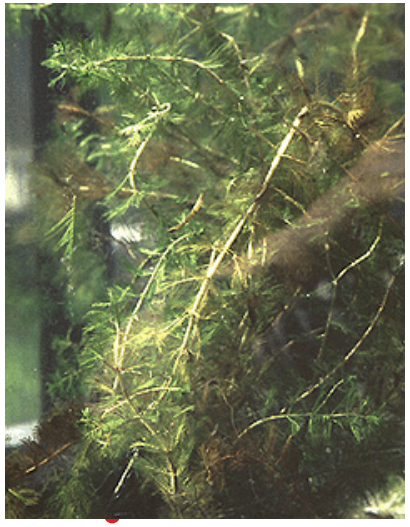


Invasive and Non-native Species:

How big a problem are they?

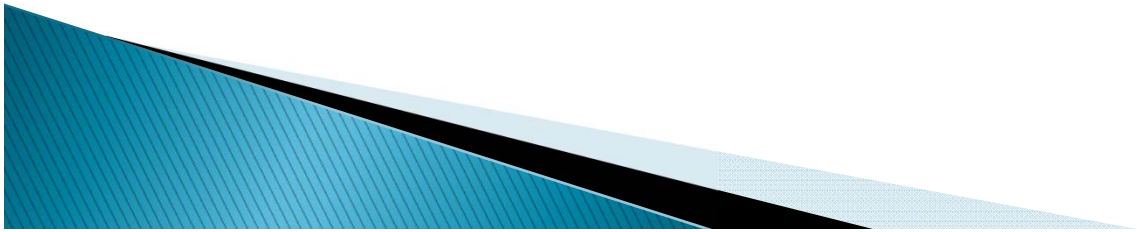
What do we really know?

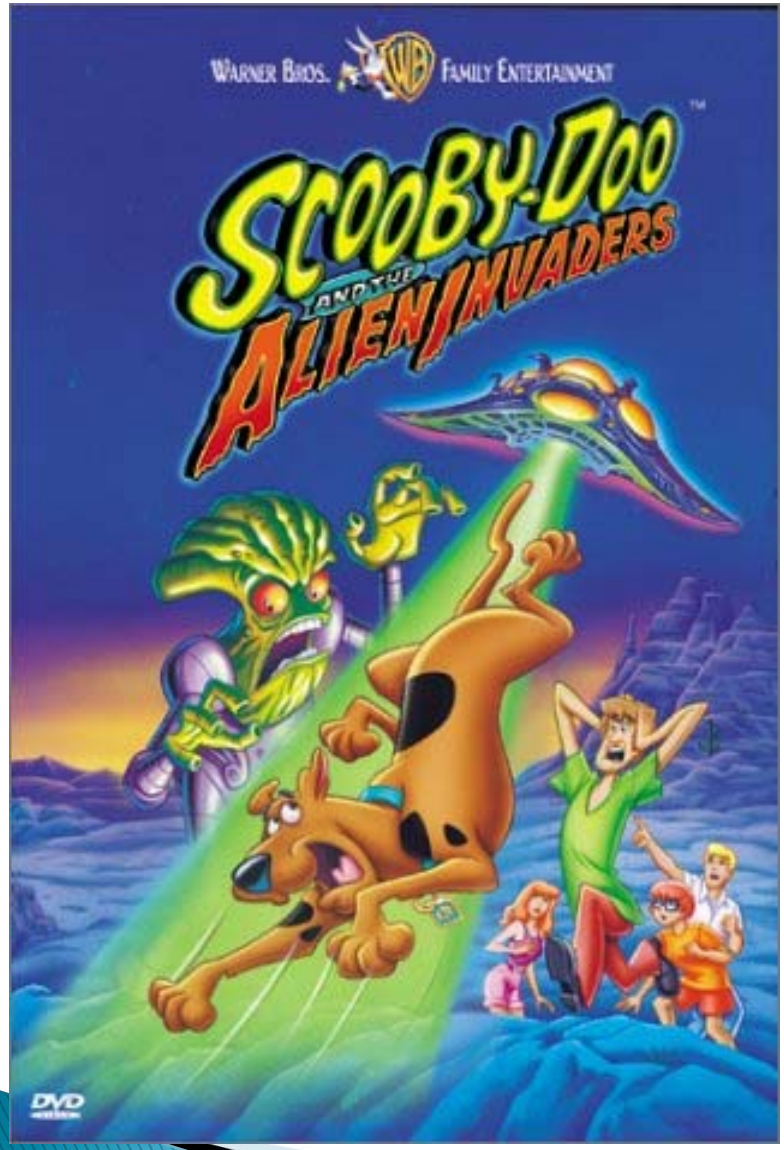
Definition

A species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
US Government definition, National Invasive Species Council

www.invasivespecies.gov

A species that spontaneously and aggressively spreads after deliberate or inadvertent introduction to a new locale.
Rejmanek & Richardson 1996




Warner Bros.
Family Entertainment
Scooby-Doo
and the
Alien Invaders
DVD

Vascular plant invasions (non-native)

