



Michigan Natural
Features Inventory
Discover. Define. Deliver.

THE ART OF SCIENCE

**Celebrating Four Decades of
Discovering, Defining, and Delivering the
Science that Guides
Biodiversity Conservation and Stewardship**

Special Report: 2020



MICHIGAN STATE
UNIVERSITY | Extension

MICHIGAN NATURAL FEATURES INVENTORY

A PROGRAM OF MICHIGAN STATE UNIVERSITY EXTENSION

FROM THE MNFI DIRECTOR

How you perceive forty years depends a lot on your perspective. For some of the current staff members of the Michigan Natural Features Inventory (MNFI), it's longer than their lifetime. In evolutionary/geologic time, it less than the blink of an eye. I fall somewhere in between.

Forty years is a fair amount of time, but I can clearly remember a point when MNFI, along with the rest of the Natural Heritage programs throughout the U.S. did not exist. It was the mid-1970s, when The Nature Conservancy (TNC) recognized that to support their efforts at preserving lands of high conservation value, it would help to have a pretty good idea of exactly where those lands were and what biodiversity resources they contained.

TNC set about the task of building a network of Natural Heritage programs throughout the U.S. with a common mission:

- To discover and keep track of the location and condition of rare species and high-quality natural communities
- To develop understanding as to how the ecosystems that support these species function.

As the number of programs increased state-by-state, it became apparent that this network needed a coordinating body, and the Association for Biodiversity Information (ABI) was formed in 1994. As the network outgrew TNC and the programs established themselves within state natural resource agencies, tribes, and academic institutions, they maintained their common mission of identifying, understanding, and conserving biodiversity.

In 2000, MNFI joined Michigan State University Extension in the College of Agriculture and Natural Resources. That same year, ABI became NatureServe (NS), which still coordinates the Natural Heritage Network today.

I had the opportunity to interact with a number of the programs in their early years...Missouri, New York, Wisconsin, and, of course, Michigan. The efficacy of the data collected, as well as the common methodology and approach, was immediately apparent.

The data maintained by MNFI is considered "the gold standard" for information on rare species because the data are well-vetted by scientists and managed via a common methodology. It is the primary source of biodiversity information used by all environmental regulatory agencies, both state and Federal, in Michigan, as well as by conservation planners.

"Nobody does it better than MNFI." But don't just take my word for it. As you read the rest of this report, be aware that some of the projects resulted in national awards, like our work on wind energy, which was recognized by NatureServe, and our highway planning efforts, honored by the Federal Highway Administration.

The above is just the briefest of histories, and the people involved in getting MNFI to this point are really too numerous to list, but several have played significant roles, including the directors: Sue Crispin in the early days (who was also the director of the Montana program), followed by Leni Wilsmann. Judy Soule oversaw the transition of MNFI from TNC to MSU, followed by Pat Brown, with Yu Man Lee as Acting Director prior to me.

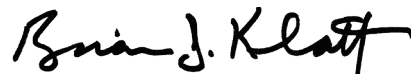
Of course, our data is considered the gold standard thanks to the scientists that shaped MNFI, including Pat Comer, Kim Chapman, Denny Albert, Michael Kost, and Mike Penskar among others. I would be remiss if I didn't acknowledge our current staff...a more dedicated group I have never seen. The passion for their work is reflected in the fabulous photography contained in this report, most of which was taken by staff members.

And like the recognition of our efforts at the national level, individual staff members have received numerous awards for their conservation work. It has been an honor to work with them and play some role in the history of MNFI.

