Chapter 6: Hazard Identification

Overview

Montmorency County is vulnerable to the effects of a wide range of natural, technological and human-related hazards. Managing these varied threats, and protecting life and property, are challenges faced by emergency management officials at all levels of government. In order to attain an effective emergency management capability to mitigate, prepare for, respond to, and recover from all types of hazards, an understanding of the multitude of hazards that confront the County must first be obtained. The first step in this process is to identify potential hazards within a community. Next, the hazards are ranked according to the relative risk to the community. The final step in the process will be to assess the level of vulnerability for each identified hazard.

When coupled with relevant community profile information, hazard identification and vulnerability assessment becomes a powerful planning tool that can enable emergency management officials to set priorities and goals for resource allocation and mitigation and preparedness activities. This process should not be considered a reliable predictor of the occurrence of any hazard. Hazards have always had an uncanny way of occurring when least expected. This section can give communities a realistic base by which to plan for mitigation, preparedness, response and recovery activities.

Natural Hazards Affecting Montmorency County

Severe Winter Weather

The Montmorency Hazard Mitigation Committee ranked severe winter weather as its second greatest hazard concern. Winter weather hazards consisting of heavy snow from winter storms, freezing rain and blizzards are regular and prevalent natural hazards that occur in Montmorency County and can be expected to occur several times every year. Since January 1993, 56 heavy snow or ice events have been recorded in Montmorency County. Over the past 10 years the county has averaged 3.3 severe winter weather hazard events each year. The number and intensity of winter weather hazards can fluctuate dramatically from year to year as shown in **Table 6.1.**

Table 6.1: Severe Winter Weather Events Frequency -- 1993-2011

Year	Number of Events
1993	7
1994	5
1995	1
1996	0
1997	5
1998	2
1999	0
2000	1
2001	2
2002	2
2003	3
2004	2
2005	6
2006	2
2007	5
2008	5
2009	4
2010	1
2011	1
2012	2
Source: National Climatic Data Center	

Winter weather hazards consisting of heavy snow from winter storms, freezing rain and blizzards are prevalent natural hazards that occur uniformly across Montmorency County, and can be expected to occur several times every year. While extreme cold often accompanies winter weather hazards, the effects of cold temperatures is discussed in the extreme temperature section

Ice and Sleet Storms:

Ice and sleet storms are identified as any storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage. Sleet storms differ from ice storms in that sleet is similar to hail (only smaller) and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires, etc. with ice, sometimes causing extensive damage. When electric lines are downed, inconveniences are felt in households and economic loss and disruption of essential services is often experienced in affected communities. Michigan has had numerous damaging ice storms over the past few decades.

Montmorency County has experienced freezing rain or ice storm events as recorded by the National Climatic Data Center of the National Oceanic and Atmospheric Administration.

Snowstorms:

A snowstorm is defined as a period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles of snow, which are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous. As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. Since winter storms tend to move from west to east, the western parts of the state usually have greater amounts of snow than the eastern parts. The highest seasonal snowfall recorded at Atlanta was 139.2 inches during the 1996-97 season**. (Table 6.2)**

Table 6.2: Montmorency County Snowfall Extremes 1991-2010

Month	High (in)	Year*
January	46.8	2004
February	38.4	2006
March	35.0	1998
April	14.6	1996
May	1.0	2004
June	0.0	-
July	0.0	-
August	0.0	-
September	0.0	-
October	6.0	1997
November	39.0	1995
December	42.4	2008
Year (July to June)	139.2	1996-1997

Recorded at Station: 200343, Atlanta, MI
Source: Midwest Regional Climate Center
* Data missing for 1983, 1984, 1987 & 1988

Montmorency County is susceptible to all these winter+ weather conditions. As discussed in Chapter 2, Montmorency County averages 70 to 80 inches of snowfall per year. Since 1993, the county has experienced 39 severe snowstorms, four of which were categorized as blizzards. Montmorency County is well equipped and extremely capable of dealing with winter weather hazards. The greatest concern with winter weather hazards is the possibility of infrastructure failure they sometimes cause.

Montmorency County's internal location in Northeast Lower Michigan makes it less susceptible to the onshore winds off of either Lake Huron or Lake Michigan and resultant pure lake–effect snow. But in specific situations generally easterly winds off Lake Huron generate lake–effect snow and can become a problem. As indicated by an analysis conducted by the Gaylord Office

of NOAA, winds from a generally easterly flow do not produce pure lake-effect snow. Cold air associated with these flow regimes are generally quite shallow, and low-level flow is generally anti-cyclonic and not favorable to heavy lake effect snow. It is more common to receive heavy lake enhanced snow with these easterly flow patterns off of Lake Huron. When this occurs counties shaded blue **(Figures 6.1 and 6.2**) should be most susceptible to enhanced snowfall.

Figure 6.2 East Southeast Flow

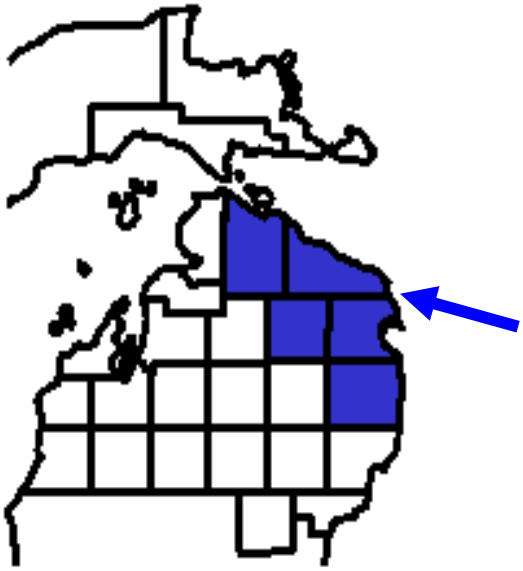
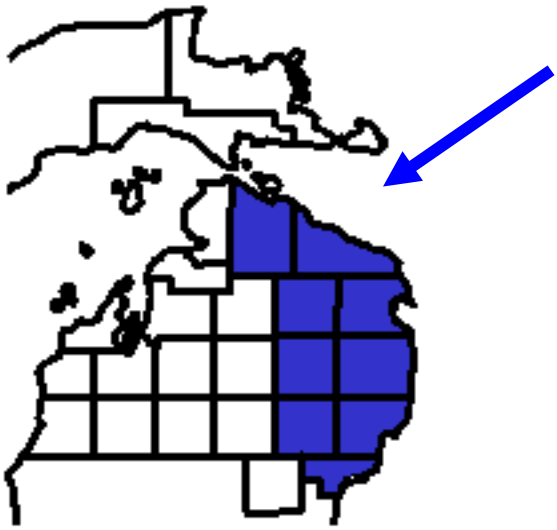


Figure 6.1: East Northeast & East Flow



Severe Summer Weather Hazards

Severe Winds (Windstorm)
According to the National Weather Service, winds in excess of 58 miles per hour are classified as a windstorm. Windstorms are a fairly common occurrence in many areas in Michigan. Severe windstorms can cause damage to homes and businesses, power lines, trees and agricultural crops, and may require temporary sheltering of individuals without power for extended periods of time. Some severe windstorms that have struck Lower Michigan are summarized in (**Table 6.3).**

Severe wind storms do occur in Montmorency County independent of thunder storm events, since 20066 there have been 6 instances of thunderstorm related winds in excess of 50 knots. Of these storms the highest wind speed was recorded at 62 knots. Although potential for violent storms is not predictable and can occur anywhere in the county, more densely populated urbanized sections of the county provide the greatest human/property risk and require the most concentrated mitigative consideration and action.

Hailstorms:
Hailstorms develop in a condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth. Hail is a product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, however, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred in the most severe thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people.

Large hail is a characteristic of severe thunderstorms, and it often precedes the occurrence of a tornado.

> *According to the Michigan Hazard Analysis Plan: A line of severe thunderstorms that ravaged northern Lower Michigan during the weekend of September 26-27, 1998 produced hail up to 2" in diameter in Manistee County, destroying an estimated 30,000-35,000 bushels of apples at area farms. The same storm system produced tennis ball size hail north of the town of Gladwin, which damaged several homes and vehicles. In Arenac County, near Sterling, 3.5" diameter hail damaged crops and injured some livestock at area farms, and damaged several homes, satellite dishes, and vehicles.*

The National Weather Service began recording hail activity in Michigan in 1967. Statistics since that time indicate that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July, and nearly 80% have occurred during the prime-growing season of May through August. As a result, the damage to crops from hail is often extensive.

Table 6.3 – Severe Windstorms in Northern Michigan	
Location	Summary of Impact
West Michigan	On April 6-7, 1997, an intense early spring low pressure system moving across the Great Lakes brought gale force winds to much of Lower Michigan. Wind gusts of 50-70 miles per hour created 10-15 foot waves on the Lake Michigan shoreline, causing widespread wind damage and lakeshore beach erosion. Private damage was estimated at $5 million, most of that occurring in a handful of West Michigan counties. The winds downed numerous trees and power lines across the region, causing roof damage to many structures and power outages for nearly 200,000 Consumers Energy electrical customers. No deaths or injuries were reported in this severe wind event.
Lower Michigan	On April 30, 1984 a windstorm struck the entire Lower Peninsula, resulting in widely scattered damage, 1 death, and several injuries. Wind gusts measured up to 91 miles per hour in some areas. Damage was widely scattered, but extensive, with 6,500 buildings, 300 mobile homes, and 5,000 vehicles being damaged. Over 500,000 electrical customers lost power. In addition, 10-16 foot waves on Lake Michigan caused severe shore erosion, collapsing some cottages and driving many boats aground.
Statewide	Nov. 10-11, 1998:One of the strongest storms ever recorded in the Great Lakes moved across Michigan on the 10th and 11th of November, 1998, producing strong, persistent winds that damaged buildings, downed trees and power lines, killed one person, and left over 500,000 electrical customers in the Lower Peninsula without power. Wind gusts of 50-80 miles per hour were common, and a peak gust of 95 miles per hour was reported on Mackinac Island. Damage was widespread but relatively minor for a storm of that intensity. However, there were several pockets of significant damage across the state. The U.S. Forest Service reported that at least $10 million worth of timber was lost in the Ottawa and Hiawatha National Forests.
Northern Lower Michigan	Sept. 26-27, 1998: During the weekend of September 26-27, 1998, severe thunderstorms ravaged northern Lower Michigan, producing strong winds that damaged or destroyed homes, businesses and public facilities, and downed trees and power lines. Otsego County, and specifically the city of Gaylord, was hardest hit, although damage was also reported in Crawford and Charlevoix counties as well. The storm front, which ran along and north of the M-32 corridor from East Jordan to Alpena, was approximately 12 miles wide and 15 miles long. When the front slammed into Gaylord, wind speeds had reached hurricane force of 80-100 miles per hour. The wind was accompanied by brief heavy rainfall and golf ball size hail. The storm lasted only a few minutes in Gaylord, but the damage was tremendous. Thousands of trees were snapped off at waist level, homes and businesses were torn apart, power lines were downed, and several public facilities were substantially damaged – including the Otsego County Courthouse, which lost half of its roof. Approximately 818 homes were damaged throughout Otsego County, including 47 that were destroyed and 92 that incurred major damage. In addition, the storm injured 11 persons – none seriously. Region-wide, about 12,000 electrical customers lost power. A Governor's Disaster Declaration was granted to the county to provide state assistance in the debris cleanup effort
West-Central and Central Michigan	On May 31, 1998, a line of severe thunderstorms passed through west-central and central Michigan, producing in some areas hurricane and tornado-force winds that damaged or destroyed 1,500 homes and 200

	businesses, severely damaged numerous public facilities, and downed thousands of trees and power lines throughout the 15 county affected area. The downed power lines left nearly 900,000 electrical customers without power, some for up to one week. The storms directly and indirectly caused four fatalities and injured over 140 more. The severe winds were measured at speeds of up to 130 miles per hour in some areas – equivalent to an F2 tornado or strong hurricane. Damage to homes and businesses were estimated at $16 million, while public damage totaled another $36 million. A Presidential Major Disaster Declaration was granted for 13 of the 15 counties, making available both public and hazard mitigation assistance to affected local jurisdictions. In addition, Small Business Administration disaster loans were made available to 11 of the 15counties to help rebuild homes and businesses damaged in the storms.

The incidence of hail follows the incidence of severe thunderstorms. Therefore, those areas of the state most prone to severe thunderstorms are also the area's most prone to large and damaging hail. Generally, severe thunderstorms that produce hail occur more frequently in the southern half of the Lower Peninsula than any other area of the state. However, damaging hail has occurred in every part of Michigan. The National Weather Service forecasts of severe thunderstorms usually give sufficient warning time to allow residents to take appropriate action to reduce the effects of hail damage to vehicles and some property. However, little can be done to prevent damage to crops.

The National Climate Data Center reports 25 hail events in Montmorency County since 1983, or an average of about 1.25 storms per year. The largest diameter hailstone recorded in the County had been 2.5 inches, and was recorded on August 27, 1990.

Tornadoes**:**

A tornado is defined as a violently whirling column of air extending downward to the ground from a cumulonimbus cloud. The funnel cloud associated with a tornado may have winds up to 300 miles per hour and an interior air pressure that is 10-20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that - some even up to 200 miles - have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in the greatest loss of life of any natural hazard, with the mean national annual death toll being 111 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year. Michigan averages approximately 16 tornadoes per year, most occurring in the southern Lower Peninsula.

Figure 6.3, Hillman Tornado
Picture courtesy of Hilary Edison

Michigan is located on the northeast fringe of the Midwest tornado belt. The lower frequency of tornadoes occurring in Michigan may be, in part, the result of the colder water of Lake Michigan during the spring and early summer months, a prime period of tornado activity. Over the past 47 years, six tornadoes have been recorded in Montmorency County. Although relatively rare, these tornadoes have caused extensive damage, responsible for $240,000 reported damage and no reported injuries. Three of the severe tornadoes occurring in Montmorency County were ranked as F1 on the Fujita Scale, and three were F0. The most recent tornado to affect Montmorency County occurred on June 13, 2004. **(Figure 6.3)** This tornado covered distance of about seven miles on a southwest to northeast course just south of the Village of Hillman, and caused $150,000 damage to property. The tornado was reported in the Alpena News as follows:

> ***By KERRIE L. MILLER***
> ***News Staff Writer***
> *Several funnel clouds, funnel-like clouds and a few tornado sightings were reported to local emergency service agencies early Sunday night.*
> *Weather became severe in some areas between 6:30 and 8 p.m. during a tornado watch.*
> *The only confirmed tornado touch-down according to the National Weather Service came at approximately 6:40 p.m. in Hillman near the Thunder Bay Golf Course.*
> *According to Dep. Scott Patton of the Montmorency County Sheriff's Department there were trees down and several roofs damaged during the storm. Patton saw the tornado as he was driving. He said the tornado was not extremely large, "like you see on TV," but large enough to cause a number of trees to be downed, an old barn to collapse and a tree to fall onto the home of a Hillman resident. Patton said at the edge of the funnel, it was very calm and without rain.*

Lightning:
Lightning is the discharge of electricity from within a thunderstorm. Although lightning is often perceived as a minor hazard, it damages many structures and kills and injures more people in the U.S. per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat that lightning presents. ***Michigan ranks second in the nation in both lightning-related deaths and lightning-related injuries.***

The following information is compiled in the Michigan Hazard Analysis Plan: Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

Location of Lightning Strikes
- 40% are at unspecified locations
- 27% occur in open fields and recreation areas (not golf courses)
- 14% occur to someone under a tree (not on golf course)
- 8% are water-related (boating, fishing, swimming, etc.)
- 5% are golf-related (on golf course or under tree on golf course)
- 3% are related to heavy equipment and machinery
- 2.4% are telephone-related

Gender of Victims
- 84% are male; 16% are female

Months of Most Strikes

July (30%); August (22%); June (21%)

Days of Most Strikes

#1 – Sunday; #2 – Wednesday; #3 – Saturday

Time of Most Strikes

- 2:00 PM – 6:00 PM

Number of Victims

- One victim (91%); two or more victims (9%)

NLSI estimates that 85% of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. Approximately 20% of lightning strike victims die, and 70% of survivors suffer serious long-term after-effects such as memory and attention deficits, sleep disturbance, fatigue, dizziness, and numbness.

Table 6.4 - Lightning-Related Deaths in Michigan: 1959-July 2001

Number of Deaths	Location	Percent of Total
28	Open fields, ball fields	28%
26	Under trees (not golf)	27%
11	Boats/water related	11%
10	Golf Course	10%
4	Near tractors/heavy equipment	4%
2	At telephone	2%
18	Other locations/unknown	18%

Source: Storm Data, National Climatic Data Center

Unfortunately, lightning has taken a tremendous toll on Michigan's citizens in terms of injury and loss of life. Since 1959 when the National Weather Service began keeping such records, Michigan has incurred 99 lightning deaths, 693 lightning injuries, and 792 lightning casualties (deaths and injuries combined) – consistently ranking it near the top of the nation in all three categories. During the period 1959-1994 (the last period for which composite statistics are available), Michigan was ranked 2nd nationally (behind Florida) in lightning injuries, 12th nationally in lightning deaths, and 2nd nationally (again, behind Florida) in lightning casualties. Undoubtedly, the fact that Michigan is an outdoor recreation-oriented state contributes heavily to its high lightning death and injury tolls. As **Table 6.4** indicates, Michigan's lightning deaths and injuries are fairly consistent with the national trends in terms of location of deadly or injury-causing strikes.

Extreme Temperatures

Extreme temperatures are defined as prolonged periods of very high or very low temperatures, often accompanied by other extreme meteorological conditions such as high humidity, lack of rain (drought), high winds, etc. Extreme temperatures - whether extreme heat or extreme cold - share a commonality in that they both primarily affect the most vulnerable segments of society such as elderly, children, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense. The major threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. Extreme cold is probably the greatest concern to Montmorency County.

Montmorency County is subject to both temperature extremes. The Hazard Mitigation Committee ranked this forth among hazards facing the County. Temperatures in the county have reached as high as 104°F and as low and –46°F. Temperatures in the region can change very rapidly and 50-degree swings in a 24-hour period are not uncommon. An analysis of extreme temperatures at an Atlanta weather station is shown in **Table 6.5.**

While the physical effects of extreme temperatures are a concern, the residents of Montmorency County are generally well prepared and can handle extreme temperatures with little difficulty. The primary concern with hot and cold temperatures is infrastructure failure.

