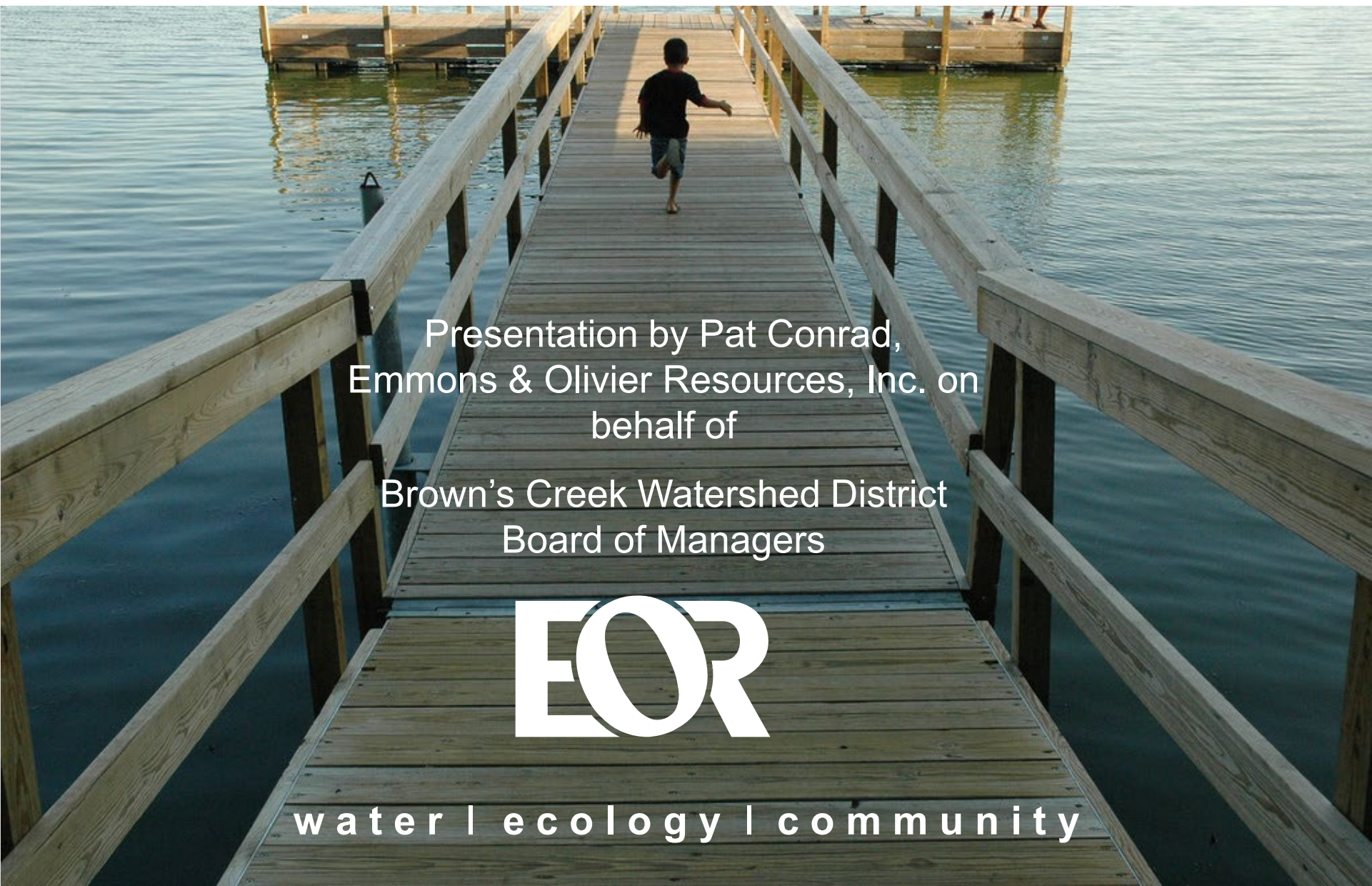


# Bass Lakes Management Plan



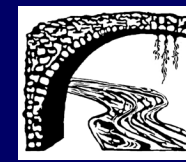
Presentation by Pat Conrad,  
Emmons & Olivier Resources, Inc. on  
behalf of

Brown's Creek Watershed District  
Board of Managers



water | ecology | community

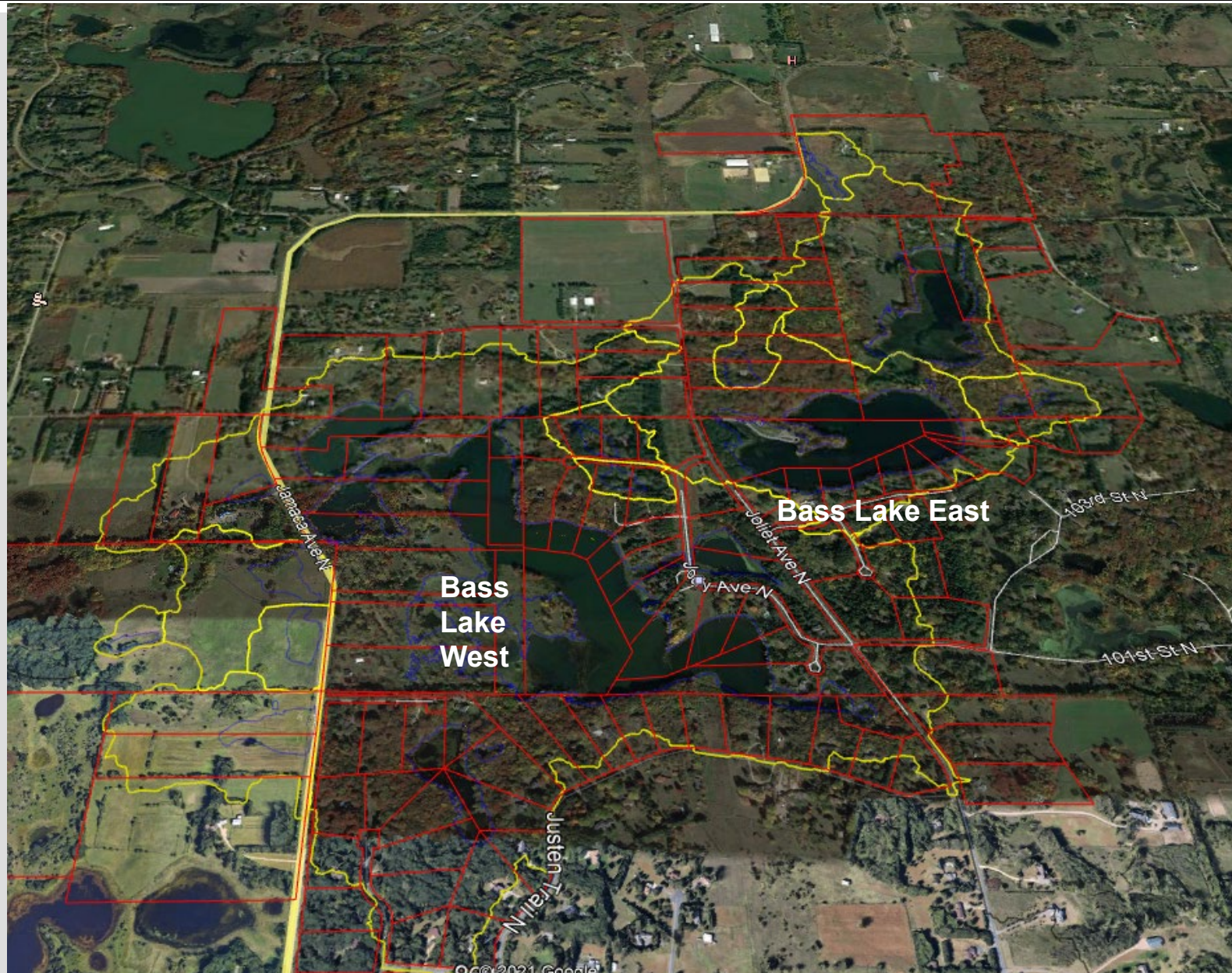
# Introductions



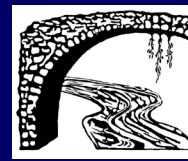
Pat Conrad & Ryan Fleming  
Emmons & Olivier Resources

Karen Kill  
BCWD Administrator

Brett Stolpestad  
Washington Conservation Senior  
Landscape Restoration Technician



# Lake Management Plan Components



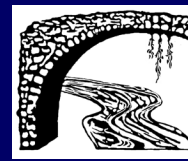
1- Conduct lake condition assessment

2 - Identify issues and establish reasonable goals for future conditions

3 - Develop implementation plan to meet goals



# Lake Condition Assessment



## Lake and Watershed Data Collection

Aquatic macrophyte survey

Watershed conditions assessment

Shoreline assessment\*\*

Flood assessment

Lake resident input

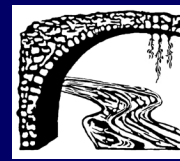
## Watershed & In-Lake Computer Modeling

Determine pollutant loadings

Define flood vulnerabilities



# Watershed Effect on Lake Dynamics



The natural characteristics of a watershed coupled with the land use in a watershed define the amount and quality of water reaching downstream resources

