk Assessment Rating Total
<b>DOUGLAS COUNTY NATURAL HAZARDS</b>	Probability of hazard occurring in the future	Frequency of past hazard occurrences	Degree of past hazard events causing injuries, sickness and/or deaths	Degree of past hazard events causing damage to homes	Degree of past hazard events causing damage to business and/or interruption of business trade	Amount of local, state, & federal funds expended on past hazard recovery activities	Human population vulnerable to injury, sickness, and/or death from hazard	Amount of homes vulnerable to damage from hazard	Number of businesses vulnerable to damage or interruption of business trade	Percent Risk = Relative threat
<b>Scoring</b>	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 to 100%
Wildfire	3	3	2	3	1	2	2	2	3	<b>75%</b>
Lightning	3	3	1	2	1	1	2	3	3	<b>67%</b>
Flood	3	3	1	1	1	3	1	2	2	<b>58%</b>
Winter Weather	3	3	1	1	2	2	2	1	1	<b>54%</b>
Landslides	3	3	1	1	1	1	1	2	1	<b>46%</b>
Hail Storms	2	2	1	2	1	1	1	3	3	<b>39%</b>
Thunderstorm	2	3	1	1	1	3	1	2	2	<b>39%</b>
Coastal Hazards	3	2	1	1	1	1	1	1	1	<b>38%</b>
Droughts	2	2	1	1	1	1	1	1	1	<b>25%</b>
Excessive Heat	2	2	1	1	1	1	1	1	1	<b>25%</b>
Tornado	1	1	1	1	1	2	2	3	3	<b>19%</b>
Health	1	0.5	0.5	0	0	3	2	0	2	<b>11%</b>
Earthquakes	1	0	0	0	0	0	2	2	2	<b>8%</b>

The Douglas County Hazard Priority Matrix was developed by the hazard mitigation planning committee in order to prioritize natural hazards. The incorporated communities of Superior, Solon Springs and Oliver developed their own matrices to reflect individual local concerns. This matrix identifies the likelihood of occurrence and severity of the natural hazards identified in the preceding chapter of the mitigation plan. Based on the evaluation criteria such as frequency, damage, threat to life safety, duration and impact area, each of the natural hazards was scored. The composite score was used to rank each of the natural hazards. Based on the results of this ranking process, flood hazards were identified as being the highest priority hazard in Douglas County.



DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Incorporated Communities**

**Village of Lake Nebagamon**

**Table 23: Village of Lake Nebagamon Hazard Priority Matrix**

Hazard Identification	Hazard Frequency	Hazard Probability	Health & Public Safety	Home Damage	Business Disruption	Public Expenditures	Magnitude of Population At Risk	Magnitude of Homes At Risk	Magnitude of Businesses At Risk	Risk Assessment Rating Total
<b>LAKE NEBAGAMON NATURAL HAZARDS</b>	Probability of hazard occurring in the future	Frequency of past hazard occurrences	Degree of past hazard events causing injuries, sickness and/or deaths	Degree of past hazard events causing damage to homes	Degree of past hazard events causing damage to business and/or interruption of business trade	Amount of local, state, & federal funds expended on past hazard recovery activities	Human population vulnerable to injury, sickness, and/or death from hazard	Amount of homes vulnerable to damage from hazard	Number of businesses vulnerable to damage or interruption of business trade	Percent Risk = Relative threat
<b>Scoring</b>	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 to 100%
Lightning	2	2	1	2	2	1	1	2	2	<b>36%</b>
Hail storms	2	2	1	2	2	1	1	2	2	<b>36%</b>
Thunderstorm	2	2	1	2	2	1	1	2	2	<b>36%</b>
Flood	2	2	1	2	1	2	1	2	1	<b>33%</b>
Winter weather	2	2	1	1	1	2	2	1	1	<b>31%</b>
Tornado	1	1	1	1	1	1	2	2	1	<b>14%</b>
Wildfire	1	1	1	1	1	1	1	1	1	<b>11%</b>
Droughts	1	1	1	1	1	1	1	1	1	<b>11%</b>
Excessive heat	1	1	1	1	1	1	1	1	1	<b>11%</b>
Landslides	1	1	1	1	1	1	1	1	1	<b>11%</b>
Earthquakes	1	1	1	1	1	1	1	1	1	<b>11%</b>



DOUGLAS COUNTY HAZARD MITIGATION PLAN

Village of Solon Springs

Table 24: Village of Solon Springs Hazard Priority Matrix

Hazard Identification	Hazard Frequency	Hazard Probability	Health & Public Safety	Home Damage	Business Disruption	Public Expenditures	Magnitude of Population At Risk	Magnitude of Homes At Risk	Magnitude of Businesses At Risk	Risk Assessment Rating Total
<b>SOLO SPRINGS NATURAL HAZARDS</b>	Probability of hazard occurring in the future	Frequency of past hazard occurrences	Degree of past hazard events causing injuries, sickness and/or deaths	Degree of past hazard events causing damage to homes	Degree of past hazard events causing damage to business and/or interruption of business trade	Amount of local, state, & federal funds expended on past hazard recovery activities	Human population vulnerable to injury, sickness, and/or death from hazard	Amount of homes vulnerable to damage from hazard	Number of businesses vulnerable to damage or interruption of business trade	Percent Risk = Relative threat
<b>Scoring</b>	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 to 100%
Thunderstorm	2	2	1	2	2	2	2	2	2	<b>42%</b>
Lightning	2	2	1	2	1	1	2	2	2	<b>36%</b>
Winter weather	2	2	1	1	1	1	1	1	1	<b>25%</b>
Tornado	1	2	1	2	2	1	1	2	2	<b>18%</b>
Wildfire	1	2	1	1	1	2	1	2	2	<b>17%</b>
Hail storms	1	2	1	1	1	1	1	2	2	<b>15%</b>
Flood	1	1	1	1	1	1	1	1	1	<b>11%</b>
Drought	1	1	1	1	1	1	1	1	1	<b>11%</b>
Excessive heat	1	1	1	1	1	1	1	1	1	<b>11%</b>
Earthquake	0	1	0	0	0	0	0	1	1	<b>0%</b>



## **Flooding**

**Risk:** High

**Magnitude:** Flooding may range from nuisance to severe. Portions of the county are more flood prone than others. Contributing factors include high water tables or a high volume rain event or combination of the two. Floods in the urbanized areas are historically associated more with stormwater run-off than with riverine flooding. The impact on buildings includes damage to foundations and belongings in lower levels. The impact on the infrastructure includes damage to streets, blockage of traffic and the endangerment of pedestrians, especially children.

**Duration:** Flooding events may come as flash floods or as slowly rising waters and may have repercussions that last for days, weeks, months, or even years. The term "flash flood" describes localized floods of great volume and short duration. In contrast to riverine flooding, this type of flood usually results from a torrential rain on a relatively small drainage area. Precipitation of this sort usually occurs in the summer. The sudden breakup of an ice jam or the failure of a dam may also result in flash flooding. Flash floods are a potential threat to life and property in areas characterized by steep terrain, high surface runoff rates, and narrow streams and/or subject to severe thunderstorms. Riverine flooding may last for weeks or longer dependent on local conditions.

**Distribution:** Affected areas are usually small and isolated. Flash flooding may occur on any perennial or intermittent stream. Large-scale riverine flooding is typically associated with larger river systems, such as the Nemadji, Amnicon, St. Louis, or Brule. Federally designated floodplains indicate the areas of concern related to flooding.

**Area Affected:** All levels of society within impacted areas. May have more direct impact within urbanized or populated areas.

**Frequency:** Wisconsin has experienced several major floods during the last two decades. The 1973 and 1986 floods revealed that no flood plains or urban areas in Wisconsin are considered safe from flood damages.

In July of 1993 there were heavy rains to Douglas County and some minor runoff produced problems for a few residents; basements and yards had water standing for days. Rain recorded was at 1 to 1 ½ inches per hour and some heavy concentrations occurred in a short time.

A trout creek in the Solon Springs area caused heavy runoff into a basement of a resident. Highway personnel were dispatched to survey and mitigate the runoff. Rural fire personnel were alerted to offer assistance with pumps and support services. Some culvert and diking was done by the joint efforts of the County highway department and township officials



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Fall of 1994, Dairyland Township (south highway 35) County roads and ditches were filled with water from heavy rains. Runoffs caused minor flooding of roads resulting in soft shoulders, and highway crews were dispatched to barricade and sign roads covered with water. Minor flooding of the Nemadji and Lake Nebagamon areas did occur in 1995, due to heavy rain.

Douglas County historically does not have a serious flooding problem. However, there have been a couple of notable flood recently. In the Town of Lakeside, an ice jam backed up the Amnicon River in 1986 causing damage to homes in the area. In 1985 a flash flood caused damage to roads and other structures when 6 to 8 inches of rain fell within a matter of hours.

1999 brought sudden repeated heavy rains to Douglas County. Starting July 4 and continuing throughout the month, continued rains caused in excess of two million dollars of damage to public property. Damage was severe enough that a Presidential Disaster Declaration was made for ten northern counties. Most areas of the County were hit. The Solon Springs, Gordon, and Wascott areas were hit the hardest. Basements in the City of Superior were flooded when sewers backed up due to heavy rains.

Many water front structures were flooded in Solon Springs. Water was over Highway 53 in downtown Solon Springs for several days. One home in Solon Springs received severe damage to its basement walls and foundation when a nearby creek overflowed its banks.

The summer of 2000 brought one heavy thunderstorm that caused some flooding and road washout throughout the County. Most damage was repaired in several days and no major disruptions occurred.

April 2001 saw heavy rains on frozen ground causing enormous runoff and flooding. Numerous roads were damaged, several homes flooded, and the Radigan Dam damaged. As a result of this flooding, a Presidential Disaster was declared for Douglas County. At least one home was purchased through a mitigation project and removed.

The only report of flooding in 2002 was about eight inches of water over Hwy M. The highway department was notified and responded. Several homes were endangered during the spring thaw as ice created dams on several rivers causing water to backup into yard.

### **June 2012 Flood Event**

On June 19-20, 2012 a severe thunderstorm dropped eight to ten inches of rain over the Superior area resulting in flash flooding. There were 694 damage reports to homes, mostly in the City of Superior, resulting in an estimated \$6.3 million in damages. A total of 29 businesses also sustained an estimated \$4 million in damage. Public infrastructure losses were also significant with numerous road and culvert washouts reported. The



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

University of Wisconsin-Superior Campus also sustained more than \$23 million in damage, with at least \$18 million in damage to the Jim Dan Hill Library.

**Probability:** Based on historical data, the odds of a significant flood occurring in any given year is approximately 1 in 13 or 7%, although localized minor flooding is much more probable.

**Vulnerability:** Five flood events were reported in the National Climate Data Center Storm Events database for Douglas County, Wisconsin between 1950 and 2015.

**Table 25: Major Flood Events in Douglas County**

Event	Type	Location	Timeframe	Damage	Deaths
1	Flood	County wide	3/13/95-3/23/95	\$0	0
2	Flash Flood	County wide	7/25/99	\$2,000,000	0
3	Flood	County wide	4/06/01-4/23/01	\$888,000	0
4	Flash Flood	Northern DC	8/02/11-8/04/11	\$0*	0
5	Flash Flood	Northern DC	6/19/12-6/23/12	\$0*	0

\*No losses reported in NCDC DATA. Total flood losses for Event 5 are estimated at more than \$35 million.

### Event Descriptions

Event 1: No description available

Event 2: Flash flooding caused by very heavy thunderstorm rains occurred across much of the County, with many roads washed out or under water. Hardest hit was the central part of the County, including Parkland, Oakland, and Solon Springs townships. U.S. Highway 53 in the City of Solon Springs and County Highway C near South Range were under several feet of water through the night, and traffic had to be rerouted. Streets and basements in the City of Superior were also flooded. The total cost of damage County wide was nearly \$2 million.

Event 3: Three heavy rain events plus the melting of a snow pack with a high water content added up to high water levels on many creeks, streams, rivers, and lakes. The worst flooding occurred on the 22nd and 23rd. Many roads were covered with water in both counties; and high water levels, especially along the Amnicon River, affected several houses. Douglas County losses were estimated at \$888,000.

Event 4: Heavy rains on August 2nd resulted in major flooding of the Nemadji River and the tributary Black River. Many roads were washed out, including Wisconsin State Route 35. Specifically, the Nemadji River Gage, near Superior, reached the flood stage of 20 feet at 1230 PM CDT August 2nd, crested at 27.37 feet at 200 AM CDT August 3rd, and returned back below flood stage at 300 PM CDT August 4th. The crest was the highest ever reported for that gage. State Highway 35 was closed at the Black River Crossing, 19 miles south of Superior.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Event 5: A stationary front over central Wisconsin early June 19th moved north into the coastal counties of northwest Wisconsin late in the day, on the 19th. Air to the south of the front was remarkably warm and humid. Weak low pressure along the front moved through the interior counties of northwest Wisconsin overnight. Some thunderstorms produced isolated wind damage and hail. Excessively heavy rain just to the northwest spread rainfalls up to 6 inches into western areas of Superior along the Lake Superior shore to west-southwest of Port Wing on the Bayfield Peninsula.

### Assessment of Flood Potential

Areas susceptible to flooding are considered unsuitable for development because of risks to lives and property. Effective in the early 1990's, the Flood Insurance Rate Maps (FIRM) for Douglas County are the most recent source for identifying areas subject to flooding. These maps can be viewed at the zoning administrator's office at the County courthouse in Superior. The FIRMs are intended to be interim maps prior to the completion of a more detailed study and may not include all flood hazard areas in the County. Additional field checking may be required to determine whether or not a given area is in the floodplain before development would be authorized or denied.

### Douglas County Communities Participating in the National Flood Insurance Program

<u>Municipality</u>	<u>Date of Entry</u>	<u>Date of Effective Map</u>
Douglas County	2/04/1981	2/04/1981
Village of Lake Nebagamon	8/15/1978	8/15/1978
Village of Oliver	4/17/1984	6/18/1976
Village of Poplar	9/01/1986	9/01/1986
Village of Solon Springs	8/15/1978	8/15/1978
City of Superior	4/03/1978	2/23/1979
Village of Superior	9/01/1988	9/01/1988

### Flood Vulnerability

Vulnerability analysis is a major component of flood-hazard assessment. It combines the analysis of the floodplain boundary with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, and 500-year) are not readily available, calculating a community's vulnerability to flood events is not straightforward. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

### Flood Vulnerability GIS Analysis



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

A flood vulnerability analysis was conducted by Douglas County Land Records using GIS to determine structures within the designated floodway. Structure locations were cross-referenced with FEMA's National Flood Hazard Layer (NFHL) in order to identify structures located within designated floodplains (1% annual chance of flooding). Improvement values were assigned by joining attributes from the county's tax roll.

**Table 26: Basic Flood Analysis, Douglas County**

<b>MCD</b>	<b>TOTAL UNITS</b>	<b>YEAR ROUND</b>	<b>SEASONAL</b>	<b>IMPROVEMENT VALUE</b>
Solons Springs	49	16	33	\$5,065,600
Wascott	39	8	31	\$4,893,800
Oakland	36	30	6	\$3,639,400
Highland	18	1	17	\$2,751,700
Brule	18	3	15	\$1,843,900
Gordon	23	10	13	\$1,724,800
Lakeside	10	9	1	\$1,394,400
Hawthorne	12	7	5	\$1,111,900
Summit	11	10	1	\$1,019,500
Bennett	11	6	5	\$998,700
Cloverland	4	4	0	\$939,100
Amnicon	10	9	1	\$924,500
Parkland	8	8	0	\$770,600
Dairyland	11	4	7	\$500,400
Superior	5	5	0	\$398,900
<b>TOTAL</b>	<b>265</b>	<b>130</b>	<b>135</b>	<b>\$ 27,977,200</b>

### **Villages**

Lake Nebagamon	38	11	27	\$4,326,700
Solon Springs	24	9	15	\$2,233,600
Poplar	1	1	0	\$235,000
Oliver	3	3	0	\$141,400
<b>TOTAL</b>	<b>66</b>	<b>24</b>	<b>42</b>	<b>\$ 6,936,700</b>



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Based on the analysis, there are 331 structures in Douglas County that lie within designated floodplains. The total estimated countywide valuation of structures within the floodplain is \$34,913,900. Communities with the highest valuation within the floodplain include the Towns of Solon Springs, Wascott, Oakland and Highland and the villages of Lake Nebagamon and Solon Springs.

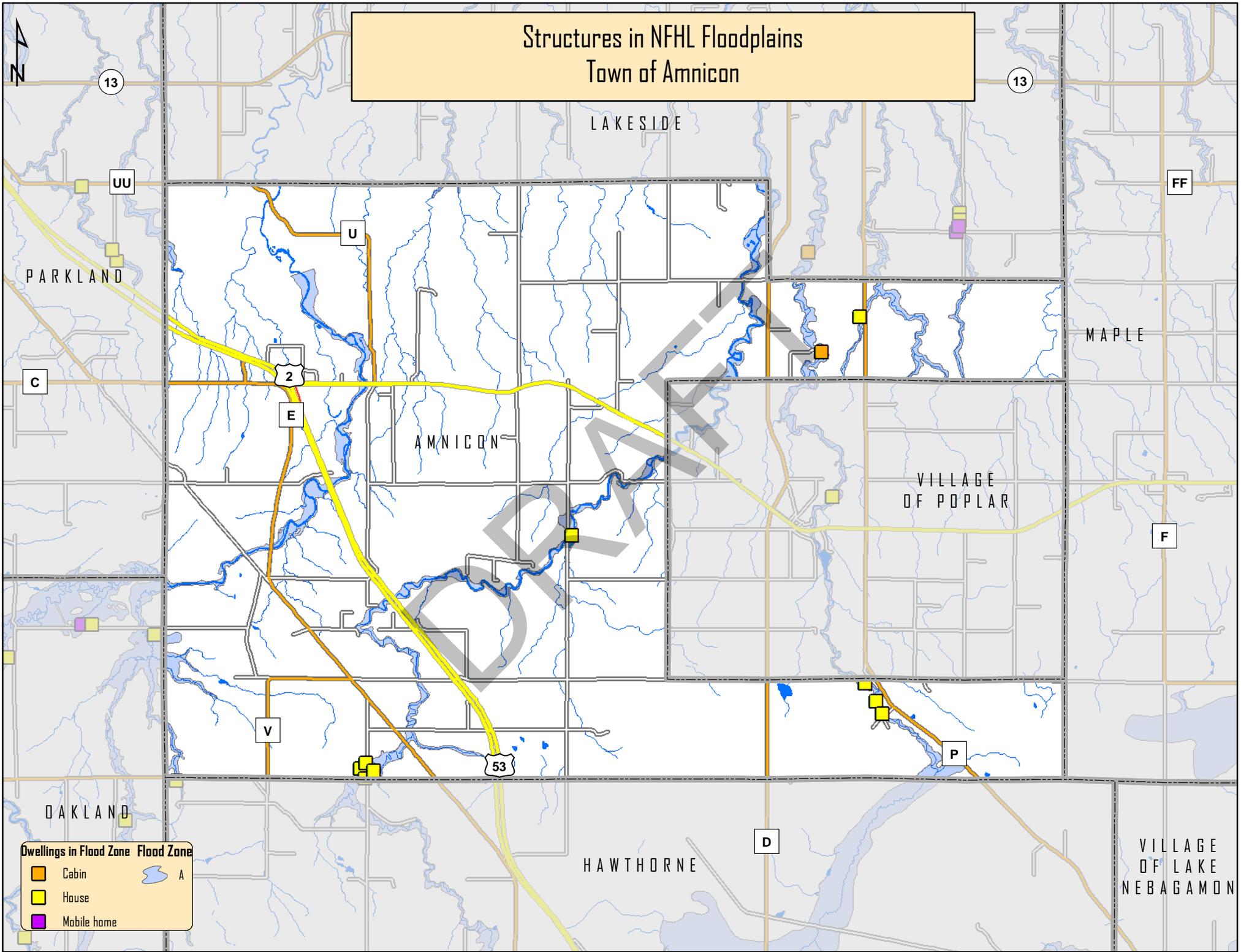
The basic flood vulnerability study used in Douglas County indicated that none of the County's critical facilities were located within the floodway. Map 2 (page 12), depicts the current pattern of physical development within Douglas County. Within the rural areas, development pressure is strongly influenced by the presence of lakes and rivers. The shoreland development trend may indeed impact potential flood losses by placing additional structures within the zone of vulnerability.

### **Repetitive Loss Properties**

There are no NFIP repetitive loss properties within Douglas County.

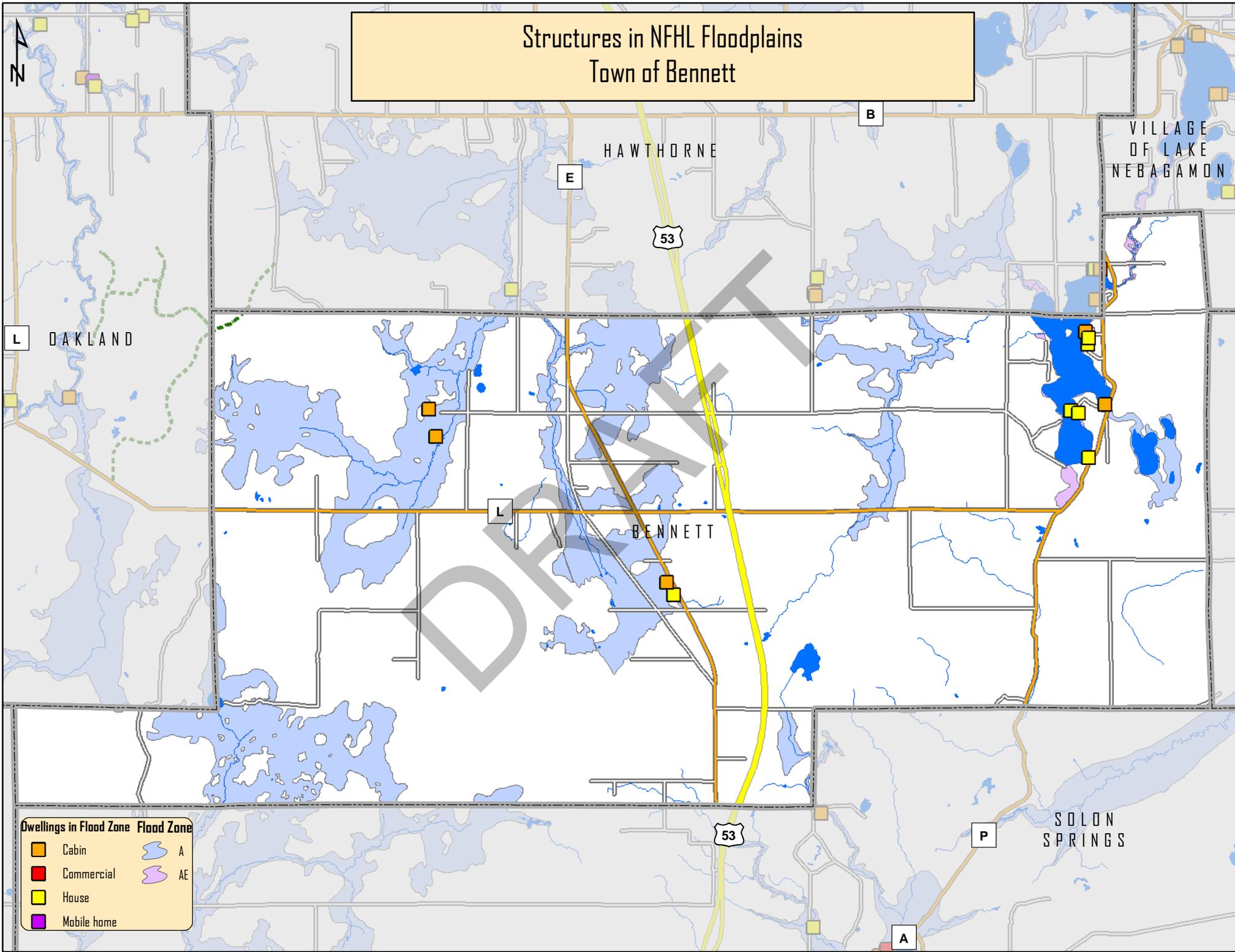
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# Structures in NFHL Floodplains Town of Amnicon



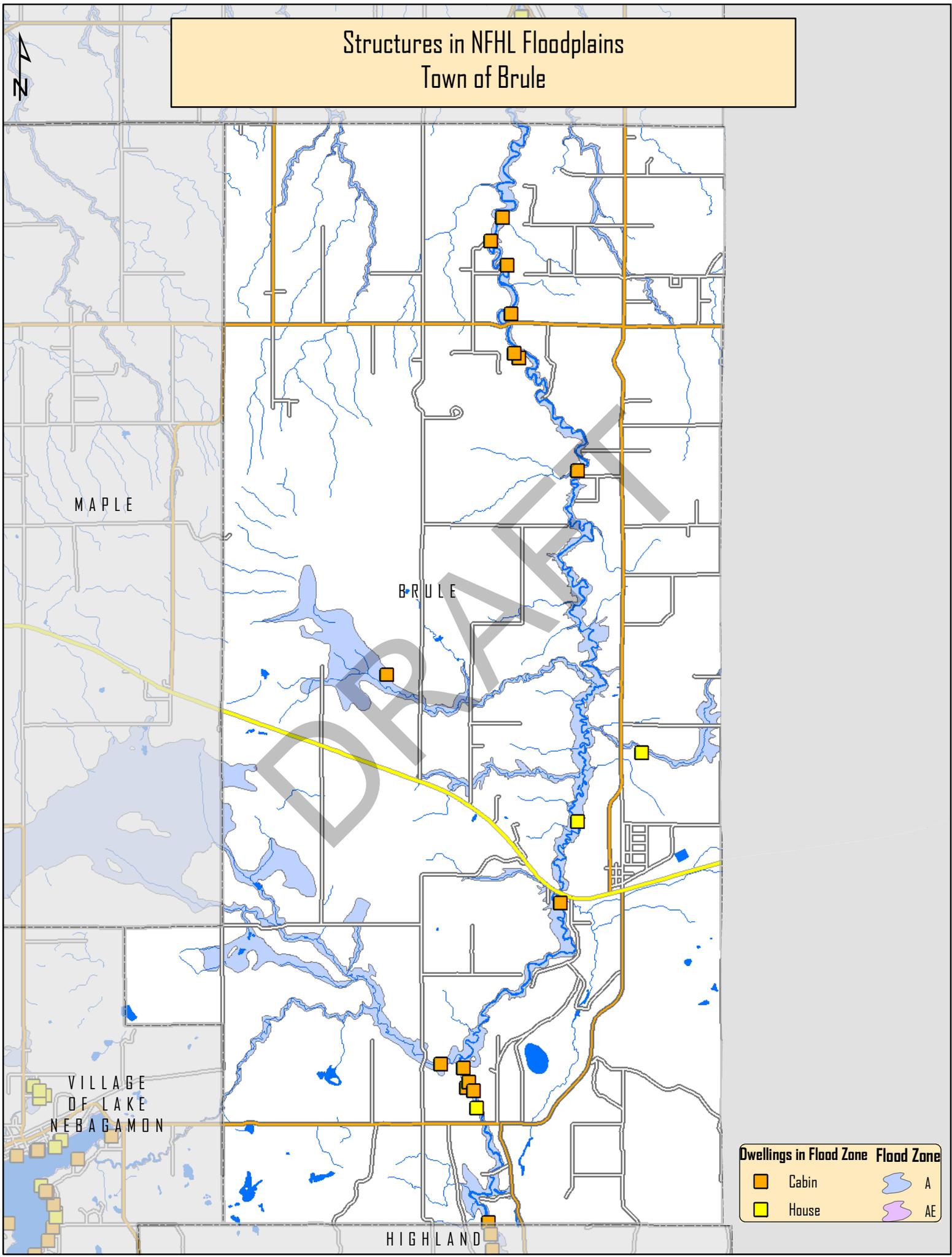
Dwellings in Flood Zone	Flood Zone
 Cabin	 A
 House	
 Mobile home	

# Structures in NFHL Floodplains Town of Bennett



Dwellings in Flood Zone	Flood Zone
Cabin	A
Commercial	AE
House	
Mobile home	

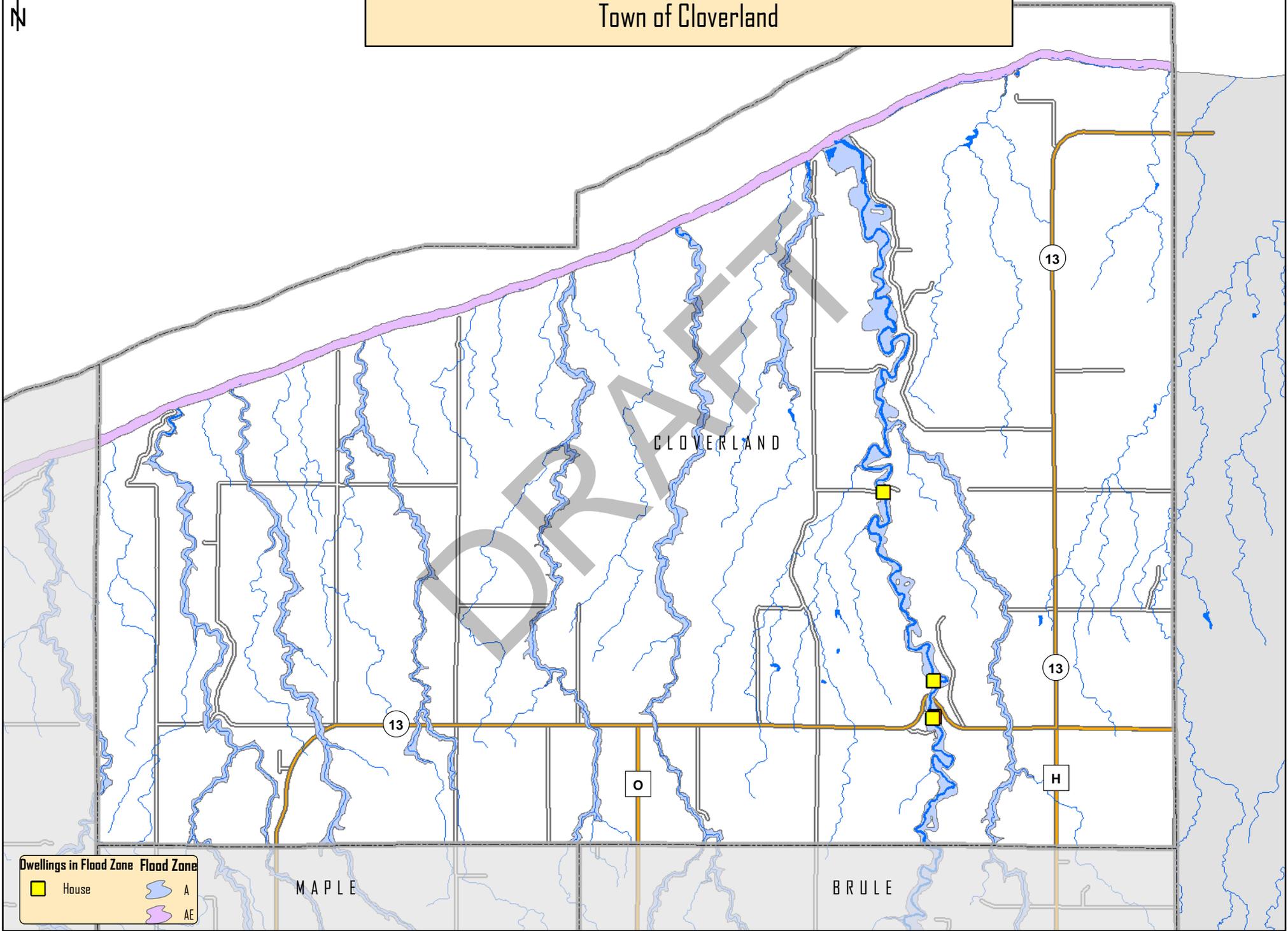
# Structures in NFHL Floodplains Town of Brule



Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE



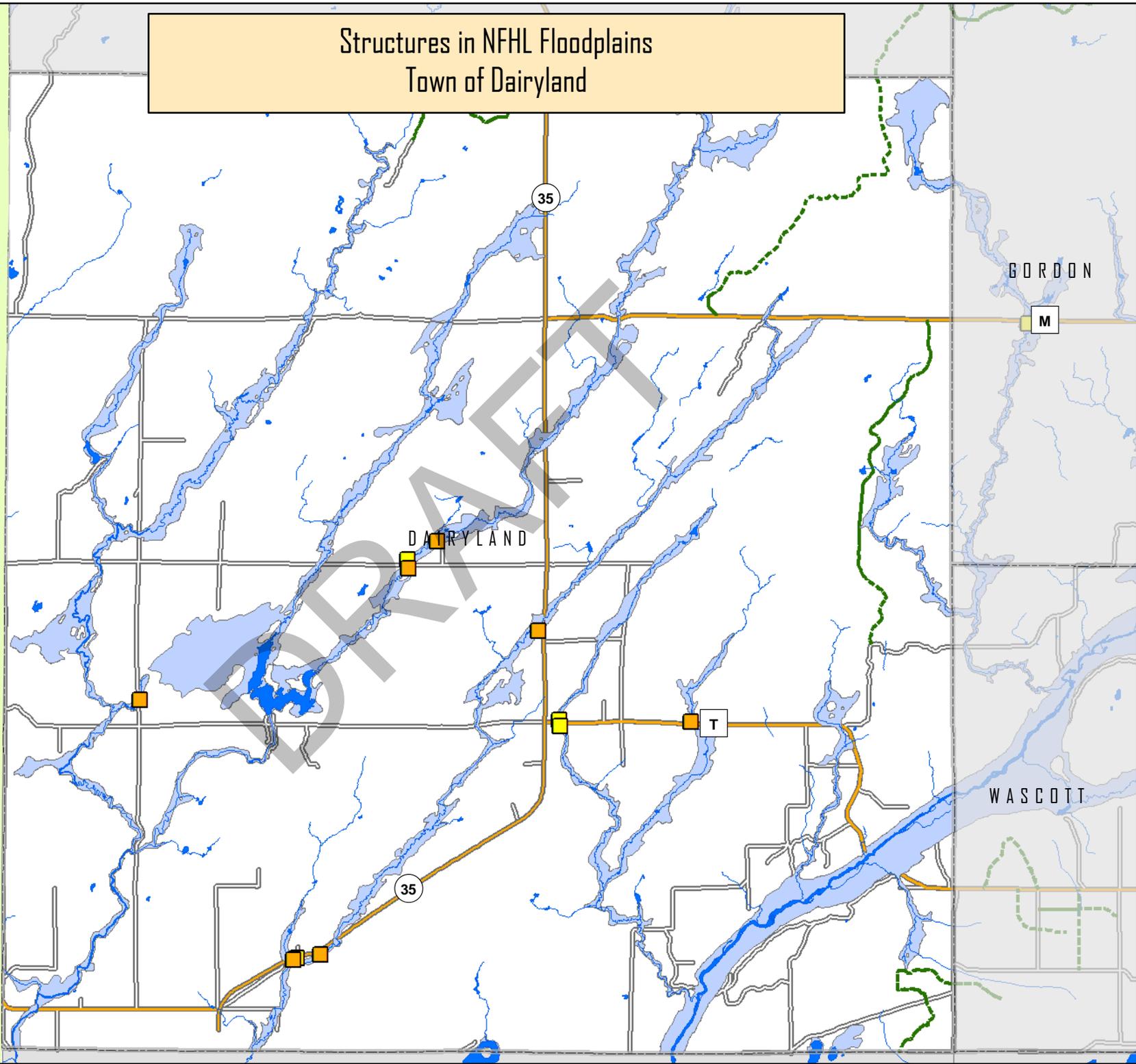
# Structures in NFHL Floodplains Town of Cloverland



Dwellings in Flood Zone	Flood Zone
House	A
	AE

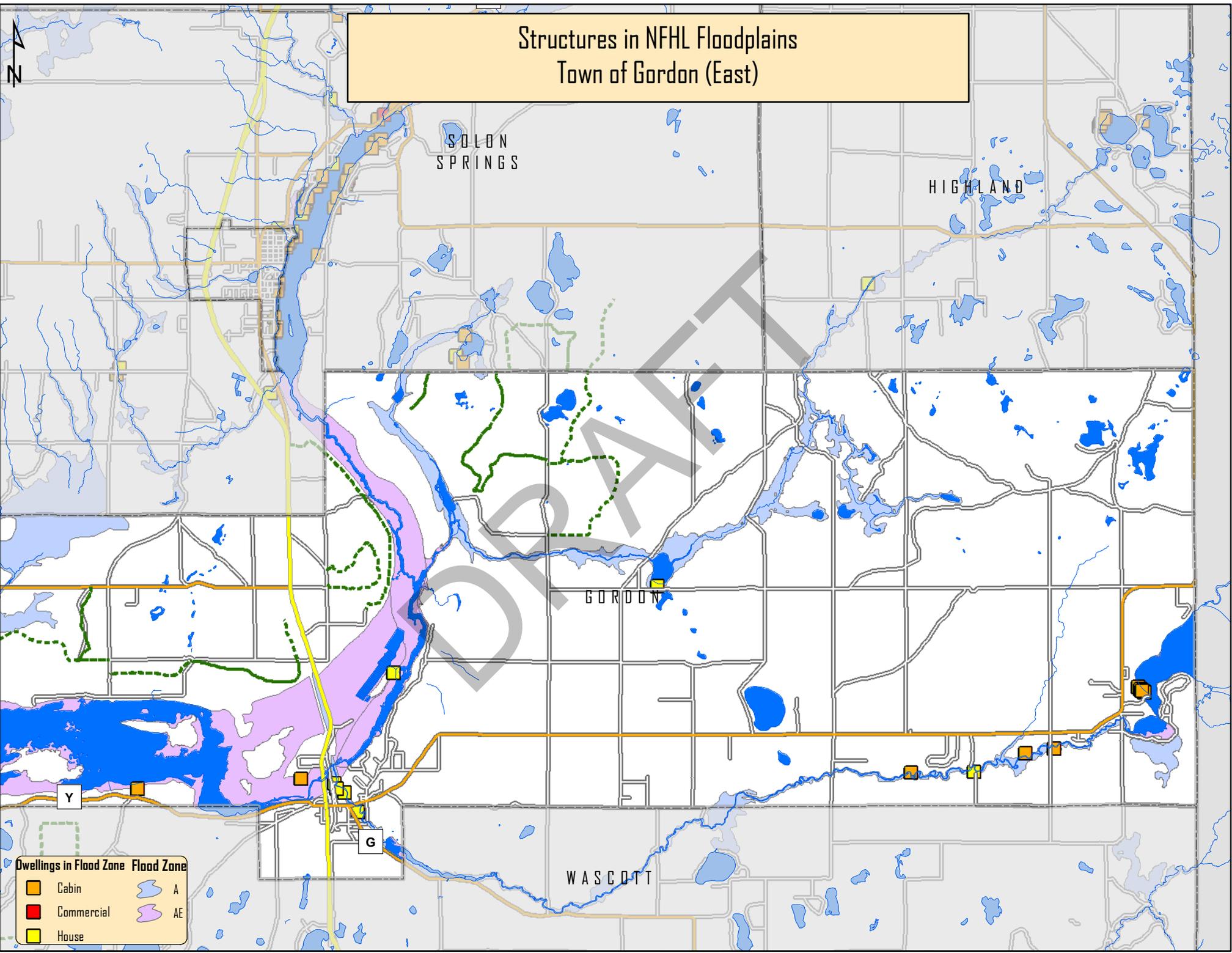
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# Structures in NFHL Floodplains Town of Dairyland



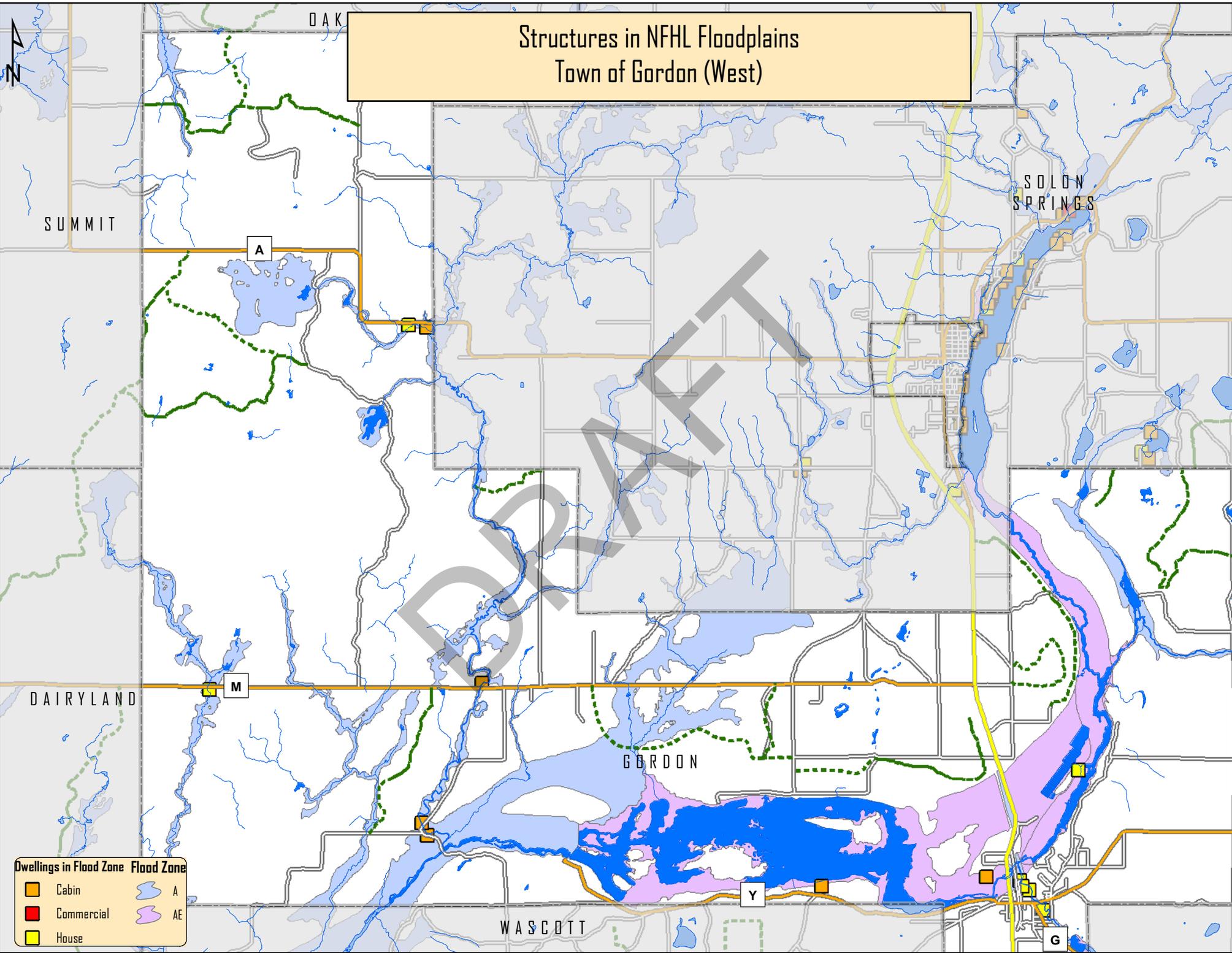
Dwellings in Flood Zone	Flood Zone
 Cabin	 A
 House	

