

Remote Great Lakes Islands Surveys: Notable Discoveries and Prioritization Schema for Biodiversity Stewardship

**Joshua Cohen, Rachel Hackett, Jesse Lincoln,
Tyler Bassett, Scott Warner, Helen Enander, and
Elizabeth Haber**

Michigan Natural Features Inventory
Michigan State University Extension
2023 Great Lakes Conference
March 7, 2023

Acknowledgments

- Joshua Booker, Richard King, Cathy Nigg, Sadie Odell, Bill Peterson, Francis Gercz, David Bolin, Joel Vos, Michelle Vanderhaar, Eric Dunton, Scott Simmons, Jessica Fletcher, Steve Dushane, Ron Huffman, Jason Lewis, Clayton Hamilton, and Sara Siekierski (NWR USFWS)
- Bill Parsons, Doug Craven, and Noah Jansen (Little Traverse Bay Bands of the Odawa Indians – Natural Resources Department)
- Michael Castagne, Colton Hudak, Eric Clark, and Dani Fegan (Sault Ste. Marie Tribe of Chippewa Indians – Natural Resources Department)
- Gene Mensch and Erin Johnston (Keweenaw Bay Indian Community – Natural Resources Department)
- Matt Preisser, Bretton Joldersma, Stephanie Swart (EGLE)
- Phyllis Higman*, John Paskus*, Michael Monfils, Denny Albert*, Mike Penskar*, Michael Kost*, Brian Klatt, and Ashley Adkins (MNFI and MNFI Alumni*)
- Photo Credits
 - Joshua Cohen, Jesse Lincoln, Tyler Bassett, Elizabeth Haber, Scott Warner, and Rachel Hackett

MSU is an affirmative-action, equal-opportunity employer. Michigan State University Extension programs and materials are open to all without regard to race, color, national origin, sex, gender, gender identity, religion, age, height, weight, disability, political beliefs, sexual orientation, marital status, family status or veteran status.

USDA
United States Department of Agriculture

AND JUSTICE FOR ALL

In accordance with Federal law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, disability, and reprisal or retaliation for prior civil rights activity. (Not all prohibited bases apply to all programs.)

Program information may be made available in languages other than English. Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, and American Sign Language) should contact the responsible State or local Agency that administers the program or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339.

To file a program discrimination complaint, a complainant should complete a Form AD-3027, USDA Program Discrimination Complaint Form, which can be obtained online, from any USDA office, by calling (866) 632-6892, or by writing a letter addressed to USDA. The letter must contain the complainant's name, address, telephone number, and a written description of the alleged discriminatory action in sufficient detail to inform the Assistant Secretary for Civil Rights (ASCR) about the nature and date of an alleged civil rights violation. The completed AD-3027 form or letter must be submitted to USDA by:

mail:
 U.S. Department of Agriculture
 Office of the Assistant Secretary for Civil Rights
 1400 Independence Avenue, SW
 Washington, D.C. 20250-9410, or

fax:
 (855) 256-1885 or (202) 680-7442;

email:
 program.intake@usda.gov.

This institution is an equal opportunity provider.

Continúa a la ley federal y los polícticos y regulaciones de derechos civiles del Departamento de Agricultura de los Estados Unidos (USDA), esta institución tiene prohibido discriminar por motivos de raza, color, origen nacional, sexo, edad, discapacidad, venganza o represalia por actividades realizadas en el pasado relacionadas con los derechos civiles. (No todos los principios de prohibición aplican a todos los programas.)

La información del programa puede estar disponible en otros idiomas además del inglés. Las personas con discapacidades que requieren medios de comunicación alternativos para obtener información sobre el programa (por ejemplo, Braille, letra grande, grabación de audio y lenguaje de señas) deben comunicarse con la agencia estatal o local responsable que administra el programa o con el TARGET Center en USDA al (202) 720-2600 (voz y TTY) o comunicarse con el USDA a través del Servicio Federal de Transmisión de Información al (800) 877-8339.

Para presentar una queja por discriminación en el programa, el reclamante debe completar un formulario AD-3027, Formulario de queja por discriminación del programa de USDA, que se puede obtener en línea, en cualquier oficina de USDA, llamando al (866) 632-6892, o escribiendo una carta dirigida al USDA. La carta debe contener el nombre, la dirección y el número de teléfono del reclamante, y una descripción escrita de la supuesta acción discriminatoria con suficiente detalle para informar al Subsecretario de Derechos Civiles (ASCR), por sus siglas en inglés, sobre la naturaleza y la fecha de la presunta violación de los derechos civiles. La carta o el formulario AD-3027 completado debe enviarse al USDA por medio de:

correo postal:
 U.S. Department of Agriculture
 Office of the Assistant Secretary for Civil Rights
 1400 Independence Avenue, SW
 Washington, D.C. 20250-9410; o

fax:
 (855) 256-1885 o (202) 680-7442;

correo electrónico:
 program.intake@usda.gov.

Esta institución ofrece igualdad de oportunidades.

Form AD-3027, 06/2016 (Rev. 07/2014) 3/18/2018



Land Acknowledgment

We collectively acknowledge that Michigan State University occupies the ancestral, traditional, and contemporary Lands of the Anishinaabeg – Three Fires Confederacy of Ojibwe, Odawa, and Potawatomi peoples. In particular, the University resides on Land ceded in the 1819 Treaty of Saginaw. We recognize, support, and advocate for the sovereignty of Michigan’s twelve federally-recognized Indian nations, for historic Indigenous communities in Michigan, for Indigenous individuals and communities who live here now, and for those who were forcibly removed from their Homelands. By offering this Land Acknowledgement, we affirm Indigenous sovereignty and will work to hold Michigan State University more accountable to the needs of American Indian and Indigenous peoples.



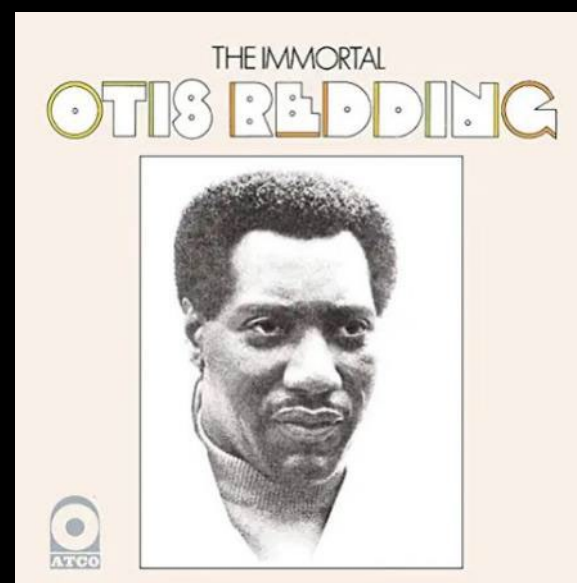
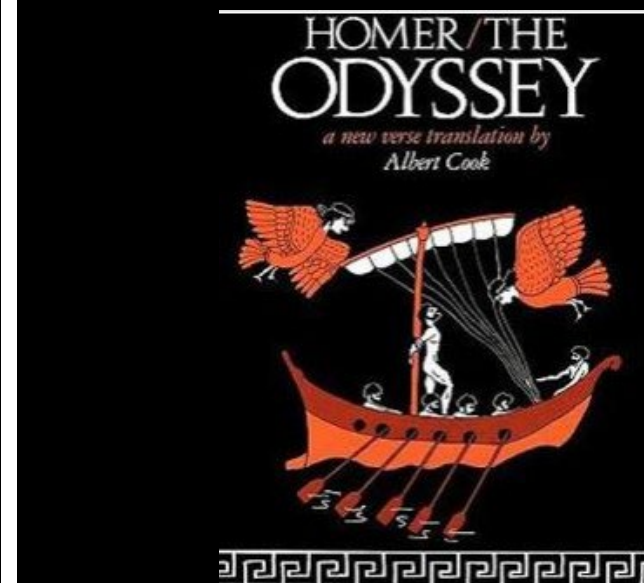
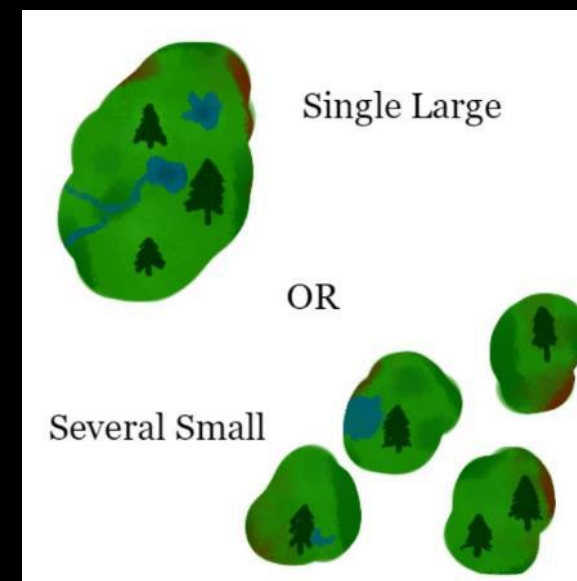
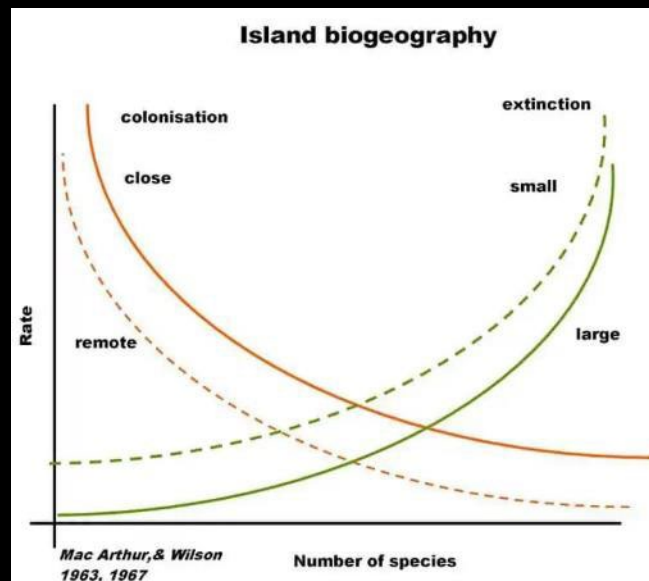
MNFI Background

- *Mission:* Guide the conservation of Michigan's biodiversity by providing the highest quality scientific expertise and information.
- *Vision:* Be the authoritative source of information on biodiversity that is widely used to conserve Michigan's unique natural heritage for current and future generations.

