Aquatic Invasive Species Outreach

Fisheries Division

Seth Herbst, Ph.D.

Aquatic Species and Regulatory Affairs Unit Manager

Michigan Department of Agriculture & Rural Development

Department of Natural Resources Michigan

EGLE

Michigan Department of Environment, Great Lakes, and Energy

Aquatic Invasive Species

A species that is **not native** and whose introduction causes, or is likely to cause, economic or environmental **harm** or harm to human health

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Michigan Department of AGRICULTURE & Rural Development

MICHIGAN INVASIVE SPECIES PROGRAM

Quality of Life (QOL) agencies

Department of Natural Resources

- Fisheries
- Wildlife
- Parks and Recreation
- Law Enforcement
- Forest Resources
- Marketing and Outreach

Department of Environment, Great Lakes, and Energy

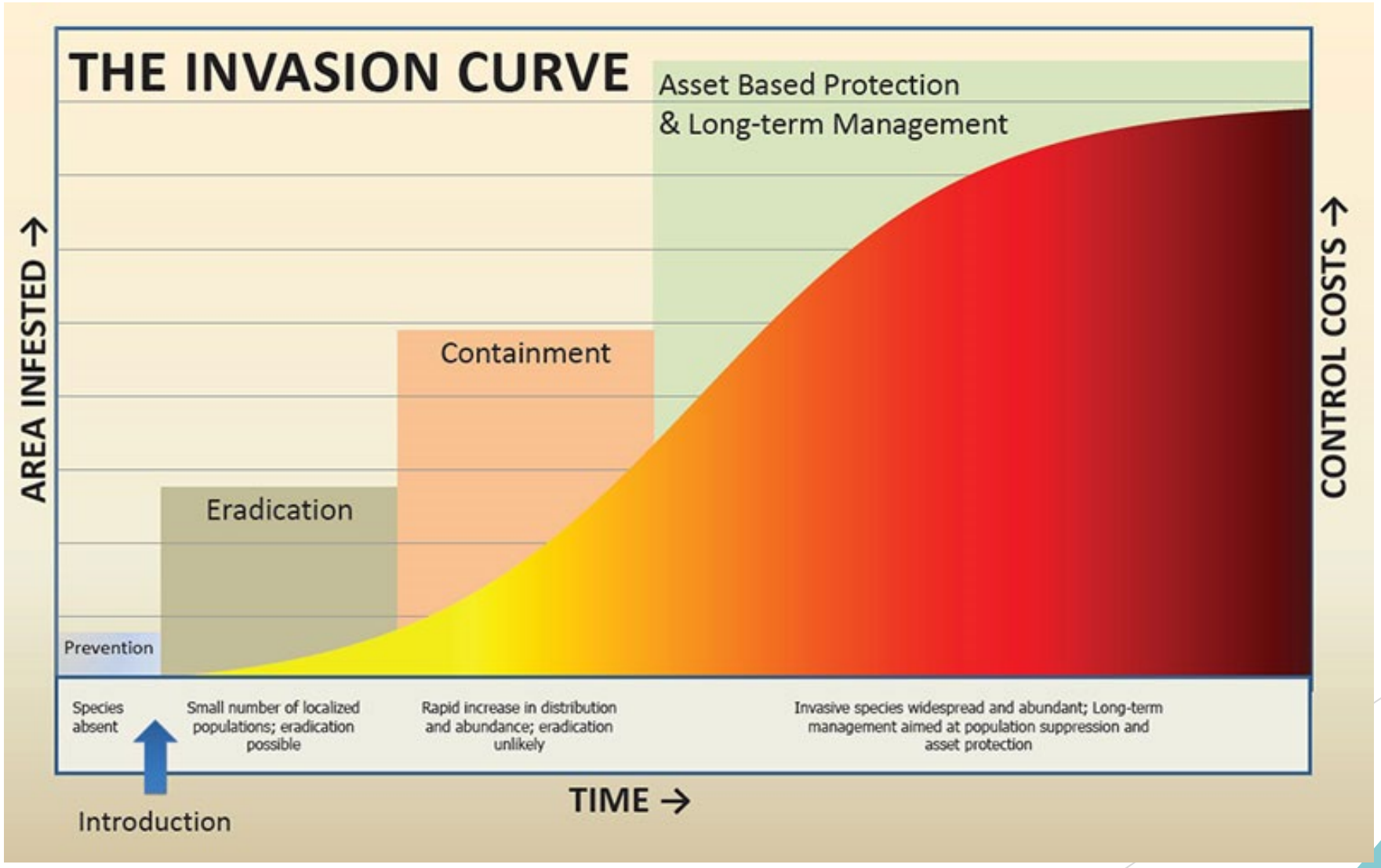
- Water Resources

Department of Agriculture and Rural Development

- Pesticide and Plant Pest Management
- Animal Industry
- Environmental Services Division

Department of Transportation

Managing Along the Invasion Curve



Control Costs

Total = over $2.5 billion over 20 years

Implementing Existing Management Plans

- **Invasive Carps Management Plan**
  - Prevention is critical!
  - Increased focus on Brandon Road Lock and Dam and Grass Carp concerns in Lake Erie

- **AIS State Management Plan**
  - Goals linked to invasion curve
  - QOL Decontamination policy and procedure
  - QOL Early detection guided by Watch-list
  - QOL AIS Response Plan

Prevention Measures to Protect our Resources

- Multifaceted approach to protect natural resources from invasive species
  - Focus on pathways of AIS introduction
- Regulatory framework to prevent introduction and spread
  - Part 413 of NREPA
  - Director's Invasive Species Order
  - Fisheries Orders
- Non-regulatory outreach efforts
  - Passive and active efforts

AIS Signage

HELP STOP AQUATIC HITCHHIKERS!

Avoid spreading aquatic invasive species.
Recommended Actions:

- ✓ **CLEAN** boats, trailers and equipment
- ✓ **DRAIN** live wells, bilges and all water
- ✓ **DRY** boats and equipment
- ✓ **DISPOSE** of unwanted bait in the trash

IT'S THE LAW

Violation of the law is a state civil infraction. Violators may be subject to fines.

DO NOT launch or transport watercraft or trailers unless they are free of aquatic organisms, including plants.
DO NOT transport a watercraft without removing all drain plugs and draining all water from bilges, ballast tanks, and live wells.
DO NOT release unused bait into the water.

Michigan.gov/InvasiveSpecies

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Clean Boats, Clean Waters "Tool Sign"

Angler NOTICE!

HELP STOP Aquatic Hitchhikers

New Zealand mudsnails and didymo (rock snot) have been detected in Michigan rivers. Both have harmful impacts on aquatic ecosystems and hinder fishing opportunities.

New Zealand Mudsnail

Didymo (rock snot)

CLEAN Your gear with HOT water or chemical disinfectants and remove any visible plants, mud and aquatic life before transporting.

DRAIN The water from all equipment before transporting elsewhere.

DRY All your gear for at least 5 days before going to a new waterbody.

mi.gov/invasives

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AIS Rack Cards

New Michigan Boating Law

Effective 2019

New requirements to stop the introduction and spread of ***Aquatic Invasive Species!***

It's the law:

- ✕ **DO NOT** launch or transport watercraft or trailers unless they are free of aquatic organisms, including plants.
- ✕ **DO NOT** transport a watercraft without removing all drain plugs and draining all water from bilges, ballast tanks, and live wells.
- ✕ **DO NOT** release bait into the water.

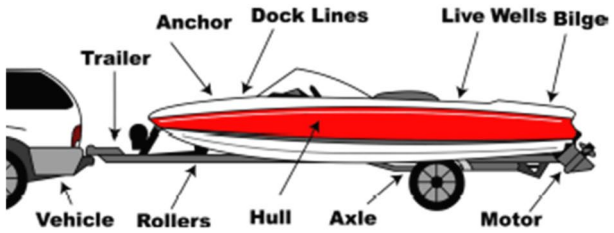
Violation of the law is a state civil infraction. Violators may be subject to fines.

Follow these steps:

1. **CLEAN** boats, trailers and equipment.
2. **DRAIN** live wells, bilges, ballast tanks, and all water by pulling drain plugs.
3. **DRY** boats and equipment.
4. **DISPOSE** of unwanted bait in the trash.

Prevent the spread of ecologically and economically harmful aquatic invasive species such as zebra mussels and Eurasian watermilfoil with the following simple steps:

- ✓ **CLEAN** boats, trailers and equipment and remove all mud, debris and aquatic plant material from trailers and watercraft before launching or retrieving a watercraft.
- ✓ **DRAIN** live wells, bilges, ballast tanks, and all water from boats before leaving the access site. Disinfect live wells and bilges with a bleach solution (1/2 cup bleach to 5 gallons of water) when possible.
- ✓ **DRY** all boats and equipment thoroughly before leaving an access area and prior to relaunching in a new waterbody.
- ✓ **DISPOSE** of bait in the trash. Do not release bait into the water.
- ✓ **DO NOT TRANSFER FISH** to water bodies other than where they were caught.



Inspection points on boats, trailers, and vehicles for aquatic invasive species decontamination.

Help stop the spread of Didymo and New Zealand Mudsnails

CLEAN

boats and gear with **HOT (140° F)** water or chemical disinfectants and remove any visible plants, mud and aquatic life before transporting.

DRAIN

the water from all equipment and watercraft before transporting elsewhere.

