Exploring the water's edge: shoreland habitat, biodiversity, and restoration opportunities

Aug. 27th & 28th, 2014 - Heidel House Resort & Spa

5.0 lakes and their land-water connection

5.1 characteristics and benefits of intact lakeshores

5.2 challenges created from unsound lakeshore development

5.3 the economics of water

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The Wisconsin Lakes Partnership

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WISCONSIN LAKES
WE SPEAK FOR LAKES!

College of Natural Resources

WISCONSIN DEPT. OF NATURAL RESOURCES

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- Google UWEX lakes
- http://www.uwsp.edu./cnr/uwexlakes/
- http://www.wisconsinlakes.org/
- http://www.dnr.state.wi.us/

- Lake Tides… The Lake Connection
- Lake List
- CBCW
- CLMN

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Talk outline

Lakeshore habitat

What/where is it?
Why does it matter?
Who does it support?

Lakeshore biodiversity review

Characteristics and benefits of intact lakeshores

Challenges created from unsound lakeshore development

The economics of water

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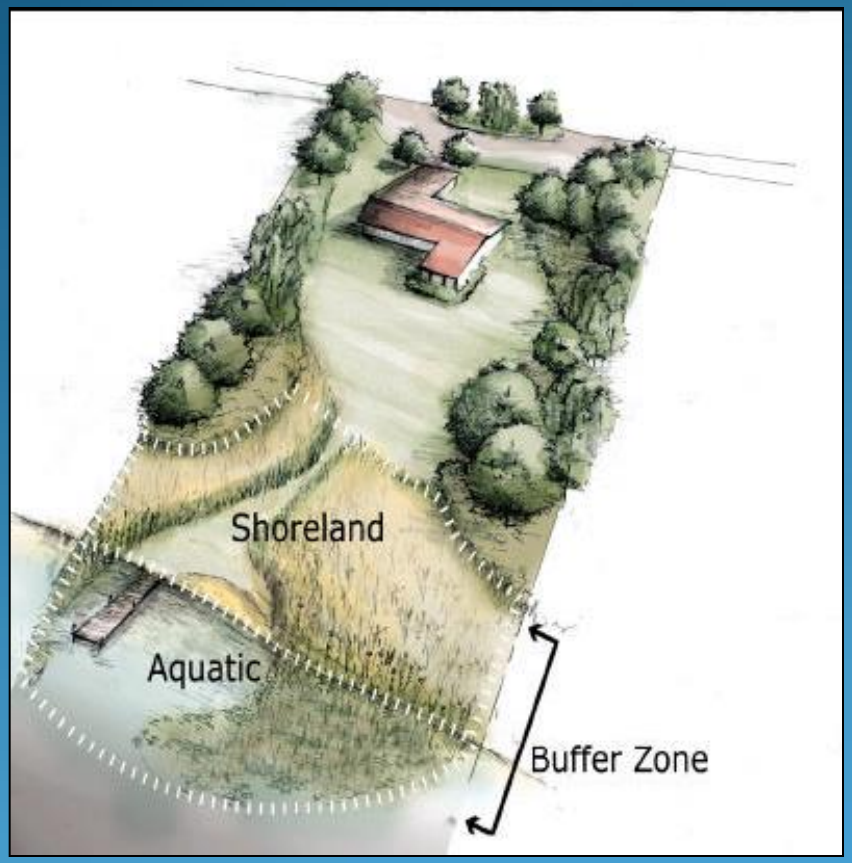
It's all about HABITAT!

5.0 lakes and their land-water connection



- Interface between land and water --area adjacent to lakes/streams.
- Links together the world of water with the terrestrial uplands.
- Essential habitat plants and animals—corridor between uplands and lowlands as well as between habitats along the shore.
- Important for water quality protection and other functions.

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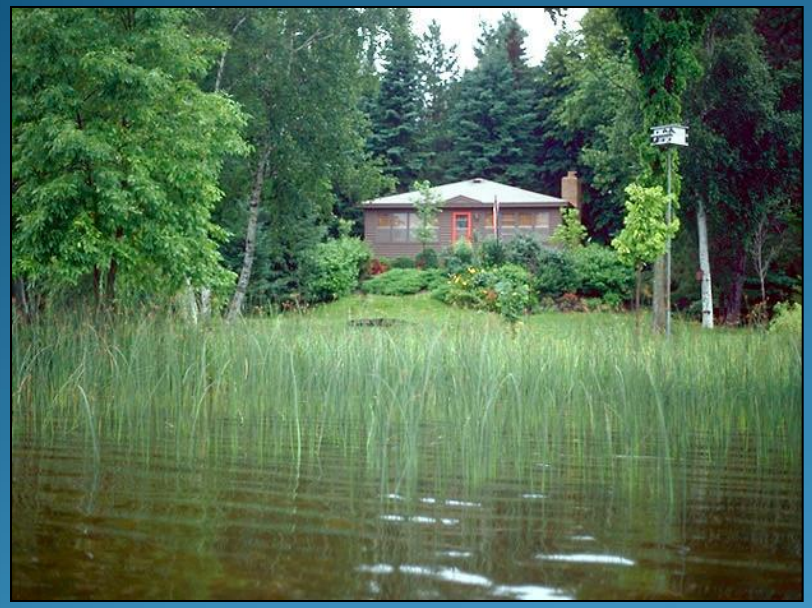
Importance/functions of the land-water interface—the water's edge habitat zones

5.0 lakes and their land-water connection



- Help clarity by holding sediment in place.
- Take up nutrients that would be used by algae.
- Shelter for wildlife.
- Wildlife food and nesting areas.
- Can help reduce erosion and runoff.
- Spawning beds in sedges /emergent plants for fish.

90% of all lake life is born, raised and fed in the area where land and water meet.

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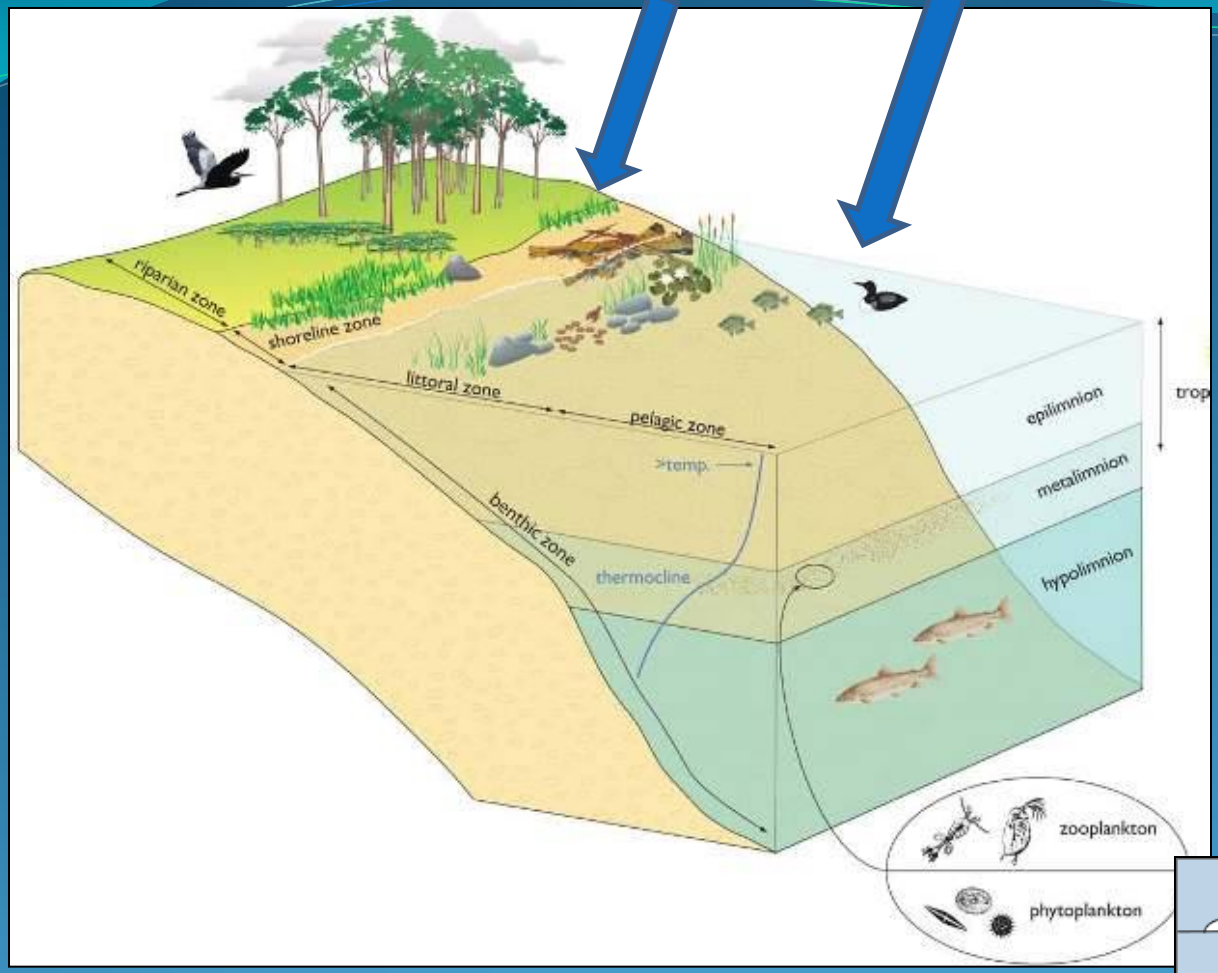
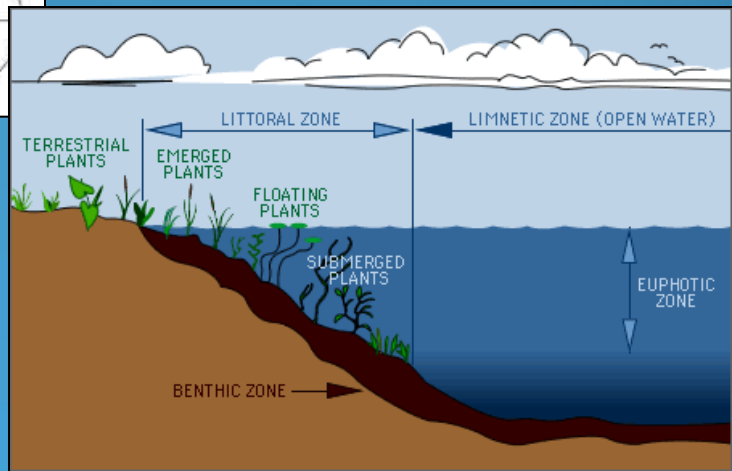
Lakeshore zone

