

LIMNOLOGY 101

Part 2: Habitat, Shoreline Development Trends, and Management Challenges & Opportunities

Courtesy of the WI Lakes Partnership

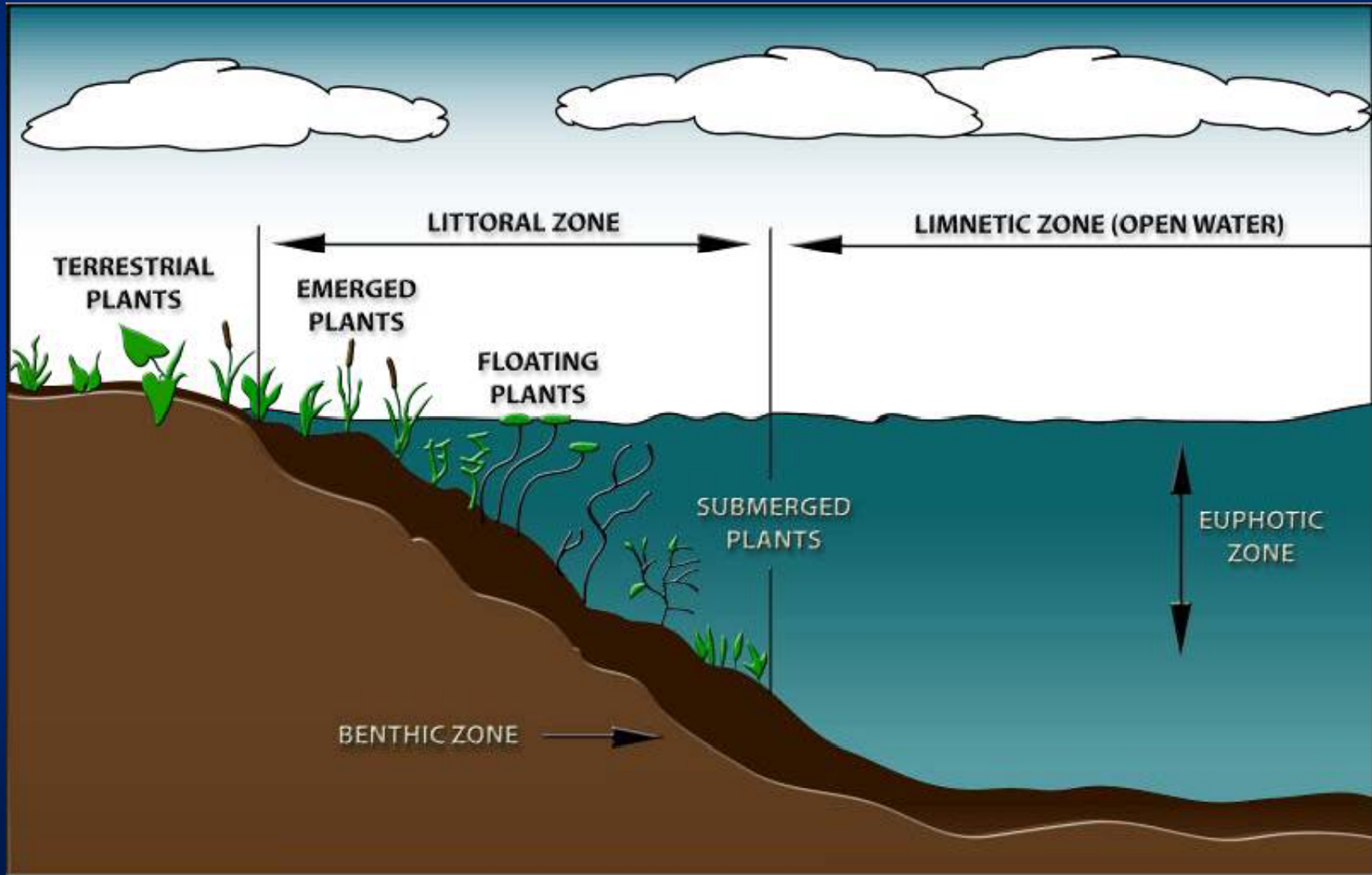




Lake & River Management Coordinator Age 2+

Habitat

HABITAT AREAS IN LAKES



Habitat

LAKE LITTORAL ZONE

- Intercepts nutrients
- Refuge from predators
- Nursery for fish



Oligotrophic Northern Lake



Eutrophic Southern Lake

HABITAT FEATURES IN LAKES

A photograph of a lake with a dense covering of green lily pads on the water's surface. In the background, there is a thick line of green trees and tall reeds along the shoreline under a blue sky with some clouds.

Floating and Emergent Vegetation

A photograph showing clear, shallow water in a lake. The bottom is covered with smooth, rounded rocks of various sizes and colors, ranging from light tan to dark brown. The water is clear enough to see the rocks in detail.

Substrate

A close-up photograph of a small, greenish-brown fish, possibly a sunfish, held in a white mesh net. The fish is surrounded by tall, green, submerged aquatic plants, likely water hyacinths or similar species.

Submersed Vegetation

A photograph of a shoreline with a large pile of weathered, greyish-brown driftwood logs and branches. The water is calm and blue, and a line of green trees is visible in the background across the water.

Wood

Habitat



90% of all lake life is born, raised and fed in the area where land and water meet. *(Ontario, Ministry of Natural Resources)*

Habitat

FORESTS, WETLANDS & OTHER CRITICAL AREAS



About Wisconsin's wetlands



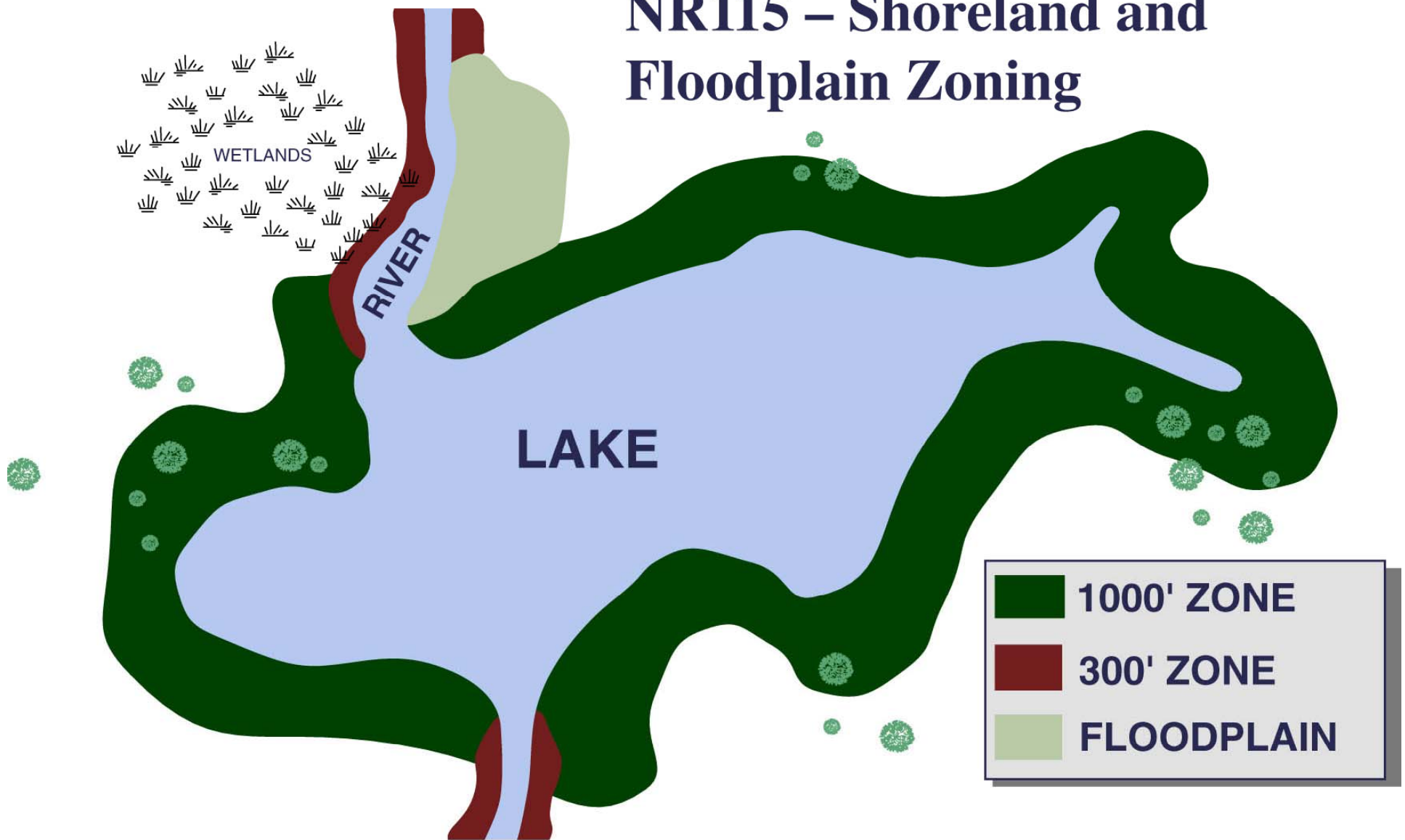
- Wisconsin has ~5.3 million acres of wetlands remaining.
- 75% of WI's wildlife species depend on wetlands during some stage of their life cycle
- 1/3 of WI's endangered and threatened plants and animals depend on wetlands
- *20% of Wisconsin's wetlands are "isolated"*



