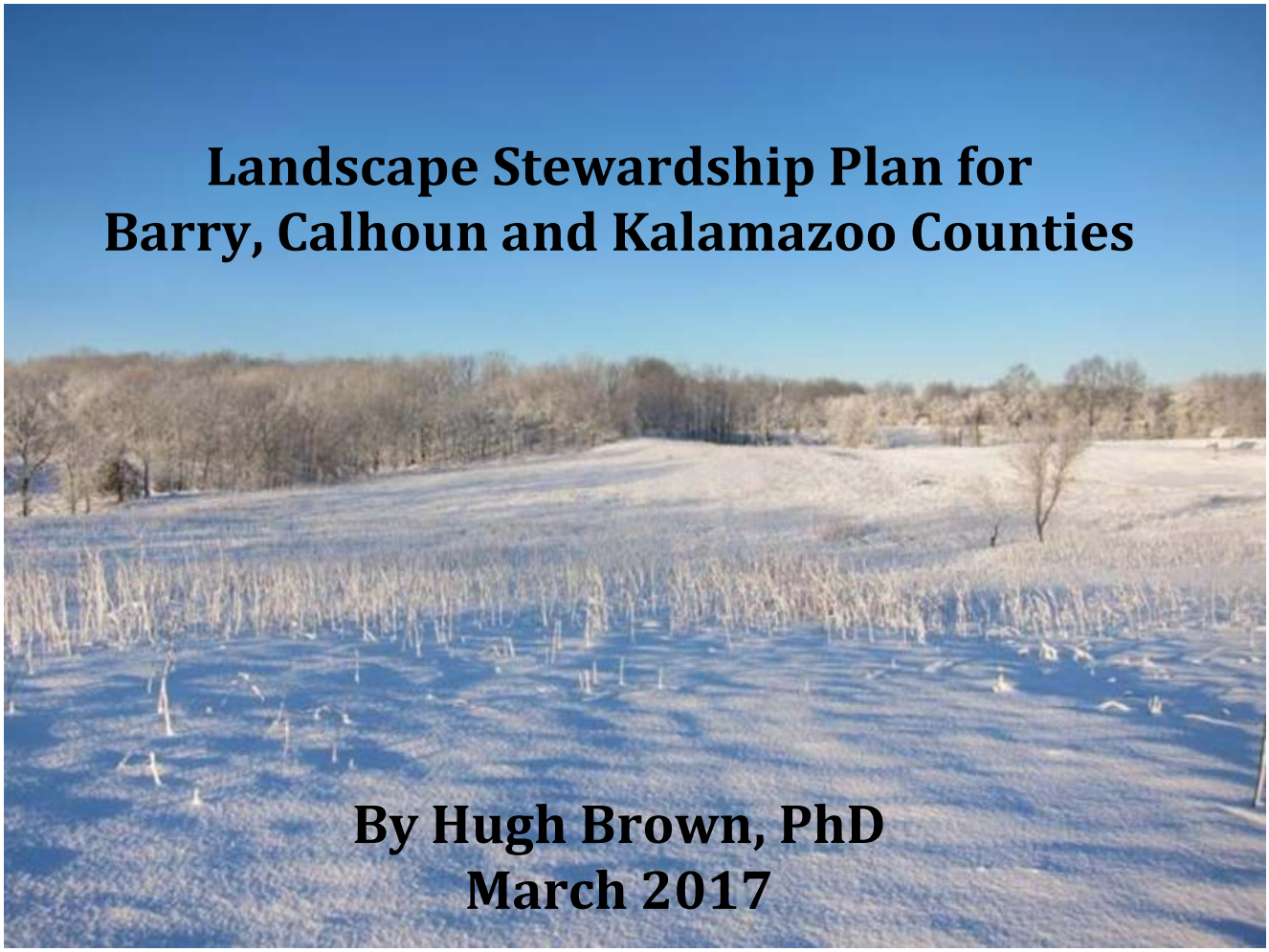
Landscape Stewardship Plan for Barry, Calhoun and Kalamazoo Counties



By Hugh Brown, PhD

March 2017

The Stewardship Network

Foreword

This Landscape Stewardship Plan is intended to help landowners to understand the resources on their property, provide assistance in setting goals and objectives for their property, and manage their land more effectively.

Acknowledgements

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The author would like to thank the US Forest Service for funding the project, the DNR Forest Stewardship staff (especially Mike Smalligan) for coordination, and Lisa Brush at The Stewardship Network for administering the subcontract for this plan. The author appreciates the assistance from the many private landowners, public agencies, and nonprofit organization staff that provided input for the plan. Josh Liesen from Huron Pines provided material for the Project Introduction section of this document. Michael Anderson (Kalamazoo Nature Center staff member and Kalamazoo College alumnus) contributed two of the Stewardship Stories.

Cover photo: Winter scene at Pierce Cedar Creek Institute in Barry County

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About the Author

Dr. Hugh Brown is a natural resource consultant with more than thirty-five years of experience in environmental management. His PhD in Soil Management is from Iowa State University and he had a postdoctoral appointment at the University of Vermont studying nitrogen management on a dairy farm. He was an Associate Professor in the Natural Resources and Environmental Management Department at Ball State University in Muncie, Indiana and also served as its Chair for six years. He was Field Station Director at Pierce Cedar Creek Institute near Hastings, Michigan from 2011 to 2013. His publications include articles in the Australian Journal of Soil Research, Agronomy Journal, and the Soil Science Society of America Journal; he co-authored "Caring for Land Trust Properties" (one of Land Trust Alliance's Standards and Practices Curriculum books). He previously served as President of the Michigan Chapter of the Soil and Water Conservation Society and the Indiana Land Protection Alliance.

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1. Executive Summary

The nine Landscape Stewardship Plans developed through this project describe the areas' physical, biological and cultural resources; provide a summary of existing resource assessments; and review existing stewardship plans. The process of developing each landscape stewardship plan has brought resource professionals and other stakeholders closer together, and the plans serve to connect landowners and land managers with information about practices and programs that will help people take the next step toward becoming more engaged land managers. The intent of developing this plan is to connect the people and organizations to each other and to foster stewardship information, resources and assistance programs, thereby increasing our collective capacity to protect and maintain the products, services and values on which this region depends. By working collaboratively at the landscape scale we can better address the regional challenges that threaten the health and sustainability of our forests and other natural resources.

This Landscape Stewardship Plan covers Barry, Calhoun and Kalamazoo Counties and is part of a larger project funded by a U.S. Forest Service grant administered by the Michigan Department of Natural Resources. This is a region with a landscape composed of a mixed land use with forests, cropland, wetlands, and urban areas. It includes major portions of the Kalamazoo and Thornapple River Watersheds along with smaller sections of the Gun, Paw Paw, Upper Grand and St. Joseph Rivers. Well-managed land provides an economic base for the region with agriculture, recreation, and tourism; improves quality of life; and allows residents to enjoy sense of place.

Barry, Calhoun and Kalamazoo Counties (BCK area) have many forests and wetlands that contribute to the natural beauty of the landscape. In particular, there are large tracts of public land in the Barry State Game Area and Fort Custer State Recreation Area. In addition to public lands, many private landowners have preserved natural plant communities including forests, grasslands, and wetlands. These efforts are supported by the Southwest Michigan Land Conservancy, which owns seven nature preserves with public access in the three-county area. The conservancy also holds conservation easements on many properties including several of those who shared their conservation success stories (see Section 4). The BCK area has several environmental education centers including Kalamazoo Nature Center, Pierce Cedar Creek Institute and the Outdoor Education Center (part of the Battle Creek school system).

The landscape in the three counties was shaped by glaciers that retreated about 13,000 years ago, leaving extensive deposits of sand and gravel outwash as well as loamy materials on the till plains. These deposits served as parent materials for the soils that have formed under the influence of topography, climate, and biological processes. The climate in the area is humid continental with hot summers and cold winters that are characterized by lake effect snowfall. Prior to European settlement, the landscape was dominated by extensive forests. These were logged and converted into farmland which now covers almost half of the area. The BCK area has abundant water resources in rivers, lakes, and smaller water bodies including wetlands.

Wildlife is another important natural resource and the Barry Calhoun Kalamazoo area has high quality habitat for diverse animals including two endangered species (Indiana bat and Mitchell's Satyr Butterfly) and many threatened species. The area has large populations of games species such as white-tailed deer, wild turkeys, waterfowl, and others that support hunting and trapping. Fishing in the area's lakes and streams is another popular recreational activity that helps support the local economy.

The Landscape Stewardship Plan is designed to encourage a collaborative landscape-scale approach to stewardship by partnering with many conservation organizations (see Section 3.2). Because most land is privately held, individual landowners are the target audience of this plan. The project partners hope that the resources provided herein can assist in management that keeps private land healthy and productive.

A good first step in this process is to create a stewardship plan for your property. 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.

Qualifying landowners can use the Michigan Department of Natural Resources' program to create a Forest Stewardship Plan. At last count, there were 20,847 acres covered by forest stewardship plans in the three-county area. 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. Whether a landowner decides to have a plan written through a forester or write their own plan, the local conservation district can provide cost-free assistance landowners throughout this process.

A key element of each landscape stewardship plan is the collection of inspirational stewardship stories told by the people living and working within the focal landscapes. Through these stories, local landowners and land managers share why and how they are active stewards of their own forests. Whether that means a small private property or a large area of public land, these stories are told with the hope of inspiring other landowners and land managers to join in and become actively involved in the stewardship of our collective forest resources. Our forests are, after all, interconnected with all of the other physical, ecological and cultural elements of the landscape we call home.

See Landscape Stories in Section 4 and Best Management Practices in Section 5.1 for more information.

2. Project Introduction

The Michigan Department of Natural Resources received a grant in 2015 from the United States Forest Service that funded a two-year partnership with three conservation organizations to promote the stewardship of private and public forest land in Michigan. Each partner solicited input from many collaborators in their project area during the project.

At the start of the project, Mike Smalligan, Forest Stewardship Program coordinator for the DNR, said "This project will develop nine 'Landscape Stewardship Plans' in three very diverse regions in Michigan. Each Landscape Stewardship Plan will describe the current forest resources in a one to four county region and include a collection of stories that highlight a variety of forest management opportunities." Smalligan added that the Landscape Stewardship Plans will highlight both private and public landowners doing interesting forest stewardship activities on their land.

Smalligan continued "This innovative project will combine the strengths of multiple organizations to enhance public and private partnerships for sustainable forest management in nine landscapes that total eight million acres throughout Michigan. Developing these landscape stewardship plans will help us to better engage private landowners by sharing stories that inspire them to become active managers of their own forest land."

The Stewardship Network developed six Landscape Stewardship Plans (Fig. 1) 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 very strategic as it is where 75% of Michigan's population of 10 million people resides.

Huron Pines, a nonprofit organization working to conserve the forests, lakes and streams of Northeast Michigan, developed 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 cover two very common forest types in northern Michigan (northern hardwoods and jack pine).

The Nature Conservancy developed 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.

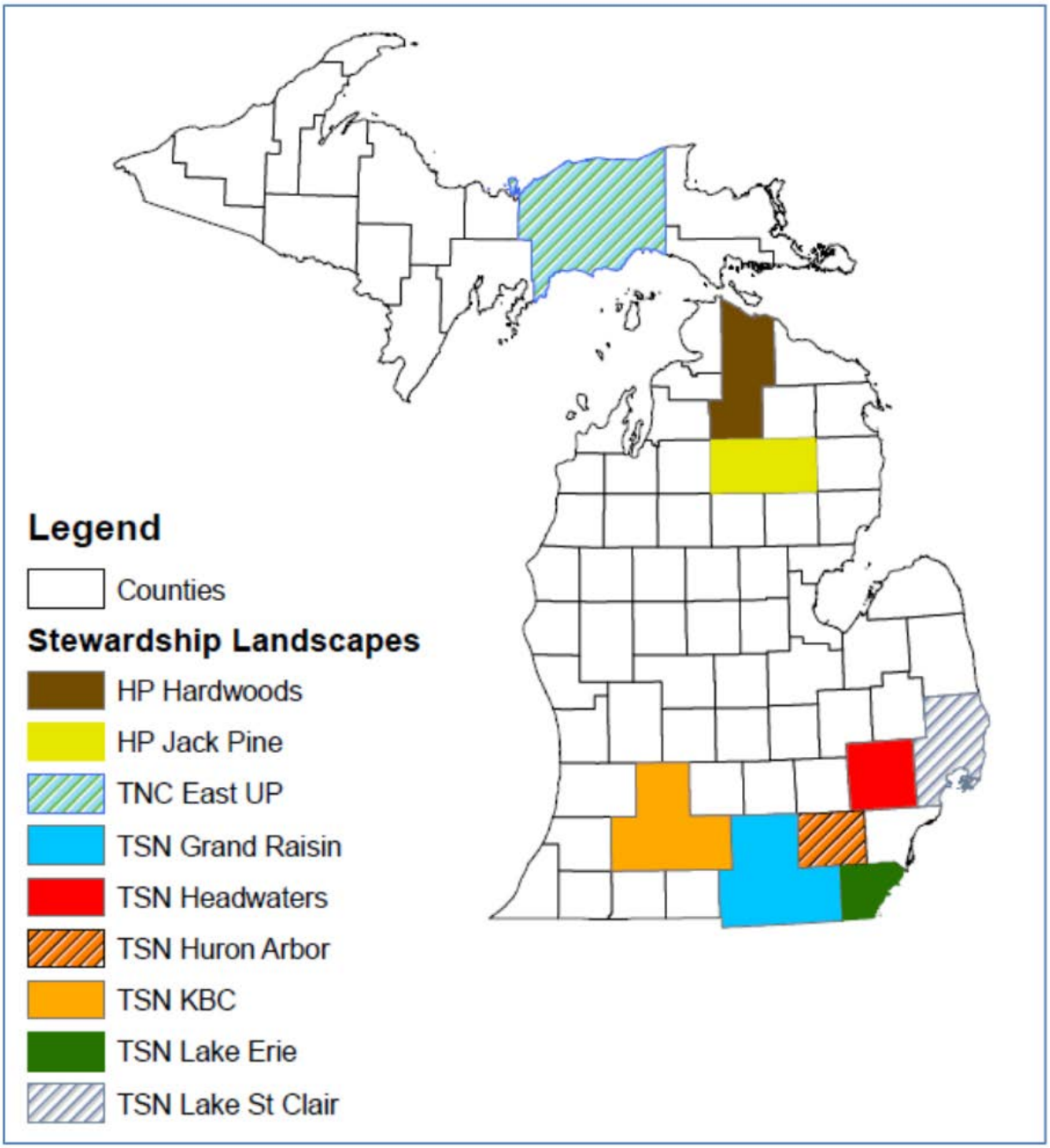

Fig. 1. Map of Michigan showing location of Landscape Stewardship Plan Areas. TSN KBC corresponds to The Stewardship Network's Barry, Calhoun, and Kalamazoo Counties Area.

2.1 Project Goals and Objectives

Michigan's forests face myriad threats—invasive species, tree diseases, climate change, habitat fragmentation, and 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 2.4: 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 3.5: Maintain Community Quality of Life and Economic Resiliency
  - Issue 3.6: Maintain and Enhance Scenic and Cultural Quality on Private Forestland
  - Issue 3.7: Maintain Forested Ecosystems for Biodiversity and for Wildlife Habitat
  - Issue 3.8: 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 acres are privately owned. Federal, state and local agencies are responsible for managing our 7.7 million acres of public lands which compose about 21% of the state's land area. However, the overall health of Michigan's unique forest, water and wildlife resources ultimately depends on the collective management activities of all landowners and 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 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 at 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. Nevertheless, people in surrounding counties or other areas with similar characteristics will generally also find that these landscape stewardship plans are useful.

The Barry-Calhoun-Kalamazoo Counties Area (BCK) was identified as an appropriate landscape because it has important resources such as the Barry State Game Area, Middleville State Game Area, Fort Custer State Recreation Area, Yankee Springs State Recreation Area, Michigan Audubon Sanctuaries, Kalamazoo Nature Center, Pierce Cedar Creek Institute, and numerous other natural areas. Coupled with private lands, these properties create a broad expanse of forested area (unusual for the Southern Lower Peninsula). The three counties are also the service area for the recently organized BCK Cooperative Invasives Species Management Area which coordinates efforts to effectively manage problematic exotic plants and animals and educate stakeholders through regional, community-based collaborations.

The Stewardship Network coordinated with the landscape stewardship project partners (especially Huron Pines) to develop the text in Section 2, including the project background and project goals, objectives and methodology. To complete Section 3: Landscape Context, the author conducted a review of existing resource assessments and management plans/strategies. We also met with government agencies, private resource providers and nonprofit organizations to collect information on the various assistance programs and opportunities that are available, with a focus on forest stewardship. Contacts for each program are included 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.

Eleven stewardship stories, based on interviews with local landowners and land managers, are included to illustrate some of the practices that people near you are doing. Rather than simply providing a list of recommendations that property owners can follow, we hope these stories inspire others to learn more and take advantage of the opportunities that are out there. The Stewardship Network and our partners identified people that are doing great stewardship on their land and who want to tell their stories. We had conversations with individual, state and nonprofit land owners and managers to document the land stewardship activities that people are doing in Barry, Calhoun, and Kalamazoo Counties. 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.

For a summary of the available assistance programs, additional resources and contacts to help you enhance your land stewardship, see Sections 3.2.1, 3.2.2 and 3.2.3.

3. Landscape Context

3.1 The Physical, Ecological and Cultural Landscape

3.1.1 Geographic Scope

This landscape stewardship plan covers Barry, Calhoun, and Kalamazoo Counties in Southwest Michigan (Fig.2). Altogether, Barry, Calhoun, and Kalamazoo Counties contain 1,874 square miles (1,199,383 acres) of land, most of which is in agricultural land use. Barry has 577 square miles (4.2% water); Calhoun has 718 square miles (1.7% water); and Kalamazoo has 580 square miles (3.2% water). The three counties include major portions of the Kalamazoo and Thornapple River Watersheds along with smaller sections of the Gun, Paw Paw, Upper Grand and St. Joseph Rivers. The land supports our region's economy and helps define our sense of place.

All counties are just over 24 miles in the N-S dimension and in the E-W direction, except for Calhoun County which is 30.1 miles wide. The southern border of Kalamazoo County is at 42.069 N degrees of latitude (Calhoun County is nearly the same) and the northern boundary of Barry County is at 42.771 N, giving a spread of slightly more than 0.7 of a degree of latitude. The eastern limit of Calhoun County is -84.710 W and the western boundary of Kalamazoo County is -85.766 W, producing 1.06 degrees of longitudinal variation.

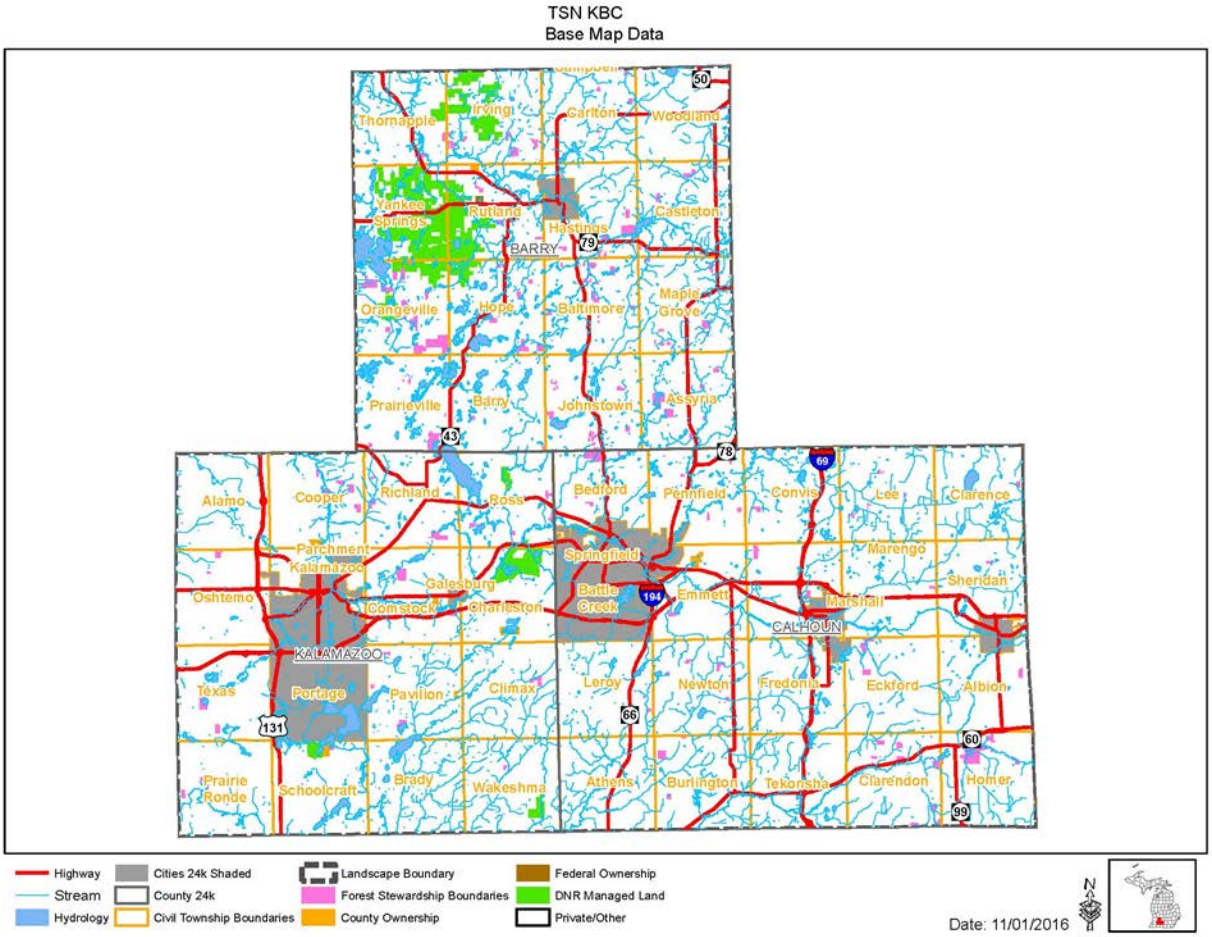

Fig. 2. Base map of Barry, Calhoun and Kalamazoo Counties (Michigan DNR).

3.1.2 Cultural Landscape

The three counties have a range of cultural features ranging from large blocks of natural area to urban areas that include Kalamazoo, the 16th most populous city in Michigan; Battle Creek, which ranks 30th; and Portage, which is 37th in population. Barry County has the smallest population at 59,173 people (2010 Census) with Hastings as its largest city and county seat. Calhoun County had 136,146 people in 2010 and Marshall is the county seat but Battle Creek is more populous. Kalamazoo County had 250,331 people according to the 2010 Census with Kalamazoo being the county seat and serving as home to 74,262 persons. Barry and Kalamazoo Counties have been increasing slightly in population but Calhoun County lost 1.3% between 2000 and 2010. Each county has a number of towns and villages and many of the residents live in rural areas or around the many lakes that dot the land. Kalamazoo County is the most densely populated area at 446 persons per square mile compared to 192 for Calhoun County and 107 persons per square mile for Barry County.

The area is served by several colleges and universities: Western Michigan University, Albion College, Kalamazoo College, Kalamazoo Valley Community College and Kellogg Community College in Battle Creek which has the satellite campuses at the Eastern Academic Center in Albion and the Fehsenfeld Center in Hastings. Michigan State University has both academic and research facilities at their Kellogg Biological Station near Hickory Corners in Kalamazoo County.

See Stewardship Story 4.2 Asylum Lake at Western Michigan University and 4.9 Lillian Anderson Arboretum at Kalamazoo College.

3.1.3 Climate, Geology, Topography and Land Cover

Climate

The BCK area has a humid, continental climate and it is affected by its proximity to Lake Michigan. The lake effect, combined with prevailing westerly winds, increases cloudiness and snowfall during the fall and winter, and moderates temperature throughout most of the year. The Kalamazoo-Portage area (the most populous urban area in the three counties) has a mean (1981 to 2010 data) annual temperature of 49 F (20 C) and mean precipitation of about 36 inches (0.9 m). Summers can be hot and humid, while winter temperatures occasionally drop below 0 °F (-18° C). Lake-effect storms are commonplace in the area and Kalamazoo's mean annual snowfall is 65 inches (1.65 m).

Link for climate: http://www.ncdc.noaa.gov/cdo-web/datatools/normals

Michigan State University has weather stations at several locations including Albion, Ceresco, Hastings, Hickory Corners, and Kalamazoo as part of their Enviroweather network. This service provides real-time weather data as well as historical records of air temperature, precipitation, relative humidity, etc. (https://enviroweather.msu.edu/homeAlpha.php)

Typical frost-free dates for Kalamazoo range from May 1 to 10 (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.

Southwest 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

Most climate models show Michigan getting warmer (average annual temperature has increased 1.5 F in the last 100 years) and to have more extreme weather events such as rainfall in excess of 2 inches. However, warmer summer temperatures and low summer rainfall may lead to an increase in drought. (https://www.epa.gov/climate-impacts/climate-impacts-midwest)

According to the third U.S. National Climate Assessment, "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 Northern Institute of Applied Climate Science (NIACS) and Northern Michigan University have produce vulnerability reports for Michigan forests, identifying "winners" and "losers" among tree species and forest communities (www.nrs.fs.fed.us/pubs/45688). 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 are negatively impacted. 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

Geology

The geology of the BCK area consists of a gradient of bedrock materials that radiate out from near Alma to form the Michigan Basin. These sedimentary layers were deposited in the Mississippian Age (approximately 325 to 360 million years ago). In northeastern Barry County is the Michigan Formation, an assemblage of limestone, shale and gypsum that is a younger material than the layers to the southwest (Marshall Sandstone and Coldwater Shale). There are few outcrops of bedrock because the area was covered by glacial deposits, generally 150 to 400 feet in depth, during the last ice age (Wisconsinan).

Report of Bedrock Geology - Barry County, Michigan Investigation 15 - State of Michigan www.michigan.gov/documents/deq/GIMDL-RI15_216262_7.pdf

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 tends to be coarse material with a large amount of sand, gravel and boulders) reflects the retreats and halts of the glacial lobes that covered the area: Lake Michigan in the west and the Saginaw sublobe of the Huron lobe to the east. The Kalamazoo moraine extends from Hastings south and east through Marshall and west through Kalamazoo. The Outer Ridge of the Kalamazoo moraine marks the most easterly extent of the Lake Michigan lobe.

Between the Michigan and Saginaw lobes is a geologic deposit called the Barry Interlobate which is characterized by rugged topography created by ice contact features (partially stratified sand and gravels produced by meltwater coming off of the edge of a glacier). The most dramatic glacial features on the map are northeast-southwest trending Saginaw Lobe tunnel valleys, many of which contain eskers (winding ridges of stratified sand and gravel deposited by glacial meltwater) and cross a broad, high-relief, hummocky terrain formed by the stagnation of the Saginaw Lobe. The bedrock surface, rising in elevation to the south, may have provided a topographic barrier to impound glacial lakes in the northern part of the area according to survey work done by Alan Kehew and colleagues from the Department of Geosciences at Western Michigan University. These glacial deposits were the parent material for soils in the upland portion of the landscape.
Link for Moraines: http://geo.msu.edu/extra/geogmich/moraines.html

The Kehew map of glacial geology in Barry County is available at:
www.secure.touchnet.net/C21782_ustores/web/product_detail.jsp?PRODUCTID=2265&SINGLESTORE=true

Oil and Gas

There are oil and gas wells in all three counties with the highest concentration found in northeastern Calhoun County. A map showing the distribution of oil & gas wells is at: http://www.michigan.gov/documents/deq/deq-ogs-gimdl-GGMOG05_310107_7.PDF

Hydraulic Fracturing in Michigan

Recent developments with hydraulic fracturing (or "fracking"), which is the process of pumping a mixture of water, sand and a small amount of chemicals into an oil or gas formation, have yielded more hydrocarbons, but critics are concerned about the potential for contamination, the large amounts of water that are used in the operation, disposal of the fracking fluids that are reclaimed, truck traffic, and other environmental issues. The State of Michigan is generally supportive of the oil and gas industry.
See: www.michigan.gov/documents/deq/deq-FINAL-frack-QA_384089_7_452648_7.pdf

The Hydraulic Fracturing in Michigan Integrated Assessment is a partnership involving the University of Michigan, industry representatives, environmental organizations, and state regulators that examined aspects of gas extraction technique with an emphasis on impacts and issues related to the State of Michigan. The goal of the Assessment was to present information about the likely strengths, weakness, and outcomes of various courses of action in order to support informed decision making. The website provided below has a useful Executive Summary on the topic.
http://graham.umich.edu/emopps/hydraulic-fracturing

Topography:

The topography of the three-county area is generally hilly and is influenced strongly by past glaciation and contemporary river valleys. The high point of Barry County is 1,138 feet above sea level (near Yankee Springs); in Calhoun it is 1,106 feet (near Tekonsha); and for Kalamazoo County, the highest elevation is 1,056 feet (at several points along the west edge of the county). The floodplains of rivers such as the Kalamazoo and Thornapple have gentle slopes in a mostly westerly direction towards Lake Michigan. Topography has a major effect on land use and areas with steeper slopes or high water tables more likely to be forested. The more level till plains and outwash plains (material deposited by meltwater from the glaciers) are commonly in row-crop agriculture. The lowest areas on the landscape are typically occupied by streams, lakes or wetlands.

