



Michigan Natural Features Inventory

Discover. Define. Deliver.

The Science that Guides
Biodiversity Conservation and Stewardship

Annual Report 2017



MICHIGAN NATURAL FEATURES INVENTORY

A Program of Michigan State University Extension

Lake Michigan at Ludington State Park
Photo by: Aaron Kortenhoven

"If you understand, things are just as they are; if you do not understand, things are just as they are."

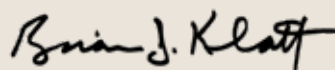
Zen Proverb

From the MNFI Director

The mission of the Michigan Natural Features Inventory (MNFI) is not to simply collect data on the location and condition of rare species and their habitats, but rather to take that information and develop knowledge that can guide the conservation of Michigan's biodiversity. We do this because it is important not only to document nature, but to understand nature. It is not possible to wisely or effectively manage natural resources without having an understanding of the ecosystems involved. We gain understanding of ecosystems by investigating their components and processes through scientific methodologies, like the Natural Heritage Methodology that guides our inventory efforts. In attempting to assure sustainability of our natural resources, we ignore the components and processes inherent to ecosystems at our peril. Yet, we seem to be in a period where science and scientists are not trusted by a segment of the population or by some of our leaders.

In this annual report, we present information on a number of efforts that we have conducted this year geared toward three main goals: 1) to better understand our natural world; 2) to help the public to better understand our natural world; and 3) to help our state leaders to plan for conservation

of the state's biodiversity in their activities. In the following pages you will see described our efforts to understand pollinators . . . an issue that has gained worldwide attention and one that is of the utmost urgency in assuring food and economic security. It is also an issue of particular importance to Michigan and the wide variety of crops grown here. You will read about our efforts in helping citizen scientists to be effective local stewards of the environment. And finally, you will see how MNFI applied our understanding to help conserve biodiversity working hand-in-hand with the Michigan Department of Environmental Quality in mapping Michigan's dunes, a critical and fragile resource. While these may seem disparate efforts, all of them are geared to the goal of "understanding things as they are" . . . and it's better to understand than not to.



Brian J. Klatt, Ph.D., *Director*
Michigan Natural Features Inventory



Our Mission

To guide the conservation and stewardship of Michigan's biodiversity by providing the highest quality scientific expertise and information.

Our Vision

To be the authoritative source of information on biodiversity that is widely used to conserve Michigan's unique natural heritage for current and future generations.

MSU Extension Mission

Michigan State University Extension helps people improve their lives through an educational process that applies knowledge to critical issues, needs and opportunities.

TABLE OF CONTENTS

- 02** From the Director
- 04** What We Do: Discover. Define. Deliver.
- 06** The Year in Review
- 10** The Natural Heritage Database and Featured Listed Species
- 12** Nature's Contributions to People
- 14** Michigan's Rare Pollinators: Finding Them, Restoring Habitat
- 18** Mapping Michigan's Coastal Dunes and Shoreline Types in the Northwest Lower Peninsula
- 22** Growing Conservation Super Heroes
- 24** 2017 Publications
- 26** The People of Michigan Natural Features Inventory

On the Cover

Ecologist Joshua Cohen in a Granite Bedrock Glade overlooking a Bog in the Gwinn Forest Management Unit in Marquette County.

Photo by: Clay Wilton

MICHIGAN STATE UNIVERSITY | Extension

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DISCOVER.
DEFINE. DELIVER.

Lake Michigan at Ludington State Park
Photo by: Aaron Kortenhoven

Applying the Nature of Science to the Science of Nature

WE **DISCOVER** AND **DEFINE** Michigan's most current biodiversity data through scientific research, field work, and stewardship of the Natural Heritage Database (NHD)—the most authoritative and comprehensive database available on the distribution and condition of rare species and high quality natural communities in Michigan.

WE **DELIVER** scientific information to:

- governmental and non-governmental agencies,
- the private sector and their environmental consultants,
- fellow researchers,
- the public, and
- the NatureServe Network international database.

Our work informs state, regional, national, and international decisions that impact biodiversity and ecosystems. We contribute to the state's current and future economic well-being and environmental stewardship through:

Research and Consulting

- Projects to study emerging and ongoing issues that impact Michigan's biodiversity
- Site Reviews and Assessments of Rare and Invasive Species to generate up-to-date information

- Natural Features Inventories to create strong foundations for sound land use, natural resource management, and conservation decisions

Conservation Planning Services

- Site ecological summaries
- Evaluation of the conservation value of a site
- Conservation plans for sites most in need of protection
- Land use planning services

Partnerships and Outreach

- The involvement of a wide range of international, national, regional, and local partners from many disciplines, organizations, and perspectives to create and disseminate knowledge
- Educational workshops to inform decision makers
- Information available to the public online and through educational materials
- Access to in-depth natural heritage data through subscriptions
- Educational project components for students and adult volunteers to promote environmental stewardship



THE YEAR

In Review

Bog and Granite Bedrock Glade,
Marquette County
Photo by: Jesse Lincoln

In the News

The I-75 Corridor Conservation Action Plan Wins Prestigious Award

In September 2017, the American Association of State and Highway Transportation Officials awarded its prestigious President's Transportation Award in the Environment Category to the Southeast Michigan Council of Governments and its partners—the Michigan Department of Transportation, Michigan State University Extension, and the Michigan Natural Features Inventory—for the I-75 Corridor Conservation Action Plan in Monroe County.

While transportation projects typically focus on mitigation and avoidance within the right-of-way corridor, this project considered the broader landscape context, investigated the health of natural communities, watersheds, coastal systems, and wildlife movement, and identified strategies that can make a difference at a meaningful scale.

The award recognized the project's process as well as its outcomes. The strength of the resulting plan lies in the multitude of local partners and experts who provided critical information and input at key junctures in the process. These same partners will play a critical role in the long-term health of this region's ecological assets by implementing strategies they helped develop, monitoring results, and adapting to change.

B-WET Project Inspires Students

As part of a national program funded by the National Oceanic and Atmospheric Administration—Great Lakes Restoration Initiative, the Great Lakes Bay Education and Training Program (B-WET) supports and promotes meaningful, locally relevant, experiential learning for K-12 students and professional development in environmental education for their teachers.

In support of the I-75 Conservation Action Plan, MNFI developed and piloted a B-WET program focused on "Healthy Watersheds, Healthy Communities." MNFI conducted 13 classroom presentations and 4 field outings in 2017 for a total of 180 students and their teachers from Monroe High School (Monroe, Michigan) and Carlson High School (Gibraltar, Michigan). Sessions included classroom presentations and field experiences.

The MNFI/MSU Extension Vernal Pools Team/Project Receives Community Partnership Award

The MSU Extension Community and Natural Resources Development Association 2017 award recognizes members for outstanding efforts in building community partnerships through collaboration with local groups, agencies and organizations to meet the educational needs and/or concerns of their community.



