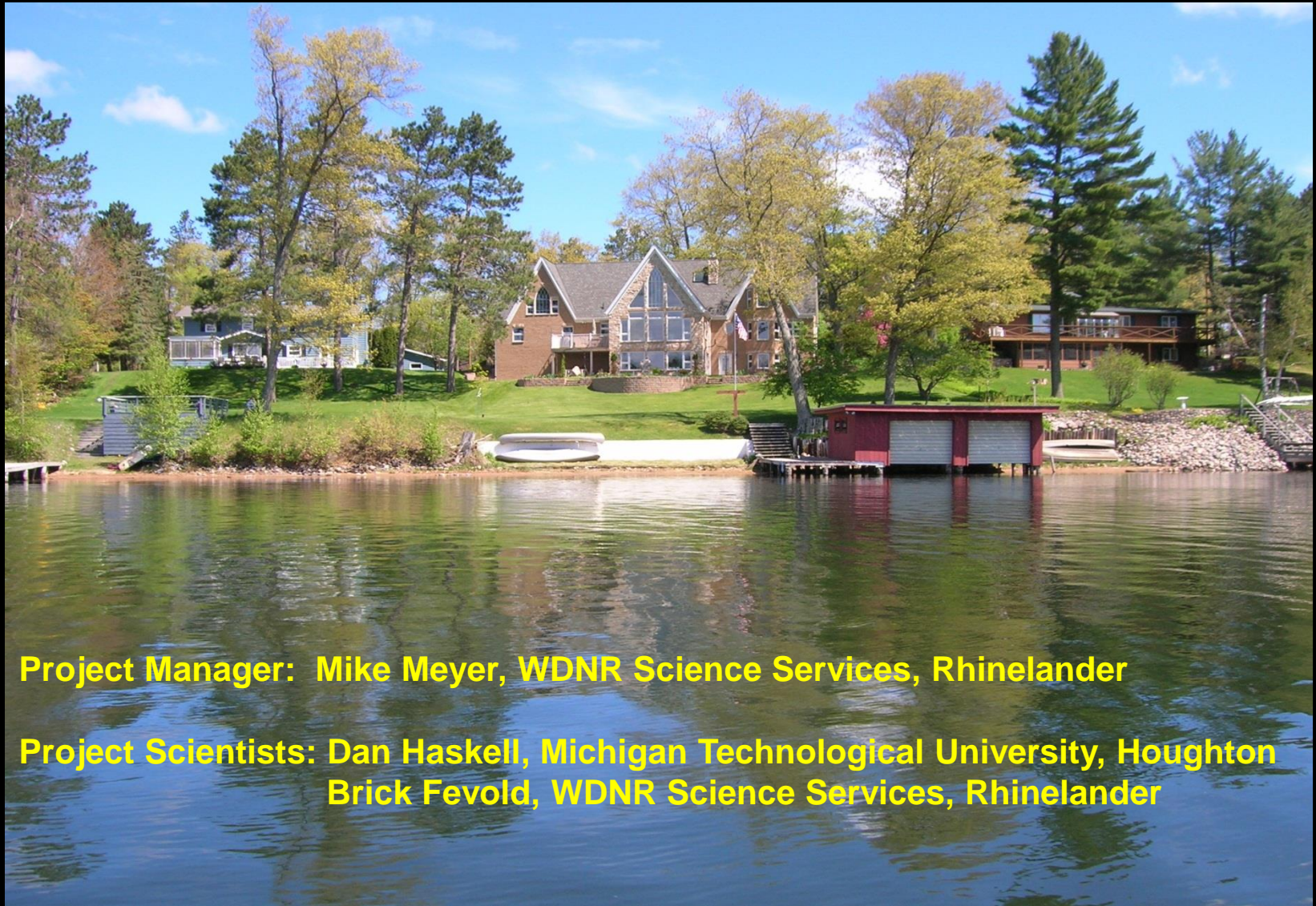


Quantifying the Ecological Benefits of Lakeshore Restoration in Northern Wisconsin



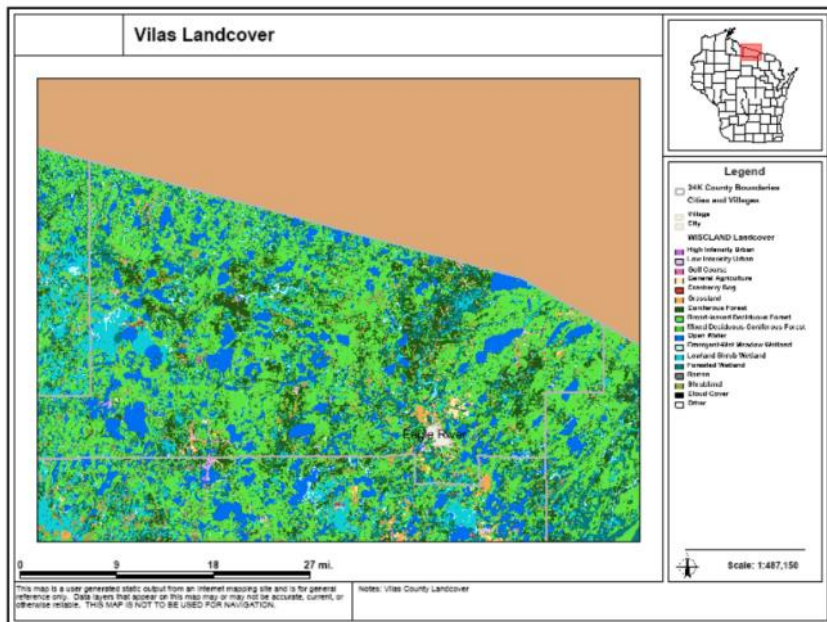
Project Manager: Mike Meyer, WDNR Science Services, Rhinelander

**Project Scientists: Dan Haskell, Michigan Technological University, Houghton
Brick Fevold, WDNR Science Services, Rhinelander**

Wisconsin lakes by county

Globally significant cluster of glacial lakes

Shown are the number of lakes located in each county.



