Chapter 4 - Natural Resources

Introduction

The woodlands, open spaces, wildlife, water, and rolling hills are several key resource values that draw people to both recreate and live in the Township. Abundant public lands offer access to thousands of acres of recreational lands for hunting, hiking, wildlife viewing and snowmobiling. Several small creeks and the Pine River provide opportunities for fishing, boating and water sports.

A rural landscape, abounding with views of farmland and forestland, typifies the community character of Mikado Township. Farm and forest lands are important to the local economy; recreational use and production of forest and farm goods bring dollars into the Community. Many long time visitors decide to move to the area upon retirement. These renewable yet priceless resources warrant special considerations when planning for future growth.

The protection and wise use of these natural resources is central to maintaining a sustainable community. Along with planning for the built-up infrastructure like roads and utilities, a community needs to plan for the green infrastructure; the forests, wetlands, farmland and water. Development, without consideration of carrying capacity of the land, can have long term negative impacts on the resources. When planning for future growth, the community must identify environmental constraints, such as wetlands, steeply sloped areas, ecological corridors and ground water recharge zones. This chapter will analyze the physical environment to assist local officials in developing the desired future of the Township. Natural resources addressed include climate, geology, topography, soils, water, vegetation and wildlife.

Climate

The climate is yet another reason why people are drawn to the area. Typical of northern Michigan, the distinct four seasons offer an ever changing landscape. Long snowy, cold winters; and moderately warm summers are separated by a cool, green spring and a cool colorful fall. Located in the northeastern part of the northern lower peninsula, the eastern boundary of the Township is less than five miles inland from Lake Huron. Given this geographic location, the weather is influenced by the lake moderating effect of Lake Huron.

According to the USDA Soil Survey of Alcona County, the average annual precipitation is 29.46 inches (includes water equivalent of snowfall). Precipitation is heaviest during the summer months with 60 percent of the annual precipitation from April through September. The average annual snowfall is 49.5 inches. Records show a long term average of 93 days when there is at least one inch of snow on the ground. Of course, the number of days varies greatly from year to year. The average daily temperature ranges from 67.9 ºF for the month of July to 20.0 ºF during January. The average mid-afternoon relative humidity is 61 percent. Since humidity levels are highest at night, the average relative humidity at dawn is 83 percent.

Geology

The rolling hills, river valleys, swamps and lakes were created by the retreating continental glacier some 12,000 years ago. Beneath this thick mantel of the glacial deposits lays a foundation of layered sedimentary bedrock. This section will describe the glacial landforms or quaternary geology and the underlying bedrock geology.

Starting some 2 million years ago, during the Pleistocene era, continental glaciers formed in the Hudson Bay area. Several times, over this two million year period, the massive sheets of ice built up and inched their way south across what is today Michigan. The massive ice sheets, more than one mile thick, advanced in a southerly direction, bulldozing their way across the landscape. The glacier pushed material in front of it, incorporated rocks and soil into the debris laden ice; and scraped, ground and broke apart the sedimentary bedrock of the Michigan Basin.

Each advance and retreat of the continental glaciers took tens of thousands of years. This reoccurring process shaped and reshaped the land; obliterating and then creating hills, valleys, rivers and lakes, swamps and marshes. The last glacial period, called the Wisconsin era, created the landscape we know today. The glacier left behind boulders, rocks, cobble, sand, gravel, silt, clay and loam. In some areas the material was deposited in unsorted masses called till plains, ground moraines and end moraines. Water flowing from the melting glaciers also sorted materials, creating outwash channels, sand deltas, kames and eskers. Fine materials, captured in the fast moving glacial meltwater, settled to the bottom of expansive glacial lakes creating lacustrine clay and silt plains. **Figure 4.1** shows the formation of glacial landforms.

According to a map prepared by W. A. Burgess and D. F. Eschman **(Figure 4.2)**, titled "Landform Units in Northeastern Lower Michigan," Mikado Township is dominated by a sand delta and till plain, both created by the glacial meltwaters.

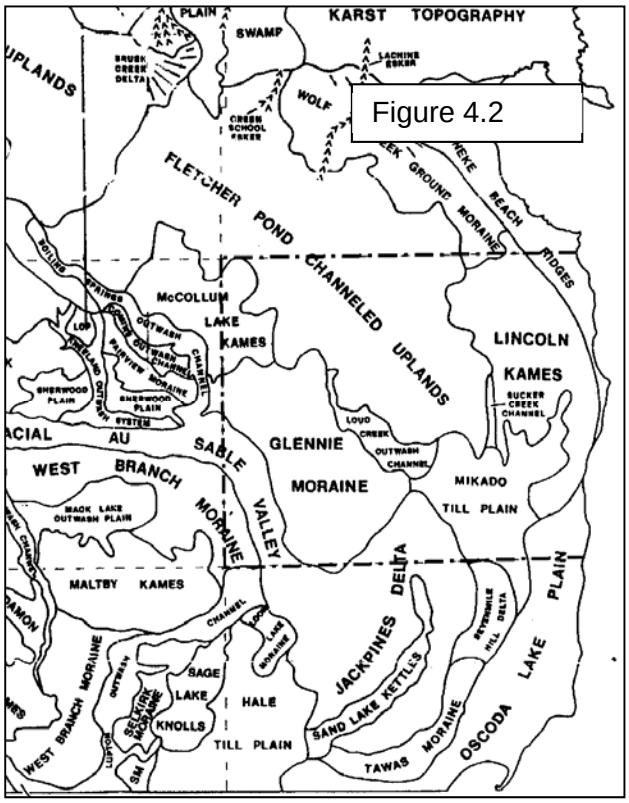
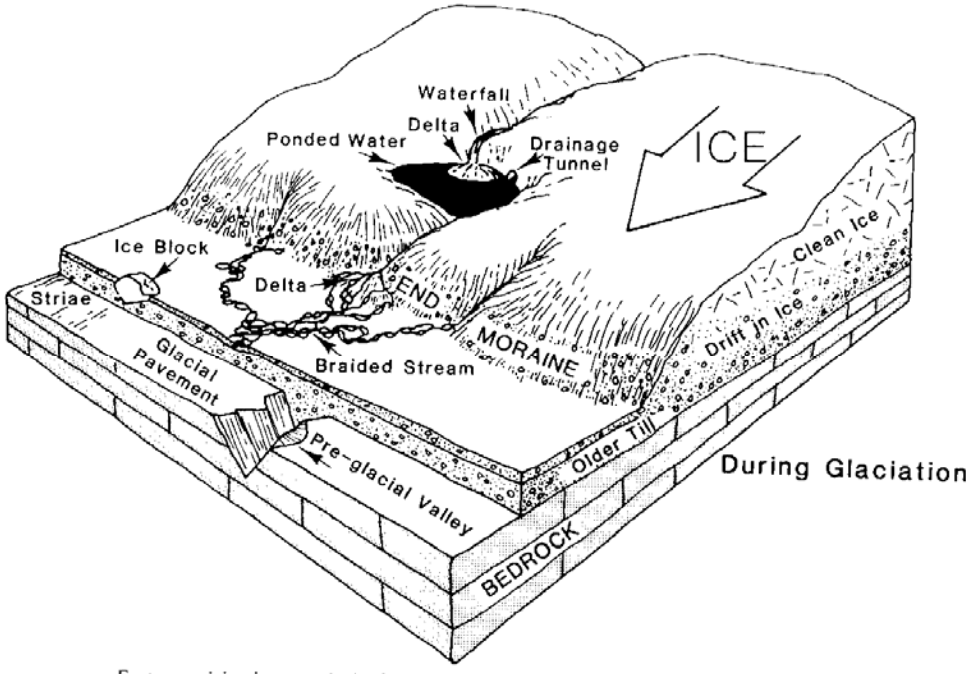
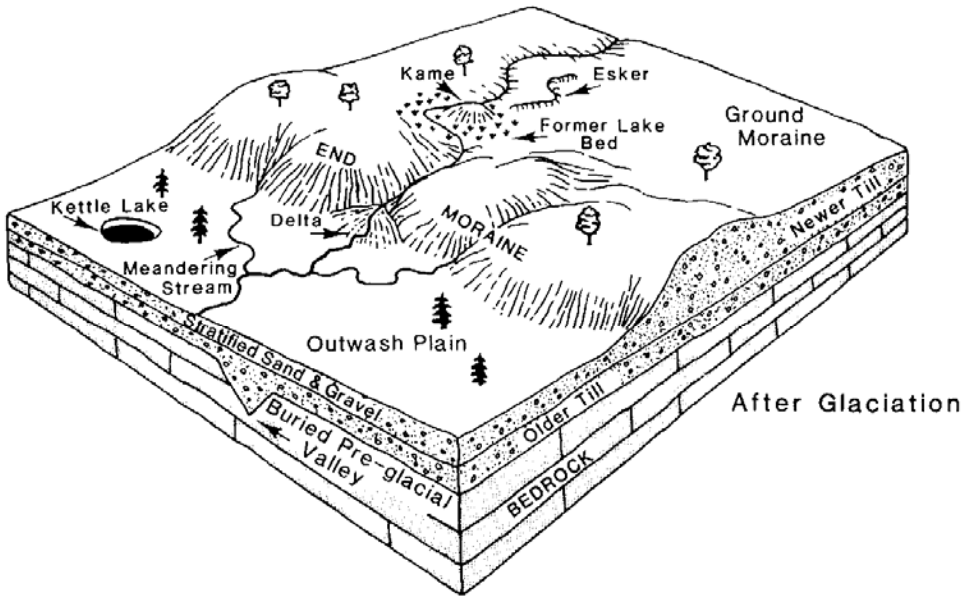


Figure 4.2

At the front of the massive retreating glaciers, large streams originated from the melting ice. The debris laden water carved through moraines and outwash plains creating wide drainageways and outwash channels. The AuSable River follows one of those large glacial river valleys. As the continental glaciers melted, water flowed across the landscape creating landforms and pooling into the expansive post glacial lakes. These emerging lake basins were the beginnings of our Great Lakes. During different periods, the post glacial great lakes were both much higher and lower than the lake levels we have grown accustomed to in recent times. Geologists have identified and named the different post glacial great lake stages.



