

Biodiversity Matters: Moving Beyond a Shotgun Approach to Managing Invasive Species

Phyllis Higman

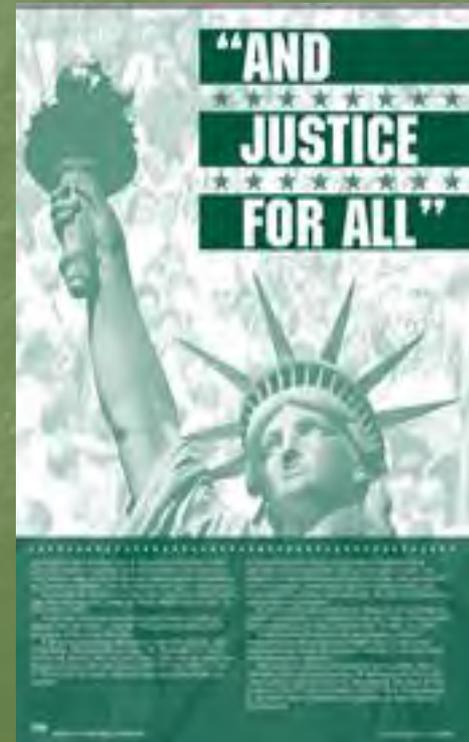


Michigan Natural Features Inventory

Nature Center Summit, February 14, 2020

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Special thanks to:

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Ian Shackelford: USFS

Ray Fahlsing, Glenn Palmgren, Bob Clancy: Parks, MDNR

Pam Grassmick: Beaver Island

Many funders including:



AND all of YOU!

Agenda:

- A bit about biodiversity
- Invasives 101 speed course
- A teeny bit about control
- Reporting and Mapping using the MISIN
- Priority Species ID

Objectives:

You will be able to:

- Explain what an invasive species is and is not.
- Give examples of some of their impacts.
- Compare the “invasion curve” to strategies.
- Recognize at least 5 priority invasive plants
- Report occurrences (with pictures!) of priority species using the MISIN app.
- Share your love for our amazing native ecosystems with others.

Michigan Natural Features Inventory

Maintains the most comprehensive database on Michigan's vulnerable elements of biodiversity

GIS based database:

~ 18,000 element occurrences (EO's)

- endangered, threatened, special concern spp.
- high quality natural communities



420 plants



302 animals



77 natural communities

Mission: Guide the conservation of Michigan's biodiversity by providing the highest quality scientific expertise and information.





A great day!

Imagine if....

you were in charge of protecting
Michigan's biodiversity



How would you go about it?



Natural Communities

The coarse filter



Natural Communities

Interacting plants, animals and other organisms occurring across the landscape under similar environmental conditions; predominantly structured by natural processes.

A Field Guide

to the Natural Communities

of Michigan

JOSHUA G. COHEN, MICHAEL A. KOST, BRADFORD S. SLAUGHTER, AND DENNIS A. ALBERT



How did we know what was here
a long time ago?

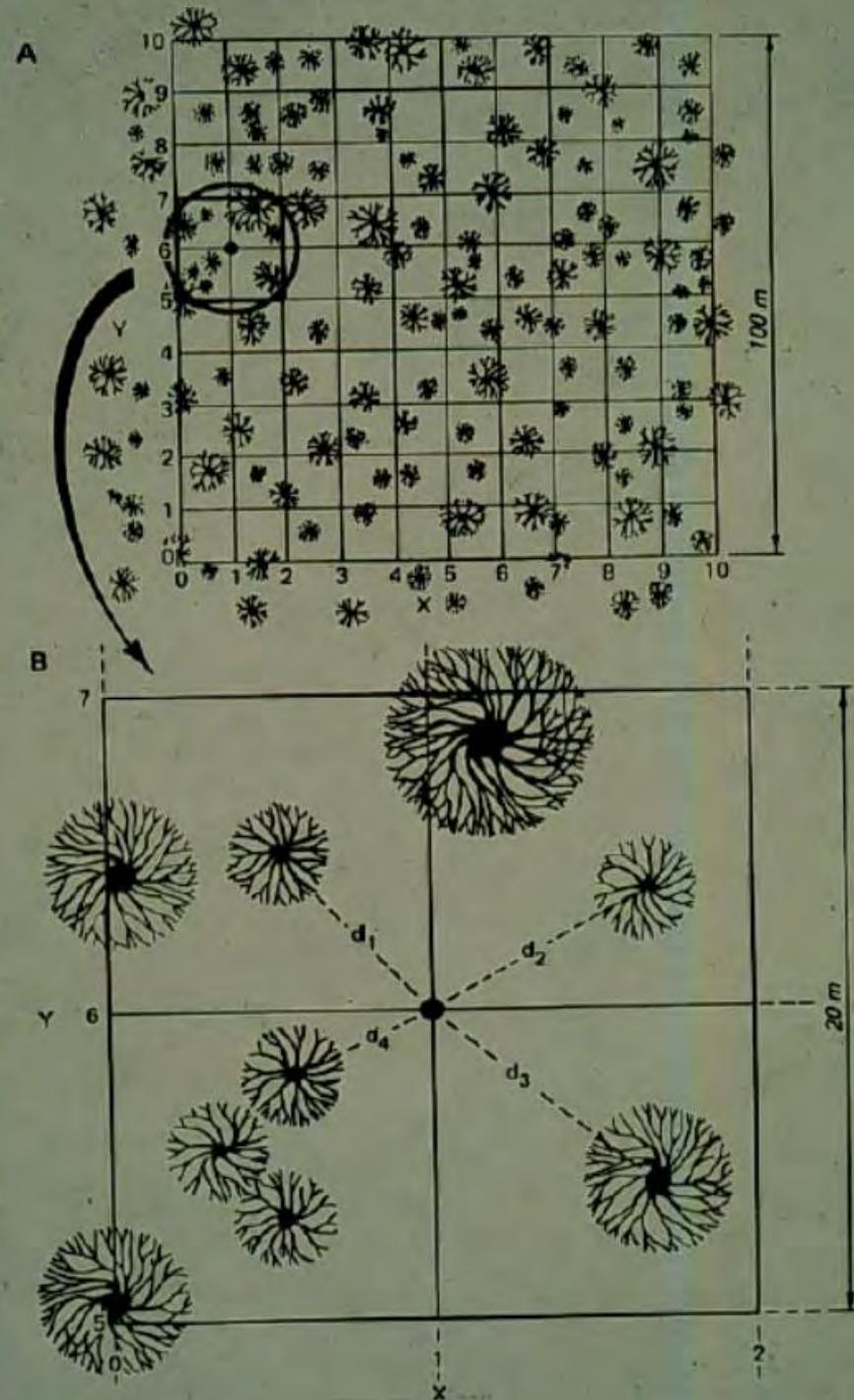


1816-1865 General Land Office Surveyors

divided state into townships with 36 square mile sections

marked four trees at each section corner

(species, dbh, angle, distance)



There are patterns in vegetation based upon what the glaciers left behind

- 14,500 years ago, glaciers covered most of the state
- Enormous volumes of meltwater sorted sand and gravel

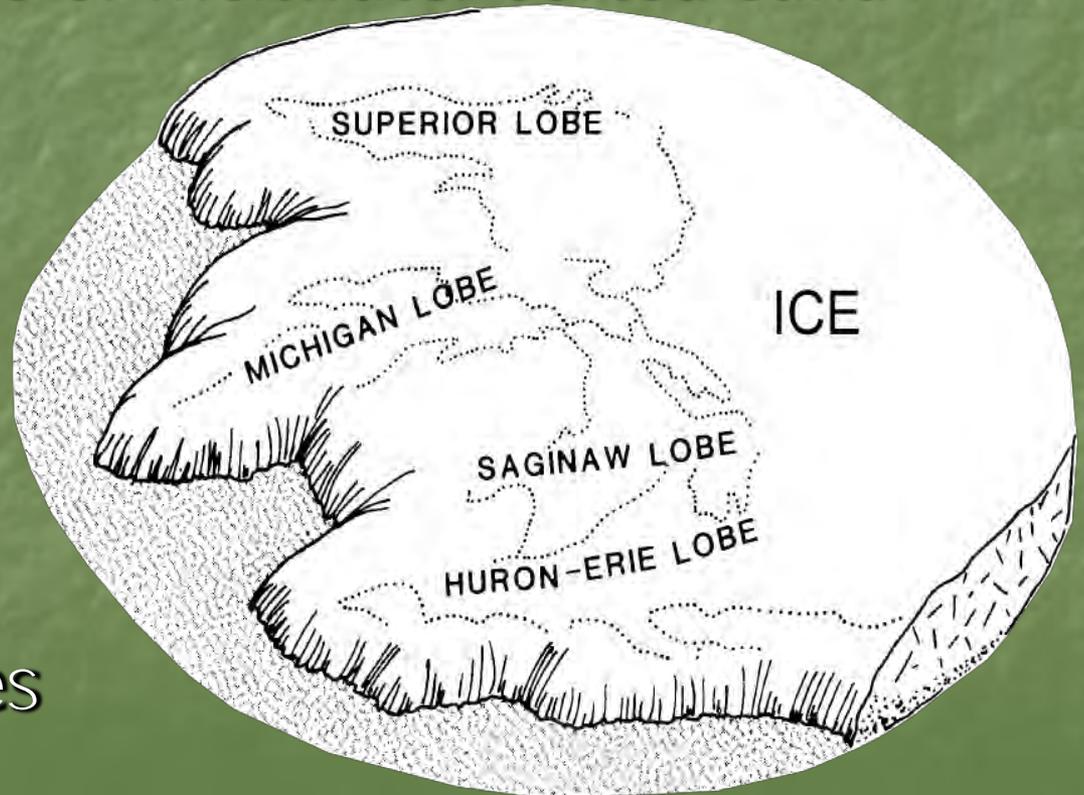
Landforms!