Table 6.5:
Extreme Temperatures – 1981 - 2010, Atlanta Station, 200343

Month	Year*	Maximum High °F	Month	Year*	Minimum Low °F
JAN	1996	53	JAN	1981 & 1982	-30
FEB	2000	62	FEB	1996	-30
MAR	2000	82	MAR	1982 & 2009	-24
APR	1985 & 1990	87	APR	1982	0
MAY	2006	96	MAY	2005	19
JUN	1994, 1995 & 2009	98	JUN	1982	24
JUL	1981 & 1995	98	JUL	2005	33
AUG	2006	99	AUG	1982	25
SEP	1999, 2002 & 2008	92	SEP	1989	24
OCT	2007	89	OCT	1981 & 2008	16
NOV	2008	75	NOV	1996	1
DEC	2001	64	DEC	2008	-19

Source: Midwest Regional Climate Center
Recorded at Station 200343, Atlanta MI
* Data missing for the years of 1983, 1984, 1987 & 1988

Drought

According to the Michigan Hazard Analysis: Drought is a normal part of the climate of Michigan and of virtually all other climates around the world – including areas with high and low average rainfall. Drought differs from normal arid conditions found in low rainfall areas in that aridity is a permanent characteristic of that type of climate. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation. This multi-faceted nature of the hazard makes it difficult to define a drought and assess when and where one is likely to occur.

Droughts can cause many severe impacts to a wide range of communities and economic activity across the Montmorency County, including: 1) water shortages for human consumption, industrial, business and agricultural uses, power generation, recreation and navigation; 2) a drop in the quantity and quality of agricultural crops; 3) decline of water quality in lakes, streams and other natural bodies of water; 4) malnourishment of wildlife and livestock; 5) increase in wildfires and wildfire-related losses to timber, homes and other property; 6) declines in tourism in areas dependent on water-related activities; 7) declines in land values due to physical damage from the drought conditions and/or decreased economic or functional use of the

property; 8) reduced tax revenue due to income losses in agriculture, retail, tourism and other economic sectors; 9) increases in insect infestations, plant disease, and wind erosion; and 10) possible loss of human life due to food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant concentrations in surface water. Some other drought related economic impacts are reflected in **(Table 6.6).**

Table 6.6 -- Economic Impact of Drought

Costs and losses to agricultural producers	Annual and perennial crop losses Damage to crop quality Income loss for farmers due to reduced crop yields Reduced productivity of cropland (wind erosion, long-term loss of organic matter, etc.) Insect infestation Plant disease Wildlife damage to crops Increased irrigation costs Cost of new or supplemental water resource development (wells, dams, pipelines)
Energy-related effects	Increased energy demand and reduced supply because of drought-related power curtailments Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for hydroelectric power
Costs and losses to livestock producers	Reduced productivity of rangeland Reduced milk production Forced reduction of foundation stock Closure/limitation of public lands to grazing High cost/unavailability of water for livestock Cost of new or supplemental water resource development (wells, dams, pipelines) High cost/unavailability of feed for livestock Increased feed transportation costs High livestock mortality rates Disruption of reproduction cycles (delayed breeding, more miscarriages) Decreased stock weights Increased predation Range fires
Loss from timber production	Wildland fires Tree disease Insect infestation Impaired productivity of forest land Direct loss of trees, especially young ones
Loss from fishery production	Damage to fish habitat Loss of fish and other aquatic organisms due to decreased flows
General economic effects	Decreased land prices Loss to industries directly dependent on agricultural production (e.g., machinery and fertilizer manufacturers, food processors, dairies, etc.) Unemployment from drought-related declines in production Strain on financial institutions (foreclosures, more credit risk, capital shortfalls) Revenue losses to federal, state, and local governments (from reduced tax base) Reduction of economic development Fewer agricultural producers (due to bankruptcies, new occupations) Rural population loss
Loss to recreation and tourism	Loss to manufacturers and sellers of recreational equipment Losses related to curtailed activities: hunting and fishing, bird watching, boating, etc.
Food Production decline	Increase in food prices Increased importation of food (higher costs)

Source: National Drought Mitigation Center, University of Nebraska, Lincoln

The 1976-77 drought in the Great Plains, Upper Midwest, and West also severely impacted Michigan. Extreme drought conditions contributed to wildfire, crop damage and low Great Lakes levels. The 1988 drought / heat wave in the Central and Eastern U.S. (an event that greatly impacted Michigan) caused an estimated $40 billion in damages from agricultural losses,

disruption of river transportation, water supply shortages, wildfires, and related economic impacts.

In response to the 1988 drought, Michigan communities instituted temporary water use restrictions. To stem the potential for wildfire in Michigan, the Governor issued (in June, 1988) a statewide outdoor burning ban. The summer of 1998 drought / heat wave from Texas to the Carolinas caused an estimated $6-9 billion in damage. The summer of 1999 drought / heat wave caused over $1 billion in damage – mainly to agricultural crops in the Eastern U.S. The summer of 2000 drought / heat wave in the South-Central and Southeastern U.S. resulted in over $4 billion in damages and costs. The drought / heat wave that struck Michigan during the summer of 2001 damaged or destroyed approximately one-third of the state's fruit, vegetable and field crops, resulting in a U.S. Department of Agriculture Disaster Declaration for 82 of the state's counties.

In addition, the drought / heat wave caused water shortages in many areas in Southeast Michigan, forcing local officials to issue periodic water usage restrictions. In Montmorency County, impacts from extended drought are reduction in crop and livestock production, increased potential for wildfires, reduction in farm products, reduction in timber production, and loss of tourism and decreased watercraft access large inland lakes.

Riverine and Urban Flooding

Riverine flooding is defined as the periodic occurrence of overbank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain. Riverine floods are generally caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

Riverine floods occur on river systems whose tributaries may drain large geographic areas and encompass many independent river basins. Floods on large river systems may continue for several days. Many areas of Michigan are subject to riverine flooding. Flash flooding differs from riverine flooding in extent and duration. Flash floods are brief, heavy flows on small streams or in normally dry creeks. Flash floods are normally the result of locally-intense thunderstorms resulting in significant rainfall. Flash floods are typically characterized by high velocity water often carrying large amounts of debris. Urban flooding involves the overflow of storm sewer systems and is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt. The Montmorency Hazard Mitigation Committee ranked riverine flooding as fourteenth among the hazards faced by the county. Historically, Montmorency has had few problems with riverine flooding. Soils maps show that relatively small areas of flood prone soils exist in the county and the most vulnerable area for riverine flooding is in along the Thunder Bay River in the area of Genre Drive and Avery Drive.

Pre-existing homes and businesses, though, could remain as they were. Owners of many of these older properties could obtain insurance at lower, subsidized, rates that did not reflect the property's real risk. In addition, as the initial flood risk identified by the NFIP has been updated over the years, many homes and businesses in areas where the revised risk was determined to be higher have also received discounted rates. This "Grandfathering" approach prevented rate increases for existing properties when the flood risk in their area increased.

In 2012, the U.S. Congress passed the Flood Insurance Reform Act of 2012 which calls on the Federal Emergency Management Agency (FEMA), and other agencies, to make a number of changes to the way the NFIP is run. As the law is implemented, some of these changes have already occurred, and others will be implemented in the coming months. Key provisions of the legislation will require the NFIP to raise rates to reflect true flood risk, make the program more financially stable, and change how Flood Insurance Rate Map (FIRM) updates impact policyholders. The changes will mean premium rate increases for some – but not all -- policyholders over time.

Flood Insurance Rate Maps (FIRM) will not be developed for Montmorency County. *A review of the State of Michigan database found no incidents of repetitive loss properties in Montmorency County.*

Earthquakes

A sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain, which results in ground shaking, surface faulting, or ground failures defines earthquakes. Most areas of the United States are subject to earthquakes including parts of Michigan, and they occur literally thousands of times per year. Northeastern Michigan to date has been out of known earthquakes impact areas and Montmorency County is located in an area with less than a 2%g (peak acceleration) and has a relatively low seismic risk.

Subsidence

The process of subsidence and related Karst topography is described on page 4 in Chapter 2 of this plan. Geologic subsidence can cause depressions, cracks, and sinkholes in the ground surface, which can threaten people and property. Subsidence depressions, which normally occur over many days to a few years, may damage structures with low strain tolerances, such as dams, nuclear reactors, and utility infrastructure. The sudden collapse of the ground surface to form sinkholes poses an immediate threat to life and property. Such ground movements may continue for several days, weeks, months or even years, until the walls stabilize.

The population most at risk would be in areas where industrial or residential development has occurred above active or abandoned mines where underground cavities are present near the surface, as well as areas where an extensive amount of groundwater has been withdrawn. The most prevalent subsidence features in Northern Michigan are Karst sinkholes. Although Collapse of a sink is usually a localized natural hazard it can in some circumstances offer a threat of exposing groundwater to rapid contamination across extensive areas. Karst subsidence also offers the threat of exposing groundwater to rapid contamination in certain circumstances.

The Hazard Mitigation Committee ranked subsidence 24th among potential hazards in the County. In Montmorency County sinkholes can be found in the northwest part of the county, primarily on State owned land.

Technological Hazards in Montmorency County

Air, Land and Water Transportation Accidents

Transportation accidents are defined as a crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury. Vulnerable areas would include: 1) communities with, or near, an airport offering commercial passenger service; 2) communities with railroad tracks on which commercial rail passenger service is provided; 3) communities in which commercial intercity passenger bus or local transit bus service is provided; 4) communities with school bus service; and 5) communities in which commercial marine passenger ferry service is provided. A serious accident involving any of the above modes of passenger transportation could result in a mass casualty incident, requiring immediate life-saving community response. In addition, a marine transportation accident would require a water rescue operation, possibly under dangerous conditions on the Great Lakes.

In terms of commercial passenger transportation service, Michigan has: 1) approximately 19 airports that offer commercial air passenger service; 2) 130 certified intercity passenger bus carriers providing service to 220 communities; 3) 72 local bus transit systems serving 85 million passengers; 4) 19 marine passenger ferry services; and 5) 3 intercity rail passenger routes operating on 568 miles of track, along 3 corridors, serving 22 communities.

The Montmorency Hazard Mitigation Committee ranked transportation related hazards as the number one problem to be considered. Although Montmorency County has no specific transportation problem area, and local transportation considerations are restricted almost entirely on ground transport, general transport related incidents are a major concern of public safety and emergency management authorities. The County does not have regular commercial air service or passenger rail service, commercial marine passenger service, or scheduled bus service. School bus transportation and specialized public transit service do exist in the county. The transportation system is described on pages 9 and 10 of Chapter 5 of this plan. Accidents related to either component of either aspect of the public transit system could result in injuries and loss of life. There is a significant volume of heavy trucking on both main and secondary roads in the county. This truck traffic is generated by the both the timber harvest and gas production industries.

The County's extensive and beautiful open area attracts many tourists and recreation enthusiasts to the area each year. In many cases this growing recreational market is based on some form of vehicle related activity. Increasingly, seasonal recreational activity and travel presents a significant hazard potential. Heavy weekend traffic over county roads can now be expected throughout the year. Each year several snow mobile related deaths occur in the County. In additions the County Sherriff Department maintains a marine component to monitor boat traffic on the large lakes of the county.

Hazardous Material Incident – Transportation

Transportation of hazardous material provides hazard potential through an uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment. All modes of transportation - highway, railroad, seaway, airway, and pipeline -

are carrying thousands of hazardous material shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. The U.S. Department of Transportation regulates the transportation and shipping of over 18,000 different materials. Areas most at risk are within a 1-5 mile radius of a major transportation route along which hazardous material shipments move.

All areas in Michigan are potentially vulnerable to a hazardous material transportation incident, although the heavily urbanized and industrialized areas in southern Michigan are particularly vulnerable due to the highly concentrated population. M-32 and M-33 running through Montmorency County present an risk of a hazardous material incident transportation incident . Routine shipment of hazardous materials through the County provides a constant potential for and occurrence of hazard related accidents. There is an always increasing potential for hazardous incidents demands that demands continuous oversight and reaction preparedness.

The Hazard Mitigation Committee has ranked incidents related to transport of hazardous material as fifth among the hazards facing the County. While no significant hazardous materials spills have occurred in Montmorency County, there have been incidents. Many types of hazardous materials travel to, from and through Montmorency County each day. The areas with the greatest risk of hazardous material transportation accidents are the main transportation routes of M-32 and M-33 which are the most heavily traveled routes in the county and which also pass through the population centers of Atlanta, Vienna, and close the Village of Hillman. Sharp curves along M-32 at dead man's hill and at the junction of M-32 and M-33 south are particularly dangerous areas and the accumulation of snow and ice in the winter months adds significantly to the possibility of an accident.

Hazardous Material Incident - Fixed Site

Hazardous material can also experience uncontrolled released from a fixed site, and are capable of posing a risk to health, safety, property and the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances, which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

The world's deadliest hazardous material incident occurred on December 4, 1984, in Bhopal, India. A cloud of methyl isocyanate gas, an extremely toxic chemical, escaped from a Union Carbide chemical plant, killing 2,500 people and injuring tens of thousands more. This incident triggered historical Federal legislation intended to minimize such disasters from occurring in the United States.

Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases are bound to occur. Areas at most risks are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but releases can still cause severe harm to people, property and the environment if proper mitigative action is not taken in a timely manner.

The Hazard Mitigation Committee has ranked incidents related hazardous material at fixed sites as ninth among hazards facing the County. Currently, the Hillman Power Plant is the only designated SARA Title III Section 302 site in Montmorency County. The Hillman Power Plant is critical due to its location just north and east of the Village of Hillman, and close proximity to the local elementary school. 302 sites are required to have an emergency plan on file with the local emergency planning Commission (LEPC), fire department and at their facility. In addition to the 302 sites, hazardous materials are located in other locations in the county. Facilities such as fuel storage areas, agricultural operations, businesses and industries may have hazardous materials on site.

Oil and Gas Well and Pipeline Accidents

Oil and gas pipeline accidents are defined as uncontrolled release of oil or gas or the poisonous by-product hydrogen sulfide, from a pipeline. As a major oil and gas consumer in the United States, vast quantities of oil and natural gas are transported through and stored in Michigan. Though often overlooked as a threat because much of the oil and gas infrastructure in the state is located underground, oil and gas pipelines can leak, erupt or explode causing property damage, environmental contamination, injuries and loss of life.

In addition, there is also a danger of hydrogen sulfide release. Hydrogen sulfide is an extremely poisonous gas that is also explosive when mixed with air temperatures of 500 degrees or above. In addition to major pipelines, these dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content.

The threat related to hydrogen sulfide exposure is reflected in the following incident, which occurred on June 7, 1994, in Otsego County (five miles east of Gaylord) at the site of a West Bay Exploration Company gas well. During maintenance operation, crew intentionally released H2S. Poison gas that filled a nearby home, injuring husband & wife who suffered severe burning of the eyes, difficulty breathing, and disorientation. Both sought medical treatment. Wife, whose hands and arms turned purple, was unable to continue working after incident.

There is always a potential for an uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide from the wells themselves. Oil and gas are produced from fields in over 60 counties in the Lower Peninsula. Over 40,000 wells have been drilled in these counties. Of that total, approximately one-half (20,000) have produced oil or gas. Over 1.1 billion barrels of crude oil and 3.6 trillion cubic feet of gas have been withdrawn from these wells.

BDWThere have been 15,077 wells have been permitted and/or drilled in Northeast Lower Michigan. There have been over 3,850 wells drilled in Montmorency County of which 2,528 are producing gas 15 are producing oil and 100 are brine disposal injection wells. The combination of numerous oil or gas wells and buried pipeline connecting each well to centralized processing facilities provides a very significant hazard potential. This hazard threat is intensified by the fact that wells, especially in Albert, Hillman and Vienna Townships, are located in areas very susceptible to wildfire. **(Figure 6.5)** The Hazard Mitigation Committee has ranked incidents related to gas and oil accidents as eleventh among hazards facing the County Although Michigan Department of Environmental Quality regulates these wells, it is very important that local vigilance of this process be maintained. In most cases local emergency providers will be first responders to on site incidents. To the extent possible it is very important that each well be adequately tagged for quick identification and pipeline location be available. Communication between the gas and oil industry, State regulators and County emergency management providers should be established and maintained.

Fire Hazards

Wildfire

Wildfire is defined as an uncontrolled fire in grass, brushlands, or forested areas. The most immediate dangers from wildfires are the destruction of homes and timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area. Long-term effects can be numerous and include scorched and barren land, soil erosion, landslides/mudflows, water sedimentation, and loss of recreational opportunities. Forests cover approximately one-half of Michigan's total land base. As a result, much of the state is vulnerable to wildfire. In addition, development in and around forests and grasslands is increasing rapidly, making public safety a primary consideration in wildfire mitigation and suppression efforts.