Region	Number of native species	Number of non-native species	% non-native species
USA	?	2,000	?
Alaska	1,230	145	11
Florida	5,000	1,225	20
New England	2,000	890	30
Europe	11,000	1,600	13
Egypt	2,815	86	3
Bermuda	165	303	65
Puerto Rico	2,740	355	11
New Zealand	1,790	1,570	47

Invaders and the Invaded

Invasiveness:

- High fertility
- Good dispersers (seeds, cuttings, etc)
- Alter ecosystem
- Stress tolerant
- Few predators/diseases
- Good competitor
- Wide niche tolerance

Ecosystem vulnerabilities:

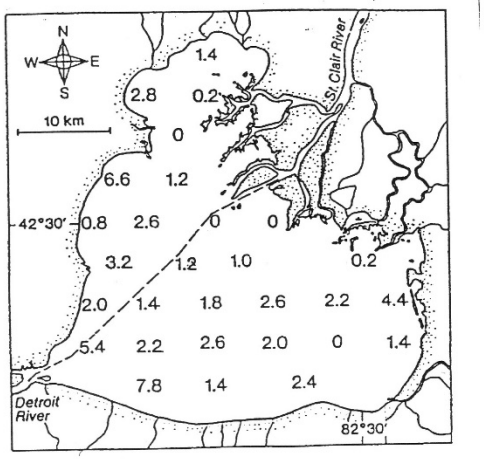
- Nutrient loading
- Vacant niche
- Physical disturbance
- Altered hydrology
- Increased salinity
- Accessibility/ connectedness
- General human alteration of landscape

What do invasives do to invaded ecosystems?

Difficulties for wetland creation/restoration
Harm endangered/threatened/rare species
Reduce diversity (at varying levels)
Alter physical structure of ecosystem
Alter hydrology
Alter disturbance regime
Alter ecosystem processes
Damage human industries
Harm humans

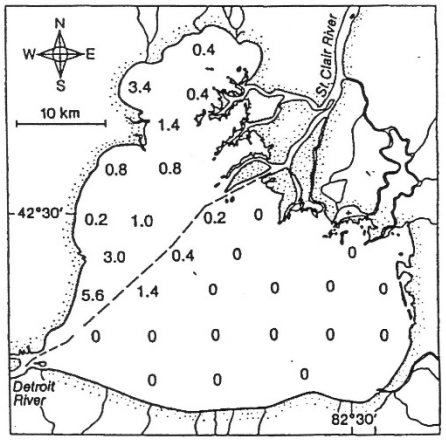
But do we actually have evidence that invasive species do these things in wetlands or aquatic systems?

Harm endangered/threatened/rare species



1986

Purple loosestrife
Lythrum salicaria



1992

Reduce diversity

Pre and post purple loosestrife invasion

Plant diversity – decrease at highly invaded sites
Native plant abundance – large decrease
Plant biomass – negative effect
Invertebrate community – smaller sizes
Wetland birds – shift to generalist species??