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

Michigan Physiographic Map

The Michigan Physiographic Map web page 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/

Land Cover

This is a region with a landscape composed of a mixed land use with cropland, forests, wetlands, and urban areas (Fig. 3). The dominant land use in the three-county area is agricultural, a combination of row crops (corn and soybean) as well as dairy operations, and other types of farms including vegetable growers. Based on analysis completed by MDNR, 46.5% of the land was used for agriculture. Calhoun County has the most farmland and Kalamazoo County the least (it has more developed land). Barry County had the most livestock which produced slightly more economic return than Calhoun, but Kalamazoo County had the most farm income at $224 million (2012) according to the National Agricultural Statistical Service.

The second most common land use is forest with 21.6% of the area covered by trees. Most of the land was covered by forest prior to 1800 except for a fairly large grassland tract (Prairie Rhonde) in southwest Kalamazoo County and smaller pockets of grassland in other portions of the area.

The third most common land use is wetland with woody wetlands being most extensive, emergent/herbaceous wetlands intermediate, and shrub/scrub wetlands occupying the smallest area. The total of the three types is 14.2% of the total land area and the National Wetland Inventory shows a similar area (169,941 acres) as wetlands.

The final land use category mapped is developed area with low, medium and high intensity. A total of 13.8% of the area is urbanized with open space within developments tallying 51% and low intensity (residential areas) accounting for 34% of the developed land use.

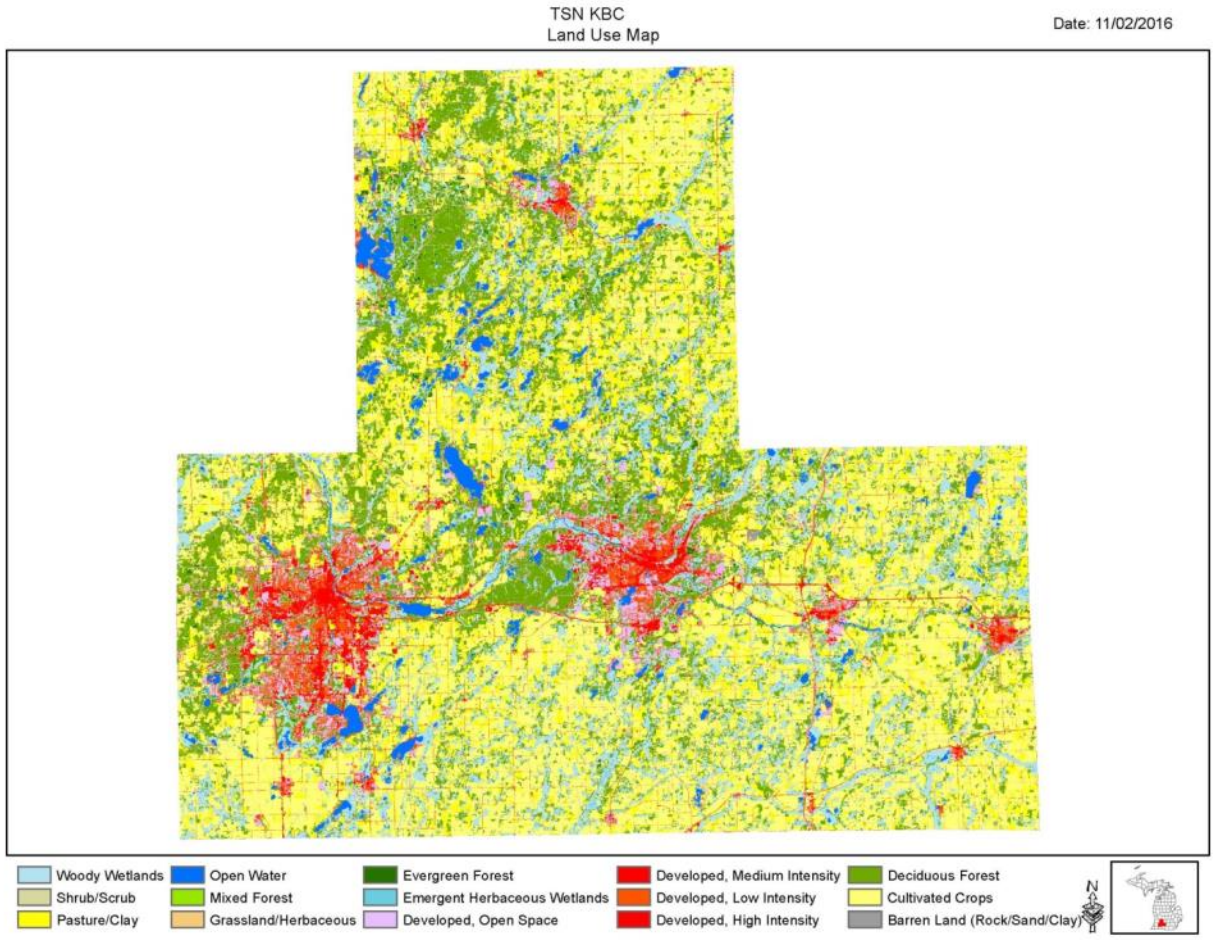

Fig. 3. Land Cover Map for Barry, Calhoun and Kalamazoo Counties (Michigan DNR).

Land Ownership

In the BCK area, there are 30,408 acres owned by the MDNR (Fig.4). These include the Barry State Game Area, Middleville State Game Area, Fort Custer State Recreation Area, and Yankee Springs State Recreation Area as well as several smaller properties. The largest tract of federal land is the state-operated Michigan Army National Guard training facility at Fort Custer. Private land ownership dominates in each of the three counties. In 2016, there were 20,847 acres covered by Michigan Department of Natural Resources' Forest Stewardship Plans in the three-county area.

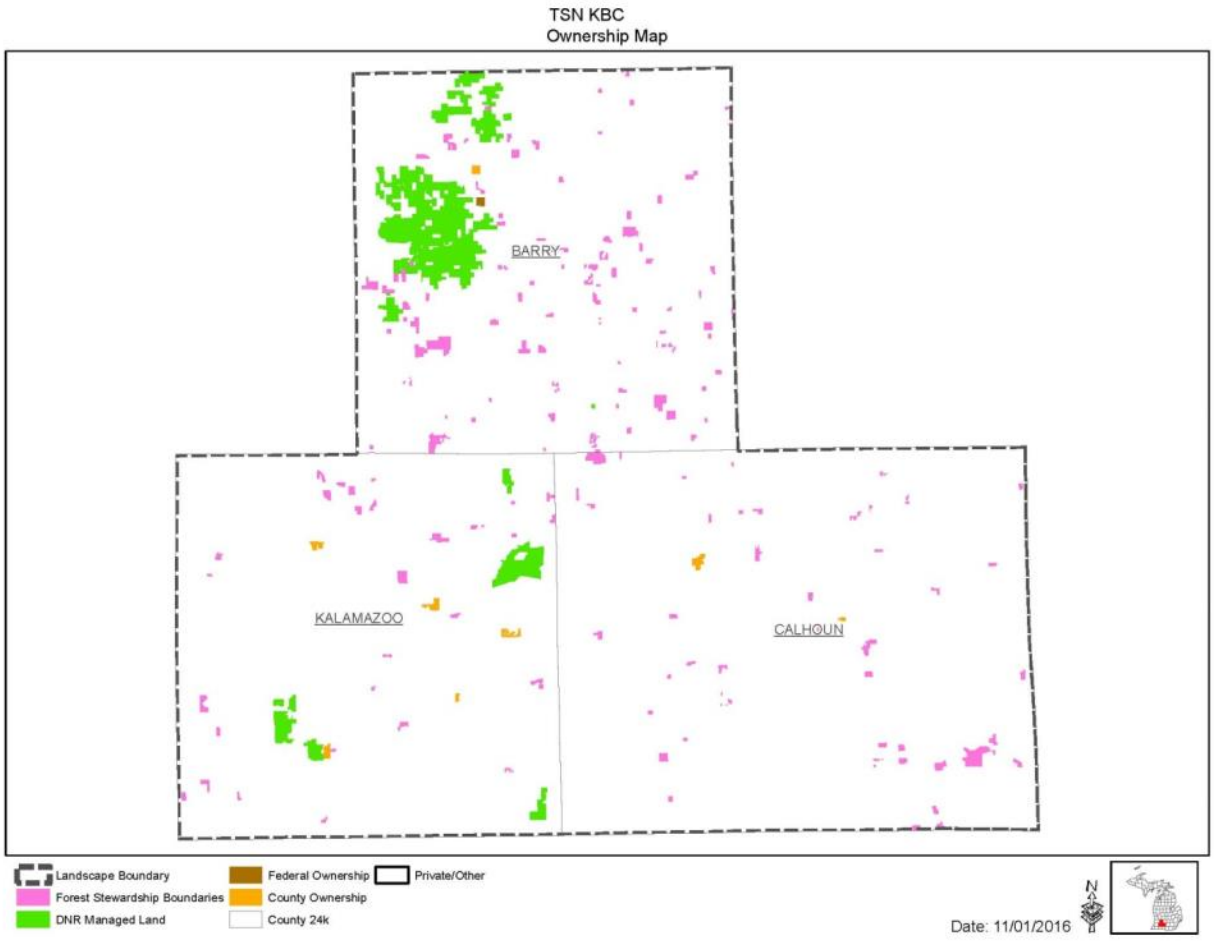

Fig. 4. Land Ownership Map for Barry, Calhoun and Kalamazoo Counties (Michigan DNR).

Presettlement Vegetation

Between 1816 and 1856, Michigan was systematically surveyed by the General Land Office (GLO) and information collected by the land surveyors was 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 to assess historical plant communities. An example map for Kalamazoo County is shown below (Fig. 5).

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

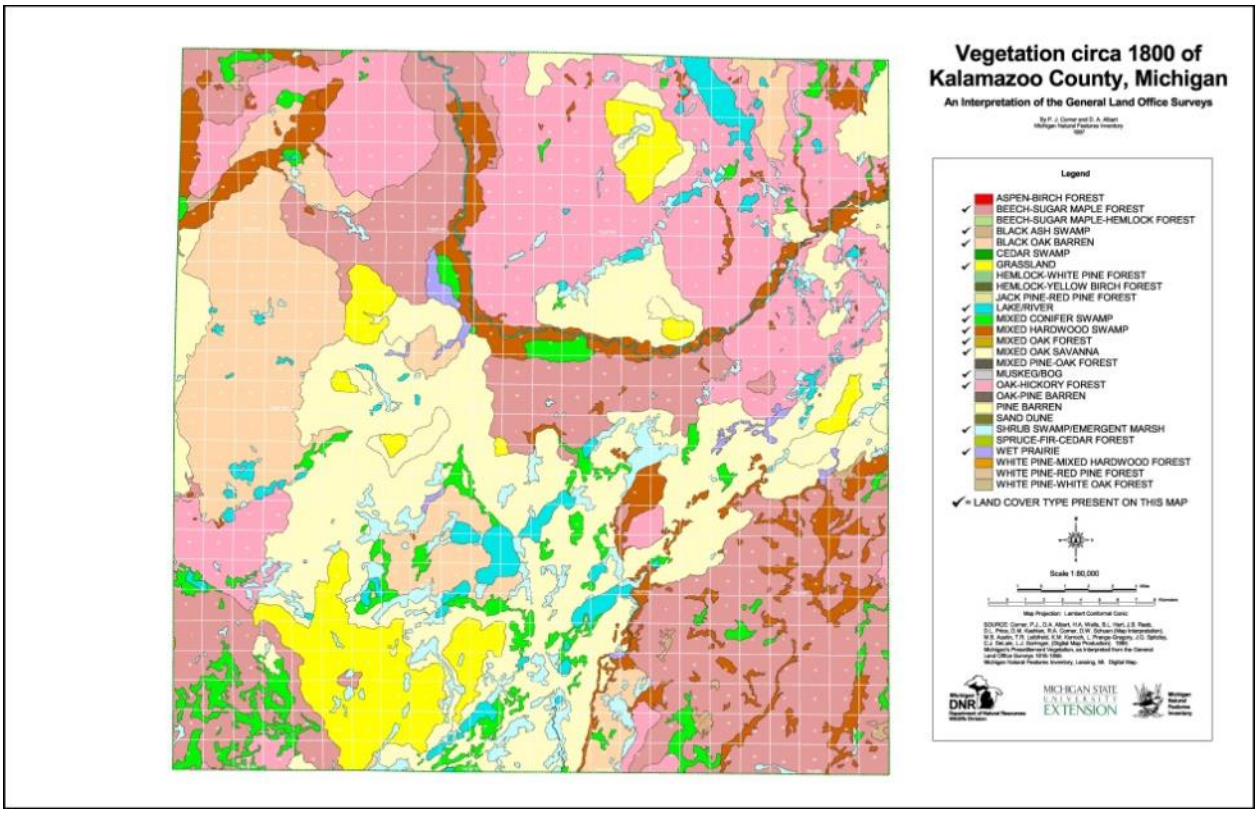

Fig. 5. Presettlement Vegetation Map for Kalamazoo County (MNFI).

3.1.4 Soils

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. 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. Healthy soils are resilient, resist erosion, and are able to support plant growth during droughts. Land management practices can enhance soil health by increasing soil organic matter levels. Landowners can benefit from understanding the relationship between soil characteristics and appropriate land use.

The soils of BCK are generally sandy or loamy and well drained in the uplands with poorer drainage in lower landscape positions that resulted in accumulation of organic deposits and the development of Histosols (soils dominated by organic matter) such as Houghton muck. The soils most frequently mapped in the area are: Oshtemo sandy loam, Kalamazoo loam, and Marlette loam. Most of the soils are productive for agriculture and forestry, but the drier sites may need irrigation to obtain high yields. Table 1 below shows a general relationship among soil properties and ecological habitats but exceptions can occur in certain parent materials and landscape positions.

Table 1. Soil properties in relation to the continuum of ecological habitats.

	Ecological Habitats				
Properties	Xeric	Dry-Mesic	Mesic	Wet-Mesic	Hydric
Average moisture	Very dry	Somewhat dry	Moist	Very moist	Very wet
Drainage	Excessively well	Very well	Well	Somewhat poorly drained	Very poorly or undrained
Surface soil textures	Sand to loamy sand	Loamy sand to sandy loam	Sandy loam to loam	Loam to clay loam	Sandy to clay loam or organic
Natural fertility	Infertile	Moderately infertile to fertile	Very fertile	Fertile to moderately fertile	Moderately fertile to very infertile

Adapted from Michigan Forest Communities: A Field Guide and Reference
By Donald I. Dickmann, Department of Forestry, Michigan State University
See: http://web2.msue.msu.edu/bulletins/Bulletin/PDF/E3000.pdf

Soil investigations have been conducted by the USDA Natural Resources Conservation Service and the three counties have been mapped at a scale of 1:15,840 which is fine enough to represent areas larger than about two acres. The mapping is supported by a large data base that contains information about basic soil properties and the appropriate use of soil areas based on those characteristics. There are numerous interpretations that cover commodity crop production, hydric soils (those associated with wetlands), recreational development, soil health, etc. Under the land management heading, there are several interpretations that relate to forestry such as haul roads, erosion hazard, harvest equipment, seedling mortality and windthrow hazard.

Detailed soil information is provided by the USDA Natural Resources Conservation Service though printed soil surveys (available from County Conservation District Offices) and Web Soil Survey, an Internet site 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. 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 one or two common 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.

See Stewardship Story 4.1 Succession Effects on Soils at Barry State Game Area

3.1.5 Water

Water is a critical resource for growing plants, providing aquatic habitat for fish and other animals, and for residential and industrial use. Southwest Michigan has abundant water resources, but overuse or contamination can negatively impact water quantity and quality.

The Barry Calhoun Kalamazoo area has multiple watersheds draining the land (all of which flow to Lake Michigan). These are the Coldwater River (which flows into the Thornapple), Kalamazoo River (with tributaries of Augusta Cr., Battle Cr., Indian Cr., Rice Cr., Wanadoga Cr., and Wilder Cr.), Paw Paw River (the headwaters extend into western Kalamazoo County), Portage River, St. Joseph River (tributaries include Bear Cr., Nottawa Cr., and Pine Cr.), Gun River, and Thornapple River (fed by Cedar Cr., Glass Cr., Highbank Cr., and Mud Cr.). Rivers and creeks provide fish and aquatic organism habitat, waterfowl, drinking water, recreational opportunities (fishing, boating, and swimming). In the Thornapple River there are more than 48 different fish species, including large and small mouth bass, bluegill, trout, catfish, walleye and perch, indicating a healthy river. Several streams in the region support trout and some people consider the Coldwater River to be one of the best trout streams in Southwestern Michigan.
Trout stream maps: www.michigan.gov/dnr/0,4570,7-153-10364_63235-211883--,00.html

All three counties have many lakes that provide numerous recreational opportunities: boating, fishing, birding, etc. The LakePlace website lists 161 lakes larger than 5 acres in Barry County with Gun Lake having 2,680 acres; Calhoun has 78 lakes with Duck Lake being the largest at 630 acres and Kalamazoo has 100 lakes with Gull Lake having 2,050 acres. The DNR website has maps that show lake depth and other features for selected lakes at:
http://www.michigan.gov/dnr/0,1607,7-153-10364_52261_52964_66796-67543--,00.html

The US Geologic Survey has an extensive amount of watershed information for rivers in the BCK area including stream flows, water quality assessments, and non-indigenous aquatic species that is available at: http://water.usgs.gov/wsc/sub/0405.html

The Kalamazoo River has been affected by polychlorinated-biphenyl (PCB) contamination from the paper industry and was assigned Area of Concern status under the 1987 Great Lakes Water Quality Agreement. The pollution concerns resulted in an 80-mile stretch of the river from Morrow Lake dam (Kalamazoo County) to Lake Michigan being designated as a federal "Superfund" site (Kalamazoo River Watershed Council, 2011). The Kalamazoo River near Marshall was also the site of a 2010 oil spill that resulted in a multi-agency effort to mitigate the effects. The oil spill cleanup effort has been terminated and the court has released Enbridge from additional remedial actions.
https://www3.epa.gov/region5/enbridgespill/ www.mi.gov/oilspill

Resources for Landowners

Many of the rivers in the BCK area have watershed groups that have developed management plans to address resource concerns in the drainage area. These groups are supported by the Department of Environmental Quality which also has a Michigan Natural Shoreline Partnership program to educate property owners about using native plants and technologies that benefit lake ecosystems.
http://www.mishorelinepartnership.org/

See Sections 3.1 and 3.2 and Stewardship Story 4.2: Asylum Lake at Western Michigan University

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 BCK area has about 14% of its land area in wetlands with woody wetlands being the largest in extent, followed by emergent wetlands and 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 Barry Calhoun Kalamazoo 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 from pre-settlement to 2005. Cumulative losses from presettlement to present range from 23% for Barry to 28% for Kalamazoo with Calhoun being intermediate with a 27% loss. Losses in the three-county area for the period of 1978 to 2005 were slight with Barry and Calhoun keeping nearly all of their wetlands and Kalamazoo showing a loss of 1%. As of 2005, the wetland area was: Barry at 46,153 acres, Calhoun at 77,231 acres and Kalamazoo at 41,361 acres.

The Department of Environmental Quality's wetlands program is using geographic information technology 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 maintenance 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 (Fig. 6). 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 helpful guide for understanding wetlands "Wetland Mitigation: Planning Hydrology, Vegetation, and Soils for Constructed Wetlands" (written by Dr. Gary Pierce, first Field Station Director at Pierce Cedar Creek Institute) is available from the Wetland Training Institute.
http://www.wetlandtraining.com/wetland-mitigation/

See Stewardship Stories 4.3: Wetlands: Larry Holcomb and 4.5 Vernal Pools at PCCI.

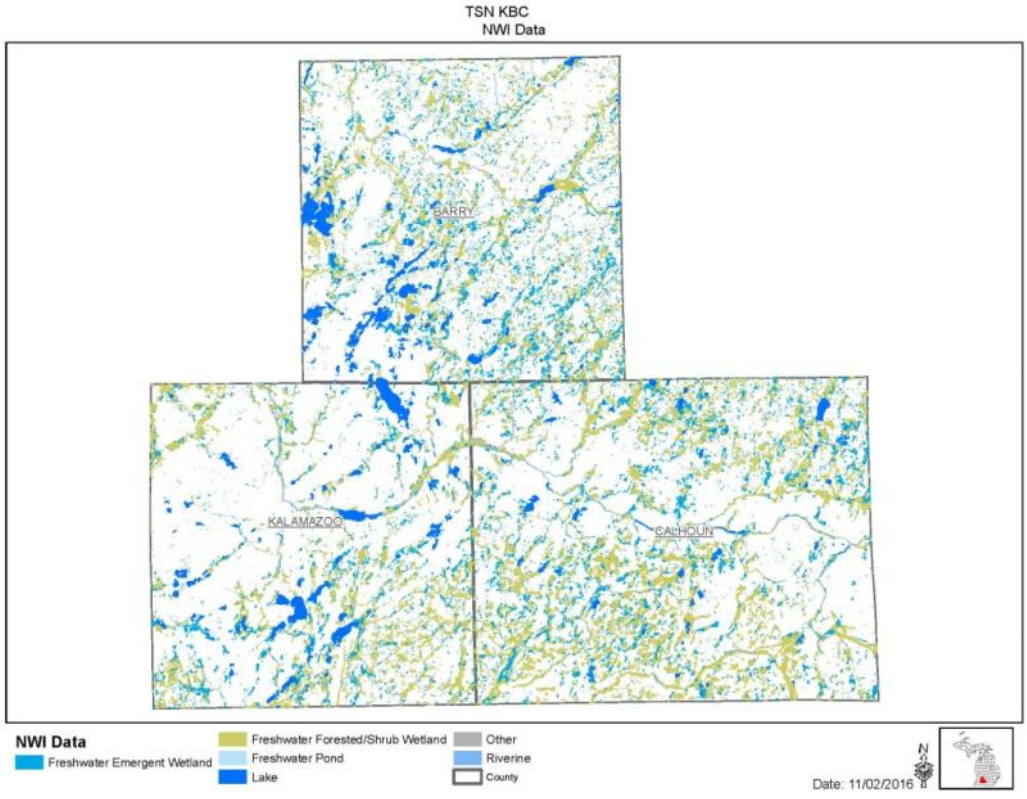

Fig. 6. Wetlands Map for Barry, Calhoun and Kalamazoo Counties (Michigan DNR).

3.1.7 Biological Diversity and Wildlife Habitat

Biological diversity is a term that describes the variety and abundance of species, communities, and ecosystems at spatial scales that range from local to global. Michigan has more vegetation types than any other Midwestern state (it is also the 11th largest and the biggest state east of the Mississippi River). The three counties in this plan have a diverse collection of animals, plants, and plant communities. The main repository for plant and animal distribution information is the Michigan Natural Features Inventory (part of Michigan State University Extension).

Threatened and Endangered Species

The Michigan Natural Features Inventory (MNFI) program 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.

According to the MNFI's Rare Species Explorer, there are 89 endangered, threated, or species of special concern in Barry, 71 in Calhoun and 157 (including 99 flowering plants) in Kalamazoo County. The MNFI website can be searched by taxonomy (type of organism), habitat, state and federal status, and county. Searches for the three counties returned a list of 11 state endangered species for Barry and Calhoun Counties and 18 for Kalamazoo County.
https://mnfi.anr.msu.edu/explorer/search.cfm

Clarence R. Hanes, a faculty member at Western Michigan University, and his wife Florence were avid collectors and helped increase the total number of rare plants for Kalamazoo County. He published "Flora of Kalamazoo County, Michigan Vascular Plants" in 1947 and the WMU Herbarium is named after him. Duane D. McKenna, Department of Organismic & Evolutionary Biology at Harvard University, followed up on the Haneses' work with an article in the Michigan Botanist in 2004 that describes some of the species that have been lost since settlement by Euro-Americans. Mckenna paper: http://quod.lib.umich.edu/m/mbot/0497763.0043.301?rgn=main;view=fulltext

The US Fish and Wildlife Service lists two endangered species in the BCK area: Indiana bat (Myotis sodalis) and Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*). The northern long-eared bat (*Myotis septentrionalis*) has threatened status. The bats roost and forage 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 Calhoun County. 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.

Pierce Cedar Creek Institute is a biological field station that serves as a summer home to a number of college students from surrounding schools, and they have conducted an extensive inventory of its biological resources. Their species list contains 445 plants, 131 birds, 73 bees, 66 dragonflies and damselflies, 52 mammals, 21 ants, 10 frogs and toads, 9 snakes, 7 turtles and 4 salamanders. The Institute's habitats include forests, prairies, fens, marshes, streams, and lakes on 742 acres in the Cedar Creek watershed. That species list is available at:
www.cedarcreekinstitute.org/DataArchive.html

The Four Townships Watershed Council (Barry and Prairieville in Barry County and Richland and Ross in Kalamazoo County) engaged the Kalamazoo Nature Center to conduct a breeding bird survey and 152 species were recorded. Rare birds included: American woodcock, cerulean warbler, grasshopper sparrow, Louisiana waterthrush, northern saw-whet owl, pine siskin, spotted sandpiper, white-eyed vireo and yellow-bellied sapsucker. According to the study "Appropriate habitat exists for both the cerulean warbler and the grasshopper sparrow within the study area, but regional populations of these two species are down… Minimal habitat currently exists for the more southerly Louisiana waterthrush and white-eyed vireo."

A species inventory conducted at Spring Valley Park, a 180 acre property located in the City of Kalamazoo, identified 426 plants (34% of which were non-native) and 56 species of birds. The diversity of habitats, size of the property and the length of time that it has been protected are factors that affect the number of plants and animals present in a given area. The duration of monitoring and the skill level of the surveyors will also impact the number of species identified.

See Stewardship Story 4.6 on Cerulean Warblers.

Wildlife Habitat

The habitat needs of different animal species vary greatly from patches of plants of less than an acre to territories of about ten square miles for predators such as bears and coyotes. Some species prefer edge habitat, while others require large blocks of grassland or forests. What benefits 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 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, establishing food plots, and planting native trees and shrubs for year-round food and cover. The most common strategy for reducing deer numbers is through hunting. For natural areas near human dwellings, harvesting can be done by 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 so they may want to cooperate with neighbors to achieve management goals.
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 DNR 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, Quality Deer Management Association, and Trout Unlimited. Many of these organizations have programs to provide financial and technical assistance for enhancing wildlife. Michigan United Conservation Clubs form local units to help property owners manage habitat for animals that range more widely such as deer and turkeys. Conservation Districts work with all of these groups as well as landowners to provide wildlife habitat assistance. 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.). The soils in the Barry-Calhoun-Kalamazoo area are generally favorable for tree growth and two of the tallest trees in the state are a 139 ft. shingle oak (5th tallest) in Calhoun County and a 138 ft. sycamore (6th tallest) in Kalamazoo County. These trees are in the "Tallest Trees" portion of the Big Tree Registry maintained by the Michigan Botanical Club (http://michbotclub.org/registry/). American Forest's list of U.S. Champion trees includes a pin cherry in Kalamazoo County. https://www.americanforests.org/explore-forests/americas-biggest-trees/

Forests of Recognized Importance (FORI) are defined by the American Tree Farm organization as "globally, regionally and nationally significant large landscape areas of exceptional ecological, social, cultural or biological values." FORI occur at the landscape level, not the individual stand or ownership level. In Michigan, FORI on private forest land are mostly associated with important wildlife habitat, rare forest types, corridors of unique rivers, and Great Lakes coastlines. In the Southern Lower Peninsula, large intact forests greater than 500 acres that provide habitat for state and federally listed species or for species that require core interior habitat can be considered FORI. In the BCK area, examples would include: the Barry State Game Area, Fort Custer State Recreation Area and Michigan Audubon's Baker Sanctuary.

