



Human Impacts of Lakeshore Development on Fish and Wildlife Habitat: Obvious Remedies, Yet Difficult Choices

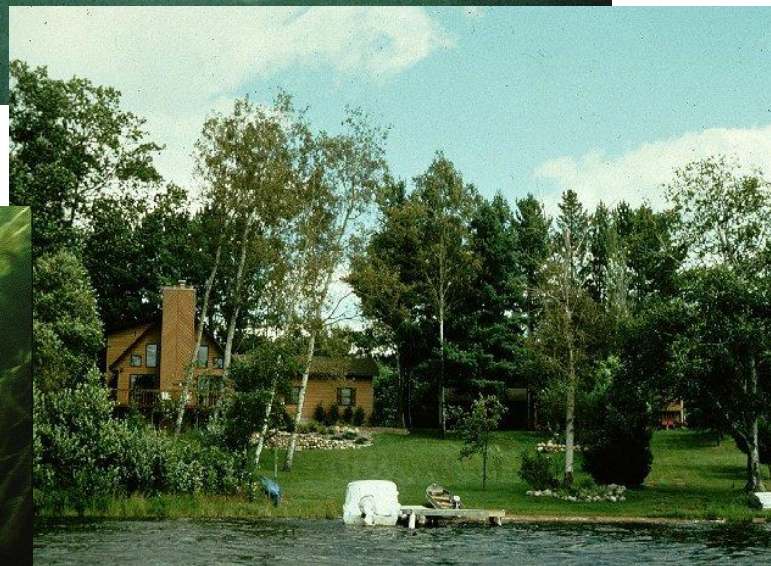
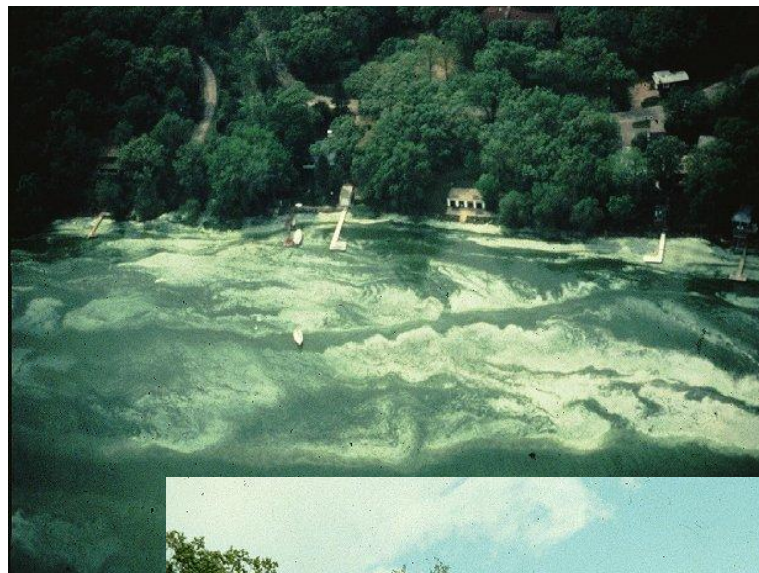
Paul Cunningham
Bureau of Fisheries Management

Wisconsin's Lakes are Changing Faster than Ever:

**Algae blooms
(phosphorus pollution)**

**Destruction of
shoreline habitat**

Invading plants and animals



Essential Habitat

"Geographically or physically distinct areas that one or more species finds indispensable for its survival at some phase in its life history"

Langton et. al 1996

Essential Habitat

- Littoral zone
- Tributary areas
- Adjacent shoreland

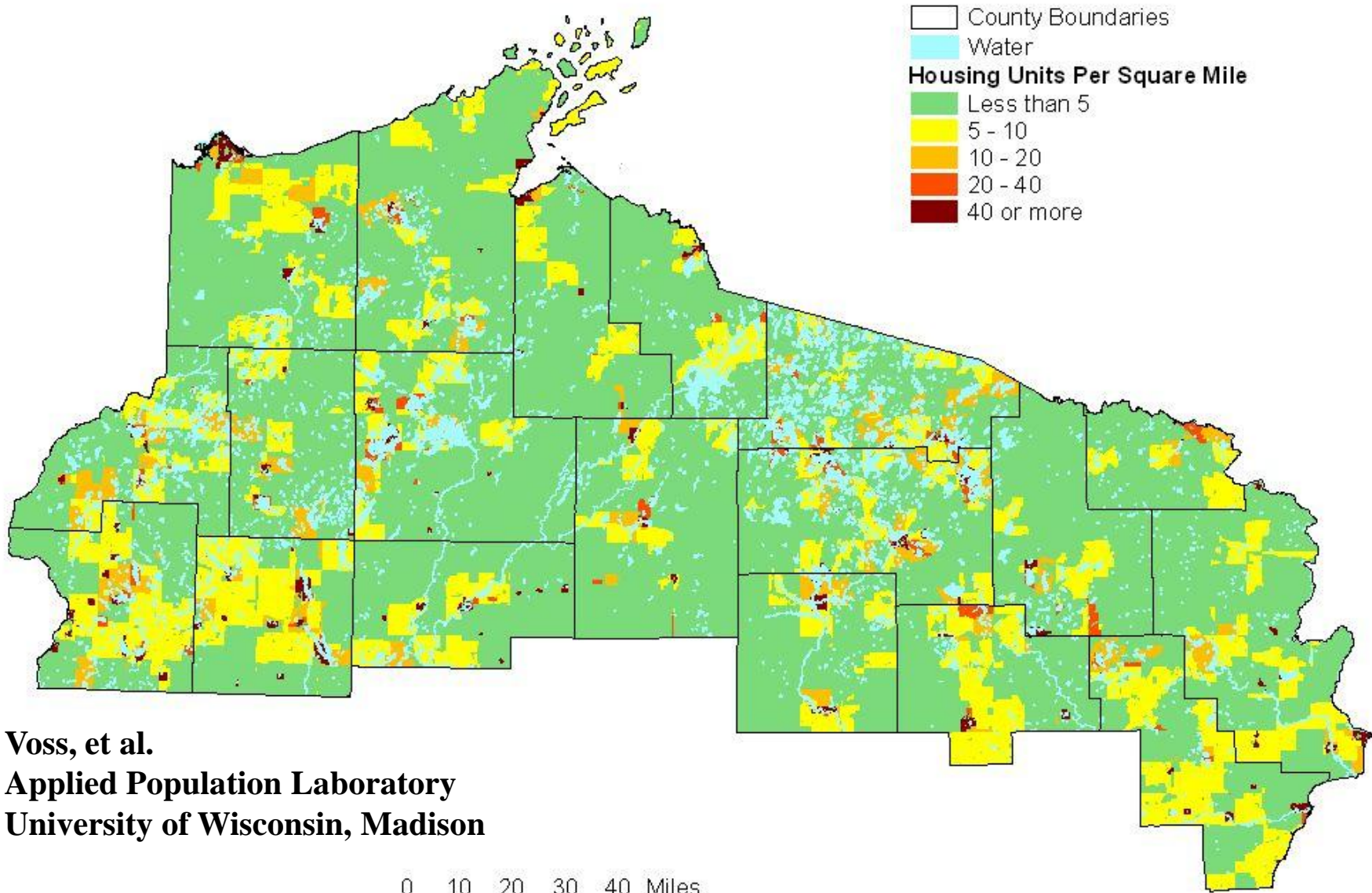


Features of Littoral Zone Habitat

- Vegetation
- Substrate
- Woody Cover
- Overhanging Bank Cover
- Depth and Depth Gradients