Shallow zone / littoral zone



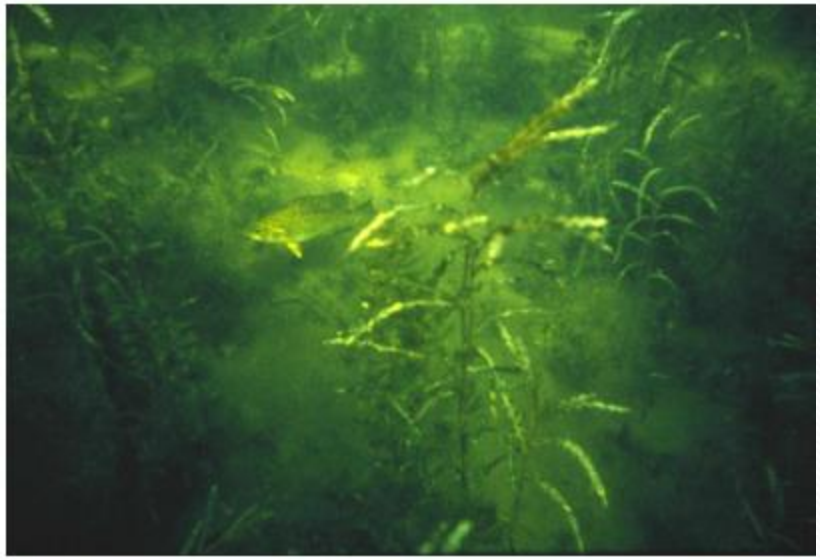
- The land and water ecotone facilitates movement of food into and out of lakes.
- Shoreland and littoral zone habitats act as the “skin” of a lake, nurturing biodiversity of all kinds.
- The littoral zone is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (macrophytes) to grow.

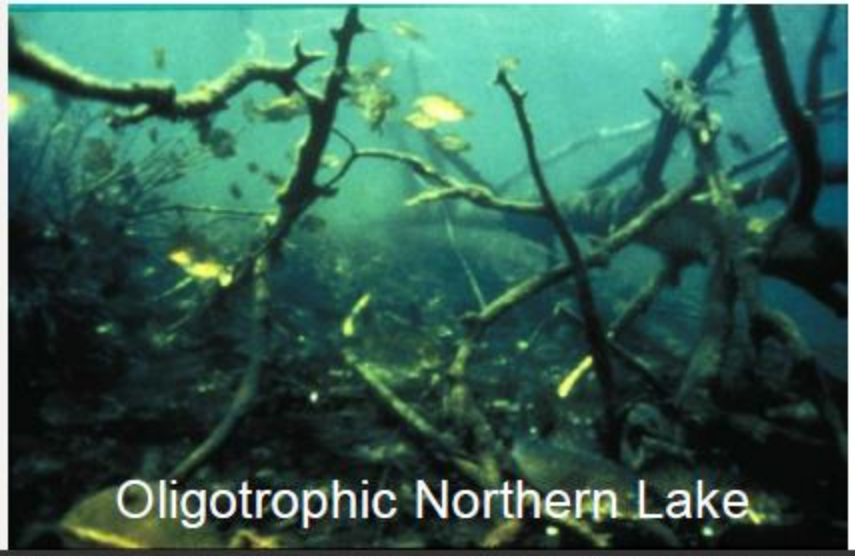


5.0 lakes and their land-water connection

LAKE LITTORAL ZONE

- Functions
  - Intercepts Nutrients
  - Refuge from Predators
  - Nursery for Fish





Oligotrophic Northern Lake

Eutrophic Southern Lake

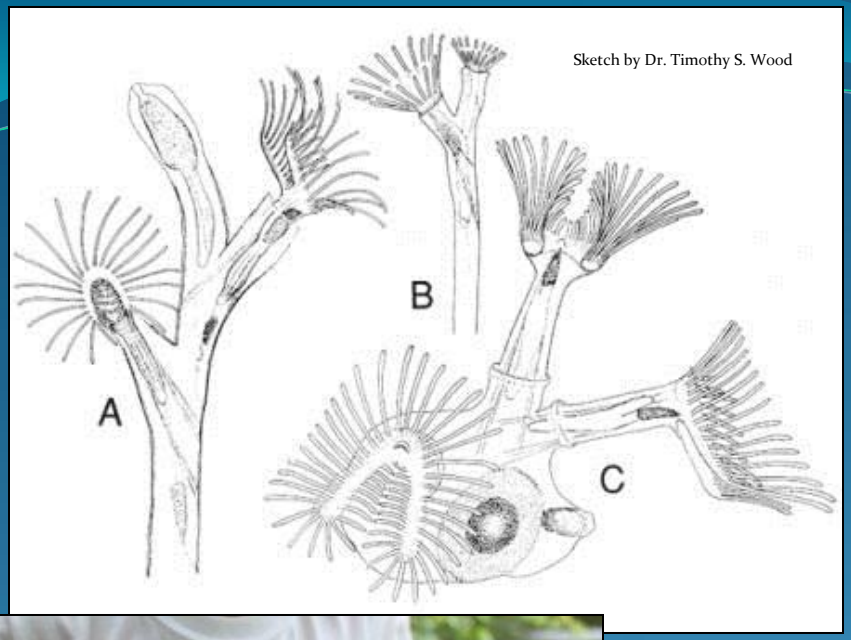
AQUATIC PLANTS

- Habitat
- Energy Dissipation
- O_2 Producers

Let’s walk down to the dock and see what’s along the water’s edge…

5.1 characteristics and benefits of intact lakeshores

Bryozoans



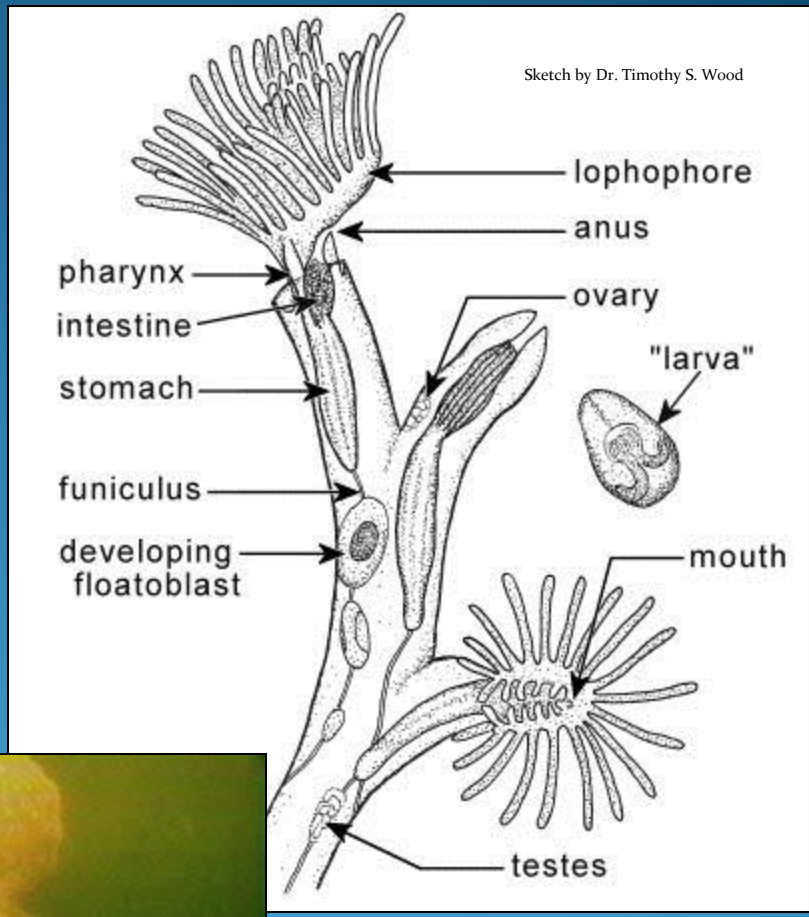



Photo by The Woodward family


Photo by UMass

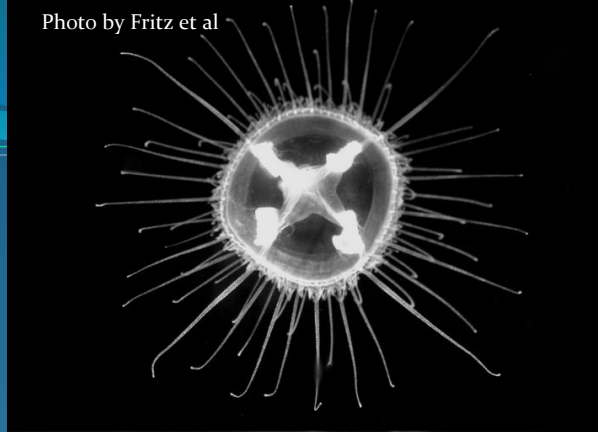
5.1 characteristics and benefits of intact lakeshores

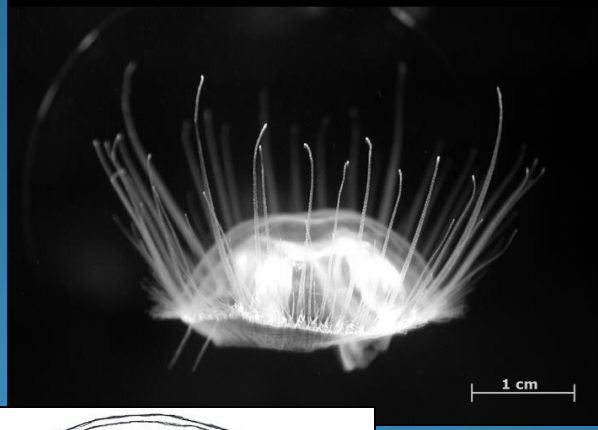
Jellyfish (*Craspedacusta sowerbyi*)