Features originating at a glacier front occur in a definite order.

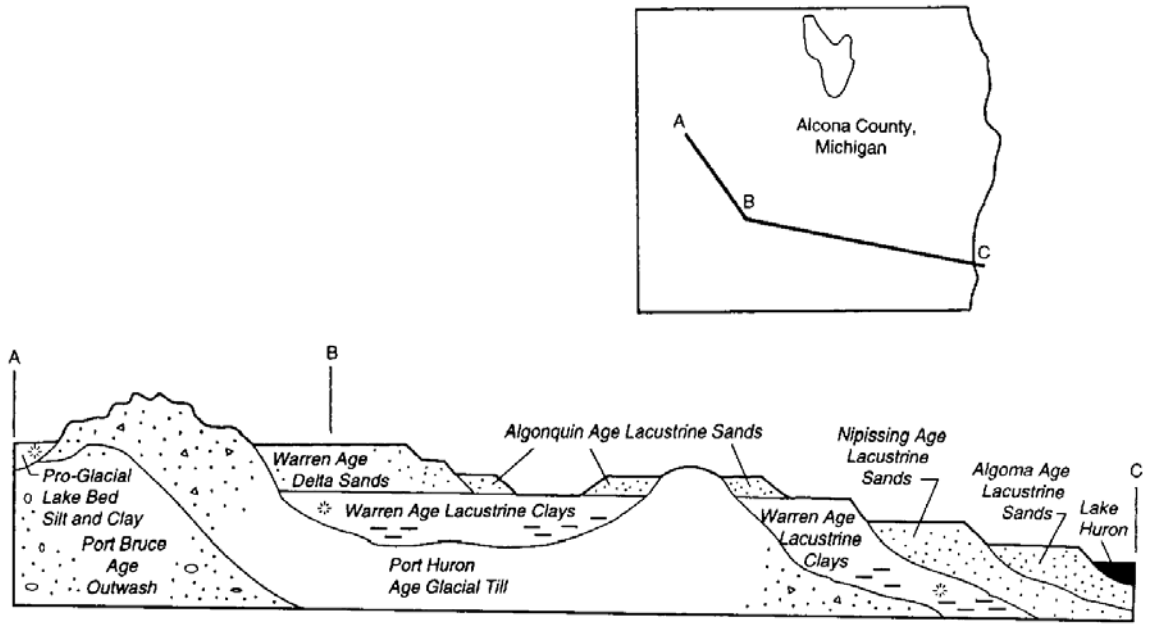


Landforms of continental glaciation are unmistakable.

Figure 4.1

Figure 4.3 shows the different stages of the glacial great lakes Warren, Algonquin, Nipissing and Algoma. Landforms and soils in eastern Alcona County was heavily influenced by these different lake stages. Glacial Great Lake Warren formed at the front of the melting Huron glacial lobe around 12,000 years before present and was the most extensive, flooding much of the land area of Mikado Township.

Figure 4.3



—Diagrammatic cross-section showing glacial deposits of Alcona County. Modified after Burgis and Eschman, 1981.

The west central part of Mikado Township is dominated by a sand delta. The ancient shoreline of Lake Warren was 850 feet above sea level as compared to 577 feet above sea level of Lake Huron. In other words, the lake level of Lake Warren was 273 higher than Lake Huron! As the debris laden meltwaters of the large glacial AuSable River emptied into Lake Warren, the coarse sands settled out first. This created a sand delta called the Jackpines Delta, the one of the largest glacially formed sand deltas in Michigan. This delta extends southward covering much of the north central part of Iosco County. The delta is characterized by broad, nearly level plains, dissected by widely spaced streams and creeks. The soils are excessively drained to somewhat excessively well drained sandy soils.

The eastern part of the Township is called the Mikado Till Plain. When the water slowed to a near standstill in Lake Warren, the fine materials, clays and silts settled to the bottom. According to the Alcona County soil survey, the lake plains are characterized by nearly level to undulating areas dominated by moderately well drained to poorly drained loamy soils. At the transition of the higher sand deltas and the lower lake plains the soils are somewhat poorly drained to very poorly drained sandy and mucky soils.

The Glennie Moraine extends into the northwestern part of Mikado Township. During some periods, the continental glacier's retreat stagnated, that is to say, the ice at the face of the glacier melted as fast as it advanced southward from the polar ice cap. The debris laden,

glacial ice then deposited large amounts of materials in one locale. Acting like a large conveyer belt, the materials piled up at the front of the glacier forming moraines or glacial hills. There were periods when the retreating continental glaciers re-advanced southward, and like a huge bulldozer, it pushed the previously deposited materials into larger hills. These are called push moraines.

Beneath the glacial deposits, hundreds of feet below the surface, is sedimentary bedrock that was created during the Late Mississippian ages of the Paleozoic Era. The bedrock was formed in ancient seas which covered the area some 310- 345 million years ago. The shallow marine seas deposited layers of silt, clay, sediments, marine animals, plants, coral, and other calcareous materials. These deposits formed shale, limestone, and dolomite bedrock. The upper layer of bedrock in the township is Coldwater shale. Other bedrock formations beneath the glacial overburden include Sunbury shale, Berea sandstone, Bedford shale and Antrim shale. Antrim shale contains rich deposits of natural gas. In recent years, intensive exploration has resulted in numerous producing wells throughout the region.

Topography

The topography ranges from nearly level to steeply rolling hills. In the northwest part of the Township, within the Glennie moraine landform, the terrain is rolling to steep, knoblike hills and pothole depressions. The highest elevations (900 feet above sea level) are found in this area. There is a gradual drop in elevation in a south and easterly direction towards Lake Huron. The direction of the flow of water in the rivers is evidence of this general gradient to the east and south. The lowest elevation (600 feet above sea level) is found where the Pine River flows out of the southeast corner of Mikado Township in Section 36.

In the west central part of the Township, in the Jackpines delta landform, the terrain is gently sloping to the east, with elevations ranging from 840 to 800 feet above sea level. Streams and creeks flow in steep sided ravines that cut 70 or more feet into this nearly level sand plain. At the eastern edge of the Jackpines Delta, there is a steep scarp with a 100 feet drop in elevation over a one half mile distance. The elevation changes from approximately 800 feet to 700 feet above sea level. At the base of the slope, begins the Mikado Till Plain. The topography is nearly level to undulating. The elevations range from around 700 feet above sea level to 600 above sea level; a drop in elevation of 100 feet in 5 to 7 miles. The stream and creek valleys are wide and do not cut as deep into the landscape as they do in the Jackpines Delta.

The elevations above sea level of the ancient shorelines of Great Lakes Warren, Algonquin and Nipissing are 850 feet, 680 feet and 600 respectively as compared to the 577 feet above sea level of Lake Huron.

Soils

When planning for types and intensity of future land uses, soil types and slopes are two important factors that determine the carrying capacity of land. The construction of roads, buildings and septic systems on steeply sloped areas or areas with organic and hydric soils require special design considerations. In addition, costs for developing these sensitive areas are greater than in less constrained parts of the landscape. If developed improperly, the impacts to natural resources can be far reaching.

The Natural Resource Conservation Service completed a detailed soil survey of Alcona County. A digital or computerized version of the soil survey maps was acquired from the Michigan Department of Natural Resources, MIRIS program. Using information contained within the published soil survey book, a series of maps will be presented that depict hydric soils, slopes 18 percent and greater, soils with building limitations and soils with septic system limitations.

Hydric Soils and Steeply Sloped Areas

Figure 4.4 is a color thematic map that classifies hydric soils and soils on steep slopes. Lower density and less intensive development should be directed to these areas with severe building constraints. Hydric soils are saturated, flooded or ponded during part of the growing season and are classified as poorly drained and very poorly drained. Hydric soils have poor potential for building site development and sanitary facilities. Wetness and frequent ponding are severe problems that are difficult and costly to overcome. Sites with high water tables may be classified as wetlands and a wetlands permit would be required to develop these areas.