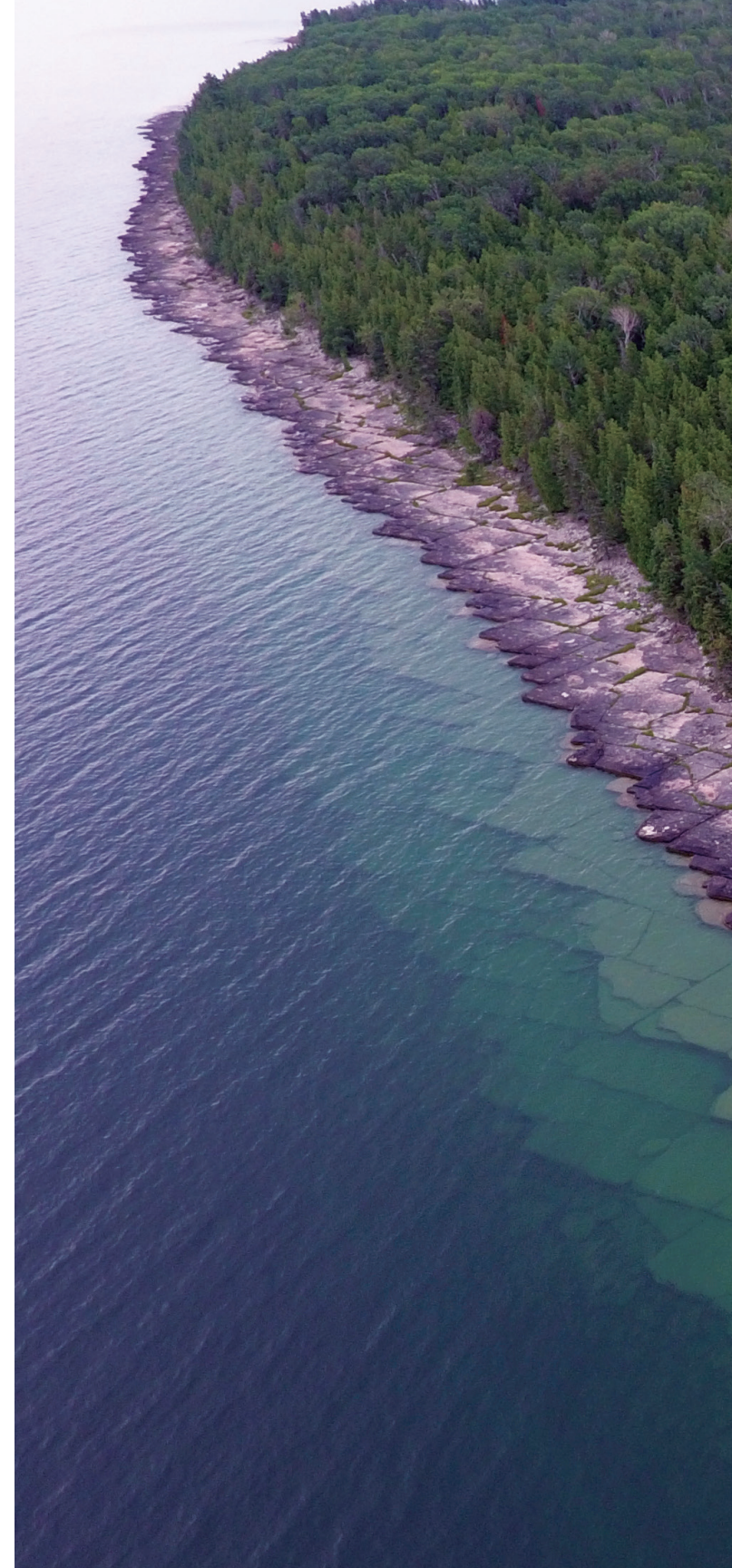
All of us at MNFI want to recognize the vital role of the partners in our work including local, regional, state and federal governmental agencies, non-governmental organizations, tribal agencies, the private sector, the research community, and volunteer citizen scientists.

But as the song goes, "if memories were all I played, I'd rather drive a truck." Forty years are past, but the entire future lies ahead of us. With a recent United Nations study predicting the extinction of about one million species in the coming years, there has never been a greater need for MNFI, the Natural Heritage Network, and reliable, science-based information to guide conservation.

So, read the rest of this anniversary edition of our annual report, recognizing MNFI's many accomplishments and imagining what's yet to come.



Brian J. Klatt, PhD, Director
Michigan Natural Features Inventory



"We're so pleased to be celebrating 40 years of partnership with The Michigan Natural Features Inventory. Since joining the NatureServe Network in 1980, they've been a leader among natural heritage programs with their many contributions to advance science, information, and technology for conservation. As the first US heritage program to pilot Biotics, MNFI pioneered the use of GIS for biodiversity mapping and continues to be a strong advocate for the use of innovative technology and consistent standards across our Network."

Sean T. O'Brien
President and CEO, NatureServe

"The Michigan Department of Natural Resources Wildlife Division has worked hand-in-hand with the Michigan Natural Features Inventory from its inception. We are proud of that partnership and all it has accomplished, from working to conserve threatened and endangered species to conservation planning for state lands. The relationship has resulted in benefits to the people of the State of Michigan in countless ways and we look forward to continuing our partnership into the future."

Dan Kennedy
Endangered Species Coordinator, Michigan Department of Natural Resources, Wildlife Division

"The Huron-Manistee National Forests (HMNF) would like to extend our regards to MNFI for 40 years of exemplary environmental management in the State of Michigan. The HMNF and MNFI have partnered for many years on projects ranging from individual Endangered, Threatened, or Sensitive species management to National Forest-wide surveys for high quality ecosystems and potential Research Natural Areas. The partnership continues to grow and now includes an agreement for extensive botanical and wildlife surveys to help guide management decisions on the National Forests. Congratulations! And a sincere "thank you" for all you have accomplished."

Rich Corner
Huron-Manistee National Forest, US Forest Service, Region 9

"As the conservation management landscape continues to evolve — for example, the trend towards fostering multi-disciplinary partnerships and collaborative networks — MNFI scientists have been able to adapt and meet the changing needs of government agencies like EGLE and others. All the while, they do not lose focus on the core science that underpins it all."

