# Landscape Stewardship Plan
# Jackson, Hillsdale, and Lenawee Counties

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Cover photograph of the River Raisin looking back upstream towards Blissfield, MI.
Credit: Robert Burns, Detroit Riverkeeper.

# Landscape Stewardship Plan for Lenawee, Jackson, and Hillsdale Counties

## Contents

## 1. Executive Summary

The goal of this project is to help the MDNR Forest Stewardship group develop products that improve outreach and education about stewardship to private landowners. The end products are Landscape Stewardship Plans from across Michigan that will help landowners understand the natural resource assets on their property and provide guidance for setting goals and objectives for managing their property. The guides will also provide references for more information about resource management and, in particular forest stewardship management.

Nine Landscape Stewardship Plans were created covering southwest and southeast lower Michigan, central northern, lower Michigan and the central upper peninsula regions. The plans characterize each region's physical, biological, and cultural resources; summarizes existing resource assessments, and reviews existing stewardship plans. The aim of this project is to connect landowners and land managers with information about practices and programs that will help them become more engaged land managers. By working collaboratively at the landscape scale, we can better address landscape-scale challenges that threaten the health and sustainability of our forests.

Each Landscape Stewardship Plan collects stewardship stories told by the people living and working on their land. Through these stories, local landowners and land managers share why and how they are active stewards of their own forests and some of the challenges associated with managing their land. The stories cover small private properties as well as large public tracts. The intent of including the stories is to both inspire and challenge other landowners to think, plan, and act in ways that improve the stewardship of their land.

This Landscape Stewardship Plan covers Jackson, Hillsdale, and Lenawee Counties and is part of a larger project funded by a U.S. Forest Service grant administered by the Michigan Department of Natural Resources. The landscape in this region is composed primarily of crop land, but includes wetlands, and some forest areas. The Irish Hills area, in the northeast corner of Hillsdale County, is home to headwaters for the River Raisin, Maumee, St. Joseph, Grand, and Kalamazoo Rivers.

The Landscape Stewardship Plan is designed to encourage collaborative landscape-scale approach to stewardship by partnering with many conservation organizations. Because most land in this area is privately held, individual landowners are the target audience of this plan. We hope that the resources provided can assist them in keeping their land healthy and productive.

A good first step for landowners is to create a stewardship plan for their property. Qualifying landowners can use the Michigan Department of Natural Resources' program to create individual Forest Stewardship plans. Those property owners who do not qualify for MDNR programs can hire a forester or use other consultants to assist in the development of a stewardship plan. Do-it-yourself types can use the information provided in this document and other resources to write their own plan. Plans can characterize existing resource features found on a particular property and identify strategies for achieving the landowner's goals through

stewardship activities that also yield public benefits such as protection of clean water and provision of wildlife habitat.

## 2. Project Introduction

The Michigan Department of Natural Resources (MDNR) received a grant in 2015 from the United States Forest Service (USFS) to fund a two-year partnership with three conservation organizations to promote the stewardship of private and public forest land in Michigan. The project developed nine Landscape Stewardship Plans in three very diverse regions in Michigan. This is the Stewardship Plan for Jackson, Hillsdale, and Lenawee Counties.

Each partner facilitated input from collaborators in their project area during the two-year project. The Landscape Stewardship Plans highlight both private and public landowners doing useful forest stewardship activities on their land. The regions covered by each plan are shown in Figure 1 below.

The Stewardship Network developed six Landscape Stewardship Plans in the southern Lower Peninsula where the landscape is a mixture of cities, agriculture, small private forests, and relatively little public forest land. This area of the state is strategic and is where 75% of Michigan's population of 10 million people resides.

Huron Pines, nonprofit organization working to conserve the forests, lakes, and streams of Northeast Michigan, will develop two Landscape Stewardship Plans in the northeast Lower Peninsula where the landscape is composed of forests owned by medium-sized private landowners and public land managed by federal and state agencies. This area is important as the forest stewardship stories will occur in northern hardwoods and jack pine forest types, two very common forest types in northern Michigan.

The Nature Conservancy will develop a Landscape Stewardship Plan for a four-county region in the eastern Upper Peninsula. This landscape is dominated by large blocks of private and public forest land. This area is strategic for telling the story of increasing connections between the owners of large, unbroken tracts of forest land.

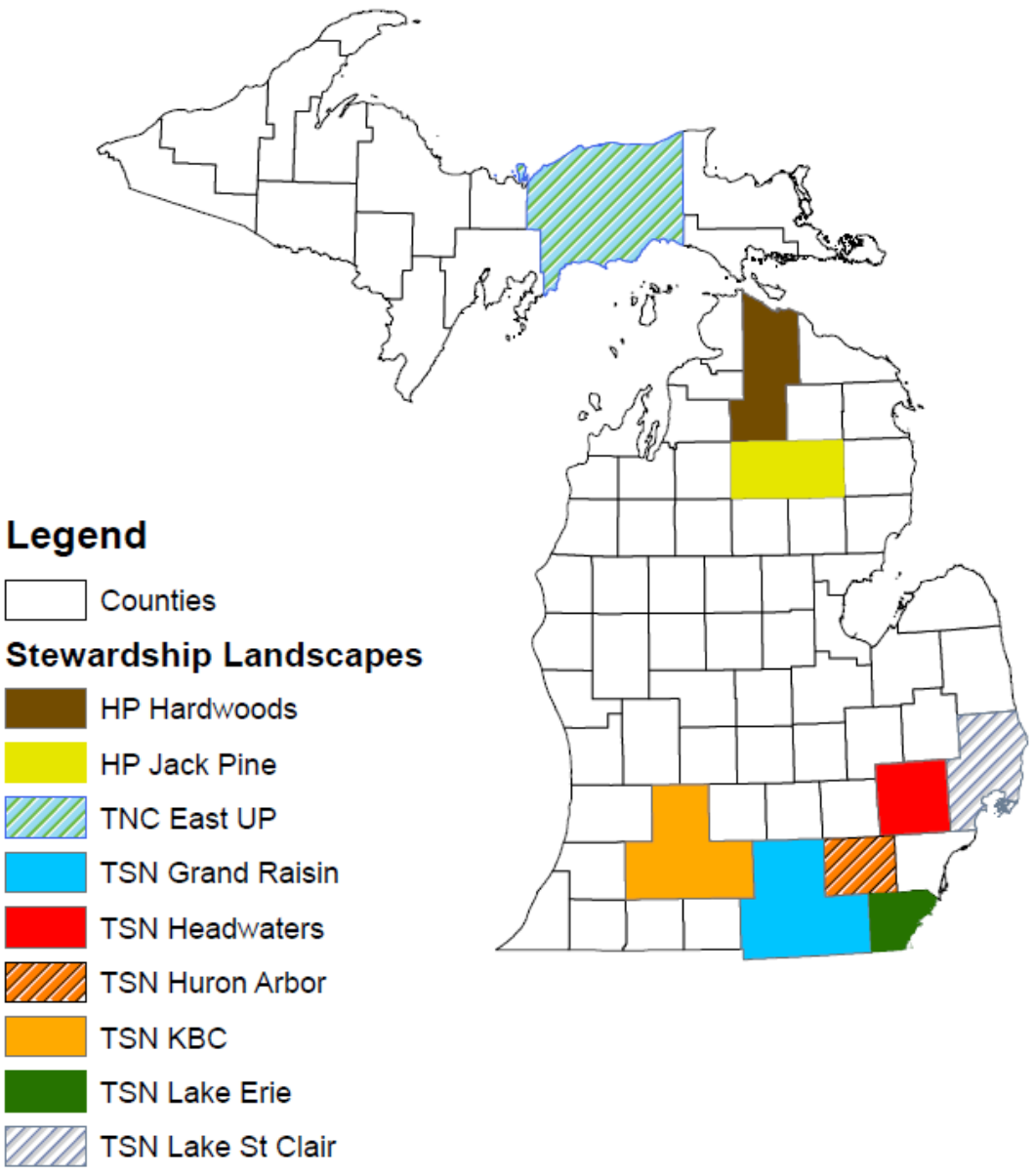


Figure 1. The Nine Michigan Regional Landscape Stewardship Planning Areas

## 2.1 Project Goals and Objectives

Michigan's forests face myriad threats—invasive species, tree diseases, habitat fragmentation, financial challenges—that sometimes make it difficult to achieve forest stewardship goals. It is estimated that only 20% of Michigan's 11 million non-industrial private forest lands are being actively managed, yet active stewardship of private forest land is vital to the long-term health and productivity of the forest resources (including soil, water and wildlife) on which our local economies and communities depend. Therefore, the primary goal of this project is to **increase interest, awareness and participation in active forest stewardship opportunities** through the development of nine landscape stewardship plans covering strategic and unique forest ecosystems throughout the state of Michigan.

Specific objectives that we seek to accomplish in order to achieve that goal include:

- Objective 1: Describe the physical, cultural, and resource management context of each of the nine landscapes to serve as a comprehensive reference for landowners and land managers.
- Objective 2: Facilitate collaborative management of multi-county areas by state, federal, and local resource agencies, nonprofit conservation organizations, private sector professionals, and individual landowners.
- Objective 3: Promote sustainable forest management practices and encourage people to be more active stewards of their land (e.g., develop and implement a Forest Stewardship Plan).
- Objective 4: Connect people with tools, resources, and programs to help them take the next steps toward achieving their personal land management goals and increase our collective capacity to manage forest resources at the landscape scale.

These Landscape Stewardship Plans also aim to support and inform strategies for addressing national priorities and state-level issues identified in "Michigan Forest Resource Assessment and Strategy," which was completed by the MDNR in 2010. These priorities and issues are:

- Priority 1: Conserve Working Forest Landscapes
  - Issue 1.1: Promote Sustainable Active Management of Private Forests
  - Issue 1.2: Reduce Divestiture, Parcelization and Conversion of Private Forestlands
  - Issue 1.3: Reduce the High Cost of Owning Private Forestland

- Priority 2: Protect Forests from Threats
  - Issue 2.1: Maintain and Restore Aquatic Ecosystems and Watersheds
  - Issue 2.2: Reduce Threats from Invasive Species, Pests and Disease
  - Issue 2.3: Reduce Impact of Recreational Activities on Forest Resources

- Priority 3: Enhance Public Benefits from Forests
  - Issue 3.1: Maintain Markets for Utilization of Forest Products
  - Issue 3.2: Maintain Ecosystem Services from Private Forestlands
  - Issue 3.3: Provide Effective Conservation Outreach for Private Forestlands
  - Issue 3.4: Maintain Community Quality of Life and Economic Resiliency
  - Issue 3.5: Maintain and Enhance Scenic and Cultural Quality on Private Forestland
  - Issue 3.6: Maintain Forested Ecosystems for Biodiversity and for Wildlife Habitat

- Issue 3.7: Maintain and Enhance Access to Recreational Activities on Private Forestlands

### 2.2 The Need for Active Forest Stewardship

Forest land accounts for 55% of Michigan's total land area, and of Michigan's 20 million acres of forests, 12 million of those acres are privately owned. Federal, state, and local agencies are responsible for managing our public lands, but the overall health of Michigan's unique forest, water, and wildlife resources ultimately depends on the collective management activities of all landowners. Unfortunately, a survey conducted by Michigan State University revealed that only about 20% of Michigan's non-industrial private forest lands are currently under active management.

The condition of a particular forest property is highly dependent on the condition of other lands across the landscape. Conversely, the management actions (or lack of active forest management) on a single property can impact forests, rivers, wildlife, property, and people far beyond the boundary of that individual piece of land. Native wildlife, forest fires, harmful invasive species, tree diseases, and insect pests all move freely among private and public land—they do not recognize property boundaries. Likewise, rivers and streams flowing from one property to the next can carry the effects of poor land management activities downstream (or even upstream, as is the case with dams or poorly designed road crossings that block fish passage).

Maintenance of healthy forest landscapes is also important at the regional and global scale. We depend on our forests for timber and other forest products, to provide wildlife habitat, to help mitigate climate change, to protect the quality and quantity of our water resources, and for the myriad aesthetic, recreational, and spiritual values they provide. Protecting our forest products, services, and values starts with active stewardship of individual properties by landowners and land managers. Because widespread threats to forest health act across scales larger than single parcels, our approach to maintaining healthy, functional and sustainable forests must also incorporate landscape-scale considerations. The purpose of this project is to encourage and inspire people to actively manage their forests to realize benefits for both individual landowners and the larger community. The next section describes our methodology for doing so.

### 2.3 Methodology: A Landscape Approach to Natural Resource Conservation

The Michigan DNR applied for and was awarded funding by the US Forest Service in 2015 to coordinate with The Stewardship Network, Huron Pines, and The Nature Conservancy to develop nine Landscape Stewardship Plans. These partners strategically identified landscape types containing a set of unique physical and cultural features that help define each landscape area while also distinguishing them from other landscapes. Of course, ecological landscapes do not conform to political boundaries and tend to transition gradually and unevenly from one landscape type to another. However, for the purpose of managing landscape-scale issues and challenges while also keeping the project areas manageable and relevant to local landowners and land managers, we've defined each landscape area as ranging from one to four counties in

geographic scope. One advantage of defining the project area based on county boundaries is that these align with jurisdictional areas of different resource agencies and nonprofit organizations. Therefore, the assistance programs, resources, and opportunities offered within each landscape project area are generally consistent and the background information and stewardship stories are tailored to a particular local audience. Contacts for each program are also included in this document to make it easy for property owners and land managers to learn more and to take the next step toward becoming a more active land steward. Nevertheless, people in surrounding counties or other areas with similar characteristics will generally also find that these Landscape Stewardship Plans are useful.

The Jackson, Hillsdale, and Lenawee Counties Area was identified as an appropriate landscape because it is representative of much of the land use in southern Michigan. These counties are predominantly agricultural and much of the forest land is limited to either state-owned hunting areas or parks. Frequently farms have woodlots and/or tree windbreaks or stream buffers that can have trees but they tend to not be extensive areas.

Rather than simply providing a list of recommendations that property owners can follow, we hope these stories inspire others to learn more about their land and to take advantage of the opportunities that are out there. All landowner stories were provided voluntarily for inclusion in this plan and with permission to distribute in the hopes of encouraging other landowners to become active land stewards.

Forests also tell their own stories. An acoustic monitoring device was placed in a Southwest Michigan Land Conservancy (SWMLC) management area, which recorded for one minute every thirty minutes from May through August 2016. Similar acoustic monitoring devices were deployed in several other landscapes throughout the state of Michigan. The Michigan DNR is planning to host an online story map where people can read the stewardship stories collected through this project, submit their own stories, view images, and listen to sounds of our forests.

For convenience, a summary of the available assistance programs, additional resources, and contacts is included at the end of the plan to help enhance individual land stewardship.

# 3. Landscape Context

## 3.1 The Physical, Ecological and Cultural Landscape

### *3.1.1 Geographic Scope*

This Landscape Stewardship Plan covers the three-county region located in the south-central portion of the Lower Peninsula, just north of where Indiana, Michigan, and Ohio meet. It comprises 2,092 square miles of land, including areas of rich farmland and forests, lakes and rivers, and 36 distinct incorporated (e.g., cities and villages) and unincorporated (e.g., census designated places) settlements with a variety of neighborhoods and other distinct areas. The region also contains the Irish Hills Area and the flatlands of eastern Lenawee County.

The region contained 306,828 residents in the Year 2010. Population centers include Greater Jackson (93,900), the Adrian-Tecumseh-Clinton Corridor (57,445), and the Hillsdale-Jonesville Corridor (13,664). Jackson County has the greatest population (160,248), followed by Lenawee County (99,982) and Hillsdale County (46,688). Jackson County has a total area of 723 square miles, of which 702 square miles is land and 22 square miles (3.0%) is water. Hillsdale County has a total area of 607 square miles, of which 598 square miles is land and 8.9 square miles (1.5%) is water. Lenawee county has a total area of 761 square miles, of which 750 square miles is land and 12 square miles (1.6%) is water.

Although there are no mountains in Hillsdale County, there are heights that rise 1,250 feet above sea level, giving life to the headwaters for five major rivers that drain into Lake Erie and Lake Michigan. Topographical maps indicate that the highest point in the county is located near the corners of Wood and Kelso Roads in Adams Township. The rivers that begin within the county's borders include the St. Joseph flowing into Lake Michigan, the Maumee (starting as the St. Joseph and Tiffin), the Kalamazoo, the Grand, and the Raisin. Spring fed, the rivers flow north, south, east, and west from the highlands (see Figure 2).

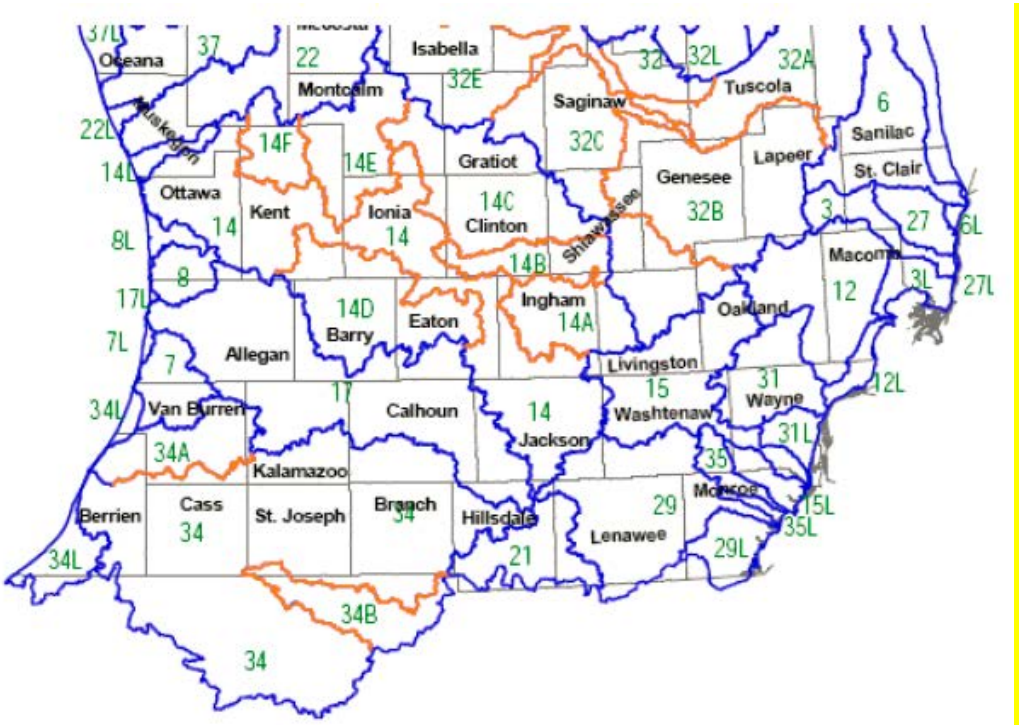

Figure 2. Intersection of the headwaters of the River Raisin (#29), the Grand (#14), the Kalamazoo (#17), the Maumee (#21) & St. Joseph (#34) rivers in Hillsdale County (MDEQ).

### *3.1.2 Cultural Landscape*

When Europeans first arrived in this location, these counties were mostly covered in dense forests. Hillsdale County was predominantly a vast beech-sugar maple forest with some mixed oak forest to the north. Lenawee County was also mostly beech-sugar maple as well, although the southeast area of the county was a mixed hardwood swamp. Jackson County was more of a mix with beech-sugar maple, mixed oak forest, mixed oak savannah, white pine and white oak forests. Lowland areas, particularly in the major river valleys across all three counties tended to be wet prairie and/or mixed hardwood swamps.

Central Michigan was home to the Pottawattomie Indian tribe. Their territory extended over northern Indiana and southern Michigan as far as the Shiawassee River. The Hurons occupied the eastern part of the state; the Chippewas or Ojibway occupied Saginaw Valley and north, while the Ottawas occupied the western portion (Deland's History of Jackson County; Colonel Charles V. Deland, 1903; B.F. Bowen, Publisher).

The French were the first Europeans to explore and build in Michigan but they mostly confined settlement to southeast Michigan and the Detroit area. Over time, the English followed and in 1773, they displaced the French as a result of the French and Indian Wars. Following the Revolution, the Northwest Territories, including what would become the states of Michigan, Ohio, Indiana, Illinois, and Wisconsin, was ceded to the United States in 1783 as part of the Treaty of Paris.

Following the War of 1812, General Lewis Cass, the appointed Governor of the Territory, drove the remaining Huron, Wyandotts, and Chippewa Indians into Canada and the Saginaw Valley. By 1840 the Federal government moved most of the Pottawatomies to a reservation near Green Bay, Wisconsin. European settlement of these three counties began in earnest following the removal of most of the area's native population.

Jackson County was named after Andrew Jackson, who served as the 7th President of the young United States from 1829-1837. Hillsdale was named for its terrain, featuring hills and dales. The name Lenawee came from the Shawnee word *Lenawai* meaning *'Men'* or *'The People'*. Source "Lenawee County, A Harvest of Pride and Promise" by Charles N Lindquist. © 1997. Found in "The Indians of Lenawee County" by Erich A. Von Fange, PhD, c 1988 & 1997: The nameLenawee is said to be a Delaware or Shawnee word for man or Indian.

The area was progressively cleared and drained for farming and was likely completely clear cut by the early 20th century, when wood was in particularly high demand for home and ship building.

For centuries prior to the 1820s, this area was familiar to generations of Native Americans. From Mastodon and Woolly Mammoth hunters of the post-ice age era to the mound- building Hopewell and Adena cultures of the pre-Columbus period and to the last tribe of Huron-Potawatomi's, this was an important location within the Great Lakes region. The area was the transportation cross roads of the old Northwest with the intersection of the Maumee Trail, a northern spur of the Great Trail (Now U.S. 120 in northern Ohio and Indiana) that led from the east coast to the Mississippi and beyond, and the Sauk Trail at approximately the location of present day Allen. The rivers also served as important travel routes and the area comprising present-day Hillsdale County was a major apex of a water system that led from the east coast to the Mississippi and beyond.

Long before white settlers began pouring into southern Michigan over the Chicago Military road, known today as US-12 (Figure 3), Native Americans from many tribes beat a worn path from the shores of Lake Erie in the east to the sandy beaches of Lake Michigan in the west. For centuries, Indians used this route for hunting, trading, and all too often, war. During the middle 1600s, Hillsdale County was undoubtedly a battleground between the British-supplied Iroquois tribes of upstate New York who invaded Potawatomi's territory. Hillsdale County's recorded history began in 1825 when the Chicago Turnpike (Sauk Trail) was surveyed.

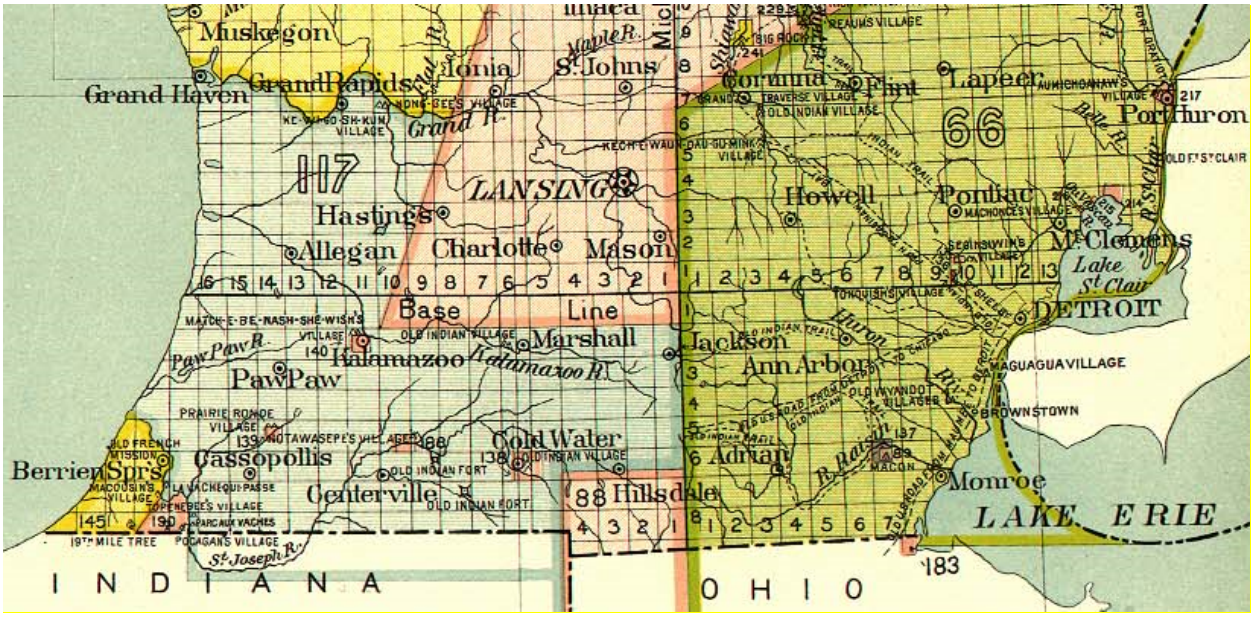


Figure 3. Southern Michigan portion of the Royce Indian Treaty Map of 1807. Produced by the Smithsonian Institution.

### *3.1.3 Climate, Geology, Topography and Land Cover*

**Climate**

While the three counties are close together, they do experience slightly different climate patterns. Of the three counties, Lenawee's climate is most mediated by its proximity to Lake Erie. Lenawee County is in the driest and warmest region of the state, with a mean annual temperature between 47°F and 49°F and mean annual precipitation of 32 – 34 inches. The average annual snowfall ranges between 32 and 38 inches. Average annual groundwater recharge is between 5 and 12 inches. Runoff is roughly 8-inches annually. The remainder of the precipitation, 12-21 inches is lost via evapotranspiration (ET). The watershed has low levels of warm season runoff due to high average air temperatures and high ET rates. ET exceeds precipitation by more than 80% during the growing season and total annual surface runoff in the area is lower than in most of the rest of the state (Dodge, 1998).

Typical frost-free dates for this area range from May 1 to 8 (for last frost) and Oct. 11 to 20 (for first frost). Using the May 1 and Oct. 20 dates gives a normal maximum growing season of 172 days. Earlier fall or later spring frosts are possible in a given year that would shorten the growing season. The USDA Plan Hardiness Zone for most of the area is 5b which has a low of -10 to -15 F; however, the urban area around Kalamazoo is in Zone 6a with a predicted minimum temperature of -5 to -10 F.

Southeast Michigan experiences occasional droughts such as the one in the summer of 2012. The Palmer Drought Severity Index shows the relative levels of dryness and wetness in the United States.
(www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif)

**Climate Change**

The Great Lakes region is predicted to experience a warmer future and more chaotic precipitation patterns. Over the last century (1899-1992) the growing season has grown by an average of 14 days across the Midwest. The region may be simultaneously experiencing hotter and longer droughts but more unpredictable and extreme rain events. In a study of Midwestern precipitation patterns over the last century, researchers found that in Michigan, the size of intense precipitation events and their frequency of occurrence is going up. On average, the ten wettest days of the year account for more than 30% of total annual precipitation. Figure 4 below shows the trend of the sum of the 10 wettest days each year from 1901-2000 across the Midwest. In Michigan, the increase in the rainfall amount for the 10 wettest days annually is going up 1% to 3% a decade over that period (Pryor, S.C., Howe, J.A., and Kunkel, K.E., 2009, "How Spatially coherent and statistically robust are temporal changes in extreme precipitation in the contiguous USA? Int. J. Climatology, 29:31-45).