Size and Shape

Topography

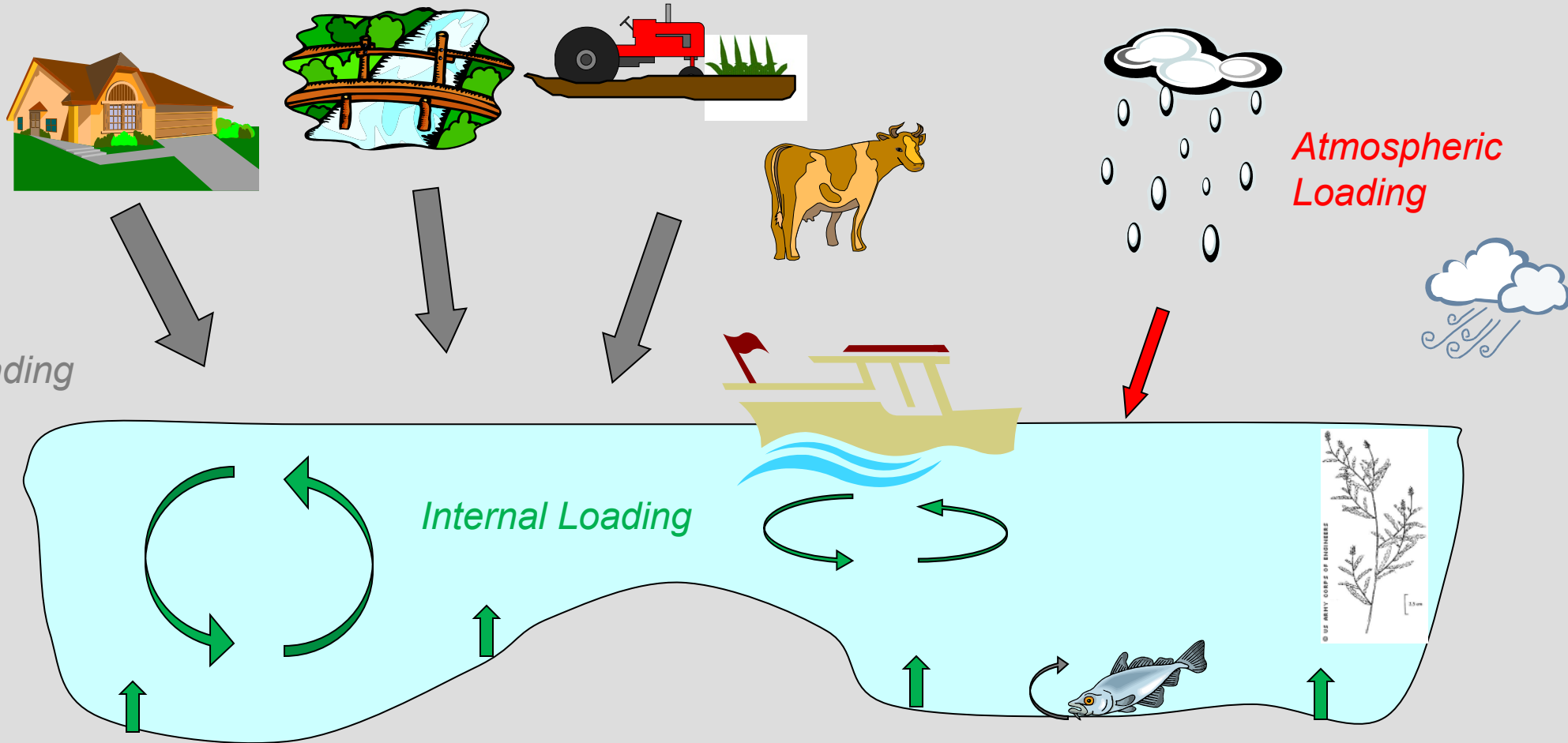
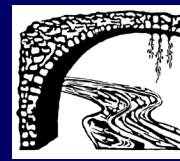
Soils

Vegetative Cover

Land Uses



# Watershed Pollutant Loading



Watershed Loading

Atmospheric Loading

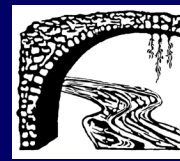
Internal Loading

Nutrients – Phosphorus, Nitrogen, Chloride

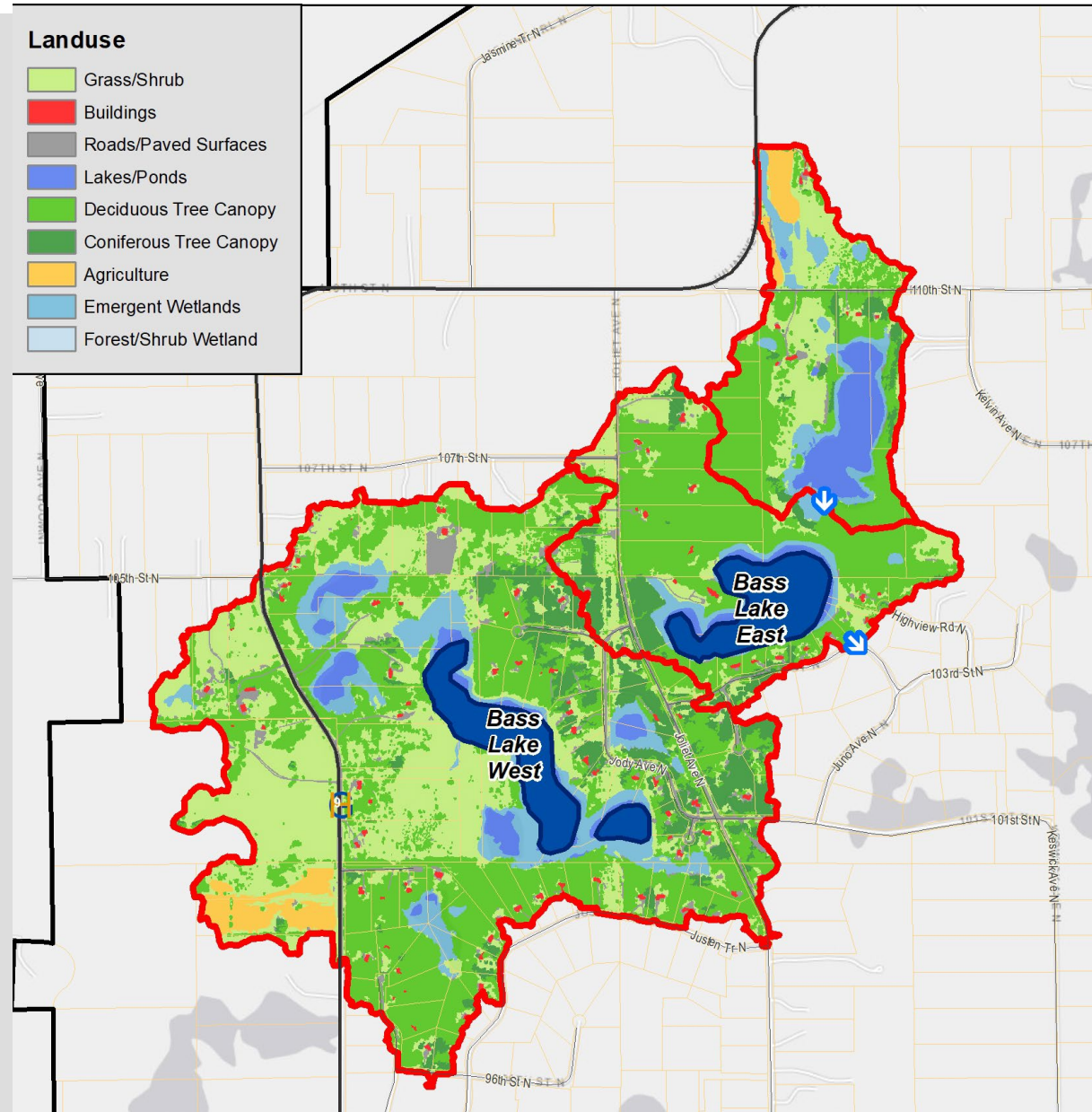
Sediment

Pollutants – Metals, Pesticides, Bacteria

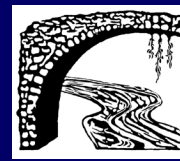
# Bass Lake Land Cover



Deciduous Trees  
Grasslands and Shrubs  
Coniferous Trees  
Rural Residential  
Wetlands  
Limited Row Crop Agriculture  
Minimal Impervious surfaces