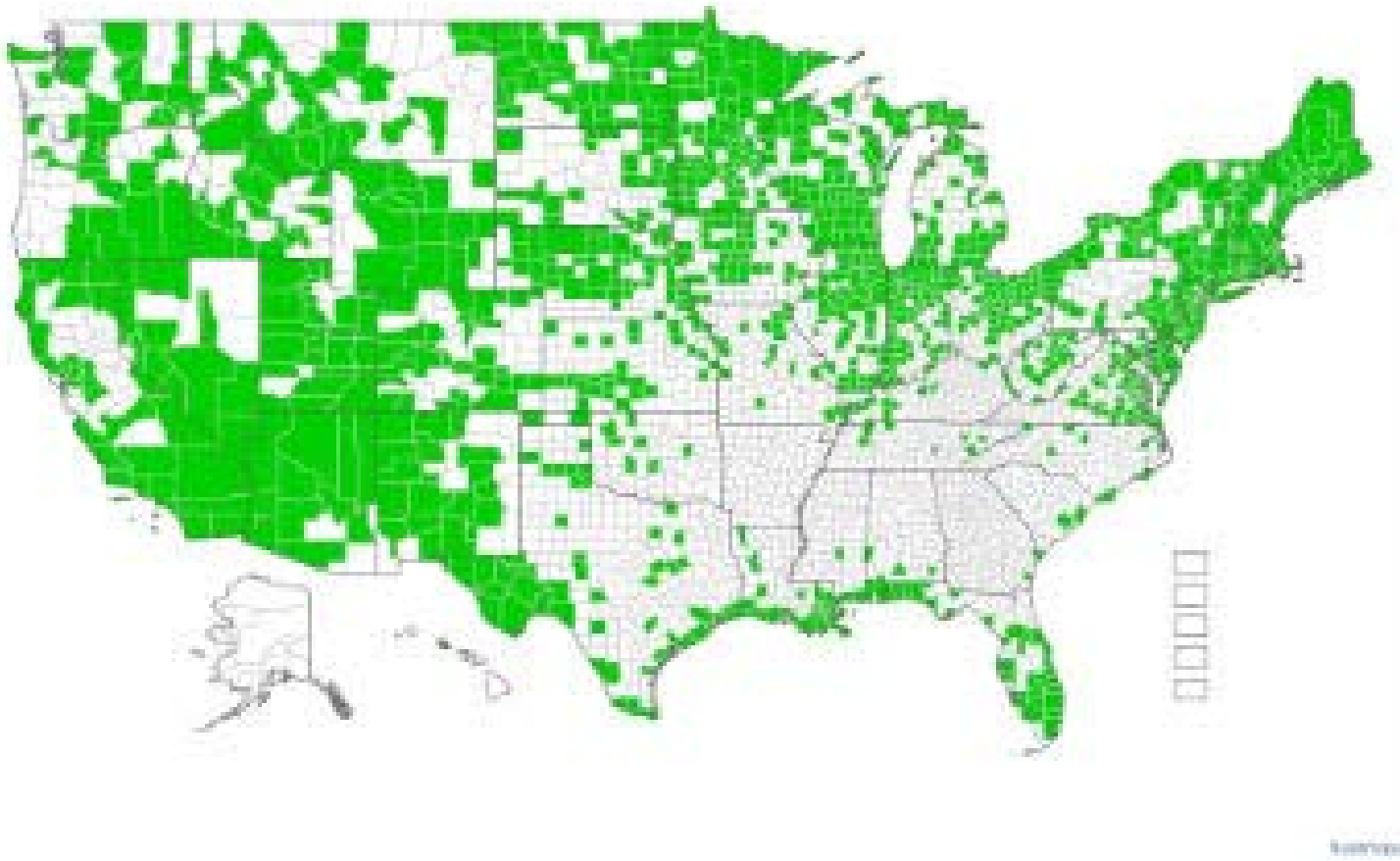
Reduce diversity

Reed canary grass
Phalaris arundinacea

Common reed
Phragmites australis

Tall invasives reduce plant diversity
Some reduce invert community diversity
Some reduce bird usage of the area

Phragmites in Green Bay, WI



Phragmites australis range map

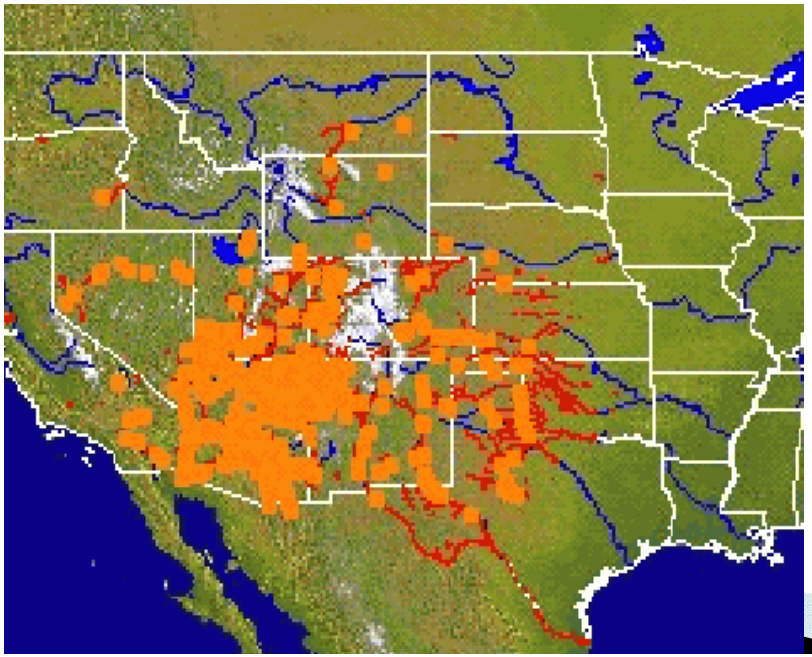
Reduce diversity

Saltcedar (Tamarisk spp.):

Invertebrates – negative effect on richness & diversity

Shrubs & herbaceous plants – negative
effect on composition & biomass

Bird community – less food, nesting sites;
lower densities, lower diversity
154 birds/40 ha vs. 4/40 ha
in 39 ha > # in 19,000 ha