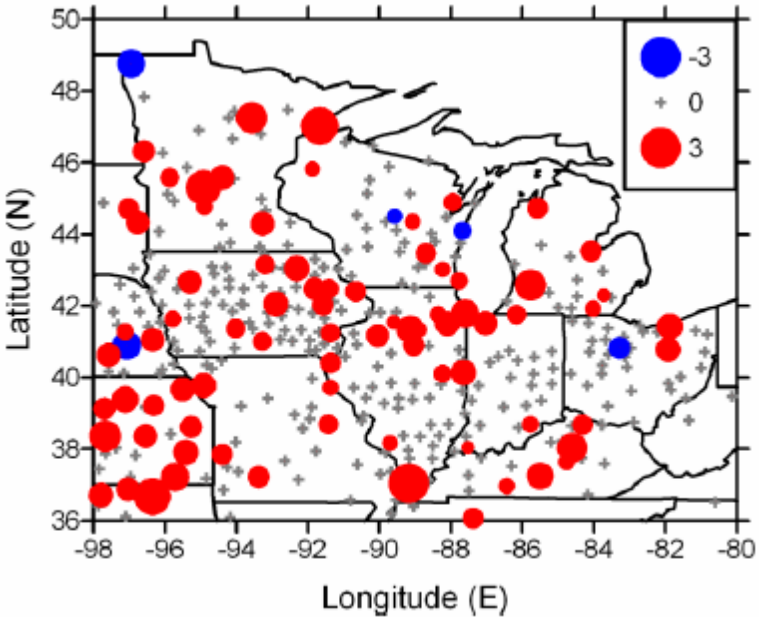


Figure 4. Trend in the sum of the top-10 wettest days in a year from 1901-2000, expressed as a percent per decade. Red circle indicates that the station showed a statistically significant increase over time. Blue circle indicates a statistically significant decline. Plus symbol indicates trend was not significant. The diameter of the dot scales linearly with trend magnitude (Pryor, S.C., Howe, J.A., and Kunkel, K.E., 2009, "How Spatially coherent and statistically robust are temporarl changes in extreme precipitation in the contiguous USA? Int. J. Climatology, 29:31-45).

Summer temperatures are changing quickly, and it is expected that within the next 25 years, summers in Southeast Michigan are predicted to feel like Kentucky does today and by 2095 will feel like Arkansas today (Kling et al., 2003). Winters will warm as well, resulting in less ice cover on the Great Lakes and inland lakes. Coupled with increased evaporation, an overall drying trend may result in lower water levels in the Great Lakes and inland lakes and streams. Our winters are already getting shorter and extreme heat and precipitation events are occurring more commonly than in the past (Kling et al., 2003). The Union of Concerned Scientists' report "Confronting Climate Change in the Great Lakes Region" (Kling et al., 2003) predicts that native species ranges (including fish and other aquatic species) will shift northward, and that invasive

species problems will likely get worse as native species in the southern limits of their ranges die off, leaving unfilled niches that non-natives can occupy.

Plant hardiness zones have already shifted so that more southern plants can now survive Michigan winters. Plant hardiness zones are categorized according to the mean of the lowest temperature recorded each winter. According to the National Arbor Day Foundation (2006), southern Michigan warmed from Zone 5 (-29 °C to -23 °C) to Zone 6 (-23 °C to -17 °C) between 1990 and 2006.

According to the third U.S. National Climate Assessment (NCA),

> "The composition of the region's forests is expected to change as rising temperatures drive habitats for many tree species northward. The role of the region's forests as a net absorber of carbon is at risk from disruptions to forest ecosystems, in part due to climate change. Among the varied ecosystems of the region, forest systems are particularly vulnerable to multiple stresses. The habitat ranges of many iconic tree species such as paper birch, quaking aspen, balsam fir, and black spruce are projected to decline substantially across the northern Midwest as they shift northward, while species that are common farther south, including several oaks and pines, expand their ranges northward into the region." (NCA, Ch. 18: Midwest. www.globalchange.gov)

The probable effects of climate change and their likelihood are summarized in the NCA as:

1. Climate change will amplify many existing stressors to forest ecosystems, such as invasive species, insect pests and pathogens, and disturbance regimes (very likely).
2. Climate change will result in ecosystem shifts and conversions (likely).
3. Many tree species will have insufficient migration rates to keep pace with climate change (likely).
4. Climate change will amplify existing stressors to urban forests (very likely).
5. Forests will be less able to provide a consistent supply of some forest products (likely).
6. Climate change impacts on forests will impair the ability of many forested watersheds to produce reliable supplies of clean water (possible).
7. Climate change will result in a widespread decline in carbon storage in forest ecosystems across the region (very unlikely).
8. Many contemporary and iconic forms of recreation within forest ecosystems will change in extent and timing due to climate change (very likely).
9. Climate change will alter many traditional and modern cultural connections to forest ecosystems (likely).

Another report on future tree species distribution under warmer temperatures, published by the US Forest Service, expects most oaks to benefit from climate change in Michigan, but most conifers to be negatively impacted. Refer to: Prasad, A. M., L. R. Iverson., S. Matthews., M. Peters. 2007-ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. Northern Research Station, USDA
http://www.nrs.fs.fed.us/atlas/tree

In addition, the Great Lakes Integrated Science and Assessment Center (GLISA), a collaboration between the University of Michigan and Michigan State University and funded by NOAA was created to inform the National Climate Assessment from the Great Lakes' perspective. Their website: http://glisa.msu.edu/ provides a number of resources related to Great Lakes climate change impacts.

**Forest Adaptation Resources**
Government and non-profit organizations have begun to try to address the impacts of climate change on various ecosystems, including forests. This includes the development of tools that can help land managers consider climate change in planning exercises.

For instance, there is an inter-agency and non-governmental partnership – the Climate Change Response Network – that was recently created to encourage collaboration, reduce duplication of effort, and provide useful information, discussions, practices, and projects to address climate change impacts on forests. While this is an initiative looking at forests on a regional scale, the work reflects and can inform forest management at all scales. For more information, visit: www.forestadaptation.org.

**Geology**
All three counties were glaciated until about 13,000 years ago and have extensive deposits of glacial till, glacial outwash, and more recent deposits of alluvium. A pattern of recessional moraines (hilly deposits of till that tend to be coarse material with a large amount of sand, gravel, and boulders) reflects the retreats and halts of the glacial lobes that once covered the region.

This area was once covered with mile-high glaciers that pushed and pulled everything in their path, dropping and dragging sediment, advancing and retreating across the landscape. The formation of the Raisin watershed actually dates back to before the formation of modern Lake Erie. At around 15,000 years ago, a series of glacial lakes were formed from what was known as the Wisconsin ice sheet or Pleistocene Glacier. The drainage of water eastward did not occur at first. What we call Lake Erie used to comprise many smaller lakes such as Maumee, Arkona, Whittlesey, Warren, Wayne, Grassmere, and Lundy. Drainage started westward from Lake Maumee (at an elevation of 800 ft. above sea level) towards Fort Wayne, Indiana into the Wabash River. The drainage of waters eastward started 12,000 years ago and resulted in a low lake level stage for 8,000 years. During that low lake stage, the River Raisin was born. Gradually, the Lake Erie water level rose from 470 feet above sea level to its current elevation of 570 feet above sea level after the Niagaran escarpment rebounded from the loss of the glaciers' weight.

**Topography**
The topography of the three-county area is generally rolling hills and transitions to the flat, ancient Lake Erie lake plain on the eastern side of Lenawee County and is influenced strongly by past glaciation and contemporary river valleys. Surficial geology transitions from coarse and

medium textured glacial till and moraine deposits in the northwest, to fine sediments in Lenawee County, to very fine lacustrine deposits in the Lake Erie lakeplain in the southeast corner of Lenawee County (see Figure 5). The thickness of the glacial deposits ranges from 50 to 300 feet, with the thickest portions occurring in the northeastern and southwestern portions of the watershed. Thicker deposits generally provide more storage and thus increase the percentage of flow of a river that has a subsurface rather than an overland (Knutilla and Allen, 1975) source.

Lake bed deposits consist principally of clays and sands which were deposited in former glacial lakes (van Wagner et al., 1998). In general, the coarse sand and gravel of moraines promote groundwater retention and flow, whereas silt, clay, fine sand, and till favor surface drainage (Knutilla and Allen 1975). Landforms in the area generally northwest of Adrian consist of kames, end moraines, and ground moraines. The kames are formed by unsorted glacial till deposited directly from ancient mile-high sheets of ice. The end moraines and ground moraines are generally stratified gravel, sand, silt, and clay deposited from streams flowing from the retreating glacier. These deposits produce a hilly to gently rolling topography (USDA, SCS, 1961). Many of the lakes in the Irish Hills area were formed in kettles, or depressions formed when blocks of ice broke off from the glacier and were subsequently buried in debris and later melted leaving holes in which the lakes formed. Southeast of a line generally connecting Morenci, Adrian, and Tecumseh is an area once covered by the glacier and by glacial lakes that were part of the predecessor to Lake Erie. This lake bed plain contains a series of narrow, low beaches, bars, and deltas formed by streams flowing into the lake. These lake bed deposits are moderately fine to fine grained materials covered by deltaic deposits up to 20 feet thick. Lacustrine or lake deposits of sand, silt, and clay are common in the southeastern part of the watershed. These deposits produce the flat topography dissected by entrenched drainage with steep sides (USDA, SCS, 1961).

The US Geologic Survey has published topographic maps covering 7.5 minutes (one eighth of a degree of latitude and longitude) which have a scale of 1:24,000 so that 1 inch on the map represents 2,000 feet on the land. These maps generally have contour intervals of 10 feet (vertical dimension) and show a number of useful features: forests, rivers, wetlands, etc. The maps are available from multiple sources including:
Topo map link: http://www.michigan.gov/dnr/0,4570,7-153-10371_14793-31264--,00.html

The Michigan Physiographic Map website provides map data (region names, boundaries, and defining characteristics) for 91 physiographic regions in the state. The interface supplies standard basemap backgrounds provided in Google Maps as well as the 7.5-minute USGS topographic basemap. The mapping project was done by Randall Schaetzl (soils@msu.edu) and David Lusch in the Geography Department at Michigan State University. The regions identified in the three-county area include: Barry Interlobate, Battle Creek Hills, Lansing Loamy Plain, Niles-Thornapple Spillway, Union Streamline Plains, and Three Rivers Lowlands.
Source: http://mgs.geology.wmich.edu/flexviewers/physiography/

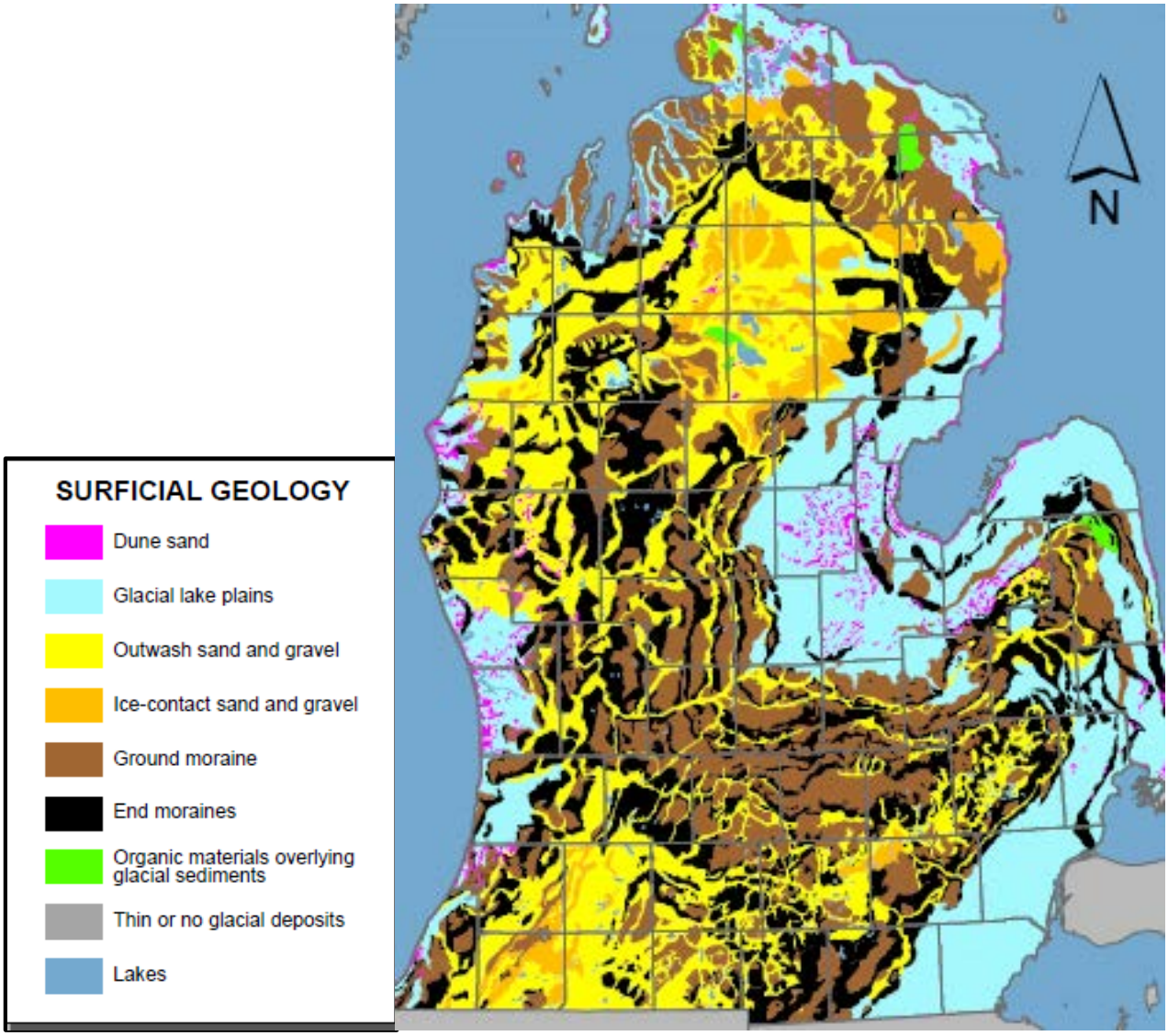

Figure 5. Surficial Geology Map of the Southern Peninsula of Michigan

**Land Cover**

This is a region with a landscape composed of a mixed land use with cropland, forests, wetlands, and some urban areas (see Figure 6). The dominant land use in the three-county area is agricultural, a combination of row crops (corn and soybean), and pasture, and other types of farms including vegetable growers. Together row crops and pasture account for approximately 60% of the land cover in the three county area. There are a few Confined Animal Feeding Operations (CAFOs >500 animals) but mostly in southern Hillsdale County, and almost all of them draining to Lake Erie via the Tiffin River, and then the Maumee River. About 14% of the area is forested, counting both deciduous and evergreen forests, and about 13.6% is wetland, including emergent, scrub-shrub, and forested wetland areas. Developed areas, including urban, suburban, and exurban comprise approximately 10.4% of the entire area.

**Presettlement Vegetation**

The presetttlement vegetation maps for the three counties of Jackson, Hillsdale, and Lenawee are shown in Figures 7-9 below. Based on this data, pre-settlement vegetation in this area consisted primarily of oak-hickory and beech-maple forests and mixed hardwood swamps. These maps were assembled by the Michigan Natural Features Inventory (MNFI), a group that works within the Michigan Department of Natural Resources using surveyor notes taken between. 1816 and 1856, when Michigan was systematically surveyed by the General Land Office (GLO).

Information collected by the land surveyors has been used to reconstruct Michigan's pre-European settlement landscape. Surveyors took detailed notes on the location, species, and diameter of each tree used to mark section lines and section corners. Biologists from the Michigan Natural Features Inventory developed a methodology to translate the notes of the GLO surveys into a digital map that can be used by land managers and the general public. The Nan Weston Nature Preserve (in Washtenaw County) and Ives Road Fen (in Lenawee County) give a visitor a sense of what this landscape may have looked like before settlement (Figure 10).

Nan Weston Preserve (photo source: flowerwalks/wordpress.com)

Maps for each county in Michigan are available at: https://mnfi.anr.msu.edu/data/veg1800.cfm

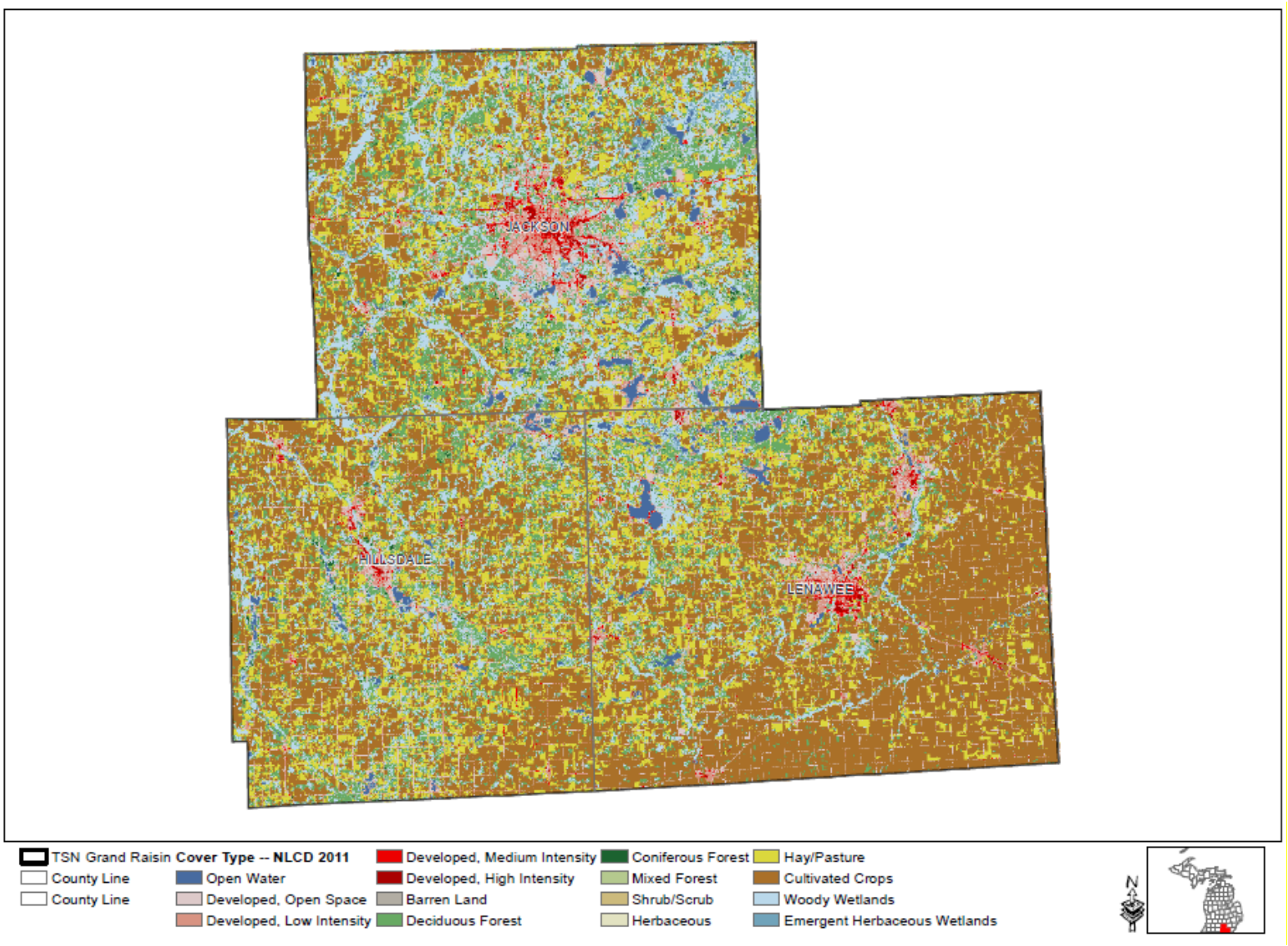


Figure 6. Land Use Map for Lenawee, Jackson and Hillsdale Counties (compiled by MDNR)

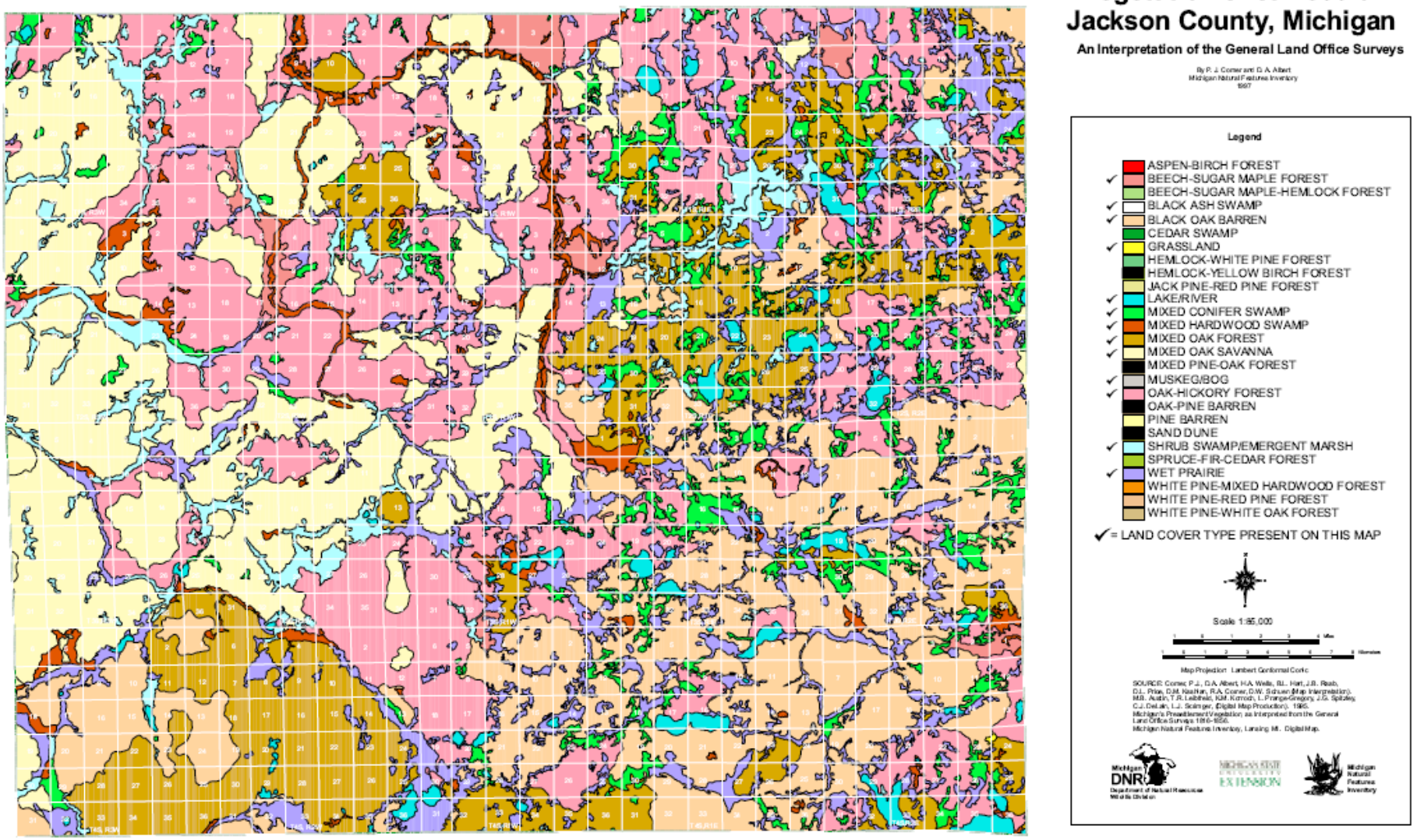


Figure 7. Vegetation circa 1800 of Jackson County, Michigan (MDNR)

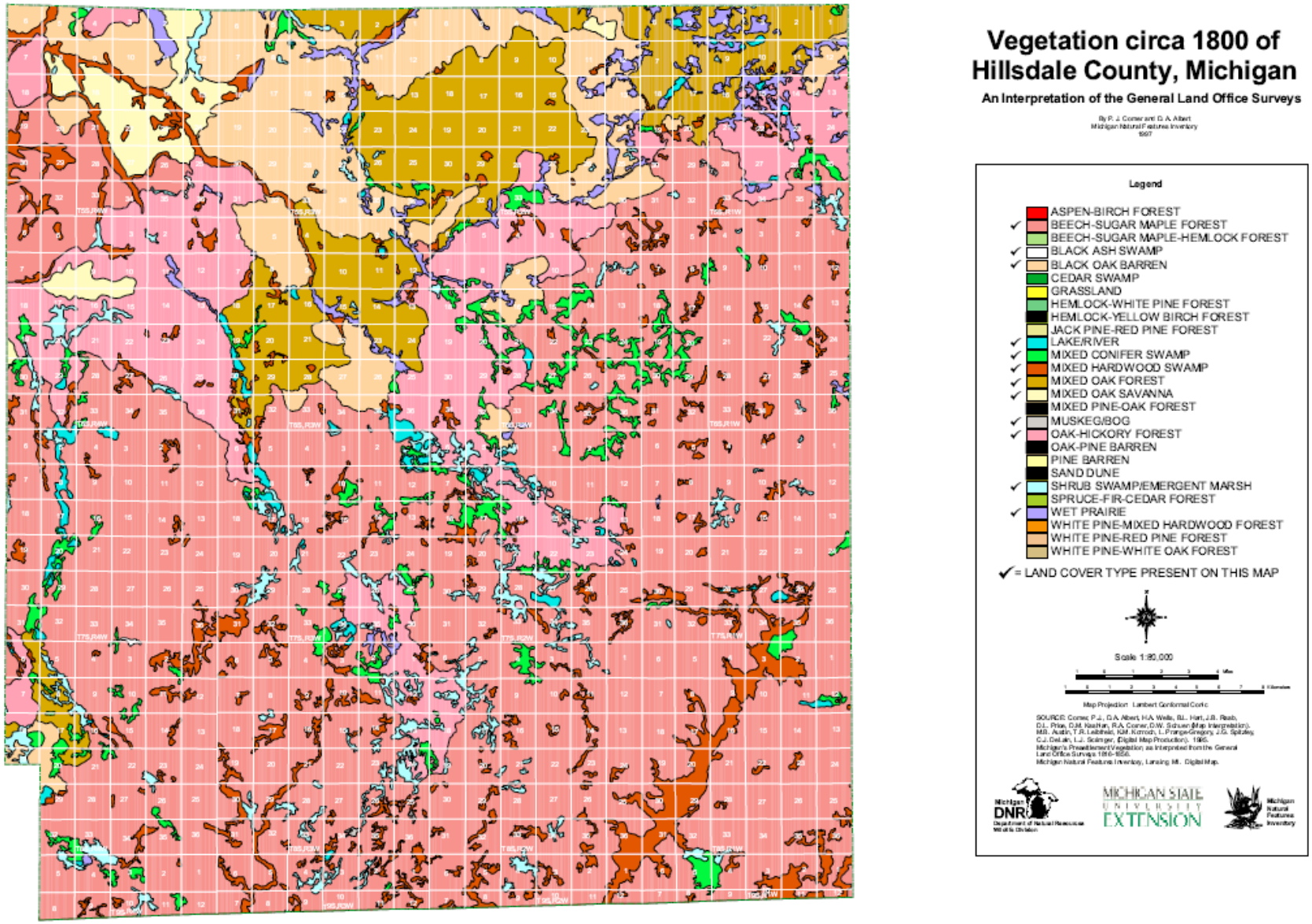


Figure 8. Vegetation circa 1800 of Hillsdale County, Michigan (MDNR)