Moraines

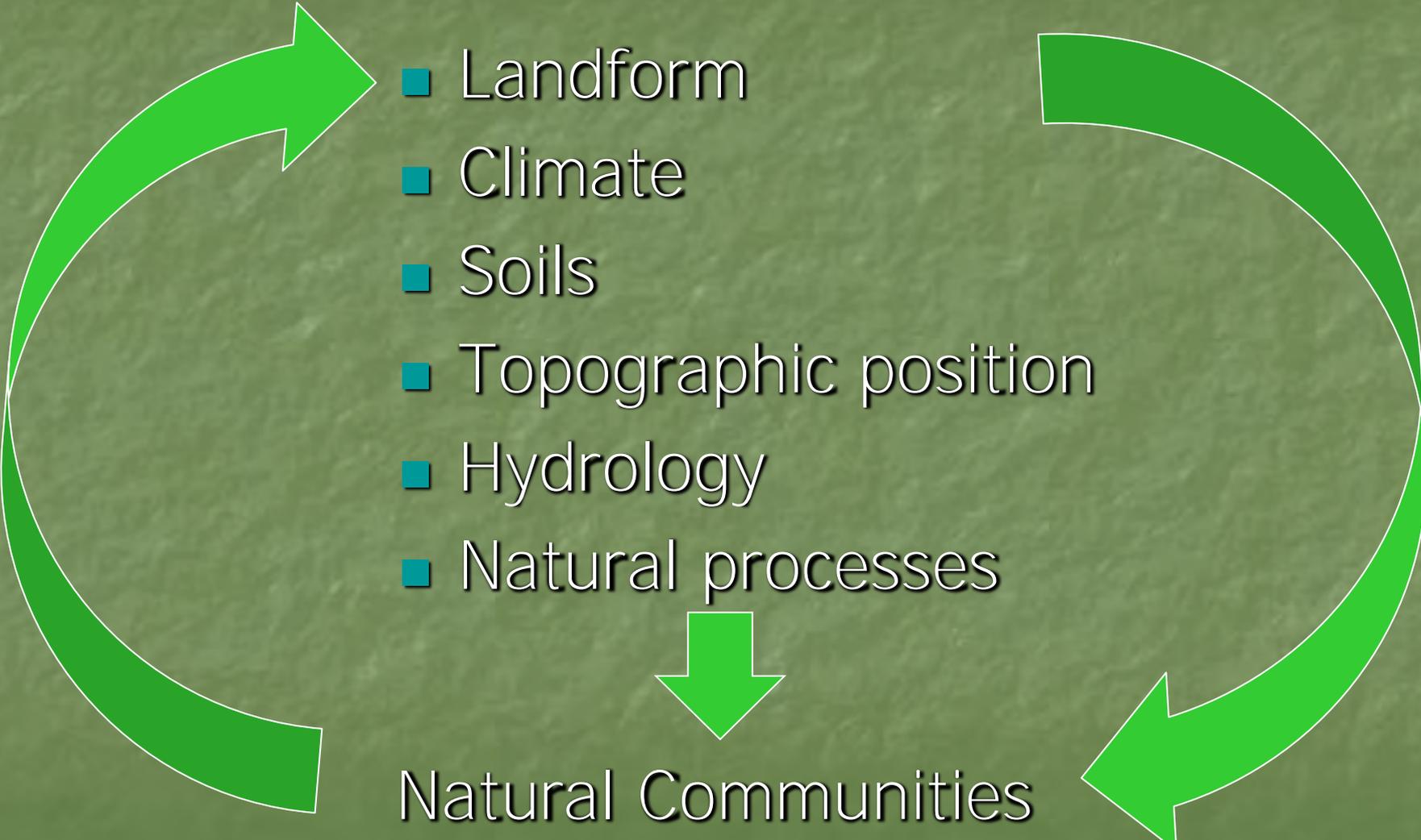
Glacial outwash

Lakeplains

Ice contact features



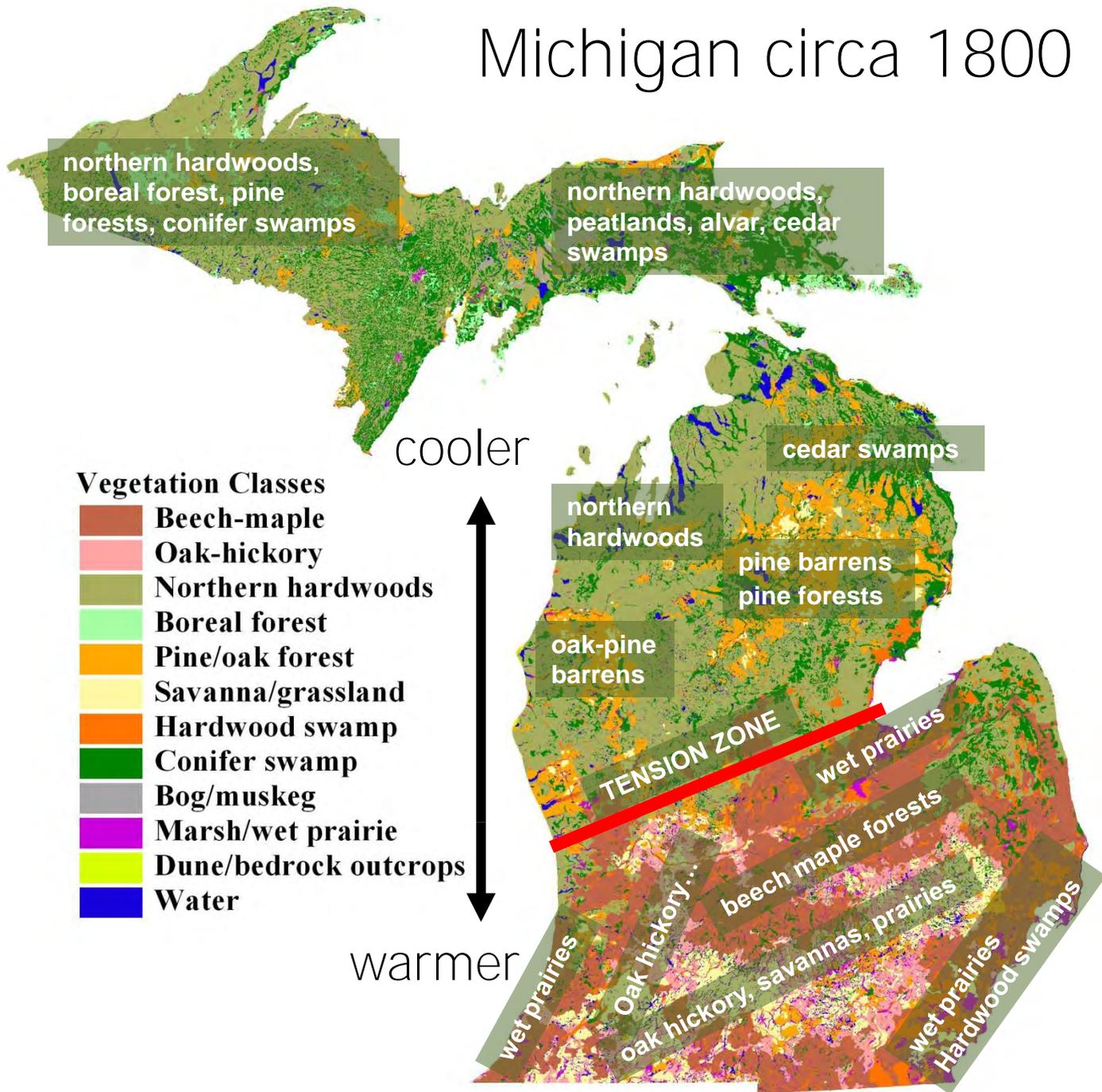
Landforms shape the soil type

- 
- Landform
 - Climate
 - Soils
 - Topographic position
 - Hydrology
 - Natural processes

Natural Communities

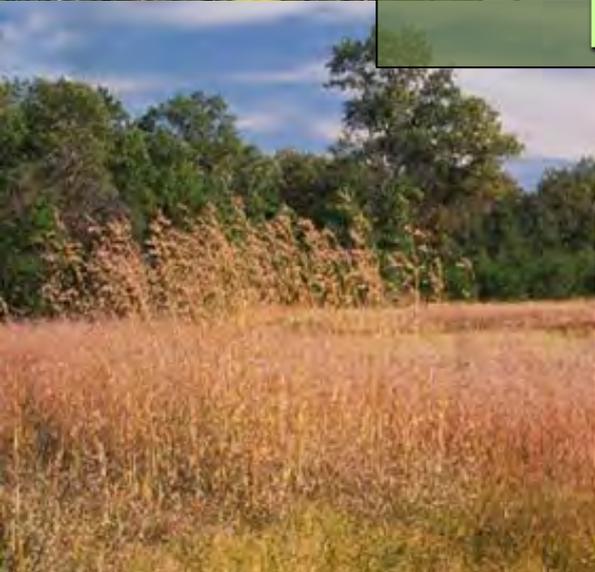
Plants, animals abiotic factors

Michigan circa 1800





Natural Communities
The coarse filter





Vulnerable Species
The fine filter





Biodiversity is not just
a numbers game.