Landowners who want to increase the number of trees on their land have several options:

- Allow natural regeneration from neighboring trees
- Plant seeds or seedlings of selected trees
- Transplant larger trees (usually with equipment such as a tree spade or backhoe)

The first option is the least expensive, but it may not produce the most desirable tree species. The most common approach is the planting of small seedlings (often with bare roots). This gives faster growth than planting seeds and is relatively inexpensive (many of the conservation districts and other resource organizations offer tree sales). Whichever method is used, the landowner should consider which tree will thrive in a given location based on soil fertility, moisture availability, light conditions and other factors. Use of native trees is highly preferred because they have evolved under local environmental conditions and provide more food for native birds and other wildlife than non-natives. The plantings may need to be watered, weeded, mulched and maintained to encourage tree health. Tree plantings should be monitored regularly in the first few years to ensure that they are not being eaten by deer or rodents. Keep in mind the size of the mature tree and avoid planting near power lines, sidewalks or other areas where they will cause problems in the future. The local conservation district can provide native tree recommendations and sells bare-root seedlings, usually in the spring.

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.

Justification of 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 SW 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. In Barry County, the local conservation district forester can provide cost-free assistance to landowners interested in harvesting a woodlot.

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 (such as for a single mature tree 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.

There is a range of tree-harvesting equipment with the simplest tools being a chainsaw and a tractor (or draft horses). 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 cut 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 (some have jaws that can cut trees up to 15 inches in diameter) and a feller-buncher (cuts trees off with a chainsaw, saw disk, or shears and then stacks for pickup). All 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 (Fig. 7). 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, forest 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 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

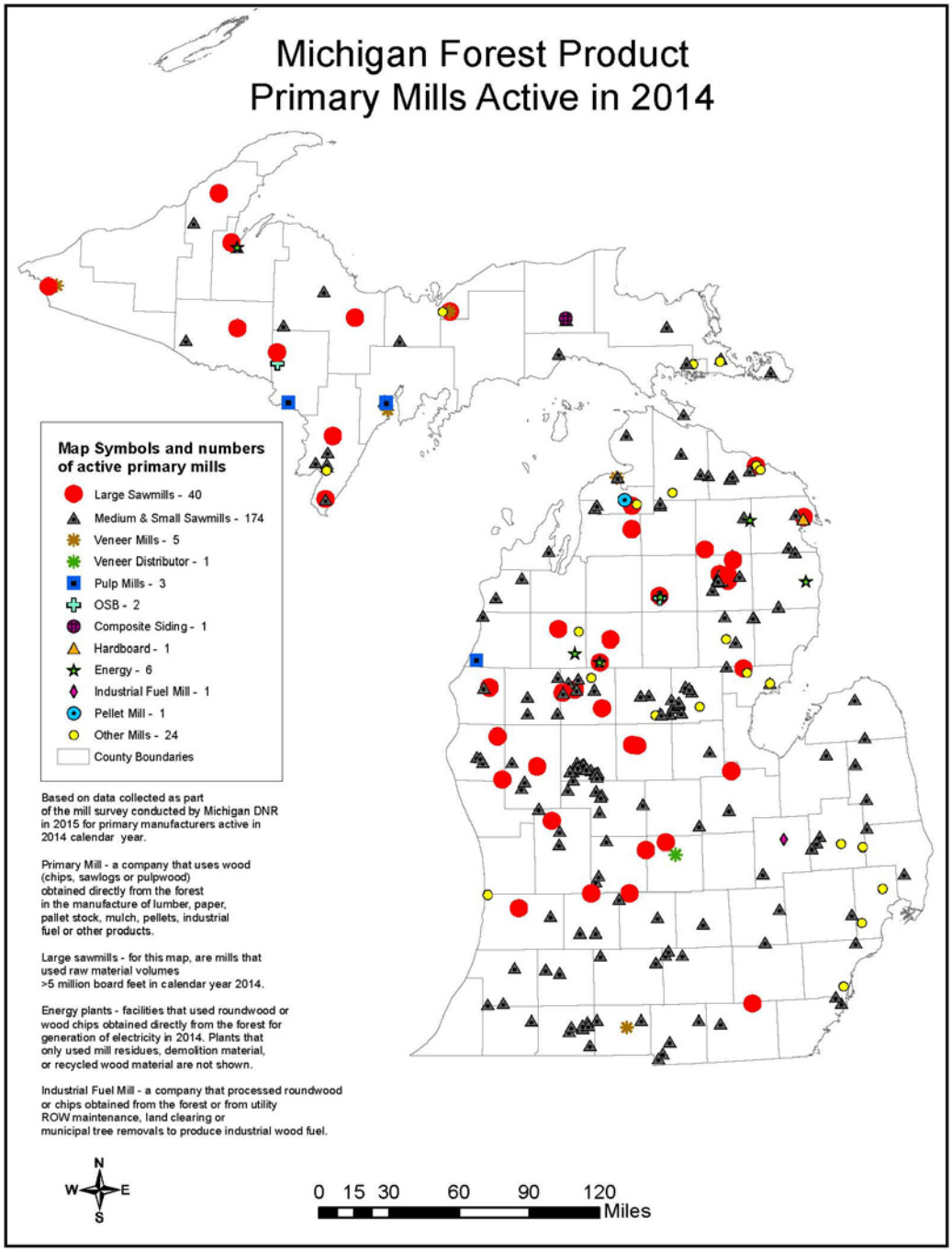

Fig. 7. Forest Product Industries Map for Michigan (DNR).

In addition to the sawmills and other industries shown in Figure 7, the Michigan DNR's Forest Product Industries website (www.michigandnr.com/wood) shows 22 wood-related businesses in Barry County, 19 in Calhoun County, and 37 in Kalamazoo County.

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." Local Permaculture Courses have been offered at Pierce Cedar Creek Institute, the Lillie House in Kalamazoo and the Gibbs House at Western Michigan University.

Agroforestry

The Center for Agroforestry at the University of Missouri has published a manual that provides information on agroforestry (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 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).

The Barry Conservation District has a Forestry Assistance Program grant that funds District Forester Benjamin Savoie's position (he also covers Allegan and Ottawa Counties). He works to guide landowners through the process of sustainable forest management by providing education and one-on-one technical assistance regarding management planning and local forest health issues. The district forester can also help refer landowners to local professionals for management services such as writing a management plan, coordinating and preparing for a harvest, tree maintenance, and logging.

Another good source of forest information is the 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

A highly recommended book is "A Landowner's Guide to Managing Your Woods" by A.L. Hansen, M. Severson, and D.L. Waterman published in 2011 by Storey Publishing. It covers how forests grow, successional processes, planning, inventorying, working safely in the woods, and how to do a timber sale.

3.1.9 Forest Health and Invasive Species

Anyone who has recently looked at forests in the Barry-Calhoun-Kalamazoo area has seen the effects of emerald ash borer which has decimated most types of ash and left skeletons of trees in the forest. That may be the most obvious example of impacts to forest health but there are a host of other concerns worthy of attention. Keeping your trees healthy requires observation to detect problems and taking appropriate action to maintain them. Non-native species such as autumn olive and garlic mustard also threaten forest health and landowners should be knowledgeable about identification and control of invasives.

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 most 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. 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. 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.
EAB Link: http://www.michigan.gov/mdard/0,4610,7-125-2390_18298---,00.html

Gypsy moth has also presented a problem for area forests. From 1999 to 2002 and again in 2009, Barry County participated in the Michigan Department of Agriculture's Gypsy Moth Suppression Program. The program assessed gypsy moth damage, provided landowners with information and treated areas where landowners permitted with aerially applied Bt and Gypcheck. Populations have subsequently declined to a minimal level. Landowners should be observant and should contact their local Conservation District if populations again reach the nuisance level.

Other insects that are on the watch list for Michigan include the Asian longhorned beetle, spruce budworm, and hemlock wooly adelgid (which has been detected in Muskegon and Ottawa Counties). 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. The adult beetles are about 1 inch long and have long antennae (about 2 inches) with distinctive black and white bands on each segment. The females create roundish pits when they lay their eggs and the adults leave round exit holes when they emerge after having developed from the larval stage. The damage (like emerald ash borer) is done by the larvae that feed and excavate channels below the bark. 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.
See: http://msue.anr.msu.edu/news/forest_pests

A number of diseases are potential problems in Michigan with oak wilt receiving the most significant 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 whereas 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. If red or black oaks are damaged during warm months, tree wound sealant or latex house paint should be applied immediately to prevent infection. 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 or individual trees with high value.

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 (MDNR has observed it in Allegan County, but not in Barry Calhoun or Kalamazoo Counties). Spruce needlecast is a common fungal pathogen frequently seen on Colorado blue spruce trees older than fifteen years. 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 create mulch on the soil surface (resulting in faster decomposition of branches).

Tree Owner's Manual: www.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, non-native invasive 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, prioritized 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
- Obtain permits (if required for method used, i.e., herbicide application in wetlands)
- If using herbicide, be sure to read the product label before applying and follow it
- 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

One of the keys to avoiding infestation by invasive plants is to have a healthy community of native or intentionally introduced plants (crops, orchards, etc.). The more robust the desired vegetation is, the less likely that invasives will proliferate. Soil-disturbing activities such as plowing, land clearing, and vehicle trafficking can create a favorable zone for invasive plant establishment. Disturbance should usually be followed quickly by reseeding or planting to limit invasive species competition.

A timber harvest can have serious unintended negative effects on a forest ecosystem if the landowner does not realize that there are invasive species in the understory. If the harvest opens the canopy, the extra light could cause invasive species that had been fairly innocuous to grow, reproduce, and take over the open ground rapidly. For this reason, landowners should be aware of invasive species in the area and plan to treat such infestations prior to a harvest.

Cutting or mowing is not effective on many of these species and may actually make them more of a problem, so please seek treatment recommendations from Michigan DNR, BCK Cooperative Invasive Species Management Area, or your local conservation district. Information, including photos and identification modules, can be found at www.misin.msu.edu.

Invasive Shrubs

Woody invasive shrubs such as autumn olive, bush honeysuckles, and common and glossy buckthorns are a particularly important problem because they completely alter the forest community and, in many cases, prevent the growth of native species. Many invasive herbaceous shrubs (Japanese knotweed, giant knotweed, Bohemian knotweed, Japanese barberry, and multiflora rose) can negatively impact forest systems. The following paragraph covers autumn olive, but information for other invasive shrubs is similar.

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. Fire will set the plant back, but will not usually kill the autumn olive shrub. Because the plant 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).

Invasive Trees

Black locust, Amur cork tree, Norway maple, and tree of heaven are all invasive tree species found in the BCK area. Landowners should be aware of how to identify and treat these species.

Vine Management

Fast-growing vines (oriental bittersweet, English ivy, Japanese honeysuckle, Chinese yam, black swallow-wort, pale swallow-wort, mile-a-minute weed, and kudzu) should be treated. They can cause structural problems due to the added weight 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. Native grape vines can cause damage, but poison ivy and Virginia creeper 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/

Invasive Herbaceous Plants

Depending on how open the canopy is, a landowner may encounter herbaceous invasive species such as garlic mustard, spotted knapweed, black jetbead, dame's rocket, and others. 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 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. For invasive species control, monitor the land to determine infestations early in their development, treat satellite populations first and then work towards more densely infested weed areas to be efficient.
Garlic Mustard: http://www.ipm.msu.edu/invasive_species/garlic_mustard/about_garlic_mustard

Aquatic Invasives

There are many problem plants that thrive in water and property owners on lakes, streams, and wetlands should be aware of them as they can limit land use and cause harm to healthy systems. Wetland and aquatic invasive species in the BCK area include flowering rush, European frogbit, yellow floating heart, non-native phragmites, reed canarygrass, purple loosestrife, hydrilla, curly leafed pondweed, Carolina fanwort, Brazilian elodea, starry stonewort, and Eurasian milfoil. Plant growth is accelerated by excess nutrients from lawn and agricultural runoff, increased surface runoff due to increased impermeable surfaces (roads), failed septics, and other sources. Treatment of invasive species in wetlands or aquatic systems should only be done with wetland safe products and with the appropriate DEQ permits. Establishing natural vegetative shoreline buffers can also reduce issues with problem plants.

Some of the aquatic invasive animals are invasive carp (silver, bighead and grass), Northern snakehead, red swamp crayfish, zebra mussel, quagga mussel, and New Zealand mudsnail. To avoid the spread of these invasive species, boats (motorized and non-motorized) should be fully cleaned, drained of any bilge or other water, and dried before leaving a launch site. Boats should be left to dry for five days before entering another body of water Tackle should be decontaminated before changing locations and all bait should only be disposed of in a trash can.

http://www.michigan.gov/deq/0,4561,7-135-3313_3681_3710-134641--,00.html
https://www.invasivespeciesinfo.gov/aquatics/main.shtml

Resources for Landowners

Cooperative Invasive Species Management Areas (CISMA) are a collaboration of private landowners, non-governmental organizations, natural resource management groups, governmental agencies, and others who are interested in combating invasive species. Michigan's DNR, DEQ, and the Agriculture and Rural Development Department (DARD) funded a CISMA for Barry, Calhoun and Kalamazoo Counties. The BCK CISMA will develop a comprehensive, strategic, and long-term approach for managing invasive species including phragmites, black and pale swallow-wort, Japanese and giant knotweed, European frogbit, flowering rush, and Chinese yam.
CISMA: http://www.naturecenter.org/ConservationStewardship/Invasives.aspx
or http://www.michiganinvasives.org/bckcisma

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. 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 trees (such as maples and beech) are sensitive to burning. 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 invasives. 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.

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

Fire involves risk because of changing winds, unpredictable fuel conditions, human error, etc. Particularly during drought conditions, appropriate care must be taken to keep prescribed fires under control. Property owners should also check their insurance coverage before starting a blaze. Unless the landowner has experience with fire management, it is prudent to hire contractors to conduct burns (See list in 3.2.3).

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.
Burns for land clearing and related activities require a burn permit issued by the local DNR Fire Manager. The DNR encourages residents with Internet access to get their burn permits online (www.michigan.gov/burnpermit). Residents can use the interactive map to find the burn conditions in their area. If a "yes" is shown in the "burning permits issued" column, burning is allowed for that day. There is no need to print anything; this serves as a burn permit. The DNR's toll-free burn permit number is 866-922-2876.
(http://www.michigan.gov/dnr/0,4570,7-153-30301_30816_44539---,00.html)

See Stewardship Story 4.10 Fire Management at Southwest Michigan Land Conservancy

3.1.11 Archaeological, Cultural and Historic Sites

The Barry-Calhoun-Kalamazoo area was occupied by a succession of Native Americans including the Moundbuilders who constructed a prominent mound now located in Kalamazoo's Bronson Park. According to History of Kalamazoo webpage (www.kalamazoomi.com/hisf.htm), the region was occupied by the Sioux, the Mascoutin, the Miami and the Potawatomi Tribe, a branch of the Algonquin people. White settlers came into the area in the late 1700s and gradually displaced most of the Native Americans. The name "Michigan" means large lake in Ojibwe (another Algonquin tribe) which came into English via French.

Potawatomi Tribe

There are two bands of the Potawatomi Tribe (Anishinabek) in the area and both tribes run casinos: Gun Lake in Wayland and Firekeepers in Battle Creek. The Match-E-Be-Nash-She-Wish or Gun Lake Tribe is actively involved in a number of conservation and environmental stewardship programs including grassland and woodlot management (black ash is a species that has special value to the tribe). In the Anishinabe creation story there was a great flood and afterwards a small speck of soil was placed on the turtle's back, which grew to become North America or "Turtle Island." Thus turtles (Mshike) are very important to the Anishinabek and they are engaged in conservation efforts. Because of its cultural importance, the tribe is restoring populations of wild rice (mnomen) with a Bureau of Indian Affairs Great Lakes Restoration Initiative grant which includes monitoring known mnomen beds, identifying water bodies with high potential for restoration success, and conducting restoration activities. The tribe is also working on Lake Sturgeon Rehabilitation, a multi-agency project to protect and increase the population of Kalamazoo River lake sturgeon. http://mbpi.org/administration/environmental/

The Nottawaseppi Huron Band of the Potawatomi is headquartered in Fulton Michigan, a small village 14 miles north of Battle Creek. Their service area includes reservation boundaries, and Kalamazoo, Calhoun, Ottawa, Kent and Allegan Counties. http://nhbpi.com/

Charlton Park

Historic Charlton Park has been a fixture in Barry County since 1936, and is situated on 310 acres on Thornapple Lake. It features a turn-of-the-century Historic Village and Museum with a self-guided tour. One of the historic items in the park is the 1895 Steam-Powered Corley Sawmill powered by a Farrar Trefts Fire Tube Boiler. They have antique logging equipment and there are saws and woodworking tools in the Carpenter Shop and Hardware Store. Charlton Park's Recreation Area offers many options including hiking, boating, swimming and fishing. There are special events at Historic Charlton Park ranging from yard sales to a Civil War Muster held during the summer. (www.charltonpark.org/)

See Stewardship Story 4.9 on the Lillian Anderson Arboretum

Archaeological Resource Protection

The BCK area has rich archaeological resources with Native American, fur traders and pioneer settler sites. According to the MDNR, there are 5,660 known archaeological sites in the three-county area, or about 3 sites per square mile. Asylum Lake is one archaeological site that has been explored by researchers from Western Michigan University's Department of Anthropology. https://wmich.edu/asylumlake/history/archeology_report.html

Proper management of archaeological sites is guided by one overriding principle which is to avoid disturbing the soil by grading the site, pulling stumps or 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 (SHPO) within the Michigan State Housing Development Authority. The SHPO's main function is to provide technical assistance to local communities in their efforts to identify, evaluate, designate, and protect Michigan's historic above- and below- ground resources. The SHPO is led by the state historic preservation officer, who is designated by the governor to carry out provisions of the Historic Preservation Act of 1966, as amended.

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 beers, 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). The Barry Calhoun Kalamazoo area has two State Recreation Areas (Fort Custer and Yankee Springs), several State Game Areas (Barry, Fulton, Gourdneck, and Middleville), and many local parks (county, township, city, etc.). It has hundreds of lakes larger than five acres that provide fishing, boating and other recreational opportunities. A portion of the North Country National Scenic Trail, the longest (4,600 miles) in the US, runs from Homer in southeastern Calhoun County, through Battle Creek and exits Barry County near Middleville. The Chief Noonday Chapter is responsible for developing, maintaining, protecting and promoting their section of the North Country National Scenic Trail. For more information on the trail go to: https://northcountrytrail.org/

Other trails in the area include the Calhoun County Trailway, Battle Creek Linear Trail, Kal Haven (Kalamazoo to South Haven), Kalamazoo River Valley, and the Paul Henry-Thornapple (Middleville to Vermontville).

There are many locally managed (county, township, city, town, etc.) parks in the Barry Calhoun Kalamazoo area. Some of the larger parks include Barry's Charlton, Fish Hatchery and McKeown Bridge; Calhoun's Ott Biological Preserve and Kimball Pines; and Kalamazoo's Markin Glenn, River Oaks, Prairie View, and Cold Brook. The Leila Arboretum is owned by the City of Battle Creek and manages more than 3,000 trees, shrubs, perennials, and annuals. It has a Children's Garden and offers "Growing in the Garden" classes for home landscape management. Kingman Museum is located on the arboretum's grounds.

The area has several high quality environmental education centers such as the Kalamazoo Nature Center, Pierce Cedar Creek Institute (PCCI), and the Battle Creek Outdoor Education Center (a.k.a. Clear Lake Camp). The first two have extensive restoration areas and public access trails (Kalamazoo Nature Center charges admission and, while most PCCI programs have a fee, trail use is free). Clear Lake Camp is part of the Battle Creek School system and was the first public school camp in the United States when it was founded in 1940. Their motto is "Leave no child inside." These centers frequently have classes in topics that can assist landowners in managing their properties.

Kalamazoo Nature Center 7000 N. Westnedge Ave. Kalamazoo, MI 49009-6309
(269) 381-1574 http://www.naturecenter.org/

Pierce Cedar Creek Institute 701 West Cloverdale Rd Hastings, MI 49058
(269) 721-4190 http://www.cedarcreekinstitute.org/

Clear Lake Camp 10160 S. M-37 Hwy. Dowling, MI. 49050
(269) 721-8161 www.clearlakecamp.org
Director: Amy Cherry acherry@battle-creek.k12.mi.us

W.K. Kellogg Bird Sanctuary is a wildlife center near Augusta that offers conservation-focused public programs, interpretive tours, and accessible trails that allow close views of captive and wild birds. The grounds are open year round and admission is charged.

W.K. Kellogg Bird Sanctuary 12685 E C Ave, Augusta, MI 49012.
(269) 671-2510 https://birdsanctuary.kbs.msu.edu/visit/

Binder Park Zoo is one of the largest zoos in Michigan and has 140 different species of animals including the Wild Africa Exhibit on their 433-acre property in Battle Creek.

Binder Park Zoo 7400 Division Dr., Battle Creek, MI 49014
(269) 979-1351 http://www.binderparkzoo.org/

The Gilmore Car Museum, north of Richland, is North America's largest auto museum with nearly 400 vehicles on display and more than 189,000 square feet of exhibit space. The Museum's 90-acre Historic Campus features numerous vintage structures including a restored and fully-functioning 1941 Silk City Diner, a recreated 1930s Shell Station, six onsite Partner Museums, and much more. The museum has established a tall grass prairie on the grounds in collaboration with the Kalamazoo Nature Center and the Wild Ones has planted pollinator habitat as part of a Monarch Waystation project. http://www.gilmorecarmuseum.org/

The annual Fall Arts & Eats Tour of Southwest Michigan features artists creating in their studios, working farms producing food and fiber, and restaurants that serve locally grown food. The tour is organized by Barry and Allegan County Tourism Councils with partners including Barry Community Foundation, Kalamazoo County, Michigan State University Extension, Richland Area Community Center, and the Thornapple Arts Council.

See Stewardship Story 4.10: Trails at Fort Custer State Recreation Area

3.1.13 Forest Sounds

Forests also tell their own stories. Stuart H. Gage, a Professor of Entomology at Michigan State University and Director of the Remote Environmental Assessment Laboratory has conducted analysis of sound recordings made in several of the plan areas and has posted results on his website. (http://real.msu.edu/projects/one_proj.php?proj=ls).

Dr. Sharon Gill from the Biology Department at Western Michigan University installed a recording device in Southwest Michigan Land Conservancy's Black River Preserve in Van Buren County (GPS location: 42° 22′ 58″ N, 86° 12′ 60″ W). She recorded 1,419 one-minute recordings from May 14, 2016 to June 19, 2016. This data will be included in Dr. Gage's analysis.

Photo of site at time of deployment (May 14). Photo of site at time of retrieval (June 19).

Stuart H. Gage
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Manly Miles Bldg. Michigan State University
1405 S. Harrison Rd. Ste 101East Lansing, MI 48823
Phone: 517-355-2135 Email: gages@msu.edu
Website: http://www.msu.edu/~gages

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.

3.2 Local Resource Providers and Existing Stewardship Plans

"... It is evident that in our daily lives nature must be thought of not as a luxury to be made available if possible, but as a part of our inherent indispensable biological need."
Frederick Law Olmsted

Green Infrastructure can be defined as network of green spaces that conserves natural ecosystem functions through a series of hubs (large, core natural areas), connected by links (corridors) that tie the system together; and smaller, isolated sites that provide ecological benefits and serve as "stepping stone" for some wildlife movement. Green Infrastructure protects critical water resources; provides recreation, health and educational benefits; and contributes to the quality of life and economic well-being of America's communities. It is designed to help shape urban infrastructure and provide a framework for growth that pre-identifies ecologically significant lands and suitable development areas. No green infrastructure plans have been developed for the entire BCK area, but the counties and many communities use some aspects of this process. A Landscape-scale Conservation Planning Conference was held on October 17, 2013 at Pierce Cedar Creek Institute which was part of the impetus for the current project that is funding this Landscape Stewardship Plan.

Planning can occur at multiple scales, from multi-state areas such as the Landscape Conservation Cooperatives (see page 54), to pocket habitats on residential city yards. Many of the government agencies and nonprofit organizations described in Sections 3.2.1 and 3.2.2 have plans that guide resource management in their areas. These sections explain resources that are available to private landowners and discuss some of the planning efforts that may help individuals with their own plans and management.

Southwest Michigan Land Conservancy has identified strategic conservation areas in several watersheds including the Kalamazoo River, St. Joseph River, Paw Paw River, Rocky River, Augusta Creek, Glass Creek, and Prairieville Creek (see page 66). They also created a plan for the Barry State Game Area which supplements work done by Michigan Natural Features Inventory for prioritizing natural areas in Barry County (see page 47).

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 Southwest Michigan). The DNR 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.
State Forests in Upper Peninsula: Copper Country, Escanaba River, and Lake Superior
State Forests in the Northern Lower Peninsula: Mackinaw, Pere Marquette, and Au Sable

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.
DNR Forest Management Plan: www.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
Regional State Forest Management Plans are only available for the Western Upper Peninsula, Eastern Upper Peninsula, and Northern Lower Peninsula(there are no state forests in the Barry Calhoun Kalamazoo area), but the information contained within can be useful for forest management by private and public landowners. www.Michigan.gov/regionalforestplans

Michigan's 2010-2020Forest 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 DNR'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

The DNR 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 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 have 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 Forest Stewardship Program
Mike Smalligan, Forest Stewardship Coordinator
(517) 284-5884 SmalliganM@michigan.gov

Barry State Game Area

Barry County is fortunate to have the second largest state game area (approximately 17,000 acres of land) protected by the Michigan Department of Natural Resources. The primary purpose of the Barry State Game Area (SGA) is to provide hunting opportunities and habitat for Michigan game animals and much of the land was purchased with money from hunting licenses and taxes on firearms and ammunition (authorized by the Pittman Robertson Act). Sara Thompson, a DNR Biologist and former SGA Manager, wrote a Master Plan for the property in 2015 that inventoried the existing land cover and identified desired future conditions of habitat to support the SGA's purposes. The plan specified goals (desired future condition) and objectives and actions which were defined as follows:

Objective - A management approach or strategy that the best science suggests can be used to move the area toward the Goal. An objective is a quantifiable input to be completed within a defined timeframe that contributes towards accomplishing the goal.

Action - An operational means to accomplish an objective. An action is a step needed to complete an objective and is described in sufficient detail to inform planning. An action is a quantifiable input to be completed within a defined timeframe that contributes towards accomplishing the objective.

Goal 1 is to maintain abundant populations of white-tailed deer, Eastern wild turkey, ruffed grouse, cottontail rabbit and other game animals. For white-tailed deer, some of practices that support the herd include: maintaining trees that produce hard mast (beech, oak); maintaining thermal cover by selecting for white cedar and hemlocks; providing abundant browse by managing for young forests (particularly aspen and jack pine) through clear cuts and rotational harvests of timber; and planting annual food plots with rye, clover, and pea.

According to Sara Thompson, the deer herd is currently at a population level that is in balance with food resources and the understory is healthy. The general guidance for population in this type of habitat is 25 to 30 deer per square mile. In order to keep the numbers in check the state issues antlerless permits for the management area but not all permits get filled.

Out of 5,888 acres of oak habitat inventoried, only 3% were young trees (less than 50 years old). About 28% of the area was classed as being older than 110 years, and, as the older trees die, shade tolerant trees such as maples will take over the forest. The State Game Area has conducted selective harvest of older hardwoods and on about 800 acres of pine plantations (most of which were planted more than 50 years ago) in order to favor young oaks which will ensure that hard mast will continue to be available to wildlife. Northern pin oak and scarlet oak are intolerant of shade, while white and northern red oak seedlings are midtolerant, and beech and sugar maple are very tolerant. Intolerant species require more light than tolerant species and this affects what succeeds in becoming the canopy trees of the future. The state game area is using oak regeneration SILVAH software decision support system to diversify the oak community.

The timber harvest conducted by the SGA follows the same guidelines and BMPs as the state forests. Specifications to ensure compliance are built into the contracts they sign with timber companies. They have seen good interest in the timber that has been offered including pine, oak, walnut, and aspen.

The high value of this site for wildlife habitat and to support natural plant communities was recognized by the 2007 Barry County Potential Conservation Areas report prepared by the Michigan Natural Features Inventory. Unfortunately the endangered Mitchell's satyr butterfly has been extirpated from the SGA and its habitat would need to be improved prior to reintroduction. A

more recent inventory completed by MNFI in 2014 identified the dry-mesic forest community (oak and hickory) as fire suppressed (based on presence of red maple, black cherry and sassafras). Non-native invasive species observed include autumn olive, multiflora rose and garlic mustard. Sara Thompson said that they "treat autumn olive in old fencerows by grubbing it out with a backhoe, spraying sprouts with Crossbow and then seeding to grass to establish ground cover and help prevent reinfestation." Priority invasives at present are tree of heaven and Japanese knotweed. Rules for preventing spread of aquatic invasives are posted at boat launches.