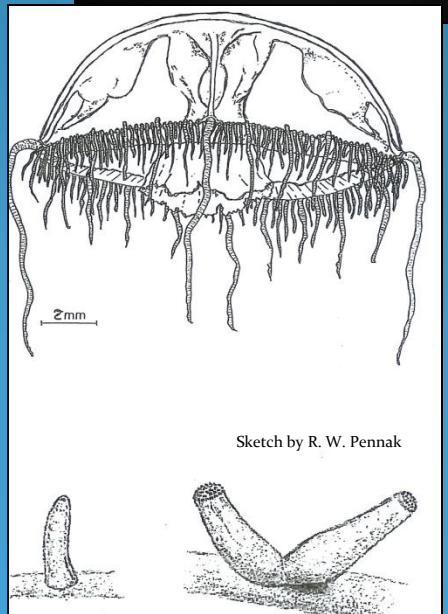
Photo by Sharon Milstead

Photo by USGS

Photo by Fritz et al



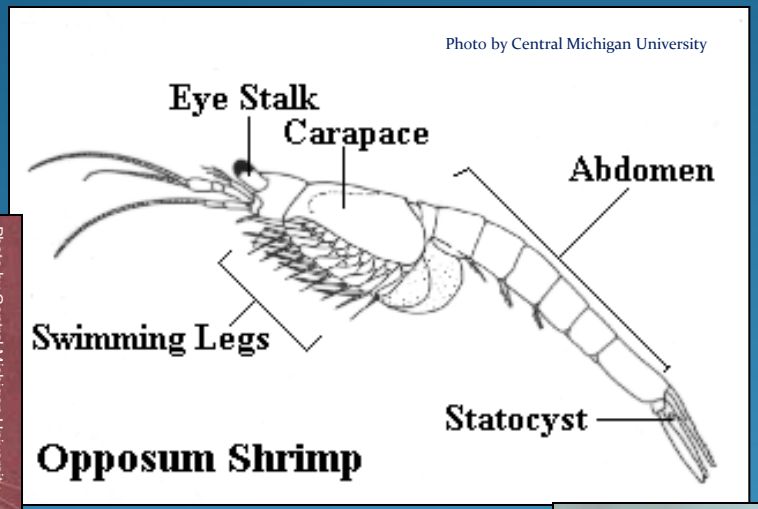




Sketch by R. W. Pennak

5.1 characteristics and benefits of intact lakeshores

Freshwater opossum shrimp (*Mysis relicta*)



Frogs, treefrogs and toads

Treefrogs – live in forests around lakes/ponds

Northern Cricket Frog (*Acris crepitans*)
METALLIC 'GICK-GICK-GICK' NOISES (mid-May)

Spring Peeper (*Pseudacris crucifer*)
RISING PEEP (late-March)

Cope's Gray Treefrog (*Hyla chrysoscelis*)
FAST, HARSH, BUZZING TRILL (early May)

Toads – live in forests around lakes/ponds

Eastern American Toad (*Bufo americanus*)
TRILLING (April)

Eastern Gray Treefrog (*Hyla versicolor*)

5.1 characteristics and benefits of intact lakeshores

Frogs, treefrogs and toads [continued]

5.1 characteristics and benefits of intact lakeshores

True frogs – live in forests around lakes/ponds

American Bullfrog (*Lithobates catesbeianus*)
DEEP "BUR-RUM"/FOG HORN -GUIN(mid-May)

Green Frog (*Lithobates clamitans*)
"CLUNG-CLUNG-CLUNG"/BANJO TWANG (mid-May)

Pickerel Frog (*Lithobates palustris*)
LOW-PITCHED, SNORE-LIKE CROAK (April)

Northern Leopard Frog (*Lithobates pipiens*)
LOUD, BROKEN SNORE/BALLOOON RUB (late March)

Mink Frog (*Lithobates septentrionalis*)
LOW-PITCHED CROAKS/DISTANT HAMMERING-
"TOK"-"TOK"-"TOK"-"TOK"

Wood Frog (*Lithobates sylvaticus*)
CLUCKING CROAKS/QUACKING DUCK (late-March)

Salamanders

Redback Salamander (*Plethodon cinereus*)

Four-toed salamanders (*Hemidactylium scutatum*)

Tiger Salamander (*Ambystoma tigrinum*)

Spotted Salamander (*Ambystoma maculatum*)

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Central Newt (*Notophthalmus viridescens*)

Mudpuppy (*Necturus maculosus*)

Common mussels and clams

Floater (*Pyganodon grandis*)

Fatmucket (*Lampsilis siliquoidea*)

Fingernailclams and Peaclams
(*Musculium*, *Pisidium*, and *Sphaerium*-Family *Sphaeriidae*)

Threeridge *(Amblema plicata)*

Threehorn wartyback (*Obliquaria reflexa*)

5.1 characteristics and benefits of intact lakeshores

5.1 characteristics and benefits of intact lakeshores

Dragonflies

Lake emerald (*Somatochlora cingulata*)

Lake darner (*Aeshna eremita*)

Twelve-spotted Skimmer (*Libellula pulchella*)

Widow skimmer
(*Libellula luctuosa*)

Common green darner
(*Anax junius*)

Common pondhawk (*Erythemis simplicicollis)* eating a pearl crescent

Common whitetail (*Plathemis lydia)*

Common baskettail (*Epitheca cynosura*)

Damselflies

Powdered dancer (*Argia moesta*)

Violet dancer (*Argia fumipennis violacea*)

Alkali Bluet (*Enallagma clausum*)

Amber-winged spreadwing (*Lestes eurinus*)

Boreal bluet (*Enallagma boreale*)

Marsh bluet (*Enallagma ebrium*)

5.1 characteristics and benefits of intact lakeshores

Turtles

Eastern Spiny Soft shell (*Apalone spinifera*)

Painted Turtle (*Chrysemys picta)*

Common Snapping Turtle (*Chelydra serpentina*)

5.1 characteristics and benefits of intact lakeshores

Snakes

Common garter snake (*Thamnophis sirtalis)*

Smooth greensnake (*Opheodrys vernalis)*

Western foxsnake (*Elaphe vulpina)*

Red-bellied snake (*Storeria occipitomaculata)*

Northern watersnake (*Nerodia sipedon)*

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Butterflies

White admiral (*Limenitis arthemis*)

Canadian tiger swallowtail (*Papilo canadensis)*

Bronze copper (*Lycaena hyllus)*

Viceroy (*Limentitis archippus)*

Mourning cloak (*Nymphalis antiopa)*

Dorcas copper (*Lycaena dorcas*)

5.1 characteristics and benefits of intact lakeshores

Aquatic plants-very soft water

Brown-fruited rush
(*Juncus pelocarpus)*

Least waterwort (*Elatine minima)*

Pipewort (*Eriocaulon aquaticum*)

5.1 characteristics and benefits
of intact lakeshores

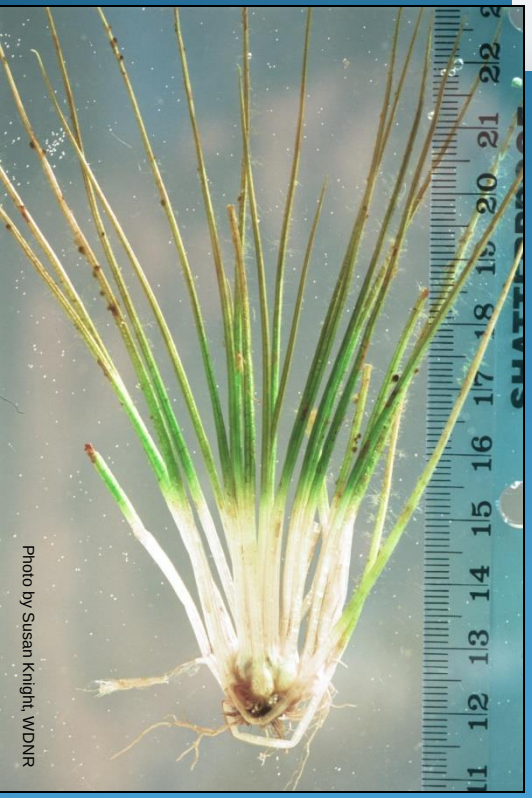
Ribbon-leaved pondweed (*Potamogeton epihydrus*)

Aquatic plants-soft water

5.1 characteristics and benefits of intact lakeshores

Fern pondweed (*Potamogeton robbinsii)*

Large-leaved pondweed (*Potamogeton amplifolius*)



Quillwort (*Isoetes sp.)*

Water lobelia (*Lobelia dortmanna*)

White-stemmed pondweed (*Potamogeton praelongus*)

Aquatic plants-hard water

Slender pondweed (Pot*amogeton pusillus*)

Photographer: Robert W. Freckmann

Waterweed (*Elodea canadensis)*

Northern water-nymph (*Najas flexilis)*

Water beggar's-tick (*Megalodonta beckii*)

American eel grass (*Vallisneria americana*)

5.1 characteristics and benefits of intact lakeshores

Aquatic plants-very hard water

5.1 characteristics and benefits of intact lakeshores

Coontail (*Ceratophyllum demersum)*

Flat-stemmed pondweed (*Potemogeton zosteriformis*)

Comb pondweed (*Stuckenia pectinata*)

White water crowfoot (*Ranunculus aquatilis*)

Illinois pondweed (*Apalone spinifera*)

Fries' pondweed (*Potamogeton friesii)*

Upland plants-trees

Amelanchier arborea – downy Juneberry

Prunus serotina - wild cherry

Abies balsamea – balsam fir

Acer rubrum - red maple

Tilia americana - basswood)

5.1 characteristics and benefits of intact lakeshores

Betula alleghaniensis – yellow birch

Quercus rubra – red oak

5.1 characteristics and benefits of intact lakeshores

Upland plants-shrubs

Aronia melanocarpa – black chokeberry

Diervilla lonicera – northern bush honeysuckle

Vaccinium angustifolium – early low blueberry

Sweet fern (*Comptonia peregrina*)