According to the U.S. Forest Service, approximately 81% percent of Montmorency County's land area is accessible forest. Forest types vary depending upon the soils, moisture and past activities such as logging, fires and land clearing. The most prevalent forest types are Aspen, Maple/Beech/Birch, and Oak/Hickory. The combined jack pine and oak/hickory types covers about 30% of the county's forested land area. The draughty, low fertility sandy soils, found in outwash plains and channels, supported pre-settlement oak/jack pine forests that for thousands of years were perpetuated by wildfires. A review of the pre-settlement vegetation of Montmorency County **(Figure 6.6)** shows that wildfire prone areas are located in the southwest and northwest areas of the county

Figure 6.5: Oil & Gas Wells and Wildfire Risk

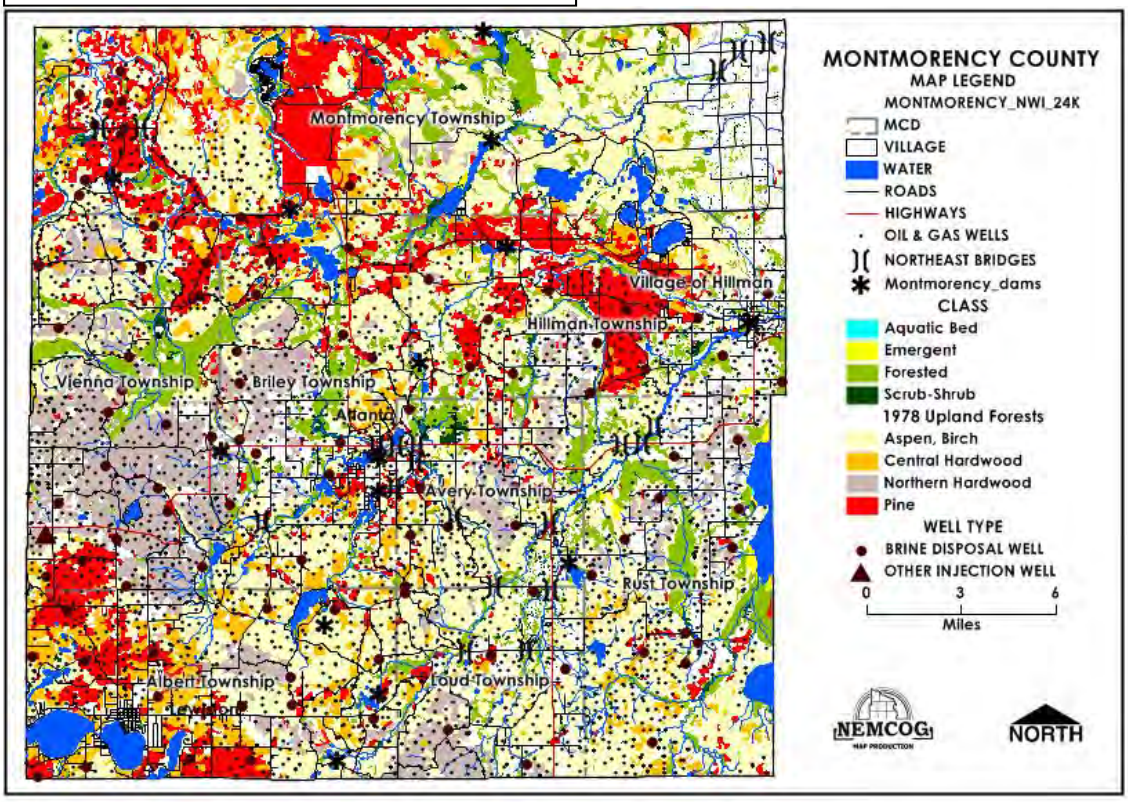
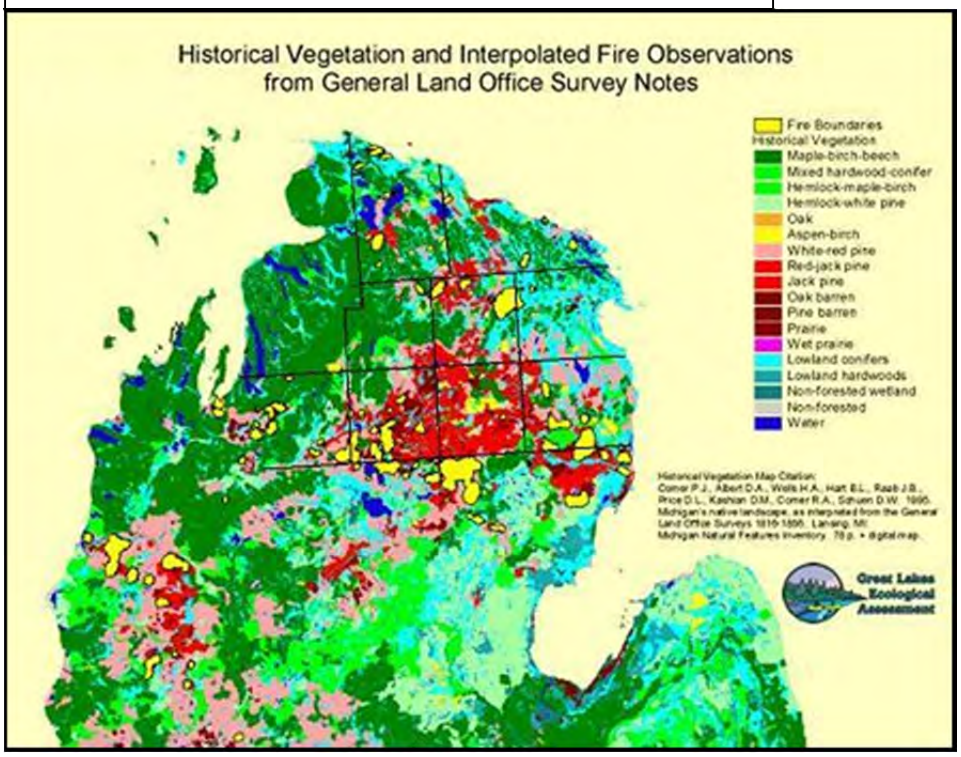


Figure 6.6: Historic Vegetation/Fire Observations



Information from the Michigan Department of Natural Resources show there have been 300 wildfires of over 200 acres recorded in Montmorency County. There have been 110 wildfires recorded from 1981 to 1999 in the county. **(Table 6.7)** It should be noted that the figures shown on the maps do not include those wildfires suppressed by local volunteer fire departments or the U.S. Forest Service. If records from those sources were readily available, and broken down by county, the statistics would be affected. Montmorency County ranks fifth among the eight Northeast Michigan counties.

Major wildfires have regularly occurred in northern Michigan and wildfire is part of a natural process, however, most wildfires are caused as a result of human activity. In 1980, just south of Montmorency County, a major wildfire in Montmorency County, known as the Mack Lake fire, destroyed 44 homes and buildings, forced the evacuation of 1,500 people and killed one firefighter. A total of 24,000 acres were destroyed resulting in a property loss of $2 million.

Table 6.7
Number of Wildfires by County in Northeast Michigan, 2001-May of 2012
(MDNR jurisdiction only)

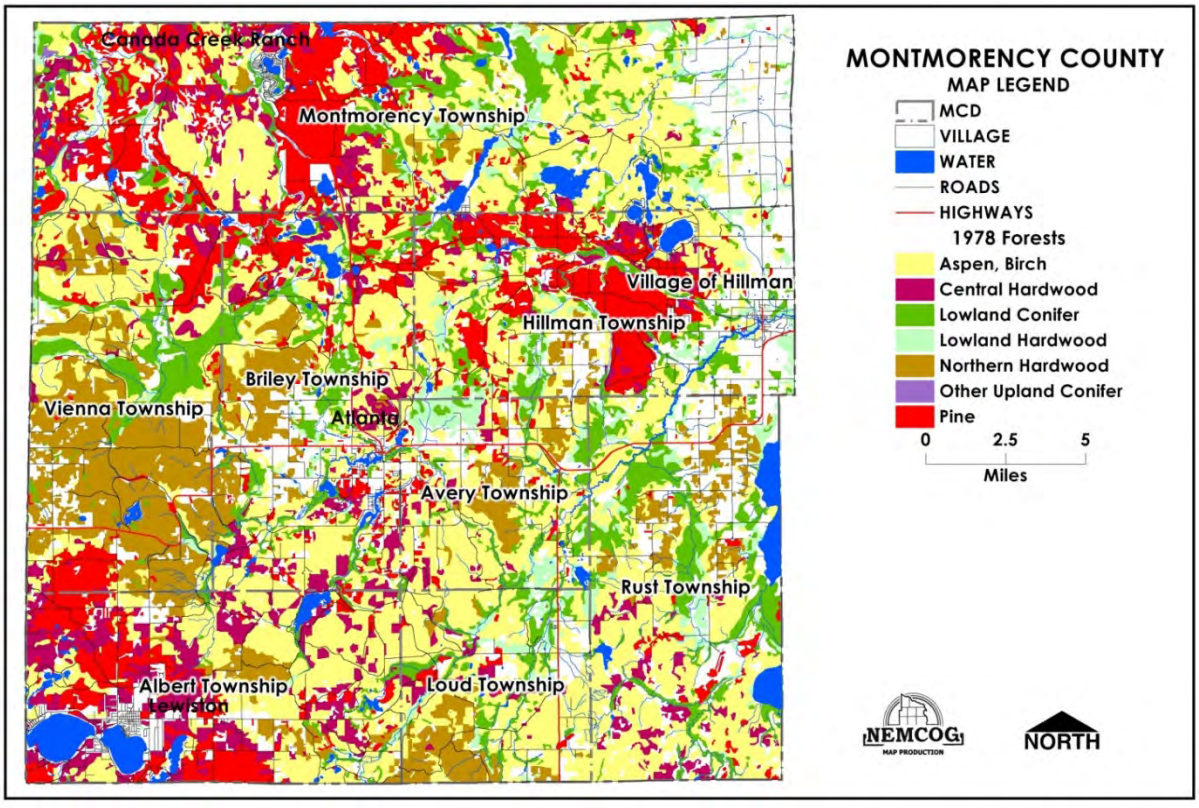
County	Number of Wildfires	Acres Burned
Otsego	**231**	**329**
Alcona	135	376
Alpena	135	303
Cheboygan	136	328
Crawford	224	11,819
Montmorency	110	416
Montmorency	61	256
Presque Isle	74	424

Source: Michigan Department of Natural Resources, Forest Management Division

The local Hazard Mitigation Committee has ranked wildfire as eighth among the hazards faced by Montmorency County. More than 100,000 acres of jack pine, red pine and red oak forests are spread across the county. These forests are most prevalent in Albert, Hillman Townships and the western half of Montmorency Township. Included in these vulnerable areas are Lewiston, the Village of Hillman and Canada Creek Ranch. The combined population of these Townships is 6164, or about 60% of Montmorency County's total population. There are 5656 housing units located in these townships, of which about 50% are seasonal dwellings. The highest concentration of residences in Montmorency Township is located on Canada Creek Ranch, which is surrounded by wildfire prone forest cover. To a significant extent these wildfire susceptible areas are located on either on State owned lands or on large club acreages (**Figure 6.7**).

The "club land" with the greatest susceptibility for wildfire is Canada Creek Ranch. Canada Creek Ranch is located on 13,500 acres in the northwest part of Montmorency County. The Canada Creek Ranch Association was incorporated in 1934, and presently there are 1526 members, owning 1901 memberships. A residential area is located in the northeastern portion of the acreage. There are 538 private homes with 185 of those considered permanent residences. The 2000 Census indicates 405 permanent residents. It seems safe to assume a summer population of well over 1000. The main Ranch House, which replaced the original lodge in 1978, has a dining room and 19 motel rooms. There are also three rental cabins and a campground with 125 sites of which 80 have full service. About one-half the Ranch owned acreage is comprised of wildfire prone vegetation, and the ranch itself by jack pine/oak scrublands. At this time the ranch provides fire protection, but is coordinated with surrounding emergency facilities.

Figure 6.7: Montmorency County Wildfire Susceptibility



Structural Fires

A structural fire occurs with any instance of uncontrolled burning which results in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. In terms of average annual loss of life and property, structural fires - often referred to as the "universal hazard" because they occur in virtually every community - are by far the most prevalent hazard facing most communities in Michigan and across the country. Each year in the U.S., fires result in approximately 5,000 deaths and 300,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Particularly devastating are large urban conflagrations in which multiple structures are damaged or destroyed. Not surprisingly, Michigan's structural fire experience mirrors the national figures. The State Fire Marshal estimates that a structural fire occurs every 24 minutes in Michigan. During 2003, there were 64 fires recorded in Montmorency County, with a total property/contents loss of $276,400.

As with many surrounding rural counties in Northeast Michigan, Montmorency County relays on a combination of partially paid and non-paid fire department personnel. **(Table 6.8)** This provides the county with an adequate array of firefighting services available to the respective communities. But, lack of full-time professional fire fighters in outlying rural townships means less time available to conduct fire inspections, training and take other preventive measures necessary to lessen structural fire threat. Out of necessity, efforts in these communities are directed more at fire suppression. This typical scenario in rural areas of the state poses great challenges for maintaining a sustainable fire prevention and inspection program.

Scrap Tire Fires

Any instance of uncontrolled burning scrap tire storage or recycling site is defined as a scrap tire fire. Each year in the U.S., an estimated 250 million vehicle tires have to be disposed of. Michigan alone generates 7.5-9 million scrap tires annually. Many of these scrap tires end up in disposal sites (legal or illegal), some of which may have several hundred thousand tires. Michigan currently has more than 24 million scrap tires at disposal sites scattered across the state. Tire disposal sites can be fire hazards due to the large quantity of "fuel" onsite, coupled with the fact that the shape of a tire allows air to flow into the interior of a tire pile, rendering standard firefighting practices nearly useless. Flowing burning oil released by the burning tires spreads the fire to adjacent areas. Some scrap tire fires have burned for months, creating acrid smoke and an oily residue that can leach into the soil, creating long-term environmental problems. Scrap tire fires differ from conventional fires in several respects: 1) even relatively small scrap tire fires can require significant resources to control and extinguish; 2) the costs of fire management are often far beyond that which local government can absorb; 3) the environmental consequences of a major tire fire can be significant; and 4) the extreme heat from the fire converts a standard passenger vehicle tire into about two gallons of oily residue, which can then leach into the soil or migrate to streams. There are no known tire storage sites in Montmorency County.

Table 6.8
Montmorency County Fire Staffing

Department	Sq. Mi.	Population	Paid On-call
Albert Twp./Lewiston FD	72	2400	34
Tri-Township. FD	144	2550	24
Hillman FD	408	4500	23
Vienna Twp. VFD	72	650	8

Infrastructure Failures

Infrastructure failures are defined as a failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services. Such interruptions could last for periods of a few minutes to several days or more. Public and private utility infrastructure provides essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet inter-related, systems fails due to disaster or other cause - even for a short period of time - it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes.

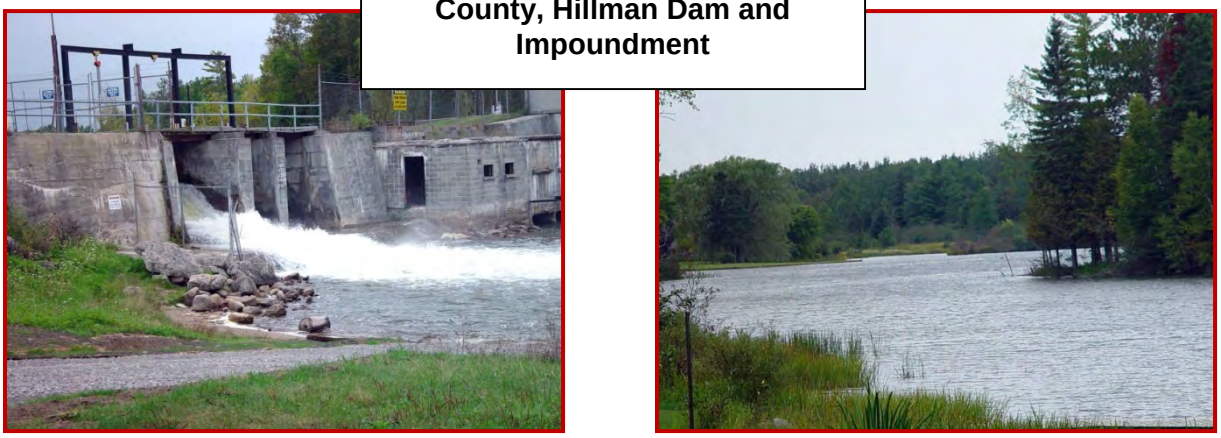
When water or wastewater treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur. All of these situations can lead to disastrous public health and safety consequences if immediate mitigation steps are not taken. Typically, it is the most vulnerable segments of society - the elderly, children, ill or frail individuals, etc., that are most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and even regions can be negatively impacted.

Dam Failures

Dam failure is the result of collapse or failure of an impoundment resulting in downstream flooding. Dam failures can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Failure of a dam does not only occur during flood events, which may cause overtopping of a dam. Failure can also result from mis-operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation. Michigan has experienced over 260 dam failures in its history.

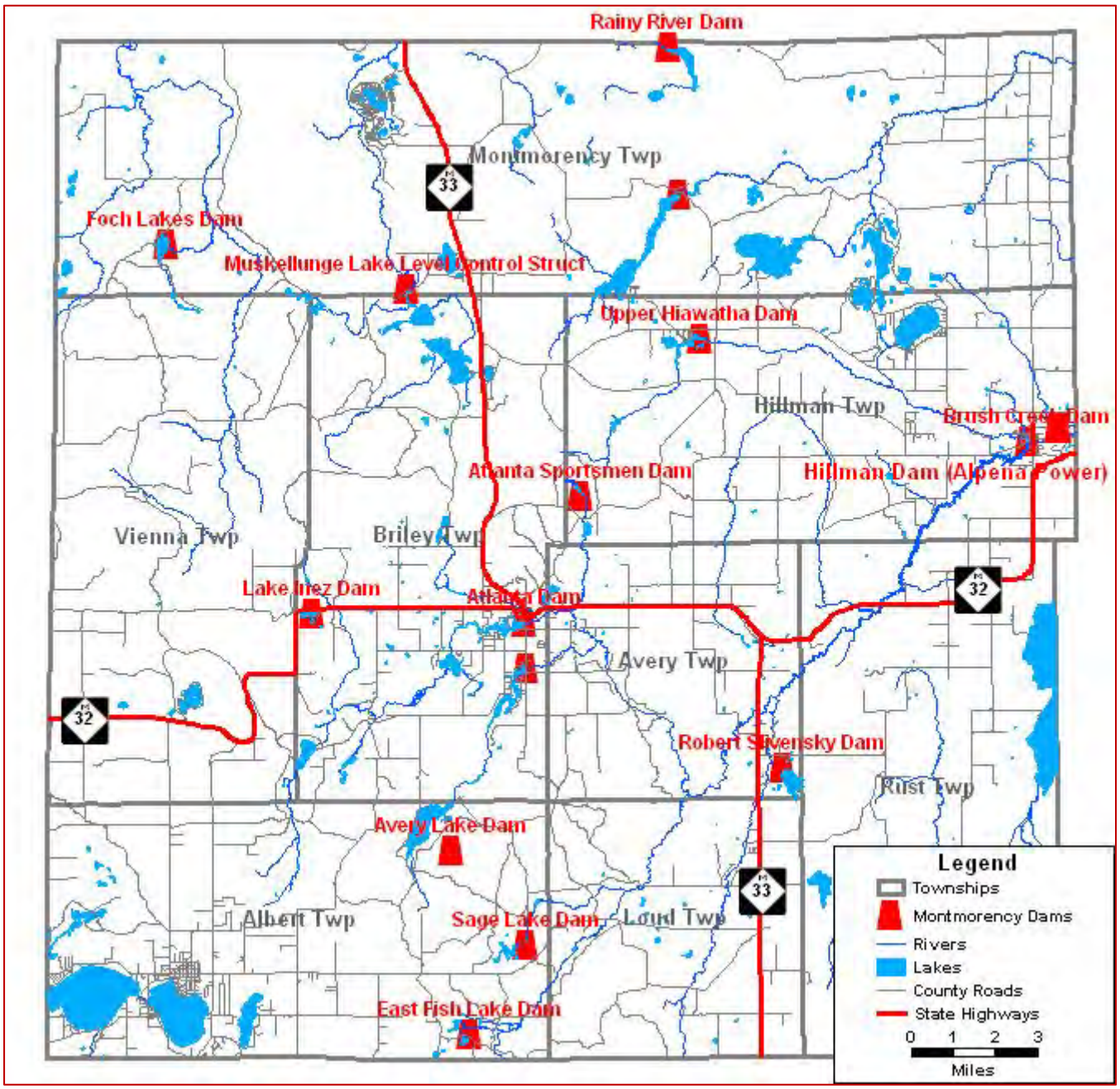
There are fifteen dams located in Montmorency County. **(Figure 6.8)** Two dams (the Robert Slivensky and the Upper Hiawatha dams) are rated by the Department of Environmental Quality as a significant hazard, while the remainder of the county's dams are rated as low hazard. The Montmorency Hazard Mitigation Committee has ranked dam failure as 22nd among the potential hazards facing the County.