The Middleville State Game Area (4,583 ac in NW Barry County) is administered by the Barry SGA office and the Edger Waterfowl Production Area on Chief Noonday Road in Barry County (157 acres) is cooperatively managed for wildlife by the DNR Wildlife Division and USFWS Midwest Office. The Gourdneck SGA (2,165 acres in SW Kalamazoo County) and Fulton (672 acres in SE Kalamazoo County are administered by the Crane Pond DNR Wildlife Office. Gourdneck State Game Area near Portage is undergoing a restoration of its historic prairie and savanna complex, which was lost due to agricultural development. Learn more about the Gourdneck State Game Area project at: www.michigan.gov/workingforwildlife

With thoughtful planning and management, the State Game Areas will continue to provide habitat for both game and non-game species and offer hunters and other recreational users a high quality experience.

See Stewardship Story 4.1 on Successional Effects on Soil

Barry State Game Area 1805S Yankee Springs Rd, Middleville 49333
(269) 795-3280
Randy Hines, DNR Private Lands Biologist and Acting Game Area Manager

Barry State Game Area Master Plan, Sara Schaefer (Thompson). 2015.
http://www.michigan.gov/dnr/0,1607,7-153-10363_10913-31657--,00.html#Barry

Crane Pond DNR Wildlife Office
60887 Highway M-40, (P.O. Box 158), Jones, MI 49061; phone (269) 244-5928.

Allegan State Game Area Field Office 4590 118th Avenue, Route 3, Allegan 49010
Mark Mills, DNR Biologist (269) 673-2430

State Game Areas: www.michigan.gov/dnr/1,1607,7-153-10363-31657--,00.html#B

Fort Custer State Recreation Area

The Fort Custer State Recreation Area, located near Augusta in Kalamazoo County, was historically a part of the federal Fort Custer military base. It was deeded to the Michigan Department of Natural Resources (DNR) for recreation and natural resource preservation in 1971. Fort Custer SRA has 3,033 acres of land, three miles of the Kalamazoo River, and features three lakes: Eagle, Jackson Hole, and Whitford-Lawler. It has a variety of recreational opportunities including a modern campground, cabins, picnic shelters, day-use beach area, and four boating access sites. Fort Custer Park Manager Tony Trojanowski explained that "Michigan state recreation areas are open to hunting and trapping unless specifically closed, whereas state parks are closed to hunting and trapping unless specifically ordered open."

More than 25 miles of trails are available for hiking, mountain biking, horseback riding, dog mushing, and cross-country skiing. A portion of the North Country National Scenic Trail runs through the property and extends into Yankee Springs SRA in western Barry County. The trail is the longest (4,600 miles) in the US and crosses seven states from New York to North Dakota. Based in the southwestern Lower Peninsula of Michigan, the Chief Noonday Chapter is responsible for developing, maintaining, protecting and promoting their section of the North Country National Scenic Trail which spans from just south of Grand Rapids to Battle Creek. For more information on the trail go to: https://northcountrytrail.org/

See Stewardship Story on Trails in Section 4.10

To better steward its resources, a Fort Custer General Management Plan was written in 2009 that divides the SRA into management zones such as Backcountry, Primitive, Natural Resource Recreation, Developed Recreation, and Scenic (the entire property is also classified as a Cultural Landscape). Fort Custer is a biological hot spot and has several rare plant communities (oak barrens, dry-mesic southern forest, and fens) and is the home to four plants and animals that are threatened and 13 that are of special concern in Michigan. There are many threats to these rare plants and animals, but some of the more prevalent ones are presence of invasive species and excessive trafficking by hikers and vehicles. Lack of fire is often a threat to natural areas, but the SRA has been regularly burned to promote native vegetation.

Tony Trojanowski's advice to landowners is to determine your final goal for the property before performing actions that will cause problems in the future. Having a master plan for the land allows the owner to take steps in the proper sequence to accomplish their goals.

Fort Custer State Recreation Area
5163 Fort Custer Drive Augusta MI, 49012 (269) 731-4200
http://www.michigandnr.com/parksandtrails/details.aspx?id=117&type=SPCG

Fort Custer Recreation Area – General Management Plan, Joe Strach. 2009.
www.michigan.gov/documents/dnr/fort_custer_gmp_321134_7.pdf

Fort Custer Training Center

The recreation area borders the adjacent Fort Custer Training Center which is used by the National Guard and other law enforcement personnel. Collectively, the two facilities cover more than 10,000 acres and DNR Stewardship employees work with FC Training Center staff to accomplish mutual natural resource goals. Both the recreation area and the training center conduct prescribed burns to accomplish management goals and a number of fire training classes have been held on the two properties. The Michigan Natural Features Inventory conducted a Fort Custer Vegetation and Natural Features Survey that goes into detailed descriptions of the flora and fauna and discusses appropriate management practices to reduce the threat to its biology.

Cohen, J.G., R.P. O'Connor, B.J. Barton, D.L. Cuthrell, P.J. Higman, and H.D. Enander. 2009. Fort Custer Vegetation and Natural Features Survey 2007-2008 Report. Michigan Natural Features Inventory, Report Number 2009-04, Lansing, MI.

Yankee Springs Recreation Area

In addition to Fort Custer, Yankee Springs Recreation Area is a state-managed property located in NW Barry County (just west of the Barry State Game Area). The park is 5,200 acres in area and has 120 rustic, 200 modern and 25 equestrian camping sites. It has beaches and boat ramps on Gun Lake and trails for hiking (30 mi.), mountain biking (12 mi), cross-country skiing (10 mi.), and horse riding (9 mi.). Special points of interest in Yankee Springs include the Devil's Soupbowl (a glacially carved kettle formation); Graves Hill Overlook; and the Pines (a large area of planted conifers).

Yankee Springs Recreation Area 2104 S. Briggs Road Middleville MI, 49333 (269) 795-9081
Joe Jandernoa (269) 795- 9081 JandernoaJ@michigan.gov

http://www.michigan.org/property/yankee-springs-recreation-area/
http://www.michigandnr.com/parksandtrails/details.aspx?id=511&type=SPRK

Future management of this recreation area is guided by the General Management Plan (GMP), which serves two primary purposes. First, it establishes a 20-Year Management Zone Plan that provides specific guidance for development, stewardship, public use, education & interpretation, and park operations & management at Yankee Springs Recreation Area. Second, the Plan provides 10-Year Action Goals that address the desired future condition in the park as a whole and within each Management Zone. This Plan seeks to uphold the Parks and Recreation Division's Mission Statement: *to acquire, protect and preserve the natural, historic, and cultural features of Michigan's unique resources and provide public recreation and educational opportunities*.

http://www.michigan.gov/documents/dnr/Approved_General_Management_Plan_548239_7.pdf.

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

Michigan Department of Natural Resources – Wildlife P.O. Box 30444 Lansing, MI 48909-7944
Amy Derosier, Wildlife Action Plan Coordinator (517) 284-6166 derosiera@michigan.gov

DNR Fish and Wildlife Habitat Programs

Most stewardship plans address wildlife habitat and there are many practices that can be used to improve conditions for animals. Support for wildlife habitat is available from both public and nonprofit entities. The DNR 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, the Quality Deer Management Association and Trout Unlimited. Many of these organizations have programs to provide financial and technical assistance for enhancing wildlife.

DNR 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 savannas and oak barrens. Financial assistance may be available for restoring native prairie; restoration of oak savanna or oak barrens sites; practices such as prescribed fire, disking or inter-seeding; and invasive species control in and immediately around grassland, savanna 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

Kenneth S. Kesson Wildlife Biologist for Southwest Michigan Region
269-244-5928 Kessonk1@michigan.gov

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.

Clay Buchanan Wildlife Division Grant Coordinator
(517) 284-6214 buchananc1@michigan.gov

Kelly Parker Wildlife Habitat Grant Program Manager
(517) 284-5957parkerk4@michigan.gov

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 regulates air, land, water, and waste generation activities in the state. 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. 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. 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.
(https://miwaters.deq.state.mi.us/miwaters/#/external/home)

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).
www.mishorelinepartnership.org/

Julia Kirkwood, Michigan Department of Environmental Quality (DEQ)
Water Resources Division-Nonpoint Source Program, MNSP-Chair
(269) 312-2760 kirkwoodj@mi.gov

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. 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.
http://www.michigan.gov/deq/0,4561,7-135-3313_3677_76614---,00.html

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. MNFI has completed several reports for the BCK area (see below).

Thomas, S.A, J.G. Cohen and H.D. Enander. 2009-2010. Mapping Plant Alliances of the Fort Custer Training Center. Report for the Fort Custer Training Center, MI Dept. of Military and Veterans Affairs. 39pp.

Cohen, J.G., R.P. O'Connor, B.J. Barton, D.L. Cuthrell, P.J. Higman and H.D. Enander. Fort Custer Vegetation and Natural Features Survey: 2007-2008 Report. Report for the Fort Custer Training Center. 77pp.

Michigan Natural Features Inventory. 2007-2009. Barry County Potential Conservation Areas. Report for Barry Conservation District. 23pp.

To obtain the reports above (pdf files), go to https://mnfi.anr.msu.edu/pub/publications-list.cfm and scroll down to the year of the publication.

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. 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. Landowners are required to sign an agreement to leave the project in place for a minimum of 10 years (longer agreements are encouraged) and landowners are responsible for project maintenance.

In the Midwest, Fish and Wildlife Service restoration projects generally occur in three habitat types: wetlands, prairies, and streams. The Partners Program also restores sensitive habitats supporting endangered or threatened species such as the copperbelly water snake and the Mitchell's satyr butterfly.

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.

Grasslands (especially those larger than 20 acres) help provide adequate cover and food throughout the year for declining grassland birds such as bobolinks, meadowlarks, and pheasants as well as other wildlife. Prairie restoration requires reseeding native warm-season 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.

Michigan Private Lands Office 2651 Coolidge Road, Suite 101 East Lansing, Michigan 48823
Jim Hazelman, Assistant State Coordinator (517) 351-2555 Email: EastLansing@fws.gov
Meredith Bryant (517) 351-6238 meredith_bryant@fws.gov

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 world's 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.
www.GreatLakesLCC.org

Bradly Potter, Acting Coordinator, U.S. Fish and Wildlife Service Bradly_Potter@fws.go
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/

Climate, Fire, and Carbon Cycle Sciences: 410 MacInnes Dr. Houghton, Michigan 49931
(906) 482-6303

Forest Adaptation Resources

Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers provides a suite of materials that enables land managers to consider climate change and increase the ability of forests to cope with climate change impacts. It does not provide specific recommendations, but rather serves as a decision-support tool for incorporating adaptation considerations into current management objectives. (www.forestadaptation.org)

Cooperative Invasive Species Management Area

Michigan's DNR, DEQ, and DARD provided a grant to support a Cooperative Invasive Species Management Area (CISMA) for Barry, Calhoun and Kalamazoo Counties. CISMAs are comprised of private landowners, non-governmental organizations, natural resource management groups, governmental agencies, and others who are interested in combating invasive species. Each of the three Conservation Districts is hosting an Invasive Outreach Educator, and coordinating with the CISMA invasive strike team to survey, prioritize, and treat the invasive species outbreaks of greatest concern. Ryan Koziatek, project coordinator at the Kalamazoo Nature Center, said "We are looking forward to increasing our knowledge capacity and making changes for a productive future managing and educating about invasive species in our area."

The Barry-Calhoun-Kalamazoo CISMA will develop a comprehensive, strategic, and long-term approach for managing invasive species including phragmites, black and pale swallow-wort, Japanese and giant knotweed, European frogbit, flowering rush, and Chinese yam. A strike team will survey and verify high-priority areas and use the results to create a comprehensive GIS database to prioritize, implement, and monitor treatments. Education and outreach efforts will raise citizen awareness and encourage involvement in detection and monitoring. The intent is to better understand the threats in our region and prioritize solutions by combining efforts and centralizing communication.

CISMA Link: http://www.michiganinvasives.org/bckcisma
http://www.naturecenter.org/ConservationStewardship/Invasives.aspx
Ryan Koziatek, CISMA Coordinator, Kalamazoo Nature Center
(269) 491-0488 invasives@naturecenter.org

Barry County Invasive Outreach Educator: Sarah Nelson (269) 908-4135
1611 S. Hanover St. Suite #105 Hastings MI 49058

Calhoun County Invasive Outreach Educator: Brian Huggett. (269) 697-1723
13464 Preston Dr., Marshall, MI 49068.

Kalamazoo County Invasive Outreach Educator: Bridgett Bell (269) 382-5121 ext. 5
1911 W. Centre Ave. Portage, MI 49024

To report an invasive species sighting, visit www.misin.msu.edu

Barry Conservation District

The Barry Conservation District (BCD) was formed in November 1944 and encompasses all of Barry County, including townships, cities and incorporated villages. Since 1999, BCD has expanded its mission to include all natural resources including forestland, grasslands, and wetlands. The district has developed partnerships with the MDARD and the MDNR to address local conservation issues and provide education and assistance to all residents of Barry County. The district continues to work closely with the USDA's Natural Resources Conservation Service (NRCS) to bring cost share programs to county farmers implementing conservation practices.
http://www.barrycd.org/home/about/

1611 S. Hanover St. Suite #105 Hastings MI 49058
Barry Conservation District Executive Director- Sarah Nelson
(269) 908-4135 sarah.nelson@macd.org

Barry Conservation District's Forestry Assistance Program

The Michigan Department of Agriculture and Rural Development (MDARD) awarded a grant to the Barry Conservation Districts (under an agreement with the Michigan Department of Natural Resources) to provide education and one-on-one technical assistance to private land owners regarding local forest health issues. In this program, professional foresters help Michigan citizens better understand, plan, manage, protect and utilize their forest resources. The Barry Conservation District's Forestry Assistance Program forester will work to increase the number of landowners and acres that are managed under a sustainable forest management plan.

Barry Conservation District Forester: Benjamin Savoie
1611 S. Hanover St. Suite #105 Hastings MI 49058
(269) 908-4134 ben.savoie@macd.org

Calhoun Conservation District

The Calhoun Conservation District (CCD) works with the environmental and agricultural communities by coordinating conservation projects and programs that benefit residents and the community as a whole. Guided by a locally elected Board of Directors, CCD employs knowledgeable staff who focus on ground and surface water issues, sustainable agricultural practices, environmental stewardship, education, wildlife habitat, aquatic ecosystems, forestry management, and community projects. CCD owns and/or manages twelve properties totaling more than 960 acres of forest, wetland, riparian, and upland habitats throughout Calhoun County. Some are leased for wildlife management; some contain valuable timber that, through sustainable forest management, provides funding to continue our programs; a few are river/stream access sites; and some are simply a quiet area to enjoy nature. One example is the Charles Brandt property, a 100-acre woods whose management goals include non-motorized, passive recreational use such as hiking, birding, cross-country skiing, and natural resource education (Albion College frequently conducts plant, bird, reptile, and amphibian studies on the property).
http://www.calhouncd.org/

Calhoun Conservation District: 13464 Preston Drive Marshall, MI 49068
Tracy Bronson Executive Director (269) 781-4867 x 5 tracy.bronson@macd.org

Kalamazoo Conservation District

The Kalamazoo Conservation District's mission is: "Protecting soil & water for generations; not only today's generation but future generations." In order to meet their mission, they work closely with the community, identifying resource needs and then partnering with others who have similar goals to address those needs. By implementing technologies and practices that are environmentally friendly we can ensure long term use of our precious natural resources.
http://www.kalamazooconservation.org/

Kalamazoo Conservation District: 1911 W. Centre Ave. Portage, MI 49024 District Manager: Ginger Koester (269) 382-5121 ext. 150 kalamazooconservation@gmail.com

Michigan Agriculture Environmental Assurance Program

Each of the Conservation Districts is participating in the Michigan Agriculture Environmental Assurance Program 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/

Barry MAEAP Technician: Ben Galbraith (269)908-4136 benedict.galbraith@mi.nacdnet.net

Calhoun MAEAP Specialist: Jeremiah Swain (269) 781-4867 x 5 Jeremiah.Swain@mi.nacdnet.net

Kalamazoo MAEAP Specialist: Linda Zabik (269) 382 -5121 x 151 linda.zabik@mi.nacdnet.net

Note: Mailing addresses are the same as the Conservation Districts.

County Planning and Zoning Offices

Each of the three counties has planning staff and a number of resources on their webpages that might be useful for landowners with preparation of stewardship plans for their individual properties. The Geographical Information Systems (GIS) layers vary from county to county but most include aerial imagery and parcel maps (showing approximate ownership boundaries).

Barry County Planning and Zoning

Barry County has a 2005 Master Plan that describes natural resources and identifies efforts to maintain its rural character. The plan identifies one of its goals as "Existing and future development in the County will include natural and open areas in harmony with, and connected to, permanently preserved natural environments coordinated with plans for larger, contiguous greenways and waterways."

http://www.barrycounty.org/directory/
Barry County Courthouse –220 W State St Hastings MI 49058
Director: James McManus (269) 945-1290 jmcmanus@barrycounty.org
Information Systems GISP IT/GIS Coordinator: David Shinavier, (269) 945-1413

Calhoun County Planning

Calhoun County has a 2005 Master Plan which was amended in 2012 that discusses protection of woodlands and wetlands. Their online GIS has layers for floodplains and county drains (it is in the process of being updated).

https://www.calhouncountymi.gov/government/county_departments/planning/
315 West Green Street Marshall, Michigan 49068
Phone (269) 781-0817 Hours 8:00 am - 1:00 pm Wednesday
Jennifer Bomba, Consultant, J. Bomba Land Planning
Brent Thelen, GIS Coordinator

Kalamazoo County Planning

Kalamazoo County's Master Plan is in the process of being revised (target date is mid 2017). The Kalamazoo County Master Plan project website (www.kalcountymasterplan.org) has plans for cities, towns, villages and townships, the 2016 Kalamazoo County Parks and Recreation Master plan, zoning maps, future land use maps, and other plans and documents. An ad hoc working group is preparing a proposal for a farmland preservation ordinance to present to the County Board of Commissioners in the near future.

http://www.kalcounty.com/planning/generalized_zoning.htm
Kalamazoo County Department of Planning & Community Development
201 West Kalamazoo Avenue, Kalamazoo, Michigan 49007
Director: Lotta Jarnefelt (269) 384-8112 lmjarn@kalcounty.com

Drain or Water Resources Commissioner Offices

The duties of the Drain/Water Resources Commissioner include the construction and maintenance of drains, determining drainage districts, apportioning costs of drains among property owners, and receiving bids and awarding contracts for drain construction and maintenance. The Commissioner also approves drainage in new developments, subdivisions, maintains court-ordered lake levels, and administers the Municipal Separate Storm Sewer System (MS4) permits.

Barry County Drain Commissioner

Barry County Courthouse – Floor 3 220 W State St Hastings MI 49058
Jim Dull, Drain Commissioner: jdull@barrycounty.org
Tammy Berdecia, Deputy Drain Commissioner: tberdecia@barrycounty.org
(269) 945-1385
www.barrycounty.org/departments_and_officials/officials/drain_commissioner/index.php

Calhoun County Water Resources Commissioner

Calhoun County Building 315 West Green Street Marshall, MI 49068
Fred Heaton, Water Resources Commissioner
Sherry Trader, Deputy Water Resources Commissioner
(269) 781-0790 www.calhouncountymi.gov/government/water_resources/

Office of the Kalamazoo County Drain Commissioner

201 West Kalamazoo Avenue Kalamazoo, Michigan 49007
Patricia A.S. Crowley, PhD, Drain Commissioner
Jeffrey VanBelle, Deputy Drain Commissioner
(269) 384-8117 www.kalcounty.com/drain/

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 at 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 financial assistance programs (see Section 5.5) are Environmental Quality Incentives, Conservation Stewardship, and Agricultural Conservation Easement. 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 Farm Service Agency's 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. As of 2015 there were 4,844 ac. of CRP in Barry, 3,479 ac. in Calhoun and 715 ac. in Kalamazoo County.

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. (See the discussion of easements in the Southwest Michigan Land Conservancy Section on page 65 for more information).

Barry County: Hastings Service Center	1611 S Hanover Street Hastings, MI 49058-2579
Kelly Bushong, District Conservationist	kelly.bushong@mi.usda.gov (269) 940-4120
Shawn Kelly, Soil Conservation Technician	shawn.kelly@mi.nacdnet.net (269) 940-4133
Calhoun County: Marshall Service Center	13464 Preston Drive Marshall, MI 49068-9683
Megan Fawcett, Soil Conservationist	megan.fawcett@mi.usda.gov (269) 781-4263
Constance Zauhar, Soil Conservation Tech.	Constance.Zauhar@mi.usda.gov
Kalamazoo County: Portage Service Center	5950 Portage Road Portage, MI 49002
Jean Gagliardo, District Conservationist	jean.gagliardo@mi.usda.gov (269) 382-5121 X 3
Kandrea Johnson, Soil Conservationist	kandrea.johnson@mi.usda.gov (269) 382-5121 X 3

Natural Resources Conservation Service (NRCS) Field Office Technical Guide
(http://www.nrcs.usda.gov/technical/efotg/)

W.K. Kellogg Experimental Forest

The 716-acre W.K. Kellogg Experimental Forest in Kalamazoo County is an internationally-known facility that does research on tree breeding and genetics, planting techniques, and plantation establishment and management. Kellogg Forest, established in 1931 on abandoned agricultural land near Augusta, is used for research, teaching, and outreach activities and is administered by the Michigan State University Department of Forestry. 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. An example of a current research project is an American beech plantation established to evaluate levels of genetic resistance to beech bark disease. This planting may later be used as a seed orchard. Kellogg Forest is open to the public for biking, hiking, horseback riding and cross-country skiing, and has several interpretive trails. Michigan State University also has research sites in forests at Kellogg Biological Station (near Hickory Corners) and Lux Arbor Reserve near Delton.

Patrick Duffy, Forester Manager at Kellogg Forest, encourages landowners to hire a professional forester to avoid mistakes that will have future consequences. He observed that "trees generally have a lifespan exceeding 100 years and often take decades to reach marketable size. This means that mistakes in logging, plantation siting, and other management can have serious, lasting consequences to forest health and productivity."

Kellogg Forest Link: http://agbioresearch.msu.edu/centers/kelloggforest
7060 N. 42nd Street Augusta, MI 49012 (269) 731-4597

One of the research plots at the Kellogg Forest showing description of management practice.

Michigan State University's Kellogg Biological Station

Michigan State University's Kellogg Biological Station (KBS), located on Gull Lake near Hickory Corners, is the school's largest off-campus facility (3,200 acres). Some of the facilities were built by Will Keith Kellogg (of Kellogg cereal fame) in the 1920s, including the Manor House which is now used for meetings and public tours. The station, which is overseen by MSU's College of Natural Science and the College of Agriculture and Natural Resources, has significant research facilities and offers courses for graduate students, undergraduates, K-12, and community members. KBS has a Long-Term Ecological Research (LTER) site funded by the National Science Foundation that compares agricultural production systems with varying intensity of inputs along with treatments that include poplar plantations and prairie restorations (http://lter.kbs.msu.edu/). KBS LTER researchers study interactions among plants, microbes, insects, management, and the environment to learn how agriculture can provide both high yields and environmental outcomes that benefit society.

W.K. Kellogg Biological Station: http://www.kbs.msu.edu/
3700 E. Gull Lake Drive Hickory Corners, MI 49060 (269) 671-5117 info@kbs.msu.edu

Michigan State University also houses a Soil and Plant Nutrient Laboratory (on the main campus in East Lansing) which offers a variety of analytical services on samples of soil, composts, plant tissue, water and other materials related to the growing of plants. http://www.spnl.msu.edu/

Kellogg Bird Sanctuary

The Bird Sanctuary at Kellogg Biological Station is home to many wild birds and waterfowl, including trumpeter swans, Canada geese, diving and dabbling ducks, herons, cranes, songbirds, and more. The Sanctuary has been an integral part in re-establishing trumpeter swan populations to the Midwest, serving as an important flyway stop for migrating birds. The Sanctuary offer tours, self-guided visits, courses and programs to the public year-round (admission is charged).
http://birdsanctuary.kbs.msu.edu/about/
12685 E C Ave, Augusta, MI 49012. (269) 671-2510

Michigan State University Extension Service

Michigan State University's Extension Service has offices in each of the three counties that offer 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

Barry County: 206 W. Court St. Hastings, MI 49058
269-945-1388. msue.barry@county.msu.edu

Calhoun County: County Building 315 West Green St. Marshall, MI 49068
269-781-0784. msue.calhoun@county.msu.edu

Kalamazoo County: 3299 Gull Road 2nd Wing Room 410 Kalamazoo, MI 49048
269-383-8830. msue.kalamazoo@county.msu.edu

Master Gardener

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

The Michigan Gardener Website is an online resource with guidance for specific plants including: planting and growing instructions, common pests, and lots of other valuable information. www.migarden.msu.edu Call: 1-888-678-3464 or Email ask.extension.org/ask
Kalamazoo County Master Gardeners: http://msue.anr.msu.edu/county/kalamazoo/master

Charlton Park

Historic Charlton Park is located on 310 acres along the Thornapple Lake east of Hastings in Barry County. The Park has a Forestry Stewardship Plan whose objective is to properly manage the natural resources of Historic Charlton Park, while not sacrificing its unique historical and recreational value. The standing timber on the property can be managed in a sustainable manner to improve the health and diversity of the forestry.
(http://www.charltonpark.org/park/forestry_plan/)

2545 S Charlton Park Rd, Hastings, MI 49058 (269) 945-3775

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 hold an annual conference on the Science, Practice & Art of Restoring Native Ecosystems 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.

Other programs conducted by the Stewardship Network include monthly seminars on environmental topics, a garlic mustard challenge (in which Clusters compete to see which one can remove the most pounds of the invasive plant), and assistance to local groups to obtain grant funding for stewardship activities. This Landscape Stewardship Plan is an example of the Stewardship Network's efforts to get financial support for land management activities. The Stewardship Network's website has a host of practical articles on topics from ecological restoration to chainsaw training.
https://www.stewardshipnetwork.org/
416 Longshore Dr., Ann Arbor, MI 48105
(734) 395-4483 staff@stewardshipnetwork.org

Central Southwest Cluster

The Cluster covers all three counties in the Barry-Calhoun-Kalamazoo area and facilitates field trips, seminars, and workshops provided by regional experts. Varied educational topics range from species identification to conservation planning, equipment use and maintenance to ecological restoration, and are offered throughout the year. This dynamic group collaborates, combines, and coordinates their resources, knowledge, and experience in order to enhance capacity for:
1) natural areas stewardship through education, and
2) regional invasive species management.

The Cluster partners are dedicated to restoring native landscapes and waterways on all scales through invasive species management, native species enhancement, and monitoring, as well as regional invasive species detection, awareness, mapping, and treatment. One partner is the Stewards of Kleinstuck which unites neighbors, ecologists and Western Michigan University land managers to create a healthier, more diverse and beautiful ecosystem in the Kleinstuck Preserve, for the benefit of our community and wildlife. (http://stewardsofkleinstuck.org/). They have been active in invasive species management, but that role is now being led by the BCK- CISMA.

Contact Central Southwest Cluster Coordinator Paul MacNellis (269-744-7718) by email at: swcc@stewardshipnetwork.org

See Stewardship Story 4.4 Biological Diversity (on the Paul MacNellis property).

Southwest Michigan Land Conservancy

Southwest Michigan Land Conservancy (SWMLC) works in nine counties of Southwest Michigan: Allegan, **Barry**, Berrien, Branch, **Calhoun**, Cass, **Kalamazoo**, St. Joseph, and Van Buren. In their 25-year history, they have conserved 14,000 acres across their service area through 85 conservation easements, 49 preserves, and 4 assists to other agencies or organizations. SWMLC's office is located at the Chipman House in Galesburg.

One of their primary methods of land protection is a Conservation Easement which is a legal document negotiated between the Conservancy and the landowner which restrict certain land uses, such as residential development, mining, and other activities that affect the conservation values of the land. Those values include providing wildlife habitat, protecting soil and water quality, and maintaining scenic vistas. Conservation Easement lands are not owned by SWMLC but they conduct annual monitoring to ensure that the terms of the easement are enforced. Preserves are different in that they are owned and managed by SWMLC.

In addition to the environmental benefits of placing land in a Conservation Easement (CE), there are potential financial benefits that arise from federal, state and local tax policies. Landowners should consult their lawyer, accountant and other professionals in order to fully understand these laws. If a landowner donates a CE, they may be eligible for an income tax reduction on the difference between the value of the property with and without a CE (as determined by a certified appraiser). Additionally, there may be a reduction in estate and property taxes. A decision to enter into a CE should not be made lightly because it is held in perpetuity (at least for those CEs that qualify for income tax reduction). This means that future landowner (heirs or buyers) must abide by the terms of the CE which is recorded in the property record at the Courthouse.