Habitat

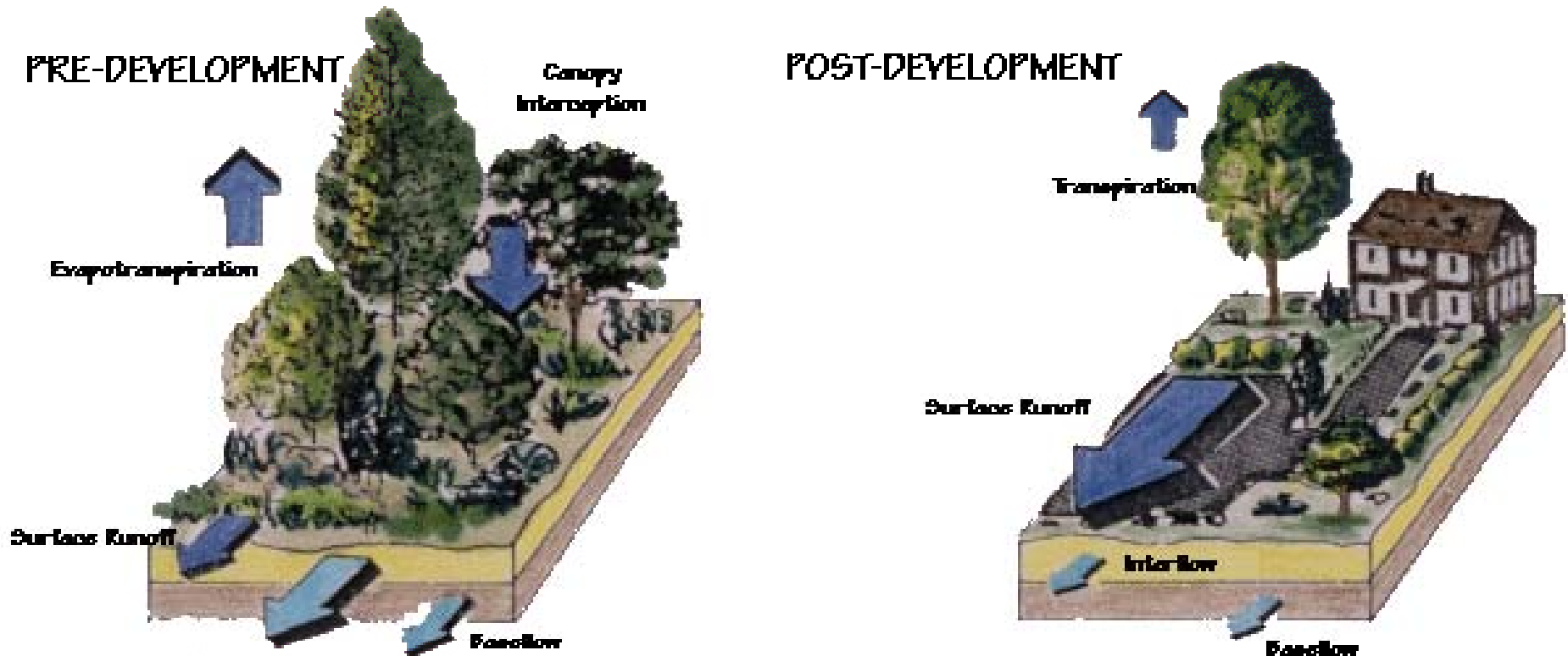


NR115 – Shoreland and Floodplain Zoning



SHORELINE DEVELOPMENT TRENDS

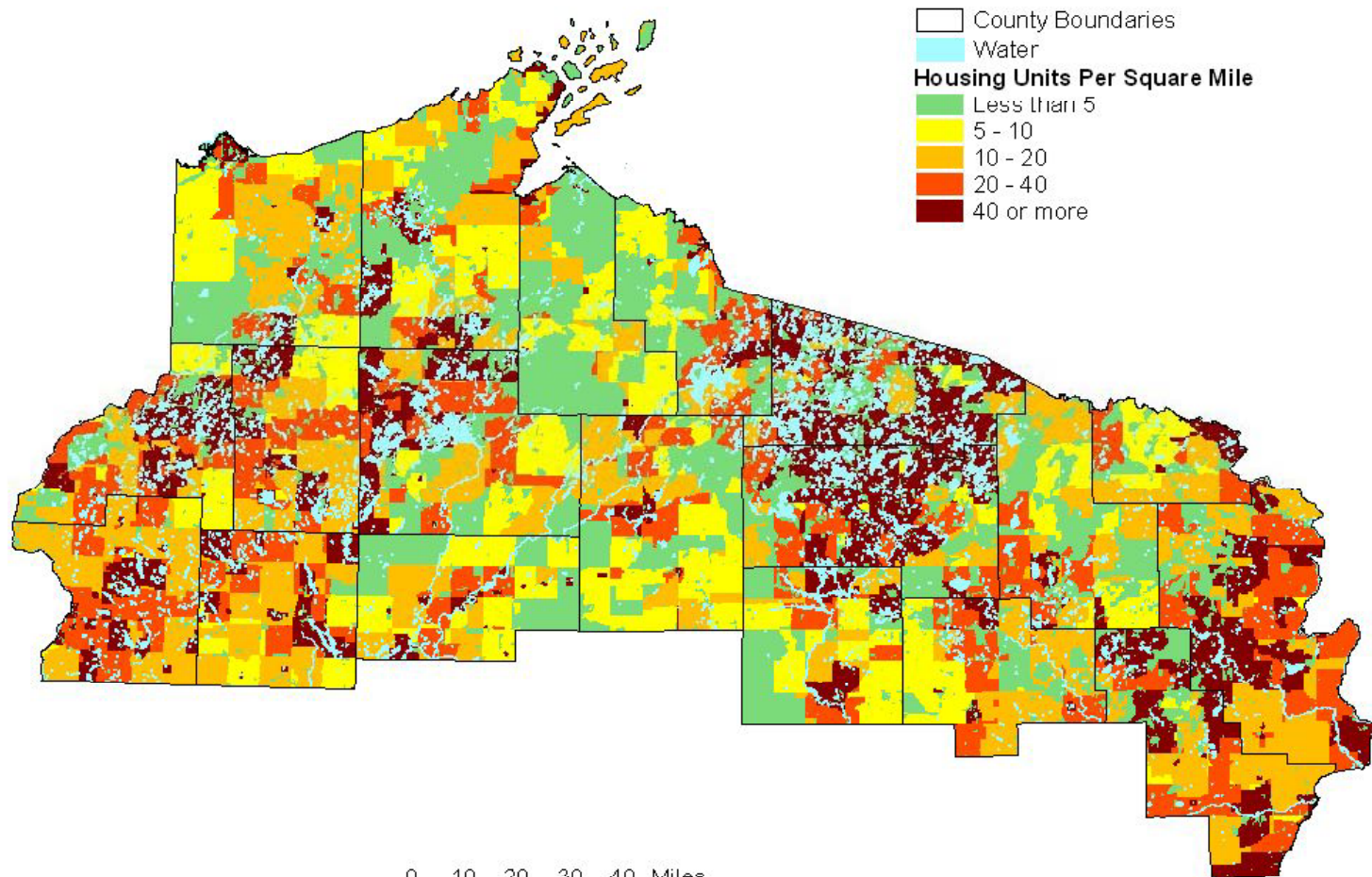
WATER BALANCE



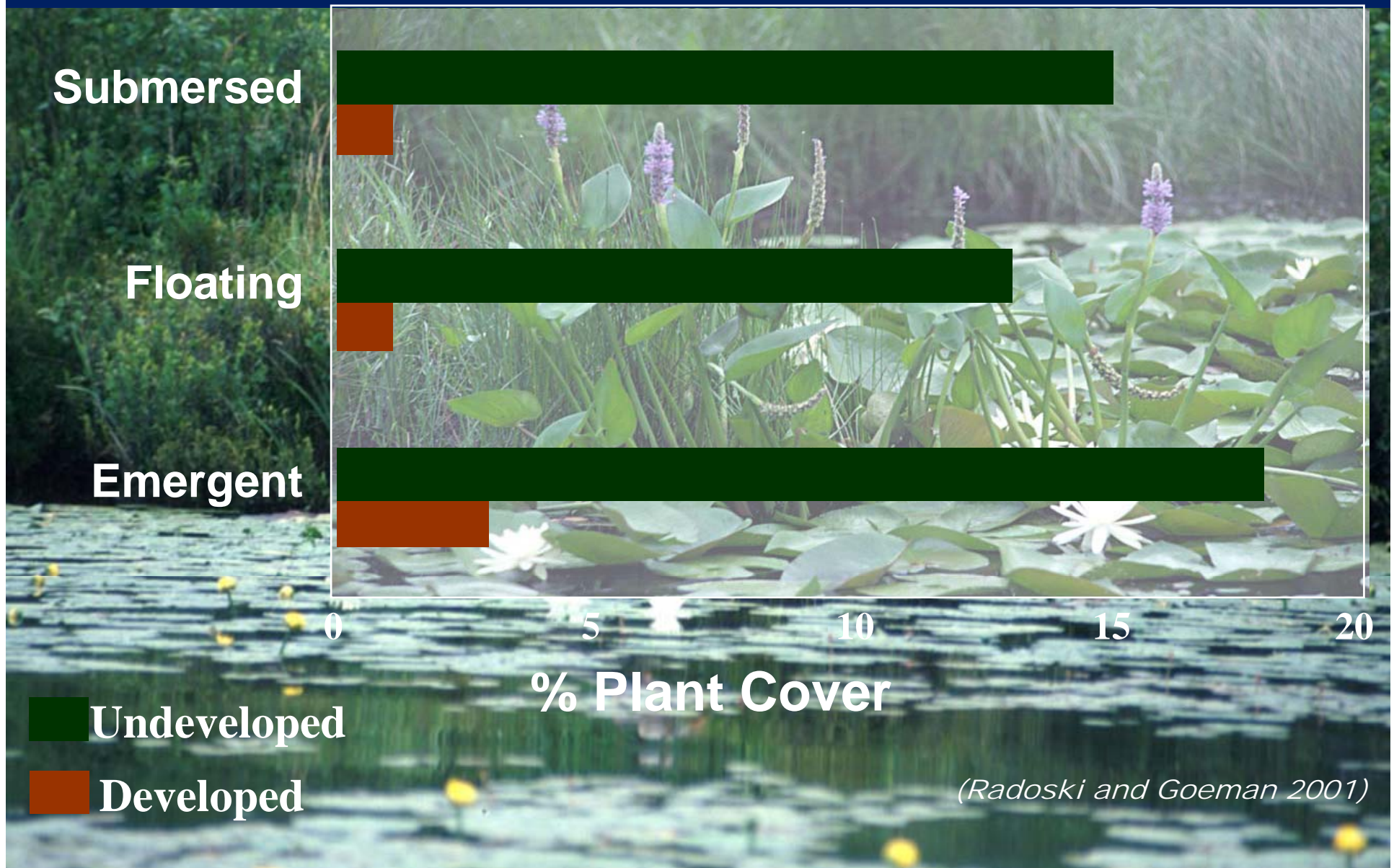
Development also affects nutrient uptake & soil stability

SHORELINE DEVELOPMENT TRENDS

2010 Housing Density by Partial Block Group
Rural Renaissance Forecast



What's Happened to Aquatic Plants?