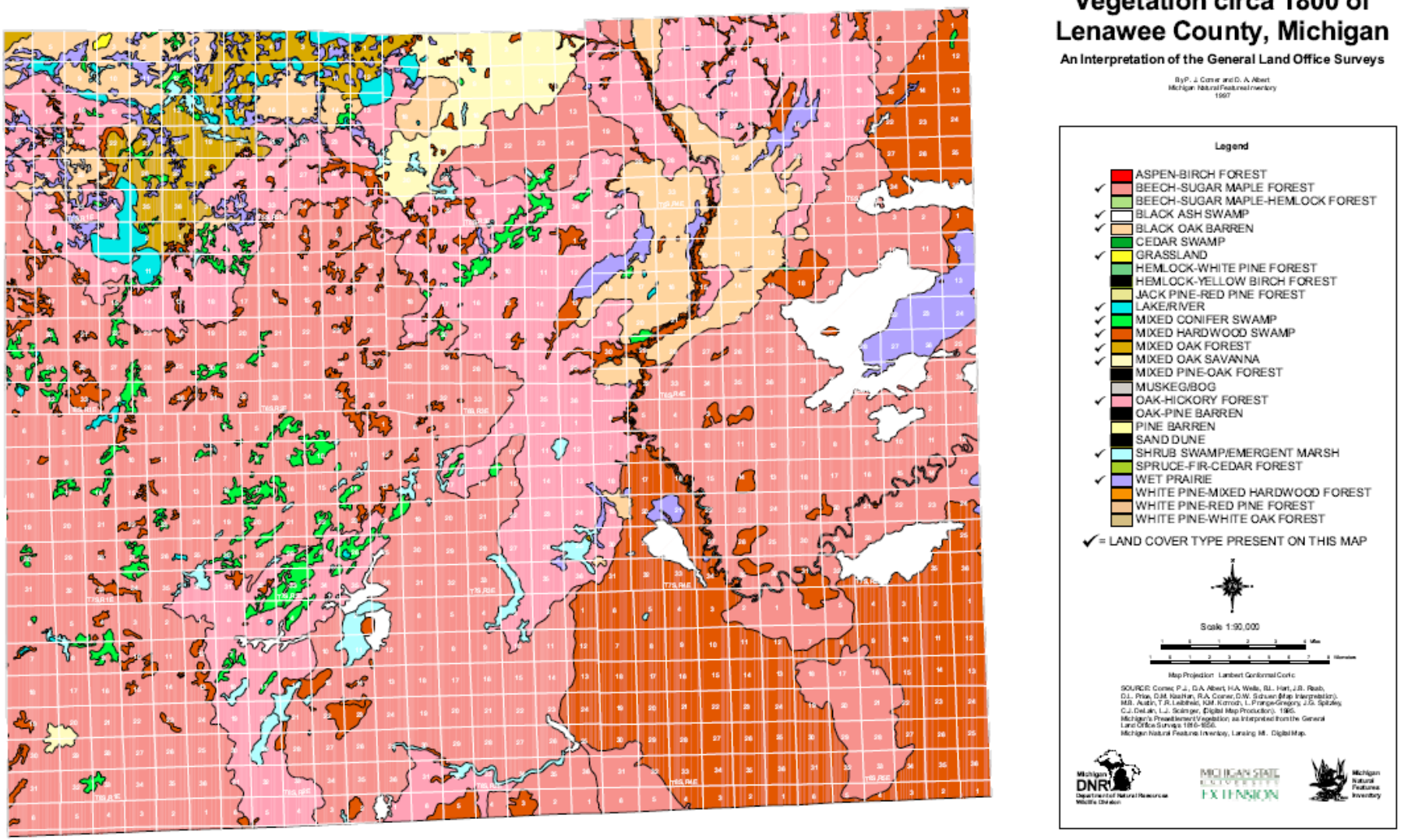


Figure 9. Vegetation circa 1800 of Lenawee County, Michigan (MDNR)

### *3.1.4 Soils*

Although filled with glacial debris from the last ice age, this area retained significant prime soil for growing crops, an all important consideration for early 19th century peoples dependent upon an agriculturally-based society. For three-fourths of the year during the spring, summer, and autumn, southern Michigan is lush green peppered with colors of striking contrast. It is this productivity that has converted much of the landscape to agricultural uses.

Soils perform many functions: they sustain plant growth, provide habitat for many animals, hold and filter water, recycle dead material, and support buildings and roads. Soil physical, chemical, and biological properties such as the amount of sand, silt and clay (texture), the acidity/alkalinity (pH), nutrient status, organic matter content, can vary dramatically-sometimes in relatively short distances. Landowners can benefit from understanding the relationship between soil characteristics and appropriate land use. Organic matter is the living portion of the soil and the microbes within it recycle dead organisms and release the nutrients in a form that can be taken up by plants. Land management practices can enhance soil health by increasing soil organic matter levels. Healthy soils are resilient, resist erosion, and are able to support plant growth during droughts.

The parent material of the soils in this three county area was deposited about 10,000 years ago during the Wisconsin stage of Pleistocene glaciations and the lacustrine deposits of the ancestral Great Lakes. The soils are highly variable and the topography is split between rolling hills to the northwest and low-lying, flat old lake plain to the southeast. Within the hills to the northwest, well drained loamy sands and sandy soils, and very poorly drained loamy-muck soils that formed in glaciofluvial deposits or in organic matter, are found on the kames, end moraines, and ground moraines (USDA, SCS, 1961). To the north and west are large areas of gently rolling soils comprised of silty clay loams and limey clays along with nearly level poorly drained soils developed from clay loams and clays found on end moraines and ground moraines. This central region also includes long narrow areas of level to nearly level, poorly drained loam, sandy loam and loamy sand overlying limey sand and gravel in the south central area with level to gently rolling well drained sandy loam and loamy sand overlying sand and gravel in the north central area (USDA, SCS, 1961). Nearly level, very poorly drained, silty soils are located along the Lake Erie Shoreline. Level, poorly drained soils developed from silty clays, and clays developed in deltaic and lacustrine deposits are located in the eastern watershed
(USDA, SCS, 1961).

Detailed soil information is provided by the USDA Natural Resources Conservation Service (NRCS) though printed soil surveys (available from County Conservation District Offices) and Web Soil Survey, a website that shows recent aerial imagery and allows the user to select an area of interest to assess the soil map units present and search interpretations such as suitability for paths and trails. There are numerous interpretations that cover commodity crop production, hydric soils (those associated with wetlands), recreational development, soil health, etc. Under the land management tab, there are several interpretations that relate to forestry such as haul

roads, erosion hazard, harvest equipment, seedling mortality, and windthrow hazard. The print versions of Soil Survey show appropriate trees to plant on different soil types and the site index for a few of the most common trees that are adapted to the soil characteristics (drainage, depth, etc.) for the mapped area. Web Soil Survey:
http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Smart phone users can take advantage of the SoilWeb app which uses the device's GPS location to display the most common one or two soils at that site. It has basic information that includes a soil profile, landscape position, and simple graphs that display sand, silt, clay, organic matter, and pH with depth.

Michigan State University houses a Soil and Plant Nutrient Laboratory which offers a variety of analytical services on samples of soil, composts, plant tissue, water, and other materials related to the growing of plants. Determining pH and nutrient status of soil by soil testing is a key method of determining which amendments (lime and fertilizer) to add for optimal plant growth. Soil and Plant Nutrient Laboratory: http://www.spnl.msu.edu/

For more detailed understanding of the soils on your site, contact the Natural Resources Conservation Service or Michigan State University Extension. See Section 3.2.1 for details.

### *3.1.5 Water*

The headwaters of five major rivers that flow through Michigan, Ohio, and Indiana originate from a high area in Hillsdale County. These five major systems include the River Raisin, the Grand River, the Kalamazoo River, the St. Joseph River (that flows to Lake Michigan), and the Maumee River. The Maumee River in Hillsdale County originates as the St. Joseph River (the St. Joseph River that drains to Lake Erie) and the Tiffin River. Both the St. Joseph River and the Tiffin flow south from Hillsdale County through Ohio as tributaries to the Maumee River that eventually discharges to Lake Erie. While Hillsdale County is broken up across these five major watersheds, Jackson County is almost entirely within the upper Grand River watershed, while Lenawee County is almost entirely contained within the River Raisin watershed.

Water use in Michigan, like the rest of the country, is guided by federal definitions. For instance, all fresh water bodies in Michigan are defined as having at a minimum, potential uses for irrigation, navigation, warm water fishery, indigenous aquatic life and wildlife, partial and total body contact recreation, public and industrial water use, and fish consumption. Water quality is judged by how well the site conforms to the standards designed to healthfully deliver those services. However, the impacts of human development, whether it be landscape modification or other forms of land use/land cover changes, can significantly degrade water quality.

Four of the five major river systems running through these counties has multiple water quality impairments, like PCBs, mercury, sediment, hydromodification, hydrologic disconnection, etc. There are no listed impairments in the upper reaches of the St. Joseph River (Lake Michigan

tributary) in Hillsdale County. This is partly due to the fact that there is not as much development in this area, and that the area is relatively small. The other aspect to consider is that all three counties occupy the headwaters of these systems. Firstly, this implies an additional "responsibility" as these areas supply the initial recharge to these rivers. Additionally, some issues in these rivers arise and are exacerbated in the downstream direction. For instance, while there is a PCB fish consumption and a water column impairment listed for almost the entire Kalamazoo River, the worst conditions for PCBs are far downstream from Hillsdale and Jackson Counties. The upper reaches would only be impacted by atmospheric deposition of airborne PCB, rather than by the former paper mill industrial practices that is responsible for impacting the downstream reaches so greatly.

Most of these river systems are also impaired due to mercury contamination, but again, the source is airborne deposition, likely having entered the atmosphere through the burning of fossil fuels. The Raisin in Lenawee, the Upper Grand River in Jackson, the St. Joseph River (Maumee mouth) and the Tiffin River in Hillsdale all have impairments due agricultural and urban/suburban runoff. The lower Raisin in Lenawee also has a nitrate Total Maximum Daily Load (TMDL) that is likely a result of crop fertilization practices. There are also a few impairments on the Grand River and Raisin Rivers that are due to untreated human sewage. In the case of the St. Joseph River (Maumee mouth) and the Tiffin River there are Concentrated Area Feeding Operations (CAFOs) that are contributing to high bacteria concentrations causing impairments.

Trout stream maps: www.michigan.gov/dnr/0,4570,7-153-10364_63235-211883--,00.html

The DNR website has maps that show lake depth and other features at:
http://www.michigan.gov/dnr/0,1607,7-153-10364_52261_52964_66796-67543--,00.html

### *3.1.6 Wetlands*

Wetlands are defined as areas that have wetland vegetation (hydrophytes); hydric soils, and wetland hydrology. According to the MDNR's GIS analysis, the Lenawee-Jackson-Hillsdale area has almost 11% of its land area in wetlands, with woody wetlands being the largest in extent, followed by emergent wetlands, and then shrub/scrub wetlands. Trees in woody wetlands can consist of deciduous species such as cottonwood, swamp white oak, silver maple, red maple, and others. Conifer swamps typically have northern white cedar, tamarack, and hemlock as the dominant trees.

There are many wetland types found in the Lenawee-Jackson-Hillsdale area including emergent wetlands, fens, bogs, swamps, bottomland forest, etc. Detailed information about natural communities is available on the Michigan Natural Features Inventory website. Many wetlands in Michigan have been drained and the ones that remain are usually affected by altered hydrology (drainage by tiles and ditches or increased surface water inputs because of dams or additional runoff in the wetland's watershed), changes in water quality (nutrients, pesticides, salts, etc.), and introduction of invasive species (reed canary grass, purple loosestrife, and others).

The Michigan DEQ reported on the Status and Trends of Michigan's Wetlands: Pre-European Settlement to 2005 in 2014 and showed a loss of about 39% of the state's wetlands over that time period.

The Department of Environmental Quality's (DEQ) wetlands program is using geographic information technology (GIS) to improve the evaluation of wetlands on a watershed scale in a Landscape Level Assessment. The assessment uses a computer model to integrate wetland maps with hydrologic data, site topography, and other ecological information to provide a generalized map of current wetland functions within a watershed, the loss of wetland function associated with past land use changes, and potential wetland restoration areas. This wetland assessment can be used to support watershed planning, zoning decisions, and definition of wetland restoration/protection priorities at the local or regional level. Wetlands play a critical role in the regulation of water quality and quantity, and wetland protection and restoration should be an integral component of watershed planning.

Wetlands have been mapped by the US Fish and Wildlife Service in a program called National Wetland Inventory. That mapping uses the Cowardin System of Classification with distinctions among palustrine (inland wetland which lacks flowing water), lacustrine (associated with lakes), and riverine systems. The Wetlands mapper integrates digital map data along with other resource information to display wetland type and extent using a biological definition of wetlands. https://www.fws.gov/wetlands/Data/Mapper.html

Wetlands mapper does not define the limits of proprietary jurisdiction of any federal, state, or local government, so landowners should consult with appropriate agencies (Michigan DEQ and USDA) before conducting clearing, earth moving or other operations in potential wetlands. http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10801--,00.html

The main state regulation that affects wetland use and alteration is Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, which is administered by the Department of Environmental Quality (DEQ). In Michigan, the Section 404 federal authority associated with inland waters and wetlands was assumed by the state in 1984. Section 10 of the Rivers and Harbors Act of 1899 is a federal law which regulates construction in, over and under navigable waters.

Wetlands on agricultural land are regulated by the USDA Natural Resources Conservation Service under the Wetland Conservation provisions, commonly referred to as Swampbuster, which prohibit USDA program participants from converting remaining wetlands on their agricultural operations to cropland, pasture, or hay land unless the wetland acres, functions, and values are compensated for through wetland mitigation. The 2014 USDA Farm Bill established a Wetlands Reserve Easements program that is designed to provide a financial incentive to private landowners to encourage the restoration of previously degraded or drained wetlands. NRCS pays a per-acre easement fee, plus 100 percent of the cost to restore the agricultural lands back to natural wetland ecosystems. The landowner retains title, control of access, and hunting rights, but must protect the restored wetland ecosystem for future

generations. The landowner can sell the land, but the easement (and its protections) remain enforce for perpetuity.

A good guide for understanding wetlands (written by Dr. Gary Pierce, first Field Station Director at Pierce Cedar Creek Institute) is available from the Wetland Training Institute. Wetland Mitigation: Planning Hydrology, Vegetation, and Soils for Constructed Wetlands by Gary J. Pierce with contributing editors Mallory N. Gilbert and Robert J. Pierce. http://www.wetlandtraining.com/wetland-mitigation/

### *3.1.7 Biological Diversity and Wildlife Habitat*

While there are several species that have disappeared from this local landscape, such as Eastern Elk, the passenger pigeon, and harelip sucker, a remarkable variety of plants and animals still persist in the Jackson-Hillsdale and Lenawee area. However, many native species are threatened or endangered. These threats include non-invasive aquatic and terrestrial species, housing, urban and shoreline development, climate change, dams and barriers, agriculture, and forestry non-point source pollution.

At least 90 fish species are now found in the River Raisin watershed alone, distributions of which range from basin wide to localized populations; eleven non-indigenous fish species have been introduced in the watershed (Dodge, 1998). Common species in the basin include sunfishes, darters, catfishes, suckers, pike, carp, and smallmouth bass. Researchers from the University of Michigan collected over 3,000 fish from 18 sites in the River Raisin watershed in the late 1990's. 75% percent of the captured specimens were made up of six species, with the creek chub being the most abundant, captured at 17 of 18 sites. Twenty-eight species were collected in total, half of which were species that made up less than 1% of the catch (Lammert and Allan, 1999). Results of a 1984 MDNR survey found smallmouth bass populations were highest in the higher gradient river segments near Manchester and near Monroe and lowest in the low-gradient mid-section near Blissfield (Dodge, 1998).

**Threatened and Endangered Species**

The Michigan Natural Features Inventory (MNFI) program, administered by Michigan State University Extension, conducts field surveys to locate and identify threatened and endangered species and communities throughout the state, created and maintains a database of all relevant species and community locations, provides data summaries and analysis in support of environmental reviews, and provides biological expertise to individuals, agencies, and other interested parties. This information can be used to: reveal population trends and ecological requirements, and guide land use and management activities. Threatened species are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting, and restoring endangered and threatened species is the primary objective of the U.S. Fish and Wildlife Service's endangered species program.

According to Michigan Natural Features Inventory's Rare Species Explorer, there are 92 endangered, threated, or species of special concern in Jackson County, 67 in Hillsdale County and 107 in Lenawee County. The website can be searched by taxonomy (type of organism), habitat, state and federal status, and county. See Appendix 3 for a complete list.

All three counties share three species that the US Fish and Wildlife Service have listed as threatened or endangered including the Indiana bat (*Myotis sodalis*), the Northern Long-Eared Bat (*Myotis septentrionalis*), and the Eastern Massasauga Rattlesnake(*Sistrurus catenatus*). Jackson County and Hillsdale County also share the federally-listed Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*), and the Poweshiek skipperling (*Oarisma poweshiek*). Hillsdale County and Lenawee County also share the T&E mussel species the Rayed bean (*Villosa fabalis*).

The northern long-eared bat roosts and forages in riparian and upland forests during spring and summer and hibernate in caves. Mitchell's satyr butterfly lives in fens (wetlands characterized by calcareous soils fed by water from seeps). The Eastern massasauga rattlesnake (*Sistrurus catenatus*) was changed to threatened status as of September 2016 and also spends much of its time in wetlands. The copperbelly watersnake (*Nerodia erythrogaster neglecta*) is threatened and lives in wooded and permanently wet areas and is on the FWS list only for Hillsdale County. The Clubshell clam (*Pleurobema clava*) is only threatened in Hillsdale County. The rusty-patched bumble bee ( Bombus afinis) and the the northern riffleshell (Epioblasma torulosa rangiana) are listed in Lenawee County only.

**Wildlife Habitat**

The habitat needs of different animal species can vary greatly from patches of plants of less than an acre to territories of several square miles for predators (bears and coyotes). Some species prefer edge habitat, while others require large blocks of grassland or forests. What favors one species may be detrimental to another, so a landowner who wants to manipulate habitat needs to decide which animals they want to favor. Another strategy is to have multiple types of habitat (mature forest, early successional forest, prairie, wetlands, etc.) to satisfy the needs of several species. While agricultural land does not have as much biodiversity as natural plant communities, it is usually the dominant land use and there are practices that can improve the habitat value of working lands.

Most stewardship plans address wildlife habitat and there are many practices that can be used to create or improve support for animals. To survive, animals need food, water, cover, and enough space to live and reproduce. These resources can be provided by appropriate management of existing natural areas or restoration of plant communities that support the target species.

**White-tailed Deer**

The premier game species in Michigan is the white-tailed deer, which thrives in a mixed habitat of woodlots, brushy areas, meadows, and croplands. They feed in different areas depending on the season, but will eat grasses, legumes, weeds, fruit, agricultural crops, acorns, leaves, and

woody plant stems. Cedar swamps, shrubby areas, and tall prairie grasses can help provide winter cover. Overpopulation can damage the understory of wood lots, reduce yields in crop fields, and result in higher mortality due to diseases, parasites, and malnourishment. Management to increase deer populations includes creating forest openings, thinning timber stands, burning to reduce invasive shrubs that are not readily eaten, and planting food plots. The most common strategy for reducing deer numbers is through hunting. For natural areas near human dwellings, harvesting can be done with sharpshooters or bow hunters who have demonstrated proficiency. The desired deer population depends on management goals, but 20 to 30 deer per square mile can be supported by much of the local area habitat. Most landowners don't have enough area to support the home range of larger animals like deer that can use several hundred acres or more.
For more information, see:
http://www.michigan.gov/dnr/0,4570,7-153-10363_10856_10905-56904--,00.html

**Resources for Landowners**
Support for wildlife habitat is available from both public and nonprofit entities. The MDNR has several programs such as the Private Lands Program and the Wildlife Habitat Grant Program for government, profit or non-profit groups, and individuals interested in conservation. The US Fish and Wildlife Service has the Partners for Fish & Wildlife program which works with private landowners to improve fish and wildlife habitat on their lands through voluntary, community-based stewardship programs for conservation. See Section 3.2.1.

There are also many nonprofit organizations that are dedicated to providing wildlife habitat including: Audubon, Ducks Unlimited, National Wild Turkey Federation , Pheasants Forever, Ruffed Grouse Society, and the Quality Deer Management Association. Many of these organizations have programs to provide financial and technical assistance for enhancing wildlife. See Section 3.2.2.

### *3.1.8 Forest Resources*
Most rural (and urban) properties have trees that can serve as a source of income, provide food, and offer numerous other benefits (wildlife habitat, aesthetics, erosion control, etc.). Lenawee County is renowned for having the tallest measured tree in Michigan a 155-ft Blue Ash and the seventh tallest 136-ft Burr Oak. These trees are part of a Big Tree Registry maintained by the Michigan Botanical Club (http://michbotclub.org/registry/).

Justifying a commercial harvest usually requires enough trees to be logged at one time to make it worth the timberman's effort. Advice on the feasibility of tree harvest can be obtained from a certified forester (see SE Michigan list in Section 3.2.3). A professional forester will mark trees to be harvested but, equally importantly, identify trees to be retained. The remaining trees may still be growing towards their optimum size or be used as seed trees for the next generation. The key benefit that the forester brings is an understanding of how to maintain the productivity and

health of the forest. In tree farm systems a sustainable yield of timber products can be obtained by harvesting less biomass than what is growing.

Careful harvesting can be used to mimic disturbances (death due to diseases, insects, fire, or windthrow) that happen naturally to forests. These disturbances may create a small opening (for example: a single large tree that is knocked over by wind) or may remove many trees from a big area (large-scale fire). These disturbances facilitate succession and produce the next generation of trees. Forests that have no harvest tend towards shade tolerant species such as sugar maple and beech. Managing light availability can affect which species dominate in an area that has been harvested.

A forest stand is a grouping of woody plants dominated by trees that can vary widely in age and structure and can be on widely varying sites (upland-wetland complexes for example). Even-aged stands are those with trees of similar age while uneven-aged stands can have a wide distribution of tree ages. A single or group selection cut is the removal of one or a few neighboring trees that will favor an uneven-aged stand. A shelterwood cut is done in several phases with one that sets the stage for the establishment of a seed bed for a new age class and a later removal cut that releases the already established small trees. Clear cutting removes all trees in an area with site reforestation by natural regeneration or by planting seeds or seedlings to create an even-aged stand. Some species (shade intolerant species in this case) such as aspen, benefit from a clear cut because they regenerate by root sprouting and require full sunlight to encourage growth. Clear cuts can vary in size with small ones being called patch cuts and can be a variety of shapes such as a strip cut.

There is a range of tree-harvesting equipment with the simplest tools being a chainsaw and a tractor. Commercial loggers may use skidders which gather and lift one end of several logs but drag the other end on the ground. Tree companies that harvest large volumes of timber may use a harvester (machine that cuts the tree off at the stump and then trims the log and cuts it into desired lengths) and a forwarder (equipment that carries logs rather than dragging them). Other equipment that might be employed includes a tree shear (has jaws that can cut trees up to 15 inches in diameter or so) and a feller-buncher (cuts trees off with a chainsaw, saw disk, or shears and then stacks for pickup). Any of these machines can cause damage to soil (compaction, rutting, or erosion) so it is preferable to harvest when soils are dry or frozen. Care should also be taken to avoid introduction of weed seed from other work sites.

The value of a timber harvest depends on multiple factors including the species logged, the end use of the log (veneer material, saw timber, pulpwood, pallet wood, etc.) and distance to the mill or processor. According to Patrick Duffy, Forest Manager at W.K. Kellogg Experimental Forest near Augusta MI, white oak and walnut currently sell well with black cherry intermediate and red oak and sugar maple on the low end (however stumpage price for sugar maple veneer can be strong). For conifers, red pine is valuable for utility pole production, and while white pine can be valuable, it is not currently in high demand. The value of timber

products increases in the process from stumpage (standing timber) through saw logs, milled lumber, and retail distribution of boards or value added operations such as furniture making.

In addition to logs and biomass, forests can yield a variety of other products, many of which can be commercial enterprises. Michigan has many sugar maples that can be tapped to obtain sap which is boiled down to make maple syrup (about 40-50 gallons of sap for one gallon of syrup). Edible products such as nuts, berries, and mushrooms can be harvested for family use or for sale. http://www.edibleforestgardens.com/

**Urban Forestry**
Trees provide many benefits in any location, but urban trees have additional functions. Deciduous trees planted in locations that shade buildings during warm months and coniferous trees that block winter winds can significantly reduce heating and cooling costs. Urban trees contribute to community health and wellness by improving air, soil, and water quality and by providing aesthetical green space. A Midwest Community Tree Guide PDF is available on the MI DNR's website: http://www.michigan.gov/dnr/0,4570,7-153-30301_40936---,00.html

**Permaculture**
Permaculture is agriculture with trees in which the production system is designed to be self-sustaining and regenerative. Permaculture was developed in Australia by Bill Mollison and David Holmgren in 1968, but has gained international acceptance. Design elements include layers (canopy to soil layer) and zones that typically concentrate labor intensive activities close to the dwelling with grazing, forestry, and other less active land uses farther out. Mollison said: "Permaculture is a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless labor; and of looking at plants and animals in all their functions, rather than treating any area as a single product system." A great resource for finding Permaculture information is the Great Lakes Permaculture Network: http://www.greatlakespermaculture.org/?page_id=47

**Agroforestry**
The Center for Agroforestry at the University of Missouri has published a manual that provides information on the combination of agriculture and forestry. This involves practices such as silvopasture (trees in grazing areas), alley cropping (having herbaceous plants between rows of trees), windbreaks, and forested riparian buffers.

Training Manual for Applied Agroforestry Practices. 2015. Edited by Michael Gold, Mihaela Cernusca & Michelle Hall. http://www.centerforagroforestry.org/pubs/training/index.php

**Resources for Land Owners**
There are many resources available to assist land owners with the creation of forest stewardship plans (that usually include harvesting of some trees), and managing the forest for productivity and health. The US Forest Service has a "Managing the Land" section on their website

(http://www.fs.fed.us/managing-land) that covers natural resources on public and private land. The Michigan Department of Natural Resources Forestry Division has a wealth of information on their website and they maintain a list of professional foresters (see Section 3.2.3).

Another good source of forest information is the Michigan State University (MSU) Extension Service. Their website has links to the Natural Resource Enterprises Program designed for landowners and community leaders to encourage informed decision-making regarding the management of land and enterprises. Extension programs are aided by studies done at the W.K. Kellogg Experimental Forest in Kalamazoo County. The facility conducts research on tree breeding and genetics, planting techniques, and plantation establishment and management. Information about new plant materials and forest practices developed at Kellogg Forest are used by Michigan State University Extension and other professionals to improve forest management http://msue.anr.msu.edu/program/info/natural_resource_enterprises

### *3.1.9 Forest Health and Invasive Species*

One of the prime threats to healthy landscapes, including forests are invasive species. The Jackson-Hillsdale-Lenawee area is plagued by the Emerald Ash Borer, Autumn Olive, Glossy and Common Buckthorn, Common Reed Grass, garlic mustard, Japanese Honeysuckle, Japanese Knotweed, Multiflora Rose, Purple Loosestrife and Reed Canary Grass, among others.

The health of individual trees can be assessed by looking at their structure and appearance. Having a canopy that branches over at least one third of the height of the tree is helpful to obtain the light required for photosynthesis. Emergents are trees that are above others in the canopy, dominants get light from above and some from the sides, codominants get light from above and but not from the sides and suppressed or overtopped trees have crowns below the canopy which reduces light and tree vigor. Trees that have small or low canopies are more likely to lose the competition for light and die before reaching optimum size (this applies less to trees and shrubs that are adapted to low light conditions).