From: Internal Revenue Code § 170(h)(4)(A): *In order to qualify for a tax deduction, the land must meet a "conservation purpose" test that addresses at least one item in the following language:*
(i) the preservation of land areas for outdoor recreation by, or the education of, the general public,
(ii) the protection of a relatively natural habitat of fish, wildlife, or plants, or similar ecosystem,
(iii) the preservation of open space (including farmland and forest land).

Conservation Easement Management

Stewardship of lands in Conservation Easements is the responsibility of the landowner. SWMLC may provide guidance about managing natural resources, but, except in the case of certain habitat restoration grants, the conservancy is not responsible for the implementation of such practices. Easements usually have management zones such as building envelope (residential construction is allowed), natural area (invasive species management/habitat restoration only), managed woodlot (tree harvest allowed with approved forest management plan), and agricultural land.

Preserve Management

The goal of the Stewardship Team is to protect the diversity, stability, and beauty of southwest Michigan by preserving natural and scenic lands. The management of SWMLC's preserves is guided by two principles: what is ecologically appropriate and what is feasible given the human and financial resources available. Each preserve is inventoried and assessed to determine its most appropriate use based on accessibility, invasive species distribution, species of conservation concern, water resources, historical vegetation type, and historical land use. The stewardship plans specify actions to maintain or move the land toward a particular desired ecosystem that will promote regional biodiversity. Preserves are monitored and the impact of active management efforts is evaluated.

Management practices include:
- Eradicating or suppressing invasive plant species by hand pulling, mechanical cutting, and/or chemical treatments.
- Controlled burning to maintain certain vegetation types, such as prairie plantings.
- Monitoring indices of habitat quality, species diversity, and management effectiveness.
- Preparing and periodically updating species lists for the preserves.
- Establishing and maintaining parking, trails, and boardwalks for public access.
- Allowing hunting where appropriate to maintain ecosystem balance

Public use of preserves depends on access difficulties, presence of rare/endangered species or fragile communities. Some public uses that on preserves that are illicit or restricted are: recreational motorized vehicles, camping/campfires, dumping, collecting of anything except with specific permission by SWMLC, and hunting without permission.

Strategic Conservation Planning

The Southwest Michigan Land Conservancy recognizes the importance of strategic conservation planning and the benefits of creating partnerships to create effective and long-term conservation projects. They use a collaborative public process with a stakeholder committee assisted by Geographic Information Systems (GIS) mapping analysis to identify priority conservation areas. Examples of conservation planning projects in which SWMLC was actively involved include: Barry State Game Area, Kalamazoo River Watershed Strategic Conservation Plan, Wetland Partnership Project for the St. Joseph River Watershed, Glass Creek Watershed Protection, Augusta Creek Watershed Protection, Prairieville Creek (part of the Gull Lake Watershed), Four Township Water Resources Council, Paw Paw River Watershed, Rocky River Watershed, and Mitchell's Satyr Butterfly Priority Habitat Protection. Details for these plans are available on the organizations' websites. SWMLC has conserved many properties that were identified through strategic conservation planning process including the Ford Farm Conservation Easement (Augusta Creek Watershed Plan) and Hidden Pond (Barry State Game Area).

In summary, SWMLC is an important conservation organization that offers landowners assistance in permanently protecting properties that meet the conservation purposes test. Three of the landowner stories in this plan (Pamela Dewey, Larry Hayward and Larry Holcomb), are about individuals who have CEs on their properties. Individuals who are not interested in CEs can still learn useful information about stewardship by attending their events, workdays or visiting their website.

Southwest Michigan Land Conservancy http://swmlc.org/content/about-us
8395 E Main St, Galesburg, MI 49053 (269) 324-1600

Individual Nature Preserve Plans http://www.swmlc.org/content/conservation-planning

Barry State Game Area Conservation Plan Executive Summary

Prairieville Creek Watershed Conservation Plan

Kalamazoo Nature Center

The Kalamazoo Nature Center (KNC) is a not-for-profit organization located in Kalamazoo, Michigan whose mission is to "inspire people to care for the environment by providing experiences that lead them to understand their connection to the natural world." In the late 1950's gravel mining threatened Cooper's Glen, so a group of community leaders came together to purchase the land and establish an outdoor environmental education center. Dr. H. Lewis Batts, Jr., a nationally-known environmentalist and Kalamazoo College professor, was the driving force behind the purchase of the property and the incorporation of the Kalamazoo Nature Center in 1960 (making it one of the first nature centers in the country). The Kalamazoo Nature Center, now recognized as one of the top nature centers in the country, has expanded to include 1,100 acres of mostly wooded, rolling countryside along the Kalamazoo River.

The KNC Conservation Stewardship Department works with the community to enhance their property for wildlife habitat. They encourage environmental awareness and stewardship and provide the education, resources, and assistance necessary to improve ecological systems in Southwest Michigan. The Department has several initiatives including Great Lakes Ecological Management, Kalamazoo Valley Bird Observatory, Michigan Butterfly Network, Citizen Science, Heronwood Field Station, Michigan Breeding Bird Atlas II, Kalamazoo Climate Change Coalition, Invasive Species Management, and an Urban Nature Park. Research has involved many topics (such as ticks, birds, and butterflies) and has led to numerous publications. Kalamazoo Nature Center's Management Plan is in the process of being revised.

Kalamazoo Nature Center: http://www.naturecenter.org/
7000 N. Westnedge Ave. Kalamazoo, MI 49009-6309 (269) 381-1574
Ashley Wick, Biological Research Director (269) 381-1574 awick@naturecenter.org

Citizen Science

Citizen science is the collection of data by members of the public and it provides a method by which individuals can assess and study the natural world in an effort to contribute to meaningful scientific projects. Citizen science provides a great outlet for individuals looking to do something of value in the greater context of conservation efforts yet something that is vested in personal interest. The Kalamazoo Nature Center (KNC) located on Westnedge Avenue in Kalamazoo County strives to engage passionate individuals through training and education on available citizen science projects. One of the KNC's largest citizen science endeavors is the Michigan Butterfly Network, a state-wide butterfly monitoring program that allows participants to design a study area and monitor butterflies on their own time throughout the summer season. Some of the KNC's other citizen science projects include: winter bird feeder surveys, Christmas bird counts, photo monitoring, macro-invertebrate surveys for the Kalamazoo River Watershed (River Guardians), nest box monitoring, and monarch tagging. If you are interested in citizen science but unable to commit physically, there are several online projects from which to choose. Habitat Network allows you to map your yard online and gives you suggestions on how to make your property wildlife friendly. (See The Nature Conservancy entry for more information on Habitat Network).

They are continually adding more projects, so for more information on these projects please visit the KNC website: http://naturecenter.org/ConservationStewardship/CitizenScience.aspx

Jennifer Tagett, Citizen Science Coordinator (269) 381-1574 ext. 22 jtagett@naturecenter.org

Pierce Cedar Creek Institute

Pierce Cedar Creek Institute is a nature center, environmental education center and biological field station located south of Hastings in rural Barry County. In keeping with its mission (to inspire appreciation and stewardship of our environment), the Institute manages its property to support biodiversity and provides an outdoor classroom for environmental education programs. Through a recent land donation from neighbor Alice Jones (and her deceased husband Kensington), the Institute's area has grown to 742 acres, most of which is protected by an easement held by the Southwest Michigan Land Conservancy. The bulk of the area is hardwood forest (both oak-hickory and beech-maple) but there are also 58 acres of tamarack and northern white cedar swamp. Within the hardwood forests are several vernal pools (ephemeral ponds) that are relicts of past glaciation.

The Institute provides educational programs for community members of all ages as well as recreational opportunities. Each year, several of the programs focus on land stewardship and volunteers are encouraged to assist with restoration plantings, invasive species control, environmental monitoring and other activities. Visitors to the Institute can enjoy ten miles of hiking trails and learn about nature through outdoor signage and guided tours.

Jen Howell, former Stewardship Manager, and her staff prepared a management plan for the property that identifies target plant communities and provides a schedule of management practices including restoration plans, prescribed fire, invasive species control and monitoring. They have set up permanent photo-monitoring locations where pictures are taken in each of the cardinal compass directions and the plant community is inventoried at intervals to determine the success of stewardship activities. See the Biodiversity section for information on species inventory at PCCI.

(http://www.cedarcreekinstitute.org/Property.html

Pierce Cedar Creek Institute 701 West Cloverdale Rd Hastings, MI 49058 (269) 721-4190

See Stewardship Story 4.5 Vernal Pools

Michigan Audubon

Michigan Audubon has five sanctuaries in the Barry-Calhoun-Kalamazoo area (Baker, Mildred Harris, Otis Farm, Voorhees Brothers, and Warner). There are two local chapters: Battle Creek Brigham Audubon (https://www.facebook.com/#%21/BCBrighamAudubon) and Audubon Society of Kalamazoo (http://www.kalamazooaudubon.org). The Grand Rapids Chapter manages the Maher Sanctuary in northern Barry County. All of the Michigan Audubon properties have management plans to promote habitat important to the target bird species.

The 980-acre Bernard W. Baker Sanctuary in Calhoun County is best known as a refuge for nesting and migrating Sandhill Cranes (it was first bird sanctuary in North America dedicated to conservation of the cranes). Habitats at Baker feature the 200-acre Big Marsh Lake, a restored wetland, but also include ponds, streams, cattail marsh, tamarack swamp, oak opening, floodplain forest, wet meadow, and ongoing prairie and wetland restoration projects. More than 200 species of birds have been recorded on the property including Bald Eagle, Osprey, Northern Harrier, migrating waterfowl, and diverse warblers. This property is adjacent to land managed by Larry Holcomb (See Stewardship Story 4.3 about Wetlands).

Two Michigan Audubon sanctuaries (Otis and Warner) are adjacent to the Globally Important Bird Area in the Barry State Game Area, which is recognized for providing critical breeding habitat for cerulean warblers. The Otis Farm Bird Sanctuary is a 128-acre sanctuary with prairie, mature forest, and expansive marshlands along Glass Creek. Notable bird species at the Otis Sanctuary include: pileated woodpecker, red-headed woodpecker, grasshopper sparrow, Henslow's sparrow, warblers, bald eagle, osprey, and Sandhill crane. Ronald H. Warner Sanctuary, which is less than a mile north of the Otis Sanctuary, is located in an area of glacial moraines, and contains rounded ridges, seasonally flooded ponds, a stream, and lake. Most of the 108 acres is wooded with old-growth beech, oak and tulip trees and is home to breeding forest birds such as Acadian flycatchers, ovenbirds, scarlet tanagers, and yellow-billed cuckoos. The 35-acre Voorhees sanctuary near Albion is a beech-maple woodlot and is home to forest birds such as red-eyed vireos, Acadian flycatcher, and various woodpeckers. The 40-acre Mildred Harris sanctuary northwest of Kalamazoo has a mature beech-maple forest with diverse understory and spring ephemerals. See Stewardship Story 4.6: Cerulean Warblers

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.

Within Barry, Calhoun, and Kalamazoo Counties the Michigan Nature Association protects and manages nine nature sanctuaries and holds two conservation easements. These sanctuaries protect 282 acres of unique areas including high quality prairie fen, southern bog, emergent swamp and upland forest. These sanctuaries also help protect populations of a variety of rare species including spotted turtle, Blanchard's cricket frog, queen of the prairie, black cottonwood, orchids, as well as a waterfowl stopover area.

http://www.michigannature.org/
Andrew Bacon, Stewardship Coordinator, abacon@michigannature.org.

The Nature Conservancy

The Nature Conservancy, the largest nonprofit land conservancy in the United States, has the mission "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. The Nature Conservancy has a Resilient Forest project that has developed tools such as Key Ecological Attributes and Climate Informed Metrics to help inform forest management. They are also involved in one of the Landscape Stewardship Plans for the eastern Upper Peninsula.

Main Office: 101 East Grand River, Lansing, MI 48906 Phone (517) 316-0030

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 each year. 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 of pesticides and fertilizers to keep nature in balance. "Science shows us that small changes in the way properties are managed can make a huge impact towards improving our environment," said Megan Whatton, project manager for Habitat Network at The Nature Conservancy. "Creating and conserving nature within cities, towns and neighborhoods are key to global conservation." 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. Meetings are held on the fourth Wednesday of the month from October through April, unless otherwise noted, at the First United Methodist Church, 212 S. Park St., Kalamazoo. http://www.kalamazoowildones.org/

Kalamazoo Area Wild Ones, PO Box 20324, Kalamazoo MI 49019
Email: info@kalamazoowildones.org

National Wildlife Federation Garden for Wildlife

According to the National Wildlife Federation a wildlife garden should include:

- Food: Native plants provide nectar, seeds, nuts, fruits, berries, foliage, pollen and insects eaten by an exciting variety of wildlife. Feeders can supplement natural food sources.
- Water: All animals need water to survive and some need it for bathing or breeding as well.
- Cover: Wildlife needs places to find shelter from bad weather and places to hide from predators or stalk prey.
- Places to raise young: Wildlife needs resources to reproduce and keep their species going. Some species have totally different habitat needs in their juvenile phase than they do as adults.

When you plant the native plant species that animals depend on, you create habitat and begin to restore your local environment. How you manage your yard and garden can have an effect on the health of the soil, air, water and habitat for native wildlife as well as the human community.
http://www.nwf.org/garden-for-wildlife/create.aspx

Michigan United Conservation Club

Michigan United Conservation Club partners with Pheasants Forever, Quality Deer Management Association, and the Department of Natural Resources to deliver the Michigan Wildlife Cooperatives program which was created to improve habitat and hunting experiences on private lands by providing resources, supplying information, and supporting collaboration among individuals and groups. The Michigan Wildlife Cooperatives program provides wildlife and habitat management training and resources to grow and promote cooperative development and expansion. Collective management works especially well for game that has a large home range such as white-tailed deer, pheasants, and turkeys. There are wildlife cooperatives in each of the three counties addressed by this plan. See: http://www.mucc.org/cooperatives

Anna Mitterling: amitterling@mucc.org (517) 346-6454
Amy Trotter: atrotter@mucc.org (517) 346-6484

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."

Calhoun County	Jim Hoffman	chp0513@pfofficers.org	(269) 781-2158
Barry County	Bill Dangle	chp0550@pfofficers.org	(616) 443-8206

Baltimore Township Pheasant Co-op
A group of Baltimore Township (Barry County) landowners founded a pheasant co-op to re-establish a thriving pheasant population in the area. Current projects include creating and managing pheasant habitat (spraying/seeding grasses) and controlling predators. Partners are U.S. Dept. of Agriculture, Michigan DNR, Barry Co. Conservation District, and the Barry Co. Chapter of Pheasants Forever.
For more information or to get involved, please contact:

George Cullers	269-945-9218
Jake Ypma	269-945-3228

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

White tails Unlimited

Whitetails Unlimited's mission is to raise funds in support of (1) educational programs, (2) wildlife habitat enhancement and acquisition, and (3) preservation of the hunting tradition and shooting sports for future generations. Their website has information on forest management, wildlife habitat and food plot practices. http://www.whitetailsunlimited.com/about-us/

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
SW MI - Craig Curtis 48958 Beulah Way, Mattawan MI 49071
(269) 806-0440(C) or (231) 290-2740(H) ccurtis@ducks.org

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.
Battle Creek, MI Turkeyville Toms
Aaron Shaughnessy ashaughnessy@nwtf.net (269) 720-9234
Middleville, MI Rabbit River Longspurs; Nashville Thornapple Valley MI; and Vicksburg, MI Southwestern Michigan Longbeards
Tom Karsten tkarsten@nwtf.net (616) 260-5028

Trout Unlimited

There are two chapters of Trout Unlimited in the BCK area: the Kalamazoo Valley Chapter (covers the Kalamazoo River watershed and other areas) and Schrems West (Thornapple River watershed in northern Barry County and other watershed such as the Grand River and Muskegon River). The Trout Unlimited Kalamazoo Valley Chapter's mission statement is "To conserve, protect and restore North America's cold water fisheries and their watersheds, and to promote angling in a sportsmanlike manner." Both chapters are involved in stream restoration projects such as the replacement of two culverts under Cedar Creek (east of Hastings) with a single-span timber bridge in order to improve stream function and fish passage. The Barry Conservation District was awarded a grant from the Michigan Department of Natural Resources for that project and worked with the Barry County Road Commission and other partners.
Kalamazoo Valley Chapter Trout Unlimited 8400 N. 26th St. Kalamazoo, MI 49004
http://www.kvctu.org/
Schrems West Michigan Trout Unlimited P.O. Box 230094 Grand Rapids, MI 49523 info@swmtu.org

Kalamazoo River Watershed Council

The Kalamazoo River Watershed Council is a public, nonprofit 501(c)(3) organization whose mission is "to work collaboratively with the community, government agencies, local officials, and businesses to improve and protect the health of the Kalamazoo River, its tributaries, and its watershed. "*The goals of the Kalamazoo River Watershed Council are to: Promote wise stewardship and use of the natural resources of the Kalamazoo River and its watershed through education about its environmental, social, and economic issues; promote and celebrate the river as a recreational, aesthetic, and economic resource; facilitate, support, and provide technical assistance to partners addressing river and watershed issues, management planning, and funding; and develop and implement resource protection and ecological enhancement projects.*

They deal with a wide variety of watershed issues including contaminated sediments, aging dams, and excessive nutrient inputs. The Watershed Council is committed to re-establishing waters that are safe for fishing, swimming, and other uses, seeking to clean up old pollution problems and prevent new ones. The website contains a number of Watershed Management Plans, Watershed Assessments, Conservation Plans, and Remedial Action Plans.
http://kalamazooriver.org/learn/plans/

Jamie McCarthy, Watershed Coordinator 1415 Harrison St. Kalamazoo, MI 49007
(269) 978-4806 krwc@kalamazooriver.org

Watershed information for Kalamazoo River:
http://water.usgs.gov/lookup/getwatershed?04050003/www/cgi-bin/lookup/getwatershed

Battle Creek (a tributary of the Kalamazoo River) has a watershed plan completed in 2004:
www.michigan.gov/documents/deq/ess-nps-wmp-battle-creek-river_208908_7.pdf

The Lower Kalamazoo River (in Allegan County) is designated as a Natural River by the MDNR. The plan developed covers the BCK portion of the river.
http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_31442-95805--,00.html

Thornapple River Watershed

The Thornapple River Watershed Management Program brought together agencies and organizations from throughout the watershed to assess, study and develop recommendations to sustain the health of the Thornapple River, its tributaries and the lands surrounding them. The main outcome of the program was the development of the Thornapple River Watershed Plan, which assesses the water quality of the entire Thornapple River by analyzing the pollution causes as well as sources. The various pollution levels impair drinking water, fisheries, recreation uses (swimming, kayaking, boating and canoeing) as well as wildlife and critical areas that have been identified for the need for improvement.
You can access the Thornapple River Watershed Management Plan at.
http://www.barrycd.org/home/programs/watershed/trwmp/

Coldwater River Watershed Council

The Coldwater River Watershed Council works to improve the health and quality of the watershed including the creeks which empty into the Coldwater River. They are monitoring temperature, flow rate, *E.coli* levels, wildlife populations, erosion, and results of flooding. The Council's website has the Management Plan for the watershed and a Management Atlas, a tool that illustrates where the pollutants are geographically. The Coldwater River was the site of an aggressive channel

maintenance operation in early 2015 which resulted in action by the Dept. of Environmental Quality because of its impacts on the stream's trout fishery and other ecological damage.
http://www.coldwaterriver.org/home/index

Lower Grand River Organization of Watersheds

The Lower Grand River Organization of Watersheds (LGROW) has a website, managed by Grand Valley Metro Council, which has information on the Thornapple and Coldwater River watersheds as well as the tributaries of those rivers.
http://www.gvsu.edu/wri/isc/lower-grand-river-watershed-management-plan-312.htm
Robert B. Annis Water Resources Institute
Lake Michigan Center 740 W. Shoreline Dr. Muskegon, Michigan 49441
John Koches, Associate Research Scientist (616) 331-3792 kochesj@gvsu.edu

An interactive website for Michigan residents encourages them to take voluntary proactive steps to protect Michigan's water quality. See: www.MiWaterStewardship.org

Four Township Water Resources Council

The Four Township Water Resources Council (FTWRC) is a group of concerned citizens dedicated to protecting water quality in Barry and Prairieville Townships in Barry County, and Richland and Ross Townships in Kalamazoo County, Michigan. The group was organized as a Michigan non-profit corporation in 1994 to discuss and address common land use and water quality issues on a watershed basis. Their mission is: *To assist in the development and implementation of land use strategies that retain the rural environment currently enjoyed by township residents, protecting lakes, streams, drinking water, agriculture and open space.*

The Four Township Water Resources Council publishes studies, reports and educational materials to help local officials and residents that can be viewed or downloaded from their website. One example is the Four-Township Natural Features Inventory completed in 2005. This technical report covers a project that identified 20 potential conservation areas that have special and unique natural areas. Fact sheets are available for each PCA at http://www.ftwrc.org/

St. Joseph River Watershed

The Friends of the St. Joe River Association, Inc. helps Conservation Districts and other partners in Indiana and Michigan with watershed education, planning and implementation projects within the St. Joseph River Basin. The Friends of the St. Joe River Association aspires to:

- Serve as a center for watershed information
- Offer technical assistance and support to partners
- Coordinate implementation of watershed management plans
- Provide tools to target and secure funding for conservation practices

http://www.fotsjr.org/

3.2.3 Private Sector Natural Resource Professionals

Table 2. Forest Stewardship Plan Writers in the Southwestern Lower Peninsula

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

Atwood Forest Products, (Industry Forester)
Address: 1177 17 Mile Rd NE, Cedar Springs, MI 49319
Office: 616-696-0081
Website: www.AtwoodForestProducts.com
Brett Kuipers; Registered Forester. brett.kuipers@gmail.com; 616-399-6527

Berrien Natural Resource Consulting LLC, (Wildlife Biologist)
Address: 777 East Napier Avenue, #I-6, Benton Harbor MI 49022
Ryan Postema; berriennrc@gmail.com; 517-204-8951

Nikita Brabbit, (Consulting Forester)
Address: 917 West Genesse Street, Lansing MI 48915
Nikita Brabbit; nbrabbit@gmail.com; 507-458-4947

Dan Brown, Forester Type: Consulting Forester
Address: 2167 Gunnell Road, Eaton Rapids, MI 48827
Dan Brown; brownd94@msu.edu; 517-898-5670

Burhop Forestry Consulting (Consulting Forester)
Address: PO Box 362, Dexter, MI 48130
Carl Burhop; burhopforestry03@yahoo.com; 734-904-5233
Credentials: Registered Forester, Certified Forester, Association of Consulting Foresters

Brody Coval, (Consulting Forester)
Address: 14469 Mercury Drive, Grand Haven, MI 49417
Brody Coval; covalbro@gmail.com; 616-566-9961

Darling Forestry LLC, (Consulting Forester) Credentials: Registered Forester
Address: 1111 West Barnes Road, Mason, MI 48854
Website: www.DarlingForestry.com
Jason Darling; jason@darlingforestry.com; 517-243-2000

Rod Denning (Consulting Forester)
Address: 1926 Sylvan Ave SE, Grand Rapids, MI 49506
Rod Denning; denningr@gvsu.edu; 616-248-7993

Dennis Worst (Consulting Forester)
Address: 3409 Scenic Drive, North Muskegon, MI 49445
Office: 517-278-4364
Registered Forester Dennis Worst; dennisworst@frontier.com; 231-766-2711

Devereaux Sawmill (Industry Forester)
Address: 2871 North Hubbardston Rd, Pewamo, MI 48873
Office: 989-593-2130
Website: www.DevereauxSawmill.com
Ryan Simon; rsimonforester@gmail.com; 989-640-0135

Ecosystems Management LLC (Certified Wildlife Biologist)
Address: 3210 Bewell Avenue SE, Lowell, MI 49331
Jack Boss; ecosystemsmgt@att.net; 616-897-8575

Eco Management LLC (Wildlife Biologist)
Address: 6610 East M-63, Luther MI 49656
Travis Miller; miller.travis27@yahoo.com; 231-342-3819

Graham Forestry Services LLC (Consulting Forester)
Address: 6729 Trotwood Street, Portage, MI 49024
Registered Forester Michael Graham; mgrahamforester@aol.com; 269-207-4176

The Land Steward LLC (Consulting Forester)
Address: 300 Woodbridge Lane, Ortonville, MI 48462
Office: 248-627-7109
Rick McAvinchey; thelandsteward@frontier.com; 248-462-3524
Credentials: Registered Forester, Association of Consulting Foresters

Dave Mathis (Consulting Forester)
Address: PO Box 28, Chelsea, MI 48118
Dave Mathis; dmmathis@yahoo.com; 734-395-4113

Mark Janke Consulting Forester LLC (Consulting Foresters)
Address: 2676 111th Avenue, Allegan, MI 49010
Office: 269-673-7367
Website: www.MichiganForester.com
Mark Janke; mark@michiganforester.com; 269-330-0347
Ryan Hauser-Jeryc; ryanhauserjeryc@gmail.com; 734-320-4030
Credentials: Registered Forester, Association of Consulting Foresters, Certified Forester

Tom Nederveld (Wildlife Biologist)
Address: 9840 Tiffany Creek Drive, Rockford, MI 49341
Tom Nederveld; wmcnederveld@juno.com; 616-874-3256

Natural Community Services LLC (Ecologist)
Address: 30775 Longcrest, Southfield MI 48076
John DeLisle; j_delisle@hotmail.com; 248-672-7611

Natural Resource Insight LLC (Consulting Forester)
Address: 934 Thomas Street SE, Grand Rapids, MI 49506
Website: www.NaturalResourceInsight.com
Shawna Meyer; shawnameyer1@gmail.com; 517-388-6954

Northwoods Natural Resources (Consulting Forester)
Address: 913 Virginia SE, Grand Rapids, MI 49056
Website: www.NorthwoodsResources.com
Registered Forester Lee Mueller; MuellerL@NorthwoodsResources.com; Cell: 248-266-0659

Post Hardwoods (Industry Forester)
Address: 3544 38th Street, Hamilton, MI 49419
Office: 269-751-7307
Registered Forester Justin Brabon; jbrabon91@gmail.com; 616-799-0262

Progressive Forest Management (Consulting Forester)
Address: PO Box 521, Coldwater, MI 49036
Office: 517-238-4048
Pete Klink; marklink@dklb.net

Quality Hardwoods Inc. (Industry Foresters)
Address: 396 East Main Street, Sunfield, MI 48890
Office: 517-566-8061
Website: www.QualityHardwoodsInc.com
Registered Forester Abe Kempf; abraham@qualityhardwoodsinc.com; 231-735-3470

River Bend Willow Forestry (Consulting Forester)
Address: 116 East Willow Street, Lansing, MI 48906
Registered Forester Lisa Parker; parke204@msu.edu; 517-763-8637

Steinkraus Forest Management LLC (Consulting Foresters)
Address: 18623 Marcellus Highway, Marcellus, MI 49067
Office: 269-228-0139
Website: www.SteinkrausForestry.com
Jeff Steinkraus; jjs@locallink.net; 269-646-7306
Chris D'Hulster; dhulsterc@gmail.com; 269-908-6463
Credentials: Registered Forester, Association of Consulting Foresters, Certified Forester

David Syckle (Wildlife Biologist)
Address: 1410 Charles Avenue, Alma MI 48801
David Syckle; syckl1de@cmich.edu; 989-533-8447

Jeff Tuller (Consulting Forester)
Address: 5433 Colby Road, Owosso, MI 48867
Office: 989-723-9522
Jeff Tuller; tuller@straightturn.com; 810-841-4414
Credentials: Registered Forester, Association of Consulting Foresters

Weber Brothers Sawmill (Industry Forester)
Address: 2863 West Weidman Road, Mt Pleasant, MI 48858
Website: www.WebersSawmill.com
Amy Salisbury; amysalisbury@live.com; 989-330-0421

West Shore Forestry LLC (Consulting Forester)
Address: 4678 Hunt Street, Montague, MI 49437
AJ Smith; westshoreforestry@gmail.com; 269-808-6146

David Wilson (Consulting Forester)
Address: 1118 East Park Road, Rothbury, MI 49452
David Wilson; wilsonforestry@icloud.com; 231-861-8549

Credentials
Registered Forester – www.michigan.gov/foresters
Certified Forester - www.safnet.org/certifiedforester
Association of Consulting Foresters - www.acf-foresters.org

Table 3. Southern Lower Michigan Restoration Contractors (from Stewardship Network)

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

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, lot clearing, free wood recycling, excavating, landscaping, and mulch.
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!
www.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

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

Note: The lists provided are for reader's use but do not constitute an endorsement or guarantee of the quality of service. Other contractors not listed may also be available in your area.