Matt Preisser
Michigan Department of Environment, Great Lakes, and Energy

"Michigan Natural Features Inventory has been an invaluable partner to Forest Resources Division over the years. The expertise they have provided on Michigan's special plants, animals, and places through field reviews, surveys, and trainings has certainly contributed to better management of our State Forest lands."

Debbie Begalle
Chief, Forest Resources Division, Michigan Department of Natural Resources

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.

On the Cover:
Sunset over old-growth mesic northern forest
in the Porcupine Mountains State Park
Photo by: Clay Wilton

Limestone Bedrock Lakeshore along the
northern shoreline of Drummond Island
Photo by: Jesse Lincoln



AS WE CELEBRATE 40 YEARS...

We invite you to look at these magnificent Michigan landscapes through the eyes of MNFI experts. Discover the kinds of questions they ask and the answers they seek and find.

Watch for the magnifying glass in some of the photos to spot what the experts see.

Within each of the widely varied and unique landscapes is a story of:

DISCOVERY

How research and field work contribute to knowledge:

- Establishing a baseline of information
- Collecting data over the long term
- Using the latest technology to keep pace with rapid changes in nature

DEFINITION

How deep study of natural features over time leads to:

- Identifying threats to natural communities and species
- Creating classification systems, methodologies, and protocols
- Setting standards to prioritize future study and conservation efforts

DELIVERY

How science informs decisions that impact biodiversity through:

- Unbiased scientific data on Michigan's natural features to:
 - Governmental agencies (local, regional, state, federal and tribal),
 - Non-governmental organizations,
 - Industry,
 - Environmental consultants,
 - The research community, and
 - The public
- Planning, inventory, survey, and environmental review services
- In-depth online resources and publications
- Conservation and land use plans
- Training programs for professionals and volunteers
- Educational programs for adults and students
- Strong partnerships with the public and private sectors

We hope you will be inspired to learn more.

Enjoy the vast amount of information at:
<https://mnfi.anr.msu.edu/>

WHAT DID THE SCIENTISTS SEE?

The Importance of Establishing Historic Baseline Data to Frame Ecological Understanding and Inform Conservation

In the 1990s, ecologists launched an ambitious project to find data from Government Land Office surveys of Michigan between 1816 and 1856, to capture a record of the natural environment before the arrival of large numbers of Europeans and the logging industry. Surveyors' detailed notes included the location, species and diameters of trees, and information on water features, timber quality, natural disturbances, and indigenous people's trails and villages.

MNFI transferred the information by hand onto tracing paper laid over maps. It was then meticulously digitized into a statewide map, *The Vegetation of Michigan circa 1800*, which beautifully illustrates a slice of Michigan's historical ecological context and provides an invaluable tool to compare today's vegetation and land cover to that of the early 1800s.

MNFI published *The Atlas of Early Michigan's Forests, Grasslands, and Wetlands* in 2008. Its descriptions of vegetation types and color-coded maps are used by researchers, land managers, governmental agencies, and the public. This information is available online at: <https://mnfi.anr.msu.edu/resources/vegetation-circa-1800>

Statewide Vegetation Circa 1800 Dataset

WHAT DO THE ECOLOGISTS SEE?

The Need to Survey and Document Michigan's Unique Coastal Ecosystems

With the longest freshwater coastline in the U.S., Michigan boasts natural communities and species that are entirely unique to this state and endemic to the Great Lakes region.

From the very beginning, MNFI has surveyed dunes, marshes, coastal wetlands, and wooded dune and swale complexes along mainland and island Great Lakes coastal zones. Partnering with the federal, regional, state, and tribal agency partners, MNFI has:

- Conducted inventories and added evolving data to the Heritage Database
- Mapped sections of coastline
- Devised methods to assess coastal ecosystems
- Studied threats, such as invasive species, fire suppression, and human use
- Created monitoring protocols for rare coastal ecosystems
- Measured changes to system integrity
- Prioritized areas needing conservation
- Provided data to decision-makers
- Trained resource managers
- Shared information with the public and property owners

WHAT DOES THE BOTANIST SEE?

The Need to Monitor the State's Wildflower

Growing in dense clumps, the Dwarf lake iris is a federally and state threatened wildflower only found along the forested coasts of Michigan, Wisconsin and Ontario.



Dwarf Lake Iris
(*Iris lacustris*)

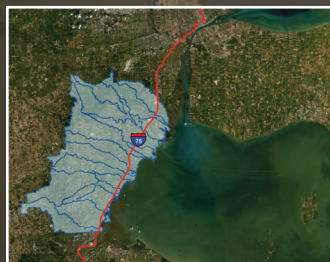
WHAT DOES THE CONSERVATION PLANNER SEE?

The Opportunity to Rebuild a Landscape While Rebuilding a Highway

The reconstruction of I-75 between Detroit and Toledo involved a roadbed that traverses an important Great Lakes coastal region. Its original natural and endemic communities once hosted abundant wildlife and plant diversity, but have been severely impacted by large scale land conversion, pollution, and invasive species.