Tamarisk

Reduce diversity

Mimosa

Alter physical structure of ecosystem

Phragmites

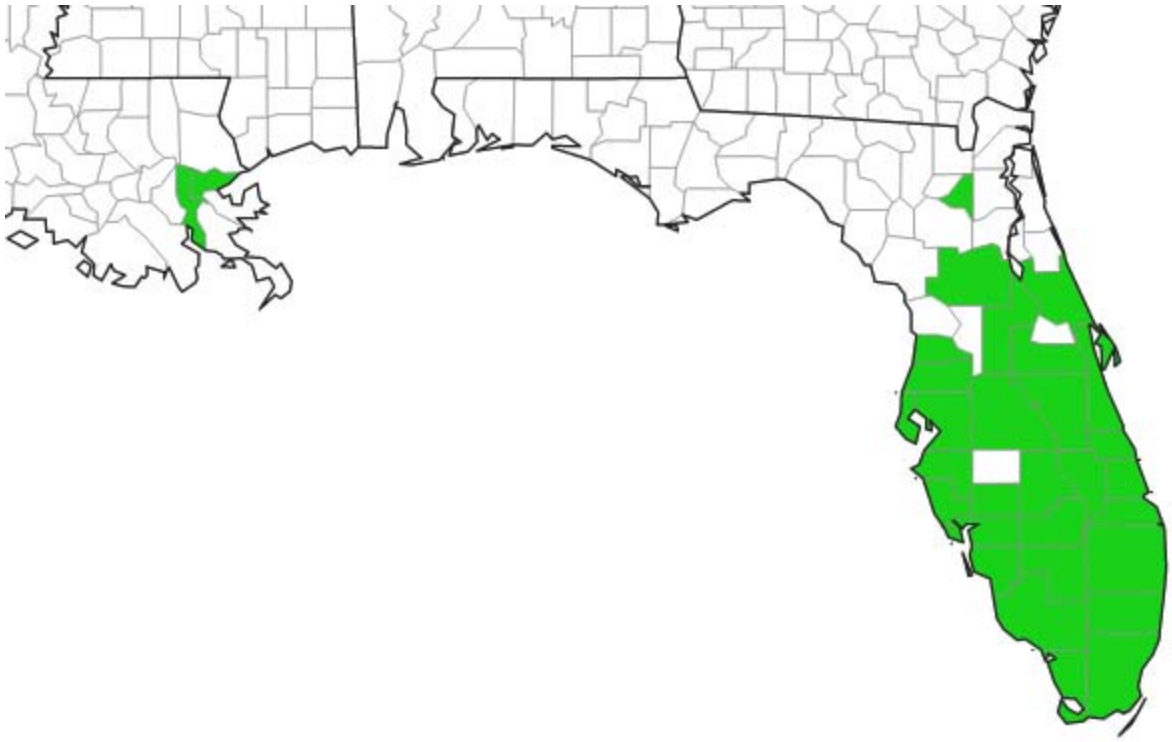
Spartina hybrid

Alter hydrology

Phreatophyte: sends roots to groundwater

Water hyacinth
(*Eichornia crassipes*)

