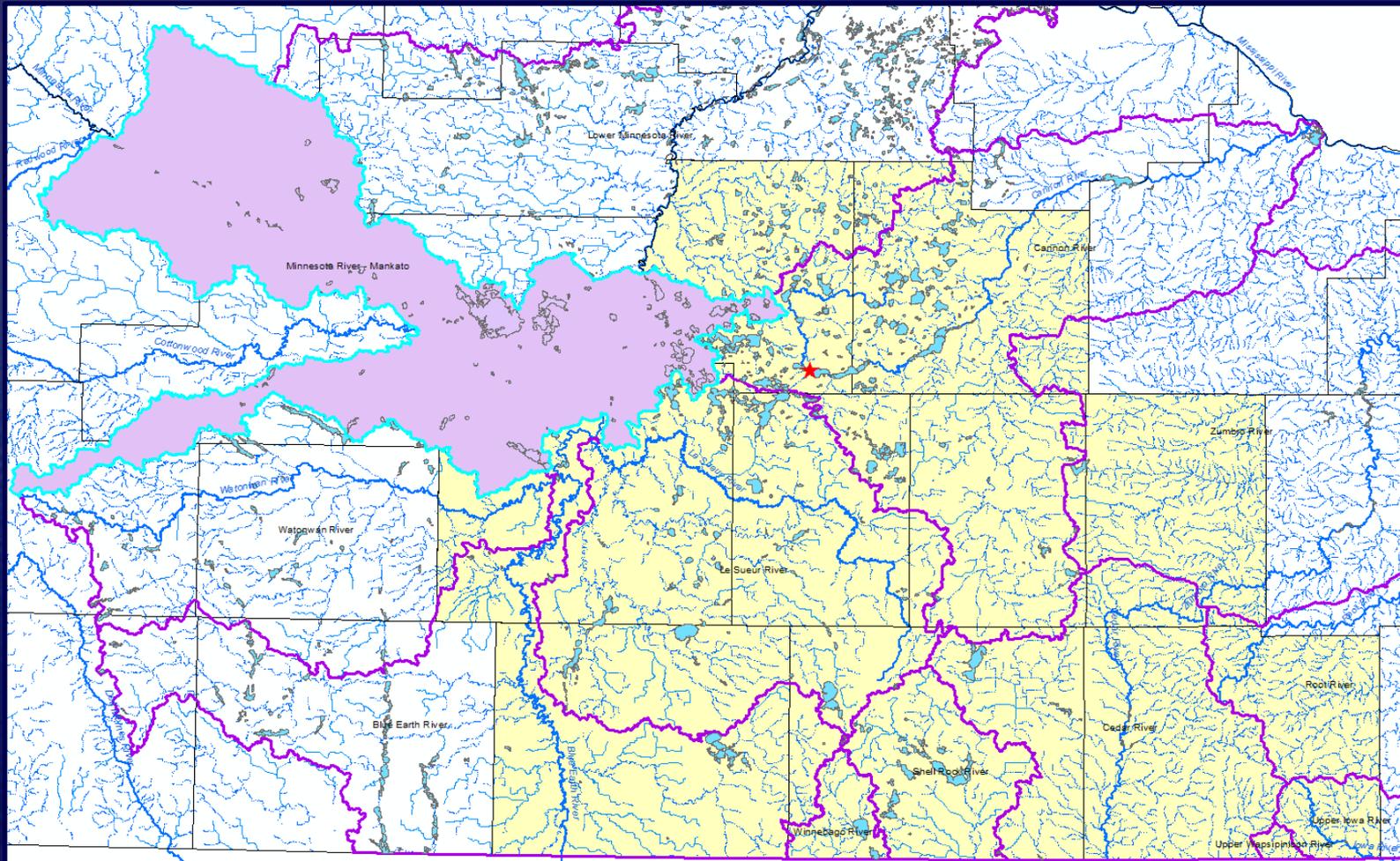


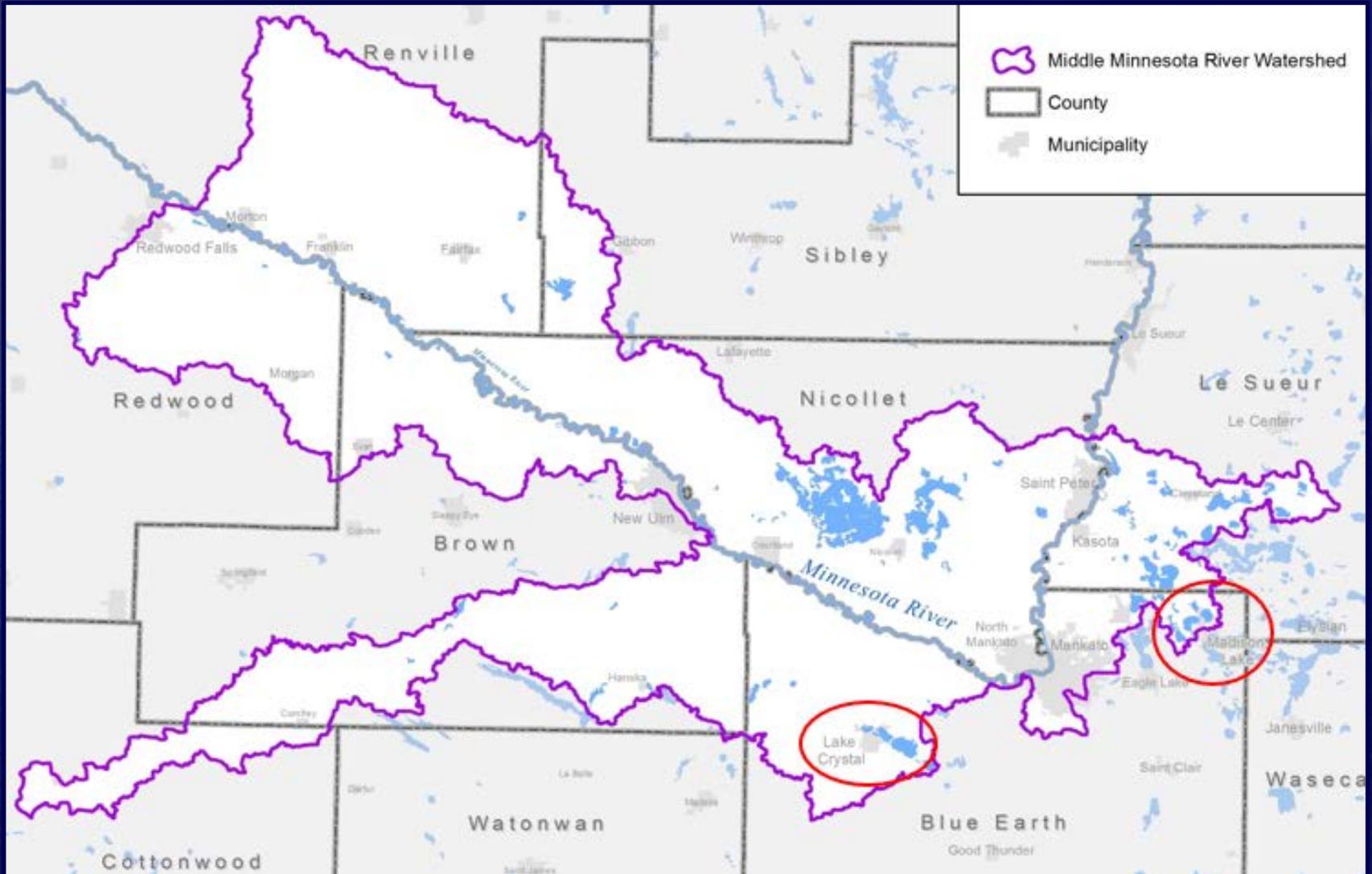
Watersheds, Shoreline Habitat, Development, Fisheries, and the Choices We Make



Waterville Area Fisheries



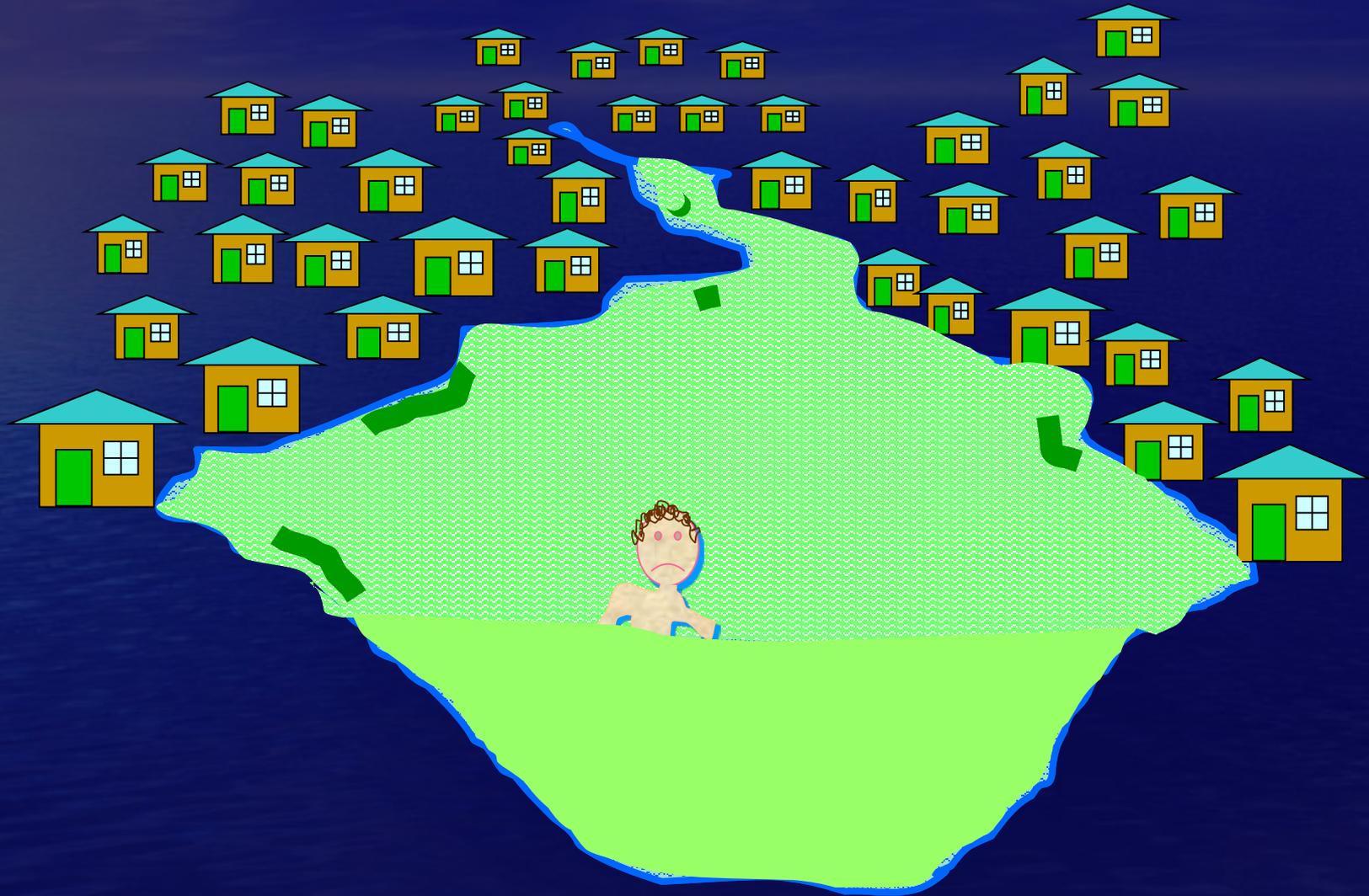
Minnesota River-Mankato Watershed



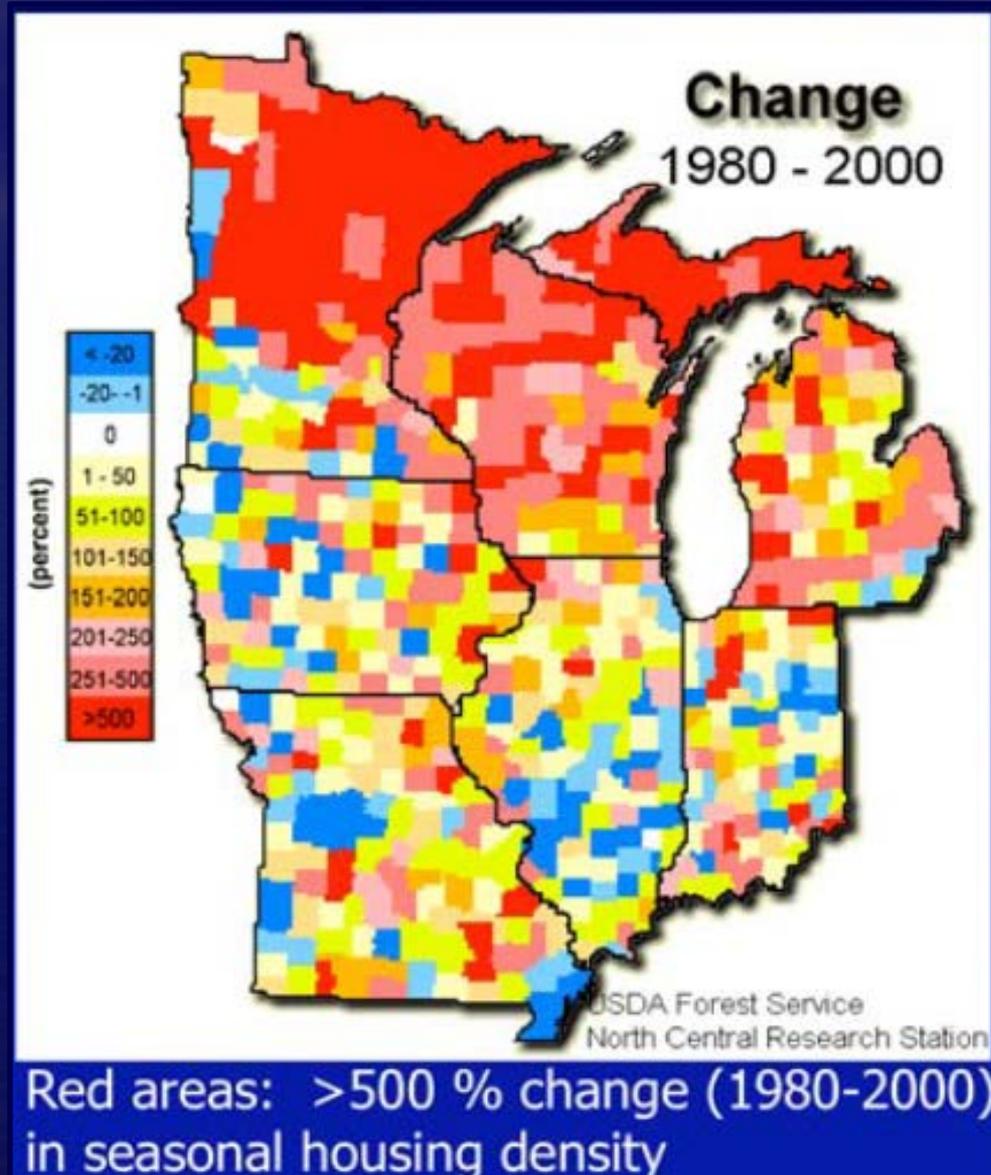
What is the issue?