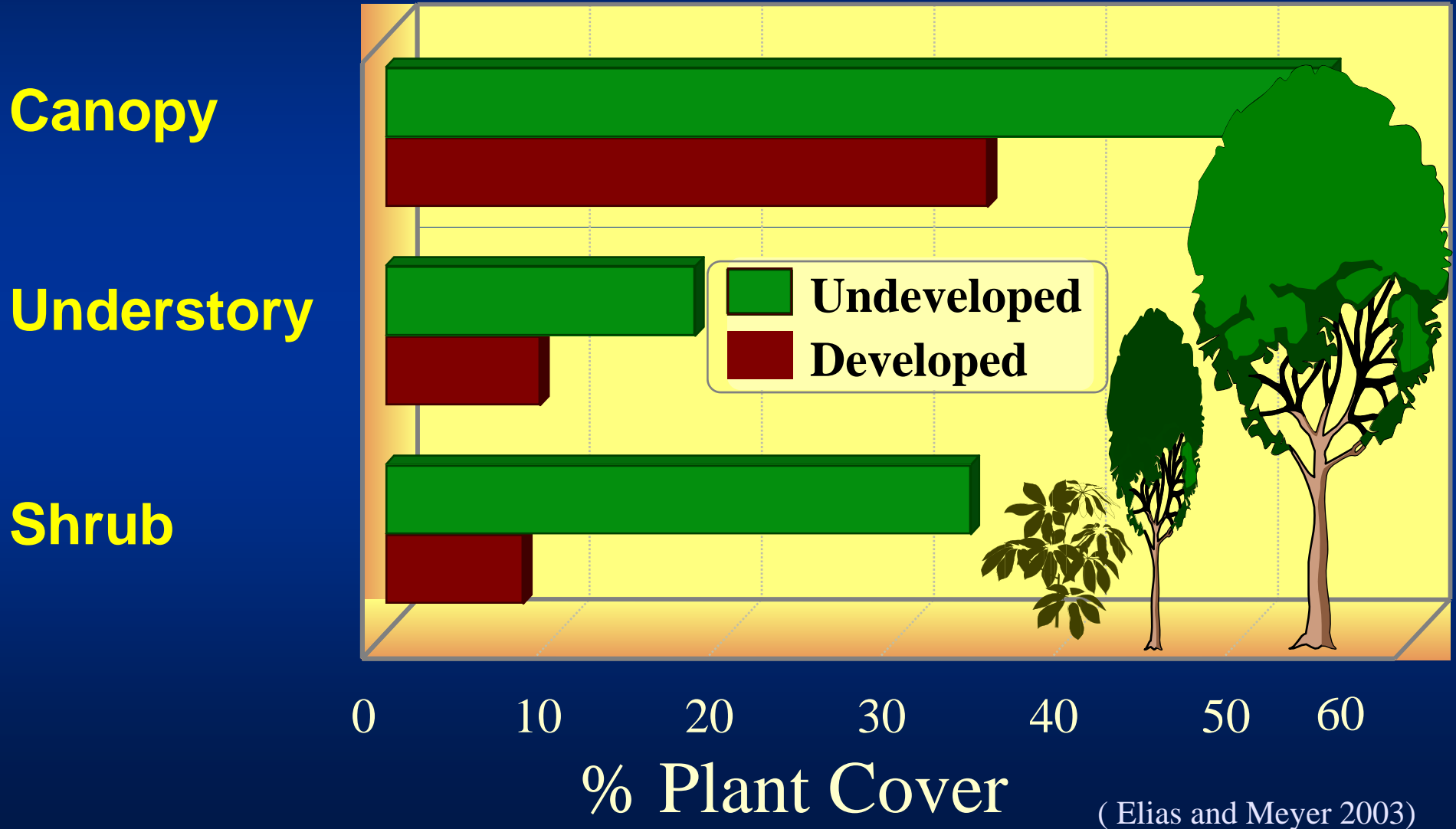


Shoreline Development Trends

Shifts in aquatic plant communities from short- to tall-growing species in some lake types (Borman 2007)

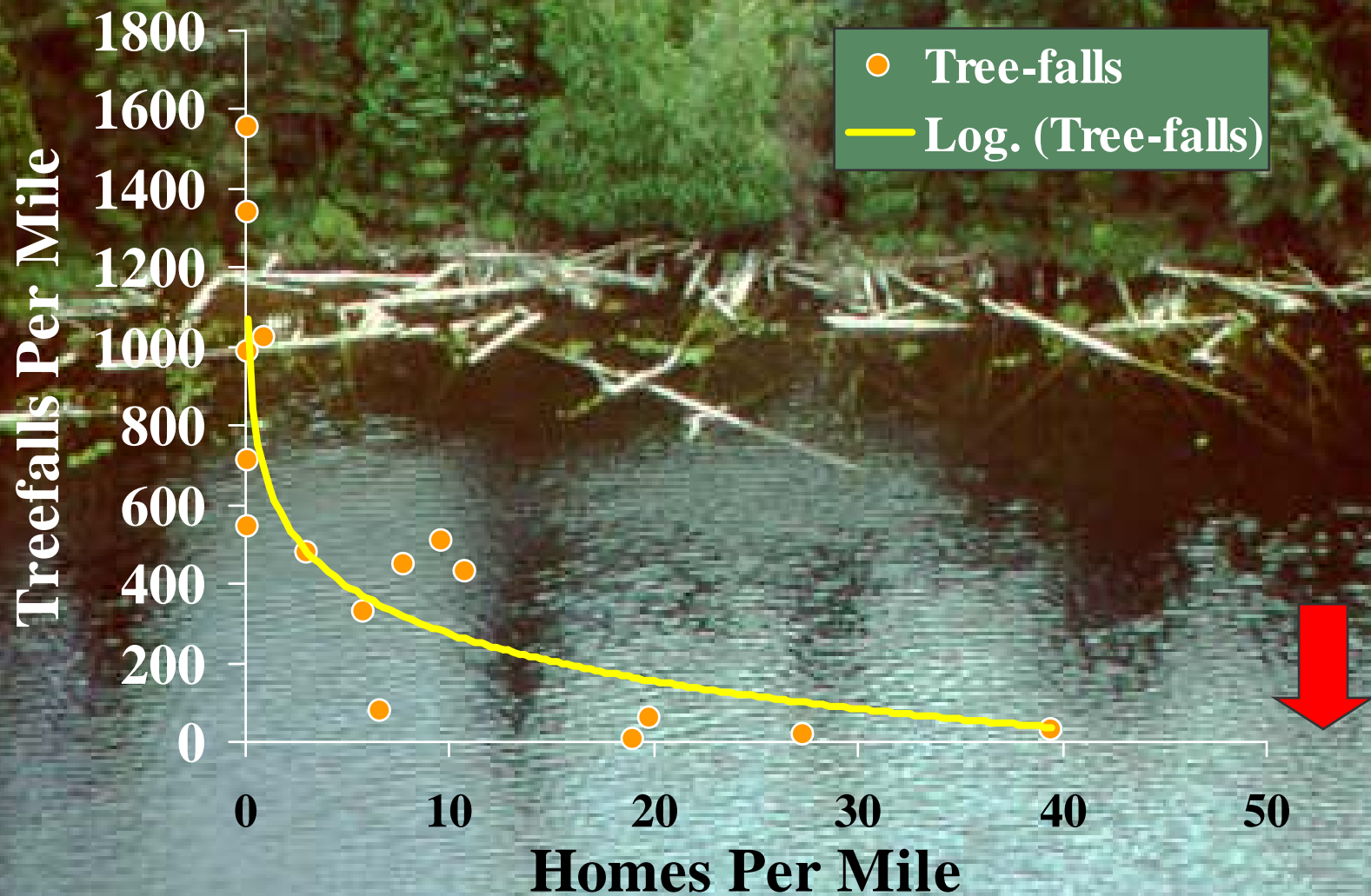


What's Happened to Shoreline Plants?





Impacts of Development on Tree-falls



Christensen et al. 1996

TREE LOGIC

- Trees in riparian areas grow, mature and fall into lakes
- Seedlings replace older trees
- Two types of disruption of cycle
 - Natural periodic, i.e. windstorm or fire
 - Human induced, i.e. logging or shoreline development
- Submerged wood is resilient, it bounces back!