# Structures in NFHL Floodplains Town of Gordon (East)



Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	Commercial		AE
	House		

# Structures in NFHL Floodplains Town of Gordon (West)



# Structures in NFHL Floodplains Town of Hawthorne

MAPLE

HAWTHORNE

D

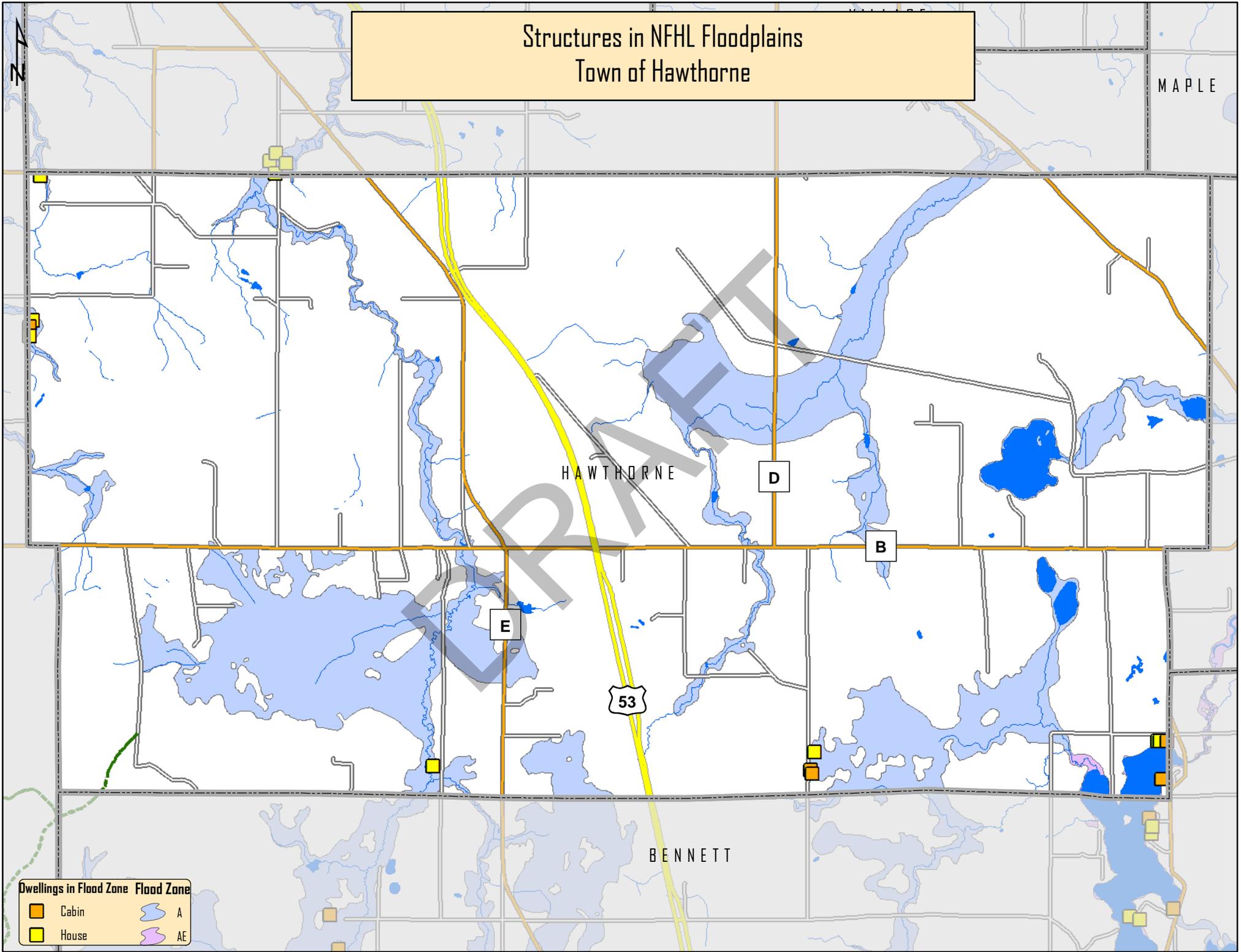
B

E

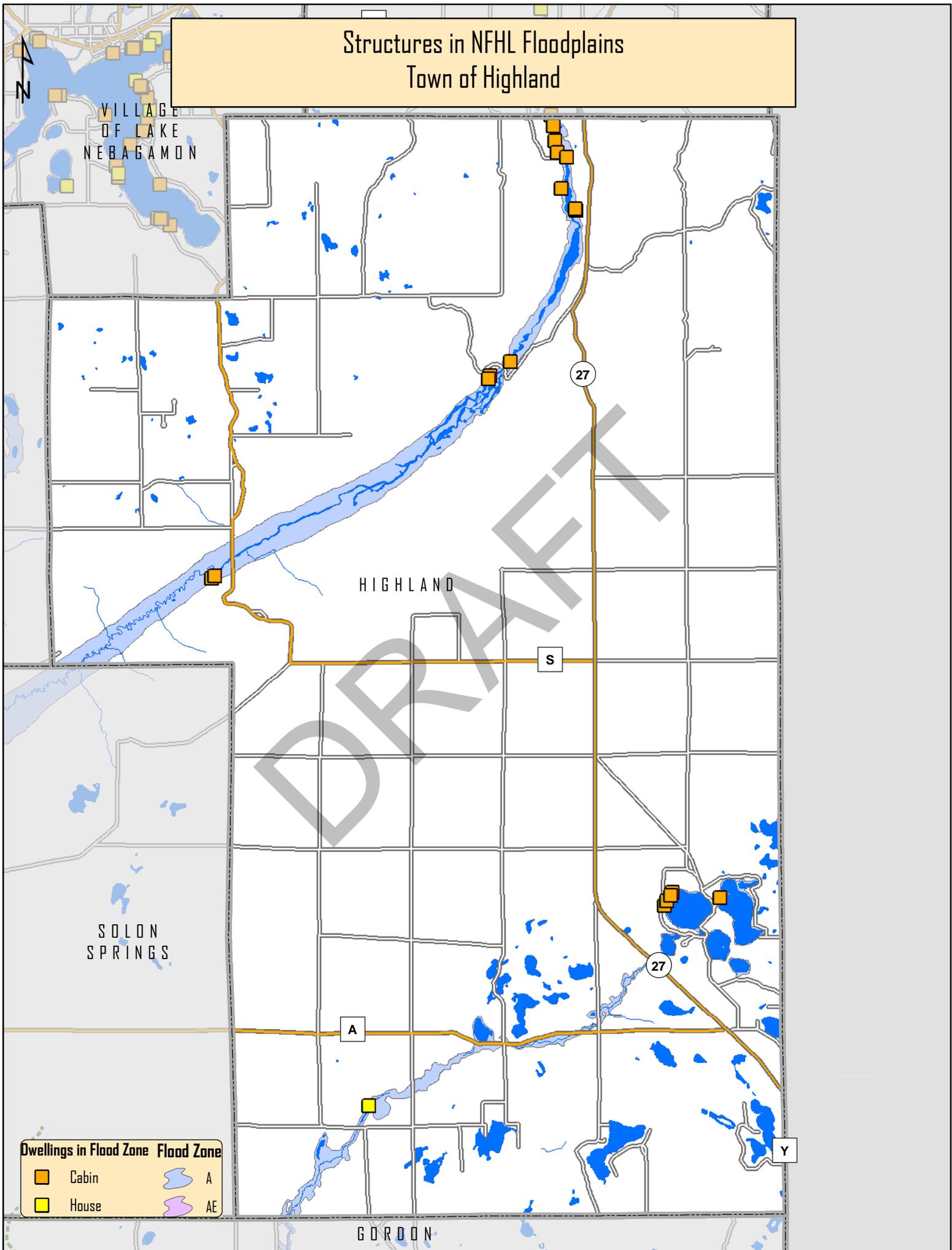
53

BENNETT

Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE



# Structures in NFHL Floodplains Town of Highland



Dwellings in Flood Zone		Flood Zone
	Cabin	 A
	House	 AE

VILLAGE  
OF LAKE  
NEBAGAMON

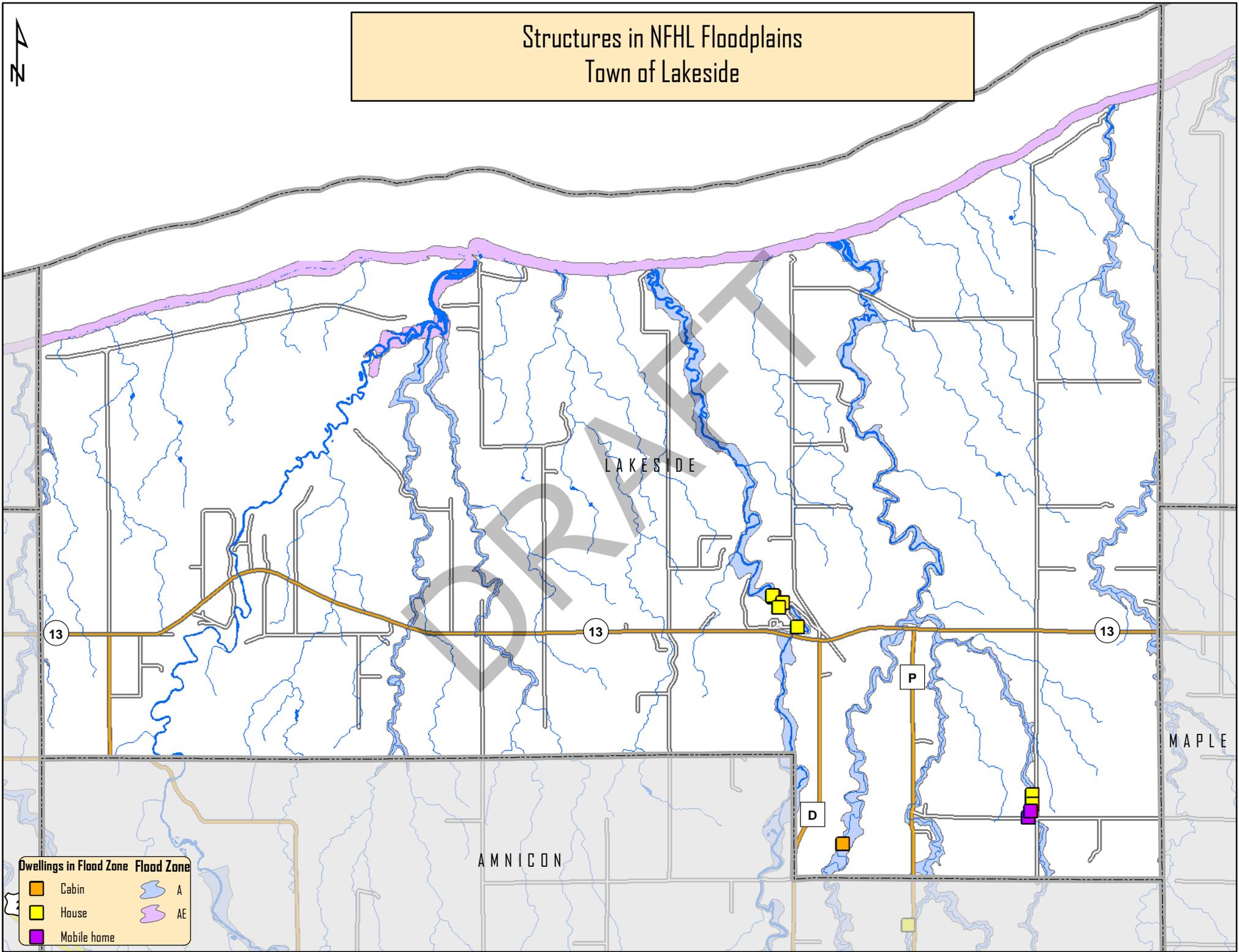
HIGHLAND

SOLO  
SPRINGS

GORDON

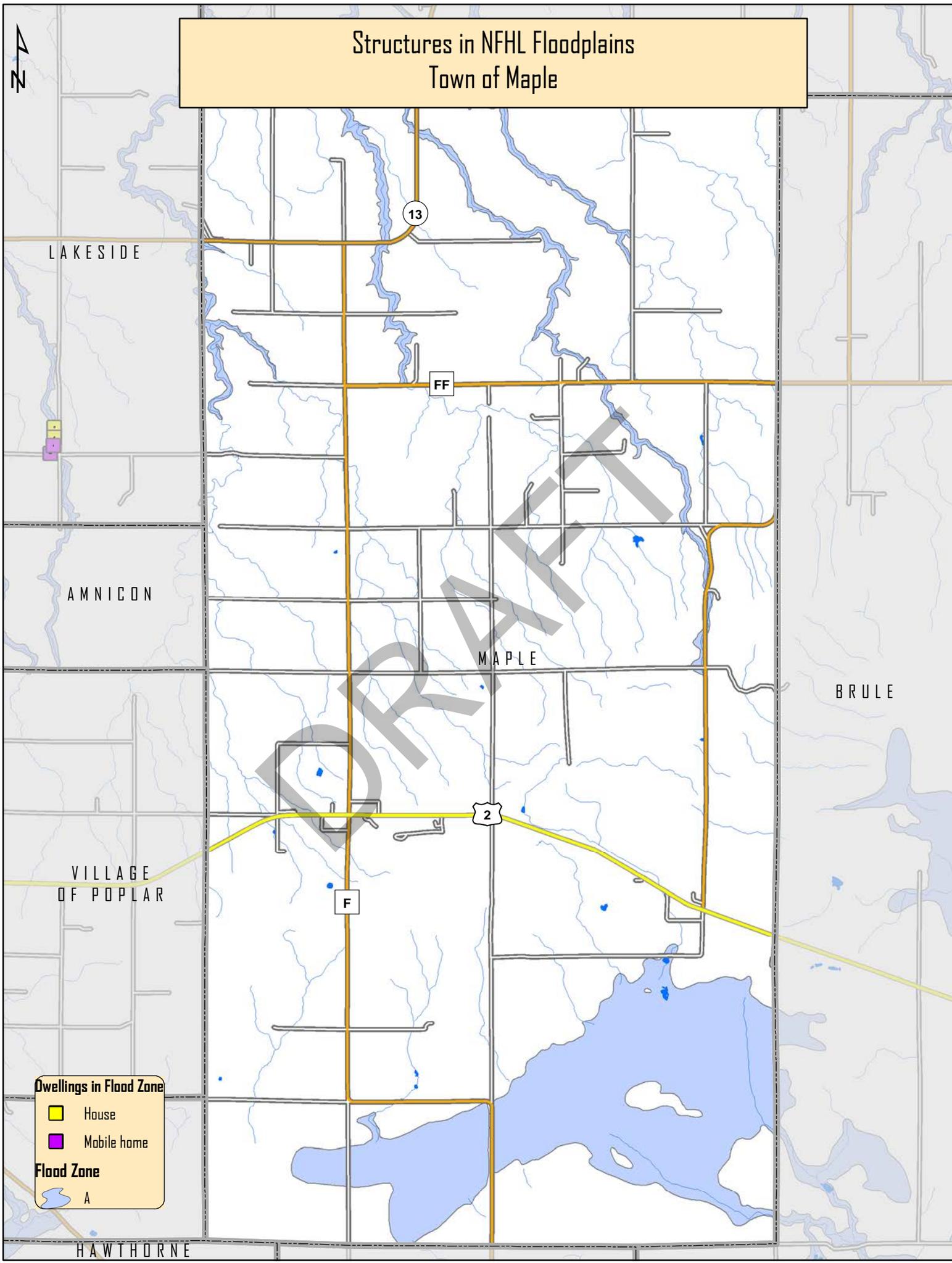


# Structures in NFHL Floodplains Town of Lakeside



Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE
	Mobile home		

# Structures in NFHL Floodplains Town of Maple



### Dwellings in Flood Zone

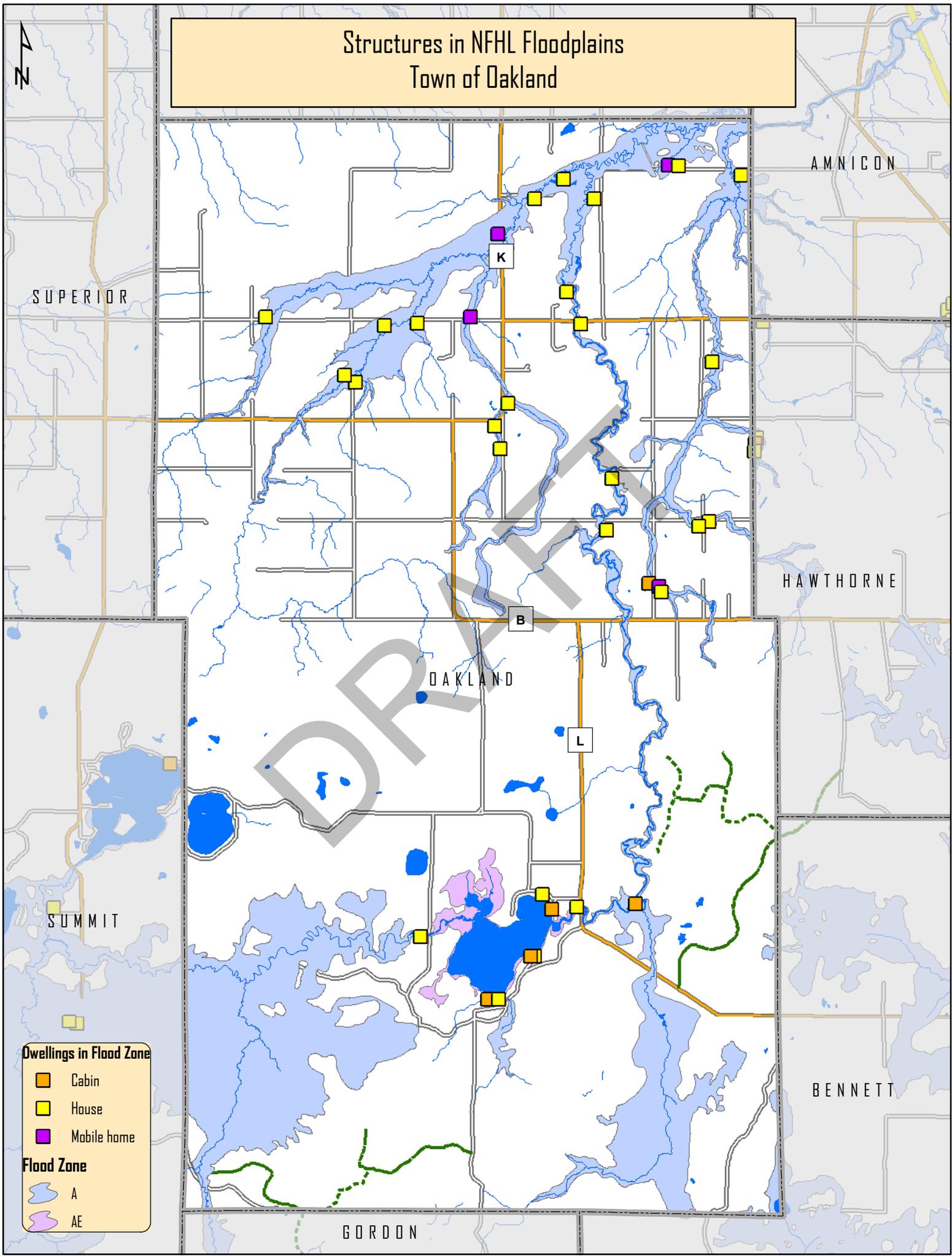
-  House
-  Mobile home

### Flood Zone

-  A

HAWTHORNE

# Structures in NFHL Floodplains Town of Oakland



### Dwellings in Flood Zone

-  Cabin
-  House
-  Mobile home

### Flood Zone

-  A
-  AE

# Structures in NFHL Floodplains Village of Oliver



OF  
SUPERIOR

105

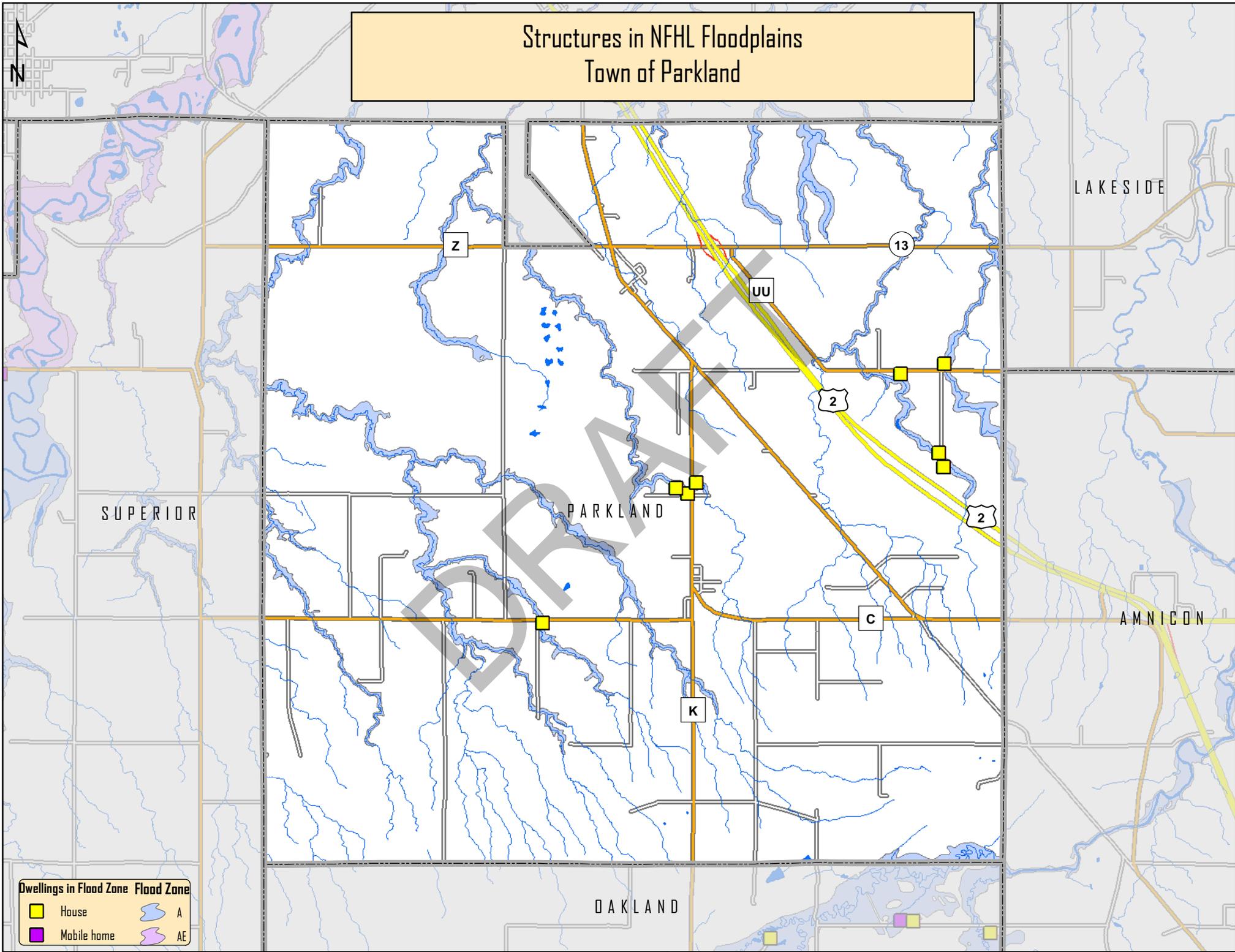
VILLAGE  
OF OLIVER

W

SUPERIOR

Dwellings in Flood Zone		Flood Zone	
	House		A
			AE

# Structures in NFHL Floodplains Town of Parkland



42

AMN

# Structures in NFHL Floodplains Village of Poplar

D

VILLAGE  
OF POPLAR

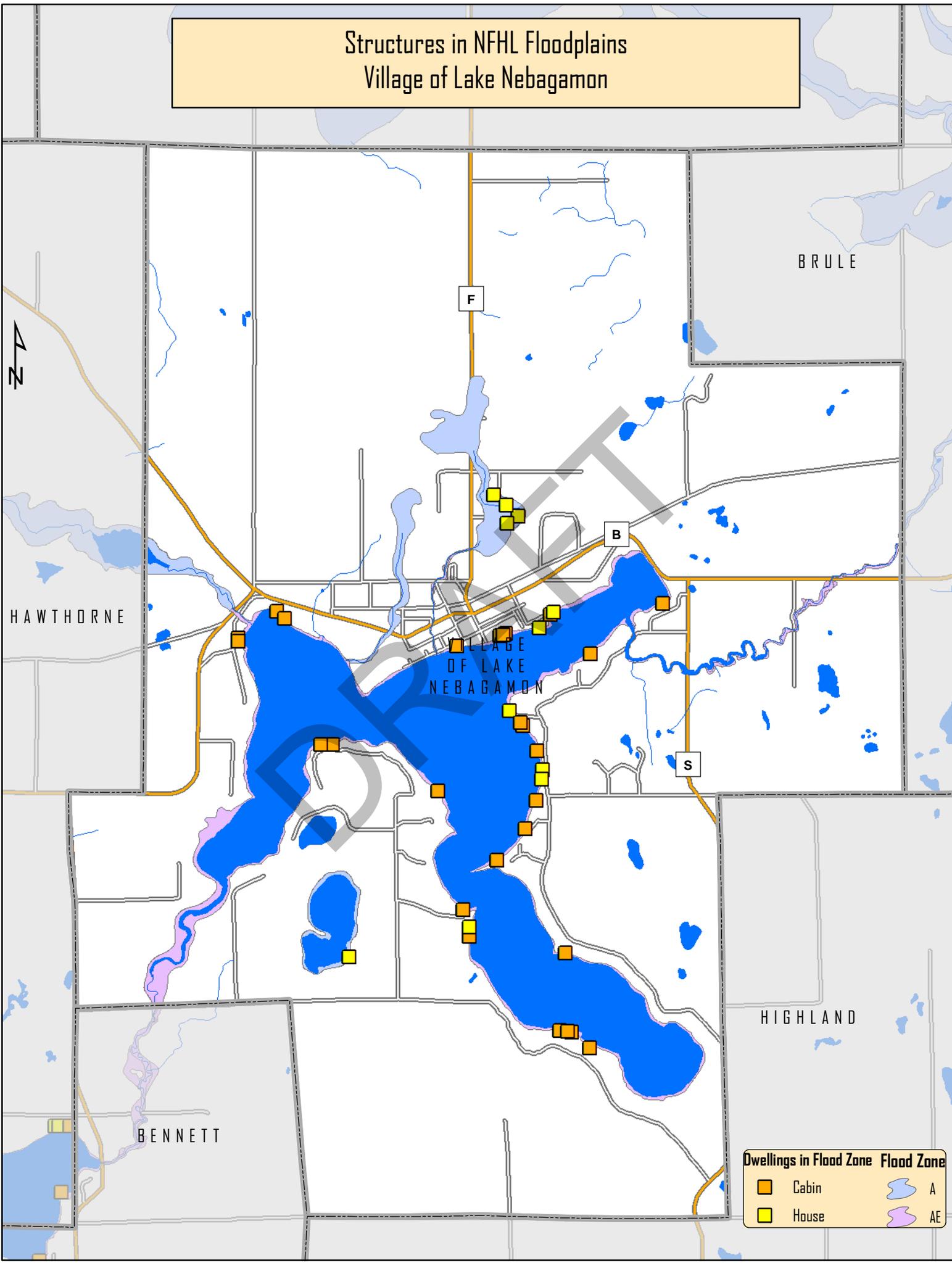
2

MAPLE

P

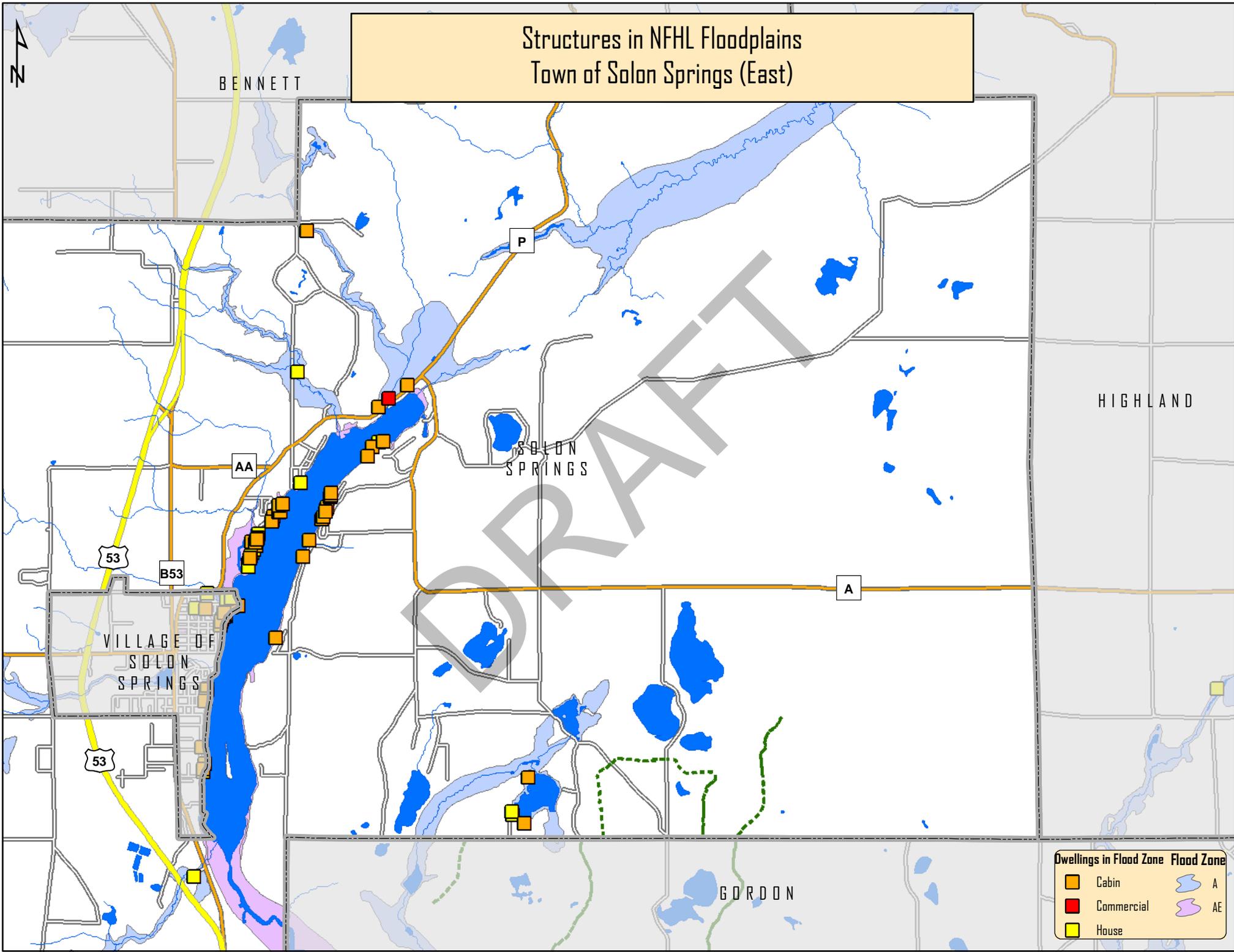
Dwellings in Flood Zone		Flood Zone
	Cabin	 A
	House	

# Structures in NFHL Floodplains Village of Lake Nebagamon



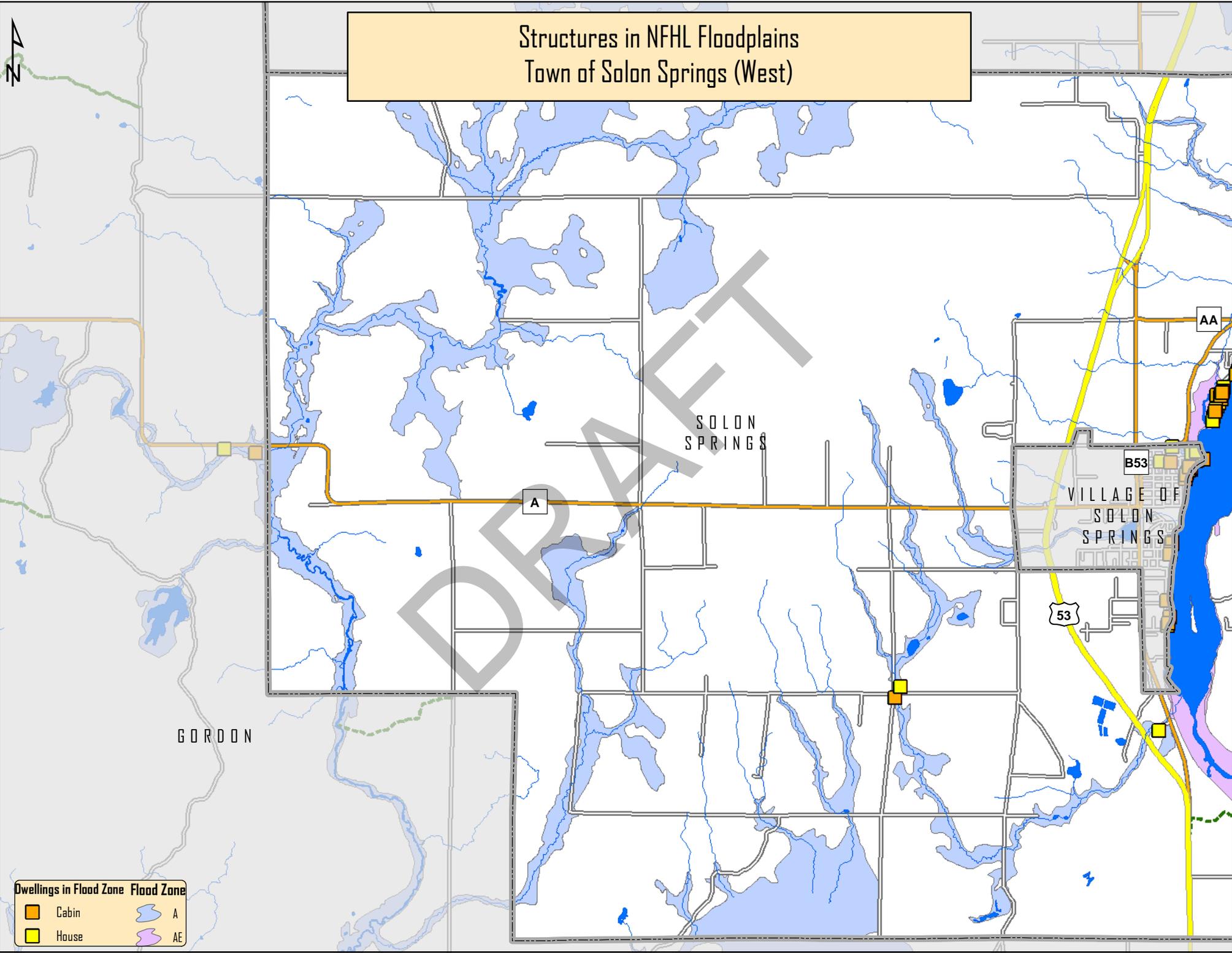
Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE

# Structures in NFHL Floodplains Town of Solon Springs (East)



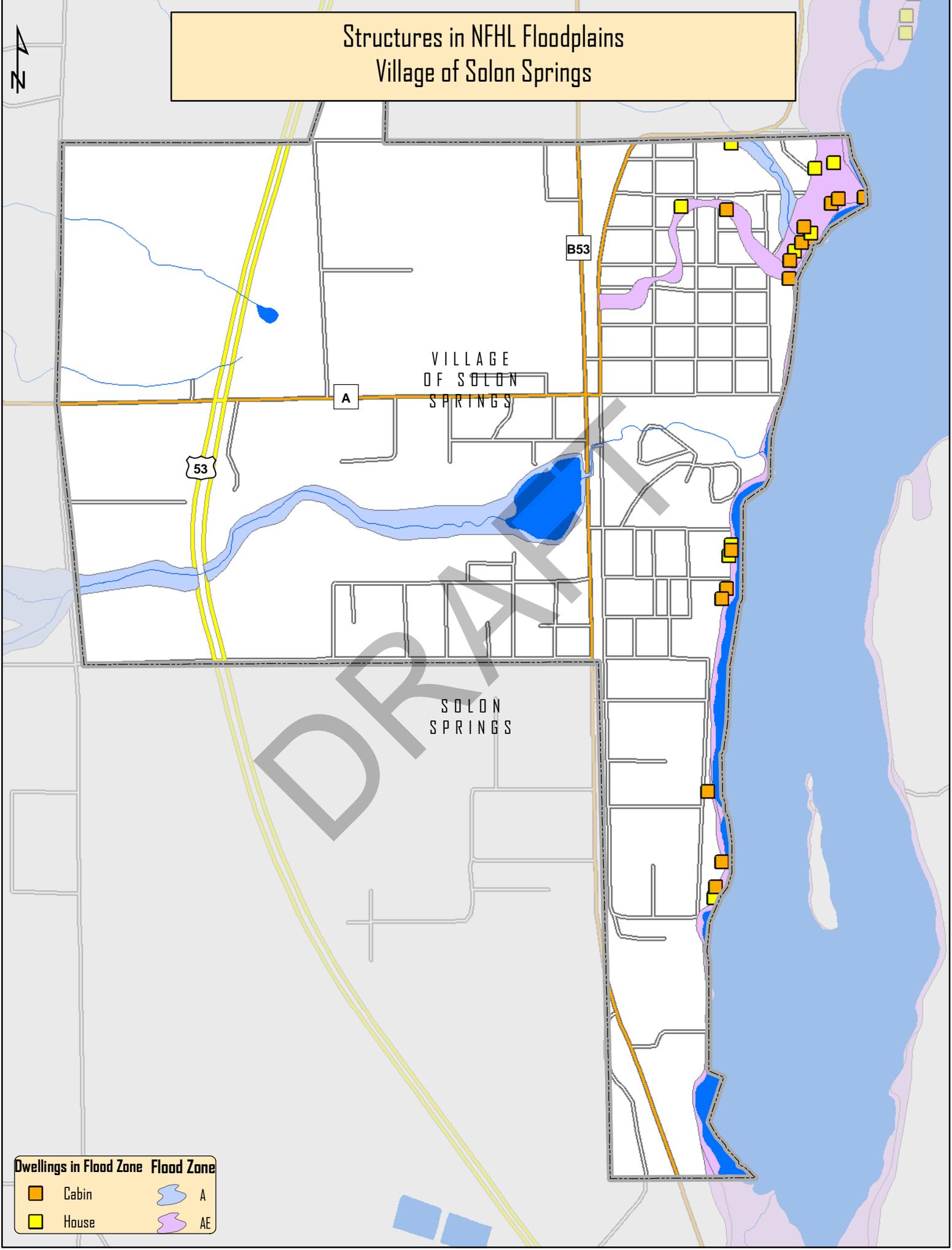
Dwellings in Flood Zone	Flood Zone
Cabin	A
Commercial	AE
House	