DRY

all gear for at least five days before going to a new water body.

These methods work for didymo, New Zealand mudsnails and most other aquatic invasive species.

Helpful Tips:

- Avoid visiting multiple rivers in a single day.
- Plan time to decontaminate between trips.
- Designate specific gear, especially porous items like rope and nets, for use only in infested waters.

The problem

Didymo - nuisance algae

- Didymo (aka "rock snot"), a microscopic alga (diatom), produces stalks that can form thick mats that cover river and stream beds.
- These mats alter habitat and food sources for fish and can foul fishing gear and impact fishing access and wading.
- Didymo looks and feels like white or brown wet wool – it is not slimy.
- Infestations range from cotton ball-sized patches to thick blankets and long, rope-like strings that flow in currents.

Invasive New Zealand mudsnail

- The brown-to-black, 1/8-inch long New Zealand mudsnail reproduces cloning - a single snail can start an entire population.
- With few natural predators, their numbers grow rapidly each year, decreasing food for other invertebrate populations.
- Fish that feed on native invertebrates like mayflies and caddisflies may find it more difficult to forage.
- Fish will consume New Zealand mudsnails, but they offer the fish little nutritional value, are difficult for fish to digest and can be excreted alive.
- Feeding on mudsnails can reduce the growth, condition and ultimately the abundance of key sport fish including trout.

Take extra steps to decontaminate

- Clean all surfaces that can transport didymo and New Zealand mudsnail, including boats, anchors and fishing gear such as waders, wading boots and nets.
- Didymo's microscopic cells and New Zealand mudsnails can survive without water for days. Thorough drying (five or more days) or rinsing with hot water or a chemical disinfectant is necessary to assure no live organisms are transported.
- Because porous items don't fully dry and may not be disinfected by chemical washes, avoid using rope, netting, felt-soled wading boots or other porous materials when possible, or restrict use of these items to a single stream or river.

For more information, visit *Michigan.gov/Invasives*. To report new locations of didymo or New Zealand mudsnail, email photos and location information to *EGLE-WRD-AIP@Michigan.gov*.

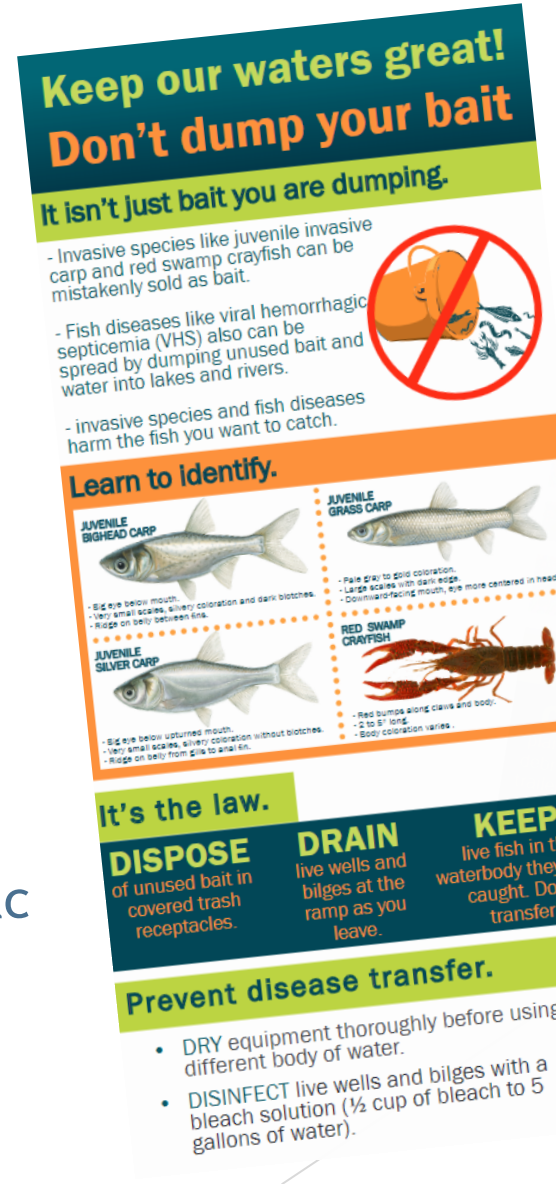
New AIS Outreach: Kiosks

Several panels for relevant issues

- Boater laws/recommendations panel
- Species focused panels
  - New Zealand mudsnail
  - Invasive carps
  - Red swamp crayfish
- "Don't Dump Bait" panel
- General AIS awareness panel

Distribution

- Carl T. Johnson Hunt and Fish Center in Cadillac
- Trade shows, events, etc.
- Hatcheries and visitor centers



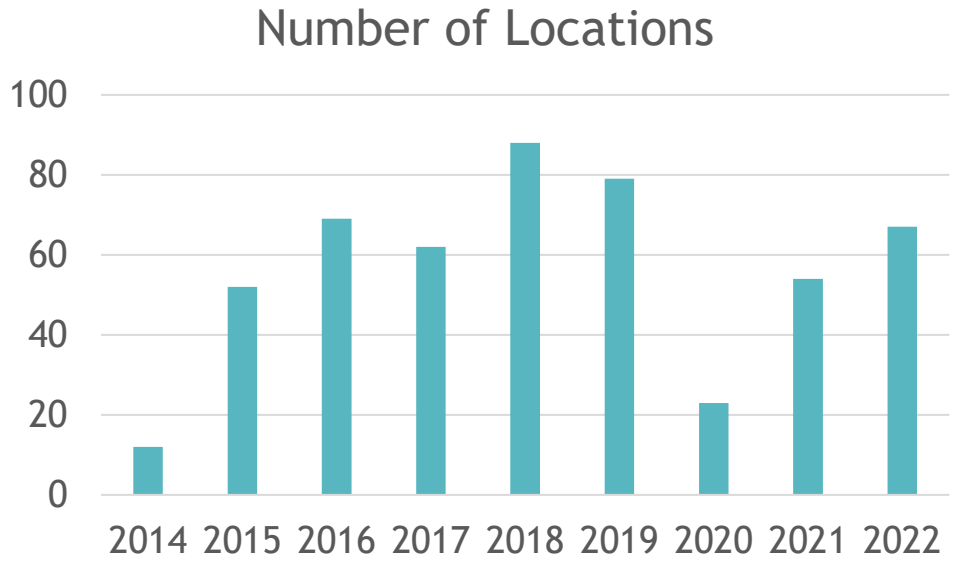
New AIS Outreach: Billboards

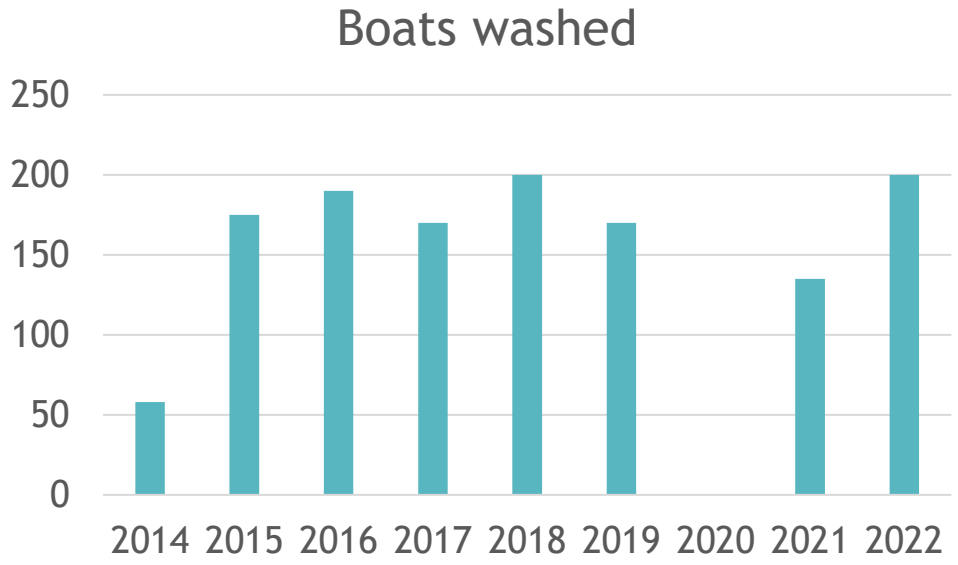
- Multiple billboards with AIS prevention messaging for boaters and anglers
- Summer 2021 & Summer 2022
- AIS program is currently working with Wildlife Forever to evaluate messaging, locations, and costs