Hazelnuts (*Corylus sp.*)

Prunus virginiana --chokeberry

Aquatic insects

Giant water bug (*Lethocerus americanus*)

Water boatman (*Sigara sp.*)

Water strider (*Aquarius remigis*)

Water scorpion (*Ranatra fusca*)

Northern casemaker caddisfly (*Nemotaulis hostililis*)

5.1 characteristics and benefits of intact lakeshores

Backswimmer (*Notonecta sp.*)

Beetles

Giant water scavenger beetle *(Hydrophilus triangularis)*

Photo by Tom Murray

Predaceous diving beetle (*Dytiscus sp.*)

5.1 characteristics and benefits of intact lakeshores

Water lily beetle (*Galerucella nymphaeae*)

Photo by © David Liebman

Large whirligig (*Dineutus sp.*)

Water birds

Common loon (*Gavia immer*)

Osprey (*Pandion haliaetus*)

Belted kingfisher (*Ceryle alcyon*)

5.1 characteristics and benefits of intact lakeshores

Great blue heron (*Ardea herodias*)

Wood duck (*Aix sponsa*)

Bald eagle (*Haliaeetus leucocephalus*)

Fishes-small

Pumpkinseed sunfish (*Lepomis gibbosus*)

Bluegill (*Lepomis macrochirus*)

Fathead minnows (*Pimephales promelas*)

Common shiner (*Luxilus cornutus*)

Green sunfish (*Lepomis cyanellus*)

Burbot (*Lota lota*)

Iowa darter (*Etheostoma exile*)

5.1 characteristics and benefits of intact lakeshores

Rock bass (*Ambloplites rupestris*)

Fishes-large

Northern pike (*Esox lucius*)

Muskellunge (*Esox masquinongy*)

Large mouth bass (*Micropterus salmoides*)

Common carp (*Cyprinus carpio*)

Black bullhead (*Ameiurus melas*)

Lake sturgeon (*Acipenser fulvescens*)

Small mouth bass (*Micropterus dolomieu*)

Walleye (*Sander vitreus*)

Big-mouth buffalo (*Ictiobus cyprinellus*)

5.1 characteristics and benefits of intact lakeshores

Small mammals

Beaver (*Castor canadensis*)

North American river otter (*Lontra canadensis*)

Star-nosed mole (*Condylura cristata*)

Long-tailed weasel (*Mustela frenata*)

Short-tailed weasel (*Mustela erminea*)

5.1 characteristics and benefits of intact lakeshores

Snowshoe hare (*Lepus americanus*)

Muskrat (*Ondatra zibethicus*)

Eastern Cottontail (*Sylvilagus floridanus*)

Fisher (*Martes pennanti*)

Large mammals

White-tailed deer (*Odocoileus virginianus*)

Bobcat (*Lynx rufus*)

Moose (*Alces alces*)

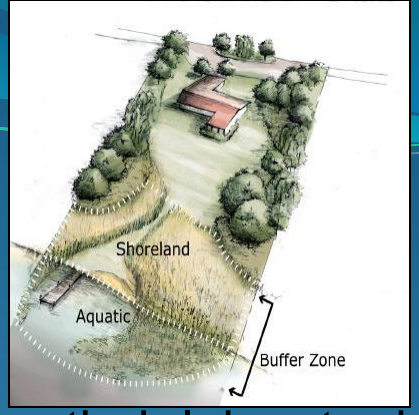
Black bear (*Ursus americanus*)

5.1 characteristics and benefits of intact lakeshores

Grey fox (*Urocyon cinereoargenteus*)

Red fox (*Vulpes vulpes*)

One other critter—People!



- In many places, people were loving their lakes to death with development—"*death by a thousand cuts*"
- Research findings got people and lake groups around Wisconsin rethinking what is best for lakes?
- Lake residents and organizations, natural resource agencies, tribal entities, energy companies, and businesses like resorts and restaurants all have embraced the idea of restoring shoreland buffers
- Large investments by DATCP and WDNR grants have gone toward shoreline and littoral zone habitat protection and conservation

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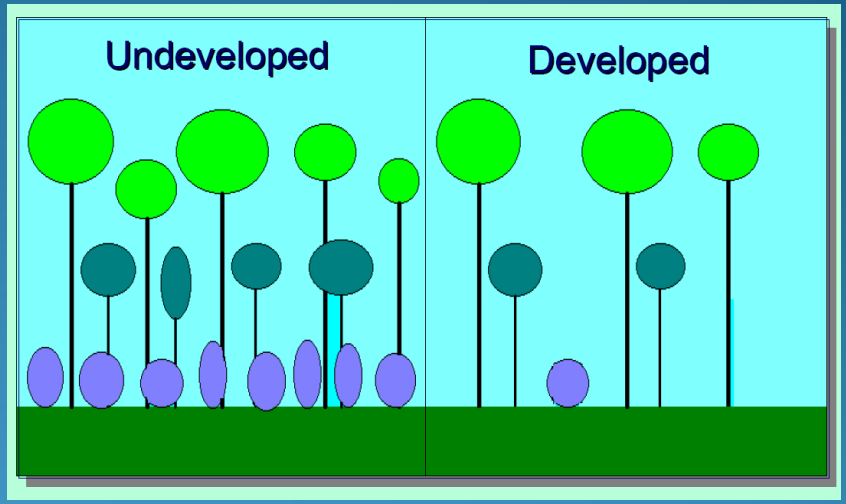
Development pressures have changed our lakes



Affects include:

- wildlife diversity decline;
- water quality degradation;
- less vegetation—especially less shrub and ground layers & woody habitat along shore;
- more lake users on the water;
- '*death by a thousand cuts*' w/ population growth and housing density rise
- more impervious surfaces on the average lot
- erosion control challenges

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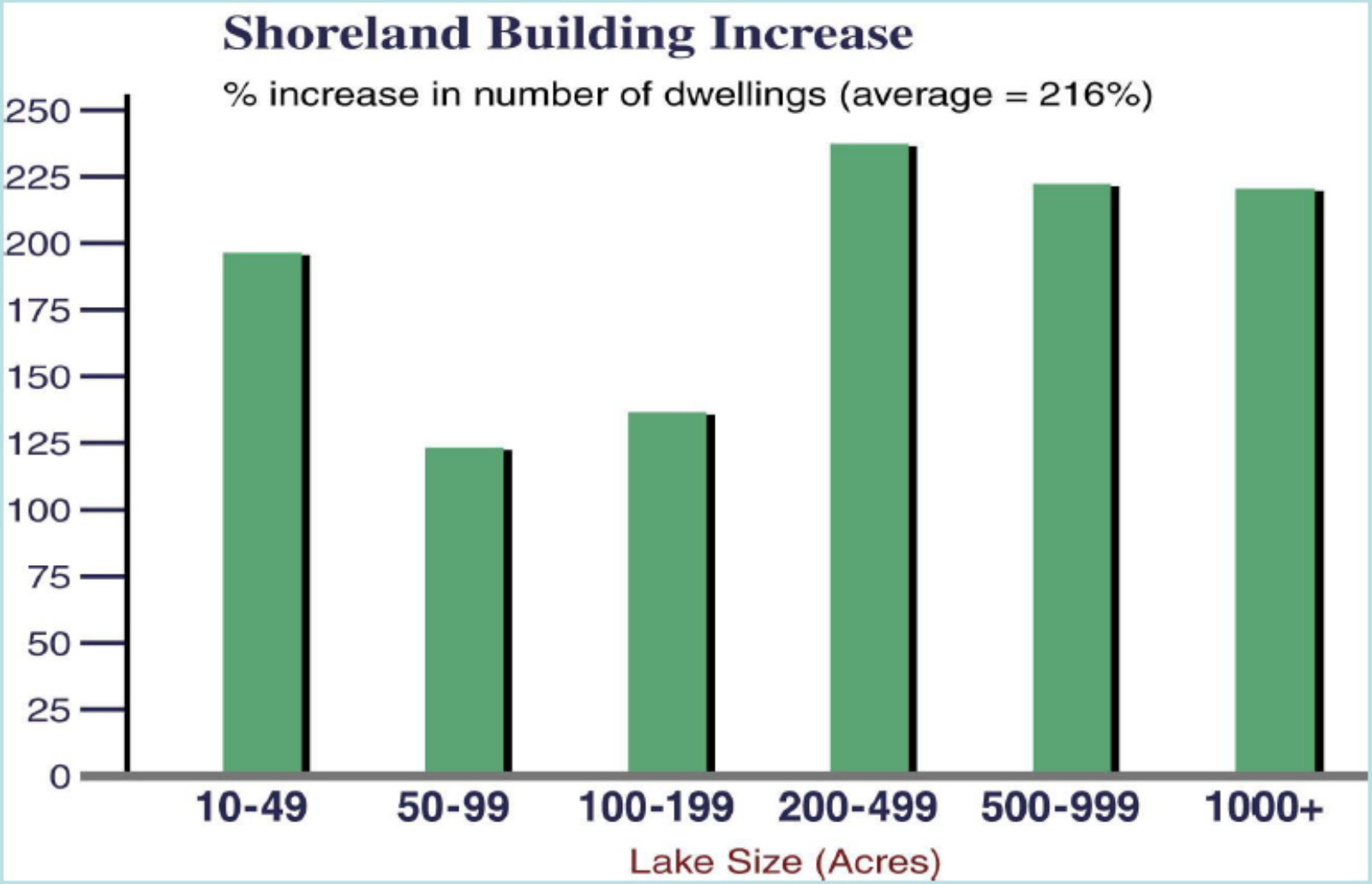
Housing Development Since 1965