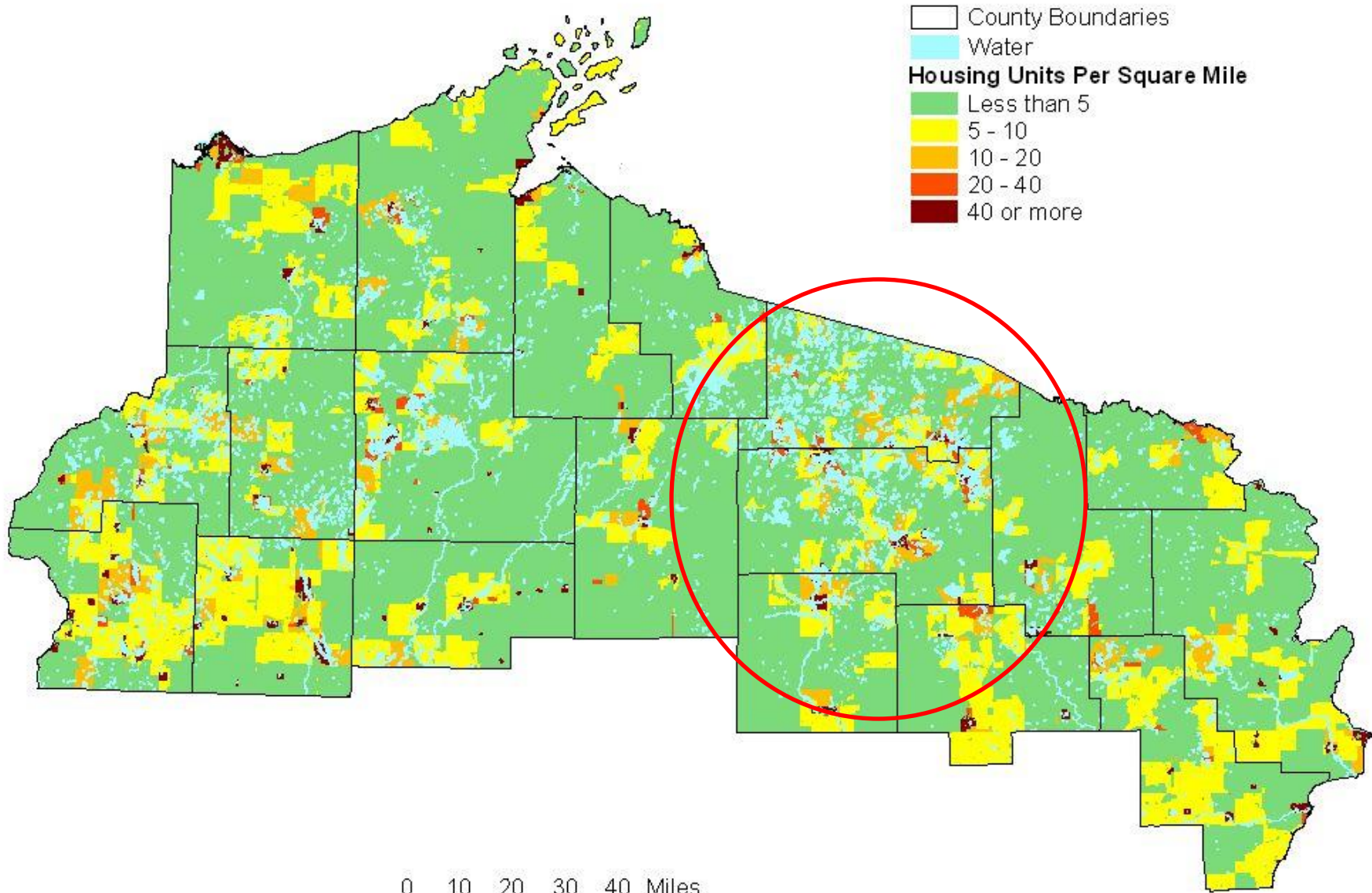


**Research Findings
(1990s – 2000s)
Current Wisconsin
Shoreland Management
Rules (NR 115)
do not protect critical
fish and
wildlife habitat –**