MNFI Background

- Core Activities:
 - Natural heritage database
 - Surveys and inventories
 - Research and monitoring
 - Conservation planning
 - Conservation education

Please visit our website: <http://mnfi.anr.msu.edu/>



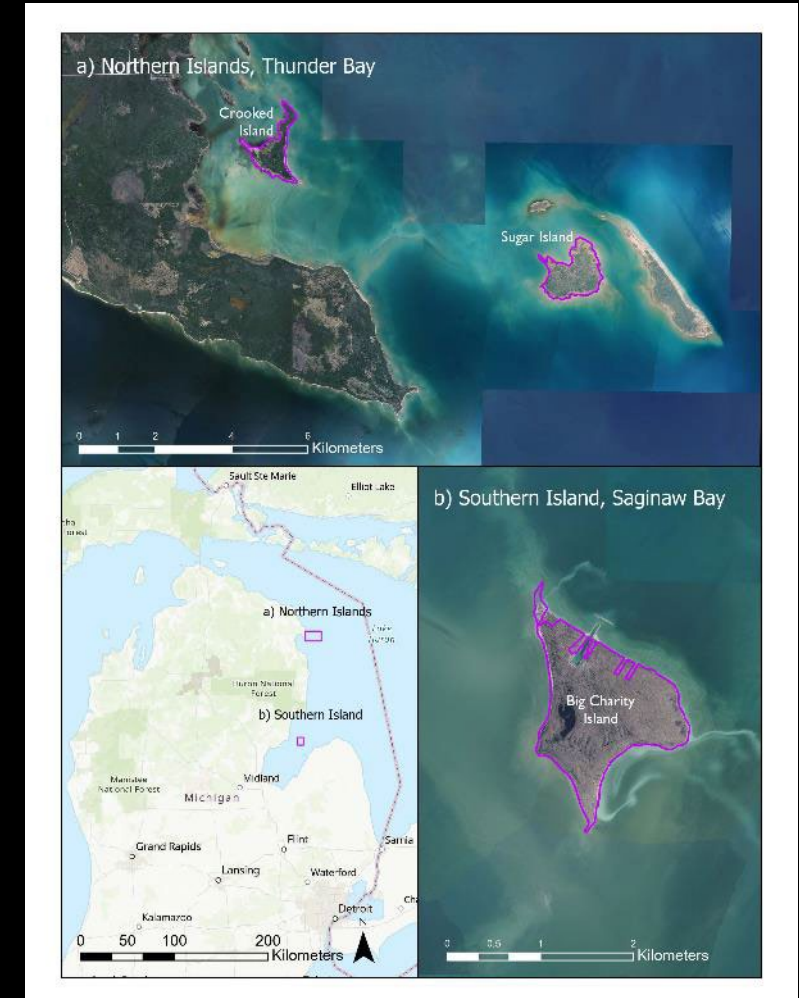
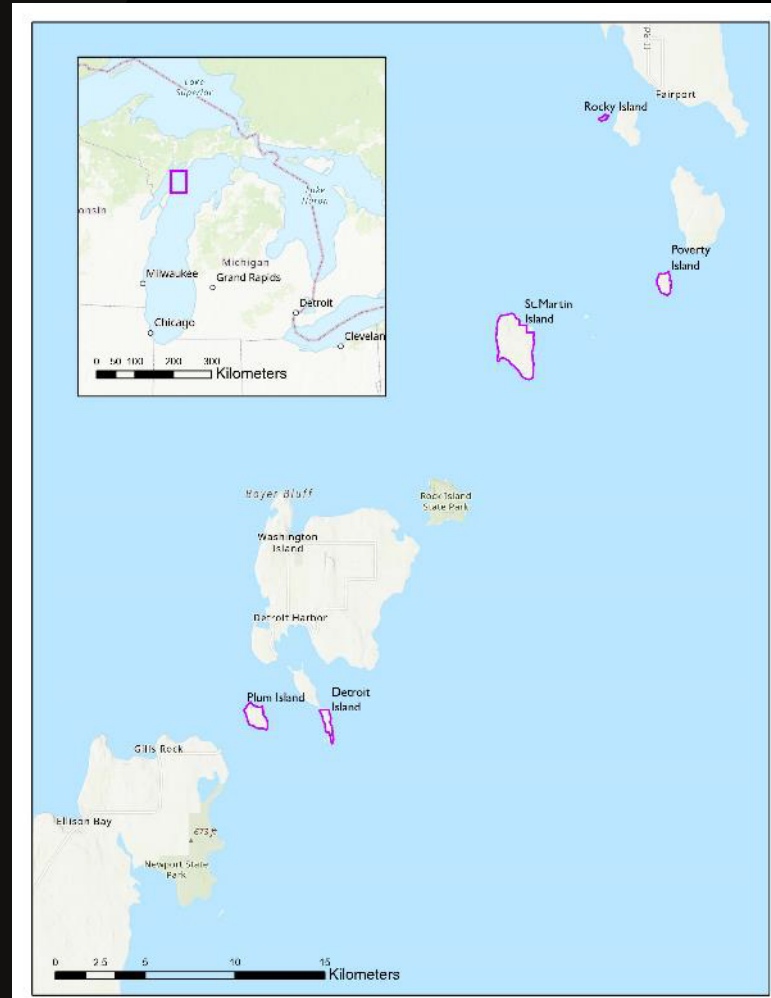
Great Lakes Islands

- Over 32,000 Islands
- Largest and most diverse collection of freshwater islands in the world
- Critical habitat for native biodiversity, migratory species, and colonial nesters
- Support rare and endemic species and ecosystems
- Rich histories
 - Occupied and utilized by Indigenous Peoples for thousands of years
 - Provide loci for lighthouses and fog stations for Great Lakes shipping industry



National Wildlife Refuge

- 36 islands across the Great Lakes (MI, WI, OH)
- Managed by USFWS to
 - Maintain ecological integrity
 - Support needs of priority bird species
 - Protect threatened and endangered species
 - Provide stopover habitat for migrating birds and insects



Huron Islands NWR:
4 islands (147 acres)

Michigan Islands (L Michigan) NWR:
4 islands (246 acres)
Harbor Island NWR:
2 islands (720 acres)

Green Bay NWR:
7 islands (2117 acres)
Gravel Island NWR:
2 islands (35 acres)

Michigan Islands
(L Huron) NWR:
5 islands (459 acres)

Detroit River IWR:
2 islands (32 acres)
West Sister Island NWR:
1 islands (81 acres)

Remote Islands

- Difficult to access
- Challenging to survey
- Face a variety of threats to native biodiversity including invasive species and climate change
- Limited or outdated data, which hinders effective management and decision-making



National Wildlife Refuge

- Rare plant surveys
- Invasive plant species mapping
- Qualitative natural community surveys
- Quantitative forest sampling
- 36 Islands (MI, WI, and OH)

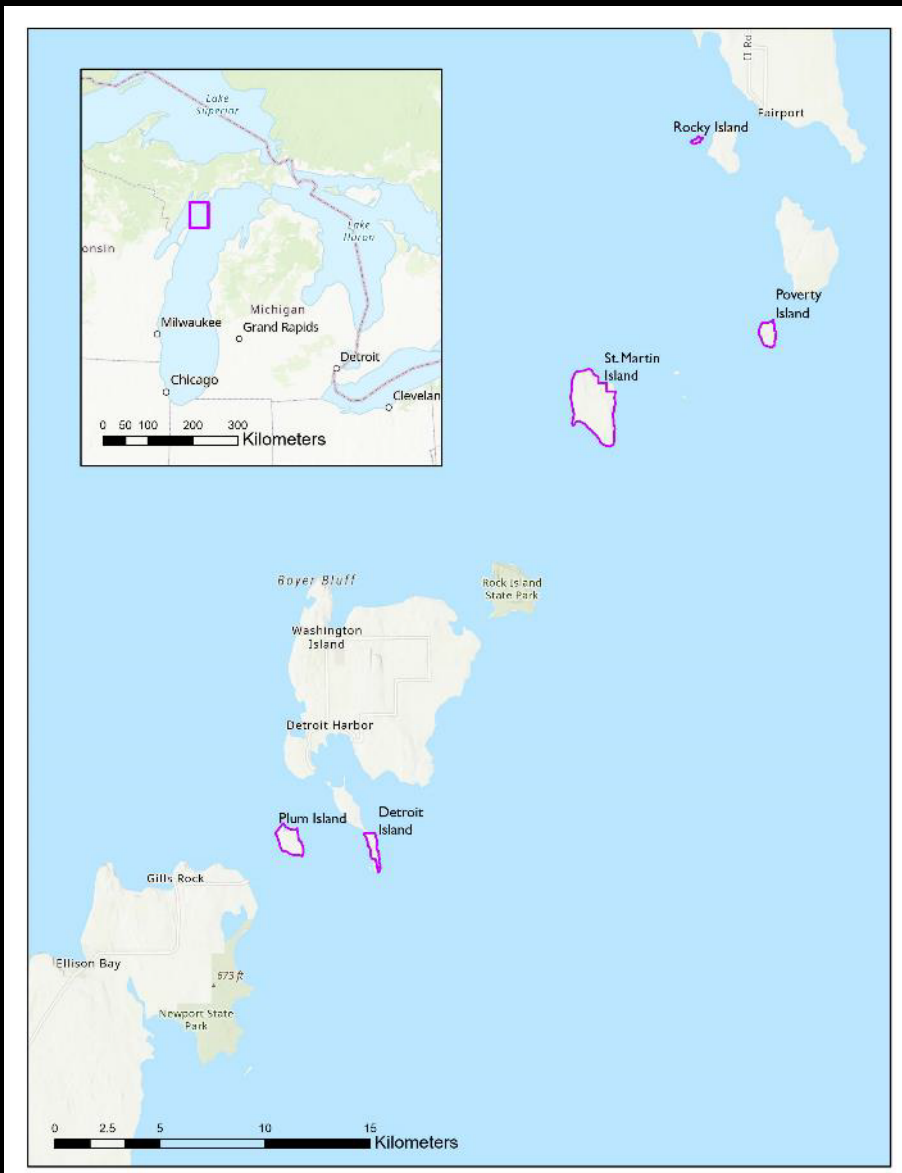




- Summary of survey effort
- Notable discoveries
- Research opportunities
- Prioritization schema