- Watershed development and changes have resulted in impairments to surface waters.
 - Modification of hydrology
 - Increased shoreline development on shallow lakes
 - Nutrient loading from land use practices
 - Multiple use pressure for a limited resource
 - Presence of undesirable fish populations

Development Impacts are cumulative



Lakeshore Development



Development Impacts: Aquatic Vegetation



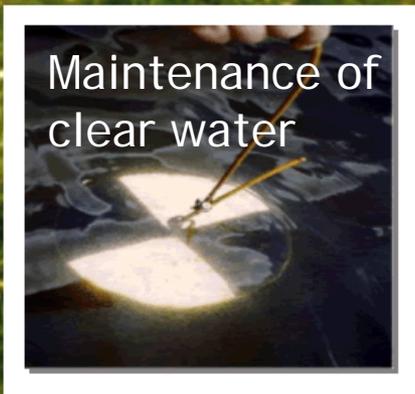
- Developed shoreline has less aquatic vegetation than undeveloped.
- 66% reduction in aquatic vegetation cover with development.
- Statewide, MN has lost nearly 30% of its emergent and floating vegetation in lakes.

- Losses have resulted in lower fish production.





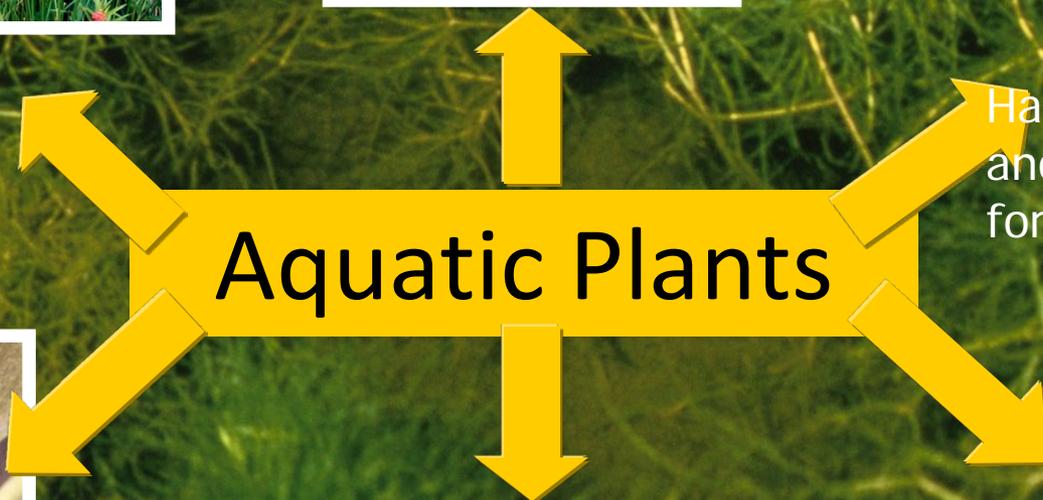
Bank protection,
Visual amenity,
Wildlife habitat



Maintenance of
clear water



Habitat, food, cover
and nesting material
for wildlife



Aquatic Plants



Food for
invertebrates



Refuge for small
invertebrates



Good fish habitat

Total Phosphorus concentration ppb

Forest lakes

Prairie

25

50

Transition

100

200

Controlled by
low nutrient
availability

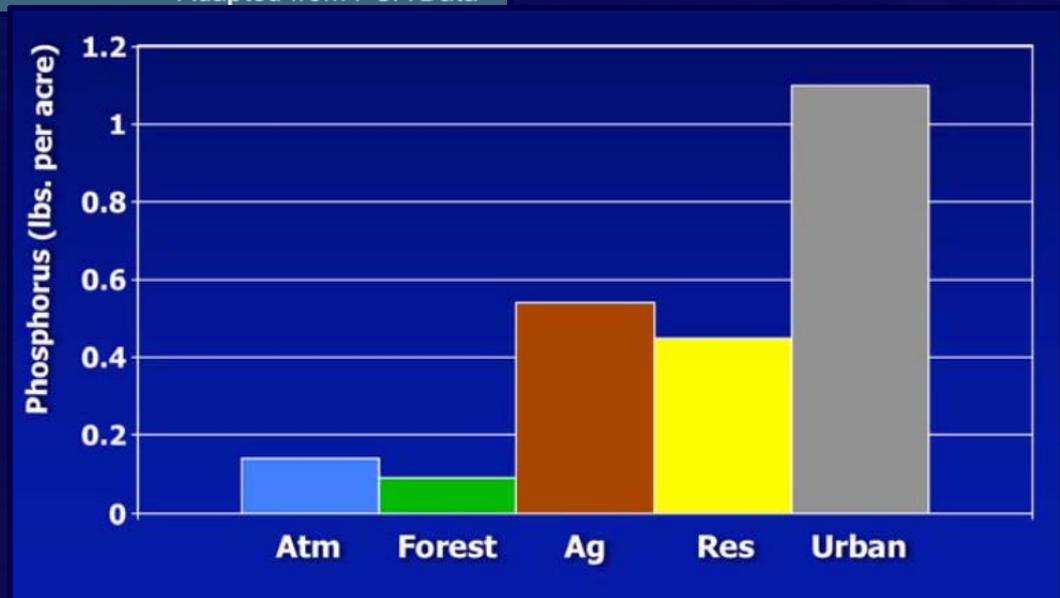
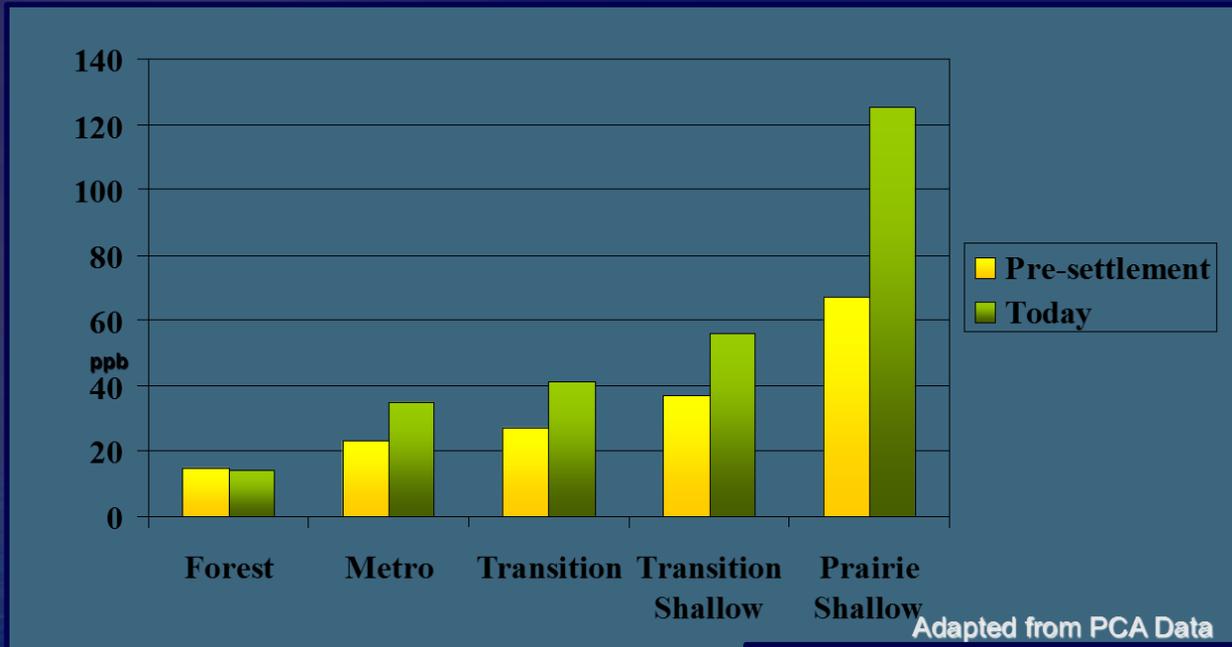
Plant dominance, clear water

Sparse plants
present by clear-
water maintained by
cladoceran grazing

Phytoplankton dominance,
turbid water

Difficulty of maintaining clear water

Development Impacts: Phosphorus



Development Impacts: Coarse Woody Habitat!

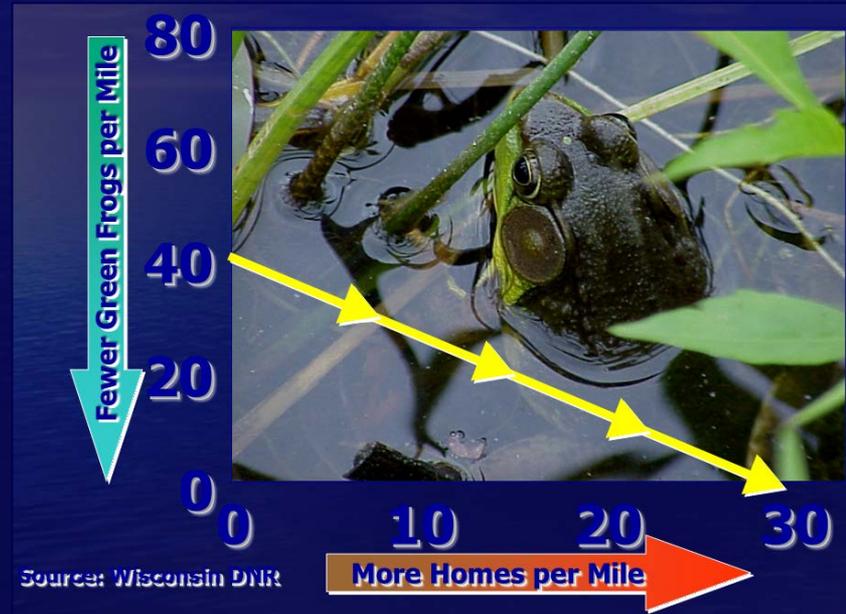
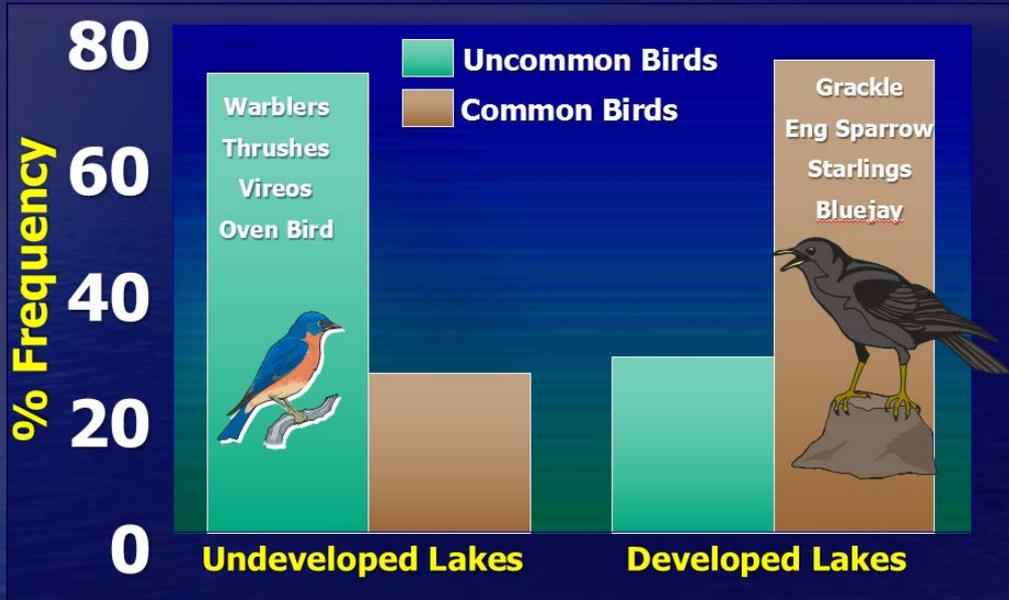
- Significantly less trees in water along developed compared to undeveloped shorelines



- Losses have resulted in lower fish production.



Development Impacts: The Birds and the Bees...



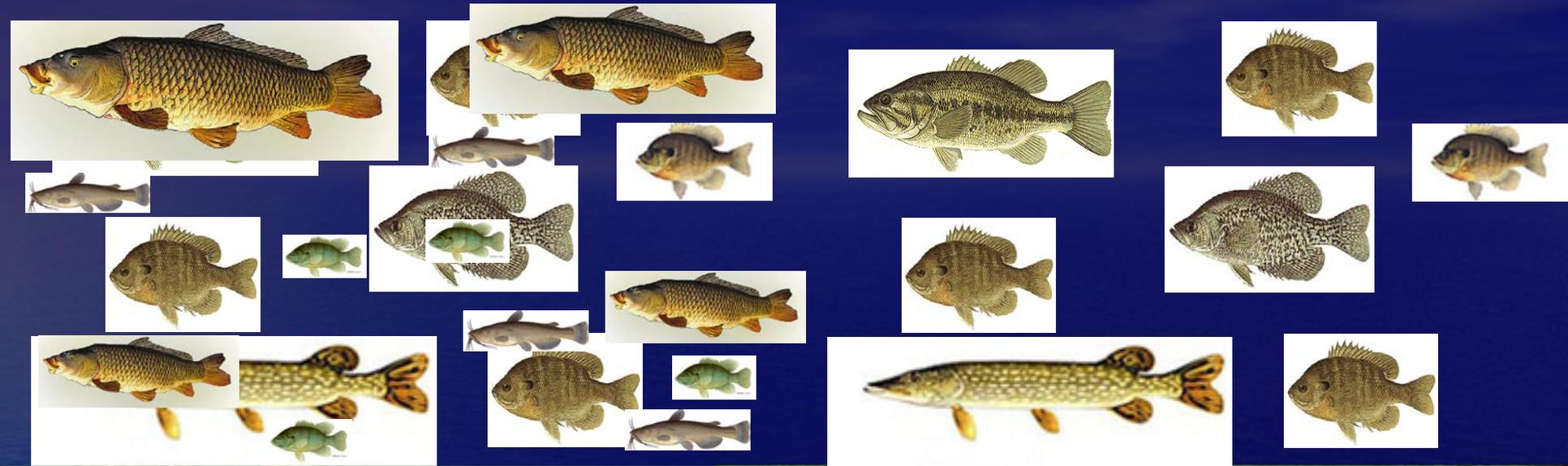
Development Impacts: Disturbance



- Natural shoreline habitat, or stripped down boat parking lots?