To tackle these “wicked” (a technical term) landscape-scale challenges, MNFI, a member of the global Conservation Coaches Network, harnessed the power of the Open Standards for the Practice of Conservation (OS) comprehensive decision-making process. More than 30 non-governmental organizations and federal, state, regional, and local governments worked together on technical advisory and action teams.

The process created a conservation action plan to guide transportation planning while maximizing conservation and restoration outcomes for the region. In other partnerships, MNFI has also used these standards to create conservation action plans for three of the five Great Lakes.



I-75 Project Focus Area

I-75 Bridge over Halfway Creek, Monroe County
Photo source: MDOT



WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Importance of Partnership in Ongoing Conservation of Michigan's Public Lands

Most MNFI scientists are involved in the long-term, integrated inventories of Michigan's state lands for the DNR. This long and vital partnership brings science to the management of Michigan's natural resources and reinforces the mission of each organization.

A multi-disciplinary team of MNFI scientists brought decades of expertise to the inventory of the 15,691-acre Muskegon State Game Area. Over several years of field work, they mapped the land cover of the game area, updated historical records, and documented new occurrences of natural communities and rare plants and animals.

MNFI worked closely with game area managers to develop recommendations to protect the region's native biodiversity and critical habitat for game and non-game species. The restoration of critically rare oak-pine barrens and wet-mesic sand prairie is the hallmark of this unique conservation partnership.

Where, When, and How to Put Data into Action

As partners in environmental stewardship, MNFI and the DNR Wildlife Division put data to work for DNR implementation of conservation efforts.

MNFI provides training to DNR staff in field practices, rare species, natural communities, land management, and threats, such as invasive species.

Another major threat is fire suppression. Fire is a natural and vital part of ecosystem regulation. The lack of it erodes diversity of natural communities and causes loss of habitat critical for numerous rare species. Prescribed burns can help restore fire-dependent ecosystems. MNFI developed a statewide prescribed fire needs assessment model and assigned scores for state lands at the landscape and stand level. This model helps the DNR prioritize where to implement prescribed fire as a stewardship tool.



Controlled burn at
Allegan State Game Area

Oak-Pine Barrens at Allegan State Game Area
Photo by: Jesse Lincoln
Inset by: Maria Albright

WHAT DOES THE CONSERVATION SCIENTIST NEED?

High Tech and Low Tech Equipment

Out in the field, it's beautiful, but it can also be muddy, rocky, hot, cold, wet, and full of mosquitoes, black flies, deer flies, ticks, and chiggers. Scientists bring their respective tools of the trade – in the trunk of the car, in a backpack, and/or in a vest with lots of pockets.

DON'T GET LOST:

- GPS
- Printed/digital maps of area
- Compass
- Smartphone or tablet
- Relevant apps
- Field guides

PROTECTION FROM THE ELEMENTS:

- Waders
- Boots
- Snorkel gear
- Drysuit
- Rain gear
- Life jackets
- Paddles
- Tents
- Extra socks
- Hat
- Sunglasses
- Protective eyewear

PERSONAL PROTECTION:

- Bug spray
- Sunscreen
- Chap stick
- First aid kit
- Benadryl (bee stings)
- Tecnu (poison sumac/ivy)
- Water bladder or bottles
- Water purifier
- Wet wipes
- 4L of water
- Camp spork
- Snacks!

EQUIPMENT:

- Pencils
- Permanent markers
- Rite in the rain paper/journals

- pH/conductivity water quality meter
- D-net
- Glass-bottom-bucket
- Drones
- Camera
- Binoculars
- Hand lens
- Clinometer
- Measuring tape
- Pocket knife
- Machete
- PCV quadrats
- Pin flags
- Soil probe
- Soil test kit
- Munsell soil color charts

- Botanical dissecting kit
- Plant press
- Hand pruners
- Tree borer/corer
- Tree basal area prism
- DBH tape, duct tape, flagging tape
- Ziploc bags
- Retractable key chains
- Leatherman multi-tool

STAY SAFE:

- Whistle
- Bear spray and air horn
- Mosquito net!

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Need for Cutting Edge Technology that Can Match the Pace and Scale of Landscape Change

MNFI scientists are utilizing low-cost drones, high-resolution, visible spectrum imagery, and deep learning algorithms to evaluate ecosystem integrity of Michigan's rare and endemic coastal ecosystems, including this lakeplain prairie. Drones provide a fast, flexible, accurate, and affordable method for monitoring remote, extensive, and fragile ecosystems.

With grant support, MNFI and the Michigan Aerospace Corporation brought together experts in ecology, biodiversity conservation, computer programming, remote sensing, and deep learning.

Research sites focused on coastal ecosystems threatened by invasive plants. Custom-designed, cloud-based software was developed to annotate the collected imagery and classify species through machine learning or deep neural networks. From this data, "heat maps" identify the locations and types of invasive species, providing the basis for evaluating risk, planning treatments, and monitoring the effectiveness of interventions.