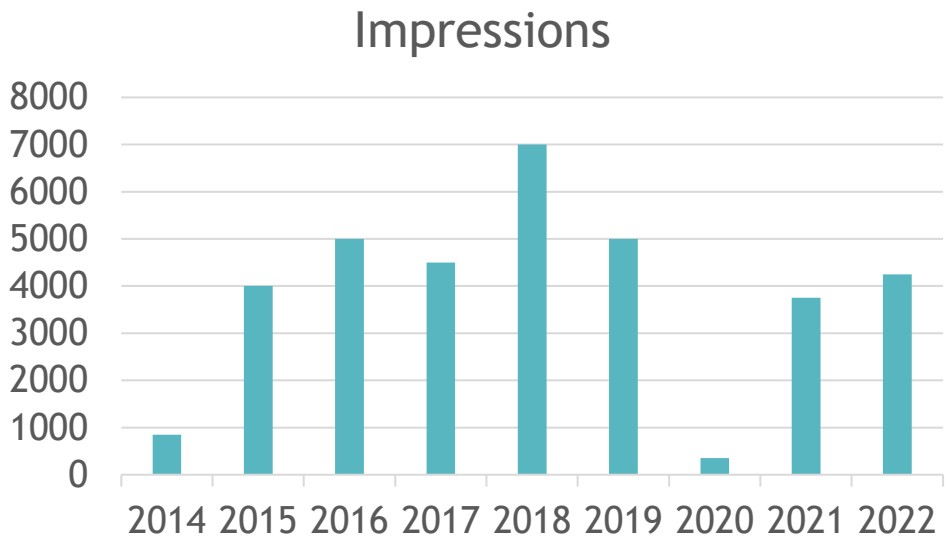
Actions at Boating Access Sites

- Clean Drain Dry stenciling at boating access sites
- Installation of boat washes and CD3 stations through partnerships with local organizations
- Law Enforcement Division efforts to engage with boaters and enforce laws
  - Thousands of officer hours and user contacts annually
  - Warnings and citations issued

Michigan's AIS Landing Blitz







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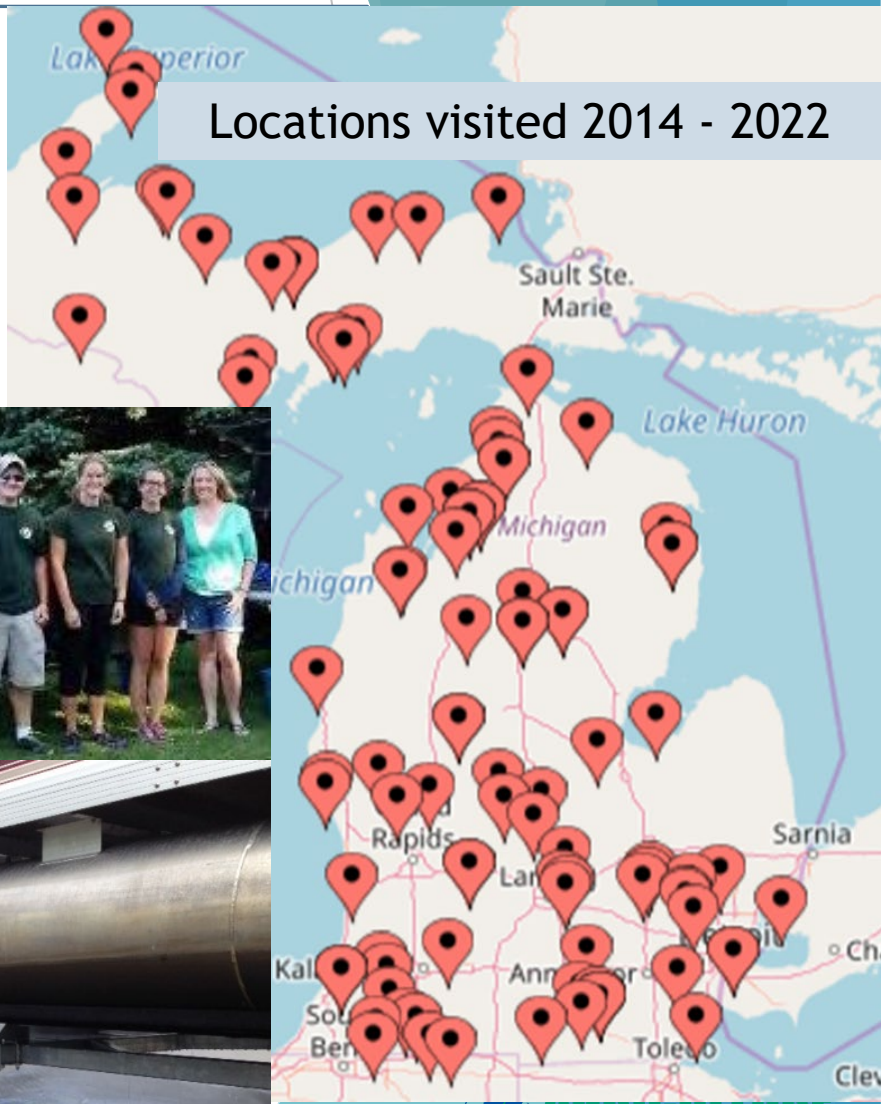
Michigan Department of AGRICULTURE & Rural Development

Mobile Boat Wash Partnership

8-yr program summary

- 344 events
- 135+ locations
- 2,352 boats washed
- 14,000+ contacts
- 2,200+ volunteer hours
- ~75k social media impressions
- 2022: 133+ boats washed and 600+ boaters reached during 43 mobile boat wash events



MICHIGAN STATE UNIVERSITY

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

& Rural Development

DNR Mobile Boat Wash Program

- Received GLRI to begin implementation in 2023
- Focus will be on DNR-administered access sites
  - Boating access properties during the summer
  - State game areas during the fall (waterfowl season)
- First year will focus on SE MI, second year will be statewide

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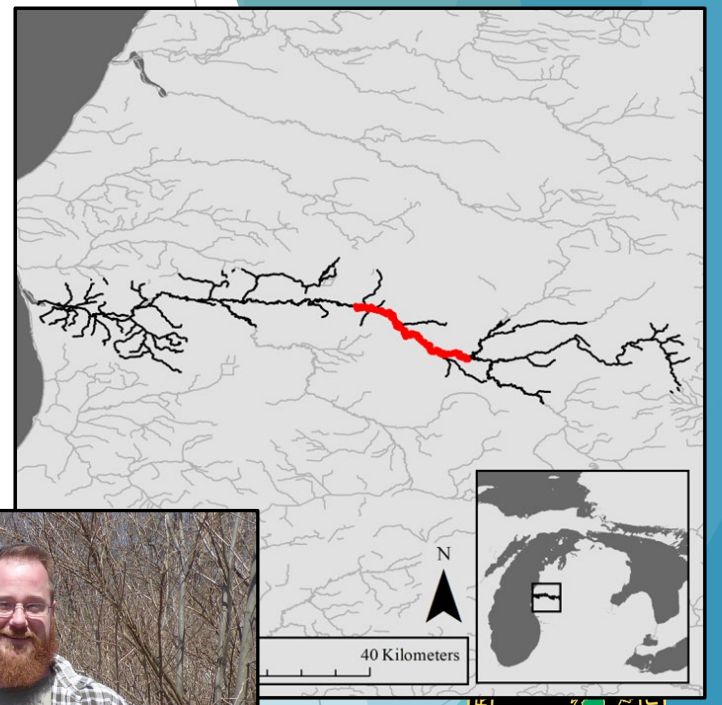
Michigan Department of AGRICULTURE & Rural Development

Assessing Risk and Engaging Angling Community

- Pere Marquette River – first reported New Zealand Mudsnail (NZMS) infestation in 2015
- 300+ angler surveys in 2016-17
- 56% didn't decontaminate
- 52% aware of NZMS infestations
- Only 46% of "aware" anglers decontaminate gear
- Transient anglers
  - Many visit multiple waters within a few days



Great Lakes RESTORATION

DNR MICHIGAN

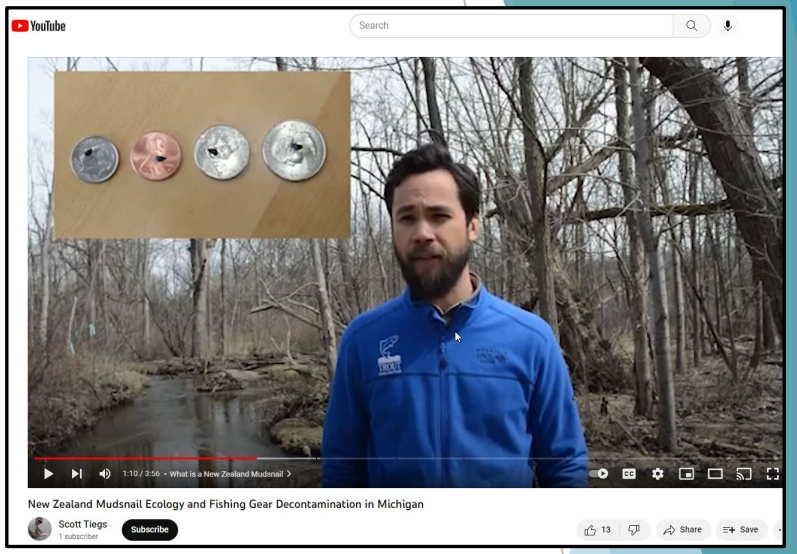
Wader Wash Stations – Partnering for Impact!