Alter hydrology



Melaleuca quinquenerva in 2015

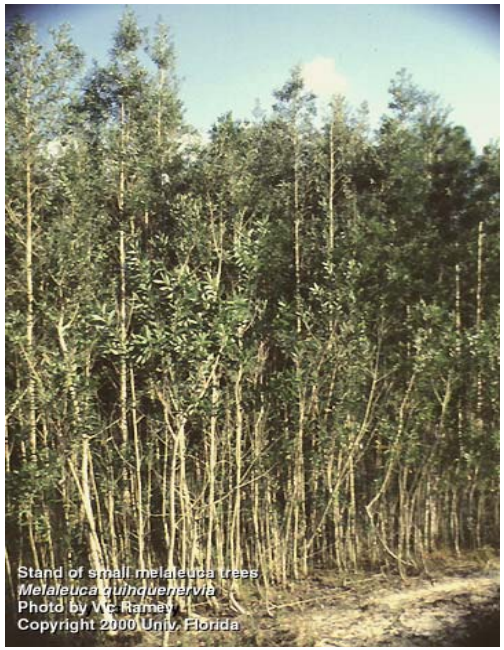
Alter disturbance regime

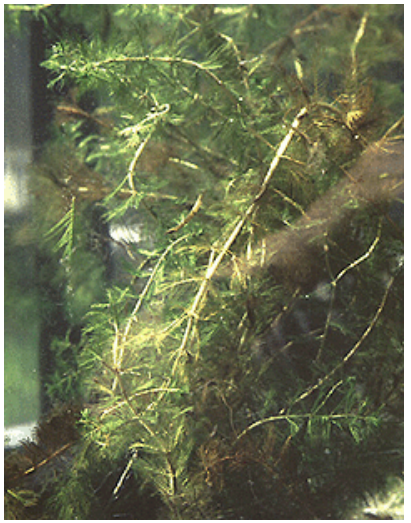
Fire frequency

Erosion alteration

Alter ecosystem processes

Carbon cycles: herbivory, detritivory
predator-prey interactions





Edibility & quality of food
Habitat & cover alterations

Alter ecosystem processes