# Bass Lake Watershed Pollutant Loading Assessment



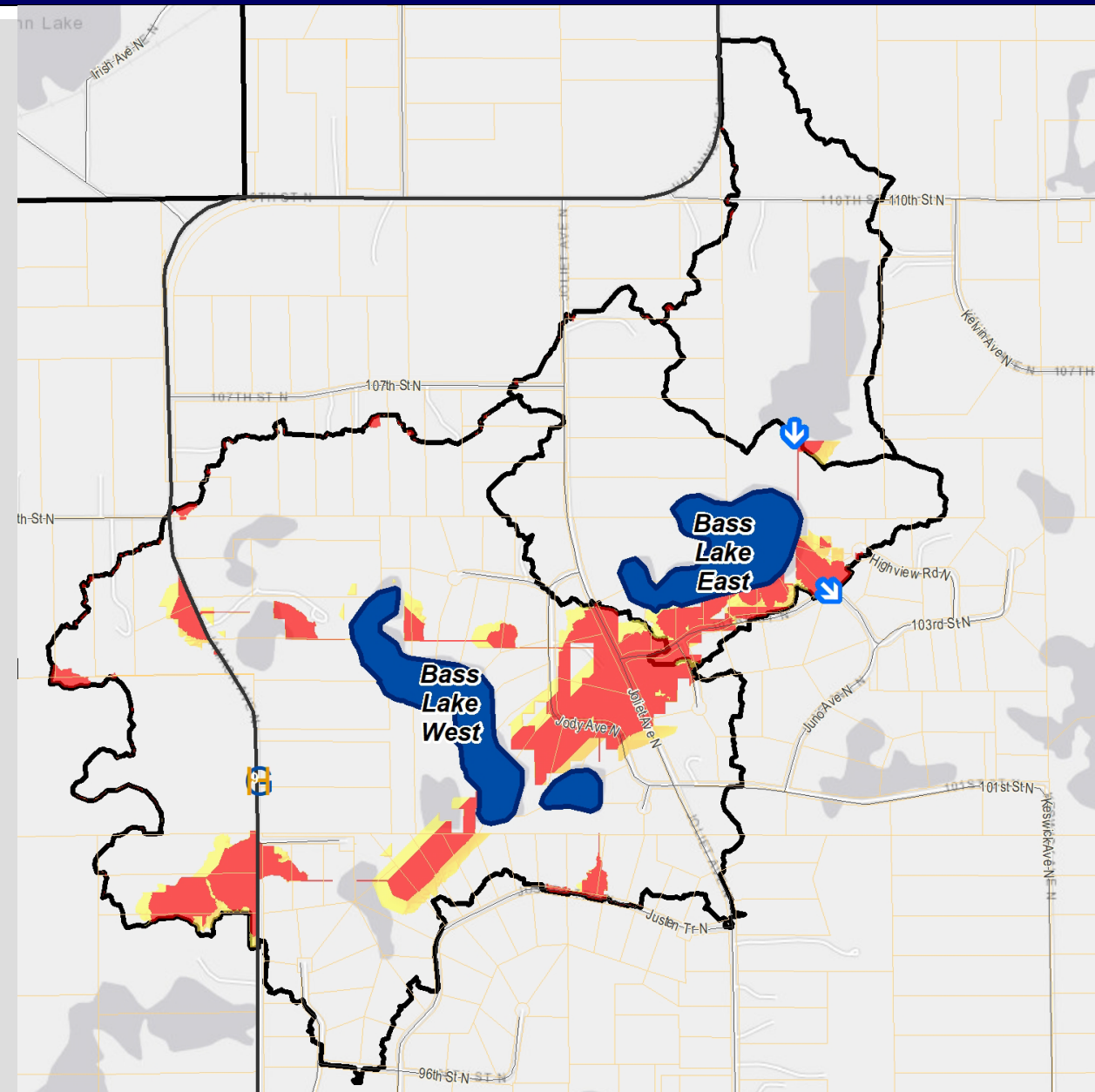
## Model-Identified Pollutant “Hot-spots”

High contributing areas

Total Phosphorus & Sediment

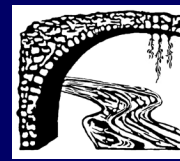
Erosion prone, steep, bare soils

Field Verification – limited potential





# Limnology – Lake Science



## Physical

Size & Shape

Water temperature

## Biological

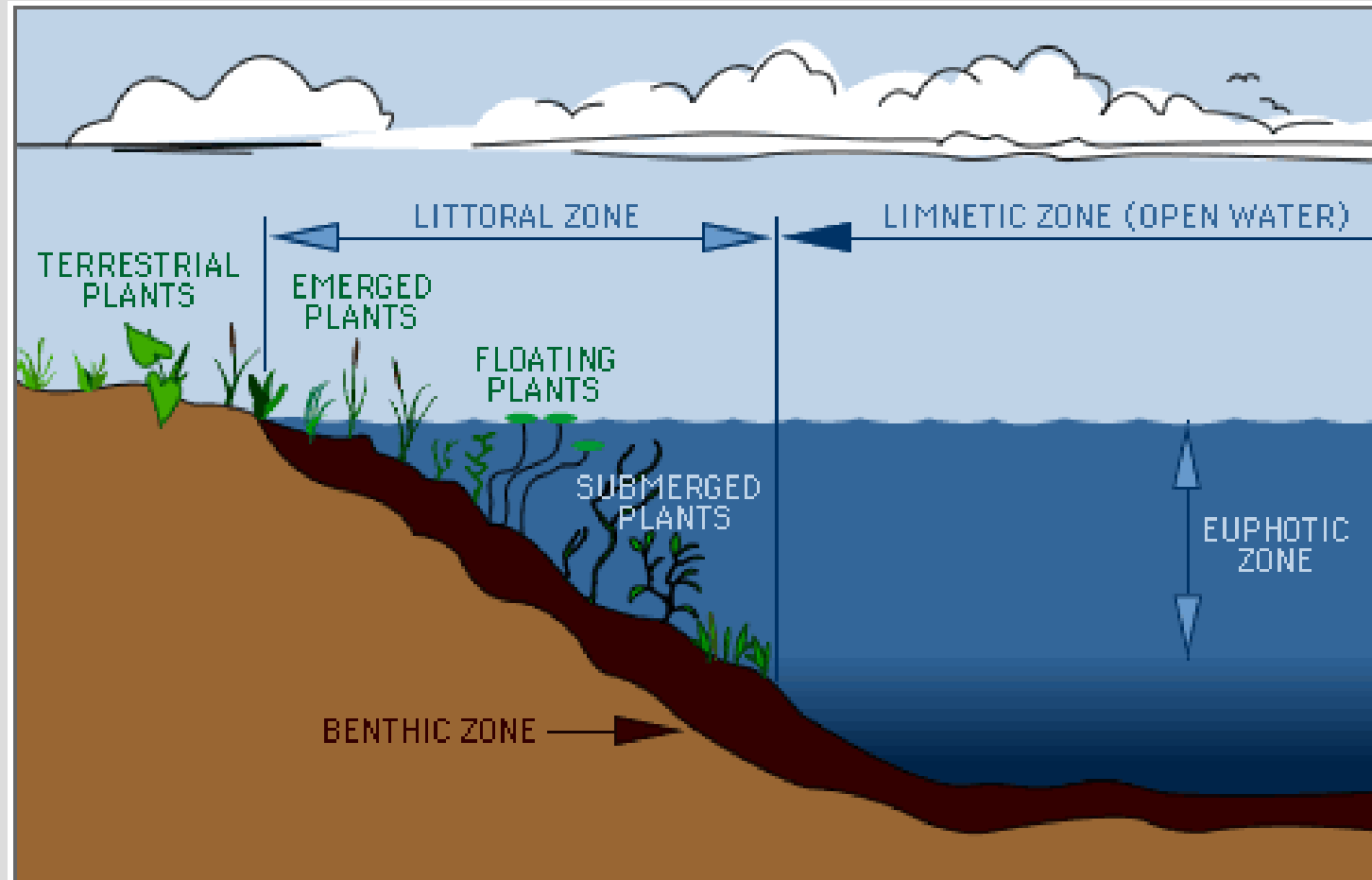
Food chain: algae, macrophytes, fish

## Water Quality

Nutrients (phosphorus, nitrogen)

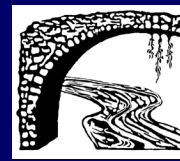
Transparency

Dissolved oxygen



[waterontheweb.org](http://waterontheweb.org)

# Phytoplankton - Algae



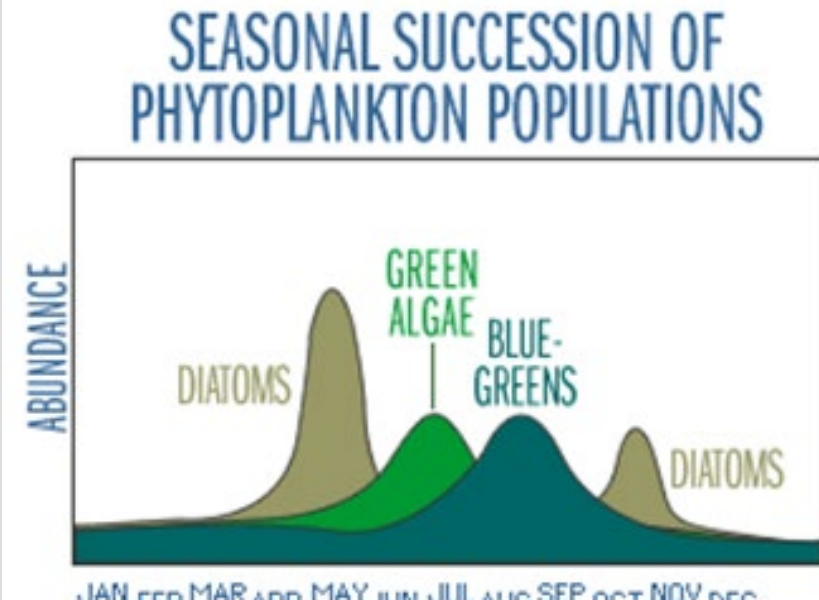
Need phosphorus and nitrogen to grow

Phosphorus is typically 'limiting' nutrient

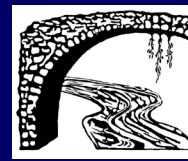
Provide food for zooplankton, which in turn are food for fish

Too much algae ('algae blooms') cause water quality impairment

Decaying algae consume oxygen – impact fisheries



# Macrophytes – ‘Weeds’



Nursery area for fish

Zooplankton refuge

Wave break – reduce shoreline erosion

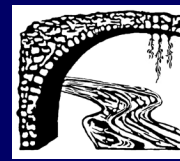
Can utilize phosphorus and decrease  
algae levels

Can be a nuisance: milfoil, curlyleaf  
pondweed



**Bass Lake East**

# Two Stable Lake States



## CLEAR-AQUATIC PLANT DOMINATED STATE

Balanced fish community and abundant aquatic plants keep water clear.