- **Losses have resulted in lower fish production.**

Development Impacts: Fish Populations



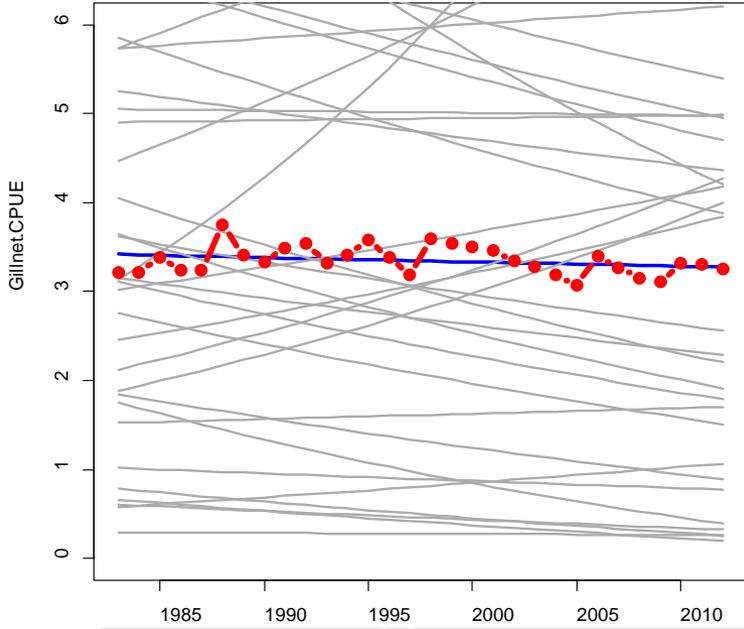
Waterville Area Fisheries

- Primary Sport Fish Management Species

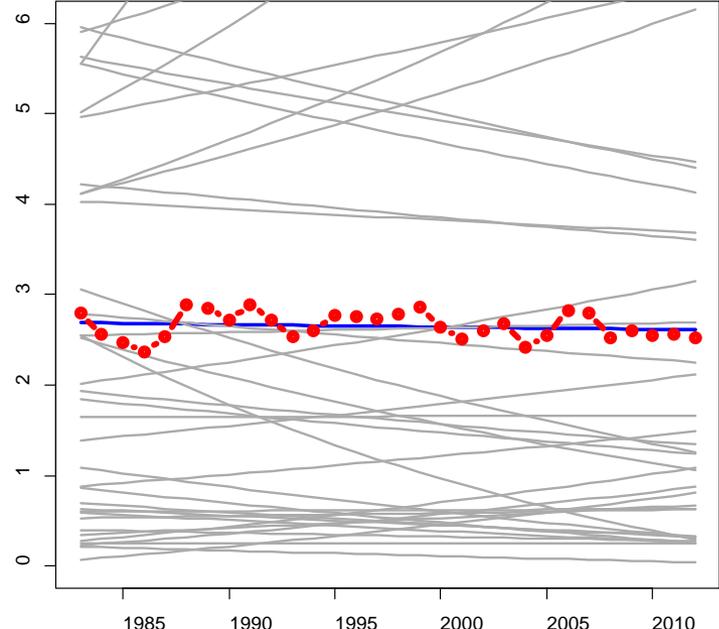
- Walleye
- Northern pike
- Largemouth bass
- Bluegill
- Yellow perch
- Black crappie
- Muskellunge
- Smallmouth bass
- Channel catfish
- Flathead catfish