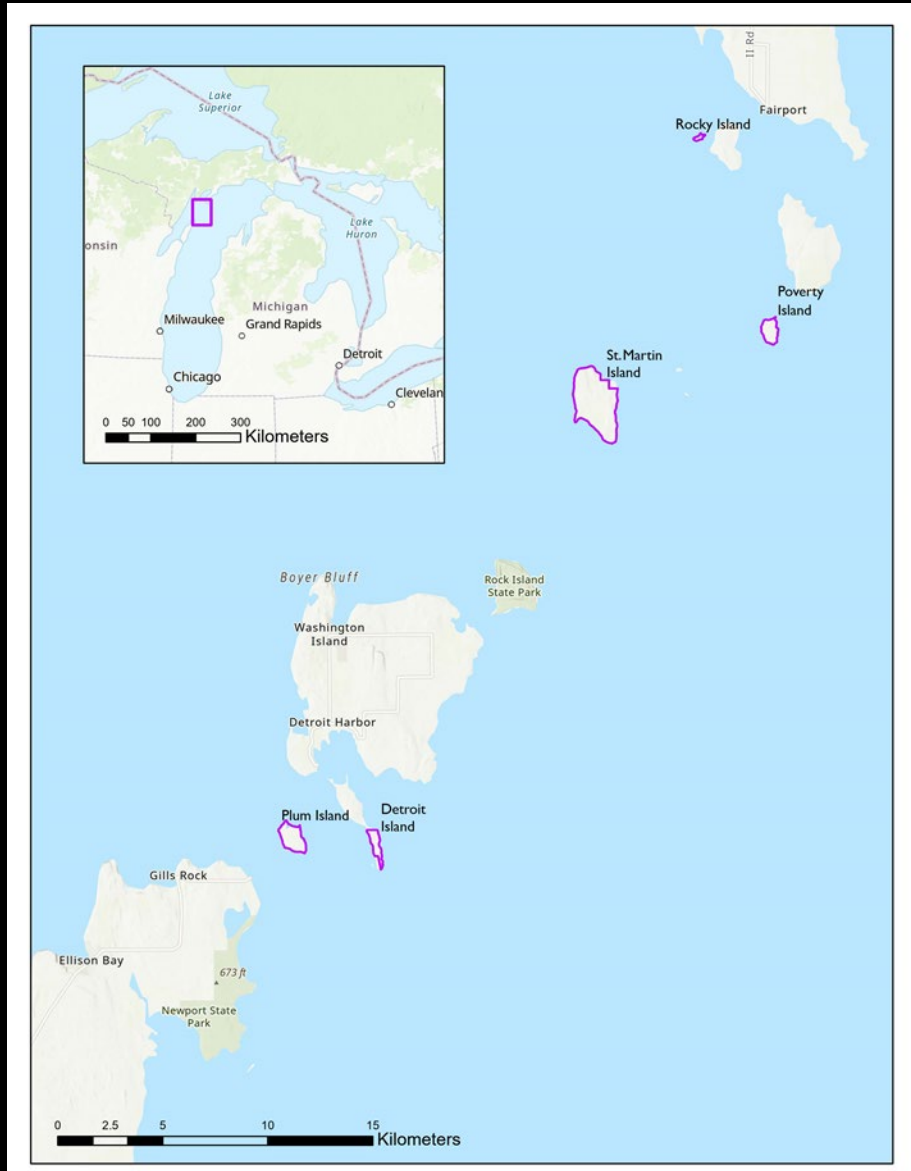
























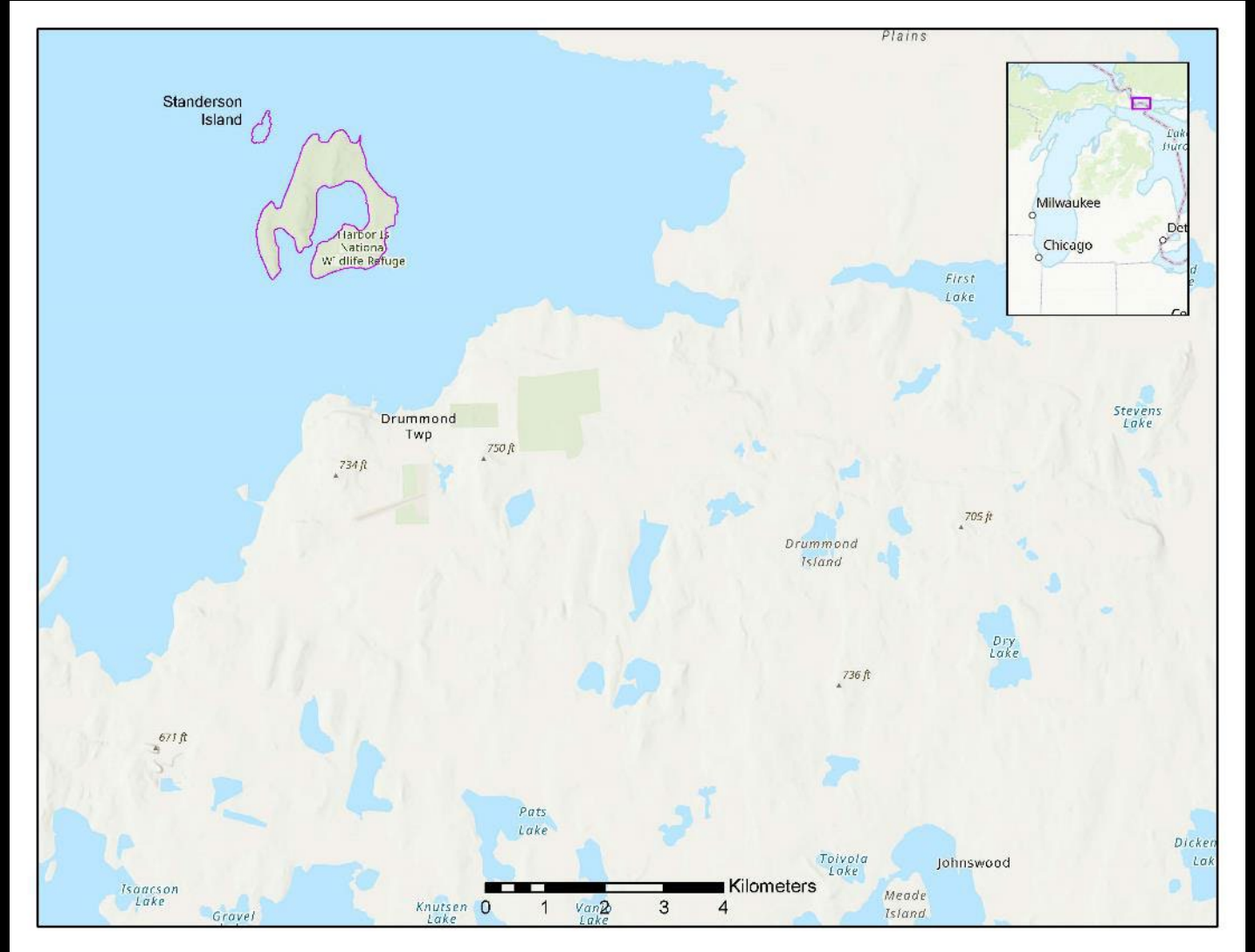




















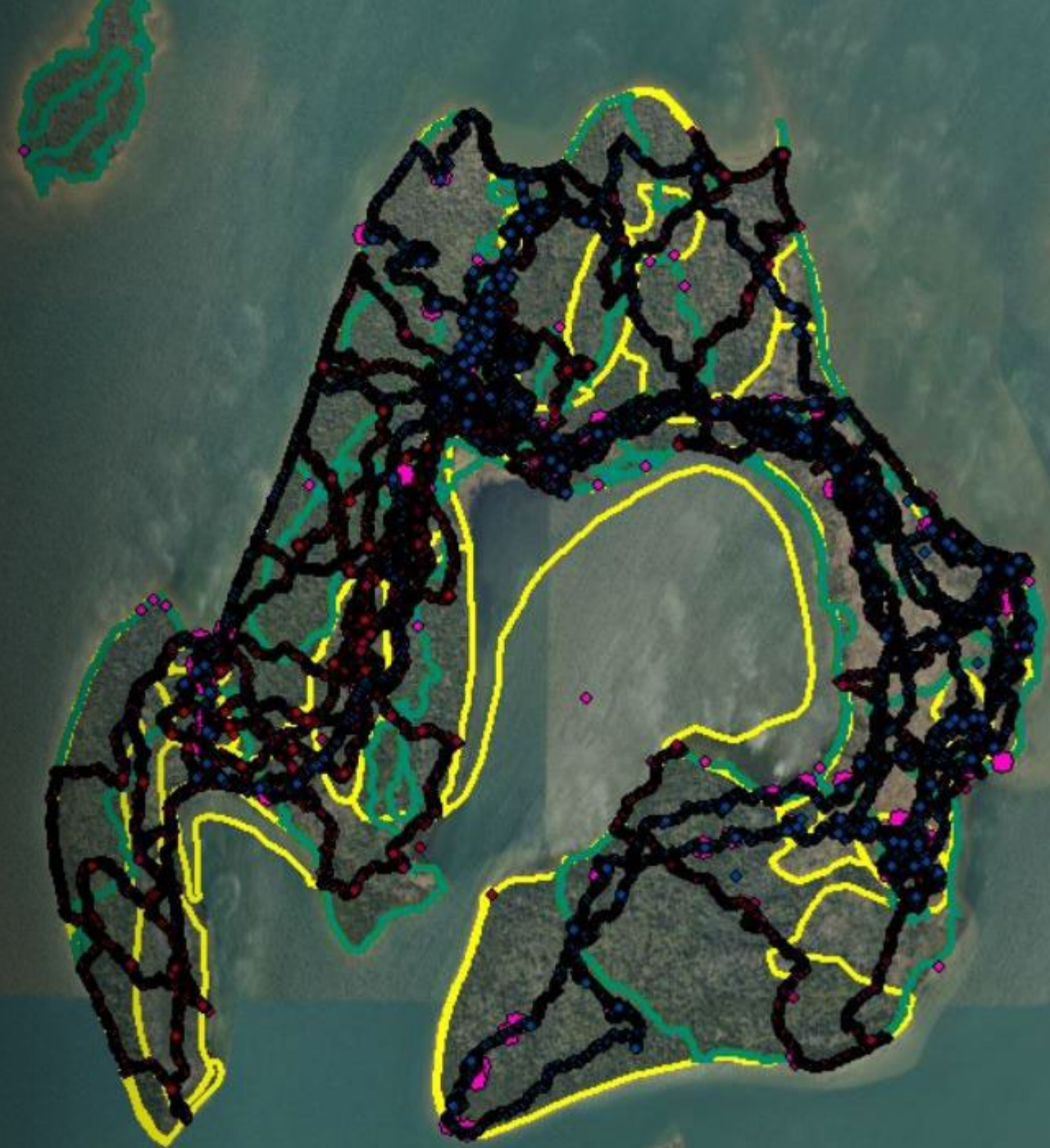






Natural Community Element Occurrences

- Boreal Forest (EO Update)
- Dry-Mesic Northern Forest (New EO)
- Great Lakes Marsh (EO Update)
- Limestone Cobble Shore (New EO)
- Mesic Northern Forest (EO Update)
- Rich Conifer Swamp (New EO)



Natural Community Element Occurrences

- Boreal Forest (EO Update)
- Dry-Mesic Northern Forest (New EO)
- Great Lakes Marsh (EO Update)
- Limestone Cobble Shore (New EO)
- Mesic Northern Forest (EO Update)
- Rich Conifer Swamp (New EO)



































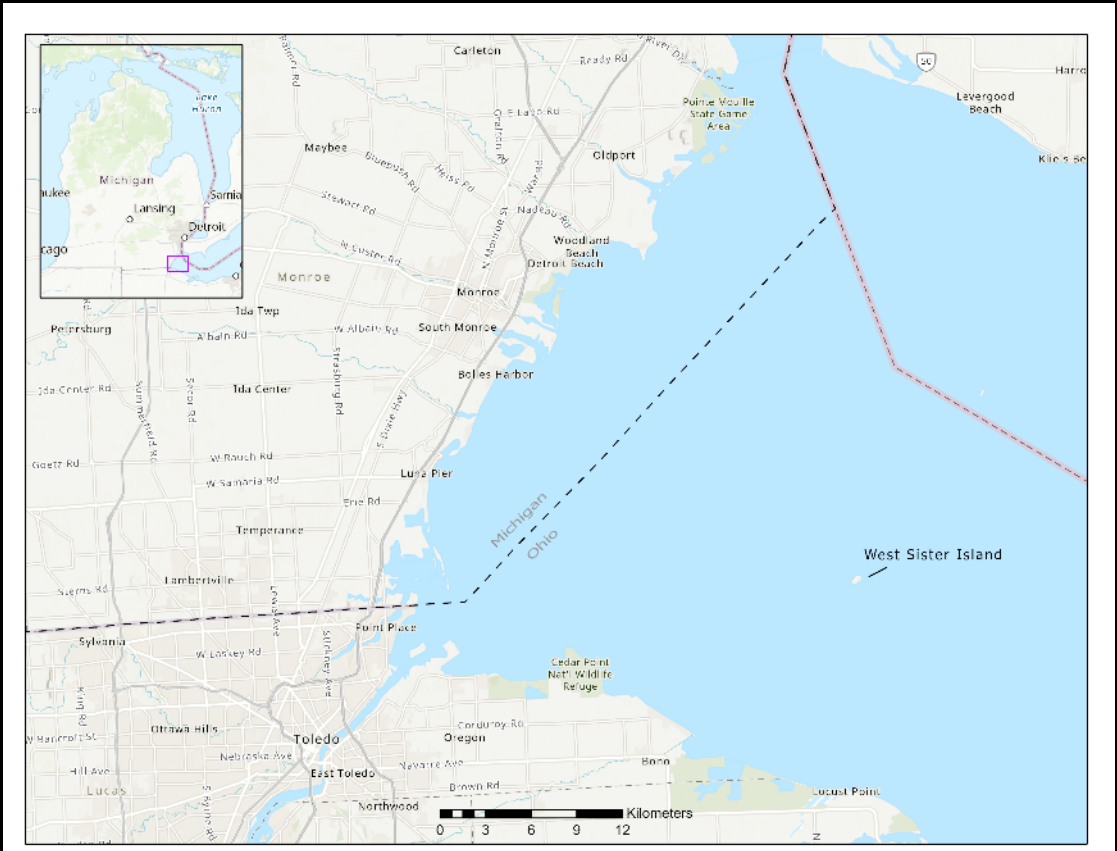




Hydrocharis morsus-ranae (European frog's-bit)