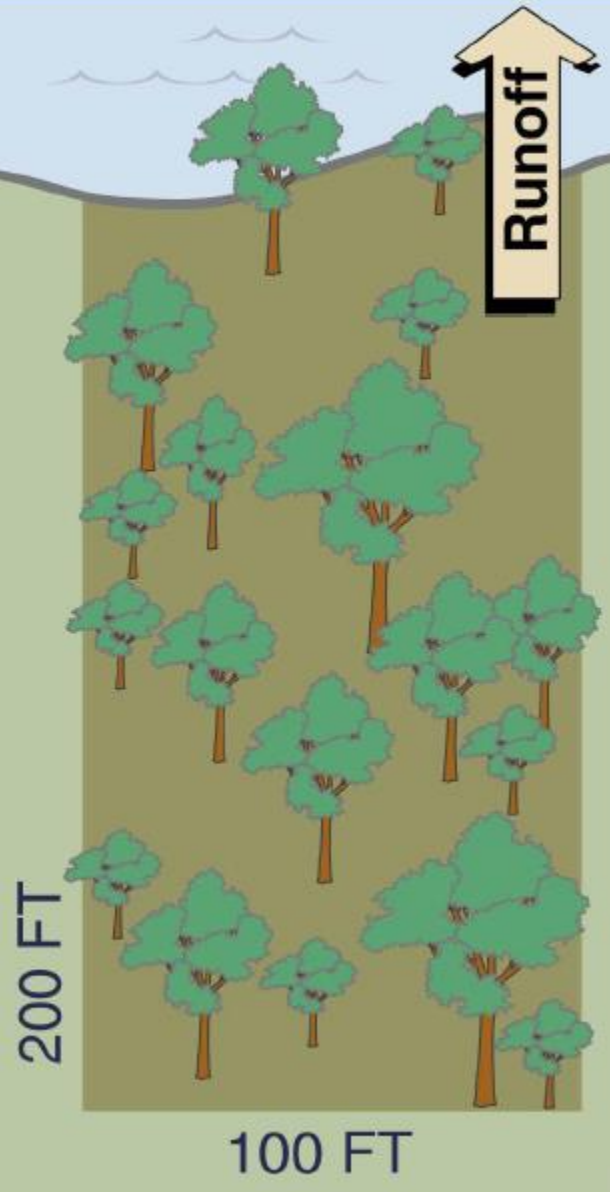


5.2 challenges created from unsound development

Source WDNR

Undeveloped – Apr.-Oct. phosphorus/sediment runoff model

- maple-beech forest
- 6% slope to lake
- sandy loam soil



IMPACT ON LAKE
(April - Oct.)

- 1,000 ft^3 runoff to lake
- 0.03 lbs. phos. to lake
- 5 lbs. sediment to lake

5.2 challenges created from unsound development

Source: Wisconsin Dept. of Natural Resources

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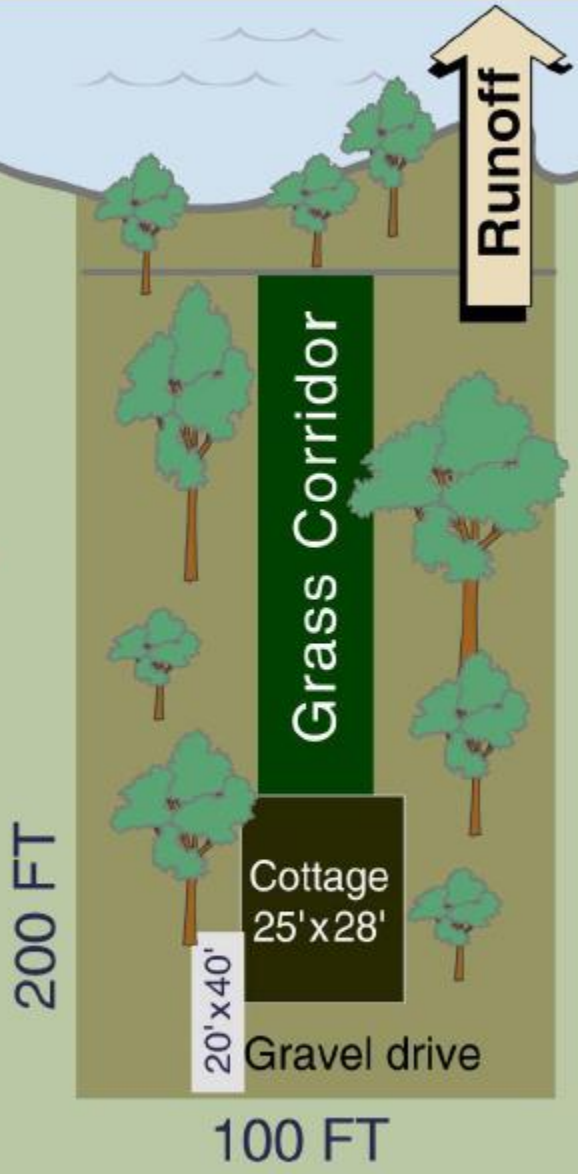
5.2 challenges created from unsound development
Laine Cabin, Long Lake Chippewa County

1940s development – Apr.-Oct. phosphorus/sediment runoff model

5.2 challenges created from unsound development

- maple-beech forest
- 6% slope to lake
- grass corridor 20'-wide
- cottage 700 ft^2 perimeter
- gravel drive 800 ft^2
- 35'-wide buffer strip



IMPACT ON LAKE
(April - Oct.)

- 1,000 ft^3 runoff to lake
- 0.03 lbs. phos. to lake
- 20 lbs. sediment to lake

Source: Wisconsin Dept. of Natural Resources

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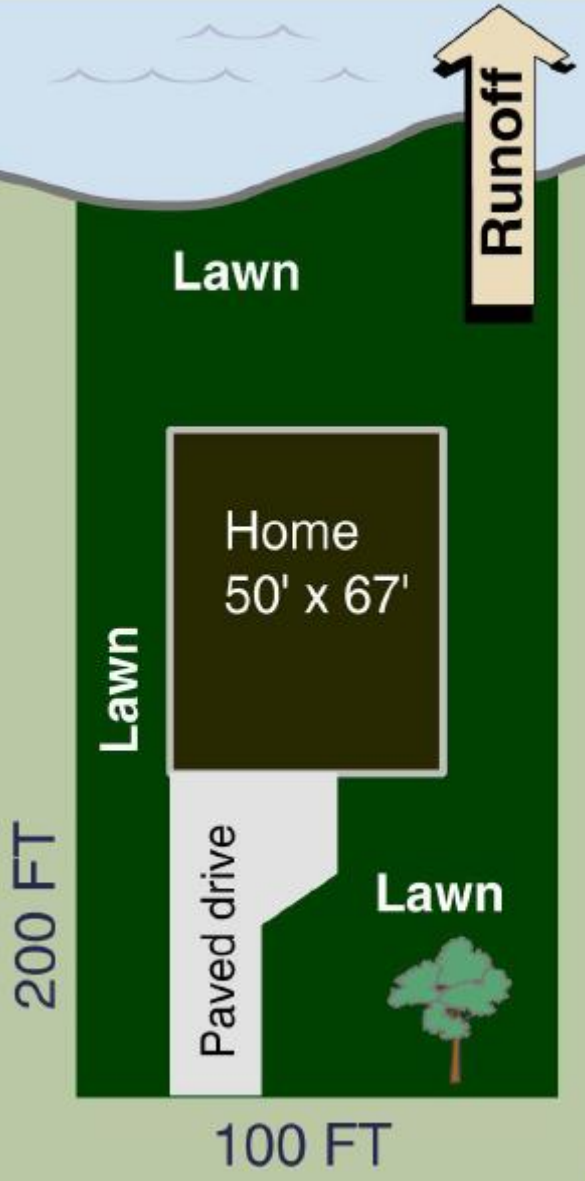
5.2 challenges created from unsound development
Redevelopment Long Lake Chippewa County
4 26 '94

1990s development – Apr.-Oct. phosphorus/sediment runoff model

- maintained lawn, soil graded
- 6% slope to lake
- home 3,350 ft² perimeter
- paved drive 770 ft²



IMPACT ON LAKE
(April - Oct.)