# Structures in NFHL Floodplains Town of Solon Springs (West)



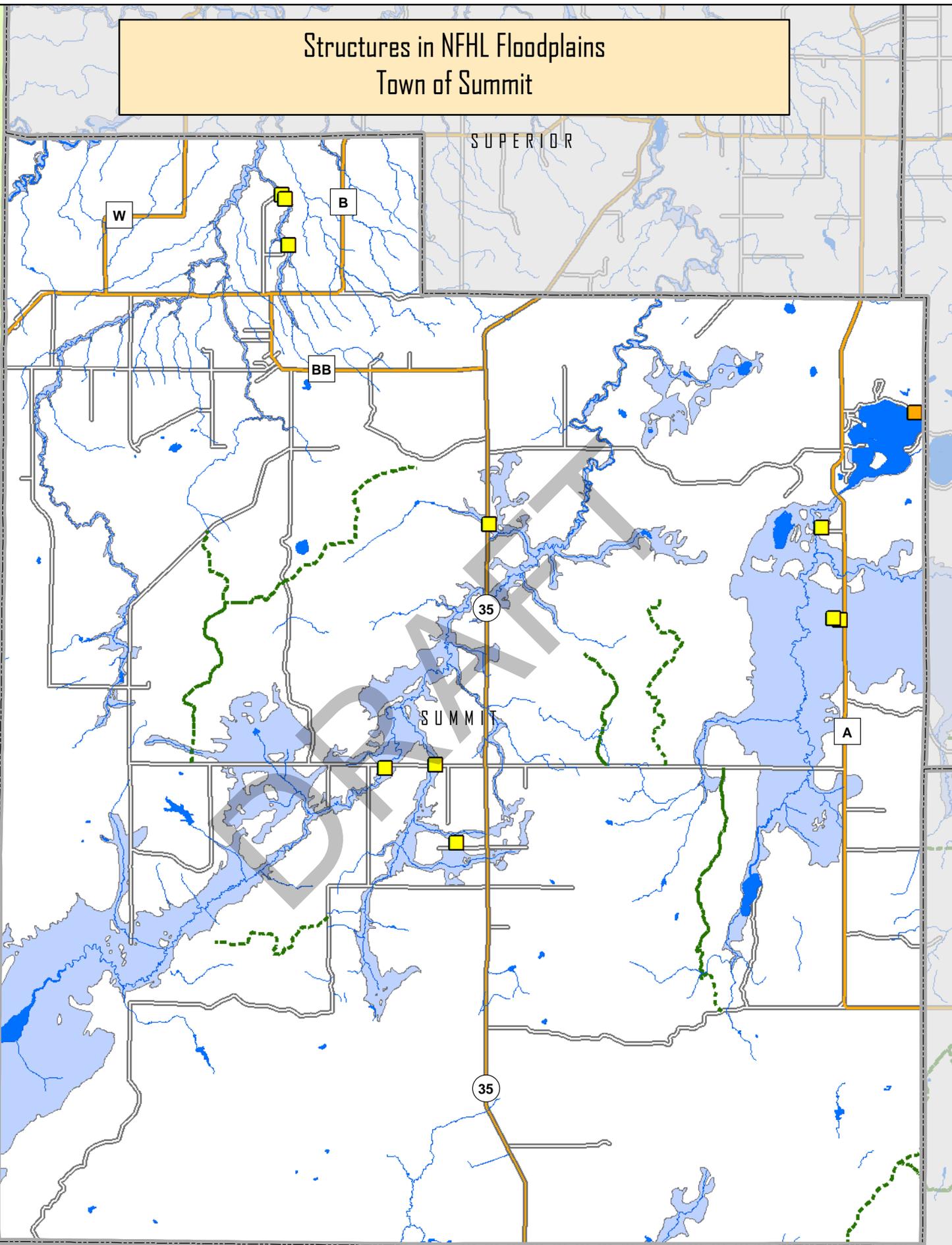
Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE

# Structures in NFHL Floodplains Village of Solon Springs



Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE

# Structures in NFHL Floodplains Town of Summit

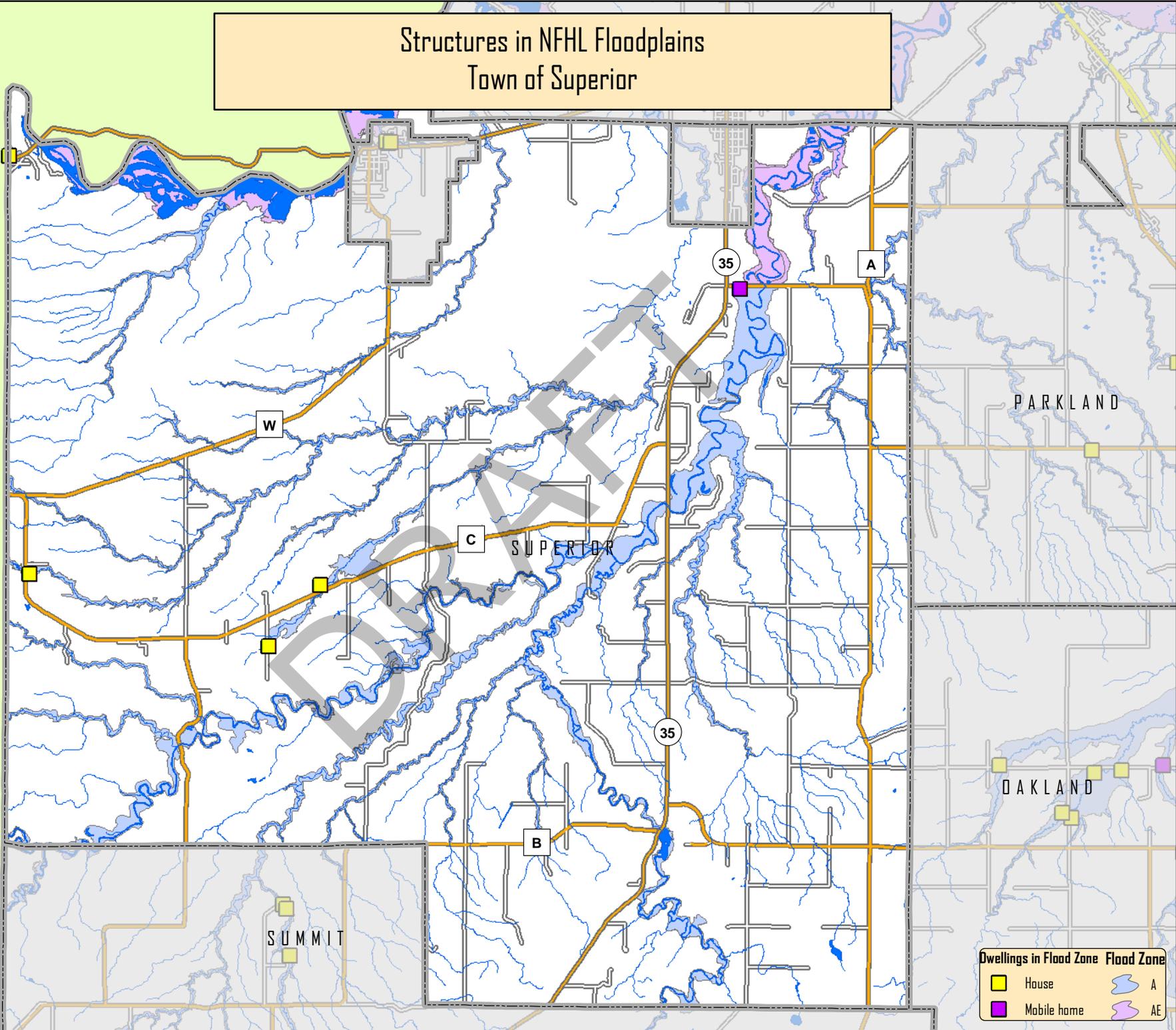


Dwellings in Flood Zone	Flood Zone
 Cabin	 A
 House	

DAIRYLAND

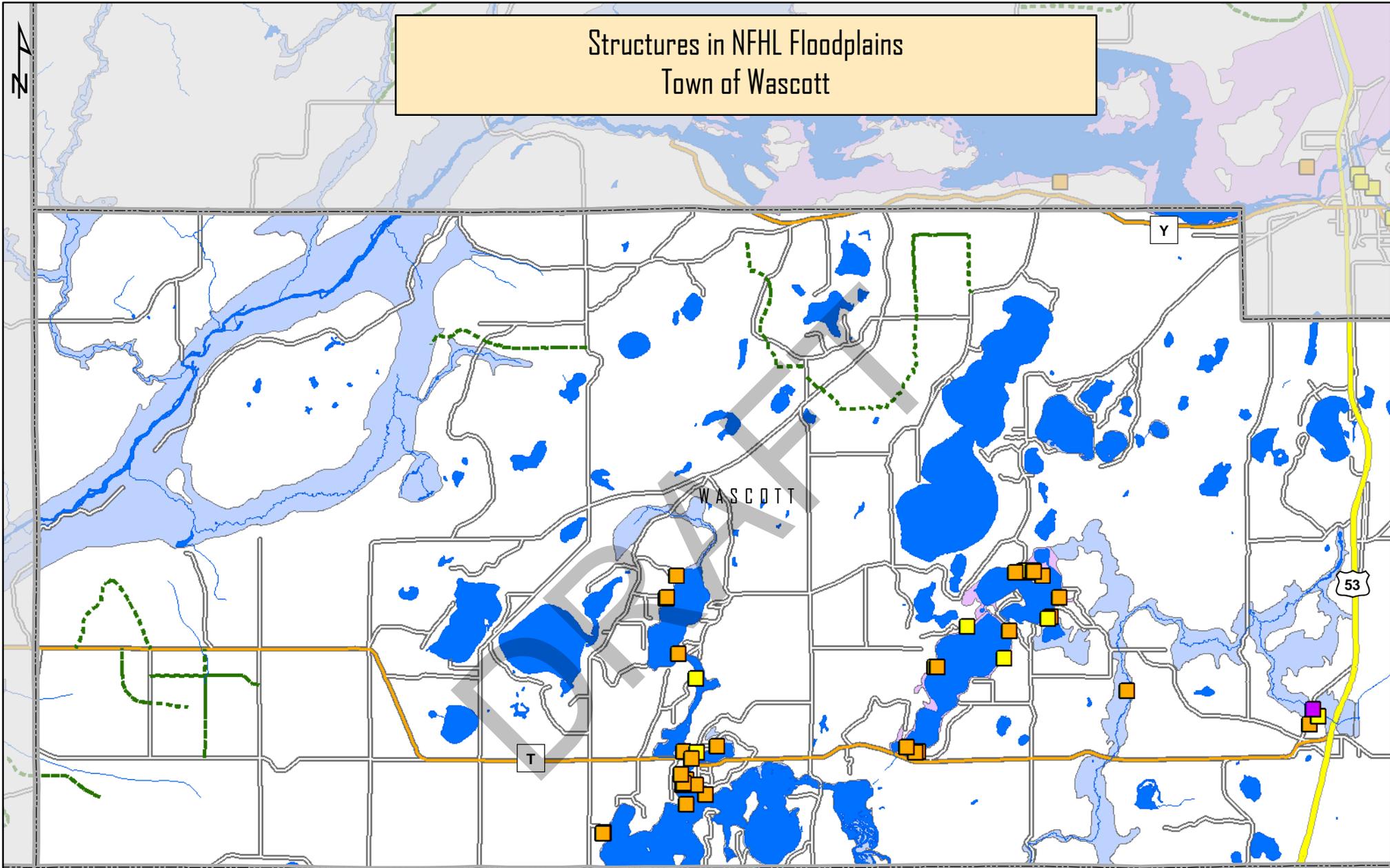
N

# Structures in NFHL Floodplains Town of Superior



Dwellings in Flood Zone		Flood Zone	
	House		A
	Mobile home		AE

# Structures in NFHL Floodplains Town of Wascott



Dwellings in Flood Zone		Flood Zone	
	Cabin		A
	House		AE
	Mobile home		



## **Tornadoes**

**Risk:** Low

**Magnitude:** Can range from minimal, or no damage, to catastrophic.

**Duration:** Tornadoes are typically very brief, with long recovery times

**Distribution:** All areas of the County are equally at risk.

**Area Affected:** Tornadoes can cut a path of devastation a mile wide. Such a situation would affect large areas of the County. The area affected by tornado damage is highly dependent upon degree of urbanization and development. For example, a tornado would likely have a significant impact in the City of Superior and a lesser impact in the rural portions of the County.

**Frequency:** Wisconsin lies along the northern edge of the nation's tornado belt, which extends northeastward from Oklahoma into Iowa. Winter, spring, and fall tornadoes are more likely to occur in southern Wisconsin than in northern counties. Yet, tornadoes have occurred in Wisconsin during every month except February.

Wisconsin's tornado season runs from the beginning of April through September. However, tornadoes have occurred at other times. Personal property damage, deaths, and injuries have and will continue to occur in Wisconsin.

Douglas County has had numerous reports of tornadoes and funnels aloft in the rural areas including the destruction of a building in 1987. In 1980, a tornado destroyed a trailer home in the Town of Maple.

In June of 1994 in the early evening, a tornado did some damage in the Dairyland area. A business sustained roof and window damage, also snapping off trees three to four feet above the ground. A large barn now used for machine and miscellaneous storage was lifted and moved on its foundation. Most windows on one side were sucked out. The same property sustained movement of a two-stall auto garage and uprooting of large trees. Electrical service was disrupted as yard poles were snapped off felling feed lines.

From this same storm, which passed in the lower part of the County, the Town of Wascott received damage assessed at \$55,000.00. Most damage was in the Person Lake area. Most homes on the west and north side received damage roofs, decks, porches, windows, and out buildings were heavily damaged. Docks, boats, and miscellaneous watercraft were damaged and placed on land around trees; buildings and trees stopped and destroyed most craft in their flight from the lake. Heavy tree damage was done, some larger trees were uprooted, while smaller trees twisted off above ground and placed 50-60 feet from actual growth. Douglas County Forestry suffered heavy timber



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

damage in this same storm. Emergency sales were conducted, and recovery efforts lasted three weeks. No one was injured in this storm. The alternate E.O.C. at Solon Springs was operational during this period. Zoning, emergency management, town assessor, and regional director accomplished storm damage assessment.

The year 1996 produced some tornado-type damage in the Maple, Lake Nebagamon, and Southeastern area. In 1997, reported sightings of funnel clouds in the Highland area were confirmed. No damage reported. In 1998, a tornado was reported in Maple with damage to several buildings, power lines, and forest.

**Probability:** Very difficult to predict, although Douglas County does experience active tornado seasons occasionally. See **Figure's 11** and **12**. The date of peak probability of tornado occurrence in Douglas County is on or about June 17<sup>th</sup>. On this date, the estimated peak probability of *any* tornado occurring within Douglas County is approximately 0.20% or 1 in 500. The estimated probability of a *significant* tornado (F/EF 2 or greater) occurring within Douglas County on June 17<sup>th</sup> is about 0.05%, or one in 2,000.

### Vulnerability:

**Table 27: Tornado Occurrences in Douglas County**

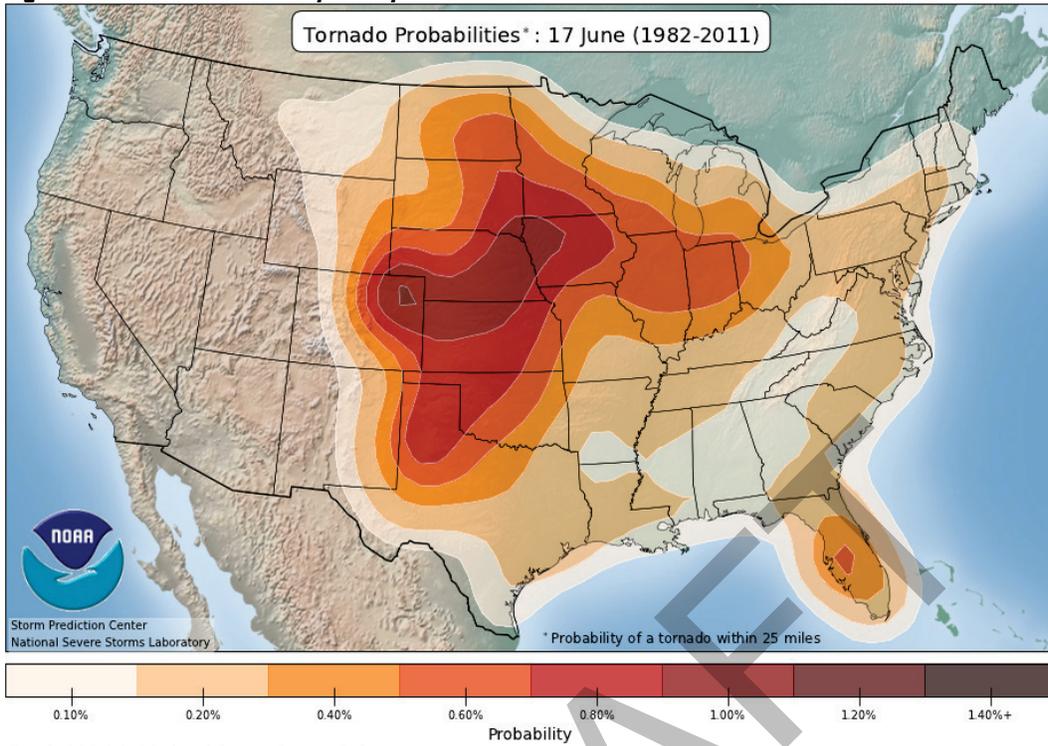
Date	Magnitude	Deaths	Length	Width	Injuries	Property Damage	Crop Damage
5/10/1953	F2	0	-	-	0	N/A	N/A
6/30/1968	F2	0	11 miles	300 yards	0	\$250,000	0
7/7/1970	N/A	0	5 miles	100 yards	0	0	0
9/9/1977	N/A	0	UNK	33 yards	0	0	0
9/8/1979	F1	0	UNK	33 yards	0	\$3,000	0
9/3/1980	F2	0	10 miles	80 yards	0	\$25,000	0
6/27/1994	F1	0	1 mile	100 yards	0	\$50,000	\$50,000
6/27/1994	F1	0	4 miles	250 yards	0	\$500,000	\$50,000
8/23/1998	F0	0	0 miles <sup>4</sup>	25 yards	0	\$29,000	0
7/1/2011	F2	0	2.93 miles	300 yards	0	0	0
8/9/2012	F0	0	.05 miles	20 yards	0	0	0

Source: National Climate Data Center and the Tornado Project

<sup>4</sup>Brief tornado touchdown

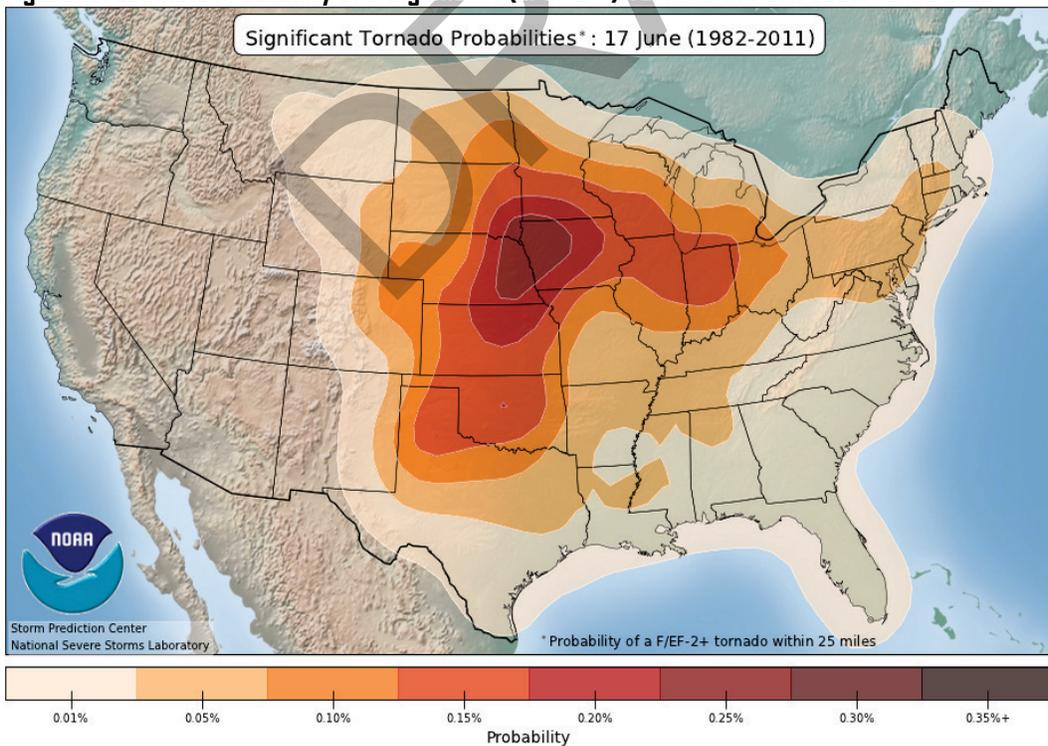


**Figure 11: Estimate Probability of Any Tornado at Peak Occurrence Date**



Graph: NOAA, National Severe Storms Laboratory

**Figure 12: Estimate Probability of a Significant (E/EF 2 +) Tornado at Peak Occurrence Date**



Graph: NOAA, National Severe Storms Laboratory



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Based on an analysis of the assets found in the community and that of future land use trends, critical facilities found to be susceptible to tornados is significant. In addition to critical resources, residential, commercial, and industrial buildings are also prone to tornado damage. Due to the geographic distribution of critical facilities, the probability of a tornado damaging all facilities is slight. There are an estimated 995 occupied mobile homes (ACS, 2013) in Douglas County. These structures often lack the wind speed resistance of other residential structures, and many units are not placed upon permanent foundations, making them particularly vulnerable to high wind events, including tornadoes.

**Economic Impact:** The tornado hazard is projected to have no impact on land use and development trends in Douglas County as tornados can strike in any part of the County. The impact of a tornado in a concentrated area of population or buildings would have a significant impact on people and property. Determination of the potential dollar losses associated with tornados is made difficult due to the lack of information relative to risk. Basically, all portions of the County equally share the risk of incidence. Thus, the potential for losses of life and structures is spread equally across the County. It can be inferred, however, that if a tornado event were to occur within one of the incorporated communities, damage and losses would likely be much greater than if it were to occur in the rural areas.

Based on the historic data and the calculated probabilities, the annual economic impact of tornadoes can be estimated. The total dollar loss for all historical events was \$856,000 in property damage and \$100,000 in crop damage. The average combined loss per occurrence was approximately \$87,000.

**Table 28: Estimated Value Loss Due to Tornadoes**

Strength	Percentage of Structure Value Lost Due to Damage
F1	0 to 20%
F2	50 to 100%
F3	100%
F4 and Greater	100%



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### The “Average Tornado”

For analysis purposes a hypothetical “average” tornado scenario was developed using historical data from 1953-1998. Based on this information, we can conclude that the “average” tornado path in Douglas County is 6.2 miles, or 32,736 feet in length. The average tornado width is 142.5 yards, or 427.5 feet. The combination of these two factors yields a net area of 13,994,640 square feet, or 321 acres. The average intensity of tornados in Douglas County is an F1 (wind speeds of 73-112 mph). Damages from an F1 tornado are assumed to be between 0 percent and 20 percent of the appraised value of structures within the damage area. Estimated losses from tornados are depicted in table 29.

**Table 29: Estimated Losses, “Average” Tornado Scenario**

Community Name	Total Value of Improvements <sup>5</sup>	Total Land Area (Acres)	Estimated Value at Risk <sup>6</sup>	Estimated Losses <sup>7</sup>
AMNICON	\$53,311,600	25,024	\$664,691	\$132,938
BENNETT	\$34,897,800	30,400	\$358,162	\$71,632
BRULE	\$30,146,800	35,648	\$263,852	\$52,770
CLOVERLAND	\$11,647,300	29,568	\$122,902	\$24,580
DAIRYLAND	\$13,384,500	89,728	\$46,540	\$9,308
GORDON	\$55,740,400	97,152	\$179,008	\$35,802
HAWTHORNE	\$47,120,300	29,184	\$503,753	\$100,751
HIGHLAND	\$28,855,900	48,960	\$183,886	\$36,777
LAKESIDE	\$35,033,600	25,536	\$428,042	\$85,608
MAPLE	\$27,437,000	20,544	\$416,683	\$83,337
OAKLAND	\$57,688,500	40,896	\$440,112	\$88,022
PARKLAND	\$55,705,200	22,720	\$764,966	\$152,993
SOLON SPRINGS	\$75,578,200	53,120	\$443,908	\$88,782
SUMMIT	\$56,873,900	93,824	\$189,127	\$37,825
SUPERIOR	\$116,755,500	67,968	\$535,954	\$107,191
WASCOTT	\$132,444,100	85,120	\$485,462	\$97,092
LAKE NEBAGAMON	\$84,728,100	8,128	\$3,252,358	\$650,472
OLIVER	\$18,864,400	1,280	\$4,598,198	\$919,640
POPLAR	\$29,278,400	7,616	\$1,199,430	\$239,886
SOLON SPRINGS	\$31,898,300	1,024	\$9,719,013	\$1,943,803
SUPERIOR V	\$38,378,100	768	\$15,591,103	\$3,118,221
SUPERIOR C	\$1,226,073,600	23,616	\$16,198,127	\$3,239,625

<sup>5</sup> Wisconsin Department of Revenue, 2014 Statement of Assessments

<sup>6</sup> Proportional value within land area encompassed by average tornado scenario (321 Acres)

<sup>7</sup> Value represents 20% of total estimated value at risk.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Thunderstorms**

**Risk:** High (General thunderstorm risk)

**Magnitude:** Can range from minimal, or no damage, to catastrophic.

**Duration:** Thunderstorms typically last from a few minutes to hours and may repeatedly impact a given area over the course of a thunderstorm event.

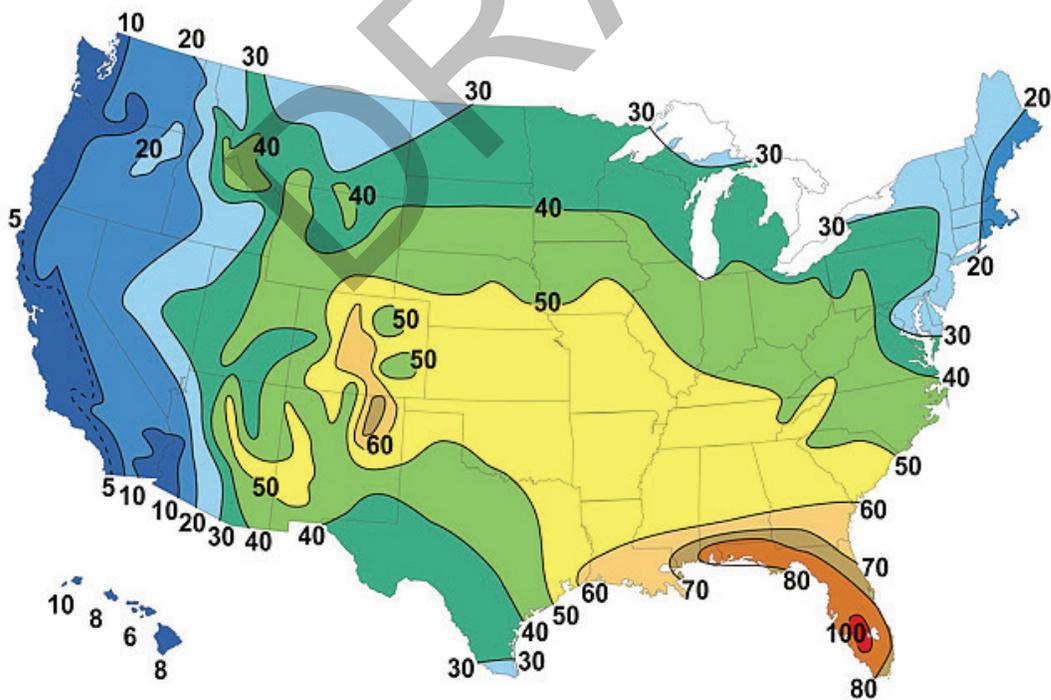
**Distribution:** Affects all areas of County.

**Area Affected:** May have more direct impact within urbanized or populated areas.

**Frequency:** Thunderstorm frequency is measured in terms of incidents observed per day. Wisconsin averages between 30 and 45 thunderstorms per year. In Douglas County, there are typically 15 severe thunderstorms per year. Thunderstorms can occur throughout the year, with the highest frequency during the months of May through September. The majority of the storms occur between the hours of noon and midnight.

**Probability:** Very likely to occur in any given year, near 100% annual probability of occurrence.

**Figure 13: Average Number of Thunderstorm Days per Year**



Source: NOAA, National Weather Service



**Vulnerability:** The Douglas County Hazard Mitigation Planning Committee has ranked the risk of thunderstorms in Douglas County as “high”. It is very likely that several thunderstorm events will occur within the County during any given year. Some of these events will be classified as “severe thunderstorms”, containing damaging wind, lightning, hail, or heavy rain. The relative risk of these events is equal to all geographic areas within the County.

**Economic Impact:** Please refer to the flooding, hail, lightning or high wind hazards.

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DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Lightning**

**Risk:** High

**Magnitude:** Typically minor, although secondary impacts could be significant (damage to infrastructure, communications, fire, etc.)

**Duration:** Very short duration. May be associated with severe storms that produce frequent lightning over an extended period of time.

**Distribution:** Affects all areas of County.

Table 30: Lightning Frequency, 2009-2014

SUPERIOR		SOLON SPRINGS	
MONTH	OCCURRENCES	MONTH	OCCURRENCES
Jan	0	Jan	0
Feb	0	Feb	0
Mar	0	Mar	0
Apr	10	Apr	7
May	36	May	74
Jun	152	Jun	44
Jul	186	Jul	289
Aug	334	Aug	336
Sep	31	Sep	159
Oct	1	Oct	1
Nov	0	Nov	0
Dec	0	Dec	0
DAIRYLAND		BRULE	
MONTH	OCCURRENCES	MONTH	OCCURRENCES
Jan	0	Jan	0
Feb	0	Feb	0
Mar	0	Mar	0
Apr	2	Apr	5
May	80	May	122
Jun	110	Jun	62
Jul	408	Jul	179
Aug	251	Aug	324
Sep	614	Sep	94
Nov	1	Nov	1
Nov	0	Nov	0
Dec	0	Dec	0

Source: National Lightning Detection Network

**Area Affected:** All levels of society. Poses serious risk to people. Areas affected increased due to lightning caused fires. Lightning damage occurs if humans and animals are electrocuted; fires are caused by a lightning stroke; or sudden power surges cause damage to electrical or electronic equipment.

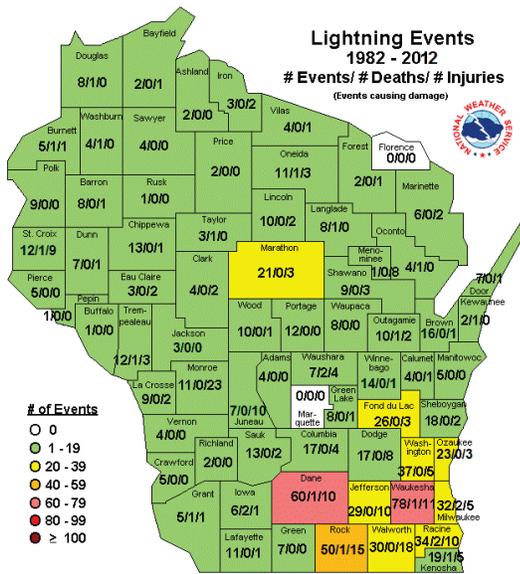
**Frequency:** Nationwide, 45 percent of the persons killed by lightning have been outdoors, about 16 percent occurred under trees, 6 percent on heavy road equipment, and 33 percent at various unknown locations. Less than 10 percent of the deaths involve individuals inside buildings. These are primarily due to lightning-caused fires.

Wisconsin has a high frequency of property losses because of lightning. Insurance records show that annually one out of every 50 farms have been struck by lightning or have had a fire which may have been caused by lightning.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Figure 14: Lightning Events, 1982-2012**



Generally, rural fires are more destructive than urban fires because of limited lightning protection devices, isolation, longer response times, and inadequate water supplies.

On May 28, 1994, there were lightning strikes in the Town of Bennett that destroyed a barn and caused minor damage to several homes.

On several occasions, during the summer of 2002, lightning struck trees in the City of Superior causing a short-term loss of electrical service. In addition several lightning strikes were reported in the rural County. No loss of life or serious damage to homes was reported.

**Probability:** Near 100%. The County experiences about 30 to 40 thunderstorms per year, with most producing visible lightning.

**Table 31: Recorded Lightning Events in Douglas County**

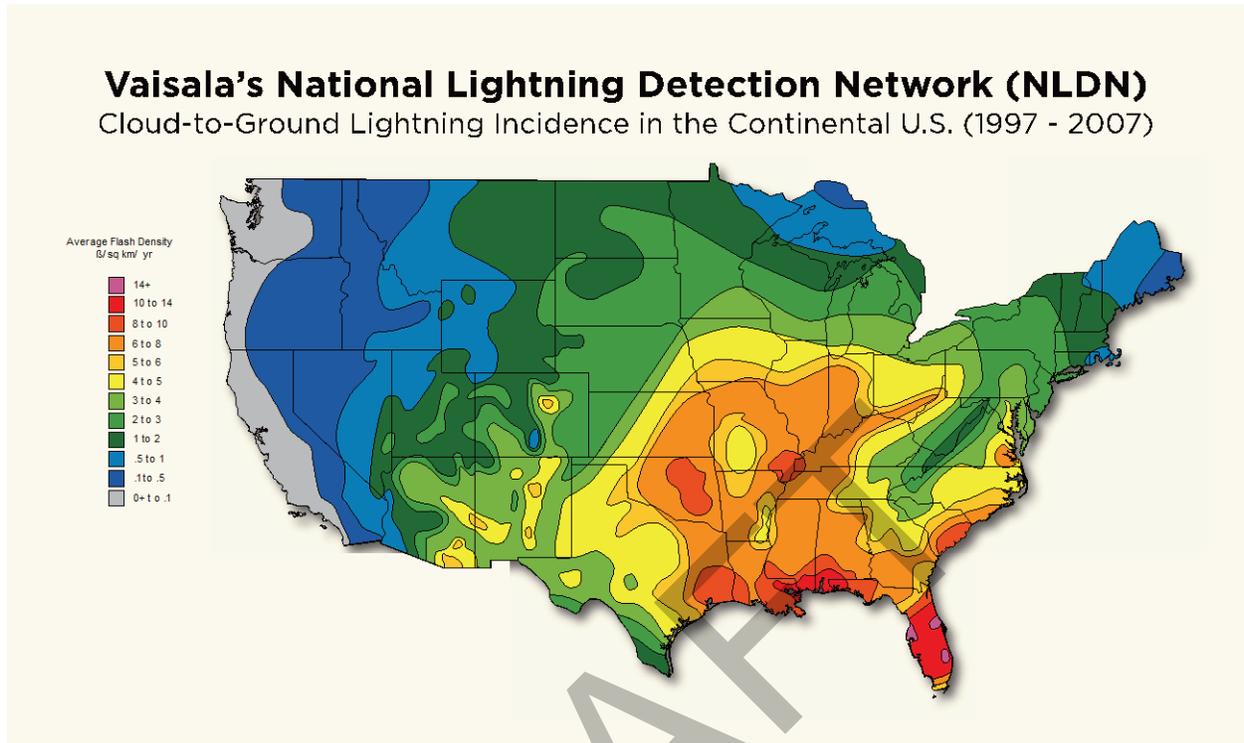
Location	Date	Time	Deaths	Injuries	Property Damage	Crop Damage
Superior	8/6/1996	11:30 PM	0	0	UNK	0
Superior	9/7/1999	5:00 PM	0	0	\$1,000	0
Superior	3/8/2000	9:50 AM	0	0	\$15,000	0
Superior	8/3/2005	4:00 PM	0	0	\$60,000	0
Wascott	5/3/2006	1:30 AM	0	0	0	0
Solon Springs	07/17/2011	4:50 PM	0	0	\$100,000	0

Source: National Climate Data Center

The National Climate Data Center records indicate 6 lightning events in Douglas County from 1996 through 2009. The August 6<sup>th</sup>, 1996, event included lightning striking a house on the east side of Amnicon Lake, starting a fire. On September 7<sup>th</sup>, 1999 lightning struck the steeple of a church, causing a small amount of damage. On March 8, 2000, lightning struck a home and started a fire on the second floor, causing \$15,000 in damage. On August 3<sup>rd</sup>, 2005 lightning struck a wood pile at Johnson Timber Corporation woodyard, causing the wood to catch fire. Four hundred cords of wood were destroyed. A May 3<sup>rd</sup>, 2006 lightning strike in the Town of Wascott caused a home to start on fire resulting in extensive smoke damage to the home. On July 17<sup>th</sup>, 2011 Lightning struck a home in Solon Springs, also causing a fire.



Figure 15: Average Annual Flash Density, United States



The lightning density graphic is available on the NOAA Lightning Safety web page. The graphic depicts the average annual flash density across the conterminous United States during the period 1997-2007. Douglas County averages about 40 thunderstorm days per year and about 1-2 lightning flashes per square kilometer per year. While the frequency of thunderstorms and lightning is moderate, the impact to both population and infrastructure is low.

**Economic Impact:** Based on historical data, Douglas County can expect to have one severe lightning event every three years. The average lightning event will result in approximately \$29,333 in damage.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### High Winds

**Risk:** Medium

**Magnitude:** Ranges from no damage to severe. Large-scale derecho winds can produce catastrophic damage.

**Duration:** Relatively short

**Distribution:** Affects all areas of County equally, usually occurs in localized instances.

**Area Affected:** All levels of society. More likely to cause property damage/loss of life in urbanized, populated areas. Significant impacts to infrastructure and transportation system.

**Frequency:** Between 1964 and 2014, there were 102 recorded thunderstorm wind events in Douglas County, with most occurring during the summer months.

**Probability:** At the mid-July peak point, there is roughly a 1.8% chance that a severe wind event could occur on this date.

**Table 32: Historical Wind Events in Douglas County**

Location	Date	Time	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Douglas County (26)	1964-1994	-	0-85	0	0	\$1,000	\$5,000
Superior	7/12/1995	5:55 AM	N/A	0	0	0	0
Brule	7/13/1995	6:50 AM	N/A	0	0	0	0
Superior	7/24/1995	4:00 PM	N/A	0	0	5K	0
Dairyland	9/30/1995	4:30 PM	N/A	0	0	0	0
Solon Springs	5/17/1996	11:15 PM	58	0	0	0	0
Lake Nebagamon	5/17/1996	11:20 PM	58	0	0	0	0
Superior	7/21/1996	8:40 PM	61	0	0	0	0
Lake Nebagamon	8/6/1996	11:30 PM	63	0	0	0	0
Maple	8/6/1996	11:30 PM	58	0	0	0	0
Gordon	8/13/1996	7:30 PM	58	0	0	0	0
Solon Springs	5/15/1998	6:10 PM	63	0	0	0	0
Bennett	5/15/1998	6:15 PM	75	0	0	0	0
Hawthorne	5/15/1998	6:15 PM	63	0	0	0	0
Maple	5/15/1998	6:25 PM	75	0	0	0	0
Poplar	6/1/1998	4:35 PM	70	0	0	0	0
Maple	6/1/1998	4:40 PM	63	0	0	0	0
Lake Nebagamon	6/6/1999	7:15 PM	58	0	0	0	0
Solon Springs	6/22/1999	5:33 PM	58	0	0	0	0



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Location	Date	Time	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Bennett	6/22/1999	5:38 PM	58	0	0	0	0
Superior	6/22/1999	5:45 PM	58	0	0	0	0
Solon Springs	6/22/1999	5:58 PM	58	0	0	0	0
Solon Springs	7/5/1999	3:15 PM	63	0	0	0	0
Gordon	7/5/1999	3:25 PM	58	0	0	0	0
Superior	7/23/1999	1:33 AM	60	0	0	0	0
Solon Springs	7/25/1999	6:50 PM	58	0	0	0	0
Wascott	7/30/1999	5:03 PM	58	0	0	0	0
Solon Springs	7/30/1999	5:58 PM	58	0	0	0	0
Solon Springs	8/8/2000	3:00 PM	58	0	0	0	0
Superior	8/14/2000	3:00 PM	58	0	0	0	0
Superior	8/14/2000	3:20 PM	58	0	0	0	0
Superior	8/8/2001	4:45 AM	58	0	0	0	0
Wascott	7/27/2002	2:40 PM	69	0	0	0	0
Superior	7/31/2002	8:38 AM	64	0	0	0	0
Superior	7/31/2002	9:00 AM	63	0	0	0	0
Blueberry	7/31/2002	9:03 AM	63	0	0	0	0
Superior	7/19/2003	8:20 PM	63	0	0	0	0
Superior	8/20/2003	8:10 PM	70	0	0	0	0
Superior	6/29/2005	10:30 PM	69	0	0	0	0
Wascott	6/29/2005	10:50 PM	69	0	0	0	0
Solon Springs	6/30/2005	12:00 AM	69	0	0	0	0
Superior	8/9/2005	6:15 AM	69	0	0	0	0
Solon Springs	8/9/2005	6:20 AM	69	0	0	0	0
Lake Nebagamon	7/28/2006	7:25 PM	58	0	0	0	0
Dairyland	7/28/2006	9:35 PM	63	0	0	0	0
Maple	7/29/2006	2:47 AM	58	0	0	0	0
Moose Jct	7/29/2006	3:40 AM	58	0	0	0	0
Dairyland	7/30/2006	3:20 AM	58	0	0	0	0
Superior	6/7/2007	5:45 PM	60	0	0	0	0
Bennett	5/16/2008	5:17 PM	59	0	0	0	0
Brule	7/25/2008	10:50 AM	70	0	0	0	0
Lake Nebagamon	6/24/2010	6:30 PM	58	0	0	\$ 2,000	0
Lake Nebagamon	6/24/2010	6:54 PM	58	0	0	\$ 500	0
Superior	6/24/2010	7:25 PM	58	0	0	\$ 3,000	0
Brule	6/24/2010	7:36 PM	58	0	0	\$ 500	0
Maple	7/27/2010	3:58 PM	58	0	0	\$ 1,500	0
Blueberry	7/27/2010	4:00 PM	58	0	0	\$ 1,500	0
Cozy Corners	7/1/2011	6:35 PM	81	0	0	0	0
Wascott	7/1/2011	6:50 PM	81	0	0	0	0



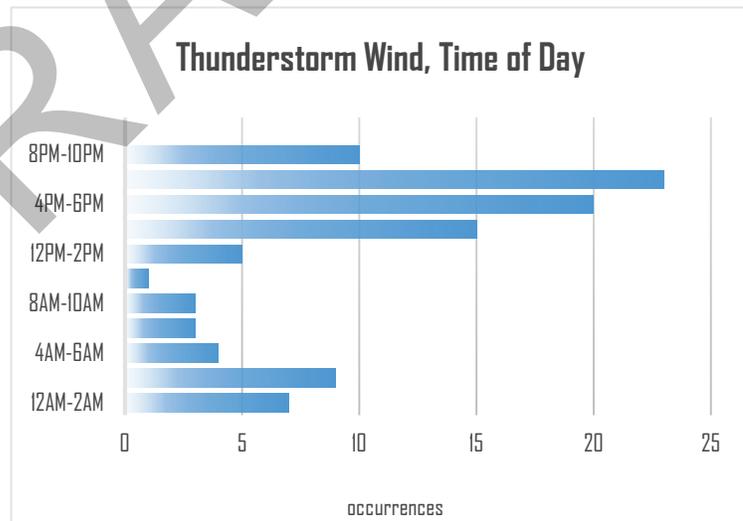
## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Location	Date	Time	Magnitude (MPH)	Deaths	Injuries	Property Damage	Crop Damage
Solon Springs	7/1/2011	6:55 PM	81	0	0	0	0
Lake Nebagamon Airport	7/1/2011	7:05 PM	81	0	0	0	0
Solon Springs	7/1/2011	7:10 PM	81	0	0	0	0
Moose Jct.	7/19/2011	3:52 PM	60	0	0	0	0
Gordon	7/19/2011	4:10 PM	60	0	0	0	0
Wascott	7/19/2011	4:15 PM	60	0	0	0	0
Solon Springs	7/30/2011	7:30 PM	60	0	0	0	0
Solon Springs	8/2/2011	2:00 AM	58	0	0	0	0
Solon Springs	8/2/2011	5:28 AM	58	0	0	0	0
Hawthorne	7/2/2012	8:30 PM	58	0	0	0	0
Brule	7/2/2012	8:40 PM	58	0	0	0	0
Gordon	8/26/2013	7:28 PM	60	0	0	0	0
Lake Nebagamon	8/26/2013	8:17 PM	60	0	0	0	0
East End	7/22/2014	12:21 AM	60	0	0	0	0
Poplar	7/22/2014	12:37 AM	70	0	0	0	0
Poplar	7/22/2014	12:38 AM	70	0	0	0	0

Source: National Climate Data Center

**Figure 16: Douglas County Wind Events by Time of Day**

Of the 102 recorded wind events in Douglas County, 25 occurred between the hours of 12:00 AM and 11:59 AM and 77 events occurred between 12:00 PM and 11:59 PM. Wind events were most likely to occur in the late afternoon or early evening hours, with most events (33) occurring between 4:00 PM and 7:00 PM.