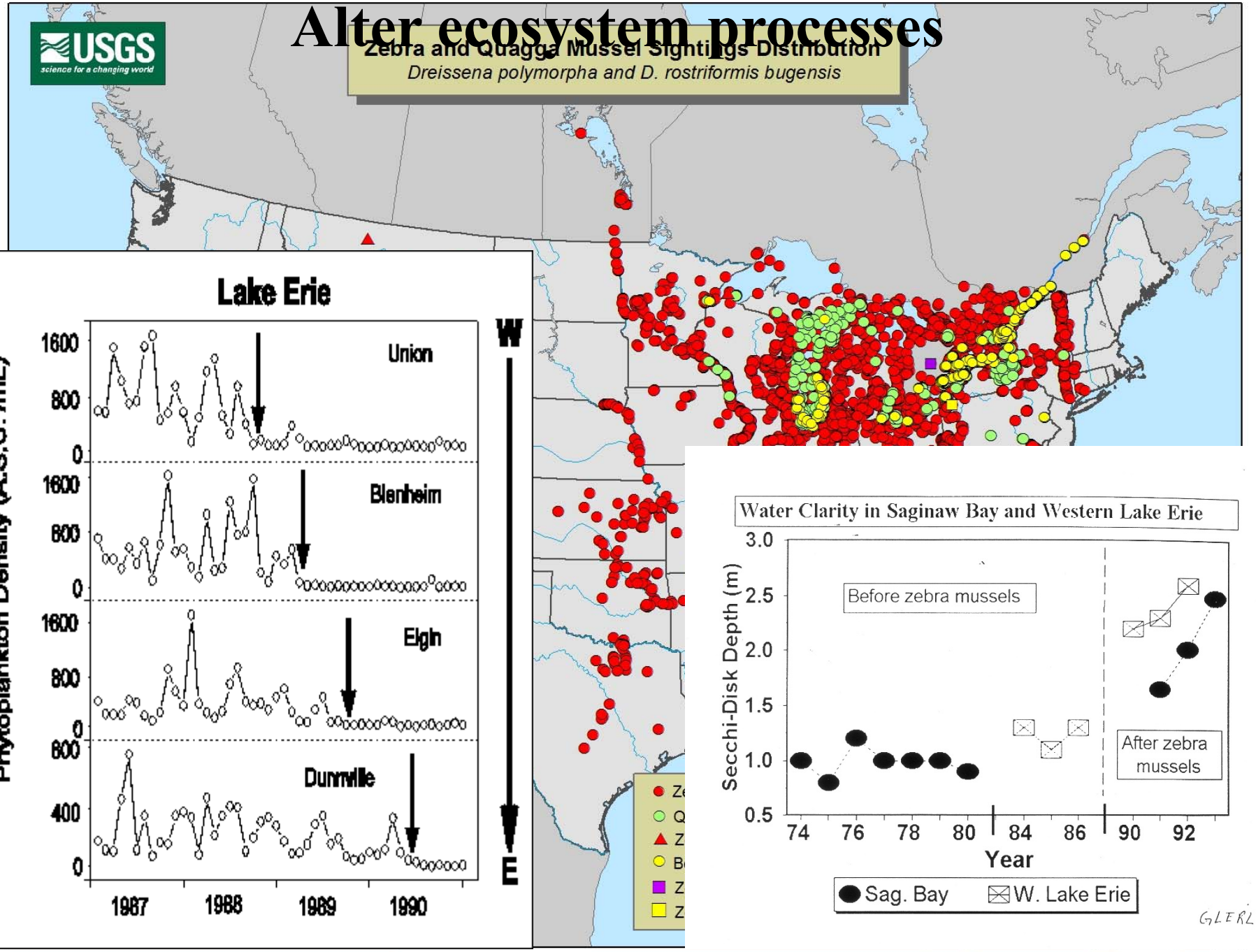
Water hyacinth

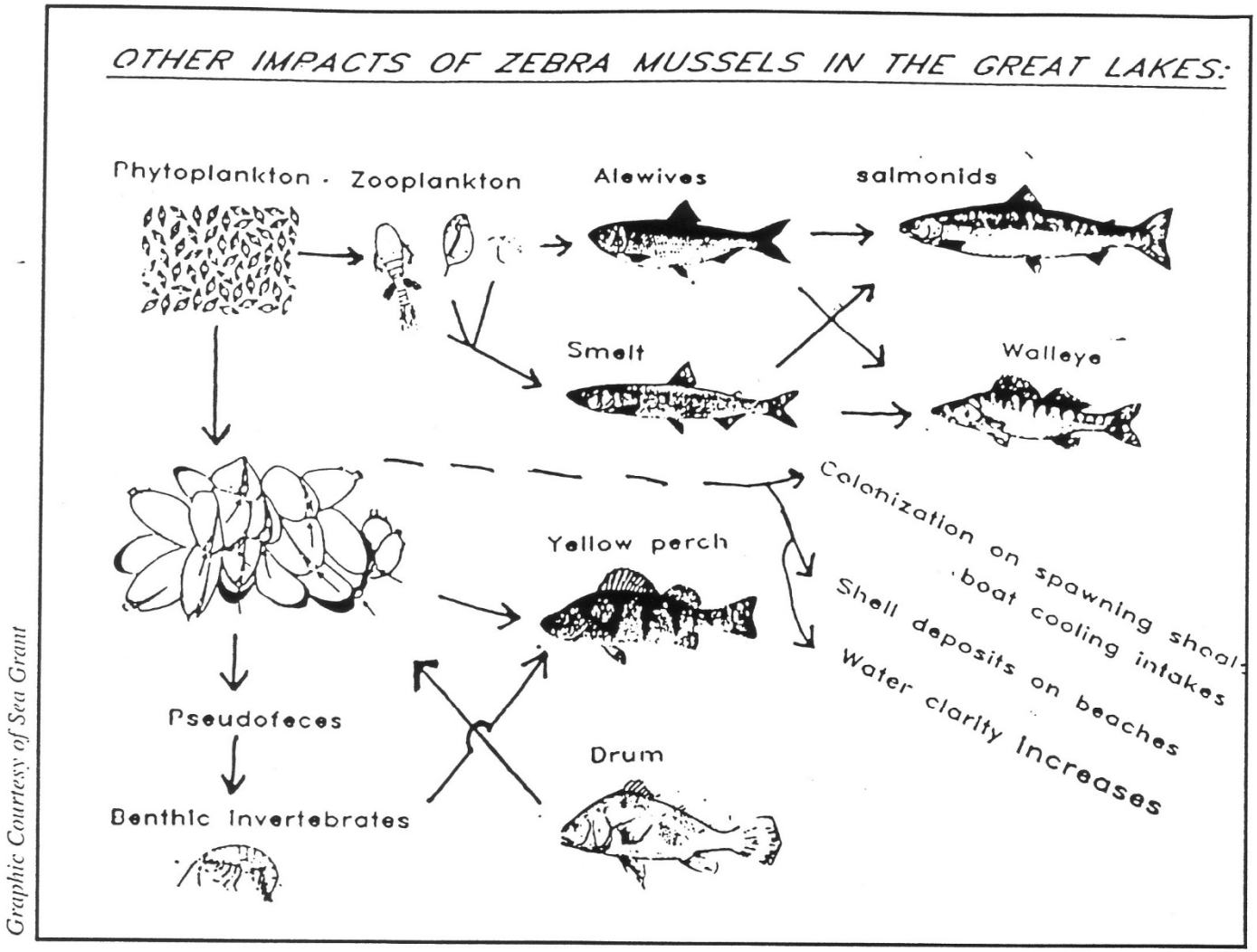
Water chemistry: DO, pH

Hybrid cattail: Typha x glauca

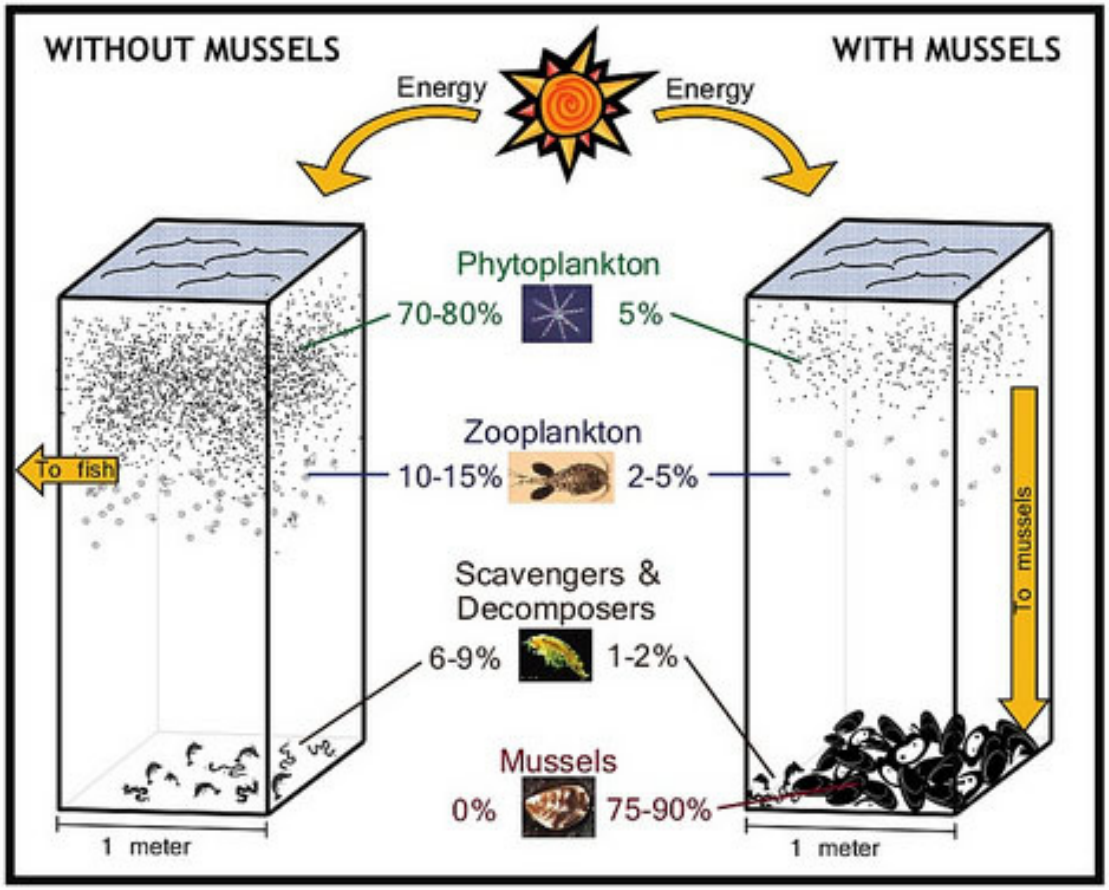
Nutrient cycles: amounts of N, P;
decomposition rates; bacterial communities

Alter ecosystem processes





The ecosystem approach involves examining changes in all important food chain components.