**Permitted shoreline
development
densities
(52 homes/mile)
are too high!**



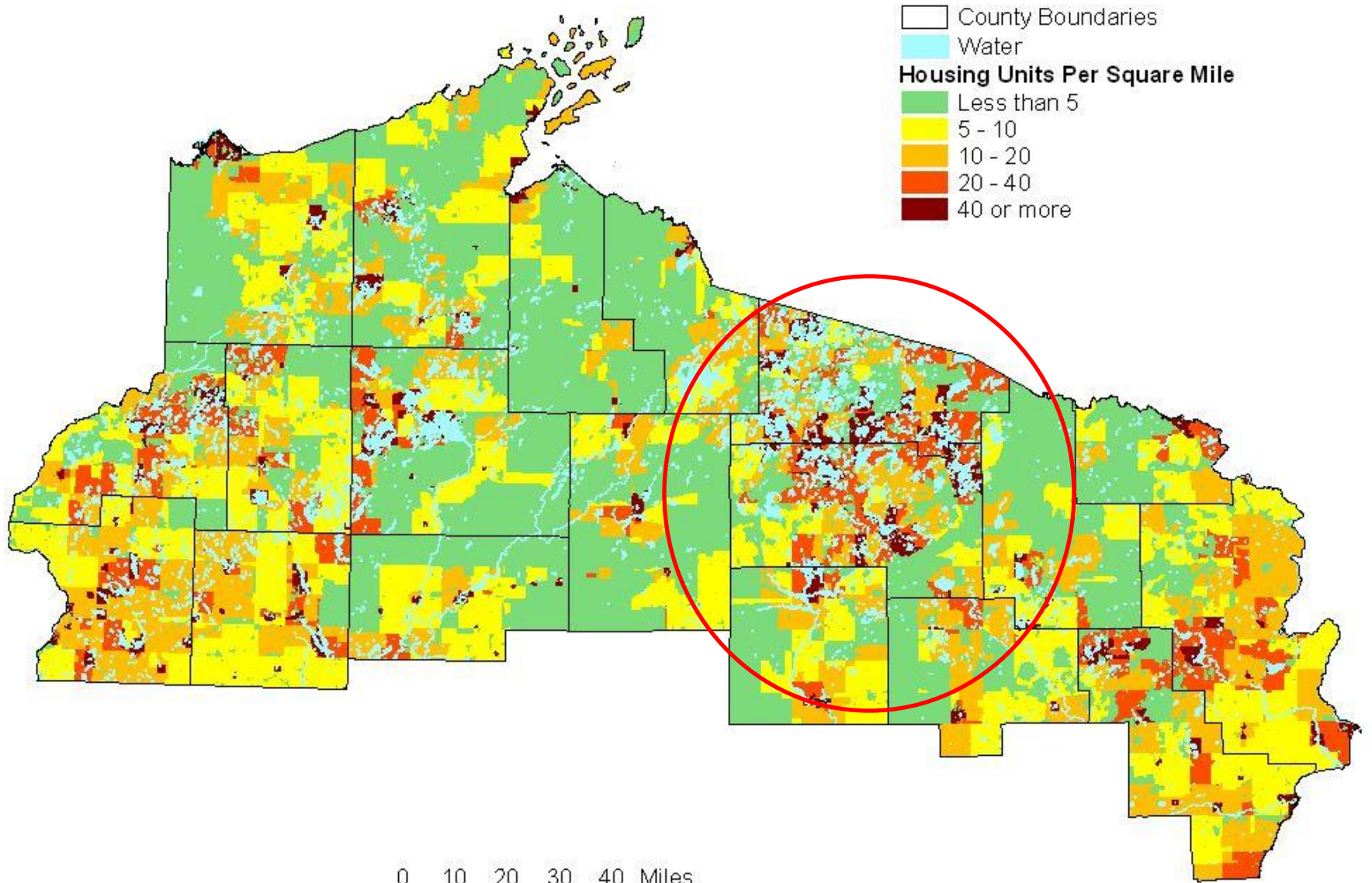
1940 Housing Density by Partial Block Group



County Boundaries
Water
Housing Units Per Square Mile
Less than 5
5 - 10
10 - 20
20 - 40
40 or more