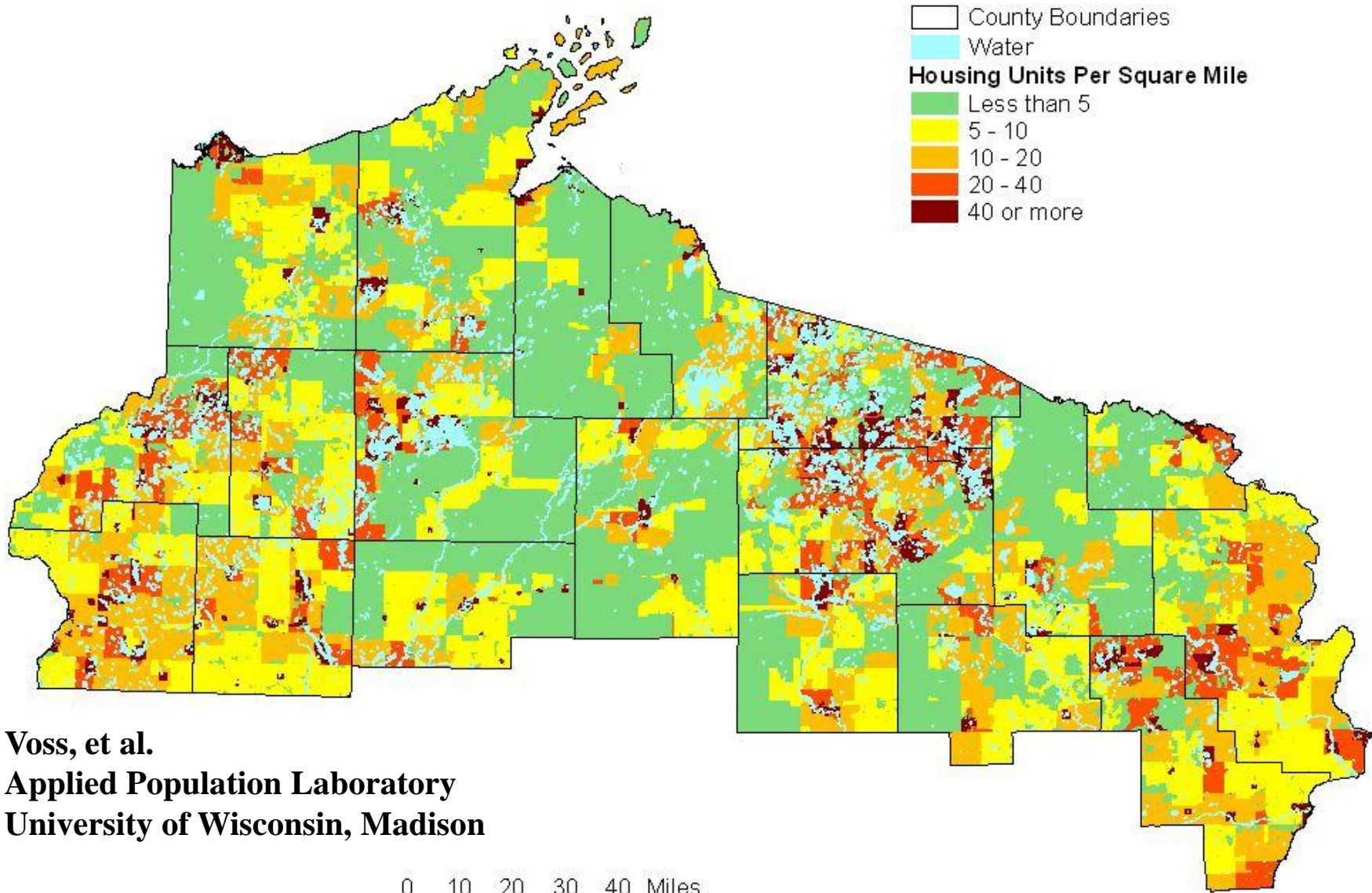
1940 Housing Density by Partial Block Group