Less than 17 percent of the Township's surface area is mapped as hydric soils with a high potential for wetlands. The hydric soils are mainly located adjacent to streams and creeks. This connectivity of riparian wetlands and surface water features can be seen throughout the landscape. There are extensive hydric soils areas in Sections 12 and 13 of western half and Section 1, 4, 5, 9, 12 and 13 of the eastern half of Mikado Township.

Hills and steeply rolling terrain may provide opportunities for spectacular views of the landscape. However, steeply sloped sites have severe building constraints, are more difficult and costly to develop. Maintenance costs tend to be higher on steeply sloped terrain. Special design standards such as erosion control measures, limiting size of disturbed areas, retaining natural vegetation, re-vegetation, slope stabilization and on-site retention of water run-off from impervious surfaces would all serve to minimize resource impacts. According to information presented in the Alcona County Soil Survey areas with slopes 18 percent and greater are minimal and are concentrated in the northwest corner of the Township. Steep slopes can also be found along creek and stream valleys on U.S. Forest Service Lands.

Building Site Development

The USDA soil survey of Alcona County rates soils for various uses such as building site development and identifies the limiting factors such as steep slopes or high water table. The rating system is slight, moderate and severe limitations. Areas with well drained soils and slopes less than 10 percent tend to have slight limitations for building development. Areas with slopes greater than 18 percent, high water tables and organic soils have severe limitations. Based on criteria established by the Natural Resource Conservation Service (NRCS), extensive areas with severe constraints are found in the eastern half of the Township, **Figure 4.5**. Areas with somewhat poorly drained and very poorly drained sandy and mucky soils, and moderately well drained to poorly drained loamy soils have severe constraints. In the western half of the Township lands with severe constraints are located along stream corridors, in wetlands and steeply sloped areas.

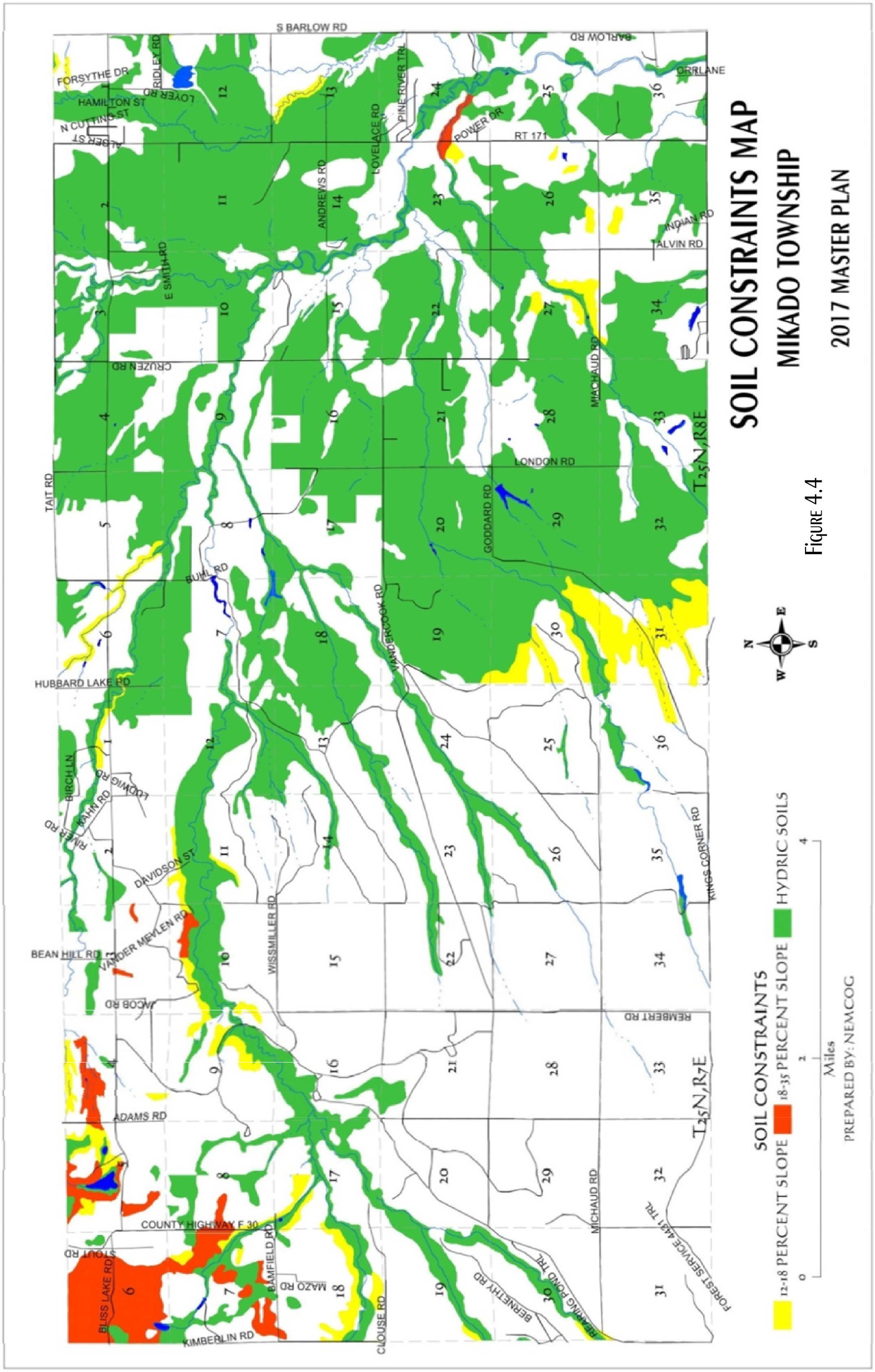

SOIL CONSTRAINTS MAP
MIKADO TOWNSHIP
2017 MASTER PLAN
SOIL CONSTRAINTS
12-18 PERCENT SLOPE
18-35 PERCENT SLOPE
HYDRIC SOILS
Miles
PREPARED BY: NEMCOG
T25N,R8E
T25N,R7E
S BARLOW RD
BARLOW RD
FORSYTHE DR
HAMILTON ST
N CUTTING ST
RIDLEY RD
LOYER RD
PINE RIVER TRL
LOVELACE RD
POWER DR
ANDREWS RD
E SMITH RD
CRUZEN RD
RT 171
INDIAN RD
ALVIN RD
MIACHAUD RD
LONDON RD
GODDARD RD
TAIT RD
BUHL RD
VANDERCOOK RD
HUBBARD LAKE RD
BIRCH LN
LOOKING RD
KAHN RD
DAVIDSON ST
KINGS CORNER RD
WISSMILLER RD
VANDER MEULEN RD
BEAN HILL RD
JACOB RD
REMBERT RD
ADAMS RD
MICHAUD RD
COUNTY HIGHWAY F 30
STOUT RD
BLISS LAKE RD
BAMFIELD RD
MAZO RD
KIMBERLIN RD
CLOUSE RD
BERNETHY RD
ROARING POND TRL
FOREST SERVICE 4431 TRL