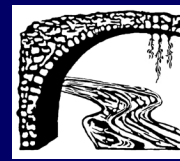


## TURBID-ALGAE DOMINATED STATE

Too many pan fish and/or too few aquatic plants keep water turbid.



# Carlson Trophic State Index Bass Lake West



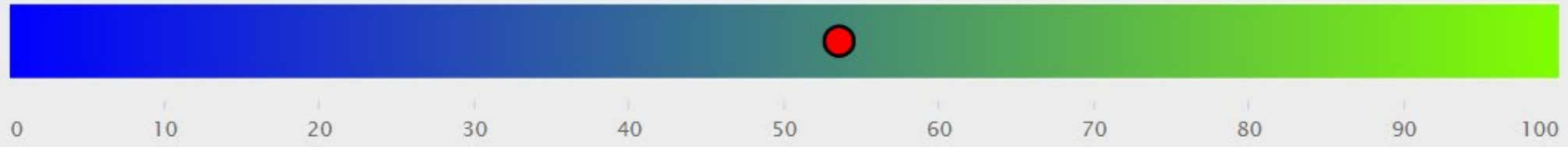
**Clear**  
Oligotrophic

**Moderately Clear** Mesotrophic

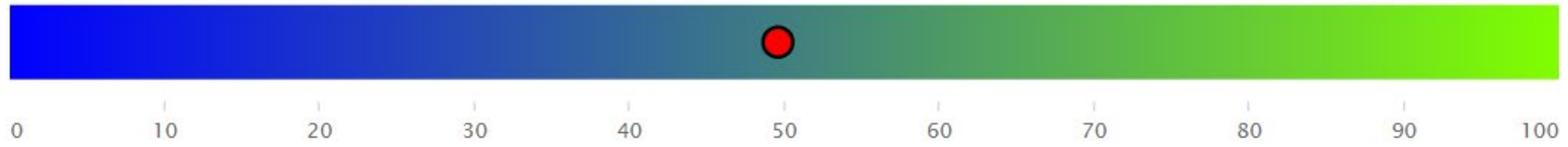
**Green**  
Eutrophic

**Very Green**  
Hypereutrophic

**Trophic State Index (TSI)**



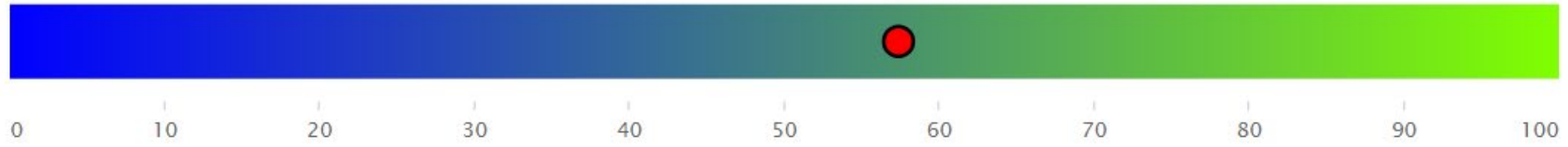
**Transparency**



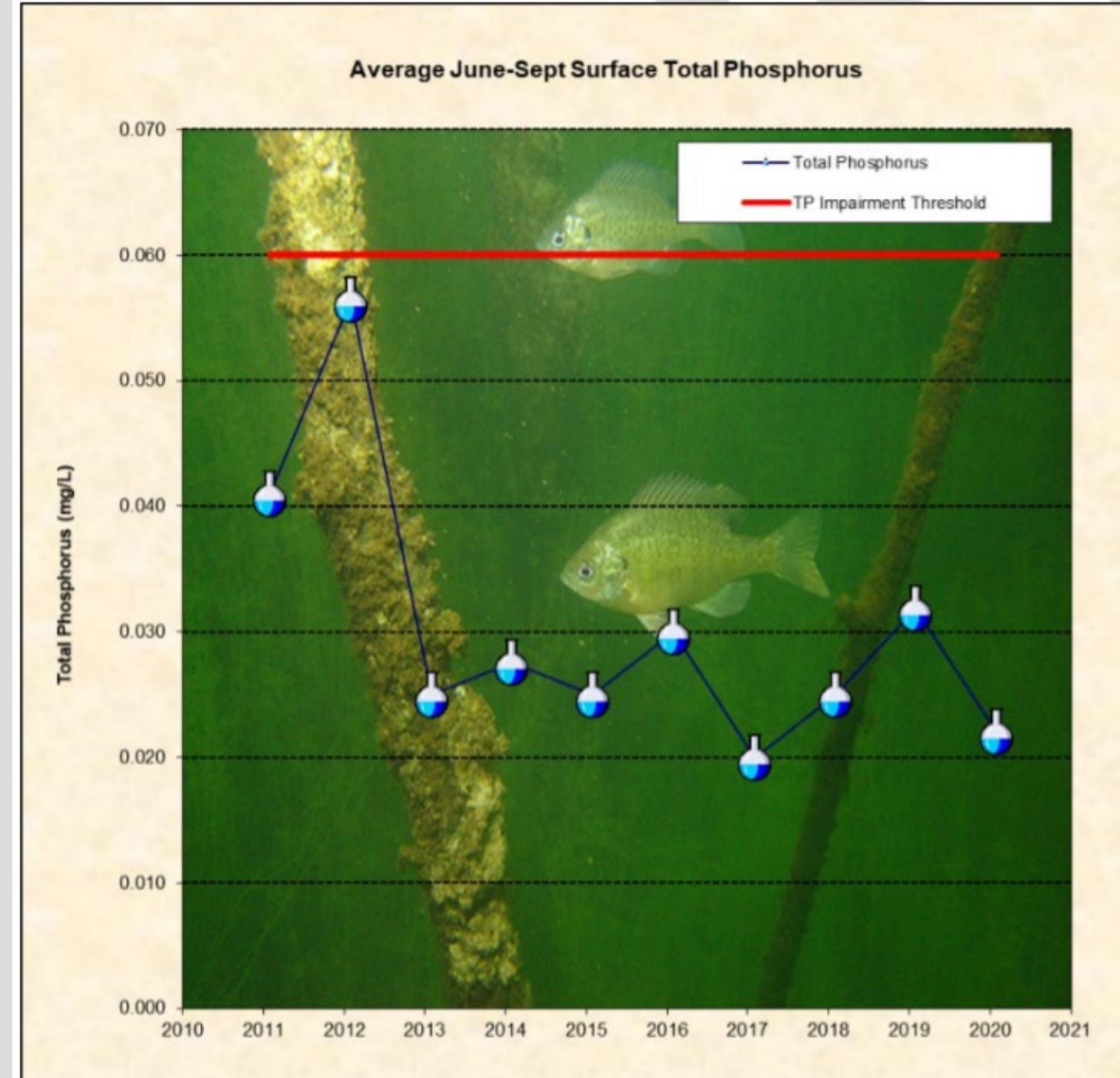
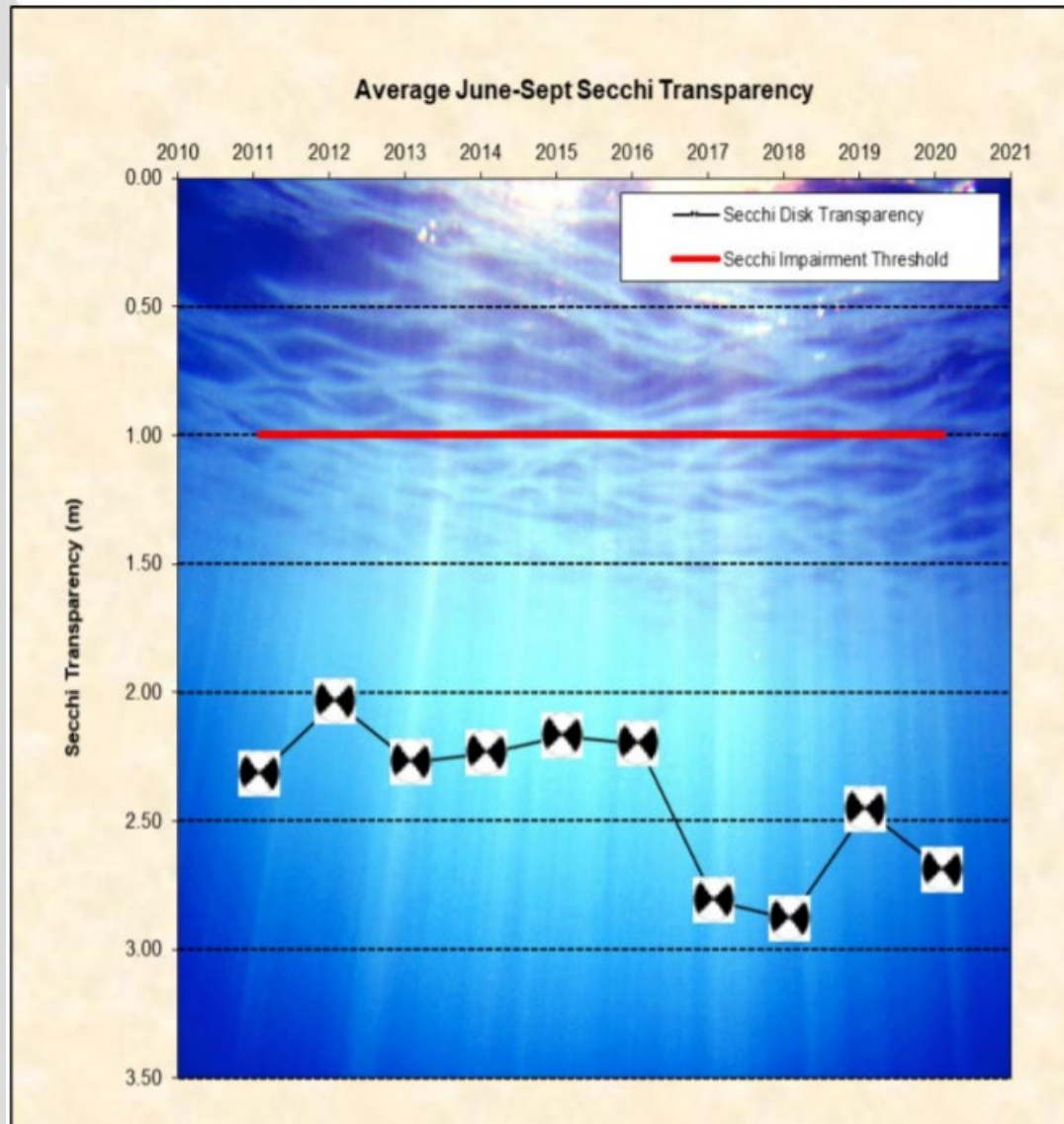
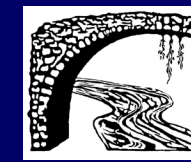
**Chlorophyll-a**