The insect with the greatest impact on Michigan forests in recent years has been the emerald ash borer. Many of the larger ash trees in the Lower Peninsula have been infected and the area is under a quarantine which prevents the movement of regulated materials (any timber product except wood chips smaller than one inch in two dimensions) outside of the quarantined area. One of the most important practices is to NOT transport firewood more than about 10 miles from its original location to help prevent another disaster like Emerald Ash Borer. The borer tends not to attack small diameter trees and ash is still being established from seed, so if the borer population can be controlled, there may be more ash trees in Michigan forests in the future. For more EAB information: http://www.michigan.gov/mdard/0,4610,7-125-2390_18298---,00.html

Other insects that are on the watch list for Michigan include the Asian longhorned beetle, gypsy moth, hemlock wooly adelgid (detected in Muskegon and Ottawa Counties), and spruce budworm. Although it is not in the local area yet, the Asian longhorned beetle is a major threat

because it is a generalist and attacks maples, oaks and many other species of trees. Given the level of commerce and travel by people in and out of Michigan, landowners should monitor their woods to see if any obvious signs of forest pests are present and contact a forester or other natural resource professional for advice with dealing with such problems.

A number of diseases are potential problems in Michigan with oak wilt receiving the most attention at present. Oak wilt is a lethal disease of oak especially members of the red oak family (red, scarlet, black, and pin) caused by a vascular wilt fungus *(Ceratocystis fagacearum).* Members of the white oak family are generally not as susceptible (white oaks have leaves with rounded lobes but red oaks have pointed leaf tips). The disease can be transmitted by insects or through root grafts, and it kills the host plant rather quickly (in a matter of months). The keys to control are to avoid pruning or harvesting during warm months (April to Oct. 15) and to remove infected trees quickly to avoid spread of the fungus. Cut trees can be debarked or chipped and processed as saw logs or biomass. If used for firewood, it should be covered under a clear plastic tarp sealed by soil or rocks to avoid transmission of spores by insects. Other techniques such as trenching to prevent spread by root grafts or injection of fungicide can be used to protect neighboring trees but these practices are relatively expensive and more appropriate for residential areas.

Additional diseases that may impact Michigan trees include sudden oak death, thousand cankers (attacks walnut trees), *Heterobasidion* root disease (a fungal pathogen that has been found in Barry County), white pine blister rust, and beech bark disease, a disease that has begun to infest the Lower Peninsula but has not reached Jackson, Hillsdale or Lenawee Counties, yet. The MDNR publishes a Forest Health Highlights Report annually that contains information on pests and diseases (the 2015 report is available on their website). DNR Link: http://www.michigan.gov/dnr/0,4570,7-153-30301_30830---,00.html

Timber stand improvement involves pruning and removal of trees that are of lower quality or in the wrong place. Pruning (which should be done in the dormant season) can be used to remove low limbs to produce a higher quality saw log. There are many common mistakes made in pruning, so the landowner should study the subject or hire a professional to do the work. A forester can be hired to mark the trees to be thinned or weeded (just like in a vegetable garden, one can select preferred plants). These operations can contribute to forest health by increasing growth of remaining trees and helping them to resist insects and diseases. There are several ways to deal with the material removed including pulp sale, fire wood harvest, or creating brush piles for wildlife. There are also machines that can grind up woody debris and use it to mulch the soil surface (resulting in faster decomposition of branches).

Tree Owner's Manual: http://na.fs.fed.us/urban/treeownersmanual/

**Invasive Plant Species**

A non-native invasive species is one whose introduction causes harm to the economy, environment, or human health. Many non-native species in Michigan, including fruits, vegetables, field crops, livestock, and domestic animals, are important to our economy and

most are not harmful. Compared to natives, invasive non-native plants typically have less herbivory (consumption by animals) and fewer disease organisms affecting them in their new environment. Invasive species cause harm when they out-compete native species by reproducing and spreading rapidly, thus reducing the health of natural and managed communities.

Typical steps in planning and implementing an invasive species control program are:

- Map known populations
- Determine whether it occurs in high-quality habitat or on important recreational lands
- Prioritize high-value sites for treatment
- Choose appropriate control methods, given site conditions and available resources
- If using herbicide, be sure to read the product label before application
- Obtain permits (if required for method used, i.e., herbicide application in wetlands)
- Eradicate smaller satellite populations focusing on seed-producing plants first
- Treat larger infestations on sites with lower value later
- Monitor to ensure desired results are being achieved

Woody invasive shrubs such as autumn olive, bush honeysuckles, and buckthorns are a particularly important problem to address because they completely alter the forest community and, in many cases, prevent the growth of native species. The following paragraph covers autumn olive, but information for other woody invasive shrubs is similar.

**Autumn Olive**

Autumn olive can reach heights of 20 feet with multiple stems supporting leaves that are olive colored on the bottom (making it fairly easy to identify). The shrub leafs out in March and can retain leaves until November making it difficult for other plants to survive in its shade. It is a nitrogen fixer and the altered nutrient levels can change the plant and microbial communities. While it grows faster in full sun, it is moderately shade tolerant and will invade forests. It produces thousands of seeds that are transported by birds and mammals. Control can be achieved by several methods, some of which can be used in combination. Because its stump sprouts after fire or cutting, it is usually treated with herbicide (triclopyr appears to be an effective chemical). The herbicide can be sprayed on a cut stump (avoid spring when sap is rising), applied to foliage (normally done in late fall when other plants are dormant), or as a basal bark treatment (apply to lower 18 inches of trunk except when sap is rising). Fire will set the plant back, but will not usually kill the autumn olive shrub which will then stump sprout.

**Vine Management**

Fast-growing vines (oriental bittersweet, English ivy, Japanese honeysuckle, and grape) should be removed (if possible) because they can cause structural damage due to the added weight of these vines which can break branches or topple the tree. The vines also shade the tree's leaves and the competition can reduce tree growth. A few vines grow thick enough to "strangle" the tree. Some vines that start as a groundcover (such as ivy), form a dense mat of leaves on the

tree's base which traps moisture against the trunk and can result in fungal and bacterial diseases. Poison ivy and Virginia creeper may be controlled where appropriate, but they usually don't damage trees and they do serve as a food source for wildlife.
https://midwesternplants.org/2015/02/25/vines-growing-on-trees-good-or-bad/

**Garlic Mustard**
Garlic mustard is a biennial, herbaceous plant that has the ability to dominate the forest floor, limit the growth of other species, and prevent reproduction of native species. It spends its first year as a rosette and then sends up a flowering stalk in the second year that produces a prolific number of tiny seeds. The seed is transported by birds, rodents, deer and humans and can remain viable for 10 years. Garlic mustard releases allelopathic compounds that harm other plants by interfering with mycorrhizal relationships (an interaction between fungi and plant roots that provides nutrients to the plant). Control can be achieved by pulling (preferably before flowering), herbicide application (early season application can be done before other plants emerge) and by limiting disturbance and maintaining a high level of canopy. Treatment has to be performed over multiple years to reduce the negative impacts of the invasive. As with any invasive species, monitoring of the land to determine infestations early in their development is beneficial and treatment of satellite populations first and then working towards more weed populated areas is more efficient.
Garlic Mustard:
http://www.ipm.msu.edu/invasive_species/garlic_mustard/about_garlic_mustard

**Aquatic Invasive Species**
There are many problem plants that thrive in water and property owners on lakes and streams should be aware of some of the more common ones such as purple loosestrife, non-native phragmites, and Eurasian milfoil. Plant growth is accelerated by excess nutrients from runoff, failed septics, and other sources. Some of the animals that can cause problems are Asian carp (silver, bighead and grass), Northern snakehead, red swamp crayfish, and New Zealand mudsnail. To avoid the spread of these invasive species, boats and tackle should be decontaminated before changing locations.

The Midwest Invasive Species Information Network (MISIN) is a regional effort to develop and provide an early detection and rapid response resource for invasive species. The goal of this regional resource is to assist in the detection and identification of invasive species in support of the successful management of invasive species. This effort is being led by researchers with the Michigan State University Department of Entomology Laboratory for Applied Spatial Ecology and Technical Services in conjunction with a growing consortium of Supporting Partners.
To report an invasive species sighting, visit www.michiganinvasives.org.

See Section 3.2.1 for listings of agencies that address invasive species.

### *3.1.10 Fire Management*

Many plant communities (prairies, oak savannas, fens, oak-hickory forests, etc.) in southwest Michigan are fire dependent. Many plants coevolved with fire but some (such as maples and beech) are sensitive to burning. Fire was used by Native American tribes for a variety of purposes, but one effect was to reduce the number of woody plants in cultivated lands and around settlements.

Landowners who want to manage fire dependent communities may need to burn or to introduce that disturbance with other practices such as mowing or chemical control of non-target species. One of the problems that most landowners experience is the growth of invasive plants such as autumn olive, bush honeysuckle, and other woody shrubs. Fire can top kill these shrubs, but they will resprout from the stumps. Because of the low amount of fuel, areas invaded with bush honeysuckle don't carry fire well. Many land managers use fire as a complement to mechanical (pulling or cutting) or chemical methods to control the invasive species.

Michigan Natural Features Inventory has documented the benefits of prescribed fire as the single most significant factor in preserving fire-dependent communities such as oak barrens, dry sand prairie, and prairie fen. Many current dry-mesic southern forests are degraded oak openings that have been long deprived of fire. The use of prescribed fire is a management tool for promoting oak regeneration, deterring the succession of shade-tolerant species, and reducing the encroachment by invasive shrubs such as honeysuckles and autumn olive. Open canopy conditions can be restored by mechanical thinning or girdling. Restored sites will need to be maintained by periodic prescribed fire, control of woody invasive species, and may require native plant seeding.

Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural Communities of Michigan: Classification and Description. Michigan Natural Features Inventory, Report No. 2007-21, Lansing, MI

Periodic fire causes the tree canopy of an oak savanna to remain open, with wide spaces between the branches. The two principal fuels of an oak savanna fire are grasses and oak leaves. Oaks produce leaves that contain flammable chemicals and the leaves curl, so that fire moves more easily through the area. http://oaksavannas.org/index.html

Burns for land clearing and related activities require a burn permit issued by the local DNR Fire Manager. Under DEQ air quality rules, the burning of logs, stumps, trees, and brush is not allowed within 1,400 feet of a city or village. Local regulations vary so check before lighting your fire.
(http://www.michigan.gov/dnr/0,4570,7-153-30301_30816_44539---,00.html)

### *3.1.11 Archaeological, Cultural and Historic Sites*

Before contact with Europeans, much of the River Raisin watershed was inhabited by the Kickapoo Indians who lived in northwest Ohio and southern Michigan, occupying most of the area between Lake Erie and Lake Michigan. The other watersheds were mostly occupied by the Potawattamie, but attributing tribal land occupation was much more fluid than European standards for land ownership. Seeking new hunting territory for fur to trade with the French, Tionontati, Ottawa, and Neutrals warriors attacked the Kickapoo and their neighbors the Fox and Sauk to the north. A full-scale invasion by the Iroquois followed during the 1650s, which forced the Kickapoo to abandon their lands and retreat west around the south end of Lake Michigan to the Mississippi River in southwestern Wisconsin.

There were other tribes in this region who vanished long ago taking their history with them. Today, there are eleven federally recognized Indian tribes in Michigan, none of which have a reservation within the River Raisin watershed. Lack of recognition and legislation to protect archeological sites in Michigan has forced some American Indians to keep references to their ancestral sites off any maps. Without protection, the chances that recovered artifacts fall under the control of someone other than an American Indian, rises considerably. It is unfortunate that more of the Raisin's rich and living American Indian heritage cannot be shared as a collective resource.

**Archaeological Resource Protection**

Proper management of archaeological sites is guided by one overriding principle: avoid disturbing the soil. This includes grading of the site, pulling stumps and other activities requiring excavation of soil. Activities that will involve only the surface of the site, such as lawn seeding or trail coverings and erosion control measures are generally acceptable. The exact location of artifacts in the ground and their spatial relationships to other artifacts and soil composition are clues that archaeologists can translate into a more complete picture of the past. Michigan's State Archaeologist is on the staff of the State Historic Preservation Office within the Michigan State Housing Development Authority.

http://www.michigan.gov/mshda/0,4641,7-141-54317_19320_54320-273279--,00.html

### *3.1.12 Tourism and Recreation*

Michigan has forests, lakes, parks, local foods, craft breweries, and other resources that are attractive to visitors and the state encourages tourism with its Pure Michigan campaign. The economic impact of all forms of recreation in Michigan was estimated to total $18.7 billion and it accounted for 194,000 jobs in the state (according to the Outdoor Industry Foundation). There are many locally managed (county, township, city, town, etc.) parks in the Lenawee, Jackson, and Hillsdale area.

**<u>Jackson County</u>**

**Meridian-Baseline State Park**
This unique park designates the spot where all township, range, and section measurements begin for the entire state of Michigan. It is being preserved for its historic value. It is approximately a 1.5 mile round trip hike to view the monuments.

**Grass Lake State Game Area**
This 125-acre property is in Grass Lake, Jackson County, Michigan. This area has been dedicated for wildlife conservation and management by the MDNR Wildlife Division.

**Malan Waterfowl Production Area**
This is a 142-acre parcel that is cooperating Federal Land in Jackson County. This WPA is cooperatively managed for wildlife by the MDNR Wildlife Division and USFWS Midwest Office.

**Schlee Waterfowl Production Area**
This is a 160-acre parcel that is cooperating Federal Land in Jackson County. This WPA is cooperatively managed for wildlife by the MDNR Wildlife Division and USFWS Midwest Office.

**Sharonville State Game Area**
This is a 4,337-acre area in Jackson and Washtenaw Counties and includes a Designated Field Trial Area which has specific rules and regulations about dog training and public land use. This area has been dedicated for wildlife conservation and management by the MDNR Wildlife Division.

**Waterloo Wildlife Unit of Waterloo State Recreation Area** in Jackson and Washtenaw Counties is approximately 5,776 acres (just the wildlife unit). This area is co-managed for wildlife by the MDNR Wildlife and Parks-and-Recreation Divisions.

## Hillsdale County

**Lost Nation State Game Area** in Hillsdale County
This 2,478-acre area has been dedicated for wildlife conservation and management by the MDNR Wildlife Division.

**Somerset State Game Area** in Hillsdale County
This 769-acre area has been dedicated for wildlife conservation and management by the MDNR Wildlife Division.

## Lenawee County

**Walter J. Hayes State Park** is a 654-acre State park located along US Highway 12 in the Irish Hills region of Lenawee County and extending into small parts

of Jackson and Washtenaw counties in the Round Lake area. The park is surrounded by scenic lakes, namely Wamplers, Evans, and Sand lakes, as well as chains of smaller lakes. It is near Cambridge Junction Historic State Park. First dedicated in the 1920s, Hayes is one of the oldest state parks in Michigan and was originally named "Cedar Hill State Park." It was renamed in honor of Walter J. Hayes, a former Michigan State Senator, after his family donated land to the state for the park.

**Cambridge Junction Historic State Park**

The Cambridge Junction Historic State Park is a State park in Cambridge Township, Michigan- not far from Hayes State Park. The park is the site of the Walker Tavern, a major stopping place for stagecoaches traveling between Detroit and Chicago in the early nineteenth century. The visitor center and restored tavern with period furniture tell the story of taverns and stagecoach travel for early Michigan residents. The Barn Exhibit has displays about barns, roads, and travelers at Walker Tavern in the nineteenth century. The site is operated in cooperation with the Department of History, Arts, and Libraries which is responsible for staffing the site with interpreters. The tavern is part of the Michigan Historical Museum System, and is open May through October.

**Lake Hudson Recreation Area**

Lake Hudson Recreation Area has 2,796 acres of recreational opportunities around Lake Hudson in Onsted, Michigan. The park, which lies in southeast Michigan, offers premier muskie fishing and game hunting. The terrain is gently rolling with a mixture of open brush land to mature hardwood forest, with some pockets of open meadows mixed in. An open beach area provides users a place for sunbathing and swimming. Since 1993, Lake Hudson has been designated a dark sky preserve for observation of the nighttime sky.

**Hidden Lake Gardens**

Hidden Lake Gardens is owned and operated by Michigan State University under the division of Land Management, but supported through admission fees, endowments, gifts, and the "Friends of Hidden Lake Gardens" membership program. Hidden Lake Gardens began as a simple testament to the education and enjoyment of the public. The Gardens are a place to connect with the world of nature. The bonsai courtyard displays miniature trees as works of art. Rare and exotic plants boldly thrive in the arid, tropical, and temperate conservatory settings. Annuals and perennials offer bright blooms in the sun and soothing foliage in shade. Trees and shrubs across acres and acres of rolling terrain demonstrate their natural and ornamental attributes.

**Schoonover Waterfowl Production Area**

This 95-acre property is a cooperating Federal Land in Grass Lake in Lenawee County. This WPA is cooperatively managed for wildlife by the MDNR Wildlife Division and USFWS Midwest Office.

## 3.2 Local Resource Providers and Existing Stewardship Plans

### *3.2.1 Government Agencies and Land Managers*

**Michigan Department of Natural Resources**

The Michigan Department of Natural Resources has a number of programs to support forestry on private lands in addition to their management of state forests (none of which are in Lenawee, Jackson or Hillsdale Counties). The MDNR Forestry Division provides a number of useful resources to private landowners including information on growing and harvesting trees, forest health, fire management, and urban and community forestry. The MDNR Forest Stewardship office offers several programs that help fund Forest Steward plans (see Section 5.1-5.3).

Helping Private Forest Landowners Develop Plans for Sustainable Forest Management: A Landowner's Guide. www.michigan.gov/foreststewardship

Plan Writers:www.michigan.gov/dnr/0,4570,7-153-30301_34240_68762---,00.html

Michigan Landowner Forest Stewardship Plan (Sample)
www.michigan.gov/.../FSP_Plan_Example_September2014_468852_7.pdf

Michigan's four-million acres of state-managed forest land provide critical habitat for wildlife, valuable resources for a thriving timber products industry, and beautiful outdoor spaces for a variety of outdoor recreation activities. To encourage this $14 billion/ year industry, the Forest Division has completed several planning activities. Forest Management:
Michigan.gov/forestmanagement

The State Forest Management Plan written in 2008 provides strategic direction with goals and objectives for management of Michigan's state forests. The plan was amended in 2014 with a 10-year time framework. http://www.michigan.gov/dnr/0,4570,7-153-30301_30505---,00.html

Michigan's 2010-2020 Forest Action Plan provides a statewide assessment of forest conditions and trends for all Michigan forest land. The plan focuses on private landowner assistance through cooperative programs for forest stewardship, urban and community forestry, forest health, wildfire management and forest legacy.

The Forest Resources Division also developed a five-year strategic plan to guide decisions and actions governing the health of Michigan's state forest resources. The goals and objectives of the plan lay the groundwork for meeting the division's mission and complement the MDNR's overall strategic direction. The first goal of the Forest Resources Division's Strategic Plan is: Sustainably and proactively manage and protect forest resources.
www.michigan.gov/dnr/0,4570,7-153-30301_30505_62551---,00.html

Michigan's Forest Legacy Program is a partnership with USDA Forest Service with a goal of protecting privately owned and environmentally significant forest lands from being converted to non-forest uses. This voluntary program acquires land through purchase of fee simple title or by conservation easements, legally binding agreements that transfer a negotiated set of property rights without removing the property from private ownership. Conservation easements purchased using FLP funds restrict development, require sustainable forestry practices, and protect a variety of other values. Michigan's FLP encourages partnerships with local governments and land trusts, recognizing the important contributions landowners, communities and private organizations make to conservation efforts. The program requires public access for fee lands but not for conservation easements.

The DNR state forest resources has been recognized by the Forest Stewardship Council® (FSC®) and the Sustainable Forestry Initiative® (SFI®). Independent auditors have reviewed the DNR's on-the-ground forest practices against biological, social and economic requirements in the FSC and SFI standards and certified those practices as sound and comprehensive.

**Michigan DNR Wildlife Action Plan**

The goal of Michigan's Wildlife Action Plan is to provide a common strategic framework that will enable Michigan's conservation partners to jointly implement a long-term holistic approach for the conservation of all wildlife species. The Michigan DNR is in the process of revising its Wildlife Action Plan that addresses Species of Greatest Conservation Need and the habitats that support them. The document addresses aquatic and terrestrial landscape features within the Great Lake basin and ecoregion. The Wildlife Action Plan draft summaries for each landscape feature provide sets of priority species, significant threats to the landscape features and associated wildlife, and conservation actions needed to address the identified threats. An example landscape is fen which supports Mitchell's satyr butterfly, massasauga rattlesnake, tamarack tree cricket, and other rare species.

Wildlife Action Plans (several landscape feature summaries are posted)
http://www.michigan.gov/dnr/0,1607,7-153-10370_30909---,00.html

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**DNR Fish and Wildlife Habitat Programs**
Most stewardship plans address wildlife habitat and there are many practices that can be used to create or improve support for animals. Support for wildlife habitat is available from both public and nonprofit entities. The MDNR has several programs such as the Private Lands Program and the Wildlife Habitat Grant Program for government, profit or non-profit groups, and individuals interested in conservation. The US Fish and Wildlife Service has the Partners for Fish & Wildlife program which works with private landowners to improve fish and wildlife habitat on their lands through voluntary, community-based stewardship programs for conservation. There are also several nonprofit organizations dedicated to providing wildlife habitat including: Audubon, Ducks Unlimited, National Wild Turkey Federation, Pheasants Forever, Ruffed Grouse Society, and the Quality Deer Management Association. Many of these organizations have programs to provide financial and technical assistance for enhancing wildlife.

**MDNR Private Lands Program (PLP)**
The primary goal of the Private Lands Program (PLP) is to provide private landowners with the resources to create and manage habitat to benefit a variety of wildlife. The PLP provides technical and financial assistance to eligible landowners for habitat improvements that address wildlife needs. In the Southwest region, the Private Lands Program focuses on providing technical and limited financial assistance to landowners interested in management and restoration of wildlife habitat. Currently financial assistance is available only for projects involving grasslands, oak savannahs and oak barrens. Financial assistance may be available for restoring native prairie; restoration of oak savannah or oak barrens sites; practices such as prescribed fire, disking or inter-seeding; and invasive species control in and immediately around grassland, savannah or barrens sites.

To qualify for technical assistance, projects must generally be larger than 20 acres or be adjacent to sites of high ecological value (i.e. fens, savannahs, Threatened & Endangered occupied) or grasslands that are in close proximity to other grassed cover type areas. Additional technical assistance may be available for landowners interested in improving habitat for deer and/or turkeys. For landowners interested in improving your land for wildlife, and who meet the above criteria, contact the Private Lands Biologist (see below) to discuss your property and wildlife goals and determine what assistance is available.

http://www.michigan.gov/dnr/0,4570,7-153-10370_12148---,00.html

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The Wildlife Habitat Grant Program purpose is to provide funding to local, state, federal and tribal units of government, profit or non-profit groups, and individuals to assist the Wildlife

Division with developing or improving wildlife habitat for game species. The WHGP is administered by the Michigan DNR through a cooperative effort between Wildlife Division and Grants Management.

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Wildlife Habitat Grant Program Manager
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A useful publication for management of deer as well as many other game and non-game species is provided by the DNR Landowner's Guide. This 1999 publication also offers instructions on land management planning for forests, grasslands, wetlands, cropland, and backyard habitats.
http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/

**Michigan Department of Environmental Quality**
The Michigan Department of Environmental Quality (MDEQ) regulates air, land, water, and waste generation activities in the state. Under the land category, earth change activities on areas greater than one acre or located within 500 feet of a lake or stream require a Soil Erosion and Construction Storm Water permit. The MDEQ endeavors to protect water from both point and nonpoint pollution sources by partnering with watershed groups and others. They issue National Pollutant Discharge Elimination System (NPDES) and storm water discharge permits. Large scale water withdrawals are limited by law and the Water Withdrawal Assessment Tool is designed to predict the effect of groundwater use. Other programs cover regulation of wetlands, handling of septage, and use of flood plains.

MDEQ's Water Resources Division administers MiWaters, a web-based database that provides a streamlined electronic permitting process to fulfill federal electronic reporting requirements and gives online access to public information. The focus of MiWaters is permitting and compliance, including National Pollutant Discharge Elimination System (NPDES), storm water, groundwater discharge, aquatic nuisance control, Part 41 construction, and land and water interface.
Permit Coordination is available through the Environmental Assistance Hotline at 800-662-9278.

**Michigan's Water Strategy**
Michigan's Water Strategy is a 30-year plan for Michiganders to protect, manage, and enhance Michigan's water resources for current and future generations. The Strategy identifies key

actions for actors at many levels to promote healthy water resources. It is organized around nine goals and outcomes designed to ensure the viability and sustainability of Michigan's water resources over time, placing Michigan on a path to achieving its water vision in a way that builds economic capacity while sustaining ecological integrity of this globally-significant resource.

**Michigan Natural Shoreline Partnership**

The Department of Environmental Quality's Inland Lakes and Streams program has been participating in the Michigan Natural Shoreline Partnership (MNSP) to promote natural shoreline landscaping to protect Michigan's Inland Lakes. Their mission is "Promoting Natural Shorelines through the use of green landscaping technologies and bioengineered erosion control for the protection of Michigan inland lakes." One of the goals of the Michigan Natural Shoreline Partnership is to educate property owners about natural shorelines and technologies that benefit lake ecosystems. It provides support for practices that restore or preserve the ecological function of the shoreline and stabilize shorelines by reducing erosion. They offer educational resources and the website lists contractors who are certified by the program (see Section 3.2.3)

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http://www.mishorelinepartnership.org/

See List of Natural Shoreline Contractors in Section 3.2.3

**Low Impact Development**

SEMCOG, the Southeast Michigan Council of Governments, completed a Low Impact Development Manual for Michigan: A Design Guide for Implementers and Reviewers manual (PDF, 21.27 MB) in 2008. It provides communities, agencies, builders, developers, and the public with guidance on how to apply LID to new, existing, and redevelopment sites. It contains technical details of best management practices and provides a broader scope for managing stormwater through policy decision, including ordinances, master plans, and watershed plans. The level of application of LID practices will vary depending on individual's goals and needs. http://www.swmpc.org/mi_lid_manual.asp

**Michigan Natural Features Inventory**

The Michigan Natural Features Inventory (MNFI) program, administered by Michigan State University Extension, conducts field surveys to locate and identify threatened and endangered species and communities throughout the state, created and maintains a database of all relevant

species and community locations, provides data summaries and analysis in support of environmental reviews, and provides biological expertise to individuals, agencies, and other interested parties.

**US Fish and Wildlife Service**
The Partners for Fish & Wildlife program works with private landowners to improve fish and wildlife habitat on their lands through voluntary, community-based stewardship programs for conservation. More than 90% of land in the Midwest is in private ownership. To accomplish this work, the FWS teams up with private conservation organizations, state and federal agencies, and tribes to share funding, materials, equipment, labor and expertise to meet the landowner's restoration goals.

In the Midwest Fish and Wildlife Service restoration projects generally occur in three habitat types: wetlands, prairies, and streams. Wetlands provide critical nesting, feeding, resting and migration habitat for waterfowl and many other animals. Wetland projects usually involve restoring wetlands that have been drained, which requires heavy equipment to move dirt. Typical wetland restorations involve plugging drainage ditches, removing drainage tiles or building berms to impound degraded wetlands. Most native prairies have been converted to agricultural uses or development. Prairie restoration requires reseeding native grasses and wild flowers. Once grassland habitats are established, periodic mowing, burning or grazing is used to control invasive species and woody plants and to assist the growth of native prairie plants, which evolved with wildfire.