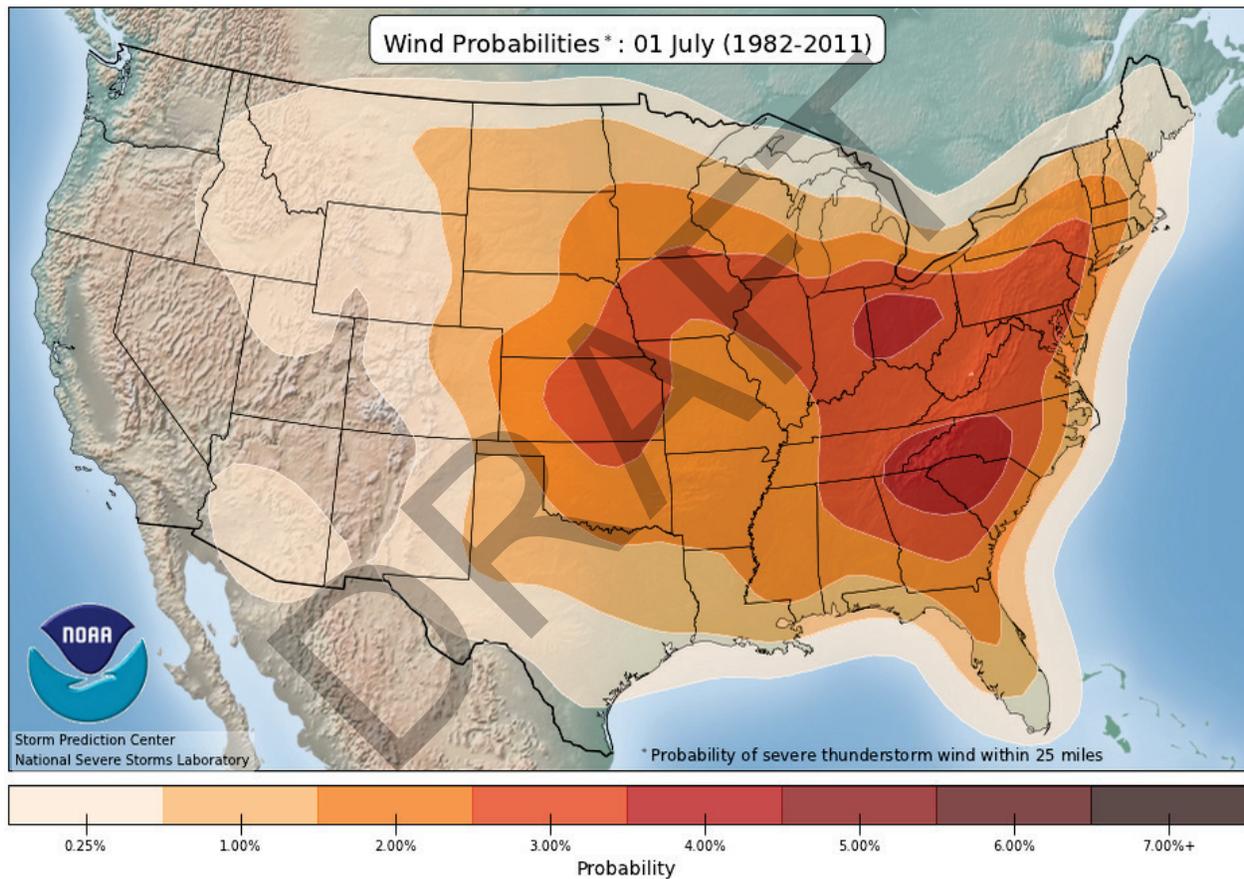




## DOUGLAS COUNTY HAZARD MITIGATION PLAN

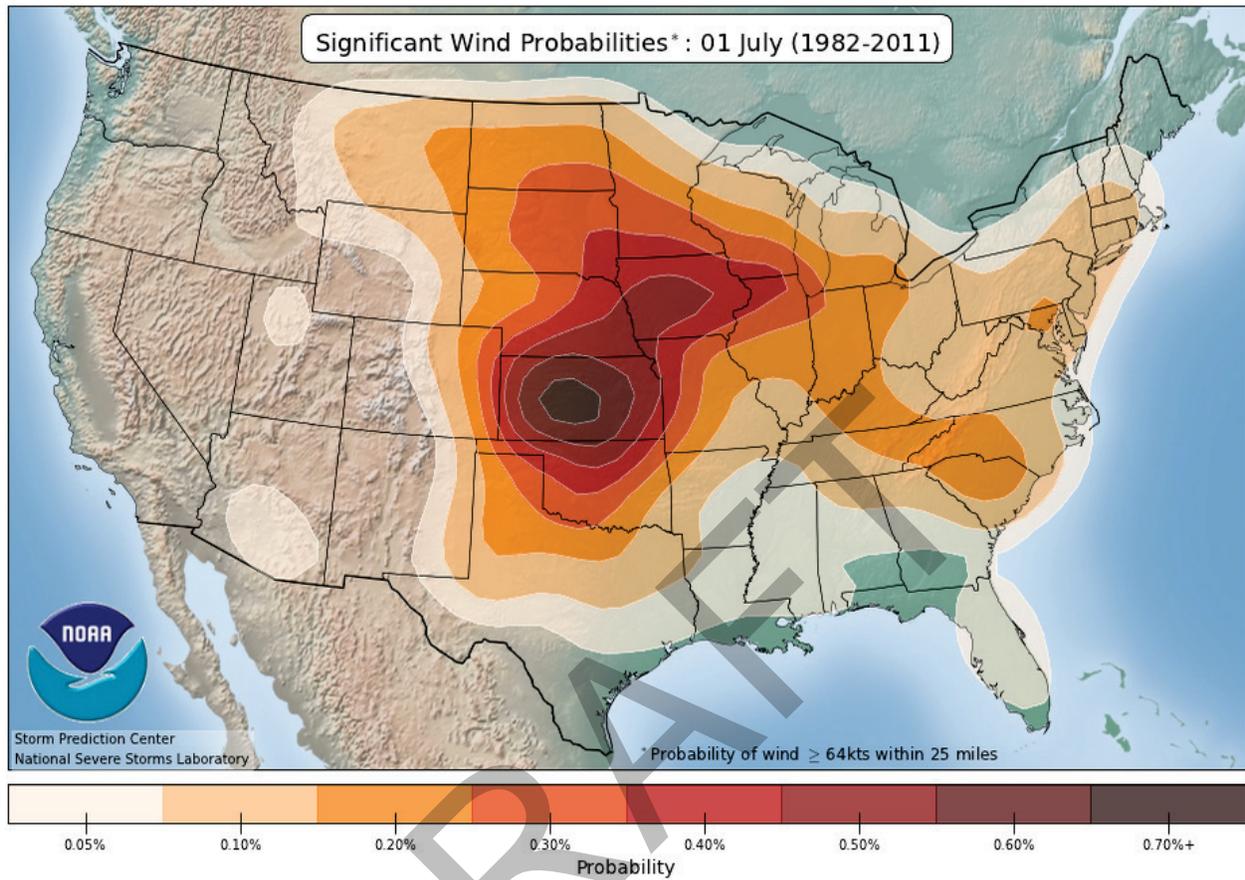
**Probability:** The National Severe Storms Laboratory estimates for peak probability of wind event (58 mph and greater) occurrences in Douglas County are depicted in Figure 17. Historically, these events have occurred from about the 85<sup>th</sup> day of the year through the 309<sup>th</sup> day of the year (late March – early November). Based on the 1964-2014 data, peak probability for wind events occurs in early July. As indicated in the graphic below, on July 1<sup>st</sup>, there is roughly a 1-2 percent chance that a severe thunderstorm wind event could occur, and about 0.10 percent probability that a significant thunderstorm wind event could occur within the county.

**Figure 17: Wind Probability, Thunderstorm Wind**





**Figure 18: Wind Probability, Significant Wind**



**Economic Impact:** Based on historic storm data (1996-2006), Douglas County will likely see 2 to 3 severe windstorm events during the course of any given year. The average severe windstorm in the County has wind speeds of approximately 63 miles per hour (54.4 kts). Based on historical losses, it is expected that the average loss per event will be between 0\$ and \$5,000. Average crop losses are also expected to be between 0\$ and \$5,000 per event.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Wildfire**

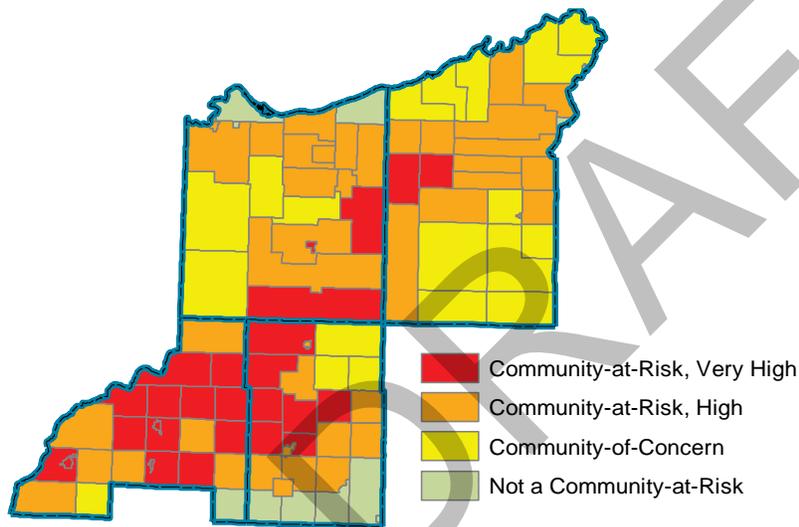
**Risk:** Medium

**Magnitude:** Wildfire impacts range from relatively minor to large scale, dependent on the size, intensity, and location of the impact area.

**Duration:** Wildfires can last from minutes to weeks, dependent on the size, intensity, weather conditions, location of the impact area, and the available fuel load.

**Distribution:** Affects all areas of County, although more risk within the heavily forested areas. Highest risk of occurrence is found within the sand barrens of southern Douglas County.

**Figure 19: Community Wildfire Risk**



Source: Wisconsin Department of Natural Resources

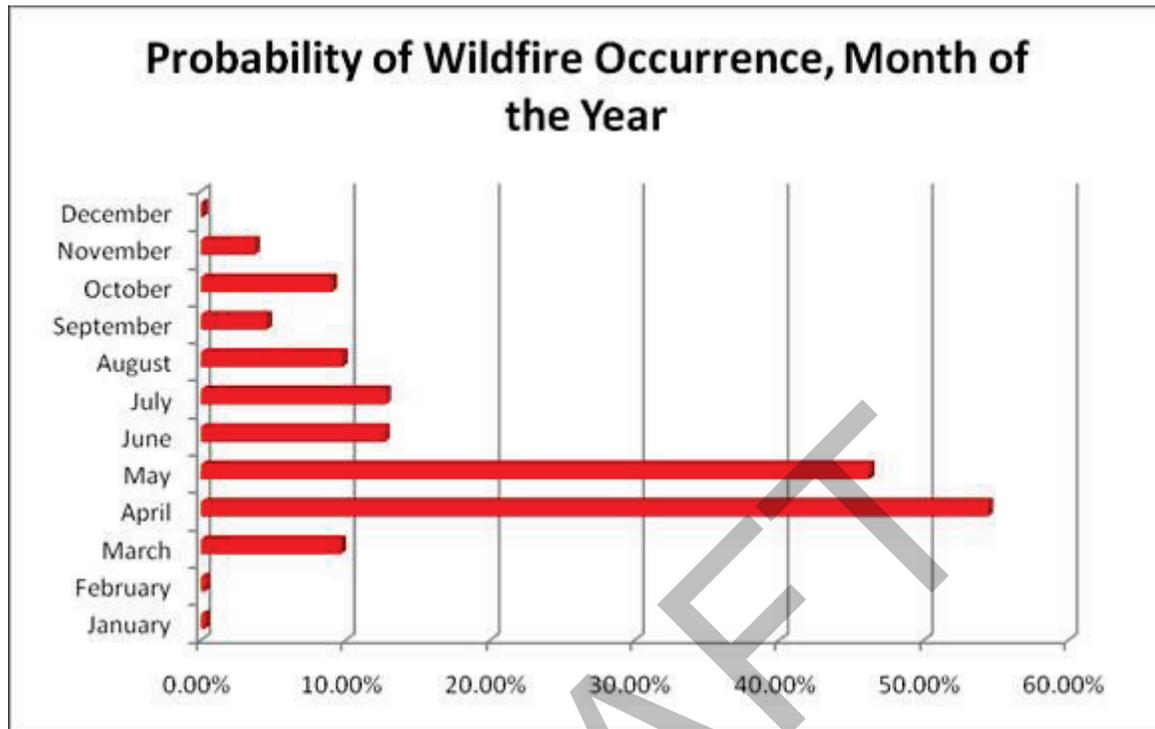
**Area Affected:** All levels of society.

**Frequency:** While the number of forest fires has decreased over the years, the potential danger to lives and property has not. Because of increased numbers of seasonal homes and recreational facilities in the County, the possibility of disastrous forest fires continues to climb. WDNR records show 6,336 wild land fires burning a total 19,645 acres within the Brule Dispatch Area between 1945 and 2009. The average length of fire season in the region is 219 days, with an average of 102 fires in any given fire season.

**Probability:** Wildfires typically occur on an annual basis in Douglas County. The highest probability of wildfire occurs during the months of April and May, with peak probability occurring on about April 19<sup>th</sup>.



Figure 20: Probability of Wildfire Occurrence



**Vulnerability:** Douglas County has a large investment in the timber industry and forest crops. The forest crops are subject to loss through forest fires. County residents are also at risk as forest fires pose potential hazards to people, homes, property and businesses.

The forest fire season in Douglas County begins in the spring, about mid-March, and continues through the end of the fall season. Seasonal and environmental factors contribute significantly to the chance of occurrence. Winter seasons with low snowfall amounts and summers with little rain produce very dry forest lands, increasing the likelihood and/or intensity of wildfire. Another factor contributing to frequency and intensity of wildfire is the available fuel load. Storms, disease and insect infestations can kill large stands of timber, which dry out and contribute to the fuel load.

Increased development in Douglas County in recent years has increased the potential impact of wildfires as structures that locate near vulnerable woodlands become vulnerable themselves. Because wind fuels wildfires, structures in close proximity to potential wildfire fuels are at risk of damage as wind direction and velocity change. With increased development of structures and increased human activity, the potential for fire has increased. More people residing in fire prone areas (particularly the sands area) present greater opportunities for fire to develop.

The Wisconsin DNR is responsible for forest fire protection on approximately 18 million acres of forest and wild land in Wisconsin. The U.S. Forest Service maintains forest fire



DOUGLAS COUNTY HAZARD MITIGATION PLAN

protection on two million acres of this land while local fire departments concentrate efforts on structures in cooperation with the forest fire containment effort.

**Table 33: Fire Season History, Brule Area Dispatch<sup>8</sup>**

Year	First Fire	Last Fire	#Fires	Acres	Length of Fire Season (Days)
1948	11-Apr	Oct. 23	191	1,698	196
1949	9-Apr	7-Nov	59	588	213
1950	11-May	30-Oct	55	33	173
1951	16-Apr	25-Jul	49	600	101
1952	15-Apr	23-Nov	97	344	223
1953	13-Apr	17-Nov	76	538	219
1954	12-Apr	18-Nov	47	194	221
1955	10-Apr	19-Oct	43	195	193
1956	20-Apr	10-Nov	43	68	205
1957	22-Apr	28-Oct	59	131	190
1958	4-Apr	19-Oct	65	210	199
1959	20-Mar	3-Nov	92	1,775	229
1960	8-Apr	27-Nov	89	1,045	203
1961	Jan 17	18-Nov	200	492	261
1962	5-Apr	28-Nov	70	931	238
1963	30-Mar	3-Nov	131	415	219
1964	16-Mar	18-Nov	59	64	248
1965	27-Apr	5-Nov	33	646	193
1966	12-Apr	29-Oct	64	263	201
1967	31-Mar	19-Dec	142	469	265
1968	11-Mar	29-Aug	94	185	172
1969	12-Apr	3-Dec	121	73	236
1970	9-Apr	2-Oct	128	108	177
1971	12-Apr	27-Aug	68	234	138
1972	19-Apr	25-Nov	108	56	221
1973	22-Mar	21-Oct	168	395	214
1974	15-Apr	8-Nov	155	421	208
1975	16-Apr	6-Nov	101	423	205
1976	1-Apr	21-Nov	307	226	235
1977	(Feb 16) March 24	16-Nov	140	558	239
1978	8-Apr	9-Nov	98	174	216
1979	6-Apr	7-Oct	68	37	185
1980	4-Apr	4-Nov	157	259	215
1981	Jan 30-31 March	21-Nov	133	101	254
1982	1-Apr	26-Oct	87	320	209
1983	Mar-84	5-Nov	98	84	226
1984	27-Mar	17-Aug	91	54	144
1985	25-Mar	14-Nov	63	70	234
1986	1-Apr	8-Nov	40	82	222
1987	11-Mar	16-Nov	177	268	251
1988	6-Apr	13-Oct	220	307	191
1989	8-Apr	11-Nov	146	358	218

<sup>8</sup> Includes Douglas, Bayfield, Ashland and Iron Counties



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

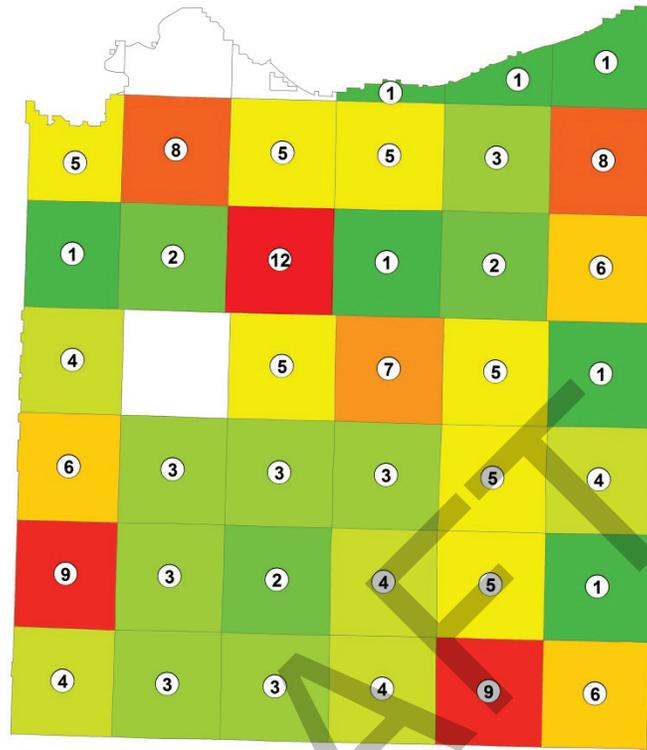
Year	First Fire	Last Fire	#Fires	Acres	Length of Fire Season (Days)
1990	4-Mar	17-Nov	129	91	259
1991	16-Mar	20-Oct	82	78	219
1992	30-Mar	30-Sep	62	99	185
1993	24-Mar	21-Nov	85	234	243
1994	5-Mar	23-Nov	130	357	264
1995	31-Mar	8-Nov	96	106	223
1996	21-Apr	14-Oct	87	128	177
1997	4-Apr	22-Oct	132	145	202
1998	11-Mar	12-Dec	151	606	277
1999	2-Mar	8-Dec	58	62	281
2000	28-Feb	4-Nov	121	336	251
2001	13-Apr	5-Nov	51	100	207
2002	7-Apr	29-Nov	49	63	214
2003	21-Jan	8-Dec	126	406	322
2004	3-Apr	14-Nov	92	67	226
2005	3-Apr	9-Nov	71	26	221
2006	8-Apr	21-Nov	108	72	227
2007	2-Feb	2-Nov	120	1,025	284
2008	8-Apr	31-Oct	45	50	207
2009	18-Mar	12-Nov	109	122	286
<b>Totals</b>			<b>6336</b>	<b>19,645</b>	<b>13575</b>
<b>Average</b>			<b>102</b>	<b>317</b>	<b>219</b>

DRAFT



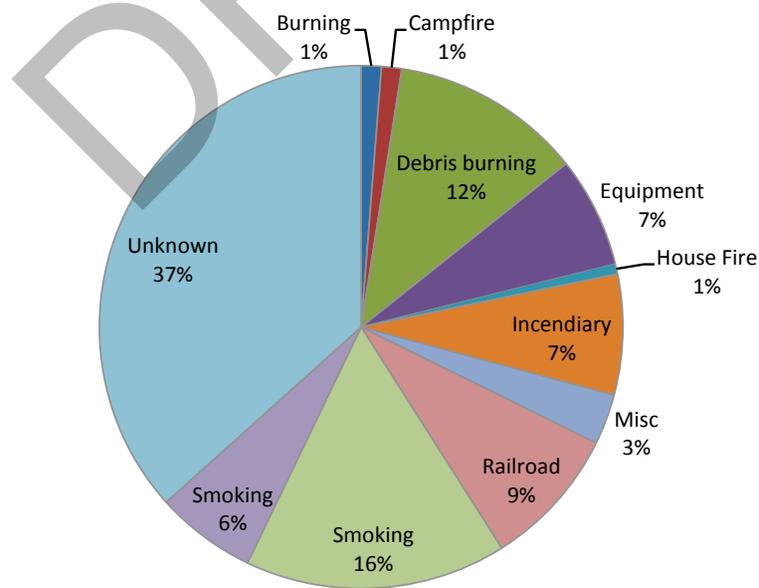
DOUGLAS COUNTY HAZARD MITIGATION PLAN

Figure 21: Wildfire Occurrences by Congressional Townships, 1928-2009



Data Source: Wisconsin Department of Natural Resources

Figure 22: Wildfire Causes, 1928-2009

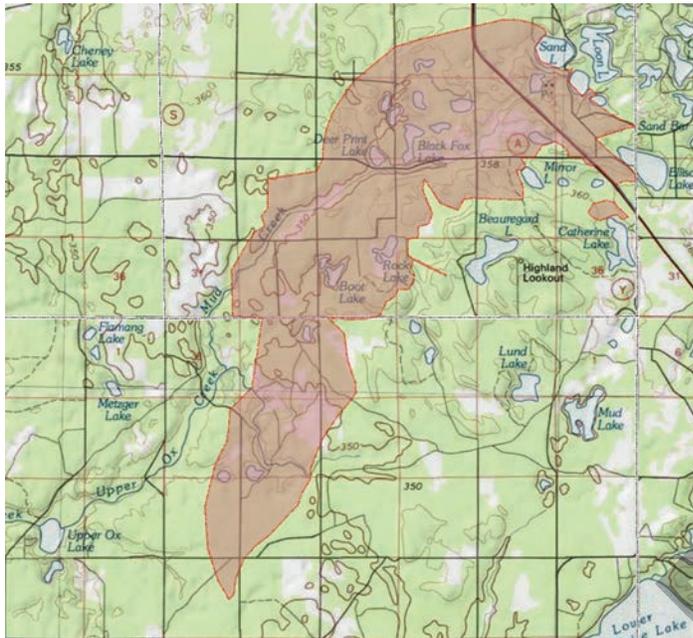


Data Source: Wisconsin Department of Natural Resources



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Figure 23: Germann Road Fire**



During 2002, rural Douglas County experienced 23 wildland fires totaling 11.53 acres. None of the reported fires caused any significant damage and consumed mostly grassland. The City of Superior had numerous grass fires during 2002; one causing the death of a resident from burns and smoke inhalation.

Easter Sunday 1998 brought winds to Douglas County that caused numerous wild land fires from downed power lines. At one time, 15 of the County's 18 volunteer fire departments, as well as all available resources from the D.N.R. were committed fighting wild land fires. In

June 1993, a large resort burned in rural Douglas County. It was in the Wascott lakes area. Five rural fire departments along with the Wisconsin DNR were involved via mutual agreements for fire suppression.

On May 14<sup>th</sup>, 2013, the largest wildfire in Wisconsin in over 30 years consumed nearly 7,500 acres in southern Douglas County. The Germann Road Fire burned over the course of two days, and caused extensive loss and damage to natural resources and structures. Over 100 buildings were destroyed in the fire, including 22 primary residences. Another 350 structures were threatened, but either survived the fire or were directly saved by firefighter assistance. The Germann Road Fire resulted in an estimated \$2,239,900<sup>9</sup> in direct structural losses, \$602,766 in fire suppression costs and timber-related losses in the hundreds of thousands of dollars.

Douglas County has a well-balanced forest protection organization. This includes a public information program which is operated on a year round basis that reaches all sectors of the public. While wildfire can occur virtually anywhere within the County, the Northwest Sands area of southeastern portion of the County is likely to have the greatest regional vulnerability. Fire has been a significant part of the historical natural disturbance regime within this landscape. Housing density within this area is generally low, although pockets of higher density shoreland development are found within the area. As rural development increases within the sands area, and throughout Douglas County, increased vulnerability to wildfire will be likely. Increased development will result in elevated exposure value, and further increased risk of human induced wildfire.

<sup>9</sup> Assessed value of structures lost in Germann Road Fire, Douglas County Tax Roll



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Year 2009 assessment data from the Wisconsin Department of Revenue was used to determine the total value of land, improvements and personal property which is potentially at-risk due to wildfires. The majority of wildland fires are extinguished in their initial stages, with little or no impact to homes and personal property. This analysis assumes that all affected properties are completely destroyed, which is often the case in wildland-urban interface fires. It is not likely that a wildfire would consume all of these structures in one occurrence, so this representation should be considered a worst-case scenario.

**Table 34: Total Value At-Risk, Wildfire Hazard (Based on Statewide Risk Assessment)**

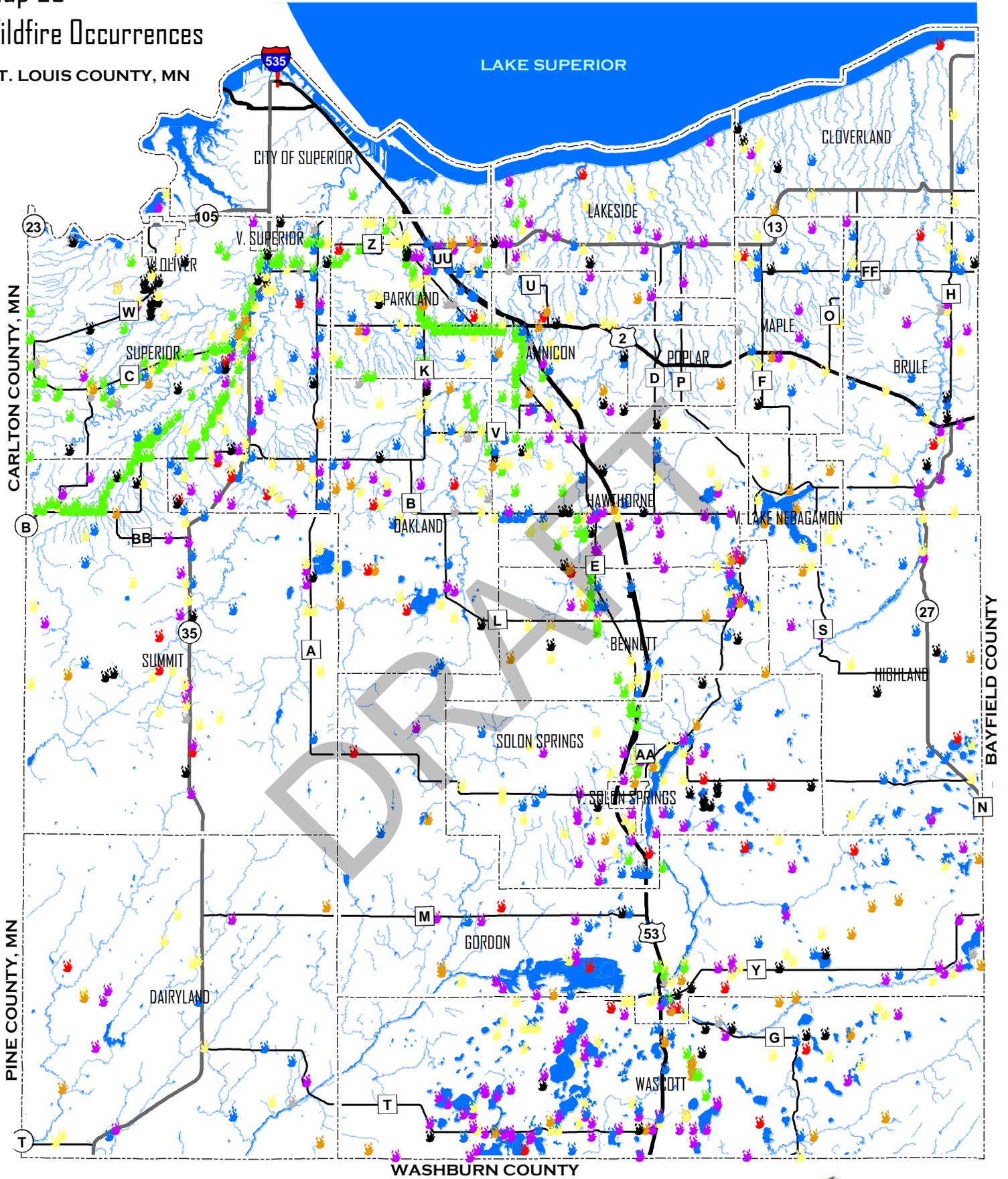
<b>Lowest Risk</b>
Total Assessed Improvement Value \$ 27,664,200
<b>Low-Moderate Risk</b>
Total Assessed Improvement Value \$ 328,218,700
<b>Moderate Risk</b>
Total Assessed Improvement Value \$ 267,008,700
<b>Highest Risk</b>
Total Assessed Improvement Value \$ 204,758,800

**Table 35: Total Value At-Risk by Municipality, Wildfire Hazard (Based on Statewide Risk Assessment)**

TOWN	LOW	LOW-MOD	MOD	HIGH
Amnicon	\$3,847,400	\$35,060,600	\$12,974,900	\$76,900
Bennett	\$1,157,200	\$9,801,300	\$23,996,100	\$-
Brule	\$3,247,600	\$10,934,400	\$15,384,700	\$835,900
Cloverland	\$1,709,000	\$7,924,000	\$2,132,200	\$-
Dairyland	\$314,400	\$5,624,500	\$7,223,800	\$170,600
Gordon	\$101,000	\$4,582,000	\$11,256,700	\$40,635,100
Hawthorne	\$1,025,500	\$20,608,900	\$25,060,200	\$474,600
Highland	\$38,200	\$2,464,900	\$13,345,200	\$13,124,000
Lakeside	\$2,326,100	\$24,598,400	\$7,856,600	\$-
Maple	\$2,351,400	\$14,558,300	\$9,524,500	\$1,056,600
Oakland	\$2,247,900	\$32,488,200	\$23,380,900	\$24,300
Parkland	\$4,410,800	\$39,448,300	\$12,247,900	\$-
Solon Springs	\$612,200	\$8,865,700	\$28,222,700	\$37,386,200
Summit	\$2,551,500	\$26,453,200	\$27,555,000	\$-
Superior	\$6,521,700	\$81,332,300	\$30,196,600	\$-
Wascott	\$1,248,900	\$3,260,400	\$16,177,300	\$110,974,600

# Map 29 Wildfire Occurrences

ST. LOUIS COUNTY, MN



- |                 |                |               |
|-----------------|----------------|---------------|
| <b>HIGHWAYS</b> | CAMPFIRE       | LIGHTNING     |
| COUNTY          | DEBRIS BURNING | MISCELLANEOUS |
| INTERSTATE      | EQUIPMENT USE  | RAILROAD      |
| STATE           | INCENDIARY     | SMOKING       |
| US              |                |               |

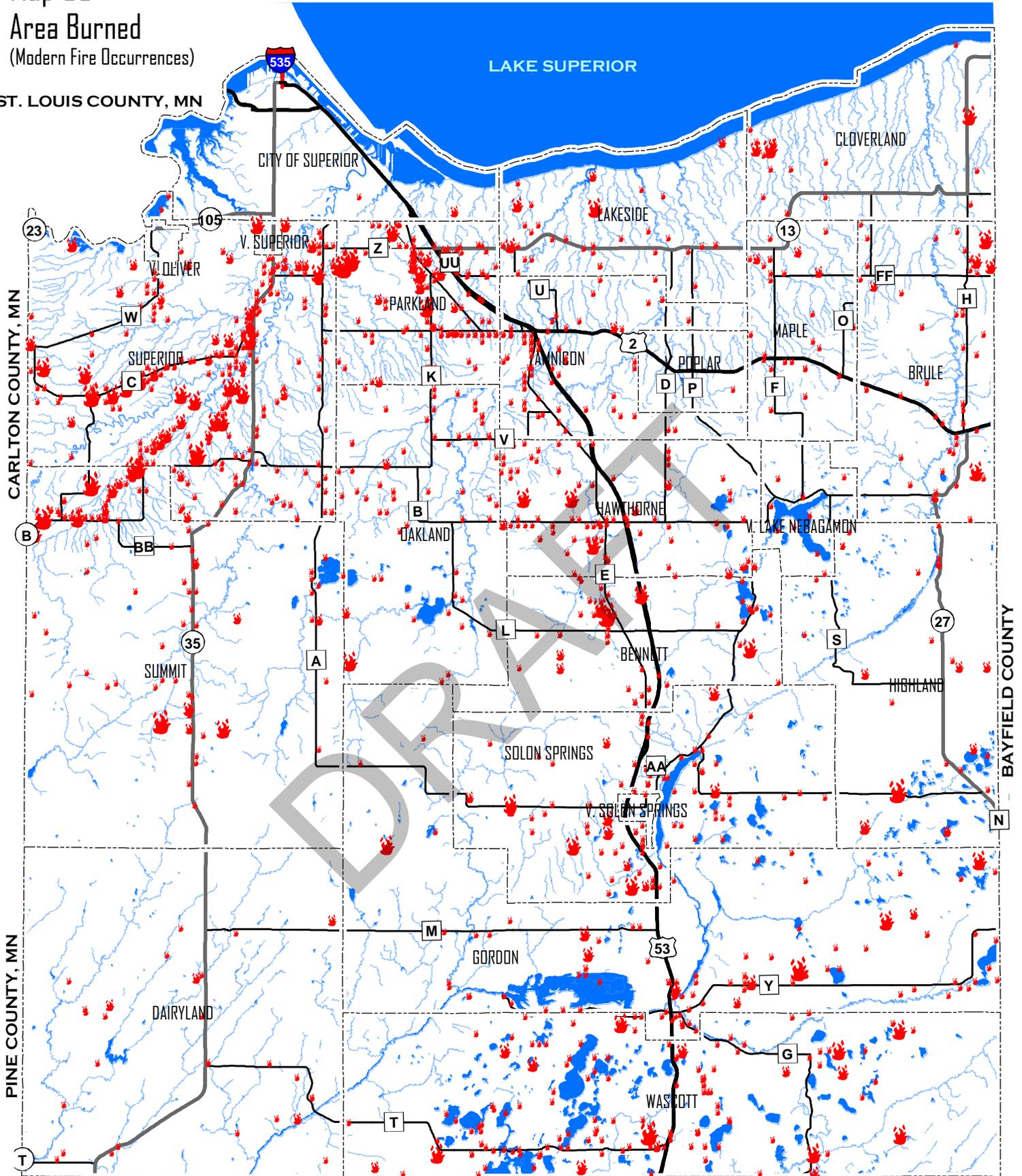


# Map 30

## Area Burned

(Modern Fire Occurrences)

ST. LOUIS COUNTY, MN



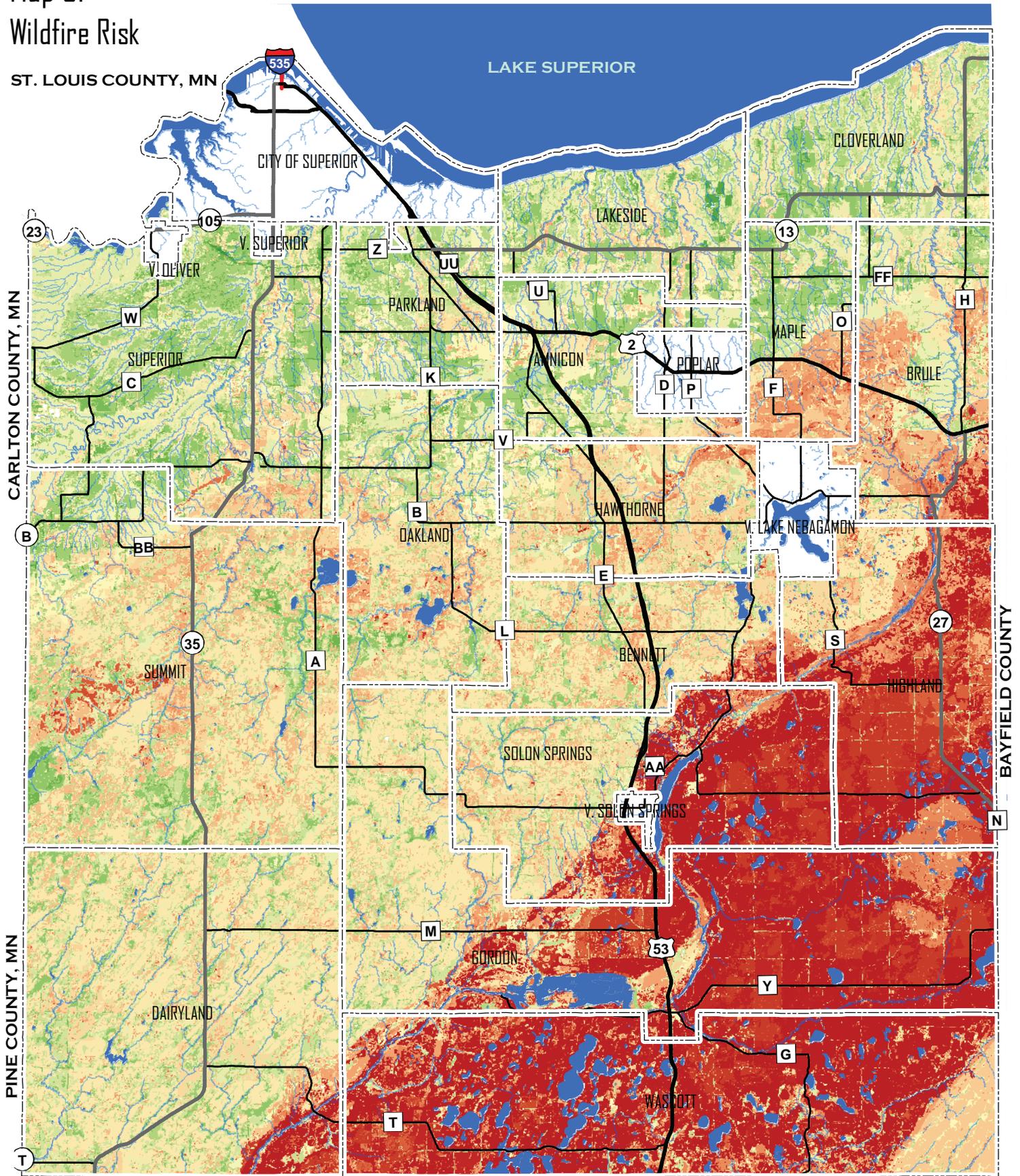
WASHBURN COUNTY

<b>HIGHWAYS</b>	<b>AREA BURNED</b>		5.1 - 10.0 ACRES	
		0.0 - 2.0 ACRES		10.1 - 50.0 ACRES
		2.1 - 5.0 ACRES		50+ ACRES
				
				
				