NW

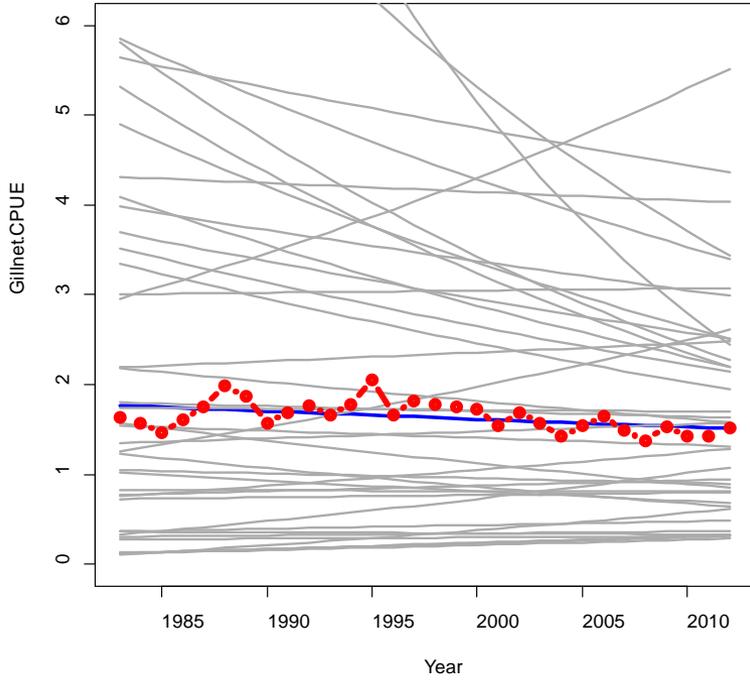


NE

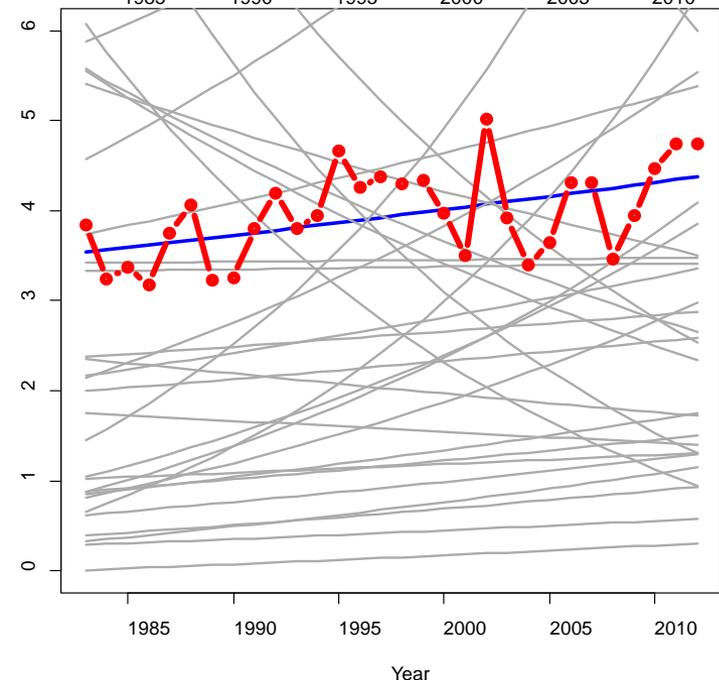


Walleye

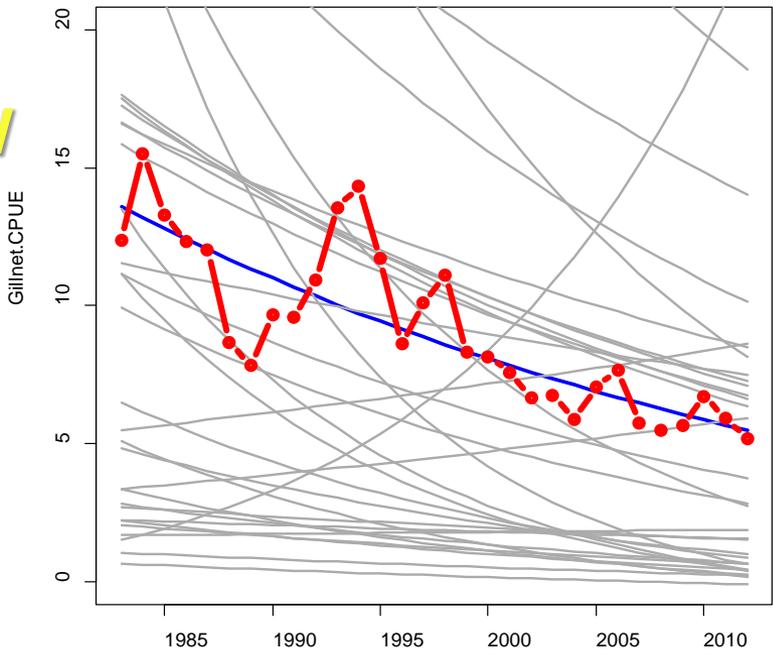
SW



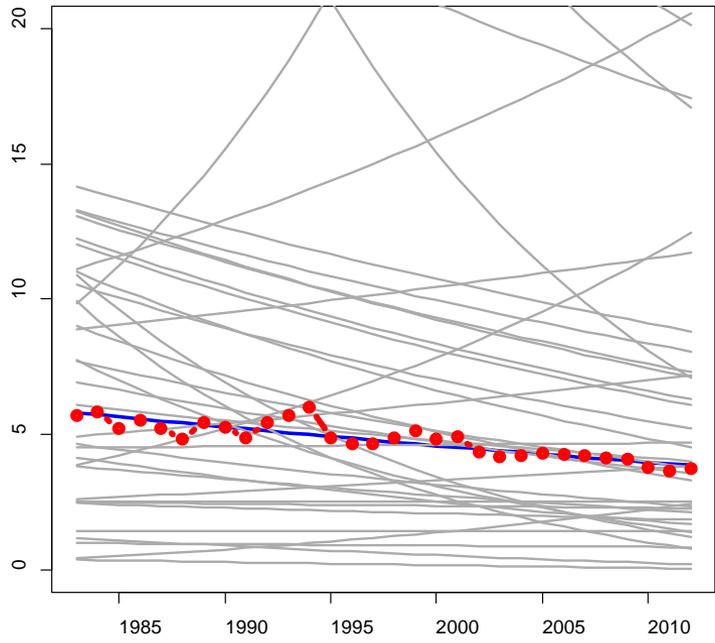
SE



NW

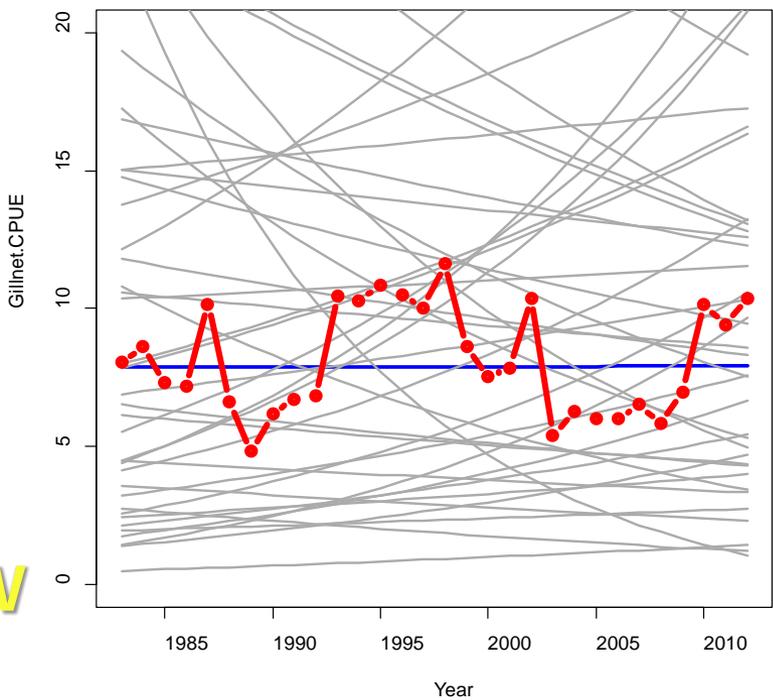


NE

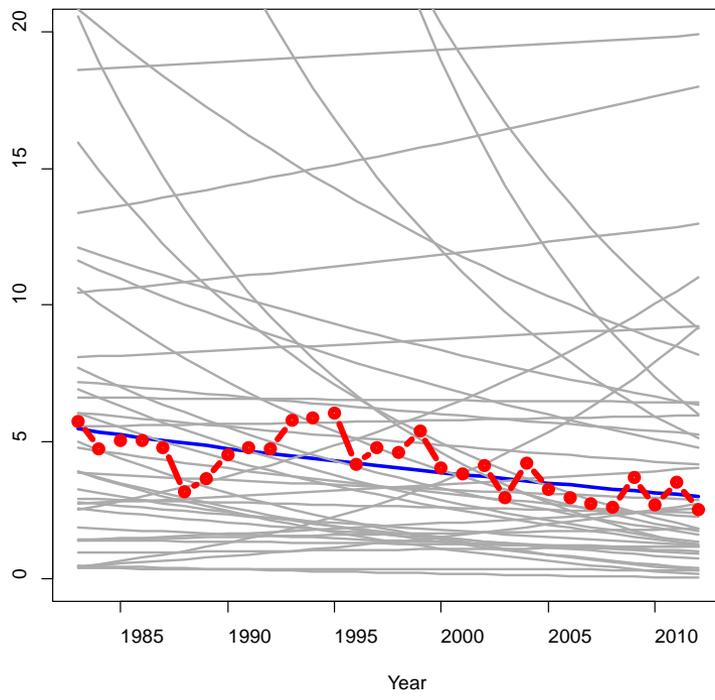


Yellow Perch

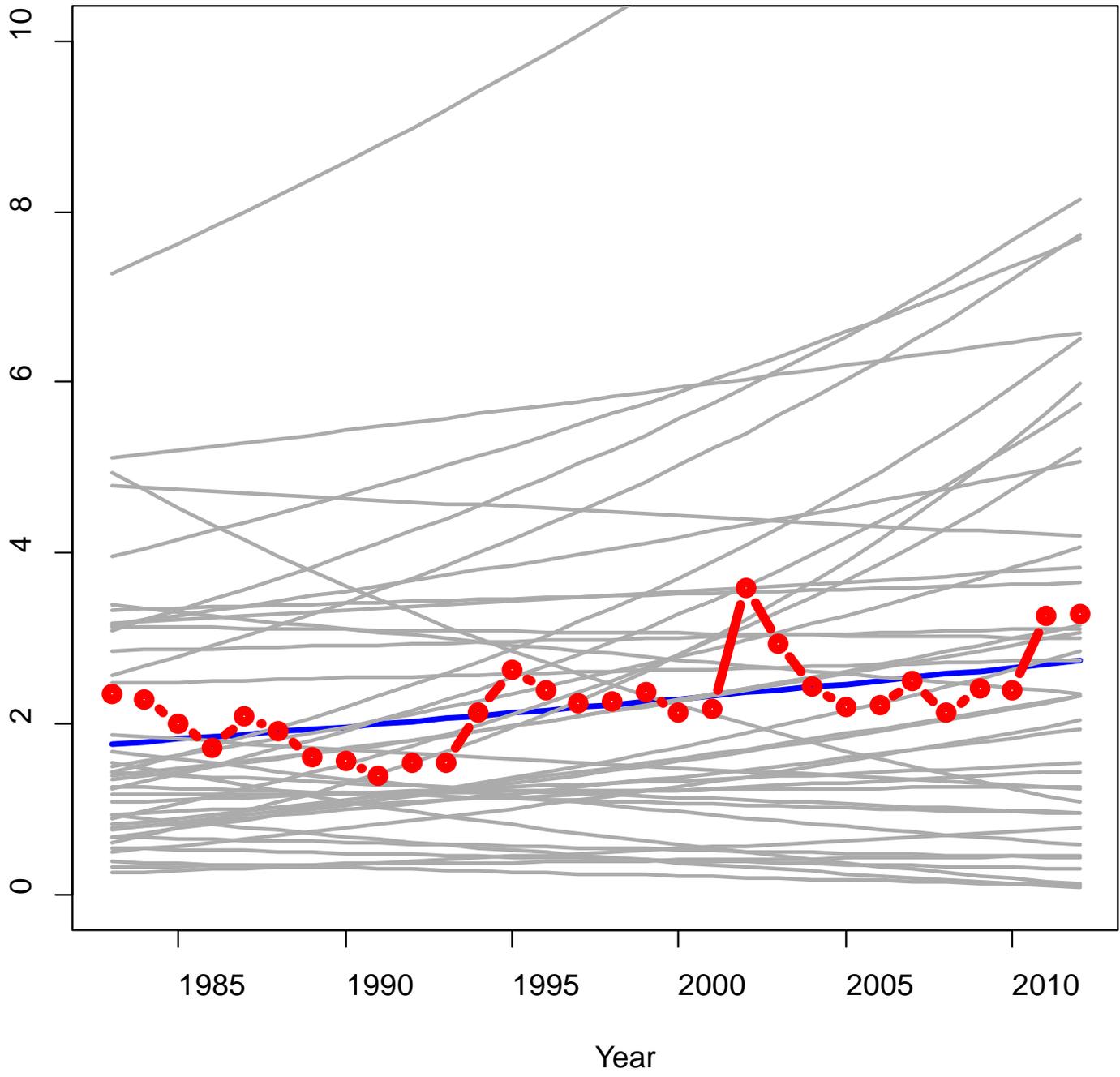
SW



SE



Northern Pike



SE

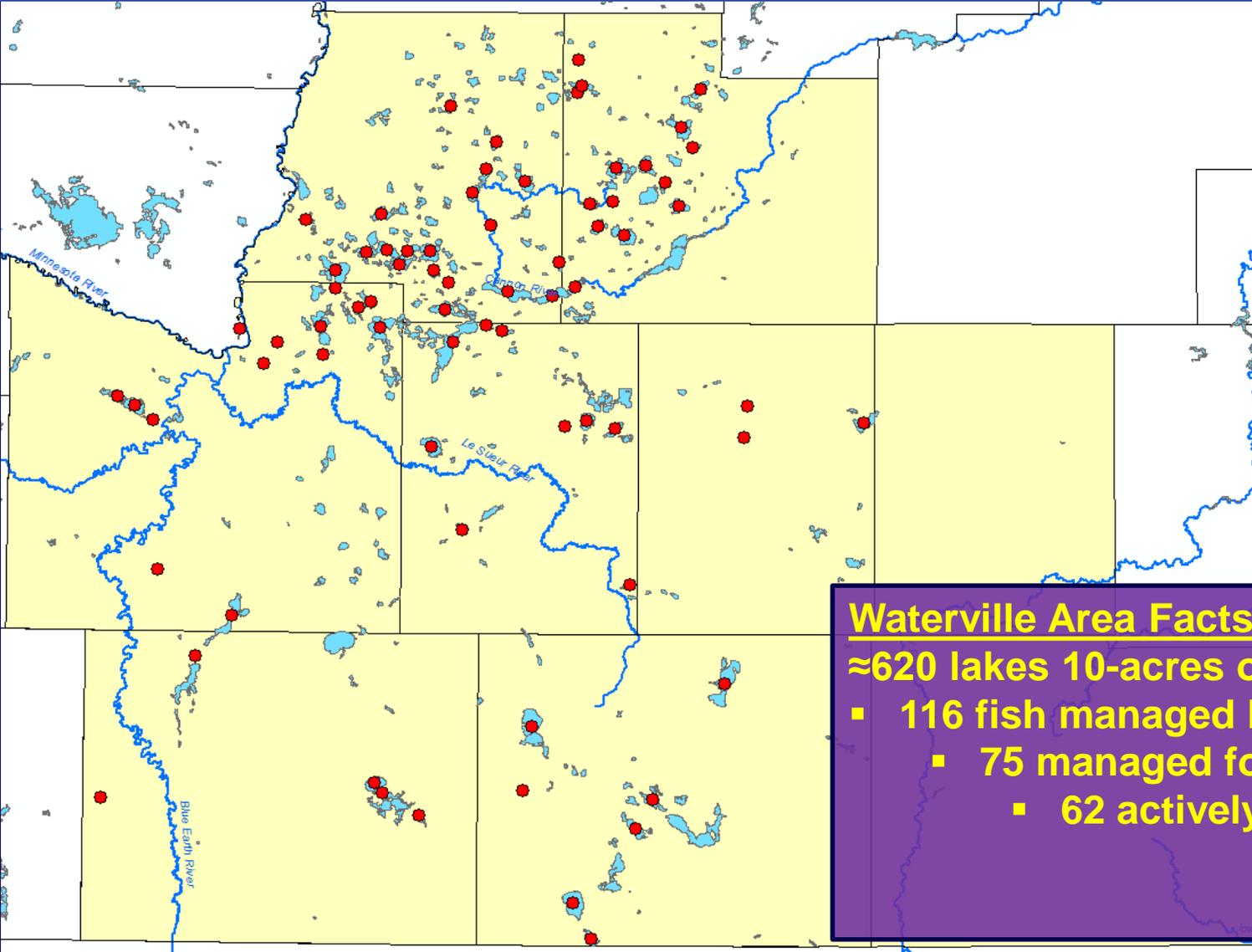




Northern Pike Hatchery Production



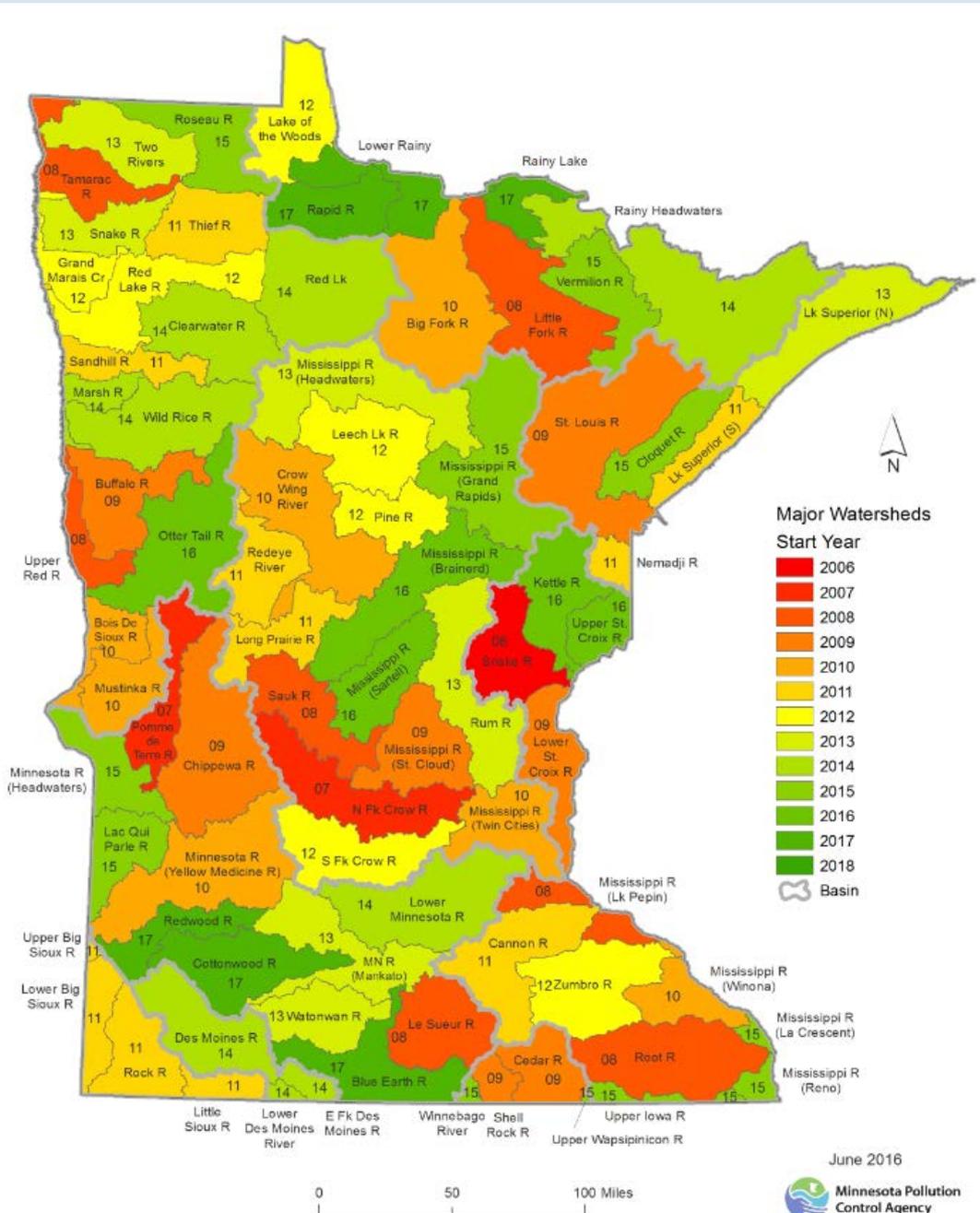
Waterville Area Fisheries: Northern Pike Management



Waterville Area Facts

- ≈620 lakes 10-acres or larger
 - 116 fish managed lakes
 - 75 managed for pike (65%)
 - 62 actively stocked (83%)

Watershed Monitoring Approach



Minnesota Clean Water Act Indicators

Beneficial Use		Lakes
<p data-bbox="63 307 484 361">Aquatic Life Use</p>  <p data-bbox="396 639 562 656">Photo: Bill Lindner</p>		<p data-bbox="1319 307 1862 511">Fish IBI Chloride Plant IBI-provisional</p>  
<p data-bbox="63 702 349 906">Aquatic Recreation Use</p> 		<p data-bbox="1319 702 1707 756">Eutrophication</p> 
<p data-bbox="63 1035 529 1162">Aquatic Consumption Use</p> 		<p data-bbox="1319 1035 1831 1162">Fish Mercury, PCBs, and PFOS</p>  

Lake Aquatic Recreation Assessments

LAKE	Mean Phosphorus	Phosphorus Samples	Mean Chlorophyll-A	Chlorophyll-A Samples	Secchi	Secchi Samples	Assessment
Duck	80.9	5	52.58	5	0.78	98	NS
Ballantyne	30.6	13	24.59	13	0.89	13	FS
Crystal	251	17	87	17	0.32	82	NS
Washington	67.11	30	51.68	28	1.45	288	NS
Emily	24.75	8	24.3	8	0.91	147	FS

Minnesota Clean Water Act Indicators

Beneficial Use		Lakes
<p data-bbox="63 307 484 361">Aquatic Life Use</p>  <p data-bbox="396 639 562 656">Photo: Bill Lindner</p>		<p data-bbox="1319 307 1862 511">Fish IBI Chloride Plant IBI-provisional</p>  
<p data-bbox="63 702 349 906">Aquatic Recreation Use</p> 		<p data-bbox="1319 702 1705 756">Eutrophication</p> 
<p data-bbox="63 1035 529 1163">Aquatic Consumption Use</p> 		<p data-bbox="1319 1035 1831 1163">Fish Mercury, PCBs, and PFOS</p>  

FIBI Metrics Selected based on correlations to shoreline and watershed disturbance