Stream restoration is available for landowners who are interested in protecting their small streams and river banks. These projects often involve reshaping stream banks and fencing to protect banks from erosion. Fish habitat is enhanced by strategically placing rocks and large woody debris to scour pools favored by fish. Fish passage is improved by removing barriers such as dams and non-functioning culverts.

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**US Fish and Wildlife Landscape Conservation Cooperatives (LCCs)**
Landscape Conservation Cooperatives (LCCs) address large scale natural resource challenges that transcend political and jurisdictional boundaries and require a networked approach to conservation—holistic, collaborative, and grounded in science – to ensure the sustainability of

America's land, water, wildlife and cultural resources. The geographic area of the Upper Midwest and Great Lakes LCC transcends state and the international borders and includes portions of Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, New York and Vermont, as well as parts of Manitoba, Ontario and Quebec. The Great Lakes are among the worlds largest and the Great Lakes Fishery Commission has estimated the value of Great Lakes fisheries at $7 billion annually.

Michigan is in the Upper Midwest and Great Lakes Landscape Conservation Cooperative. The area is home to a diverse range of fish, wildlife plants and habitats including the Great Lakes, coastal wetlands, boreal forests, major river systems and prairie-hardwood ecosystems. Physical and social stressors like climate change, energy development, water demands, invasive species and population growth are all threatening the ecological integrity of the upper Midwest and Great Lakes landscape. The Upper Midwest and Great Lakes LCC is a partnership of more than 30 natural resources agencies and organizations working on a collaborative approach to solve environmental problems.
GreatLakesLCC.org

Bradly Potter, Acting Coordinator
U.S. Fish and Wildlife Service
Bradly_Potter@fws.gov
2651 Coolidge Rd
East Lansing, MI 48823

**The Northern Institute of Applied Climate Science**
The Northern Institute of Applied Climate Science develops synthesis products, fosters communication, and pursues science in the following focus areas:

- Climate change: Changes in the earth's climate are having substantial effects on forest ecosystems and may reduce the ability of forests to provide important environmental benefits.
- Carbon science and management: Forests store carbon in all components and levels, from soils to shrubs to tall trees. Forests play an important role in the global carbon cycle, and forest management activities can affect the amount of carbon that is stored in forest ecosystems.
- Bioenergy: Bioenergy creates electricity, heat, and fuel from renewable energy sources, including woody materials from forests.

http://www.nrs.fs.fed.us/niacs/

To report an invasive species sighting, visit www.michiganinvasives.org

**Jackson County Conservation District (JCCD)**
Established in 1948, the District is a locally controlled agency of State government operating under Soil Conservation District Law 297—P.A. 1937 as amended. JCCD is one of 79 county Conservation Districts throughout Michigan (There are 83 counties in Michigan, but a few counties have combined Conservation District offices). Michigan's Conservation Districts are unique local units of State government that utilize state, federal and private sector resources to solve today's conservation problems. They work in partnership with others organizations to establish local conservation priorities, develop and distribute educational materials, and provide technical assistance. The mission of the Conservation District reads: The District is a locally elected nonpartisan entity of state government, whose purpose is to promote wise land use decisions, based upon the capability of the natural resources of Jackson County, through technical assistance and education. The District is NOT a regulatory agency. They provide education and technical assistance to residents of Jackson

Contact: Lori Fitzgibbons, *District Manager*
211 West Ganson, Suite 200
Jackson Michigan 49201
517-784-2800 x5
lori.fitzgibbons@mi.nacdnet.net
http://www.jacksoncd.org/

**Hillsdale Conservation District**
The Conservation District is the local provider of natural resource management services that help our citizens conserve their lands and our environment for a cleaner, healthier, economically stronger Michigan. They assist in natural resource management for improved water quality, reduced soil erosion, farmland preservation, wetland preservation, wildlife habitat, clean air, energy conservation, and land beautification.

Contact: Alyssa Blonde, District Manager
Hillsdale Conservation District
588 Olds Street (Industrial Pkwy.) Bldg. #2
Jonesville, MI 49250
Office Phone: (517) 849-9890 Ext. 3
hillsdalecd@macd.org
http://www.hillsdalecd.org/index.html

**Lenawee Conservation District**
Established in 1946, Lenawee Conservation District is an independent county level resource assisting residents, producers, and communities to help resolve natural resource concerns. The District is self-funded, serving the public with revenue obtained through an

annual tree and shrub fundraiser sale, grants, and County appropriations. Lenawee Conservation District works with a variety of other local, state, and federal agencies and organizations to accomplish greater results in conservation and protection of our local natural resources. As a result of the Dust Bowl in the 1920s from severe erosion due to negatively impacting farm practices, Congress established the Natural Resources Conservation Service, which directed money toward programs that would help protect natural resources and empower landowners to become better stewards of the land. But with no delivery approach for the federal programs, Congress realized that a local level organization was needed to help promote conservation programs available to agricultural landowners. Thus, a Conservation District Law was established, allowing communities to elect their own county conservation district boards, which would partner with the federal agencies and serve as the storefront and information center for available conservation programs and assistance.

Contact: Lindsay Garrison - District Manager
USDA Service Center
1100 Sutton Road, Adrian, MI 49221
Office Phone: (517) 263-7400 Extension 3
http://www.lenaweeconservationdistrict.org/

**Michigan Agriculture Environmental Assurance Program**
Each of the Conservation Districts is participating in the Michigan Agriculture Environmental Assurance Program (MAEAP) which is a voluntarily, proactive program that helps farmers minimize risks from agricultural pollution. This program is designed to reduce farmers' legal and environmental risks through a three-phase process: 1) education; 2) farm-specific risk assessment; and 3) on-farm verification that ensures the farmer has implemented environmentally sound practices. The program's systems are Farmstead, Cropping, Livestock, and the newly developed Forest, Wetlands and Habitats System.
http://www.maeap.org
(269) 781-4867

MAEAP contacts:
Jackson: Jeremiah Swain, 269-781-4867 x5
Hillsdale: Allison Dauer, Jake Bildner, 517-849-9890 x3
Lenawee: Holden Branch, Amy Gilhouse, Nick Machinski, 517-263-7400 x3

**County Planning and Zoning Offices**
This three county area is also the three county area covered by the Region 2 Planning Commission (http://www.region2planning.com/). The Region 2 Planning Commission is a voluntary local governmental association serving Jackson, Hillsdale and Lenawee counties in south-central Michigan. Region 2 serves as a planning, research, and advisory resource to its member units of government. Staff provides a variety of professional planning services which benefit member communities including transportation, economic development and community

planning assistance. Master Plans, Solid Waste Management Plans and Hazard Mitigation Plans for each county can be found at this website.

**USDA Natural Resources Conservation Service and Farm Service Agency**
The United States Department of Agriculture (USDA) administers the Natural Resources Conservation Service (NRCS) and the Farm Service Agency programs in service centers in each of the three counties in the plan area. The Natural Resources Conservation Service has tools and other technical resources to assist in Conservation Planning, Conservation Compliance on highly erodible land, nutrient and pest management and Rapid Watershed Assessment. The agency also conducts the Soil Survey Program, the National Resource Inventory and the Conservation Effects Assessment Project. Some of the key programs (see Section 5.5) are Environmental Quality Incentives, Conservation Reserve, Conservation Stewardship, and Agricultural Conservation Easement Program. The Conservation Reserve Program (CRP) pays a yearly rental in exchange for farmers removing environmentally sensitive land from agricultural production and planting species that will improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. Conservation Stewardship is a program that provides technical and financial assistance to qualified farmers whose applications rank high enough (on the Conservation Measurement Tool) to be accepted into the program. The Agricultural Conservation Easement Program has several components including Agricultural Land Easements and Wetlands Reserve Easements. These both provide financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Some easements are permanent while others are 30 year contracts.

**Michigan State University Extension Service**
Michigan State University's Extension Service offers information on natural resources, agriculture, lawn and gardens and other topics. They also have a Conservation Stewards Program: http://msue.anr.msu.edu/program/info/conservation_stewards_program

1200 N. Telegraph Road #26
E Pontiac, MI 48341
(248) 858-0880
msue.oakland@county.msu.edu
http://www.oakgov.com/msu

**Master Gardener Program**
Michigan State University Extension conducts a Master Gardener Program to train adults in horticulture education and as volunteer leaders. The Master Gardener Helpline is set up to answer questions about gardening (plant identification, disease or pest questions, or basic garden-care).
Call: (269) 384-8056 or
Email: mghelp@anr.msu.edu

### *3.2.2 Nonprofit, Non-governmental Conservation Organizations*

**Stewardship Network**
The Stewardship Network promotes community-based collaborative conservation by supporting clusters in Michigan and other states. The Stewardship Network's mission is "to connect, equip, and mobilize people and organizations to care for lands and waters in their communities." The Stewardship Network empowers people to better care for the land and water in their own backyard and community. They sponsor an annual conference on the Science, Practice & Art of Restoring Native Ecosystems held in January in East Lansing. The Stewardship Network contracted with the Michigan DNR to prepare the Landscape Stewardship Plans for six areas in the Southern Lower Peninsula.

https://www.stewardshipnetwork.org/
416 Longshore Dr.
Ann Arbor, MI 48105
(734) 395-4483
staff@stewardshipnetwork.org

**The Stewardship Network's Grant Raisin Cluster**
The Grand-Raisin Cluster (GRC) was formed in late 2002. Each year since, The GRC has offered public workshops on subjects of interest to those who would explore and interact with native habitats. The GRC has two main areas of focus: 1) on the ground conservation action and planning, and 2) educating community members in conservation issues, techniques and other relevant topics. The GRC provides unique educational opportunities through events, workshops, activities and online networking to share ideas, information, skills and resources to enable local groups to increase their capacity to care for local land and water.

**Raisin Valley Land Trust (RVLT)**
The RVLT is a local, private, non-profit, corporation dedicated to the preservation of natural areas and farmland in the River Raisin watershed. Founded in 1992, the RVLT relies on donations of time, money, conservation easements and property to meet their goals. The mission of the RVLT is to preserve natural areas, historic structures, active farmland, and scenic roads that enhance the rural nature of the River Raisin Watershed; promote public awareness of these natural features; and engage individuals and communities in preserving them. The RVLT is located in Adrian and their website is: http://rvlt.org/wp/

**Mid-Michigan Land Conservancy (MMLC)**
The MMLC is a charitable, non-profit land protection organization. It is operated by a board of directors consisting of local residents, and it has a president, vice-president, secretary, and treasurer. All are volunteers. MMLC works with land-owners and conservation partners to permanently protect natural land and farmland in mid-Michigan. Is qualified to receive tax-

deductible donations of conservation easements on land and gifts of land. MMLC works in Ingham, Eaton, Clinton, Ionia, Shiawassee, Hillsdale and Jackson counties. It is funded by donations from members and others, with occasional funding from grants. Their website is: http://www.midmilandcons.org/

**Legacy Land Conservancy**

Founded in 1971, Legacy Land Conservancy is Michigan's oldest organization dedicated to the voluntary conservation of locally important land. Faced with growing concerns about the potential for development of land along the Huron River, a group of Ann Arbor leaders banded together to acquire land along the river and keep it in public trust. From those humble beginnings, Legacy has helped protect over 8,000 acres of land that provides fresh water, places to play, and working farms, all right here at home.

These founders called their organization the Washtenaw Land Conservancy. Its work produced such community gems as the Osborne Mills Riverlands Preserve, Black Pond Woods, and parts of Bandemer Park and Bird Hills Nature Area. Legacy's history also includes the Potawatomi Land Trust, formed in 1989 to focus on the protection of farmland. Potawatomi protected the land that houses the Community Farm of Ann Arbor, one of the first farms in the nation to experiment with community supported agriculture. The project was made possible by gifts large and small from hundreds of individuals. The personal nature of this giving is a tribute to the importance placed on this unique community asset, and the commitment of our community to voluntary conservation.

In 1999, Washtenaw Land Conservancy and Potawatomi Land Trust merged to form the Washtenaw Land Trust. The collaboration between their similar missions has led to new success. Today, more than 100 individual properties have been conserved—forever.

In 2008, the Land Trust took steps to formally extend its service area to include Jackson County. This action was in response to increased landowner interest, and recognition that Jackson County possesses some of the world's rarest natural areas, worthy of a concentrated land protection effort. The organization changed its name to Legacy Land Conservancy to reflect its expanded service area. Shortly thereafter, Legacy became one of the first accredited land trusts in the nation. This accreditation is a testament to over 45 years of voluntary conservation, supported by our extended community, and adhering to a set of standards designed to help guarantee that our work will endure forever.

In late 2014, Legacy was reaccredited by the Land Trust Accreditation Commission
Legacy Land Conservancy is a 501(c)(3) organization, and a member of the Land Trust Alliance and Heart of the Lakes.

**Audubon**

Michigan Audubon has two bird sanctuaries in Jackson County, but none in Hillsdale or Lenawee County. The two sanctuaries in Jackson County are the Phyllis Haehnle Memorial Sanctuary and the Kate Palmer Wildlife Sanctuary.

Phyllis Haehnle Memorial Sanctuary
9066 Seymour Road, Pleasant Lake, MI
Michigan Audubon's largest bird sanctuary is located in Jackson County bordering the Waterloo Recreation Area. At 1,008 acres, it is known to attract thousands of migrating Sandhill Cranes every fall. However, the diversity of animal and plant life includes over 270 plant species and 200 species of birds. Benches on a hill overlooking Mud Lake Marsh provide an ideal location for viewing large numbers of cranes in October and early November. A restored wetland and grassland demonstration area at the west side of the sanctuary is accessed from Wooster Rd. Public access to the marsh is restricted.

Kate Palmer Wildlife Sanctuary
Lat/Long: 42.234645, -84.490400
Although bisected by a busy country road, this 53-acre sanctuary in Jackson County is home to a mature hardwood forest that nestles Sandstone Creek. Biotic communities include upland and lowland deciduous woods, a grove of large Eastern White Pines, and a marsh with natural springs that flow into Sandstone Creek. This is one of the richest woodlands in Jackson County for spring wildflowers. Two champion trees of Jackson County, American Hornbeam and Shingle Oak, grow here. A host of birds frequent the area. Volunteers recently constructed a boardwalk and woodland hiking trail.

http://www.michiganaudubon.org/our-conservation-impact/bird-sanctuaries/

**Michigan Nature Association**
The Michigan Nature Association (MNA) is dedicated to the conservation of rare, threatened and endangered species, imperiled natural communities and unique geological features throughout the State of Michigan. Established in 1952, MNA is Michigan's oldest land conservancy. Today MNA protects over 170 nature sanctuaries encompassing over 12,500 acres across Michigan.
http://www.michigannature.org/
Andrew Bacon
Stewardship Coordinator
abacon@michigannature.org.

**The Nature Conservancy**
The Nature Conservancy is the largest nonprofit land conservancy in the United States whose mission is "Conserving the lands and waters on which all life depends." To accomplish their mission, they have an extensive planning process (Conservation by Design) supported by scientists and other resource professionals. They work to inform policies and practices in the

following strategic areas: Agriculture, Forestry, Coasts, Native Fisheries, Watershed Connectivity, and Aquatic Invasive Species. The Nature Conservancy has no preserves in the three county area, but the Michigan office has projects in Eastern Lake Michigan and Southern Fens.
Nature Conservancy Ecoregional Plans:
www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/michigan/projects/

**Habitat Network**
The Nature Conservancy and the Cornell Lab of Ornithology launched Habitat Network, a free online citizen science platform that invites people to map their outdoor space, share it with others, and learn more about supporting wildlife habitat and other natural functions across the country. Forty million acres of U.S. land are covered by lawn—short grass that has minimal ecological function and costs property owners more than $30 billion to maintain. Habitat Network offers alternate solutions for yards, parks and other urban green spaces to support birds, pollinators and other wildlife, plus manage water resources, and reduce chemical use like pesticides and fertilizers to keep nature in balance. http://content.yardmap.org/learn/ (also has supporting articles)

**Wild Ones**
Wild Ones is a not-for-profit environmental education and advocacy organization that promotes environmentally sound landscaping practices to preserve biodiversity through the preservation, restoration and establishment of native plant communities. Wild Ones offers regular monthly field trips in the summer months and the tours provide an understanding of how to create a diverse landscape with native plants. https://www.wildones.org/

**The National Wildlife Federation's Garden for Wildlife Program** helps people restore habitat and wildlife populations to our cities, towns and neighborhoods. Since 1973, the program has been educating and empowering people turn their own small piece of the Earth--their yards and gardens--into thriving habitat for birds, butterflies and other wildlife. In doing so, the Garden for Wildlife program helps wildlife and gives people a daily connection to the natural world, literally right outside their door.
http://www.nwf.org/garden-for-wildlife/create.aspx

**Michigan United Conservation Club**
The Michigan Wildlife Cooperatives program was created to provide support through networking individuals, providing resources and information, and assistance to fund habitat work within cooperative properties. MUCC http://www.mucc.org/cooperatives

**Quality Deer Management Association**
The Quality Deer Management Association offers Deer Steward courses and a Land Certification Program that was developed to recognize the accomplishments of landowners implementing the four cornerstones of Quality Deer Management. The program is a multi-level, voluntary process which will evaluate and certify properties against an established list of QDM standards. - See more at: https://www.qdma.com/steward/land-certification/#sthash.VurAJlTg.dpuf

**Pheasants Forever**
The mission of Pheasants Forever is "dedicated to the conservation of pheasants, quail and other wildlife through habitat improvements, public awareness, education and land management policies and programs." https://www.pheasantsforever.org/

**Ducks Unlimited**
Ducks Unlimited "conserves, restores, and manages wetlands and associated habitats for North America's waterfowl. These habitats also benefit other wildlife and people." Ducks Unlimited aims to conserve waterfowl by reversing the degradation of wetlands and other habitats across the continent. http://www.ducks.org/Michigan

**National Wild Turkey Federation**
The National Wild Turkey Federation in Michigan focuses on conservation management on public and private lands through political advocacy and partnerships. http://www.nwtf.org/

**Trout Unlimited**
There is an Ann Arbor chapter of Trout Unlimited (TU) that covers the Jackson, Washtenaw, Hillsdale and Lenawee County area. Their website is: http://www.annarbortu.org/
As of May, 2017-
President of Ann Arbor Chapter
John Zolan
(734) 975-0234

### *3.2.3 Private Sector Natural Resource Professionals*

**Forest Stewardship Plan Writers in the Southeastern Lower Peninsula**

Nikita Brabbit
Forester Type: Consulting Forester
Address: 917 West Genesse Street, Lansing MI 48915

Email: nbrabbit@gmail.com; Phone: 507-458-4947
Related Programs: Tree Farm, Commercial Forest

Dan Brown
Forester Type: Consulting Forester
Address: 2167 Gunnell Road, Eaton Rapids, MI 48827
Email: brownd94@msu.edu; Phone: 517-898-5670
Related Programs: Tree Farm, Commercial Forest

Burhop Forestry Consulting
Forester Type: Consulting Forester
Address: PO Box 362, Dexter, MI 48130
Email: burhopforestry03@yahoo.com; Phone: 734-904-5233
Related Programs: Tree Farm, Commercial Forest, TSP
Credentials: Registered Forester, Certified Forester, Association of Consulting Foresters

Darling Forestry LLC
Forester Type: Consulting Forester
Address: 1111 West Barnes Road, Mason, MI 48854
Website: www.DarlingForestry.com
Email: jason@darlingforestry.com; Phone: 517-243-2000
Related Programs: Tree Farm, TSP, Qualified Forest, Commercial Forest
Credentials: Registered Forester

Ecosystems Management LLC
Forester Type: Wildlife Biologist
Address: 3210 Bewell Avenue SE, Lowell, MI 49331
Email: ecosystemsmgt@att.net; Phone: 616-897-8575
Related Programs: TSP, Qualified Forest, Commercial Forest, QDMA
Credentials: Certified Wildlife Biologist

Jacques Forest LLC
Forester Type: Consulting Foresters
Address: 1251 Spartan Road, Tawas City, MI 48763
Office: 989-362-6245
Email: jacquesforest@yahoo.com; Phone: 989-329-8079
Jenilee Jacques; jenileerae@gmail.com; 734-272-2365
Related Programs: Tree Farm, TSP, Qualified Forest, Commercial Forest

Spencer Kellum
Forester Type: Biologist
Address: 2318 Parkwood Avenue, Ann Arbor, MI 48104

Email: spencer.kellum@gmail.com; Phone: 734-794-3879
Related Programs: Commercial Forest

Rich McAvinchey
The Land Steward LLC
Forester Type: Consulting Forester
Address: 300 Woodbridge Lane, Ortonville, MI 48462
Office: 248-627-7109
Email: thelandsteward@frontier.com; Phone: 248-462-3524
Related Programs: Tree Farm, Commercial Forest
Credentials: Registered Forester, Association of Consulting Foresters

Doug Less
Lee Forestry Services
Forester Type: Consulting Forester
Address: 404 John K Drive, Auburn, MI 48611
Email: foresterdoug@charter.net; Phone: 989-662-0139
Related Programs: TSP, Qualified Forest, Commercial Forest
Credentials: Certified Forester

Dave Mathis
Forester Type: Consulting Forester
Address: PO Box 28, Chelsea, MI 48118
Email: dmmathis@yahoo.com; Phone: 734-395-4113
Related Programs: Tree Farm, Qualified Forest, Commercial Forest

John DeLisle
Natural Community Services LLC
Forester Type: Ecologist
Address: 30775 Longcrest, Southfield MI 48076
Email: j_delisle@hotmail.com; Phone: 248-672-7611
Related Programs: Tree Farm

Shawna Meyer
Natural Resource Insight LLC
Forester Type: Consulting Forester
Address: 934 Thomas Street SE, Grand Rapids, MI 49506
Website: www.NaturalResourceInsight.com
Email: shawnameyer1@gmail.com; Phone: 517-388-6954
Related Programs: Commercial Forest

Justin Brabon
Post Hardwoods

Forester Type: Industry Forester
Address: 3544 38th Street, Hamilton, MI 49419
Email: jbrabon91@gmail.com; Phone: 616-799-0262 or 269-751-7307
Related Programs: Qualified Forest, Commercial Forest
Credentials: Registered Forester

Peter Klink
Progressive Forest Management
Forester Type: Consulting Forester
Address: PO Box 521, Coldwater, MI 49036
Email: marklink@dklb.net; Phone: 517-238-4048
Related Programs: Qualified Forest, Commercial Forest

Abe Kempf
Quality Hardwoods Inc
Forester Type: Industry Foresters
Address: 396 East Main Street, Sunfield, MI 48890
Office: 517-566-8061
Website: www.QualityHardwoodsInc.com
Email: abraham@qualityhardwoodsinc.com; Phone: 231-735-3470
Related Programs: Tree Farm, Qualified Forest, Commercial Forest
Credentials: Registered Forester

Lisa Parker
River Bend Willow Forestry
Forester Type: Consulting Forester
Address: 116 East Willow Street, Lansing, MI 48906
Email: parke204@msu.edu; Phone: 517-763-8637
Related Programs: Tree Farm, Qualified Forest, Commercial Forest
Credentials: Registered Forester

David Syckle
Forester Type: Wildlife Biologist
Address: 1410 Charles Avenue, Alma MI 48801
Email: syckl1de@cmich.edu; Phone: 989-533-8447

Jeff Tuller
Forester Type: Consulting Forester
Address: 5433 Colby Road, Owosso, MI 48867
Email: tuller@straightturn.com; Phone: 810-841-4414 or 989-723-9522
Related Programs: Tree Farm, TSP, Qualified Forest, Commercial Forest
Credentials: Registered Forester, Association of Consulting Foresters

Amy Salisbury
Weber Brothers Sawmill
Forester Type: Industry Forester
Address: 2863 West Weidman Road, Mt Pleasant, MI 48858
Website: www.WebersSawmill.com
Email: amysalisbury@live.com; Phone: 989-330-0421
Related Programs: Tree Farm, Qualified Forest, Commercial Forest

Source: www.michigan.gov/dnr/0,4570,7-153-30301_34240-298690--,00.html

**Southern Lower Michigan Restoration Contractors (from The Stewardship Network)**
*Note: The lists above are provided for reader's use but do not constitute an endorsement or guarantee. Other contractors not listed may also be available in your area. Available online at: http://stewardshipnetwork.org/resources/southern-michigan-restoration-contractors*

Appel Environmental Design - Ann Arbor, MI
Provides site design and analysis based on ecology and human and pet needs, invasive plant removal, native plantings.
http://appelenvironmental.com

ASTI Environmental - Brighton, MI; Grand Rapids, MI
ASTI provides environmental and ecological services, including wetlands / woodlands management and habitat restoration; bat, tree, mussel and threatened / endangered species assessments; phytoremediation; invasive species control and NEPA clearances to commercial, governmental and institutional clients.
www.asti¬env.com/services

Black River Habitats - Fennville, MI
Offers habitat creation, maintenance, and restoration
www.blackriverhabitats.com

Cardno JFNew - West Olive, MI
Offers expertise in wetlands, water resources, wildlife and habitat, sustainability and conservation, restoration, and cultural resource issues as well as expertise in the streamlined management of regulatory permitting and compliance.
www.cardnojfnew.com

Creating Sustainable Landscapes - Novi, MI

Provides consulting and installation services to businesses and private landowners who want to transform their landscapes utilizing sound ecological principles and native plants that support local wildlife.
http://creatingsustainablelandscapes .com

ECT Inc. - Ann Arbor & Lansing, MI
Specializes in the resolution of complex environmental issues through cost-effective project planning, management, as well as applied engineering and scientific expertise.
www.ectinc.com

GEI Consultants, Inc. - Allendale & Ann Arbor, MI
Provides broad array of landscape/habitat restoration/site civil planning, design, installation and maintenance services operating at a wide range of site scales.
www.geiconsultants.com

Grand Arbor Group, Inc. - Grand Rapids, MI
Offers a variety of professional products and services related to arboriculture
www.grandarborgroup.com

Great Lakes Tree Experts, Inc. - Swartz Creek, MI
Provides safe removal of trees and stumps, trim trees to owners request, lot clearing, free wood recycling, excavating, landscaping, as well as a whole sale mulch supplier.
www.greatlakestreeexperts.com

Hamilton Helicopters, Inc. - Hamilton, MI
A Commercial Pesticide Application Business. Licensed in Michigan and in categories: field and vegetable crops, fruit crops, aquatic, mosquito, right of way, forestry, and aerial.
http://hamiltonhelicopters.com

Kalamazoo Nature Center - Kalamazoo, MI
Encourages environmental awareness and stewardship and provide the education, resources, and assistance necessary to improve ecological systems in Southwest Michigan.
www.naturecenter.org/ConservationStewardship

Michigan Wildflower Farm/Farm Enterprises Inc. - Portland, MI
Specializes in installation and management of rain gardens, shoreline restorations, detention and retention basins, bioswales, wetland mitigations, CRP and SAFE projects, meadows, prairies and gardens.
www.michiganwildflowerfarm.com

Native Connections - Three Rivers, MI

Ecological restoration and management firm in southern Michigan committed to improving our environment by creating and restoring natural landscapes, providing native wildflower and grass seed, and managing land for biodiversity.
http://nativeconnections.net

Native Plant Nursery - Ann Arbor, MI
Grows only local native species from Michigan seed sources and produce a diverse selection of native perennials and a few species of native trees and shrubs.
www.nativeplant.com

Natural Community Services, LLC - Southfield, MI
Ecological monitoring & restoration, invasive species management, environmental consulting, green infrastructure, and native landscape design!
naturalcommunityservices.webs.com

Niswander Environmental, LLC - Brighton, MI
Specializes in site planning, wetland services, treatment wetlands, stream restoration, ecological assessments, threatened and endangered species assessments, GIS services, and NEPA clearance. www.niswander¬env.com

Owen Tree Service - Attica, MI
Provides innovative, practical, top-quality tree care services and tree care products that set the standard for the tree care industry to follow.
www.owentree.com

PlantWise - Ann Arbor, MI
PlantWise, LLC is a business dedicated to creating, restoring, and interpreting native ecosystems and plant communities throughout Michigan and Ohio.
http://plantwiserestoration.com

PLM - Lake & Land Management Corp - Caledonia, MI
PLM offers a variety of watershed management tools, products and services including lake and pond surveys, vegetation mapping , invasive species management, herbicide and algaecide applications for aquatic and terrestrial species, bathymetric mapping, water quality testing, aquatic harvesting, fish assessments, and right of way management.
http://plmcorp.net/

Restoring Nature With Fire - Ann Arbor, MI
Offers a full range of ecological restoration services specializing in controlled burns.
www.restoringnaturewithfire.com

Wildtype plants - Mason, MI

Provides ecological services for public, commercial and residential projects focusing on restoration
www.wildtypeplants.com

**Natural Shoreline Contractors**
Source: http://www.mishorelinepartnership.org/find-a-shoreline-contractor.html

Frasson-Hudson, Gina
Geum Services, Inc.
P.O. Box 035
Richland, MI 49083
269-370-0984
ginafh@prairiesmoke.com
www.prairiesmoke.com

Prism Science & Technology, LLC
3133 Lakeshore Dr.
St. Joseph, MI 49085
269-983-5775 269-277-6092 269-983-5333
agblind@prismscitech.com

Grieves, Bethany
Circlewood Design LLC
35129 52nd St.
Bangor, MI 49013
269-370-8053
circlewooddesign@gmail.com
www.circlewooddesignllc@wordpress.com

LandTech WMI, LLC
76 Veterans Dr., Ste. 500
Holland, MI
616-928-0786
curt@landtechwmi.com
www.landtechwmi.com

Hoch-Melluish, Patty
Kieser and Associates
536 E. Michigan Ave.
Kalamazoo, MI 49007
269-344-7117
mkieser@Kieser-associates.com

www.Kieser-associates.com

Kornoelje, Anna
Kalamazoo Nature Center
7000 N. Westnedge Ave.
Kalamazoo, MI 49009
269-381-1574 Ext 18
akornoelje@naturecenter.org
www.naturecenter.org

Niewoonder, Ron
E. Niewoonder & Sons, Inc.
2319 N. Drake Rd.
Kalamazoo, MI 49006
269-382-0243
ronniewoonder@sbcglobal.net
www.niewoonderlandscaping.com

Reding, Sarah
Kalamazoo Nature Center
7000 N. Westnedge Ave.
Kalamazoo, MI 49009
269-381-1574 ext 17
sreding@naturecenter.org
www.naturecenter.org

Snyder, Bruce
Gull Lake Landscape Co.
9868 E. M-89
Richland, MI 49083
269-629-0001
mannslandscape@sbcglobal.net
www.gulllakelandscape.com

**Sources of Michigan Native Plants**
This list of suppliers is meant to provide a start in your search for native plant suppliers near you. Note: The Michigan Department of Environmental Quality's bio-engineering permit does require the use of Michigan native plants below the ordinary high water mark when doing work that requires a permit.