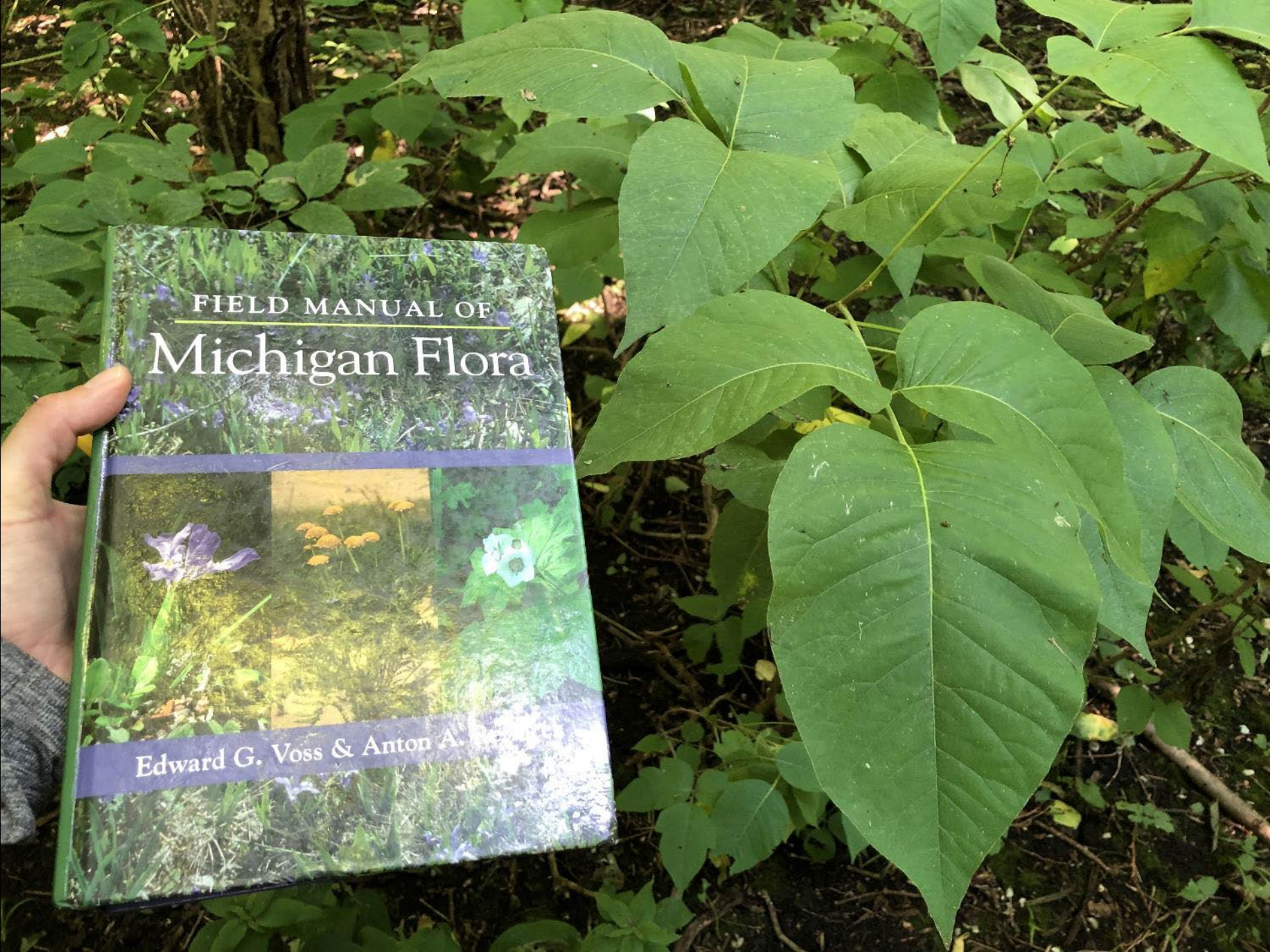












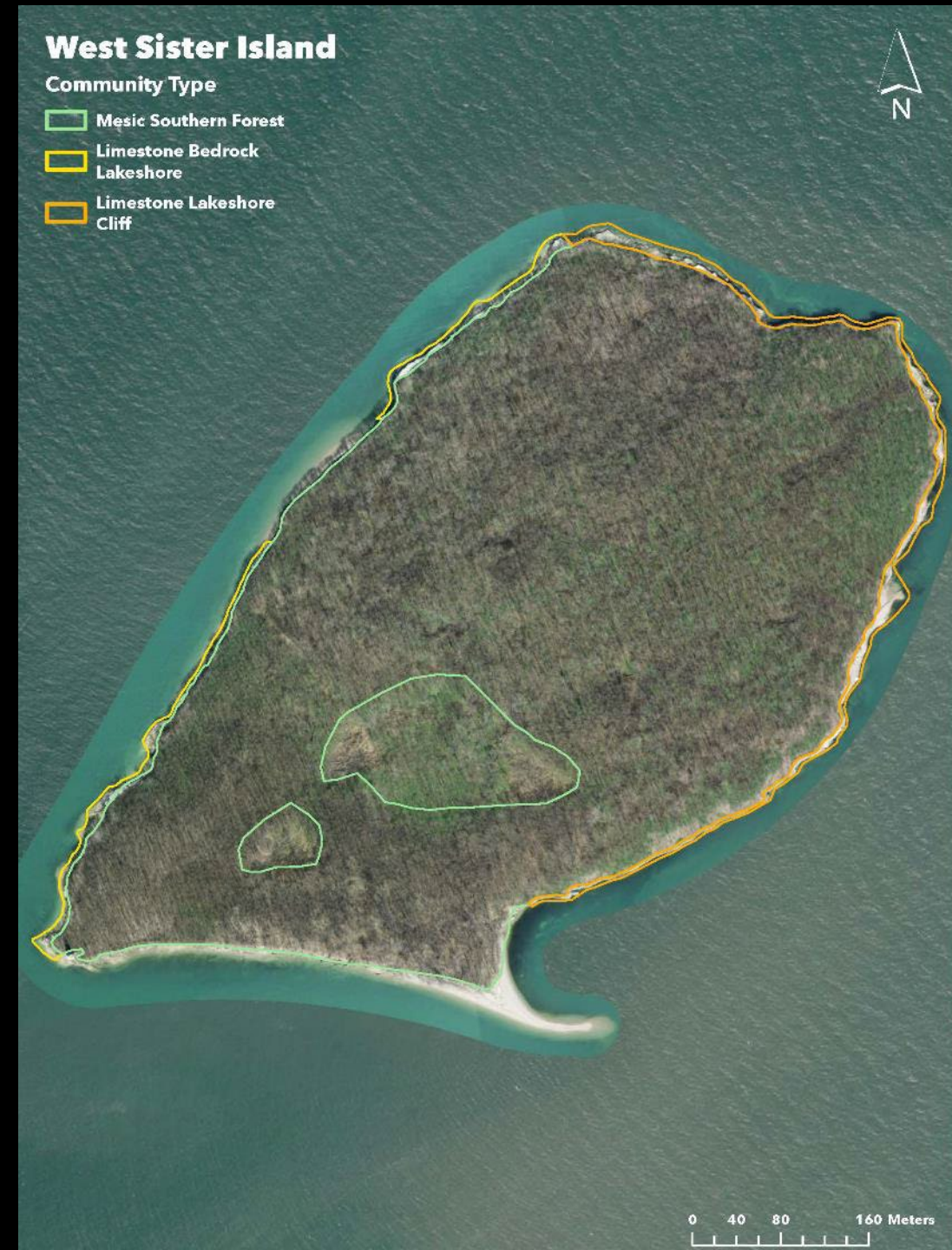
FIELD MANUAL OF
Michigan Flora

Edward G. Voss & Anton A. [unclear]



Natural Community Element Occurrences

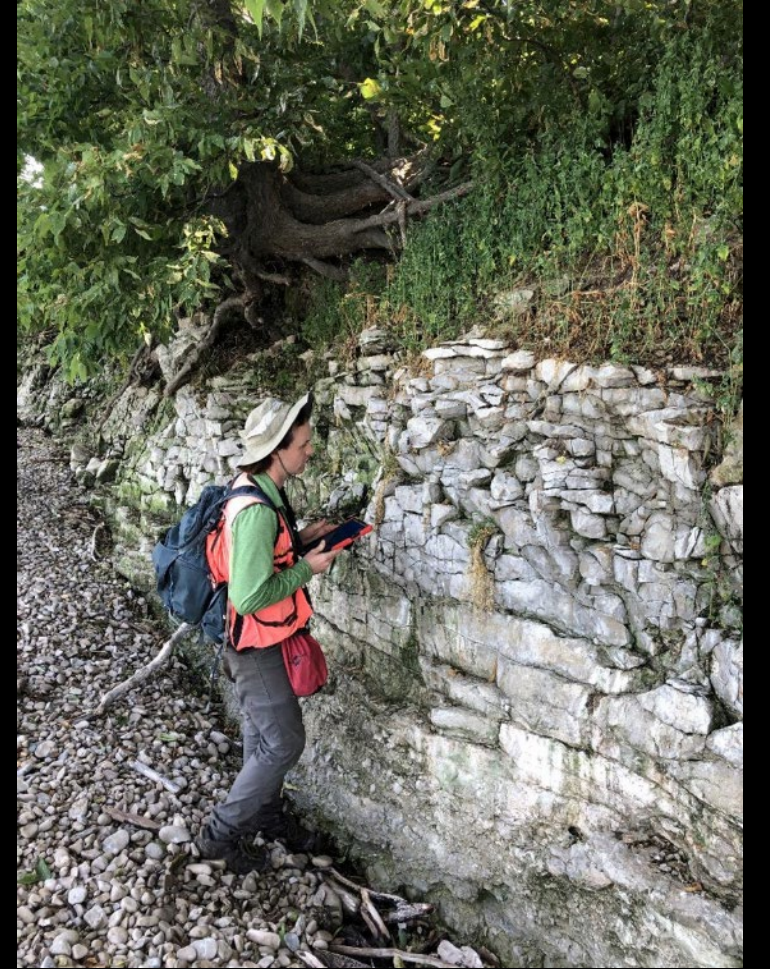
- Limestone Bedrock Lakeshore (New EO)
- Limestone Lakeshore Cliff (New EO)
- Mesic Southern Forest (New EO)

