Table 4. 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	
Blind, Gaye	Prism Science & Technology, LLC	3133 Lakeshore Dr. St. Joseph, MI 49085	
269-983-5775	agblind@prismscitech.com		
Grieves, Bethany	Circlewood Design LLC	35129 52nd St. Bangor, MI 49013	
269-370-8053	circlewooddesign@gmail.com	www.circlewooddesignllc@wordpress.com	
Hall, MCLC #447	Curtis 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 requires 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 (http://macd.org/)
Many of Michigan's 78 Conservation Districts host native plant sales in the spring and fall.
See Section 3.2.1 for local Conservation Districts' information.

4. Landscape Stewardship Stories

4.1 Barry State Game Area: Succession Effects on Soils

The Barry State Game Area's is the second largest game area in Michigan with approximately 17,000 acres under ownership of the Department of Natural Resources. The SGA's primary purpose is to provide hunting opportunities and habitat for Michigan game animals and much of the land was purchased with money from hunting licenses and taxes on firearms and ammunition (authorized by the Pittman Robertson Act).

Succession Effect on Soils

The pine plantations at Barry State Game Area played an important role in stabilizing eroded areas and improving soil productivity for oak regeneration. A typical soil for the pine lands is Coloma, a loamy sand formed by glacial deposits that is excessively well drained with a very deep profile that supports growth of adapted trees (northern pin oak and jack pine) reasonably well. It has less development (formation of horizons with higher clay content) and lower organic matter content than many of the other soils mapped in Barry County. The lack of clay and organic matter makes this type of soil more likely to erode and that is what happened historically. Much of the area was farmed at the end of the nineteenth century, but by the 1930s, many of the fields were bare sand that was carried away during wind storms. The planted pines blocked the wind and added organic matter to the soil to improve its nutrient and water holding capacity. The keys to keeping this soil healthy are to maintain plant cover and to avoid excess traffic or tillage. Protecting the topsoil on the surface will result in more plant growth which sets up a positive feedback loop with more organic matter holding more water and providing more nutrients, thus resulting in even more plant growth.

Now that the area has benefited from the growth of pines, it is prepared to support the growth of oak trees. These will be regenerated from local seed sources or planted with the oak species that require more light than some other trees (such as maple and beech) and the harvest of the pines will increase the openness of the site. Once the oaks are established, it will take at least 20 years before they produce acorns and peak production requires about 50 years (or more). Acorns (mast) are an important food source for deer, turkeys and many other forest animals. Having an uneven age class of oaks is beneficial to providing a more constant supply of mast over time.

Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm) is an excellent source of information on site specific soils by mapping soil types present and in providing a better understanding of the proper use of soils. For example, the tool shows the operability of heavy equipment that would be used for tree harvest. Sara Thompson (former game area manager) noted that she had seen areas that stayed wet thus resulting in more ruts from equipment traffic. Knowledge of soil limitations can help prevent these problems. See figure on next page.

Oaks regenerating in area where pine was harvested at Barry State Game Area.

This harvest equipment operability rating for a portion (about 140 acres) of the Barry State Game Area was produced by Web Soil Survey. The rating system predicts the likelihood of damage by rutting or problems with equipment access. The red area of Glendora loamy fine sand (18) is poorly suited because of wetness and low soil strength. The yellow areas are Coloma loamy sand (57E) which is rated as moderate because of slope and Brems sand (59A) which is too sandy. The areas in green have slight limitations for operating harvest equipment.

4.2 Asylum Lake at Western Michigan University

Western Michigan University (WMU) is a large (23,000 students), public institution located in Kalamazoo that has a national reputation for sustainability and is actively engaged in stewardship of its natural resources. (Source: http://www.bestcolleges.com/features/greenest-universities/). The school has instituted a number of innovative practices to enhance environmental protection on both campus areas and more than 500 acres of natural landscape. The University has been recognized as a Tree Campus (one of four in Michigan) by the Arbor Day Foundation for effectively managing their campus trees, developing connectivity with the community, and engaging students in service-learning opportunities centered on campus and community forestry. They have established many native plants and have reduced lawn mowing to save time labor and fuel. They have a permaculture program that features a Food Forest and the use of two double-layer hoop houses to grow food for students and to support on-campus research projects.

Landscape Services maintains public access to several properties for education and recreation through their Natural Areas and Preserves Program. Locations include Asylum Lake Preserve (next to the Parkview Campus), the 48-acre Kleinstuck Preserve off of Oakland Drive, and 130 acres of various woodlots. Asylum Lake Preserve is a 274-acre parcel of land owned by Western Michigan University in the West Fork of Portage Creek Watershed. The Asylum Lake Preserve supports multiple habitat types; oak savanna, oak-hickory forest, prairie, wet meadow, emergent marsh, shrub carr and two lakes. It was once occupied by the Kalamazoo State Hospital, so the habitats have been highly influenced by human disturbance. The land is preserved as a passive-use recreation area under an agreement between the City of Kalamazoo and WMU. The property also serves as a research area for professors and students of anthropology, biology, geography, hydrogeology, and environmental studies at WMU as well as other educational institutions.

The property is managed by the Asylum Lake Policy & Management Council, a 14-member council made up of representatives from local neighborhood organizations, environmental groups and WMU departments. A management plan for each of the habitats was prepared in 2008 by the Management Committee of the Council. The three goals at Asylum Lake as stated in the declaration of conservation agreement are:
1. Ecosystem integrity
2. Passive recreation
3. Education and research

The primary management in the Asylum Lake forest is removal of understory invasive trees and shrubs. The hope is that the herbaceous native understory grasses, sedges and forbs will respond to the reduced competition from exotic shrubs and create a more diverse ground layer. They are already seeing an expansion of plants like Pennsylvania sedge under the heritage oaks!

Steve Keto, Supervisor of Landscape Services, implements the management plan for Asylum Lake as part of his responsibilities for Natural Areas Preserves at WMU. Their mission statement is: WMU's Natural Areas Program partners with students and faculty, local ecological organizations, area schools, and volunteer groups in order to promote environmental stewardship, provide research and education opportunities, and create healthier natural areas on WMU properties. Because the plant communities in natural areas evolve over time, he is planning for the Twenty-second Century. He emphasized that “natural areas have many values that benefit people and those values should be considered when making land-use decisions.” He stated that “the protection of soil biology is critical to the health of ecosystems and that we should view soils as more than a structural commodity.” He is an advocate of using adaptive management to guide natural habitat management. This practice

requires a scientific approach to test management assumptions and techniques, and then adapting management strategies based on the results of monitoring.

Prescribed burns are conducted at Asylum Lake and Kleinstuck Preserves to reduce invasive plants and encourage healthy native vegetation. Wildtype, LTD was hired to perform restoration work along the north and south edges of Asylum Lake and brush was piled for later burning. WMU's Natural Areas Program has hosted a "Big Pull" event in which hundreds of volunteers come together to learn about the negative impacts of garlic mustard on ecosystems.

Keiser and Associates (a Kalamazoo consulting firm) conducted a water quality assessment of Asylum Lake to develop a better understanding of lake conditions, identify factors influencing water quality, and recommend strategies for long-term management and improvement. Activities included vegetation surveys, hydraulic modeling, assessing a phosphorous mass balance, and creating a set of BMPs for stormwater treatment. Issues included excess nutrients (N and P), anoxic conditions (lack of oxygen) and presence of invasive species. Another water quality issue for Asylum Lake is the development of a very dense (because of high salinity), non-mixing layer of water at the lake's bottom. The likely cause is inputs of road salts from stormwater. A recent issue of "Encore" magazine has a nice article on this.

As part of Western Michigan University's Municipal Separate Storm Sewer System permit, WMU is treating stormwater within the Portage and Arcadia Creeks Watersheds. WMU's goal is to infiltrate all storm water from both new development and redevelopment areas of campus. Best Management Practices that have been implemented include retention basins (designed to allow water to infiltrate back into the ground); detention basins (designed to hold storm water for slow release), rain gardens, underground infiltration chambers that capture runoff and increase infiltration, native plants installed in a riparian buffer zone around Goldsworth Valley Pond, and a no-mow zone established along Arcadia Creek. These storm water controls are estimated to have reduced annual nonpoint source phosphorus loadings from Arcadia Creek to the Kalamazoo River by nearly 25 percent.

The Hydrogeology Field Course offered by the Department of Geosciences at Western Michigan University teaches aquifer testing, environmental surface geophysics, groundwater sampling and monitoring, HAZWOPER training, remediation, and well drilling and installation. The majority of the geophysical testing, field work and training for this course is conducted at the Asylum Lake research and training site, which was developed to provide opportunities for hands-on experience. This practical groundwater education helps students get jobs with both environmental consulting firms and regulatory agencies where they help manage our water resources with a goal of sustainable use. Sustainable use of the groundwater and surface water resources of Michigan will protect ecosystems and landscapes as well as communities and commerce.

Asylum Lake with US Geologic Survey gaging station in foreground.

4.3 Wetlands: Larry Holcomb's Wildlife Diversity Project

Larry Holcomb has an ambitious goal of having the most diverse wildlife in the state of Michigan on his 995 acres near Olivet. Towards that end, he, his wife Jerrilynn, and other members of his family have planted thousands of trees, created 60 acres of tall grass prairie and established a variety of food plots including corn, buck-forage oats, turnips, radishes, clover, etc. There are several parcels under the family's ownership that are managed according to the plant communities that are present or being established. He is an avid hunter and fisherman who placed conservation easements on two large tracts of his property with the Southwest Michigan Land Conservancy to protect conservation values.

The dominant land cover on his property is wetlands with a mosaic of ponds, marshes, fens, wet meadows, and swamps. Larry owns a 480-acre tract with several wetlands that drain north into the Big Marsh on Michigan Audubon's Bernard W. Baker Sanctuary. Most of the wetland areas contain Houghton muck, an organic soil that formed under saturated conditions that persist for very long periods of time. The stream that connects hydrologically to the marsh has two dams with water-level control structures that create shallow pools upslope. Those pools are home to trumpeter swans, great blue herons, wood ducks, and many other birds (Larry has seen bald eagles fishing in the ponds). While visiting the site, we saw a red-headed woodpecker which is becoming less abundant due to competition for nesting sites from starlings and other birds. The area is a likely habitat for the Eastern massasauga rattlesnake which is Threatened under the federal Endangered Species Act. The site also supports pitcher plants, a native wetland plant that is found only in bogs and fens and is indicative of high quality habitat.

Michigan Audubon's Bernard W. Baker Sanctuary (which neighbors the Holcomb land on the north) is a staging area for thousands of Sandhill cranes that congregate there in the fall before heading south. Mr. Baker purchased the initial 497 acres of the Audubon's site (now at 980 acres) in 1941 to create the first crane sanctuary in the United States. The site is home to Cranefest, the largest wildlife event in Michigan, which is held annually in October. The sanctuary has almost 300 plant species and a high Floristic Quality Index of 62 indicating that the site has rare species that are characteristic for the plant communities present. Animals that have been sighted at Baker (and most likely use the Holcomb property as well) include black bear, bobcat, copperbellied water snake, spotted turtle, and cricket frog.

The Holcomb family has planted tall grass, short grass and wet prairies with a plant list that includes: big bluestem, Indian grass, switchgrass, Canada wild rye and little bluestem, black-eyed Susan, purple coneflower, New England aster, partridge pea, purple prairie clover, stiff goldenrod, wild bergamot, wild lupine and others. With assistance from Pheasants Forever, Larry tries to burn about 20 acres of prairie per year to help control woody invaders. Autumn olive has been removed with a tool (HedgeHog made by Hoelscher) with wedge-shaped openings attached to a front loader on his tractor. The wedge secures the stem of the shrub and allows the plant to be lifted out of the ground and piled for later burning. In addition to removing woody plants from the interior of the prairie, the tool is used on the perimeter where invasive shrubs commonly grow. Autumn olive bushes that are not accessible by tractor are cut and treated with Tordon or a combination of Crossbow and diesel fuel.

Most of the trees that were planted are conifers (Fraser and concolor fir, Scotch, white and red pine; blue and Norway spruce) that were intended to be harvested as Christmas trees, but most of the trees have become too large for that purpose. He worked with forester Jim Bruce to create a forest management plan and has conducted selective timber harvest on some sites. He will likely do some thinning in the pine, spruce and fir plantings with a possible timber harvest 15 to 25 years in the future. One of the land use categories in his conservation easement is managed woodland which

does allow harvest if done according to a timber harvest plan. Larry created snags (dead standing trees) to provide potential nesting habitat for bald eagles.

His advice to other landowners is: “Be patient. Review your goals each year and modify goals and management plans. Keep records. Be active in conservation groups.”

Having diverse wildlife requires having many types of habitat and Larry works hard to provide resources for the animals on his land. His quest to create diverse wildlife habitat is facilitated by his academic training (BS from Olivet College, MS and PhD from Michigan State University) and the fact that he is a certified wildlife biologist. This knowledge base is maintained by reading professional journals from Wildlife Society, American Ornithology, etc. and newsletters from wildlife organizations such as Ducks Unlimited, Pheasants Forever, Whitetails Unlimited. Larry has made a sincere effort to obtain his goal of having the most biologically diverse property in Michigan and we hope he succeeds in the task.

Larry Holcomb standing at one of his favorite spots, just south of Bernard Baker Sanctuary.

View of marsh/fen wetlands with Baker Sanctuary in the background.

Pitcher plant observed in the fen.

Tractor equipped with HedgeHog bar for removal of invasive shrubs.
The disk is used to prepare a seedbed for food plots.

4.4 Biological Diversity: Paul MacNellis Kalamazoo County

By Michael Anderson

Historical descriptions reveal that the now restored twenty-acre prairie nestled behind and divided among four properties on South 1st Street in Kalamazoo County was once a black oak barren. Not too long ago, the parcel was part of a much larger agricultural plot of land. The old 171-acre bromegrass field was used to supply local dairy farms for a period of time. When the land was divided up in 2000, Paul MacNellis and wife immediately jumped on the opportunity to own the corner property of the agricultural field where they often meandered around with their companion dogs.

Paul MacNellis came to Kalamazoo, Michigan to achieve a degree at Western Michigan University. Upon graduation, Paul became Director of Landscape & Transportation Services at the university. Though Paul disagreed with yard work in his youth, as most any kid instructed by parental figures to execute such labor does, and never would have thought he would end up directing the landscape department at an institution such as Western Michigan University, the career proved fruitful for Paul; much of the knowledge acquired along the way now allows him to approach land stewardship with keen awareness in many areas of land management.

Paul retired from the university the fall of 2010, notably leaving behind a legacy with the hiring of Steve Keto as the Director of the Natural Areas Program at Western Michigan University, and knew that he wanted to spend his time nurturing the land around him back to an ecologically healthy state of being. Paul is often recruited by such organizations as the Southwest Michigan Land Conservancy and the Kalamazoo Nature Center whenever a steadfast, committed volunteer such as Paul is needed, but he ensures that a significant portion of his time remains dedicated to the land in his own backyard. Paul is the coordinator for the Southwest Corner Cluster of the Stewardship Network.

Paul also met his wife at the university and together the couple resided in a school house built in 1864 on South 1st Street for twenty-four years. Paul fondly recalls noticing a substantial number of black oak trees on the school house property, but when the agricultural land on South 1st Street was divided the corner property of the bromegrass field beckoned. Onlookers can easily sight such features as an approximately two-hundred-year old black oak wolf tree that wisely stands behind the MacNellis house and understand why the couple was initially attracted to the property.

A black oak wolf tree is pictured above: a tree that will hopefully persist for years to come because of its impressive crown that competitively excludes any significant understory growth.

Nate Fuller at the Southwest Michigan Land Conservancy put Paul into contact with James Hudgins and Meredith Bryant at the US Fish & Wildlife Service in hopes that Paul could secure a Partners for Fish and Wildlife grant for restoration work on the property in his backyard. A proposal was submitted by Paul and his efforts led to three adjacent neighbors joining in to commit the combined twenty acres of land behind their homes to the project. A grant was secured and Paul signed the landowner's agreement in the fall of 2014. He then began the task of developing a more natural site by burning and applying herbicide to rid the land of many invasive species in order to prepare the plot of soil for the introduction of native species. The grant allowed funding for the seeds of 8 native grass species and 18 forb species to be planted, a richness that Paul would like to enhance as the project proceeds into the future.

The photograph above (taken in early fall 2016) reveals the work that Paul and so many others have put in until now managing the land that was once used for farming.

Paul even has plans to one day obtain a forestry grant to move some of the trees he has tirelessly cared for that surround the prairie into the land that is now making strides away from the monoculture of bromegrass that once was. Paul purposefully cultivates the trees of ecological value that grow in his yard including black oaks, hickories, and walnuts in hopes that they will one day be introduced to the prairie landscape to create a savanna. Paul is devoted to continued restorative work on the prairie, though for Paul it is always important to critically approach the term "restoration" with careful diligence. Paul grounds himself with the basic rule that he wishes to make the land as ecologically sound and healthy as it can be and, for Paul, the definition of restoration suggests the achievement of a past state that will realistically never again be attained. Land should be managed in order for it to be as healthy as possible, and Paul translates health into achievable diversity and realistic goals. Diversity represents strength. Healthy systems depend on the diversity of species that sustain them and create dynamic stability, but above all else Paul advises that stewards tackle projects that can be sustained and land management that is feasible. Ethical, strategic, and realistic management are crucial for successful stewardship in the eyes of Paul MacNellis.

4.5 Fish and Wildlife Habitat: Vernal Pools at Pierce Cedar Creek Institute

Pierce Cedar Creek Institute is a nature center, environmental education center and biological field station located south of Hastings, Michigan in rural Barry County. In keeping with its mission (to inspire appreciation and stewardship of our environment), the Institute manages its property to support biodiversity and provides an outdoor classroom for environmental education programs. The Institute provides educational programs for community members of all ages as well as recreational opportunities. Each year, several of the programs focus on land stewardship and volunteers are encouraged to assist with restoration plantings, invasive species control, environmental monitoring and other activities. Visitors to the Institute can enjoy ten miles of hiking trails and learn about nature through outdoor signage and guided tours.

Through a recent land donation from neighbor Alice Jones (and her deceased husband Kensington), the Institute's area has grown to 742 acres, most of which is protected by an easement held by the Southwest Michigan Land Conservancy. The bulk of the area is hardwood forest (both oak-hickory and beech-maple) but there are also 58 acres of tamarack and northern white cedar swamp. Within the hardwood forests are several vernal pools or ephemeral ponds that are relicts of past glaciation.

Depressions or "kettles" formed when a block of ice was isolated from the glacier and melted later, thus leaving a low spot that often retains water longer than the surrounding land. Although much of the area is mapped as Marlette loam which is moderately well or well drained, the low areas that form vernal pools probably intersect local groundwater. The vernal (spring) part of the feature's name comes from the fact that the water is normally higher in the spring and then drops as temperatures increase. Some of the vernal pools at the Institute are connected hydrologically and water cascades from the higher ones to lower pools.

The plant community that is common for vernal pools includes hardwoods like black ash, swamp white oak, pin oak, cottonwood, silver maple, red maple and conifers northern white cedar and hemlock. Typical shrubs that grow in vernal pools are speckled alder, buttonbush, winterberry, highbush blueberry, dogwood, and willows. Aquatic vegetation such as algae and duckweed are present in most pools. The mix of vegetation will depend on the depth and persistence of water as well as the amount of sunlight penetrating the tree canopy. Trees normally overhang the water and leaf fall provides carbon input into the system.

As plants leaf out and evaporation increases, vernal pools usually dry out in summer, so they do not support fish, but do provide habitat for many amphibians such as salamanders. Many animals use vernal pools for feeding or for habitat. Examples include: salamanders, frogs, fairy and clam shrimp, fingernail clams, snails, dragonflies, springtails, etc. The smaller organisms become food for larger animals such as Blanding's turtle, garter snake, northern water snake, great blue heron, wood duck and others.

The Institute started monitoring salamanders and frogs in four vernal pools in 2015. Monitoring efforts continued in 2016 but two ponds were added on the Jones parcel, while two previously-sampled ponds were dropped. They observed 164 blue spotted salamanders in 2015 and 202 in 2016. Spotted salamanders were less common with 54 and 24 in the two years of monitoring. Wood frogs were the most common frog with 264 in 2015 and 245 in 2016 (combining counts from the four pools). Fluctuating numbers of salamanders and frogs shows that long-term monitoring is important to understand population dynamics.

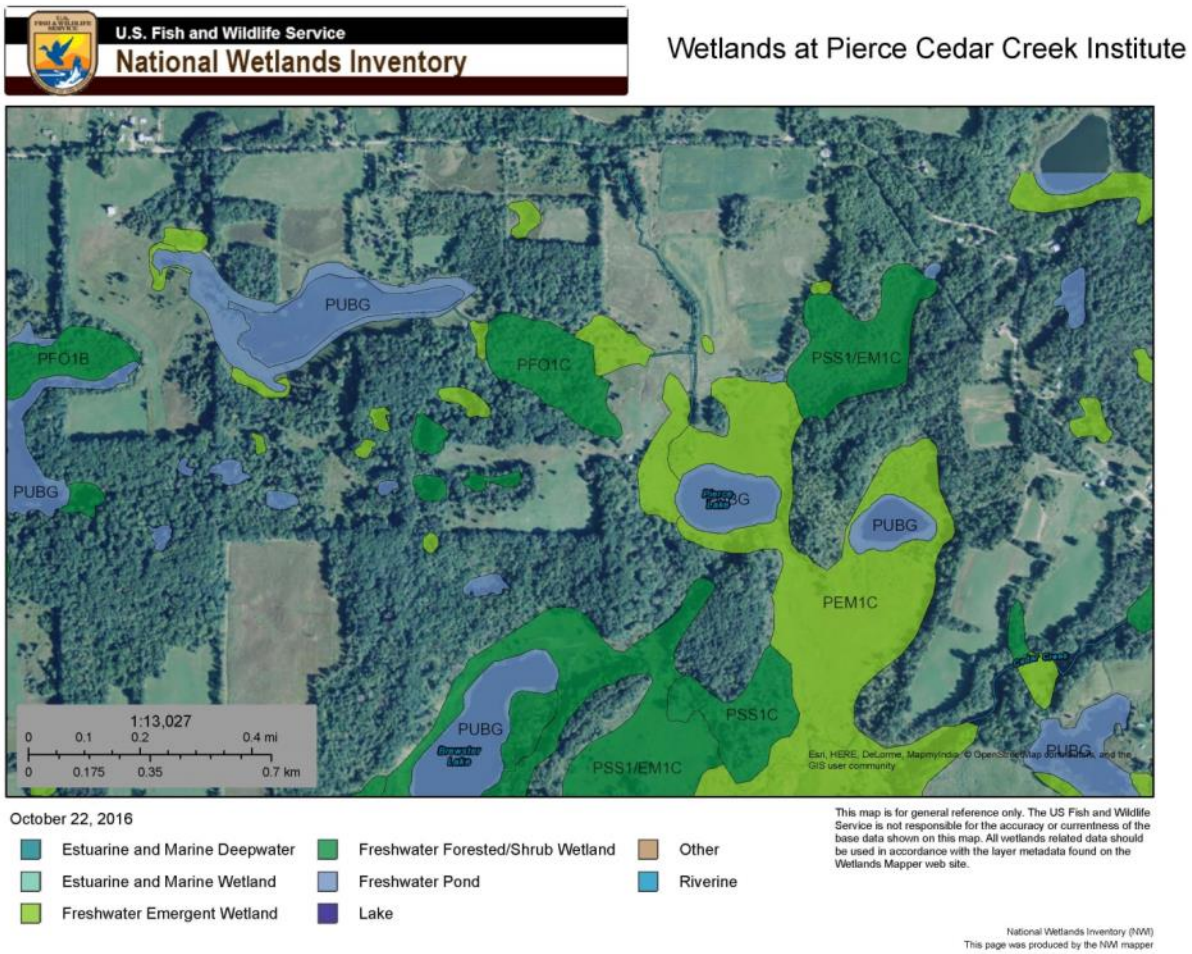
Management of vernal pools involves avoiding disturbance and maintaining a vegetative buffer (especially native forest plants) around the perimeter. Having vegetated corridors by which animals can migrate among pools is also helpful. The vernal pools at PCCI are numerous and several are connected hydrologically on the landscape. Protection of vernal pools is important because many have been lost in association with conversion of forest land in the state (about half of Michigan's forests have been changed into a different land use).

Note: The Michigan Amphibian and Reptile Best Management Practices document was created for the Michigan Department of Environmental Quality to provide a comprehensive guide to practices that improve and maintain the viability of Michigan amphibian and reptile populations. www.herprman.com/amphibian-reptile-management-practices-michigan

Example of vernal pool at Pierce Cedar Creek Institute. Photo taken June 9, 2016.

Researchers (Matt Dykstra on left and Sara Syswerda on right) from Pierce Cedar Creek Institute and Yu Man Lee from Michigan Natural Features Inventory, sample for amphibians in a vernal pool in early spring.

Spotted salamanders found during monitoring.



National Wetland Inventory Map of Wetland Types at Pierce Cedar Creek Institute. The vernal pools discussed in the text are located in the southwest part of the map (above the scale box). The codes displayed are explained at: www.fws.gov/wetlands/data/wetland-codes.html

4.6 Threatened and Endangered Species: Cerulean Warblers

Cerulean warblers are small birds who live in the canopy of large stands of mature forest. This sky-blue (blue-green in female) warbler has the fastest declining population of any songbird in North America. The Michigan Department of Natural Resources listed the cerulean warbler as a State Threatened species in 2009. It has two broad white wingbars with blue stripes on the sides of a white chest. Its favored habitat is bottomland hardwoods (silver maple and sycamore) or mesic to wet deciduous forest (beech, maple, oak and black walnut) on upland sites with some slope. Large areas of forest (at least 3 square miles) are required and extensive areas of more than 10 square miles improve the bird's breeding success.

The main threats to the species on its breeding grounds are: loss of mature deciduous forest; fragmentation of remaining mature deciduous forest; loss of key tree species (especially oaks, sycamores, and elms); nest parasitism by the brown-headed cowbird; and use of even-aged management and short rotation periods. The harvest of large areas of forest and reduced time for trees to grow results in smaller trees that are less suitable for the warblers. Single tree selection that mimics the loss of an individual tree is beneficial to the warbler's breeding success.

According to Michigan Natural Features Inventory, all three counties, Barry, Calhoun, and Kalamazoo have cerulean warblers but the largest tract of suitable habitat is the 17,000-acre Barry State Game Area. Based on observations recorded on Ebird, Fort Custer State Recreation Area is another hotspot. Ebird is a website (http://ebird.org/ebird/explore) that allows individuals to report bird observations and to record their own species lists. Ebird was developed by Cornell University which also supports the "All About Birds" website which has a guide that helps with identification and provides sounds for each of the species (https://www.allaboutbirds.org/guide/search/).

The nearby Michigan Audubon Otis Farm Bird Sanctuary is the site of an annual Cerulean Warbler Weekend festival held in early June attended by more than 100 birders. The neotropical migrating birds usually arrive in early May and leave between July and September to travel to winter ranges in South America. They are difficult to see because they spend most of their time in the tree canopy, but experienced birders can detect them from their song (males only).

Protection of habitat for cerulean warblers will benefit other forest interior specialist species. Organizations like the Kalamazoo Nature Center and the Southwest Michigan Land Conservancy are protecting existing forested parcels and trying to connect them with areas that could be reforested to provide the large blocks of forest that the species requires.

Mature hardwood forest serves as favorable habitat for cerulean warblers.

Rich Keith from the Kalamazoo Valley Bird Observatory observed "When you catch a glimpse of this difficult to see species the thrill is tempered, knowing how little of the habitat it needs is left." The Pitsfield Banding Station at the Observatory bands many birds but has only captured two cerulean warblers in 42 years (using passive netting methods).

Photo Credit: Rich Keith from the Kalamazoo Valley Bird Observatory

Kalamazoo Valley Bird Observatory and Pitsfield Banding Station
5616 East "S" Avenue Vicksburg Michigan 49097
269-327-0671 cell 269-762-9269 warblerrke@gmail.com

4.7 Forest Resources: Pamela Dewey's Selective Harvest for Oak Regeneration

Barry County

Pamela Dewey's connections to the land go far back in time and through multiple generations. Her great-grandfather was one of the early settlers in the area and she has a strongly developed sense of place. Although an accountant by profession, she has learned about nature through the National Gardening Clubs, Inc. Certified Gardening Consultant, Certified Environmental Studies and Certified Landscape Design programs as well as Michigan State University's Master Gardener Program. She has also been active in the Wild Ones, an organization that advocates for native plants and the sustainable landscaping movement (http://www.wildones.org/). This combination of motivation and knowledge has served her well in stewardship activities.