Figure 6.9: Montmorency County, Hillman Dam and Impoundment



The Hillman Dam is located near the Village of Hillman and has an impoundment of 160 acres. (**Figure 6.9**) The dam is owned and operated by Alpena Power and specified maintenance standards are required for licensing.

Figure 6.8: Montmorency County Dams



Shoreline Flooding/Erosion

Although Montmorency County has no Lake Huron coastline, the Thunder Bay River and its tributaries and many large lakes and ponds scattered through the county have provided opportunity for shoreline erosion. Since the lumbering period the County's streams have received significant amounts of sand deposition. In recent years, the extent of critical sandy shoreline along these water bodies, and its inherent capacity for erosion, has generated extensive remediation activities.

Implementation of land use policies and regulations is an important strategy used by local, state and federal units of government for protecting water quality. In addition to their benefits for aquatic resources, planning and zoning are tools used for ensuring the conservation of wildlife habitat, providing for sustainable development, protecting property values, and maintaining community character.

The Thunder Bay River Watershed Initiative was published in 2001, and identified sedimentation as the top priority in treating pollutants entering that river. In that study criteria for determining critical areas were defined as:

- Areas within 1000 feet of the Main Branch of the Thunder Bay River.
- Designated tributaries, including intermittent drainages.
- Inland lakes within the watershed.
- Contiguous wetlands, defined as being within 1,000 feet of the Thunder Bay River, or within 500 feet of streams or lakes within the watershed.
- Urban areas that drain to surface waters.
- Contiguous steep slopes, defined as 10% slope or greater.
- Areas of ground water recharge

Figure 6.10 shows the critical areas shaded in orange for the Thunder Bay River Watershed.

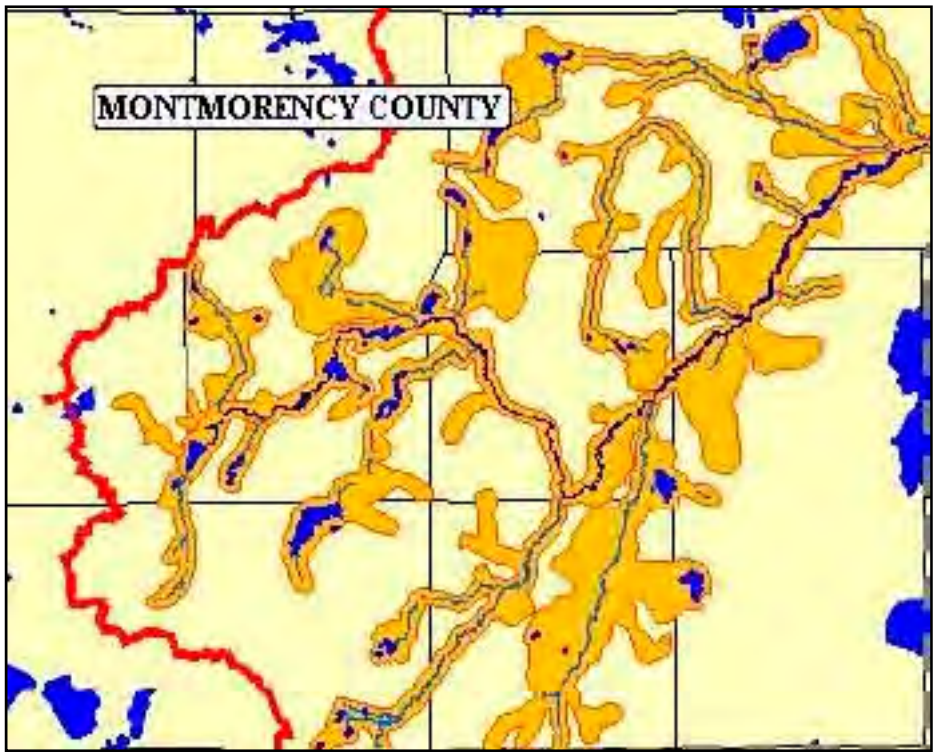


Figure 6.10: Montmorency County, Thunder Bay River Critical Area

The study also identified the highest-ranking source for sediments as road stream crossings within the critical area. Steep slopes, short culverts and runoff direct in to the river are the primary causes for sediments entering at road stream crossings. For over a decade the Montmorency County Road Commission, working in conjunction with Michigan Department of Environmental Quality, Montmorency Conservation District, Huron Pines Resource Conservation and Development, the Thunder Bay Watershed Council, Black River Watershed Council and local industry and environmental organizations have cooperated to implement a program to evaluate and improve road stream crossing on the streams and rivers in Montmorency County. Improvements have included culvert extension and relocation and bridge construction. **(Figure 6.11)** Completion of this program is dependent on available funding.

Figure 6.11: Examples of Road Stream Crossing Problem and Improvement

Societal Hazards

Public Health Emergencies

A widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public. Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological or biological agents; or 5) large-scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events another disaster or emergency, such as a flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

A public health consideration in any community experiencing significant growth or expansion has to do with stresses on exiting sewer and water system capacities. It is important to balance extension of services with the capacity of existing systems to absorb new loads.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical or biological agent with the potential to adversely impact a large number of people. Such a release would most likely be an act of sabotage aimed at the government or a specific organization or segment of the population. Fortunately, to date Michigan has not experienced such a release aimed at mass destruction. However, Michigan has experienced hoaxes and it is probably only a matter of time before an actual incident of that nature and magnitude does occur. If and when it does, the public health implications – under the right set of circumstances – could be staggering.

Another social situation, specific to Northeast Lower Michigan and with its apparent origins in Montmorency County is related to the impact of Bovine TB and resultant governmental regulations and enforcement impact. For about a decade the Bovine TB situation in Northeastern Michigan as had a significant impact on personal, social and economic health. Various quarantines have had a direct effect on the agriculture and hunting industries across Northeast Lower Michigan. The stress from this situation has not only had economic ramifications, but also introduced some severe social and psychological stress across the community.

Nuclear Attack

Any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries place these areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the “Cold War” and the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there still exist in the world a large number of nuclear weapons capable of destroying multiple locations simultaneously. In addition, controls on nuclear weapons and weapons components are sporadic at best in the former Soviet Union, and the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

Civil Disturbances
A public demonstration or gathering (such as a sports event), or a prison uprising, that results in a disruption of essential functions, rioting, looting, arson or other unlawful behavior. Large-scale civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events: 1) labor disputes where there is a high degree of animosity between the two dissenting parties; 2) high profile/controversial judicial proceedings; 3) the implementation of controversial laws or other governmental actions; 4) resource shortages caused by a catastrophic event; 5) disagreements between special interest groups over a particular issue or cause; or 6) a perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society.

Areas subject to civil disturbances may encompass large portions of a community. Types of facilities that may be subject to or adversely impacted by civil disturbances may include government buildings, military bases, Community College, businesses, and critical service facilities such as our hospital, police and fire facilities. Civil disturbances (including jail uprisings) often require the involvement of multiple community agencies in responding to and recovering from the incident. There have been no recorded incidences of civil disturbances in recent history.

Nuclear Power Plant Accidents
An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population. Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant, and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the Federal government. Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10 mile Emergency Planning Zone (EPZ) around the plant, and a 50 mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has 3 active and 1 in-active commercial nuclear power plants, in addition to 4 small nuclear testing/research facilities located at 3 state universities and within the City of Midland. Montmorency County does not have a Nuclear power plant.

Mitigation Planning Sectors

The hazard mitigation planning approach being used in this plan has been to divide Montmorency County into its geographic sub-parts (sectors) for the purpose of developing a more detailed, targeted hazard analysis and set of mitigation, preparedness, and response and recovery strategies. Sectoring has been accomplished by using existing municipal boundaries.

The following section includes maps of each planning sector, descriptions of significant features and identification of specific Natural, Technological and Societal hazards that may exist in the community. Countywide hazards, such as weather related hazards, are not specifically listed and should be assumed to be an equal hazard in all planning sectors.

Albert Township

- 2010 population 2,526, 6.3% decrease from 2000; 2,684 housing units, 1,218 occupied, 1,466 vacant, 1,347 seasonal.
- 39.8% of housing units are 40+ years old.
- Predominant land cover is upland forest. Concentration of residences and infrastructure in the Lewiston area. Large amount of state recreation land.
- Primary transportation routes, County Road 491 and County Road 612.
- Large number of gas wells. Airport located in Lewiston.

Potential Hazards
Natural: Shoreline flooding/erosion, riverine flooding, wildfire
Technological: Transportation accident (water, land, air), structural fire, infrastructure failure hazardous material spill, oil and gas well accident
Societal: Bovine TB

Avery Township

- 2010 population 646, 9.9% decrease from 2000; 662 housing units, 298 occupied, 364 vacant, 327 seasonal. 35.8% of housing units are 40+ years old.
- Predominant land cover is upland forest.
- 2001 Annual Average 24 hour traffic volume; M 32, - 2,400 vehicles per day, M 33 -1,700 vehicles per day. Airport near Atlanta. Large number of producing gas wells.

Potential Hazards
Natural: Shoreline flooding/erosion, wildfire
Technological: Transportation accident (water, land, air), structural fire, hazardous material spill, oil and gas well accident
Societal: Bovine TB

Briley Township

- 2000 population 2,029; 1,530 housing units, 889 occupied, 571 seasonal. 33.4% of housing units are 40+ years old, 16.1% are mobile homes.
- Predominant land cover is upland forest with some lowland forest and agricultural. Concentration of residences and infrastructure in Atlanta.
- 2001 Annual Average 24 hour traffic volume; M 32, - 4,400 vehicles per day, M 33 -1,800 vehicles per day. Large number of gas wells.

Potential Hazards
Natural: Shoreline flooding/erosion, riverine flooding, wildfire.
Technological: Transportation accident (water, land, air), structural fire, hazardous material spill , oil/gas well accident.
Societal: Bovine TB

Village of Hillman

- 2010 population 697; 363 housing units, 300 occupied, 63 vacant, 10 seasonal. 46.2% of housing units are 40+ years old.
- Predominant land cover is residential. Concentration of residences and Infrastructure. Bisected by Thunder Bay River.
- 2001 Annual Average 24 hour traffic volume; M 32, - 4,400 vehicles per day.

Potential Hazards
Natural: Rivirene flooding
Technological: Transportation accident (land), structural fire,hazardous material spill, infrastructure failure
Societal: civil disturbance

Hillman Township

- 2010 population 2,175, 6.6% decrease from 2000; 1,714 housing units, 919 occupied, 795 vacant, 636 seasonal. 46.5% of housing units are 40+ years old.
- Predominant land cover is upland forest with some lowland forest and agricultural. Concentration of residences around Avalon and Ess lakes. Large amount of public recreation land. Many gas producing wells.
- Major roads are County Road 624 and County Road 451. Airport near Village of Hillman.

Potential Hazards
Natural: Shoreline flooding/erosion, riverine flooding, wildfire
Technological: Transportation accident (water, land, air), structural fire, hazardous material spill, oil/gas well accident
Societal: Bovine TB

Loud Township

- 2010 population 293, 3.2% increase from 2000; 405 housing units, 150 occupied, 255 vacant, 235 seasonal. 53% of housing units are 40+ years old.
- Predominant land cover is upland forest with some lowland forest. Large amount of public recreation land. Many gas producing wells.
- Annual Average 24 hour traffic volumes; M 33, - 1,500 vehicles per day.

Potential Hazards
Natural: Riverine flooding, wildfire
Technological: Transportation accident (land), structural fire, hazardous material spill, oil/gas well accident
Societal: Bovine TB

Montmorency Township

- 2010 population 1,117*, 7.1% decrease from 2000; 1,507* housing units, 526* occupied, 981* vacant, 839* seasonal. 37.8%* of housing units are 40+ years old.
- Predominant land cover is upland forest . Large concentration of residences at Canada Creek Ranch.
- Annual Average 24 hour traffic volume; M 33, - 1,100 vehicles per day. Airstrip near Foch Lake.

Potential Hazards
Natural: Shoreline flooding/erosion, riverine flooding, wildfire
Technological: Transportation accident (water, land, air), structural fire, hazardous material spill, dam failure
Societal: Bovine TB.

Rust Township

- 2010 population 561, 2.2% increase from 2000; 476 housing units, 223 occupied, 253 vacant, 229 seasonal. 46.5% of housing units are 40+ years old.
- Predominant land cover is upland forest and lowland forest.
- Annual Average 24 hour traffic volume; M 32, - 4,400 vehicles per day. Township has 3 airstrips. Many gas producing wells

Potential Hazards

Natural: Shoreline flooding/erosion, riverine flooding, wildfire
Technological: Transportation accident (water, land, air), structural fire, hazardous material spill, oil/gas well accident
Societal: Bovine TB

Vienna Township

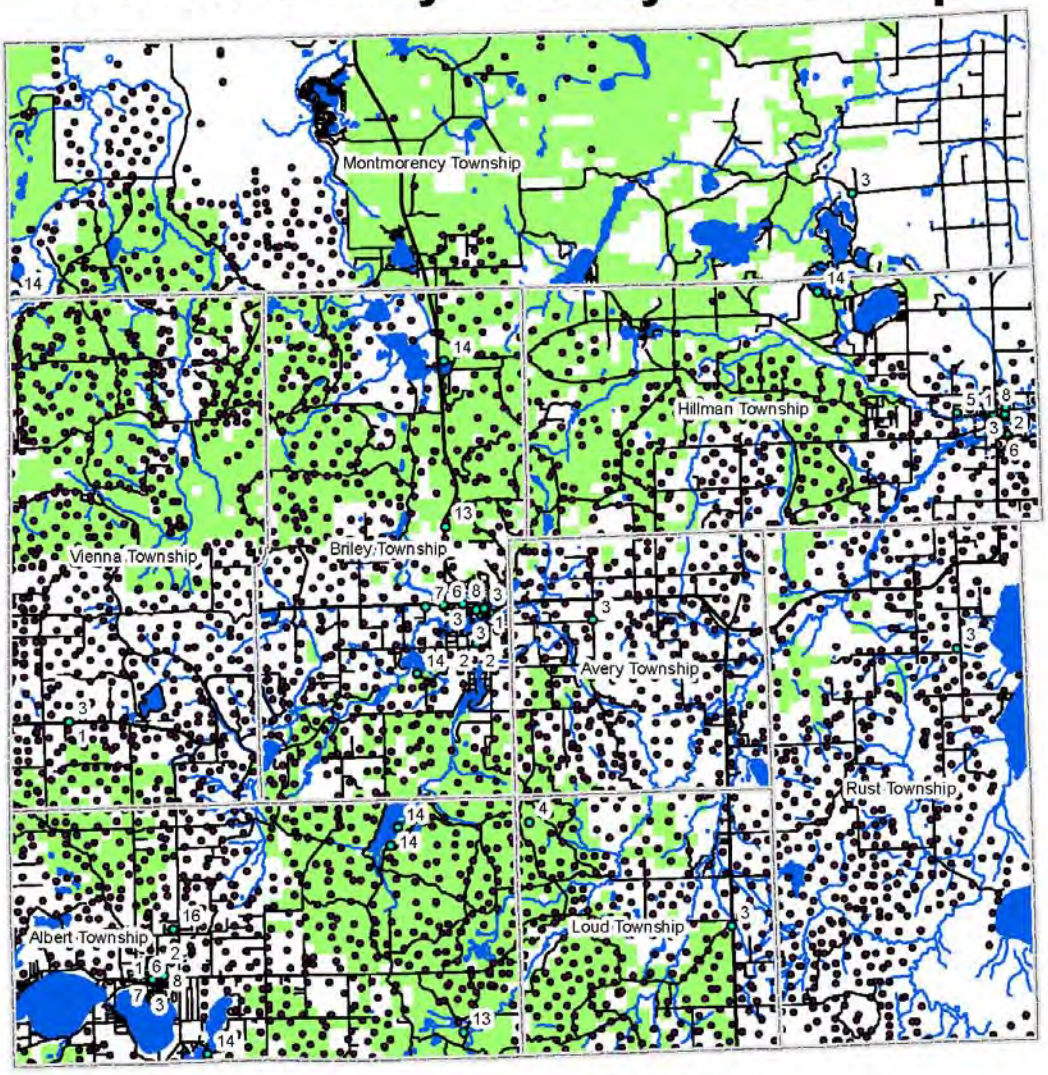
- 2010 population 587, 2.6% increase from 2000; 578 housing units, 249 occupied, 329 vacant, 295 seasonal. 47.1% of housing units are 40+ years old.
- Predominant land cover is upland forest and lowland forest.
- Annual Average 24 hour traffic volume; M 32, - 2,400 vehicles per day. Many gas producing wells.