Figure 4.4

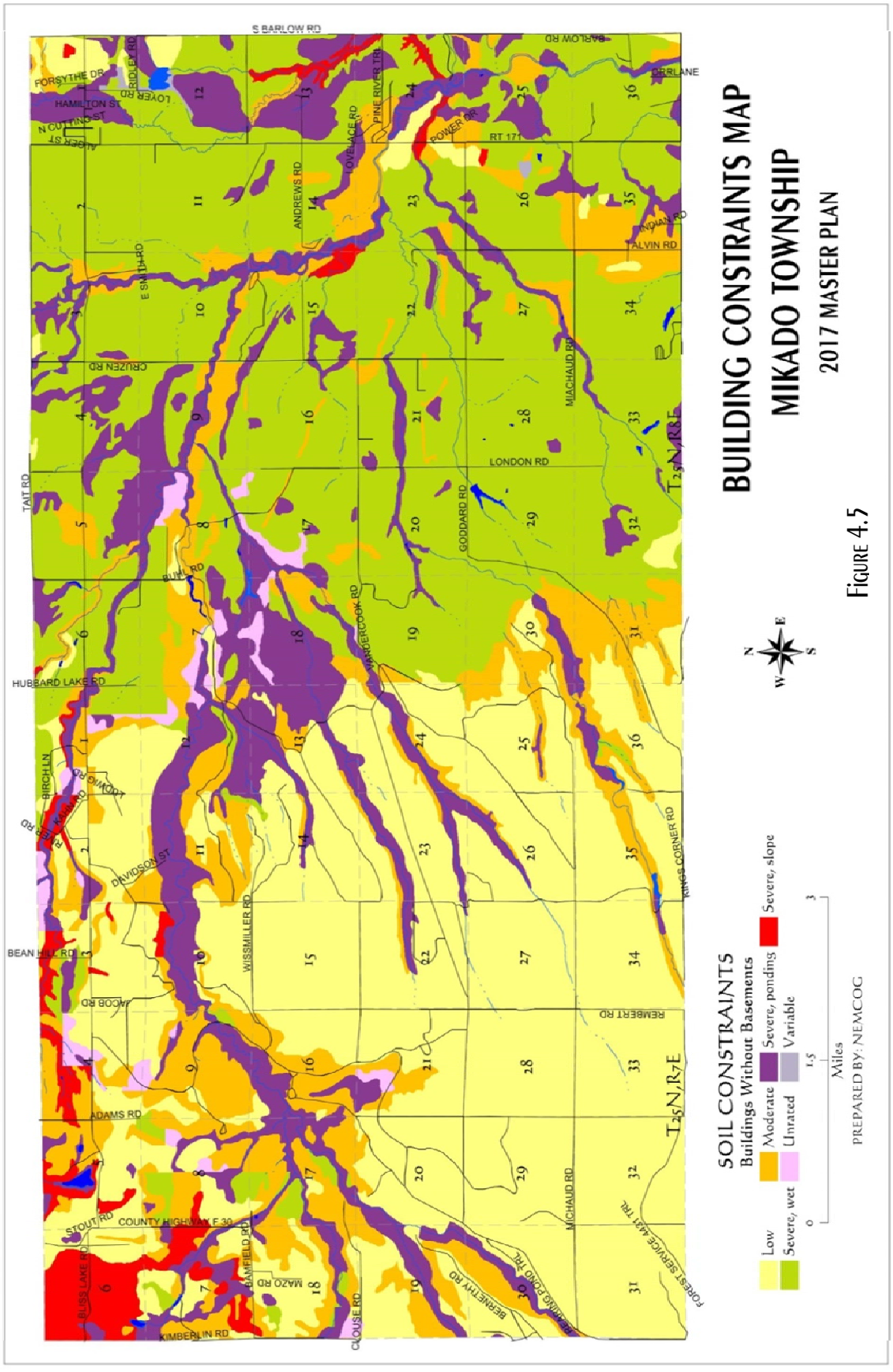

BUILDING CONSTRAINTS MAP
MIKADO TOWNSHIP
2017 MASTER PLAN
SOIL CONSTRAINTS
Buildings Without Basements
Low
Moderate
Severe, ponding
Severe, slope
Severe, wet
Unrated
Variable
0
1.5
3
Miles
PREPARED BY: NEMCOG
T25N,R7E
T25N,R8E
S BARLOW RD
BARLOW RD
FORSYTHE DR
HAMILTON ST
N CUTTING ST
LOWER RD
RIDLEY RD
ANDREWS RD
OVERACE RD
PINE RIVER TRL
POWER PR
RT 171
DERR LANE
INDIAN RD
TALVIN RD
E SMITH RD
CRUZEN RD
MICHAUD RD
LONDON RD
GODDARD RD
TAIT RD
BUSH RD
MERCOOK RD
HUBBARD LAKE RD
BIRCH LN
LOOMIS RD
DAVIDSON ST
WISSMILLER RD
KINGS CORNER RD
BEAN HILL RD
JACOB RD
REMBERT RD
ADAMS RD
STOUT RD
COUNTY HIGHWAY F 30
BLISS LAKE RD
BAMFIELD RD
MAZO RD
KIMBERLIN RD
COUSE RD
BERNETTY RD
FOREST SERVICE 4421 TRL
BEAVER POND TRL

FIGURE 4.5

Septic Systems

Using a computer mapping system, soils maps have been color coded to show areas with moderate to severe septic system limitations as defined by the USDA Natural Resource Conservation Service. Criteria include depth to water table, wetness, filtering capacity and ability to perk water. **Figure 4.6** is a septic system limitation map. Generally, the western portions of the Township contain sandy soils with severe limitations due to poor filtration of septic effluents. This is a critical issue when the water table is close to the surface or when high density development occurs. Limiting types and density of development or making public water and sewer available for high density development are likely the best options for protecting the groundwater resources in these areas. The eastern parts of the Township are dominated by clay/loamy soils and high water tables. These environmental factors will often require the construction of mounded septic systems. This has been a particular issue within town of Mikado, where these environmental factors combined with small lot sizes has presented difficulties with siting septic systems.

Water Resources

One of the most valuable and most sensitive natural resource in Mikado Township is water. Maintaining high quality groundwater and surface water is vital to the long term sustainability of the community. Residents of the Township must rely on individual wells for drinking water. Streams and lakes provide scenic values and recreational opportunities for residents and visitors. The water resources provide critical habitat components for a wide range of fish and wildlife species. Most importantly, these resources extend far beyond the Township boundaries, as a result, impacts to these resources can have far reaching implications.

Groundwater

Two factors used to evaluate groundwater are the quantity and quality of the water. In much of the Township, the thick mantel of glacial till contains underground aquifers that provide residents with sufficient water quantities. Areas where the underlying glacial deposits are clay to great depths, groundwater availability is a limiting factor in community growth. There have been cases in Sections 27, 28, 33 & 34 in the eastern half of the Township that potable water supplies are not obtainable. In general, Mikado Township has good ground water quality. Though quite variable, high levels of iron and calcium can be found in some wells.

The vulnerability of drinking water aquifers to surface contamination is high in the Township due to highly permeable soils. A review of the *Aquifer Vulnerability to Surface Contamination in Michigan Map* prepared by the Center for Remote Sensing and Department of Geography at Michigan State University shows the vulnerability classification as highly permeable soils over highly sensitive drift lithology within the Jackpines Delta and Glennie Moraine landform areas. The area known as the Mikado Till Plain is classified as moderately and slowly permeable soils over least sensitive drift lithology and moderately permeable soils over unknown drift. Therefore, in Mikado Township, water quality is potentially more of a limiting factor than water supply. For example, the combination of highly permeable soils, shallow wells, on-site septic systems and dense residential development can result in high nitrate levels in drinking water.