**It's about coevolved
relationships.**

Keep all the parts!

Resiliency!



Diverse functional ecosystems sustain life on earth

That was my view of the context for
invasive species work.

Knowing what to protect is critical to cost-
effective invasive species management.

Step number one:

Identify the most important places in
your area and understand them.



Threats

- Fragmentation
 - Development
 - Roads, etc.
- Aquatic barriers:
 - Dams
 - Stream-road intersections
- Terrestrial barriers
 - Roads
- Hydrologic alteration
 - Water withdrawal
 - GL water level changes
- Nutrient enrichment
- Point source pollution
- Non-point source pollution
- Suppression of natural processes
 - Fire, flooding, etc.
- Loss of upland buffers
- Invasive species
- Climate change

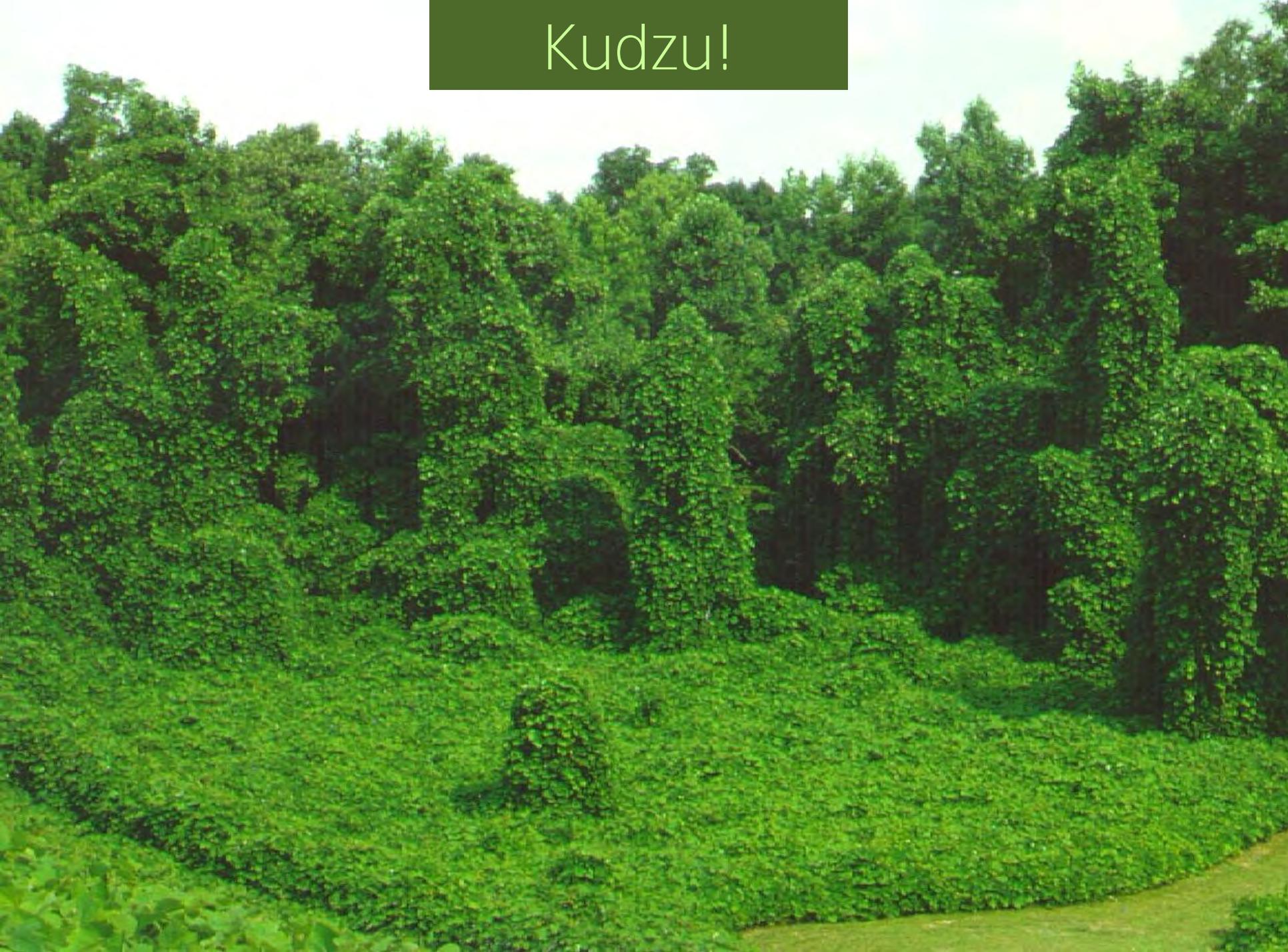
What is an invasive species?



Asian carp!



Kudzu!



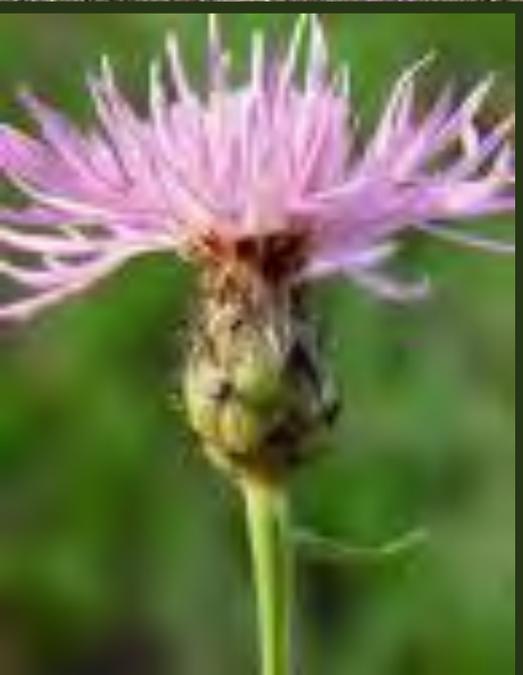
Purple loosestrife



Garlic mustard!



Spotted knapweed!



Glossy buckthorn!



Purple loosestrife

Garlic mustard



We're not talking about dandelions!



Glossy buckthorn



Spotted knapweed

Oriental bittersweet

Japanese knotweed



Invasive species are simplifying ecosystems and eroding native biodiversity.



Japanese barberry

Swallow-wort







Invasive species change the rules of existence for associated species.



If the rules change too fast & last a long time, there can be consequences for many species.









Invasive species:

Big impacts to things we desire.

- Non-native to the ecosystem under consideration

AND

- Likely to cause harm to:
 - Economy
 - Environment
 - Human health

Executive order
13112
Bill Clinton, 1999



Native species: “have been here for a sufficient amount of time to develop complex and essential relationships”

Douglas Tallamy;
Bringing Nature Home

Invasive species: “have NOT been here for a sufficient amount of time to develop complex and essential relationships”



Currently we don't have evidence of invasive species filling functional roles without dominating or reducing diversity to many fewer species than were here originally.

Which of these are invasive?

- Introduced species
- Non-indigenous species
- Exotic species
- Alien species
- Non-native species

These all mean the same thing. They have been introduced to new areas on purpose or by accident.

Only some of them become invasive.
The ones that cause HARM.

Should we be managing invasive species?



We can do something or we can do nothing.