- Seeking partners to increase awareness and maintain a wader washing station
- DNR-Fisheries Division could assist partners with construction and provide messaging

Bolstering Efforts via Grant Programs

Oakland University

- Evaluated effectiveness of decontamination methods
- Developed video to promote decontamination



Michigan State University

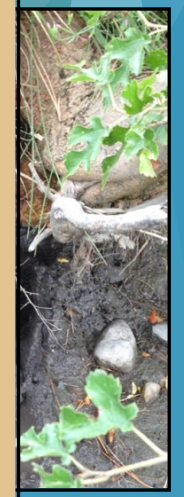
- Evaluating effectiveness of different AIS messaging
- Determining usage rates of wader washing stations
  - Identify hurdles for adopting decon efforts
- Identify strategies to improve effectiveness of outreach to prevent AIS spread

Addressing Concerns with Didymo “Rock Snot”

- Nuisance blooms detected in Michigan
  - St. Marys, Manistee, and Boardman rivers
- Didymo blooms ≠ poor water quality
- No open water treatment options available
- Focus on increased awareness
  - Press releases, social media, direct communications with stakeholders, NotMISpecies webinar, promoting decontamination
  - Developed and installed new signage
- Funded Lake Superior State University to investigate environmental conditions that may lead to nuisance blooms

Threat of Red Swamp Crayfish

- Most invasive crayfish worldwide
  - Outcompete native species
  - Dig complex burrows causing erosion and infrastructure problems
  - Feed on vegetation and negatively impact water clarity (water becomes turbid)
  - Reproduce in large numbers
- Listed as a prohibited species in 2015
  - Widely available in trade
  - MI anglers using live crayfish purchased from food markets in southwest MI



Outreach Response for Red Swamp Crayfish

- First confirmed detections in 2017
- Crayfish could have been introduced from releases linked to multiple vectors
  - Biological supply for schools
  - Live food markets
  - Live bait
  - Pet stores
- Law Enforcement Division
  - Inspections and enforcement

Tiny lobsters of doom: Why this invasive crayfish is bad news

By KATE WELLS · JUL 27, 2017

PROGRAM
The Environment Report

Tweet
Share
Google+
Email

This is the photo sent to Seth Herbst. "And as soon as I saw that photo, it was a clear as day that that was a red swamp crayfish," he sighed.

Great Lakes RESTORATION

Promote public/private collaboration to leverage expertise & resources as a mechanism to address Michigan's AIS priorities

Michigan Invasive Species Grant Program

- Competitive state grant program started in 2014
- $3.6M required each year and appropriated by state legislature
- Over $29 million awarded to 203 projects

Great Lakes Restoration Initiative

Clean Boats, Clean Waters

- Mini-grants since 2020
- MSUE AIS Educator
- Resources include E/O materials and training/education

AIS Task Force

- Engage partners and collaborate on shared goals for AIS prevention
  - MI Waterfront Alliance, MI Lakes and Streams Assoc., MI Boating Industry Assoc.

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Michigan Department of AGRICULTURE & Rural Development

Thank You!

Seth Herbst, Ph.D.

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Fisheries Division

Aquatic Species and Regulatory Affairs Unit Manager

Michigan Department of Agriculture & Rural Development

Department of Natural Resources Michigan

EGLE

Michigan Department of Environment, Great Lakes, and Energy

Forest Roads Inventory Update

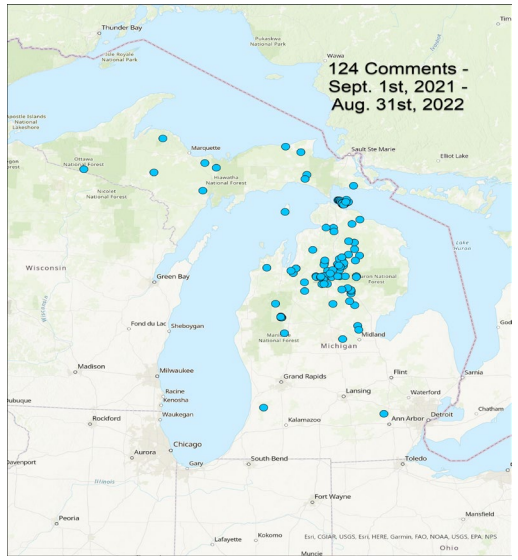
Mark Monroe
PRCSF Unit Manager/Road Inventory Lead
Forest Resources Division
NRC 01/12/2023

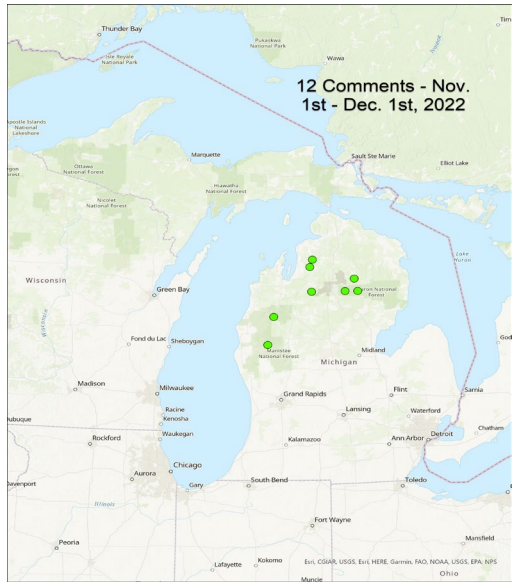
Public Act 288

- Signed by Gov. Snyder in 2016
- Requires determination of motorized and non-motorized use restrictions
- Requires DNR to post maps and mileage open to motorized use each year
- Requires an inventory of forest roads by region, including:
  - Location
  - Condition
  - Development Level

Inventories Completed

- Dec. 14, 2017: LUOD designated roads open to ORVs in the NLP
- Dec. 13, 2018: LUOD identified UP and SLP roads open to ORVs
- Maps are fine-tuned each year
- Roads may be opened or closed to ORVs or other vehicles



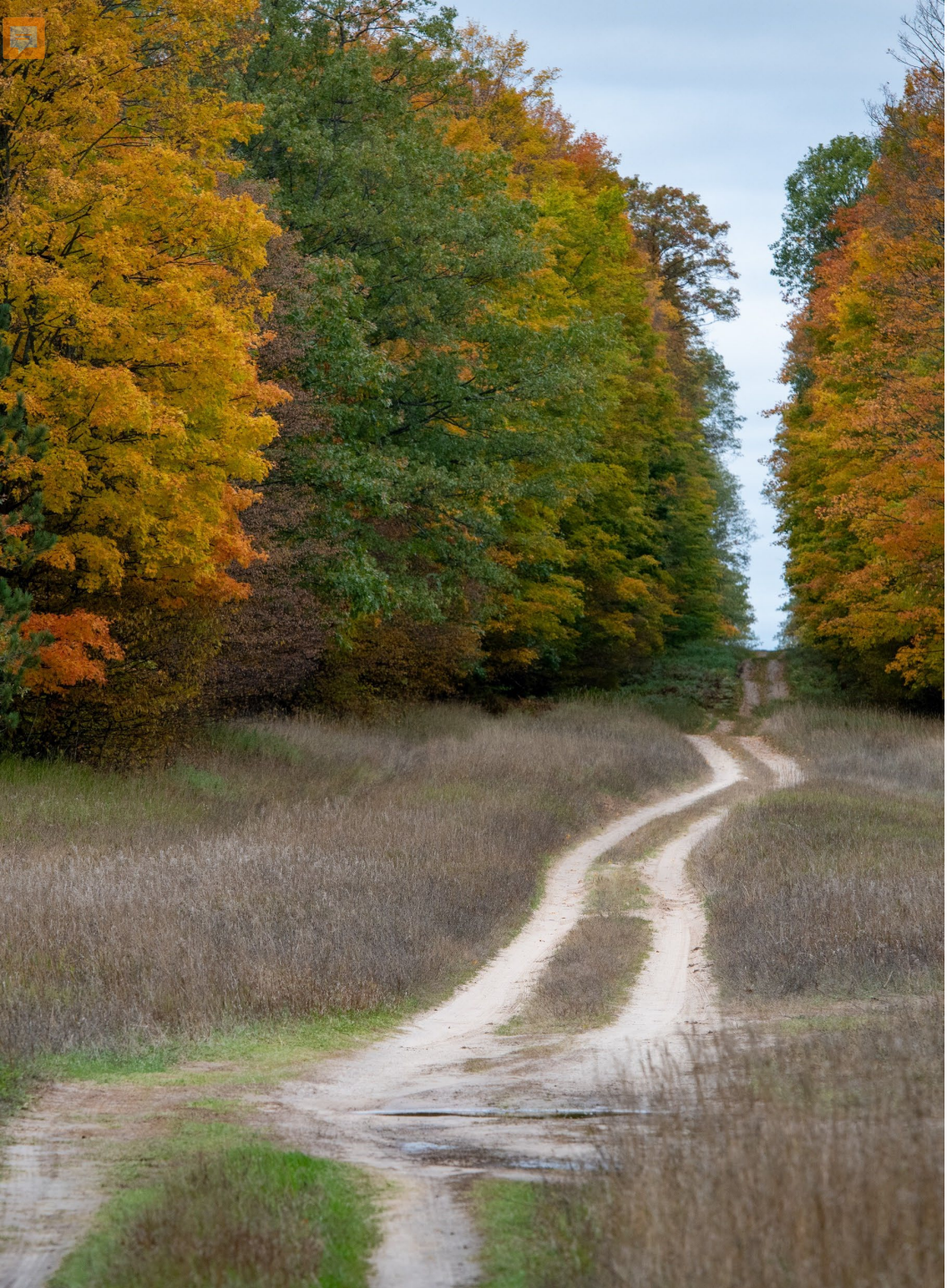


Process for Change

- Status changes can be initiated by public comment, Department staff, stakeholders, tribal governments or local units of government
- Multi-disciplinary DNR team reviews and recommends changes
- 30-day public review each year before proposed changes are made
- DNR received 124 comments from Sept. 1, 2021-Aug. 31, 2022; 12 comments were received during the Nov. 1-Dec. 1, 2022 public review phase

2022 Proposals

- Remove 28.3 miles of road segments from state forest maps for conventional & ORV use
- Delete 23.3 miles of roads due to data cleanup of non-existing or duplicate roads
- Add 39.7 miles of roads to maps that were not previously included in the inventory; 26.5 miles will be open to ORV use, 12.9 miles closed to ORV use, and 0.3 miles open to seasonal ORV.