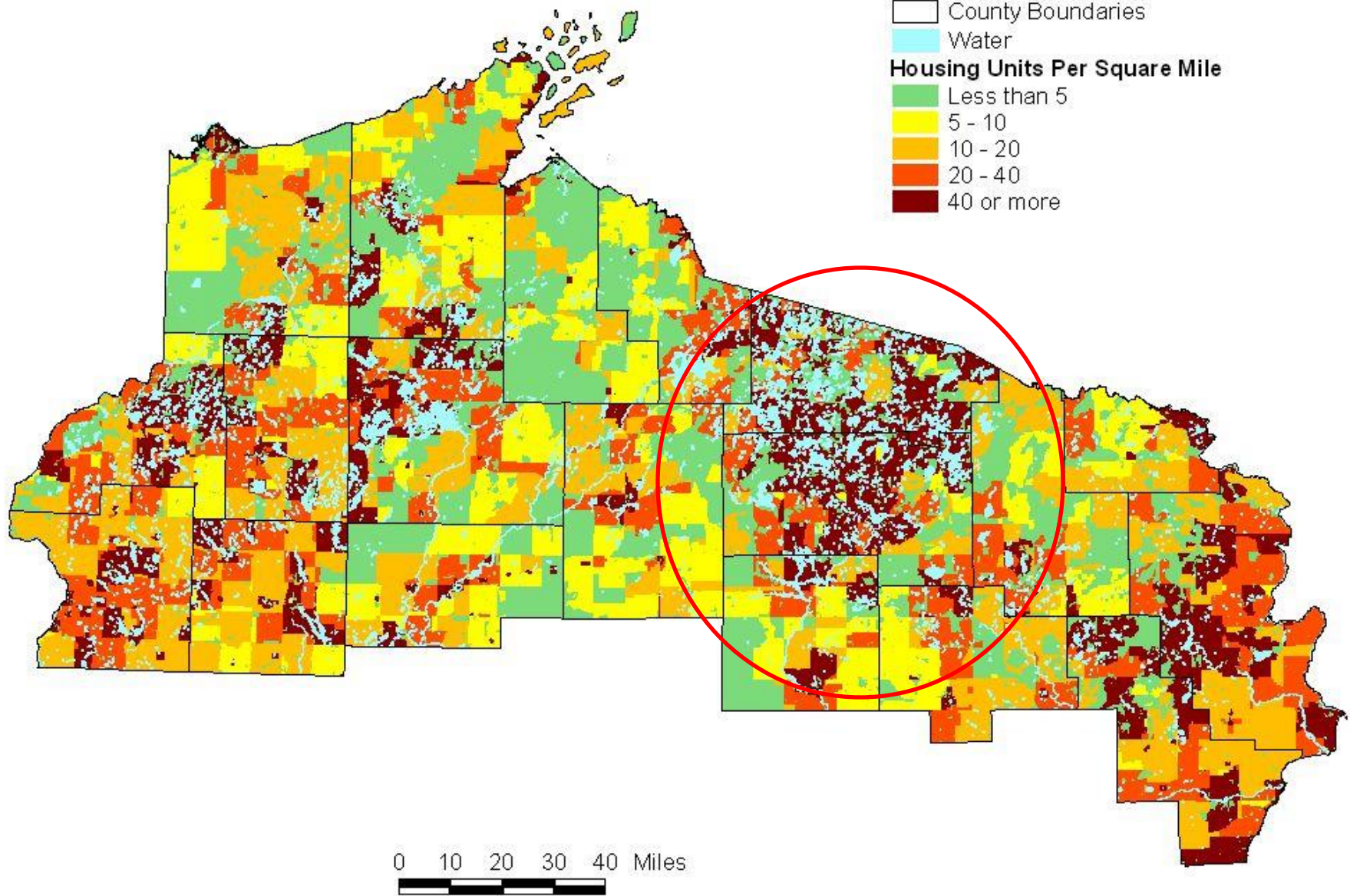


1990 Housing Density by Partial Block Group

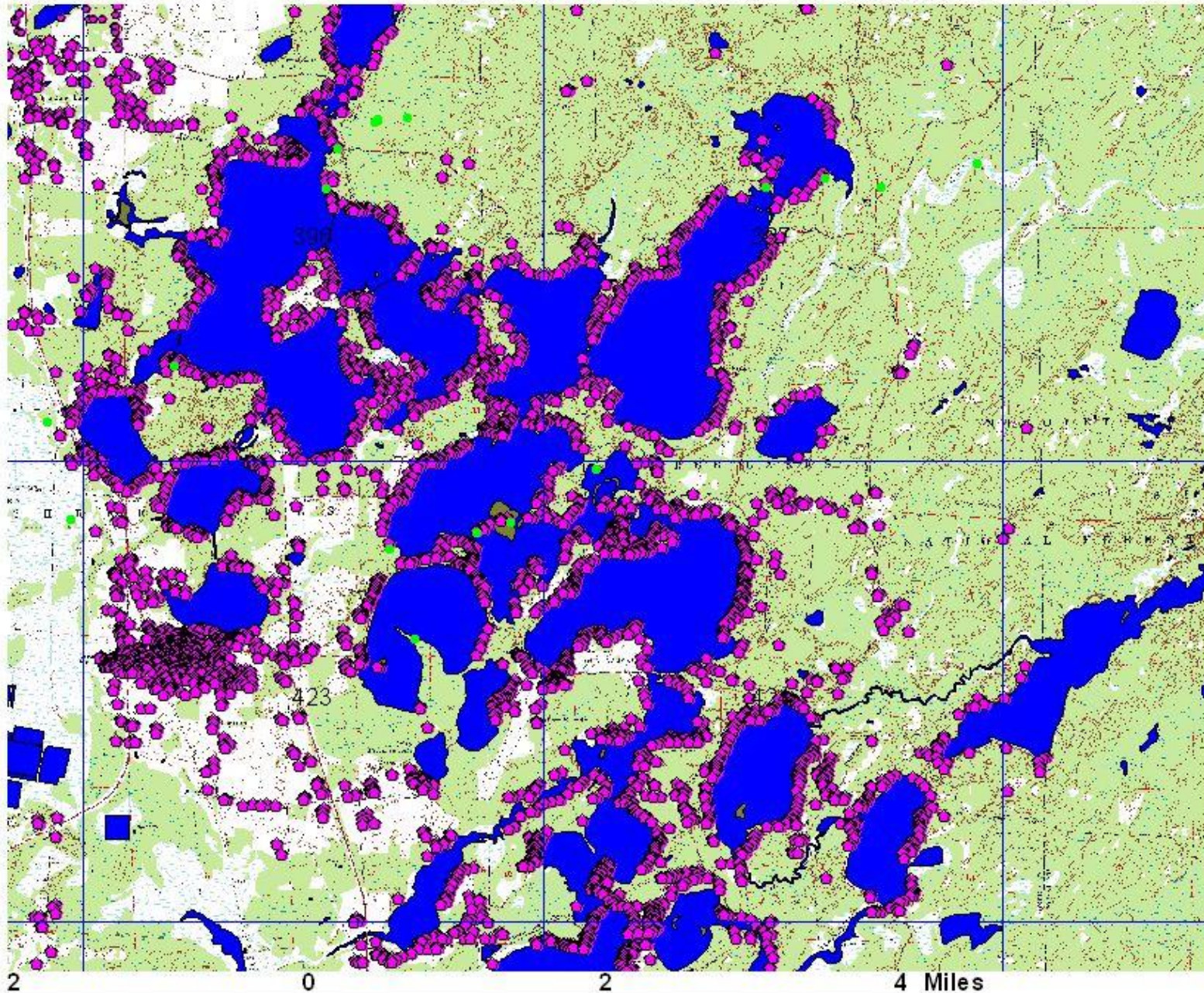


0 10 20 30 40 Miles

2010 Housing Density by Partial Block Group Rural Renaissance Forecast