Phragmites growing in a Lakeplain Prairie at
St. Johns Marsh Wildlife Area
Photo by: Joshua Cohen

WHAT DO THE SCIENTISTS WANT TO CREATE?

Polygons of documented populations of
Karner Blue butterfly along corridors, Montcalm County
Inset by: David Cuthrell

Comprehensive, Historic and Current In-Depth Data on Michigan's Natural Features

The Heritage Database is fundamental to the work of MNFI. Data on Michigan's rare species and natural communities meet rigorous scientific standards and are shared with governmental agencies and non-governmental organizations, including industry, environmental consultants, the research community, and the public. That data is used to generate a variety of products and services to inform decisions.

For example, when a power company plans to build or maintain a transmission line, it is required by law to review the potential environmental impact on the site. An environmental consultant conducts an on-site survey, compares new occurrences of rare and protected species with MNFI data, and identifies areas of potential harm to avoid.

In a forest such as this, one potential impact could be on the federally endangered, state threatened Karner Blue butterfly. Recommendations would be made to protect the species.



Karner Blue Butterfly
(*Lycaeides melissa samuelis*)

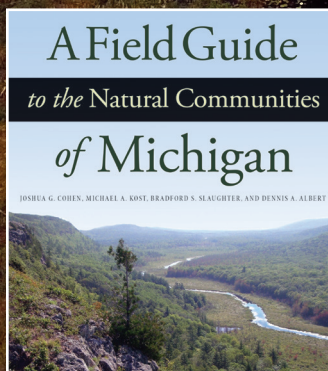
WHAT DO THE CONSERVATION SCIENTISTS SEE?

The Need to Define Michigan's Diverse and Unique Landscape

MNFI's foundational Field Guide was 30 years in the making. Many ecologists researched existing literature, conducted field surveys, and mined the Heritage Database for information. Their analysis led to the classification of 77 diverse natural community types in a hierarchical system which provides a common language about Michigan's biodiversity and ecological context.

Natural communities are defined as assemblages of interacting plants, animals, and other organisms that occur repeatedly under similar environmental conditions across the landscape. They are structured by natural processes rather than disturbances caused by modern human activity.

Designed to fit in a field pack, the Field Guide contains detailed descriptions, photos, plant lists, and maps for use by professionals and nature lovers who seek to understand, describe, document, and restore native natural communities. The classification is also available online at:
<https://mnfi.anr.msu.edu/communities>.



Hogsback Mountain Granite Bedrock Glade,
Marquette County
Photo by: Jesse Lincoln

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Need to Address the Serious Threat of Invasive Species

Invasive species pose one of the great threats to Michigan ecosystems. Understanding the essential importance of this area of study, MNFI has worked for more than a decade to identify, map, and devise strategies to deal with invasive plant and animal species.

Michigan is in the forefront of this conservation effort. MNFI's work with many partners has:

- Promoted Prevention, Early Detection and Strategic Management of priority invasive species
- Created methodology and models to prioritize intervention
- Helped develop important partnerships: Cooperative Invasive Species Management Areas (CISMAs), Michigan Invasive Species Coalition (MISC), and Midwest Invasive Species Information Network (MISIN)
- Trained natural resources professionals, citizens scientists, and students to identify and document occurrences
- Published two popular, pocket-sized field guides to invasive plants
- Developed an automated monitoring protocol for identifying invasives using drones and machine learning

Elberta Dunes, an open dunes ecosystem,
Benzie County
Photos by: Joshua Cohen



Spotted Knapweed
(*Centaurea stoebe*)

WHAT DOES THE AQUATIC ZOOLOGIST SEE?

Invasive Invertebrates Cause Great Harm, Too

Native freshwater mussels are in serious decline. Almost half of Michigan's 40+ species are state listed as endangered or threatened, with some on the federal endangered list. For 20+ years, MNFI scientists have been documenting populations of these shellfish and providing information about them to natural resources managers and the public.

In the aquatic ecosystem, they represent a key link in the food chain and help filter fresh water. Larvae attach themselves to specific fish species to complete their life cycle and migrate to new habitats. Mussel shells provide habitat for other aquatic animals, such as fish, crayfish, and aquatic insects.

Native mussels have declined due to impacts to stream and lake ecosystems, pollutants, and invasive zebra mussels, which attach to native mussels and eventually prevent reproduction and feeding.



Slippershell Mussel
(*Alasmodonta viridis*)

Watkins Lake State Park
Photos by: Peter Badra

**WHAT DOES THE
CONSERVATION SCIENTIST SEE?**

How Classifying and Mapping Michigan's Iconic Dunes is Key to their Protection

Michigan's dunes are central to the state's identity, biodiversity, and tourism industry. In spite of their global significance, a comprehensive digital dataset of them did not exist.