Michigan Native Plant Producers Association (www.mnppa.org/)

The Michigan Native Plant Producers Association comprises 7 independently owned nurseries located throughout the state of Michigan. Together they grow and sell over 400 species of Michigan native plants and seeds, including, trees, shrubs, wildflowers, grasses, and ferns.

Wildflower Association of Michigan (www.wildflowersmich.org/)
The Wildflower Association of Michigan encourages the preservation and restoration of Michigan's native plants and native plant communities. They provide education on native plants and native landscaping through their conference, website, grant program, and quarterly newsletter. They also have sources of native plants and a business directory listed on their website.

Michigan Association of Conservation Districts
Many of Michigan's 78 Conservation Districts host native plant sales in the spring and fall. See Section 3.21 for local Conservation Districts' information.

## 4. Landscape Stewardship Stories

### 4.1 Caring for the Community of Living Things

By Bob Kellum

For over fifty years I have associated with a piece of family land in Michigan's 'Irish Hills'. Although the land was 'settled' by farmers, the area's rolling landscapes, numerous lakes, and meandering wetland systems have discouraged agriculture. For most of those 50 years I indulged the belief that if we left nature to her own devices, she would forgive the indignities of our forebears and reward our passive management by returning the land to a 'natural' state. I stood by as open fields converted to woodlands. I was slow to recognize the infilling of the understory with invasive brush. I wondered at the sudden proliferation of unfamiliar flowers. Under my watch the land I knew and loved was becoming a stranger to me.

Like many others, it has only been in the last two decades that I have come to recognize the loss of familiar habitats and sought to intervene on their behalf. I now grapple with the consequences of my decades-long disconnect from this reality. I have since endured the panic of an accidental grass fire before learning to employ prescribed fire as a management tool. Enter The Stewardship Network in 2003. For the first time I sat in a room of people who all seemed to know something about which I wanted to know. Each of the subsequent years has been filled with a seasonal parade of lessons from an array of sources. That parade of planned and unplanned lessons is now integrated, like the lunar calendar, into the rhythm of my life. I have learned that in the absence of fire, trees and brush will inevitably dominate grasses and shade out the historic savanna ecosystems. I am aware of the critical, but underappreciated role that wetlands play as storehouses for biodiversity and in regulating and purifying water. I have come to understand that we necessarily impact the places we inhabit and that the only relevant question is what that impact should be.

Currently there is little I find more rewarding than to see the living landscape respond to a strategic expenditure of precious resources. It is a sweet unfolding that reveals a multigenerational reason for being. The work we do now may well show benefit a century into the future. This is not to claim that I am immune from ignorance, misstep, and doubt, but it is to recommend the inoculating effect of patiently engaging with nature on her own terms and willingly following her 'directives'.

As the caretaker of ecologically evolving land, I fret about its living future. Who will care for it after me? Who will notice whether it continues to evolve toward biologically diverse and ecologically nuanced habitats? Who will intervene when it inevitably threatens to backslide into a homogeneity of invasive species? How do we create stewards who will 'care', 'notice' and 'intervene' on behalf of the community of living things? This concern, because of its fundamental nature and long time horizon, to me constitutes the overriding issue of our time.

Here I employ an optimistic strategy of nurturing an awe-inspiring landscape while introducing the community to the expectation that such landscapes were once, and can be again, the norm. Beauty will speak for itself, but understanding its many faces and our role in stewarding them, must be taught. A core of family, friends, and neighbors share similar philosophies. The community is ripe to appreciate and value native habitats and understand the profound implications of their loss. Opportunities abound!

Whatever our station in life, we are immeasurably enriched by our engagement with nature, and inversely, we are likewise impoverished by a lack of engagement. If we are to honor an earth who would have us want for nothing, we need only to internalize her rules and play the game that she is playing. By that conscious and unequivocal shift, we will reap the sustained benefits that come with such a well-grounded life. With the community so 'inoculated', I expect one day to enthusiastically relinquish my concerns for the future and embrace the joy inherent to a vibrant and thriving community of living things.

### 4.2 Michigan Nature Association: Goose Creek Grasslands Nature Sanctuary

The Michigan Nature Association (MNA) is dedicated to the conservation of rare, threatened, and endangered species, imperiled natural communities, and unique geological features throughout the state of Michigan. Established in 1952, MNA is Michigan's oldest land conservancy. Today MNA protects over 175 nature sanctuaries encompassing over 12,000 acres across Michigan.

Under the visionary leadership of Bertha Daubendiek, what started six decades ago as a small bird study group became a statewide land conservation organization. From that bold beginning, MNA members, donors, and volunteers built a remarkable statewide network of more than 175 nature sanctuaries across Michigan. Continuing today, MNA is a place where members of the public are welcome to engage in direct land conservation through membership, donations, volunteering, outreach, and other actions.

One of these sanctuaries, the Goose Creek Grasslands Nature Sanctuary, is located within the region of the state known as the Irish Hills, a name originally coined by Rev. William Nardissus Lyster who said the area reminded him of his Irish homeland. Prior to settlement, the Irish Hills landscape was predominately a mosaic of fen, prairie, and black oak barrens. The sanctuary is also just north of the historic Great Sauk Prairie Trail, which was an early Indian route used by settlers in the 1800s and later was adopted as the route for US-12.

The Sanctuary was largely unknown to conservationists prior to the early 1980s at which time it came to the attention of the Michigan Nature Association. At that time the sanctuary was part of a 700-acre property owned by the Goose Lake Land Company which used marl from some of

the nearby prairie fens for making cement, hence the name Cement City for the village located on the northern edge of the sanctuary. The property quickly became a favorite of MNA members due to the floral diversity of the grasslands found in this glacially formed creek valley. MNA purchased the 70-acre sanctuary in 1986.

Goose Creek Grasslands extends over ¾ mile from southwest to northeast along the Goose Creek, and includes many diverse habitats. Saturated soil, wet prairie, marsh, and prairie fen habitats are all found within the sanctuary's boundaries, allowing for a wide range of plant and animal species to exist. Prairie fens are extremely delicate areas that form where groundwater flows back to the surface through alkaline soil. Because of its rarity and size, the fen of Goose Creek Grasslands is an extremely important remnant.

Over two hundred plant species have been identified at Goose Creek Grasslands, including seven species that are classified as rare. Sedges and rushes are found among many fen plants, including buckbean and pitcher plants. Aquatic plants, including pickerel weed and pondweed, occur within the waters of the creek along with a healthy mussel population. Various types of goldenrods and asters can be found in the wet prairies, as well as prairie flowers including culver's root, fringed gentian, Indian paintbrush, and joe pye weed.

Goose Creek Grasslands also provides excellent habitat for wildlife. Birdwatchers enjoy the flat open landscape as they search for species such as the sandhill crane, warblers, and flycatchers. Additionally, the site has been noted for a stunning diversity of butterflies, reptiles, and amphibians.

Over the past thirty years, the MNA stewardship program has engaged members from the community and around the state to participate in the care and upkeep of the sanctuary. With the assistance of volunteers, MNA has been able to conduct a comprehensive invasive species management program focusing on problematic plants such as glossy buckthorn, reed canary grass, and phragmites. Additionally, MNA implements a controlled burning program to care for the grasslands, invigorate native plants, and discourage the invasion of shade-producing shrubs and trees.

Partnership and volunteer engagement have been the key resources for the implementation and success of natural area management at Goose Creek Grasslands. Volunteers selflessly donate their time and energy to the cause and help protect and maintain this special natural area. Numerous volunteer days are held at the sanctuary annually to allow individuals to lend a hand. Additionally, numerous groups and organizations assist at the sanctuary with group projects, some of the recent participants include Addison High School and the Michigan State University – Restoration Ecology Class. Additional conservation partners who have assisted with the care of the sanctuary include the Natural Resources Conservation Service - Farm Bill Programs and the Department of Natural Resources - Private Lands Program.

## 4.3 Ives Road Fen: A Success Story

Less than an hour away from Detroit lies the Ives Road Fen Preserve. This is a rare, unique ecosystem that has been restored to its ecological glory through the hard work of hundreds of volunteers and staff at The Nature Conservancy's Michigan Chapter.

The Nature Conservancy began purchasing land at Ives Road Fen in 1987 with a 73-acre parcel and, over time, the preserve has grown to its current size of approximately 700 acres. Most of the lands in the preserve had historically been impacted by human activity including agriculture, sand and gravel mining, and drainage ditches. Throughout the late 1980s, there were many discussions about whether restoration at this site would even be possible. However, thanks to the Conservancy's dedicated staff and thousands of volunteer hours given by local community members, the preserve is now largely restored to its natural state.

This wet, spring-fed prairie blends into a floodplain forest to create a globally significant fen habitat. Fens are unusual and increasingly rare wetlands that receive water from underground alkaline springs, rather than from precipitation. The water from this fen flows in rivulets through the thick grasses of the preserve, which help to filter the water before it empties into the River Raisin at the preserve's eastern edge. The River Raisin is one of the best warm-water rivers in the state of Michigan, and three of the four local communities downstream draw all of their drinking water from the river. The preserve is home to many rare plants, including the carnivorous sundew and pitcher plant, as well as unique animals such as the Blanchard's cricket frog and a chorus of migratory birds.

Invasive species are one of the key threats to this ecosystem; and the biggest battle against invasive species at Ives Road Fen Preserve has been waged against glossy buckthorn. In the years since buckthorn removal efforts began, Conservancy staff and volunteers have removed more than 2.5 million adult buckthorn stems, spot burned 10 million buckthorn seedlings, and burned nearly 400 brush piles of adult buckthorn shrubs. In 2010, we celebrated the removal of the last populations of adult glossy buckthorn from the preserve; a monumental milestone.

While the large stands of glossy buckthorn are history, the fen will require continued stewardship, including control of other invasive plant species. Birds, mammals and even the River Raisin can carry invasive plant seeds into the fen. Annual sweeps of the fen to treat buckthorn seedlings will continue along with detection and control for other invasive species, such as Phragmites, reed canary grass, and purple loosestrife that can degrade the fen

community. Once invasive plant species populations are reduced, prescribed fires will become the major natural disturbance to help us manage this fire-dependent ecosystem.

There is a long history of exceptional volunteer involvement at Ives Road Fen. In the years following the creation of this preserve in 1987, The Nature Conservancy initiated recurring volunteer work days to control invasive glossy buckthorn. In 1997, a Volunteer Conservation Committee was formed under the extraordinary leadership of Chuck Pearson, who had led dozens of volunteer days over the years. Chuck and the group of dedicated volunteers began weekly work days from April through November. Then, on November 13, 2010, the last stand of adult glossy buckthorn was removed from the preserve, expanding the restored fen from five acres to almost 100 acres! This was a tremendous achievement, which would never have happened without the hard work of Chuck Pearson and the many members of the Volunteer Conservation Committee.

With the buckthorn removed, volunteers have turned their attention to other invasive plants such as autumn olive, garlic mustard, and dame's rocket. They have also begun restoring the native prairie on uplands adjacent to the preserve, and surveying populations of the native Eastern Massassauga rattlesnake. The Conservancy is deeply grateful for this group of dedicated volunteers and the thousands of hours they contribute to make Ives Road Fen such a beautiful, natural place.

## 4.4 Volunteering at The Dahlem Conservancy

By Bill Strohaver

About the same time that the Development Director asked me to share my experiences of volunteering at The Dahlem Conservancy, Nicholas Kristof released a new book entitled *A Path Appears*. The book provides a unique and essential narrative about making a difference in the world and a roadmap to becoming a conscientious global citizen. The book recounts some of the most successful local and global initiatives that provide a compelling and inspiring truth of how real people have changed the world. Kristof resoundingly upends the view that one person can't make a difference. The title of the book comes from a quote by Lu Xun, a Chinese essayist of the early 20th Century: "Hope is like a path in the countryside. Originally, there is nothing – but as people walk this way again and again, a path appears." So my sharing is about finding my personal path walking toward the opportunities and experiences that Dahlem provides.

As a lifelong educator, I knew how important it was after retirement to find meaningful activities that were both intellectually and physically stimulating, and that also provided personal growth and involvement. I was concerned about environmental issues – particularly the accelerated rate of extinction caused by habitat loss and climate change. My wife and I had just moved into our new home on Skiff Lake with 15 acres of land. I was interested in learning more about the esker that I lived on, as well as what the pre-settlement landscape looked like. I wondered how I might restore it. I also wanted to volunteer and contribute to an environmental organization that shared my concerns and that was educating the community about solutions.

After reading Douglas Tallamy's book, *Bringing Nature Home: How you can Sustain Wildlife with Native Plants*, I became convinced that Tallamy had found a path as to how individual land owners could contribute to building habitat by creating a patchwork of neighborhood enclaves that would support and sustain wildlife. This could be done by removing invasives and replacing them with native plants. I set about wanting to learn all I could about invasive plants, native plants, and general land management, so that I could improve my own property but also share what I had learned with neighbors and others. Dahlem became my adult learning center providing both the science and the application of the principles about habitat preservation and restoration. Dahlem provided three different avenues for developing an understanding of the issues impacting habitat: education opportunities, volunteer opportunities, and network opportunities.

The educational opportunities were provided through workshops conducted by Dahlem staff (Yes, one of the workshops even helped me to identify different scat), as well as expert guest speakers, conferences provided by partner organizations, field trips every Tuesday, a loaner library providing field manuals and handbooks and lecture notes with bibliographies that included environmental websites. Dahlem provided the ability to access the latest scientific based research on the issues associated with habitat.

Secondly, through numerous volunteer activities coordinated by Dahlem staff and partners, practical information was reinforced by hands on projects and activities. My initial volunteer hours centered around the Cut and Dab Society, meeting every Thursday, removing invasives around the buildings in the arboretum and in various sections of the Land Management Plan. Through training and hands on experience this stewardship group learned to identify the major invasive threats to Dahlem's four hundred acres using the approved removal techniques for buckthorn, honey suckle, autumn olive, and oriental bittersweet. The land stewardship's goal was to restore and protect habitat for the massasauga rattlesnake and create opportunity for nesting birds such as henslow's sparrow, among other threated species. This stewardship group also provided the leadership for the development of the Nature For All Trail – which was designed to be ADA compliant trail that would additionally showcase the removal of invasive species and the replanting of native species. This initial path, that became a trail, had now become a highway that included a number of other Dahlem activities, such as assisting in the DEQ required monitoring of a 40-acre Wetland Land Preservation Area through a partnership among Dahlem, Liberty Environmentalists, Inc., and the Michigan Natural Features Inventory. The project required that stewards identify and protect endangered species, remove invasive species, and generally monitor the wetland preservation area. This project afforded me the opportunity to wade through knee deep water and muck while dodging Poison Sumac and swatting mosquitoes as a plant inventory was conducted. I also partnered with Jackson College and the College's Writing Fellows to provide a semester of instruction on invasive species identification and hands-on removal opportunities at Dahlem (By the way, Tallamy's book was required reading for these students). The information leaned led to annually volunteer at the Birds, Blooms, and Butterfly Festival, providing information about and selling native plants on consignment from WildType Native Plant Nursery in Mason, Michigan.

Thirdly, working with Dahlem also provided numerous networking opportunities with other environmental non-profits that collectively work on many of the same environmental goals such as the Legacy Land Conservancy, The Stewardship Network's Grand-Raisin Cluster, Wildflower Association of Michigan and The Nature Conservancy. The paths leading to these organizations, that I now belong to, were introduced to me through my involvement with Dahlem. Perhaps influencing neighbors has been as rewarding as volunteering at Dahlem and other organizations – neighbors are asking questions about removing invasive species and actively working on their own properties. Additionally, as they see the native plants that I'm using in the landscape, they are beginning to think and plant native alternatives. The path that originally led to Dahlem now has a number of additional spurs that link Dahlem, environmental organizations, and neighborhoods in Jackson County.

Kristof writes in *A Path Appears* that:

> "There tends to be this yearning for a silver bullet" – he goes on to say "One of the things that I've seen over a long time reporting is that it is hard to find a silver bullet. Life is more like silver buck shots, a lot of little things that make incremental differences, and together they can move the needle a great deal."

I would like to think that through my volunteer work with Dahlem and donations to other organizations that share my concerns that I am one of those "silver buck shots." Believing, hopefully, that Dahlem's participation in numerous initiatives designed to preserve and restore habitat will make a difference. Through its stewardship initiatives, Dahlem can create some of the "wildness" experiences –such as monarch butterflies flitting across fields of milkweed, hearing the call of the Red Winged Blackbird signaling the end of winter, watching the courtship dances of the Woodcock on the prairie, or simply catching tadpoles or crawfish - experiences that as kids, we adults took for granted that are now at risk for the next generation. I hope you will join me in becoming one of those "silver buck shots" helping to sustain a path that leads others to Dahlem or other environmental organizations.

## 4.5 Grand River Fen Preserve

The Nature Conservancy's Grand River Fen Preserve contains the second largest high-quality occurrence of cinquefoil-sedge fen in the North Central Tillplain Ecoregion. The 453-acre complex of high quality wetland communities also includes southern swamp and southern shrub-carr. The presence of these community types makes the preserve a critical habitat for special insects, including the blazing star borer, tamarack tree cricket, pine tree cricket, regal fern borer, angular spittlebug, and red-legged spittlebug. One globally-rare plant, the bog bluegrass, is also found at the Grand River Fen Preserve, along with a very high diversity of flowering plants, sedges, and grasses.

The Nature Conservancy allows hunting for white-tail deer on the preserve to reduce an unnaturally high deer population in the area and lessen the threat those high numbers of deer pose to conservation targets. All hunters are required to receive a permit from the Conservancy as well as a Michigan deer hunting license. Additionally, hunters must report any deer taken from the preserve.

**Why the Conservancy Selected This Site**

Three separate areas of high-quality prairie fen are the heart of this site. These fens are renowned among lepidopterists for their diversity of butterflies and moths, including four globally rare species. The wetlands occupy a glacial outwash channel that forms a portion of the headwaters of the Grand River. The fens, along with associated swamp and upland forest communities, harbor a regionally significant and diverse fauna and flora, including seven globally rare and eight state-rare species. Because of the limited amounts of these habitat types and the rarity of species they support, the protection of sites such as these is crucial for maintaining biodiversity

**What the Conservancy Has Done/Is Doing**

The Nature Conservancy has set forth multiple conservation targets and ecological objectives for the Grand River Fen Preserve. Grand River Fen is one of our most active restoration and management sites.

**Conservation Targets**

- The complex of high quality wetland communities, including prairie fen, southern swamp, and southern shrub-carr.
- Populations of globally-rare insects and plants, including the tamarack tree cricket, the blazing star borer, the pine tree cricket, the silphium borer moth, the angular spittlebug, the Poweshiek skipperling, and bog bluegrass.
- Populations of other rare animals, such as the regal fern borer and red-legged spittlebug.

**Ecological Objectives**

- Protect the mosaic of wetland and upland ecosystems and key ecological processes, especially the cycle of groundwater recharge and discharge that maintains the prairie fens and associated rare animals and plants.
- Locate, protect, maintain, and enhance the populations of globally rare insects.
- Use controlled burns and invasive species management in the prairie fens and dry prairies to improve rare insect populations.
- Evaluate restoration of degraded dry prairie sites and other formerly open uplands.

## 4.6 Phyllis Haehnle Memorial Sanctuary

The Phyllis Haehnle (pronounced Hane-lee) Memorial Sanctuary, a Michigan Audubon sanctuary, has an area of over 1,000 acres. The sanctuary contains a variety of habitats. The upland areas include Beech and Oak Climax forests and native grasslands, while a fen, a hardwood swamp, Eagle Lake, and Mud Lake Marsh are among the habitats in the wetland areas.

Today, Haehnle is renowned for its sandhill cranes. Many pairs of cranes nest in the area and hundreds more gather there during fall migration (September to mid-November). A record 8,177 cranes were counted as they landed in Mud Lake Marsh on the afternoon of November 15, 2010. During fall weekends, greeters welcome the many visitors who come to witness this glorious sight. The annual rite of fall can be viewed at the Harold Wing Observation Hill, which is located east of the parking lot and is handicap accessible. There is an interpretive display in the observation area and benches for weary birdwatchers.

The Phyllis Haehnle Memorial Sanctuary has a very interesting history. Up until 1921, hundreds of wood ducks would feed on wild rice in marshes that were present along the Portage River of Jackson County. Many hunters owned or leased large tracts of marsh as their private hunting preserves, and the legal "take" was very liberal by today's standards. Common loons nested on Eagle Lake as late as 1918, and ruffed grouse were fairly common in the area. Interestingly enough, there were no White-tailed Deer back then. But, in 1921, the Portage River was dredged and straightened. Mud Lake, which had drained into the Portage River, became Mud Lake Marsh, and the marshes along the river were significantly reduced.

After the river was dredged, drained, and straightened, the area northeast of Mud Lake was farmed to produce onions, potatoes, corn, sod, and peppermint. Since its dredging in 1921, the Portage River Drain has silted in, flooding the adjacent fields until they were unsuitable for farming. During the Depression, veteran soldiers and sailors were allowed to take wood from a strip of state land east of the present sanctuary. Luckily, the stately tulip trees growing in the Beech-Maple woods southeast of the Mud Lake Marsh were largely unaffected by the cutting.

The Federal Government planned the Waterloo Recreation Area in the 1930s, which would retire many acres of sub-marginal land from agriculture and provide areas for public hunting, fishing, and recreation in southeastern Michigan, with Mud Lake Marsh on the western edge of the Recreation Area. Another incident from the ‘30s gave Bogus Lake, a small, deeper lake north of the Mud Lake Marsh, its name. A group of counterfeiters, fleeing officers of the Treasury Department, dumped their printing plates into the lake to avoid being caught with them. As farming ended, the area gradually reverted to marsh. An old peppermint still, just north of the sanctuary boundary, is the only reminder of the farming activity that once occupied the area.

One of the hunters attracted to the area was Casper "Cap" Haehnle, who purchased several pieces of property in the area over the years, including Mud Lake Marsh. After purchasing Mud Lake Marsh, Cap Haehnle built a hunting cabin on "Eagle Island", the high ground between Mud Lake Marsh and Eagle Lake to the west.

In 1935, Dr. Lawrence Walkinshaw, a Muskegon dentist and avid birder, noticed the potential of the Mud Lake Marsh while on his way to the nearby Portage Marsh. He returned several times over the next 20 years. In all Dr. Walkinshaw listed 138 species of birds, including Yellow Rail, Greater Prairie Chicken, and nesting Great Blue Herons. The area was also a favorite birding spot for Harold Wing, a member of the Audubon Society.

By the mid-forties, Cap Haehnle wasn't hunting as much as he used to. About this same time, Harold Wing approached Cap Haehnle about making the Mud Lake Marsh into an Audubon Sanctuary. At first, Cap Haehnle was uncertain about whether Michigan Audubon Society could keep Mud Lake Marsh as a Nature Sanctuary. But on January 22, 1955, after many visits by Harold Wing (accompanied by other Michigan Audubon members), he was convinced of Michigan Audubon's commitment. Cap Haehnle gave the Michigan Audubon Society 497 acres, including Mud Lake Marsh. The Phyllis Haehnle Memorial Sanctuary is named after the Haehnle's only daughter, Phyllis Haehnle Clancy, who died in 1950. Since Cap Haehnle's original gift of 497 acres, gifts from Cap's granddaughter, Judy Cory, and purchases by the Michigan Audubon Society, including the recent Klee Tract addition, have enlarged the sanctuary to over 1,000 acres. The sanctuary is owned by the Michigan Audubon Society and managed by the Jackson Audubon Society.

Many things have changed around Mud Lake in the last 95 years. The last greater prairie chicken boomed his courting call in 1941, and the great blue herons found other nesting areas after 1952. On the other hand, Canada geese, which were uncommon in the 1950s, are now regular nesters at the sanctuary, and white-tailed deer, which were unseen 80 years ago, have increased to the point of being destructive to local farm crops. Wild rice, which had vanished along the southern border of the marsh, is abundant once again.