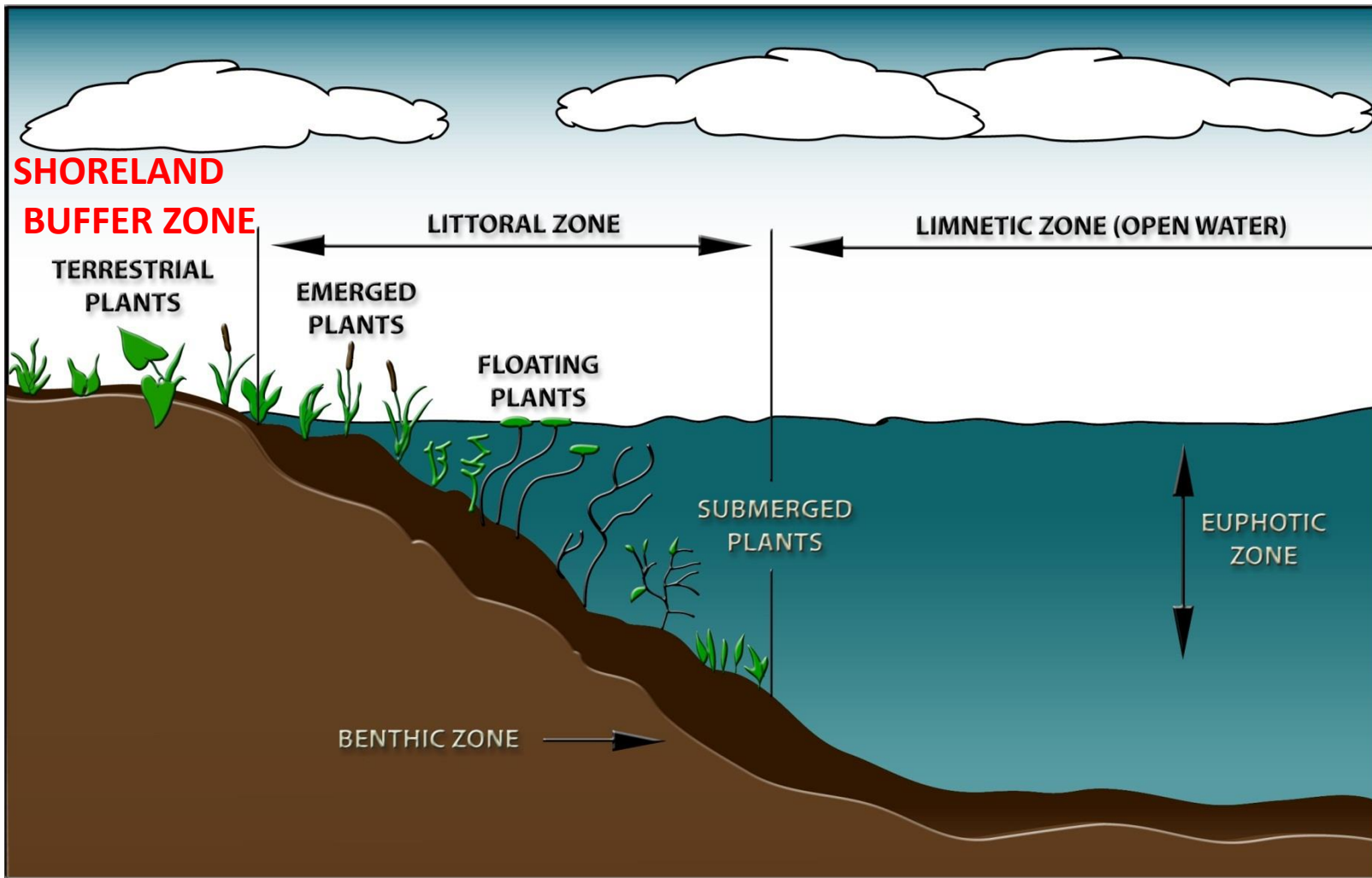
HOUSING DEVELOPMENT PLOTTED



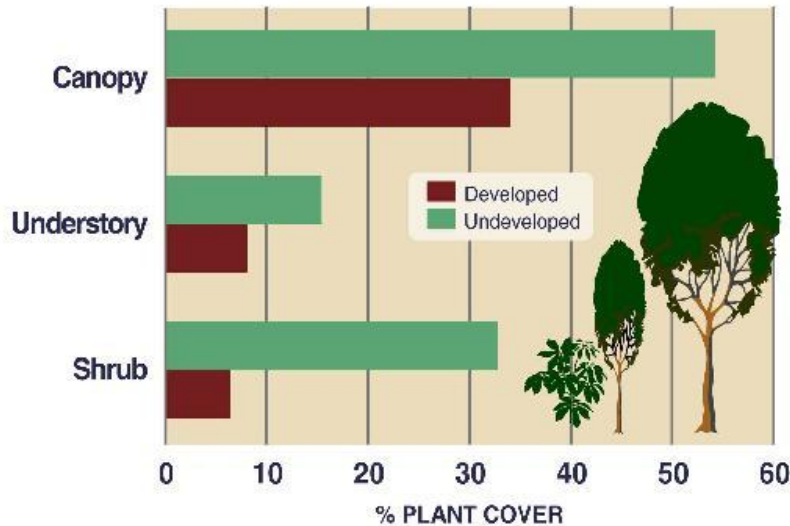




LAKE HABITAT ZONES



What has Happened to Shoreland Plants?