# Map 31 Wildfire Risk

ST. LOUIS COUNTY, MN



**HIGHWAYS**

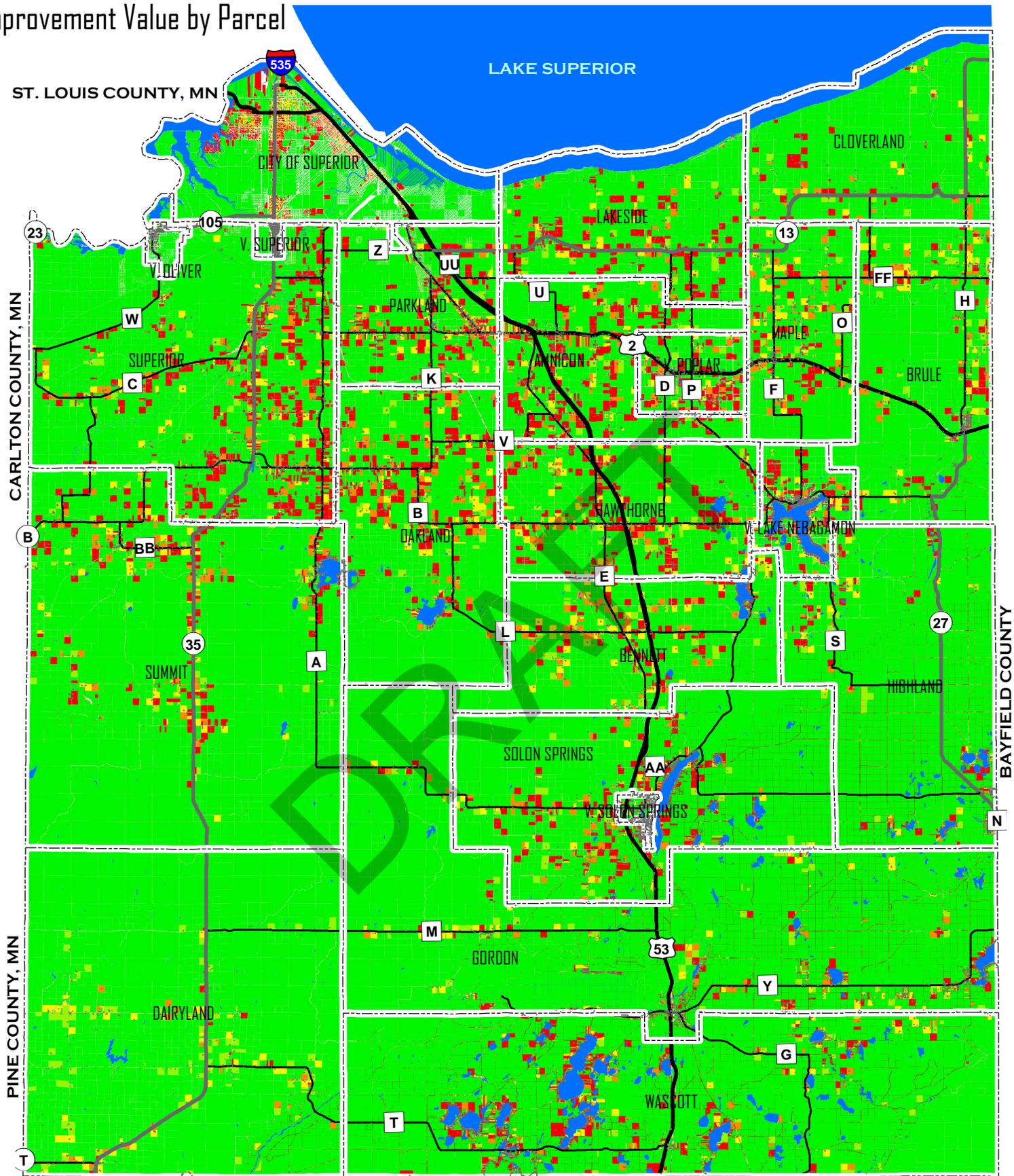
- COUNTY
- INTERSTATE
- STATE
- US

**WILDFIRE RISK**

- HIGHEST
- MODERATE
- LOWEST



# Improvement Value by Parcel



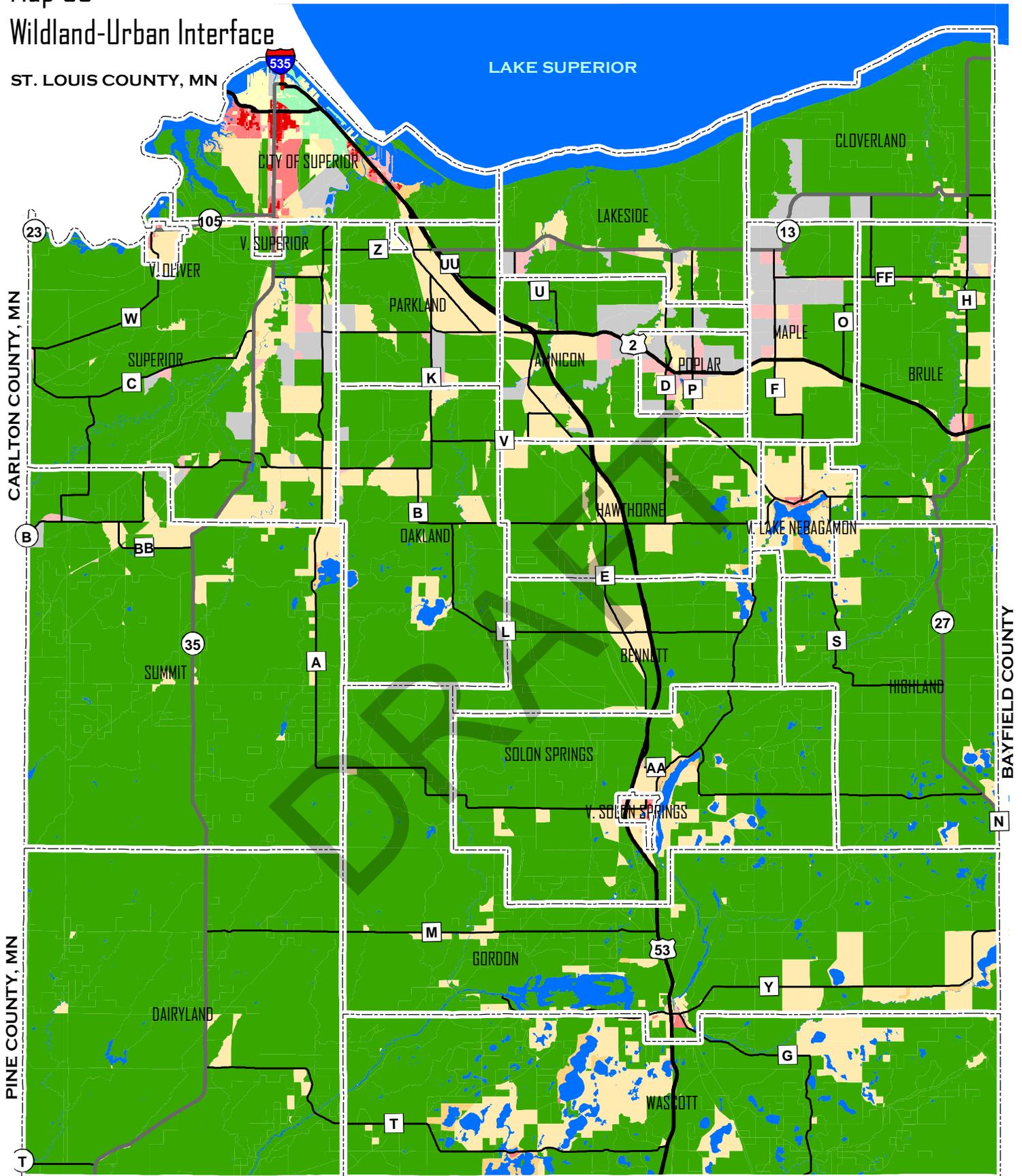
- ◆ Lowest Assessed Value
- ◆
- ◆
- ◆
- ◆ Highest Assessed Value



# Map 33

## Wildland-Urban Interface

ST. LOUIS COUNTY, MN



### WASHBURN COUNTY

- |                 |                          |                             |                                  |
|-----------------|--------------------------|-----------------------------|----------------------------------|
| <b>HIGHWAYS</b> | HIGH DENSITY INTERFACE   | MEDIUM DENSITY INTERMIX     | UNINHABITED - VEGETATED          |
| COUNTY          | MEDIUM DENSITY INTERFACE | LOW DENSITY INTERMIX        | VERY LOW DENSITY - NO VEGETATION |
| INTERSTATE      | LOW DENSITY INTERFACE    | NO VEGETATION               | VERY LOW DENSITY - VEGETATED     |
| STATE           | HIGH DENSITY INTERMIX    | UNINHABITED - NO VEGETATION | WATER                            |
| US              |                          |                             |                                  |





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Droughts**

**Risk:** Medium

**Magnitude:** Drought impacts are generally severe, especially with respect to agricultural crops. Droughts can be minor, creating a nuisance for residents and concern for farmers- or major, creating water shortages, health concerns and economic loss.

**Duration:** Drought conditions generally last for extended periods of time. Hot and dry weather can last up to several weeks or even years.

**Distribution:** Affects all areas of County.

**Area Affected:** Primarily agriculture; may also impact businesses and people.

**Frequency:** The drought frequency for the State of Wisconsin is about every 10 to 12 years. Drought is a relatively common phenomenon in Wisconsin and has occurred statewide in 1895, 1910, 1939, 1948, 1958, and 1976. Douglas County suffered a severe crop yield decline in the 1976 drought.

**Probability:** Based on historic occurrence rates, Douglas County can expect an annual probability of 16.5 % for a moderate drought (PDSI -2.0 - -2.9), 10.4% for a severe drought (PDSI -3.0 - -3.9) and 13.0% for extreme drought (PDSI -4.0 or less).

### **Vulnerability:**

**Table 36: Recent Douglas County Drought Occurrences**

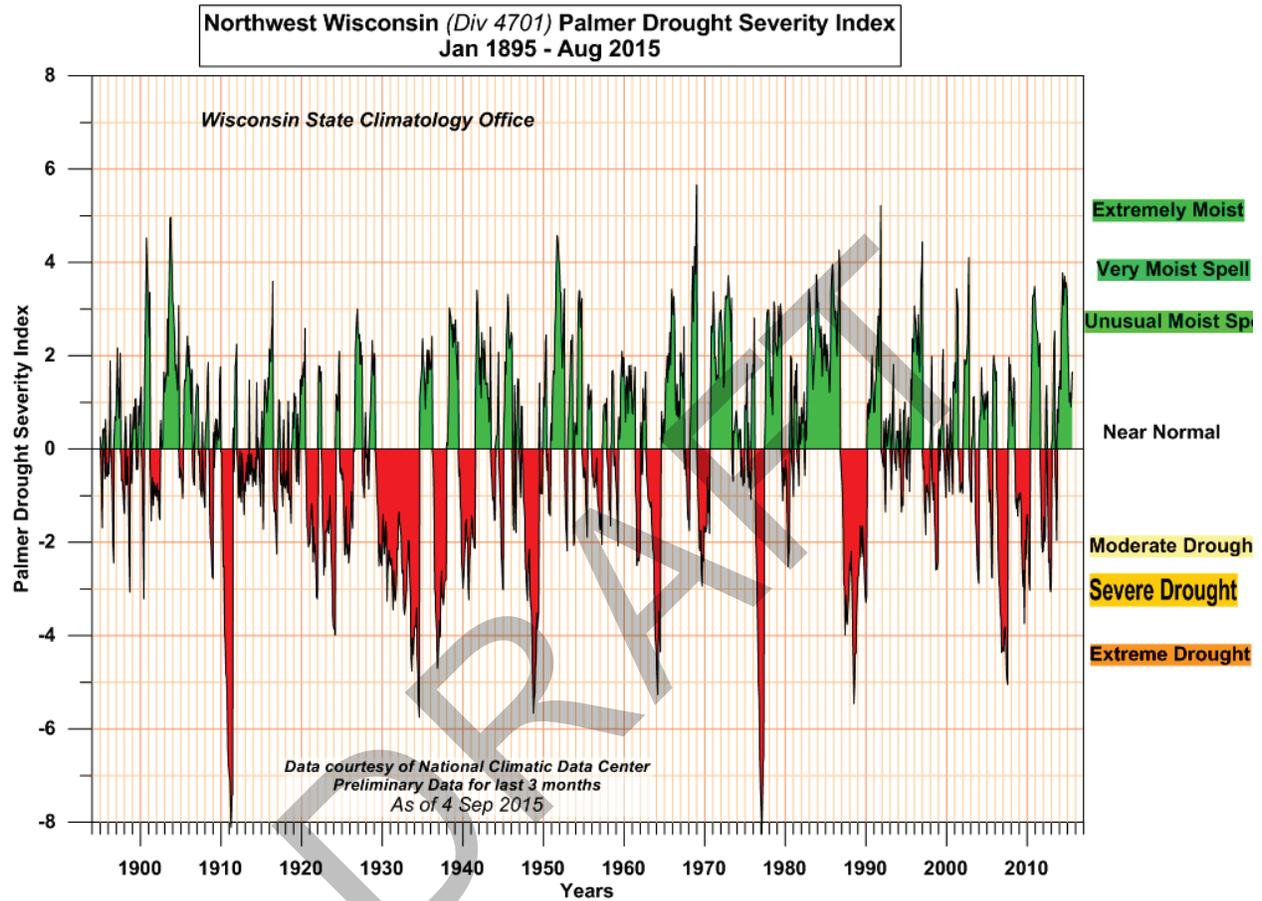
1987-88	Drought conditions impact the southern part of the County
2001	During the fall and winter of 2001/2002 the northern portion of Douglas County has experienced lower than normal precipitation. This has resulted in little or no snow cover and a great reduction in tourism for snow related industries.
2002	Lower than normal precipitation again. Expect it to have a strong impact on spring fire season.
2006-07 (July 2006 - October 2007)	Parts of northwestern Wisconsin enter a severe drought (D2). Drought conditions in northern Douglas County reach extreme (D3) levels by 2007.
2009 (July-October)	Continuing dry conditions and lack of appreciable rainfall led to an expansion of the severe (D2) drought conditions to almost all of northwest Wisconsin during the month of July. The extreme western sections of Douglas and Burnett counties were in the moderate (D1) drought category.
2010 (April-May)	Precipitation was some 25 to 50 percent of normal for the month of April, allowing for severe (D2) drought conditions to expand across northwest Wisconsin.
2012 (November 2012-April 2013)	Severe drought conditions (D2) persisting over the western Douglas County



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

There is very little data available to determine potential dollar losses from drought in Douglas County. However, due to the limited agricultural land base, it can be assumed that losses would generally be low.

**Figure 24: Historical Palmer Drought Severity Index, Wisconsin Climate Division 1 (NW Wisconsin)**



Source: Wisconsin State Climatology Office

**Table 37: Palmer Classifications**

4.0 or more	extremely wet	-3.0 to -3.99	severe drought
3.0 to 3.99	very wet	-4.0 or less	extreme drought
2.0 to 2.99	moderately wet		
1.0 to 1.99	slightly wet		
0.5 to 0.99	incipient wet spell		
0.49 to -0.49	near normal		
-0.5 to -0.99	incipient dry spell		
-1.0 to -1.99	mild drought		
-2.0 to -2.99	moderate drought		



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Federal USDA disaster declarations are considered when crop losses are 30 percent or greater on a County -by-County basis at the time of harvest. A USDA disaster declaration triggers emergency loans to eligible producers in the disaster areas. The drought event of 1976-77 resulted in a presidential emergency declaration issued for Douglas, and several other Wisconsin counties. Based on the 30 percent threshold, a drought of this magnitude would likely result in annual crop losses exceeding \$350,000.

### **Winter Weather Events**

**Risk:** High

**Magnitude:** Snowstorms can be sizable, generating high winds and deep snows historically up to 28 inches (highest in the lake effect snow belt). Ice, even in small quantities, can blanket the area. Deep freezes can occur.

**Duration:** Snow events may last a day or two, with prolonged recovery times. Ice storms have caused problems for more than one week. Deep cold snaps can last up to several weeks.

**Distribution:** Affects all areas of County.

**Area Affected:** Persons outdoors, motorists, the young and elderly- schools, daycare, - virtually all businesses, residences, and citizens are affected.

**Frequency:** Yearly snowfall totals average: 77.5". Frequency of storms producing six or more inches or about 1-3 per year (highly dependent on location). Recorded Ice Storms: 1999, 2001, 2002, 2003 and 2004.

**Probability:** Snowstorms are nearly a 100% probability every year. There is a 17.6 % probability of an ice storm in any given year. The probability of below freezing temperatures in any given year is nearly 100%. Below 0° days are a near certainty as well, especially in Jan/Feb.

**Vulnerability:** Snowfall in Wisconsin varies between 30 inches in southern counties to 100 in the north. Storm tracks, which originate in the southern Rockies or Plains states and move northeastward, produce the heaviest precipitation (typically 6 to 12 inches). Meanwhile low-pressure systems originating in the northwest (Alberta) tend to produce only light snowfalls (generally two to four inches). Those snowfalls associated with the Alberta lows occur more frequently with colder weather. Although massive blizzards are rare in Wisconsin, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause blowing and drifting of snow. A storm is not considered a blizzard unless heavy storms are accompanied by sustained wind speeds in excess of 35 miles per hour. Near blizzard conditions existed in Wisconsin in January 1979 when record snowfalls were recorded in many areas and wind speeds were over 30 miles per hour.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Both ice and sleet storms can occur at any time throughout the winter season from November to April. Ice storms of disastrous proportions occurred in central Wisconsin in February 1922 and in southern Wisconsin in March 1976. A Presidential Disaster Declaration was obtained as a result of the 1976 storm.

In October of 1991, heavy snow caused the County and City of Superior to wait out two days of wind driven snow. Many schools and businesses were closed and resources were taxed for round the clock usage. Utility crews from surrounding states were called in to restore power, which was off up to ten days in some areas. Other storms of lesser magnitude have caused power outages and treacherous highways. November 1994 closed most schools; colleges and University of Wisconsin; city and County crews were taxed to the limit. Schools and business closings are common a couple of time each year due to winter weather conditions. On February 24, 2001 approximately 20 inches of snow fell in Douglas County. This storm was predicted well in advance and no major disruptions resulted from it.

A late winter storm in March of 2002 caused numerous traffic accidents and left several motorists stranded on rural roads. No serious injuries or major property damage were reported.

March 12th-14th, 2006 saw a strong storm that produced snowfall amounts ranging from 10 to 32 inches over most of northwestern Wisconsin. Schools were closed in many northwest Wisconsin communities on the 13th and 14th. Locals say it was the worst storm in 20 years.

A low pressure system brought periods of snow to much of northwest Wisconsin beginning midday March 3<sup>rd</sup>, 2008 and continuing into the morning of April 1<sup>st</sup>, 2008. Snowfall totals generally ranged from 6 to 8 inches. Locally higher amounts, of 8 to 12 inches, fell near Lake Superior.

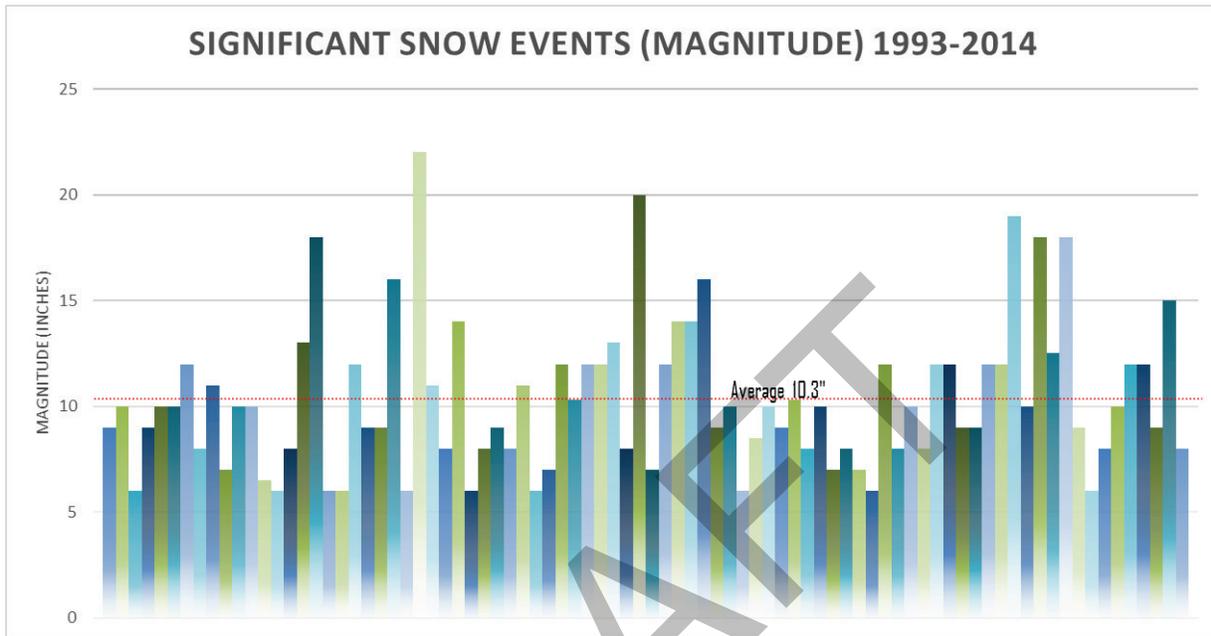
The winter of 2013-2014 was exceptionally harsh across much of the United States. Douglas County experienced 7 major snow events during this prolonged winter season which extended well into the month of April. The winter of 2013-2014 also saw extreme cold, as the "polar vortex" repeatedly brought pools of cold air from the arctic to the region.



**Snow Events**

87 heavy snow events were recorded between 1/23/1993 and 1/16/2014.

**Figure 25: Historical Heavy Snow Events**



Historical snowstorms ranged in both intensity and duration. The minimal snowfalls were in the range of 6 inches, while maximum snowfalls ranged in the mid and upper 20-inch range. Heavier snowfalls were noted within the Lake Superior snowbelt region, and most of the major events during the period of record were influenced by lake enhancement. The average snowfall of a heavy snow event was 10.3 inches.

It appears that the areas of the County bordering Lake Superior are more vulnerable to significant winter storm events. Heavy snows, enhanced by the "lake effect", combined with winds blowing across the lake can create "white out" conditions. As indicated in table 38, the Brule and Superior recording stations (both within the snowbelt) generally had the highest snowfall totals (1, 2 and 3 day records) for the period.



DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Table 38: Record 1-Day, 2-Day, and 3-Day Snowfall for December-March for stations in Douglas County**

<b>December</b>			
<b>STATION NAME</b>	<b>1-Day Snowfall</b>	<b>2-Day Snowfall</b>	<b>3-Day Snowfall</b>
BRULE R S	21.0	21.5	27.5
GORDON	12.0	15.0	15.0
SOLON SPRINGS	13.0	15.0	17.0
SUPERIOR	13.5	17.0	17.0
<b>January</b>			
<b>STATION NAME</b>	<b>1-Day Snowfall</b>	<b>2-Day Snowfall</b>	<b>3-Day Snowfall</b>
BRULE R S	18.0	19.0	21.0
GORDON	12.0	14.0	15.0
SOLON SPRINGS	15.0	15.0	15.0
SUPERIOR	14.0	18.0	19.0
<b>February</b>			
<b>STATION NAME</b>	<b>1-Day Snowfall</b>	<b>2-Day Snowfall</b>	<b>3-Day Snowfall</b>
BRULE R S	14.0	14.0	15.0
GORDON	10.0	10.4	10.4
SOLON SPRINGS	12.0	12.5	14.0
SUPERIOR	12.5	15.0	15.0
<b>March</b>			
<b>STATION NAME</b>	<b>1-Day Snowfall</b>	<b>2-Day Snowfall</b>	<b>3-Day Snowfall</b>
BRULE R S	14.0	24.0	27.0
GORDON	14.0	18.0	18.0
SOLON SPRINGS	10.3	15.5	15.6
SUPERIOR	10.0	17.0	17.0

**Table 39** reflects earliest, latest and median dates for the first 0.1” of snowfall for the season.

**Table 39: Earliest, Latest, and Median Dates of the First 0.1” Snowfall. (Superior Station)**

<b>Month/Season</b>	<b>Earliest</b>	<b>Latest</b>	<b>Median</b>
JANUARY	1/01	1/21	1/05
FEBRUARY	2/01	2/24	2/07
MARCH	3/01	3/21	3/04
APRIL	4/01	4/28	4/06
MAY	5/02	5/10	5/05
OCTOBER	10/16	10/30	10/25
NOVEMBER	11/01	11/29	11/15
DECEMBER	12/01	12/30	12/06
WINTER	12/01	2/12	12/08
SPRING	3/01	4/10	3/04
AUTUMN	10/16	11/29	11/13
ANNUAL	1/01	11/13	1/06



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Table 40: Probability of Receiving Measurable Snowfall. (Superior Station)**

Month/Season	Probability
JANUARY	100.0%
FEBRUARY	97.9%
MARCH	95.8%
APRIL	65.2%
MAY	10.0%
JUNE	0.0%
JULY	0.0%
AUGUST	0.0%
SEPTEMBER	0.0%
OCTOBER	8.5%
NOVEMBER	90.2%
DECEMBER	98.0%
WINTER	100.0%
SPRING	97.6%
SUMMER	0.0%
AUTUMN	88.6%
ANNUAL	100.0%

### Ice Storms

#### April 12, 1996

A low-pressure system moving across Iowa and northern Illinois brought a late-season mix of snow, sleet, rain, and freezing rain to northwest Wisconsin. Two to five inches of snow fell on roads glazed by as much as one-half inch of sleet and freezing rain, resulting in numerous traffic accidents. The accidents included a six-car pile-up on U.S. Highway 2 in Ashland County. Injuries were minor and no damage was reported.

#### February 1, 1999

Freezing rain and freezing drizzle coated much of northwestern Wisconsin with as much as 1/4 inch of ice. Many traffic accidents were reported, and some schools were closed. No damage was recorded.

#### January 21, 2001

Freezing rain resulted in 1/4 to 1/2 inch of ice on exposed surfaces. The ice was followed by one to four inches of snow, making driving very treacherous. Most schools were closed on January 30. No damage was reported.

#### April 16, 2003

A mixture of sleet and freezing rain fell, causing an icy glaze up to 1/2" thick to accumulate on roads, trees and power lines. The winds were also very strong with the Duluth/Superior Harbor recording sustained winds of 35 to 50 mph. The strong winds pushed ice into the harbor where a ship became icebound for several hours in the Superior Entry. Numerous trees and power lines were downed.

**December 30, 2004**

Ice, from one-quarter to one-half inch thick, coated trees, roads and sidewalks across Douglas County. There were also sporadic power outages.

Based on analysis of the NCDC historical snow data, it is evident that heavy snow events are relatively common in Douglas County. The highest probability for heavy snow events occurs in the month of January. An average of three to four events occurred in each year of the recording period. It can be assumed that this average will remain constant, and heavy snow events will continue to be a part of the regional climate in the future. Within the County, snowfall totals from any one event can vary widely. The northern portions of the County tend to receive higher snowfall amounts with an off-lake wind, which causes the lake-effect process to initiate. The most significantly impacted areas are the City of Superior, the largest municipality in the County and two of the most heavily traveled transportation routes, US 53 and US 2. Outside of the lake-enhanced zone, heavy snowfall events can also be expected to occur at least once every season. While generally not as significant as the lake enhanced snows, these areas still occasionally receive very heavy snows. Douglas County has a long history of dealing with snow events and generally has the infrastructure and experience to cope well with these events.

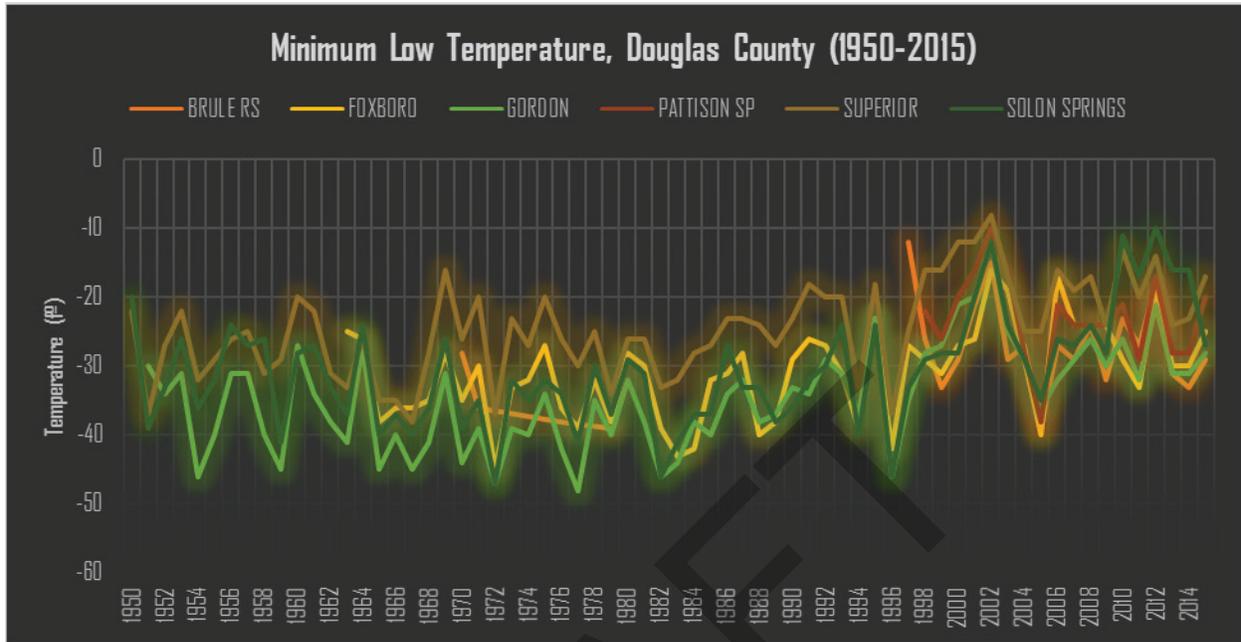
In Douglas County, ice storms occur less frequently than heavy snow events. On average, the County can expect to experience at least one significant ice storm event every 2 to 3 years. Minor icing events can be expected to occur every year during cold weather season.

**Extreme Cold**

Because of its mid-latitude position, Douglas County is subject to periodic extreme cold waves during the winter months. With the exception of the winter of 2002-2003, the minimum low temperature recorded in Douglas County was -20° F or lower in every year between 1950 and 2015. Extreme wind chills are also common during the winter months. The probability of an extreme cold event occurring within the county is nearly 100% in any given year.



Figure 26: Minimum Low Temperature, Douglas County Weather Reporting Stations (1950-2015)



**Excessive Heat**

**Risk:** Low

**Magnitude:** Generally small in scale, dependent on intensity and duration.

**Duration:** Heat waves may last from a few days to a period of weeks.

**Distribution:** Affects all areas of County.

**Area Affected:** Primarily agriculture, but also impact to business and people.

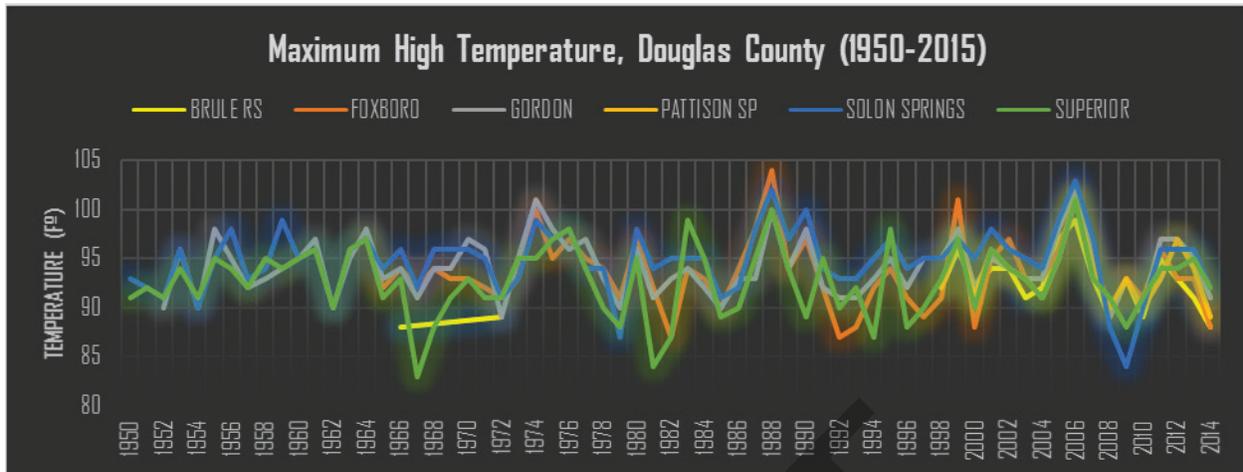
**Frequency:** Seven recorded heat wave<sup>10</sup> events between 1982 and 2014.

<sup>10</sup> Period of time (at least 24 hours) where daytime heat index values are 105 or higher for 3 or more hours and nighttime heat index values are 80 or higher, or a period of time where a heat-related death has occurred.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Figure 27: Maximum High Temperature, Douglas County Weather Reporting Stations (1950-2015)



**Probability:** Based on historical data, there is a 21.8% probability that a heat wave-type event will occur in any given year.

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## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Coastal Hazards**

**Risk:** Medium

**Magnitude:** Impacts range from no damage to severe.

**Duration:** Varied

**Distribution:** Widespread distribution. Identification of all coastal hazards within the County has not been completed. Studies to document bluff recession rates within the County are needed.

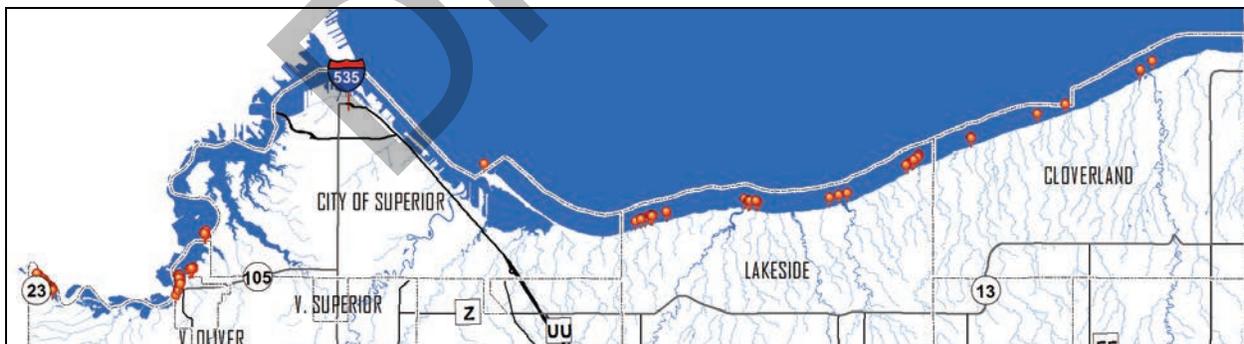
**Area Affected:** The Lake Superior coastline, St. Louis River estuary.

**Frequency:** Varies

**Probability:** Insufficient data available for analysis

**Vulnerability:** Coastal hazards primarily impact development which is directly adjacent to the shoreline of Lake Superior. Based on GIS analysis, there are 132 coastal structures in Douglas County, excluding those within the City of Superior. This was determined by querying structure locations within a distance of 500 feet from the shoreline of Lake Superior and the St. Louis River estuary. The total improvement value within the coastal zone in 2015 is \$15,154,200.

**Figure 28: Structures within the Coastal Zone, Douglas County**



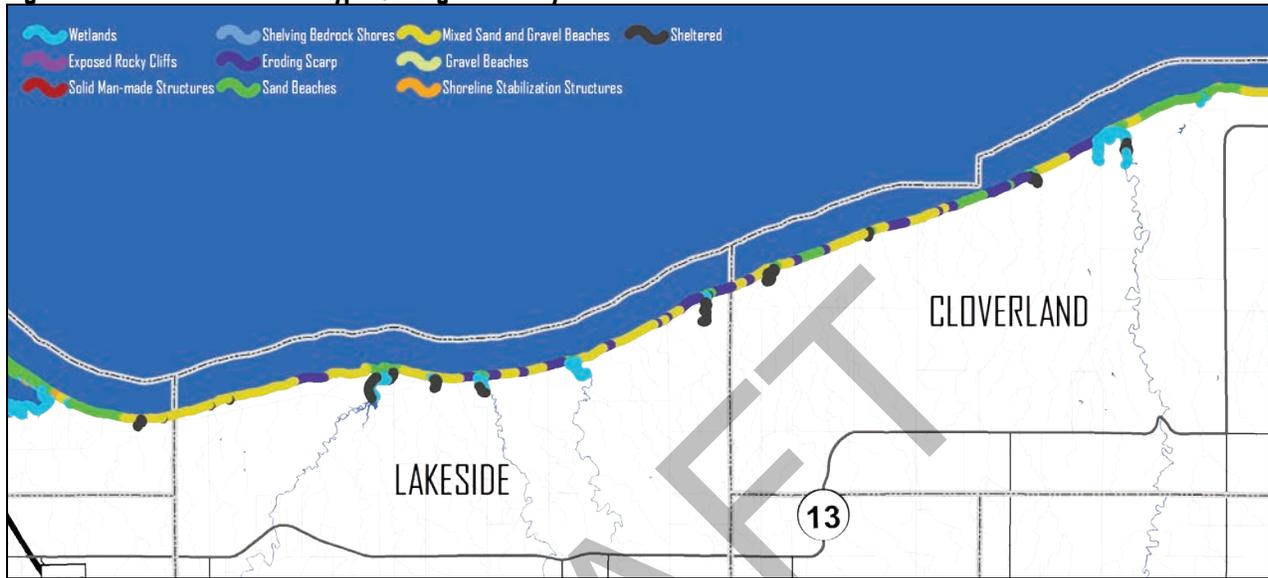


# DOUGLAS COUNTY HAZARD MITIGATION PLAN

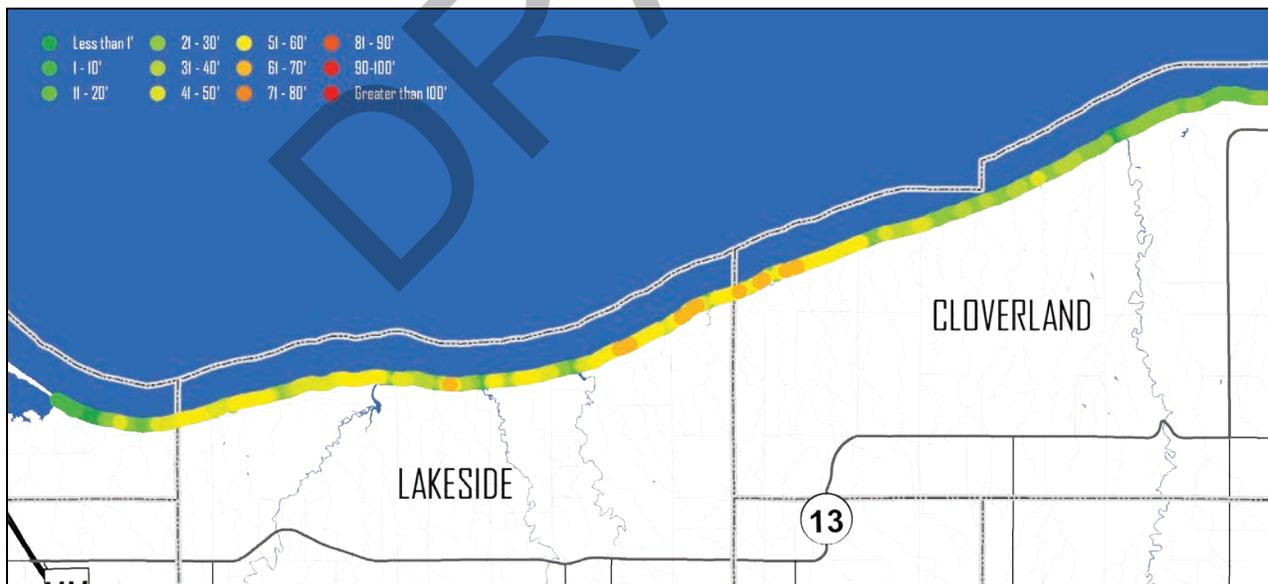
## Coastal Erosion Hazards

Erosion hazards along the south shore of Lake Superior are primarily a function of bluff morphology, composition and vegetative cover.