Daria Hyde and Monroe High School students in vernal pool project
Photo by: Sharon Venier

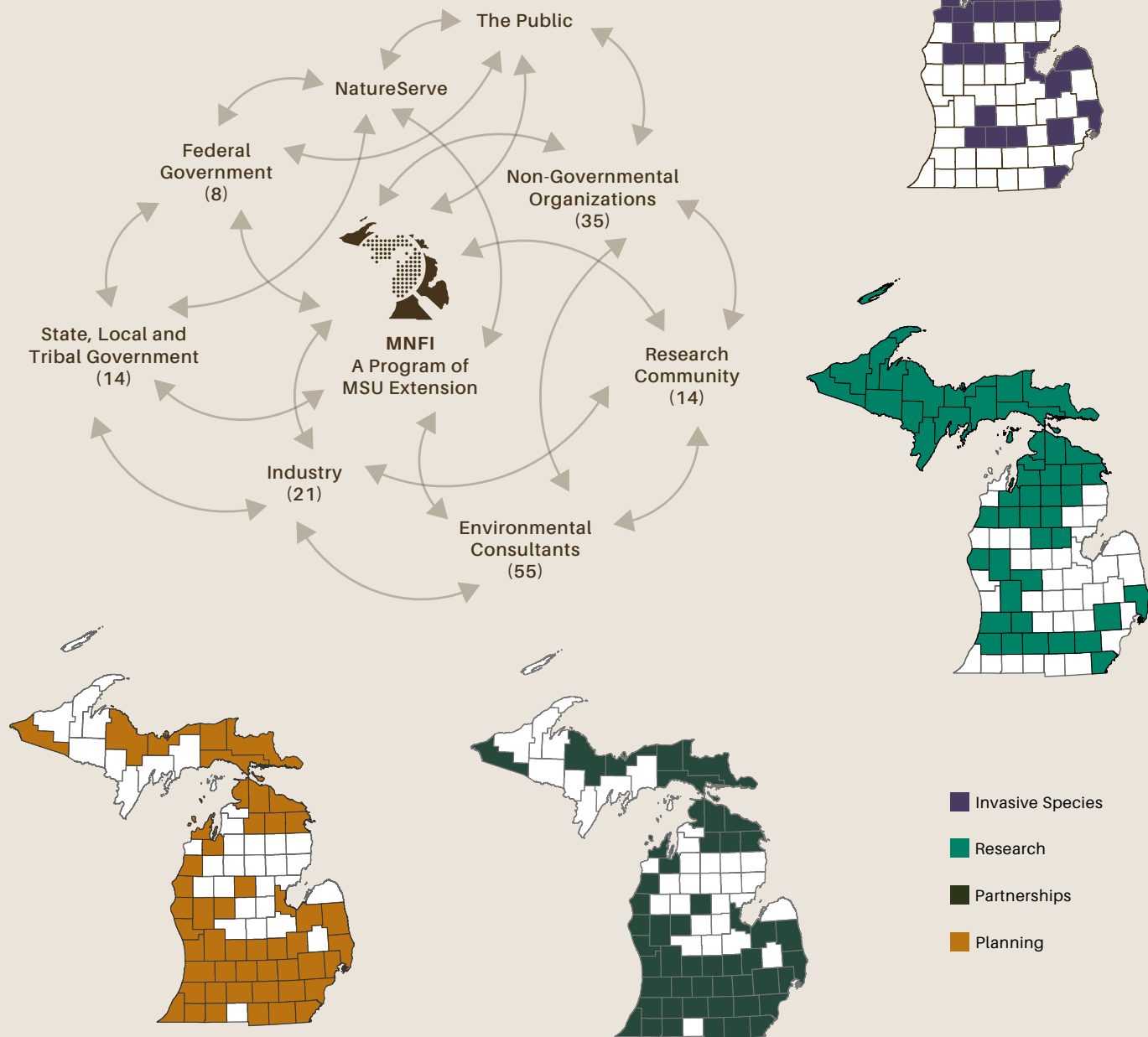
Presentations

- Beaver Island Archipelago Planning Team
- Carlson High School, Gibraltar, Michigan, B-Wet Program
- City High-Middle School, Grand Rapids
- Conservation Stewardship Program
- Grand Valley State University, Forest Ecosystems Management Class
- Great Lakes Research Community, International Association for Great Lakes Research Conference
- Little Traverse Bay Bands of Odawa Indians, Natural Resource Staff
- Meridian Township and Mid-Michigan Stewardship Initiative
- Michigan Botanical Club-Great Lakes Chapter
- Michigan Department of Environmental Quality, Office of the Great Lakes
- Michigan Department of Natural Resources, Wildlife Division and Allegan Conservation District
- Michigan Department of Natural Resources, Wildlife Division and Little Traverse Conservancy, The Nature Conservancy, LTTB of Odawa Indians Natural Resources Department, AmeriCorps, and Huron Pines
- Michigan Environmental Council Freshwater Dunes Summit
- Michigan Nature Association Southeast Region
- Michigan Partners in Amphibian and Reptile Conservation
- Michigan State University Extension Climate Change Work Group
- Michigan United Conservation Clubs
- Michigan Wetlands Association Conference
- Monroe High School, Monroe, Michigan B-Wet Program
- Oakland County Department of Economic Development and Community Affairs
- Oakland Township Parks Natural Areas Stewardship
- Owashtanong Islands/Grand Haven Audubon Society
- River City Wild Ones/Friends of Grand Rapids Parks
- Saginaw Bay Cooperative Invasive Species Management Area
- Society for Ecological Restoration, Midwest-Great Lakes Chapter
- Trail, Water, and Land Alliance Fall Conference
- University of Michigan—Flint Conservation Biology Class
- Vanderbilt Middle School Science Class, Vanderbilt, Michigan

THE YEAR IN REVIEW *(CONTINUED)*

48 Projects and 147 Partners and the General Public

Our work includes Surveys, Rare/Threatened/Endangered Species Inventories, Habitat Assessments, Invasive Species Monitoring, Land Use Planning, and Citizen Science.



Bringing Science to Nature at Home and Abroad

The Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES) is a working group of the United Nations and includes 128 member states. The platform’s mission is to increase member capacity and knowledge for better policy-making related to sustainable use of biodiversity, long-term human well-being, and sustainable development.

For the past two years, IPBES has been conducting four regional biodiversity assessments: 1) Americas; 2) Africa; 3) Asia-Pacific; and 4) Europe and Central Asia. Each regional team includes about 125 natural and social scientists.