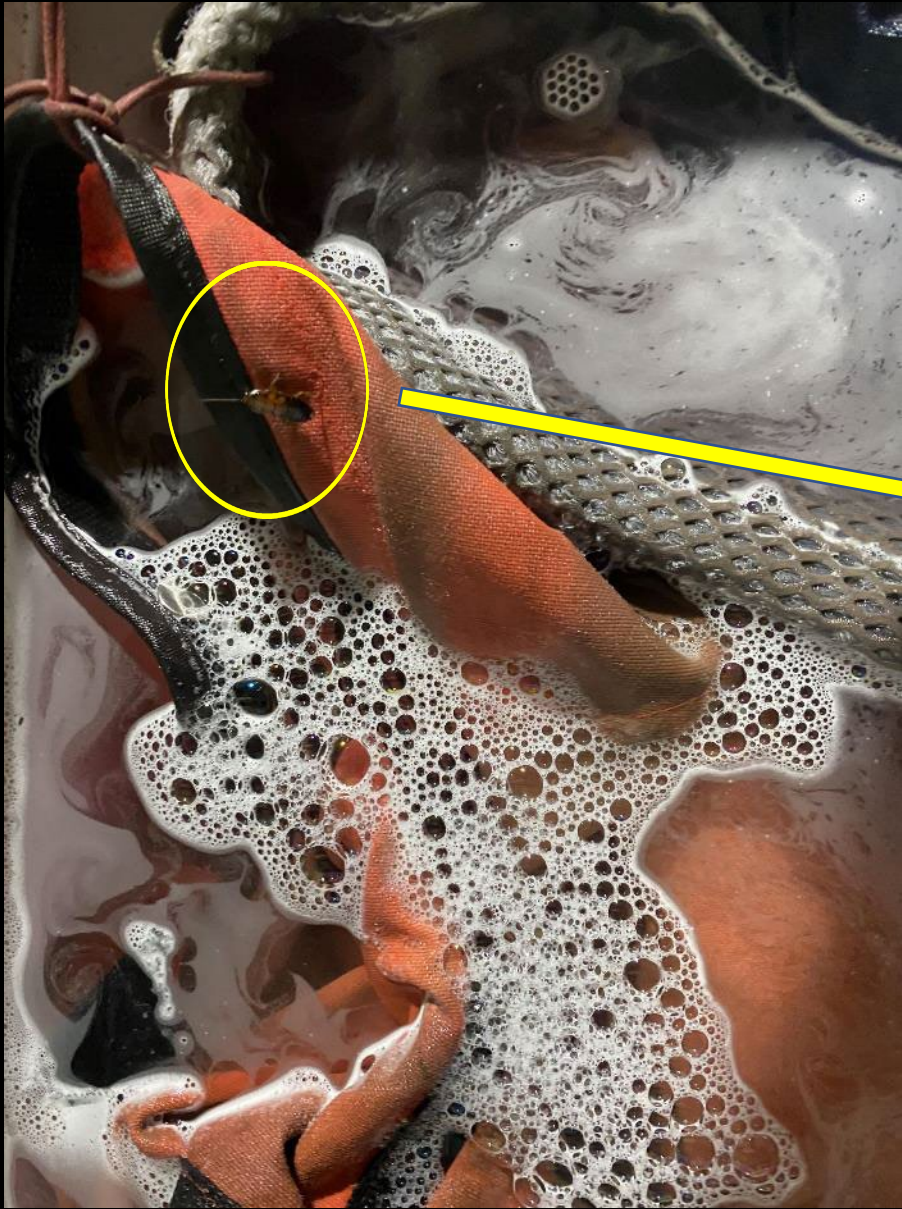




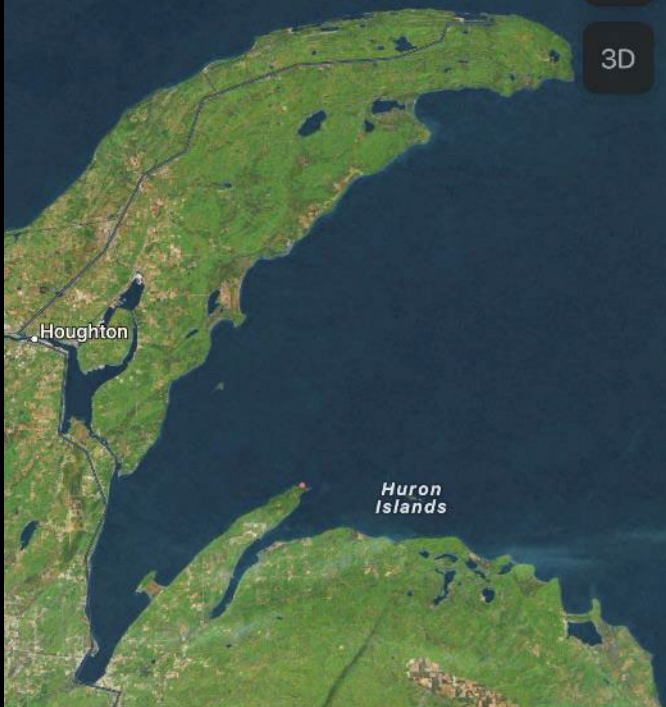








1:18 ↗



Houghton

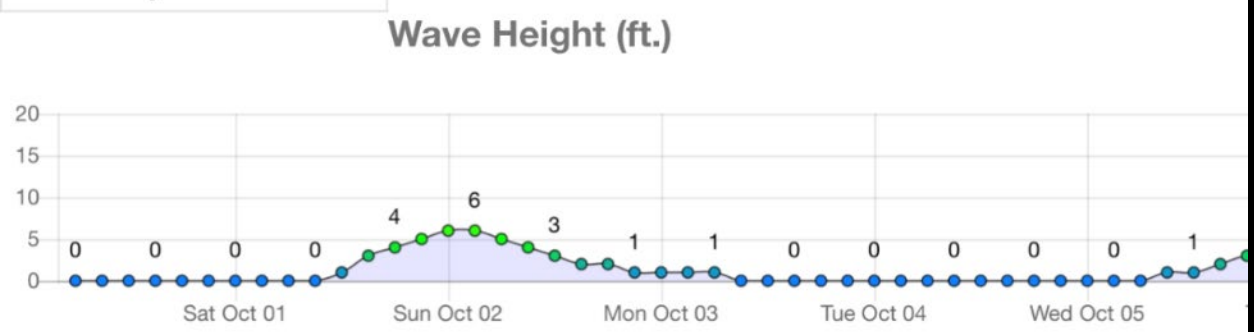
Huron
Islands



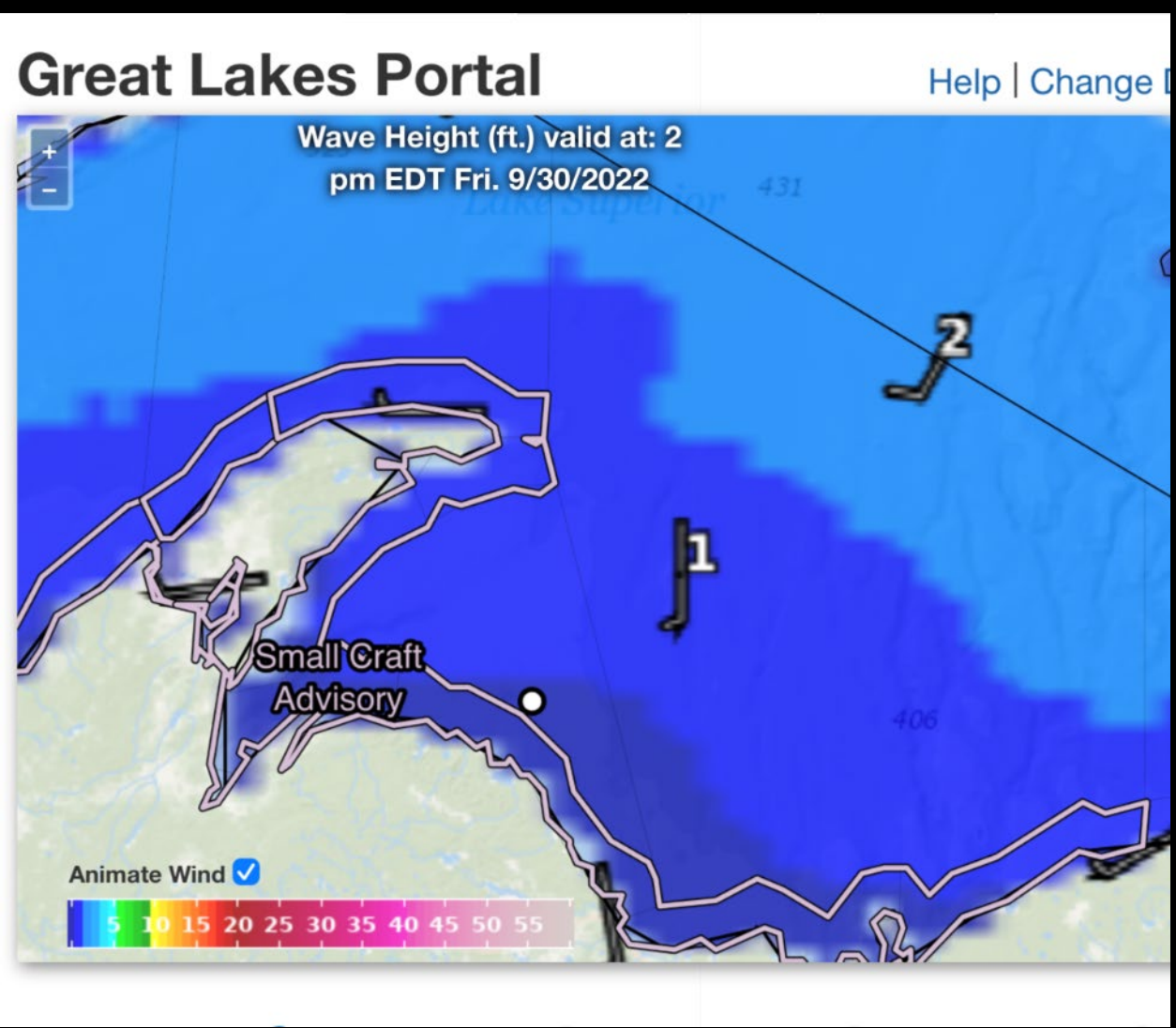
0 250 500 1,000 Meters



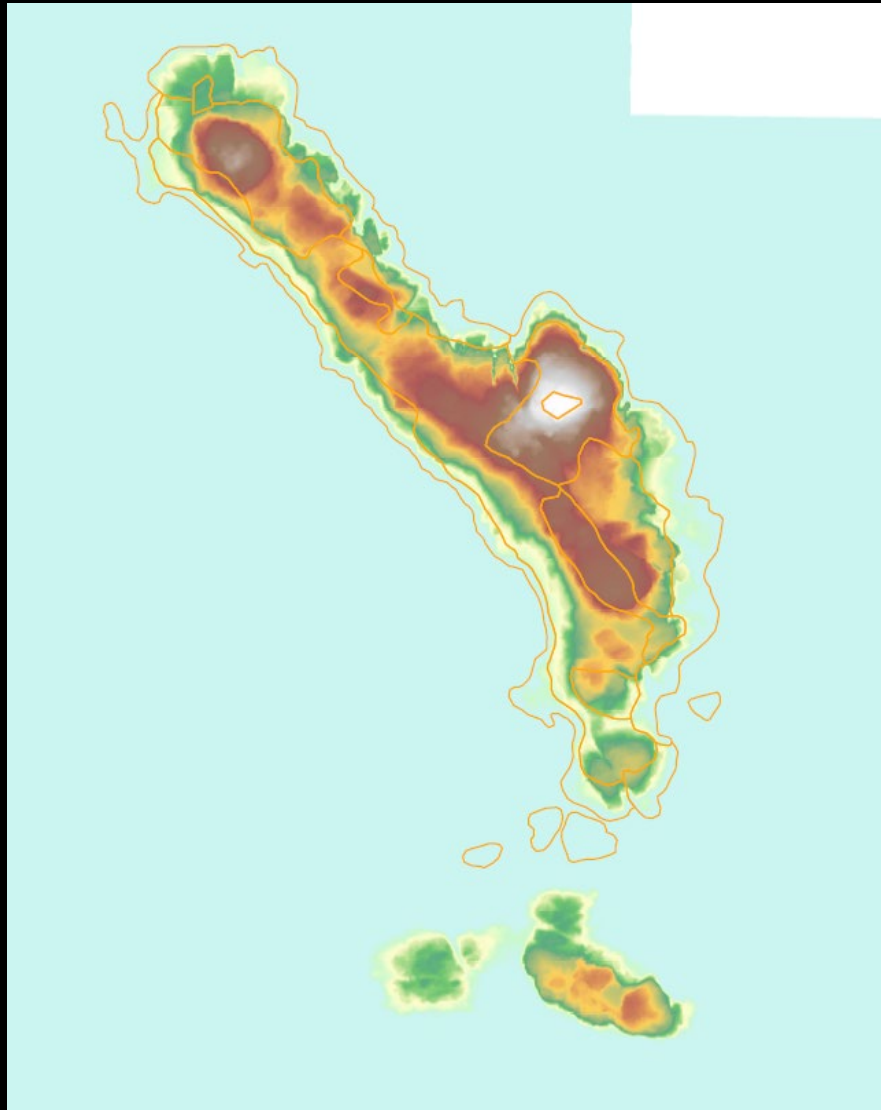
Time:	9PM	12AM	3AM	6AM	9AM	12PM	3PM	6PM	9P
Weather:									
Wave Height (ft):	5	6	6	5	4	3	2	2	1
Wave Direction:									
Wave Period (sec):	6	7	7	7	7	6	6	5	5
Wind Speed (kt):	17	18	15	12	11	10	9	9	9
Wind Gust (kt):	18	19	18	14	13	12	10	10	11
Wind Direction (°):	70	80	90	100	110	120	110	110	130
Wind Direction:									
Temperature:	51	51	50	50	51	54	56	54	51
Wind Chill:	-	-	-	-	-	-	-	-	-
Prob. of Precip.:	2	2	2	2	3	3	1	1	2