As part of a study on coastal resiliency, MNFI began building it. Scientists tracked down W.R. Buckler's 1978 dune classification system and maps, and incorporated data and maps from the 1958 Humphrys Shoretype Classification.

New mapping of dunes in the Northwest Lower Peninsula led to refining the classification system. Our study identified 224 dunes sites in Michigan totaling 346,688 acres, up 26% from 275,000 acres identified in previous studies.

The work provides the clearest picture ever of the extent, diversity, and condition of Michigan's dunes. Detailed, online, spatial information is now available to those making decisions that impact dune management and stewardship – land managers, local and state governmental agencies, land conservancies and private landowners.



Dune classification on South Manitou Island

Open Dunes along the west side of North Manitou Island
Photo by: Joshua Cohen

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Need for a Regional Approach to Conservation

Marsh birds of the Great Lakes are in decline. Because birds cross state lines, researchers from four states work as partners to study them.

To better understand the status and trends of marsh birds in the region, statewide surveys were initiated in Wisconsin in 2008, and joined by Michigan in 2010, Ohio in 2011, and Minnesota in 2016. Using identical survey methodology, each state collects data and shares them with each other and the Midwest Avian Data Center of the Avian Knowledge Network. Partners use these data to understand vital knowledge gaps, such as habitat associations, response to management actions, and population size.

MNFI provides leadership to coordinate the partners and conduct data analyses. Knowledge gained from these studies informs conservation planning and management decisions for these declining species.



Least Bittern
(*Ixobrychus exilis*)

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Power of Combining Knowledge

The ongoing partnership of MNFI with the Little Traverse Bay Bands of Odawa Indians combines tribal knowledge, scientific knowledge, and field methodology to aid in the protection of resources vital to tribal life. Working together to survey natural communities, rare species, and invasive plants continues to create a flexible framework for site-specific resource management.

In 2019, MNFI began documenting the location of black bears on state forest and state park lands within the 1855 Reservation, using tree-mounted trail cameras set on a survey grid. The black bear is important to the Odawa - culturally, spiritually and as a resource. Estimating black bear distribution and habitat use will establish a foundation for understanding the ecological and conservation needs of this unique species in northern Michigan.



Black Bear (*Ursus americanus*)

State Forest within the Little Traverse
Bay Bands of Odawa Indians Reservation
Photo by: Clay Wilton
Inset by: MNFI Trail Camera

WHAT DOES THE CONSERVATION SCIENTIST SEE?

A Rich and Varied Natural Community in Decline

The prairie fen is a ground-water influenced wetland community dominated by grasses, shrubs, and flowering herbaceous plants (forbs). Associated with headwaters and groundwater springs, they are found in the southern Lower Peninsula in interlobate regions (where two major lobes of glacial ice once joined).

It is one of the richest communities in biodiversity with an abundance of 19 rare plants, including white lady's slipper, Jacob's ladder, and shooting-star, as well as 18 rare animals, including Mitchell's satyr and the Eastern massasauga rattlesnake.

It is also a fragile community under threat. Its balance is easily disturbed by human use, changes in hydrology, fire suppression, invasive species, pollution, and fragmentation. These threats impact many species, including rare species, which are also in decline.



Prairie Fen at Seven Lakes State Park
Photo by: Bradford Slaughter
Inset by: Kile Kucher

WHAT DOES THE HERPETOLOGIST SEE?

An Endangered Species in Need of Protection

Michigan is the last stronghold for the Eastern massasauga rattlesnake. This federally threatened snake is small, secretive, well camouflaged, and venomous, but benign compared to its infamous cousins.

Its habitat is wetlands and adjacent uplands, including prairie fens — all fragile natural communities under threat from hydrological and other land use changes. Humans also threaten massasauga, often intentionally and illegally killing them.

MNFI has worked since the 1990s with the DNR and U.S. Fish and Wildlife Service to assist public and non-governmental land managers to better understand the species and the importance of their habitat. Public education outreach programs have also been conducted.

Ongoing research of the massasauga helps inform and facilitate conservation of the species.



Eastern Massasauga Rattlesnake
(*Sistrurus catenatus*)

WHAT DOES THE ENTOMOLOGIST NOT SEE?

A Formerly Abundant Native Bumble Bee

The decline of pollinators, including bees and butterflies, has been documented globally. Bumble bees provide crucial pollination services to Michigan's agricultural system and to the functioning and stability of nearly all terrestrial ecosystems. A subset of wild bees pollinate specialty crops and plants that maintain natural ecosystems.

Over the past four years, MNFI has collected data on wild bee species through field work as well as cataloging thousands of museum specimens.

The search for the Rusty-patched bumble bee continues. It has not been collected in Michigan in nearly 20 years and was added to the state Endangered Species List.

Ongoing projects address the data needed to help foster the awareness and conservation of pollinators and their habitat.