The 40-acre parcel on which she and husband, Eugene, live features a mature oak-hickory forest, an old field that has been planted to prairie and a portion of Lake Monroe. Pamela is very fond of wildlife (especially the ones that don't eat too much of her garden and landscaping plants). She is an avid birder, enjoys watching a pair of trumpeter swans that nest on the lake, and has seen a bald eagle on the property. Thus one of her primary land management goals is to protect water quality in the lake.

While red, black and white oaks are dominant in the canopy, red maples are common in the understory and will eventually replace the more wildlife friendly oaks in the future unless action is taken. To that end, Pamela worked with Mark Janke, a certified forester, to plan a selective harvest of 190 trees on the 27 acres of forest to allow more light to hit the soil surface and allow for oak regeneration. The sandy loam Oshtemo soils on the site are favorable for oaks because they are deep and well drained. A selective tree harvest was completed in fall 2016 as part of a forest management plan that Mark Janke prepared for the site. Harvest during the warm months should be avoided to help reduce the spread of oak wilt. The lake was buffered by an unharvested strip 50 feet wide to minimize impacts on water quality.

Another of Pamela's stewardship goals is to improve biological diversity on the land. She has performed a variety of management activities including pulling invasive garlic mustard and spotted knapweed and planting native species around her buildings and in an old field. Her lawn area is kept to a minimum and she avoids use of chemical fertilizer and pesticides in order to protect water quality as well as the amphibian, reptile, bird and pollinator populations. She allows deer hunting on the property but has only been marginally successful at reducing the size of the herd.
To protect the land for future generations, she is working with the Southwest Michigan Land Conservancy to put a conservation easement in place. The largest part of the property will be classified as a managed woodland while the remainder will be designated as agricultural land and buildings envelope to allow a wider range of activities. Her main objective with the conservation easement is to provide habitat for native plants and animals. Her future plans include establishing a "Certified" Monarch Waystation and obtaining certification through the American Tree Farm System. Through careful planning and a number of environmentally responsible activities, she will keep her home a happy place for many other species.

Pamela described her approach to landscaping and gardening by saying "I used a repeated trial and error process to determine what works in my planting system on my soils. Wild Ones offers regular monthly field trips in the summer months with locations varying from forests, prairies, wetlands and landscaping. The tours offer an excellent way to view the biodiversity and provide a great way to interact with others and learn from their experiences."

Pamela Dewey looking over Lake Monroe, which provides habitat for trumpeter swans and many other animals and plants.

One of the trumpeter swans that lives on the lake. It is the largest waterfowl in North America and although its numbers have been increasing, threats such as lead poisoning and habitat loss continue to affect the population. The swans are also extremely sensitive to human presence at their breeding sites and will abandon nests and cygnets if disturbed.

Left: Many of the understory trees in the forest are red maples and will eventually become dominant unless management is performed.
Right: Several of the trees that were marked for fall 2016 harvest.
The intent of this removal is to increase light availability and allow oak regeneration.

4.8 Forest Health: Fire Management at SWMLC's Chipman Preserve

A key principle of land management is to understand the past land use history of a property. When the land was first surveyed in the early 1800s, Chipman Preserve was an oak savanna. Over time, the land was cleared and used for agriculture, then it was fallowed and much of it was taken over by trees (there are mature forests on the east end of the site) and non-native plants. John and Patti Chipman donated the core property in 2002 and it was expanded through purchase in 2004 to its current size of 228 acres. The Preserve is located in Comstock Township of Kalamazoo County and the Chipman's former house now serves as SWMLC's office. The property is open to the public and features five miles of mowed trails in upland habitat.

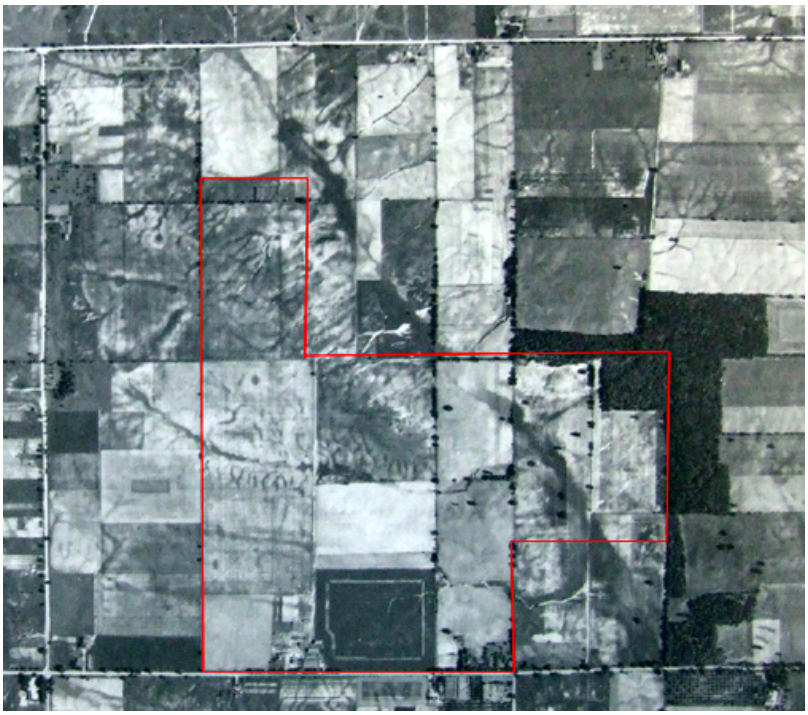
Habitat restoration and passive recreation are SWMLC's main goals for the Chipman Preserve. The plant communities include prairie, oak savanna, oak-hickory woodlands, pine forests, and old fields. SWMLC is working to restore more than 200 acres of oak savanna habitat which makes this one of the largest restoration sites on private land in the state. Small remnant populations of rare savanna and prairie plants found on the preserve are being encouraged through fire and brush removal. Additional species are being restored through seed and transplants from other nearby remnants. They have found it more difficult to restore native plants to farmed areas compared to woodland, probably because the microbial community has changed. Many plants have mycorrhizal relationships (between plant roots and fungi) that help native plants establish and thrive. Research studies have shown that this "legacy" effect can last 50 or more years before the microbial community begins to resemble the previous condition of the prior land use.

Fire was essential to maintain prairies and savannas and prevented woody species from taking over the site. Some of these fires were naturally caused by lightning and others were intentionally set by Native Americans to improve hunting and allow more visibility to detect the approach of enemies. Trees vary in their sensitivity to fire with many of the oaks (black, bur, chestnut, Chinkapin, and northern red) being resistant to fire. On the other hand, many of the trees that are dominant in younger forests are fire sensitive (beech, black cherry, black walnut and sugar maple). Fire kills or limits their growth the sensitive species by damaging the bark and conducting tissue underneath. Nate Fuller, Conservation and Stewardship Director at SWMLC, had learned lessons from his efforts to use fire to restore native communities. In one early-career burn, invasive shrubs such as autumn olive, bush honeysuckle and glossy buckthorn were top killed, but canopy trees were also set back resulting in more light penetrating to ground level. This caused a proliferation of the invasive shrubs that were the targets of the burn. Nate learned that more frequent burns conducted sooner after the initial fire were required to prevent the shrubs from taking over the site. An alternative strategy is to use mechanical or chemical control to keep the invasive in check. There are commercial brush cutting and forestry mulching machines available (e.g., Fecon's Bull Hog which can be mounted on an excavator or skid steer).

Nate and his staff do burns on smaller areas (less than 15 acres) with simple fuel models. For larger, more complex fires with multiple fuels (grass, leaves, woody material), he hires contractors such as David Mindell from PlantWise to complete the burn. PlantWise and other contractors normally carry their own insurance policies (this should be confirmed prior to signing the contract). For SWMLC conducted burns, the land trust gets a rider on their existing insurance to cover potential problems. In all cases, SWMLC notifies the local township fire department because they will likely get reports of fire when passersby see smoke.

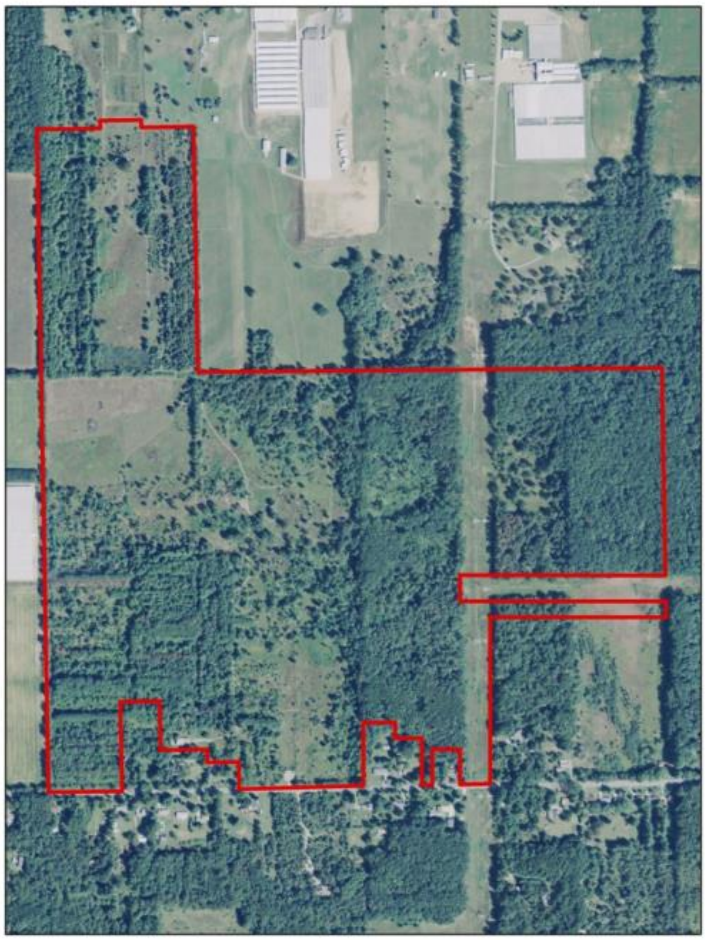
Burning natural areas requires understanding of fuels, effect of wind speed and direction, relative humidity, and other factors in order to manage the fire safely. The burn boss should prepare a burn plan that documents the acceptable range of conditions that must be present before ignition and describes the techniques that will be used during the burn. Fires can be very sensitive to environmental conditions and Nate observed that fire in a November 2015 burn was limited just by shading.

Nate and the rest of the folks at SWMLC have made great strides at restoring natural communities at Chipman and other preserves. He observes that "As long as the parts are still present, it is possible to put the system back together." Protection of remnants of relatively undisturbed sites is critical to obtaining the plant material and understanding of interactions to ensure survival of those ecosystems.



Aerial image of Chipman Preserve taken in 1938 showing agricultural land use except in NE corner.

Photo of Chipman Preserve taken in September of 2016 shows establishment of mixed oak savanna.



Aerial image of Chipman Preserve taken in 2014 showing expansion of trees over much of the property. The northwest corner of the property is prairie and the oak savanna is in the middle.

Prescribed fire conducted by Southwest Michigan Land Conservancy. Burning helps to reduce the amount of woody vegetation that survives and favors fire-tolerant plants such as bur oak. Photo by Mitch Lettow.

4.9 Cultural and Historic Sites: The Lillian Anderson Arboretum

By Michael Anderson

Kalamazoo College's Lillian Anderson Arboretum (LAA) encompasses 140 acres of marsh, prairie, second-growth deciduous forest, and pine plantation in Oshtemo Township of Kalamazoo County. The land that is now entrusted to Kalamazoo College was historically utilized for agricultural purposes throughout most of the 20th century. Today, LAA no longer persists as a site for farming and is instead employed as a natural extension of the college community's commitment to conservation and experiential learning. The current ecological state of and variety of natural habitats that exist at the arboretum can be attributed to the many directors that have labored over the land. In fact, the "mosaic of habitats" and diversity present at the LAA is one of the things the current director values most. The past two years at the arboretum have largely been guided by the current director, Dr. E. Binney Girdler, along with the efforts of the Assistant Director of Outdoor Programs at the college, Sara Stockwood.

Dr. Girdler achieved her doctorate from Princeton University and now serves as Associate Professor of Biology, Chair of the Biology Department, Co-Director of the Environmental Studies Program; and Director of the LAA at Kalamazoo College. Dr. Girdler roots much of her devoted involvement with conservation of the natural world to her childhood: "I very much have understood for a long time, since I was a little kid, the need for stewardship." A conservationist, birder grandmother fostered Dr. Girdler's connection to the outdoors as a child and to this day Dr. Girdler fondly recalls the important role that her grandmother fulfilled. A role not only fulfilled by her grandmother but also a great grandmother that served as a State Representative for Connecticut and led initiatives to preserve state forests. The natural world represents a place of great solace and a place to balance oneself for Dr. Girdler. As an ecologist, Dr. Girdler is imbued with profound curiosity to understand the workings of the natural world. Her curiosity and personal connection with the natural world tirelessly shape her commitment to ecological research activities, successful education, and strategic stewardship.

The educational resource that the LAA is for the college and greater Kalamazoo community combined with Dr. Girdler's vested personal interests in the natural world make management of the LAA and the health of the arboretum's habitats a priority. "There's a lot we don't know, even in our own back yards, and so… research projects in all the habitats and applied science, because there's a lot of management that has to go on, are important things to have students and people learn about" Dr. Girdler states. Management and applied science remain essential so that the outreach potential of the arboretum can be maximized. The college recently received a Gilmore Foundation Grant to construct a pavilion on the LAA's property to serve as an educational gathering place, a display of Dr. Girdler's investment in the LAA as a space for education and connection to nature. In order to maintain the LAA as an educational tool Dr. Girdler collaborates with people such as Sara Stockwood to manage the land. Sara's duties revolve explicitly around land stewardship, trail maintenance, and the production of a land management plan for the LAA. According to Dr. Girdler: Sara "lives in Lillian Anderson's farm house on the property… she has a 140 acre back yard. She runs in it every day. She's got her feet on the ground and she knows when a tree falls."

The most prevalent issue that stewards of the LAA are tasked to address is the control of invasive species. Invasive species degrade the overall health of land and threaten places of great ecological significance. Batts Pond, according to Dr. Girdler, "is probably the most ecologically significant and special habitat." The pond is groundwater-fed without a stream and is of great importance to the amphibian populations of the arboretum.

Pictured above is a photograph taken by Kalamazoo College Student Sharayu Salvi in the summertime. The bridge overlooks Batts Pond, an imperative habitat for many amphibian species at LAA due to the absence of any fish population.

Habitats that are not as ecologically significant and diverse are also threatened by invasive species and require land management. Maintenance of the second-growth deciduous forests and prairies systems such as the Old Field at LAA is also of concern.

It is common to observe wildflowers such as Enchanter's Nightshade or Woodland Agrimony in the oak savanna system of Old Field. Pictured above in late spring is one of the "Oak Islands" that scatter the mostly open field.

Invasive species, along with increasing human activity and development, threaten the integrity of ecological systems. Dr. Girdler identified Japanese knotweed as the most brutal invasive that the LAA manages, but the land is also threatened by ornamental bittersweet, autumn olive, multiflora rose, garlic mustard, and other invasive species. Dr. Girdler has witnessed ornamental bittersweet choke out trees from the landscape of the arboretum, Japanese knotweed competitively exclude diverse native terrestrial plant communities, and other pronounced, harmful impacts from invasive species. The college dedicates more resources and time towards invasive species management on the LAA property over anything else because invasives have been identified as the chief threat to the ecosystems present.

For Dr. Girdler the 'job is never done.' The job will never be done, but Dr. Girdler believes stewards must tactfully grapple with this grounding advice because natural systems persist as dynamic systems. Landscapes present no fixed edges for they are true natural systems. "You're always going to have to be aware of your neighbors, what's upstream… the edges are porous and ecological processes are dynamic and you need to work with that" according to Dr. Girdler.

4.10 Tourism and Recreation: Trails at Fort Custer State Recreation Area

The Fort Custer State Recreation Area, located near Augusta in Kalamazoo County, was historically a part of the federal Fort Custer military base. It was deeded to the Michigan Department of Natural Resources (DNR) for recreation and natural resource preservation in 1971. Fort Custer SRA has 3,033 acres of land, three miles of the Kalamazoo River, and features three lakes: Eagle, Jackson Hole, and Whitford-Lawler. It has a variety of recreational opportunities including a modern campground, cabins, picnic shelters, day-use beach area, and four boating access sites. Fort Custer Park Manager Tony Trojanowski explained that "Michigan state recreation areas are open to hunting and trapping unless specifically closed, whereas state parks are closed to hunting and trapping unless specifically ordered open."

Michigan has an extensive network of trails and has been called the "Trails State." According the Rails-to-Trails website, Michigan has more railroad conversion (2,380 miles) than any other state. The Outdoor Industry Foundation reported that consumers spent a total of $18.7 billion on all forms of recreation just in Michigan and that it created 194,000 jobs for the state.

More than 25 miles of trails are available for hiking, mountain biking, horseback riding, dog mushing, and cross-country skiing at Fort Custer SRA. A number of user groups have assisted with trail design and maintenance including the Southwest Chapter Michigan Mountain Biking Association, Mid Union Sled Haulers (MUSH), and FCRA Horse Friends Association. Plans to connect the Fort Custer system to the Kalamazoo River Valley Trail are being coordinated with the Parks Foundation of Kalamazoo County.

A portion of the North Country National Scenic Trail runs through the property and extends into Yankee Springs SRA in western Barry County. The trail is the longest (4,600 miles) in the US and crosses seven states from New York to North Dakota. Based in the southwestern Lower Peninsula of Michigan, the Chief Noonday Chapter is responsible for developing, maintaining, protecting and promoting their section of the North Country National Scenic Trail which spans from just south of Grand Rapids to Battle Creek. For more information on the trail go to: https://northcountrytrail.org/

In addition to the trails on land, Fort Custer has a portion of the Kalamazoo River Water Trail that allows paddlers to travel up to 130 miles on the river from the confluence of the north and south branches near Albion to Lake Michigan near Saugatuck. According to the Michigan Water Trails website (www.michiganwatertrails.org/about.asp) a water trail is a designated route specifically designed for people using small boats. The "blueways" trails, are the aquatic equivalent of a hiking trail or "greenway." Water trails feature well-developed access points; are near significant historical, environmental or cultural points of interest; and are actively supported, managed and/or maintained by at least one organization or community.

Multi-use trail in Fort Custer State Recreation Area.

The Kalamazoo River in Fort Custer State Recreation Area is part of the Kalamazoo River Water Trail which is 130 miles long from the junction of north and south branches near Albion to its mouth near Saugatuck.

4.11 Stewardship Plan Creation and Implementation: Larry Hayward

Larry and Noel Hayward have used stewardship planning and management to create a wildlife oasis on their land in Southwest Barry County. They both enjoy birdwatching and have installed about 40 bluebird boxes on the prairies planted on former crop fields. Larry, a former marine, likes to hunt and fish and would like to see pheasants established in their new habitat. In addition to the prairies, they have forests managed for future tree harvests and about 65 acres of row crop agriculture on the more favorable soil areas.

One of the more unique habitats that they are creating is a bur oak savanna that is in keeping with the circa 1800 vegetation map that was created by the Michigan Natural Features Inventory biologists (P.J. Comer and D.A. Albert) in 1997 which shows a small area of grassland east of Prairieville, an area of black oak barren west of town and a mixed oak savanna in the southwest corner of the county. The circa 1800 map for Kalamazoo County shows larger areas of grass lands and the Prairie Rhonde was estimated to cover 14,000 acres in the southwest part of the that county. The current list of Michigan Natural Feature Inventory's plant communities includes bur oak plains (which have been eliminated from the state), and oak openings and oak barrens both of which are considered critically imperiled because of extreme rarity or being especially vulnerable to extirpation. The oak openings and oak barrens are types of savannas with up to 60% canopy cover and the remaining area dominated by grasses with the oak barrens occupying coarser textured soils more prone to drought. https://mnfi.anr.msu.edu/communities/index.cfm

The Haywards manage their prairie by removing invasive plants such as autumn olive, bush honeysuckle, multiflora rose, etc. They use a combination of mowing, cutting with a chainsaw, and herbicide application to minimize the growth of woody species. They have used Blue Heron Ministries, a non-profit Christian land conservation organization based in Angola, Indiana, to conduct prescribed burns on the property. Historically, fire reduced tree density in prairies and savannas. Oaks, especially bur oaks, are more resistant to fire than many of the other native trees in Michigan.

The Haywards hired Tom Stadt, a Registered Forester to write a Forest Stewardship Plan for their property with financial support from the Department of Natural Resources. Some of the expense of implementing the plan (which included the planting of more than 10,000 hardwoods and more than 8,000 conifers) was covered by the Conservation Reserve Program of the USDA Farm Service Agency which puts land into a conservation cover such as grass or trees. This program has multiple benefits including reducing soil erosion, protecting water quality, and providing for wildlife habitat for both game and non-game animals. The plan contained strategies for Timber Stand Improvement which is intended to favor desired trees (such as oaks) by removing less desirable trees or individuals that are poorly structured or have other defects. This practice releases the remaining trees to grow more quickly and improves future harvest yield.

The Haywards have a deep appreciation of nature and have worked diligently to create diverse wildlife habitat. In addition to the 40 bluebird boxes they have on their property, Larry made 200 from boards milled from dead ash trees, another 200 from cedar and 100 more built with a smaller design. He has permission to put in the boxes in Barry County cemeteries, where they are monitored and maintained by the family. Noel loves the wildflowers and on the day of our visit, the

prairies were yellow with goldenrod. Their next project is to establish monarch habitat by planting milkweeds and nectar plants.

To control a gully that was forming at the edge of one of their crop fields, they installed a catch basin that has a berm to pond water which is then slowly released through a stand pipe connected to a pipe that discharges at a lower elevation to avoid more erosion. The soils in this field are mostly Kalamazoo loam with a slope of 2 to 6%. Although the soil is rated as moderately erodible, depletion of organic matter and compaction due to agricultural equipment can increase the amount of runoff that creates gullies. The catch basin along with the prairie vegetation they planted is effectively controlling the erosion. The structure was funded in part through the Environmental Quality Incentives Program administered by the Barry County office of the USDA Natural Resources Conservation Service.

To ensure that the property keeps its present functions, they placed a conservation easement on Blue Ridge Farm with the Southwest Michigan Land Conservancy (SWMLC). The primary intent of the easement is to protect the land from more intensive development (houses, mining, etc.) in perpetuity. SWMLC makes annual inspections to ensure that the terms of the easement have been honored.

Larry's advice to landowners is: "Obtain the services of a certified forester to manage your timber harvest. Some tree buyers will cut too many trees and the quality of the woods will suffer. A select harvest of the right trees makes the forest sustainable by leaving some of the best individuals to provide a seed source for the next generation of trees."

Larry and Noel Hayward in their savanna planting on Blue Ridge Farm.

Prairie in foreground with planted conifers and hardwood forest in back.

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

5.1 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 natural resources including 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 (in Section 3) can help you enroll in the programs mentioned, develop a 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.

Forestry 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 5.2 and American Tree Farm in Section 5.5).

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 (or actions) 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). Setting goals depends on what the landowner values: wildlife habitat, scenery, financial return, etc. A starting point for most plans is to consider past land use (this affects what can be grown), document what is currently present, and inventory the resources on the site (soil, water, plant communities, etc.).

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.

Landowners should also consider the financial aspects of implementing the plan. Costs can include consulting fees (for the plan), plant material (seeds or seedlings), site preparation (clearing or tillage), soil amendments (fertilizer, lime, etc.), invasive species control, infrastructure improvements (fencing, signage, and trails) and labor to install practices. Government agencies usually provide technical assistance for free but incentive programs normally require application and awards are normally competitive. Landowners can work with professional foresters, wildlife biologists and conservation-minded wildlife groups to identify cost-sharing programs that may fit their particular situation.

Forest Management Plans

A written plan is the foundation for good forest management and accomplishing your unique goals for your forest. There are two programs in Michigan that offer financial assistance to help pay for a portion of the total cost of developing a forest management plan. Plan writers are allowed to set their own prices, so interview several foresters before hiring one to develop your forest management plan.

The Forest Stewardship Program (FSP) encourages long-term stewardship of family forest land by connecting landowners with professional foresters to develop a Forest Stewardship Plan that helps landowners manage, protect, and enjoy their forests. Since 1990, more than 5,700 landowners in Michigan have used a Forest Stewardship Plan to help them manage, protect, and enjoy over 900,000 acres of forest land. The MDNR has trained and certified 150 private sector foresters (available in every county) and 20 wildlife biologists. Funding from the U.S. Forest Service (USFS) helps lower the total cost to landowners, and this partial cost share is made available through grants to the Plan Writer. The cost share is $225 per plan plus $0.50 per acre up to $2,500 per landowner. Landowners can enroll in the program any time of the year by completing an easy two-page form with their Plan Writer. A DNR Service Forester reviews the plan to ensure that it meets USFS standards for a simple yet comprehensive Forest Stewardship Plan. More information about the Forest Stewardship Program is available online at www.Michigan.gov/ForestStewardship.
See Section 5.2.

The Natural Resources Conservation Service (NRCS) also administers a financial assistance program (Environmental Quality Incentives Program) to develop a forest management plan. The financial assistance from the NRCS is much greater than the Forest Stewardship Program, but the landowner must apply for a contract with the local NRCS for a "conservation activity plan" (CAP 106). Applications for funding are accepted year round, but there is usually a "sign-up cutoff date" in the winter, and contracts are usually funded in the summer. After getting a contract, the landowner then hires one of Technical Service Providers (professional foresters certified by the NRCS) to write the plan. The NRCS District Conservationist in each county reviews the forest management plan to verify that it meets program guidelines. The Michigan NRCS has more information about forestry and financial assistance programs on its website.
https://www.nrcs.usda.gov/wps/portal/nrcs/main/mi/technical/landuse/forestry/
See Section 5.6.

Fees, plan quality, and plan contents can vary widely so call at least three professional foresters to ask about prices and the contents of their plans. Ask for references and a sample plan to read before you hire them. Consulting foresters frequently travel several counties away from their office, so do not feel obligated to hire the closest forester. Very low prices or very high prices are not always accurate indicators of plan quality. You do not have to use either of these two financial assistance programs to develop a forest management plan, but they are helpful to ensure consistent quality of the plan and also to lower your costs.

Timber Sales

One of the primary benefits of investing in a forest management plan is that it helps you prepare for a timber sale. A well-planned timber sale should have both economic benefits for you and ecological benefits for your forest. A forest management plan will help you to determine what trees to sell and, more importantly, what trees to keep so that you can improve your forest when you harvest your timber. All timber sales should be conducted to accomplish your stated goals for your forest, whether those are improving wildlife habitat, increasing access for recreation, removing diseased trees, modifying the species composition, improving "crop trees" for future harvest, or generating some current income.

Timber sales can be a long and complicated process so it is often a good investment to hire a consulting forester to help you administer your timber sale. A consulting forester will help you decide what trees to sell and market the sale to multiple buyers to get the best price for your trees. Your forester will also ensure that the loggers follow "Best Management Practices" to protect your soil and water resources. Consulting foresters also provide customized timber sale contracts which are often more detailed than the typical contract that a timber buyer provides. Foresters can also help you reduce the taxes on the profits of your sale by calculating your "basis" and "depletion" for capital gains. Consulting foresters may charge hourly rates, set fees, or a percentage of the sale price for their services in administering your sale.

Most timber sales in Michigan are either a "lump sum" sale where the buyer pays in full for the marked trees before the harvest begins or a "mill tally" sale where the buyer pays an agreed price for a unit of wood (cords, boardfeet, tons, etc.) when it is cut and delivered to the sawmill. Most selection harvests in hardwoods forests (oak, maple, beech, cherry, etc.) are sold in a lump sum sale. If you are thinning a pine plantation or clearcutting an aspen stand, those types of large volume harvests are often sold in a mill tally sale. Mill tally sales require a higher level of trust and usually some extra oversight.

Whether you hire a consulting forester or not, be sure that you have a clearly written contract that describes exactly what will occur and when it will occur during your timber sale. The seasonal timing of the harvest is important to protect your soil and to reduce the potential to spread diseases like oak wilt. A detailed contract will protect both the seller (landowner) and the buyer (logger or sawmill) in a timber harvest. It is the landowner's responsibility to know the location of their property corners and property lines so investing in a boundary survey conducted by a licensed land surveyor can be a good investment.

There are many excellent loggers in Michigan so be sure that you are working with a "Qualified Logging Professional." Look for loggers that have been trained by the Michigan Sustainable Forestry Initiative or are members of the Michigan Association of Timbermen or are certified as a Master Logger.

See Sections 3.2.3 and 5.8.