We have and continue to protect many places through early detection and strategic management of invasive species, and we have CISMAs across the entire state!
(Cooperative Invasive Management Areas)

Cooperative Invasive Species Management Areas (CISMA)

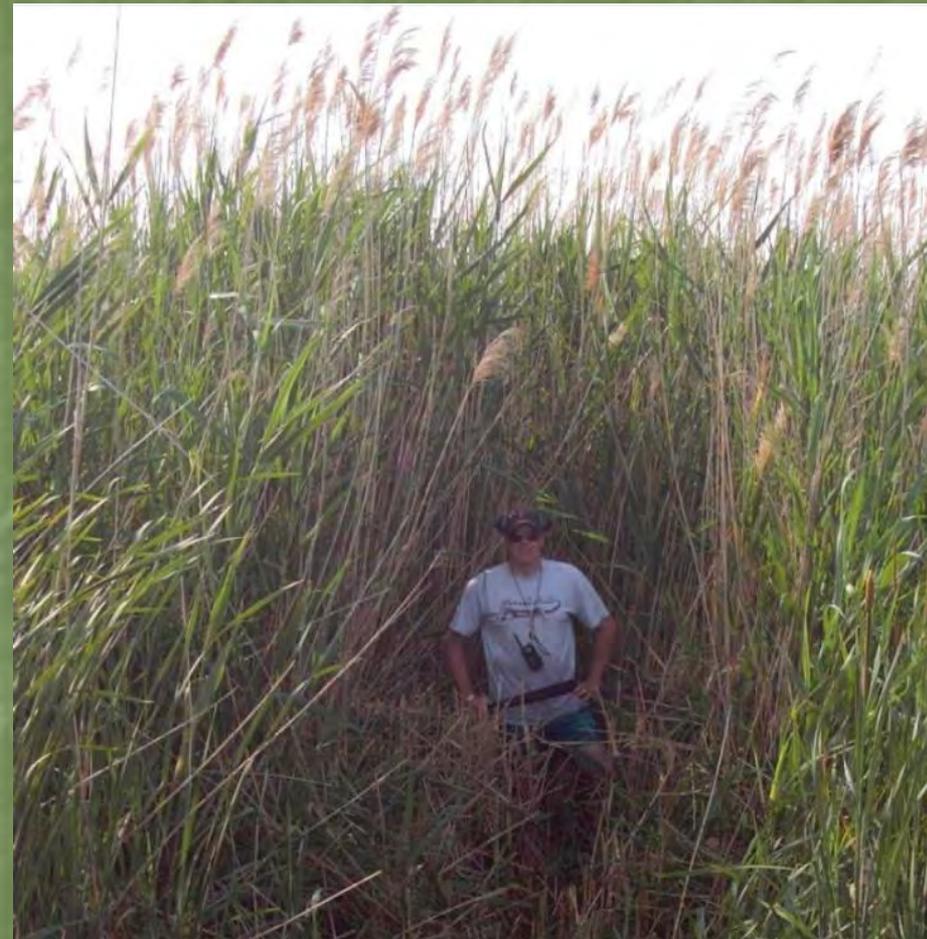


Legend

- BCK CISMA
- CAKE CISMA
- Central Michigan CISMA
- Detroit River & Western Lake Erie CWMA
- GILLS CISMA
- JLW CISMA
- Keweenaw ISMA
- Lake St. Clair CISMA
- Lake To Lake CISMA
- Mid-Michigan CISMA
- North Country CISMA
- Northeast Michigan CWMA
- Northwest Michigan ISN
- Oakland County CISMA
- Saginaw Bay Shoreline CISMA
- Southern Michigan IST
- SW x SW Corner CISMA
- Three Shores CISMA
- West Michigan CN
- Western Peninsula IC
- Wild Rivers ISC

Note: CISMAs include CNA, CWMA, IC, BCK, ISMA, ISM, and ISTs.

Safety Impacts



Non-native phragmites

Infrastructure Impacts



Japanese knotweed

Japanese knotweed



Invasive phragmites



Aesthetics impacts, property values ↓



Swallow-wort



Oriental bittersweet

Recreational impacts



MDNR-WD

European frog-bit

07.17.2013 16:03

Eroding the base of the food chain

- Non-native plants are toxic to many native insect specialists
- Insect diversity in invaded areas diminishes
- Insect diversity is vital to baby birds

Bringing
Nature Home
By Douglas
Tallamy



Lecture series
gardening by
Doug Tallamy



autumn olive



honeysuckle



Native insect specialists do not thrive here!



phragmites



buckthorn

Ecological trap!

- Invasive greens up earlier than native milkweed
- Monarchs oviposit there first
- Larvae suffer higher mortality

Photo by John M. Randall, The Nature Conservancy



Czarapata, 2005

Black swallow-wort



milkweed family



Elizabeth Czarapata, Wisconsin DNR

Are invasive species inherently evil?

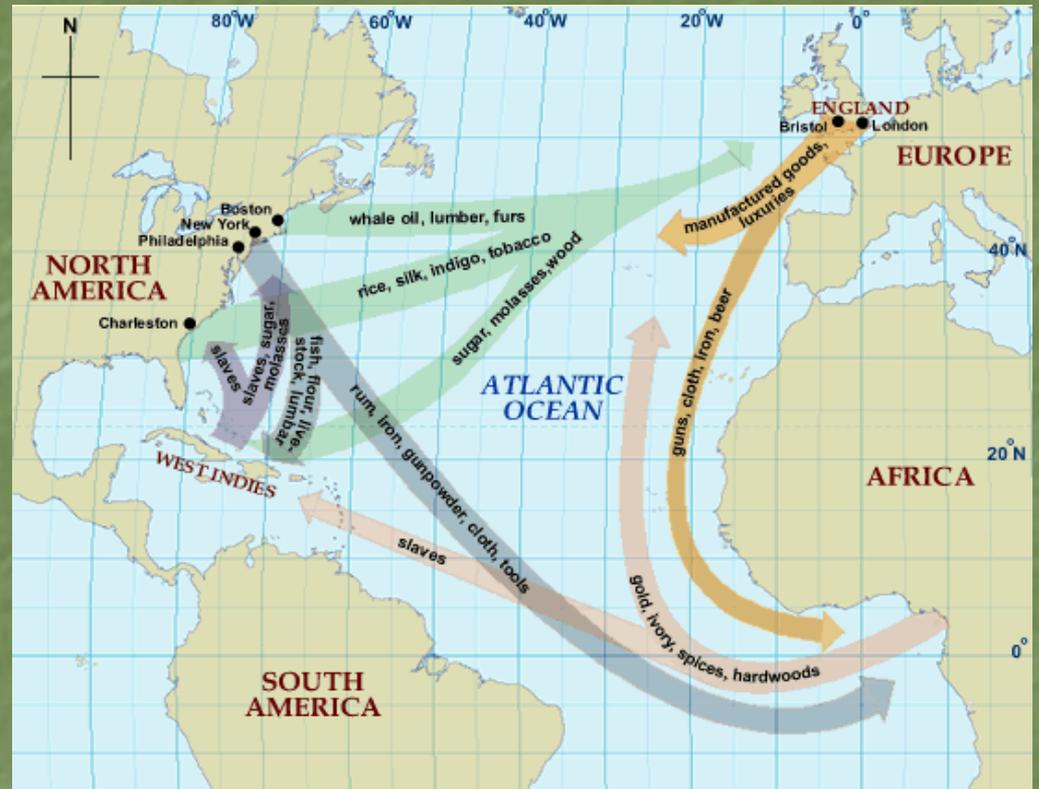
- Agriculture
- Erosion control
- Wildlife food, cover
- Medicine
- Horticulture
- Aquaculture
- Organisms in trade
- Stow-aways



Many were brought here on purpose for good reasons, before we knew they would be a problem.

Are invasive species inherently evil?

- Agriculture
- Erosion control
- Wildlife food, cover
- Medicine
- Horticulture
- Aquaculture
- Organisms in trade
- Stow-aways



Many were brought here on purpose for good reasons, before we knew they would be a problem.

Competitive Edge: reproduction and dispersal

3000 seeds/plant!



Buckthorn stump sprouts



Jap. knotweed fragment



Honeysuckle fruits

© 2003, Gary Fewless



Garlic mustard



longer growth



phragmites rhizome

How else do they spread?





So, are they evil?

No; they are just plants! BUT, they:

- Reduce diversity
- Alter habitat structure and composition
- Alter hydrology
- Alter nutrient cycles
- Alter food webs
- Affect aesthetics, recreation, infrastructure, property values

Ultimately, they reduce ecosystem resiliency.

Should we be managing invasive species?



YES! But be smart about it.