Voss, et al.
Applied Population Laboratory
University of Wisconsin, Madison

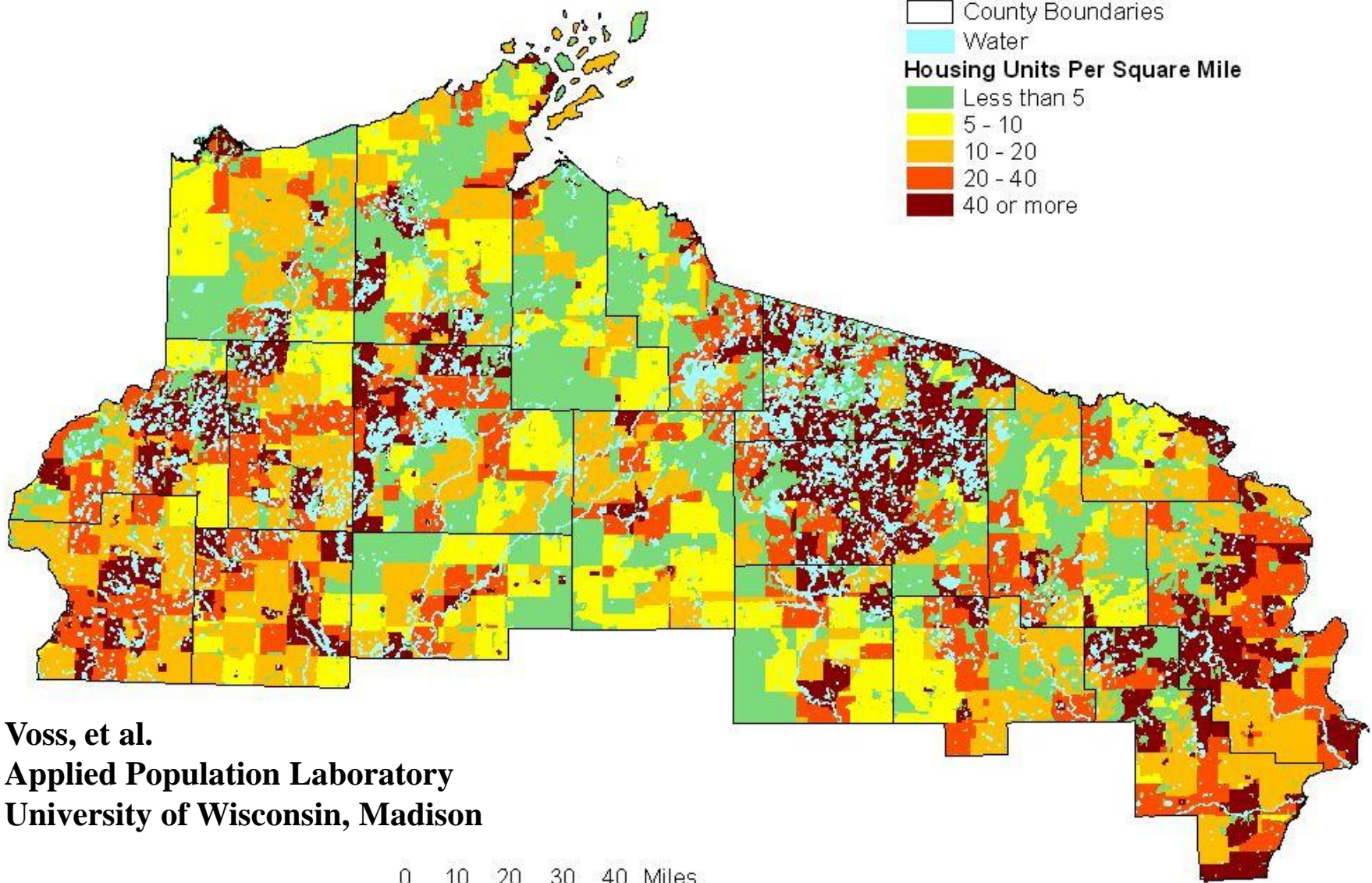


1990 Housing Density by Partial Block Group



Voss, et al.
Applied Population Laboratory
University of Wisconsin, Madison

2010 Housing Density by Partial Block Group Rural Renaissance Forecast



Voss, et al.
Applied Population Laboratory
University of Wisconsin, Madison





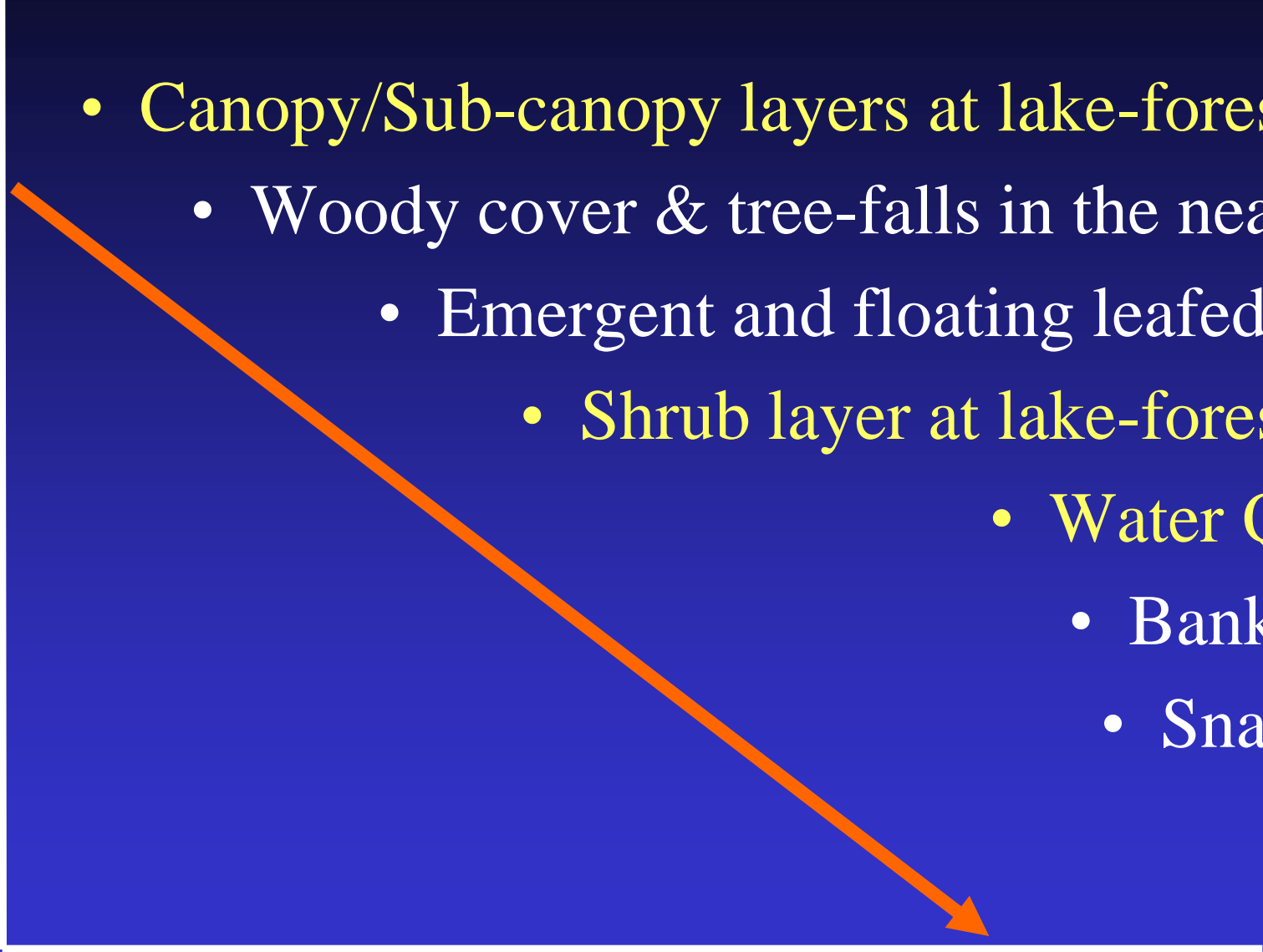
Domestication of Wisconsin Lakes