**Figure 29: Coastal Shoreline Types, Douglas County**



**Figure 30: Coastal Bluff Heights, Douglas County**

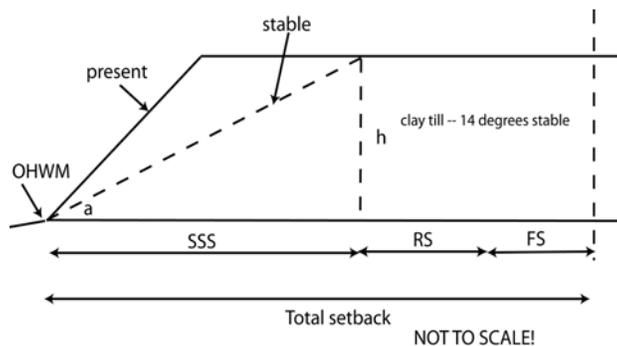




In 2010 and 2011, the Wisconsin Coastal Management Program funded a project to establish a safe setback line in Iron and Douglas Counties. This line is based on characteristics of the bluff and recession rates, as well as slope height and angle calculated from recently acquired LIDAR (Light Detection and Ranging) data. It can be viewed on a parcel by parcel basis. Field checking and interpretation by Iron and Douglas County Planning and Zoning staff members will still be required in certain instances. This will be true especially in high bluff areas in Douglas County where gullies complicate the setback issue.



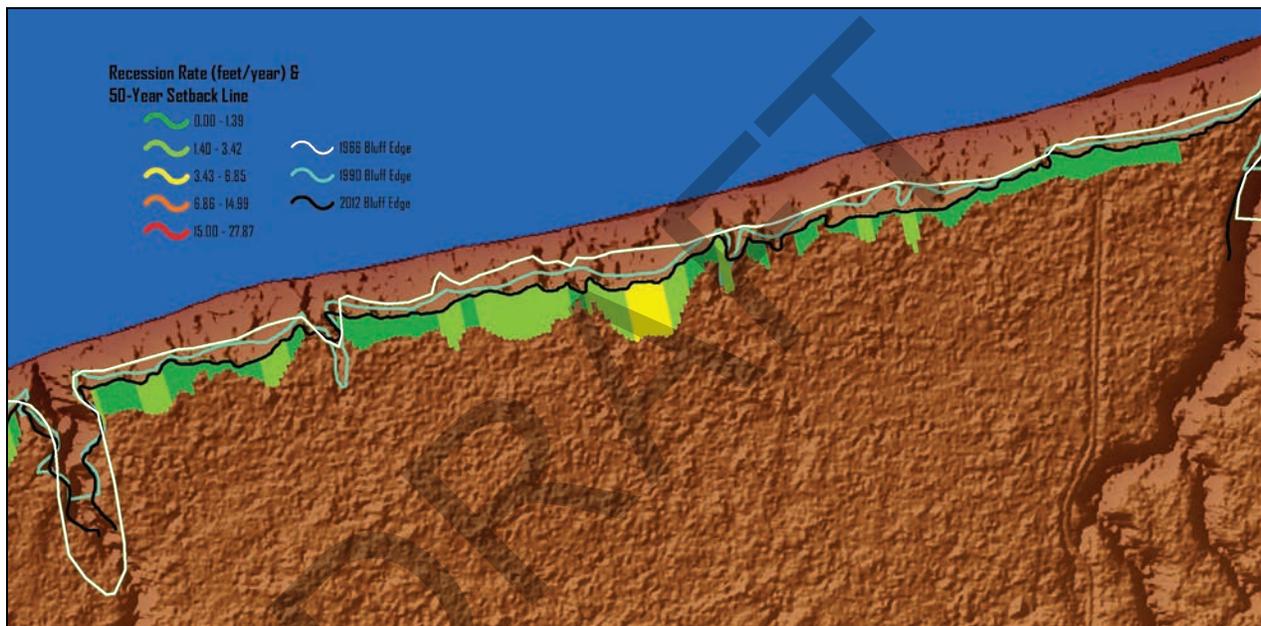
The coastal recession rate study for Douglas County first identifies the **stable slope angle** for coastal bluffs. The angle at which bluffs fail is determined by the sediments making up the bluff as well as environmental factors such as water content, weathering, etc. This information was collected through field reconnaissance on exposed bluffs where possible, while vegetated and inaccessible areas were characterized based on geologically reasonable correlation. In order to calculate the stable slope setback (SSS) from the Ordinary High Water Mark (OHWM), it is necessary to know the present slope angle and bluff height. In this study slope height and angle were calculated from recently acquired LIDAR data. The distance of stable slope setback from the OHWM is bluff height (h) divided by the tangent of angle "a" in the diagram below.





The second component examined were the historical recession rates along the Lake Superior shoreline. To determine recession rates, historical aerial imagery was rectified and the position of the top of the bluff was mapped. Two years of photography were compared using traditional photogrammetric means, the first from 1966 and the other from 1990. The average recession rate in Douglas County was 1.85 feet per year. The highest rates were by the mouth of the Amnicon River, and moving north along that western edge. The lowest rates were closest to the City of Superior where the bluff is not as pronounced. Historic recession rates applied to an assumed 50-year structure lifespan in order to calculate recession rate setback lines (RS).

**Figure 31: Recession Rate (feet/year) & 50-year Setback Line**



**Probability:** Coastal erosion is an ongoing natural process. As demonstrated in the recession rate study, coastal bluffs in Douglas County are currently actively retreating at an average rate of 1.85 feet per year.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### Landslides

**Risk:** High

**Magnitude:** Generally small in scale

**Duration:** Short duration

**Distribution:** Generally localized. Soils of the Lake Superior clay plain are of particular concern. A relatively high degree of slump erosion has been observed along the banks of the Nemadji River in Douglas County.

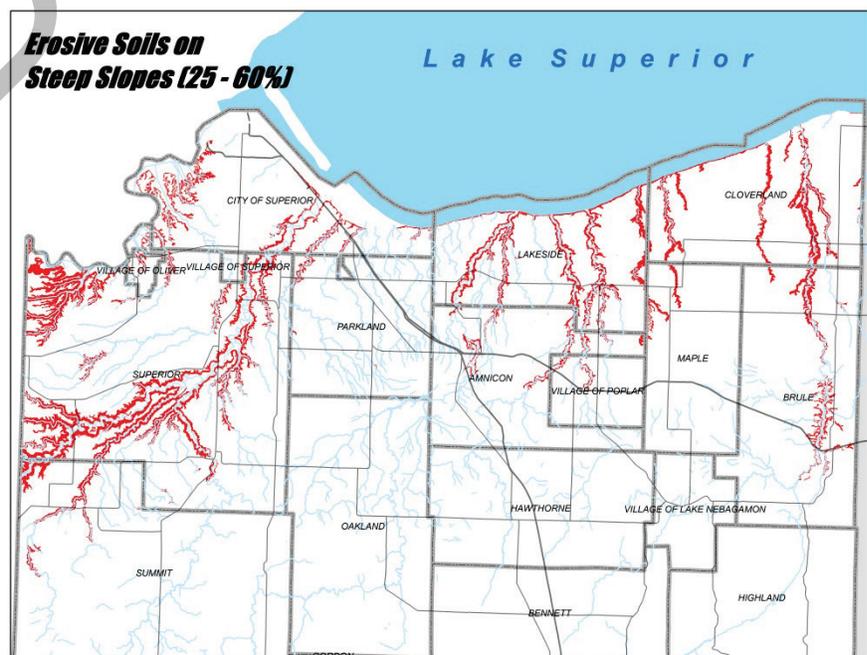
**Area Affected:** Primarily areas along river and stream corridors within the Lake Superior clay plain. In 2002, the Village of Oliver experienced some severe slumping along the St. Louis River. Seven properties were affected. One of the properties experienced a large ground failure, with an 18-foot scarp approximately one foot from the rear entrance of the home. With assistance from Wisconsin Emergency Management, the Village of Oliver acquired and demolished three of the affected properties. In a separate event, a home in the City of Superior experienced land subsidence in 2001, when the entire yard started moving toward the Nemadji River. Erosion from spring floods caused the ground within fifteen feet of the house to slide downhill; the City of Superior bought the structure and demolished it.

**Frequency:** No data available

**Probability:** Insufficient data to determine probability.

**Figure 32: Erosive Soils on Steep Slopes (25-60%)**

**Vulnerability:** According to the United States Geological Survey (USGS), landslides are major geologic hazards that occur in all 50 states, cause \$1-2 billion in damages and result in an average of more than 25 fatalities each year. (USGS, 1997) Landslides often occur with other natural hazards such as earthquakes and floods. **Figure 32** depicts the areas of Douglas County which are most vulnerable





to landslides. The steep ravines adjacent to Lake Superior tributary streams are the most susceptible areas to landslide hazards. The underlying clay soils in these areas can become unstable, especially when saturated.

SSURGO soils data were used to identify erosive clay soils on steep slopes. Cross-referencing structure locations reveals that 158 structures, with a combined assessed value of \$16.6 million are potentially vulnerable to this hazard.

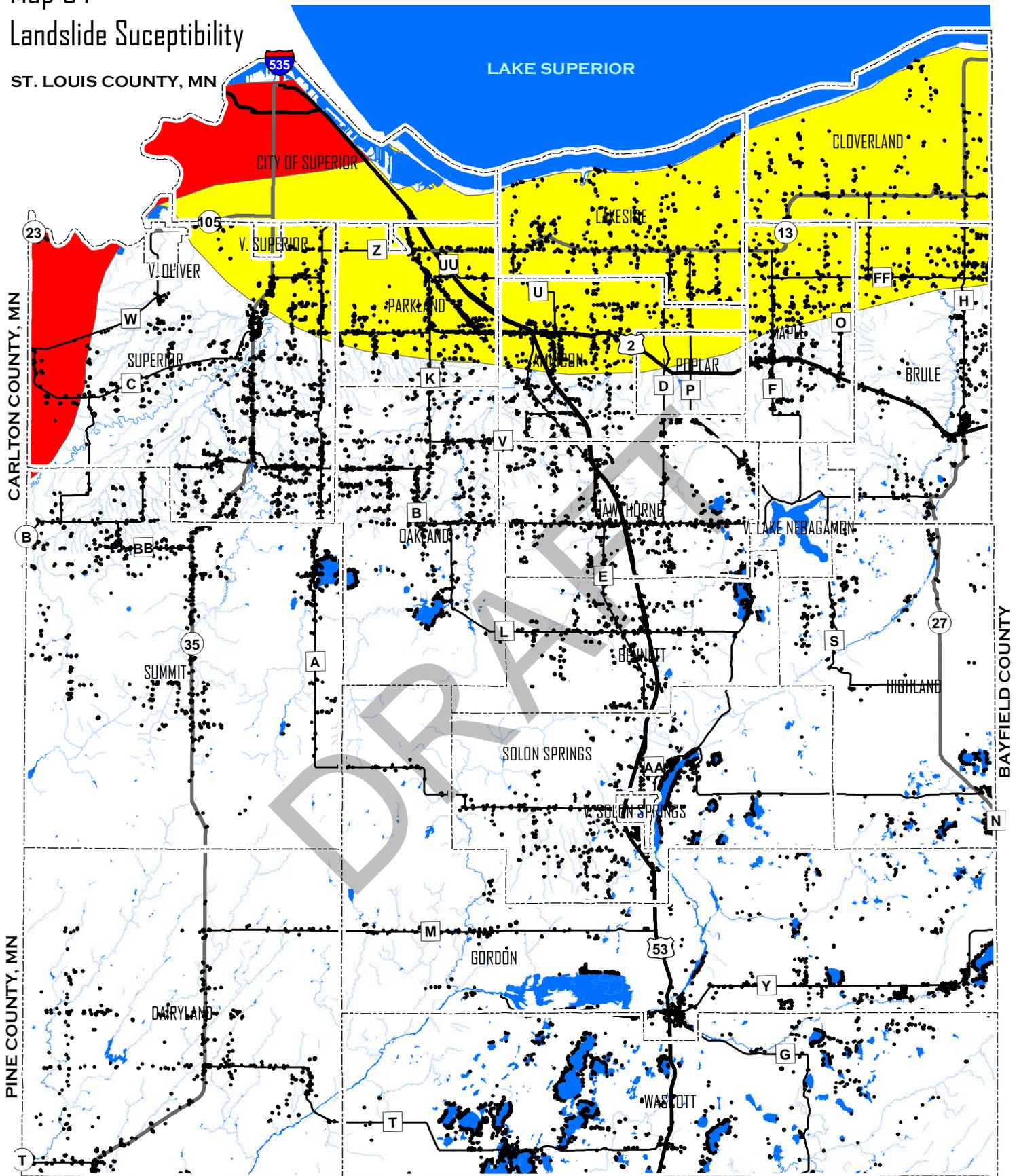
**Table 41: Structures Potentially At-Risk, Landslide Hazard**

MUNICIPALITY	STRUCTURES	IMPROVEMENT VALUE
TOWN OF SUPERIOR	56	\$ 6,629,100
TOWN OF LAKESIDE	31	\$ 3,798,700
VILLAGE OF OLIVER	17	\$ 2,004,200
VILLAGE OF SUPERIOR	7	\$ 1,780,800
TOWN OF AMNICON	12	\$ 1,445,400
TOWN OF BRULE	19	\$ 1,359,000
TOWN OF CLOVERLAND	9	\$ 975,200
TOWN OF MAPLE	3	\$ 242,000
TOWN OF PARKLAND	2	\$ 189,900
TOWN OF SUMMIT	1	\$ 96,700
VILLAGE OF POPLAR	1	\$ 84,500
<b>TOTAL</b>	<b>158</b>	<b>\$ 18,605,500</b>

# Map 34

## Landslide Suceptibility

ST. LOUIS COUNTY, MN



**HIGHWAYS**

- HIGH INCIDENCE
- MODERATE SUCCEPTIBILITY/LOW INCIDENCE
- STRUCTURE

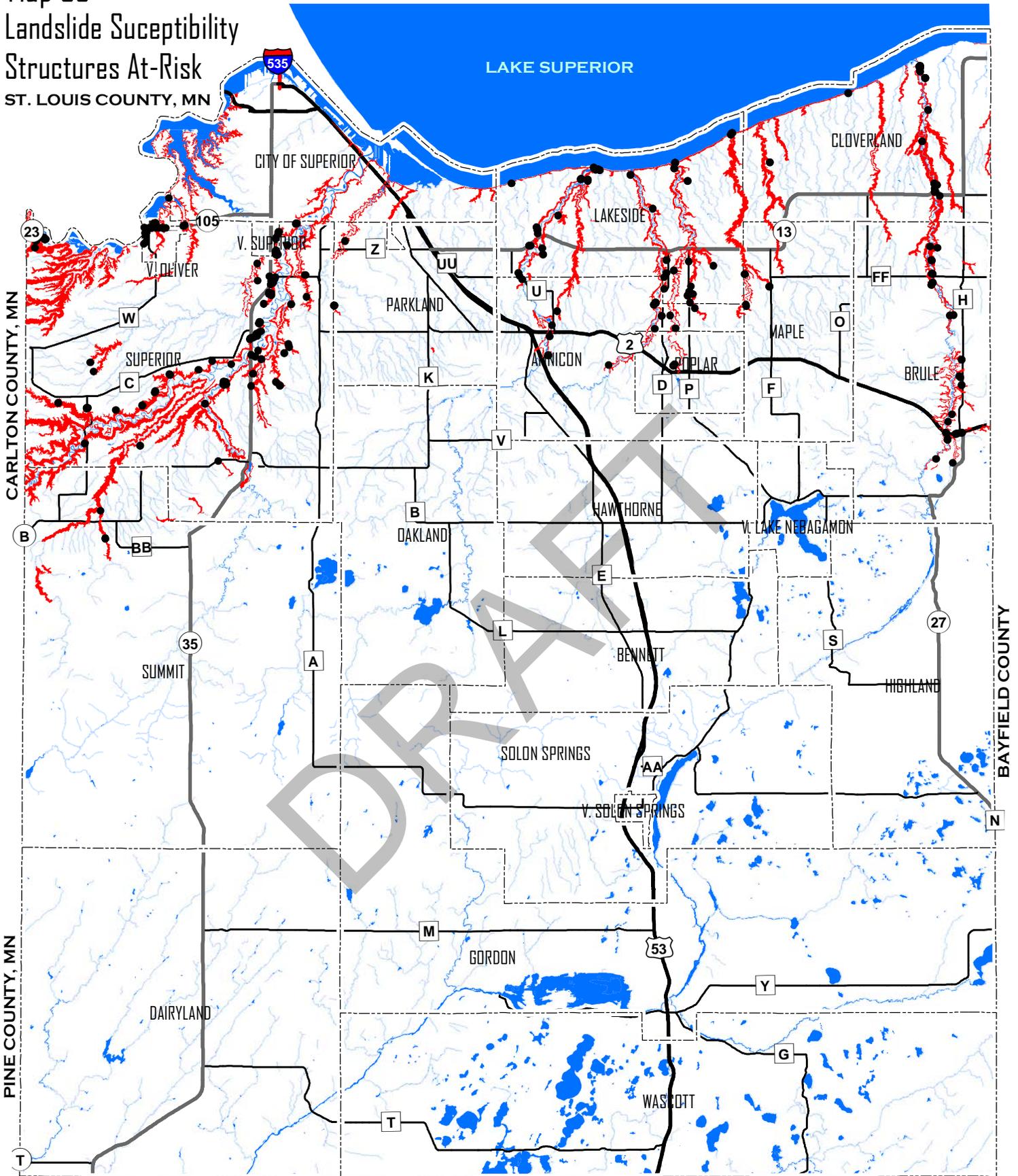
**BOUNDARIES**

- COUNTY
- INTERSTATE
- STATE
- US



# Map 35 Landslide Susceptibility Structures At-Risk

ST. LOUIS COUNTY, MN



- At-Risk Structures
- ▬ Erasive Soils on Steep Slopes





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### **Hail Storms**

**Risk:** High

**Magnitude:** Impacts to area generally minor, occasionally severe especially with respect to agricultural crops.

**Duration:** Usually associated with thunderstorm events, duration usually short.

**Distribution:** Affects all areas of County equally. Usually occurs in isolated localized events.

**Area Affected:** Primarily agriculture, but may also impact business and people. Hail has been associated with damage to structures, automobiles, utilities and infrastructure and can pose a threat to human health.

**Frequency:** Wisconsin averages two or three hail days per year. Hailstorms usually occur from May through August. Most of the hail damage is in the rural areas as these four months also correspond to the growing and harvesting seasons for most crops.

In the summer of 2000, a hailstorm passed through the County. Many homes and businesses were damaged in the southern end of our County. Damage consisted of broken window, destroyed roofs, and damaged siding. Hail was reported as large as four inches. Windshields were knocked out of cars traveling on Highway 53.

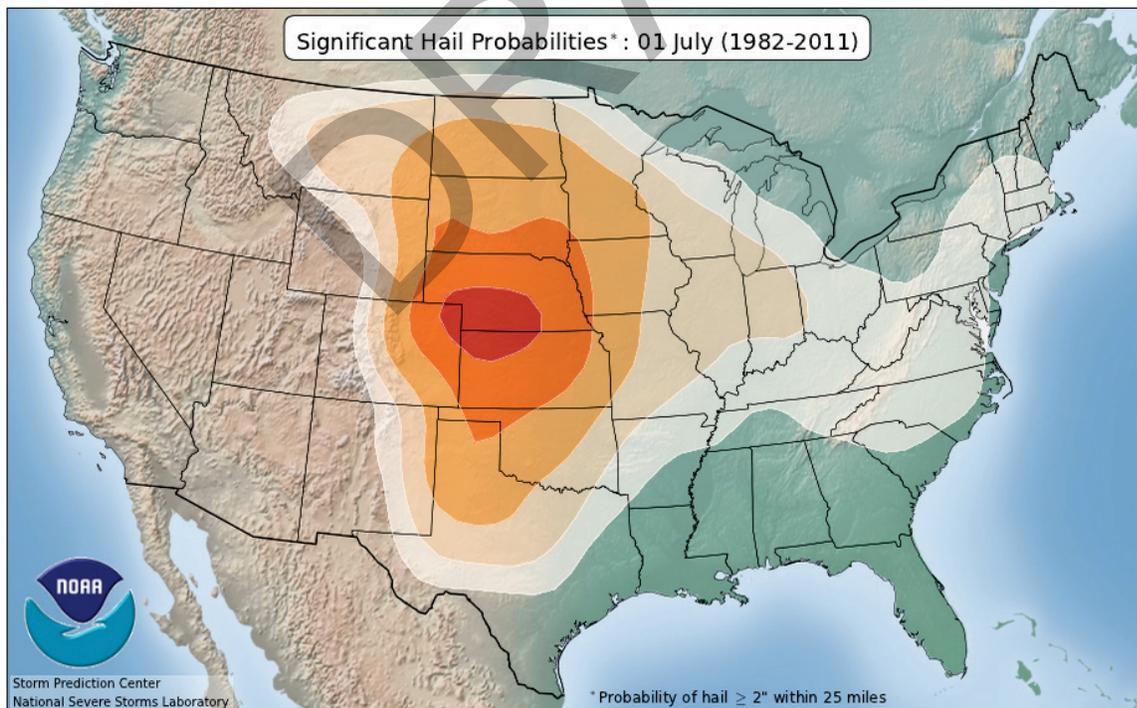
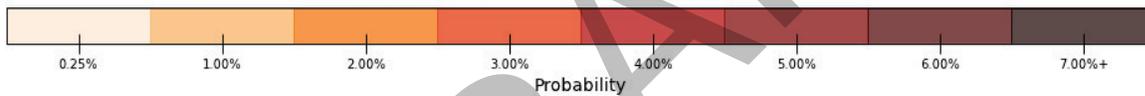
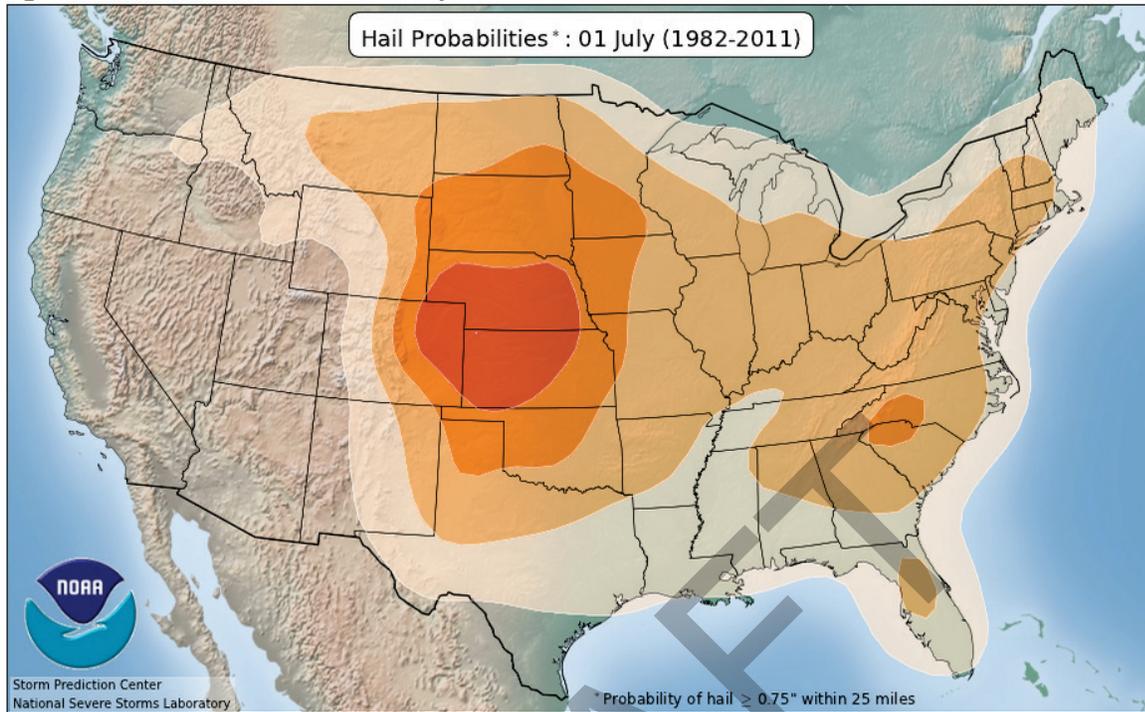
On July 1<sup>st</sup>, 2011, a cluster of thunderstorms became severe just west of the upper St Croix river, in Pine County MN, and spread rapidly northeastward through northwest Wisconsin. In addition to extensive straight line wind damage, the storm produced 2" diameter hail in parts of Douglas County.

**Probability:** According to the National Severe Storms Laboratory, the peak probability for a hail event falls on about the 1st of July in Douglas County. On this date, the hail probability (any hail) is roughly 2 percent, or 1 in 50



# DOUGLAS COUNTY HAZARD MITIGATION PLAN

Figure 33: Time Series of Hail Probability





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

A major hail event is defined as hail 2” in diameter or greater. Major hail events could occur anytime between roughly late March through early November. The estimated peak probability is about 0.10 percent, meaning that at the peak of the cycle, there would be a 1 in 1,000 chance of a major hail event on this day in any given year.

**Vulnerability:** According to the National Climate Data Center storm events database, there were 64 recorded hail events between 1964 and 2015.

**Table 42: Douglas County Hail Events**

Location	Date	Time	Diameter	Deaths	Injuries	Property Damage	Crop Damage
DOUGLAS	5/4/1964	1:30 PM	1.25 in.	0	0	0	0
DOUGLAS	5/20/1970	9:28 PM	1.75 in.	0	0	0	0
DOUGLAS	7/21/1971	6:00 PM	1.00 in.	0	0	0	0
DOUGLAS	5/21/1974	11:30 AM	1.75 in.	0	0	0	0
DOUGLAS	6/30/1983	4:24 PM	2.00 in.	0	0	0	0
DOUGLAS	6/30/1983	4:42 PM	2.00 in.	0	0	0	0
DOUGLAS	9/12/1990	8:35 PM	1.75 in.	0	0	0	0
DOUGLAS	9/16/1992	5:00 PM	1.75 in.	0	0	0	0
DOUGLAS	9/16/1992	5:00 PM	1.75 in.	0	0	0	0
Arbor Vitae	4/26/1994	2:30 PM	1.00 in.	0	0	0	0
Superior	7/5/1994	7:55 PM	1.00 in.	0	0	0	0
DOUGLAS	7/5/1994	8:10 PM	1.00 in.	0	0	0	0
Lake Nebagamon	7/24/1995	4:20 PM	1.75 in.	0	0	\$10,000	0
Gordon	7/16/1997	7:23 AM	1.50 in.	0	0	0	0
Superior	8/23/1998	6:01 PM	1.75 in.	0	0	0	0
Brule	8/23/1998	6:55 PM	0.75 in.	0	0	0	0
Lake Nebagamon	6/22/1999	6:30 AM	0.75 in.	0	0	0	0
Solon Springs	7/8/2000	3:47 PM	0.75 in.	0	0	0	0
Maple	8/14/2000	3:28 PM	1.75 in.	0	0	0	0
Solon Springs	8/14/2000	3:55 PM	4.00 in.	0	0	0	0
Solon Springs	8/14/2000	4:00 PM	1.00 in.	0	0	0	0
Solon Springs	8/14/2000	4:05 PM	1.75 in.	0	0	0	0
Bennett	8/14/2000	4:25 PM	2.75 in.	0	0	0	0
South Range	5/14/2001	7:28 AM	0.88 in.	0	0	0	0
Solon Springs	5/14/2001	8:15 AM	1.25 in.	0	0	0	0
Gordon	5/14/2001	8:25 AM	1.75 in.	0	0	0	0
Solon Springs	6/18/2001	8:25 PM	0.75 in.	0	0	0	0
Superior	8/1/2002	2:07 AM	0.88 in.	0	0	0	0
South Range	9/1/2002	2:20 PM	0.88 in.	0	0	0	0
Patzau	9/30/2002	4:10 PM	0.88 in.	0	0	0	0
Gordon	7/16/2003	11:53 PM	0.75 in.	0	0	0	0
Superior	4/18/2004	4:15 PM	1.00 in.	0	0	0	0



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Location	Date	Time	Diameter	Deaths	Injuries	Property Damage	Crop Damage
Cloverland	7/16/2006	12:53 AM	0.88 in.	0	0	0	0
Poplar	7/28/2006	7:20 PM	1.00 in.	0	0	0	0
Superior	7/28/2006	8:02 PM	0.75 in.	0	0	0	0
Superior	5/14/2007	15:50 PM	1.00 in.	0	0	0	0
South Range	5/14/2007	16:04 PM	0.75 in.	0	0	0	0
Brule	5/14/2007	16:30 PM	1.00 in.	0	0	0	0
Superior	9/21/2007	6:35 AM	0.75 in.	0	0	0	0
Solan Springs	6/20/2008	13:21 PM	0.75 in.	0	0	0	0
Superior	8/28/2008	16:15 PM	0.88 in.	0	0	0	0
Superior	8/28/2008	16:29 PM	1.00 in.	0	0	0	0
Superior	5/5/2009	16:30 PM	0.75 in.	0	0	0	0
Hawthorne	6/22/2010	4:32 PM	1.00 in.	0	0	0	0
Superior	6/24/2010	4:34 PM	0.75 in.	0	0	0	0
Oliver	8/7/2010	8:50 PM	1.00 in.	0	0	0	0
East End	7/1/2011	5:34 PM	0.88 in.	0	0	0	0
East End	7/1/2011	5:45 PM	1.25 in.	0	0	0	0
Hawthorne	7/1/2011	6:05 PM	2.00 in.	0	0	0	0
Hawthorne	7/1/2011	6:08 PM	1.00 in.	0	0	0	0
Brule	7/1/2011	6:16 PM	1.00 in.	0	0	0	0
Poplar	7/1/2011	6:16 PM	1.00 in.	0	0	0	0
Maple	7/1/2011	6:55 PM	1.00 in.	0	0	0	0
Waino	7/1/2011	7:09 PM	1.00 in.	0	0	0	0
Solan Springs	7/30/2011	7:40 PM	0.88 in.	0	0	0	0
Solan Springs	7/30/2011	7:45 PM	1.00 in.	0	0	0	0
East End	8/8/2011	5:13 PM	0.75 in.	0	0	0	0
Superior	9/12/2011	3:42 PM	1.00 in.	0	0	0	0
East End	5/28/2012	1:57 PM	0.88 in.	0	0	0	0
Superior	5/28/2012	2:00 PM	0.75 in.	0	0	0	0
East End	6/29/2014	11:51 AM	1.00 in.	0	0	0	0
Bennett	7/7/2014	6:00 PM	0.75 in.	0	0	0	0
Bennett	7/7/2014	6:19 PM	1.25 in.	0	0	0	0
East End	8/31/2014	5:45 PM	0.75 in.	0	0	0	0

For most recorded hail events, no damage totals were indicated. The exception being a hail event on July, 24<sup>th</sup>, 1995 at Lake Nebagamon, where \$10,000 in damage was observed.



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Economic Impact:** Economic impacts of hail storms are generally minimal. Severe hail storms can result in thousands of dollars of damage to agricultural crops, homes and personal property.

Economic losses have not been recorded for most historical hail events in Douglas County. With only one recorded property damage event since 1964, it is very difficult to estimate potential future losses. Based on analysis of all historical hail events, the average hail diameter during a severe event is determined to be about 1.30", or about the size of a Ping-Pong ball. Hail of this size has the potential to cause damage to vehicles, structures and vegetation. Based on the lack of historical information, annual losses are estimated to be less than \$10,000 per jurisdiction.

### **Public Health**

**Risk:** High

**Magnitude:** The magnitude of a pandemic flu or communicable disease event is dependent upon many variables, including the virus strain, level of community preparedness and planning and the availability of antiviral drugs. A small-scale event may result in increased absenteeism at schools and businesses, while a widespread pandemic may result in severe staffing disruptions in critical services, public safety and health care. A severe event could cause major disruption to businesses and commerce, transportation systems and schools.

**Duration:** Based on statistics from the U.S. Department of Health and Human Services, it is likely that a pandemic wave could last for 3 to 4 months, with community outbreaks lasting from 6 to 8 weeks.

**Area Affected:** The location of disease outbreaks is dictated by the proximity that residents have to infected people or to infected vectors. Residents in rural areas of the county may be at a slightly higher risk to vector-borne diseases, but ultimately, all county residents will be at some risk to these diseases.

**Frequency:** The frequency of pandemics and local outbreaks that tax areas with minimal resources are unpredictable. A total of 3 events have occurred in the past 90 years, resulting in a rough average of 1 event every 30 years.

**Probability:** The risk of pandemic flu is serious. The H5N1 strain has become well established in large parts of Asia, increasing the risk for more human cases. The strain has also spread to poultry and wild birds in new areas, expanding the opportunities for human transmission. While the specific probability that pandemic flu will occur in Douglas County cannot be predicted, it can be assumed that the expansion of the H5N1 virus has increased the probability and risk.



**Potential Economic Impact:** A pandemic flu event would likely have severe economic repercussions, with significant costs associated with hospitalization and care for those afflicted. Broader economic impacts associated with lost productivity and wages could also be expected. In general, most economic functions would be challenged by the high rate of absenteeism associated with a pandemic.

**Critical Facilities and Infrastructure at Risk:** While a pandemic outbreak will not directly impact critical facilities and infrastructure like other hazards, it could severely impact local health care services.

### **Earthquakes**

**Risk:** Low

**Magnitude:** Based on historical data, most earthquake events affecting Wisconsin are of a low magnitude. The average magnitude of earthquakes centered in Wisconsin is approximately 3.9, which is considered to be a minor event. Earthquake events centered outside of the area, but felt in the area, would also likely be of a relatively low magnitude.

**Duration:** Short

**Distribution:** All areas of the County are affected equally.

**Area Affected:** The impacts of an earthquake event would likely be distributed across all spectrums of society and the local economy. In the event of a major earthquake, urban and built-up areas would likely experience the most significant dollar losses.

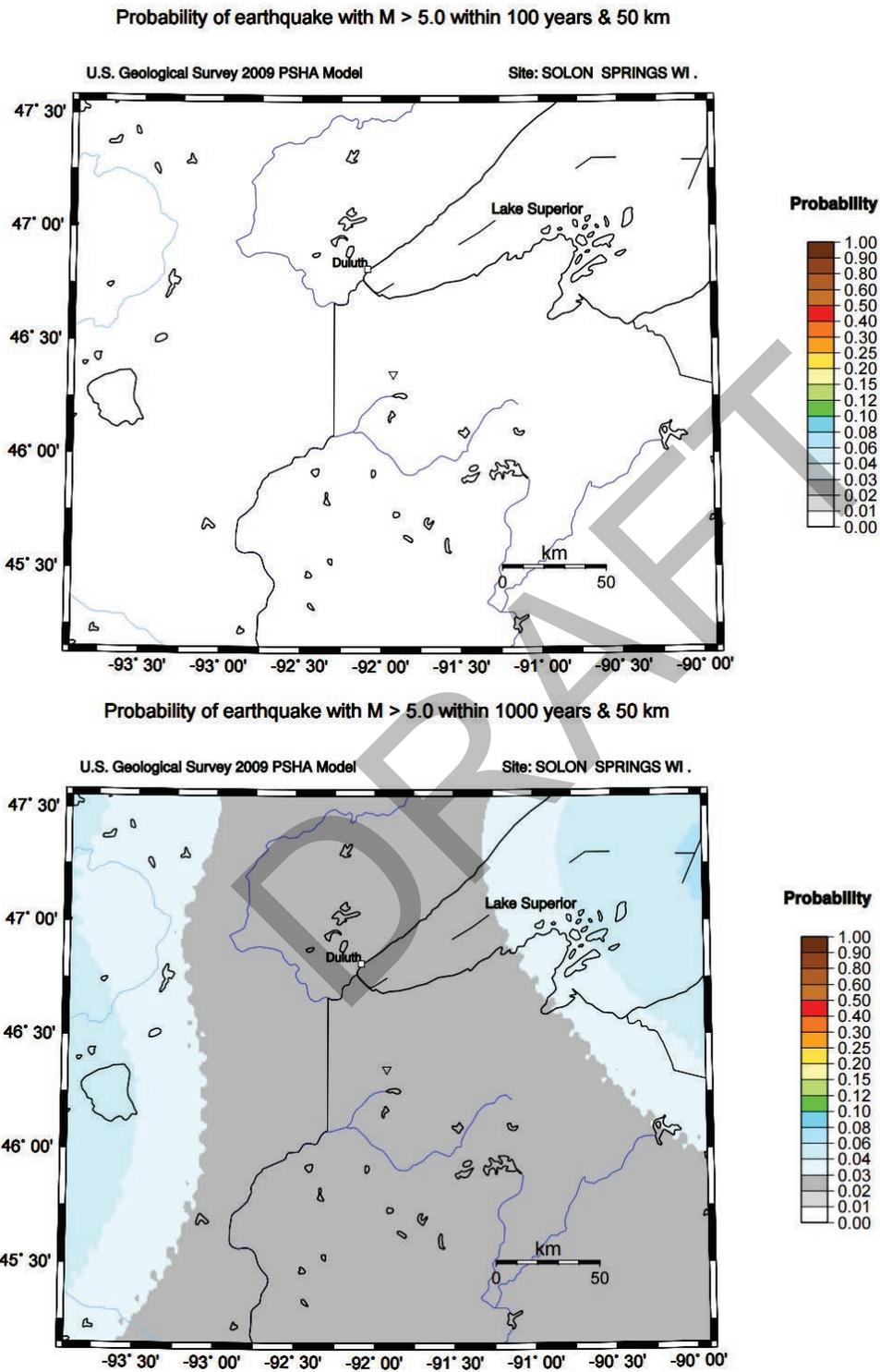
**Frequency:** The absence of a historical record of earthquake events affecting Douglas County makes it difficult to estimate frequency.

**Probability:** As indicated by **Figure 34**, the probability of a magnitude 5.0 earthquake within Douglas County over the next 100 years is near 0. Probability within 1000 years is between 0.02 and 0.03 percent.



# DOUGLAS COUNTY HAZARD MITIGATION PLAN

**Figure 34: Probability of Magnitude 5.0 Earthquake (100 years & 1000 years)**



Source: U.S. Geological Survey



**Vulnerability:** According to USGS data, there were 19 earthquake events in Wisconsin between 1905 and 1957. No events were reported for Douglas County

**Economic Impact:** A lack of a historical record provides no basis for the estimation of future losses due to this natural hazard.