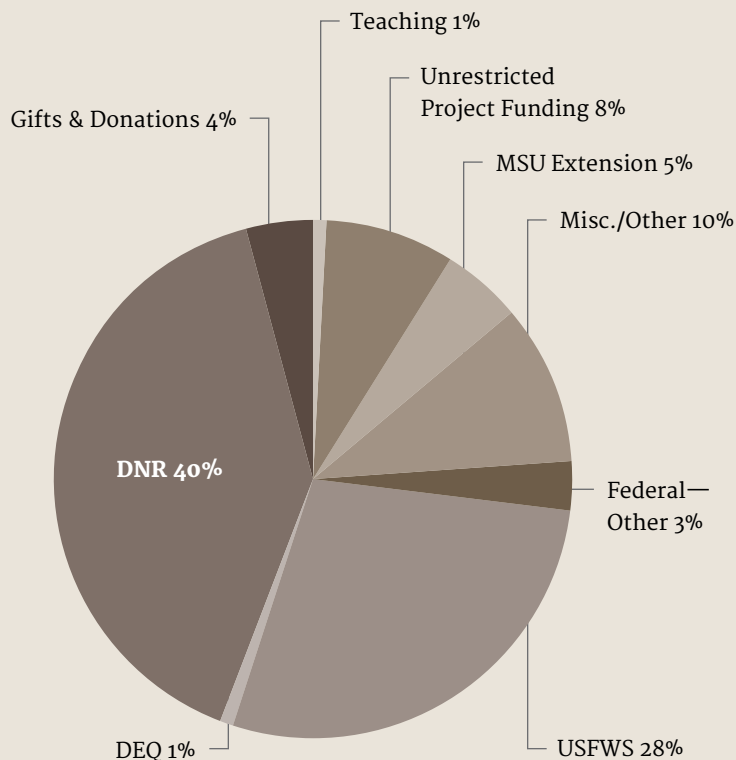
As a coordinating lead author, MNFI Director Brian Klatt leads a sub-team of 15 members to help conduct the assessment for the Americas, which is nearing completion. In August of 2017, Dr. Klatt attended a meeting in Cartagena, Colombia, at which the second draft of the assessment, along with a summary for policy makers, was discussed with governmental representatives from 17 countries.



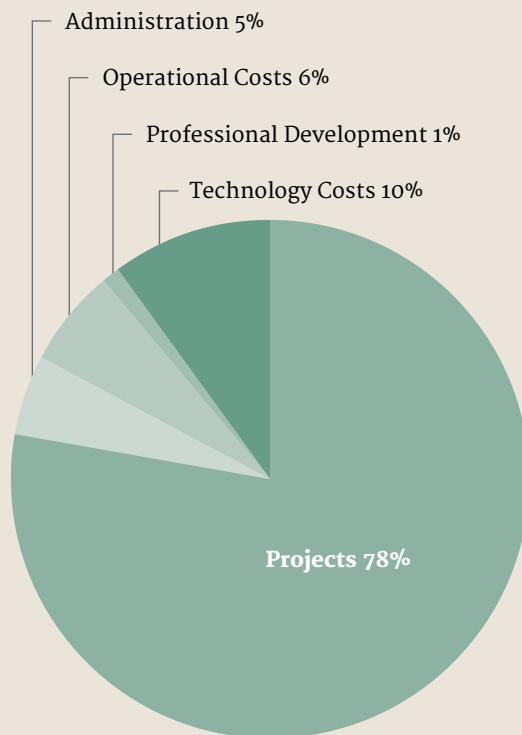
On 20 December 2017, the United Nations General Assembly adopted a resolution declaring May 20th of each year as World Bee Day.

www.ipbes.net

Funding: \$3,044,421

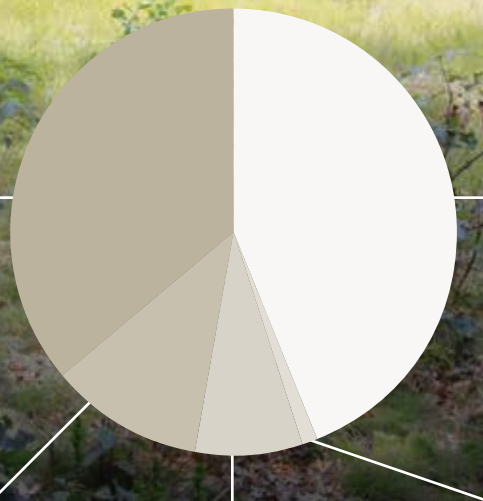


Expenses: \$2,868,925



THE NATURAL HERITAGE DATABASE

In 2017, 800 records were added for a total of 19,042 records



36% State Threatened (T)

Any species likely to become an endangered species within the foreseeable future

257 Species
6726 Records

11% Natural Communities

An assemblage of native species that occurs repeatedly under similar environmental conditions

76 Types
2038 Records

8% State Endangered (E)

Any species of fish, plant life, or wildlife in danger of extinction throughout all or a significant part of its range

139 Species
1478 Records

44% State Special Concern (SC)

Any species of concern due to declining or relict populations in the state

265 Species
8241 Records

1% State Extirpated (X)

Any species no longer found in the state, but which can be found elsewhere in the world

62 Species
121 Records

The database includes records for federally listed species

Federal Endangered (LE): Any species in danger of becoming extinct throughout all or a significant portion of its range—legally protected by the Endangered Species Act
18 Species, 544 Records

Federal Threatened (LT): Any species at risk of becoming endangered within the foreseeable future—legally protected by the Endangered Species Act
11 Species, 750 Records

(above)
Brad Slaughter in
a Dry Sand Prairie
in Muskegon County.
Photo by: Jesse Lincoln

Featured Listed Species



Pitcher's Thistle
(*Cirsium pitcheri*)

LT-Federal Threatened
T-Michigan Threatened

This native perennial grows on Great Lakes beaches and grass-land dunes. Its non-flowering form is a basal rosette. It grows five to eight years before flowering. The blossoms are cream or pink. Leaves are finely and deeply lobed and may be one foot long. The white hairs that cover its stems and leaves are an adaptation to its beach environment and help the plant retain water and reflect the sun's strong rays.



Six-Whorl Vertigo
(*Vertigo morsei*)

E-Michigan Endangered

This tiny land snail has a dark brown, beehive-shaped shell with whorls. In Michigan, it is mostly found in calcareous fens, which are rare and fragile wetlands. Primarily nocturnal and active from June to September, the snail requires moisture, shelter, food supply, and a source of calcium to maintain its shell.



Spruce Grouse
(*Falcipennis Canadensis*)

SC-Michigan
Special Concern

This chicken-like bird is 16 inches long with a 22-inch wingspan. It occurs throughout the Upper Peninsula and part of the Northern Lower Peninsula in coniferous forests of jack pine, black and white spruce, and tamaracks. Although they may seem quite tame, Spruce grouse can be very secretive and relatively quiet. Nesting and brood rearing occur from the end of April to late in July.



Swamp Metalmark
(*Calephelis mutica*)

SC-Michigan Special Concern

The wingspan of this small butterfly with metallic markings measures 1 to 1.3 inches. The caterpillars are green with black dots and covered with long, white hairs, and resemble a tiger moth caterpillar. They are active from first week of July to second week of August.



Tamarack Tree Cricket
(*Oecanthus laricis*)

SC-Michigan Special Concern

This long narrow cricket inhabits dense to open tamarack swamps and fens in Michigan and Ohio. They can be found on the upper branches of tamarack where they blend in with foliage. Their song, mainly heard at evening and night, is a slow trill with occasional interruptions.