Courtesy of MN DNR

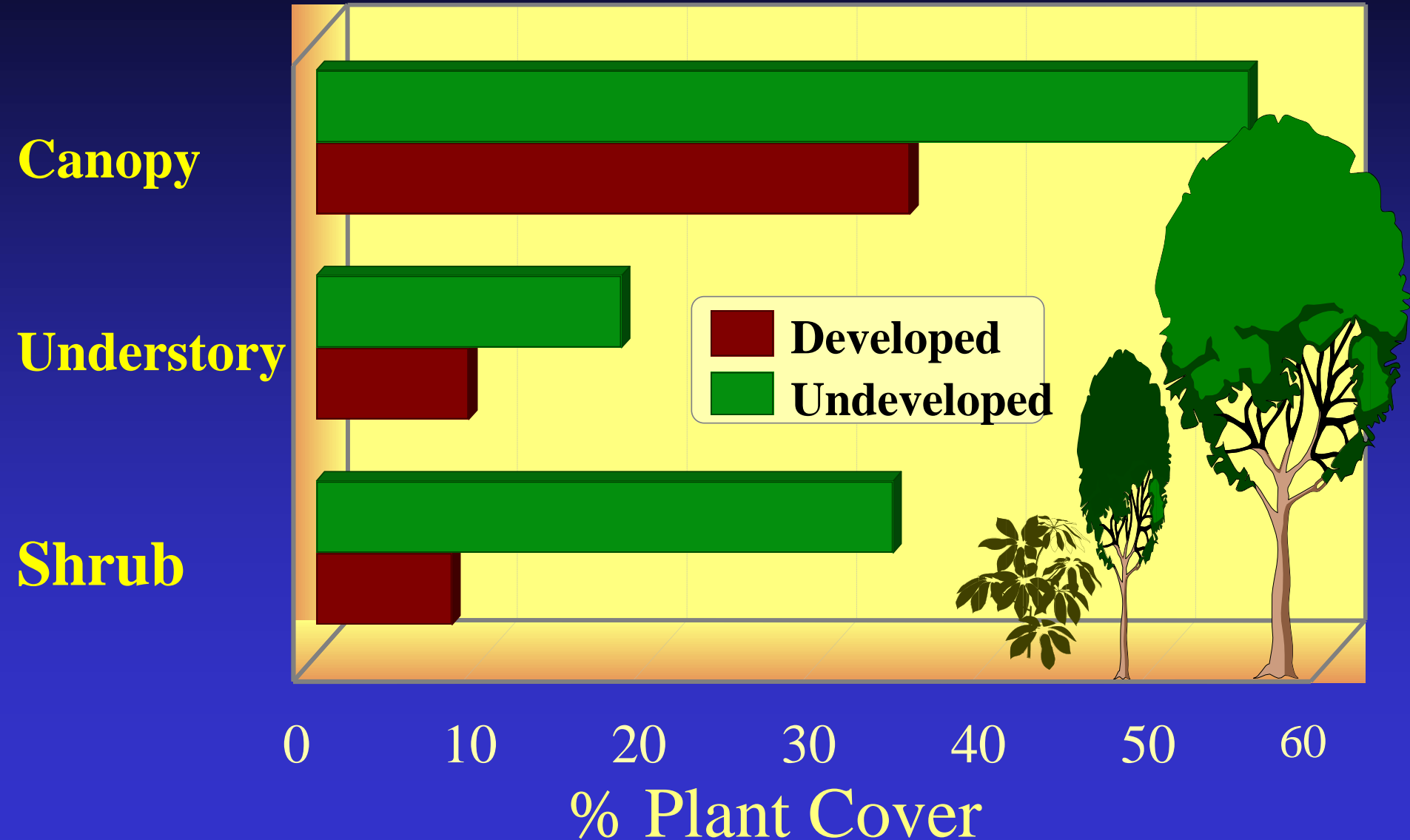




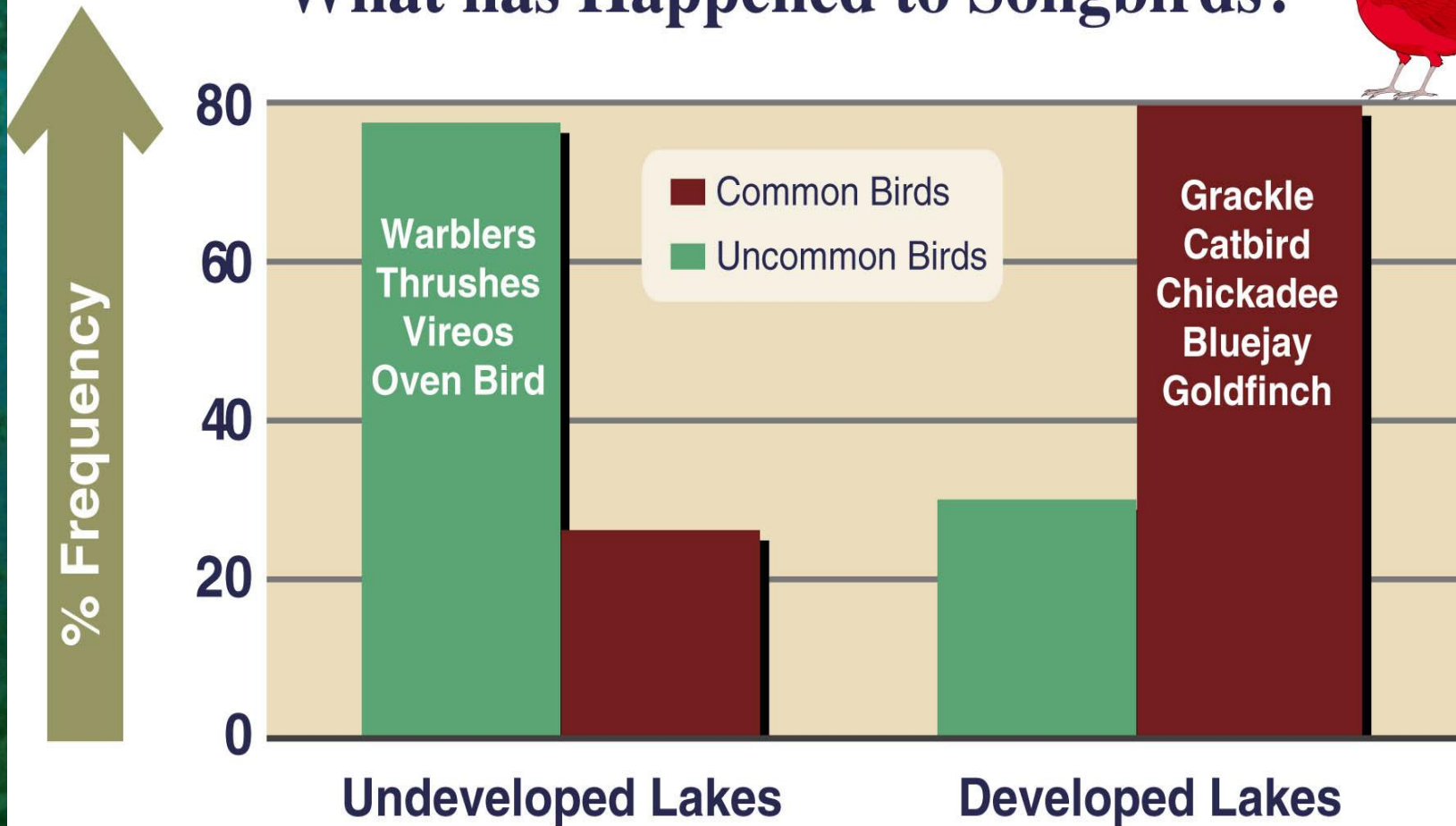
Habitat Changes With Lake Domestication

- Canopy/Sub-canopy layers at lake-forest edge
 - Woody cover & tree-falls in the nearshore
 - Emergent and floating leafed plants
 - Shrub layer at lake-forest edge
 - Water Quality
 - Bank cover
 - Snag trees
- 

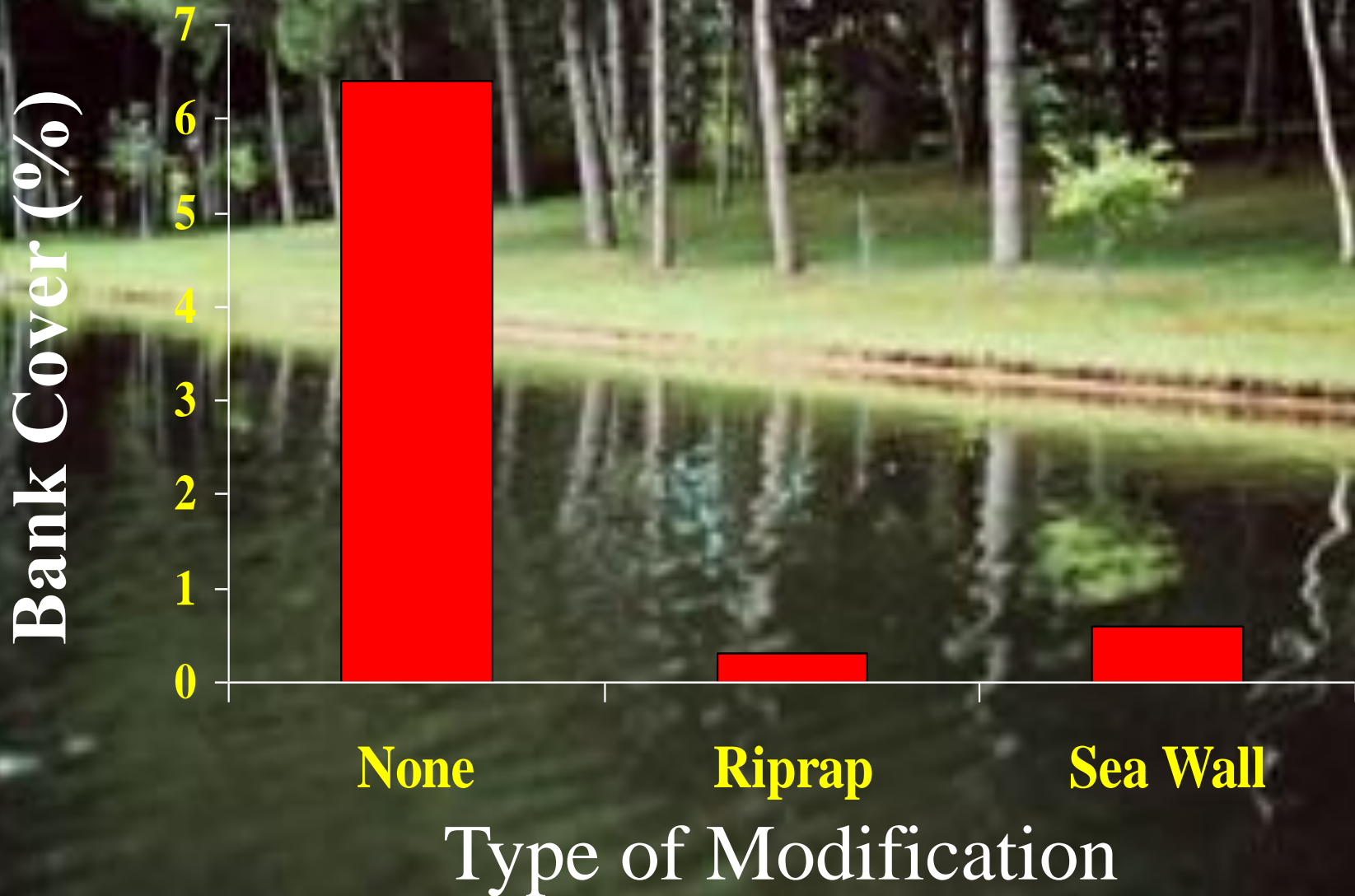
What's Happened To Shoreland Plants?



What has Happened to Songbirds?