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DOUGLAS COUNTY HAZARD MITIGATION PLAN

**IV. CRITICAL FACILITIES INVENTORY**

**AM RADIO**

CALLSIGN	LATITUDE	LONGITUDE	CITY
KQDS	46.724400000000	92.119700000000	DULUTH
WDSM	46.653600000000	92.147200000000	SUPERIOR
WEBC	46.643600000000	91.985800000000	DULUTH
WGEE	46.724400000000	92.119700000000	SUPERIOR

**FM RADIO**

CALLSIGN	LATITUDE	LONGITUDE	CITY
WGHF-LP	46.725800000000	92.095800000000	SUPERIOR
WWSA	46.466400000000	91.565600000000	BRULE
WWEN	46.535600000000	92.068600000000	WENTWORTH

**CELLULAR**

LICENSEE	ADDRESS	CITY
DULUTH MSA LIMITED PARTNERSHIP	COUNTY ROAD L AND MAKI ROAD	BENNETT
DULUTH MSA LIMITED PARTNERSHIP	BRULE BELLWOOD PIT ROAD	BRULE
NEW CINGULAR WIRELESS PCS, LLC	14049 EAST BEAUREGARD LAKE ROAD	GORDON
NEW CINGULAR WIRELESS PCS, LLC	4934 SOUTH DUMP ROAD	MAPLE
NEW CINGULAR WIRELESS PCS, LLC	4934 S DUMP ROAD	MAPLE
NEW CINGULAR WIRELESS PCS, LLC	9869S STATE HIGHWAY 35	FOXBORO
NEW CINGULAR WIRELESS PCS, LLC	14049 EAST BEAUREGARD LAKE ROAD	GORDON
NEW CINGULAR WIRELESS PCS, LLC	SOUTH SMITH ROAD	DAIRYLAND
NEW CINGULAR WIRELESS PCS, LLC	9951 EAST WILLIAMS ROAD	GORDON
NEW CINGULAR WIRELESS PCS, LLC	9869S STATE HIGHWAY 35	FOXBORO

**EMERGENCY RESPONSE FACILITIES**

FACILITY	ADDRESS	CITY
WASCOTT VOLUNTEER FIRE DEPARTMENT	7607 E COUNTY ROAD T	GORDON
DAIRYLAND VOLUNTEER FIRE DEPARTMENT	2787 E TOWN ROAD TT	DANBURY
GORDON VOLUNTEER FIRE DEPARTMENT	9925 COUNTY ROAD Y	GORDON
SOLO SPRINGS VOLUNTEER FIRE	11517 S CEMETERY ROAD	SOLO SPRINGS
BENNETT VOLUNTEER FIRE DEPARTMENT	9215 E COUTNY TRUNK L	BENNETT
HIGHLAND TOWNSHIP VOLUNTEER FIRE	709 DODGEVILLE STREET	HIGHLAND
HAWTHORNE FIRE DEPARTMENT	7227 S TOWN HALL ROAD	HAWTHORNE
TOWNSHIP OF SUMMIT VOLUNTEER FIRE	2538 E COUNTY ROAD BB	FOXBORO
OAKLAND VOLUNTEER FIRE DEPARTMENT	6588 SOUTH CONEY TRUNK	SOUTH RANGE
POPLAR VOLUNTEER FIRE DEPARTMENT	5048 S WIEHE ROAD	POPLAR
MAPLE VOLUNTEER FIRE DEPARTMENT	4778 S GONSCHOREK LOOP ROAD	MAPLE
PARKLAND VOLUNTEER FIRE DEPARTMENT	6251 EAST WICKSTROM STREET	SOUTH RANGE
TOWN OF SUPERIOR FIRE DEPARTMENT	5597 S STATE HWY 35	SUPERIOR
LAKESIDE VOLUNTEER FIRE DEPARTMENT	3196 S POPLAR RIVER ROAD	POPLAR



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

SUPERIOR FIRE DEPARTMENT	3326 TOWER AVENUE	SUPERIOR
BRULE VOLUNTEER FIRE DEPARTMENT	5766S COUNTY ROAD H	BRULE
SUPERIOR POLICE DEPARTMENT	1316 N 14 <sup>TH</sup> STREET, SUITE 150	SUPERIOR
DOUGLAS COUNTY SHERIFFS DEPARTMENT	1316 N 14 <sup>TH</sup> STREET, SUITE 100	SUPERIOR
VILLAGE OF SUPERIOR POLICE DEPT	1316 N 14 <sup>TH</sup> STREET, SUITE 150	SUPERIOR
VILLAGE OF SOLON SPRINGS POLICE DEPT	11517 S CEMETERY ROAD	SOLON SPRINGS

### MEDICAL FACILITIES

CALLSIGN	ADDRESS	CITY
ESSENTIA HEALTH ST. MARYS HOSPITAL OF SUPERIOR	3500 TOWER AVE	SUPERIOR

### SCHOOLS

SCHOOL NAME	DISTRICT	TYPE	ENROLLMENT
IRON RIVER ELEMENTARY	MAPLE	KG-05	126
NORTHWESTERN ELEMENTARY	MAPLE	K4-05	556
NORTHWESTERN HIGH	MAPLE	09-12	467
NORTHWESTERN MIDDLE	MAPLE	06-08	331
SOLON SPRINGS SCHOOL	SOLON SPRINGS	K4-12	347
BRYANT ELEMENTARY	SUPERIOR	K4-05	329
COOPER ELEMENTARY	SUPERIOR	K4-05	336
FOUR CORNERS ELEMENTARY	SUPERIOR	K4-05	243
GREAT LAKES ELEMENTARY	SUPERIOR	K4-05	365
LAKE SUPERIOR ELEMENTARY	SUPERIOR	K4-05	188
NORTHERN LIGHTS ELEMENTARY	SUPERIOR	K4-05	700
SUPERIOR COMMUNITY PRESCHOOL	SUPERIOR	K4-PK	211
SUPERIOR HIGH	SUPERIOR	09-12	1,480
SUPERIOR MIDDLE	SUPERIOR	06-08	1,021

### COLLEGES

NAME	ADDRESS	CITY
WISCONSIN INDIANHEAD TECHNICAL COLLEGE	600 N 21 <sup>ST</sup> STREET	SUPERIOR
UNIVERSITY OF WISCONSIN, SUPERIOR	1605 CATLIN AVENUE	SUPERIOR
WISCONSIN INDIANHEAD TECHNICAL COLLEGE	600 N 21 <sup>ST</sup> STREET	SUPERIOR

### GOVERNMENT OFFICES

NAME	ADDRESS	MUNICIPALITY
DOUGLAS COUNTY GOVERNMENT CENTER	1316 NORTH 14 <sup>TH</sup> STREET, SUPERIOR, WI 54880	SUPERIOR
TOWN HALL	8985E US HWY 2, SOUTH RANGE, WI 54874	AMNICON
TOWN HALL	9215E COUNTY ROAD L, BENNETT, WI 54873	BENNETT
TOWN HALL	5814S MAPLE STREET, BRULE, WI 54820	BRULE
TOWN HALL	12969E STATE ROAD 13, MAPLE, WI 54854	CLOVERLAND
TOWN HALL	15208S STATE ROAD 35, DAIRYLAND, WI 54830	DAIRYLAND
TOWN HALL	9709E COUNTY ROAD Y - PO BOX 68, GORDON, WI 54838	GORDON



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

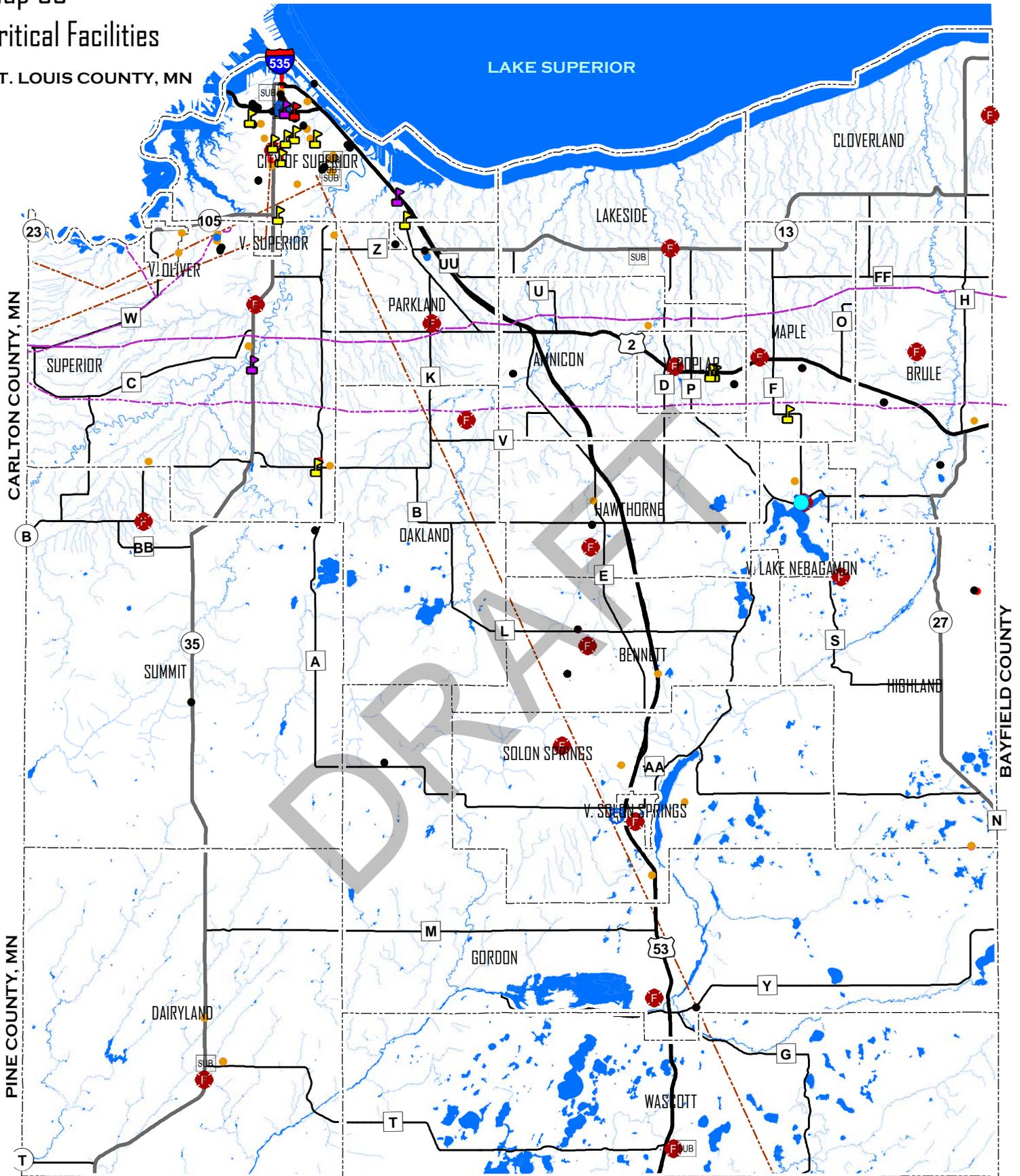
TOWN HALL	722IS TOWN HALL ROAD - PO BOX 142, HAWTHORNE, WI 54841	HAWTHORNE
TOWN HALL	9360S COUNTY ROAD S, LAKE NEBAGAMON, WI 54849	HIGHLAND
TOWN HALL	3196S POPLAR RIVER ROAD, POPLAR, WI 54864	LAKESIDE
TOWN HALL (COMMUNITY CENTER)	11037E US HWY 2, MAPLE, WI 54854	MAPLE
TOWN HALL	6410S COUNTY ROAD B, SOUTH RANGE, WI 54874	OAKLAND
TOWN HALL	6221E VETERANS DRIVE, SOUTH RANGE, WI 54874	PARKLAND
TOWN HALL	11407S CEMETERY ROAD - PO BOX 275, SOLON SPRINGS, WI 54873	SOLON SPRINGS
TOWN HALL	2731E MILCHESKY ROAD, FOXBORO, WI 54836	SUMMIT
TOWN HALL	4917S STATE ROAD 35, SUPERIOR, WI 54880	SUPERIOR
TOWN HALL	16362S TOWN HALL ROAD - PO BOX 159, WASCOTT, WI 54890	WASCOTT
VILLAGE HALL	11596E WATERFRONT DRIVE, LAKE NEBAGAMON, WI 54849	LAKE NEBAGAMON
VILLAGE HALL	2125E STATE STREET, SUPERIOR, WI 54880	OLIVER
VILLAGE HALL	4932S VILLAGE ROAD, POPLAR, WI 54864	POPLAR
VILLAGE BUSINESS OFFICE - RM III	11523S BUSINESS HWY 53 - PO BOX 273, SOLON SPRINGS, WI 54873	V. SOLON SPRINGS
VILLAGE HALL	6702 OGDEN AVENUE, SUPERIOR, WI 5480	V. SUPERIOR

### MUNICIPAL INFRASTRUCTURE

NAME	COMMUNITY
MANITOU FALLS SANITARY DISTRICT NO 1	T. SUPERIOR
SUPERIOR WATER TREATMENT PLANT	C. SUPERIOR
OLIVER WATERWORKS	V. OLIVER
BRULE SANITARY DISTRICT #1	T. BRULE
VILLAGE OF POPLAR WATERWORKS	V. POPLAR
VILLAGE OF SUPERIOR WATERWORKS	V. SUPERIOR
VILLAGE OF SOLON SPRINGS WWTF	V. SOLON SPRINGS
MIDDLE RIVER HEALTH & REHAB CENTER	T. AMNICON
CAMP AMNICON	T. LAKESIDE
NORTHWESTERN SCHOOLS	T. MAPLE
MURPHY OIL	C. SUPERIOR
UPPER ST. CROIX LAKE SANITARY DISTRICT	T. SOLON SPRINGS
GORDON SANITARY DISTRICT #1	T. GORDON
PARKLAND SANITARY DISTRICT #1	T. PARKLAND
LAKE MINNESUING SANITARY DISTRICT	T. BENNETT, T. HAWTHORNE

# Map 36 Critical Facilities

ST. LOUIS COUNTY, MN



WASHBURN COUNTY

- |                            |                             |               |
|----------------------------|-----------------------------|---------------|
| Public Schools             | County Government Center    | Microwave     |
| Private Schools            | Hospital                    | FM Radio      |
| College                    | Local FD                    | AM Radio      |
| Electric Substations       | Natural Gas Pipelines       | Antenna (ASR) |
| Local Police Department    | Petroleum Product Pipelines | Cellular      |
| County Sheriffs Department |                             |               |





## DOUGLAS COUNTY HAZARD MITIGATION PLAN

### Exposure Values

Table 43: 2014 Property Tax Assessments

MCD	TAX CLASS	LAND	IMPROVEMENTS	TOTAL
AMNICON	RESIDENTIAL	\$5,516,100	\$50,352,300	\$55,868,400
	COMMERCIAL	\$714,900	\$1,494,100	\$2,209,000
	MANUFACTURING	\$55,900	\$20,400	\$76,300
	AGRICULTURAL	\$708,500	\$0	\$708,500
	UNDEVELOPED	\$1,115,500	\$0	\$1,115,500
	AG	\$1,294,400	\$0	\$1,294,400
	FOREST	\$10,153,400	\$0	\$10,153,400
	OTHER	\$153,000	\$1,444,800	\$1,597,800
	PERSONAL PROPERTY			\$417,800
BENNETT	RESIDENTIAL	\$10,355,700	\$31,456,300	\$41,812,000
	COMMERCIAL	\$771,000	\$2,655,600	\$3,426,600
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$105,300	\$0	\$105,300
	UNDEVELOPED	\$860,900	\$0	\$860,900
	AGFOREST	\$448,600	\$0	\$448,600
	FOREST	\$11,083,800	\$0	\$11,083,800
	OTHER	\$75,000	\$785,900	\$860,900
	PERSONAL PROPERTY			\$390,538
BRULE	RESIDENTIAL	\$6,970,300	\$26,189,500	\$33,159,800
	COMMERCIAL	\$310,700	\$3,125,300	\$3,436,000
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$412,400	\$0	\$412,400
	UNDEVELOPED	\$583,600	\$0	\$583,600
	AGFOREST	\$901,700	\$0	\$901,700
	FOREST	\$11,640,100	\$0	\$11,640,100
	OTHER	\$77,900	\$832,000	\$909,900
	PERSONAL PROPERTY			\$2,012,800
CLOVERLAND	RESIDENTIAL	\$1,103,500	\$8,838,300	\$9,941,800
	COMMERCIAL	\$14,000	\$91,500	\$105,500
	MANUFACTURING	\$634,600	\$0	\$0
	AGRICULTURAL	\$393,500	\$0	\$634,600
	UNDEVELOPED	\$328,800	\$0	\$393,500
	AGFOREST	\$7,071,500	\$0	\$328,800
	FOREST	\$191,000	\$0	\$7,071,500
	OTHER	\$9,736,900	\$2,717,500	\$2,908,500
	PERSONAL PROPERTY			\$23,864
DAIRYLAND	RESIDENTIAL	\$1,797,300	\$12,414,500	\$14,211,800
	COMMERCIAL	\$27,400	\$224,400	\$251,800
	MANUFACTURING	\$0	\$0	\$0



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

	AGRICULTURAL	\$308,000	\$0	\$308,000
	UNDEVELOPED	\$625,200	\$0	\$625,200
	AGFOREST	\$462,100	\$0	\$462,100
	FOREST	\$27,624,100	\$0	\$27,624,100
	OTHER	\$113,500	\$745,600	\$859,100
	PERSONAL PROPERTY			\$212,400
<b>GORDON</b>	RESIDENTIAL	\$30,490,200	\$51,818,000	\$82,308,200
	COMMERCIAL	\$1,424,600	\$3,438,700	\$4,863,300
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$62,200	\$0	\$62,200
	UNDEVELOPED	\$1,324,600	\$0	\$1,324,600
	AGFOREST	\$296,900	\$0	\$296,900
	FOREST	\$20,161,200	\$0	\$20,161,200
	OTHER	\$6,200	\$483,700	\$109,506,300
	PERSONAL PROPERTY			\$745,800
<b>HAWTHORNE</b>	RESIDENTIAL	\$11,218,100	\$44,959,400	\$56,177,500
	COMMERCIAL	\$404,400	\$2,154,800	\$2,559,500
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$102,550	\$0	\$102,550
	UNDEVELOPED	\$2,598,000	\$0	\$2,598,200
	AGFOREST	\$74,600	\$0	\$74,600
	FOREST	\$11,791,400	\$0	\$11,791,400
	OTHER	\$8,000	\$6,100	\$14,100
	PERSONAL PROPERTY			\$565,133
<b>HIGHLAND</b>	RESIDENTIAL	\$13,707,600	\$28,388,800	\$42,096,400
	COMMERCIAL	\$108,000	\$348,000	\$456,000
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$30,400	\$0	\$30,400
	UNDEVELOPED	\$699,800	\$0	\$699,800
	AGFOREST	\$153,700	\$0	\$153,700
	FOREST	\$12,331,800	\$0	\$12,331,800
	OTHER	\$14,000	\$119,100	\$133,100
	PERSONAL PROPERTY			\$207,600
<b>LAKESIDE</b>	RESIDENTIAL	\$5,370,500	\$34,331,900	\$39,702,400
	COMMERCIAL	\$2,600	\$37,400	\$40,000
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$719,100	\$0	\$719,100
	UNDEVELOPED	\$358,100	\$0	\$358,100
	AGFOREST	\$346,300	\$0	\$546,300
	FOREST	\$20,726,900	\$0	\$20,726,900
	OTHER	\$76,200	\$664,300	\$62,833,300
	PERSONAL PROPERTY			\$16,300



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

<b>MAPLE</b>	RESIDENTIAL	\$1,829,200	\$26,148,300	\$27,977,500
	COMMERCIAL	\$169,000	\$607,000	\$776,000
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$643,000	\$0	\$643,000
	UNDEVELOPED	\$213,200	\$0	\$213,200
	AGFOREST	\$612,300	\$0	\$612,300
	FOREST	\$12,865,700	\$0	\$12,865,700
	OTHER	\$84,600	\$681,700	\$766,300
	PERSONAL PROPERTY			\$111,700
<b>DAKLAND</b>	RESIDENTIAL	\$14,308,200	\$56,168,400	\$70,476,600
	COMMERCIAL	\$92,600	\$490,900	\$583,500
	MANUFACTURING	\$139,000	\$0	\$139,000
	AGRICULTURAL	\$290,750	\$0	\$290,750
	UNDEVELOPED	\$2,340,600	\$0	\$2,340,600
	AGFOREST	\$486,800	\$0	\$486,800
	FOREST	\$10,024,300	\$0	\$10,024,300
	OTHER	\$132,000	\$1,029,200	\$1,161,200
	PERSONAL PROPERTY			\$89,400
<b>PARKLAND</b>	RESIDENTIAL	\$7,142,200	\$53,391,900	\$60,534,100
	COMMERCIAL	\$386,600	\$1,644,500	\$2,031,100
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$298,100	\$0	\$298,100
	UNDEVELOPED	\$1,032,800	\$0	\$1,032,800
	AGFOREST	\$501,900	\$0	\$501,900
	FOREST	\$8,236,300	\$0	\$8,236,300
	OTHER	\$64,000	\$668,800	\$73,367,100
	PERSONAL PROPERTY			\$598,100
<b>SOLON SPRINGS</b>	RESIDENTIAL	\$36,186,300	\$72,388,900	\$108,575,200
	COMMERCIAL	\$930,800	\$2,786,300	\$3,717,100
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$91,800	\$0	\$91,800
	UNDEVELOPED	\$1,032,200	\$0	\$1,032,200
	AGFOREST	\$46,900	\$0	\$46,900
	FOREST	\$9,181,300	\$0	\$9,181,300
	OTHER	\$47,500	\$403,000	\$450,500
	PERSONAL PROPERTY			\$798,600
<b>SUMMIT</b>	RESIDENTIAL	\$9,771,400	\$54,702,700	\$64,474,100
	COMMERCIAL	\$355,000	\$1,332,400	\$1,687,400
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$338,300	\$0	\$338,300
	UNDEVELOPED	\$3,084,100	\$0	\$3,084,100
	AGFOREST	\$689,700	\$0	\$689,700
	FOREST	\$21,058,400	\$0	\$21,058,400



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

	OTHER	\$69,000	\$838,800	\$907,800
	PERSONAL PROPERTY			\$97,400
<b>SUPERIOR</b>	RESIDENTIAL	\$15,768,700	\$110,488,000	\$126,256,700
	COMMERCIAL	\$1,995,100	\$5,268,800	\$7,263,900
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$711,700	\$0	\$711,700
	UNDEVELOPED	\$1,697,600	\$0	\$1,697,600
	AGFOREST	\$1,251,300	\$0	\$1,251,300
	FOREST	\$23,110,400	\$0	\$23,110,400
	OTHER	\$105,300	\$998,700	\$1,104,000
	PERSONAL PROPERTY			\$1,941,500
<b>WASCOTT</b>	RESIDENTIAL	\$121,023,000	\$126,916,300	\$247,939,300
	COMMERCIAL	\$2,682,500	\$5,299,700	\$7,982,200
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$25,100	\$0	\$25,100
	UNDEVELOPED	\$910,000	\$0	\$910,000
	AGFOREST	\$79,300	\$0	\$79,300
	FOREST	\$21,411,800	\$0	\$21,411,800
	OTHER	\$61,600	\$228,100	\$289,700
	PERSONAL PROPERTY			\$803,140
<b>LAKE NEBAGAMON</b>	RESIDENTIAL	\$58,121,100	\$80,677,100	\$138,798,200
	COMMERCIAL	\$2,026,500	\$4,051,000	\$6,077,500
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$600	\$0	\$600
	UNDEVELOPED	\$783,200	\$0	\$783,200
	AGFOREST	\$0	\$0	\$0
	FOREST	\$5,811,900	\$0	\$5,811,900
	OTHER	\$0	\$0	\$0
	PERSONAL PROPERTY			\$564,591
<b>OLIVER</b>	RESIDENTIAL	\$3,984,400	\$17,511,200	\$21,495,600
	COMMERCIAL	\$276,300	\$1,353,200	\$1,629,500
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$0	\$0	\$0
	UNDEVELOPED	\$0	\$0	\$0
	AGFOREST	\$0	\$0	\$0
	FOREST	\$0	\$0	\$0
	OTHER	\$0	\$0	\$0
	PERSONAL PROPERTY			\$42,100
<b>POPLAR</b>	RESIDENTIAL	\$3,911,000	\$24,306,100	\$28,217,100
	COMMERCIAL	\$703,000	\$3,477,600	\$4,180,600
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$367,350	\$0	\$367,350



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

	UNDEVELOPED	\$3,977,300	\$0	\$397,300
	AGFOREST	\$499,400	\$0	\$499,400
	FOREST	\$2,161,400	\$0	\$2,161,400
	OTHER	\$411,000	\$1,494,700	\$1,905,700
	PERSONAL PROPERTY			\$380,100
<b>SOLON SPRINGS</b>	RESIDENTIAL	\$8,960,100	\$24,862,700	\$33,822,800
	COMMERCIAL	\$1,431,800	\$6,706,500	\$8,138,300
	MANUFACTURING	\$25,800	\$329,100	\$354,900
	AGRICULTURAL	\$0	\$0	\$0
	UNDEVELOPED	\$0	\$0	\$0
	AGFOREST	\$0	\$0	\$0
	FOREST	\$0	\$0	\$0
	OTHER	\$0	\$0	\$0
	PERSONAL PROPERTY			\$1,407,000
<b>SUPERIOR V</b>	RESIDENTIAL	\$6,266,700	\$36,424,100	\$42,650,800
	COMMERCIAL	\$607,200	\$1,954,000	\$2,561,200
	MANUFACTURING	\$0	\$0	\$0
	AGRICULTURAL	\$0	\$0	\$0
	UNDEVELOPED	\$0	\$0	\$0
	AGFOREST	\$0	\$0	\$0
	FOREST	\$0	\$0	\$0
	OTHER	\$0	\$0	\$0
	PERSONAL PROPERTY			\$952,200
<b>SUPERIOR C</b>	RESIDENTIAL	\$150,409,300	\$799,324,000	\$949,733,300
	COMMERCIAL	\$98,464,500	\$369,645,200	\$468,109,700
	MANUFACTURING	\$12,469,300	\$57,104,400	\$69,573,700
	AGRICULTURAL	\$19,200		\$19,200
	UNDEVELOPED	\$59,800		\$59,800
	AGFOREST	\$0	\$0	\$0
	FOREST	\$0	\$0	\$0
	OTHER	\$0	\$0	\$0
	PERSONAL PROPERTY			\$126,709,000

Source: Wisconsin Department of Revenue



## V. GOALS AND OBJECTIVES

*Goal I: Reduce possibility of damage and loss to existing community assets including structures, critical facilities and infrastructure due to floods.*

### **Objectives:**

- A** Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities due to floods.
- B** Protect existing assets with the highest relative vulnerability to the effects of flooding.
- C** Promote the continuing purchase of flood insurance by property owners in flood prone hazard areas.

*Goal II: Reduce possibility of damage and loss to existing community assets including structures, critical facilities and infrastructure due to coastal hazards and landslides.*

### **Objectives:**

- A** Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities due to landslides.
- B** Protect existing assets with the highest relative vulnerability to the effects of landslides.
- C** Address identified data limitations regarding lack of detailed information about individual structures located in the highest landslide vulnerability areas.

*Goal III: Reduce possibility of damage and loss to existing community assets including structures, critical facilities and infrastructure due to severe weather.*

### **Objectives:**

- A** Develop a comprehensive approach to reducing the possibility of damage and loss of function to critical facilities due to severe weather in terms of high winds and heavy snow and ice loading.
- B** Protect existing assets with the highest relative vulnerability to the effects of severe weather events.
- C** Address identified data limitations regarding lack of detailed information about individual structures, other critical facilities and infrastructure with the highest relative vulnerability to the effects of high wind events and heavy snow loads



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

including characteristics of individual structures such as construction type, age, condition, compliance with current building codes, etc.

***Goal IV: Reduce possibility of damage and loss to existing community assets including structures, critical facilities and infrastructure due to wildfires.***

**Objectives:**

- A** Develop a comprehensive approach to reducing the possibility of injury and loss of life due to wildfires.
- B** Develop a comprehensive approach to reducing the possibility of damage and loss of function due to the exposure of critical facilities and infrastructure to wildfire.
- C** Address identified data limitations regarding lack of detailed information about vegetation types and individual structures (e.g., roof construction) located within areas more prone to wildfire.
- D** Aggressively pursue opportunities for improving preparedness.
- E** Improve coordination.

***Goal V: Promote disaster-resistant future development.***

**Objectives:**

- A** Continue to enforce building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
- B** Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
- C** Discourage activities that exacerbate existing hazardous conditions.
- D** Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.
- E** Coordinate hazard planning with comprehensive planning at the County and local levels.



***Goal VI: Promote public awareness of community hazards and mitigation measures***

**Objectives:**

- A** Provide public education to increase awareness of hazards and opportunities for mitigation.
  - All interested individuals will be encouraged to participate in hazard mitigation planning and training activities.
  - Managers of public facilities will be knowledgeable in hazard mitigation techniques and the components of the community's mitigation plan.
- B** Promote partnerships between the municipalities and the County to continue to develop a County -wide approach to identifying and implementing mitigation actions.
- C** Promote disaster resistance in the business community.
- D** Monitor and publicize the effectiveness of mitigation initiatives implemented in the community.

DRAFT



## **VI. HAZARD MITIGATION STRATEGIES**

Mitigation actions are activities identified by a community, that if implemented will help reduce the communities exposure and risk to natural hazards.

Utilizing planning committee and public input, a comprehensive list of mitigation goals, objectives, and actions has been developed to assist the County in efforts reduce the effects of natural hazards. The mitigation strategies have been placed in priority order as identified in the Hazard Priority Matrix on page 52. As the mitigation strategies are further developed during the implementation process, a cost-benefit review will be undertaken to determine feasibility and cost-effectiveness.

The Hazard Mitigation Planning Steering Committee identified and discussed all potential mitigation actions and narrowed down those actions that appeared to have the most impact and that appeared to be the most cost effective.

Criteria used to establish mitigation actions included,

- 1) The direct impact on saving lives and preventing property damage.
- 2) The immediate and long term impacts of each action.
- 3) The cost effectiveness of each action.

The General Hazard Mitigation Strategy and action items (A-I) are meant to identify actions which focus on multiple hazards. Action items 1-28, on pages 154-172 are focused on specific natural hazards such as floods, tornados, and coastal hazards.

### **1. Douglas County Hazard Mitigation Strategy (pages 154-172)**

A-K General Hazard Mitigation Strategy  
1-11 Flood Hazard Mitigation Strategy  
12-15 Severe Weather Hazard Mitigation Strategy  
16-19 Wildfire Hazard Mitigation Strategy  
20-28 Coastal/Landslide Hazard Mitigation Strategy

### **2. Village of Lake Nebagamon Hazard Mitigation Strategy (pages 173-175)**

### **3. Village of Solon Springs Hazard Mitigation Strategy (pages 176-178)**

### **4. Village of Poplar Hazard Mitigation Strategy (pages 179-183)**

<b>General Hazard Mitigation Strategy</b>								
Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>A. Adopt and enforce state all-hazards building codes and encourage towns to adopt County standards.</b>	All jurisdictions as identified on page 3	County staff time (10hrs)	Douglas County	Ongoing	None	POSITIVE	HIGH	Douglas County Planning and Zoning Department
<b>Comments</b> 1. Identify deficiencies within the existing building codes and propose changes incorporating new knowledge, science, or techniques. 2. Work to improve enforcement of building codes. 3. Reduce costs through the use of mutual aid/interagency agreements for utility and communications systems. Cost sharing reduces the overall cost to the County.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing Activity				<b>Progress:</b> Ongoing Activity, In effect since 2005 as part of the Uniform Dwelling Code (UDC)				
<b>B. Adopt incentives to encourage mitigation</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 40 hours = \$2,000 per year	Douglas County , State and Federal Grant Funding	Ongoing	Unknown	POSITIVE	MEDIUM	Douglas County Planning and Zoning Department, Douglas County Emergency Management Department, towns
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)				<b>Progress:</b> Not completed due to lack of funding.				
<b>C. Coordinate planning efforts, communicate issues, and cooperate with local units of government.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 80 hours = \$4,000 per year	Douglas County , State and Federal Grant Funding	Ongoing	Reduced liability	POSITIVE	HIGH	Douglas County Planning and Zoning Department and Emergency Management
<b>Comments</b> Ensure that County wide and local hazard mitigation issues are jointly addressed. Form a County Hazard Mitigation Task Force using representatives from local jurisdictions within the County, business representatives, community leaders and elected County officials.								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)				<b>Progress:</b> Action ongoing. Improved awareness, communication and coordination in the wake of the Germann Road Fire. Improved county planning efforts relative to pandemic flu.				
<b>D. Developing administrative structures to support the implementation of mitigation programs</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 20 hours = \$1,000 initially, \$1,000 annually (for meetings)	Douglas County	Ongoing	Unknown	POSITIVE.	MEDIUM	Joint responsibility between Douglas County Planning and Zoning Department and Emergency Management
<b>Comments</b> See Item "C". Consider creating a Hazard Mitigation Task Force.								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)				<b>Progress:</b> Not completed due to lack of funding.				

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>E. Mitigation should be incorporated into land use management plans</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500	Douglas County , State and Federal Grant Funding (if available)	Ongoing, as plans are developed or revised.	Unknown	Unknown, could be negative response if actions are perceived to be a threat to private property rights.	MEDIUM	Douglas County Planning and Zoning
<p><b>Comments</b></p> <p>Douglas County adopted a comprehensive plan in December of 2009. Hazard mitigation principals were incorporated into the development of the comprehensive plan and hazardous areas were avoided on the County wide future land use map. Future revision of the comprehensive plan should incorporate provisions of the updated hazard mitigation plan.</p> <p>The Village of Lake Nebagamon adopted a comprehensive plan in 2009. Future revision of the village comprehensive plan should incorporate the village hazard mitigation strategy and relevant provisions of the Douglas County Hazard Mitigation Plan (Updated)</p> <p>Since 2010, Douglas County has new floodplain and wetland mapping which will aid hazard mitigation integration in future planning efforts. In addition, the county has better technical resources and more data showing the locations of structures within the floodplain. Countywide LiDAR acquisition is anticipated in 2016, which will also greatly improve the ability of the county to analyze hazard impacts and plan for mitigation.</p>								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)					<b>Progress:</b> Ongoing Activity (Policy) Hazard mitigation principals were incorporated into the comprehensive planning process (initiated 2007, completed 2009), this HMP will be incorporated into future plan amendments, or development of other land use management plans in the county.			
<b>F. Provide Information about Programs and Funding sources that may Support Mitigation Projects Undertaken by Douglas County.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 20 hours = \$1,000	Douglas County	Ongoing	None	POSITIVE	HIGH	Douglas County UWEX, NWRPC
<p><b>Comments</b></p> <ol style="list-style-type: none"> <li>1. Identify programs and other mechanisms that may support preservation of flood hazard areas and/or supplement local projects that acquire properties in flood hazard areas. Examples include: conservation easement programs; wetland mitigation/preservation; forestry preservation/restoration; etc.</li> <li>2. Identify possible existing funding sources for cost share of eligible types of mitigation projects.</li> <li>3. Investigate linking this information to existing readily available databases and inventories.</li> <li>4. Douglas County is expected to acquire LiDAR data and new Pictometry® data in 2016. Both would support completion of this action item.</li> </ol>								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)					<b>Progress:</b> Not completed due to lack of funding and data.			

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Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>G. Work with local jurisdictions to develop feasible and cost-effective mitigation projects through the ongoing planning process, with items included in the next plan update</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 60 hours = \$3,000 over the next 5 years	Douglas County, State and Federal Grant Funding	Ongoing	Unknown	Unknown	MEDIUM	Douglas County Planning and Zoning
<b>Comments</b> 1. Identify, collect, develop and publicize tools to encourage and guide preparation of mitigation plans by local governments in Douglas County. 2. Accomplishments: Initiation of a Community Wildfire Protection Planning project in southern Douglas County 3. Home ignition zone assessments conducted in Wascott and Brule 4. Towns of Highland and Wascott have initiated local wildfire hazard informational and education programs 5. Development of a "Firewise" model subdivision in the Town of Gordon (Gordon Heights) 6. Structural Collapse Team – City of Superior is part of the state rescue team 7. National Incident Management System (NIMS) process has been ongoing with towns and villages for 4 years 8. New mobile command post 9. New mass casualty response trailers 10. County wide mutual aid agreement (fire suppression) 11. Acquisition of aerial pictometry to aid in disaster planning and recovery 12. New Emergency Planner position 13. Developed County wide emergency response book (fire zone maps) 14. Developed digital building footprint data set which can be used in emergency response planning and analysis 15. Received Section 154 funding for safety improvements to Radigan Dam in the Town of Dairyland 16. Developed a Community Wildfire Protection Plan (CWPP) for southern Douglas County in 2011. 17. Improved Firewise outreach and fire programs within the high risk (barrens) areas of Douglas County,								
<b>Status (Completed, Deferred, Deleted):</b> Partially completed. Action unchanged (Deferred)					<b>Progress:</b> Not fully completed due to lack of funding. Accomplishments are identified in items 1-17 above.			
<b>H. Increase Public Education and Awareness of general hazard mitigation.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 100 hours = \$5,000 per year	Douglas County, State (UWEX) and Federal Grant Funding.  <b>Note:</b> Douglas County should apply for FEMA grant funds to assist in promoting public awareness.	Ongoing	None	POSITIVE	MEDIUM	Joint responsibility between Douglas County Planning and Zoning Department and Emergency Management

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<b>Comments</b>								
1. Develop and implement an outreach plan involving state and federal agencies that communicate with the public (include newsletter articles, conference presentations, web page postings, industry organizations, community- and faith-based organizations, and professional associations). The objective will be to foster long-term increases in awareness of natural hazards, benefits of hazard insurance, and mitigation actions that can be taken to reduce future damage. 2. Provide weather radios to all critical facilities. County government can provide information describing all types of hazards, methods for preventing damages resulting from hazardous conditions, and how to respond when a hazard threatens. Either directly or by lobbying elected officials, citizens can also get involved in comprehensive planning activities that identify and alleviate their communities' hazards. Identify state and federal programs and potential funding that might support mitigation projects. Make available to local communities. 3. There are challenges in getting electronic media (PEGA) out to the rural areas of Douglas County 4. Brule-St. Croix CWPP completed in 2011, with significant educational component. 5. Improved communication with public relative to flooding issues of Lake St. Croix.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing actions. Unchanged (Deferred)					<b>Progress:</b> Not fully completed due to lack of funding.			
Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>I. Maintain and update the Douglas County Hazard Mitigation Plan [Updating the plan also requires updating the risk assessment every five years]</b>	Douglas County	\$50/hr County staff time x 30 hours = \$1,500 per year	Apply for state or federal grant funds	Every 5 years	None	POSITIVE	MEDIUM	Joint responsibility between Douglas County Planning and Zoning Department and Emergency Management
<b>Comments</b>								
The Douglas County Hazard Mitigation Plan should be reviewed and revised periodically (at least once every 5 years) to incorporate need data or changing values. Plan revision should focus primarily on updating the plan's goals and objectives, and revising the Hazard Mitigation Strategy.								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)					<b>Progress:</b> Ongoing Activity			
<b>J. Improve broadband Internet access in rural areas of Douglas County.</b>	Douglas County	\$Unknown	Apply for state or federal grant funds	Ongoing Activity	Significant benefit to local economic development	POSITIVE	MEDIUM	Joint responsibility between Douglas County Planning and Zoning Department and Emergency Management
<b>Comments</b>								
High speed broadband would enable first responders to share text, image and video across jurisdictional barriers. Fire incident commanders could share and gather information and monitor and direct their units via voice, video and data-enhanced communications either at the scene or remotely. High speed Internet access is currently unavailable throughout much of rural Douglas County.								
<b>Status (Completed, Deferred, Deleted):</b> New Action Item					<b>Progress:</b> N/A			

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Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<i>K. Acquire technical equipment (such as unmanned aerial vehicle) to support rapid response and emergency recovery efforts in Douglas County</i>	Douglas County	\$10,000	Apply for state or federal grant funds	2020	None	POSITIVE	MEDIUM	Douglas County Emergency Management
<b>Comments</b> Unmanned Aerial Vehicle (UAV) technology has many emergency management applications, including assessing damage from a disaster event, event monitoring and assisting in location and recovery efforts.								
<b>Status (Completed, Deferred, Deleted):</b> New Action Item					<b>Progress:</b> N/A			

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<b>Flood Hazard Mitigation Strategy</b>								
Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>1. Inventory all dams and determine "downstream area of concern".</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 200 hours = \$10,000	Douglas County, State or Federal grant funding sources.	2014, contingent upon grant funding	Little	Unknown	MEDIUM	<b>Primary:</b> Douglas County Planning and Zoning <b>Secondary:</b> Forestry Department, County GIS Department
<b>Comments</b>								
1. Identify dam ownership and responsibility. 2. Identify downstream "areas of concern" related to dam failure. 3. Douglas County Forestry has created new plans for dams on County Forest.								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)					<b>Progress:</b> Not completed due to lack of funding/data. Dams in Douglas County have been inventoried by the Wisconsin Department of Natural Resources and ownership/management information has been compiled. Mapping the downstream area of concern was not completed by the target date of 2005 due to a lack of accurate floodplain mapping and data. Newly acquired digital floodplain and structure location data greatly enhances the ability to assess downstream impacts.			
<b>2. Work with developers and landowners to alert them to past flooding in areas where development is to occur.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 40 hours = \$2,000 per year	Douglas County Emergency Management/UW-Extension	Ongoing	Unknown	POSITIVE	MEDIUM	Douglas County Planning and Zoning
<b>Comments</b>								
1. Educate private landowners. 2. Coordinate with dam safety evaluation and identification of downstream "areas of concern". 3. Contact repetitive loss property owners to discuss mitigation opportunities, and determine interest should future project opportunities arise. 4. Compile an inventory of grant programs available to assist landowners.								
<b>Status (Completed, Deferred, Deleted):</b> Deleted					<b>Progress:</b> In 2012, Douglas County completed a flood assessment to identify structures within the floodplain. Action is being implemented through the existing permit process.			

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>3. Develop improved monitoring and warning systems</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 40 hours = \$2,000 per year	Douglas County , FEMA grants	Ongoing	little	POSITIVE	MEDIUM	Douglas County Emergency Management
<b>Comments</b> 1. Work with appropriate agencies to increase the number of monitoring stations on County waterways. 2. Coordinate with local units of government, and residents along river ways to better inform citizens and monitor flood activity. 3. Encourage the public to purchase weather radios. 4. Consider implementing a cost-share or reimbursement program to businesses that sell weather radios.								
<b>Status (Completed, Deferred, Deleted):</b> Unchanged (Deferred)				<b>Progress:</b> Not completed due to lack of funding source.				
<b>4. When designing roads and culverts, use local citizen comments and knowledge of past flooding to gauge design elements.</b>	Douglas County All jurisdictions as identified on page 3	\$50/hr County staff time x 80 hours = \$4,000 per year	None	Ongoing	Little	POSITIVE	HIGH	Douglas County highway Department, Land Conservation Department, Towns
<b>Comments</b> Provide the public and local units of government with opportunities for input and involvement in the process. Process for TRANS 207 (DNR review of roads, culverts and bridges within mapped floodplain)								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing action				<b>Progress:</b> Action is part of existing local design protocols.				
<b>5. Continue to review and update zoning ordinances, and recommend revisions to requirements for development within the floodplain, where appropriate.*</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 40 hours = \$2,000 per year	Douglas County	Ongoing, Flood evaluation should be completed as soon as DFIRM data becomes available	Unknown	Unknown, could be negative response if actions are perceived to be a threat to private property rights.	HIGH	County Planning and Zoning Department, Geographic Information Systems.
<b>Comments</b> 1. Evaluate elevation requirements for new residential and nonresidential structures in the unincorporated floodplain area. 2. Conduct thorough flood evaluation as soon as digital floodplain maps (DFRIMS) become available, or FIRM maps are digitized, and flood prone areas identified.(DFIRMS not yet available) 3. Coordinate review and revisions with the Douglas County Land Use Plan, and future development of a Chapter 66 compliant Comprehensive Plan.(Completed)								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing activities				<b>Progress:</b> Modern digital floodplain maps (DFIRMS) were produced for Douglas County in 2011. The county has used this information, in conjunction with detailed structure location information, to identify potentially flood-vulnerable structures.				