Wood Turtle
(*Glyptemys insculpta*)

SC-Michigan Special Concern

The highly "sculptured," 6 to 10-inch upper shell and un-hinged, patterned bottom shell distinguish this species from other turtles in the state. Found primarily in or near moving water and associated riparian habitats, they are active from April to October, with two breeding cycles—in June and September. The most serious threat to this species is poaching for the commercial pet trade and incidental collecting by the general public.

(top to bottom)

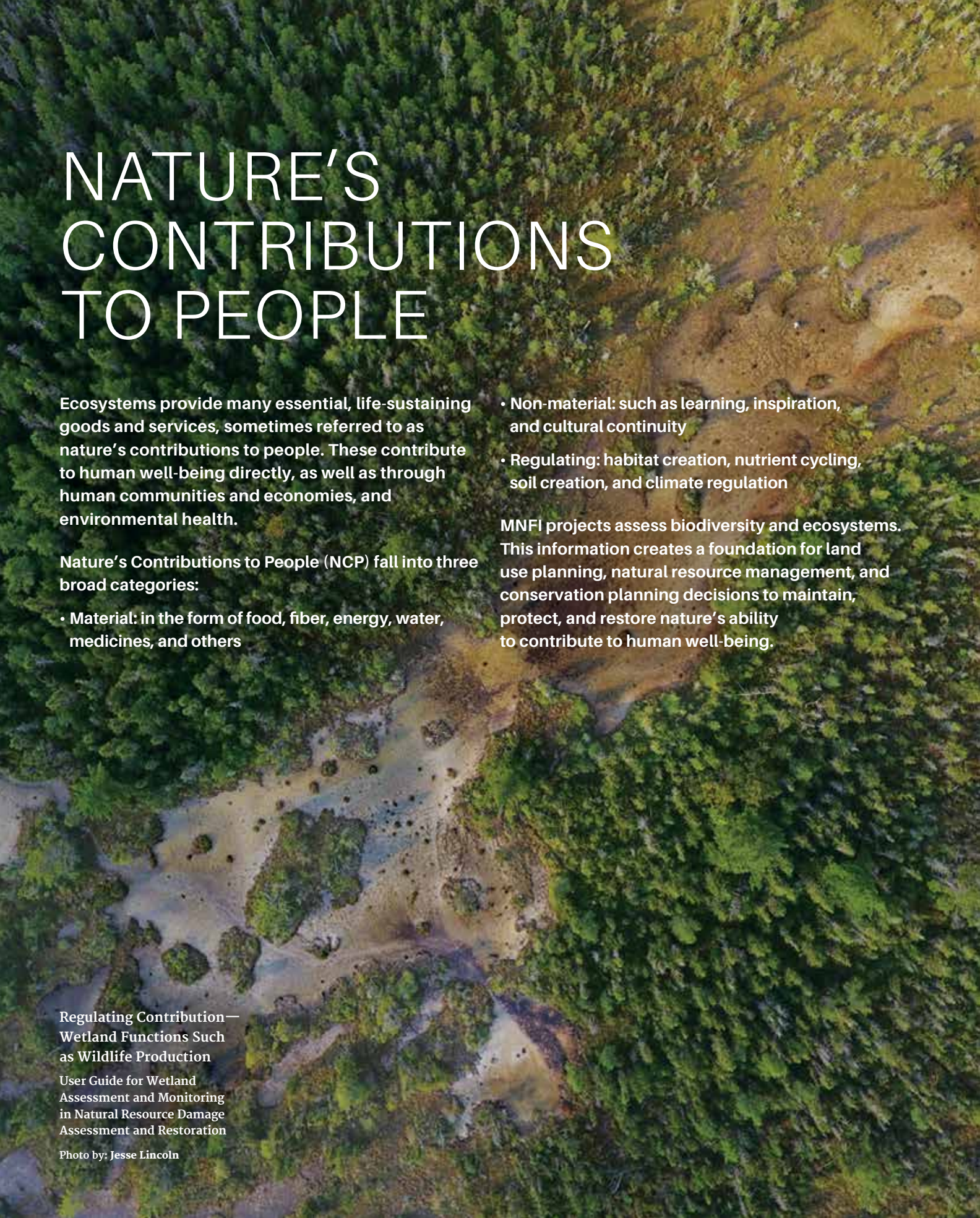
Photo by: Vince Cavalieri, Jeff Nekola, Aaron Kortenhoven

(top to bottom)

Photo by: Barb Barton, David Cuthrell, James Harding



Explore Michigan's Rare Species and Natural Communities at: mnfi.anr.msu.edu

An aerial photograph of a forest landscape. The upper half of the image shows a dense, green forest. The lower half shows a wetland area with a mix of green vegetation and brown, sandy soil. The text is overlaid on the image.

NATURE'S CONTRIBUTIONS TO PEOPLE

Ecosystems provide many essential, life-sustaining goods and services, sometimes referred to as nature's contributions to people. These contribute to human well-being directly, as well as through human communities and economies, and environmental health.

Nature's Contributions to People (NCP) fall into three broad categories:

- Material: in the form of food, fiber, energy, water, medicines, and others
- Non-material: such as learning, inspiration, and cultural continuity
- Regulating: habitat creation, nutrient cycling, soil creation, and climate regulation

MNFI projects assess biodiversity and ecosystems. This information creates a foundation for land use planning, natural resource management, and conservation planning decisions to maintain, protect, and restore nature's ability to contribute to human well-being.

Regulating Contribution—
Wetland Functions Such
as Wildlife Production

User Guide for Wetland
Assessment and Monitoring
in Natural Resource Damage
Assessment and Restoration

Photo by: Jesse Lincoln



Material Contribution— Timber and Fiber

Natural Community Surveys of
Forest Resource Division Lands 2017
Report for Michigan Department
of Natural Resources, Forest
Resources Division

Photo by: Aaron Kortenhoven



(left)

Regulating Contribution— Pollination

Laying the Foundation for
Establishment of New Mitchell's
Satyr (*Neonympha mitchellii*
mitchellii) Populations in Indiana
and Michigan and Securing
Populations through Updated
Species Management Plans
Report for the US Fish and
Wildlife Service

Photo by: Barb Barton



(right)

Material Contribution— Maintaining Wildlife Habitat

Natural Features Inventory and
Management Recommendations
for Rogue River State Game Area
Report for Michigan Department of
Natural Resources, Wildlife Division

Photo by: Jesse Lincoln



Non-Material Contribution— Cultural Continuity

Natural Community Surveys of
Beaver Island Archipelago
Report for the Little Traverse Bay
Bands of Odawa Indians, Natural
Resources Department

Photo by: Bill Parsons

MICHIGAN'S RARE POLLINATORS

Finding Them, Restoring Habitat

Clint Pogue conducting bee surveys
at Spring Park in Barry County.
Photo by: David Cuthrell



Need to “Bee” in the Know

As the second most diverse agriculture in the nation, Michigan grows a wide range of fruits and vegetables that require pollination for economical yields. While much of this work is done by honey bees brought to farms by beekeepers, there is a subset of wild bee species that visit specialty crops during bloom and help pollinate a billion dollar industry. These species are also ecologically significant for the functioning of natural areas.

