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
1990 Housing Density by Partial Block Group

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

- **Canopy**
- **Understory**
- **Shrub**

% Plant Cover

- **Developed**
- **Undeveloped**
Shoreland bird trends

What has Happened to Songbirds?

% Frequency

Warblers
Thrushes
Vireos
Oven Bird

Common Birds
Uncommon Birds

Grackle
Catbird
Chickadee
Bluejay
Goldfinch

Undeveloped Lakes
Developed Lakes

Source: Wisconsin Dept. of Natural Resources

The Wisconsin Lakes Partnership
Bank Cover

Type of Modification:

- None
- Riprap
- Sea Wall

Bank Cover (%): 7

PUBL-RS-921-96
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
What’s Happened to Green Frogs

- Equation: $y = 0.0298x^2 - 2.1712x + 41.227$
- $R^2 = 0.2854$

![Graph showing the relationship between homes per mile and frogs per mile.](image-url)
Impacts of Lakeshore Development on Tree-falls in North Temperate Lakes

Christensen et al. 1996
Impacts of Development on Tree-falls

$y = -172.78 \ln(x) + 671.59$

$R^2 = 0.7164$

Christensen et al. 1996
Fish grow ~3X faster in lakes with lots of woody habitat.

From Schindler et al. 2000

Fish growth rate (mm/yr) vs. woody habitat (no./km) diagram.
Lake Characteristics Influencing Spawning Success of Muskellunge
Lake Characteristics Influencing Muskellunge Reproduction

- Partially Developed
- Totally Developed

Percent Shoreline

Good Reproductive

Poor Reproductive
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

**Mean Biomass**

<table>
<thead>
<tr>
<th></th>
<th>Pier</th>
<th>Deck</th>
<th>Control</th>
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<tbody>
<tr>
<td>Mean Biomass (g)</td>
<td>34.6</td>
<td>7.7</td>
<td>157.2</td>
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</table>

**Mean % Cover**

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</thead>
<tbody>
<tr>
<td>Mean % Cover</td>
<td>29.4</td>
<td>26.3</td>
<td>67.2</td>
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Ecological Effects of Piers on Fish

Mean Catch Rates

Fish Numbers

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<th>Pier</th>
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<tr>
<td>0</td>
<td>11.2</td>
<td>38.7</td>
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Pier Control

Fish Numbers
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

13 Southeast Wisconsin Lakes

1970s 2004
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
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
Organizational Habitat Management

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- Local Ordinances (e.g., “slow-no-wake”)
Organizational Habitat Management

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- Shoreland Protection Rules (NR 115) and Zoning
Organizational Habitat Management

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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