Physical Structure

Properties

- vegetation
- woody habitat
- substrate



Water Quality

Properties

- sedimentation
- epiphytic algae
- hypolimnetic oxygen
- regime shifts



Primary Disturbance Drivers

Shoreline disturbance from development



Watershed disturbance from urbanization and agriculture

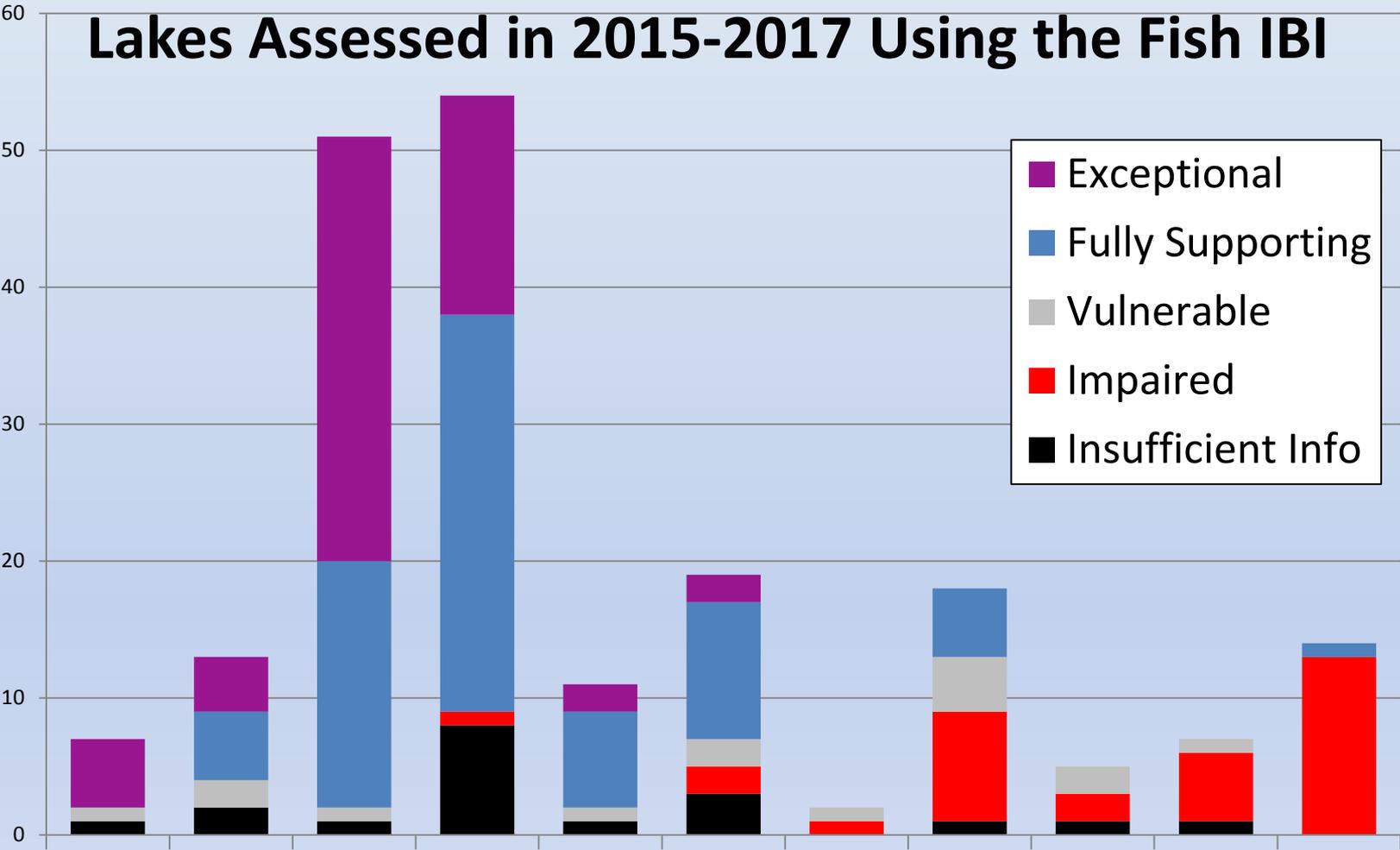


Lakes Assessed in 2015-2017 Using the Fish IBI

Number of Lakes Assessed

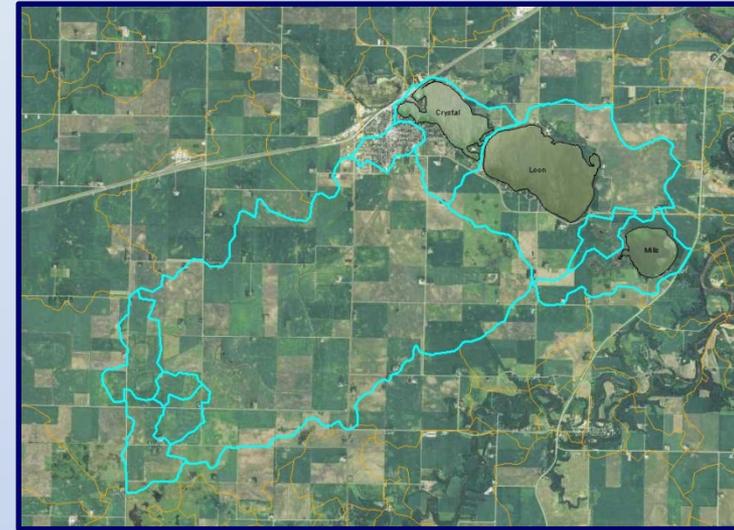


Upper & Lower Red
Clearwater
Miss. Headwaters
Miss. Grand Rapids
Wild Rice
Rum
Lower Headwaters & LQP
Lower Minnesota
Minn. R. Mankato
Watonwan
Des Moines



Crystal Lake

- Fish IBI Score
 - General Use Threshold = 36
 - IBI Score = 10
 - **Well Below General Use threshold**
 - Comments on Metrics:
 - All metrics scored poorly
 - 5 tolerant spp (BLB, CAP, FHM, BIB, GSF), 0 intolerant spp.
 - nearshore dominated by FHM & BLB
 - TN dominated by BLB
 - Gillnets dominated by BLB, CAP, and WAE
- Stressors:
 - Large watershed: 76% Ag, 8% Urban, >1% Forest & Grassland, 15% Water
 - Moderately developed shoreline; Score the Shore Score = 71
 - TP ~1790 ppb; Hypereutrophic, Nutrient Impaired



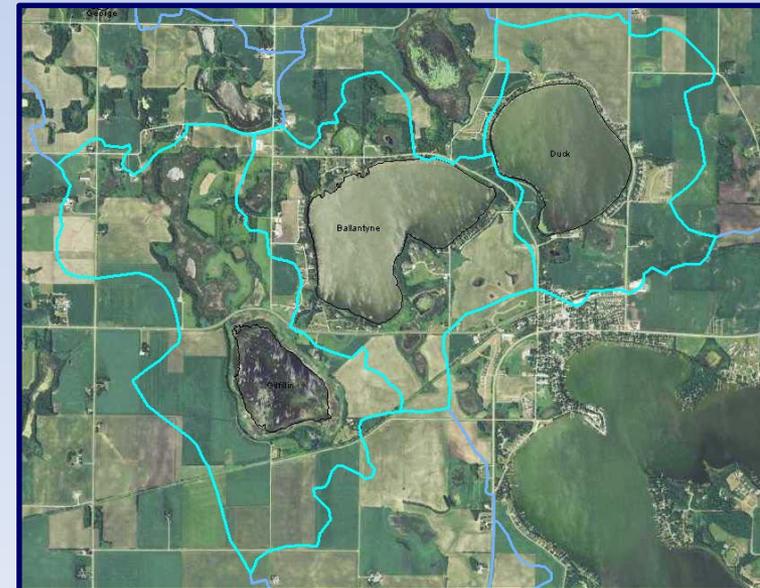
Duck Lake



- Fish IBI Score
 - General Use Threshold = 36
 - **IBI Score = 36**
 - Right at the General Use threshold
 - Comments on Metrics:
 - 3 tolerant spp (BLB, CAP, FHM), 1 intolerant (2 IOD);
 - good scores on veg-dwellers and insectivore species
 - nearshore & TN dominated by bluegills
 - Gillnets dominated by FRD & NOP
- Vulnerable to Future Impairment
- Stressors:
 - Small contributing watershed: 59% Ag, 7% Urban, 4% Forest, 30% Water
 - Highly developed shoreline (~24 docks/km), Score the Shore Score = 59 indicating poor habitat value
 - TP ~81ppb; Nutrient Impaired

Ballantyne Lake

- Fish IBI Score
 - General Use Threshold for Group 7 = 36
 - 2 nearshore surveys in 2014: IBI Scores = 38 & 40 (just above threshold)
 - Comments on Metrics:
 - 3 tolerant spp (BLB, CAP, BIB), 1 intolerant (IOD);
 - good scores on veg-dwellers and insectivores, good GN score (NOP)
 - Nearshore dominated by BNM, YEP, LMB, BLG (9/9 only), emerald shiners (6/30 only)
 - TN dominated by carp, bowfin, and bluegills
 - Gillnets dominated by NOP & CAP
- Vulnerable to Future Impairment
- Stressors:
 - 59% Ag, 6% Urban, 5% Forest, 29% Water
 - Moderate shoreline development (~10 docks /km) – some areas of very nice bulrush stands
 - TP ~39ppb
 - Identified as a high risk based on phosphorus sensitivity



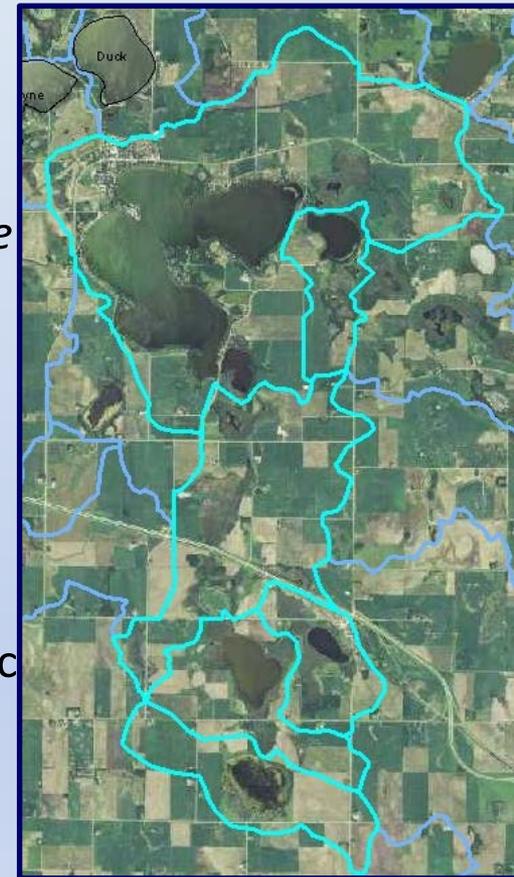
Lake Washington

- Fish IBI Score

- IBI Tool 2 General Use Threshold = 45 – *note this one of the furthest south lake in this Group*
- IBI Score = 29
- Well below general Use threshold
- Comments on Metrics:
 - 2 tolerant spp (BLB, CAP), 1 intolerant spp. (IOD)
 - Low metric scores for # of intolerant, insectivore, veg-dwelling, and small benthic spp., ratios of small benthic and intolerants also low; GN metric low
 - Nearshore dominated by BLG, BNM, BLC, YEP, SPO, LMB, EMS
 - TN dominated by FRD, WAE, YEB (very low CAP)
 - Gillnets dominated by FRD, NOP, WAE (very low CAP)

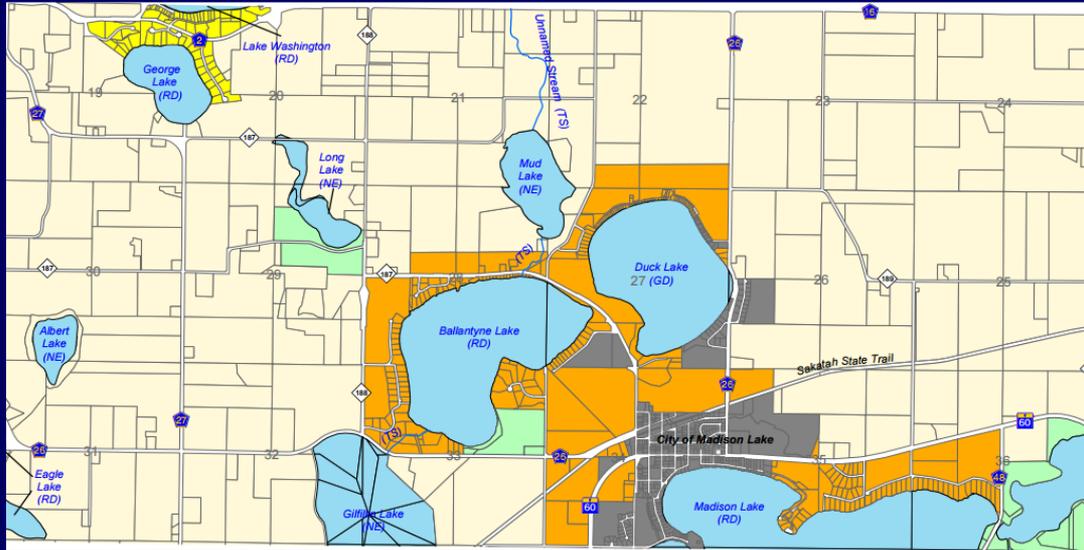
- Stressors:

- 65% Ag, 5% Urban, 6% Forest, 22% Water
- Moderate – High shoreline development (~14 docks/km); , Score the Shore Score = 59 indicating poor habitat value
- TP ~71ppb; Nutrient impaired

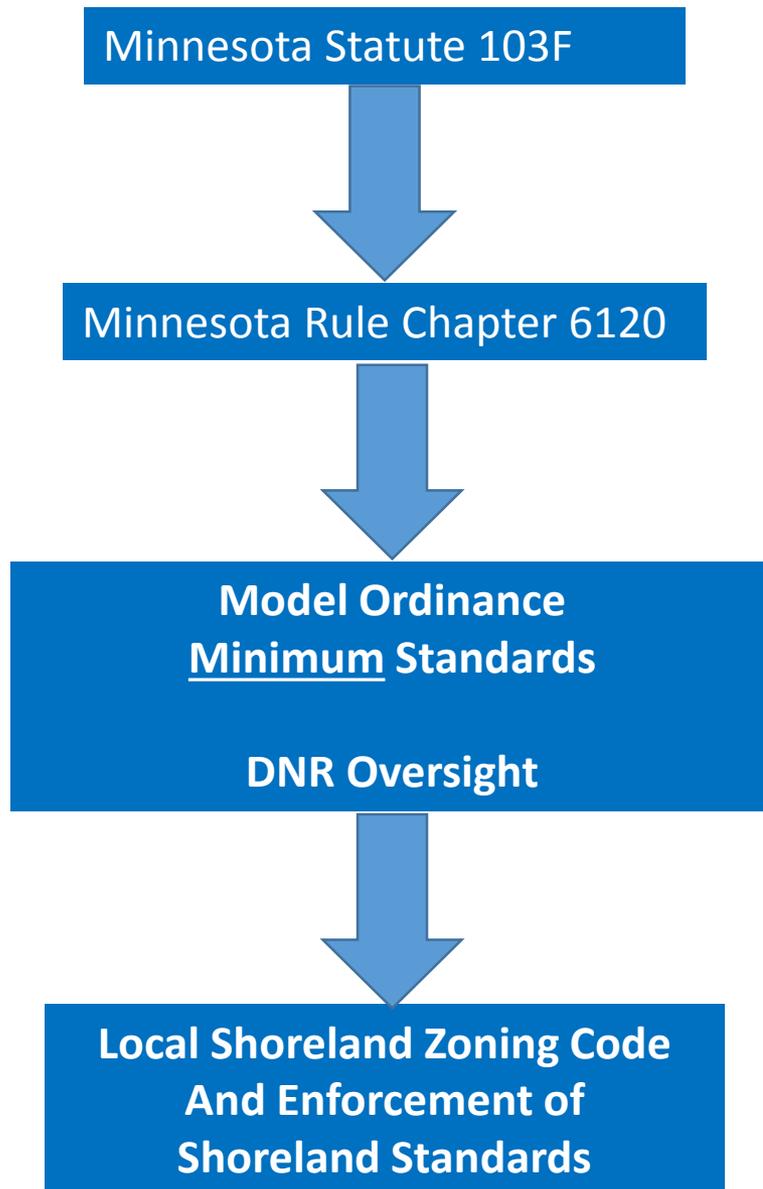


What is YOUR role?