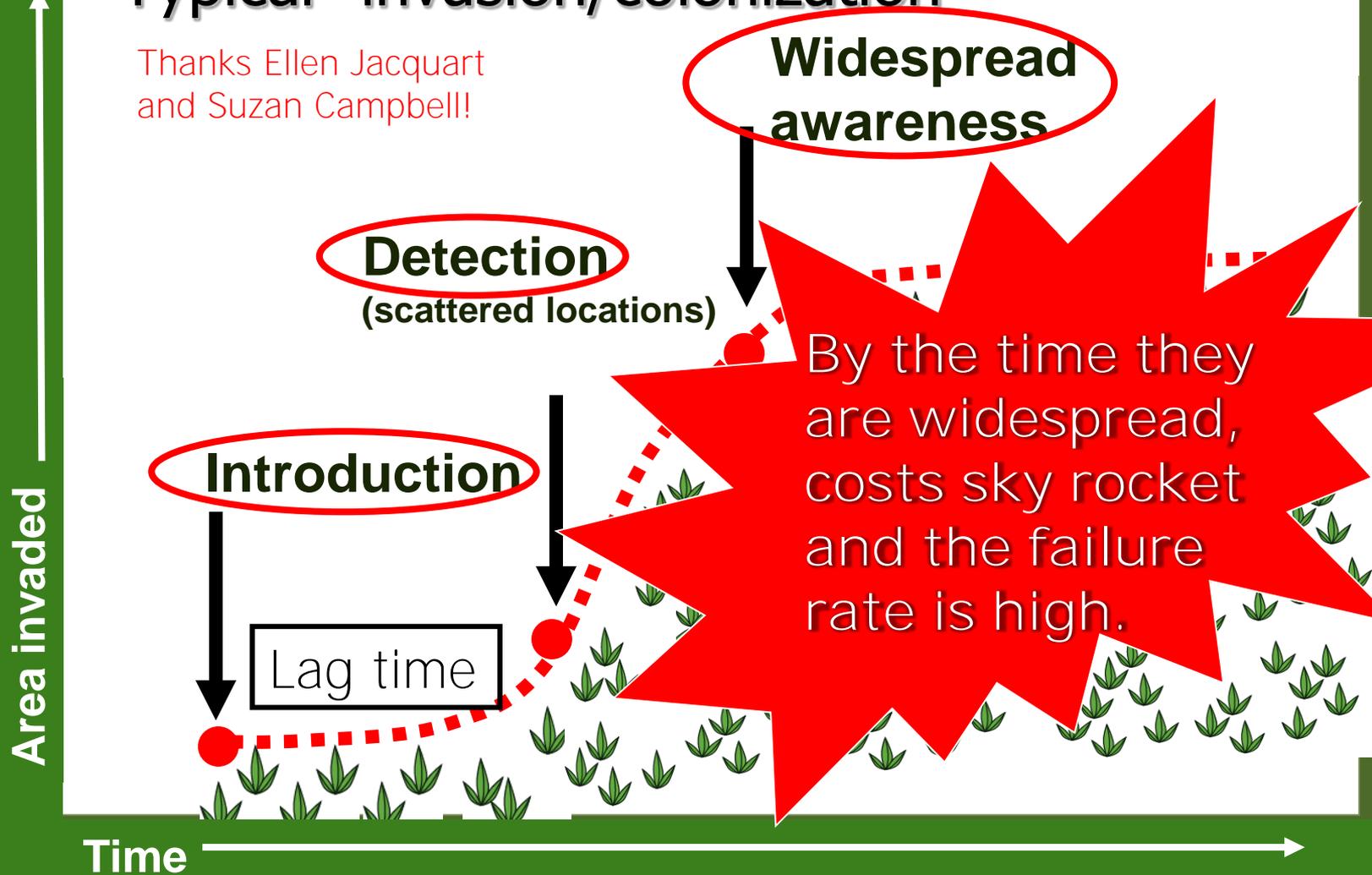


- Invasive species are NOT everywhere.
- Stop or slow the spread of high threat species that are still uncommon.
- Protect uninvaded and restorable high value sites.
- Act now before things get worse, BUT:
- Planning for success is critical.
- Taking a random shot-gun approach is not a good plan or strategy.

Thanks Ellen Jacquart!

"Typical" invasion/colonization

Thanks Ellen Jacquart
and Suzan Campbell!



| | | | |
|---------------------|----------------------|--------------------------------------|----------------------------------|
| easier, cheapest | feasible, cheaper | difficult, costs more, intensive, | expensive mgmt. lower success |
|---------------------|----------------------|--------------------------------------|----------------------------------|

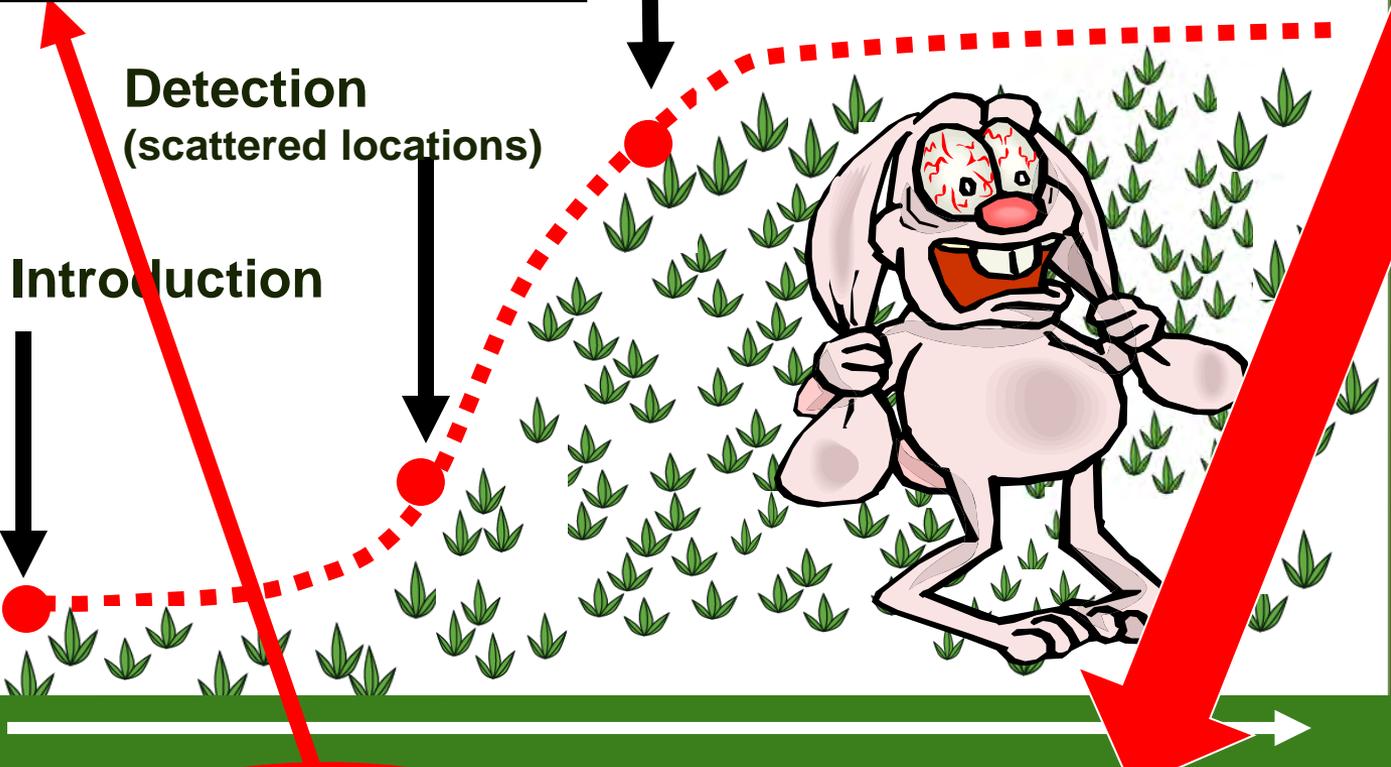
Our challenge is to pick the right battles.

Thanks Ellen Jacquart and Suzan Campbell!

Big impact species wherever they are uncommon.

Widespread awareness
(many locations)

Important places
Success likely



Detection
(scattered locations)

Introduction

Prevention

Early detection and response

Prioritizing winnable battles.
Control, contain, restore.