Source: Wisconsin Dept. of Natural Resources

The Wisconsin Lakes Partnership



b) SHORELINE	Mean % Shoreline (2SE)	
	Undeveloped	Developed
Trees**	38.8 (6.77)	29.5 (6.15)
Shrubs***	66.7 (6.98)	28.0 (6.62)

c) AQUATIC	Mean % Cover (2SE)	
	Undeveloped	Developed
Floating**	15.7 (5.50)	5.8 (2.54)
Shrub	1.8 (2.34)	0.4 (0.50)
Narrow-leaved emergent	1.2 (1.17)	1.4 (1.14)
Broad-leaved emergent	0.9 (0.71)	1.6 (1.21)
Submergent	14.0 (5.85)	3.9 (2.21)
Isoetid	1.7 (1.16)	0.8 (0.81)
Unvegetated***	65.0 (7.48)	85.5 (3.73)

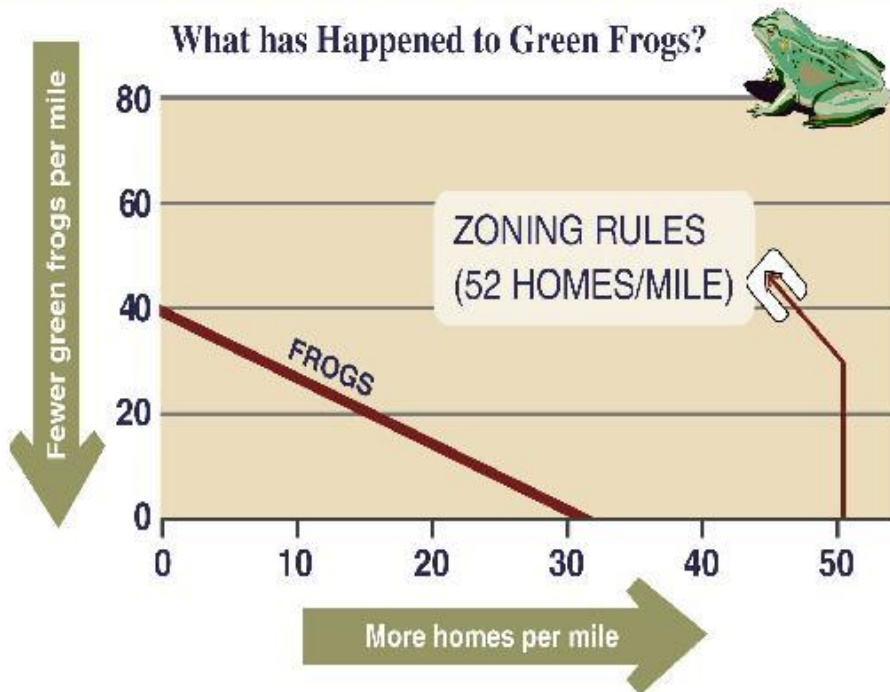
Vegetation transects show tree and shrub canopy cover and coarse wood abundance are significantly less within the shoreland buffer of developed vs undeveloped lakes – shrub layer most affected.

Coarse wood and floating aquatic vegetation are significantly lower in the littoral zone of developed lakes with un-vegetated lake bottom significantly higher.

Surveys show calling green frog abundance and habitat quality within the shoreland buffer declines as shoreline housing density increases

From: Woodford, JE and Meyer, MW (2002) *Biological Conservation*. 110(2):277-284.