Shoreline Development Trends

- Study of 16 northern WI lakes (Jennings et al. 1999)
 - Undeveloped shoreline on developed lakes averaged 610 logs/mile of shoreline
 - Developed shoreline on same set of lakes averaged 92 logs/mile of shoreline



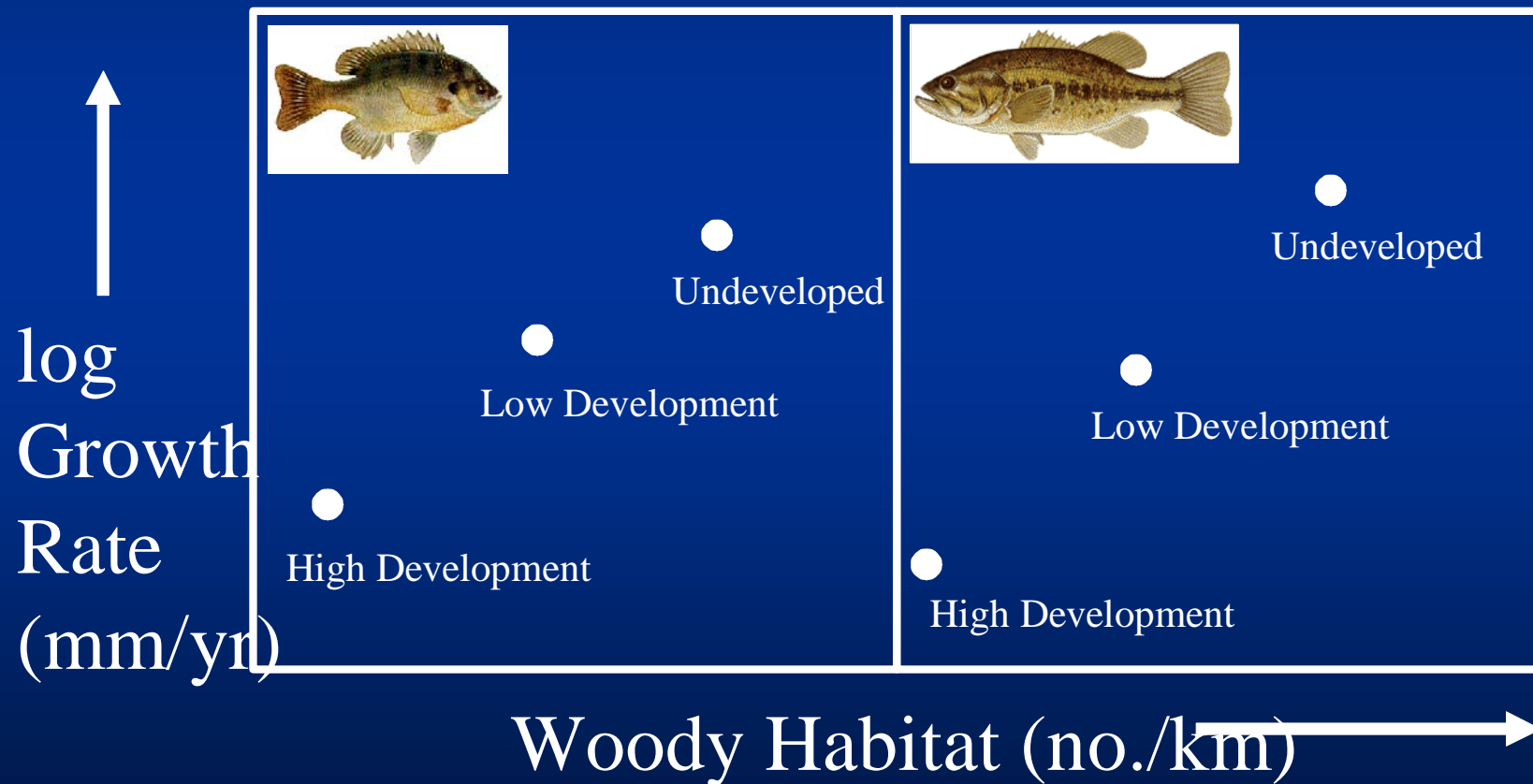
Shoreline Development Trends

- Study of 45 lakes in Vilas County (Marburg et al. 2006)
 - Best predictor of submerged wood was the density of riparian coarse wood
 - The concentration of residential development on shorelines appears to reduce the flow of coarse wood from forests to lakes



Shoreline Development Trends

Fish grow ~3X faster in lakes with lots of woody habitat



From Schindler et al. 2000

What's Happened to Fish?



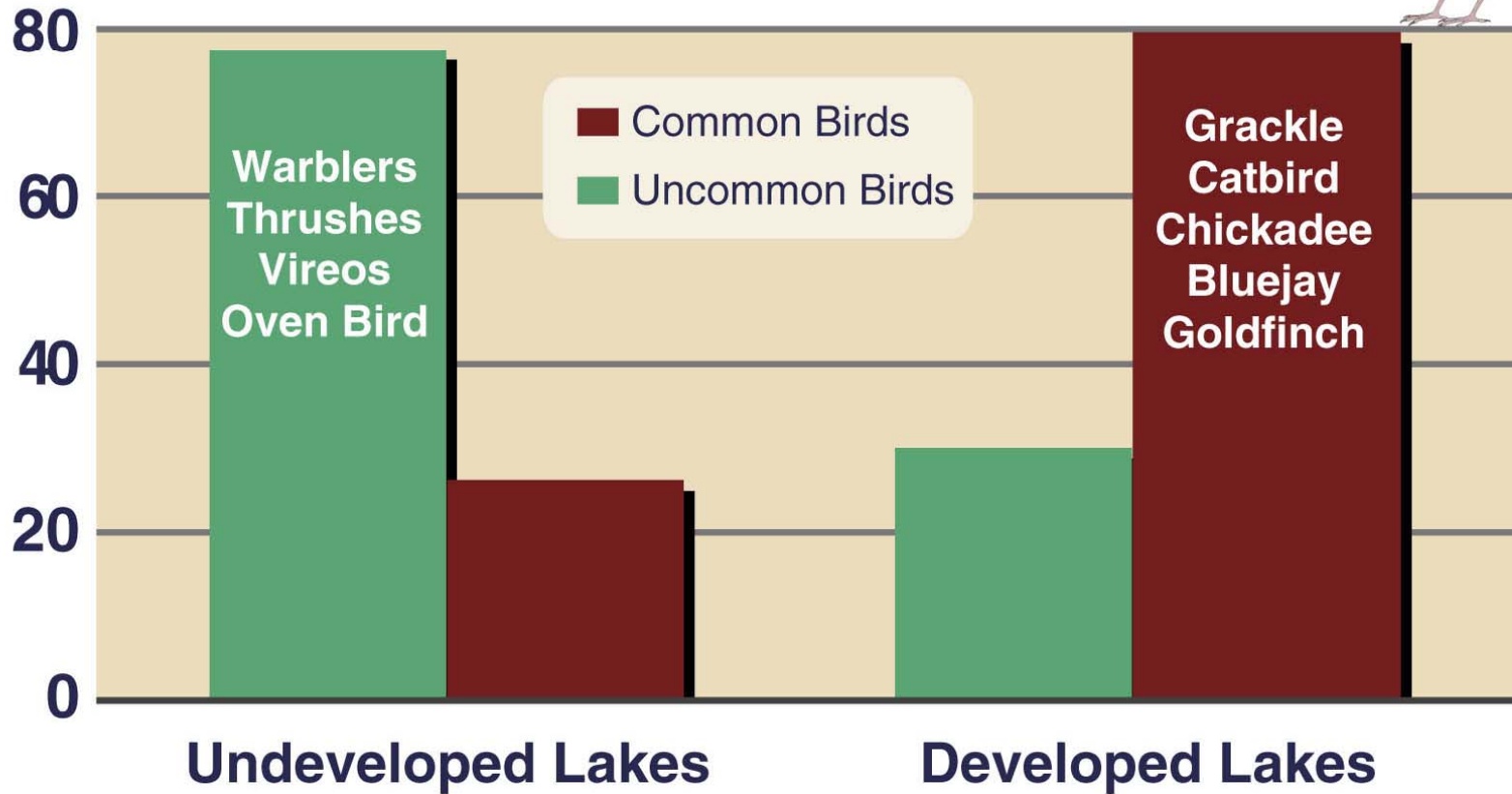
Undeveloped



Intensely Developed

Shoreline Development Effects on Nest Site Selection by Largemouth Bass and Black Crappie

What has Happened to Songbirds?