The recent Michigan State University–led bee census documented a wide and diverse community of roughly 460 species in the state’s wild bee records.* Some species are doing well. However, the Rusty-patched bumble bee (*Bombus affinis*) has not been collected in Michigan for almost 20 years, and has been added to the Endangered Species List. Other species are rare, and it is challenging to determine their status without regular and extensive sampling.

Canaries in the Coal Mine?

Pollinators are essential to maintaining healthy natural ecosystems and a vibrant agricultural economy in Michigan. Declining bumble bee and butterfly populations threaten these systems and are being studied from a variety of perspectives. MNFI’s four ongoing projects address a variety of data needed to help foster the conservation and promulgation of pollinators.

First Stop: The Museum

A three-year study undertaken with Michigan Department of Natural Resources for its Wildlife Action Plan began at MSU’s Albert J. Cook Arthropod Research Collection in 2016. The majority of the bee collections were from the 1920s to the 1960s, but there has not been much documentation since. Three specimens from the 1880s looked as fresh as if they had been collected yesterday.

The team examined, verified identities, recorded, tabulated, and assigned bar code numbers to 4,164 bumble bee specimens. MNFI entered this massive amount of information into the database, and included any information available about where the specimens were collected. From this, the team pinpointed more than 50 sites across the Lower Peninsula to inventory in its initial survey.

Field Work: Grown Men with Butterfly Nets

In spite of funny looks from passing motorists, MNFI scientists on this project, who happened to all be men, completed field work along roadsides and other habitats hospitable to bumble bees. During August and September of 2016, MNFI collected 739 individual bumble bees, representing eleven species of *Bombus* at 52 sites using two different survey methodologies, and then processed, labeled, and identified them.

The good news was finding the State Special Concern Yellow-banded bumble bee (*B. terricola*) at three different sites. And no bee stings were recorded. It was, however, very disappointing to not find the Rusty-patched bumble bee (*B. affinis*) or four other species at any of the sites.

As part of MNFI's adaptive management approach, the more efficient survey technique was employed in the second year of field work. That methodology focused on patches of dense flowering resources. Sixty-six sites across the Upper Peninsula yielded the collection of 453 individual bumble bees, with many more observed. The good news was finding the Yellow-banded bumble bee at 14 sites, 12 of which were former sites. Disappointingly, no Rusty-patched bumble bees were found, and staff suffered one bee sting.

Work in 2018 will include scouring through additional bees at other museums for these two species, as well as surveying new sites in the extreme west end of the Upper Peninsula, areas of Michigan's Thumb, and parts of extreme southwestern Michigan.

Restoring Habitat for Pollinators

The MDNR project also complements the Michigan-Wisconsin pollinator conservation project, which got underway in 2017. Its objectives are to:

- Restore and enhance 825 acres of grassland, prairie, and savanna habitat for pollinators through specific habitat management actions on public and private land in both states, and
- Assess the relative outcomes of different management actions for specific pollinator species, while collecting population data.

The MDNR study provided input to site selection for the Michigan project, and work will begin in 2018.

It's Not Just about Bees

Butterflies and many other insects can also be important pollinators. Some butterflies, including the iconic Monarch, are also in decline. MNFI is also working on projects to inventory rare butterfly populations and study threats to the habitats critical to their survival.

In 2017, a two-year study began population assessments for three rare and declining butterfly species in southern Lower Michigan:

- Mitchell's Satyr (*Neonympha mitchellii mitchellii*)
- Poweshiek Skipperling (*Oarisma poweshiek*)
- Swamp Metalmark (*Calephelis mutica*)

The team is conducting ecological risk assessments of four sites each for Mitchell's Satyr and Poweshiek Skipperling, as well as local and landscape-level environmental factors affecting the health of the prairie fen habitats they prefer. This study will also provide data on more than 35 other state and federally



Poweshiek Skipperling surveys at Big Valley Nature Sanctuary, Oakland County
Photo by: David Cuthrell



Yellow-banded bumble bee (*Bombus terricola*), State Special Concern
Photo by: David Cuthrell

MANY VITAL POLLINATORS ARE BECOMING RARE

Of the 329 rare animal species tracked by MNFI:

- 66 or (58%) of the 111 insect species are loosely classified as pollinators
- 19% of all rare species are considered pollinators

listed species. The numbers for Mitchell's Satyr appear to be declining but not as precipitously as the Poweshiek Skipperling. Swamp Metalmarks, once fairly common in Michigan, have not been seen in the state since 2008, and are now feared extirpated from the state.

In the second year of another three-year study, the Karner Blue butterfly (*Lycaeides melissa samuelis*) appears to have largely recovered from a short decline in 2010–2014, but its oak savanna habitat needs to be maintained by a combination of techniques (mowing and prescribed fire) to fight woody succession.

Data Informs Decisions

The MDNR uses data from projects to inform Wildlife Action Plans, as well as make recommendations for the conservation status of species.

MNFI enters all study data into the Natural Heritage database for use by regional, national, and international public and private decision-makers and planners concerned with stabilizing and increasing the populations of these species through reinforcement, protection, and habitat management.

*Gibbs, J., J.S. Ascher, M.G. Rightmyer, and R. Isaacs. 2017. *The bees of Michigan (Hymenoptera: Apoidea: Anthophila)*, with notes on distribution, taxonomy, pollination, and natural history. *Zootaxa* 4352(1):1–160



Poweshiek Skipperling (*Oarisma poweshiek*),
State Threatened and Federal Endangered
Photo by: David Cuthrell

Assessing Native Bumble Bee Diversity, Distribution, and Status for the State of Michigan Wildlife Action Plan

Project Partners

- MNFI
- MDNR-Wildlife Division
- US Fish and Wildlife Service
- US Forest Service-Hiawatha National Forest



MNFI Team

- David Cuthrell, *Conservation Scientist, Lead Zoologist*
- Blake Cahill, *Zoology Assistant in 2017*
- Clint Pogue, *former Zoology Assistant, 2016*

Oak Savanna Restoration and Monitoring in Michigan and Ohio for the Karner Blue Butterfly Population Recovery

Project Partners

- MNFI
- MDNR-Wildlife Division



MNFI Team

- Michael Monfils, *Wildlife Science Coordinator*
- David Cuthrell, *Conservation Scientist, Lead Zoologist*

Globally Rare and Declining Prairie Fen Butterflies: Population Status and Ecological Risk Assessments

Project Partners

- US Fish and Wildlife Service
- MNFI
- Central Michigan University graduate students



MNFI/CMU Team

- Michael Monfils, *Wildlife Science Coordinator*
- David Cuthrell, *Conservation Scientist, Lead Zoologist*