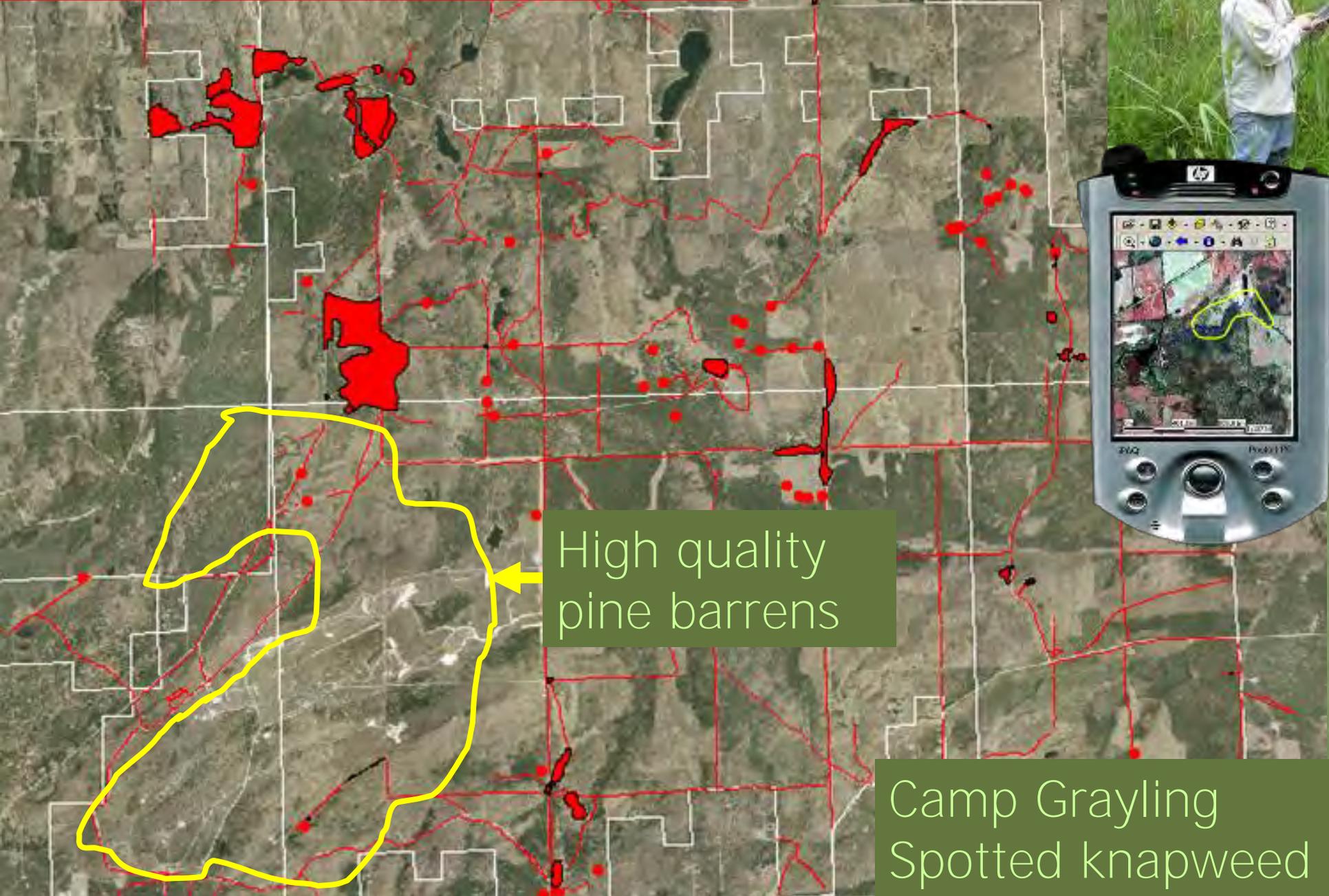
To use the invasion curve effectively it is crucial to know:

- What are you trying to protect? → PLACES
- Is the invader a real threat? → SPECIES
- Do we know how to control it? → METHODS
- Where is it, how much? → WINNABLE?

Look before you leap!



The power of mapping!



High quality
pine barrens

Camp Grayling
Spotted knapweed

A good map allows you to make informed, explicit choices.

- Important places
- Success likely

- Outliers
- Sources
- Pathways



Greens:
biodiversity
score

Red: phrag

This is when we'd like to detect phragmites!



03/19/2



With good planning and research on integrated control strategies, success is indeed possible!

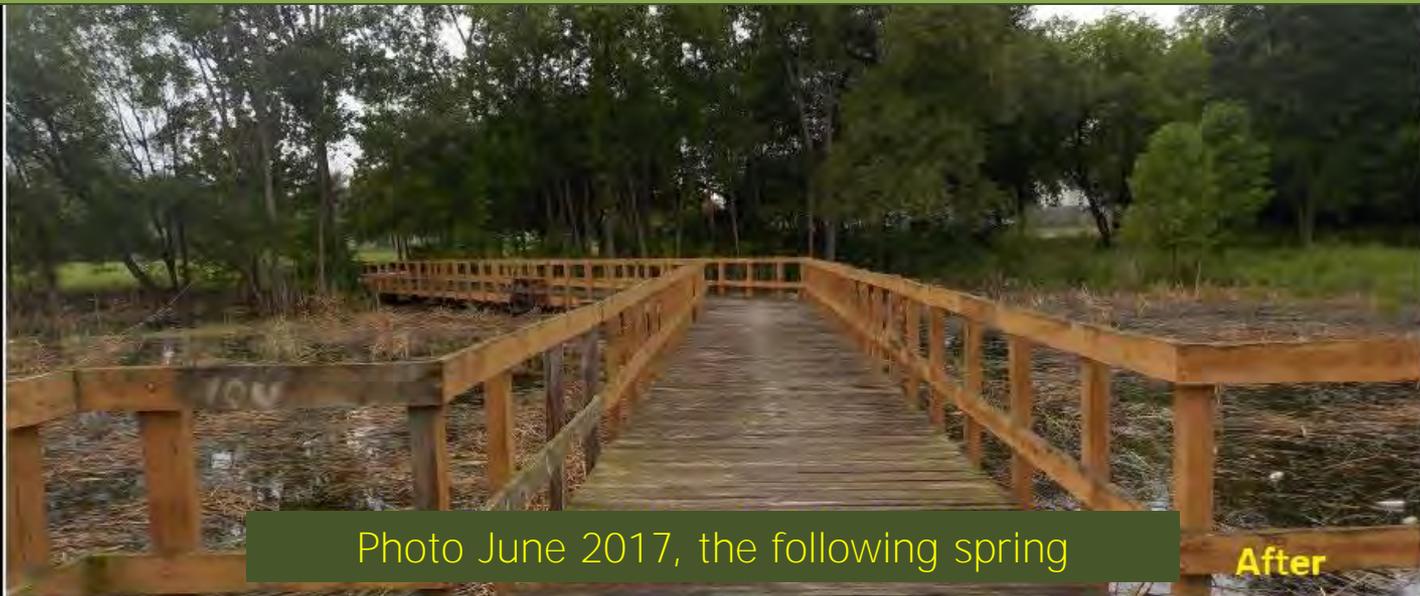


Photo June 2017, the following spring

After

The goal of management?

- Stop reproduction and dispersal.
- Therefore, you must understand the biology of the invader.

Phragmites is a perennial, rhizomatous grass.



Phragmites is a perennial, rhizomatous grass.



Apply herbicide in the fall when the plant is sending **it's** resources to the rhizomes. The herbicide will be **translocated too. If you don't kill the rhizome, it will** grow right back. If possible, burn the dead biomass from large infestations the next year and treat re-sprouts. Repeat as needed.



Garlic mustard is an herbaceous biennial that produces seed in year two and then dies. It is a prolific seeder producing seeds that can live upwards of 10 years in the seed bank.



Pull 2nd year plants just prior to **flowering. It's easier and more** effective. You must get the root crown. Do not put plants in compost; they may still produce seed! Continue each year until the seedbank is exhausted.

Start with small outliers and push back to main infestation



Common buckthorn is a woody shrub and a prolific berry producer; it stump sprouts aggressively after cutting:



(C) 2002, Gary Fewless

Cut and dab with herbicide immediately after cutting to stop stump sprouting.



OMG! Look at all the seedlings from seed bank.

Duh! Should have planned for that.



Deal w/ seedlings; use prescribed fire where possible.

Learn and understand the biology of the invader and use it to your advantage.

Multiple techniques often are required.



The Midwest Invasive Species Information Network (MISIN) is a regional effort to develop and provide an early detection and rapid response (EDRR) resource for invasive species.

The goal of this regional resource is to assist both experts and citizen scientists in the detection and identification of invasive species in support of the successful management of invasive species.

This University of Illinois Extension Support

IDENTIFICATION
MODULES

REPORT



Report invasive species in your area. Your sightings are an important part of any successful control effort.

ALERTS



Create custom email alerts for new observations in your area of interest.

DISTRIBUTION



Browse the distribution of reported invasive species. Search by common name and geography.

Species? GPS point? How much? How dense? Photo!

Midwest Invasive Species Information Network

HOME ABOUT NEWS TRAINING REPORT SIGHTINGS SPECIES INFORMATION BROWSE DATA HELP

AIS News Blogs Meetings News Highlights Partners What's New

Viewer Tools



Current Action: Re-center Map

View Species

Select a specimen

Black Swallow-Wort

We took lessons learned from DNR Parks Stewardship Program: simple but informative

Map Zoom:

15

Zoom level must be 15 or greater for location to be accepted when verified.
Leave map zoomed in after you establish your final location.

Observer:

Phyllis Higman

Latitude:

46.556853655491054

Longitude:

-87.38533973693847

Common Name:

-- Select --

Date:

/

Area:

-- Select -- (acres)

Density:

-- Select --

Comments:

Submit

Clear

Select by common
or scientific name

- Individual, few, several
- < 1000 sq. ft
- 1000 sq. ft. to 0.5 acre
- 0.5 to 1 acre
- >1 acre

- Sparse
- Patchy
- Dense
- Monoculture

Take a photo too!