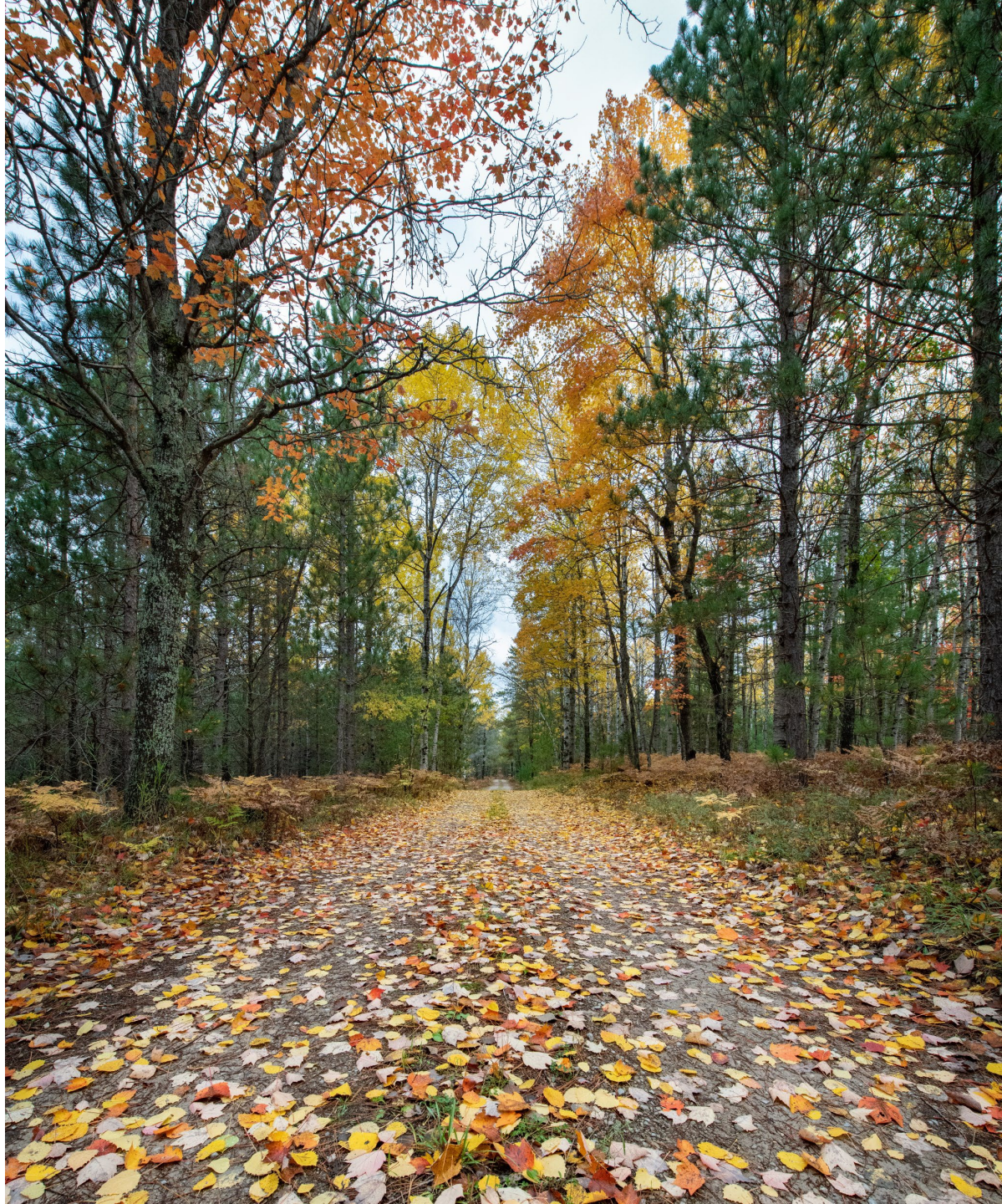


Miles of Road by Region

- Upper Peninsula: 5,503.4 miles open to ORV use out of 5,612.8 total miles
- Northern Lower Peninsula: 6,109.9 miles open to ORV use out of 7,309.2 total miles
- Southern Lower Peninsula: 10.1 miles open to ORV use out of 365 total miles

What's Next?

- Director's action in February
- Maps reflecting approved changes will be published online by April 1, 2023
- Signs will be posted on state-managed forest roads closed to ORV use, including seasonal closures



Questions?

Preliminary 2022 Elk Season Results

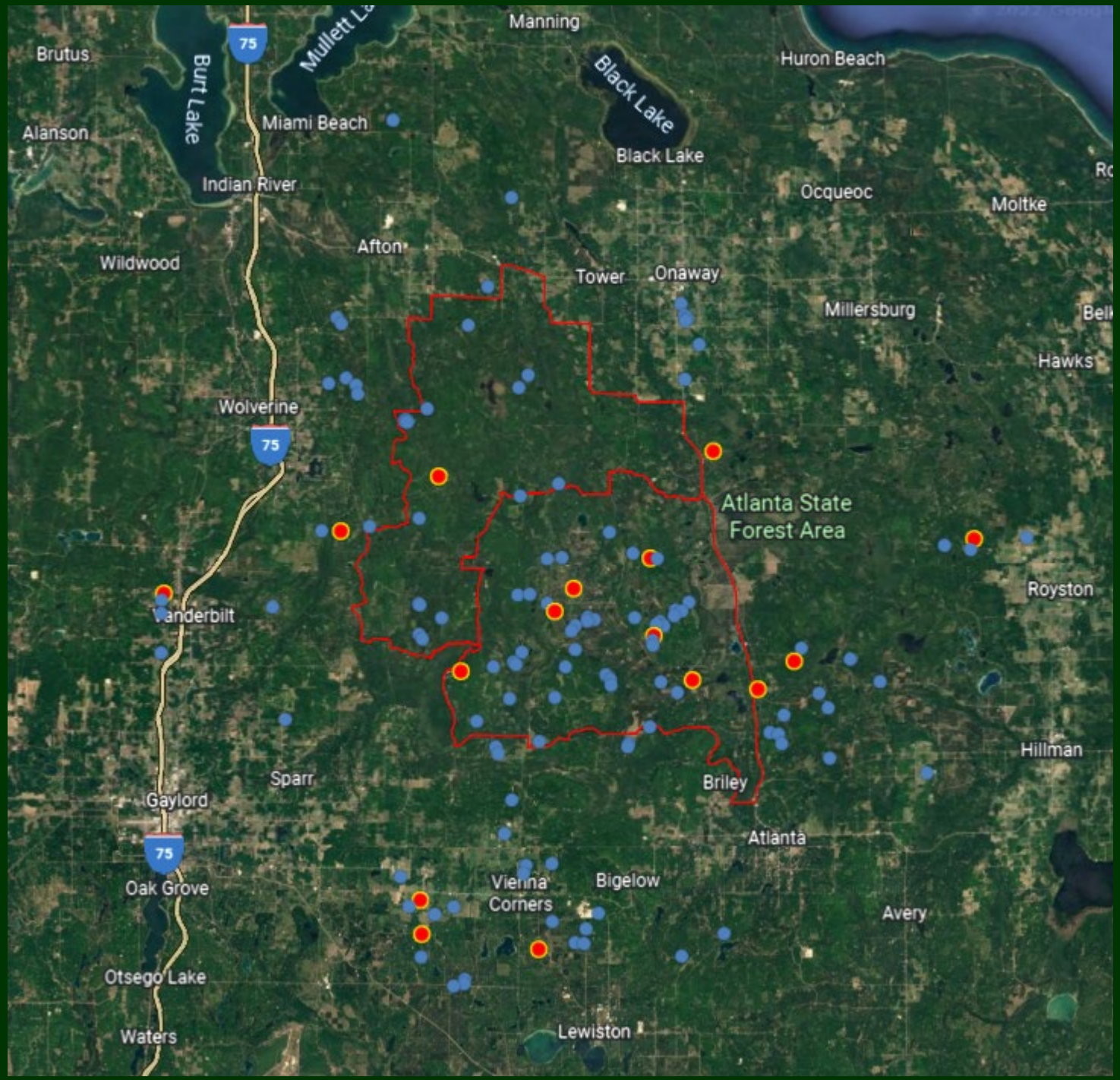
Chad Stewart, Deer and Elk Management Specialist
Wildlife Division
January 12, 2023

2022 Late Elk Season Summary

- Hunt Period 2:
  - December 10-18
  - Hunt Areas H, I, and X
- License Quota: 160
  - 50 any elk
  - 110 antlerless only elk
- Weather was variable
  - Little snow at the beginning of the season, with better tracking snow later in the season
  - Temperatures were cold to mild throughout

Elk Harvest – Late Season

- Hunt Period 2 Harvest
  - State hunter harvest: 115 legally harvested elk
    - 46 antlered bulls
    - 62 cows
    - 7 calves (3 female, 4 male)
    - 72% success (160 hunters)
  - 5 reported law events (not included in harvest totals)
  - Tribal harvest: 8 elk
    - 3 bulls and 5 cows