- 5,000 ft³ runoff to lake
- 0.20 lbs. phos. to lake
- 90 lbs. sediment to lake

5.2 challenges created from unsound development

Source: Wisconsin Dept. of Natural Resources

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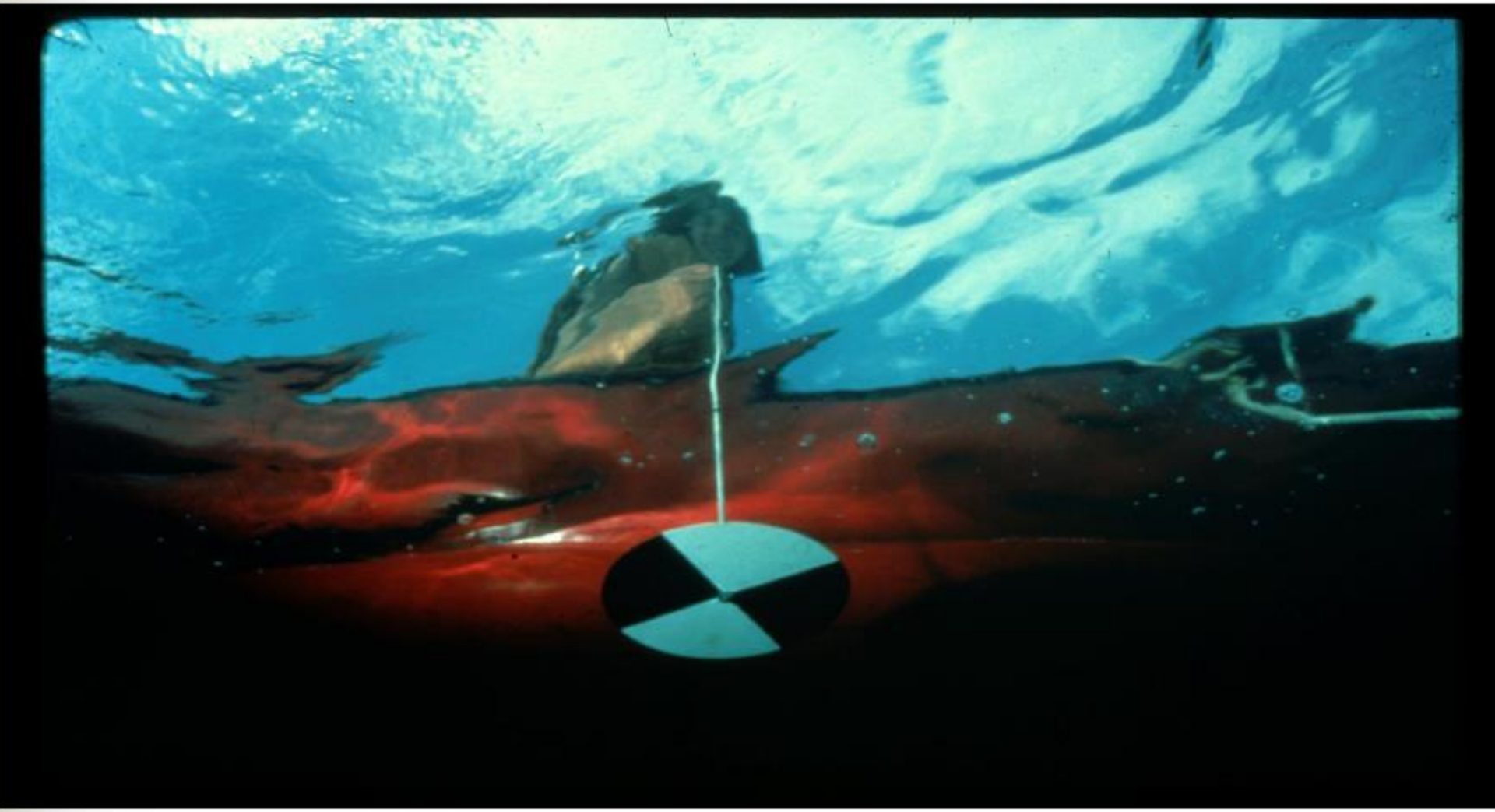
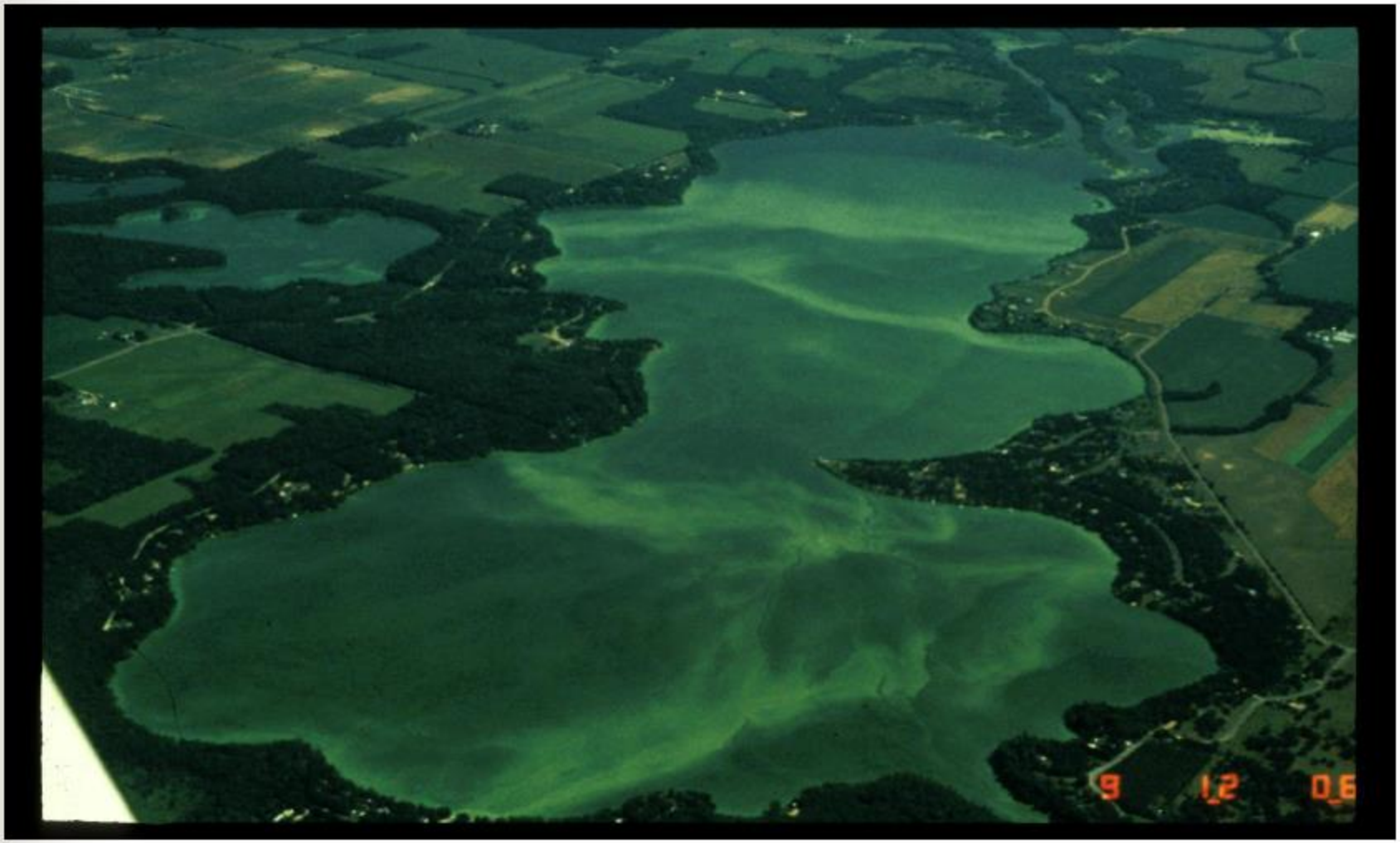
LOSS OF WATER CLARITY

5.2 challenges created from unsound development



NUISANCE ALGAE BLOOMS



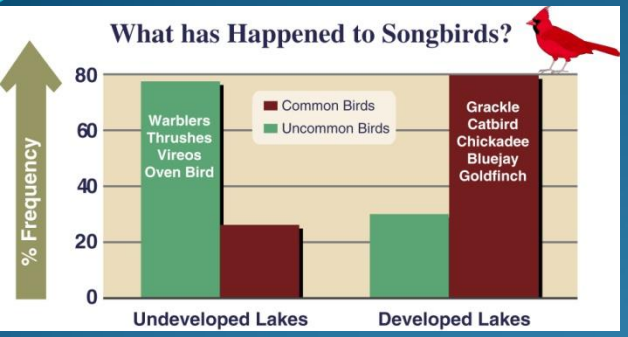
5.2 challenges created from unsound development

FISHERIES DEGRADATION

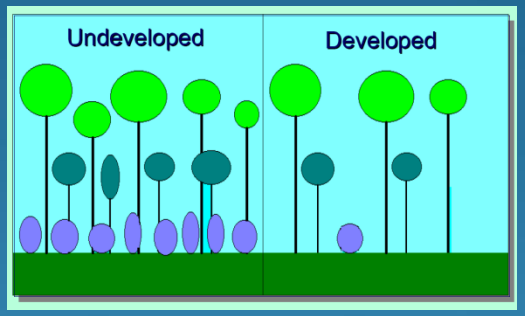
5.2 challenges created from unsound development

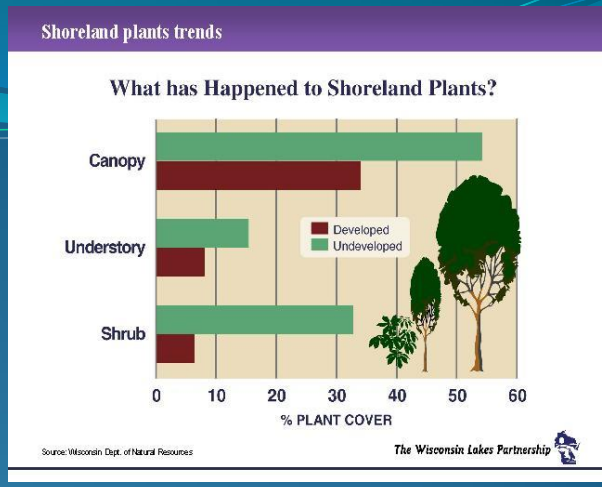
Aquatic Invasive Species

Various research over the last decade has helped illuminate the affects of development

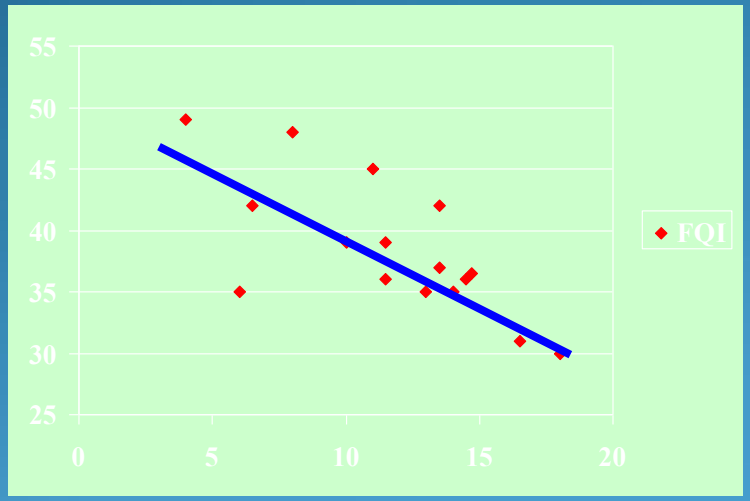


(Lindsay et al. 2003)



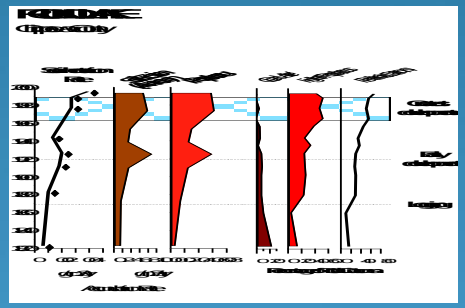


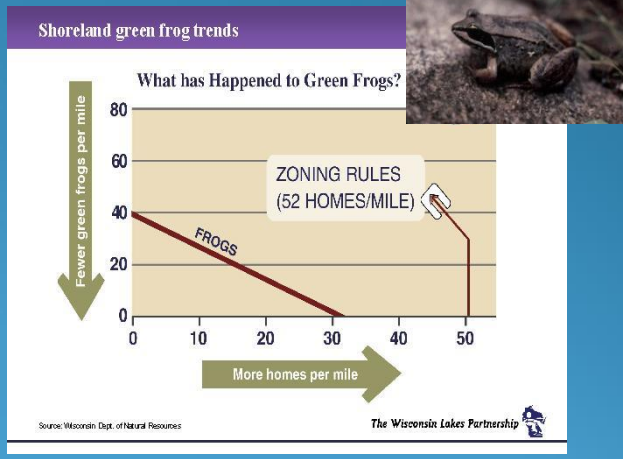
(Elias et al. 2003)