Search by Date

Search by Species

Search by Geography

Search by Project

Search by Contributor

Reported Species Observations

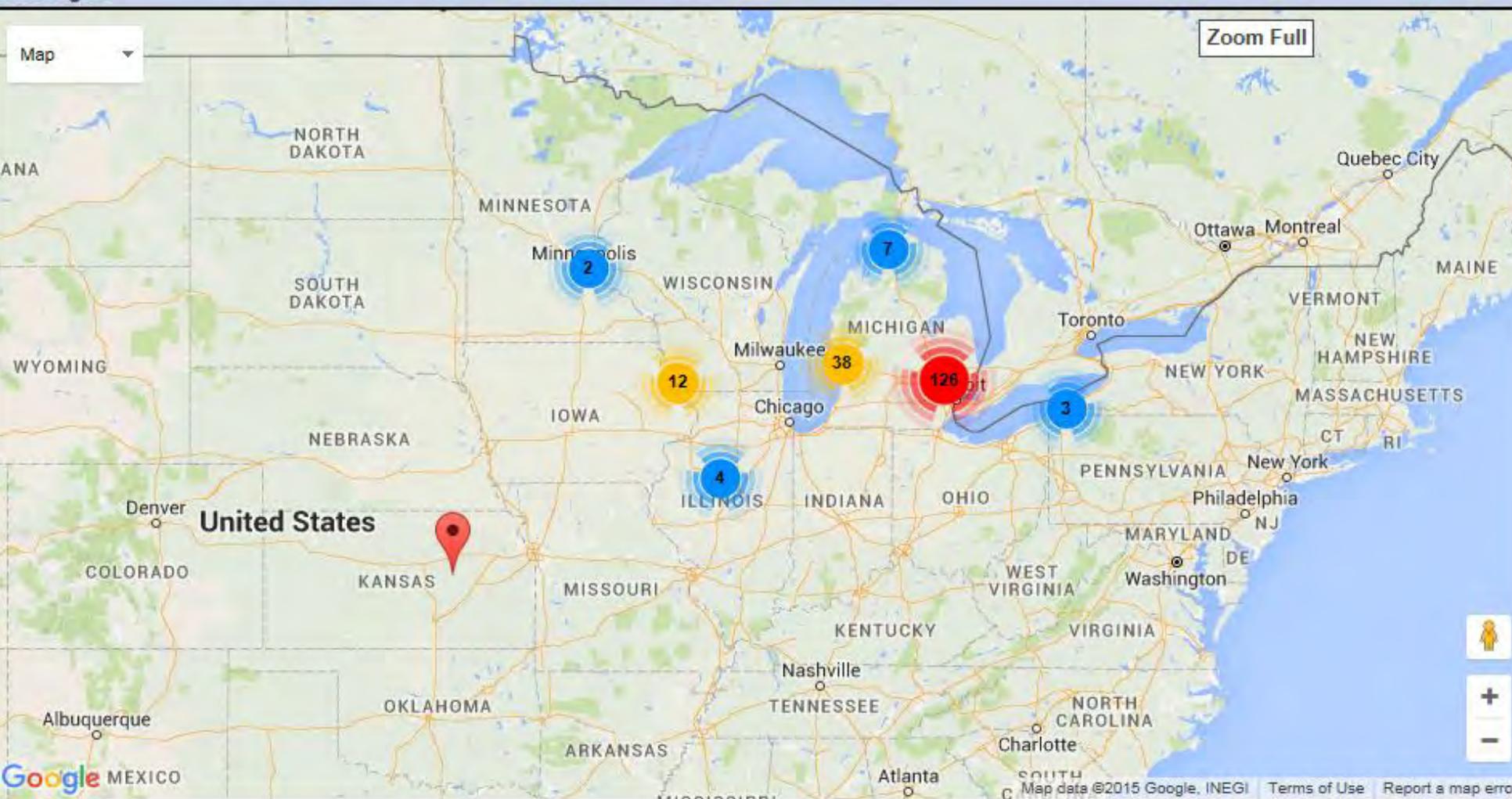
Black swallow-wort



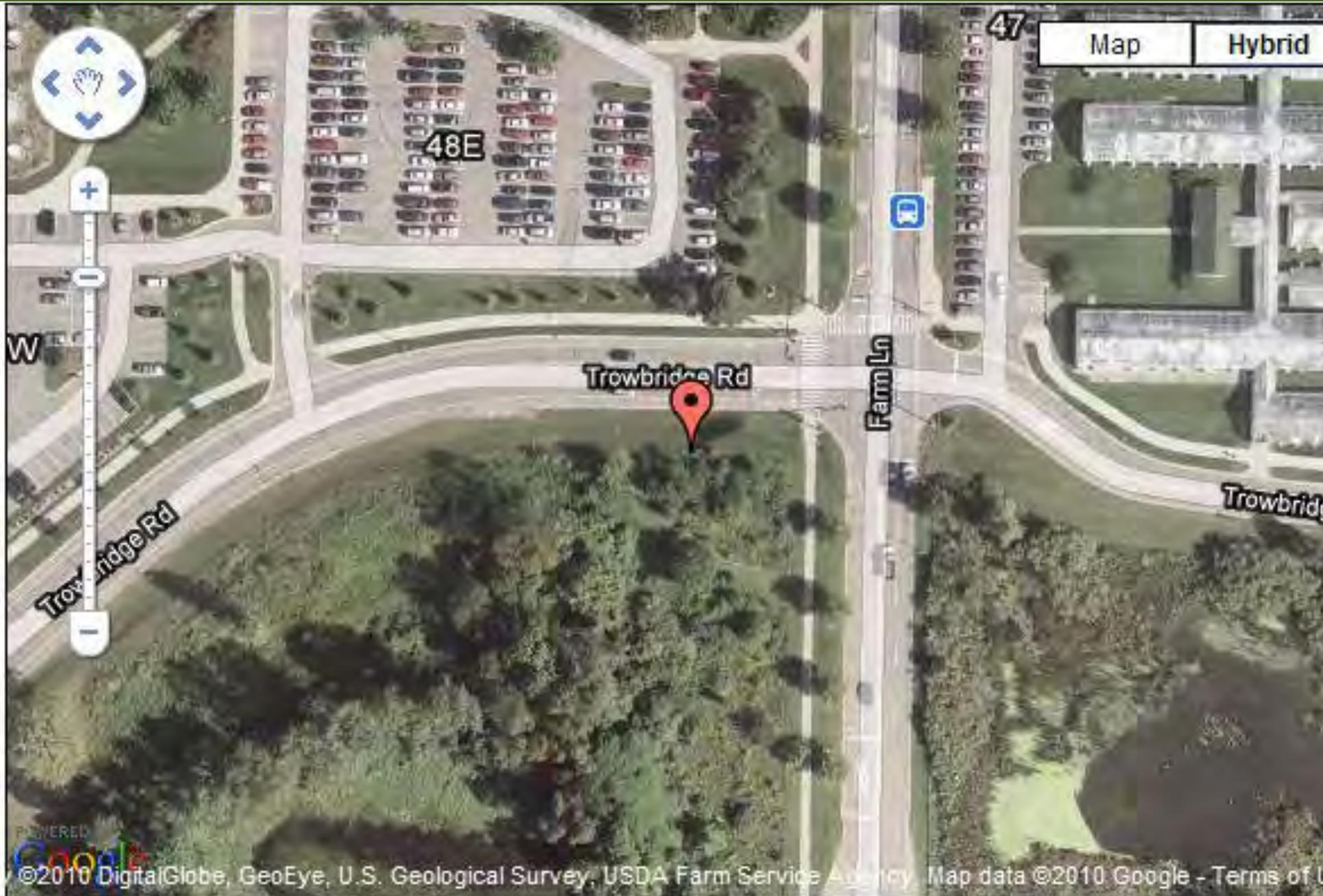
Messages:

Map

Zoom Full



Midwest Invasive Species Information Network (MISIN)



We need YOU to be early detectors!
Report locations to the MISIN!



<http://www.misin.msu.edu/>

Pop Quiz!





garlic mustard

4 petaled,
white flowers

Long siliques with
many seeds

2nd year bolt & flowering;
triangular leaves

first year, round
basal rosettes



garlic mustard



Photo by: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

garlic mustard





spotted knapweed



P. Higman

© Ted Carland

Compound, pinnately divided basal leaves



Wild parsnip

Elizabeth J. C.



Flat-topped umbel of yellow flowers

Photo: Anna Lexa Andethers

Wild parsnip



Phytotoxin: sap, skin moisture and sunlight result in serious burns





UGA0581045

Japanese knotweed



Alternate leaves; flat bases; cuspidate leaf tips

axillary flowers in clusters



P. Higman



R.W. Smith



P. Higman



Ocrea: tubular sheathing stipule

©2003 Gary Fewless

Roots!



NRCS USDA



USFS, Bugwood.org

1557047



Japanese knotweed, LTD. Ireland, Ltd.



03/28/2025

Japanese knotweed

Restricted



giant knotweed

round-lobed leaf
bases (cordate)

much bigger (lvs
up to 16" long)





small, goldish
'fuzzy' buds

alternate

glossy buckthorn



prominent
lenticles

alternate leaves, entire
margins, obovate



Berries ripen from red to black



prominent veins
to leaf margin

glossy buckthorn
in a prairie fen



glossy buckthorn



Invades full canopy too; usu. wet sites; leaves still green while overstory trees are senescing-longer growing time.