Manning
Brutus
Burt Lake
75
Mullett L
Black Lake
Huron Beach
Alanson
Miami Beach
Black Lake
Indian River
Ocqueoc
Moltke
Afton
Wildwood
Tower
Onaway
Millersburg
Hawks
Wolverine
75
Atlanta State
Forest Area
Royston
anderbilt
Hillman
Sparr
Briley
Gaylord
75
Atlanta
Vienna
Corners
Bigelow
Oak Grove
Avery
Otsego Lake
Waters
Lewiston

Historical Success Rates-Statewide Drawn Hunters

	2018	2019	2020	2021	2022	5 Year Avg.
Early Season	69%	74%	83%	75%	80%	76%
Late Season	83%	92%	86%	89%	72%	83%

2022 Total Elk Season Summary

- Hunt Period 1 Harvest:
  - State hunter harvest: 78 legally harvested elk
    - 26 bulls, 52 cows/calves; 80% success
- Hunt Period 2 Harvest:
  - State hunter harvest: 115 legally harvested elk
    - 46 bulls, 69 cows/calves; 72% success
- Tribal Harvest: 11 elk (still being tabulated)
- All 3 Pure Michigan hunters successful

Thank You

www.michigan.gov/elk

Department Climate Policy

Scott Whitcomb

Acting Natural Resources Deputy

January 12, 2023

Climate and Natural Resources

- Climate has always been considered in managing our natural resources
- Stable climate is predictable, a changing climate is unpredictable
- All aspects of mission potentially affected
  - Infrastructure, forests, recreation, cultural resources

Climate Action

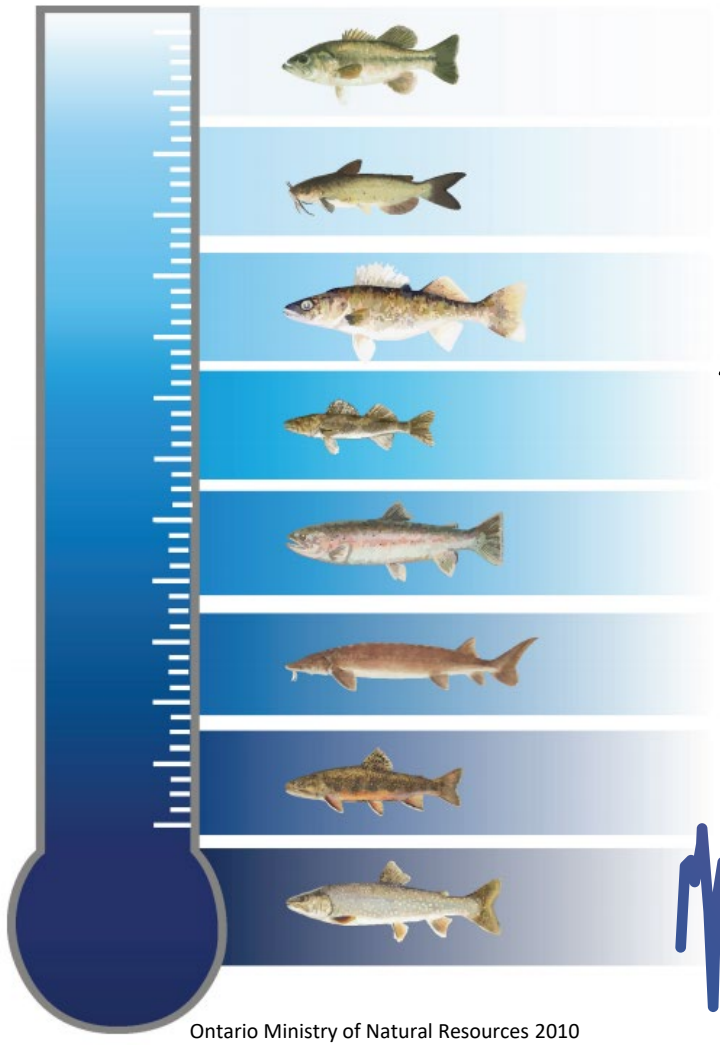
- Executive Branch (EO, ED)
- US Climate Alliance
- Department initiatives
  - Sprint Teams
  - Carbon Credits
  - Utility Scale Solar
  - Facilities
  - Mass timber

Need for Climate Policy

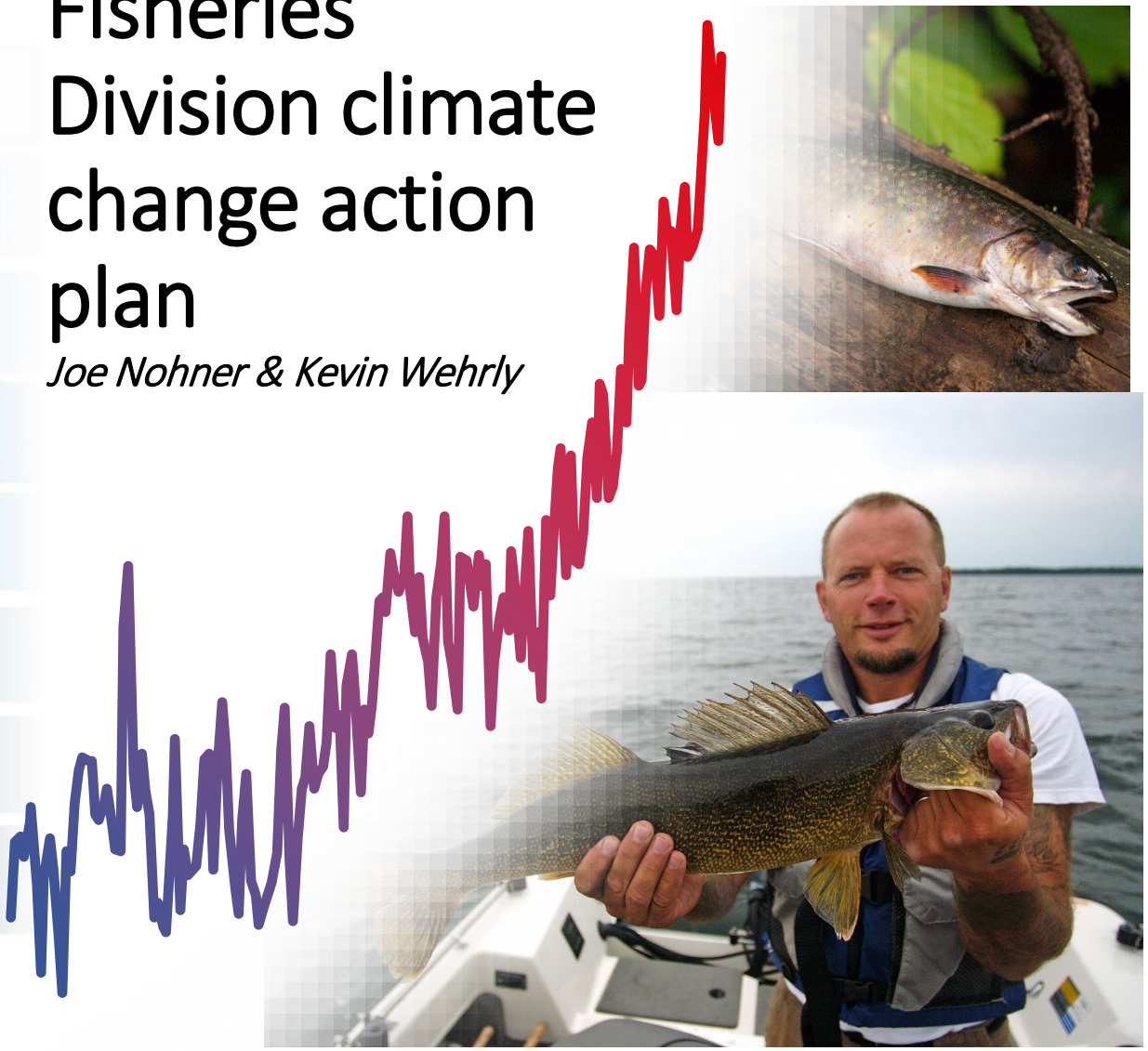
- Direct and prioritize actions strategically
- Focus on mitigation and adaptation
- Build policy and processes that support strategy and operations
- Define roles and responsibilities
  - Divisions
  - Sprint Teams
  - Office of Public Lands