Dwellings/km shoreline

Hatzenbeler et al.(2004)





(Woodford et al. 2002)

5.2 challenges created from unsound development

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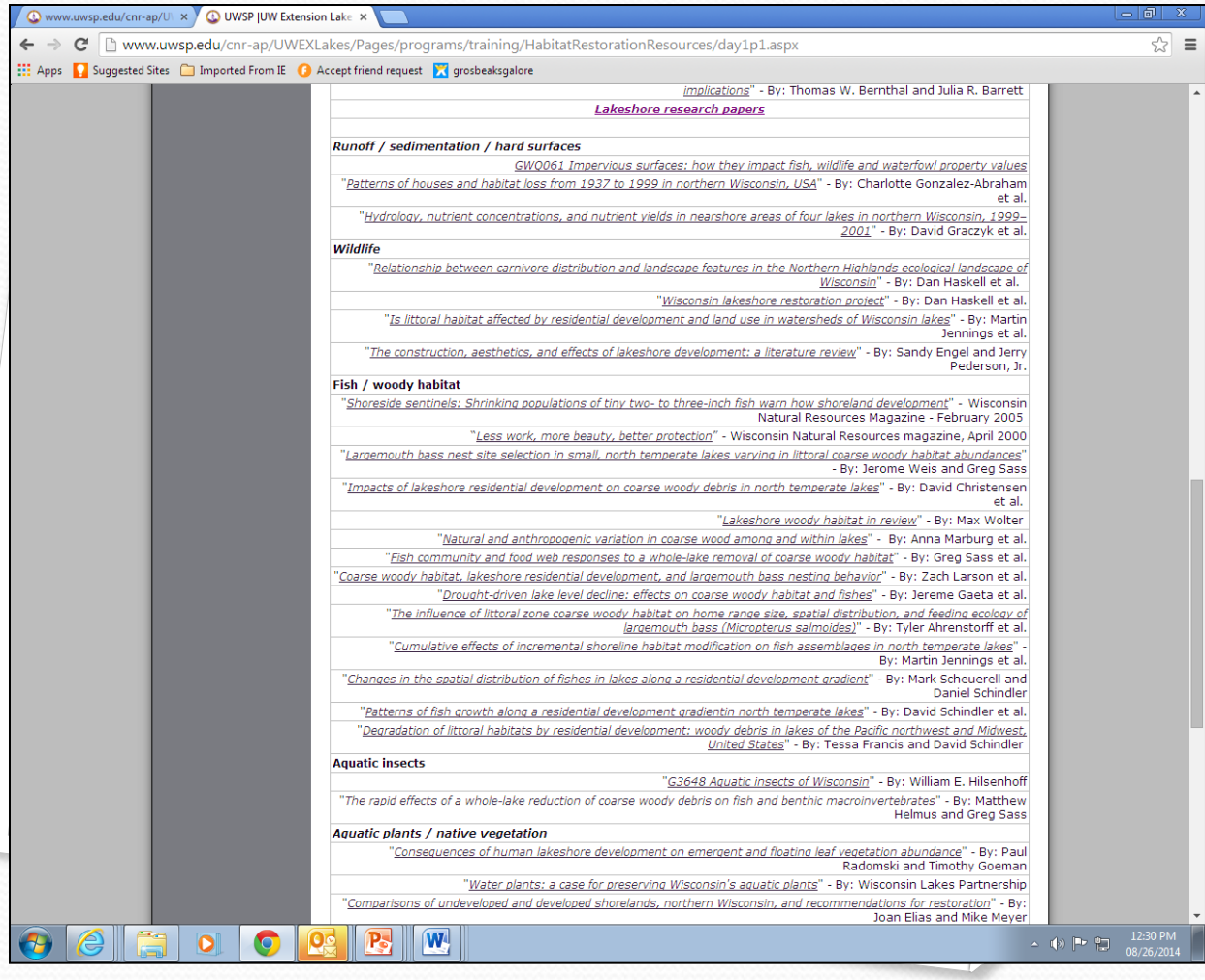
http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/training/HabitatRestorationResources/day1p1.aspx