Bank Cover



Consequences of Lakeshore Development on Emergent and Floating-Leaf Vegetation Abundance



Radomski and Goeman, 2001



Consequences of Lakeshore Development on Emergent and Floating-Leaf Vegetation Abundance



- Developed shores had less aquatic vegetation
- For each lake lot, 2/3rds of the emergent and floating-leaf vegetation was lost
- Minnesota has lost 20-28% of this vegetation

Radomski and Goeman, 2001



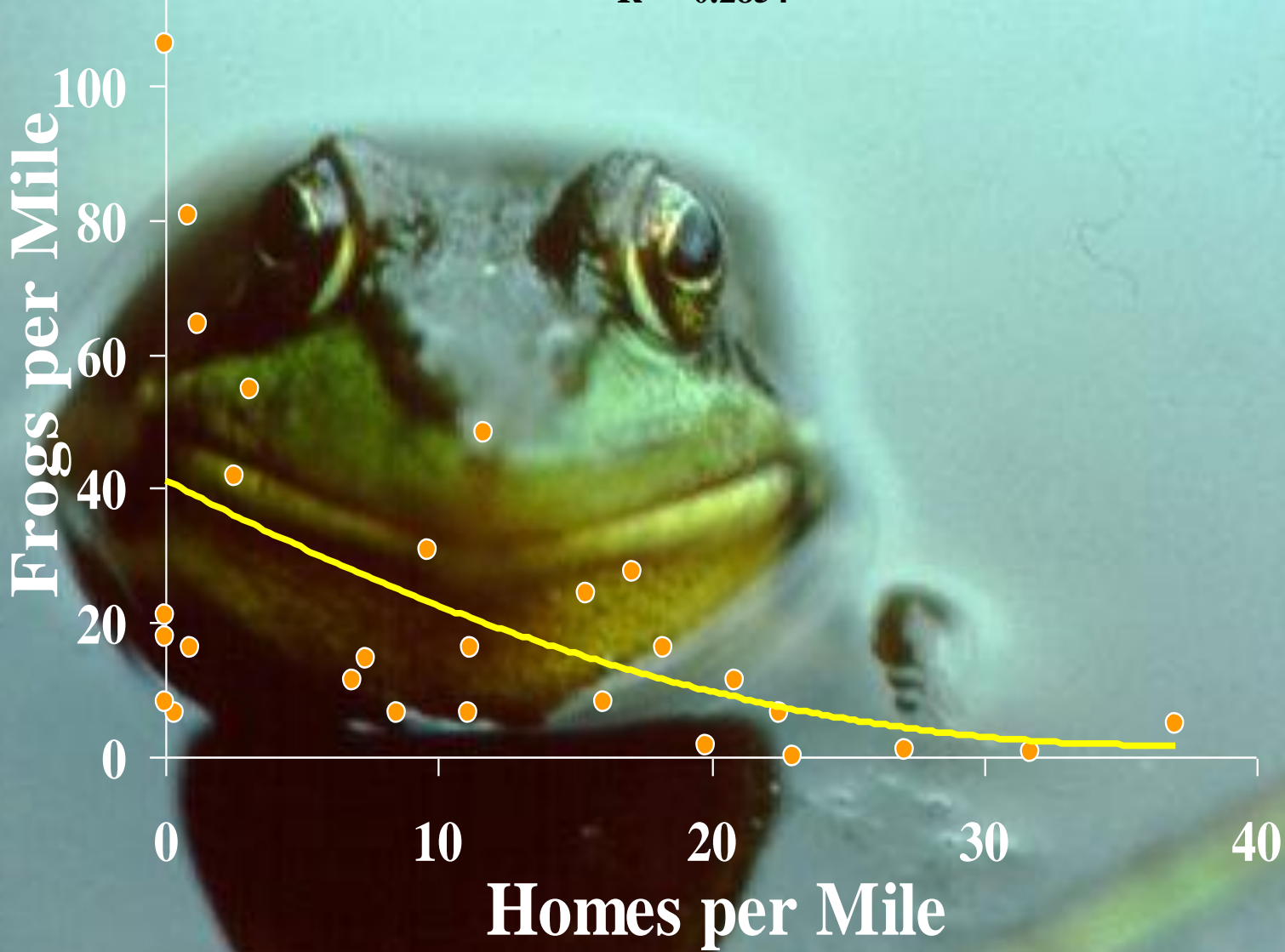
Minnesota Department of Natural Resources

What's Happened to Green Frogs

- Frogs/mile
- Poly. (Frogs/mile)