N/A

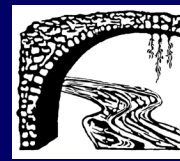
**Total Phosphorus**



# Bass Lake West: Secchi Transparency & TP



# Carlson Trophic State Index Bass Lake East



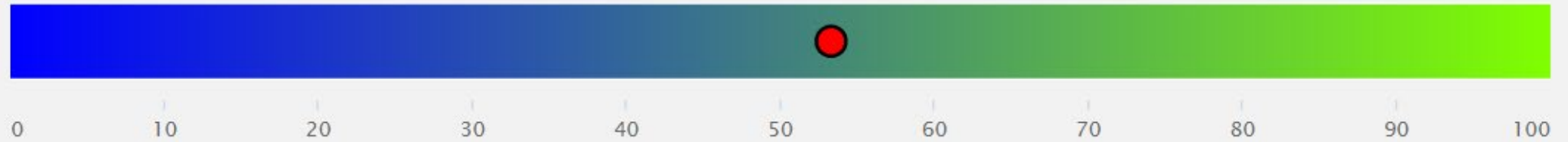
Clear  
Oligotrophic

Moderately Clear Mesotrophic

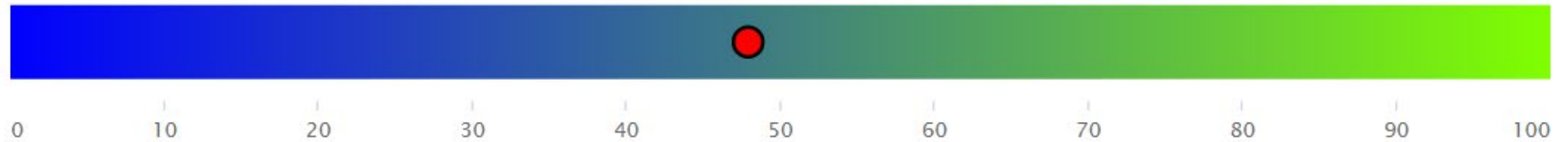
Green  
Eutrophic

Very Green  
Hypereutrophic

Trophic State  
Index (TSI)