Potential Hazards

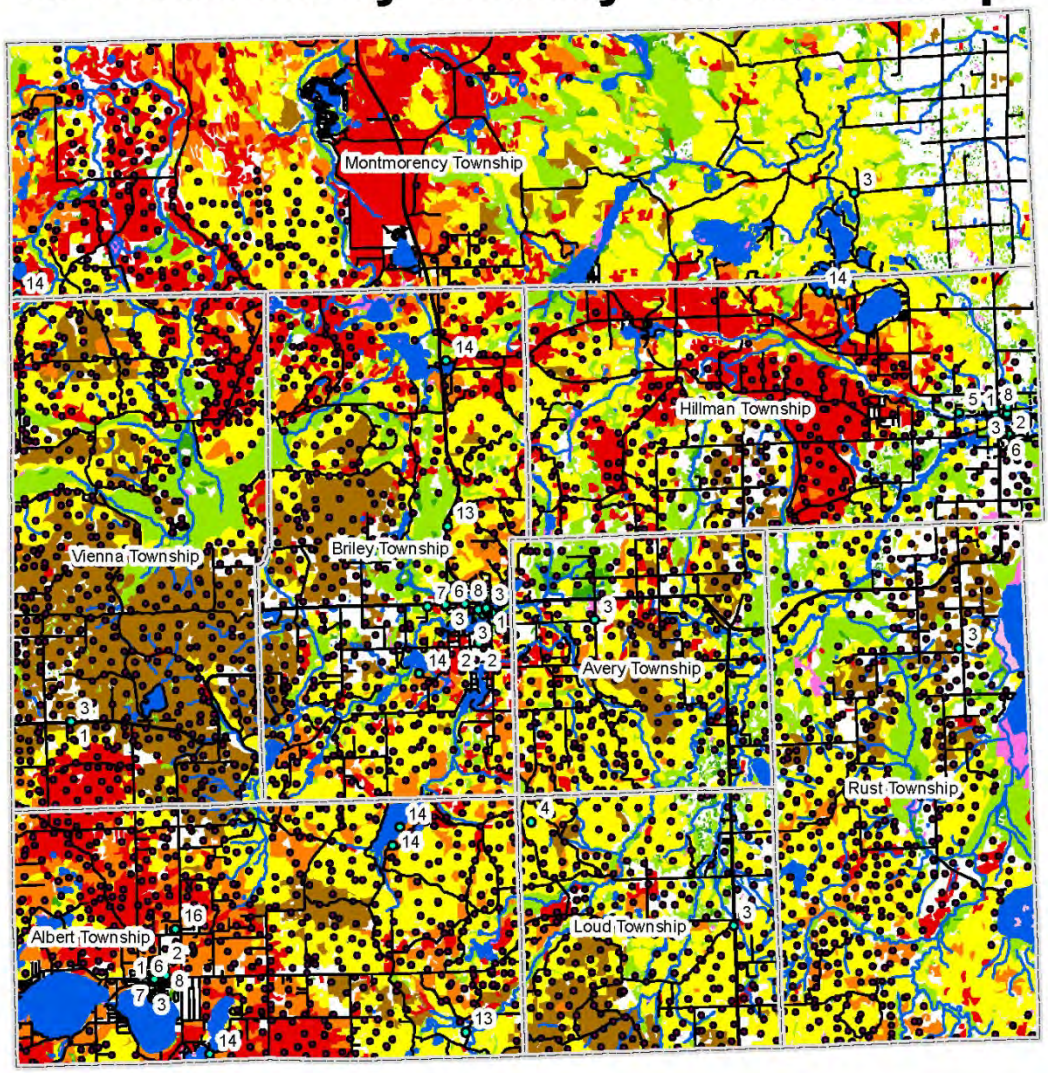
Natural: Riverine flooding
Technological: Transportation accident (land), structural fire, hazardous material spill, oil/gas well accident.
Societal: Bovine TB

Legend for Community Infrastructure on Base Maps			
Fire Stations	1	Bus Station	10
Schools	2	Port/Harbor	11
Gov'nt Buildings	3	College/University	12
Solid Waste Facil.	4	DNR Office	13
Waste Water Treat.	5	Campgrounds	14
Municip Water Supply	6	Traffic Counts	15
Police Station	7	Industrial Parks	16
Medical Facilities	8	Chamber of Commerce	17
Health Dept. Buildings	9		

Montmorency County Base Map



Montmorency County Hazards Map



Infrastructure
Oil & Gas Wells
Montmorency County
Townships
Hillman

County Roads
M 32
M 33
Rivers

Forest Types
Northern Hardwoods
Aspen-Birch
Oak
Other Upland Conifers
Pine

Wetland Types
Aquatic Bed
Emergent
Forested
Open Water
Scrub-Shrub

NEMCOG
MAP PRODUCTION

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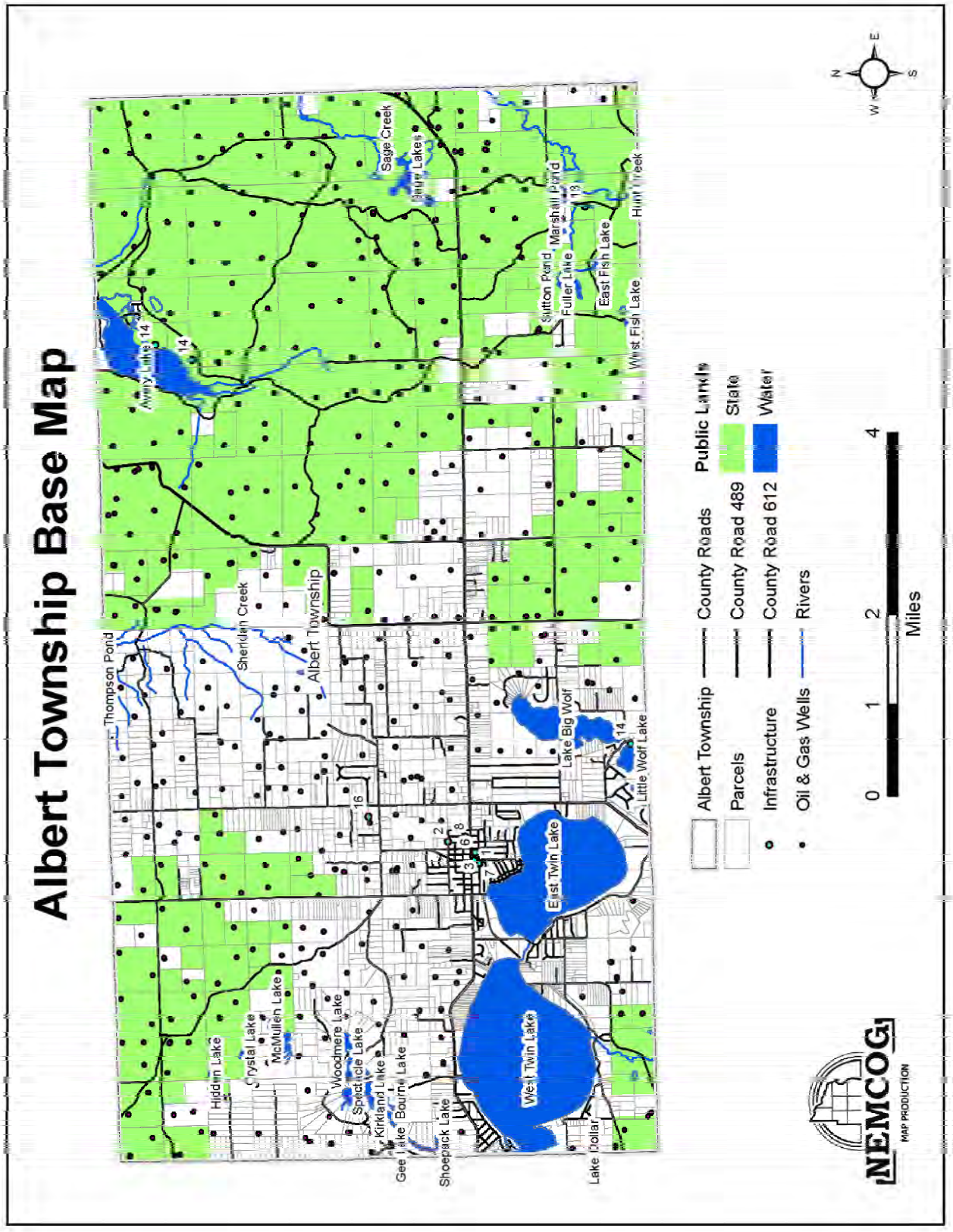
Albert Township Base Map
Albert Township
Parcels
Infrastructure
Oil & Gas Wells
County Roads
County Road 489
County Road 612
Rivers
Public Lands
State
Water
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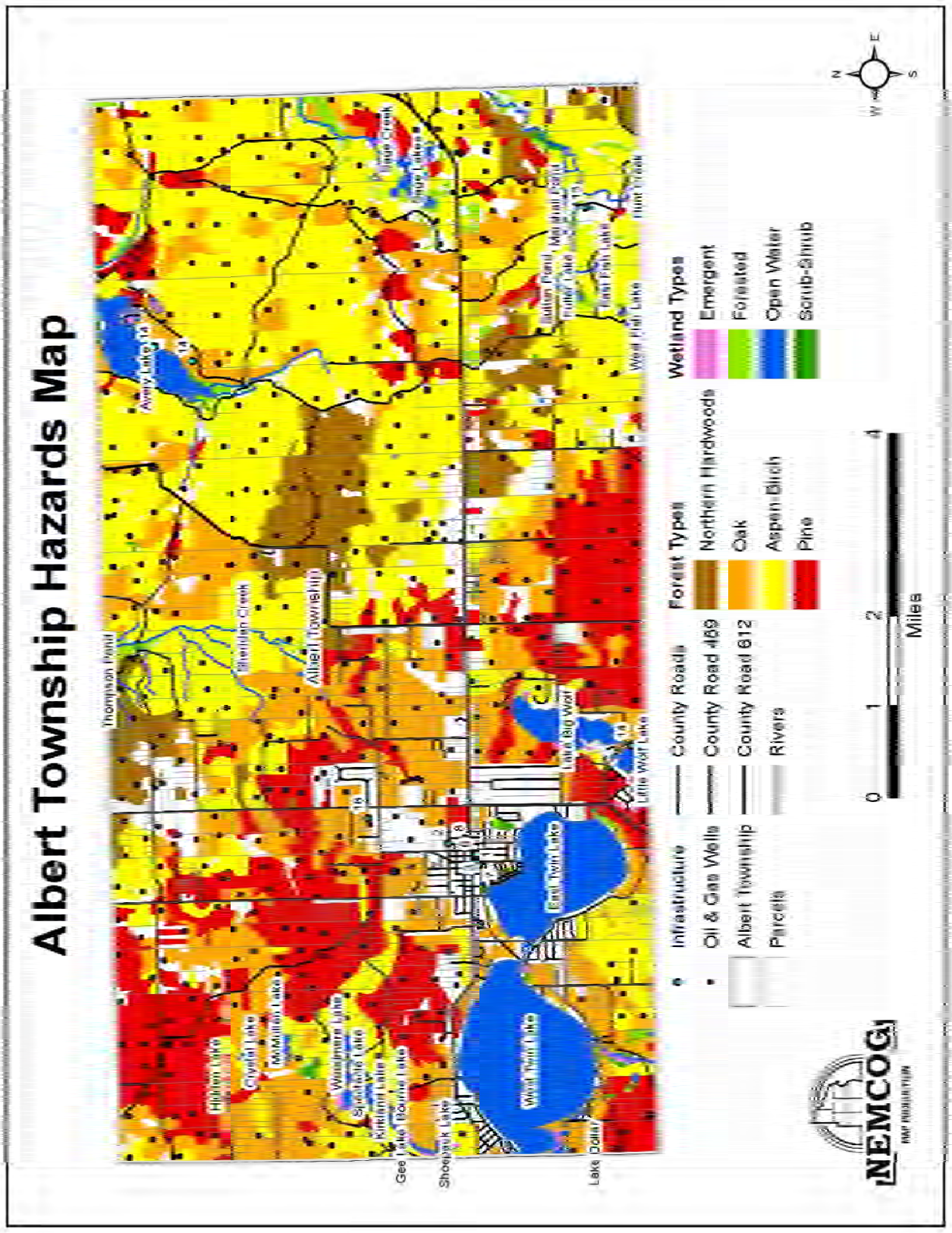
NEMCOG
MAP PRODUCTION
Thompson Pond
Sheridan Creek
Sage Creek
Avery Lakes
Sutton Pond
Marshall Pond
Fuller Lake
East Fish Lake
West Fish Lake
Hunt Creek
Hidden Lake
Crystal Lake
McMullen Lake
Woodmere Lake
Spectacle Lake
Kirkland Lake
Bourne Lake
Gee Lake
Shoepack Lake
West Twin Lake
East Twin Lake
Lake Big Wolf
Little Wolf Lake
Lake Dollar


Albert Township Hazards Map
Infrastructure
Oil & Gas Wells
Albert Township
Parcels
County Roads
County Road 489
County Road 612
Rivers
Forest Types
Northern Hardwoods
Oak
Aspen-Birch
Pine
Wetland Types
Emergent
Forested
Open Water
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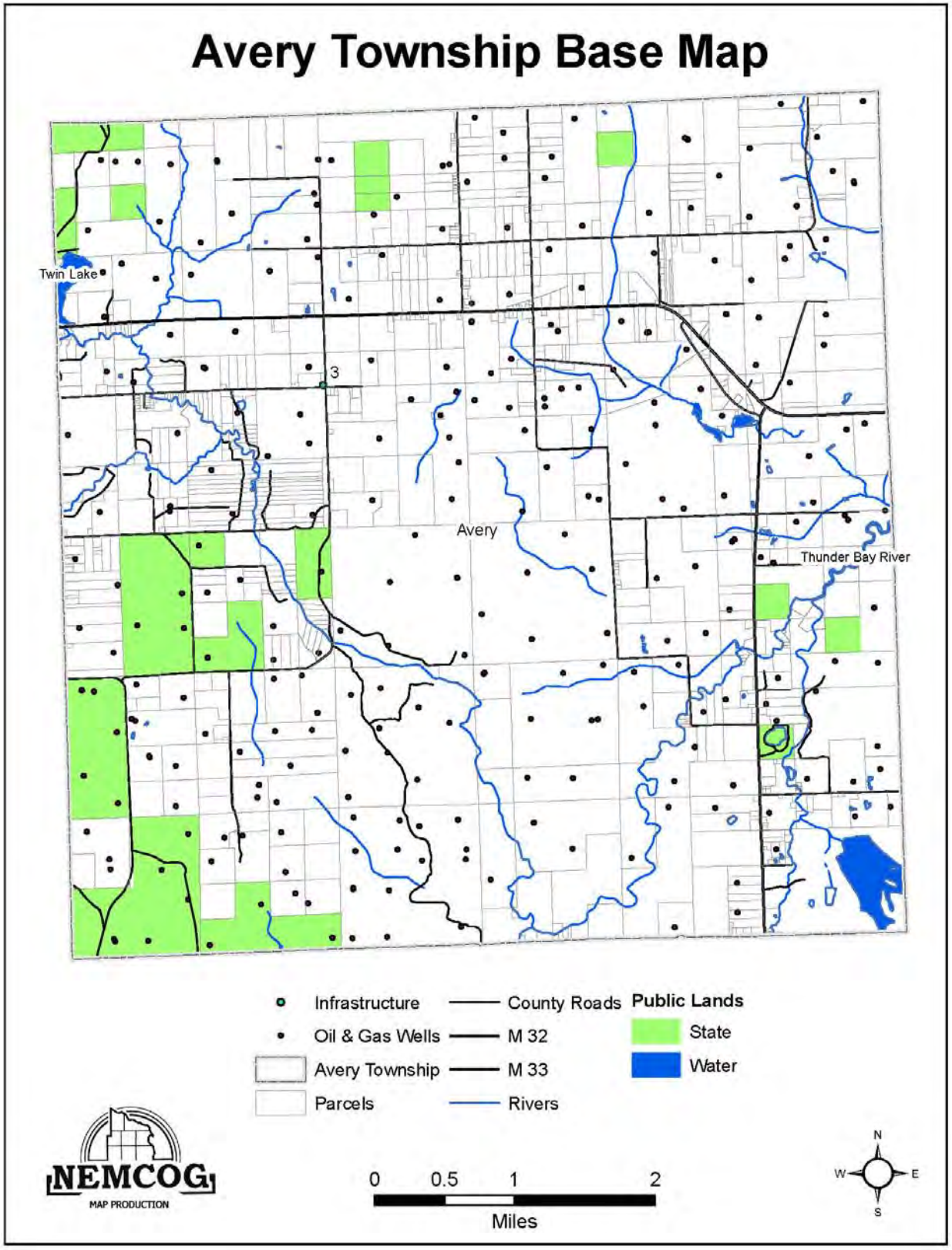
Albert Township
Thompson Pond
Sheridan Creek
Avery Lake
Hanson Creek
Hunt Creek
Helen Lake
Crystal Lake
McMillan Lakes
Woodmere Lake
Spectacle Lake
Kirkland Lake
Bourne Lakes
Gee Lake
Shoepack Lake
West Twin Lake
East Twin Lake
Lake Big Wolf
Little Wolf Lake
Sutton Pond
Miguelon Pond
Fuller Lake
East Fish Lake
West Fish Lake


Avery Township Base Map
Twin Lake
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Avery
Thunder Bay River
Infrastructure
Oil & Gas Wells
Avery Township
Parcels
County Roads
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M 33
Rivers
Public Lands
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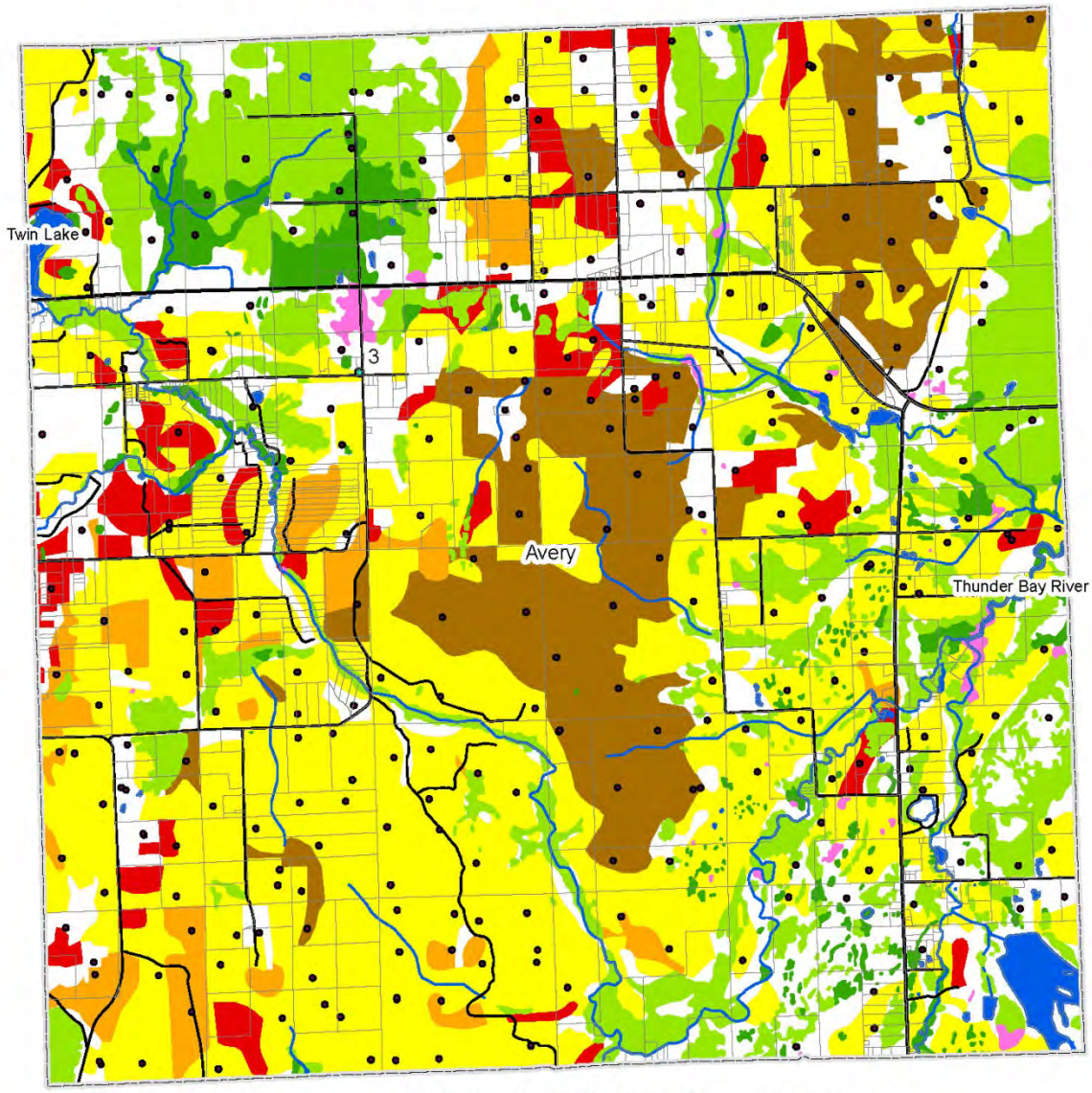
Avery Township Hazards Map