$$y = 0.0298x^2 - 2.1712x + 41.227$$

$$R^2 = 0.2854$$



Impacts of Lakeshore Development on Tree-falls in North Temperate Lakes

Christensen et al. 1996

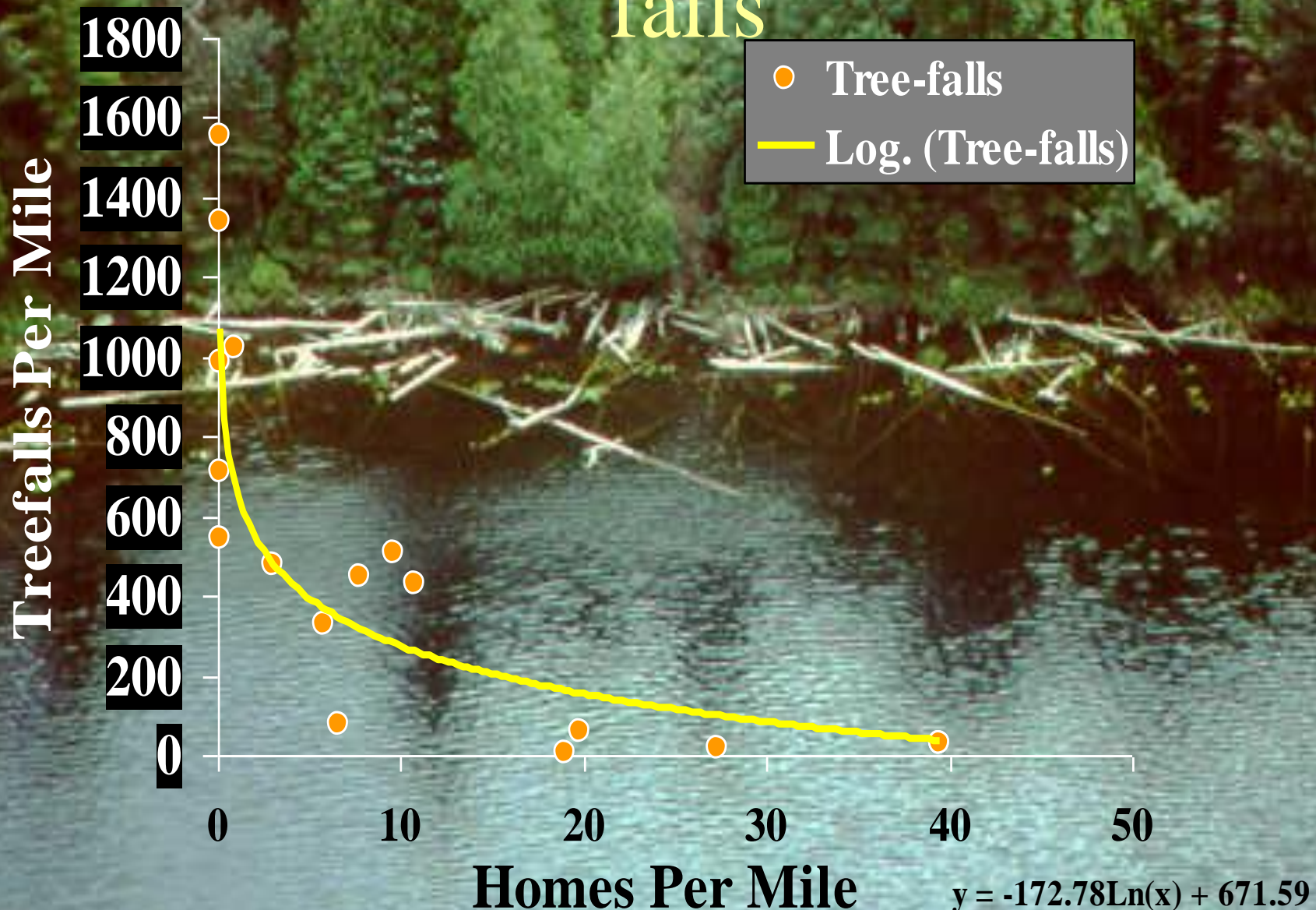


University of Wisconsin

Center for Limnology



Impacts of Development on Tree-falls



Christensen et al. 1996

$y = -172.78\ln(x) + 671.59$
 $R^2 = 0.7164$

Development Impacts on Fish Growth and Production



Schindler et al. 2000

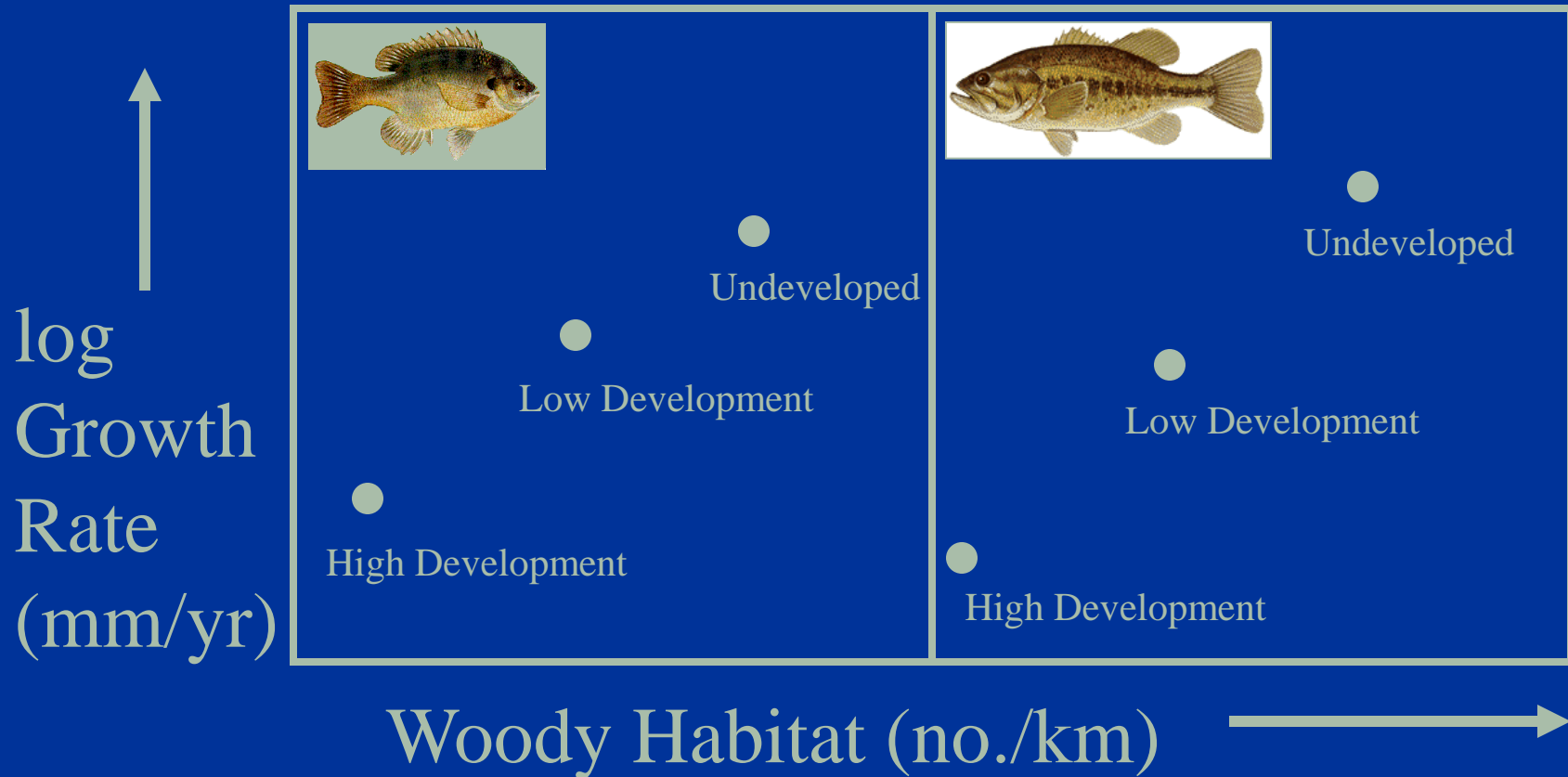


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Fish grow ~3X faster in lakes with lots of woody habitat

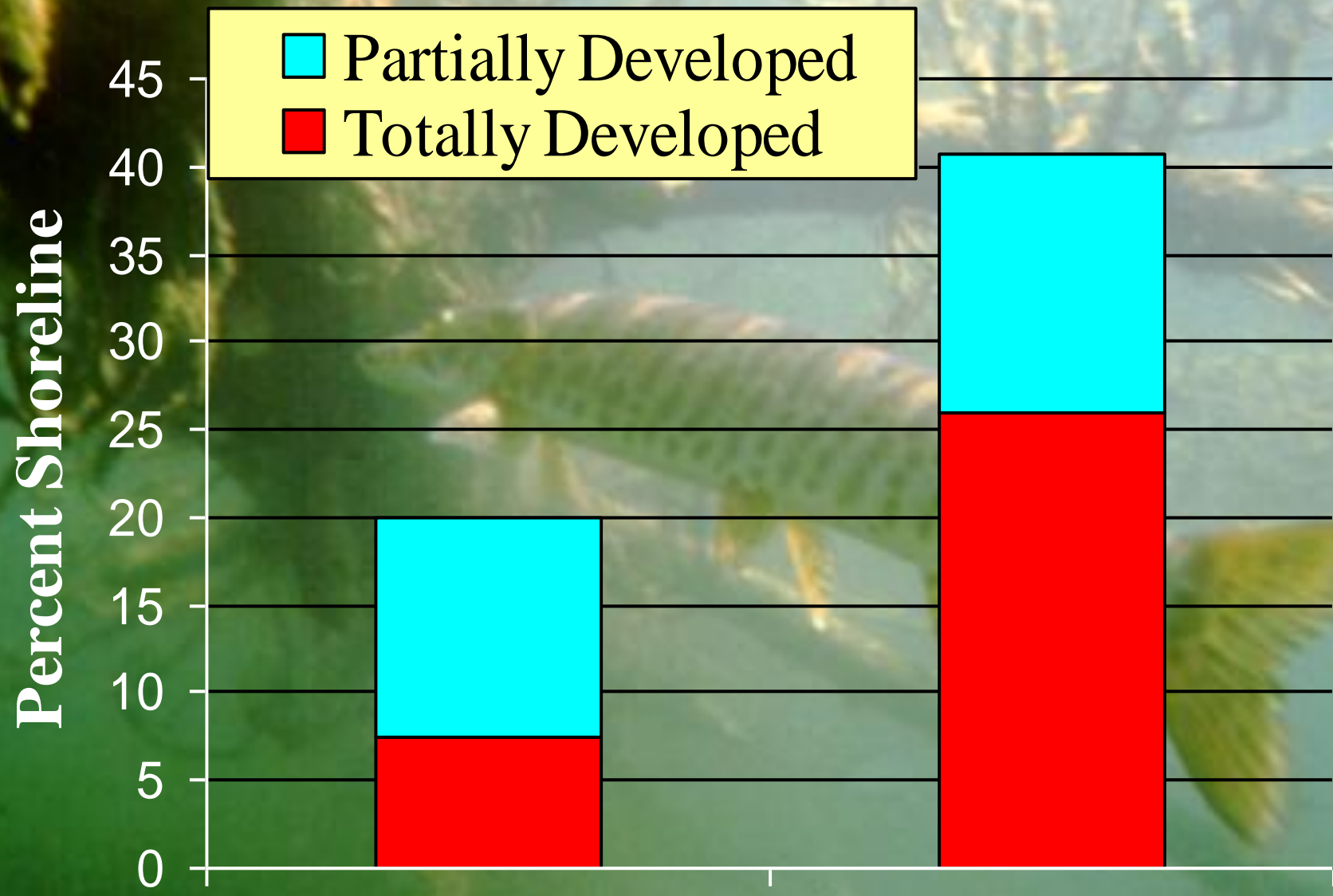


From Schindler et al. 2000

Lake Characteristics Influencing Spawning Success of Muskellunge



Lake Characteristics Influencing Muskellunge Reproduction



Effects of Pier Shading on Near-Shore Aquatic Habitat



Researchers:

Paul Garrison, DNR

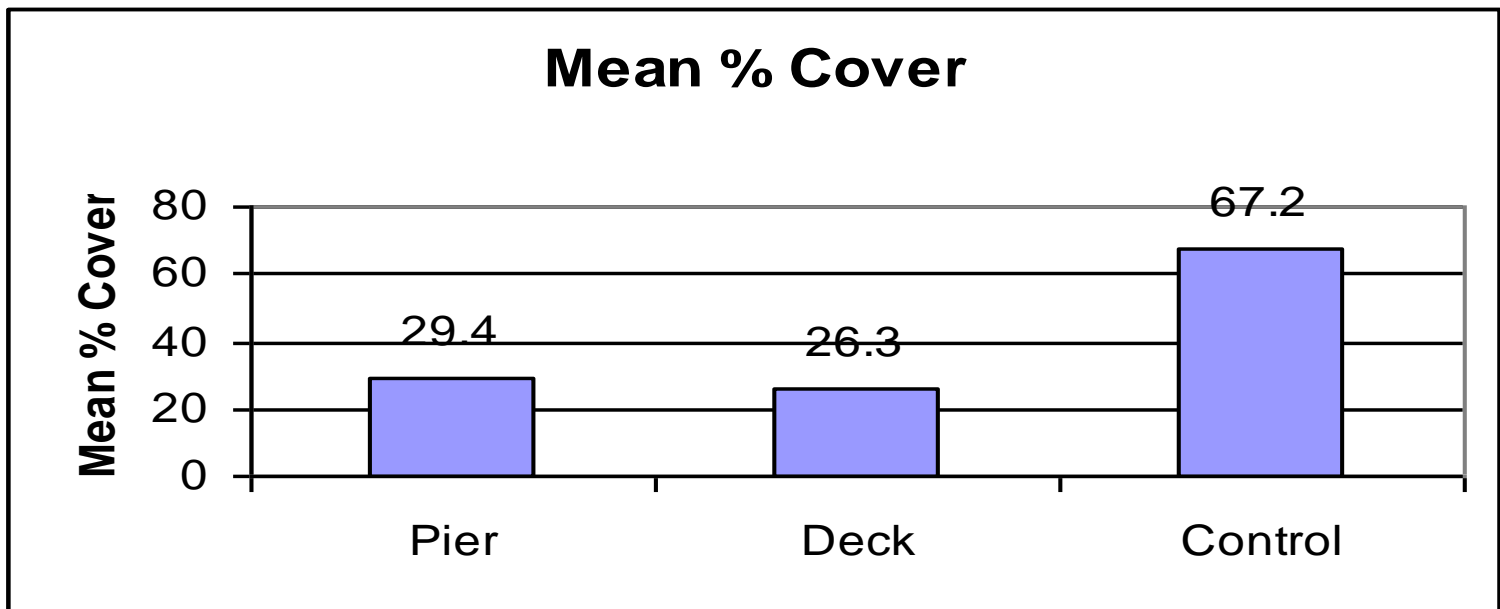
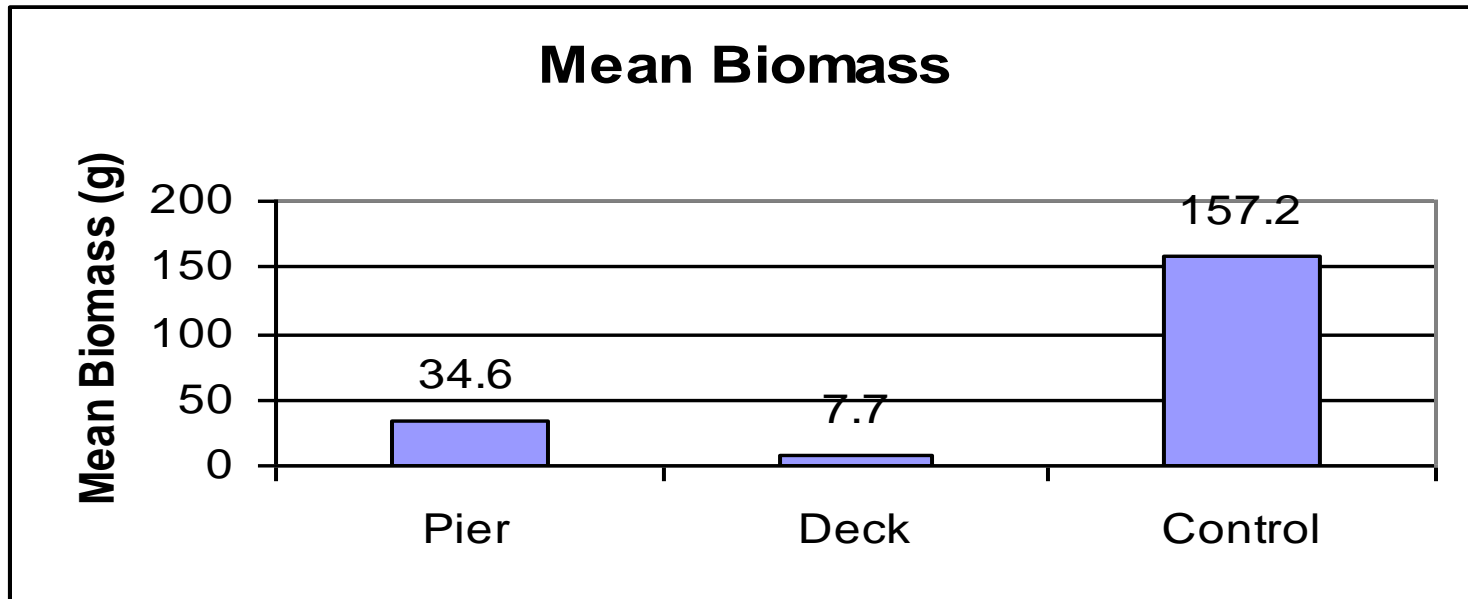
Dave Marshall, DNR