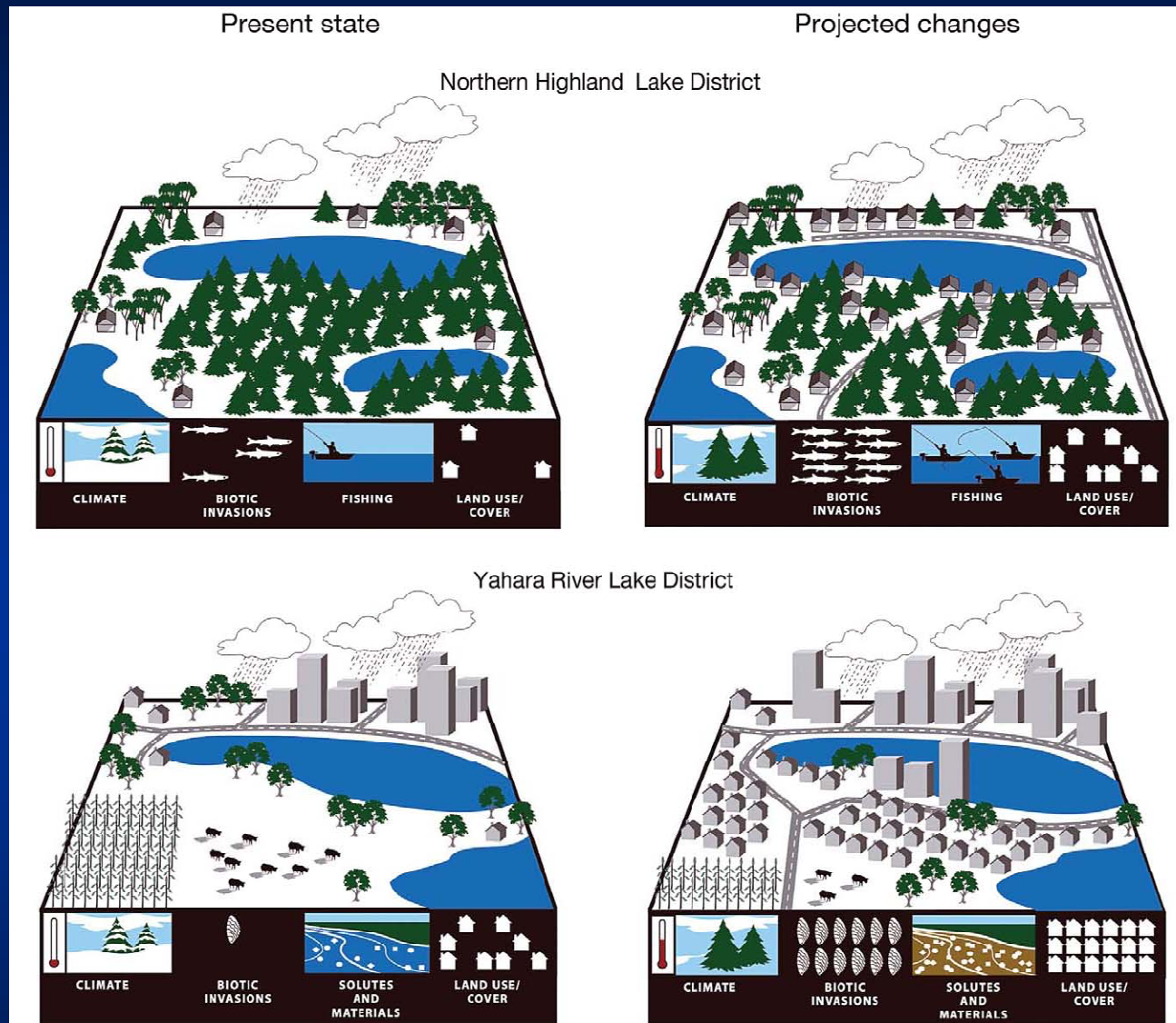


MANAGEMENT CHALLENGES & OPPORTUNITIES

- Shoreline development
- Recreational use, including transporting aquatic invasive species and motorboat impacts
- Eutrophication
- Global climate change



Management Challenges & Opportunities



Present state and plausible conditions of the Northern Highland and Yahara River lake districts if present trends continue.

(Carpenter et al. 2007)

Suburbanization of Lake Shores

Courtesy of MN DNR



SHORELINE DEVELOPMENT

Opportunities:

- ordinance/planning updates
- permanent land protection/conservation
- storm water diversion and infiltration
- shoreline and in-lake restoration



Management Challenges & Opportunities

RECREATIONAL USE – Aquatic Invasive Species

- Displace native plants and animals
- Interfere with boating and swimming
- Expensive to control



Management Challenges & Opportunities

AIS



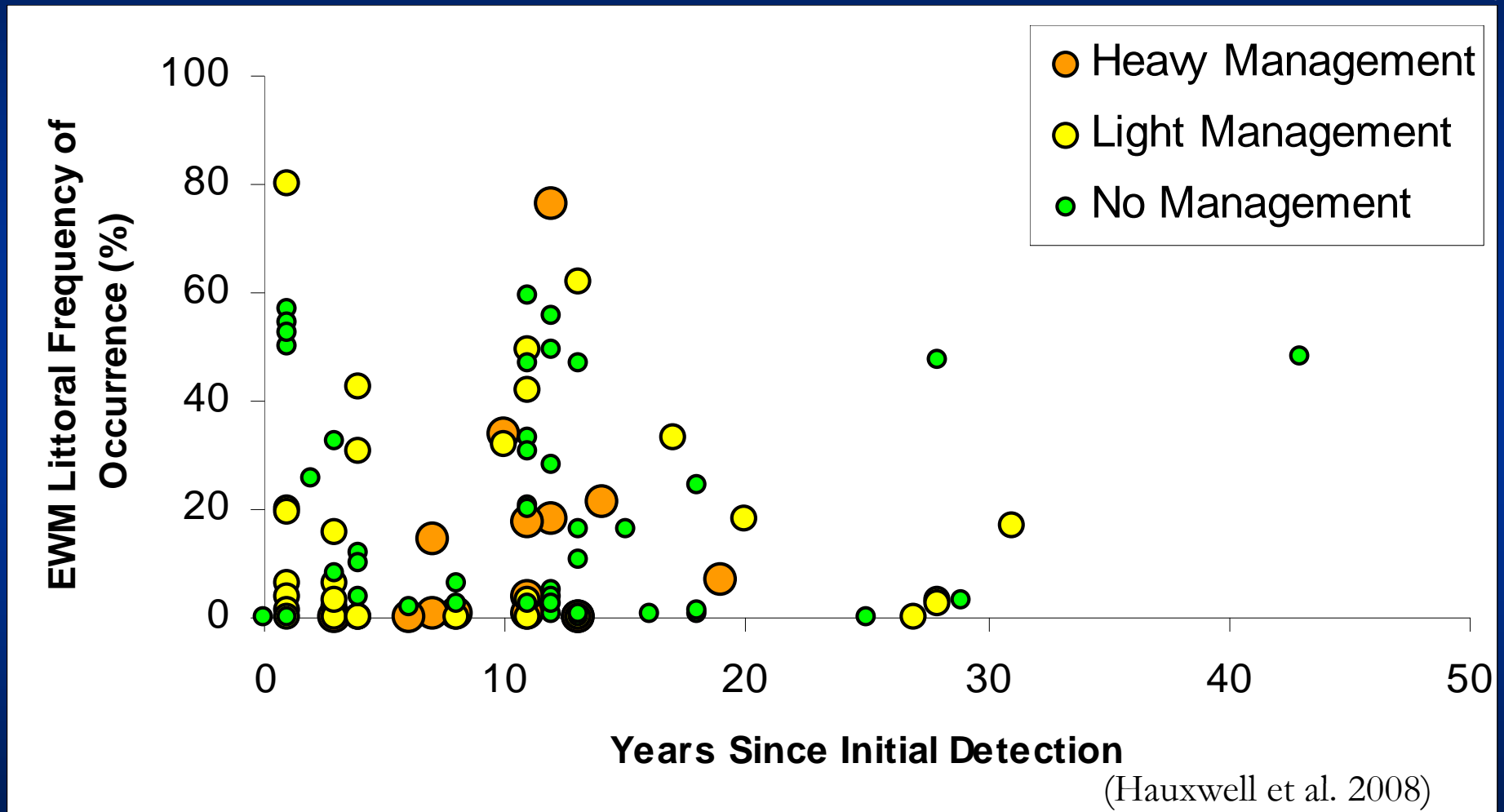
Management Challenges & Opportunities



Eurasian watermilfoil

2005-2006 Research Results

100 lakes in survey

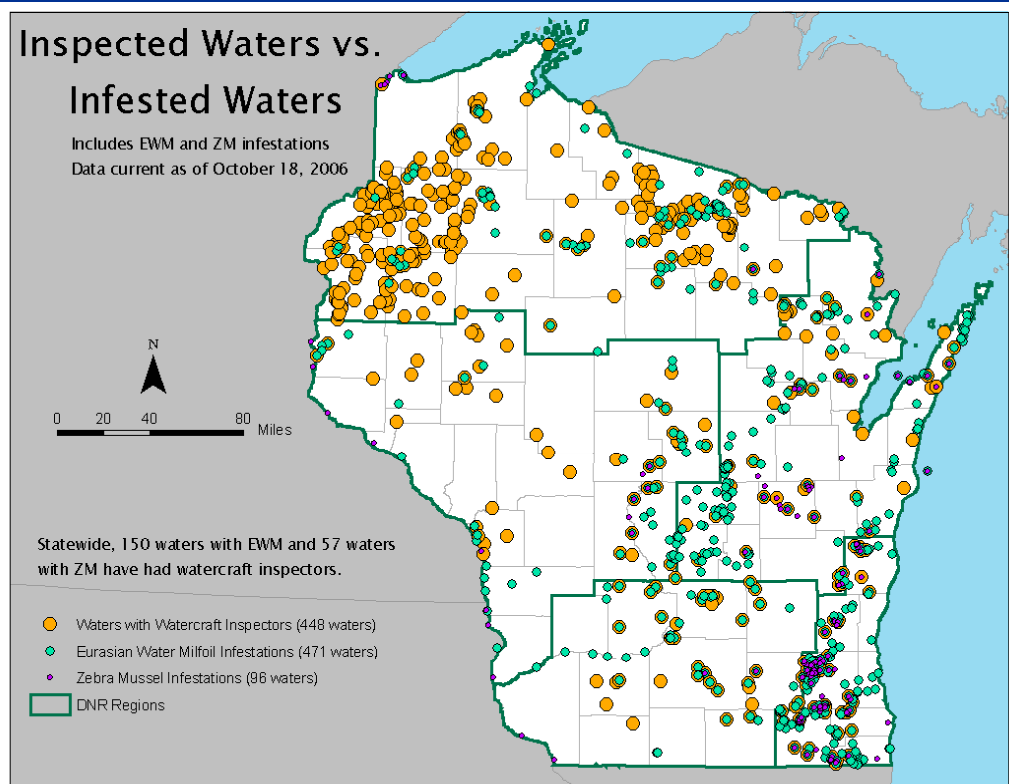


(Hauxwell et al. 2008)

Any management approach can result in wide variation in current EWM

RECREATIONAL USE – Aquatic Invasive Species

Opportunities:
good boater hygiene
political support (i.e. grant dollars)
partnerships (e.g. county illegal-to-transport ordinance)



Thank you watercraft inspection volunteers and employees!