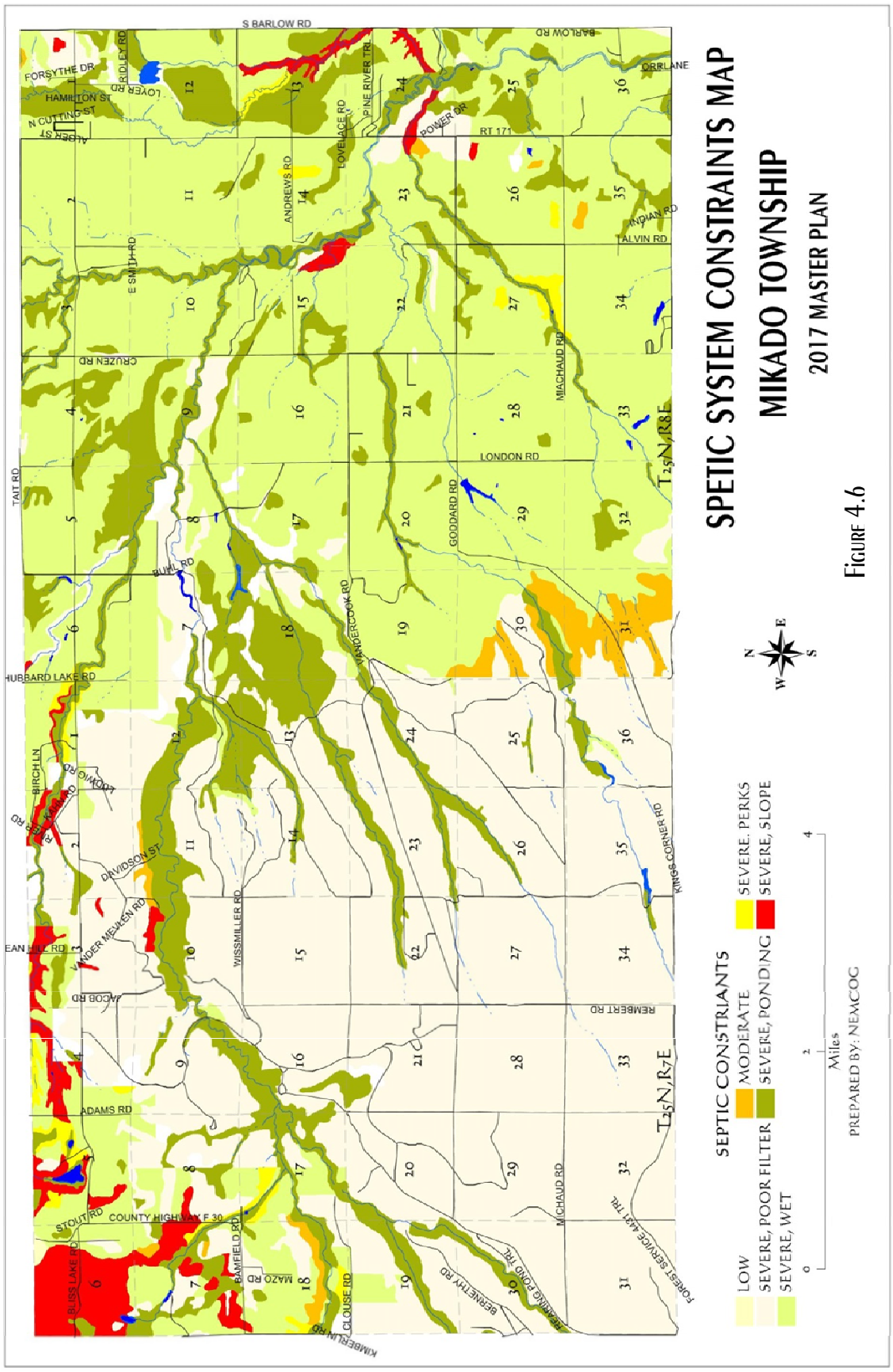

SPETIC SYSTEM CONSTRAINTS MAP
MIKADO TOWNSHIP
2017 MASTER PLAN
SEPTIC CONSTRAINTS
LOW
SEVERE, POOR FILTER
SEVERE, WET
MODERATE
SEVERE, PONDING
SEVERE, PERKS
SEVERE, SLOPE
Miles
PREPARED BY: NEMCOG
T25N,R8E
T25N,R7E
S BARLOW RD
FORSYTHE DR
HAMILTON ST
N CUTTING ST
LOWER RIDLEY RD
POWER DR
RT 171
ORR LANE
PINE RIVER TRL
LOVELACE RD
ANDREWS RD
INDIAN RD
ALVIN RD
E SMITH RD
CRUZEN RD
MIACHAUD RD
LONDON RD
GODDARD RD
TAIT RD
BUHL RD
VANDERCOOK RD
HUBBARD LAKE RD
BIRCH LN
LOOMIS RD
DAVIDSON ST
WISSMILLER RD
KINGS CORNER RD
REMBERT RD
ADAMS RD
STOUT RD
COUNTY HIGHWAY F 30
BAMFIELD RD
MAZO RD
BLISS LAKE RD
CLOUSE RD
MICHAUD RD
BERNETHY RD
FOREST SERVICE 4421 TRL
KIMBERLIN RD

FIGURE 4.6

Surface Water Resources

In the Great Lakes Region, rivers were the main thoroughfares of the pre-European inhabitants. The indigenous people used the Pine River for long distance trips and transporting large cargoes. These same rivers brought the "landlookers" and lumberman from the Great Lakes coastal communities to the interior of expansive, uncut forests. In turn, these water highways transported the raw materials to the coastal communities and sawmills, hungry for old growth pine logs.

Mikado Township is located in the 187,000 acre Pine River sub-watershed of the AuSable River Watershed. **Figure 4.7** is a map that shows the water resources and watersheds in the Township. The Pine River splits into a south branch and east branch in Section 10 of T.25N.-R.8E. Tributaries of the Pine River include Van Etten Creek, Duval Creek, Grey Creek, Roy Creek, McDonald Creek, McGillis Creek, Gimlet Creek, Bryant Creek, Wallace Creek, Kurtz Creek and Samyn Creek. There is one privately owned lake with no public access.

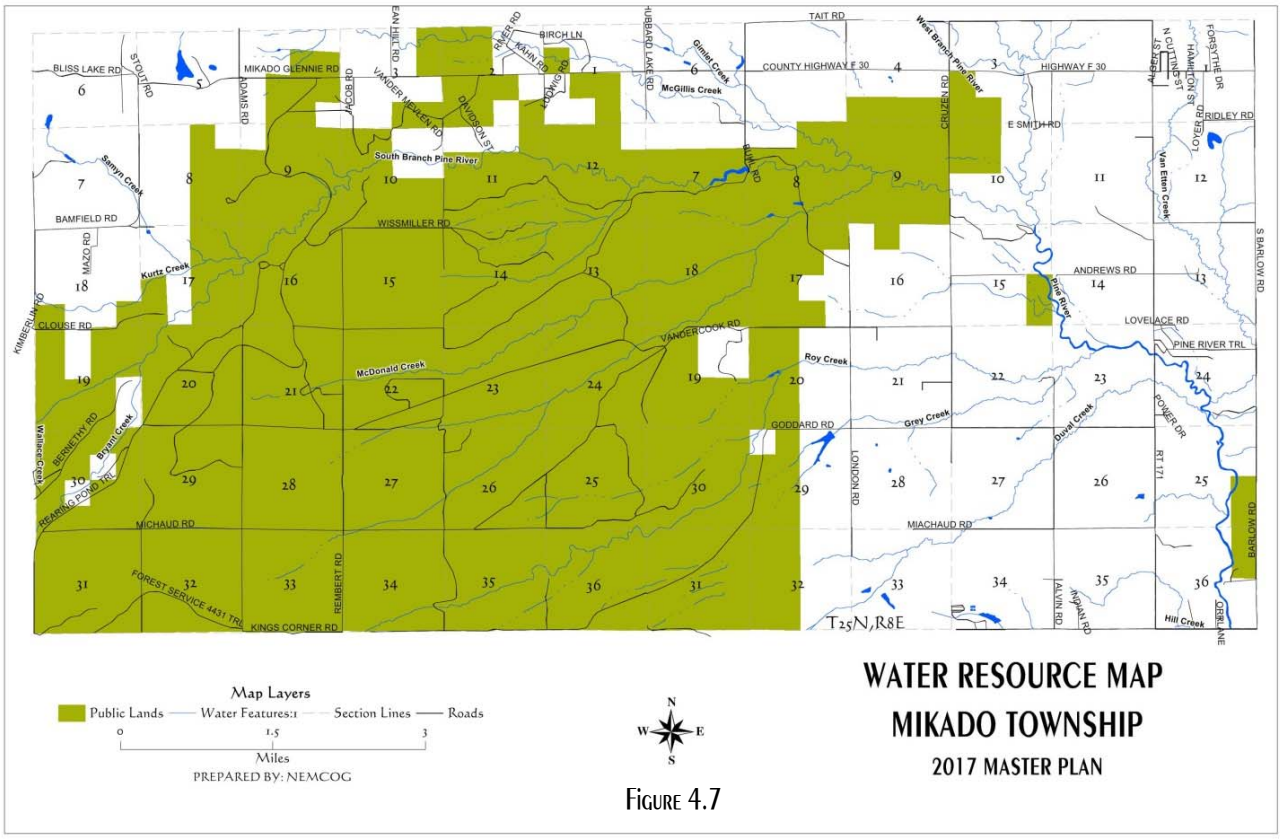


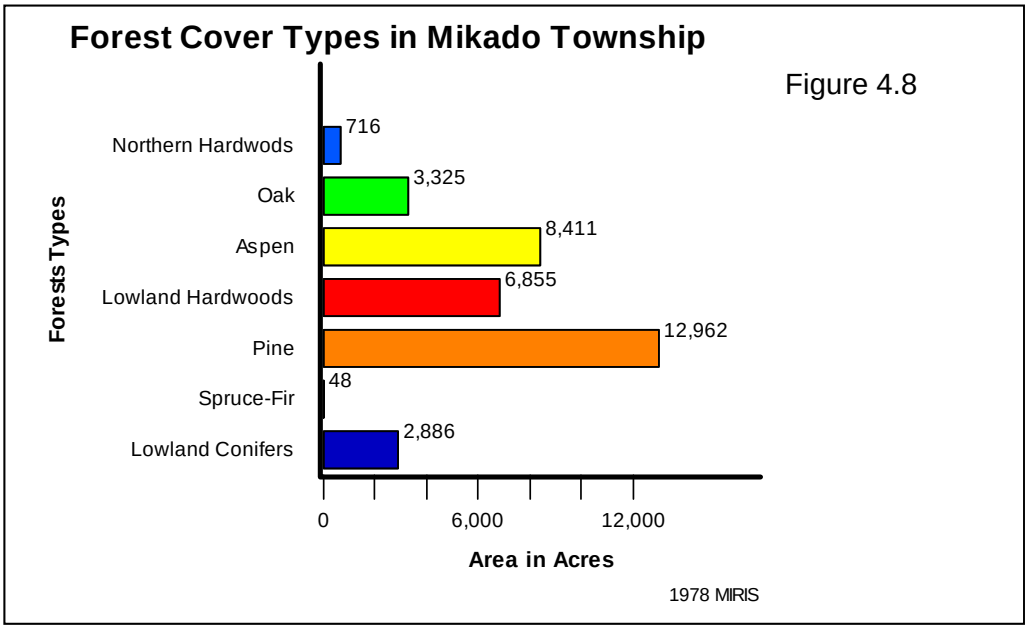
Figure 4.7

The upper Pine River watershed is plagued by excessive sediment, elevated water temperatures in the “coldwater” streams and unrestricted livestock access to streams. Van Etten Lake experiences annual algae blooms, exotic species invasions, loss of shoreline vegetation and accumulation of sediment. The Pine River-Van Etten Lake (PRVEL) Watershed Coalition was formed in 1999 to address these water quality concerns.