Shoreland green frog trends



Source: Wisconsin Dept. of Natural Resources

The Wisconsin Lakes Partnership

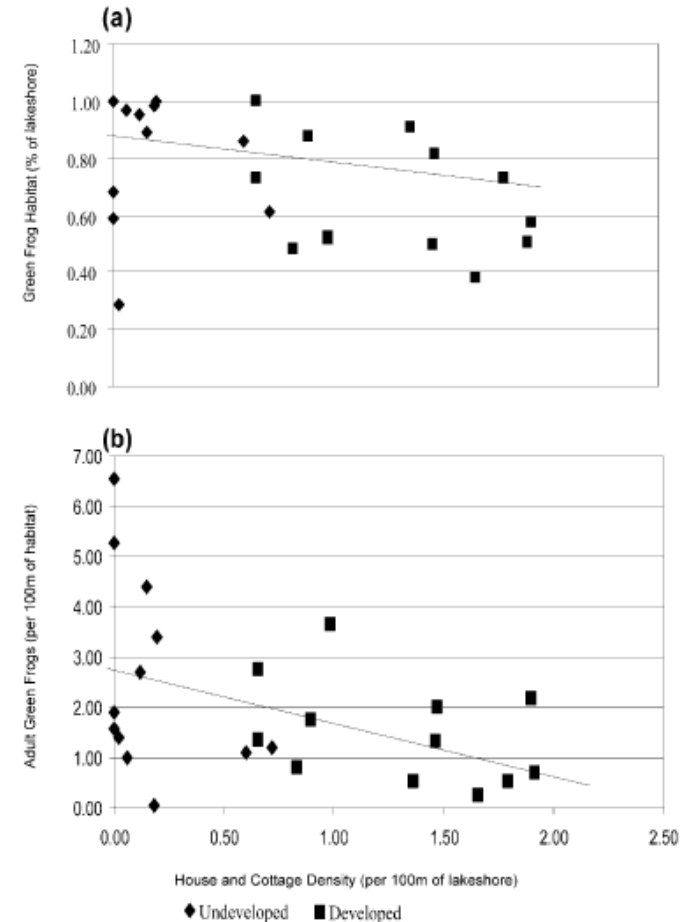
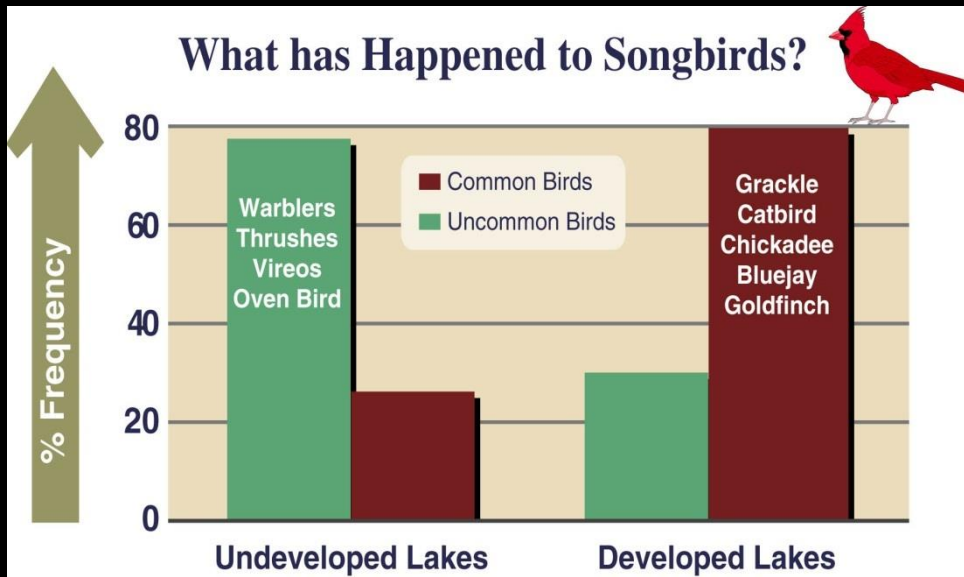


Fig. 3. "Best fit" models from linear regression for decreasing (a) green frog habitat ($y = -0.14x + 0.845$; $P < 0.05$) and (b) adult abundance ($y = -1.08x + 2.838$; $P < 0.05$) at developed and undeveloped lakes as shoreline house and cottage density increased.

Shoreland bird trends

From: Lindsay, AR et al. (2002)
 Biological Conservation 107: 1-11.



Point counts show differences in bird species present and guild composition on developed vs. undeveloped lakes. Ground nesters and insectivorous birds less abundant on developed lake; deciduous nesters and omnivore/seed-eaters more common.

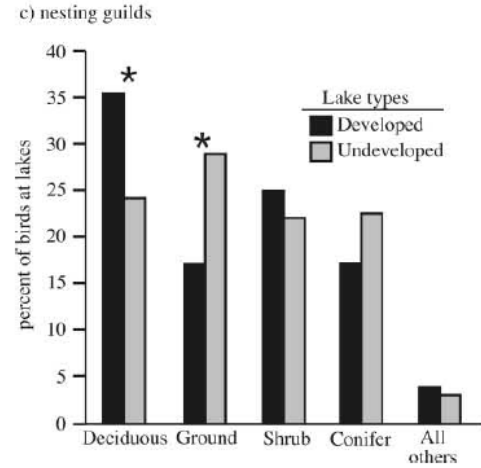
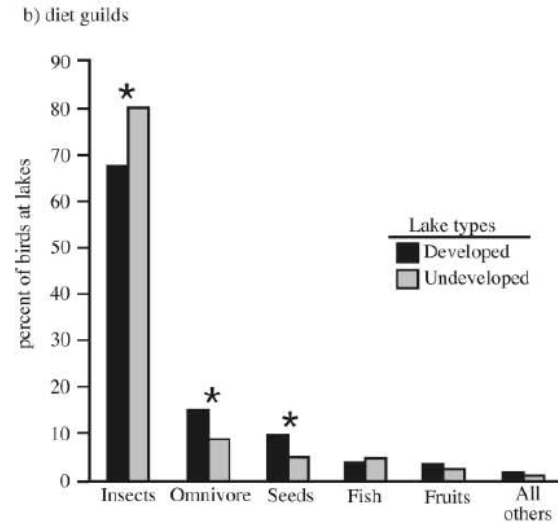


Fig. 2. Compositions of each of the three resource guild classes [(a) foraging guilds, (b) diet guilds, (c) nesting guilds] observed on developed and undeveloped lakes. Values given are the percentages of each guild within the resource guild class across all developed or undeveloped lakes. Light bars are values for undeveloped lakes, dark bars are for developed lakes.

Furbearer Abundance and Diversity Lower on Developed Lakes



Snowtrack and camera surveys show a higher diversity and abundance of furbearers on undeveloped lakes; coyotes, fishers, wolves, bobcats, and river otter were more frequent – red fox and raccoon more common on developed lakes.

From: Relationship between Carnivore Distribution and Landscape Features in the Northern Highlands Ecological Landscape of Wisconsin. *Haskell et al. 2012. American Midland Naturalist.*

White-tailed deer much more abundant on developed lakes Supplemental feeding by property owners, no hunting

Because feed sites attract deer into tight densities, natural nearby browse is often depleted.