- Regulatory Framework Relies on efforts at the local level



Shoreland Regulatory Framework

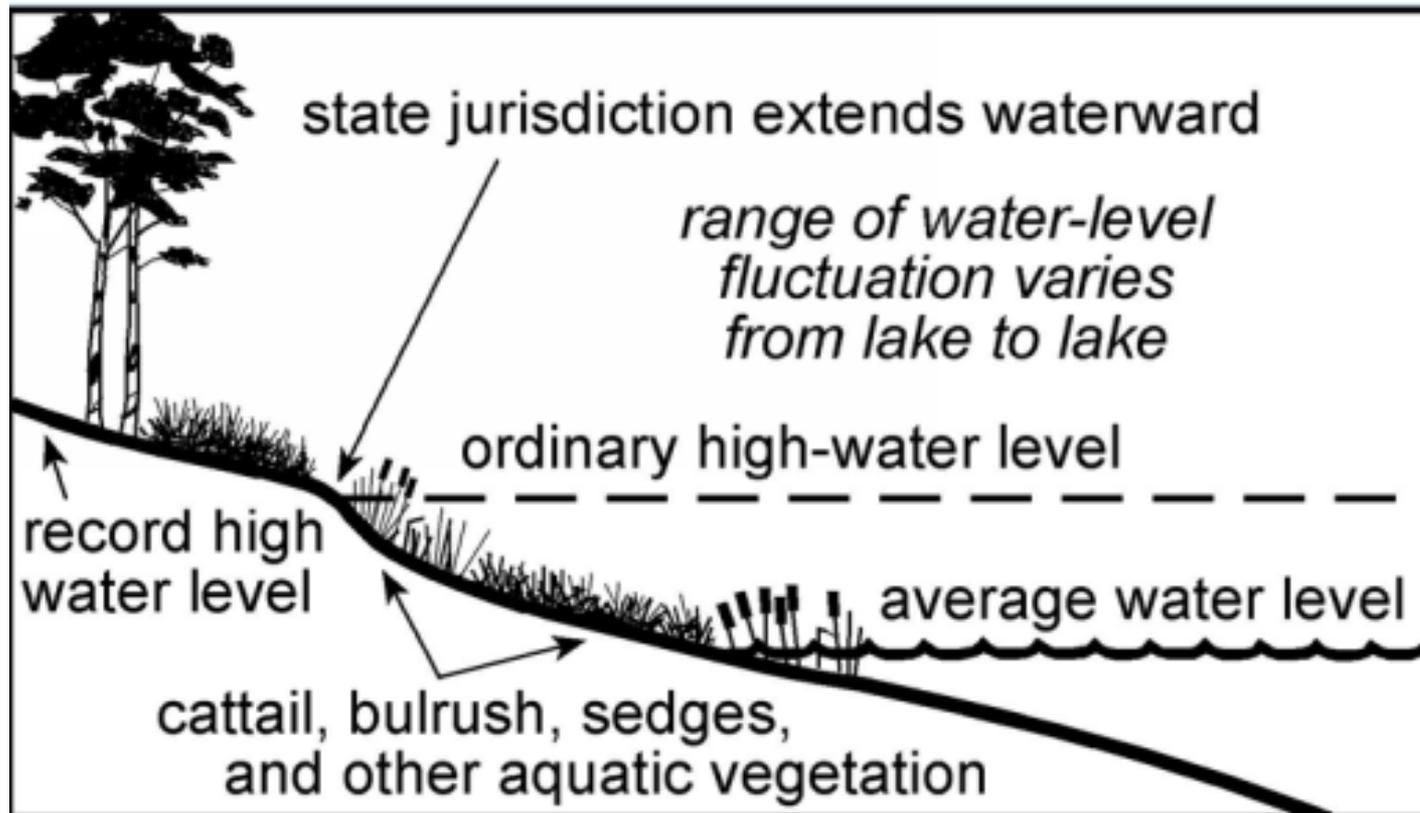


Purpose

Provide minimum guidance for the wise development of shorelands of public waters and thus preserve and enhance the quality of surface waters

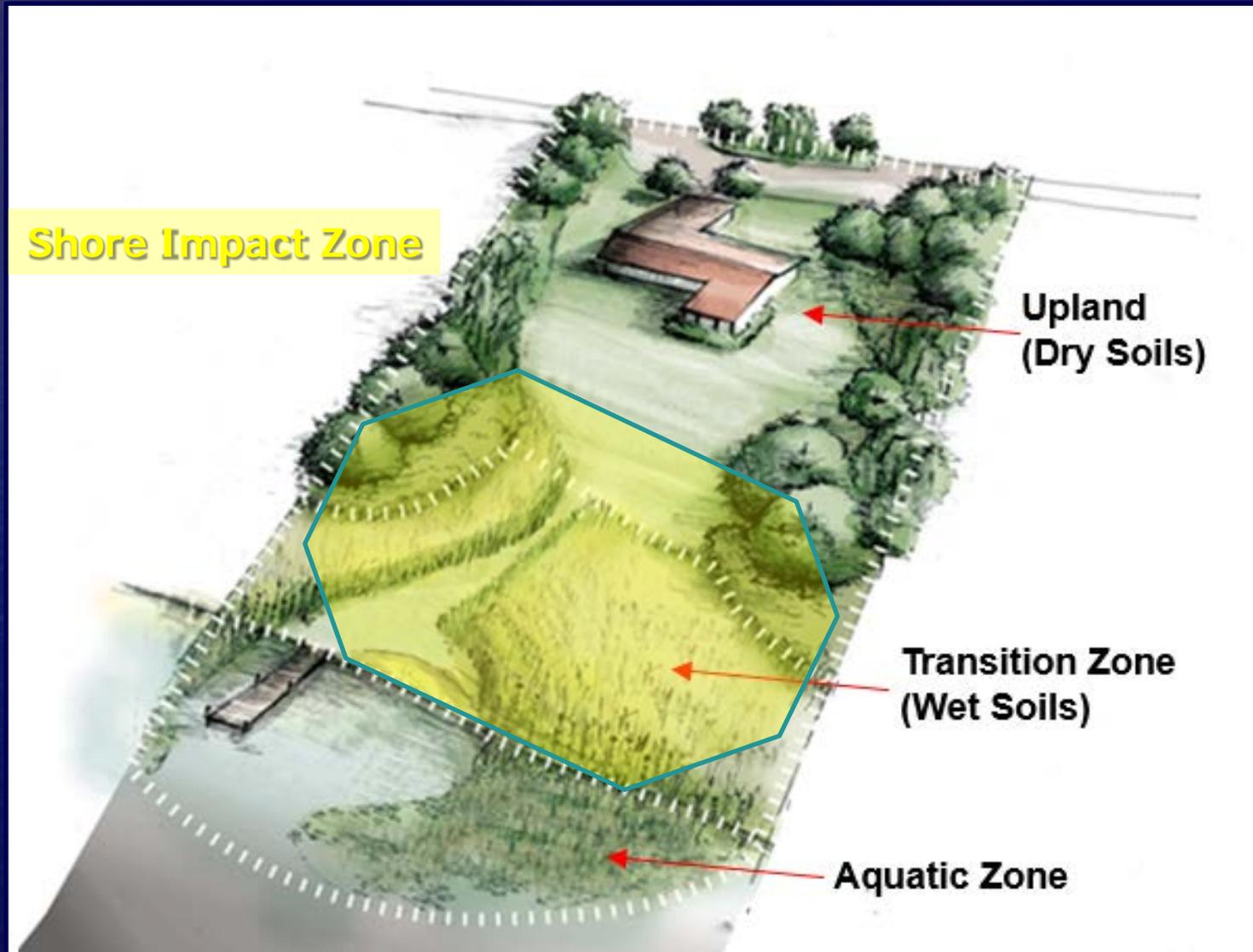
Shoreland Rules Don't Adequately Protect Water Quality and Fish and Wildlife Habitat

Ordinary High Water Level

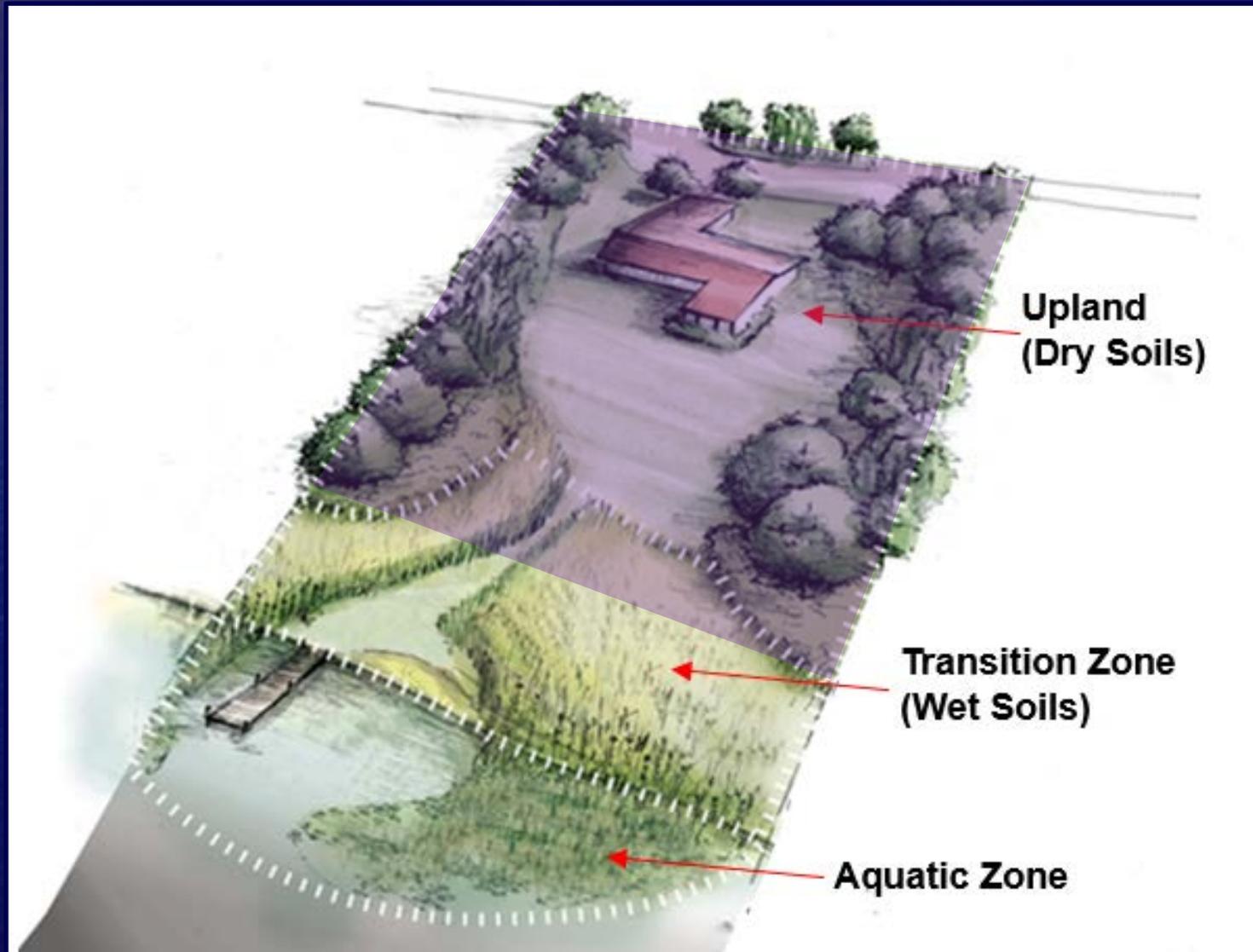


- State has Jurisdiction Below OHWL
- County/City has Jurisdiction above OHWL

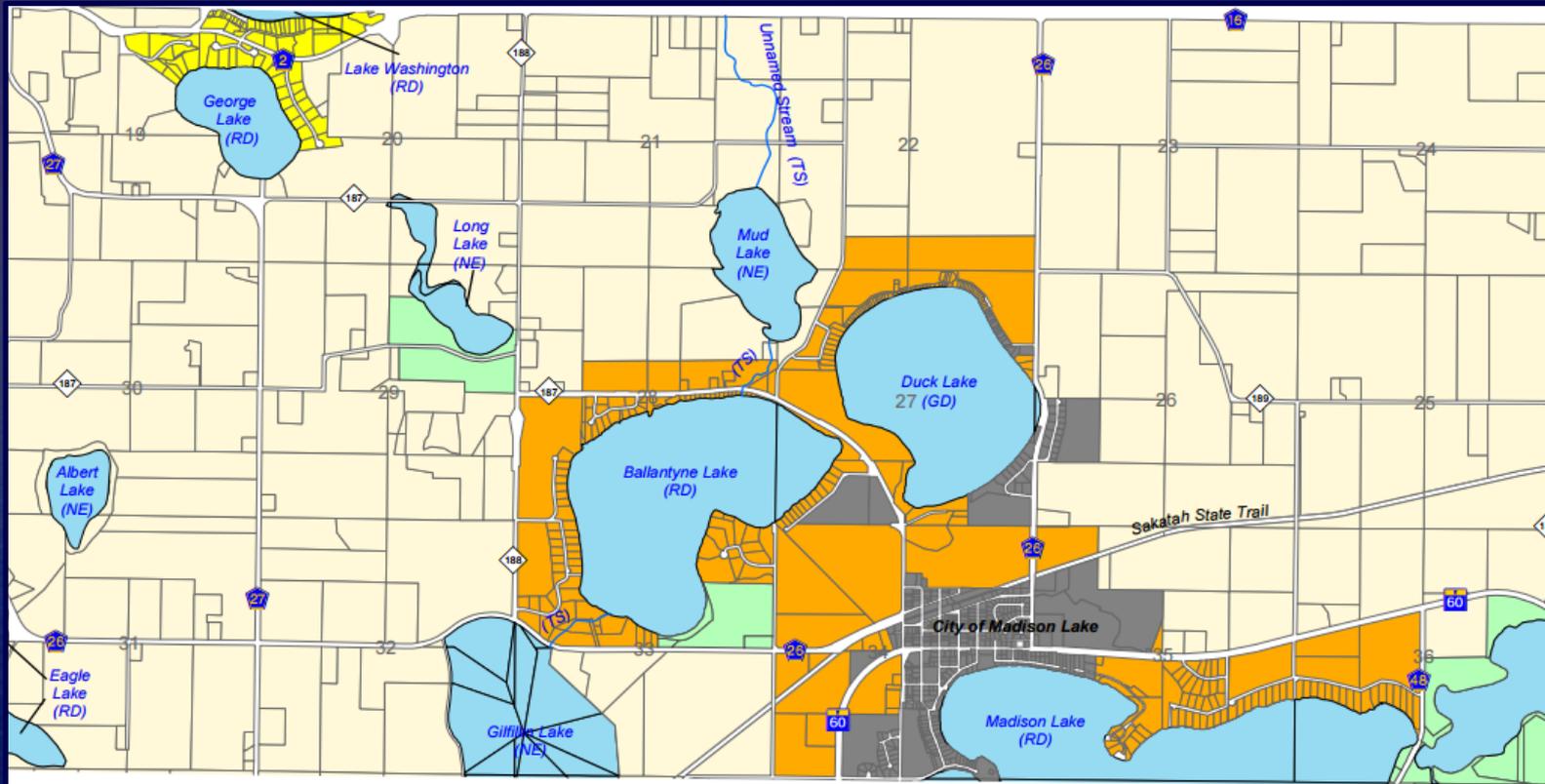
The Buffer Zone



The Upland Zone



Proper Development: The basics, good planning!