Golden apple snail has opposite effect

Damage human industries & harm humans

Cercopagis:
fish hook waterflea

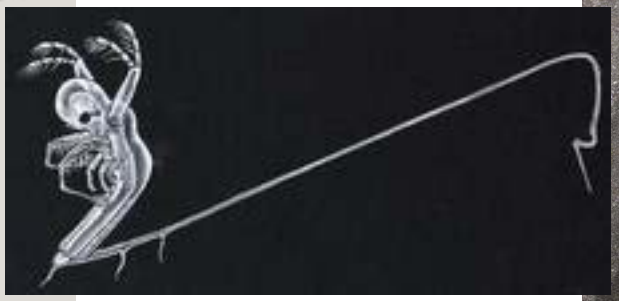
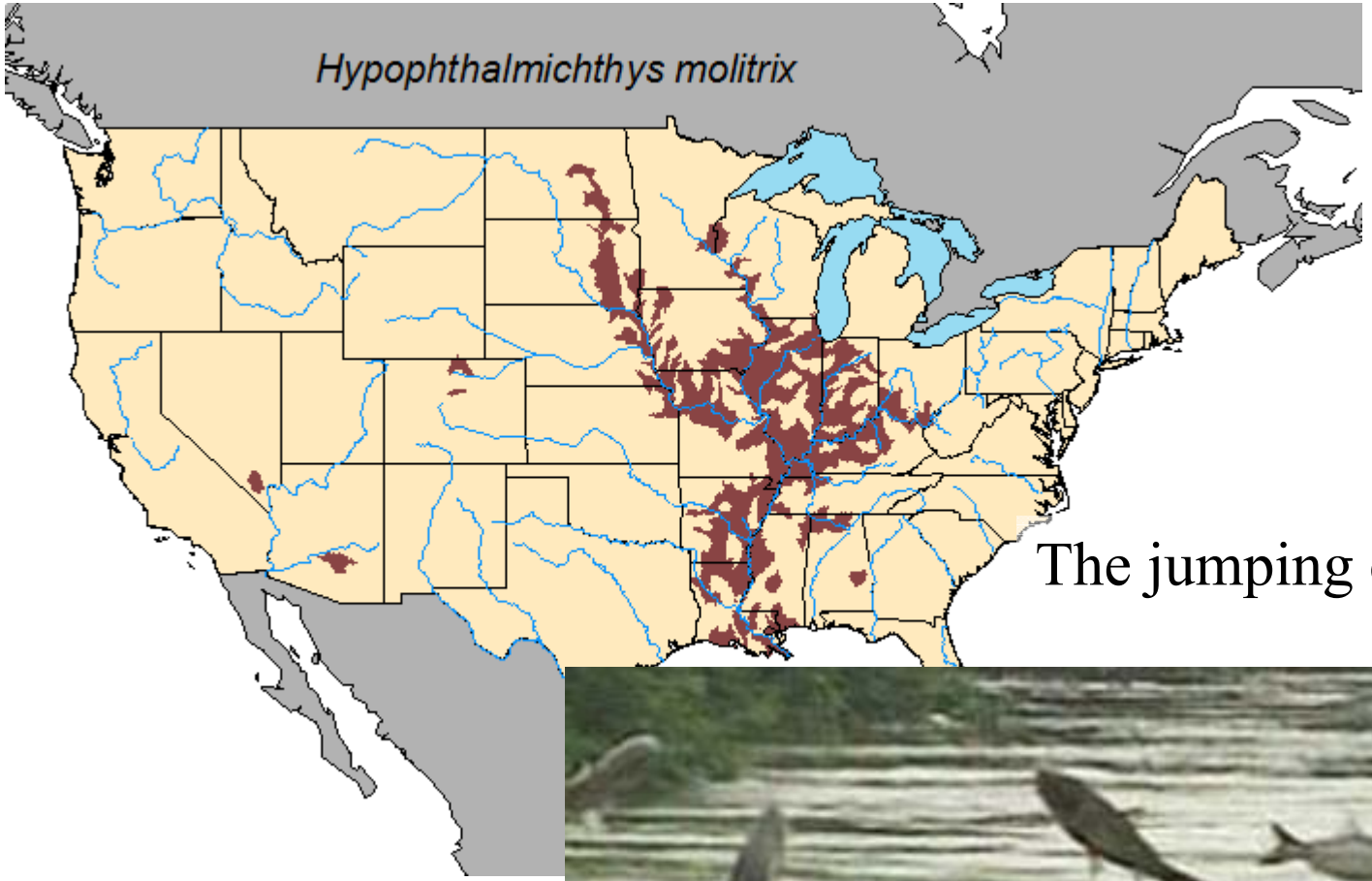