Water Quality Best Management Practices

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. Any forest management activities should minimize soil erosion near wetlands and surface water. The Manual 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. BMPs include proper location and construction of logging roads, the use of riparian management zones, installation of culverts and other stream crossings, proper use of pesticides and other chemicals, and site preparation for planting. BMPs also include the proper seasonal timing of activities to minimize the spread of insects or disease. The manual has updated information on vegetative erosion control and incorporated information on designated trout streams, vernal pools, fens and bogs. 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. Tree Farm certification requires compliance with best management practices.

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

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

Management of Wetlands and Aquatic Systems

Many of the Best Management Practices for forestry apply to other land uses as well. Protection of water quality and improvement of wildlife habitat can be achieved by Best Management Practices that are targeted for wetlands, streams and lakes. Wetlands serve to store runoff and decrease downstream flooding, but many of the area's wetlands have been drained or altered. Especially in urban areas, this can result in flashiness of stream flow (higher peak discharge during rainfall events and lower base flows during dry periods). Increasing infiltration of precipitation by use of vegetation or structures can increase movement of water into the soil thus reducing runoff which transports sediment, nutrients and chemicals into water bodies. Sediment can clog drainage ways and aggravate flooding as well as reducing light into streams and lakes (thus reducing photosynthesis). Excess nutrients, particularly nitrogen and phosphorus, can increase algal growth and, in some cases, result in the proliferation of cyanobacteria that produce toxic compounds (this caused drinking water problems in Toledo in 2014).

A starting point for management is to consider which land uses and plant communities are prevalent in the watershed (an area of land that directs surface runoff to a particular point such as the junction with another stream). Impervious surfaces (roads, roofs, etc.) have a greater amount of runoff than a similar land area that is in forest, grass or cropland. Natural areas tend to have very low amounts of runoff and their water quality is higher than more intensively used areas.

Soil testing should be used to determine the appropriate amount of fertilizer to apply to crops and lawns which helps to limit nutrient losses. Pesticides use can be reduced by following principles of Integrated Pest Management (IPM) which uses economic analysis to determine whether the benefits of applying chemicals to crops is greater than the cost of the treatment. IPM relies on crop

scouting to monitor pest (insects, weeds, and diseases) to see if the levels are above the economic threshold for treatment. IPM also advocates use of non-chemical approaches to pest management such as biological controls (predatory insects, planting of resistant varieties, etc.). Landowners who want to avoid synthetic pesticide use completely can follow "organic" practices (www.attra.ncat.org/organic.html).

Water quality can be protected by keeping vegetation and plant residues on the soil surface to increase infiltration and reduce the water runoff which can cause soil 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. The use of perennial plants (alfalfa, switchgrass, etc.) protects the soil longer than annual crops such as corn and soybean. Erosion control can also be achieved by use of vegetative practices (like grassed waterways) 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 should be used. Pesticides use can be reduced by following principles of Integrated Pest Management (IPM) which uses economic analysis to determine whether the benefits of applying chemicals to crops is greater than the cost of the treatment. IPM relies on crop scouting to monitor pest (insects, weeds, and diseases) to see if the levels are above the economic threshold for treatment. IPM also advocates use of non-chemical approaches to pest management such as biological controls (predatory insects, planting of resistant varieties, etc.). Remember to read and follow labels on pesticide containers. Landowners who want to avoid synthetic pesticide use completely can follow "organic" practices (www.attra.ncat.org/organic.html).

See Michigan Nonpoint Source Best Management Practices Manual at:
www.michigan.gov/documents/deq/deq-wb-nps-Intro_250601_7.pdf

Buffer strips around water bodies can reduce the amount of sediment and chemicals that reach the aquatic zone. The buffers can be planted to grasses, forbs, shrubs, trees or some combination of the plant types. Growing plants (and dead plant residues) can reduce the velocity of water that travels across the soil surface, thus trapping sediment and the chemicals that are attached to it. The width of the recommended buffer or filter strip depends of factors such as slope and length of the flow path for water being intercepted but should be at least 20 feet. Wider strips (100 feet or more) can improve wildlife habitat and provide corridors for animal movement. Inclusion of trees in the buffer can shade streams and moderate water temperature and improve oxygen supply (dissolved O_2 is higher in water with lower temperatures).

See "BMP Design, Pollutants Controlled Calculation Assistance, and other Technical Manuals" at:
www.michigan.gov/deq/0,4561,7-135-3313_71618_3682_3714-118554--,00.html

Control of invasive species is another important task in maintaining high quality aquatic environments. Plants such as Eurasian milfoil and Asiatic clams can replace native species and disrupt natural ecological processes. It is very difficult to control invasive species after they get a toehold in a new location, so preventing the introduction of these pests is an important strategy to reduce impacts. Cleaning of boats and equipment, avoiding use of invasive species as bait, and proper disposal of pet species can help minimize invasions.
See: www.michigan.gov/invasives/0,5664,7-324-68001-364395--,00.html

Michigan Natural Shoreline Partnership

The Department of Environmental Quality's Inland Lakes and Streams program has been participating in the Michigan Natural Shoreline Partnership to promote natural shoreline landscaping to protect Michigan's Inland Lakes. One of the goals of the Michigan Natural Shoreline Partnership is to educate property owners about using native plants and technologies that benefit lake ecosystems. (www.mishorelinepartnership.org/)

See List of Natural Shoreline Contractors in Section 3.2.3

Soil Erosion Control

There are many techniques to control soil erosion, including planting vegetative barriers such as buffer strips discussed in the Management of Wetlands and Aquatic Systems section above. There are numerous structures for water and sediment management including Water and Sediment Control Basins which are earth embankments constructed across the slope of minor watercourses to trap runoff and direct it to a stable outlet such as a pipe inlet or grassed waterway. Other structures include terraces, drop inlets (allows water to move safely to a lower elevation), rock check dams, and rock chutes. Because rip rap (stones used to allow water to move without transporting the soil below) can be expensive and unsightly in some locations, biological methods can be a viable alternative. These bioengineered solutions employ living or dead plant material to prevent stream bank erosion with willow stakes, coconut fiber logs, brush mats, or fascines (bundles of sticks held in place with stakes). Silt fence (typically a plastic mesh with fine holes) can be dug into the ground at the bottom of slopes to prevent sediment transport. Erosion control blankets made with biodegradable mesh and filled with straw or wood fibers can be used in channels to keep soil in place. These blankets stabilize the surface and allow plants to grow in areas that would be difficult to establish vegetation (areas of concentrated water flow). Seed and other materials (fertilizer, mulch, etc.) can be applied to steep slopes with hydroseeding. Many other erosion control products are available (see listings at:
http://iecaerosionprofessionalsmarketplace.com/

The MDEQ is responsible for administering the state and federal construction storm water statutes that cover earth change activities (clearing, grading, excavating, etc.) that disturb one or more acres of land or are within 500 feet of a lake or stream. Such actions are regulated under Part 91, Soil Erosion and Sedimentation Control (SESC), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Owners of properties on which regulated earth changes will occur must obtain a SESC permit from the appropriate Municipal or County Enforcing Agency (typically the county's conservation district or the city planning office).
See: www.michigan.gov/deq/0,4561,7-135-3311_4113---,00.html

Detention pond with PVC stand pipe to convey water safely downslope on Hayward Property

See Stewardship Story 4.11 Stewardship Plan Creation and Implementation:
Larry Hayward, Barry County

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 Low Impact Development principles 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 Low Impact Development practices will vary depending on the user's goals and needs. http://www.swmpc.org/mi_lid_manual.asp

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 adequate resources are available to support target species. If the desired habitat is not present, the landowner can consider creating the plant community that benefits the target species. Restoration activities can range from planting a few trees, shrubs, grasses, or forbs to large-scale conversions to forest, prairie, or other habitat (See Stewardship Stories 4.3, 4.4, and 4.11).

Four basic steps to improve wildlife habitat are:
1. Determine the species of wildlife that live in your area.
2. Select the species you want to attract and learn about their habitat and food requirements.
3. Inventory the habitat available and habitat needs on your land and that of adjacent landowners.
4. Design projects to improve wildlife habitat.

The size of your property, the vegetative types and their location, the types of wildlife you want to attract, and the habitat and land management practices on adjoining land determine what can be done to encourage wildlife use in your area. Trees, shrubs, grasses, wildflowers, and perennial and annual flower gardens all provide food and cover for wildlife. Rock piles, brush piles, decaying logs and compost piles are also valuable cover components. They supply cover for chipmunks, rabbits, weasels, salamanders, toads, snakes, snails and beneficial insects.

Trees and Shrubs

Trees and shrubs that provide food and cover for backyard wildlife are sought by many birds and mammals. The heavy cover of dense conifers, such as spruce and cedar, attract winter songbirds like cardinals and provide shelter for gamebirds such as ruffed grouse. Trees and shrubs that provide food in the form of seeds and fruit for birds and mammals are highly desirable. Plants which supply fruit (soft mast) that last into the winter include crabapples, mountain ash, American high-bush cranberry, nannyberry, arrowwood viburnum, staghorn sumac, and wild grape. Plants that furnish fruit during spring, summer and early fall include serviceberry, mulberry, elderberry, raspberries, cherries and dogwoods. Conifers such as tamarack, white spruce, blue spruce, hemlock and white cedar, which hold their seeds in a semi-loose cone, may attract crossbills, finches, evening grosbeaks, chickadees and red squirrels. Trees such as oak, walnut, hickory, hazelnut, or beech that provide hard mast (nuts) attract large seed-eating birds, small mammals and deer. Standing dead trees (snags) are very attractive to many wildlife species and can furnish cavity nest sites for many songbirds, squirrels or bats, as well as provide insect larvae for woodpeckers, nuthatches and flickers.
http://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx

Grasses and Wildflowers

Converting mowed areas to grass meadow provides nest sites, food and cover for wildlife. Tall, native prairie grass such as switchgrass, big bluestem and Indian grass provide a lush variety of cover 4-7 feet tall and provide nest sites and winter cover for quail, pheasants, songbirds such as cardinals and blue jays, rabbits and deer. Prairie grasses, mixed with prairie wildflowers such as gray-headed coneflower, woodland sunflower, and aster are an attractive way to provide wildlife habitat. Another option to mowed grass is a perennial wildflower garden. These areas are also called songbird or butterfly gardens. Many wildflower mixtures that provide colorful flowers from late April until the October frosts are commercially available. These wildflower mixtures can include a variety of species such as coreopsis, black-eyed Susan, phlox, blazing star, yarrow, and bee balm.

The Michigan Amphibian and Reptile Best Management Practices

The Michigan Amphibian and Reptile Best Management Practices document was created for the Michigan Department of Environmental Quality to provide a comprehensive guide to Best Management Practices that improve and maintain the viability of Michigan amphibian and reptile populations. The manual contains actions to protect wildlife with specific recommendations for regulators, agency land managers, consultants, residential developers, and private citizens to protect, preserve, and restore herpetofauna.
www.herprman.com/amphibian-reptile-management-practices-michigan

Most wildlife prefers native plants and control of invasive species can improve habitat quality. Methods of invasive plant control include: mechanical, chemical, fire, grazing, and competition from noninvasive species. The ability to identify plants is important and there are guides listed in Section 5.8 that can assist in this activity. The BCK Cooperative Invasive Species Management Area coordinators may be able to provide helpful information about invasive species control (see page 55).

Backyard Wildlife Management Link:
www.michigan.gov/dnr/0,1607,7-153-10370_12148-30777--,00.html

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. See Sections 5.2 through 5.6 for more information.

Enjoyment

Many landowners who have forest land spend many hours every year working in their woods for a variety of reasons. For some landowners, forests are an economic investment to secure future income. For others, owning a forest is an ethical choice to improve the world by slowing urban sprawl or providing environmental services such as clean air and water. But for many landowners, the primary motive for owning forest land is the enjoyment that they receive by spending time in their woods. Forest owners do a lot of activities in their woods because it is just plain fun! So as you work with your forester to navigate these programs and choose the best ones for you and your property, don't forget that most family forest owners in Michigan own their forest because they simply enjoy being out in their own woods. Good forest management should not only improve the ecology and economics of your forest, but also your enjoyment of your land.

Marsh in foreground with mature woods in background
at Michigan Audubon's Baker Sanctuary in Calhoun County.
Photo was taken during Crane Fest (note full moon on horizon).

5.2 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. In Michigan the Forest Stewardship Program is administered by the Michigan DNR, who trains and certifies private sector professional foresters and wildlife biologists to write Forest Stewardship Plans.

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/.

5.3 Qualified Forest Program

The purpose of the Qualified Forest Program, administered by the Michigan Department of Agriculture and Rural Development, 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 (up to 18 mills). In order to qualify for the program, landowners must have between 20 and 640 acres, have an approved forest management plan written by a "Qualified Forester," and must comply with the prescriptions included in that plan. There is a $50 application fee and an annual fee equivalent to 2 mills to help fund the operation of the program. 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.

Qualified Forest Program: Rich Harlow, Program Administrator (517) 284-5630

5.4 Commercial Forest Program

The Commercial Forest Act gives property tax breaks for forest owners in Michigan that voluntarily enroll in the Commercial Forest Program. Landowners must have at least 40 acres of contiguous forest, an appropriate forest management plan (written by a Registered Forester), 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 (e.g., hunting and fishing). 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. The application fee is $1 per acre with a minimum fee of $200 and a maximum fee of $1,000. 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.

Commercial Forest Program: Shirley Businski, Program Administrator (517) 284-5849.

Note: While it is not required to use a financial assistance program for developing a plan for these two tax programs, many landowners benefit from using either the FSP or NRCS programs to develop their forest management plan and then enroll in the separate Commercial Forest or Qualified Forest programs. Participating in a financial assistance program may hinder the schedule for developing a forest management plan in time for the application deadlines of the Commercial Forest program (April 1) or the Qualified Forest (September 1) program and delay entry into the tax program for an entire year.

5.5 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. 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. A free inspection from one of the Tree Farm Inspecting Foresters is required to enroll. For more information please visit www.treefarmsystem.org.

- **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.

My Land Plan

MyLandPlan.com is a resource for woodland owners to help you protect and enjoy your woods provided by the American Forest Foundation (AFF) that provides information about keeping your woods healthy. The AFF planning tool helps you keep track of all your woodland activities and experiences in one place. After you create a profile, you will have access to the Land Plan tool, an exclusive area of the website. The planning tool lets you: map the boundaries of your land; add features and special sites; set goals and plan actions; receive information specially tailored for what you want to do on your land; and record your actions and experiences in your own personalized forest journal.

5.6 USDA Financial and Technical Assistance Programs

Forest Stewardship Plans are accepted by the NRCS when applying for the Environmental Quality Incentives Program funding, although they do not require the same level of detail as NRCS conservation activity plans. Work with your NRCS District Conservationist and forester to fill out supplemental "Job Sheets."

For info see: www.mi.nrcs.usda.gov/technical/forestry.html

Some of the recommended activities in this plan have potential for financial assistance. NRCS forestry "conservation practices" include forest trails and landings, stream crossings, riparian forest buffers, stream habitat improvement, forest stand improvement, tree and shrub establishment, brush management, early succession habitat, wetland wildlife habitat, and upland wildlife habitat. NRCS conservation practices address "resource concerns" (environmental problems) like soil erosion, soil quality, water quality degradation, plant productivity, habitat fragmentation, invasive plants, forest health, etc. Contact your local NRCS Service Center to apply for financial assistance (see www.nrcs.usda.gov/wps/portal/nrcs/main/mi/contact/local).

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 USDA 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. There were 23.8 million acres enrolled in CRP in the US, about 209,000 in Michigan, 7,564 in Barry, 5,074 in Calhoun, and 805 acres in Kalamazoo (as of June 2013).

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 USDA-NRCS assistance programs. For more information please visit www.nrcs.usda.gov/wps/portal/nrcs/main/mi/programs/.

Healthy Forests Reserve Program

The Healthy Forests Reserve Program (HFRP) helps landowners restore, enhance and protect forestland resources on private lands through easements and financial assistance. HRFP aids the recovery of endangered and threatened species under the Endangered Species Act, improves plant and animal biodiversity and enhances carbon sequestration. HFRP provides landowners with 10-year restoration agreements and 30-year or permanent easements for specific conservation actions. HFRP applicants must provide proof of ownership, or an operator (tenant) must provide written concurrence from the landowner of tenancy for the period of the HFRP restoration agreement in order to be eligible. Visit your local USDA Service Center to apply or visit www.nrcs.usda.gov/getstarted

5.7 Capital Gains Information

If you own timber for more than twelve months, profits from timber sales are taxed as capital gains, rather than ordinary income. Expenses, including the cost of a management plan or a consulting forester's fees for a timber sale, can be deducted from profits to determine net income. 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."

5.8 Resources for Landowners

Table 5. Partner Organizations Contact List

Organization	Contact	Phone	Email
Michigan DNR	Mike Smalligan	(269) 765 3280	smalliganm@michigan.gov
DNR Wildlife Biologist	Ken Kesson	(269) 244 5928	KessonK1@michigan.gov
MI DEQ	Julia Kirkwood	(269) 312 2760	kirkwoodj@mi.gov
US Fish and Wildlife	Jim Hazelman	(517) 351 2555	EastLansing@fws.gov
Barry County			
Conservation District	Sarah Nelson	(269) 908 4135	sarah.nelson@macd.org
District Forester	Benjamin Savoie	(269) 908 4134	ben.savoie@macd.org
CISMA	Sarah Nelson	(269) 908 4135	sarah.nelson@macd.org
NRCS	Kelly Bushong	(269) 908 4120	kelly.bushong@mi.usda.gov
MSU Extension	Kathy Pennington	(269) 945 1388	msue.barry@mounty.msu.edu
Barry State Game Area	Randy Hines	(269) 765 3280	
Yankee Springs Recreation Area	Joe Jandernoa	(269) 795 9081	JandernoaJ@michigan.gov
Charlton Park		(269) 945 3775	info@charltonpark.org
Calhoun County			
Conservation District	Tracy Bronson	(269) 781 4867 X5	tracy.bronson@macd.org
CISMA	Brian Huggett	(269) 697 1723	brian@potowatomi-rcd.org
NRCS	Megan Fawcett	(269) 781 4263	megan.fawcett@mi.usda.gov
MSU Extension		(269) 781 0784	msue.calhoun@county.msu.edu
Kalamazoo County			
Conservation District	Ginger Koester	(269) 382 5121 X 5	kalamazooconservation@gmail.com
CISMA	Bridget Bell	(269) 382 5121 X 5	kalamazooconservation@gmail.com
NRCS	Jean Gagliardo	(269) 383 8830	jean.gagliardo@mi.usda.gov
MSU Extension		(269) 382 5121 X131	msue.kalamazoo@county.msu.edu
Fort Custer Recreation Area	Tony Trojanowski	(269) 731 4200	
Nonprofits			
Kalamazoo Nature Center	Ryan Koziatek	(269) 381 1575	rkoziatek@naturecenter.org
Michigan Audubon	Rachelle Roake	(517) 580 7364	rroake@michiganaudubon.org
Michigan Nature Association	Andy Bacon		abacon@michigannature.org
Pierce Cedar Creek Institute	Sara Syswerda	(269) 721 4190	Syswerdas@cedarcreekinstitute.org
Stewardship Network		(734) 395 4483	staff@stewardshipnetwork.ogr
Southwest Michigan Land Conservancy	Nate Fuller	(269) 324 1600	fuller@swmlc.org

Forestry and Other Program Websites

General Forestry Information
Forestry Assistance Program – MACD/MDARD/DNR - www.michigan.gov/mifap
MSU Extension – MSU - http://msue.anr.msu.edu/topic/info/forestry
Michigan Forest Association - MFA – http://www.michiganforests.org
National Association of Conservation Districts Forest Notes:
http://www.nacdnet.org/news-and-events/publications/forestry-notes/

Forest Management Plans
Forest Stewardship Program – DNR/USFS - www.Michigan.gov/ForestStewardship
Conservation Activity Plans – NRCS - www.nrcs.usda.gov

Forest Certification
American Tree Farm System – AFF - www.TreeFarmSystem.org
Forest Stewardship Council – FSC – www.us.fsc.org

Property Tax Incentives
Qualified Forest Program – MDARD - www.Michigan.gov/qfp
Commercial Forest Program – DNR - www.Michigan.gov/CommercialForest

Working Forest Easements
Forest Legacy Program – DNR/USFS - www.Michigan.gov/PrivateForestLand
Healthy Forest Reserve Program - NRCS -
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/forests/
Farmland and Open Space Preservation – MDARD - www.Michigan.gov/Farmland
Michigan Land Conservancies - www.heartofthelakes.org
Southwest Michigan Land Conservancy – www.swmlc.org

USDA Financial Assistance
Environmental Quality Incentives Program – NRCS - www.nrcs.usda.gov
Conservation Stewardship Program – NRCS - www.nrcs.usda.gov

Forest Health
DNR Forest Health - www.Michigan.gov/ForestHealth
DNR Invasive Species Info - www.Michigan.gov/InvasiveSpecies
MDARD Exotic Forest Pests – www.Michigan.gov/ExoticPests
USFS Forest Health - http://fhm.fs.fed.us/

The DNR publishes the annual "Forest Health Highlights" that has information about the forest insect and disease problems in Michigan. See www.Michigan.gov/ForestHealth
To report an unusual insect or disease in your forest, please email several photos to:
DNR-FRD-Forest-Health@Michigan.gov

Professional Forester Classifications

Consulting Foresters

Consulting foresters are independent businesses that work directly for the landowner. Consulting foresters administer timber sales, write Forest Stewardship Plans, manage wildlife habitat, plant trees, and offer other services for forest landowners. There are about 125 consulting foresters in Michigan.
Association of Consulting Foresters : www.acf-foresters.org
Forest Stewardship Plan Writers – www.Michigan.gov/ForestStewardship

Industry Foresters

Industry foresters work for local forest products companies to buy timber from private landowners or to manage forest land owned by their company. Industry foresters buy timber from private landowners and write forest management plans. There are about 100 industry foresters in Michigan.
Michigan Association of Timbermen : www.timbermen.org
Michigan Forest Products Council : www.michiganforest.com
Great Lakes Timber Professionals Association : http://gltpa.org

Government Foresters

Government foresters, funded by your tax dollars, provide general forestry information to landowners. Government foresters conduct workshops, hold field days, write articles, and make professional referrals. There are about 35 government foresters who help private landowners (and another 200 working on public land).
Conservation Districts – 20 foresters in the Forestry Assistance Program – www.Michigan.gov/mifap
MSU Extension – 5 educators statewide: http://msue.anr.msu.edu/topic/info/forestry
DNR – 5 foresters statewide – www.Michigan.gov/PrivateForestLand
USFS : www.fs.fed.us/spf

Credentials and Programs

"Registered Foresters" are recognized by the State of Michigan – www.Michigan.gov/Foresters
"Certified Foresters" are certified by the Society of American Foresters: www.safnet.org
"ACF Foresters" are members of the Association of Consulting Foresters: www.acf-foresters.org
"Forest Stewardship Plan Writers" write Forest Stewardship Plans – www.Michigan.gov/ForestStewardship
"Qualified Foresters" write plans for the Qualified Forest Program – www.Michigan.gov/qfp
"Technical Service Providers" write plans for the Environmental Quality Incentives Program: www.nrcs.usda.gov
"Qualified Logging Professionals" are loggers trained by the Sustainable Forestry Initiative: http://sfimi.org
"Master Loggers" are trained, audited and certified by other professional loggers: www.mimlc.com

Other Internet Resources for Landowners

DNR Forest Resources Division: www.Michigan.gov/Forestry
DNR Forest Stewardship Program: www.Michigan.gov/ForestStewardship
DNR Private Forest Land: www.Michigan.gov/PrivateForestLand
DNR Urban and Community Forestry: www.michigan.gov/ucf
Michigan Sustainable Forestry Initiative: http://sfimi.org
Michigan Forest Association Foresters List: www.michiganforests.com/forester.htm
Michigan Society of American Foresters: http://michigansaf.org
Tree Sales:
www.michigan.gov/documents/dnr/DirectoryOfMichiganSeedlingNurseries:IC4175_258828_7.pdf?20141113140132

My Land Plan: www.mylandplan.org
Woodland Stewardship: www.woodlandstewardship.org
National Woodland Owners Association: www.woodlandowners.org
Ties to the Land (succession planning to pass forest to next generation): www.tiestotheland.org
Conservation Easements:
www.landtrustalliance.org/topics/taxes/income:tax-incentives-land-conservation
Forestry Taxes: www.timbertax.org
Sample Timber Sale Contract:
www.nhdfl.org/library/pdf/Forest%20Protection/timbersaleagreement.pdf

NRCS Financial Assistance:
www.nrcs.usda.gov/wps/portal/nrcs/main/mi/technical/landuse/forestry
NRCS Technical Service Providers:
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp/

Michigan Association of Conservation Districts: http://macd.org
MSU Department of Forestry: www.for.msu.edu
MTU School of Forest Resources & Environmental Science: www.mtu.edu/forest
MSU Extension Forestry: http://msue.anr.msu.edu/topic/info/forestry
MSU Soil Testing Laboratory: www.spnl.msu.edu
MSU Diagnostics Laboratory: www.pestid.msu.edu
USDA Soil Web Survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

USFS Private Woodland Owners: http://na.fs.fed.us/pubs/misc/flg
USFS Ecosystem Services: www.fs.fed.us/ecosystemservices/index.shtml
USFS State and Private Forestry: www.fs.fed.us/spf

Project Learning Tree: www.michiganplt.org
Project WILD: www.michigan.gov/michiganprojectwild
Michigan Environmental Education Curriculum Support: www.michigan.gov/meecs
Michigan Forest Pathways: http://miforestpathways.net

Midwest Invasive Species Network: www.misin.msu.edu
Field Identification Guide 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

NRCS PLANTS Database: www.plants.usda.gov
http://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx
Leafsnap: An Electronic Field Guide: www.leafsnap.com

DNR Wildlife Division: www.Michigan.gov/Wildlife
DNR Hunting Access Program: www.michigan.gov/hap
DNR Wildlife Landowner Incentive Program: www.michigan.gov/dnrlip
The DNR Wildlife Division has an excellent publication on managing wildlife habitat at www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/index.htm
Partners for Fish and Wildlife – USFWS: www.fws.gov/midwest/partners/getinvolved.html

Michigan Association of Conservation Districts: www.mcad.org
Michigan Chapter of the Soil and Water Conservation Society: www.miglswcs.org

Audubon Society: www.MichiganAudubon.org
Foresters for the Birds: http://vt.audubon.org/foresters-birds
Michigan United Conservation Clubs: www.mucc.org
National Wild Turkey Federation: www.nwtf.org
Pheasants Forever: www.pheasantsforever.org
Quality Deer Management Association: www.qdma.com
Ruffed Grouse Society: www.ruffedgrousesociety.org
Trout Unlimited: www.michigantu.org
Whitetails Unlimited: www.whitetailsunlimited.com

Heart of the Lakes (Collective of Michigan's land conservancies): www.heartofthelakes.org
Michigan Nature Association: https://www.michigannature.org
Southwest Michigan Land Conservancy: http://www.swmlc.org/
Environment Kalamazoo: www.environmentkalamazoo.wordpress.com

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. Cost: $35

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. Cost: $15

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. Cost: $15

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 for $15. 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. Cost: $33

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. Cost: $16

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. Cost: $10.

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.

Note: Prices listed will vary depending on seller, so check for current pricing.

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 units of square feet (ft2).
Basal Area (Forest) - basal area of all trees per acre summed up, in units of ft2/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 1/2 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 are a very poor forestry practice.
Endangered Species – a species in danger of extinction.
Even-Aged Stand - stand with age difference between oldest and youngest trees is minimal (<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. Also called Timber Stand Improvement when focused on timber.
Group Selection - harvesting groups of trees to open the canopy and encourage 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.
Intolerance - characteristic of certain tree species that does not permit them to survive in the shade.
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.
Over-mature - 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 4 to 10 inches DBH.
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 1/2 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 at regular intervals to maintain uneven-aged forest.
Shelterwood Harvest – harvesting all mature trees in two or more cuts, leaving trees to protect seedlings.
Silvopasture - growing trees and improved 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 provide food and cover for a variety of wildlife species.
Softwood - any gymnosperm tree including pines, hemlocks, larches, spruces, firs, and junipers.
Species of Special Concern – not threatened or endangered 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 ft3 of timber per acre per year.
Tolerance – the capacity of a tree species to grow in shade
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: Federal and State Laws Related to Forest Management

- USA - Federal Insecticide, Fungicide, and Rodenticide Act, 1947
- USA - National Historic Preservation Act, 1966
- USA - Clean Water Act, 1948 and 1972
- USA - Endangered Species Act, 1973
- MI - Michigan Pesticide Control Act, Public Act 171 of 1976
- MI - Natural Resources and Environmental Protection Act, Public Act 451 of 1994
- MI - Right to Forest Act, Public Act 676 of 2002

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