EPA National Lakes Assessment 2007



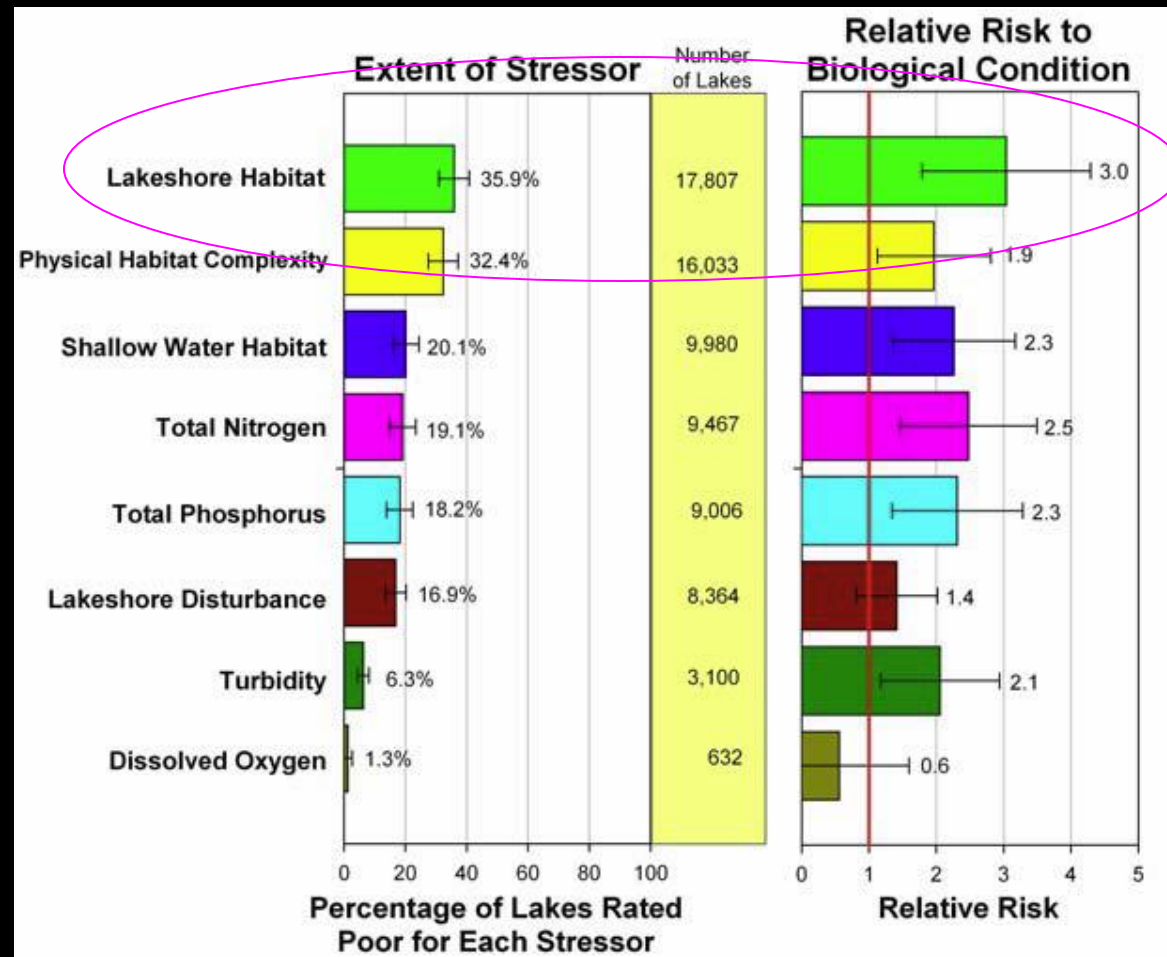
- Number one stressor to lakes nationwide—lakeshore habitat degradation / loss!

- First-ever baseline study of the condition of the nation's lakes.

- The latest in a series of surveys of the nation's aquatic resources.

- Unbiased estimates of the condition of natural and man-made freshwater lakes, ponds, and reservoirs greater than 10 acres and at least one meter deep.

- A total of 1,028 lakes were sampled for the NLA during summer 2007, representing the condition of about 50,000 lakes nationwide.!



What is Shoreland Restoration?

Shoreland Restoration is a lake management practice that uses native trees, shrubs, and groundcover, along with natural and biodegradable materials (biologs, delta-lock bags, sediment logs, soil lifts, woody material), to reduce lakeshore erosion and improve aquatic and wildlife habitat quality from OHWM to >10 meters inland.



Large-scale restorations (>1800 meters of shoreland) have occurred on 5 developed lakes at which long-term (10-year) wildlife and habitat monitoring is underway.

- Found Lake – 400 meters
- Lost Lake – 210 meters
- Moon Lake – 400 meters
- Little St. Germain Lake – 460 meters
- Crystal Lake – 320 meters



Measures of Success

Shoreland Restoration will be considered a successful management practice if 10-year post-planting survey results demonstrate:

- Increased native plant abundance and diversity
- Improved wildlife habitat quality
- Increased wildlife abundance and diversity
- Reduced surface water and nutrient run-off

Survival and growth of restored native vegetation is also monitored to develop recommendations on best practices and native plant species

Questions?



24 Vilas County
lake property
owners



Wisconsin Department of
Agriculture, Trade and Consumer Protection