Precip. Amount:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sky Cover:	56	51	44	48	42	29	23	16	1
Visibility:									

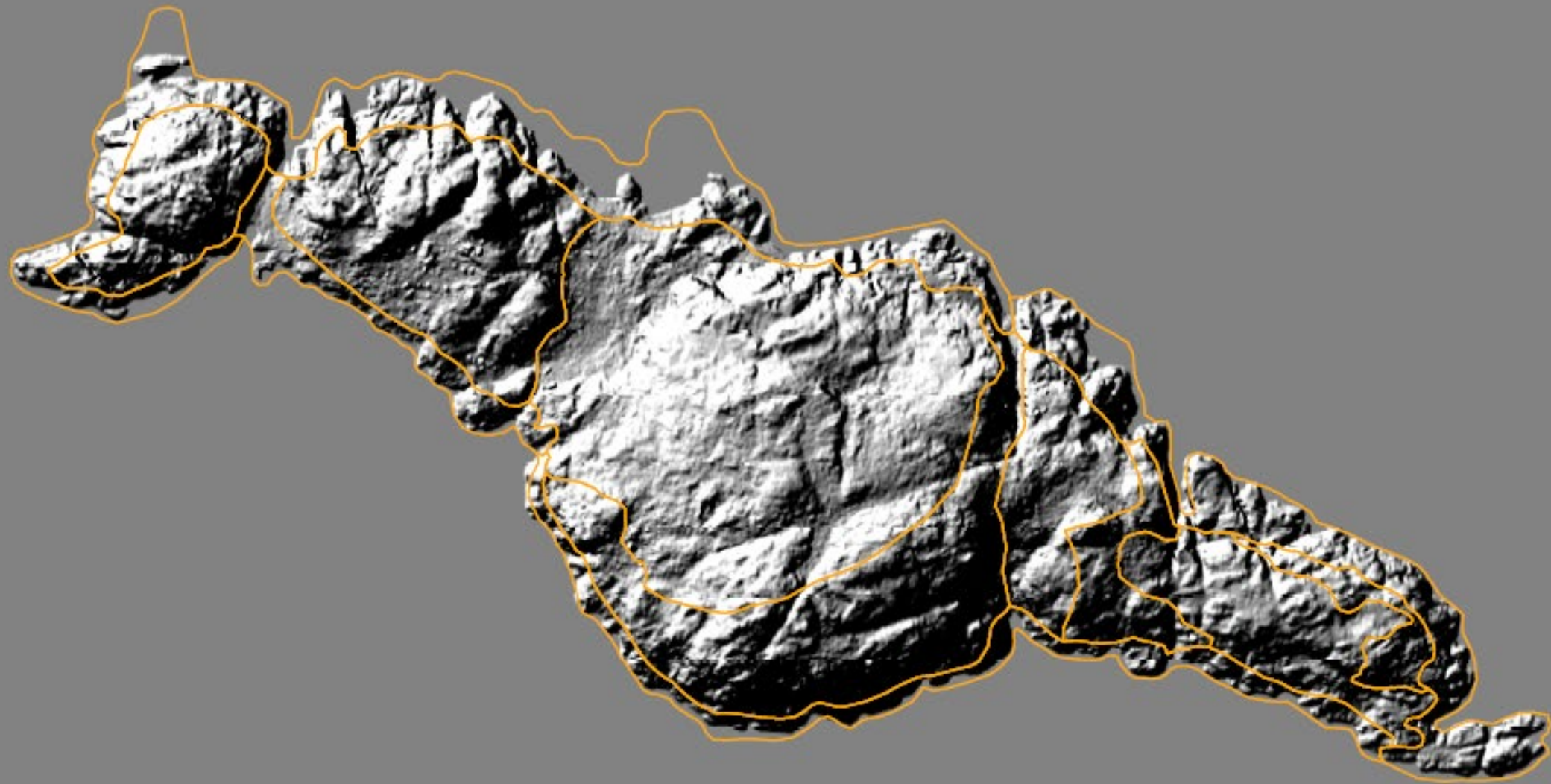


Wind Speed/Direction/Gust (kt)













CHILI MAC with BEEF
MOUNTAIN HOUSE ADVENTURE MEALS
30 SERVINGS

Red Mill
ORGANIC QUICK COOKING ROLLED OATS
WHEAT GERM

V8 Original
100% VEGETARIAN

BEEF STROGANOFF with NOODLES
CHICKEN FRIED RICE
LASAGNA with MEAT SAUCE
CHICKEN TERIYAKI
BEEF STROGANOFF with NOODLES
MOUNTAIN HOUSE ADVENTURE MEALS
BISCUITS & GRAVY
SEASON SARDINES

WETLAND PLANTS OF ONTARIO
A Field Guide to the Natural Communities of Michigan
WETLAND FLORA
FIELD MANUAL OF MICHIGAN
KITCHENS NORTH AMERICA