Pollinator Conservation through Enhancement of Michigan's and Wisconsin's Grassland, Prairie, and Savanna Habitat

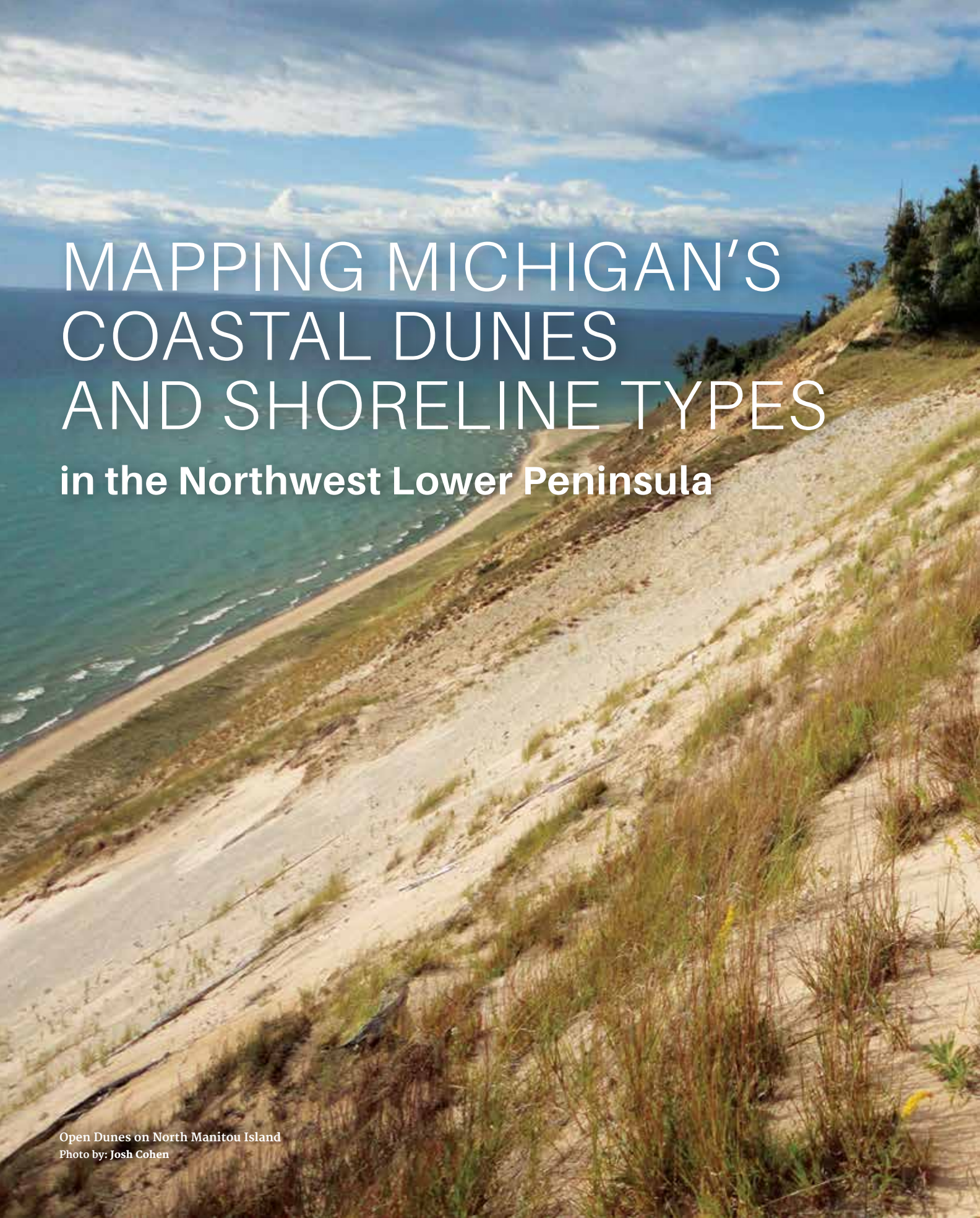
Project Partners

- US Fish and Wildlife Service
- MDNR-Wildlife Division
- MNFI
- Wisconsin DNR



MNFI/CMU Team

- Michael Monfils, *Wildlife Science Coordinator*
- David Cuthrell, *Conservation Scientist, Lead Zoologist*



MAPPING MICHIGAN'S COASTAL DUNES AND SHORELINE TYPES in the Northwest Lower Peninsula

Open Dunes on North Manitou Island
Photo by: Josh Cohen



Michigan's Iconic Northwest Lower Peninsula (NWLP) Shoreline

Michigan's coastal dunes draw visitors by the thousands and inspire many to build within and near their beauty. These iconic, dynamic systems are critical components of the economy, cultural identity, recreational assets, and natural diversity of coastal communities across the state.

Keeping Michigan's 3,288 Mile Coastline Resilient

Bordering four of the five Great Lakes, Michigan has the longest freshwater coastline in the US. When Michigan's coastal environments are healthy, the shoreline can maintain its integrity and resiliency. Natural disturbances, such as high water levels, intense storms, strong winds, and invasive species, pose challenges to these environments. So do human activities, such as development pressure, mining, and shoreline alterations. These forces can result in loss of property and loss or degradation of significant natural features.

In spite of the global significance of Michigan's coastal dunes, a comprehensive dataset of them does not currently exist. While information is available in various forms scattered among public and private entities, there is a surprising lack of easily accessible, accurate spatial information.

The MNFI project has generated new data and maps on NWLP's coastal dunes, shoreline types, and erosion potential. This information is presented in user-friendly, digital formats that will support community efforts to plan and manage future growth and development on lands adjacent to the coast, while protecting critical coastal resources.

"Information provided through the maps created by MNFI is extremely valuable towards increasing a community's resilience from coastal flooding and erosion. For this reason, the Coastal Management Program hopes to expand coverage of the maps to the rest of the state's coast."

**Matthew Warner, Coastal Hazards Specialist
Office of the Great Lakes**

Building on Shifting Sands of Data

Michigan's dunes have been protected by law since 1976. Amendments to the law have resulted in several mapping efforts over the years.

In what is considered the first and most comprehensive effort, William R. Buckler developed a dune classification system and inventory in 1978–79. MNFI tracked down Buckler's original report, but his large mylar maps were missing. After many inquiries over several months, MNFI finally heard back from John Esch at the Department of Environmental Quality —Oil, Gas and Minerals Division. Esch thought he might know where the maps were hiding. A few days later, MNFI scientists met him at the loading dock in Constitution Hall, where they found a truckload of large manila folders containing the maps. It turns out the maps had been hiding in the corner of a storage garage out by the Lansing airport for several decades.

Using Technology to Delineate the Dunes

The MNFI project mapped all dunes, not just those defined by law as "critical," on the NWLP shoreline and nearby islands in Lake Michigan. Many sources were plumbed for information: the MNFI Natural Heritage Database, SSURGO soils database, aerial imagery, land use/land cover, digital elevation models, USGS topographic maps, and state and local ownership and parcel data.