Rusty-Patched Bumble Bee
(*Bombus affinis*)

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Mitchell's Satyr Butterfly is Still in the Picture

Conservation makes a difference!

For more than 25 years, scientists have been collecting data on this endangered pollinator and its threatened prairie fen habitat.

Collaboration among many partners has resulted in progress toward restoration of this butterfly. Captive rearing currently underway at Toledo Zoo and Kalamazoo Nature Center breed Mitchell's satyrs in controlled environments. These efforts will result in the introduction of butterflies to new suitable habitats or augmentation of existing populations to improve their viability.

Restoration of habitat includes protection from fragmentation, changes in hydrology, invasive species, and pollution.



A marked (5) Mitchell's Satyr
(*Neonympha mitchellii mitchellii*)
Inset by: Barb Barton

Prairie Fen at Seven Lakes State Park
Photo by: Joshua Cohen
Inset by: Johanna James-Heinz

WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Importance of Data to Inform Development Decisions

Green solutions to energy generation may present unintended consequences. With onshore wind farms being constructed and offshore development being considered, MNFI recognized the lack of baseline data available to decision-makers to minimize the potential impact of windmills on birds and bats.

Scientists from MNFI used audio recorders onshore and offshore to measure the occurrence of birds by day and bats (ultrasonically by night), low-level aerial bird surveys off shore, and netting of bats on shore. It was surprising to find that bats frequent offshore areas, though at lower levels than on shore.

These baseline data provide a much better understanding of the potential impact on-shore and off-shore wind development could have on birds and bats.



Research Buoy

WHAT DID THE ECOLOGIST SEE?



Climbing Hempweed
(*Mikania scandens*)

A Mysterious Plant

During a natural features inventory of a lowland forest, a peculiar climbing vine with small white flowers was spotted twining all over adjacent plants in a wetland. Was it a new invasive species?

No! Research revealed it to be a climbing hempweed, an unusual vine in the aster family. This plant, which is typically found along the east coast from Maine to Florida, was last documented in Michigan in 1896 and thought to be extirpated from the state.

This new occurrence was added to the Natural Heritage Database and the status of this “rediscovered” plant was upgraded from extirpated to threatened.



WHAT DOES THE CONSERVATION SCIENTIST SEE?

The Need to Identify and Map the “Coral Reefs of the Forest”

Vernal pools are small, shallow, isolated and ephemeral — filling with water in spring or fall and drying out during summer or drought. As “nature’s nursery,” they supply breeding habitat for species at the base of the food chain. Providing nutrient cycling, water management and critical habitat for 500+ animal species, they are essential to forest health — something Michigan’s forest industry also depends on.

In the first statewide effort, MNFI worked with many partners, including the Michigan Tech Research Institute to:

- Arrive at a common definition, mapping, and monitoring approach
- Explore methodology to predict locations of vernal pools in remote areas using radar and LiDAR
- Establish the Michigan Vernal Pools Partnership of over 25 governmental, non-governmental, university and private sector members to develop management and protection strategies

WHAT DOES THE CONSERVATION EDUCATOR SEE?

The Opportunity to Inspire the Next Generation

Place-based educational programs for K-12 and college students teach environmental stewardship and spark interest in science.

Opportunities for students to work in nature, participate in data collection, and learn to identify species ignite the imagination, raise awareness, and result in changed attitudes. Teachers benefit, too, with increased knowledge. MNFI often collaborates with many partners in these programs.



Fairy Shrimp
(*Eubranchipus vernalis*)

After attending a vernal pool training program for educators in 2015, a 4-H club in northeast Michigan verified vernal pools. They also documented the occurrence of a fairy shrimp, a species found only during the spring and only in this habitat.

Vernal Pool, Iron County
Photo by: Peter Badra
Inset by: Jack Ray

WHAT DOES THE CONSERVATION EDUCATOR SEE?

The Vital role of Citizen Scientists in Advancing Knowledge and Conservation

MNFI played a foundational role in designing the Conservation Stewardship Program in partnership with MSU Extension and the DNR-Wildlife Division for adult volunteers interested in conservation and stewardship.

Experts lead the seven-week course which provides in-depth background in ecological systems and field methodology, as well as an individual or group capstone projects.

Volunteers develop knowledge and skills to assist or complement restoration, ecological monitoring, and resource management projects in their community. Through their work, the Conservation Stewards become important advocates for conservation.

Become a Conservation Steward:

https://www.canr.msu.edu/conservation_stewards_program

Conservation Stewards Field Trip to a Prairie Fen, Lakeville Swamp,
Oakland County
Photo by: John Behnke

WHAT DO THE MNFI EXPERTS SEE?

The Contribution of Michigan Data to Global Environmental Understanding

MNFI is one of 80 NatureServe Network Programs, one in each U.S. state, as well as in Canadian Provinces, and Latin America countries.

NatureServe Programs collect and analyze data about the plants, animals and ecological communities of the Western Hemisphere. Each program is a leading source of information on the locations and conditions of at-risk species and threatened ecosystems in their jurisdiction.