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>6. Work to develop/update floodplain mapping, and map flood-prone areas outside of the designated floodplains*</b>	All jurisdictions as identified on page 3	Cost of the flood analysis is included in Action Item 1. Ongoing cost of \$500 per year	Douglas County	Ongoing	Reduce liability	POSITIVE	HIGH	Douglas County Emergency Management, Douglas County GIS Department
<b>Comments</b> 1. Encourage the development of floodplain maps for all local waterways not currently mapped on Flood Insurance Rate Maps or County maps, with special attention focused on mapping rural and unincorporated areas. 2. DFIRM floodplain data is currently unavailable for Douglas County. 3. Conduct a basic flood analysis of flood-prone areas outside of the designated floodplains using existing elevation data (USGS DEM's) and in-house modeling software such as ArcView. This purpose of this evaluation would be to determine the downstream "areas of concern" relative to dam failure. 4. Need to acquire LiDAR data as a model for floodplain mapping								
<b>Status (Completed, Deferred, Deleted):</b> Partially completed, Deferred					<b>Progress:</b> Modern digital floodplain maps (DFIRMS) were produced for Douglas County in 2011. The county has used this information, in conjunction with detailed structure location information, to identify potentially flood-vulnerable structures. Douglas county updated development-risk flood mapping in the fall of 2016.			
*Denotes actions related to continued compliance with NFIP.								
<b>7. Educate public on building design and principles.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	Douglas County	Ongoing	None	POSITIVE	HIGH	Douglas County Planning and Zoning Department
<b>Comments</b> 1. Disseminate information which outlines construction flood mitigation measures, applicable zoning codes and requirements in Douglas County, recommendations, and identifies appropriate federal, state, and local contact information. 2. Explore options for incentives to encourage property owners to engage in mitigation. 3. Promote through local building contractors, Home Show, etc.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing action					<b>Progress:</b> The Planning & Zoning Department provides technical support and information on applicable zoning codes and local development requirements.			

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>8. Inventory and seek programs to purchase or move buildings impacted by flooding and have had repetitive loss, or to reduce risk of loss.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 20 hours = \$1,000 per year	Douglas County	Ongoing	Reduces liability	POSITIVE	HIGH	Douglas County Planning and Zoning Department.
<p><b>Comments</b></p> <p>1. Explore the feasibility/applicability of federal programs such as:  <b>Hazard Mitigation Grant Program (FEMA)</b>                      Individual homeowners and businesses may not apply directly to this program; however a community may apply on their behalf. HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage.</p> <p><b>Flood Mitigation Assistance Program (FEMA)</b>                      The Flood Mitigation Assistance Program provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). Under the FMA, there are three types of grant programs: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to States and communities to prepare Flood Mitigation Plans.</p> <p><b>Pre-Disaster Mitigation Program (FEMA)</b>                      The PDMP provides technical and financial assistance to States and local governments for cost-effective pre-disaster hazard mitigation activities that complement a comprehensive mitigation program, and reduce injuries, loss of life, and damage and destruction of property.</p> <p>2. Draft a letter to owners of repetitive loss or substantially damaged structures and inform them of potential state and federal resources and ways to reduce or eliminate further flood losses. Within this letter, inform property owners of Emergency Management Coordinators availability to act as a resource for questions and information.</p>								
<b>Status (Completed, Deferred, Deleted):</b> Deferred, ongoing					<b>Progress:</b> No community interest in relocating repetitive loss or flood-impacted during the planning period.			
<b>9 Identify surface water drainage obstructions for unincorporated portions of Douglas County</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 40 hours = \$2,000 per year	Douglas County	March 2014	Unknown	POSITIVE	Medium	Douglas County Emergency Management, Douglas County Highway Department, Emergency Management
<p><b>Comments</b></p> <p>1. Map all drainage structures within the unincorporated portions of the County.                      2. Prepare an inventory of drainage structures that historically create flooding problems and target them for retrofitting.                      3. Prepare an inventory of drainage problems, and identify causes and potential mitigation actions drainage problem areas.</p>								
<b>Status (Completed, Deferred, Deleted):</b> Partially complete					<b>Progress:</b> In 2010, the Douglas County Highway Department initiated a County wide culvert inventory (County level – not town level). Barriers to completion include lack of funding and manpower to complete the activity.			

Deferred or unchanged action  
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Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>10. Promote acquisition of flood prone areas for open space protection, fish and wildlife habitat and preservation of water quality</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	Unknown	Ongoing, flood mitigation planning should be part of the County land use planning process should Douglas County develop a comprehensive plan under SS 66.1001.(Completed)	Improved Water Quality	POSITIVE	HIGH	Douglas County Planning and Zoning Department, Douglas County Emergency Management, Local municipalities
<b>Comments</b>								
1. Coordinate flood mitigation planning with land use planning. 2. Consider the purchase of conservation easements as an affordable means of protecting resources. Partner with cooperating agencies (TNC, Land Trusts, etc.) where feasible. 3. Provide landowners with information about opportunities for open space protection (land trusts, easements, tax incentive programs, etc.).								
<b>Status (Completed, Deferred, Deleted):</b> Deferred, ongoing					<b>Progress:</b> As critical flood-prone areas are identified, acquisition tools will be examined for feasibility.			
<b>11. Conduct a comprehensive inventory of all dams and culverts within the County to determine condition and inspection history.</b>	All jurisdictions as identified on page 3	Existing County staff time	Douglas County	By 2015	None	POSITIVE	HIGH	Douglas County Emergency Management & Highway Department
<b>Status (Completed, Deferred, Deleted):</b> Partially completed, deferred.					<b>Progress:</b> County Forestry Department has completed dam inventory of county forestlands. All county-owned dams have been located and many flood-vulnerable culverts were identified following the 2012 flood event.			

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

<b>Severe Weather<sup>11</sup> Hazard Mitigation Strategy</b>								
<b>Action</b>	<b>Action Applies to</b>	<b>Cost Estimate</b>	<b>Funding</b>	<b>Timeframe</b>	<b>Estimated Economic Impact</b>	<b>Public and Political Response</b>	<b>Feasibility</b>	<b>Responsibility</b>
<b>12. Promote use of the weather alert system (EAS) including cable/TV alerts to ensure public informed</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 5 hours = \$250 per year	Douglas County	Ongoing	Little	POSITIVE	HIGH	Douglas County Emergency Management
<b>Comments</b>								
<ol style="list-style-type: none"> <li>Promote through PSA's, local media, newsletters, awareness days, training activities, etc. Identify additional opportunities to inform and educate the public outside of "Severe Weather Awareness Week".</li> <li>Work with local cable television providers to implement a break alert, whereby cable service is interrupted when a severe weather alert is issued.</li> </ol>								
<b>Status (Completed, Deferred, Deleted):</b> Deferred, ongoing.					<b>Progress:</b> Douglas County engages in activities to promote the weather alert system and general severe weather awareness as an ongoing part of departmental programming. The county sponsors weather spotter classes and cooperates with the National Weather Service on outreach activities in the region.			
<b>13. Encourage residents to purchase personal weather alert monitors to provide up to date information.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 5 hours = \$250 per year	Douglas County , FEMA grants, unknown	Ongoing	Little	POSITIVE	MEDIUM	Douglas County Emergency Management
<b>Comments</b>								
<ol style="list-style-type: none"> <li>Use "Severe Weather Awareness Week" publicity opportunities to inform and educate the public on the benefits of personal weather radios.</li> <li>Seek additional opportunities to publicize the use of personal weather radios.</li> <li>Investigate potential funding sources (grant funds), whereby Douglas County could acquire, or assist local units of government and residents in acquiring weather radios.</li> <li>Consider "rebate" or "reimbursement" program for vendors.</li> </ol>								
<b>Status (Completed, Deferred, Deleted):</b> Deferred, ongoing					<b>Progress:</b> The use of personal weather radios is encouraged and promoted through ongoing educational and outreach campaigns in Douglas County.			

<sup>11</sup> Severe Weather includes: Thunderstorms, severe winds, lightning, hail, heat, drought and winter weather hazards

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>14. Encourage the construction of "safe" rooms</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 5 hours = \$250 per year	Douglas County	Ongoing	Little	POSITIVE	HIGH	Douglas County Emergency Management
<b>Comments</b> 1. Promote the construction and use of concrete safe rooms in homes and shelter areas of mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas. 2. Develop and distribute educational materials and promote through other means. 3. Encourage mobile home parks and campgrounds to consider safe rooms to protect persons from threats.								
<b>Status (Completed, Deferred, Deleted):</b> Deferred				<b>Progress:</b> Not completed due to lack of funding.				
<b>15. Educate public and local units of government</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	Douglas County, State and Federal grant funding?	Ongoing	Unknown	Unknown	HIGH	Douglas County Emergency Management, Douglas County Planning and Zoning
<b>Comments</b> 1. Continue to conduct a tornado simulation exercise annually. 2. Educate government employees on the safest building locations and evacuation routes. 3. Continue to promote awareness of public shelter areas. 4. Encourage citizens to develop an Emergency Communications Plan. 5. Develop and implement an <u>ongoing public education program</u> emphasizing tornado characteristics, preparedness, personal safety measures, and sheltering requirements or availability. 6. Work with local media to promote public awareness. 7. Work cooperatively with local communities to promote updated building codes for window size and thickness, roof anchors, and mobile home tie-downs. 8. Maintain emergency response resource lists and contact information. These lists should include shelters, heavy equipment, road controls and emergency personnel identification tags. 9. Define the roles of community service agencies in providing assistance to disaster victims and rescue workers. 10. Identify the resources available for property protection. 11. Encourage people to be self-sufficient for 72-hour period. (This is for all natural disasters) (Water/food/etc.) 12. Apply for grant funds to assist Douglas County in hazard mitigation education. 13. Distribute hazard mitigation publications developed by the University of Wisconsin-Extension. 14. Participate in Severe Weather Awareness Week. 15. Promote awareness utilizing local media outlets such as radio, television and newspaper. 16. Increase awareness of hazards and hazard mitigation through the school systems. Consider the use of available audio-visual material such as the National Lightning Safety Institute's lightning safety videos. These videos teach the basics for indoor, outdoor, recreation, and work situations.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing action.				<b>Progress:</b> The directives identified in 1-16 above continue to be departmental priorities related to fostering local education and outreach.				

<b>Wildfire Hazard Mitigation Strategy</b>								
Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>16. Promote public/ landowner awareness of wildfire hazard mitigation measures.</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	Douglas County, Wisconsin CWPP Program, Wisconsin DNR Fuel Reduction Grant	Ongoing	None	POSITIVE	MEDIUM	Douglas County Emergency Management, Douglas County Planning and Zoning
<b>Comments</b> 1. Use fire prone wild areas video (WDNR) to use to promote awareness. 2. Educate public on impacts of wildfires and how public may be able to prevent structural damage. 3. Promote general fire safety. 4. Educate public on possible building designs to retard homes impacted from fires (metal roofs etc.). 5. Provide educational material on how to design home and surroundings to prevent fire impacts. 6. Advise public and developers of the danger of building homes in remote areas where fire protection is not as readily available. 7. Recommend that the foundations of homes and buildings in fire prone areas are enclosed rather than open. 8. Encourage the safe disposal of yard waste, rather than burning. 9. Ensure that structures within fire prone areas are surrounded by a “defensible space”, or buffer zone of 30 to 100 feet. Areas within the zone should be cleared of all combustible materials. 10. Encourage the use of “fuels management” property maintenance techniques such as pruning and clearing of dead vegetation, selective logging, planting fire resistant vegetation, keeping grass short, and creating fuel breaks.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing Activities.					<b>Progress:</b> The Wisconsin DNR is the lead entity promoting fire awareness education in the region. During the planning period many accomplishments were realized as a result of WDNR initiatives in Douglas County and through the implementation of the Brule-St. Croix CWPP. Some examples include: <ul style="list-style-type: none"> <li>Town of Gordon right-of-way maintenance fuel breaks constructed</li> <li>WDNR mass media blitzes (fire awareness)</li> <li>Development of 2 brush disposal sites in the Town of Wascott</li> <li>Home ignition zone assessments (HZA) completed in the Town of Gordon</li> <li>Annual “chipper day” in the Village of Solon Springs</li> <li>Construction of fuel breaks in the Town of Highland</li> <li>“Be somebody” campaign</li> </ul>			

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Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>17. Develop and distribute maps relating to the fire hazards (fire risk areas)</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 80 hours = \$4,000	Douglas County , FEMA grant, Wisconsin CWPP Program	Ongoing	little	POSITIVE	MEDIUM	Douglas County Emergency Management, Douglas County Planning and Zoning Department, forestry department
<b>Comments</b>								
1. Utilize available GIS technology to conduct a County wide wildfire risk assessment, and to identify areas of the County that are most vulnerable to wildfire. 2. Support GIS mapping of vegetative cover to assist in analysis and the planning decision-making process.								
<b>Status (Completed, Deferred, Deleted):</b> Partially completed.				<b>Progress:</b> In 2011, a community wildfire protection plan was completed for the barrens area of southern Douglas County. A localized risk assessment was completed as part of this project. The Wisconsin DNR has also completed a statewide risk assessment, which includes Douglas County.				
<b>18. Consider regulatory/enforcement changes to reduce losses to wildfire</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500	None	Ongoing	Unknown	Unknown, could be negative response if actions are perceived to be a threat to private property rights.	MEDIUM	Douglas County Planning and Zoning Department.
<b>Comments</b>								
1. Ensure that driveways meet clearance guidelines to facilitate easy access of emergency vehicles. 2. Consider fire-wise standards for subdivision design (i.e. looping access). 3. Continue to diligently enforce burning restrictions. 4. Consider a "fire hazard overlay zone". This could include an overlay area based on fire sensitivity and risk, and include standards, guidelines and recommendations relative to wildfire hazard mitigation. 5. Incorporate wildfire mitigation regulatory tools into future ordinance amendments resulting from the recently adopted (12/09) comprehensive plan.								
<b>Status (Completed, Deferred, Deleted):</b> Partially completed, deferred.				<b>Progress:</b> The unincorporated towns in Douglas County are beginning to address these issues through local driveway and access ordinances.				
<b>19. Develop an emergency water source in the Village of Poplar.</b>	Village of Poplar Amnicon Lake Nebagamon	\$500,000	HMGF Grant	Ongoing	Unknown	POSITIVE	MEDIUM	Village of Poplar Douglas County Emergency Management
<b>Comments</b>								
1. Water source to support firefighting efforts (including wildland), which would support several communities in north-central Douglas County.								
<b>Status (Completed, Deferred, Deleted):</b> New action item				<b>Progress:</b> N/A				

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

<b>Coastal Hazard/Landslide Mitigation Strategy</b>								
<b>Action</b>	<b>Action Applies to</b>	<b>Cost Estimate</b>	<b>Funding</b>	<b>Timeframe</b>	<b>Estimated Economic Impact</b>	<b>Public and Political Response</b>	<b>Feasibility</b>	<b>Responsibility</b>
<b>20. Promote public awareness of coastal hazards and landslides</b>	All jurisdictions as identified on page 3	<\$500 for mapping-related activities (utilize existing County staff)	Douglas County , Wisconsin Coastal Management Grant	Ongoing,	None	POSITIVE	HIGH	Douglas County Planning and Zoning Department, Douglas County Emergency Management
<b>Comments</b> 1. Coastal residents, property owners and communities should strive to be knowledgeable and aware of the dynamic nature of their environment and the hazards present. 2. Douglas County could seek technical assistance from the Wisconsin Coastal Management Program. The County could consider applying for WCMP grant funds to assist in identifying and mapping coastal/landslide hazards within the County, and promoting coastal/landslide hazard awareness in Douglas County. 3. Communities should consider instituting coastal stewardship programs to highlight and build awareness of their coastal resources and the value of their preservation. 4. Douglas County should utilize local media, schools and special events (County fair, "Severe Weather Awareness Week", etc.) to educate the public on coastal/landslide hazards that exist within the County. 5. Property owners should be made aware of potential coastal/landslide hazards that may exist on their property.								
<b>Status (Completed, Deferred, Deleted):</b> Ongoing action.					<b>Progress:</b> The 2013 coastal bluff recession rate study greatly increased the level of awareness of coastal bluff recession hazards and vulnerabilities in Douglas County.			
<b>21. Consider the use of land use controls to reduce coastal/landslide hazards</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 16 hours = \$800 per year	Douglas County, WCMP Grant, other?	Ongoing	Unknown	Unknown, could be negative response if actions are perceived to be a threat to private property rights.	MEDIUM	Douglas County Planning and Zoning Department
<b>Comments</b> 1. Consider revising existing zoning codes to consider the potential coastal/landslide hazards which exist in Douglas County. 2. Consider adopting minimum development standards and guidelines which consider coastal/landslide hazards. Examine the model zoning ordinance for reducing coastal hazard vulnerability which identified in the Wisconsin Emergency Management Plan, if developed. 3. Continue to enforce the existing County shoreland development standards. 4. Incorporate setbacks from identified high-hazard areas. 5. Evaluate potential land use controls as the County proceeds with amending ordinances during the implementation of the newly-adopted comprehensive plan.								
<b>Status (Completed, Deferred, Deleted):</b> Deferred					<b>Progress:</b> The 2013 coastal bluff recession rate study provides a basis for revising the county's zoning ordinance.			

○ Deferred or unchanged action    ○ Deleted Action    ○ New Action    ○ Completed or partially completed action

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>22. Coordinate coastal/landslide hazard mitigation with ongoing County and local land use planning.</b>	All jurisdictions as identified on page 3	None (utilize existing County staff)	Douglas County, apply to WCMP for grant funds to assist the County in developing a Chapter 66 compliant "smart growth" comprehensive plan. WCMP funds could be used to achieve action item 3.	Ongoing	Unknown	POSITIVE	HIGH	Douglas County Planning and Zoning Department
<b>Comments</b> 1. Ensure that the proposed future land use is consistent with local, regional, and state planning and zoning requirements. 2. Ensure that the proposed future land use considers natural constraints such as coastal and landslide hazards. 3. Consider coastal/landslide hazards as part of infrastructure planning and design.								
<b>Status (Completed, Deferred, Deleted):</b> Deferred.				<b>Progress:</b> Countywide comprehensive plan was not updated during the 2010-2015 HMP cycle.				
<b>23. Collect exiting landslide hazard information</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	FEMA grant funds or consider applying for state and federal grant funds.	Ongoing	None	POSITIVE.	MEDIUM	Douglas County Planning and Zoning Department
<b>Comments</b> 1. Identify potential land shift areas within Douglas County based upon historic data and existing studies of the area. 2. Identify resources available to conduct study. 3. Inventory property losses and potential future losses.								
<b>Status (Completed, Deferred, Deleted):</b> Partially completed, deferred				<b>Progress:</b> Partially completed as part of the 2013 bluff recession rate study. Loss estimates could be derived using calculated bluff recession rates and structure locations identified using Lidar data. Erosion areas and vulnerabilities along inland waterways have not been studied in detail. New target date for completion of 2020				
<b>24. Continued enforcement of County Shoreland Zoning Ordinance</b>	All jurisdictions as identified on page 3	Existing staff time	Douglas County	Ongoing	Unknown	Generally accepted	HIGH	Douglas County Planning and Zoning Department
<b>Comments</b> Implemented, mandated by Wisconsin Statutes								
<b>Status (Completed, Deferred, Deleted):</b> Action is ongoing as mandated by Wisconsin Statutes.				<b>Progress:</b> Ongoing activity				

Deferred or unchanged action  
   Deleted Action  
   New Action  
   Completed or partially completed action

Action	Action Applies to	Cost Estimate	Funding	Timeframe	Estimated Economic Impact	Public and Political Response	Feasibility	Responsibility
<b>25. Support and encourage coastal hazard area data development</b>	All jurisdictions as identified on page 3	\$50/hr County staff time x 10 hours = \$500 per year	Unknown	Ongoing	Unknown	POSITIVE	HIGH	Douglas County Planning and Zoning, Land Conservation Department
<b>Comments</b> 1. Use GIS technology to identify and map coastal hazard areas. 2. Consider applying for grant funds to accomplish task. Possible funding sources include: Wisconsin Coastal Management Program, Wisconsin Department of Natural Resources, and GLNPO (U.S. Environmental Protection Agency)								
<b>Status (Completed, Deferred, Deleted):</b> Completed. Coastal recession rate data collected under the 2013 bluff recession rate study. Next steps would involve integration of recession rate and bluff stability data into existing county zoning ordinance.					<b>Progress:</b>			
<b>26. Acquire at-risk properties along the St. Louis River estuary.</b>	Village of Oliver, Town of Superior	\$500,000, estimated	HMGP	At request of willing property owners.	Unknown	POSITIVE	HIGH	Affected municipalities
<b>Comments</b> 1. Two properties were acquired by the Village of Oliver in 2002, under an HMGP grant. At least four at-risk properties exist adjacent to the river corridor.								
<b>Status (Completed, Deferred, Deleted):</b> New Action Item					<b>Progress:</b> N/A			
<b>27. Implement the recommendations of the Lake Superior Recession Rate Study in Douglas County.</b>	Coastal Towns	Existing staff time	N/A	By 2017	Unknown	POSITIVE	HIGH	Douglas County Zoning
<b>Comments</b> 1. Implementation would involve integrating bluff recession rate and stable slope setbacks into existing county zoning ordinances.								
<b>Status (Completed, Deferred, Deleted):</b> New Action Item					<b>Progress:</b> N/A			
<b>28. Expand the Lake Superior Recession Rate Study to include the St. Louis River Estuary in Douglas County.</b>	Town of Superior, Village of Oliver	<\$10,000	Wisconsin Coastal Management Program (WCMP) grant	By 2018	Unknown	POSITIVE	HIGH	Douglas County Zoning
<b>Comments</b> 1. The existing Lake Superior Recession Rate Study covered rural Douglas County along the open water coast of Lake Superior. The St. Louis River estuary, and connecting tributaries are also experiencing significant bluff erosion. The same principals and methods used in the broader coastal recession rate study completed in 2012 could be applied to this area.								
<b>Status (Completed, Deferred, Deleted):</b> New Action Item					<b>Progress:</b> N/A			



### **Village of Lake Nebagamon Hazard Mitigation Strategy**

The Village Board of the Village of Lake Nebagamon identified the hazards that have potential occurrence in Lake Nebagamon and outlying areas. The hazards prioritized by the Village Board, which have occurred in past years, are tornados, flooding, wild fires, thunderstorms, hailstorms, lightning, droughts excessive heat, landslides, and winter storms such as blizzards.

The hazard ranking process determined that lightning, hailstorms, thunderstorms, and flooding are the most severe weather conditions that would affect the Lake Nebagamon area. The village board considered what activities could be enacted or taught by the village board and other units of government to lessen the damage that may occur in the event that one of these hazards effect the Village of Lake Nebagamon and outlying areas. The units of government will include Douglas Emergency Management, Federal Emergency Management Agency, American Red Cross, Wisconsin Department of Natural Resources, the Wisconsin Department of Transportation and local fire departments. The activities the village board planned to do with some being complete if funding becomes available are shown in the following pages.

#### **Lightning**

- 1) The village board will educate residents about the hazards of lightning and inform people in major storms that our auditorium is available in case of an emergency. Our fire department is paged by the County communication center for storms; the FD volunteers will be available to make residents aware when there are major storms.

**Status (Completed, Deferred, Deleted):** Ongoing action

**Progress:** A letter is sent out annually to all residents regarding safe locations in case of emergencies.

#### **Hail Storms**

- 2) The village board will try to educate residents along with insurance companies when hailstorms occur. We encourage village residents to listen to weather stations when storms occur. We encourage village residents to listen to weather stations when storms are in the area and follow warnings.

**Status (Completed, Deferred, Deleted):** Ongoing action



### Thunderstorms (wind)

- 3) The village board will educate residents about the hazards of major storms. The fire department will also be involved as they have pagers and the county communication center alerts them to major storms. The auditorium will be opened and available to the public in case of major storms. We are working on funding to notify residents of major storms.

**Status (Completed, Deferred, Deleted):** Ongoing action. In August 2014, there was an unusual incident of high winds which caused significant damage. Debris removal protocols were followed by fire department and public works.

### Floods

- 4) Residents will be notified of a threat of a flood per the fire department going door to door and evacuating if necessary. The auditorium will be available if necessary for usage in case of a flood.

**Status (Completed, Deferred, Deleted):** Ongoing action

### Winter Storms

- 5) This would include severe blizzards along with ice storms. The village crew will keep roads clear with every snowfall. If possible, the village crew will remove snow from residential areas so snow does not accumulate in large mounds. The village has stock piled an amount of sand and salt in case of an ice storm. In case of severe or excessive snow, extra help may be needed and will be addressed by the village board.

**Status (Completed, Deferred, Deleted):** Ongoing action

### Tornado

- 6) The fire department will be advised of a tornado per the County communication center paging them. They will staff the fire department and open the auditorium in case of an emergency. We are working on a siren system and trying to get funding, which is very difficult for small communities.

**Status (Completed, Deferred, Deleted):** Deferred due to lack of funding



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### Wildland Fire

- 7) The fire department will educate residents of the steps to follow in the event a wild fire occurs. The village board and the fire department work together along with the Wisconsin DNR in the event this hazard should occur. An assessment of water sources will be made. Additional water sources are identified in neighboring communities if it is needed, along with the Maple Fire Department having the super pumper available. In the fall of 2015, we are equipping a brush truck for rapid response.

**Status (Completed, Deferred, Deleted):** Ongoing action

**Progress:** The village now posts fire weather conditions on our auditorium board. The village also trains each spring with the Wisconsin Department of Natural Resources.

### Droughts

- 8) The village board will help with awareness in these cases.

**Status (Completed, Deferred, Deleted):** Ongoing action

### Excessive Heat

- 9) The village board and fire department will try to educate citizens if there is an extended time when heat is excessive.

**Status (Completed, Deferred, Deleted):** Ongoing action

**Progress:** The village publishes heat safety information in our local newsletter.

### Landslides

- 10) At this point, we have had no landslides, if this does occur the board along with the fire department will address this issue.

**Status (Completed, Deferred, Deleted):** Ongoing action



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### **Village of Poplar Hazard Mitigation Strategy**

The Village Board of the Village of Poplar identified the hazards that have potential for occurrence in Poplar and outlying areas. The hazards prioritized by the Village Board, which have occurred in past years, are tornados, flooding, straight line winds, thunderstorms, lightning, wild fires, hailstorms, winter storms such as blizzards, droughts and excessive heat.

The most severe to the least severe were ranked, using number 3 as most severe and 1 as least severe.

The hazards were ranked as follows:

HAZARD	RISK ASSESSMENT
Tornados	3
Flooding	3
Straight Line Winds	3
Thunderstorms	2.5
Lightning	2.5
Wild Fires	2.5
Hail Storms	2.5
Winter Storms	2
Droughts	1.5
Excessive heat	1

### **General Hazard Mitigation Actions**

**Action 1:** Install underground water storage for fire department use. (Action item #19 in countywide multi-jurisdictional hazard mitigation strategy)

**Action 2:** Refurbish or replace warning siren.

**Action 3:** Formalize cooperative agreements with surrounding communities for fire protection, road maintenance and wastewater needs.

**Action 4:** Replace the village hall and fire hall.

**Action 5:** Extend high speed broadband Internet access to the village.

The ranking process determined that tornados, flooding, straight line winds, and thunderstorms are the most severe weather conditions that would affect the Poplar area. The village board considered what activities could be enacted or taught by the village board and other units of government to lessen the damage that may occur in



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the event that one of these hazards effect the Village of Poplar and outlying areas. The units of government will include Douglas County Emergency Management, Federal Emergency Management Agency, American Red Cross, Wisconsin Department of Natural Resources, the Wisconsin Department of Transportation and local fire departments. The activities the village board planned to do with some being complete if funding becomes available are shown in the following pages.

### **Hazard-Specific Mitigation Actions**

#### **Tornados**

The fire department will be advised of a tornado per the County communication center paging them. They will staff the fire department and open the village hall in case of an emergency. We will look into the possibility of using the Northwestern Middle and Elementary schools as emergency shelters as well.

#### **Floods**

Residents will be notified of a threat of a flood per the fire department going door to door and evacuating if necessary. The Village Hall and Fire Hall will be available if necessary for usage in case of a flood.

#### **Straight Line Winds, Thunderstorms, Lightning and Hail**

If government funding becomes available, the Village board in conjunction with other local governments will educate people with advertisements, pamphlets and training of what steps to follow to promote safety and life in the event of these hazards occurring. We will also place information and links on our website "villageofpoplar.com" for residents to use as a resource in case of emergency.

We encourage village residents to listen to weather stations when storms occur. We encourage village residents to listen to weather stations when storms are in the area and follow the warnings.

The village board will educate residents about the hazards of lightning and inform people in major storms that our auditorium is available in case of an emergency. Our fire department is paged by the County communication center for storms; the FD volunteers will be available to make residents aware of options when there are major storms.



### **Wildfires**

The fire department will educate residents of the steps to follow in the event a wild fire occurs. The village board and the fire department will work together along with the Wisconsin DNR in the event this hazard should occur. An assessment of water sources will be made. Since the removal of the poplar dam the primary water source has been eliminated and plans are underway to place a series of underground storage tanks near the fire hall. Additional water sources have been identified in neighboring communities in case it is needed, along with the Maple Fire Department having the super pumper available. We have adequate equipment with mutual aid.

### **Winter Storms**

This would include severe blizzards along with ice storms. The village crew will keep roads clear with every snowfall. If possible, the village crew will remove snow from residential areas so snow does not accumulate in large mounds. The village has stock piled an amount of sand and salt in case of an ice storm. In case of severe or excessive snow, extra help may be needed and will be addressed by the village board.

### **Droughts**

The village board will help with awareness in these cases.

### **Excessive Heat**

The village board and fire department will try to educate citizens if there is an extended time when heat is excessive.



**Village of Solon Springs Hazard Mitigation Strategy**

The Village Board of the Village of Solon Springs identified the hazards that have potential occurrence in Solon Springs and outlying areas.

The hazards that were prioritized by the Village Board, which have occurred in past years, are straight-line winds, tornados, flooding, wild fires, thunderstorms, hailstorms, lightening, and winter storms, such as blizzards.

The most severe to the least severe were ranked, using number 3 as most severe and 1 as least severe.

The hazards were ranked as follows:

Hazard	Priority Rank
Straight-Line Winds	3
Tornados	3
Flooding	3
Wild Fires	3
Thunderstorms	1
Hail Storms	2
Lightening	2
Winter Storms	1

The ranking process determined that straight-line winds, tornados, flooding and wild fires are the most severe weather conditions that would affect the Solon Springs area. The village board considered what activities can be enacted or taught by the village board and other units of government to lessen the damage that may occur in the event that one of these hazards effect the Village of Solon Springs and outlying areas. The units of government will include Douglas Emergency Management, Federal Emergency Management Agency, American Red Cross, Wisconsin Department of Natural Resources, the Wisconsin Department of Transportation and local fire departments. The activities the village board planned to do with some being complete if funding becomes available are shown in the following pages.

**Straight Line Winds & Tornado**

- 11) If government funding becomes available, the Village board in conjunction with other local governments will educate people with advertisements, pamphlets and training of what steps to follow to promote safety and life in the event of this hazard occurring.



**Progress 2010-2015:** The village is currently working on a new website which will feature safety information for community residents. Downed trees and yard debris cleanup has been rolled into the village Firewise clean-up plan, as established in the 2011 Community Wildfire Protection Plan (CWPP). The village also continues ongoing efforts to educate and inform residents on how to prepare for natural disasters.

**Status (Completed, Deferred, Deleted):** Ongoing action

- 12) The Village board will have adequate equipment in place to receive all weather warnings as announced by the National Weather Bureau.

**Progress 2010-2015:** The Village of Solon Springs has acquired weather radios for the village hall.

**Status (Completed, Deferred, Deleted):** Completed

- 13) The Village board will have an enhanced warning device in place which will be adequately heard by all residents in the Village of Solon Springs.

**Progress 2010-2015:** This initiative was not completed due to a lack of funding. The village may attempt to apply for grant funding in the future, if sufficient local match can be secured.

**Status (Completed, Deferred, Deleted):** Deferred

- 14) Dead trees existing on properties in the Village of Solon Springs have been known to be part of the problem when straight-line winds occur. The Village of Solon Springs will keep all public lands and road right-of-ways clear of dead trees and brush.

**Progress 2010-2015:** Ongoing action. Protocols established as part of the local Community Wildfire Protection Plan, developed in 2011.

**Status (Completed, Deferred, Deleted):** Ongoing action

- 15) Property owners will be notified to remove dead trees from their property. To insure this is being done, the Village board will authorize periodic checks of properties in the village.

**Progress 2010-2015:** Ongoing action. Protocols established as part of the local Community Wildfire Protection Plan, developed in 2011.

**Status (Completed, Deferred, Deleted):** Ongoing action



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- 16) To promote safety for residents, the Village Board will keep the public informed of existing buildings that have been deemed as emergency shelters for people to take refuge in the event a hazard occurs.

**Progress 2010-2015:** Shelters have been identified. Efforts to inform local residents are ongoing.

**Status (Completed, Deferred, Deleted):** Ongoing action

### Flooding

The following steps will be taken by the Village of Solon Springs to reduce the impact of potential flooding in the Village of Solon Springs.

- 1) Education residents of steps they should follow if their property is affected by flooding.

**Progress 2010-2015:** Ongoing action, using local media, municipal web site and informational materials at the village hall.

**Status (Completed, Deferred, Deleted):** Ongoing action

- 2) Make an assessment of all culverts to determine if they are adequate to withstand the water source from streams or wetland areas in the Village.

**Progress 2010-2015:** An inventory and assessment of culverts was completed.

**Status (Completed, Deferred, Deleted):** Completed

- 3) If funding becomes available, the village board will replace any culvert or improve any area to reduce any potential flooding that may occur.

**Progress 2010-2015:** Efforts to repair, replace or improve culverts continue as funding permits.

**Status (Completed, Deferred, Deleted):** Ongoing

- 4) To enforce the floodplain, floodway and wetland ordinances the Village of Solon Springs has in place for all building projects that may occur in these areas as specified on the coordinating maps.

**Progress 2010-2015:** The Village has the latest floodplain ordinance and maps. Floodplain ordinance enforcement is a part of the local zoning protocol.

**Status (Completed, Deferred, Deleted):** Ongoing



### Wild Fires

- 1) The Village Board will educate residents of the steps to follow in the event a wild fire occurs.

**Progress 2010-2015:** The village of Solon Springs was a partner in the development of a Community Wildfire Protection Plan (CWPP) for southern Douglas County in 2011. This plan established a framework for public education and outreach activities in the village and surrounding communities. The Wisconsin Department of Natural Resources is leading regional efforts to promote Firewise education.

**Status (Completed, Deferred, Deleted):** Ongoing action

- 2) The Village Board will work in conjunction with the Solon Springs Fire Department, other area fire departments and the Wisconsin Department of Natural Resources in the event this hazard should occur.

**Progress 2010-2015:** Relationships maintained and enhanced.

**Status (Completed, Deferred, Deleted):** Ongoing action

- 3) An assessment of water sources will be made. If funding becomes available, additional water sources will be installed.

**Progress 2010-2015:** An assessment of water sources have been made – water source point at pond, three dry hydrants located on west side of village and three on the east side of village, one of which is being replaced. The Fire Department continues to add dry hydrants as funds become available.

**Status (Completed, Deferred, Deleted):** Ongoing action

### Thunderstorms, Hail Storms & Lightning

- 1) The Village Board will educate residents about the truths of these hazards, how to be further informed, and of the steps they should take in the event this hazard occurs.

**Progress 2010-2015:** Efforts were made to inform and educate the public by using the village web site, local publications and by providing informational materials at the village hall.

**Status (Completed, Deferred, Deleted):** Ongoing action



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- 2) If funding becomes available, the Village board will have in place a warning device that can be set to send a warning depending on the severity of each of these hazards that will be heard adequately by each resident.

**Progress 2010-2015:** This initiative was not completed due to a lack of funding. The village may attempt to apply for grant funding in the future, if sufficient local match can be secured.

**Status (Completed, Deferred, Deleted):** Deferred

### Winter Storms

Winter storms of severity include blizzards and ice storms.

- 1) The Village crew will keep roads clear with every snowfall; If possible the village crew will remove snow from residential areas so snow does not accumulate in large mounds.

**Progress 2010-2015:** Ongoing action

**Status (Completed, Deferred, Deleted):** Ongoing action

- 2) The Village crew will have stockpiled an adequate amount of sand and salt to use in the event of ice storms.

**Progress 2010-2015:** Ongoing action

**Status (Completed, Deferred, Deleted):** Ongoing action

- 3) If funding is available, the Village Board will have in place a contract to hire additional people and/or equipment if necessary to remove snow and open up roads if these hazards should occur.

**Progress 2010-2015:** The Village continues to maintain a list of people to call in the event additional people are needed. There is also an agreement in place with the Town of Solon Springs for use of their equipment and workers if necessary.

**Status (Completed, Deferred, Deleted):** Ongoing action



## VII. PLAN MAINTENANCE

This chapter outlines the process Douglas County will undertake to assure that the goals, objectives, and action items described in this document will remain relevant. The first section, "Monitoring, Evaluating, and Updating the Plan," describes the system established to monitor the plan, as well as how, when and by whom the plan will be evaluated. The next section describes how continued public involvement will be assured as the plan is monitored and updated.

To ensure that the Douglas County Hazard Mitigation Plan meets the needs of the County, the document should be periodically reviewed and updated. The plan's actions, goals and objectives, should be examined on an annual basis. Changing community values and beliefs, coupled with evolving technology necessitate that the document be considered a "living" document. The plan's "Hazard Mitigation Strategy" should not only be re-evaluated within this "values" context, but also include an examination of plan successes and failures.

The Douglas County Hazard Mitigation Planning Committee should meet annually to address plan maintenance and revision issues. A more complete plan revision should occur at least once every five years (next update scheduled for 2015). It is important that representatives from each of the County's jurisdictions are involved in the plan update and monitoring process. Additionally, representatives from business, the insurance industry, homeowners' association, public environmental organizations and social service providers should be included in the plan revision process.

In the process of evaluating the plan, the Hazard Mitigation Committee should answer the following questions:

Do the goals and objectives continue to address expected conditions in Douglas County?

Is the risk assessment still appropriate or has the nature or magnitude of the hazard and/or vulnerability changed over time?

- A. Are current resources appropriate for implementing this plan?
- B. Have lead agencies participated as originally proposed?
- C. Have outcomes met our expectations?
- D. What problems have occurred in the implementation process?



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- E. What were the plan's successes and failures?
- F. Have member of the public been adequately involved in the process? Are their comments being heard?

The Douglas County Hazard Mitigation Planning Committee should be responsible for the following tasks relative to the plan revision process (ANNUAL BASIS):

- 1) Review the plans goal and objective statements to ensure consistency with changing values, beliefs and technology.
- 2) Monitoring and evaluating the mitigation strategies in this plan to assure that the document reflects current hazard analyses, development trends, code changes and risk analyses and perceptions.
- 3) Documenting the successful (and unsuccessful) completion of plan implementation strategies and monitoring/adjusting established timelines.
- 4) Developing new hazard mitigation strategies, and future mitigation actions to be undertaken in the community.
- 5) Continue to involve local units of government and the public in the planning process.

The Douglas County Hazard Mitigation Planning Committee should be responsible for the following tasks relative to the plan revision process. (FIVE YEAR)

- 1) Update the plan's demographics.
- 2) Update the "Hazard Identification" and "Risk Assessment" sections of the plan with relevant information. (i.e. documenting storms occurring within the timeframe)
- 3) Update plan statistics and valuations.
- 4) Incorporate additional information that becomes available during the time period. For example, a completed shoreline recession rate study should result in new data which should be incorporated into the County's plan.
- 5) The County and participating jurisdictions will coordinate with other planning activities such as comprehensive planning, land use plans, and others to ensure that mitigation strategies are considered and addressed as appropriate. In addition, those planning activities will be coordinated with the five-year update of the hazard mitigation plan.
- 6) Revise the plan's "Hazard Mitigation Strategy" to reflect new data. Develop additional hazard mitigation measures based on new information.



### **Continued Public Involvement**

To facilitate continued public involvement in the planning process, The Hazard Mitigation Planning Committee should assure that the following steps are taken:

- A. The public should be directly involved in the update and review of the plan. All meetings should be open to the public and publicized to encourage attendance. Time for public comment should be granted throughout the process.
- B. Copies of the plan should be made available at all of the public libraries and at appropriate agencies throughout Douglas County.
- C. The plan will be available on the County's website, and will contain an email address and phone number the public can use for submitting comments and concerns about the plan.
- D. A public meeting will be held annually to provide the public with a forum for expressing concerns, opinions, and ideas.

### **Plan Integration**

The integration of the Douglas County Hazard Mitigation Plan into other planning documents will be an ongoing process. Through annual reviews of the plan and through continuous evaluation of the mitigation actions the Douglas County Hazard Mitigation Plan will be complement and enhance the Emergency Operations Plan, future Community Wildfire Protection Plans, Douglas County Comprehensive Plan, Douglas County Outdoor Recreation Plan, Douglas County Land and Water Resource Plan, existing and future plans developed by the Metropolitan Planning Organization (MPO) and other important planning documents as they pertain to hazard mitigation. Plan integration into the existing and future ordinance framework for Douglas County.

Douglas County currently utilizes comprehensive land use planning, zoning, subdivision ordinances and building codes to guide and control development in the County. After the County officially adopts the updated Hazard Mitigation Plan, these existing mechanisms will have hazard mitigation strategies integrated into them. The County Zoning Department will conduct periodic reviews of the County's comprehensive plans and land use policies, analyze any plan amendments, and provide technical assistance in implementing these requirements.

Before a new dwelling can be constructed in Douglas County, the applicant must secure a sanitary permit from the county. Land use permit applications for a dwelling must include sanitary system plans submitted prior to or with the land use permit application from Douglas County. Once the land use permit is issued, the applicant must secure a building permit from the town. The Wisconsin Uniform Dwelling Code requires that all towns issue building permits for new dwellings and additions to existing dwellings. Following adoption of the updated Mitigation Plan, Douglas County will work with all ten towns to ensure continued enforcement of minimum standards established in the



## DOUGLAS COUNTY HAZARD MITIGATION PLAN

Uniform Dwelling Code. This is to ensure that life/safety criteria are met for new construction. The County will continue to work to secure high-hazard areas for low risk uses.

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