The stewardship of the sanctuary by the Jackson and Michigan Audubon Societies has not changed in the last 60 years. Haehnle Sanctuary continues to serve its intended purpose as a sanctuary for wildlife in an increasingly developed world.

## 4.7 The Michigan State University MacCready Reserve

**Uniting education, outreach, and research through ecological restoration**

By Lars Brudvig

Michigan State University's MacCready Reserve in Jackson County, Michigan, serves as a regional resource for research, outreach and education on ecological restoration of savanna and grassland ecosystems in Michigan and the upper Midwest. Situated on over 400 acres, the MacCready Reserve is host to multiple savanna and grassland ecosystems, including globally rare hillside prairie, oak openings, oak barrens, and prairie fens, as well as southern wet meadows. The existing remnants of these once vast ecosystems harbor many of southern Michigan's rare and endangered plants and animals, but are in extreme peril due to habitat destruction, lack of fire, and invasive species. Successful conservation of these ecosystems and their flora and fauna requires active restoration to reinstate historical conditions.

Restoration on the MacCready reserve began in 2006, less than five years after the property was donated to Michigan State University by the MacCready family. Led by MSU scientists and the MSU Kellogg Forest Crew, and in partnership with The Nature Conservancy and other conservation organizations, these efforts have focused on fire suppressed hillside prairie, oak openings, and prairie fens across dozens of acres. Prescribed fire and cutting/herbiciding have been key tools for clearing invading trees and shrubs, such as glossy buckthorn, autumn olive, and red maple. These efforts have reinstated open, sunny conditions, leading to the proliferation of many native plant species and, in some cases, the reappearance of rare species

such as false boneset.  An annual garlic mustard pull has also been highly successful within the oak openings, greatly reducing the prevalence of this invasive species in these areas. Additionally, a fen corridor has been restored, connecting restored fen in the MacCready Reserve to high quality fens on nearby Skiff Lake and thereby facilitating the movement of animals between these two properties.

Many of the restoration efforts within the MacCready Reserve serve as research projects for MSU scientists and students.  Through these efforts, research findings are applied throughout the Reserve, communicated to conservation professionals outside MSU, and students are trained to embark on their own careers in research and conservation.  Some examples include: A prairie fen restoration experiment guided glossy buckthorn removal to promote a diverse fen plant and insect community on the Reserve. An oak openings restoration experiment has served as the focus of multiple field days with conservation professionals to discuss restoration techniques and the training of a regional land stewardship professional. Findings from these projects have been published in scientific journals and presented to academic and conservation professionals and meetings such as the Science, Practice, and Art of Restoring Native Ecosystems.

The MacCready Reserve restoration projects have also been a valuable resource for education and outreach through MSU courses and public field days. Courses such as Restoration Ecology, Silviculture, and Fire Ecology have held field trips and restoration demonstrations (e.g., prescribed fires) for MSU undergraduates. MSU undergraduates have also participated in the annual garlic mustard pull and in various research projects. Public field days focused on the Reserve's ecosystems and their restoration have drawn hundreds of individuals throughout Michigan and several surrounding states.

## 4.8 Land Stewardship and Restoration at YMCA Storer Camps

by Jim Mohr
YMCA Storer Camps Lands for Learning

The story of the lands and land stewardship at YMCA Storer Camps starts in 1918, with nine rented acres and a vision. The leadership of the YMCA in Toledo Ohio decided to provide opportunities for their boys to escape the hot, dusty city during the summer, and enjoy the experiences and activities more available in a wilder setting. They searched the region for a suitable site, and found it "way up north" just west of Napoleon, Michigan. "Hyatt's Grove" was mainly a semi-wooded park-like site on the shores of quiet, clean Stony Lake. The adjacent land was actively farmed. The boys enjoyed the traditional camp activities as the land allowed and made good use of the lake for swimming and boating.

In 1929, after 11 years of renting, the Y bought the original nine acres and the rest of the Hyatt farm (a total of 90 acres), to accommodate the growing numbers attending. As the years went by, the site continued to be expanded for a number of reasons: attendance growth; development of an equestrian program; a separate Girls' Camp; development of expanded opportunities for teens; more remote programming areas; connectivity between the previous parcels; and hayfields, pastures and crop lands to support the horse herd. Eventually it became possible to hike or ride horses all the way around the lake, and to experience relative solitude. The site has grown to about 1200 acres and spans 2.25 miles.

Then, as now, the site consisted of land of varied soil composition and capabilities, hills, slopes and valleys; uplands and wetlands; and the accompanying edge situations. Diverse lands allow, inspire and require diverse activities and adventures.

Nearly 800 acres of the Storer site are natural or relatively so. Fortunately, and mainly by serendipity, the land acquired through the years came with a widely varied complement of natural lands: wetlands and uplands, forested and open.

Some natural features of the Storer site include a 240-acre clean and relatively quiet natural lake, with a nearly undeveloped shoreline and an inlet stream and outlet stream. There are at least 17 soil types, in a jigsaw-puzzle pattern, over stratified glacial outwash, with 55' of elevation range throughout the site. We have identified 15-20 different natural ecosystems, including sizeable fens and black oak barrens remnants, and sizeable woodlands. There are over 20 seasonal pothole ponds and fluddles, as well as extensive, relatively undisturbed wetlands. We have 10 constructed ecosystems, and all of these features listed support a wide variety of wildlife and native plant species.

In the early 1960's, working as a summer naturalist at YMCA Storer Camps, I noticed a number of wild plants that I didn't recognize and others that seemed especially interesting to me. Many of the species turned out to be plants of fens and black oak barrens, two ecosystems that were

never mentioned in my college biology classes. A particular wide-spreading, open-grown oak was especially fascinating to me. I didn't know at that time that the tree was a survivor from pre-1800 oak barrens that covered much of south central Michigan before 1900. Most of the "new" wildflowers and shrubs were fen species. Those species and that oak still exist at Storer, for a large part because of support from the people met during field sessions, workshops and conferences around the state.

Before 1970, there were few invasive species at Storer, and those that may have been there were unrecognized. The land was agricultural land, woodlots and wetlands. A few evergreen plantations and perimeter screens had been established earlier. The environmental movement of the early '70's produced an awareness and enthusiasm throughout society to work actively on land stewardship. This made it relatively easy to recruit and utilize volunteers of all ages. In the 70's and beyond, Operation Greentree, a volunteer youth program at Storer assembled twice a year to work on a variety of environmental projects: planting trees and shrubs, trail work, litter cleanup, etc.

At one point, galerucella beetles were released to control rampant Purple loosestrife in the wetlands. The outdoor education staff and students began to raise our own beetles. It worked and we were able to get purple loosestrife under control.

In 1990, a U-M Class project was arranged to help us decide where to locate the envisioned teen center, where rustic living and less formal, natural-area-based programming were to be offered. The report mentioned that a few glossy buckthorn plants were growing in the area. Over time, staff members have volunteered to remove buckthorn in selected areas. As we become more knowledgeable, we have recognized over 20 species of invasive plants at Storer.

A planning charette in the early 2000's led to the development of the Lands For Learning Program at Storer, which has 6 main components: inventory, ecosystem diversity, ecosystem quality, ecological and eco-stewardship programming, increased use of the 1200 acres, and a support system.

Our restoration effort has four main components: prescribed burns, invasives control, hydrology conservation, and interspersion.

It has been suggested by expert restorationists that any land steward ruthlessly prioritize which of their parcels will receive restoration efforts and resources. "Restore your best and most important." We have found this difficult to do, because of the number and variety of potentially high-quality ecosystems. We value and seek to create rich biodiversity on our site and don't want it to slip away. We wrestle with this challenge each season.

At present, our priority areas are: South Fen (25 +/- acres of prairie fen. A rare ecosystem. 140+ native plant species. FQI: 57), the Frontier Savanna (Black Oak Barrens. A rare ecosystem. 40+

acres being restored), and Indian Point Ecosystem Complex (Very accessible teaching area. Wide variety of ecosystems, wildlife, native plants and geological features on about 5 acres).

We monitor, introduce prescribed fire and perform invasive species control on each of our priority areas on an annual basis. This work is performed by volunteers, staff and professional contractors.

Before and after invasive species removal

In 2008, we were chosen by the Grand Raisin Cluster of the Stewardship Network to be one of two sites to develop long-term stewardship relationships. This helped us to bolster our internal stewardship efforts, attract grant funding and engage/hire stewardship staff. Since 2013, AmeriCorps crews have been based at Storer, usually Spring and Fall sessions, to help with eco-restoration and other environmental projects. A partnership with the US Fish and Wildlife Service, coordinated by Tom Eitniear, has led to a Demonstration Prairie and two butterfly fields; has begun the restoration of a sizeable wetland formerly heavily infested with Glossy buckthorn; and has helped with the restoration of our Frontier Savanna. Staff and alumni are working on a comprehensive list of the birds of Storer (now 110 or more species, and growing).

More recently, MNFI staff visited portions of our site, and shared the information with restoration agencies and organizations. Under the the MDNR LIP Program, we began a continuing series of prescribed burning, and brush-hogged excess shrubs in the fens. Several guest naturalists have surveyed the native plants in selected areas, and the Limnotech company of Ann Arbor surveyed the lake and inlets. A teen Ecocorp was formed, and continues to work on environmental projects three or four weekends each year.

We have made mistakes at Storer. We planted borders, screens and clumps of exotic shrubs recommended for wildlife habitat, living fences and soil improvement, and simply for species diversity and landscaping. Autumn olive, Multiflora rose, black locust, Norway maple, and others. We also planted thousands of non-native evergreens for an “up-north” look. Many planted in remnant pre-1800 vegetation, making restoration difficult.

For invasive species, we didn’t start soon enough and didn't do enough early detection, rapid response. We didn’t always apply herbicide after cutting, and didn’t continually herbicide the growth from the seed bank.

Our current challenges are adequate funding for prescribed burns and invasives control, learning and keeping up with best management practices for new and ongoing projects, and finding enough workers and knowledgeable crew leaders to accomplish needed work.

We have hosted a number of sessions at our site including control of invasive plants, prescribed burning, "That area is a What?" (ecosystem types), Savannas of Michigan, Planning meetings Grand Raisin Cluster of The Stewardship Network, TSN Coordinator Summits and Coordinator Leadership meetings of the Grand Raisin Cluster. Other sessions include Fall in the Fens, Black Oak Barrens Walk, Pre-1800s ecosystems, The demonstration Prairie in August, Wetlands Prairies and Barrens: OH MY!, and others.

Stewardship agencies and organizations such as The Stewardship Network, The Nature Conservancy, Michigan Nature Association, MSU Department of Fisheries and Wildlife, the State of Michigan Department of Natural Resources, The Michigan Natural Features inventory, MDNR State Parks Stewardship, private businesses and other groups hosted and presented at the sessions. Local land stewards shared their efforts, experiences, successes and challenges.

Resources for Storer staff and volunteers included attendance at conferences, workshops and presentations sponsored by many agencies and organizations throughout the years provided up-to-date information and inspiration. Since its formation, sessions and conferences of The Stewardship Network and its Grand-Raisin Cluster have provided much information and provided opportunities to ask specific questions of top-level stewardship experts and practicing land stewards of places of all sizes and complexities. Storer has partnered with environmental agencies and groups, hosting numerous sessions, workshops and tours, in each case we have benefitted from the knowledge and experience of our partners. People from the groups mentioned above have walked our site, and shared helpful impressions and suggestions. Restoration efforts at Storer have been supported by Storer's general budget, grants from the MDNR/LIP Program, the National Fish & Wildlife Foundation, The Stewardship Network and the USFWS, and by the efforts of volunteers.

We keep learning, and keep working.

## 4.9 Sybil's Stewardship Story

By Sybil Kolon

In 1976 my husband and I moved to the old farmhouse where my grandparents had lived from 1950 until about 1970. The house was vacant and run down. Many other family members participated as we adapted to country living. We made friends with many neighbors and were fortunate to develop a strong community that continues to grow to this day. That community includes a shared commitment to land and water stewardship.

*Sybil on "The Farm"*

"The Farm", as we continue to call it, is part of the Irish Hills, in the upper reaches of the River Raisin watershed; Iron Creek runs through the west end of it. About 35 of our 80 acres was last cultivated in the 1960s. Before that it was a sheep farm for about 100 years, so only the wettest and steepest areas were relatively untouched. Yet the unique habitat has rebounded, even as my grandparents continued to dominate the land for their own purposes. The creek that surrounds the farmhouse was dredged and straightened in 1950, as shown in a video taken by my uncle that year.

Aerial photos from 1940 and 1960 give a hint of the disturbance to the creek. Part of that formerly dredged area has been part of the River Raisin Watershed Council's macroinvertebrate stream search for at least ten years. That sampling indicates this section of Iron Creek is a relatively high quality aquatic habitat.

Though I had received my degree in forestry just a few years before we moved here, I took a "let nature take its course" approach to land management, other than a bit of selective thinning in the wooded areas. We planted a big garden near the house. We planted a few fruit trees and some spruces in a small part of the "back forty". We maintained trails by mowing, cut firewood to heat our house, allowed hunting of deer, but otherwise let things go.

We even planted autumn olive shrubs for wildlife habitat, sold to us by the local soil conservation district. That spread far and wide before I even realized it was a problem. Many of the adjacent acres shared a similar history. One neighbor routinely burned their open hillside. We thought he was kind of crazy. We just didn't get it. We do now, as we struggle to attain some of that openness on portions of our property. We do that by cutting and poisoning woody invasive species, pulling garlic mustard, Japanese hedge parsley, other herbaceous plants and prescribed burning.

It took more than 20 years for me to wake up to the encroachment of invasive species. A few neighbors provided a catalyst, including Bob Kellum and Martin Bialecki, "the burn man". It was really garlic mustard moving into the trillium along the road near our house that got me

going, about 15 years ago. With yearly monitoring, I have kept garlic mustard at bay in this area.

We have made a lot of progress, but have a long way to go. About forty of our eighty acres have been restored to some extent, and are in relatively good shape. While we work on the other forty acres, we have to maintain the progress on the first forty acres. It's a tall order, but one that gives me motivation in my retirement.
My evolution in caring for our land coincided with my involvement in a few natural resource related non-profits: the Raisin Valley Land Trust, the River Raisin Watershed Council, later The Nature Conservancy and The Stewardship Network. Through a happy coincidence, I met Lisa Brush, executive director of the recently formed Stewardship Network. By 2003, several other groups and individuals formed the Raisin Cluster (now Grand-Raisin Cluster), under The Stewardship Network's umbrella.

The Grand-Raisin Cluster put on workshops, got grants to do more workshops and to implement restoration on several properties. Some of us enrolled parts of our properties in various programs, including the DNR's Landowner Incentive Program (LIP), the Conservation District's Wildlife Habitat Incentive Program (WHIP, now part of EQIP), and participated in specific grants that helped fund invasive species control and prescribed burns.

Through the Grand-Raisin Cluster we formed Iron Creek Properties, a loose association of ten property owners, covering over 600 acres. This effort has ebbed and flowed over the past ten

years, but many of us continue to coordinate, help and learn from each other as we take a more active role in managing our land.
These connections and programs have allowed us to do much more on our property than we could have hoped to do on our own. Our methods and techniques continue to evolve. There is always more to do, that is a given.

Sybil today, still working on behalf of the land the community.

What I have discovered, now that I have retired, is that my natural inclination to get involved with natural resource oriented non-profits is even stronger. Somehow, I feel like my individual desire to bring nature back to my land is only a small part of the picture. My individual efforts are fair to middling in terms of habitat restoration. I could pursue the holy grail of restoration on my 80 acres, or I could put forward effort to improve the ability of many groups and individuals to make a much bigger impact over many more acres of land.
A quote from Aldo Leopold, that I first read a few months ago, puts into words a feeling that I could never articulate: "The privilege of possessing the earth entails the responsibility of passing it on, the better for our use, not only to immediate posterity, but to the Unknown Future."

Leopold, author of *A Sand County Almanac*, and originator of the concept of the land ethic, is one of my heroes. I know his words and ideas will remind me of the importance of the restoration we have initiated, as well as the necessary work to share my passion and experience with individuals and groups who will help make the land ethic a part of our reality, even if it is not recognized by that name.

## 5. Develop Your Own Story: Resources and Services for Landowners

A variety of programs and informational resources are offered by state and federal resource agencies and nonprofit conservation organizations to help you take the next steps toward meeting your own land stewardship goals.

### 5.1 Forest Stewardship Program

The Forest Stewardship Program was created by the USFS in 1991 to encourage long-term stewardship of family forest land by providing professional planning and technical assistance to private landowners. Ultimately, the purpose of the program is to enhance and sustain the long-term productivity of forest resources and produce healthy and resilient forest landscapes. As part of the process, landowners work with a certified Forest Stewardship Plan Writer to develop a custom plan that describes your personal land stewardship goals, unique forest resources and suggested management activities.

There are many benefits to developing a Forest Stewardship Plan, including enhanced access to USDA conservation programs, forest certification programs and forest product and ecosystem service markets. For example, you can use your Forest Stewardship Plan to prepare for a timber sale, improve wildlife habitat, or to enroll in other programs that require a forest management plan. Participation in the Forest Stewardship Program is voluntary and landowners can obtain information and cost-share assistance throughout the year.

Administration of the Forest Stewardship Program varies by state. In Michigan the program is administered by the Michigan DNR, who trains and certifies 130 professional foresters and 15 wildlife biologists in the private sector to write simple yet comprehensive Forest Stewardship Plans. Since 1991, almost 5,000 Michigan landowners have used their Forest Stewardship Plan to help them to protect, manage, and enjoy their forest.

Visit www.michigan.gov/foreststewardship to connect with a certified plan writer and take your next step toward managing your land to meet your stewardship goals. More information about the program can also be found at http://www.fs.fed.us/spf/coop/programs/loa/fsp.shtml/.

### 5.2 Qualified Forest Program

The purpose of the Qualified Forest Program, administered by MDARD, is to encourage landowners to actively manage their privately owned forests for commercial harvest, wildlife habitat enhancement, and improvement of other non-forest resources. In exchange for managing their forests in a sustainable fashion, enrolled landowners will receive an exemption from the local school operating millage. In order to qualify for the program, landowners must have between 20 and 640 acres, have an approved forest management plan, and must comply with the prescriptions included in that plan. See www.michigan.gov/qfp for more information or to begin the enrollment process. The application deadline in order to receive tax benefits the following year is September 1.

### 5.3 Commercial Forest Program

The Commercial Forest Act gives property tax breaks for forest owners in Michigan that voluntarily enroll in the Commercial Forest Program. Under this program, landowners pay a specific rate of $1.25 per acre for property taxes and the State of Michigan pays counties another $1.25 per acre. Landowners must have at least 40 acres of contiguous forest, an appropriate forest management plan, and conduct commercial harvests as prescribed in their plan. Land that is included under the Commercial Forest Program must be open to the public for non-motorized recreational use. More information about this program, which is administered by the MDNR, is available online at www.michigan.gov/commercialforest. The application deadline in order to receive tax benefits the following year is April 1.

### 5.4 American Tree Farm System

The American Tree Farm System is a certification program of the American Forest Foundation that acknowledges land management practices meeting certain Standards of Sustainability. As part of this program, a network of more than 82,000 family forest owners sustainably managing 24 million acres of forestland across the country. The American Tree Farm System is recognized by the Programme for the Endorsement of Forest Certification, which is an international forest certification system. Landowners following the Standards of Sustainability can feel proud to be recognized as ambassadors for sustainable woodland stewardship.

The eight Standards of Sustainability that must be met in order to gain recognition as a certified tree farm under the American Tree Farm System program are listed below.

- **Commitment to Practicing Sustainable Forestry**: Landowner demonstrates commitment to forest health and sustainability by developing a forest management plan and implementing sustainable practices.
- **Compliance with Laws**: Forest-management activities comply with all relevant federal, state, and local laws, regulations, and ordinances.
- **Reforestation and Afforestation**: Landowner completes timely restocking of desired species of trees on harvested sites and nonstocked areas where tree growing is consistent with land-use practices and the landowner's objectives.
- **Air, Water and Soil Protection**: Forest-management practices maintain or enhance the environment and ecosystems, including air, water, soil, and site quality.
- **Fish, Wildlife and Biodiversity**: Forest-management activities contribute to the conservation of biodiversity.
- **Forest Aesthetics**: Forest-management activities recognize the value of forest aesthetics.
- **Protect Special Sites**: Special sites are managed in ways that recognize their unique historical, archaeological, cultural, geological, biological, or ecological characteristics.
- **Forest Product Harvests and Other Activities**: Forest product harvests and other management activities are conducted in accordance with the landowner's objectives and consider other forest values.

An approved Forest Stewardship Plan completed through the Forest Stewardship Program or a qualifying NRCS incentives programs can be written to also serve as a qualifying forest management plan under the American Tree Farm System. There is no additional cost to be enrolled in the American Tree Farm System certification program. For more information please visit www.treefarmsystem.org.

## 5.5 USDA Financial and Technical Assistance Programs

**Environmental Quality Incentives Program**
The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program administered by the USDA Natural Resources Conservation Service. It supports production agriculture and environmental quality as compatible goals. Through EQIP, farmers, ranchers, private forest land owners and federally-recognized American Indian tribes may receive financial and technical assistance to implement structural and land management conservation practices on eligible agricultural land. Program priorities aim to address resource concerns including soil erosion, soil quality, water quality degradation, plant productivity, habitat fragmentation, invasive plants, and forest health. Conservation practices related to forestry may include forest trails and landings, stream crossings, riparian forest buffers, forest stand improvement, tree and shrub establishment, brush management, early succession habitat, wetland wildlife habitat, and upland wildlife habitat. EQIP activities are carried out according to a site specific conservation plan developed in conjunction with the producer. Forest Stewardship Plans are accepted by the NRCS when applying for EQIP funding. All conservation practices are installed according to NRCS technical standards.

**The Conservation Reserve Program**
The Conservation Reserve Program (CRP) pays a yearly rental in exchange for farmers removing environmentally sensitive land from agricultural production and planting species that will improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. The Farm Service Agency contracts are 10 to 15 years in duration and include a number of practices: CRP-CP2 Native Grass Planting, CRP-CP3 General Tree Planting, CRP-CP4D Wildlife Habitat, CRP-CP12 Wildlife Food Plot, CRP-CP25 Rare and Declining Habitat (Prairie), CRP-CP25 Rare and Declining Habitat (Savanna), CRP-CP42 Native Pollinator Habitat, and others.

**Conservation Stewardship**
Conservation Stewardship is a program that provides technical and financial assistance to qualified farmers whose applications rank high enough to be accepted into the program. It uses the Conservation Measurement Tool to score current and planned environmental performance. Beginning and socially disadvantaged farmers as well as non-industrial forestland applications compete in separate ranking pools. Supplemental payments reward improved or newly adopted resource-conserving crop rotations. The five-year contracts are eligible for renewal.

**Agricultural Conservation Easement Program**
The Agricultural Conservation Easement Program has several components including Agricultural Land Easements and Wetlands Reserve Easements. These both provide financial

and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Some easements are permanent while others are 30 year contracts.
Contact your local District Conservationist or forester for information and enrollment forms for EQIP or other USDA-NRCS assistance programs. For more information please visit www.nrcs.usda.gov/wps/portal/nrcs/main/mi/programs/.

## 5.6 Best Management Practices for Forest Health, Water Quality and Wildlife

Best Management Practices (BMPs) are stewardship activities that are generally accepted by resource professionals to be the most effective and up-to-date management practices available for protecting forest health, water quality and wildlife habitat. Local agencies and organizations can help you select appropriate BMPs to meet your land management objectives. Financial and technical assistance may be available to help you implement certain BMPs on your land, while other BMPs are simple things you can do on your own to become a better steward of your land.

Contacts provided above can help you enroll in the programs mentioned, develop your Forest Stewardship Plan, and identify and implement on-the-ground Best Management Practices that will allow you achieve your own management objectives while also protecting and enhancing Michigan's unique Landscape.

**Best Management Practices**
Best management practices (BMPs) for forestry involve using practices that reduce impacts to forest health, water quality and wildlife. Some activities such as construction of stream crossings, work in wetlands, and impacts in floodplains are regulated.

One of the keys to good BMPs is to work with a professional forester (or other natural resource consultant) to develop a plan for your property (See Forest Stewardship Program in Section 5.1 and American Tree Farm in Section 5.4). Elements of plans include goals (desired future condition) and objectives (a strategy that moves the system towards the goal in a measurable way). Work plans to accomplish goals and objectives are the operations required to obtain the objectives and should identify the person responsible for the action and the resources needed (labor, seed, and other inputs). Landowners should also consider the financial aspects of implementing the plan. Government agencies usually provide technical assistance for free but incentive programs normally require application and awards are usually competitive. Landowners can work with professional foresters, wildlife biologists and conservation minded wildlife groups to identify programs that may fit their particular situation.

Forest Management plans should include an inventory of trees with a description of the stands (tree areas that can be managed similarly). If timber harvesting is part of the plan, it is usually beneficial to have the logging managed by a professional forester. To increase the economic potential of a forest, a timber stand improvement project may be appropriate to remove less valuable trees and thin trees that may be weak or damaged. Pruning can be done to improve the quality of saw logs, but guidance to avoid spread of oak wilt and other cautions should be followed.

**Sustainable Soil and Water Quality Practices on Forest Land**
The MDNR has a Sustainable Soil and Water Quality Practices on Forest Land Manual that describes a set of voluntary Forestry Best Management Practices (BMPs) that protect soil and water resources while allowing appropriate use of our forest resources. It contains a section on forest wetland protection practices to use when constructing roads and guidance to reduce soil rutting. It addresses forest management activities that affect the integrity and function of Riparian Management Zones. The manual has also updated information on vegetative erosion control and incorporated information on designated trout streams, vernal pools, fens and bogs to provide information about such areas. The Michigan Department of Natural Resources strongly encourages their use by everyone involved with growing, managing and harvesting trees, such as loggers, foresters and forest landowners.

Michigan's Forestry BMP Program contact:
David Price, Forest Planning and Inventory Manager
(517) 284-5891
PriceD1@michigan.gov.

Sustainable Soil and Water Quality Practices on Forest Land - Complete Version (5.60 MB)
http://www.michigan.gov/dnr/0,4570,7-153-31154_31261---,00.html

**Water Quality Best Management Practices**
Many of the Best Management Practices (BMPs) that apply to forestry apply to other land uses as well. Water quality can be protected by keeping vegetation and plant residues on the soil surface to increase infiltration and reduce runoff which produces erosion. On crop lands (and other areas such as garden plots) cover crops such as annual rye, oats, and clover can be used to protect the soil surface from the energy of falling raindrops and overland flows. Erosion control can be achieved by vegetative practices or by installing structures (check dams, detention basins, etc.) that decrease the potential for gully formation. To protect streams and lakes from excess nitrogen and phosphorus, nutrient management practices such as soil testing to determine appropriate levels of fertilization and the proper timing, placement and form of fertilizers can be used. Similarly, pest management practices include strategies like use of biological controls, integrated pest management (monitor pests and only apply when economic damage justifies use of pesticides), and careful following of pesticide label requirements.

**Wildlife Management**
Your land plan should address what wildlife is desired and how it is to be managed. Wildlife benefit from having appropriate habitat, plentiful food sources, and adequate water supply. Existing natural areas can be managed by inventorying communities present to see if resources are adequate. If the desired habitat is not present, the landowner can consider creating the plant community that benefits the target species. Most wildlife prefers native plants, so control of invasive species can improve habitat. Methods of invasive plant control include: mechanical, chemical, fire, grazing, and competition from noninvasive species.