Fisheries Division climate change action plan

Joe Nohner & Kevin Wehrly



Ontario Ministry of Natural Resources 2010



Fisheries Division Climate Change Action Plan

Goals

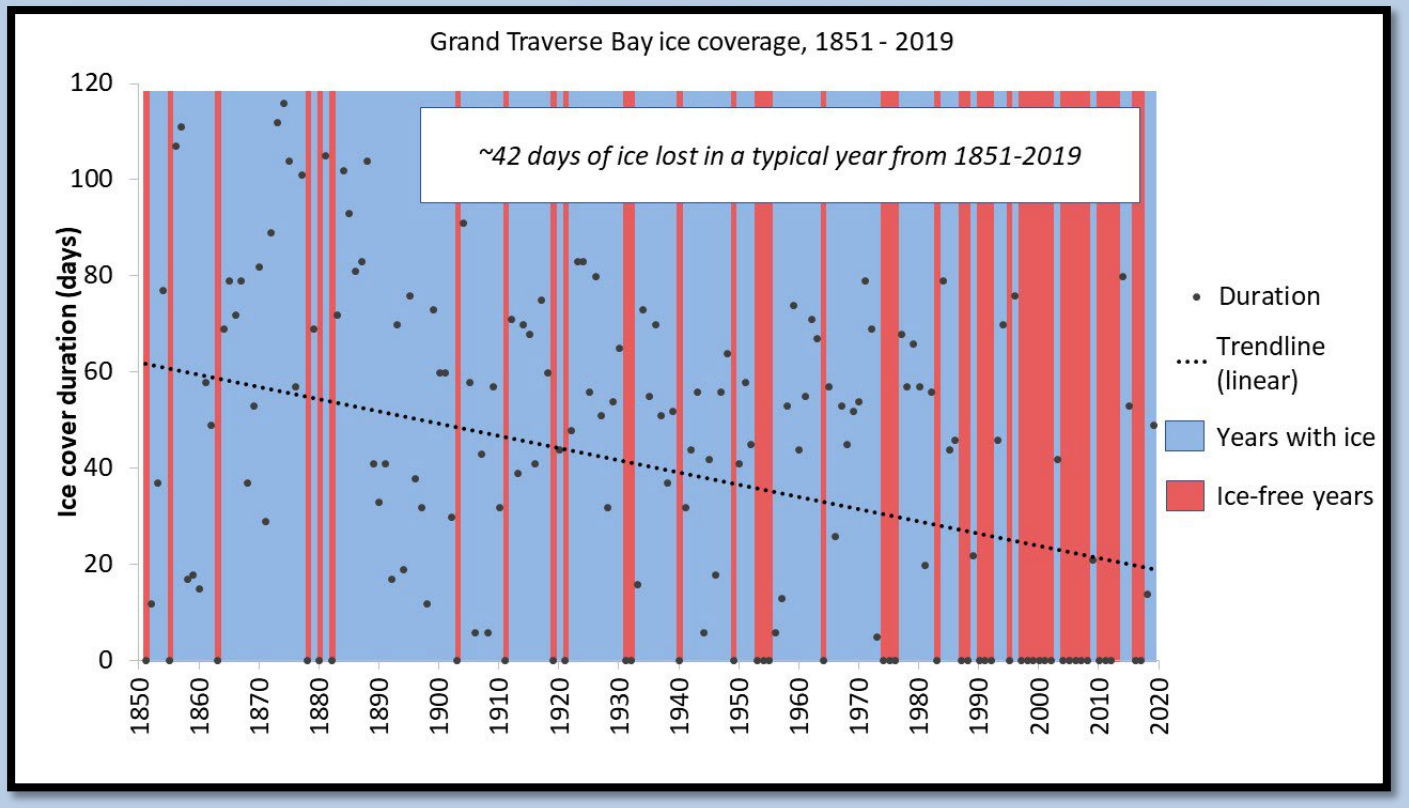
1. Increase understanding and communication about climate change
2. Consider climate change in policy, management, & operations decisions
3. Identify and address climate knowledge gaps
4. Reduce Fisheries' climate change impact

Increase understanding and communication about climate change

Consider climate change in policy, management, & operations decisions

Photo: Gavin MacDonald, Conservation Resource Alliance

Identify and address climate knowledge gaps



Data: The Watershed Center Grand Traverse Bay

Reduce Fisheries' climate change impact

Wildlife and Climate Change

Wildlife Division

Christopher Hoving, PhD

Adaptation Specialist

Outline

- Which wildlife are vulnerable and why
- Wildlife Division leadership in climate adaptation field

Data and research needed to inform regulations setting

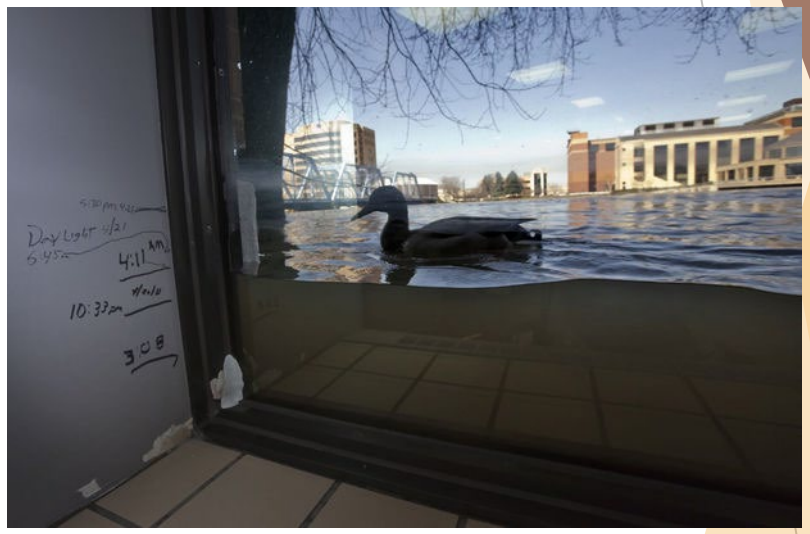
- What species are vulnerable?
- Why are they vulnerable?
- Research and monitoring
- Linking research to management

Recent research on Michigan wildlife and climate trends

- Vulnerability assessment of all terrestrial game species (Hoving et al 2013)
- Snowshoe hare, snow, and temperature (Sultaire et al 2021)
- Future of ruffed grouse in Michigan (Pomara and Zuckerberg 2017)
- The future of winter severity in Michigan (Notaro et al 2014)
- Waterfowl migration changes by species (Notaro et al 2016)

Specific vulnerability studies: Notaro et al. 2016

- USGS, Michigan DNR, and Ducks Unlimited research
- Waterfowl modeled to shift fall migration by end of century
  - Green Winged Teal: 25 days
  - Mallard : 40 days, if ever
- Shift later in fall by 3 to 5 days per decade
- Not just a moving target
- Calendar gap between early and late migrants will continue to widen

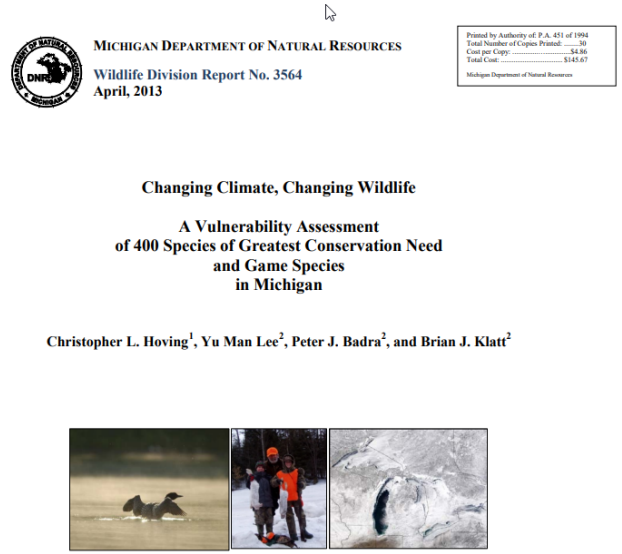


Specific vulnerability studies: Notaro et al. 2016

- Late migrants like mallards may not migrate out of the state by end of century
- Michigan's gain will be southern states' loss
- Habitat needs for resident waterfowl differ from migration

Wildlife Division is a National Leader on Climate Adaptation

- Research and monitoring
  - Only state with comprehensive climate vulnerability assessment of all terrestrial game species



MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Wildlife Division Report No. 3564
April, 2013

Changing Climate, Changing Wildlife

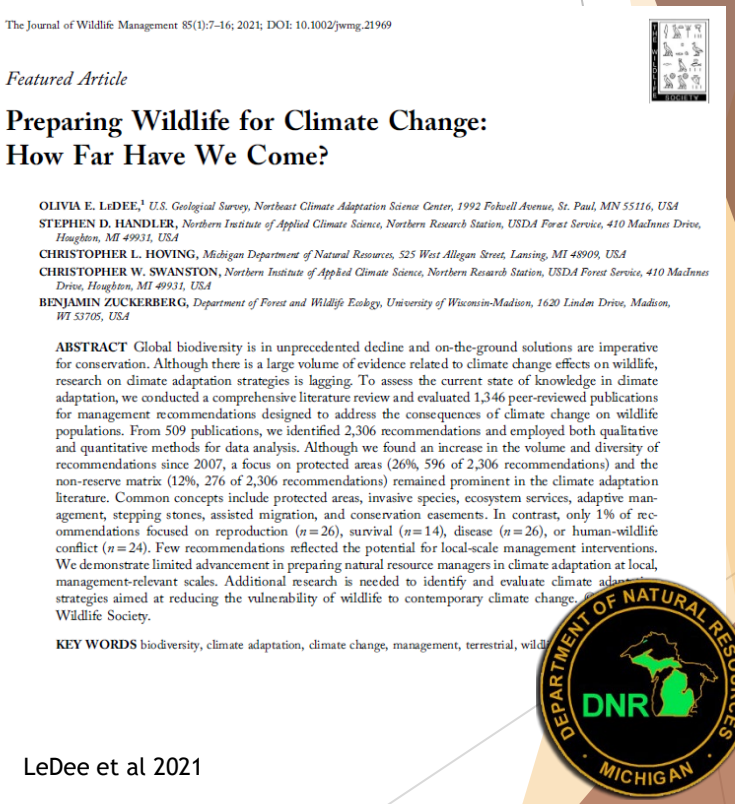
A Vulnerability Assessment
of 400 Species of Greatest Conservation Need
and Game Species
in Michigan

Christopher L. Hoving[1], Yu Man Lee[2], Peter J. Badra[2], and Brian J. Klatt[2]

Hoving et al 2013

Wildlife Division is a National Leader on Climate Adaptation

- Research and monitoring
  - Only state with comprehensive climate vulnerability assessment of game species
  - Literature review of climate adaptation strategies



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Featured Article

Preparing Wildlife for Climate Change: How Far Have We Come?