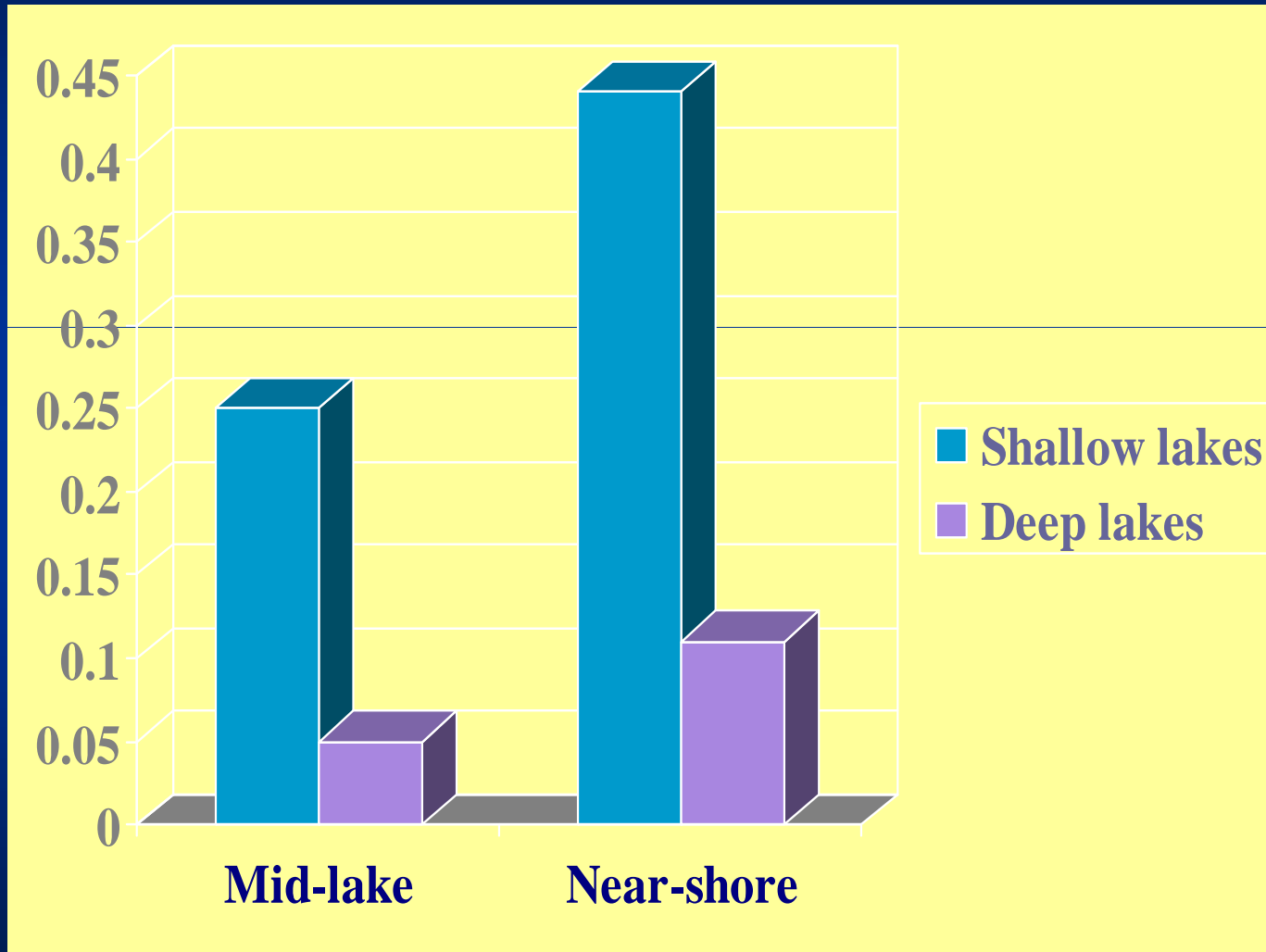
An aerial photograph of a lush green landscape, possibly a park or natural area. A winding path or road is visible, cutting through the dense vegetation. The colors range from bright yellow-green to deep forest green.

RECREATIONAL USE – Motorboat Impacts

Management Challenges & Opportunities

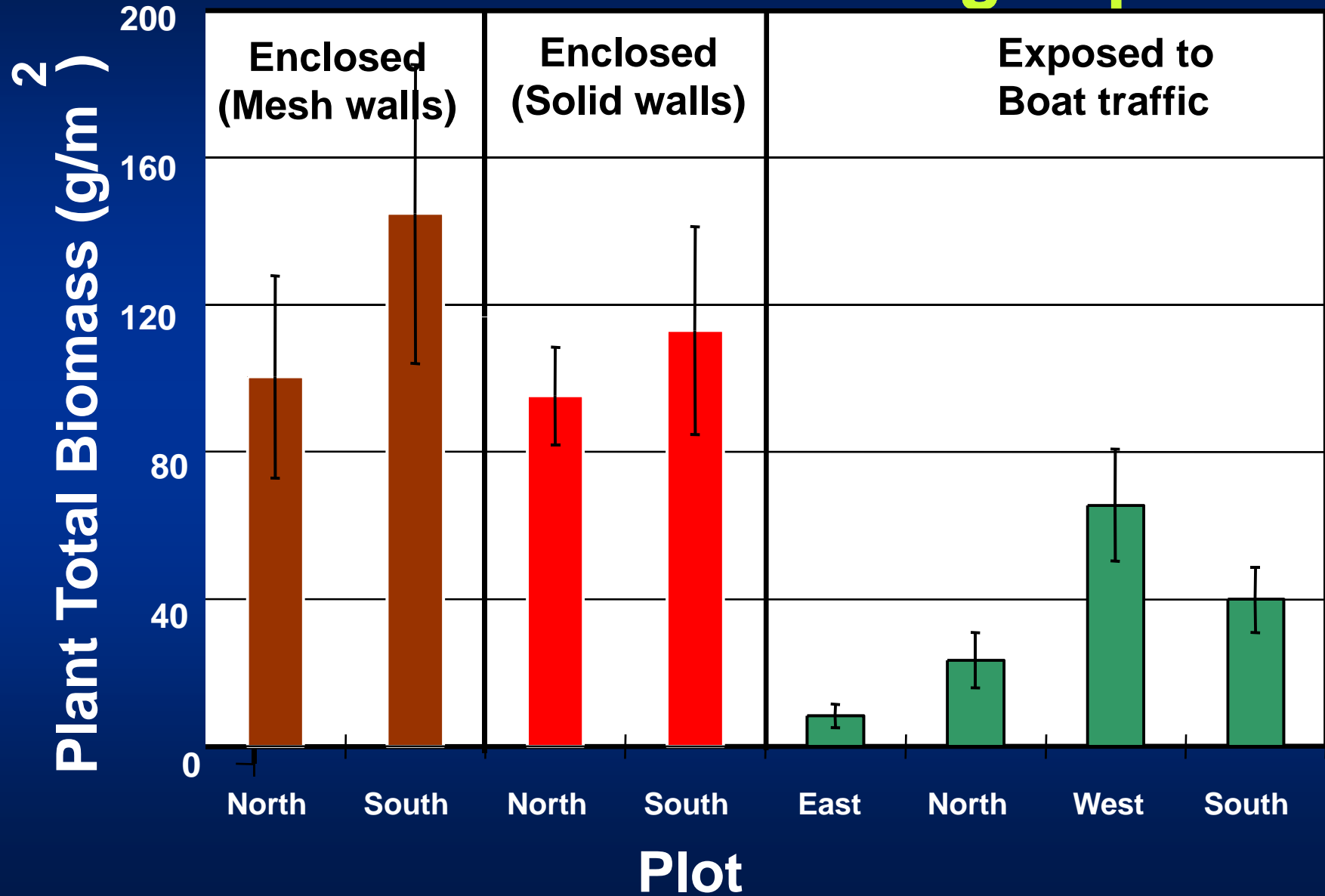
BOATING

Turbidity (NTU)



Weekday to Weekend Turbidity Change

Plant Growth - Boating Impacts



(Asplund and Cook 1997)

Management Challenges & Opportunities

Chara Beds with Prop Tracks



RECREATIONAL USE – Motorboat Impacts

Opportunities:

- personal boating choices
- recreational use ordinances
- critical habitat designations



Management Challenges & Opportunities

EUTROPHICATION

Algae blooms

Murky water

Toxic algae

Fish kills

Yucky muck!

Blue-Green Scum



Management Challenges & Opportunities



Wapogasset Lake, Polk Co.

Management Challenges & Opportunities



Management Challenges & Opportunities

EUTROPHICATION

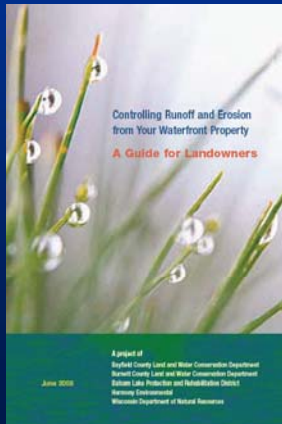
Opportunities:

Watershed Protection

- conservation easements and land acquisition

Watershed Management

- ordinance/planning updates
- no fertilizer or P fertilizer bans,
- construction site erosion control
- on-site infiltration practices (e.g. rain gardens and barrels, infiltration trenches and pits) construction site erosion control



Available from Burnett County LWCD.