Infrastructure
Oil & Gas Wells
Avery Township
Parcels
County Roads
M 32
M 33
Rivers

Wetland Types
Emergent
Forested
Open Water
Scrub-Shrub

Forest Types
Northern Hardwoods
Oak
Aspen-Birch
Pine

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MAP PRODUCTION

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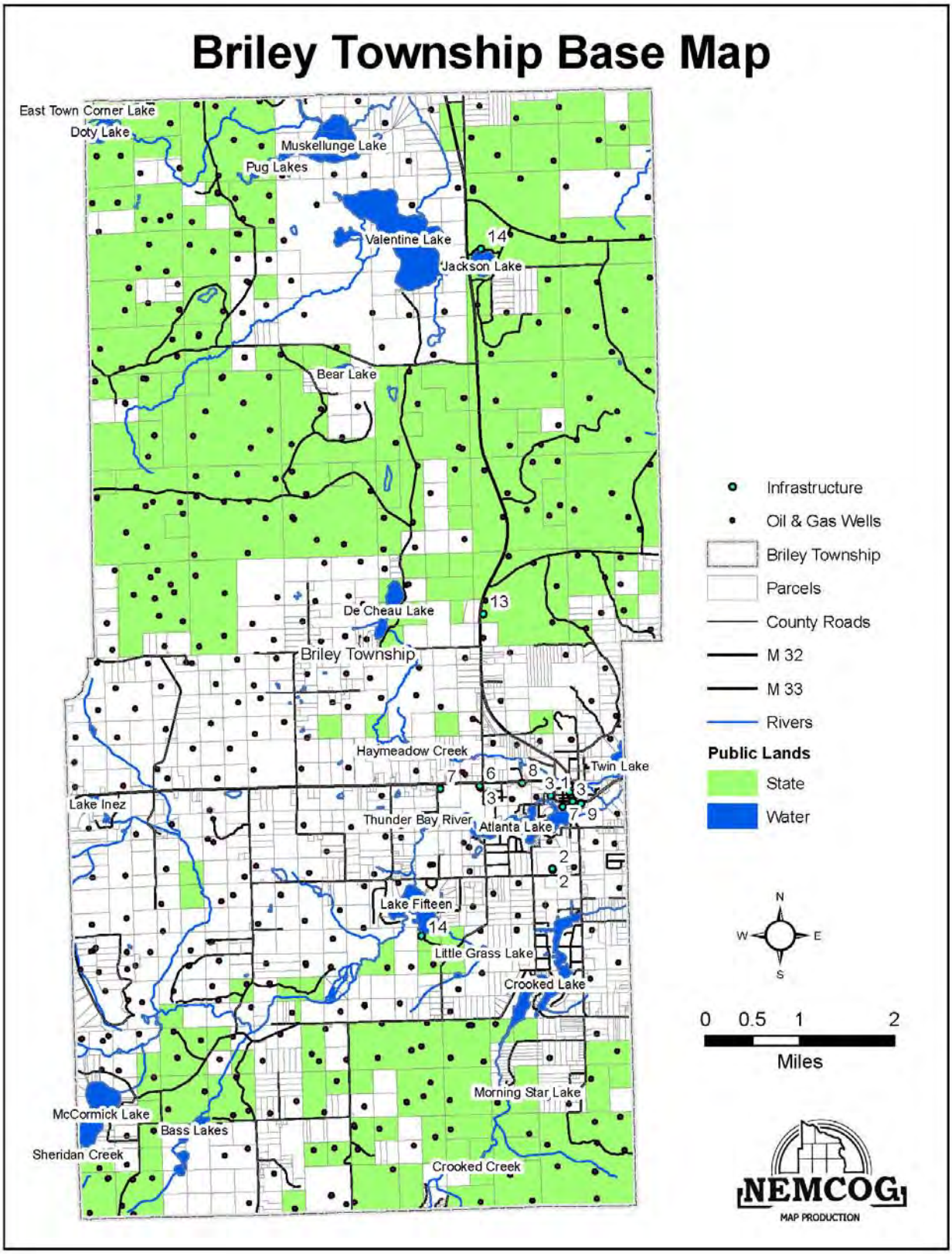
Briley Township Base Map
East Town Corner Lake
Doty Lake
Muskellunge Lake
Pug Lakes
Valentine Lake
Jackson Lake
Bear Lake
De Cheau Lake
Briley Township
Haymeadow Creek
Twin Lake
Lake Inez
Thunder Bay River
Atlanta Lake
Lake Fifteen
Little Grass Lake
Crooked Lake
Morning Star Lake
McCormick Lake
Bass Lakes
Sheridan Creek
Crooked Creek
Infrastructure
Oil & Gas Wells
Briley Township
Parcels
County Roads
M 32
M 33
Rivers
Public Lands
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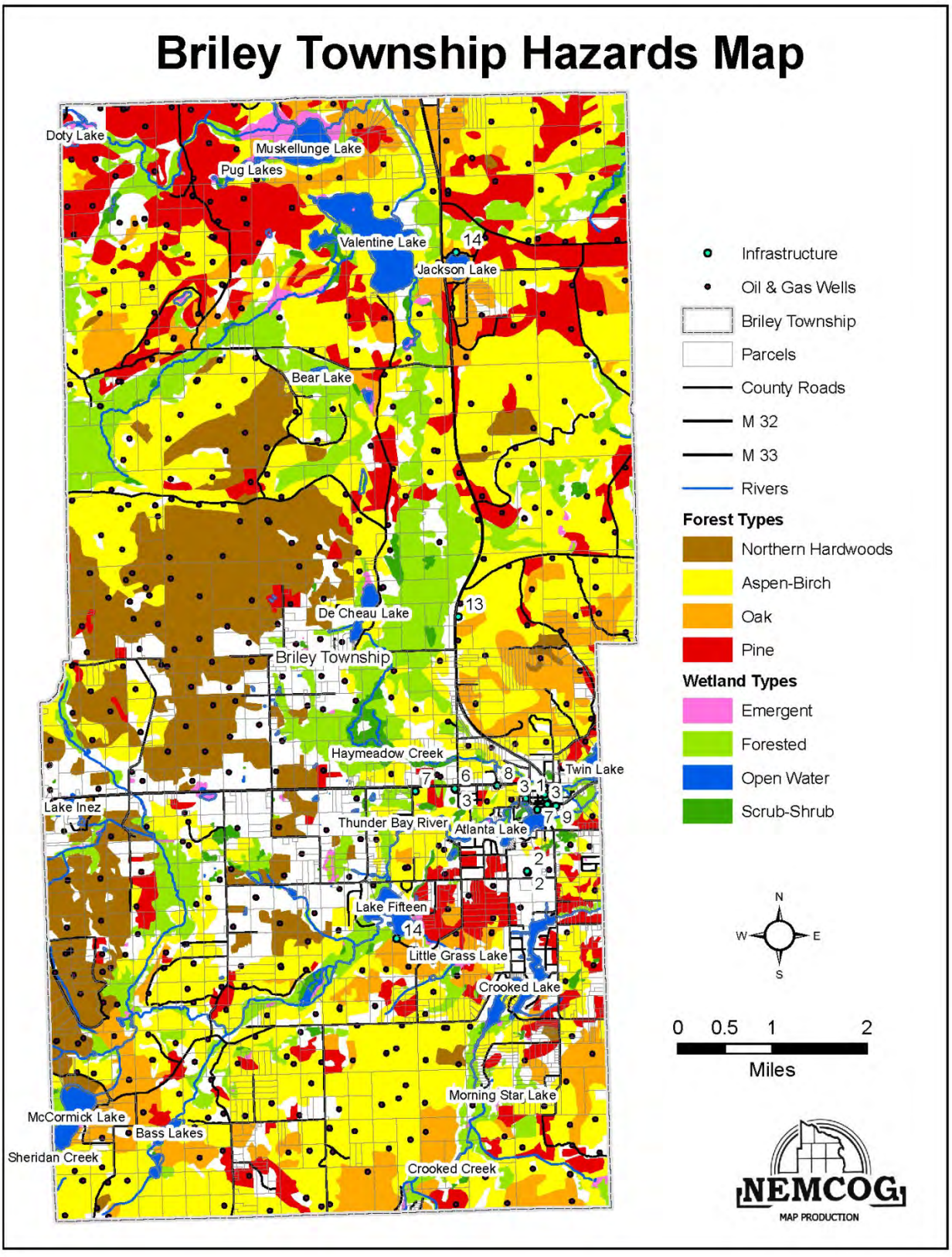
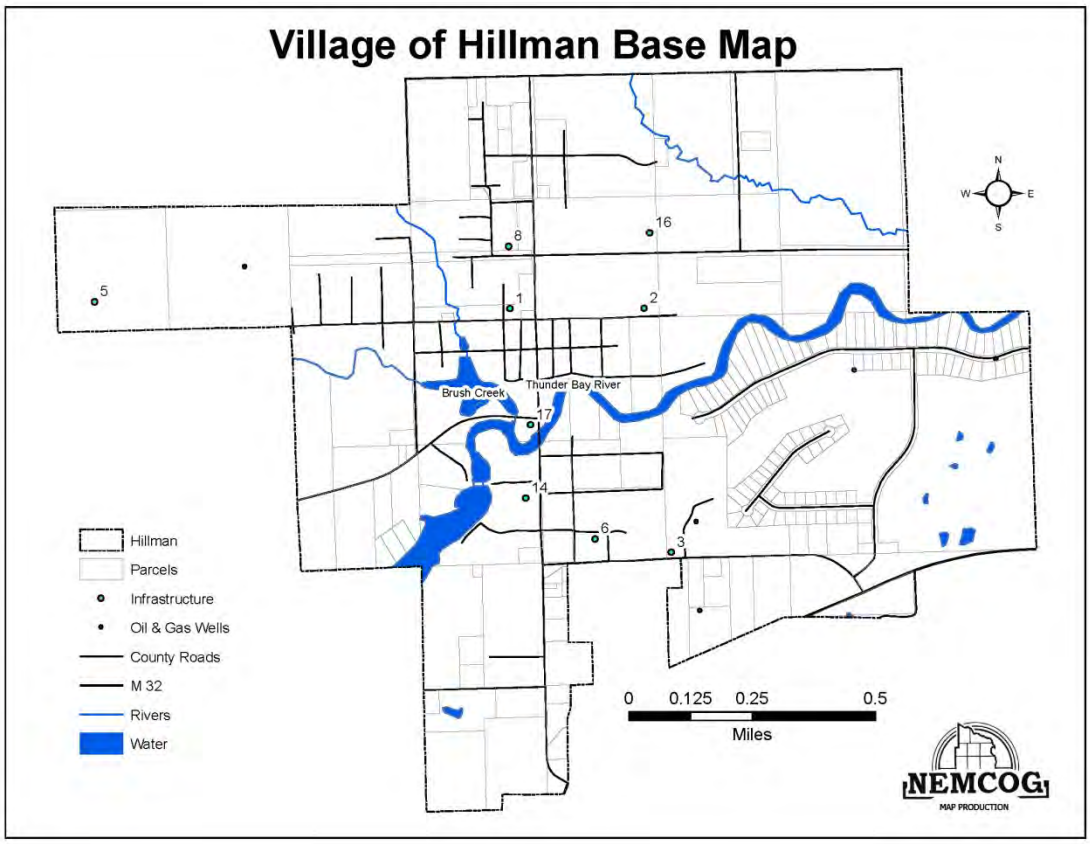
MAP PRODUCTION

Briley Township Hazards Map




Village of Hillman Base Map
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Brush Creek
Thunder Bay River
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Hillman
Parcels
Infrastructure
Oil & Gas Wells
County Roads
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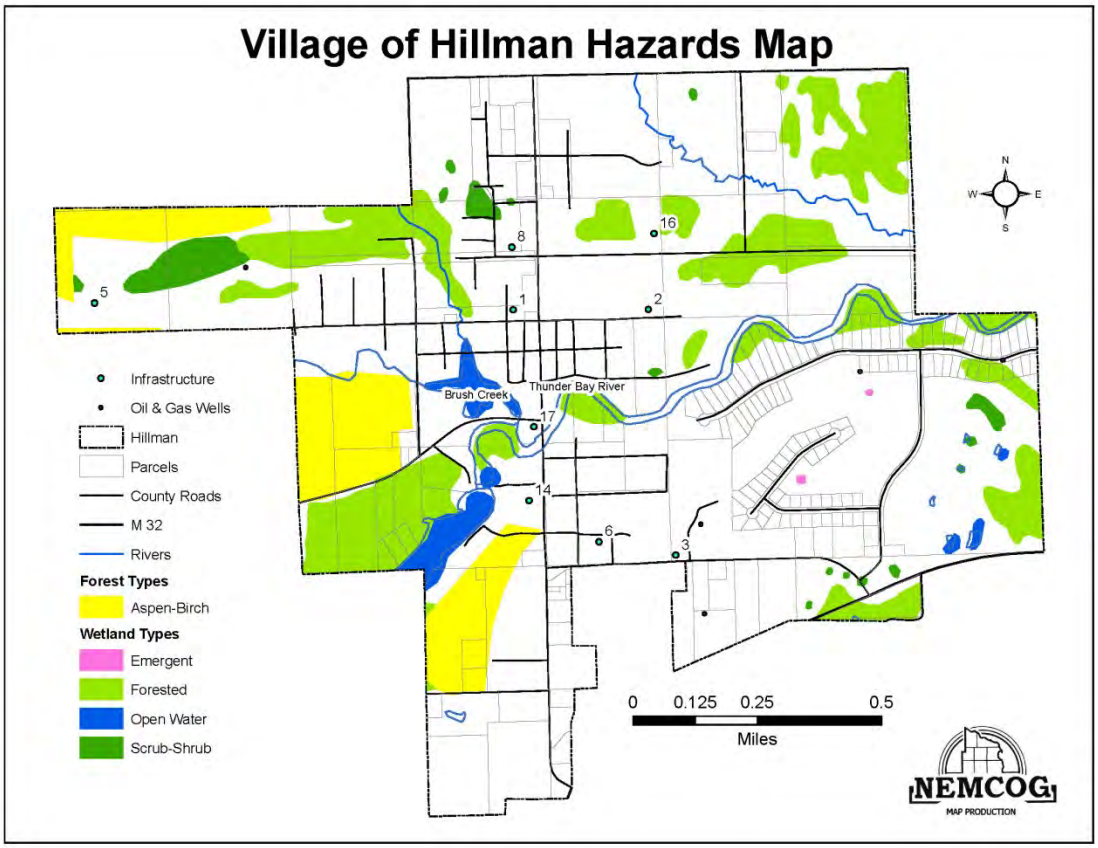
MAP PRODUCTION


Village of Hillman Hazards Map
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Brush Creek
Thunder Bay River
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Infrastructure
Oil & Gas Wells
Hillman
Parcels
County Roads
M 32
Rivers
Forest Types
Aspen-Birch
Wetland Types
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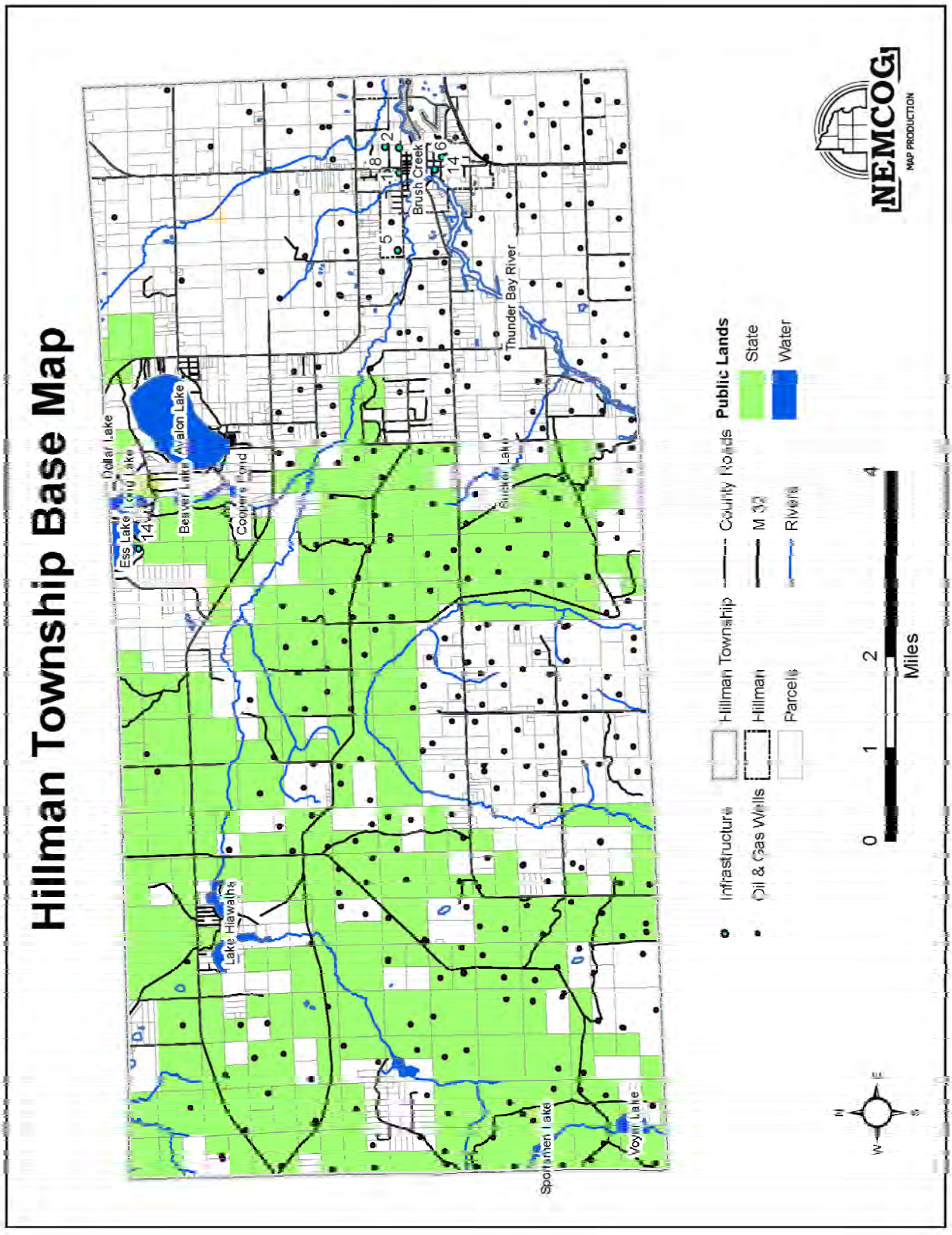
MAP PRODUCTION