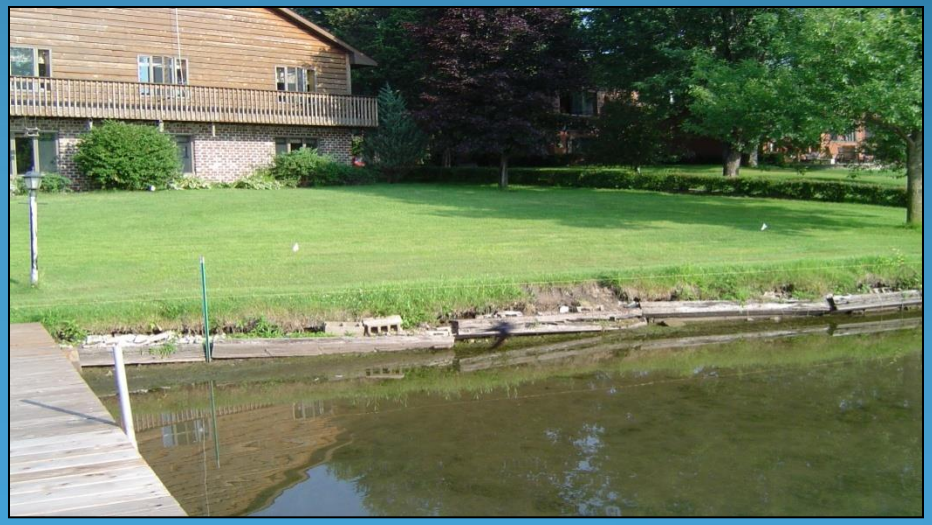
Lakeshore research papers



5.2 challenges created from unsound development

Lake shore erosion

- Slumped banks
- Root wads exposed
- Rilling
- Receding shoreline



Pictures provided by: **Bill Bartodziej et al 2007 and Rob Bursik**

5.2 challenges created from unsound development

Altered Watershed Effects

5.2 challenges created from unsound development

The Wisconsin Lakes Partnership

Coon Lake, MN

Altered Watershed Effects

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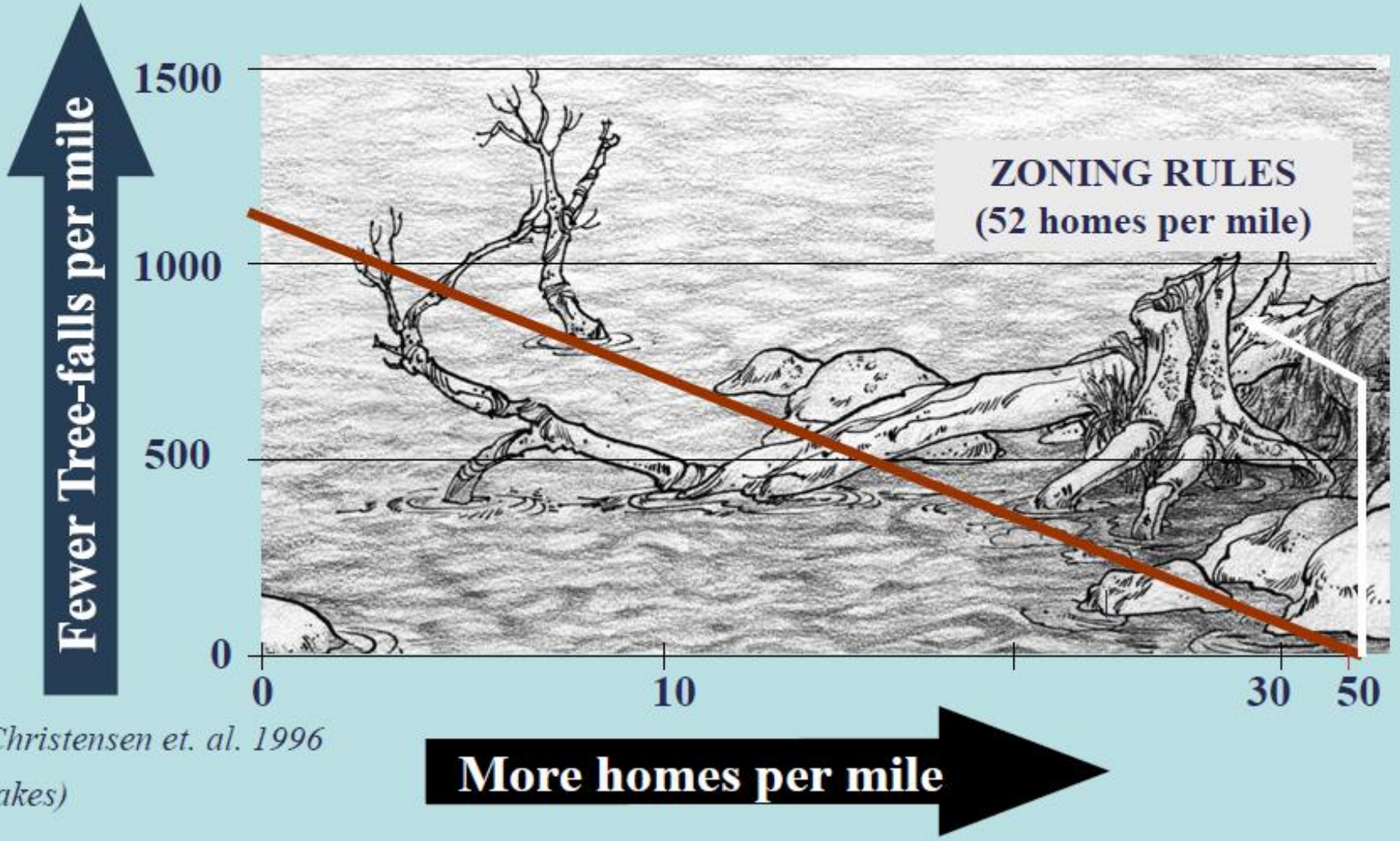
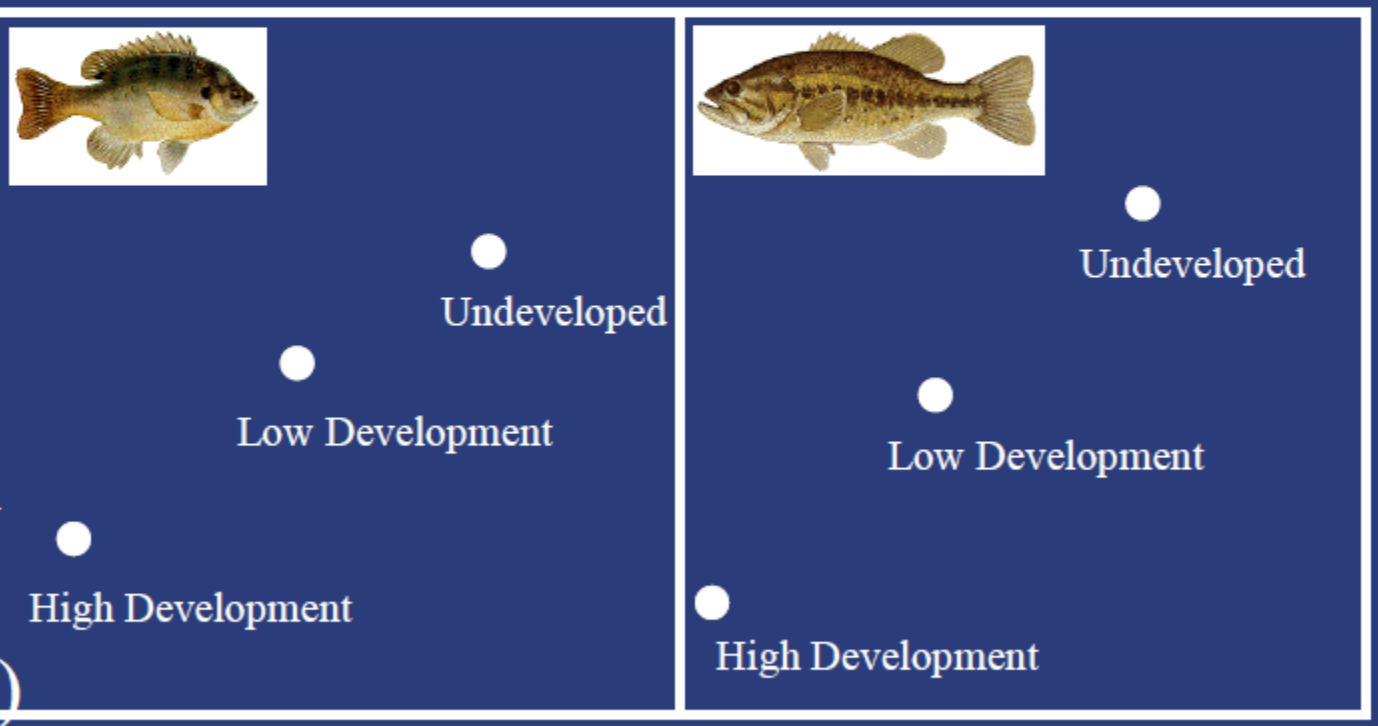
Woody Habitat in Littoral Zone



Source Christensen et. al. 1996

(16 N. Lakes)

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



From Schindler et al. 2000


Value / Function of Stable & Vegetated Shoreland Zone
Shoreland Vegetation (erosion-control, water quality, wildlife habitat, high plant diversity = high wildlife diversity)
Emergent Vegetation (water quality, erosion-control & wildlife habitat)
Tree Stumps (wildlife habitat & water quality)
Drifted-in Logs & Snags (wildlife habitat, erosion control & water quality)
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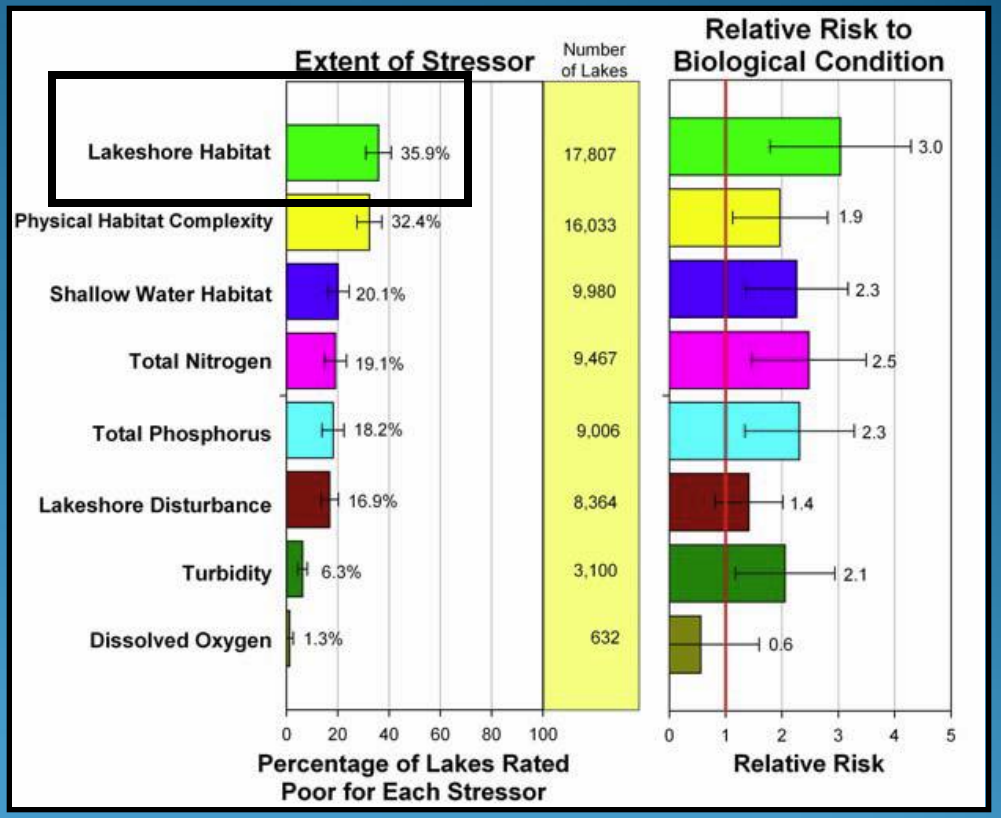
National Lakes Assessment (NLA)

- 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.



5.2 challenges created from unsound development

The Wisconsin Lakes Partnership

"Neatniks" to Ecologically Sound Landscapes

A neat and tidy landscape reflects well on a property owner, while native landscapes are often perceived as messy.

Using conventional design elements and ecological knowledge property owners can take pride in creating healthy, ecologically diverse habitats that conserve water, save energy and sequester carbon.

"our tools... do not suffice for the oldest task in human history – to live on a piece of land (water) without spoiling it" ..... Aldo Leopold

UW-Extension Lakes – *The Economics of Water* web pages

< http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/people/value/default.aspx >

Healthy Lakes & Higher Property Values

Facts and resources to help real estate professionals protect our nation's lakes and lake shorelines

Real estate professionals are important partners in maintaining and restoring the quality of our nation's lakes. "Lakeshore property is in demand because of the amenities or benefits [it] provide[s] its owners, such as water based recreation possibilities, an aesthetic setting for a home, tranquility away from urban and commercial life, and perhaps the privilege or esteem of owning an increasingly scarce and valuable resource."[1] Since the value of lakeshore property is tied to the quality of the adjacent lake, real estate professionals have a vested interest in helping homebuyers and communities restore and protect their lakes.

In April 2010, the U.S. Environmental Protection Agency published the National Lakes Assessment (NLA), the first-ever baseline study of the condition of the nation's lakes. The NLA finds that 44% of U.S. lakes are in fair or poor condition, and that, of the problems assessed, poor lakeshore habitat has the greatest impact on lake health.

Lakeshore habitat refers to the trees, shrubs, and tall grasses that grow along the shore of a lake and overhang the water. Poor lakeshore habitat occurs when native trees and shrubs are removed from around the lake and replaced by manicured lawns, armored bulkheads, paved areas, buildings, and docks. Healthy native vegetation strengthens and preserves the lake shoreline, provides shelter, habitat, and food sources for lake fish and wildlife, and helps protect the lake from the impacts of pollution, such as runoff from paved surfaces or erosion from construction sites.

Clean lakes with healthy natural shorelines are good for everyone. They provide aesthetic value, recreational opportunities, higher property values, jobs, and a higher tax base.[2] Maine and Minnesota conducted two studies linking the high quality of lakes with higher property values. The 2005 Maine study found that good water quality on lakes can increase recreational revenues by millions and individual property values by billions over time.[3]

Resources for Real Estate Professionals

EPA Clean Lakes
www.epa.gov/owow/lakes

Choosing the Right Waterfront Property
Wisconsin DNR & UW Extension
www.uwsp.edu/cnr/uwexlakes/publications/choosingProperty/ChoosingRightWaterfrontProperty.pdf

Protecting Your Waterfront Investment- 10 Simple Shoreland Stewardship Practices
Wisconsin DNR & UW Extension
http://clean-water.uwex.edu/pubs/pdf/shore.waterfront.pdf

Lakeshore Property Values & Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region
Mississippi Headwaters Board and Bemidji State University
www.friendscvsf.org/bsu_study.pdf

The Economics of Lakes-Dollars and Sense
Maine Bureau of Land & Water Quality
www.maine.gov/dep/blwq/doclake/research.htm

EPA United States Environmental Protection Agency

Web resources / flyer: < http://www.uwsp.edu/cnr-ap/UWEXLakes/Pages/programs/training/HabitatRestorationResources/day1p1.aspx >

BREAK