In 2001, the Huron Pines Resource Conservation and Development Council, Inc. was awarded a grant from the Michigan Department of Environmental Quality to develop a nonpoint Source Watershed Plan for the Pine River Van Etten Lake Watershed. In 2006, an additional grant was used to revise the plan to meet the Environmental Protection Agency's standards for watershed management plans. The management plan was developed with a steering committee comprised of a diverse group of stakeholders. The plan contains a set of goals and objectives designed to provide improvements to the overall water resources and related fisheries. The plan recognizes the roles of local units of government in protecting water quality and fisheries. One objective addresses the importance of greenbelts and providing protection within local zoning ordinances. Another objective involves local units of government adopting stormwater management ordinances or incorporating stormwater management into their zoning ordinance.

Forests and Wetlands

Conifer and hardwood forests are the dominant plant communities found in Mikado Township. Approximately 77 percent of the Township is covered with forests. Tree species vary depending upon the soils, moisture and past activities such as logging, fires and land clearing. For example areas with sandy soils and a history of wildfires support dense stands of jack pine; critical habitat for the Kirtland's Warbler. According to the MIRIS Land Cover/Use Inventory, the most prevalent forest type is jack pine, covering 37 percent of the forestland. Aspen forests account for nearly 25 percent of the woodland area**. Figure 4.8** is a chart that depicts the forest types and acreage according to the 1978 MIRIS Land Cover/Use Inventory.



Jack pine forests are the dominant forest type growing on the lacustrine sand delta appropriately called Jakcpines Delta. The draughty, low fertility sand soils supported pre-settlement jack pine forests, that were perpetuated by wildfires. White pine can be found in the creek valleys that dissect the sand delta.

Jack, red and white pine trees are found in the pine forest category. Bigtooth aspen, quaking aspen, white birch, red maple and red oak are the primary tree species found in the aspen-birch

type. Red oak, white oak and northern pin oak are the primary species growing in the oak forests. Northern hardwoods includes species such as sugar maple, red maple, American beech, basswood and yellow birch.

Poorly drained, lowland areas support northern white cedar, tamarack, balsam fir, black spruce, eastern hemlock, white pine, balsam poplar, trembling aspen, paper birch, black ash, speckled alder and shrub willows. Northern white cedar dominates the wetland areas where there is good lateral water movement and the soils are high in organic content.

These lowland forests are typically located adjacent to water features and function as riparian forests and water quality buffers. The network of lowland forests, associated with rivers and creeks, also function as wildlife corridors and are the backbone of large regional ecological corridors. Nonforested wetland types include lowland brush, marshes and bogs. Forested and nonforested wetlands are a finite resource in the township. Land use planning activities should focus on protecting and preserving these limited and critical resources. **Figure 4.9** is a color thematic map prepared from the US Fish and Wildlife Service National Wetlands Inventory that depict emergent, forested and scrub-shrub wetland areas.

Pre-European Settlement Vegetation

The Michigan Department of Natural Resources has compiled pre-European settlement vegetation maps of counties in Michigan. The maps were generated from information contained in the first government land survey notes in the 1800's along with information such as current vegetation, land forms and soils.

A review of the pre-settlement vegetation map shows the western half of the Township covered with jack pine and red pine forests. The pine forests are growing on the sand delta called the Jackpines Delta, the one of the largest glacially formed sand deltas in Michigan. Most interesting is the nine square mile area (colored yellow on the map, see **Figure 4.10**) that was classified as pine barrens. These barrens were present because naturally occurring, frequent wildfires repeatedly killed trees and created open prairie like habitats. The presence of pine barrens and jack pine forests clearly show wildfires have always been part of the natural ecosystem, even prior to logging and associated wildfires in the late 1800's. As well jack pine forests and the Kirtland's Warbler were very much a part of the landscape long before public land foresters started managing the forests.

The map shows eastern parts of the township were dominated by lowland forest types such as northern white cedar, tamarack, spruce, elm and ash trees. The high water table and clay/loam soils supported these lowland forest species. Some of these areas were cleared for farming, but much is still forested. There were smaller pockets of northern hardwoods in the northwestern and southeastern portions of the Township. These forests were growing on better soils as evidence by fact most of the active farms are located within the pre-settlement northern hardwoods forests.

Wildlife Habitat

Within the Township, there are a variety of wildlife habitats, ranging from upland forests to flowing cold water streams bordered by marshes, lowland brush and floodplain forests. The significance of these resources extends beyond Mikado Township. The U.S. Forest Service manages extensive areas of jack pine forests to provide critical habitat for nesting Kirtland's

Warblers. Habitat for wildlife that require wetlands such as marshes and cedar swamps is extremely limited. Land use planning should focus on protecting the finite resources. As with protecting the forest resources, a three pronged approach using local regulations, technical assistance, and landowner education is the best approach to long term protection of the natural resources in the Township.

The Huron National Forest manages jack pine stands for Kirtland's warbler habitat. The Pine River Kirtland's Warbler Management Area is located in Mikado Township. This is one of seven Kirtland's Warbler management units in the Huron National Forest. Approximately 15,300 acres of Jack Pine are managed in this unit, of which, 8,900 acres are in the western part of the Township. The Kirtland's Warblers require young jack pine stands for nesting cover. The pine, aspen-birch, northern hardwoods and oak forest types provide habitat for a wide variety of wildlife. Whether hunting or enjoying nature, an abundance of wildlife can be found. The land and water interface is a long narrow, sometimes meandering, edge habitat. These riparian forests adjacent to streams and lakes provide critical habitat for many species of wildlife and reptiles.

Ecological Corridors

Prior to logging and land clearing during the late 1800's, this area was covered with old growth hardwood and pine forests. The pre-settlement forests were rich ecosystems that stretched across the northern Lower Peninsula of Michigan. The backbones of these ecological corridors were the many rivers, creeks and intermittent drainages, along with their associated wetlands and riparian forests. The Pine River and its many tributaries are key ecological corridors within the AuSable River Watershed.

The wetlands and riparian forests adjacent to the rivers and creeks are links in a long green chain, a web of ecological corridors within the Pine River Watershed. These corridors are part of a larger network of ecological corridors consisting of the creeks, streams, wetlands and upland forests within the AuSable River Watershed Ecological corridors or "green infrastructure," can be likened to a highway system. All segments of the highway must be connected and in working order for the highway system to properly function. If segments are degraded or missing then the highway will not function to its fullest potential. The same holds true for ecological corridors, when segments are degraded or fragmented, the system will not function properly. In other words, activities on a given piece of property can have implications that reach far beyond the ownership boundaries.

Threatened & Endangered Species

Alcona County is home to a number of plants and animals that are threatened, endangered or of special concern as identified in Michigan Natural Features Inventory (MNFI) database. Michigan Natural Features Inventory (MNFI) is a program of Michigan State University Extension that works in close cooperation with the Michigan Department of Natural Resources and The Nature Conservancy. **Table 4.1** lists endangered or threatened plant and animal species that can be found in Alcona County, and which are protected under the Natural Resources and Environmental Protection Act of the State of Michigan (Part 365 of Public Act 451 of 1994, as amended). Species highlighted in blue have a higher probability of being found within the township. This list also includes plant and animal species of special concern. While not afforded legal protection under the act, many of these species are of concern because of declining or relict populations in the State.

Table 4.1: Alcona County Element List			
Scientific Name	**Common Name**	**Federal**	**State**
Accipiter cooperii	Cooper's Hawk		SC
Accipiter gentilis	Northern Goshawk		SC
Buteo lineatus	Red-shouldered Hawk		T
Calypso bulbosa	Calypso or Fairy-slipper		T
Carex albolutescens	Greenish-white Sedge		T
Carex frankii	Frank's Sedge		SC
Carex nigra	Black Sedge		E
Cirsium hillii	Hill's Thistle		SC
Cirsium pitcheri	Pitcher's Thistle	LT	T
Cypripedium arietinum	Ram's Head Lady's-slipper		SC
Dalibarda repens	False-violet		T
Dendroica discolor	Prairie Warbler		E
Dendroica kirtlandii	Kirtland's Warbler	LE	E
Dry northern forest	Dry Woodland, Upper Midwest Type		
Dry-mesic northern forest			
Emys blandingii	Blanding's Turtle		SC
Festuca scabrella	Rough Fescue		T
Gavia immer	Common Loon		T
Glyptemys insculpta	Wood Turtle		SC
Great blue heron rookery	Great Blue Heron Rookery		
Haliaeetus leucocephalus	Bald Eagle	PS:LT,PDL	T
Hardwood-conifer swamp			
Panax quinquefolius	Ginseng		T
Percina copelandi	Channel Darter		E
Planogyra asteriscus	Eastern Flat-whorl		SC
Poor conifer swamp			
Poor fen	Poor Shrub/herb Fen, Upper Midwest Type		
Prunus alleghaniensis var. davisii	Alleghany or Sloe Plum		SC
Pterospora andromedea	Pine-drops		T
Rich conifer swamp			
Sistrurus catenatus catenatus	Eastern Massasauga	C	SC
Sterna caspia	Caspian Tern		T
Trimerotropis huroniana	Lake Huron Locust		T
dune and swale complex	Wooded		

Source: Michigan Natural Feature Inventory, MSU Extension.
*LE = Listed endangered, LT = Listed threatened, PDL = Proposed delist, PS = Partial status (federally listed in only part of its range), C = Species being considered for federal status.
** E = Endangered, T = Threatened, SC = Special concern.