P. Higman

common buckthorn



John M. Randall, TNC



©2002, Gary Fewless



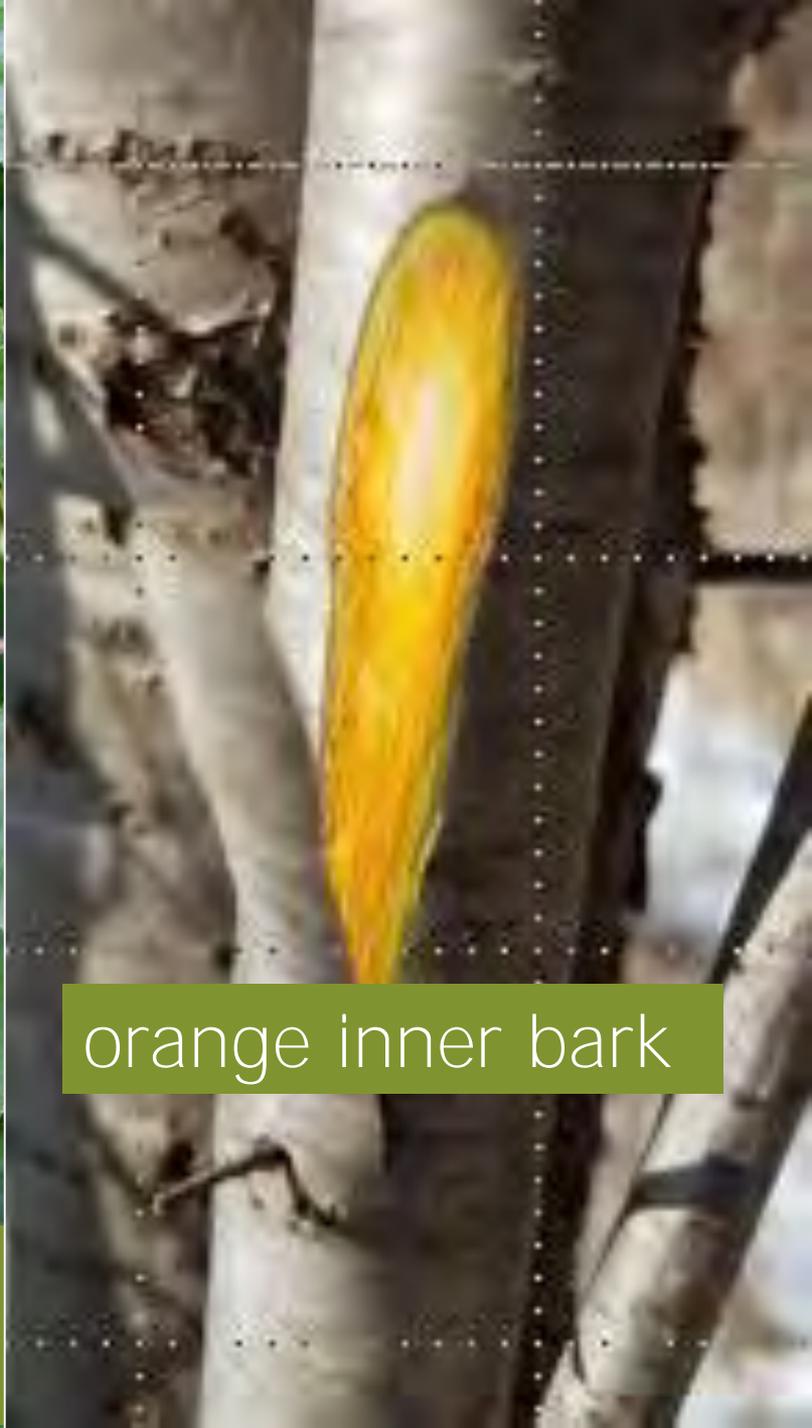
common buckthorn

round-toothed margin; veins curve towards leaf tip

sub-opposite and alternate leaves

vtinvasives.org

Chris Evans, The University of Georgia, USA



orange inner bark



©2002, Gary Fewless

Eurasian honeysuckles



irregular flowers



opposite leaves
entire margins

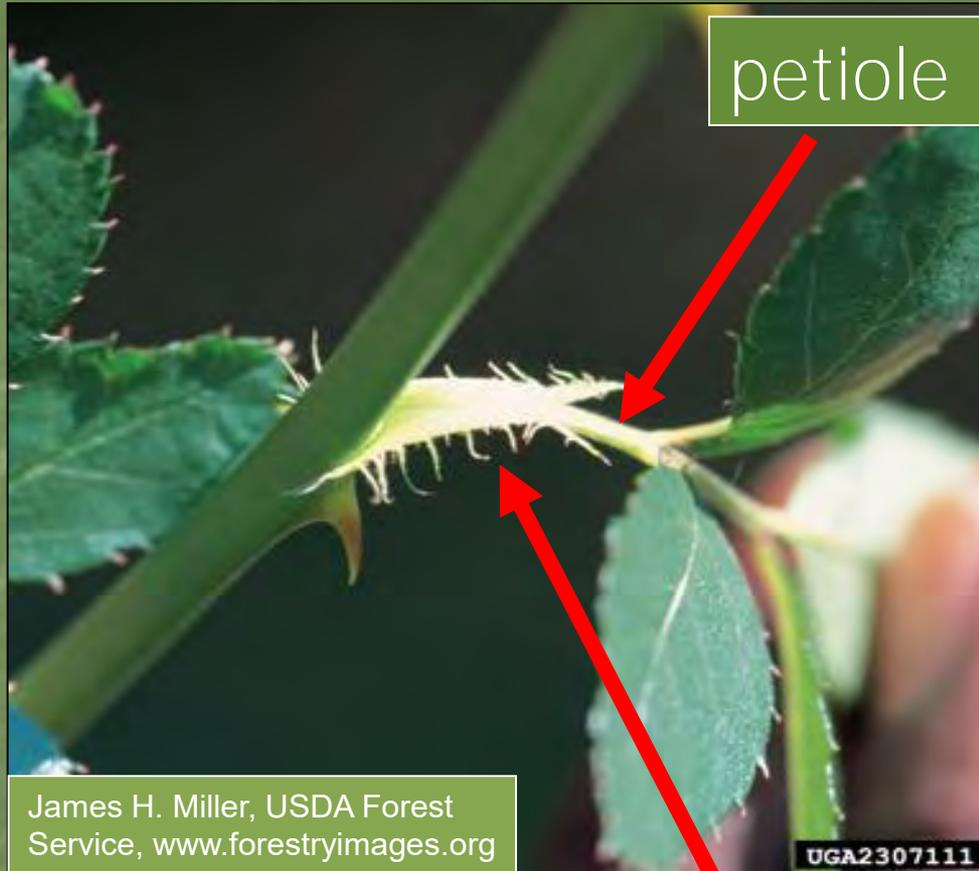
prolific berries



native honeysuckles



non-native honeysuckles



petiole (leaf stalk)

James H. Miller, USDA Forest Service, www.forestryimages.org

UGA2307111

cilia on stipule

multiflora rose



white flowers

compound leaves



stout, down-curved
thorns AND cilia







©2003, Gary Fewless

Autumn olive



Emmet J. Judziewicz,
Wisconsin State Herbarium



©2003, Gary Fewless

©2003, Gary

©2003, Gary Fewless, Wisconsin DNR, Wisconsin State Herbarium



P. Higman, MNFI

Japanese barberry



dangling flowers



small, arching shrub



alternate leaf clusters
with thorns at base

Japanese barberry





opposite leaves; entire margins

Black swallow-wort

A vine with opposite, entire leaves and winged seeds in pods



Pale swallow-wort



Black swallow-wort



Black swallow-wort





vine with alternate leaves

Oriental bittersweet



Oriental bittersweet



Native climbing
bittersweet



terminal flowers

Non-native Oriental
bittersweet



axillary flowers



Japanese stiltgrass

Nancy Loewenstein, Auburn University, Bugwood.org



white stripe on mid-rib
of leaves, slightly off-
center; short leaves

Jim Odell, Ann Arbor, MI



Leaves grow on top of each node
and root at the nodes look like



Leslie J. Mehrhoff, Univ of Connecticut, Bugwood.org

Japanese stiltgrass

MDNR Watch list



Chris Evans, IL Wildlife Action Plant, Bugwood.org

What can you do?

- Go to wild places every time you can.
- Clean your boots, clothing and vehicles.
- Think strategically: 1) prevention, 2) early detection and right response, 3) winnable battles in important places.
- Study distribution maps, control methods, & resources before acting.
- If you do act, document your methods, monitor, and share results.

Google MNFI; publications

A Field Identification Guide to
Invasive Plants
in Michigan's Natural Communities



*A resource for public land managers, land stewards
and volunteers engaged in conserving & restoring
Michigan's native plant & animal communities*



**MICHIGAN STATE
UNIVERSITY
EXTENSION**



A Field Guide to
Invasive Plants
of Aquatic and Wetland Habitats
for Michigan

Susan Campbell, Phyllis Higgins, Elise Staehelin and Ed Schuch

2010



People protect what they know and love. Take your friends to wild places so they will come to love them.





Healthy, diverse, functional ecosystems really do matter!





The sum is greater than its parts!