Minnesota Rule, Chapter 6120.3400, Subpart 11

- LGU must consider proper storm water management in all reviews, approvals, and permit issuance under their shoreland management ordinances.

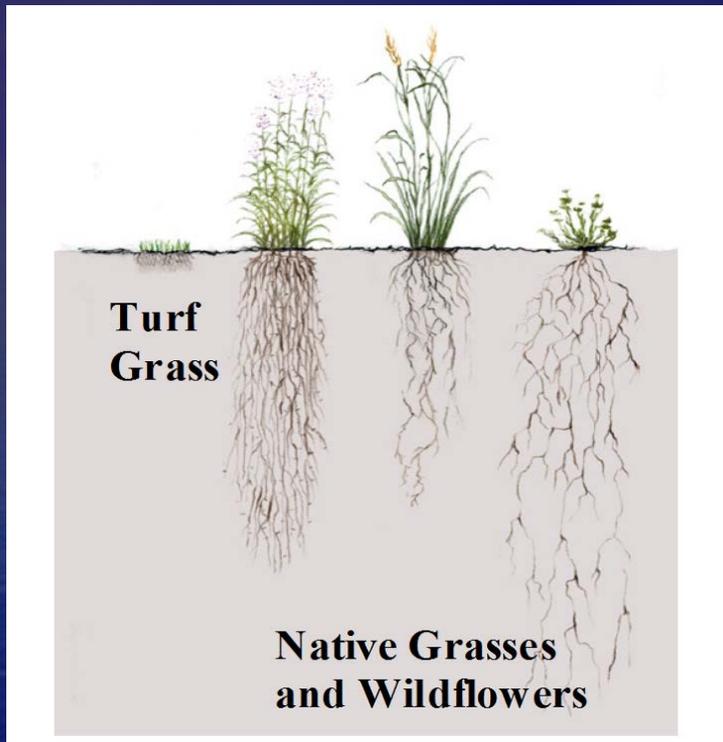
Storm Water Management



Minnesota Rule, Chapter 6120.3400, Subpart 11

- Impervious surface coverage of lots must not exceed 25% of the lot area.

Storm Water Management



Minnesota Rule, Chapter 6120.3400, Subpart 11

- When possible, existing natural drainageways, wetlands, and vegetated soil surfaces must be used to convey, store, filter, and retain storm water runoff before discharge to public waters.

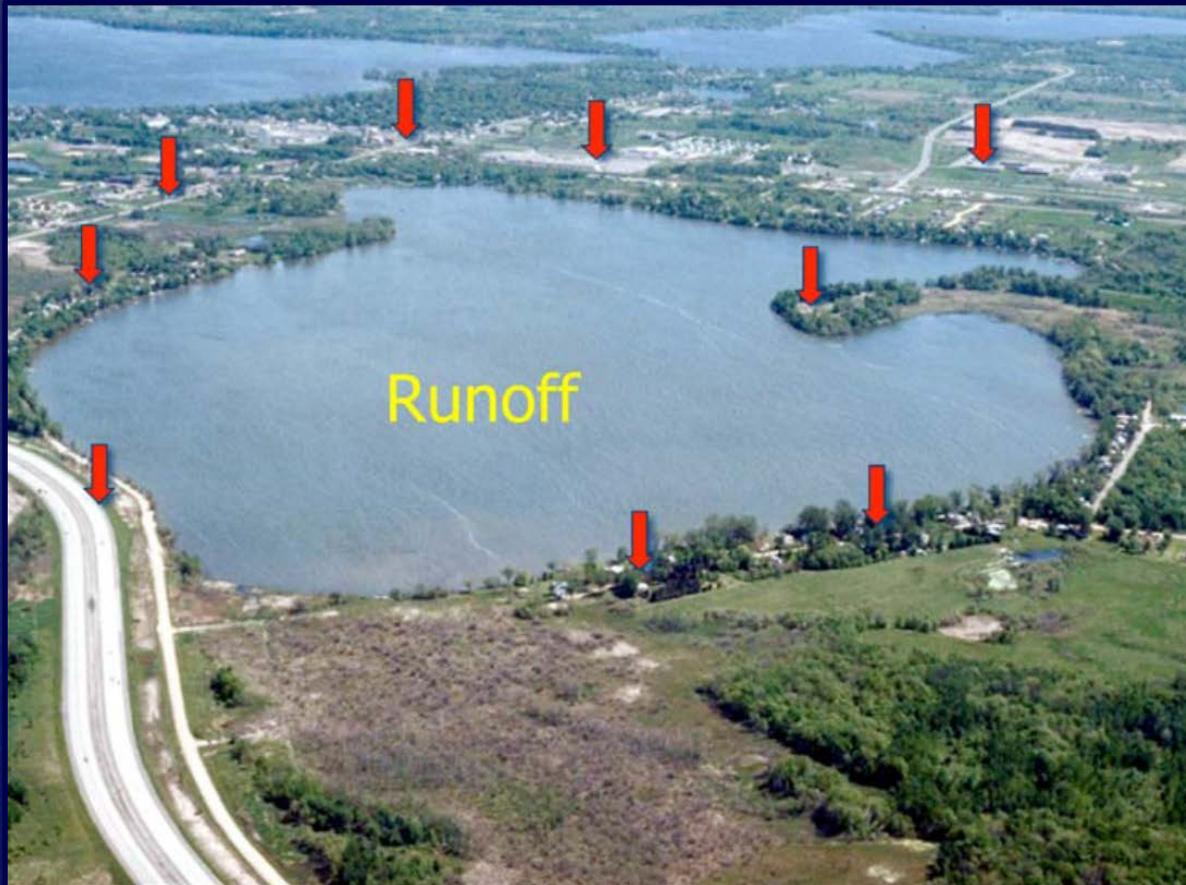
Storm Water Management

Rain Gardens



Rain Barrels

Storm Water Management: Proper Planning



Minnesota Rule, Chapter 6120.3400, Subpart 11

- Development must be planned and conducted in a manner that will minimize disturbed areas, runoff velocities, erosion potential, and reduce and delay runoff volumes.

Storm Water Management

Grass Clippings



**Break up
Compaction**

Erosion Control

Minnesota Rule, Chapter 6120.3300, Subpart 4, Item B...

- Altered areas must be stabilized to acceptable erosion control standards (consistent with field office technical guides of the local SWCD and the NRCS).



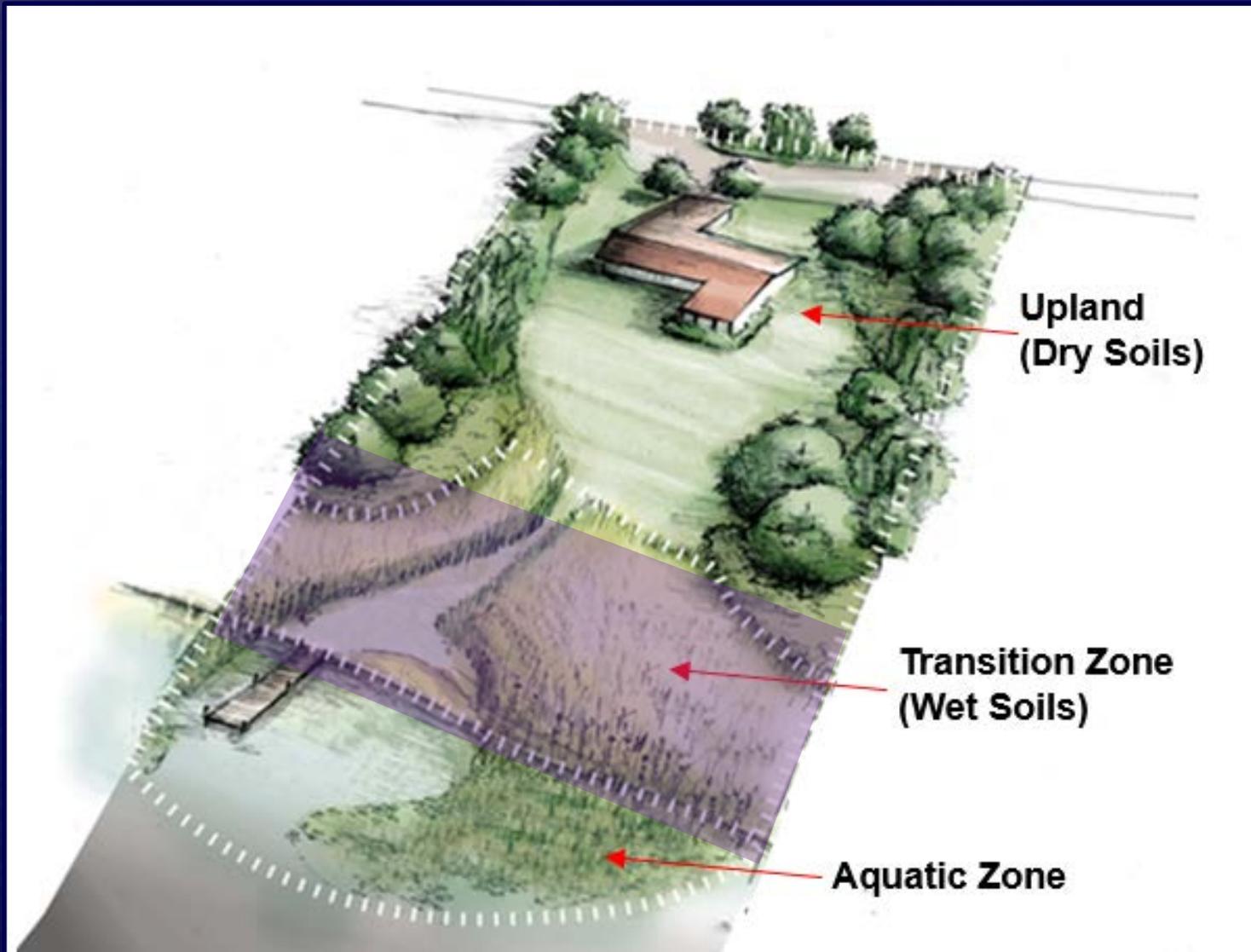
Storm Water Management

Minnesota Rule, Chapter 6120.3300, Subpart 4, Item B...

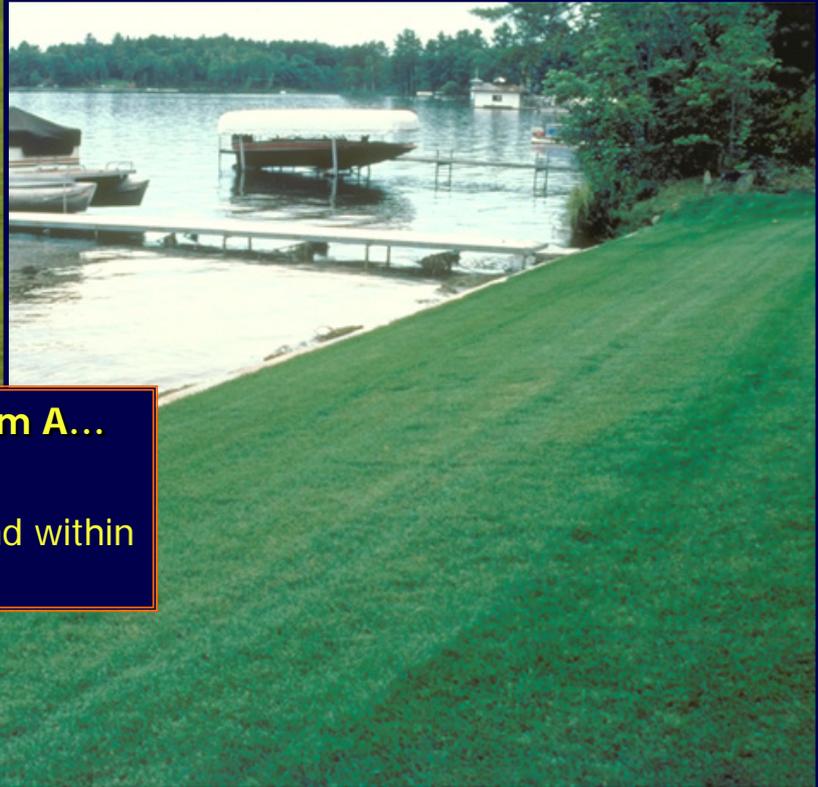
- When natural features are not adequate constructed facilities such as diversions, settling basins, dikes, waterways, and ponds may be used. Preference must be given to designs using surface drainage, vegetation, and infiltration rather than buried pipes and human-made materials and facilities.



The Transition Zone



Turf Grasses– Common Shoreline, Perception?



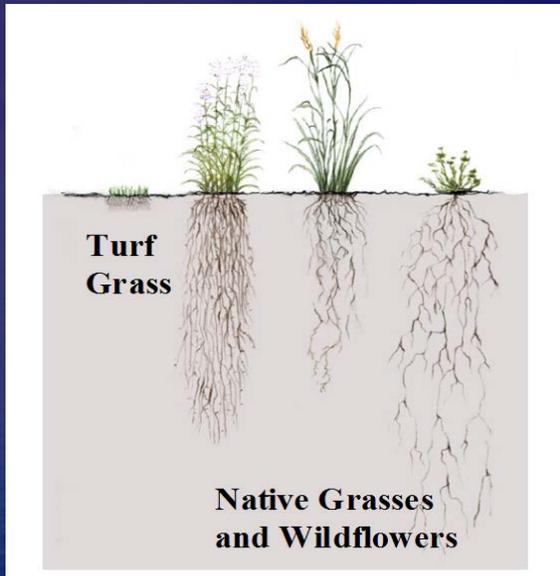
Minnesota Rule, Chapter 6120.3300, Subpart 4, Item A...