## 5.7 Capital Gains Tax Information

Profits from timber sales are taxed as capital gains, rather than ordinary income, if you own the timber for more than twelve months. Expenses, including the cost of a management plan or a consulting forester's fees for a timber sale, can be deducted from profits. There are many great tax related resources available on www.timbertax.org, including the most recent edition of the annual "Tax Tips for Forest Landowners."

## Appendix 1: Glossary of Common Forestry Terms

The following glossary is adapted from www.dnr.state.md.us/forests/gloss.html.

**Agroforestry**: A land-use system that combines both agriculture and forestry in one location.
**Alley Cropping**: Widely spaced rows of trees with annual crops growing in between the rows.
**Basal Area (Tree)**: Cross-sectional area of a tree at 4.5 feet off ground in square feet.
**Basal Area (Forest)**: Basal area of all trees per acre summed up, in units of square feet/acre; measure of density.
**Biomass**: Harvesting and using whole trees or parts of trees for energy production.
**Board Foot**: A measure of volume 1 foot by 1 foot by 1 inch or 144 cubic inches of wood.
**Bolt**: 8-foot-long log.
**Browse**: Parts of woody plants, including twigs, shoots, and leaves, eaten by forest animals.
**Carbon Cycle**: The biogeochemical cycle to exchange carbon between the biosphere and atmosphere by means of photosynthesis, respiration and combustion.
**Clearcut**: The harvest of all the trees in an area to reproduce trees that require full sunlight.
**Cord**: A unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet
**Cordwood**: small diameter or low quality wood suitable for firewood, pulp, or chips.
**Crop Tree**: A young tree of a desirable species with certain desired characteristics.
**Crown**: The uppermost branches and foliage of a tree.
**Cruise**: A forest survey used to obtain inventory information and develop a management plan.
**Cull**: A sawtimber size tree that has no timber value as a result of poor shape or damage.
**Diameter at Breast Height (DBH)**: Diameter of a tree trunk taken at 4.5 feet off the ground.
**Diameter-Limit Sale**: A timber sale in which all trees over a specified DBH may be cut. Diameter-limit sales often result in high grading and is a very poor forestry practice.
**Endangered Species**: A species in danger of extinction.
**Even-Aged Stand**: Stand with minimal age difference between the oldest and youngest trees (e.g. <10 years).
**Forestland**: Land at least one acre in size that is at least 10 percent stocked with trees.
**Forest Farming**: Cultivating high value specialty crops in the shade of natural forests.
**Forest Stand Improvement (FSI)**: Any practice that increases the health, composition, value or rate of growth in a stand. Called Timber Stand Improvement when focused on timber**.**
**Group Selection**: Harvesting groups of trees to open the canopy and encourage development of uneven aged stands.
**Habitat**: The ecosystem in which a plant or animal lives and obtains food and water.
**Hardwoods**: A general term encompassing broadleaf, deciduous trees.
**High Grading**: To remove all good quality trees from a stand and leave only inferior trees.
**Landing**: Cleared area where logs are processed, piled, and loaded for transport to a sawmill.
**Log Rule**: A method for calculating wood volume in a tree or log by using its diameter and length. Scribner, Doyle and the International 1/4-inch rule are common log rules.
**Lump-Sum Sale**: A timber sale in which an agreed-on price for marked standing trees is set before the wood is removed (as opposed to a mill tally or unit sale).
**Mast**: Nuts and seeds such as acorns, beechnuts, and chestnuts that serve as food for wildlife.
**Overmature**: Trees that have declined in growth rate because of old age and loss of vigor.
**Overstocked**: Trees are so closely spaced that they do not reach full growth potential.

**Pole Timber**: Trees ranging from 4 to 10 inches Diameter at Breast Height.
**Pre-Commercial Operations**: Cutting to remove wood too small to be sold.
**Prescribed Fire**: An intentional and controlled fire used as a management tool used to reduce hazardous fuels or unwanted understory plants (invasive, undesirable species, etc.).
**Pulpwood**: Wood suitable for use in paper manufacturing.
**Range**: Cattle grazing in natural landscapes.
**Regeneration**: The process by which a forest is reseeded and renewed.
**Riparian Forest Buffers**: Strips of land along stream banks where trees, shrubs and other vegetation are planted and managed to capture erosion from agricultural fields.
**Salvage Cut**: The removal of dead, damaged, or diseased trees to recover value.
**Sapling**: A tree at least 4.5 feet tall and between 1 inch and 4 inches in diameter.
**Sawlog**: Log large enough to be sawed economically, usually >10"diameter and 16' long.
**Sawtimber stand**: A stand of trees whose average DBH is greater than 11 inches.
**Sealed-Bid Sale**: A timber sale in which buyers submit secret bids.
**Seed-Tree Harvest**: Felling all trees except for a few desirable trees that provide seed for the next forest.
**Selection Harvest**: Harvesting single trees or groups of trees at regular intervals to maintain uneven-aged forest.
**Shade-Intolerance**: Characteristic of certain tree species that does not permit them to survive in the shade of other trees. Shade-intolerant trees require full sunlight.
**Shade-Tolerance**: The capacity of a tree species to grow in shade.
**Shelterwood Harvest**: Harvesting all mature trees in two or more cuts, leaving trees to protect seedlings.
**Silvopasture**: Growing trees and forages to provide suitable pasture for grazing livestock.
**Silviculture**: The art and science of growing forest trees.
**Site Index**: Measure of quality of a site based on the height of a dominate tree species at 50 years old.
**Site Preparation**: Treatment of an area prior to reestablishment of a forest stand.
**Skidder**: A rubber-tired machine with a cable winch or grapple to drag logs out of the forest.
**Slash**: Branches and other woody material left on a site after logging.
**Snag**: A dead tree that is still standing and providing food and cover for a variety of wildlife.
**Softwood**: Any gymnosperm tree such as pines, hemlocks, larches, spruces, firs, junipers, etc.
**Species of Special Concern**: Not a designated threatened or endangered species yet, but has low or declining populations.
**Stand**: A group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.
**Stand Density**: The quantity of trees per unit area, evaluated in basal area, crown cover or stocking.
**Stocking**: The number and density of trees in a forest stand. Classified as under-, over-, or well-stocked.
**Stumpage Price**: The price paid for standing forest trees and paid prior to harvest.
**Succession:** the replacement of one plant community by another over time in the absence of disturbance.
**Sustained Yield**: Ideal forest management where growth equals or exceeds removals and mortality.

**Thinning**: Partial cut in an immature, overstocked stand of trees to increase the stand's value and growth.
**Threatened Species**: A species whose population is so small that it may become endangered.
**Timberland**: Forest capable of producing 20 cubic feet of timber per acre per year.
**Under-stocked**: Trees so widely spaced, that even with full growth, crown closure will not occur.
**Understory**: The level of forest vegetation beneath the canopy.
**Uneven-Aged Stand**: Three or more age classes of trees represented in a single stand.
**Unit Sale**: A timber sale in which the buyer makes regular payments based on mill tally and receipts.
**Veneer Log**: A high-quality log of a desirable species suitable for conversion to veneer.
**Well-Stocked**: Stands where growing space is effectively occupied but there is still room for growth.
**Windbreaks**: Rows of trees to provide shelter for crops, animals or farm buildings.

## Appendix 2: Michigan Laws Related to Forestry

This list is not comprehensive and other laws may apply to your situation. Consult an attorney or resource professional for additional assistance.

- Natural Resources and Environmental Protection Act, Public Act 451 of 1994
- Right to Forest Act, Public Act 676 of 2002
- Commercial Forest Act, Parts 511 and 512 of Public Act 451, 1994, as amended
- Qualified Forest Program, Public Acts 42 and 45 of 2013

## Appendix 3: Threatened, Endangered, and Special Concern Species

The following tables reflects presents the Endangered (E), Threatened (T), and Presumed Extirpated (X) animal species of Jackson, Hillsdale, and Lenawee Counties, which are protected under the Endangered Species Act of the State of Michigan (Part 365 of PA 451, 1994 Michigan Natural Resources and Environmental Protection Act). For more information visit: https://mnfi.anr.msu.edu/data/county.cfm

| *Scientific Name* | *Common Name* | *Status* | *Jackson* | *Hillsdale* | *Lenawee* |
|---|---|---|---|---|---|
| *Acris blanchardi* | Blanchard's cricket frog | T | X | X | X |
| *Acronicta falcula* | Corylus dagger moth | SC | | | X |
| *Adlumia fungosa* | Climbing fumitory | SC | | | X |
| *Agrimonia rostellata* | Beaked agrimony | T | | X | X |
| *Alasmidonta marginata* | Elktoe | SC | X | X | X |
| *Alasmidonta viridis* | Slippershell | T | X | X | X |
| *Ambystoma texanum* | Smallmouth salamander | E | | X | |
| *Ammocrypta pellucida* | Eastern sand darter | T | | X | X |
| *Ammodramus henslowii* | Henslow's sparrow | E | X | X | X |
| *Ammodramus savannarum* | Grasshopper sparrow | SC | X | | X |
| *Angelica venenosa* | Hairy angelica | SC | X | | X |
| *Anguispira kochi* | Banded globe | SC | X | | |
| *Arnoglossum plantagineum* | Prairie indian-plantain | SC | | | X |
| *Artemisia ludoviciana* | Western mugwort | T | | | X |
| *Asclepias hirtella* | Tall green milkweed | T | X | | |
| *Asclepias purpurascens* | Purple milkweed | T | X | | X |
| *Asclepias sullivantii* | Sullivant's milkweed | T | | | X |
| *Asio flammeus* | Short-eared owl | E | | X | |
| *Astragalus canadensis* | Canadian milk vetch | T | | | X |
| *Baptisia lactea* | White or prairie false indigo | SC | X | X | X |
| *Basilodes pepita* | Gold moth | SC | | X | X |
| *Battus philenor* | Pipevine swallowtail | SC | | | X |
| *Besseya bullii* | Kitten-tails | E | X | | |
| *Betula populifolia* | Gray birch | SC | X | | |
| *Bombus affinis* | Rusty-patched bumble bee | SC | | | X |
| *Botaurus lentiginosus* | American bittern | SC | X | | |
| *Bouteloua curtipendula* | Side-oats grama grass | E | X | | |
| *Brickellia eupatorioides* | False boneset | SC | X | | |
| *Calephelis mutica* | Swamp metalmark | SC | X | X | X |
| *Camassia scilloides* | Wild hyacinth | T | | | X |
| *Carex albolutescens* | Sedge | T | | | X |
| *Carex conjuncta* | Sedge | T | | X | X |
| *Carex crus-corvi* | Raven's-foot sedge | E | | | X |

| | | | | | |
|---|---|---|---|---|---|
| *Carex davisii* | Davis's sedge | SC | | | X |
| *Carex lupuliformis* | False hop sedge | T | | X | |
| *Carex squarrosa* | Sedge | SC | | | X |
| *Carex trichocarpa* | Hairy-fruited sedge | SC | | | X |
| *Carex typhina* | Cattail sedge | T | X | | |
| *Catocala illecta* | Magdalen underwing | SC | | | X |
| *Chlidonias niger* | Black tern | SC | X | | |
| *Chrosomus erythrogaster* | Southern redbelly dace | E | | | X |
| *Cincinnatia cincinnatiensis* | Campeloma spire snail | SC | | | X |
| *Cirsium hillii* | Hill's thistle | SC | X | X | |
| *Cistothorus palustris* | Marsh wren | SC | X | | X |
| *Clemmys guttata* | Spotted turtle | T | X | | X |
| *Clinostomus elongatus* | Redside dace | E | | X | X |
| *Clonophis kirtlandii* | Kirtland's snake | E | | | X |
| *Collinsia verna* | Blue-eyed Mary | SC | | X | X |
| *Coregonus artedi* | Lake herring or Cisco | T | X | X | |
| *Cuscuta polygonorum* | Knotweed dodder | SC | | | X |
| *Cryptotis parva* | Least shrew | T | X | | |
| *Cyclonaias tuberculata* | Purple wartyback | T | X | | X |
| *Cypripedium candidum* | White lady slipper | T | X | X | X |
| *Dennstaedtia punctilobula* | Hay-scented fern | T | X | | |
| *Diarrhena obovata* | Beak grass | SC | | | X |
| *Dichanthelium leibergii* | Leiberg's panic grass | T | X | X | |
| *Dichanthelium polyanthes* | Round-seed panic-grass | E | | | X |
| *Discus patulus* | Domed disc | SC | X | | |
| *Dorydiella kansana* | Leafhopper | SC | X | X | |
| *Echinacea purpurea* | Purple coneflower | X | | X | |
| *Eleocharis engelmannii* | Engelmann's spike rush | SC | X | | X |
| *Eleocharis equisetoides* | Horsetail spike rush | SC | X | X | |
| *Eleocharis geniculata* | Spike-rush | X | X | | |
| *Emydoidea blandingii* | Blanding's turtle | SC | X | X | X |
| *Endodeca serpentaria* | Virginia snakeroot | T | | | X |
| *Epioblasma torulosa rangiana* | Northern riffleshell | E | | | X |
| *Erimyzon claviformis* | Creek chubsucker | E | X | X | X |
| *Etheostoma spectabile* | Orangethroat darter | SC | | X | |
| *Euonymus atropurpureus* | Wahoo | SC | | | X |
| *Eupatorium sessilifolium* | Upland boneset | T | X | | |
| *Euphyes dukesi* | Dukes' skipper | T | X | X | X |
| *Eutrochium fistulosum* | Hollow-stemmed Joe-pye weed | T | | | X |
| *Falco peregrinus* | Peregrine falcon | E | X | | |
| *Fixsenia favonius ontario* | Northern hairstreak | SC | | | X |
| *Flexamia reflexa* | Leafhopper | SC | | | X |
| *Fraxinus profunda* | Pumpkin ash | T | | X | |
| *Fundulus dispar* | Starhead topminnow | SC | | X | |

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|---|---|---|---|---|---|
| *Galearis spectabilis* | Showy orchis | T | | X | X |
| *Gallinula galeata* | Common gallinule | T | X | | |
| *Geum virginianum* | Pale avens | SC | X | | X |
| *Haliaeetus leucocephalus* | Bald eagle | SC | X | X | X |
| *Helianthus hirsutus* | Whiskered sunflower | SC | | | X |
| *Helianthus mollis* | Downy sunflower | T | X | | |
| *Hybanthus concolor* | Green violet | SC | | | X |
| *Hydrastis canadensis* | Goldenseal | T | X | | X |
| *Ixobrychus exilis* | Least bittern | T | X | | |
| *Jeffersonia diphylla* | Twinleaf | SC | | | X |
| *Lactuca floridana* | Woodland lettuce | T | | | X |
| *Lampsilis fasciola* | Wavyrayed lampmussel | T | X | X | X |
| *Lepyronia angulifera* | Angular spittlebug | SC | X | | X |
| *Ligumia recta* | Black sandshell | E | X | | X |
| *Lithospermum latifolium* | Broad-leaved puccoon | SC | | | X |
| *Lycopus virginicus* | Virginia water-horehound | T | | | X |
| *Mesomphix cupreus* | Copper button | SC | X | X | |
| *Mertensia virginica* | Virginia bluebells | E | | | X |
| *Mesodon clausus* | Yellow globelet | SC | | | X |
| *Morus rubra* | Red mulberry | T | | | X |
| *Moxostoma carinatum* | River redhorse | T | | X | |
| *Muhlenbergia richardsonis* | Mat muhly | T | X | | |
| *Myotis lucifugus* | Little brown bat | SC | X | X | X |
| *Myotis septentrionalis* | Northern long-eared bat | SC | X | X | |
| *Myotis sodalis* | Indiana bat | E | X | X | X |
| *Myrica pensylvanica* | Northern bayberry | T | X | | |
| *Neonympha mitchellii mitchellii* | Mitchell's satyr | E | X | | X |
| *Nerodia erythrogaster neglecta* | Copperbelly water snake | E | | X | |
| *Notropis amblops* | Bigeye chub | X | | X | X |
| *Notropis anogenus* | Pugnose shiner | E | | X | X |
| *Noturus miurus* | Brindled madtom | SC | | | X |
| *Notropis photogenis* | Silver shiner | E | | X | |
| *Notropis texanus* | Weed shiner | X | X | | |
| *Noturus miurus* | Brindled madtom | SC | X | X | |
| *Nycticeius humeralis* | Evening bat | T | | | X |
| *Oarisma poweshiek* | Poweshiek skipperling | T | X | | X |
| *Obovaria subrotunda* | Round hickorynut | E | | | X |
| *Oecanthus laricis* | Tamarack tree cricket | SC | X | X | x |
| *Ophioglossum vulgatum* | Southeastern adder's-tongue | E | | | X |
| *Opsopoeodus emiliae* | Pugnose minnow | E | | X | |
| *Panax quinquefolius* | Ginseng | T | X | X | |
| *Pantherophis spiloides* | Gray ratsnake | SC | X | X | X |

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|---|---|---|---|---|---|
| *Papaipema beeriana* | Blazing star borer | SC | X | | |
| *Papaipema maritima* | Maritime sunflower borer | SC | X | | |
| *Papaipema sciata* | Culvers root borer | SC | X | | |
| *Papaipema silphii* | Silphium borer moth | T | X | | |
| *Papaipema speciosissima* | Regal fern borer | SC | X | | X |
| *Parkesia motacilla* | Louisiana waterthrush | T | | X | |
| *Penstemon pallidus* | Pale beard tongue | SC | | | X |
| *Phlox ovata* | Wideflower phlox | E | | | X |
| *Platanthera ciliaris* | Orange- or yellow-fringed orchid | E | X | | |
| *Plantago cordata* | Heart-leaved plantain | E | | X | |
| *Pleurobema clava* | Clubshell | E | | X | |
| *Pleurobema sintoxia* | Round pigtoe | SC | X | X | X |
| *Poa paludigena* | Bog bluegrass | T | X | | |
| *Polemonium reptans* | Jacob's ladder | T | | | X |
| *Polygala cruciata* | Cross-leaved milkwort | SC | X | | |
| *Pomatiopsis cincinnatiensis* | Brown walker | SC | X | | X |
| *Populus heterophylla* | Swamp or Black cottonwood | E | | | X |
| *Prunus umbellata* | Alleghany or Sloe plum | SC | | | X |
| *Ptychobranchus fasciolaris* | Kidney shell | SC | | X | X |
| *Rallus elegans* | King rail | E | X | | |
| *Ruellia strepens* | Smooth ruellia | E | | | X |
| *Scleria triglomerata* | Tall nut rush | SC | X | | |
| *Scutellaria nervosa* | Skullcap | E | | X | |
| *Scutellaria ovata* | Forest skullcap | T | | | X |
| *Setophaga cerulea* | Cerulean warbler | T | X | X | |
| *Setophaga citrina* | Hooded warbler | SC | X | X | |
| *Silene stellata* | Starry campion | T | X | X | |
| *Silphium perfoliatum* | Cup plant | T | | | X |
| *Simpsonaias ambigua* | Salamander mussel | E | | | X |
| *Sistrurus catenatus* | Eastern massasauga | SC | X | X | X |
| *Sisyrinchium strictum* | Blue-eyed-grass | SC | X | X | |
| *Speyeria idalia* | Regal fritillary | E | X | | X |
| *Sphaerium fabale* | River fingernail clam | SC | X | | X |
| *Spiza americana* | Dickcissel | SC | X | | X |
| *Sporobolus heterolepis* | Prairie dropseed | SC | X | | X |
| *Sturnella neglecta* | Western meadowlark | SC | | X | |
| *Stylurus amnicola* | Riverine snaketail | SC | X | | |
| *Stylurus laurae* | Laura's snaketail | SC | X | | |
| *Symphyotrichum praealtum* | Willow aster | SC | | | X |
| *Terrapene carolina carolina* | Eastern box turtle | SC | X | X | X |
| *Toxolasma lividus* | Purple lilliput | E | | X | |
| *Toxolasma parvum* | Lilliput | E | | X | X |
| *Trichophorum clintonii* | Clinton's bulrush | SC | X | | |

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|---|---|---|---|---|---|
| *Trichostema brachiatum* | False pennyroyal | T | | | X |
| *Trillium sessile* | Toadshade | T | | | X |
| *Truncilla truncata* | Deertoe | SC | X | | X |
| *Utterbackia imbecillis* | Paper pondshell | SC | X | X | |
| *Valeriana edulis var. ciliata* | Edible valerian | T | X | X | X |
| *Vallonia parvula* | Trumpet vallonia | SC | X | | |
| *Ventridens suppressus* | Flat dome | SC | X | X | |
| *Venustaconcha ellipsiformis* | Ellipse | SC | X | X | |
| *Viburnum prunifolium* | Black haw | SC | | X | X |
| *Villosa fabalis* | Rayed bean | E | | X | X |
| *Villosa iris* | Rainbow | SC | X | X | X |
| *Zizania aquatica* | Wild rice | T | X | | |

## Appendix 4: Additional Resources for Landowners

Internet Sources (Alphabetically)

Audubon Society: www.MichiganAudubon.org

Conservation Easements: www.landtrustalliance.org/topics/taxes/income:tax-incentives-land-conservation

DNR Forest Resources Division: www.Michigan.gov/Forestry
DNR Hunting Access Program: www.michigan.gov/hap
DNR Private Forest Land: www.Michigan.gov/PrivateForestLand
DNR Urban and Community Forestry: www.michigan.gov/ucf
DNR Wildlife Division: www.Michigan.gov/Wildlife
DNR Wildlife Landowner Incentive Program: www.michigan.gov/dnrlip

Field Identification Guides to Invasive Plants in Michigan:
www.mnfi.anr.msu.edu/invasive-species/InvasivePlantsFieldGuide.pdf
www.michigan.gov/dnr/0,4570,7-153-10370_12146---,00.html
Foresters for the Birds: http://vt.audubon.org/foresters-birds
Forestry Taxes: www.timbertax.org

Heart of the Lakes (Collective of Michigan's land conservancies): www.heartofthelakes.org

Leafsnap: An Electronic Field Guide: www.leafsnap.com

Michigan Association of Conservation Districts: www.mcad.org
Michigan Chapter of the Soil and Water Conservation Society: www.miglswcs.org
Michigan Environmental Education Curriculum Support: www.michigan.gov/meecs
Michigan Forest Association Foresters List: www.michiganforests.com/forester.htm
Michigan Forest Pathways: http://miforestpathways.net
Midwest Invasive Species Network: www.misin.msu.edu
Michigan Nature Association: https://www.michigannature.org
Michigan Society of American Foresters: http://michigansaf.org
Michigan State University Department of Forestry: www.for.msu.edu
Michigan State University Diagnostics Laboratory: www.pestid.msu.edu
Michigan State University Extension Forestry: http://msue.anr.msu.edu/topic/info/forestry
Michigan State University Soil Testing Laboratory: www.spnl.msu.edu
Michigan Sustainable Forestry Initiative: http://sfimi.org
Michigan Technological University School of Forest Resources & Environmental Science:
www.mtu.edu/forest
Michigan United Conservation Clubs: www.mucc.org
My Land Plan: www.mylandplan.org

National Wild Turkey Federation: www.nwtf.org

National Woodland Owners Association: www.woodlandowners.org
NRCS Financial Assistance:
www.nrcs.usda.gov/wps/portal/nrcs/main/mi/technical/landuse/forestry
NRCS PLANTS Database: www.plants.usda.gov
http://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx
NRCS Technical Service Providers:
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp/

Pheasants Forever: www.pheasantsforever.org
Project Learning Tree: www.michiganplt.org
Project WILD: www.michigan.gov/michiganprojectwild

Quality Deer Management Association: www.qdma.com

Ruffed Grouse Society: www.ruffedgrousesociety.org

Sample Timber Sale Contract:
www.nhdfl.org/library/pdf/Forest%20Protection/timbersaleagreement.pdf

Ties to the Land (succession planning to pass forest to next generation): www.tiestotheland.org
Tree Sales:
www.michigan.gov/documents/dnr/DirectoryOfMichiganSeedlingNurseries:IC4175_258828_7.pdf?20141113140132
Trout Unlimited: www.michigantu.org

USDA Soil Web Survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm
USFS Ecosystem Services: www.fs.fed.us/ecosystemservices/index.shtml
USFS Private Woodland Owners: http://na.fs.fed.us/pubs/misc/flg
USFS State and Private Forestry: www.fs.fed.us/spf
USFS Wetland Mapper https://www.fws.gov/wetlands/Data/Mapper.html

Whitetails Unlimited: www.whitetailsunlimited.com
Woodland Stewardship: www.woodlandstewardship.org

**Books for Landowners**

1. Woodland Stewardship: A Practical Guide for Midwestern Landowners (2nd Edition). 2009. This book, written by a team of educators and foresters from Minnesota, Wisconsin, and Michigan is an excellent manual on how to manage your forest for a wide variety of goals. (A free pdf of the entire book is online at): http://woodlandstewardship.org

2. Owning and Managing Forest: A Guide to Legal, Financial, and Practical Matters (Revised). 2005. This book is written by Thomas McEvoy, an Extension Professor at the University of Vermont. It contains excellent advice on the legal and financial issues of owning and managing a family forest.

3. A Landowner's Guide to Managing Your Woods. 2011. This book is authored by a landowner, forester, and logger to give a balanced view of forest management and how to maintain a small forest for long-term health, biodiversity, and high-quality timber production.

4. Michigan Trees: A Guide to the Trees of the Great Lakes Region (Revised). 2004. This book is the classic text on tree identification in Michigan authored by two U of M professors. It has drawings instead of photos, but the book has more complete information than the ID books with prettier photos.

5. Michigan Forest Communities: A Field Guide and Reference. 2004. This book, by Dr. Don Dickmann at MSU, describes 23 forest communities in Michigan. The book is available from MSU Extension. A free pdf is at http://web2.msue.msu.edu/bulletins/Bulletin/PDF/E3000.pdf.

6. The Forests of Michigan (Revised). 2016. This book by two MSU forestry professors is an interesting history of Michigan's forests over the last few centuries and is available at the University of Michigan Press.

7. Positive Impact Forestry: A Sustainable Approach to Managing Woodlands. 2004. This book is written by Thomas McEvoy, an Extension Professor at the University of Vermont. It is a great introduction to silviculture, the science and art of growing and managing forests.

8. Estate Planning for Forest Landowners: What Will Become of Your Timberland? 2009. Nothing is more dreadful than death and taxes, but this book helps landowners prepare for both. To ease your pain, it is free at http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs112.pdf. See also www.timbertax.org

9. Trees Are the Answer (Revised). 2010. This book is written by Dr. Patrick Moore, one of the founders of Greenpeace. His perspective on forestry will appeal to both tree huggers and loggers.

10. Managing Michigan's Wildlife: A Landowner's Guide. 2001. This book, edited by two biologists for the Michigan Department of Natural Resources, is the classic text in Michigan for landowners on wildlife habitat and managing forests for preferred game species. This book about wildlife habitat management is only available at: www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm

11. A Sand County Almanac. 1949. This book by Aldo Leopold is one of the foundations for environmental ethics that continues to inform forest stewardship of both private and public lands. This book will help you to articulate your own ethical approach to managing your forest.

12. Last Child in the Woods. 2008. This book by Richard Louv is a strong argument that our nation's children are suffering from "nature deficit disorder." This book will give you great ideas about how you can bring school groups, scout groups, church groups, or even your own children out into your forest to experience and enjoy nature.

13. A Landowner's Guide to Managing Your Woods. 201. Written by A.L. Hansen, M. Severson, and D.L. Waterman. It covers how forests grow, successional processes, planning, inventorying, working safely in the woods, and how to do a timber sale.