Hillman Township Base Map
NEMCOG
MAP PRODUCTION
Avalon Lake
Beaver Lake
Cooper Pond
Dollar Lake
Ess Lake
Lake Hiawatha
Thunder Bay River
Brush Creek
Sportsmen Lake
Voyer Lake
Public Lands
State
Water
Hillman Township
County Roads
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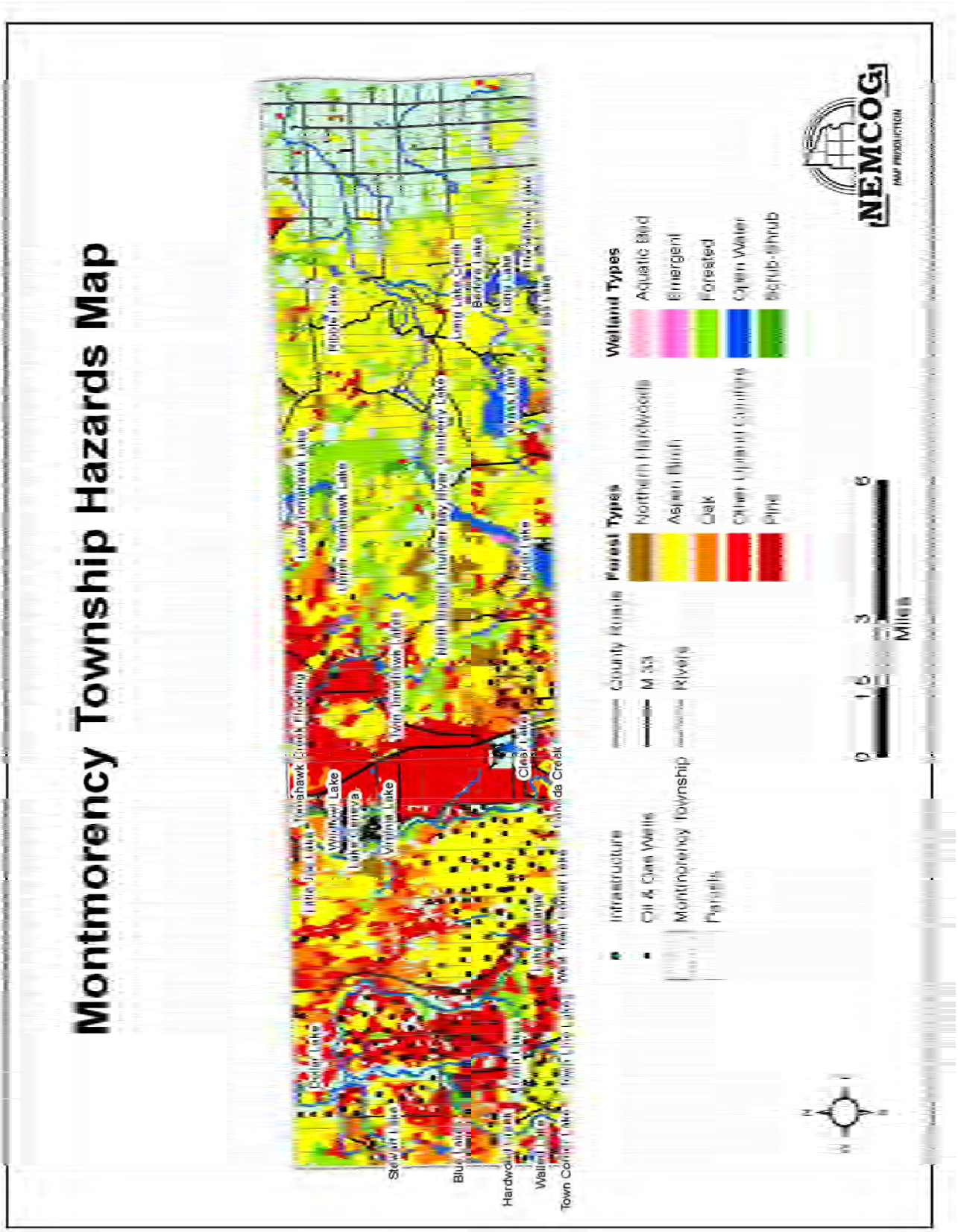
Montmorency Township Hazards Map
Infrastructure
Oil & Gas Wells
Montmorency Township Parcels
County Roads
M 33
Rivers
Forest Types
Northern Hardwoods
Aspen-Birch
Oak
Other Upland Conifers
Pine
Wetland Types
Aquatic Bed
Emergent
Forested
Open Water
Scrub-shrub
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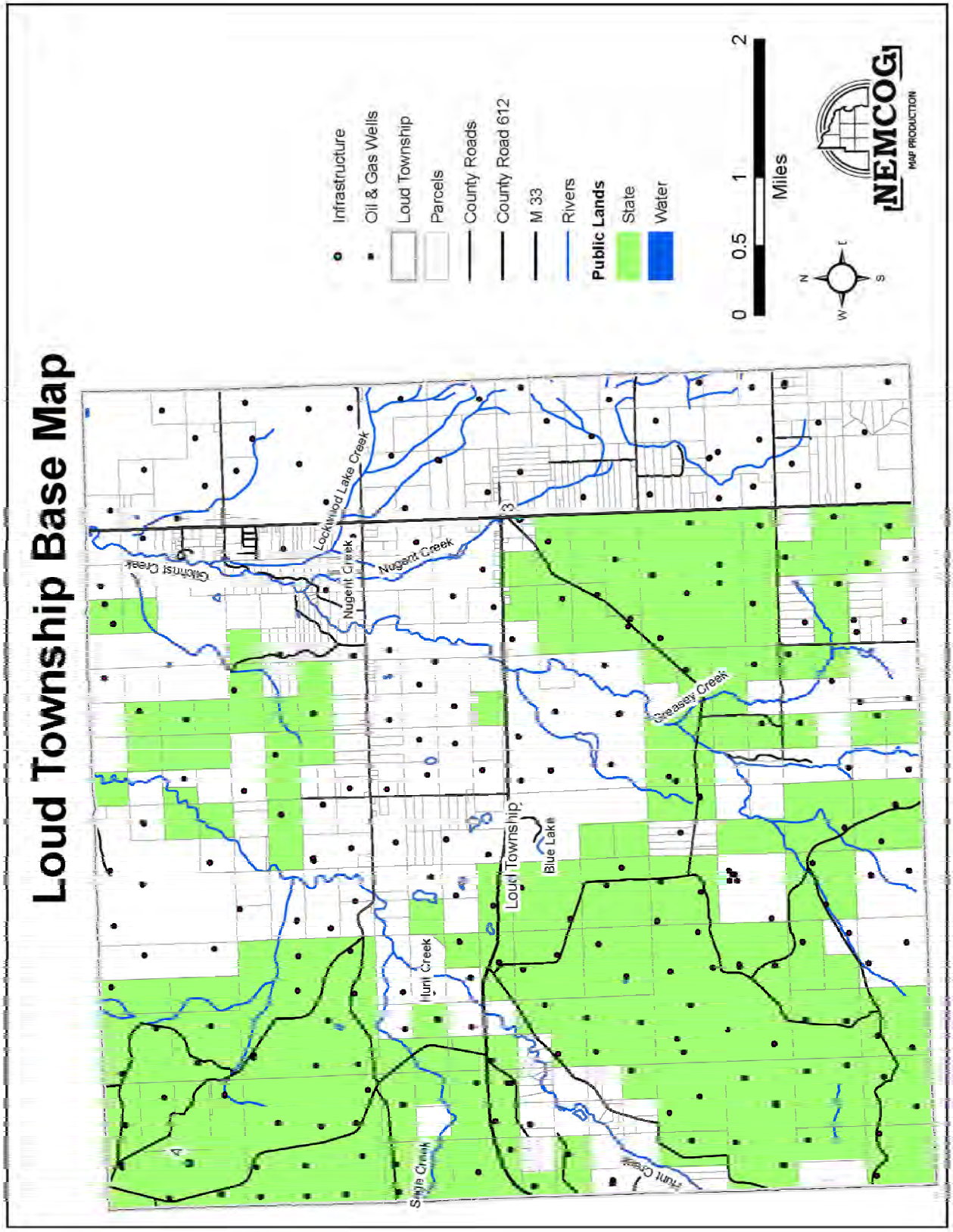
Loud Township Base Map
Infrastructure
Oil & Gas Wells
Loud Township
Parcels
County Roads
County Road 612
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Rivers
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MAP PRODUCTION
Lockwood Lake Creek
Nugent Creek
Nugent Creek
Gilchrist Creek
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Loud Township
Blue Lake
Hunt Creek
Hunt Creek
Sucker Creek
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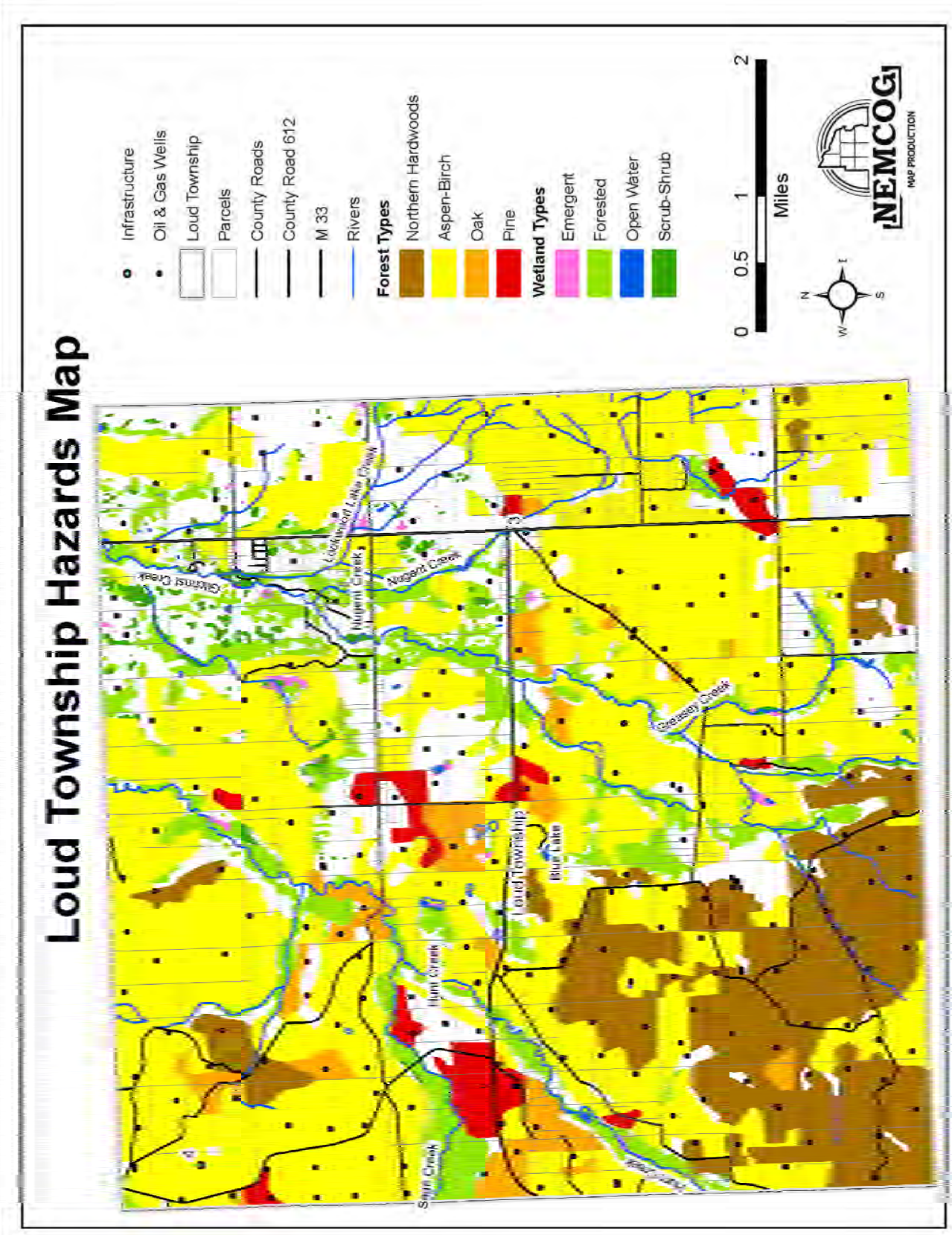
Loud Township Hazards Map
Infrastructure
Oil & Gas Wells
Loud Township
Parcels
County Roads
County Road 612
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Rivers
Forest Types
Northern Hardwoods
Aspen-Birch
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Wetland Types
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Open Water
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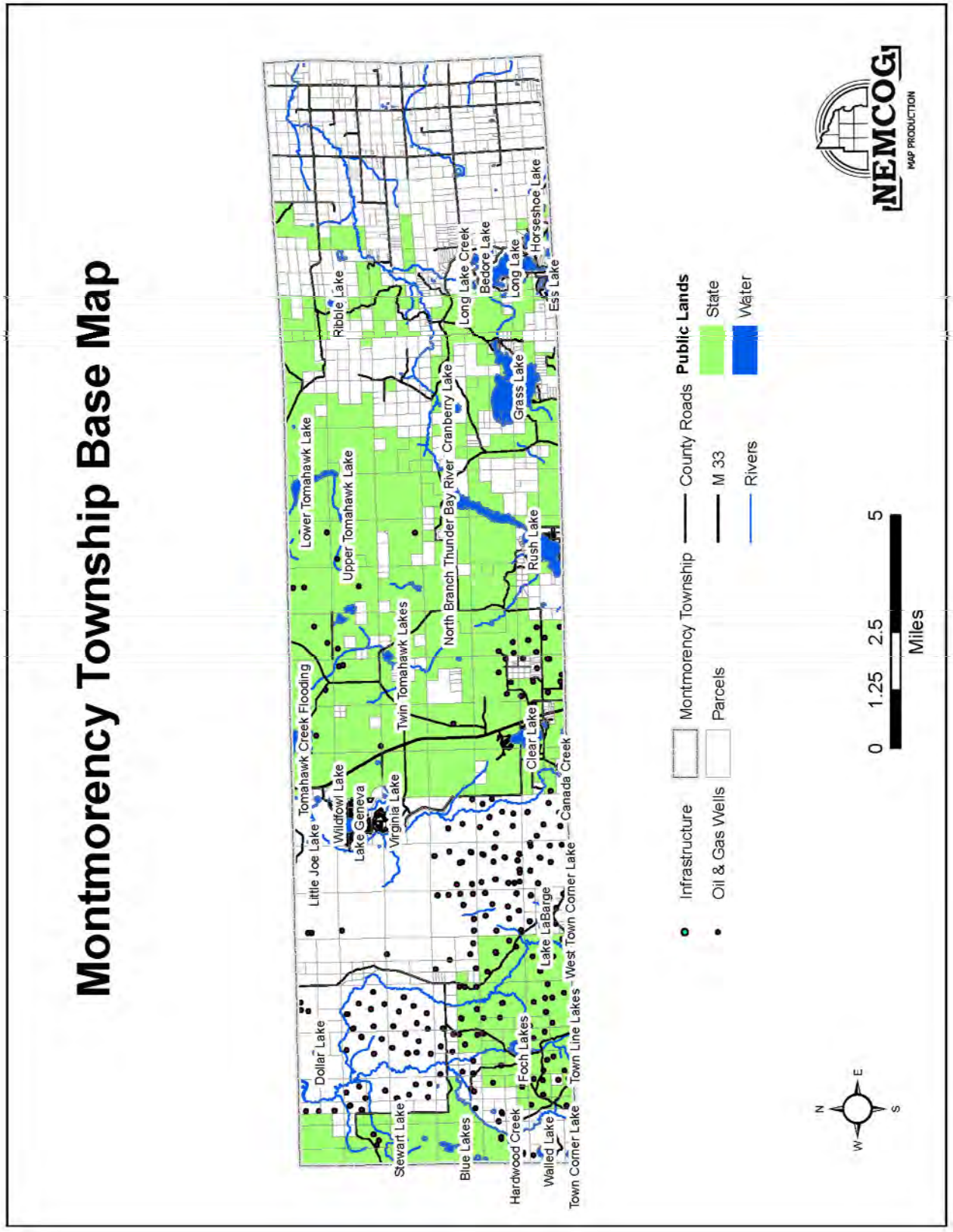
MAP PRODUCTION
Loud Township
Blue Lake
Greasley Creek
Nugent Creek
Hunt Creek
Stan Creek