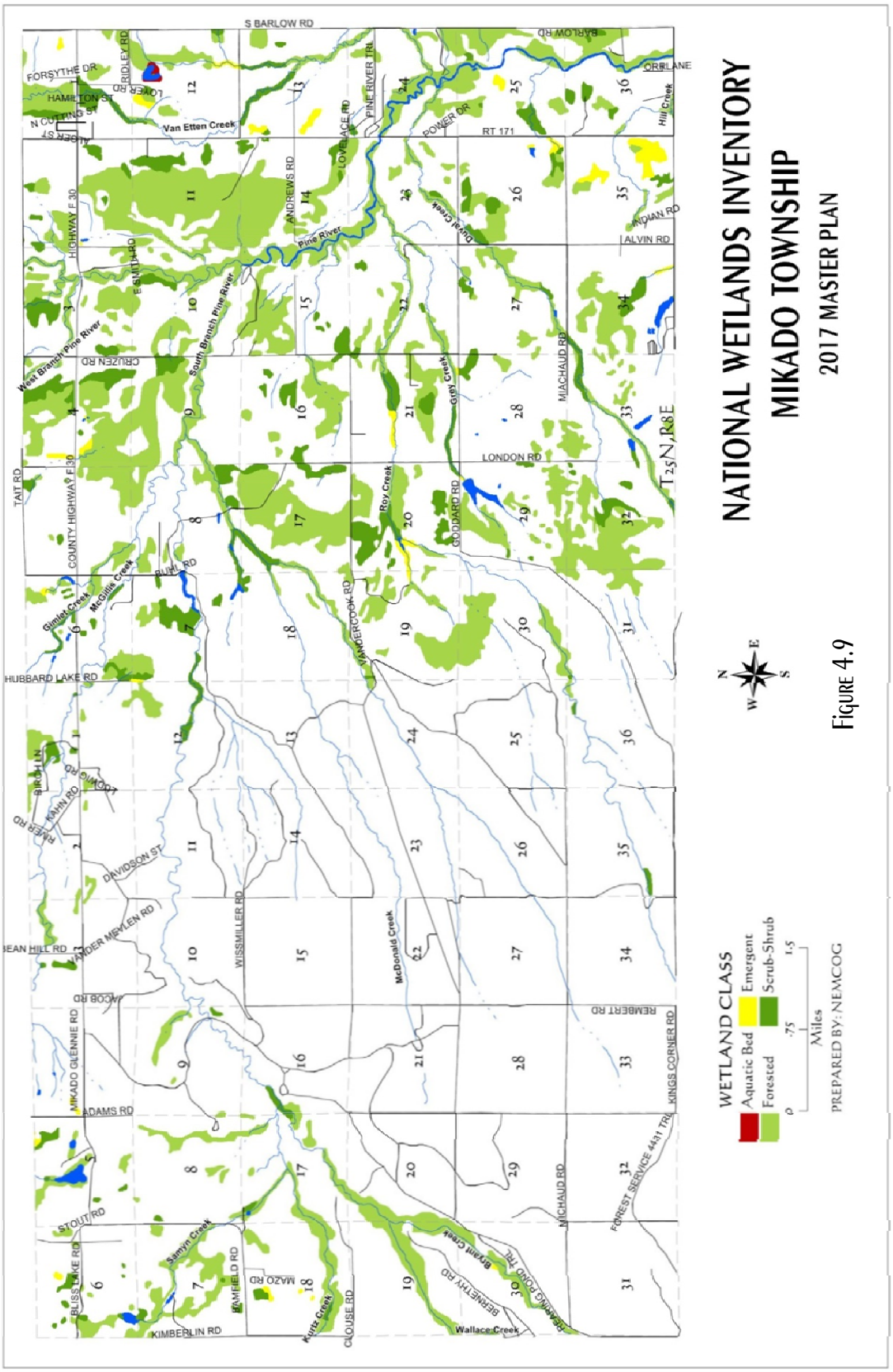

NATIONAL WETLANDS INVENTORY
MIKADO TOWNSHIP
2017 MASTER PLAN
WETLAND CLASS
Aquatic Bed
Emergent
Forested
Scrub-Shrub
0
.75
1.5
Miles
PREPARED BY: NEMCOG
T25N, R8E
S BARLOW RD
FORSYTHE DR
HAMILTON ST
N CUTTING ST
RIDLEY RD
LOWER RD
Van Etten Creek
PINE RIVER TRL
POWER DR
RT 171
ORR LANE
Hill Creek
HIGHWAY F 30
ANDREWS RD
LOVELACE RD
Pine River
Dover Creek
INDIAN RD
ALVIN RD
West Branch Pine River
South Branch Pine River
CRUZEN RD
Grey Creek
MIACHAUD RD
LONDON RD
TAIT RD
COUNTY HIGHWAY F 30
Roy Creek
GODDARD RD
Gimlet Creek
McGillis Creek
ELLIOTT RD
VANDERCOOK RD
HUBBARD LAKE RD
BIRCH LN
COOMBS RD
KAHN RD
DAVIDSON ST
VANDER MEULEN RD
BEAN HILL RD
WISSMILLER RD
McDonald Creek
REMBERT RD
KINGS CORNER RD
MIKADO GLENNIE RD
ADAMS RD
STOUT RD
Samyn Creek
BAMFIELD RD
MAZO RD
KIMBERLIN RD
Kurtz Creek
CLOUSE RD
Bryant Creek
BERNETHY RD
Wallace Creek
FOREST SERVICE 44431 TRL