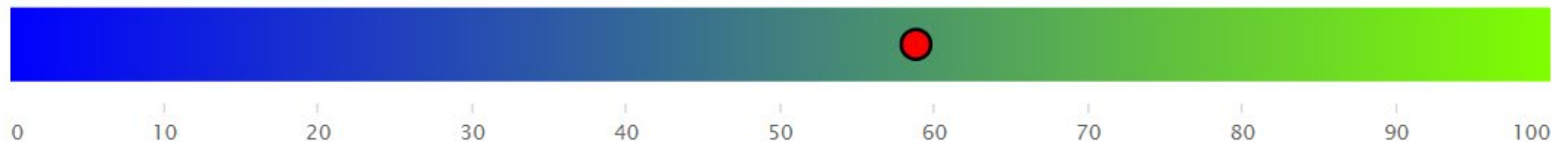
Transparency



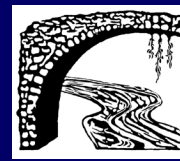
Chlorophyll-  
a

N/A

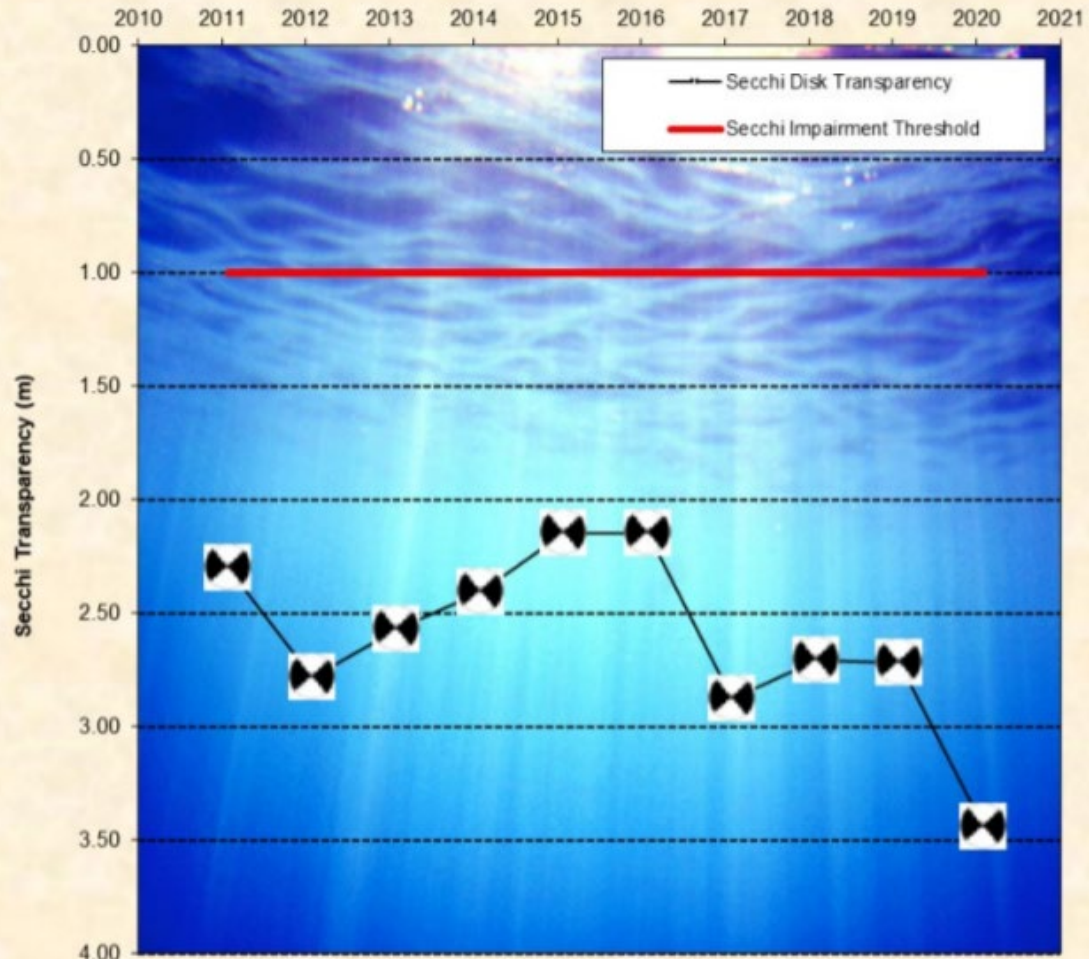
Total  
Phosphorus



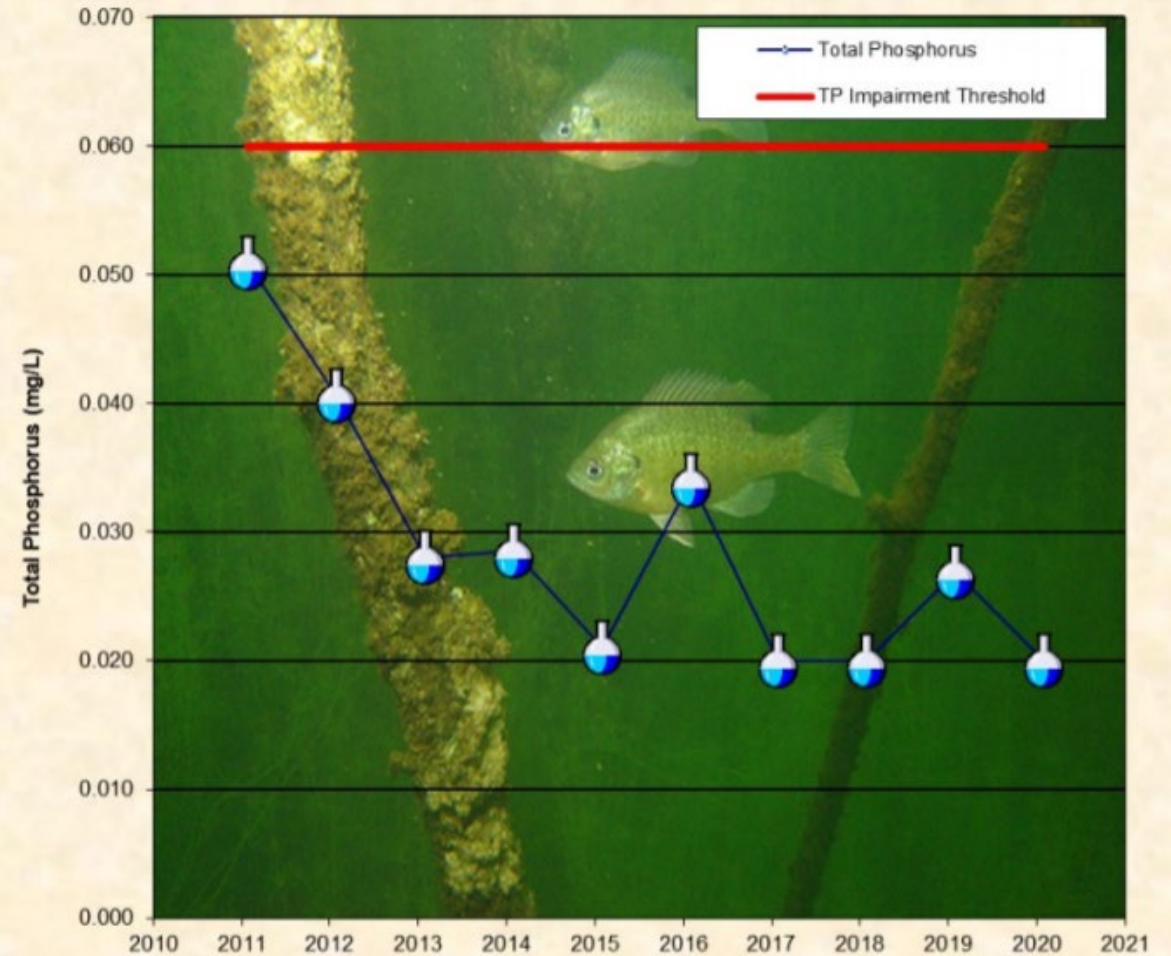
# Bass Lake East: Secchi Transparency & TP



### Average June-Sept Secchi Transparency

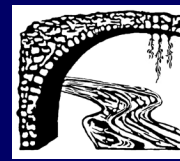


### Average June-Sept Surface Total Phosphorus





# Macrophyte Survey - 2019

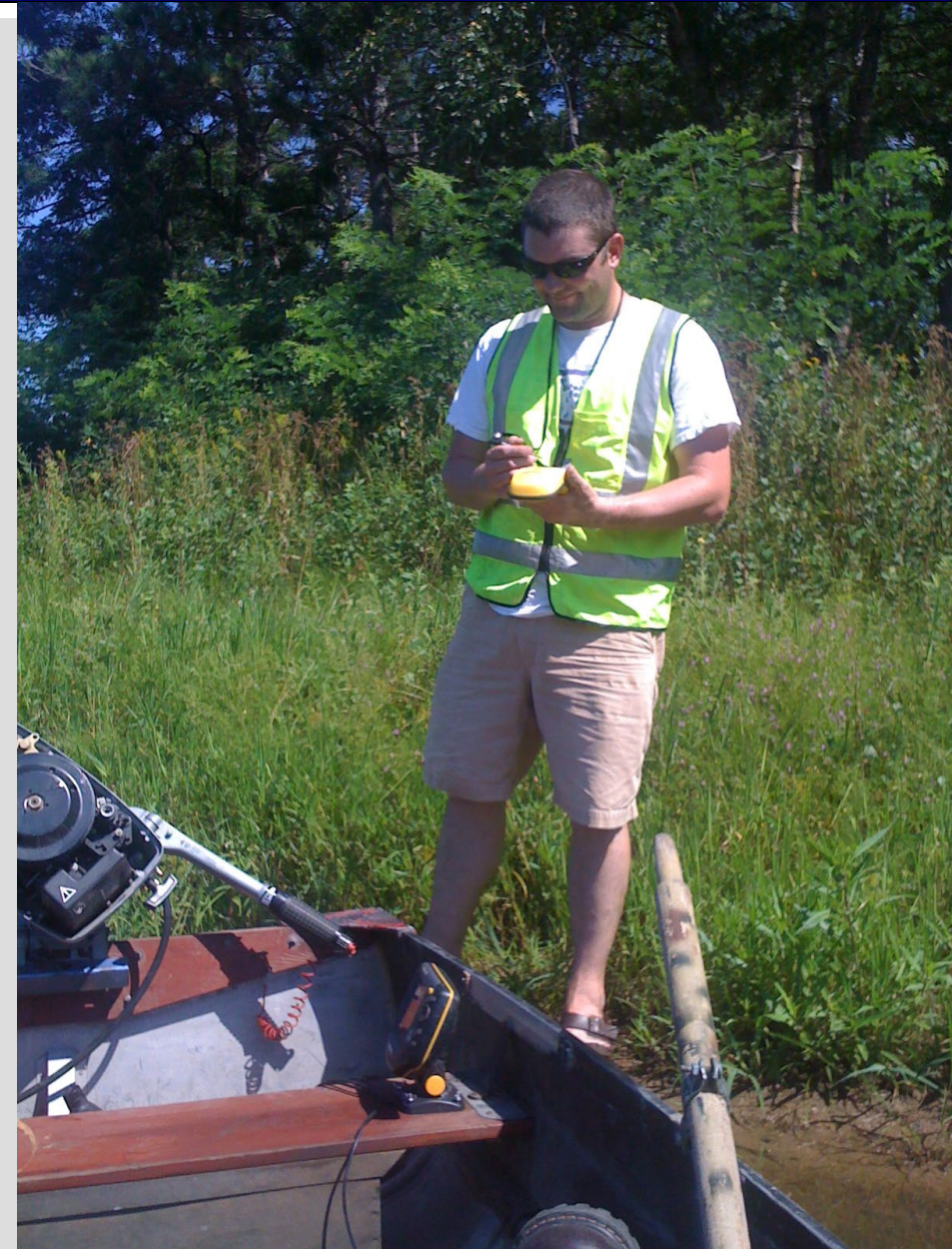


Aquatic plants were observed at over 95% of sampling points at both lakes

At depths of up to 17 feet at Bass Lake West and 10 feet at Bass Lake East = 100% Littoral

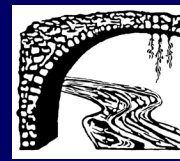
No submerged aquatic invasive plants

Purple loosestrife was observed along the shores of both lakes at low abundances.