In total, approximately 38,400 acres of coastal dunes were mapped in the seven-county region, an increase of 10,400 acres

"In 2016, Networks Northwest worked with MNFI to create new maps and planning resources for local governments. The robust online mapping tools and detailed coastal data developed by MNFI are essential for communities that are working to protect coastal lands—especially dunes—through planning and zoning."

Sarah Lucas, AICP

Director of Community Development, Networks Northwest

(37%) from the 1996 project. New maps reveal some dune sites to be smaller, some larger, some eliminated, and some added. Many of the remote islands in Lake Michigan tend to harbor the highest quality coastal dunes.

Refining Dune Types

MNFI seized the opportunity to make the dune classification system even more meaningful by adding elevation and vegetation attributes to each of the three major categories of dunes: Wooded Dune and Swale Complexes, Parabolic Dunes, and Complex Dune Fields. The resulting nine categories provide more specific, useful, in-depth information for end-users.

Who Owns the Dunes?

Approximately 75% of the dunes in the NWLP are owned and managed by public agencies and conservation organizations. This allows access for everyone, keeps sites in a natural state, and allows consistent management across a large area. Overuse

Wooded Dune and Swale Complexes

Alternating sequences of .5 to 4 meter-high arced sand ridges and swales can extend up to two miles inland and cover more than 4,000 acres in size. Although the foredunes nearest the shore are often sparsely vegetated with somewhat active sand movement, mature trees are often found on the ridges, while emergent plants and open water characterize the swales. The hydrologic connection between swales is critical to wetland plants and wildlife species, such as turtles and raptors. Although there are only 12 wooded dune and swale sites in the NWLP, at 16,331 acres, they cover more land area than any of the other dune types in the region.



Parabolic Dunes

These are the type most people envision when they talk about dunes. Vegetation is typically found on their ridges, while the blowouts in between and the smaller foredunes near the shoreline are primarily open. Sand movement and migration, especially at high elevations exposed to wind, can make them hazardous to development. Older parabolic dunes (further inland) are typically vegetated with mature trees. With 53 sites, parabolic dunes are the most common dune type in the NWLP region.



and/or mismanagement, however, can lead to excessive erosion, spread of invasive species, and disruption of natural processes.

Information gained from the project can inform private owners of the dunes' significance as well as the potential hazards to development, such as erosion, sedimentation, and property loss, as well as the negative impacts of fencing, poor design, and mass plantings.

Technology Shares the Data Effectively

MNFI used the ArcGIS online mapping platform to make spatial data available for viewing and downloading to public and private decision-makers and planners.

A multimedia Story Map was also created for the general public. It is available online at: mnfi.anr.msu.edu/coastal-dunes

Using the MNFI maps, Networks Northwest produced a guidebook, *Planning for Coastal Resiliency in Northwest Michigan's Dunes* to help inform local planners and landowners about dunes and coastal erosion in the region.

More Miles of Coastline to Map

"As a result of this project, we now have a science-based process and classification in place that we can apply to the rest of the state, and hopefully advance the long-term protection of Michigan's iconic dunes," reports John Paskus, MNFI. The project will move forward in Phase II to build on the research, lessons learned, and GIS methodology developed and apply it

to all remaining coastal areas in Michigan. The Buckler maps created in 1978–79 will be scanned and geo-rectified to develop and apply an index to predict the health of coastal dune sites, and summarize data and information about select dune sites along Lake Michigan.



Complex Dune Fields

These have been described as "non-oriented dunes, generally of a hummocky, chaotic nature." It has also been theorized that a complex dune field may just be an early stage of a parabolic dune. Dune fields represent the smallest acreage of dune types in the NWLP region at just 7,000 acres. The most famous of these, the 2,798-acre complex dune field at Sleeping Bear National Lakeshore, is the largest dune field in the NWLP and very likely the entire Great Lakes Region. Its famous steep "climb" from the edge of Lake Michigan rewards intrepid (and strong) visitors with an extraordinary view from its 450-foot crest.



Planning for Coastal Resiliency in Northwest Michigan's Dunes

New Mapping & Planning Resources for Local Stakeholders

Project Partners

- **MNFI**
Digitized coastal dune and shore type data, and created online resources
- **Networks Northwest**
Reviewed Northwest Michigan policies & best practices, and developed planning guidebook
- **DEQ Coastal Zone Management Program**
Funding

🔍 MNFI Team

- John J. Paskus, *Senior Conservation Scientist, Lead Conservation Planner*
- Joshua G. Cohen, *Conservation Scientist, Lead Ecologist*
- Helen D. Enander, *GIS Analyst*

Photos by: Josh Cohen



GROWING CONSERVATION SUPER HEROES

Phyllis Higman leading Stewards at Lakeville
Swamp Nature Sanctuary in Oakland County.
Photo by: John Behnke

On the Front Lines of Conservation

It takes people with knowledge, enthusiasm, skills, and dedication to:

- survey the “bug” or macroinvertebrate population of a river being restored from a toxic dead-zone,
- assess the distribution status and ecology of vernal pools—the “coral reefs of the forest,”
- sample monarch butterflies to track spread of a parasite,
- create a pollinator meadow, or
- lead conservation initiatives in their own communities.

Learning the Science of Nature and Nature of Science

Michigan State University Extension’s Conservation Stewards Program (CSP) helps fill that need with highly skilled volunteers. Over the last 12 years, the program has trained 433 nature enthusiasts from 11 counties in 21 cohorts.

Program success is due in no small part to understanding what makes volunteers tick. Studies of early CSP programs examined nontraditional conservation learners, the program’s impact, and the potential for building capacity for conservation volunteerism. As a result, CSP’s approach to in-depth training offers volunteers the rewards of learning, introductions to local conservation efforts, and ways to apply their new skills to projects of their own choice.

As Stewards, these volunteers understand, promote, support, and contribute to and/or lead significant, informed, scientifically-based conservation stewardship management activities on public and private lands.

“Rock Stars for Nature Nerds”

MNFI is an important ongoing program partner. The Natural Heritage Database provides online information and localized maps. Each participant receives MNFI’s *Field Guide to the Natural Communities of Michigan* as a textbook and resource.

THE CONSERVATION STEWARDS PROGRAM

CSP was initially developed and supported by MSU Extension in partnership with the MDNR-Wildlife Division and MNFI. Today, the program is supported by the MSU Extension Greening Michigan Institute's Natural Resources Work Team. CSP has evolved into a true collaboration of community-based volunteers and partners, leading conservation organizations and agencies, and educational institutions to build a statewide network of dedicated, well-prepared conservation stewards.

Become a Conservation Steward

The path to certification includes completion of:

- Classroom and field-based training
- Self-paced online learning modules
- A capstone project
- Self-selected volunteer conservation service

Fall 2018 Training Programs will be held in Oakland, St. Clair, and Kalamazoo counties. For more information go to: www.canr.msu.edu/conservation_stewards_program

Local CSP educators report that trainees get very excited when MNFI “rock stars” come to participate in classroom and field methodology training. Many students, newly aware of the complexities of conservation issues, are in awe of the work the scientists are doing. And the students soon become “Conservation Super Heroes” in their own right.