All NatureServe programs adhere to Natural Heritage Methodology — a rigorous set of field and data management standards and protocols, as well as standardized mapping of biological features and assessment of their condition. This serves as a common language for all participants. The use of common standards and protocols allows data to be integrated across political boundaries, facilitating the understanding of species and ecosystems in a range-wide context.

MNFI manages the Heritage Database for Michigan, which includes approximately 20,000 records of natural communities and vulnerable species. These data are in a GIS-based platform and can be used along with other spatial data-layers to inform conservation strategies at multiple scales.

NatureServe maps such as this combine Michigan data with that of other Heritage programs to provide documentation and understanding of perils to rare species and biodiversity protection efforts across political boundaries and in a wider geographic context.



Richness of Imperiled Species,
The Map of Biodiversity Importance (MoBI)
Data compiled by: NatureServe



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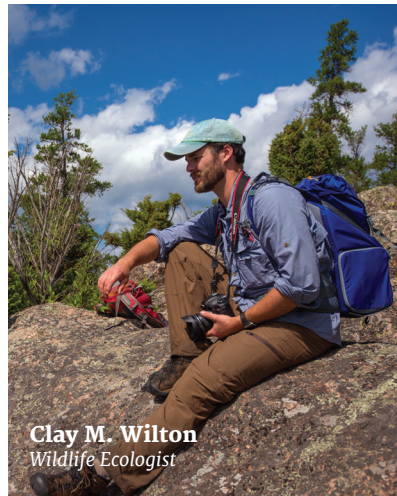
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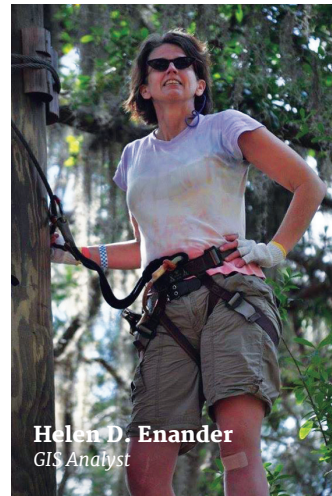
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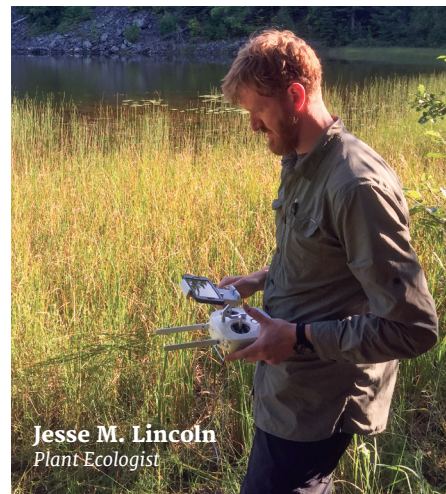
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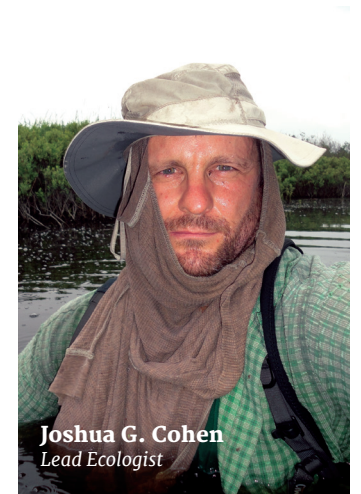
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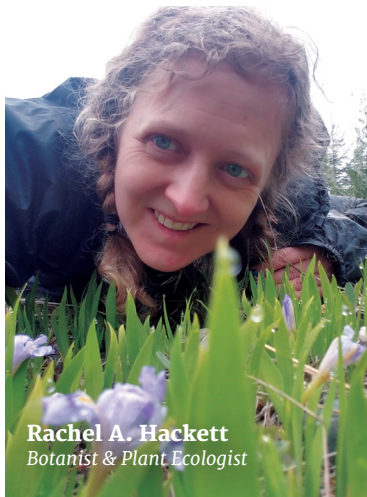
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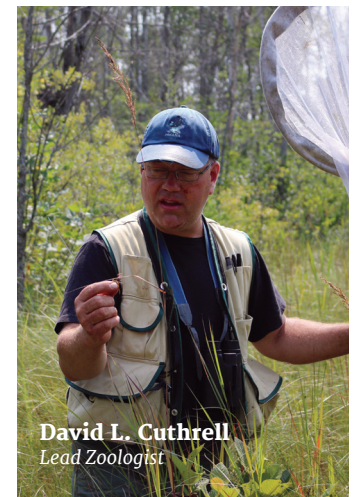
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Golden Northern Bumble Bee (*Bombus fervidus*) on a
New England Aster (*symphyotrichum novae-angliae*)
Photo by: Logan Rowe



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Michigan Natural Features Inventory

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