Photo Courtesy of Detroit Edison

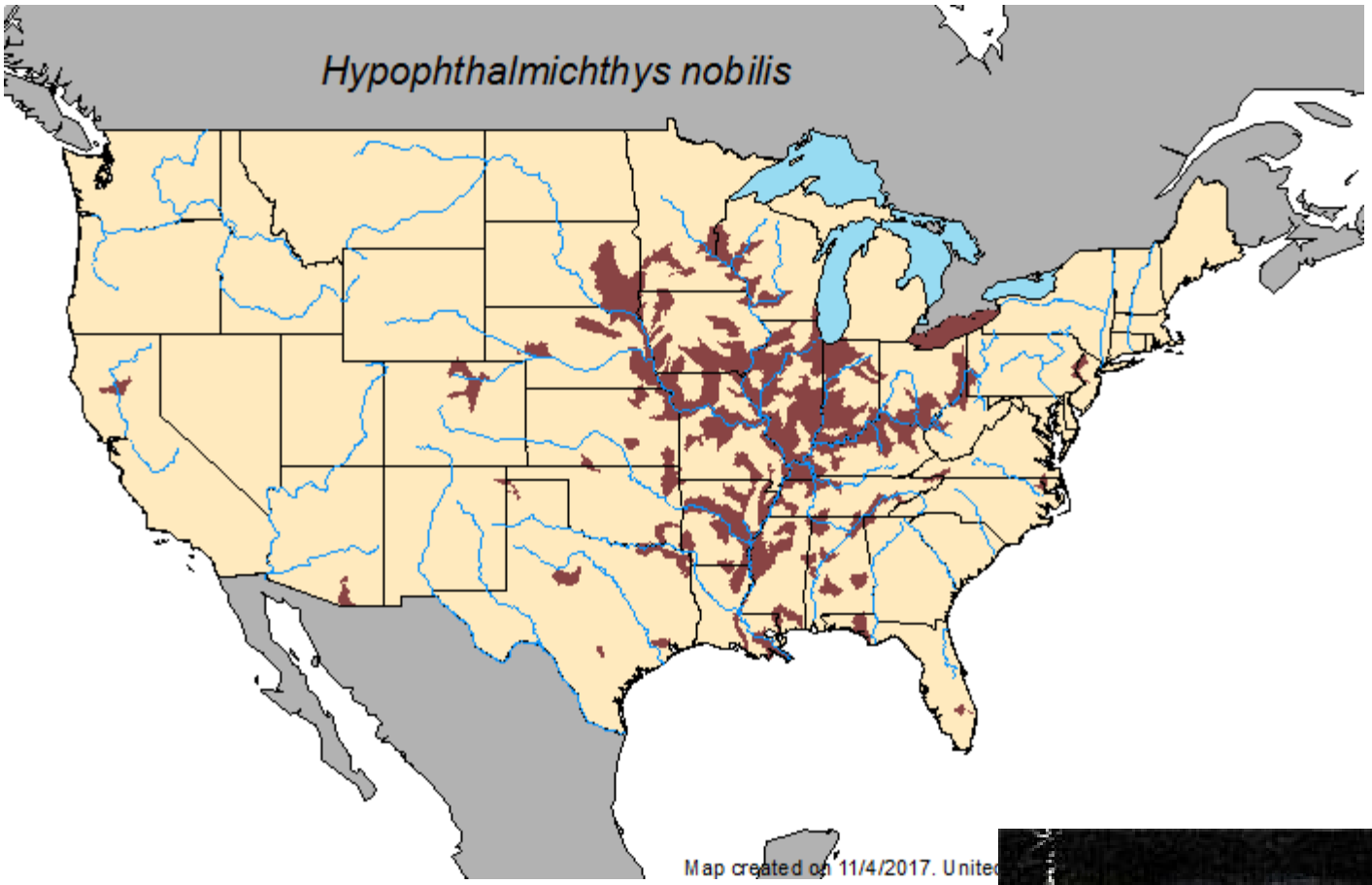
Diseases
Transportation problems
Physical blockage of water flow
Physical damage



Carp bowfishing

The jumping carp phenomenon

Silver carp



Bighead carp

Effects of invasives:

Harm endangered/threatened/rare species

Reduce diversity (at varying levels)

Alter physical structure of ecosystem

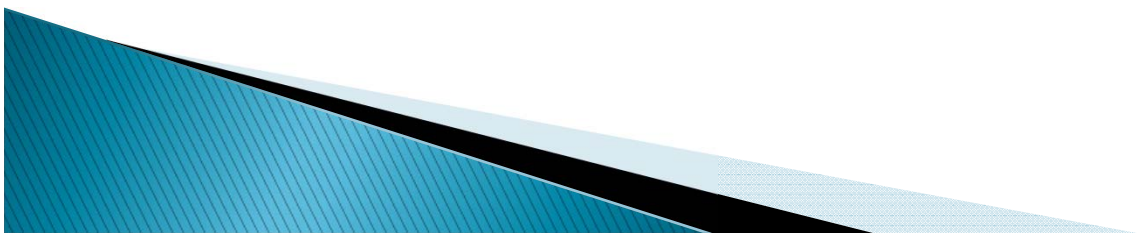
Alter hydrology

Alter disturbance regime

Alter ecosystem processes

Damage human industries

Harm humans and domestic animals



Control of invaders

- None
- Shading
- Physical removal
- Biocontrol
- Chemical control

Effectiveness
Harm to natives, ecology
Cost & difficulty
Prevention of spread

Research Needs

Landscape scale studies

Long-term studies

Impacts on ecosystem processes

Evolutionary effects

Melaleuca trees
march into the distance
in the Everglades
Photo by Randall Stocker