Management Challenges & Opportunities

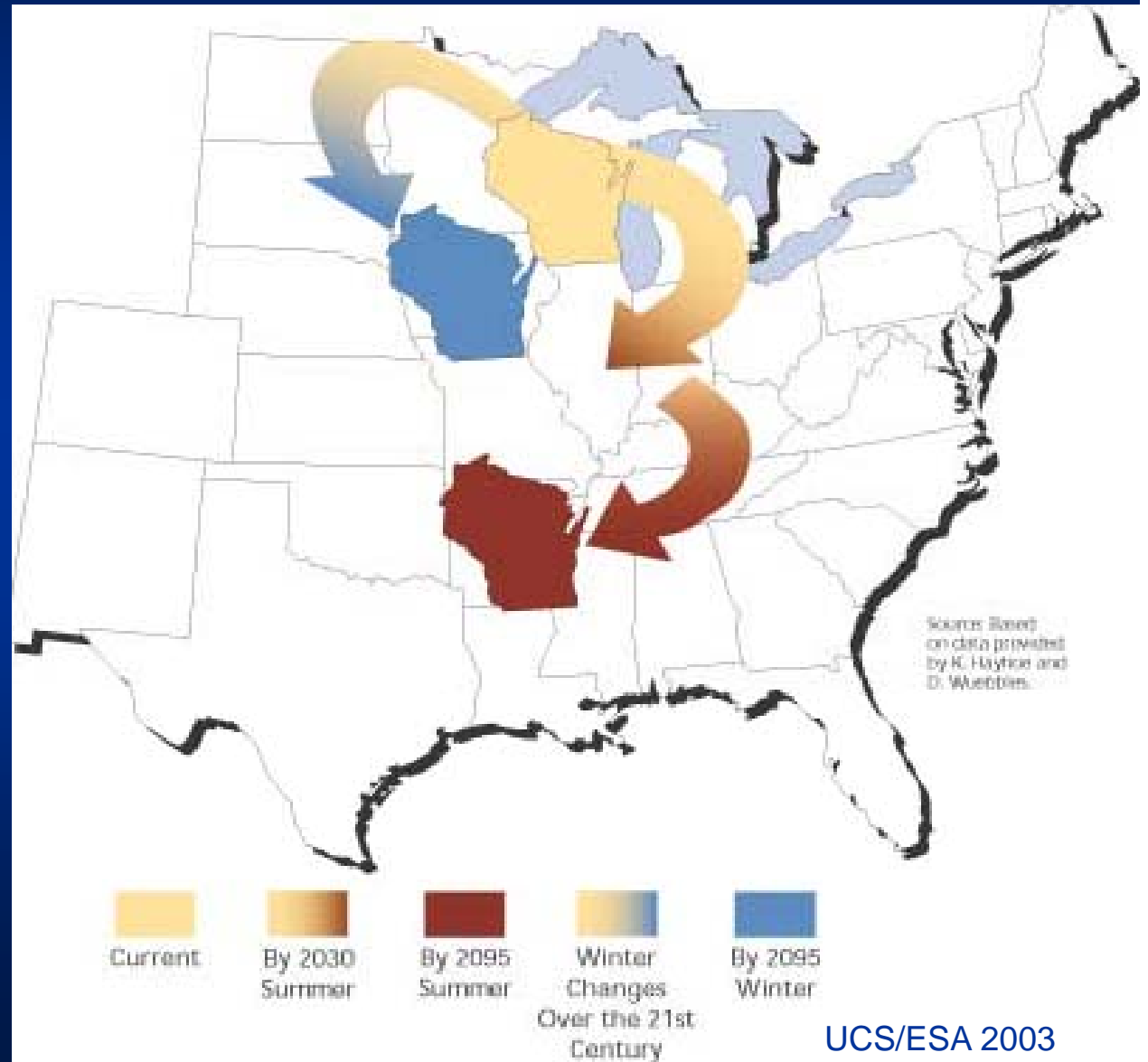
DIVERSION & INFILTRATION



Photo courtesy of Chuck Brookshaw, Rivers North Contracting and Cheryl Clemens, Harmony Environmental

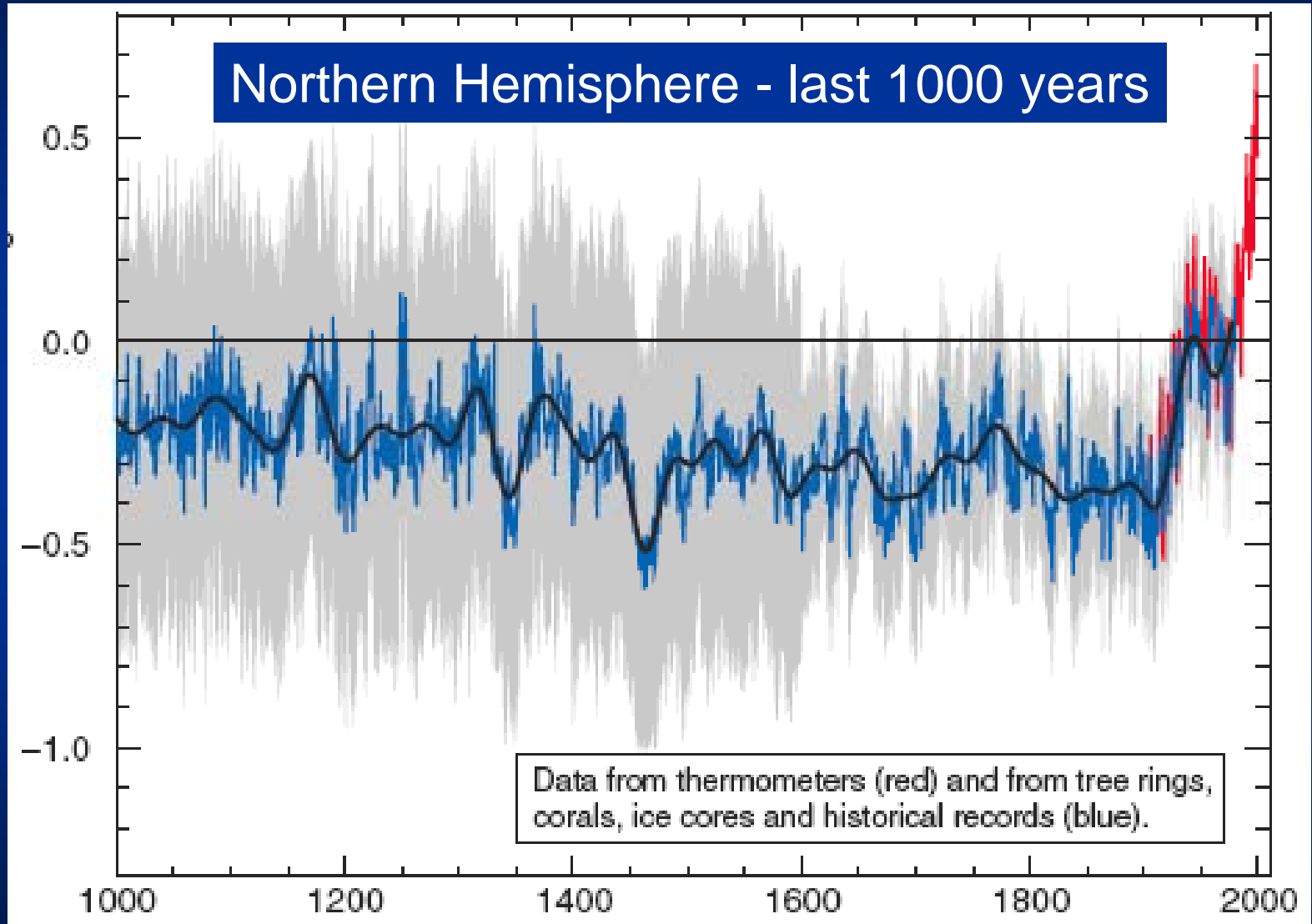
CLIMATE CHANGE

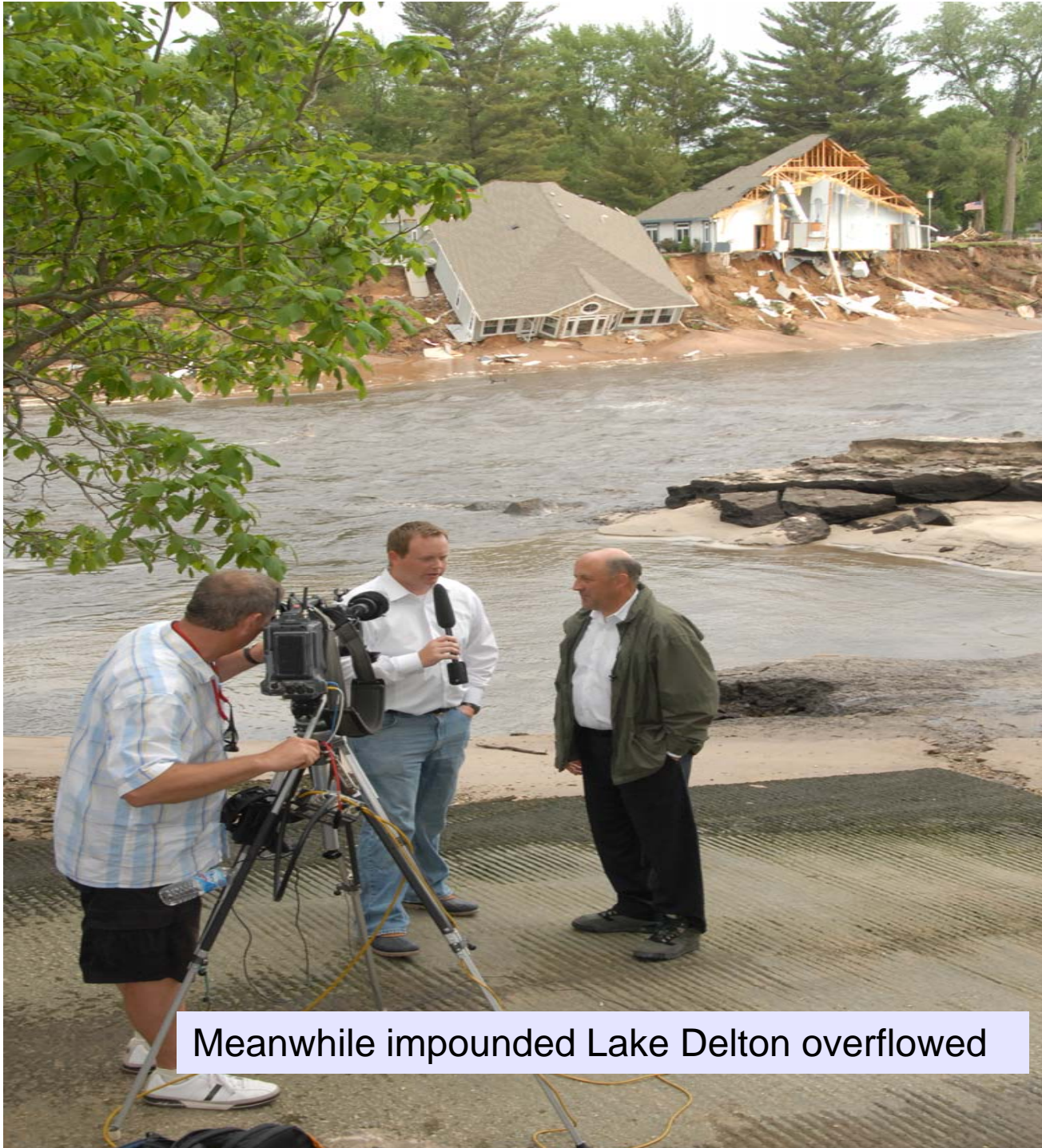
Going to Arkansas?