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ABSTRACT Global biodiversity is in unprecedented decline and on-the-ground solutions are imperative for conservation. Although there is a large volume of evidence related to climate change effects on wildlife, research on climate adaptation strategies is lagging. To assess the current state of knowledge in climate adaptation, we conducted a comprehensive literature review and evaluated 1,346 peer-reviewed publications for management recommendations designed to address the consequences of climate change on wildlife populations. From 509 publications, we identified 2,306 recommendations and employed both qualitative and quantitative methods for data analysis. Although we found an increase in the volume and diversity of recommendations since 2007, a focus on protected areas (26%, 596 of 2,306 recommendations) and the non-reserve matrix (12%, 276 of 2,306 recommendations) remained prominent in the climate adaptation literature. Common concepts include protected areas, invasive species, ecosystem services, adaptive management, stepping stones, assisted migration, and conservation easements. In contrast, only 1% of recommendations focused on reproduction ($n = 26$), survival ($n = 14$), disease ($n = 26$), or human-wildlife conflict ($n = 24$). Few recommendations reflected the potential for local-scale management interventions. We demonstrate limited advancement in preparing natural resource managers in climate adaptation at local, management-relevant scales. Additional research is needed to identify and evaluate climate adap[illegible] strategies aimed at reducing the vulnerability of wildlife to contemporary climate change. © Wildlife Society.

KEY WORDS biodiversity, climate adaptation, climate change, management, terrestrial, wildl[illegible]

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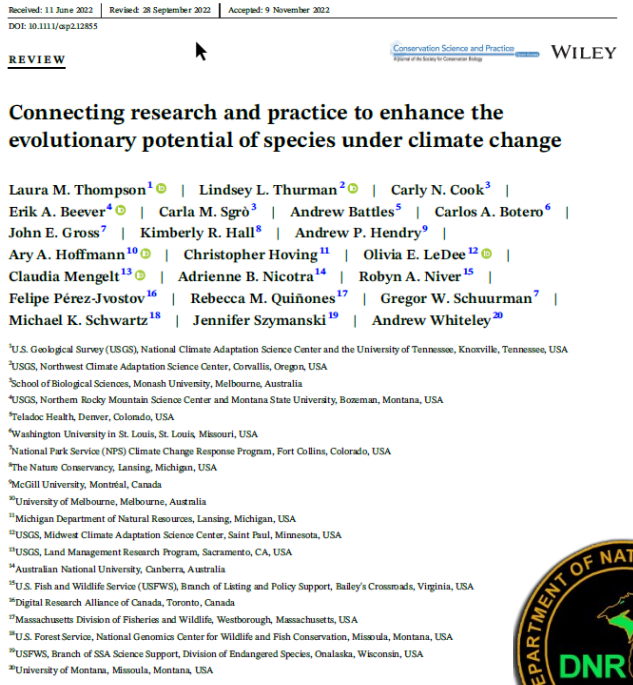
  - Review of climate adaptation strategies
  - Integrating genetics in climate adaptation



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REVIEW

Conservation Science and Practice
WILEY

Connecting research and practice to enhance the evolutionary potential of species under climate change

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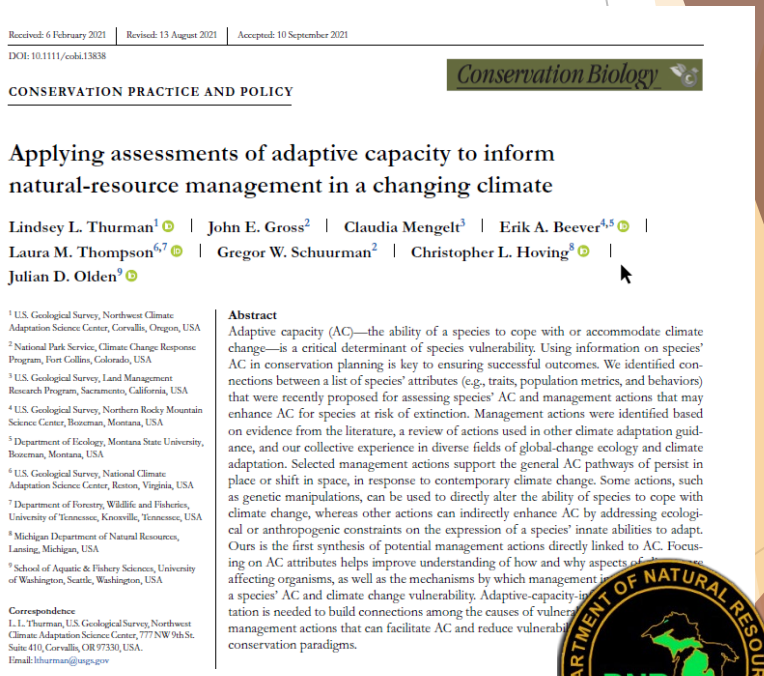
  - Integrating genetics in climate adaptation
- Decision support tools
  - Better linking vulnerability to management



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Conservation Biology

CONSERVATION PRACTICE AND POLICY

Applying assessments of adaptive capacity to inform natural-resource management in a changing climate

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Abstract

Adaptive capacity (AC)—the ability of a species to cope with or accommodate climate change—is a critical determinant of species vulnerability. Using information on species' AC in conservation planning is key to ensuring successful outcomes. We identified connections between a list of species' attributes (e.g., traits, population metrics, and behaviors) that were recently proposed for assessing species' AC and management actions that may enhance AC for species at risk of extinction. Management actions were identified based on evidence from the literature, a review of actions used in other climate adaptation guidance, and our collective experience in diverse fields of global-change ecology and climate adaptation. Selected management actions support the general AC pathways of persist in place or shift in space, in response to contemporary climate change. Some actions, such as genetic manipulations, can be used to directly alter the ability of species to cope with climate change, whereas other actions can indirectly enhance AC by addressing ecological or anthropogenic constraints on the expression of a species' innate abilities to adapt. Ours is the first synthesis of potential management actions directly linked to AC. Focusing on AC attributes helps improve understanding of how and why aspects of [illegible] affecting organisms, as well as the mechanisms by which management [illegible] a species' AC and climate change vulnerability. Adaptive-capacity-[illegible]tation is needed to build connections among the causes of vulner[illegible] management actions that can facilitate AC and reduce vulnerabi[illegible] conservation paradigms.

Thurman et al 2021

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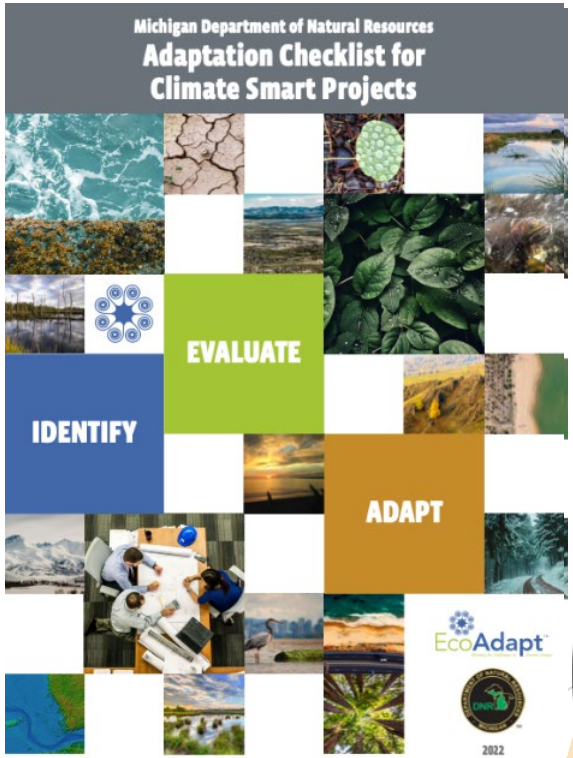
  - Project management checklist



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  - Better linking vulnerability to management
  - Project management checklist
  - Wildlife management menu and workbook

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EMERGING RESEARCH

WILDLIFE SOCIETY BULLETIN | THE WILDLIFE SOCIETY

A menu of climate change adaptation actions for terrestrial wildlife management

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US Department of Interior Northeast Climate Adaptation Science Center; USDA Forest Service

Abstract

The real-world application of climate change adaptation practices in terrestrial wildlife conservation has been slowed by a lack of practical guidance for wildlife managers. Although there is a rapidly growing body of literature on the topic of climate change adaptation and wildlife management, the literature is weighted towards a narrow range of adaptation actions and administrative or policy recommendations that are typically beyond the decision space and influence of wildlife professionals. We developed a menu of tiered adaptation actions for terrestrial wildlife management to translate broad concepts into actionable approaches to help managers respond to climate change risks and meet desired management
The menu includes actions related to managi
populations as well as managing wildlife habitat
this resource to be used with the Adaptatio
structured decision-support tool for climate
describe real-world examples in which manag

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Thank you