YETI
Starbucks DARK ROAST
BLOND

Goldfish
CHEDDAR
100% REAL CHEESE

Archer
GRASS-FED BEEF
MAINTAINING THE QUALITY OF THE MEAT







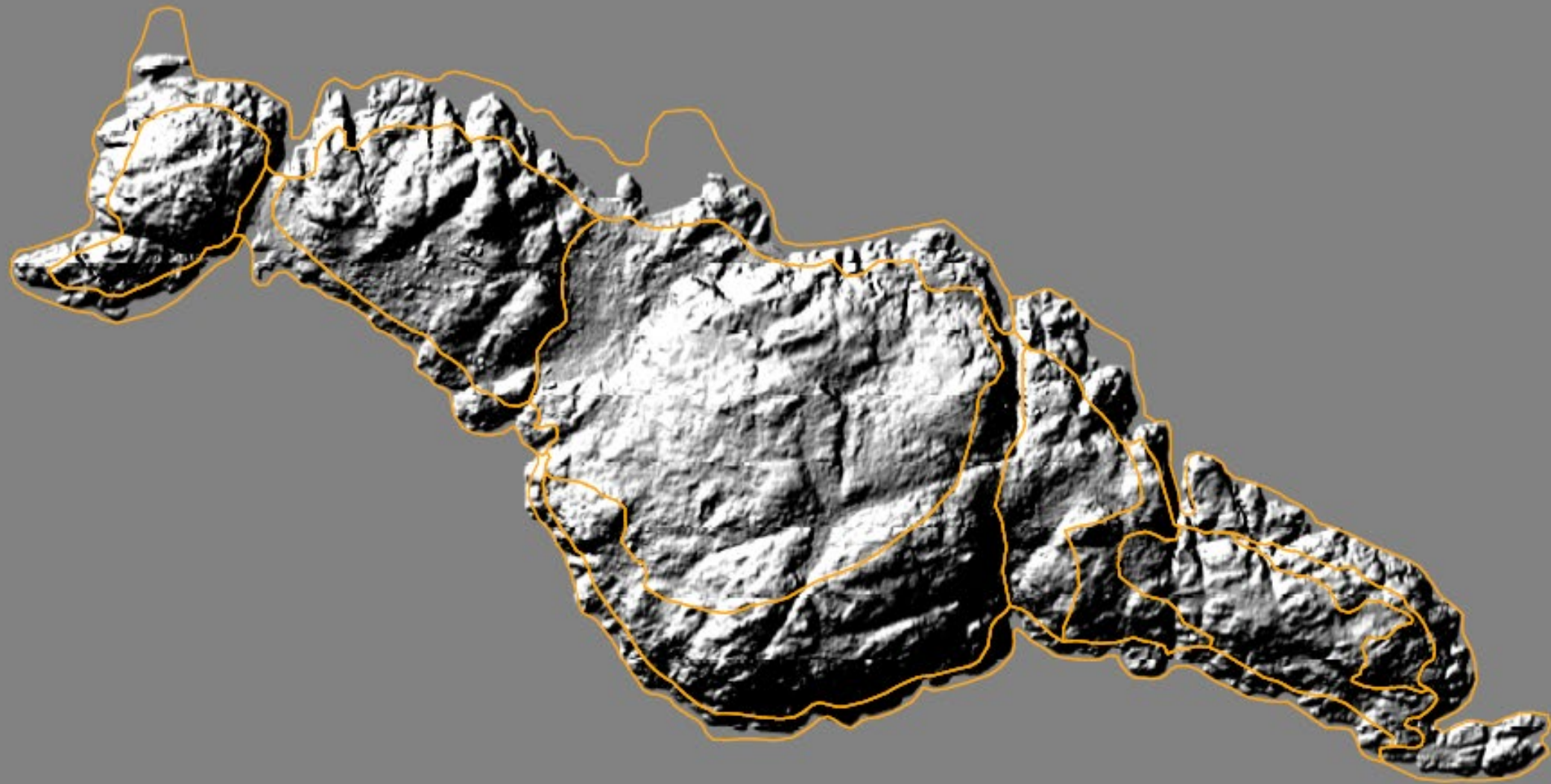






















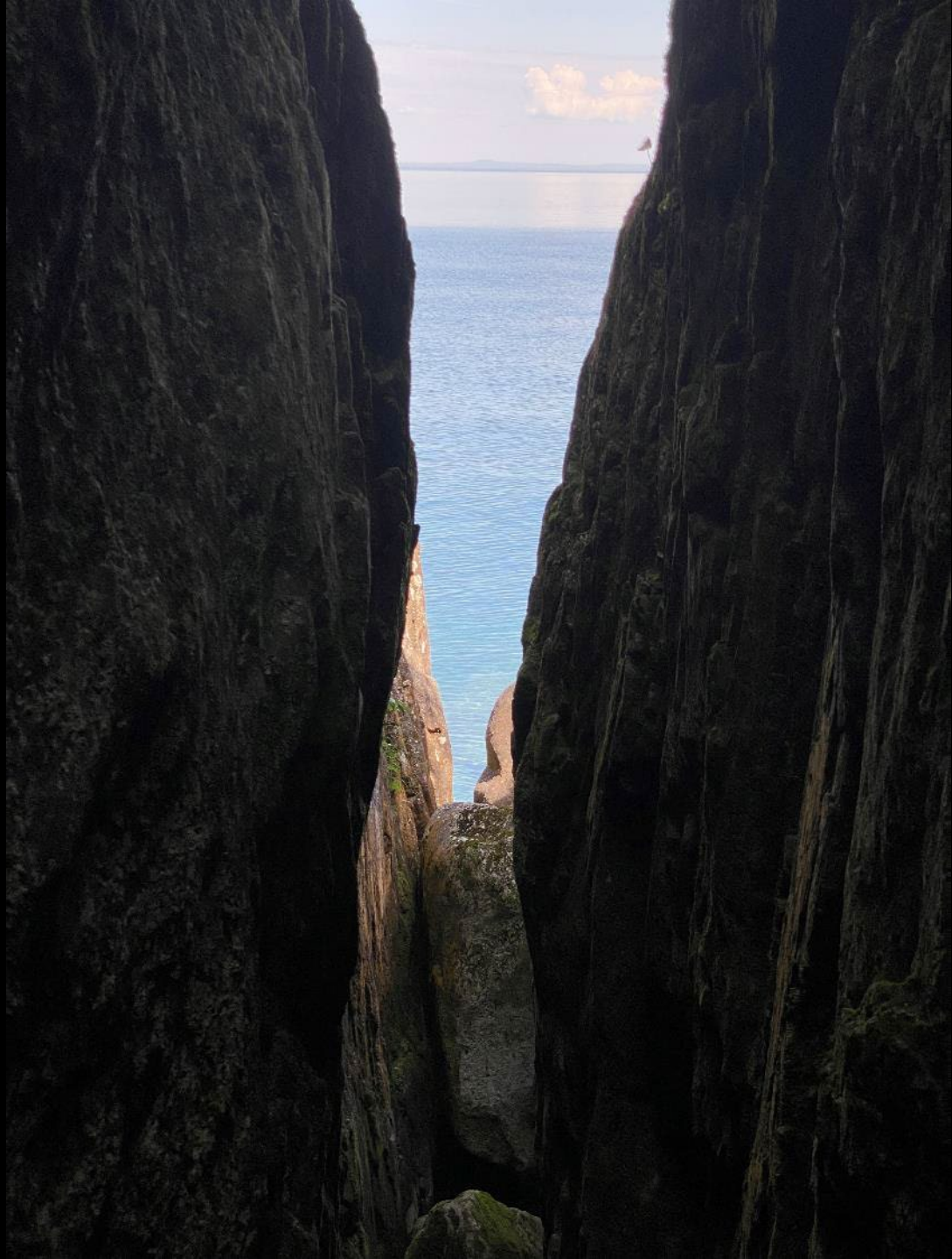
































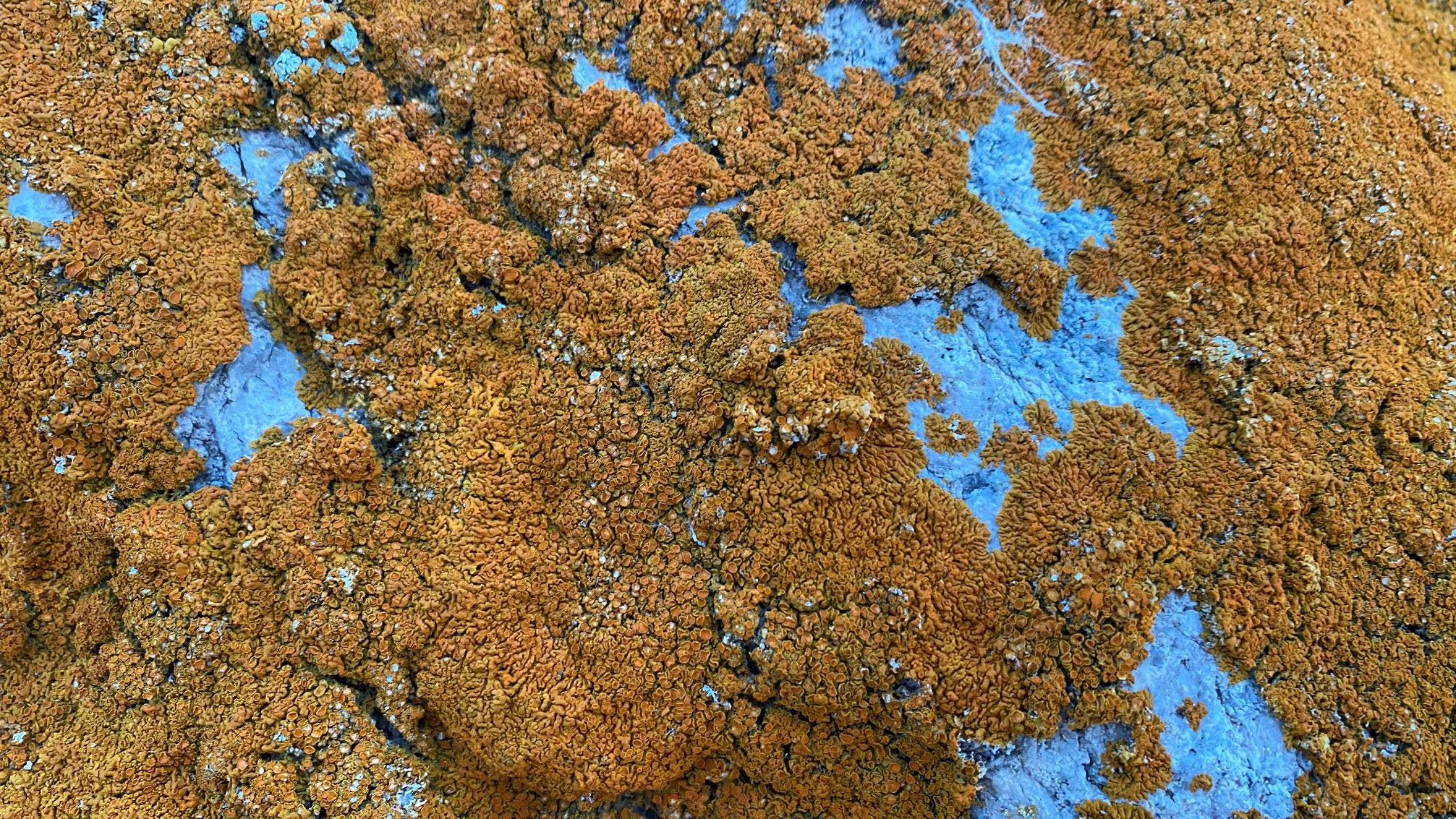










































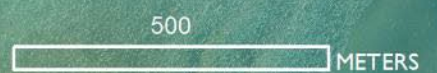
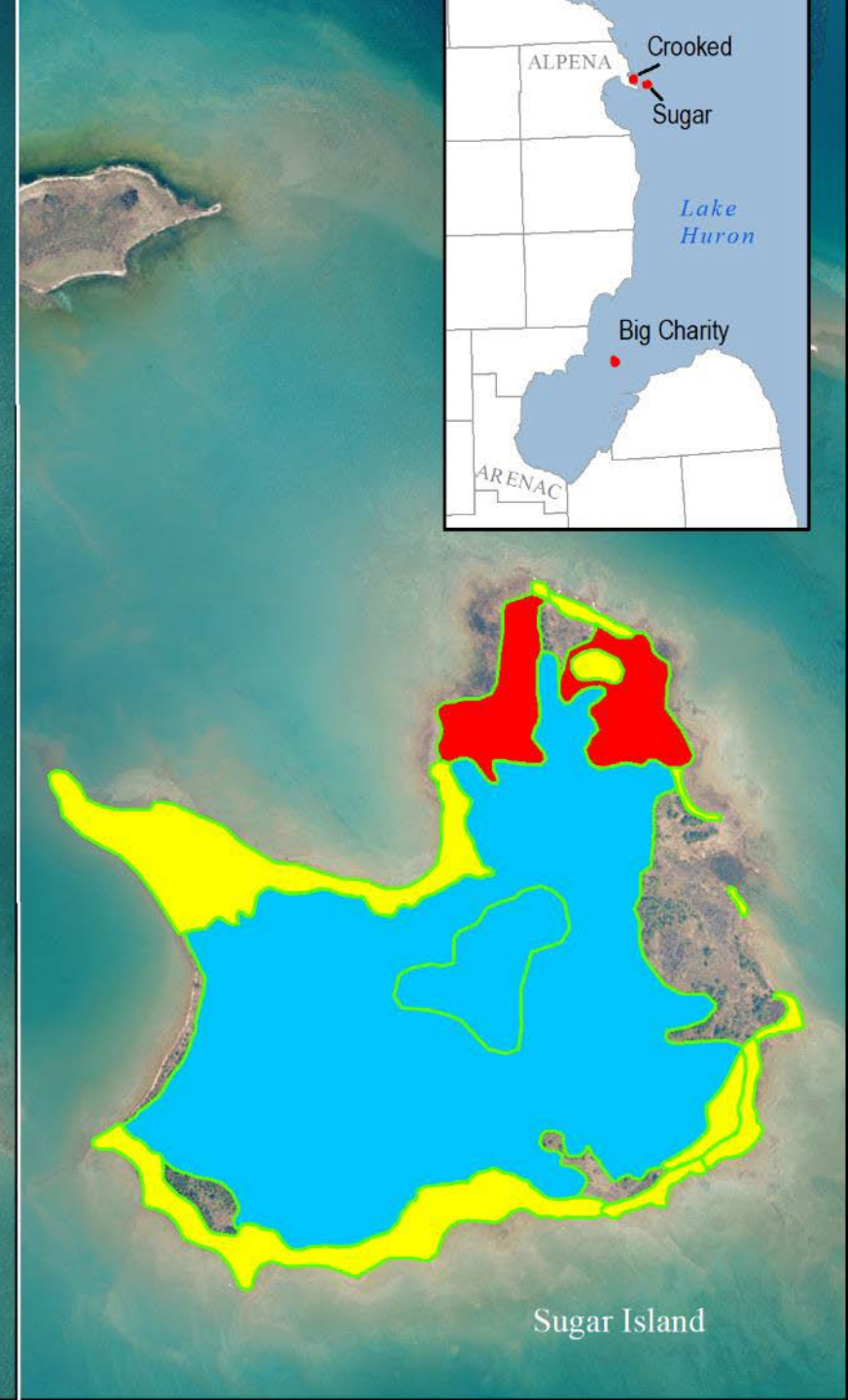
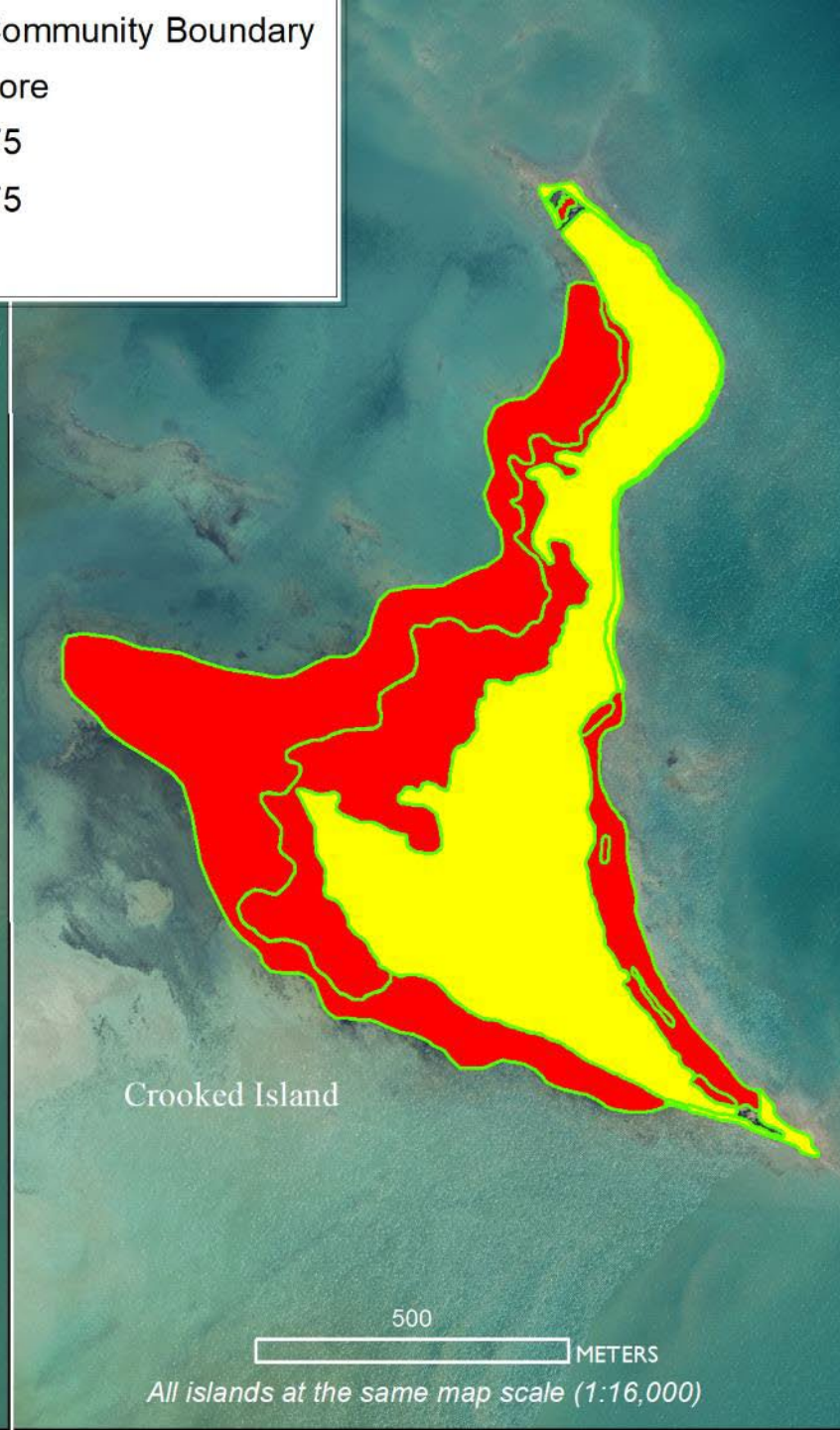


Stewardship Prioritization

- Developed scoring matrix for natural community element occurrences composed of three indices
 - Ecological Integrity Index (based on element occurrence ranking A – D)
 - Rarity Index (based on state and global rarity)
 - Invasive Index (based on invasive threat severity and treatment feasibility)



EO ID	Natural Community	Island	EO Rank	Ecological Integrity Index	Gobal Rank	Global Rank Score	State Rank	State Rank Score	Rarity Index	Invasive Threat Severity	Treatment Feasability	Invasive Index	Stewardship Priority Score
24356	Interdunal Wetland	Crooked Island	BC	3.5	G2?	4	S2	4	4	4	5	4.5	12
24382	Interdunal Wetland	Big Charity Island	C	3	G2?	4	S2	4	4	4	5	4.5	11.5
24355	Open Dunes	Crooked Island	B	4	G3	3	S3	3	3	5	4	4.5	11.5
24358	Great Lakes Marsh	Crooked Island	BC	3.5	G2	4	S3	3	3.5	4	4	4	11
24381	Open Dunes	Big Charity Island	C	3	G3	3	S3	3	3	5	4	4.5	10.5
24365	Great Lakes Marsh	Sugar Island	BC	3.5	G2	4	S3	3	3.5	4	3	3.5	10.5
24354	Coastal Fen	Crooked Island	AB	4.5	G1G2	4.5	S2	4	4.25	1	2	1.5	10.25
24359	Limestone Cobble Shore	Crooked Island	B	4	G2G3	3.5	S3	3	3.25	2	3	2.5	9.75
24362	Coastal Fen	Sugar Island	C	3	G1G2	4.5	S2	4	4.25	2	3	2.5	9.75
24363	Limestone Cobble Shore	Sugar Island	B	4	G2G3	3.5	S3	3	3.25	2	3	2.5	9.75
24384	Sand and Gravel Beach	Big Charity Island	BC	3.5	G3?	3	S3	3	3	3	3	3	9.5
24357	Boreal Forest	Crooked Island	C	3	GU	3	S3	3	3	4	3	3.5	9.5
24361	Limestone Bedrock Lakeshore	Sugar Island	C	3	G3	3	S2	4	3.5	3	3	3	9.5
24385	Limestone Cobble Shore	Big Charity Island	BC	3.5	G2G3	3.5	S3	3	3.25	2	3	3	9.25
24379	Northern Hardwood Swamp	Big Charity Island	C	3	G4	2	S3	3	2.5	2	3	2.5	8
24360	Boreal Forest	Sugar Island	B	4	GU	3	S3	3	3	1	1	1	8
24378	Dry-Mesic Northern Forest	Big Charity Island	C	3	G4	2	S3	3	2.5	1	1	1	6.5
24380	Limestone Bedrock Lakeshore	Big Charity Island	C	3	G3	3	S2	4	3.5	0	NA	0	6.5
24377	Mesic Northern Forest	Big Charity Island	C	3	G4	2	S3	3	2.5	0	NA	0	5.5
24364	Mesic Northern Forest	Sugar Island	CD	2.5	G4	2	S3	3	2.5	0	NA	0	5



All islands at the same map scale (1:16,000)

Natural Community Surveys of Great Lakes Islands in the Green Bay National Wildlife Refuge



Prepared By:
Joshua G. Cohen, Jesse M. Lincoln, Tyler J. Bassett, Scott M. Warner, Helen D. Elander, Elizabeth A. Haber, and Rachel A. Hackett
Michigan Natural Features Inventory
Michigan State University Extension
P.O. Box 30444
Lansing, MI 48909-7944

Prepared For:
U.S. Fish and Wildlife Service
National Wildlife Refuge

March 31, 2022

MNFI Report Number 2022-07



<https://mnfi.anr.msu.edu/publications/reports>

Natural Community Surveys of Michigan Islands National Wildlife Refuge: Big Charity, Crooked, and Sugar Islands



Prepared By:
Joshua G. Cohen, Jesse M. Lincoln, Tyler J. Bassett, Scott M. Warner, Helen D. Elander, Elizabeth A. Haber, and Rachel A. Hackett
Michigan Natural Features Inventory
Michigan State University Extension
P.O. Box 30444
Lansing, MI 48909-7944

Prepared For:
U.S. Fish and Wildlife Service
National Wildlife Refuge

March 31, 2022

MNFI Report Number 2022-08



Next Steps and Future Research

- Statistical analysis of plot data
- Island comparisons using plot data (e.g., high browse vs low browse)
- Comparison of flora between islands and mainland sites
- Evaluating lichen communities in bedrock communities
- Listed animal species surveys
- Continued surveys of remote islands (Isle Royale, Grand Island)
- Technical reports



Conclusions

- Critical habitat for native biodiversity, migratory species, and colonial nesters
- Refugia from stressors from fragmentation, deer herbivory, and invasive pests
- Testing ground for early detection and rapid response
- Benchmark ecosystems that we can study to inform biodiversity stewardship
- Places for dynamic systems to change in spatial extent over time



Acknowledgments

- Joshua Booker, Richard King, Cathy Nigg, Sadie Odell, Bill Peterson, Francis Gercz, David Bolin, Joel Vos, Michelle Vanderhaar, Eric Dunton, Scott Simmons, Jessica Fletcher, Steve Dushane, Ron Huffman, Jason Lewis, Clayton Hamilton, and Sara Siekierski (NWR USFWS)
- Bill Parsons, Doug Craven, and Noah Jansen (Little Traverse Bay Bands of the Odawa Indians – Natural Resources Department)
- Michael Castagne, Colton Hudak, Eric Clark, and Dani Fegan (Sault Ste. Marie Tribe of Chippewa Indians – Natural Resources Department)
- Gene Mensch and Erin Johnston (Keweenaw Bay Indian Community – Natural Resources Department)
- Matt Preisser, Bretton Joldersma, Stephanie Swart (EGLE)
- Phyllis Higman*, John Paskus*, Michael Monfils, Denny Albert*, Mike Penskar*, Michael Kost*, Brian Klatt, and Ashley Adkins (MNFI and MNFI Alumni*)
- Photo Credits
 - Joshua Cohen, Jesse Lincoln, Tyler Bassett, Elizabeth Haber, Scott Warner, and Rachel Hackett

Questions?



Joshua Cohen: 734-355-9194
cohenj@michigan.gov