Variation in Earth Surface Temperatures

Departure in Temperature ($^{\circ}\text{C}$)
from the 1961 to 1990 average





Meanwhile impounded Lake Delton overflowed



Same lake one year later



CLIMATE CHANGE and WATER

Opportunities:

- emission reductions
- minimizing pressure on the environment (i.e. water use, land use)
- adaptation to a changing hydrologic regime



Lake Monona, Dane Co (Aug 31, 2007)

CITIZENS LEAD AND GOVERNMENT FOLLOWS

- Share lake-friendly living tips with friends, family, and neighbors
- Lead by example even if it means redefining trends
- Participate in local government (e.g. BOA, municipal committees) including simply attending meetings
- Run for elected office

*Future Lake & River
Management Coordinators????*





Do what you can, with what you have, where you are.

Theodore Roosevelt

LEAVING A LEGACY

Help Protect Wisconsin's...

**WATER
RESOURCES**



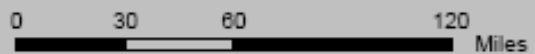
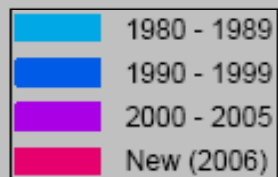




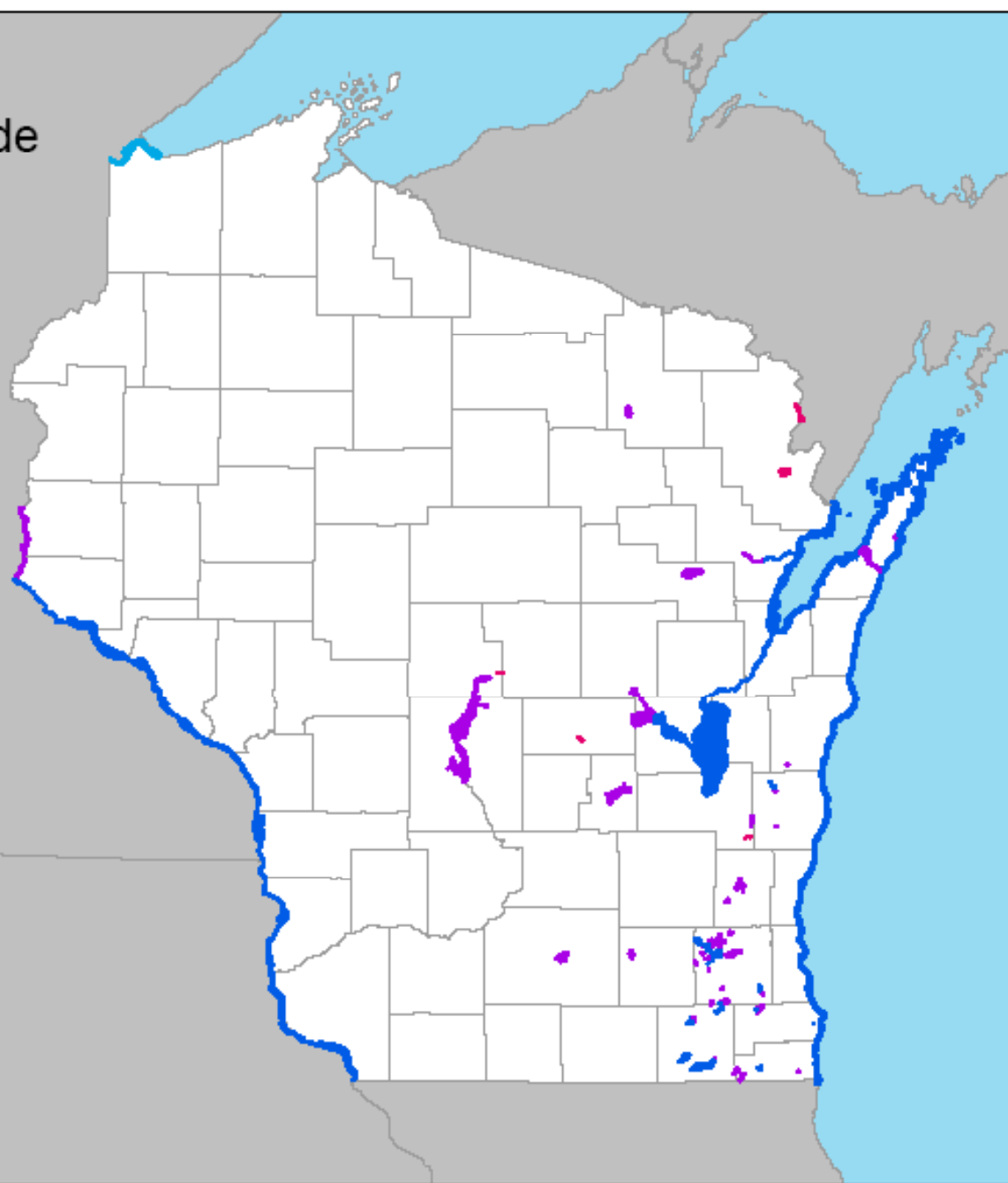




Zebra Mussel Infestations By Decade

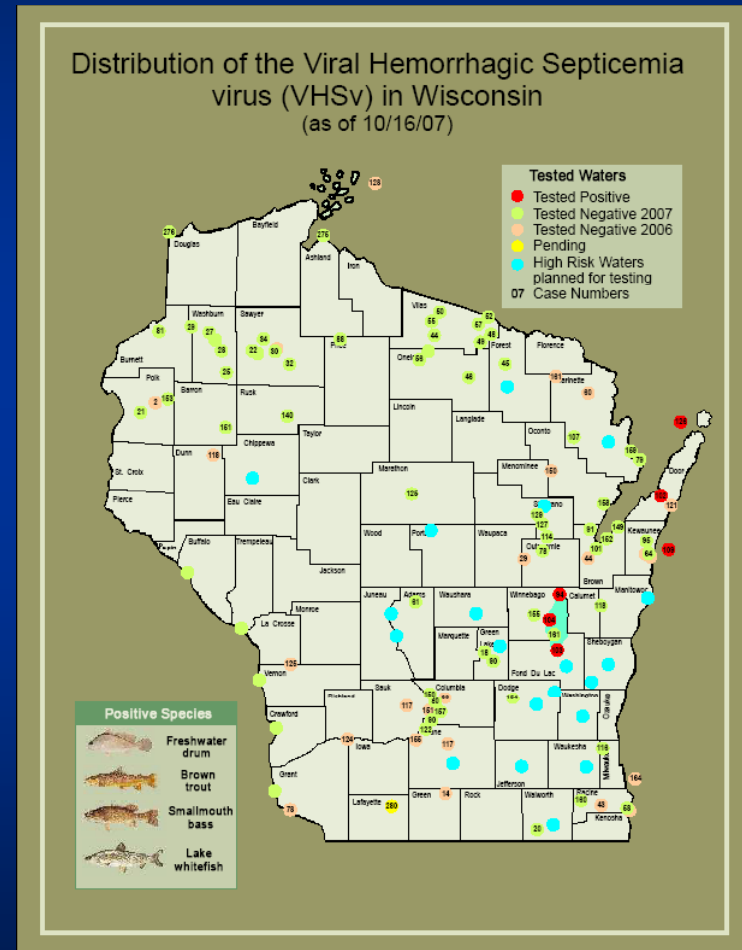


WI Dept. of Natural Resources
Bureau of Watershed Management
January 2007



Viral Hemorrhagic Septicemia virus (VHSv)

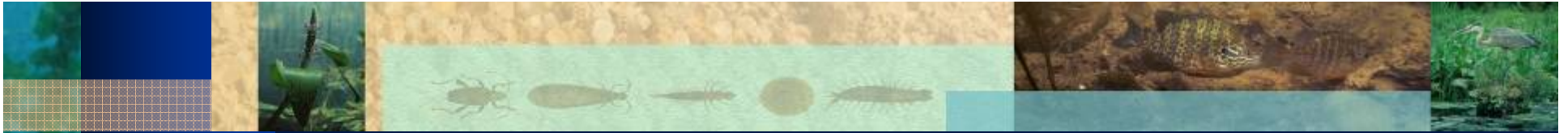
- Newly discovered in 2007
- Ability to infect and kill several different fish species at once
- Confined to Winnebago pool system and Lake Michigan
- Emergency Rules



Which one is the future?



Maybe both!



Tools for protecting shoreland wetland habitat and lake quality

- Regulation of wetland fill
- Shoreland zoning
- Invasive species control
- Slow/no-wake zones
- Restoration
- Preservation