More Stewards for More of Michigan

Discussions are underway to broaden the reach of CSP with potential partners in the Upper Peninsula, Traverse City area, Wayne County, and the capital region.

“As Stewards, our work as a family has brought valuable environmental knowledge to a land conservancy board as it assessed its properties and easements, led teams of young and old to understand the health of our watershed, and inspired our son to a career in Environmental Engineering.”

Bill Eisenman & Susan Guenther, Beverly Hills, CSP Class of 2007

CSP PROGRAM PARTNERS

Oakland County

- Oakland County Economic Development & Community Affairs (previously Planning and Economic Development)
- Oakland County Parks and Recreation
- Huron Clinton Metropolitan Authority

Washtenaw County

- Washtenaw County Parks & Recreation Commission
- Huron River Watershed Council
- Michigan Nature Association
- Washtenaw County Water Resources Commissioner
- Legacy Land Conservancy
- City of Ann Arbor Natural Area Preservation
- The Stewardship Network Huron Arbor Cluster

Kalamazoo

- Kalamazoo Nature Center
- MSU Kellogg Biological Station

MSU Extension CSP Leadership Team

- Shari Dann, MSU Department of Community Sustainability
- Patricia Norris, MSU Department of Community Sustainability
- Lois Wolfson, MSU Institute of Water Research/Department of Fisheries and Wildlife
- Bindu Bhakta, MSU Extension, Oakland
- Beth Clawson, MSU Extension, Kalamazoo
- Julie Crick, MSU Extension, Roscommon
- Erick Elgin, MSU Extension, Newaygo
- Georgia Peterson, MSU Extension
- Mike Schira, MSU Extension, Houghton/Keewenaw
- Phyllis Higman, MNFI
- Daria Hyde, MNFI
- Brian Klatt, MNFI
- Yu Man Lee, MNFI

Cooperators Leadership Team

- Michigan Department of Natural Resources Wildlife Division
- MSU Extension Fish & Wildlife Area of Expertise Team
- Michigan Natural Features Inventory
- The Nature Conservancy
- The Stewardship Network



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Hart's-tongue fern (*Asplenium scolopendrium* var. *americanum*) State Endangered and Federal Threatened
Photo by: Sue Crispin



Secretive locust (*Appalachia arcana*) State Special Concern
Photo by: David Cuthrell



Eastern Massasauga (*Sistrurus catenatus*) State Special Concern and Federal Threatened
Photo by: Kile Kucher

(left) Great horned owl nestlings at Wm C. Sterling State Park, Monroe County
Photo by: Russell Columbus

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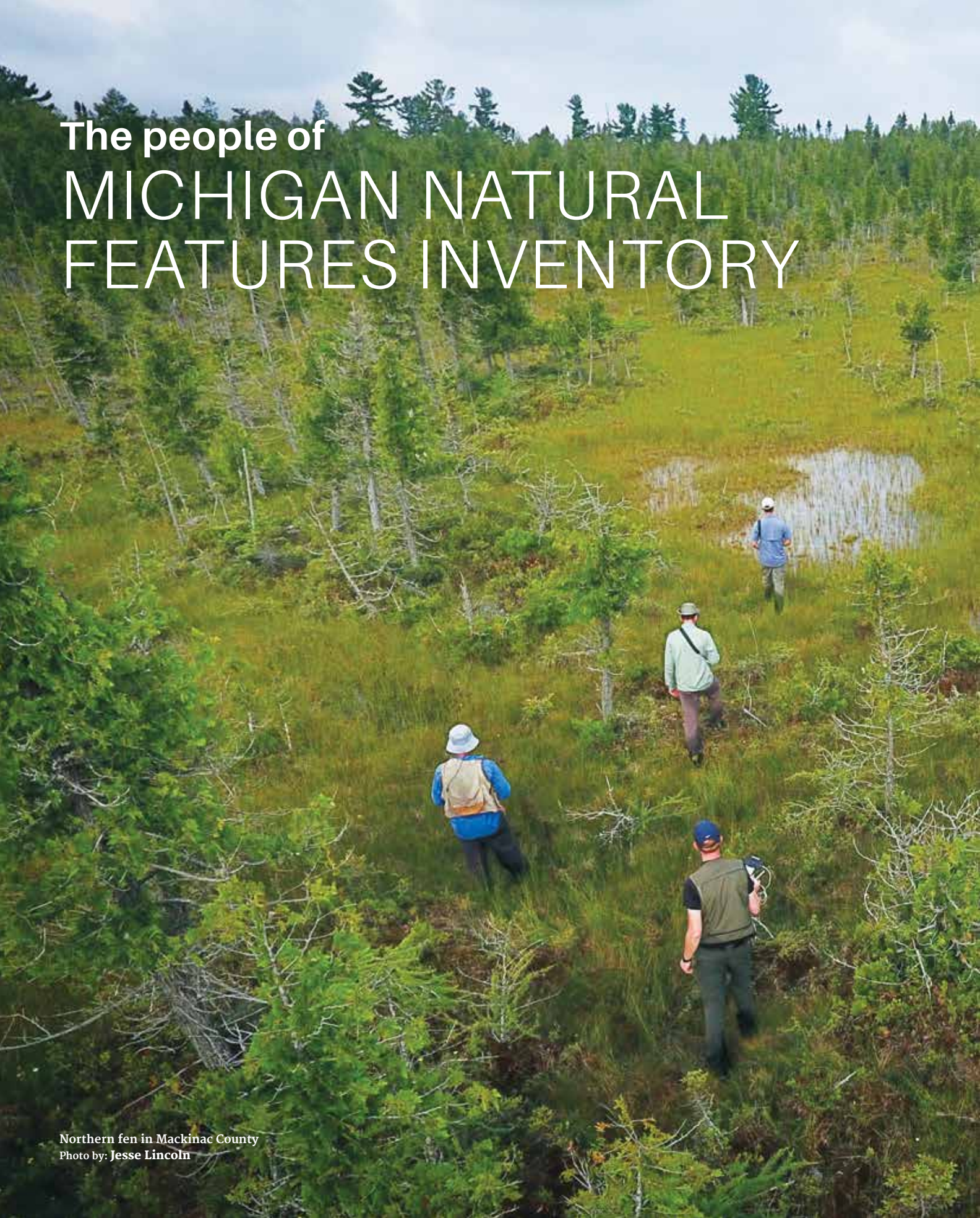
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The people of MICHIGAN NATURAL FEATURES INVENTORY

Northern fen in Mackinac County
Photo by: Jesse Lincoln



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As Brad moves on, we wish him well and thank him for his many contributions, excellent botany skills, and great sense of humor.



**Huron Pines
AmeriCorps Member**

Daniel J. Earl



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