FIGURE 4.9

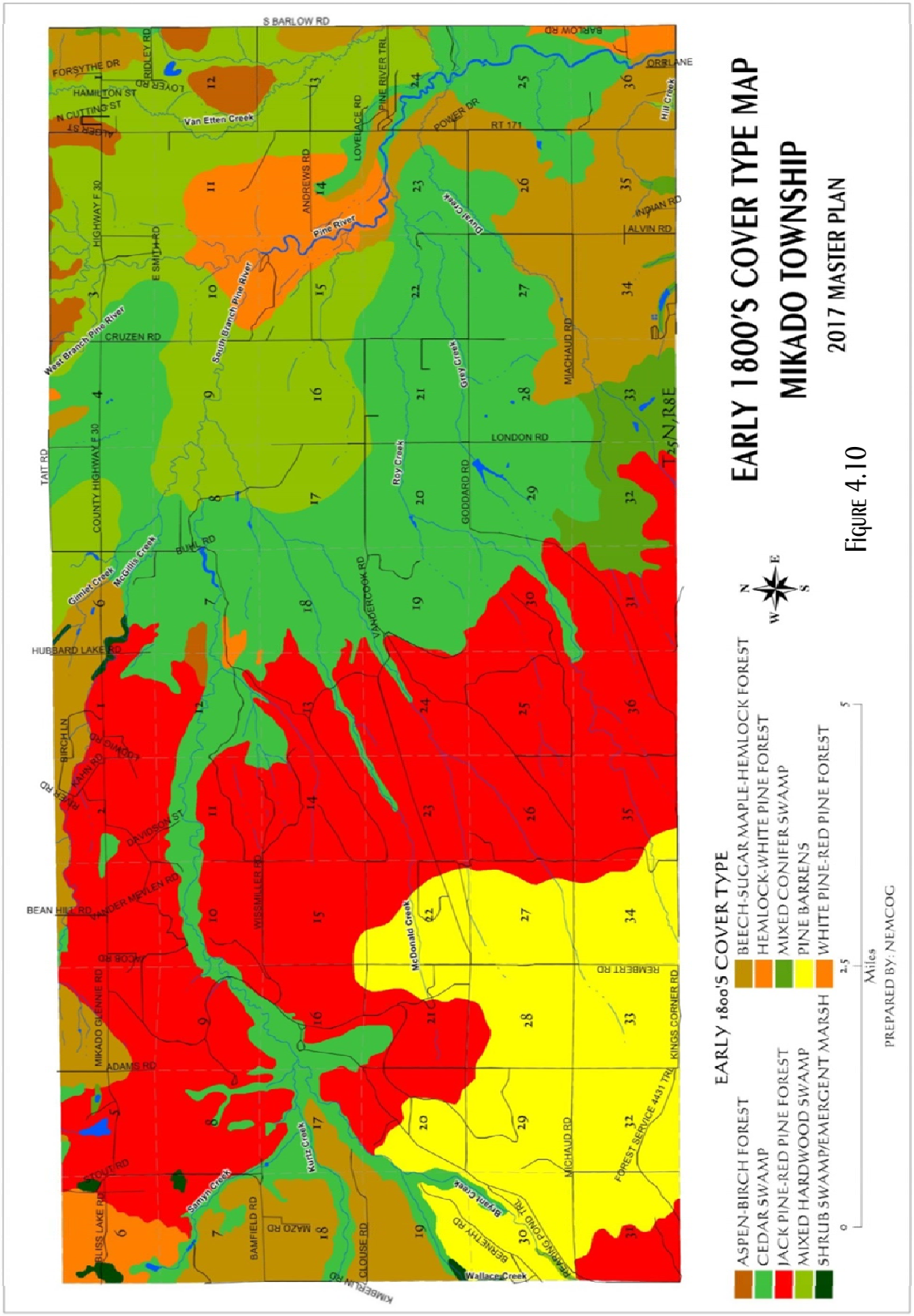

EARLY 1800'S COVER TYPE MAP
MIKADO TOWNSHIP
2017 MASTER PLAN
EARLY 1800'S COVER TYPE
ASPEN-BIRCH FOREST
CEDAR SWAMP
JACK PINE-RED PINE FOREST
MIXED HARDWOOD SWAMP
SHRUB SWAMP/EMERGENT MARSH
BEECH-SUGAR MAPLE-HEMLOCK FOREST
HEMLOCK-WHITE PINE FOREST
MIXED CONIFER SWAMP
PINE BARRENS
WHITE PINE-RED PINE FOREST
Miles
PREPARED BY: NEMCOG
T25N R8E
S BARLOW RD
FORSYTHE DR
HAMILTON ST
N CUTTING ST
RIDLEY RD
LOWER RD
Van Etten Creek
PINE RIVER TRL
LOVELACE RD
POWER DR
RT 171
DR LANE
Hill Creek
ANDREWS RD
HIGHWAY F 30
E SMITH RD
Pine River
Dwyer Creek
INDIAN RD
ALVIN RD
West Branch Pine River
South Branch Pine River
CRUZEN RD
MICHAUD RD
Grey Creek
TAIT RD
COUNTY HIGHWAY F 30
LONDON RD
Roy Creek
GODDARD RD
BUNK RD
McGillis Creek
Gimlet Creek
VANDERCOOK RD
HUBBARD LAKE RD
BIRCH LN
DAVIDSON ST
BEAN HILL RD
VANDER MEULEN RD
WISSMILLER RD
McDonald Creek
REMBERT RD
KINGS CORNER RD
MIKADO GLENNIE RD
ADAMS RD
FOREST SERVICE 4431 TRL
BLISS LAKE RD
Sawyer Creek
Kurtz Creek
BAMFIELD RD
MAZO RD
GLOUSE RD
BERNETHY RD
Bryant Creek
Wallace Creek
KIMBERLIN RD

FIGURE 4.10

Hazards and Hazard Analysis

According to the Alcona County Hazard Mitigation Plan identified potential natural, technological and human-related hazards within Mikado Township. Managing these threats, while protecting life and property, are the challenges faced by emergency management officials at all levels of government. The County Hazard Mitigation Plan identifies potential hazards; ranks hazards according to the relative risk to the community; and finally assess the level of vulnerability for each identified hazard.

The hazard identification and vulnerability assessment is a powerful planning tool that enables emergency management officials and local officials to set priorities and goals for hazard mitigation and preparedness activities. Information allows communities to plan for hazard mitigation, preparedness, response and recovery activities. Below is a listing of potential hazards.

Potential Hazards

Natural: Wildfire, riverine flooding, damaging wind, thunder storms and tornadoes, and winter storms.

Technological: Transportation accident, hazardous material spill, structural fire, and industrial accident.

Societal: Bovine TB

The Community Hazards Map, **Figure 4.11**, from the County Hazard Mitigation Plan shows forest types, wetlands, water features, and roads to emphasize areas in the communities with highest risks for wildfire, riverine flooding, shoreline erosion and flooding hazards. Jack pine forests, with a high propensity for wildfires, dominate the landscape in the west. Areas with a high potential for flooding are located along the Pine River and its tributaries; where the soils are fine and less permeable; and are associated with wetland complexes.

Environmental Permits and Concerns

Sites of Environmental Contamination

The Michigan Environmental Response Act (Part 201 of PA 451 of 1994, as amended) provides for the identification, evaluation and risk assessment of sites of environmental contamination in the State. The Environmental Response Division (ERD) is charged with administering this law. A site of environmental contamination, as identified by ERD, is “a location at which contamination of soil, ground water, surface water, air or other environmental resource is confirmed, or where there is potential for contamination of resources due to site conditions, site use or management practices. The database has information for sites of environmental contamination (Part 201), Leaking Underground Storage Tanks (Part 213) and Baseline Environmental Assessments (BEAs). The BEA is completed when a property is purchased, leased or foreclosed on for the purposes of documenting contamination and protecting from liability for cleanup of existing contamination on the property.

There are no sites listed as “Sites of Environmental Contamination (Part 201)” in Mikado Township. Paragon Metal Works (formerly known as Mikado Total gas station), located at 2246

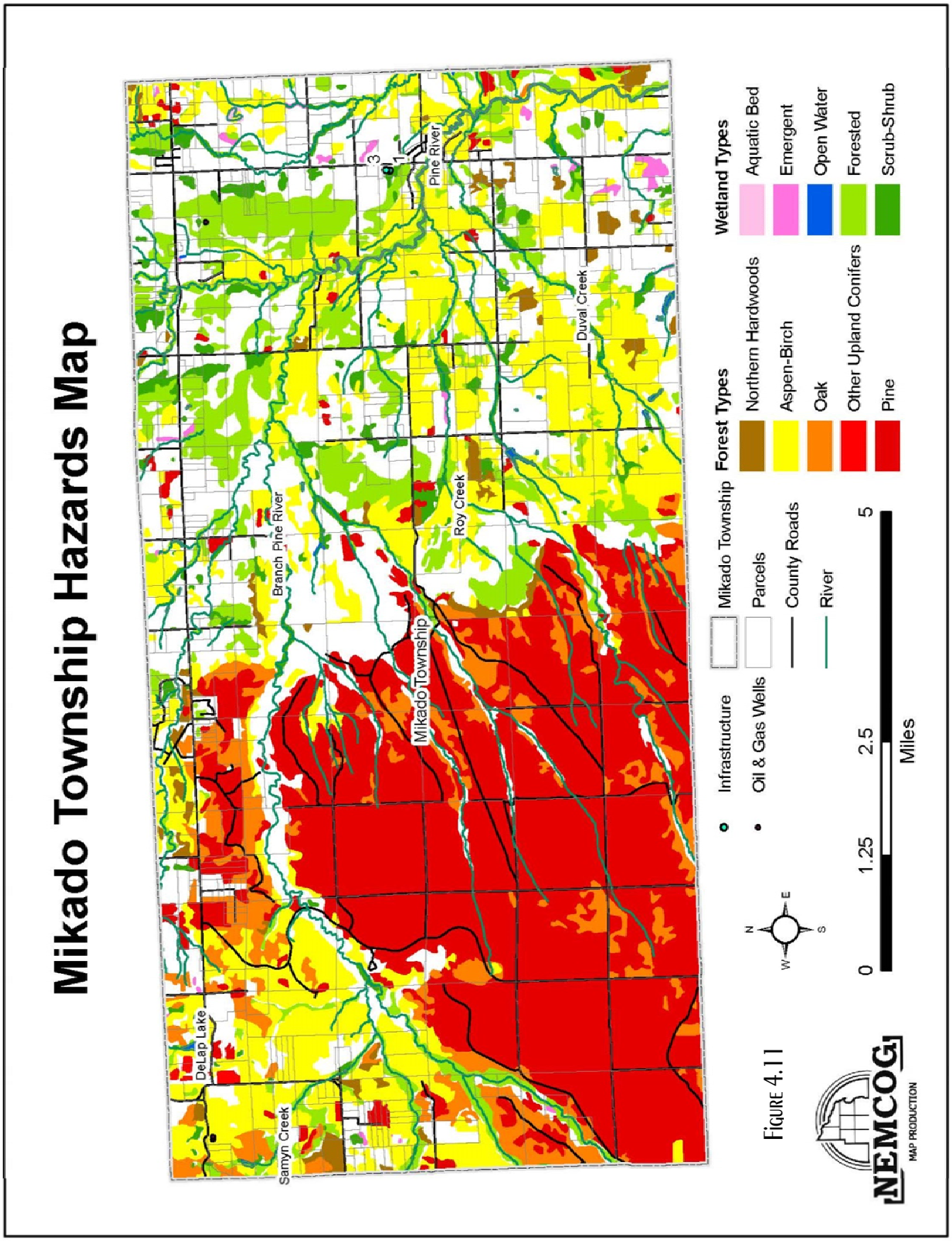

Mikado Township Hazards Map
DeLap Lake
Samyn Creek
Branch Pine River
Mikado Township
Roy Creek
Pine River
Duval Creek
Infrastructure
Oil & Gas Wells
Mikado Township
Parcels
County Roads
River
Forest Types
Northern Hardwoods
Aspen-Birch
Oak
Other Upland Conifers
Pine
Wetland Types
Aquatic Bed
Emergent
Open Water
Forested
Scrub-Shrub
N
E
S
W
0
1.25
2.5
5
Miles
NEMCOG
MAP PRODUCTION

FIGURE 4.11