Laura Stremick-Thompson, DNR

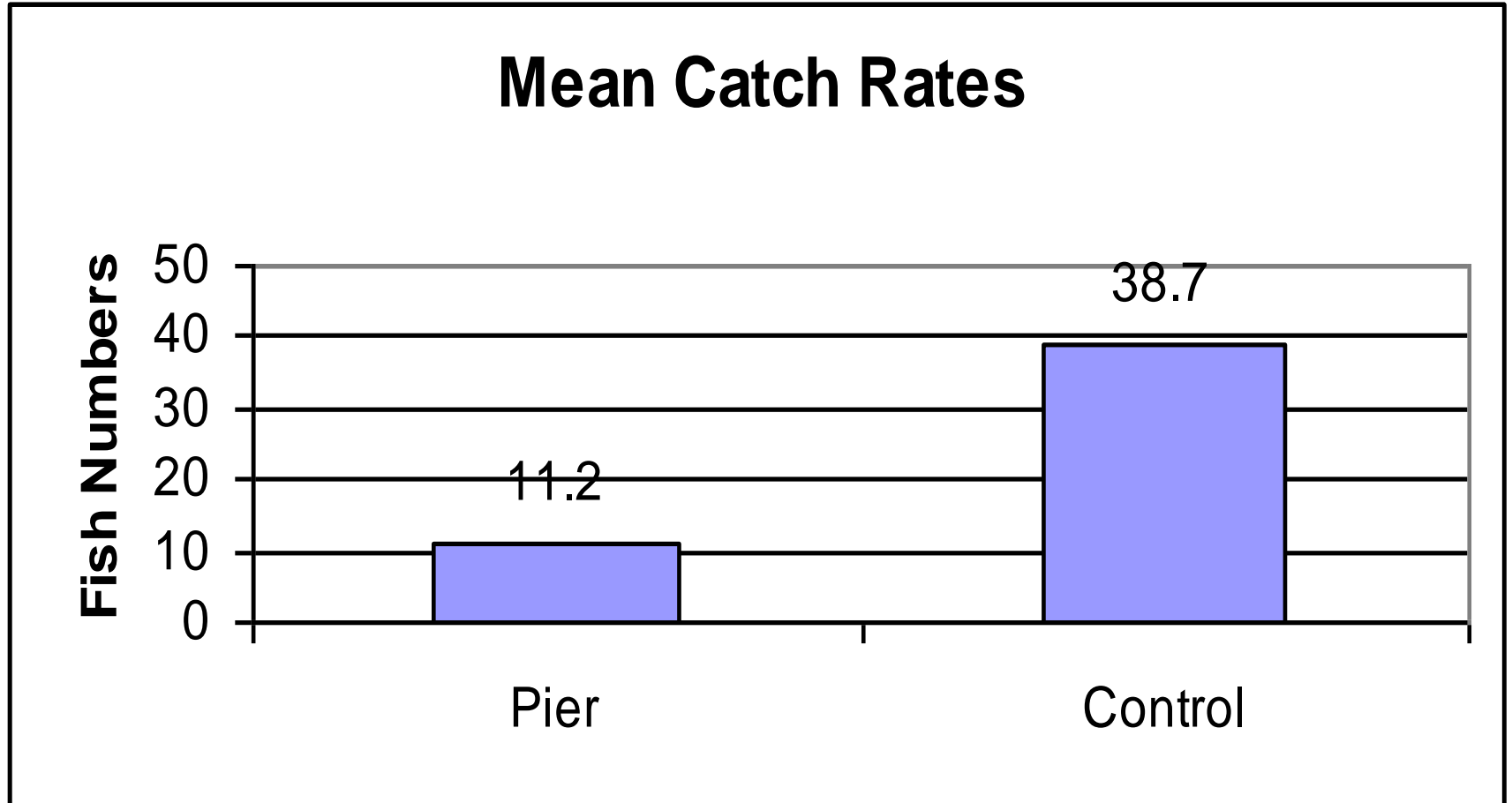
Patricia Cicero, Jefferson County LWCD

Paul Dearlove, Lake Ripley Mgmt. Dist.

Ecological Effects of Piers on Aquatic Plants



Ecological Effects of Piers on Fish



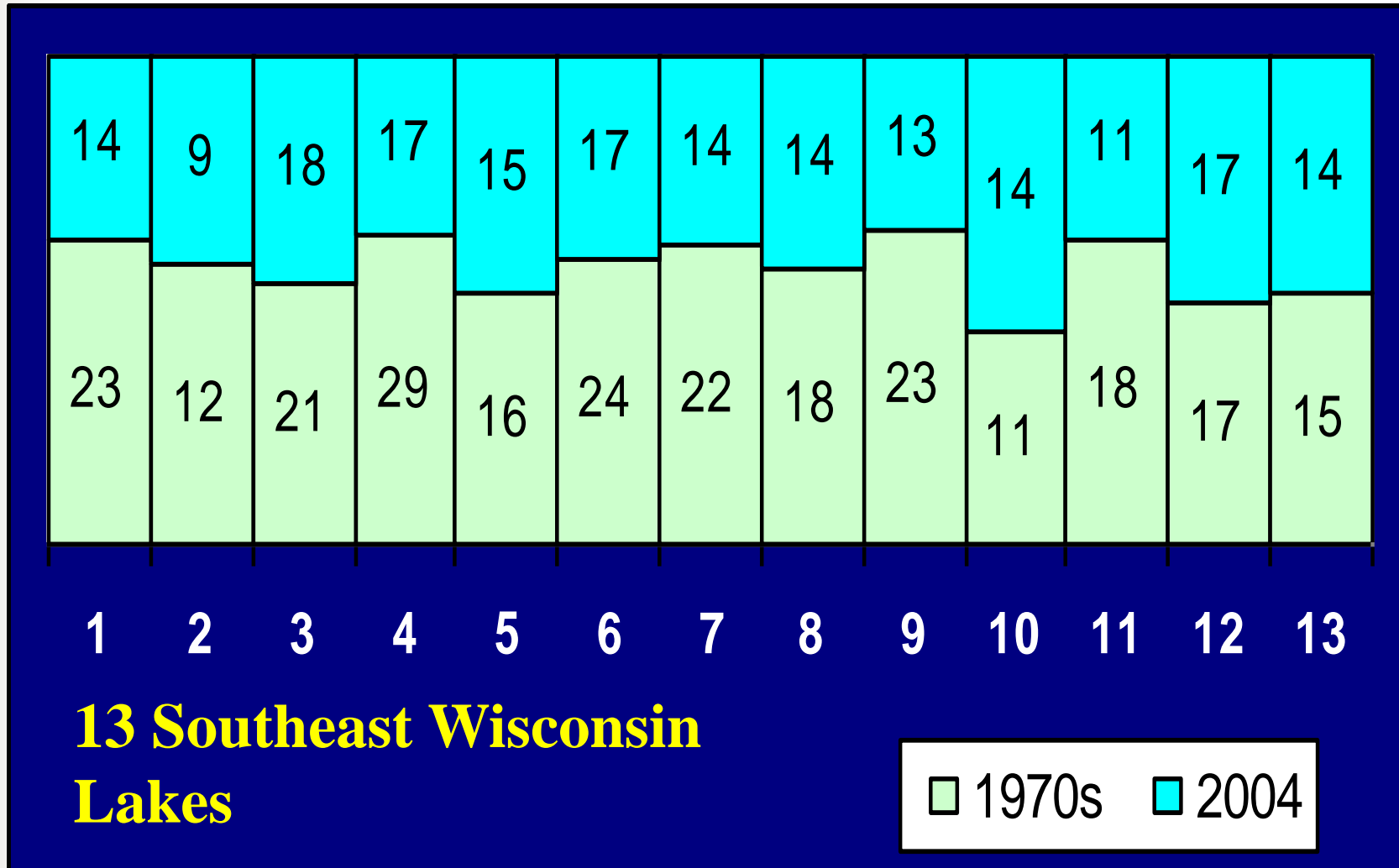
RECENT NEARSHORE FISH DECLINES IN SOUTHEAST WISCONSIN LAKES



Tadpole madtom (*Noturus notatus*) - ~ 4"

**John Lyons, Laura Stremick, Steve Galarneau,
Will Wawrzyn and Dave Marshall**

Seining Survey Results: Species Richness



The Survey said...

Some SE Wisconsin lakes still had diverse fishes in 1970s

Recent major declines (20-30%) in native, intolerant, rare species

Water quality & exotics don't fully explain species losses

Declines associated with increased lakeshore development





Domestication of Wisconsin Lakes

Courtesy of MN DNR

Natural Shoreline Habitat...





Going, ...



Going, ...



Going,

...

Gone.....



Well it Doesn't
Have to Be That
Way!





Organizational Habitat Management

➤ **Lead by Example**

An aerial photograph showing a wastewater treatment plant in the foreground with several circular aeration tanks. In the background, there is a residential area with houses and trees, and a large body of water. The text "Lead By Example" is overlaid in white on the water.

Lead By Example

Littoral Zone &
Shoreland Demo
Sites

May 12th Spooner/Shell Lake 4th Grade Field Day

Planting:



Organizational Habitat Management

➤ Lead by Example

➤ Buy Land

1. No/low development
2. High quality natural communities
3. Fish and wildlife habitat
4. Degree of development threat
5. Protection potential
6. Lakewide cumulative benefit
7. Connectivity (public lands, clusters of lakes, and linkages to other surface waters).

Organizational Habitat Management

- **Lead by Example**
- **Buy Land**
- **Support Critical Habitat and Sensitive Areas Designations (NR107, NR 1.06)**

Critical Habitat Designation Program

- Aquatic Plant Beds with High Species Richness
- Bulrush Beds
- Lakeshores with Riparian Wetlands
- Wetland Islands
- Tributary Areas
- Nearshores with Abundant Woody Habitat
- Fish Spawning Habitat
- Muskellunge, Walleye, SMB



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- **Local Ordinances (e.g., “slow-no-wake”)**

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- **Shoreland Protection Rules (NR 115) and Zoning**



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- **Waterway Permitting Statutes (s. 30) and Regs**



You can protect lakeshore habitat

➤ Go fishing!









You can protect lakeshore habitat

- Go fishing!
- Go to the beach!
- Less is more!
- Put the mower, chainsaw, rake, weed rake, herbicides, fertilizers away!



You can restore lakeshore habitat

➤ Sketch and Plan

➤ Document/Photograph

➤ Permits?

➤ Flag 35' buffer, quit mowing/brushing

➤ Remove Riprap/Seawalls and Revegetate Banks

➤ Install temporary wave breaks

➤ Leave Aquatic Plants along shoreline

➤ Introduce tree-falls

➤ Pier Belly Brush Bundles