Montmorency Township Base Map
Tomahawk Creek Flooding
Lower Tomahawk Lake
Upper Tomahawk Lake
Twin Tomahawk Lakes
Little Joe Lake
Wildfowl Lake
Lake Geneva
Virginia Lake
Dollar Lake
Stewart Lake
Blue Lakes
Hardwood Creek
Foch Lakes
Walled Lake
Town Corner Lake
Town Line Lakes
Lake LaBarge
West Town Corner Lake
Canada Creek
Clear Lake
North Branch Thunder Bay River
Rush Lake
Cranberry Lake
Grass Lake
Ribble Lake
Long Lake Creek
Bedore Lake
Long Lake
Horseshoe Lake
Ess Lake
Infrastructure
Oil & Gas Wells
Parcels
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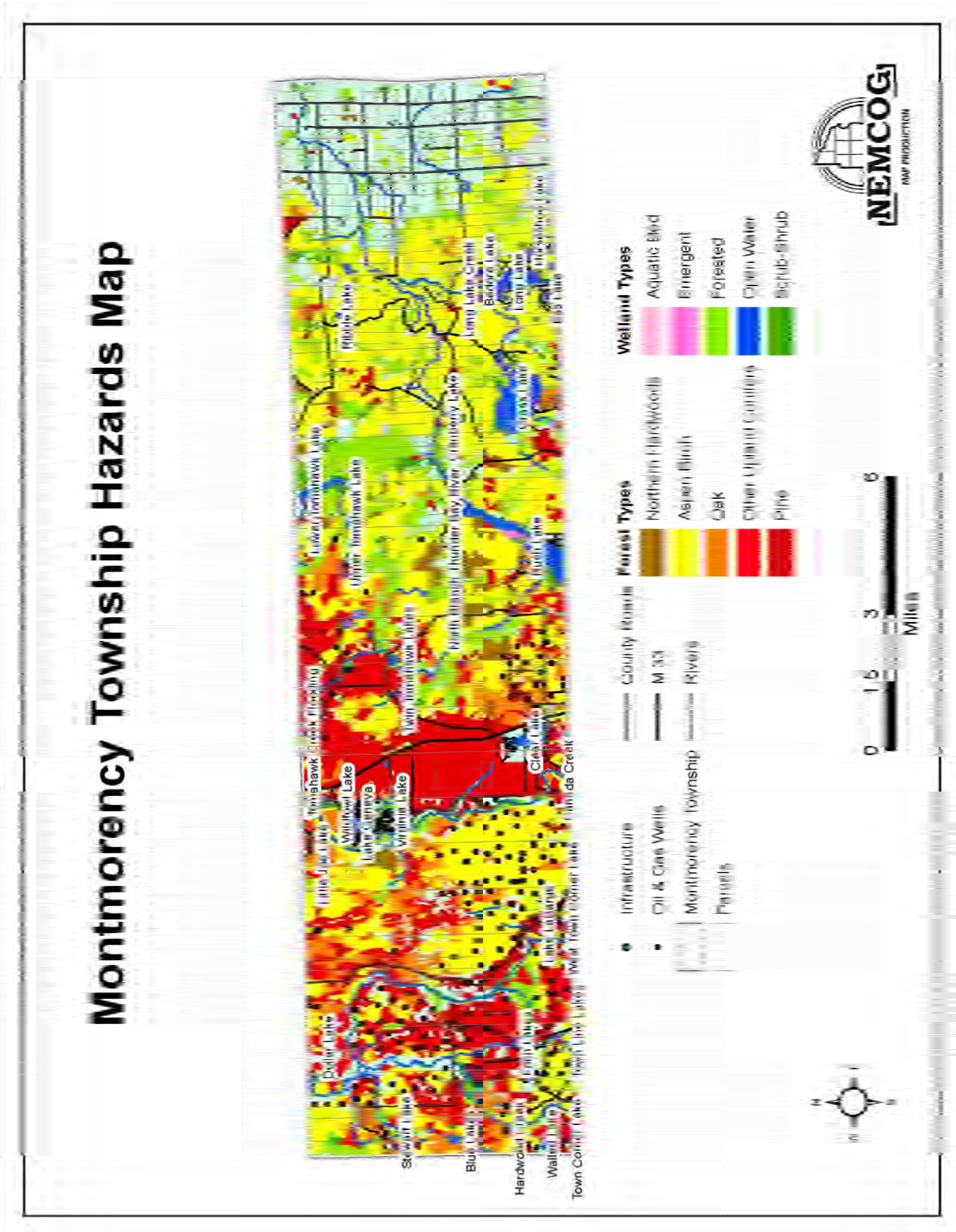
Montmorency Township Hazards Map
Infrastructure
Oil & Gas Wells
Montmorency Township
Parcels
County Roads
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Forest Types
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Wetland Types
Aquatic Bed
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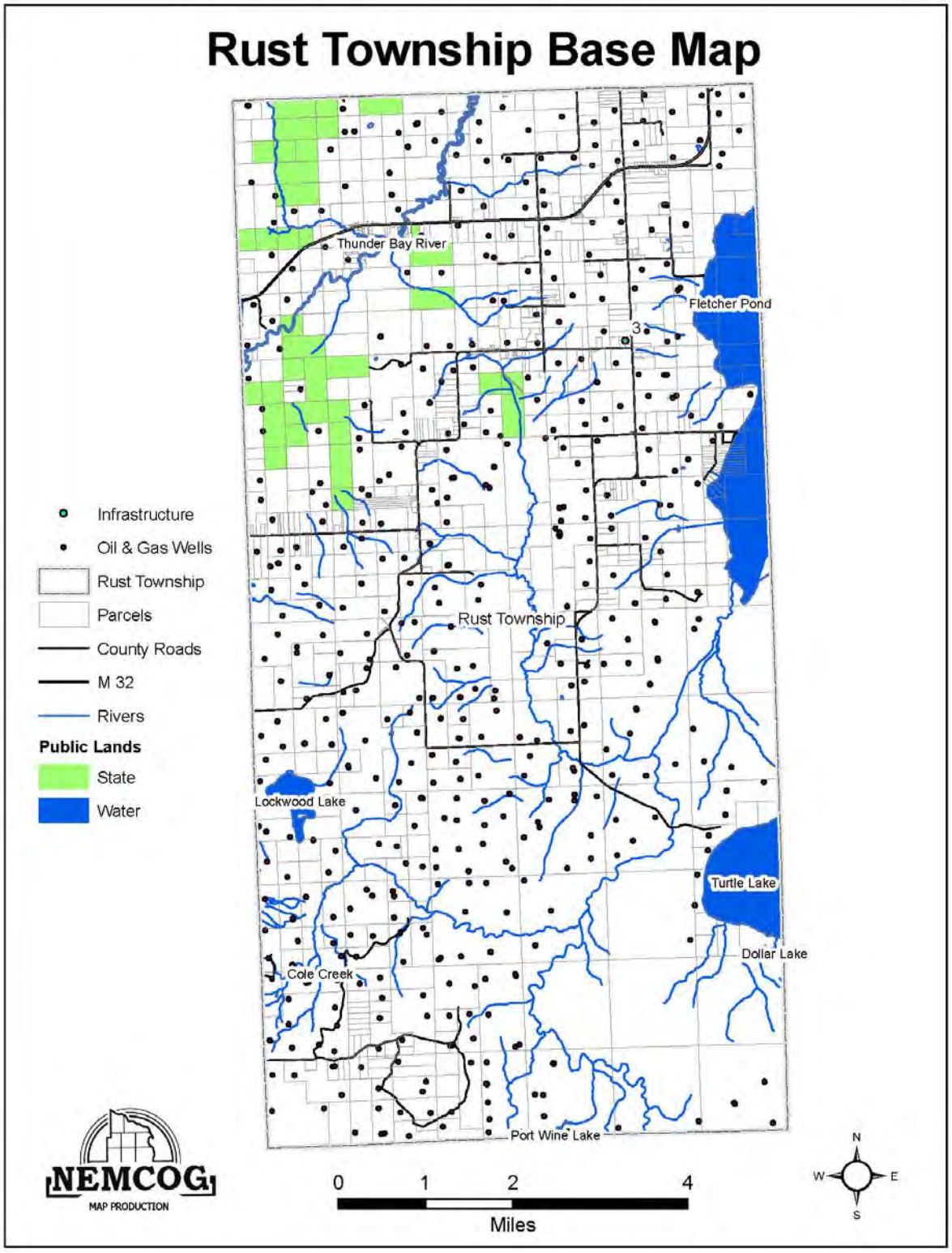
Rust Township Base Map
Thunder Bay River
Fletcher Pond
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Rust Township
Lockwood Lake
Turtle Lake
Dollar Lake
Cole Creek
Port Wine Lake
Infrastructure
Oil & Gas Wells
Rust Township
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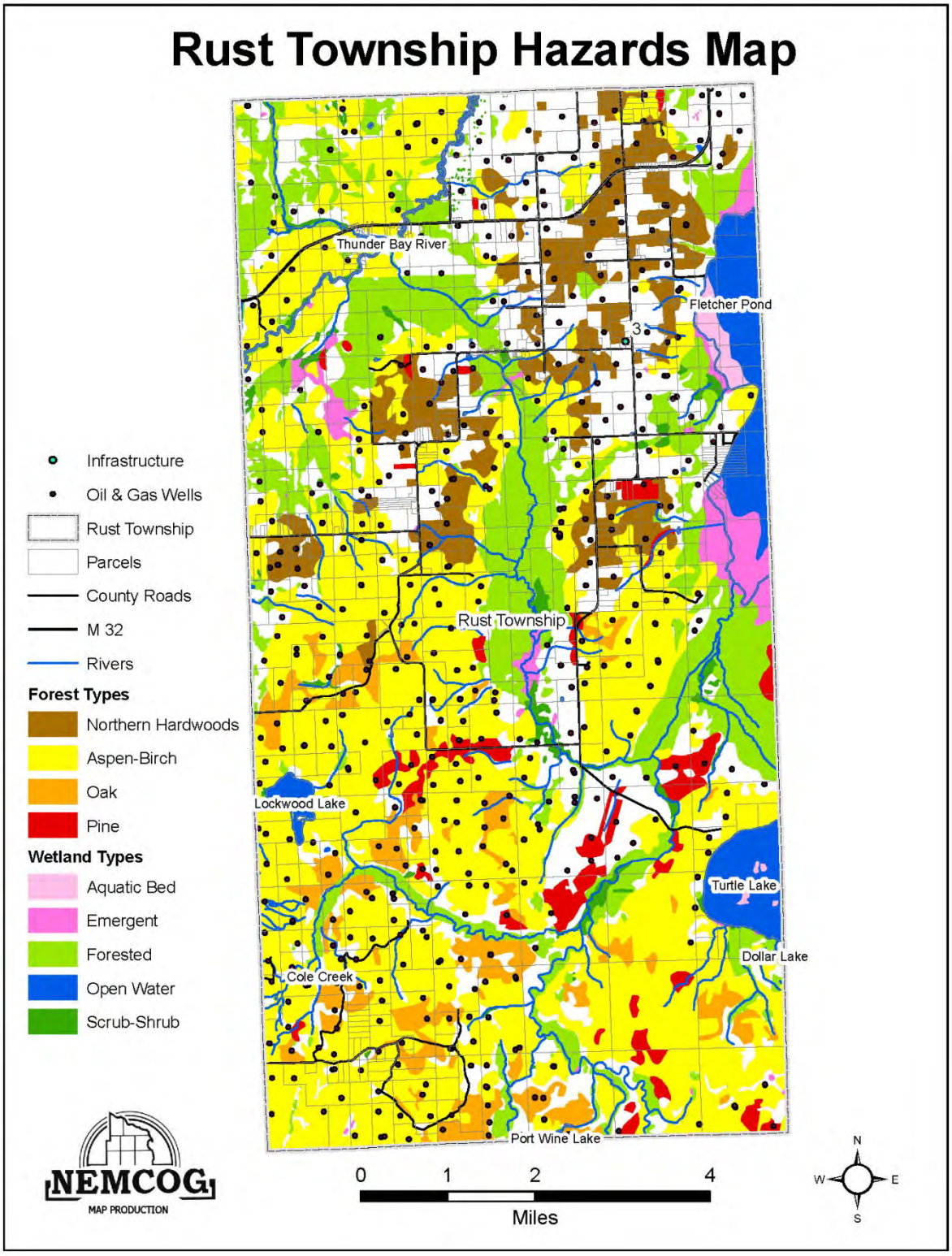
Rust Township Hazards Map
Thunder Bay River
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Rust Township
Lockwood Lake
Turtle Lake
Dollar Lake
Cole Creek
Port Wine Lake
Infrastructure
Oil & Gas Wells
Rust Township
Parcels
County Roads
M 32
Rivers
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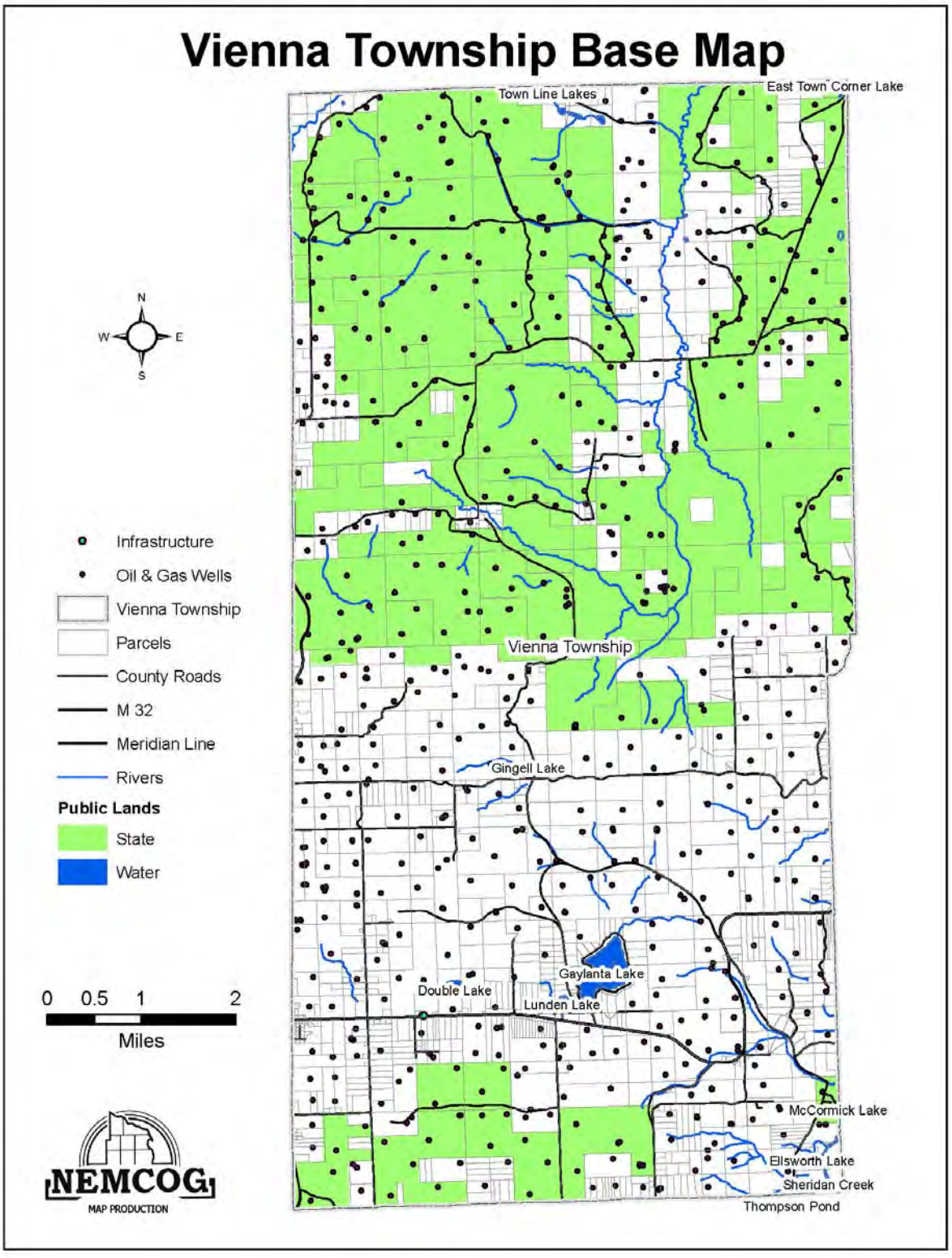
Vienna Township Base Map
Town Line Lakes
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Oil & Gas Wells
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Meridian Line
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Gaylanta Lake
Double Lake
Lunden Lake
McCormick Lake
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Sheridan Creek
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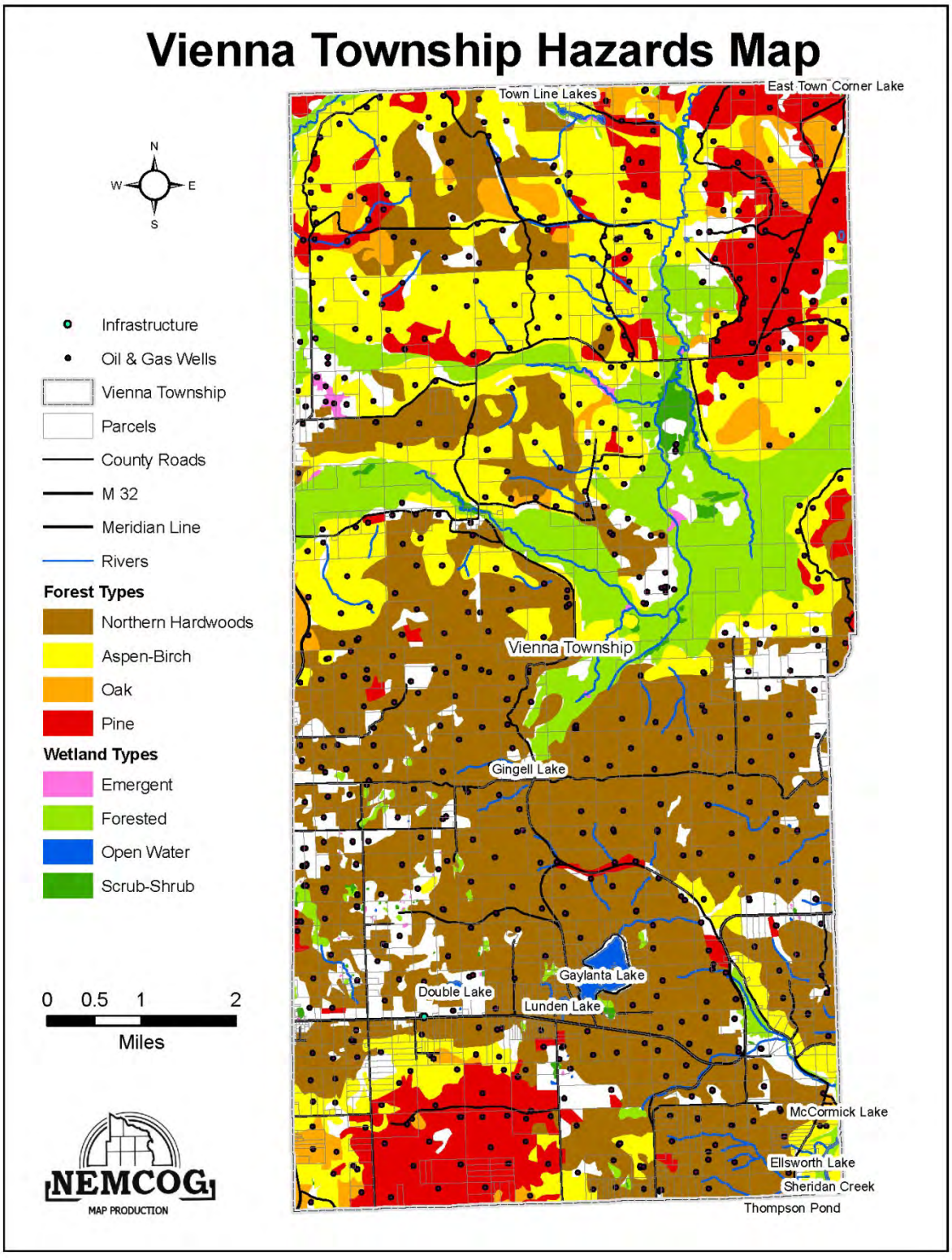
MAP PRODUCTION


Vienna Township Hazards Map
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Oil & Gas Wells
Vienna Township
Parcels
County Roads
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Meridian Line
Rivers
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MAP PRODUCTION
Town Line Lakes
East Town Corner Lake
Vienna Township
Gingell Lake
Gaylanta Lake
Double Lake
Lunden Lake
McCormick Lake
Ellsworth Lake
Sheridan Creek
Thompson Pond