- Intensive vegetative clearing (complete removal of trees/shrubs) within the shore impact zone (usually land within 50-75 feet of the lake) is NOT allowed.

Erosion Problems



Soil Stabilization: Root Depth



Typical Shoreline Landscaping



- Property owners must contact a DNR Area Hyrdologist to determine if a permit is needed.

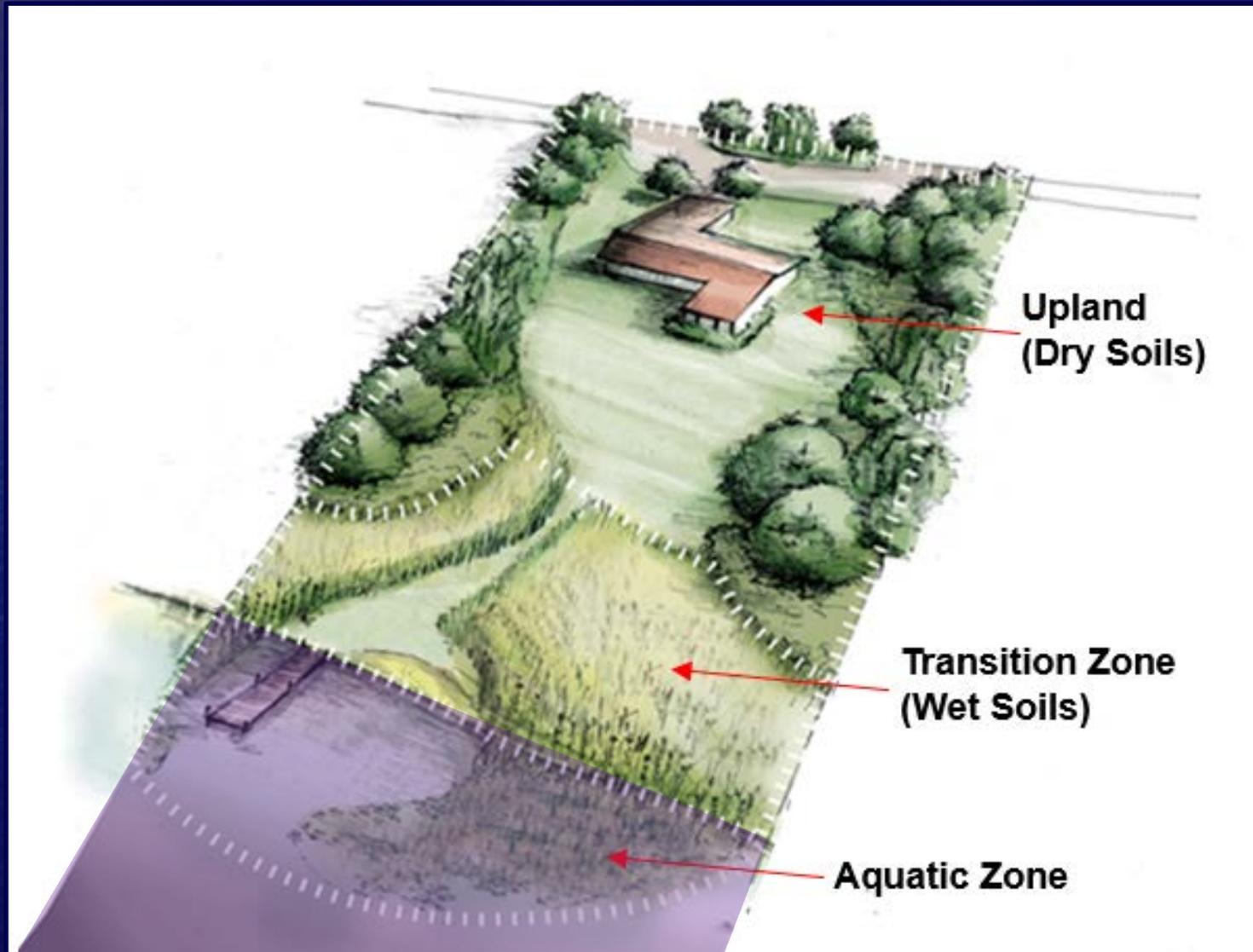
Which of the following is a healthier and more naturally appealing shoreline?



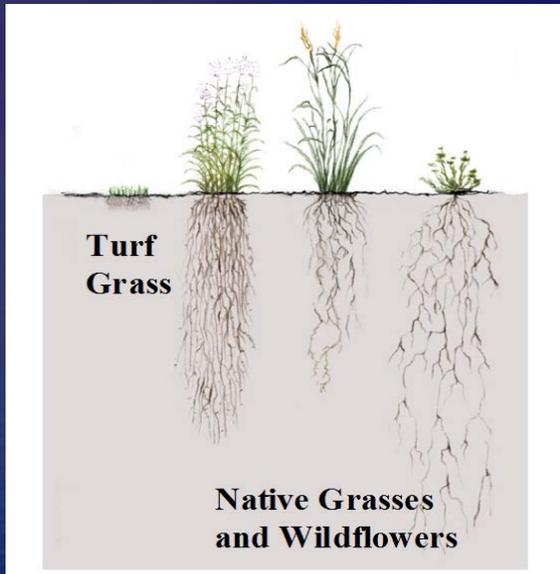
Use of Natural Materials in Restoration!!!



The Aquatic Zone



Protect Aquatic Vegetation



Minnesota Rule, Chapter 6280...

- Aquatic plant management rules dictate type, location, quantity, and methods used to control aquatic vegetation within public waters in order to provide reasonable recreational access.

Protect Aquatic Vegetation



Protect Aquatic Vegetation



Mechanical:
25 feet max

Chemical:
35 feet max

Chemical:
100 feet max

AAPCD:
35 feet
max

Up to 2500 ft²

50 feet owned

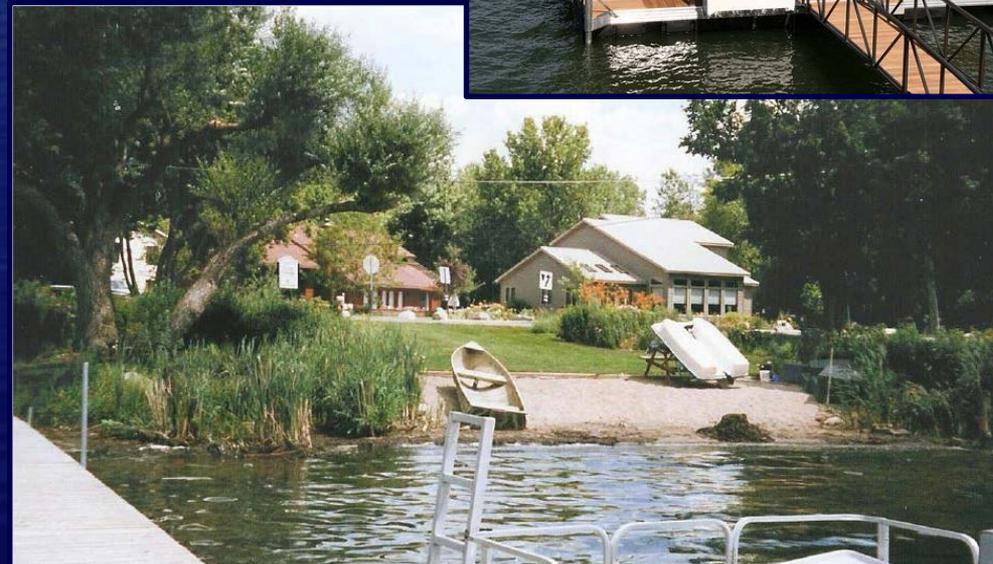
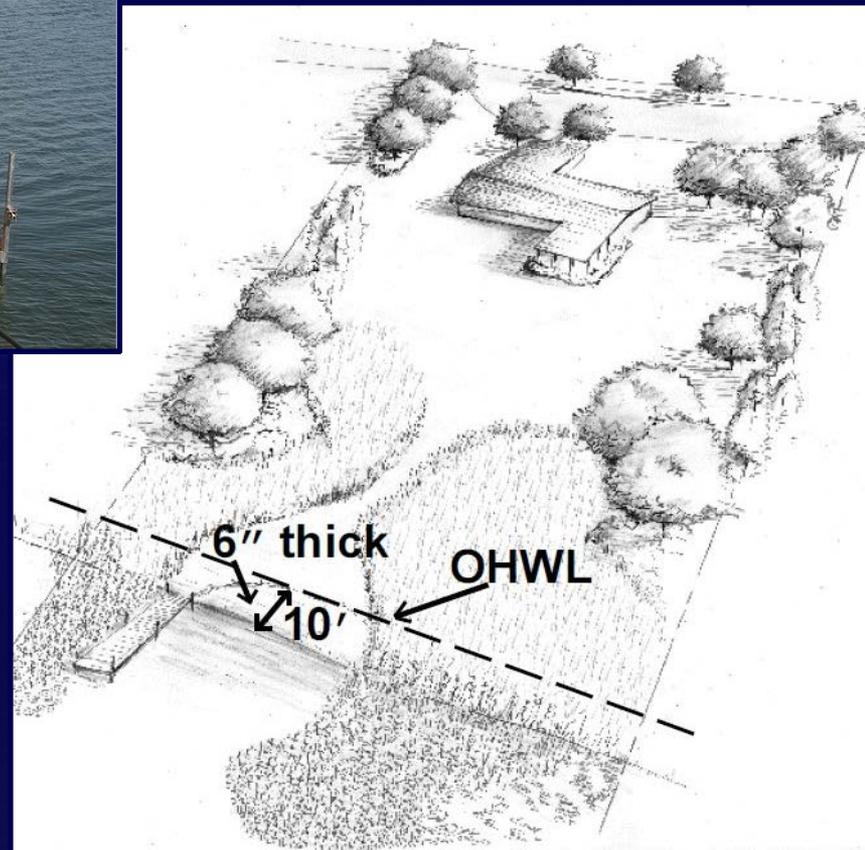
50 feet owned

250 feet owned

50 feet owned

Beach Blanket and Dock Considerations

- Property owners must contact a DNR Area Hydrologist to determine if a permit is needed.



Preserve Coarse Woody Habitat!

- **Preserve downed trees and other near shore woody habitat, this prevents shoreline erosion and provides critical habitat!**



A lake is the landscape's most beautiful and expressive feature!

The Options:



Preserve It!



Let it Recover Naturally!



Restore It!

Restore It: Ashley Park (Jackson County)



Before



After

Restore It: Lake Henderson (Kandiyohi County)



Before



2008/07/14

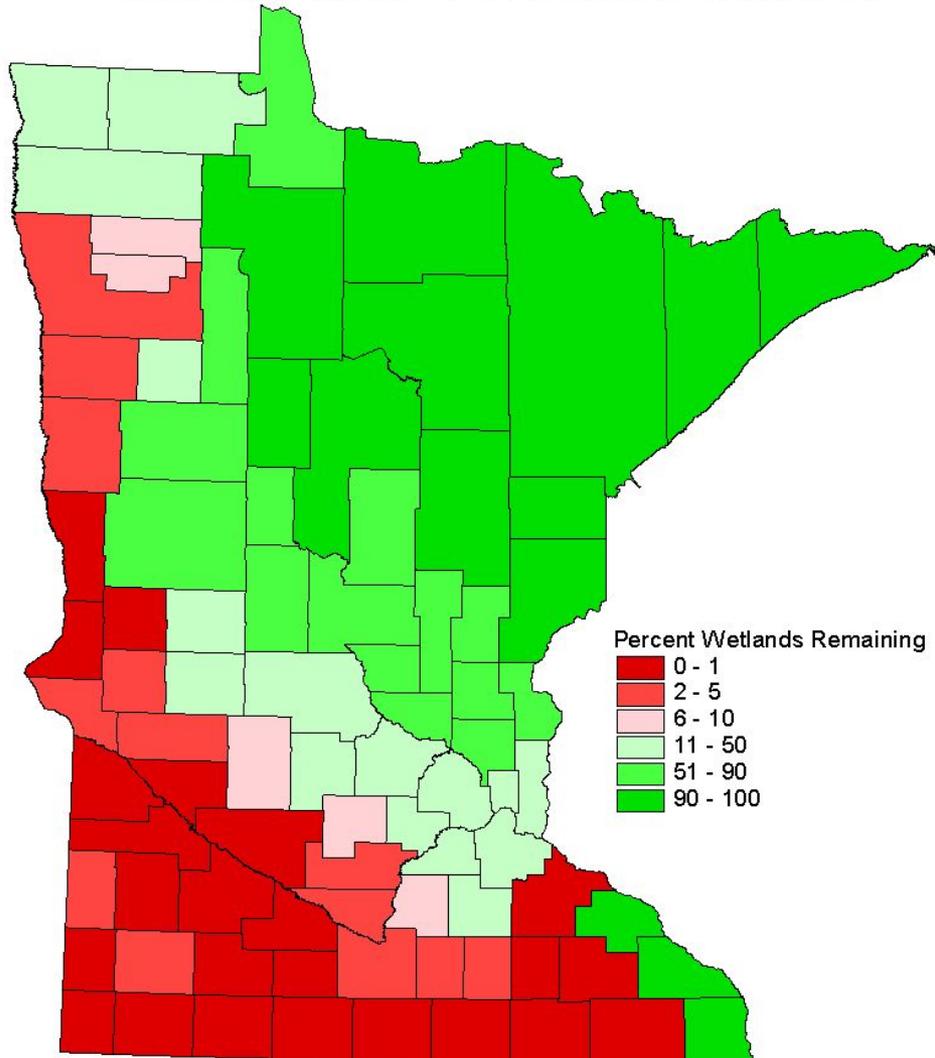
After

Restore It: Lake Marion (Dakota County)



Watershed Management

Minnesota Wetland Status



Source: Anderson, J and W. Craig, 1984. Growing energy crops on Minnesota's wetlands: the land use perspective. U. of Minn. Center for Urban and Regional Affairs, Publ. CURA 84-3.



Watershed Management

- Restoring wetlands and adjacent uplands
- Planting buffer strips
- Up-grading septic systems
- Reducing impervious surfaces
- Encouraging BMPs

Thank You! Questions?

Please remember to fill out the questionnaire!