# Bass Lake East Macrophytes

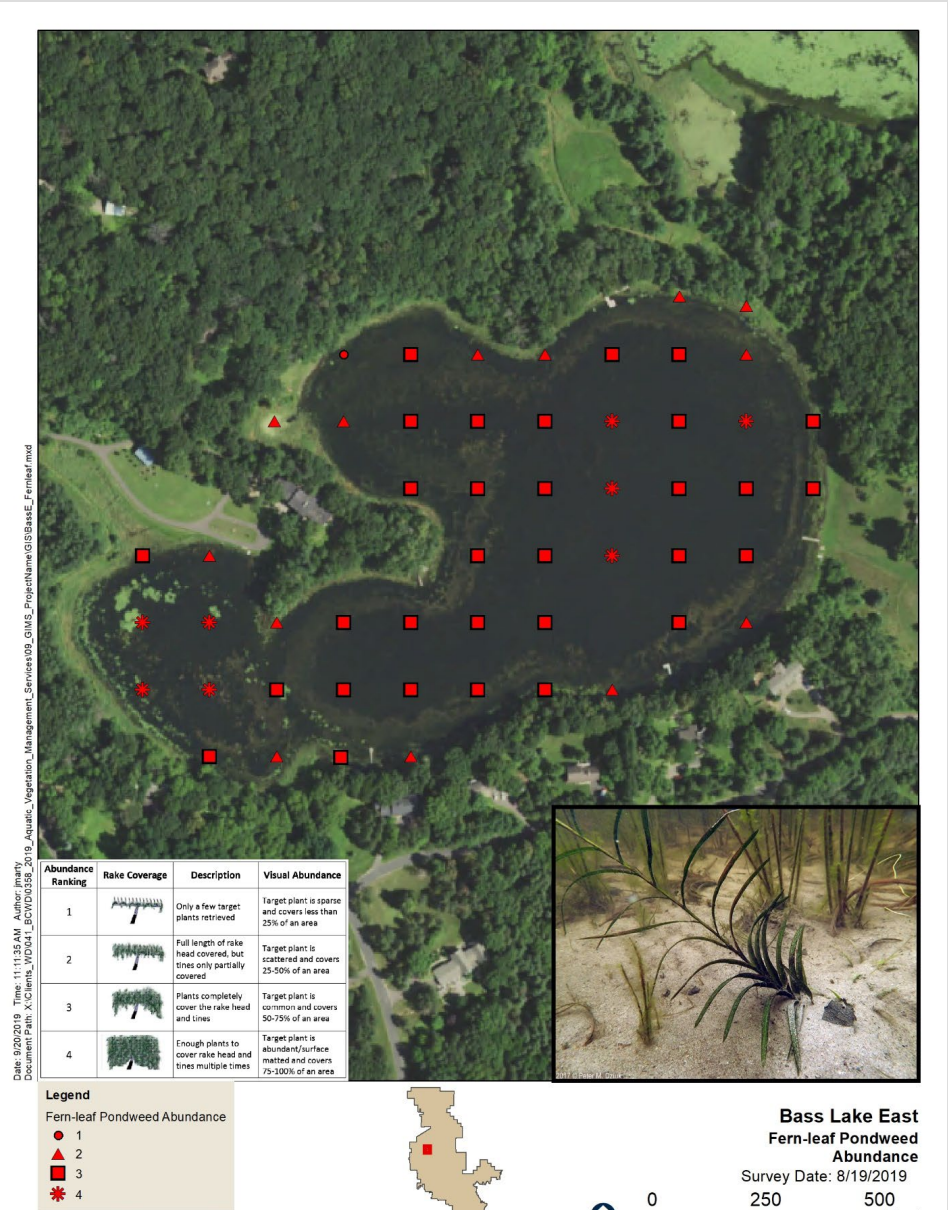


Fern-leaf pondweed  
100% of sampling points

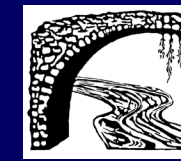
White-water-lily  
30.2% of sampling points

2.5 species per site

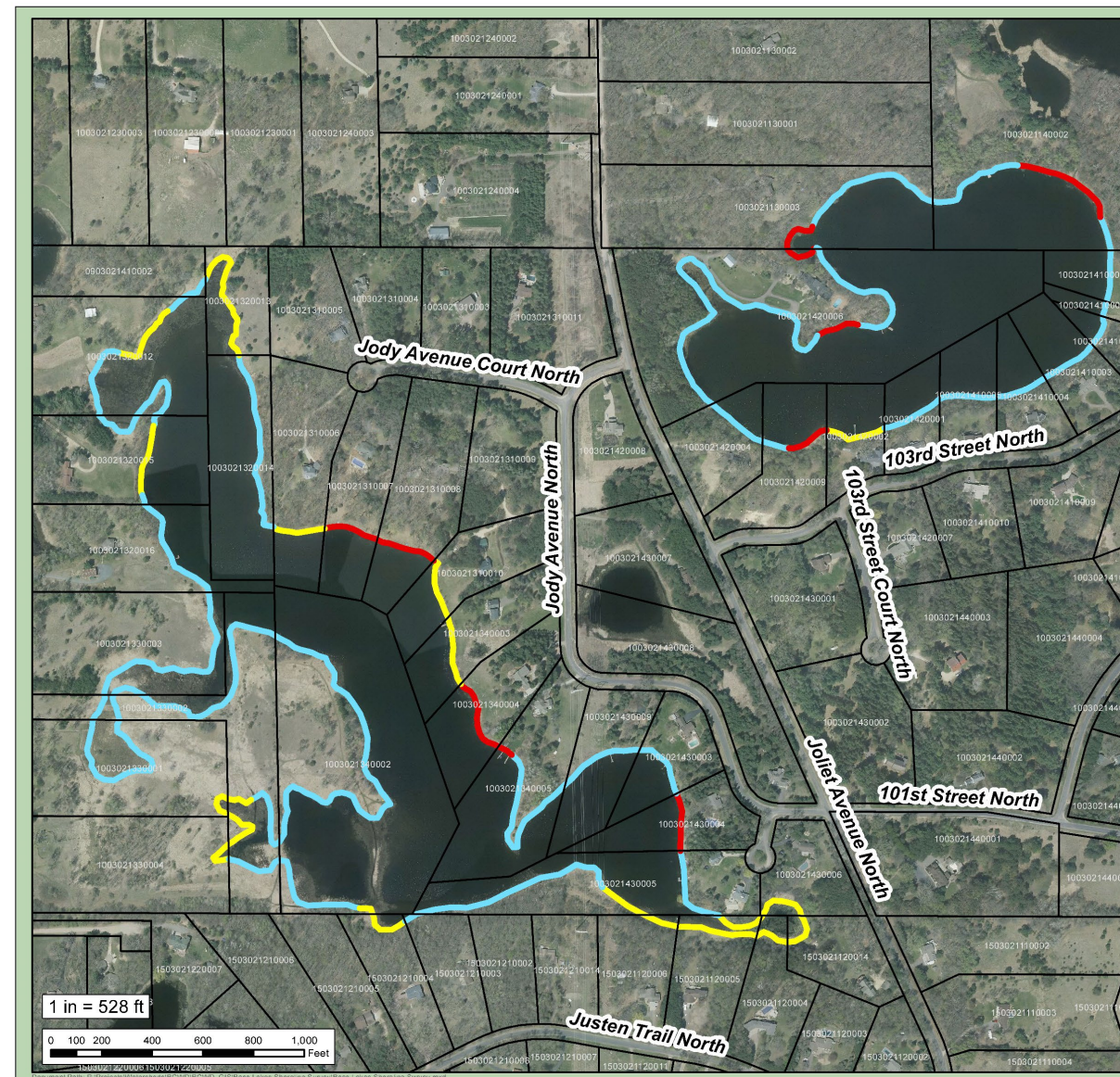
Floristic Quality Index (FQI) = 21.9  
*ecoregion median - 22.5*



# Shoreline Assessment




Shoreline Rating	Description	Rating Criteria		
		Tree Canopy	Manicured Lawn	Impervious Area
Tier 1 - Natural	Parcel with low potential for nutrient export to lake	80-100%	0-20%	0-5%
Tier 2 - Moderate	Parcel with medium potential for nutrient export	40-80%	20-40%	5-20%
Tier 3 - Developed	Parcel with high potential for nutrient export to lake	0-40%	40-100%	20-100%



**KEY TO FEATURES**

**Management Tier**

- Tier 1
- Tier 2
- Tier 3
- Parcels



**BROWN'S CREEK WATERSHED DISTRICT**

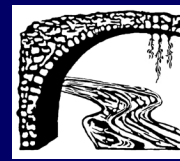
Brown's Creek Watershed District

Bass Lakes Shoreline Survey

2019 Aerial Photo

**WASHINGTON CONSERVATION DISTRICT**

# Conclusions



Overall good water quality and biological communities

Stability of existing water quality is dependent upon:

Maintaining macrophyte population

Maintaining low disturbance of sediment

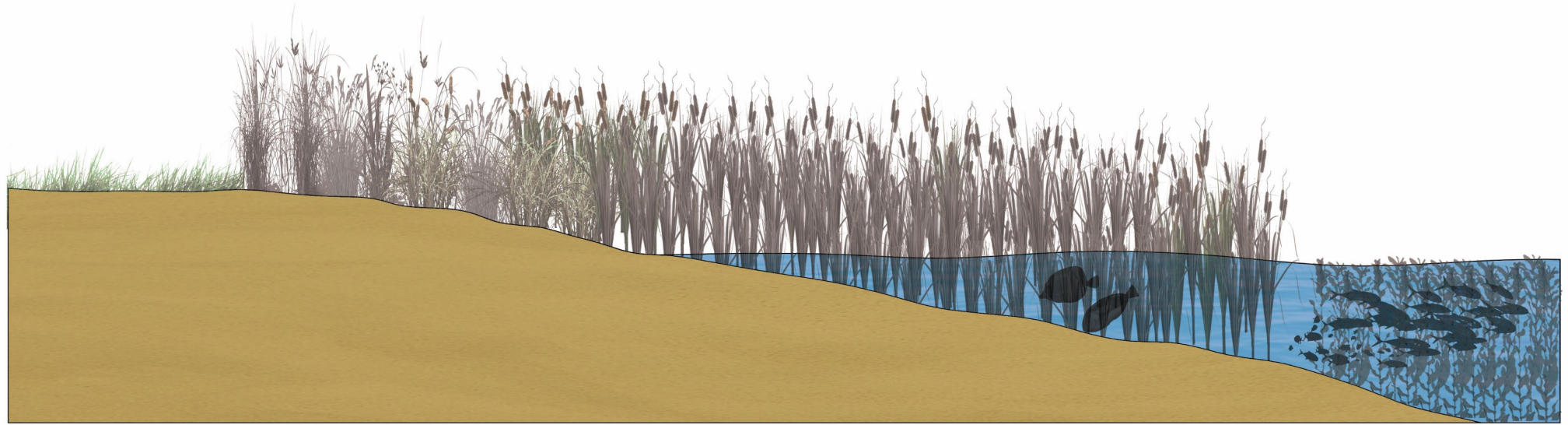
- Minimize motor boat disruption
- Keep rough fish out

Reducing watershed phosphorus loading:

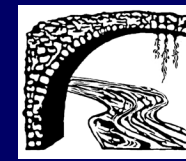
- Turf management
- Healthy lakeshore buffers



# Natural Lake Shoreline



# Shoreline Restoration

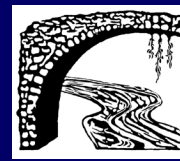


- Prevent shoreline erosion
- Intercept pollutants from upland sources
- Provides valuable wildlife habitat



Rice Creek Watershed

# Bioretention: Raingardens & Swales

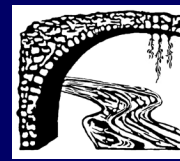


- Collect and treat stormwater runoff.
- Reduce pollution to lakes, rivers and streams.
- Provide habitat for birds, insects, and other wildlife.



**Brown's Creek Watershed District**



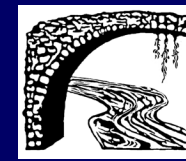


- Mow and fertilize less!
- Maintain a healthy and environmentally friendly yard by:
  - Mow to a height of 3 inches to promote deeper roots.
  - Use sharp mower blades.
  - Leave clippings in the lawn (do not sweep into the lake or street.)
- Consider low-input turf alternatives that fit your site.



Low-mow lawn in Stillwater, MN

# Rock Infiltration

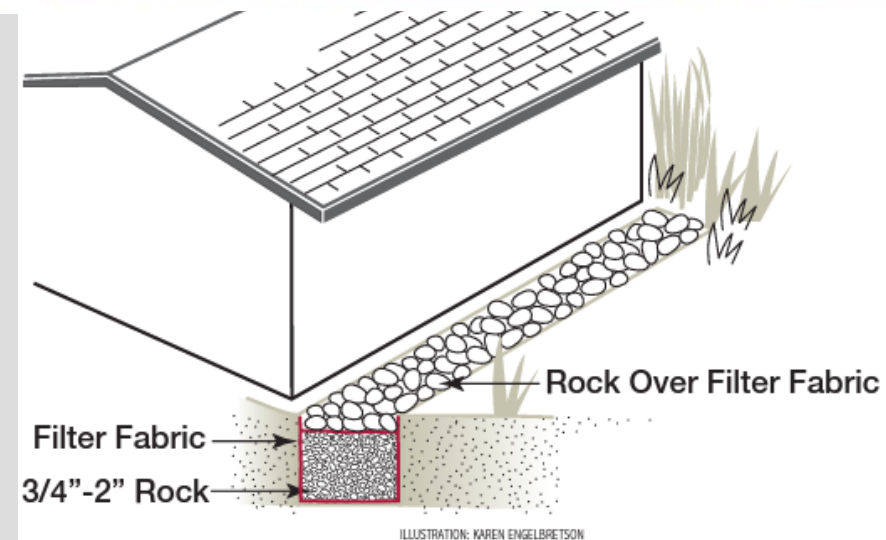


- Captures, cleans, and infiltrates runoff
- Appropriate for sandy to loamy soils only (not clay!)
- May require a catch basin or diversion practice to redirect runoff water to it

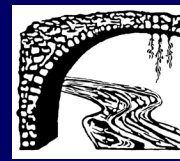


Deer Lake, Polk County - Cheryl Clemens

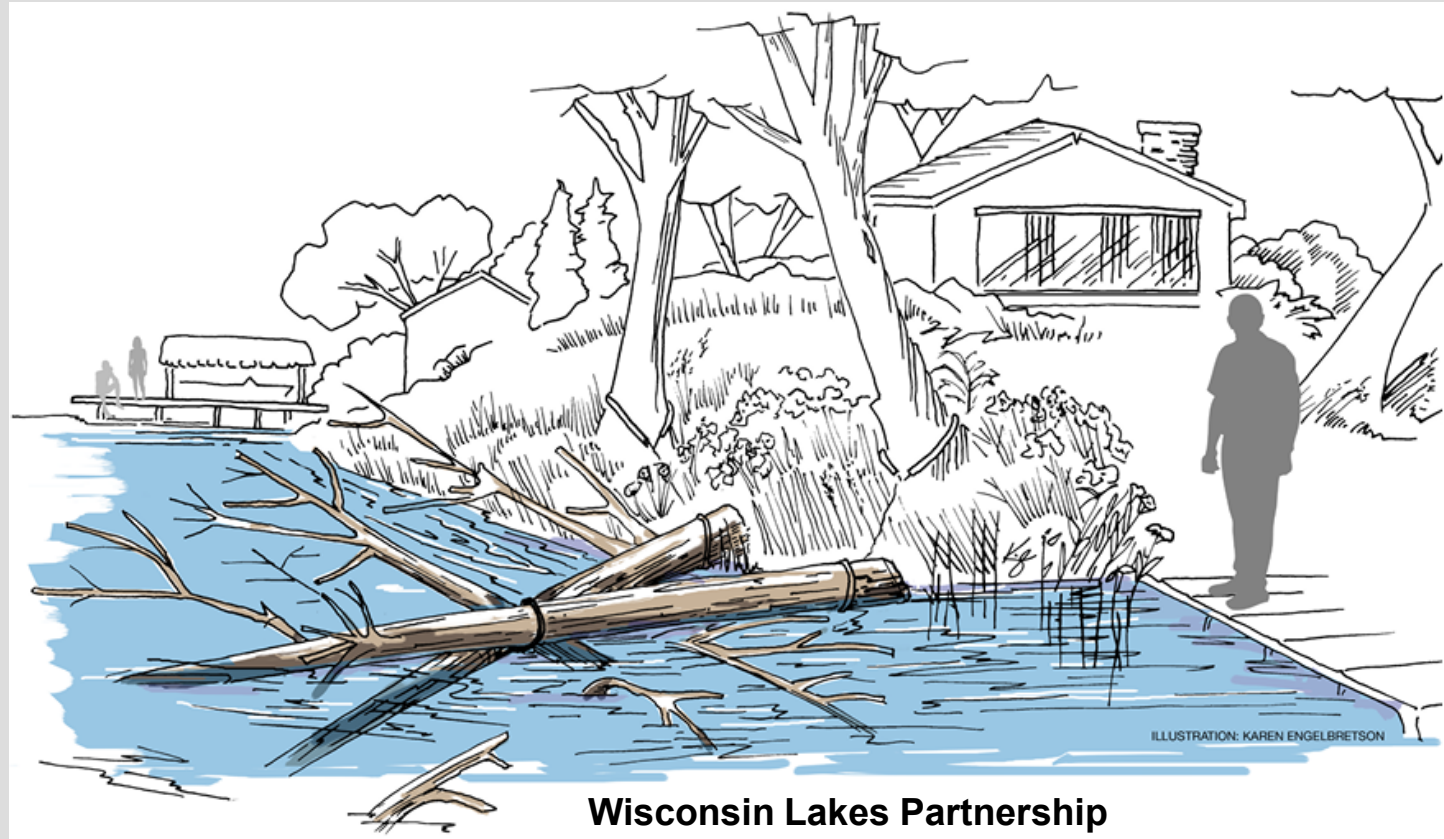
Wisconsin Lakes Partnership

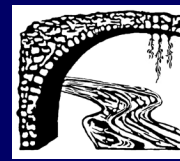


# Aquatic Habitat Practices



- Fish and wildlife habitat BMP
- Creates food, shelter, and breeding areas
- Small aquatic insects, to fish, to turtles, ducks, and songbirds
- Can also help prevent bank erosion – protecting lakeshore properties and your lake.





Do I need a permit:

<https://www.dnr.state.mn.us/permits/water/needpermit.html>

Aquatic Vegetation

<https://www.dnr.state.mn.us/apm/index.html>

Beach Sand Blanket

[https://files.dnr.state.mn.us/publications/waters/shoreline\\_ations\\_sand\\_blanket.pdf](https://files.dnr.state.mn.us/publications/waters/shoreline_ations_sand_blanket.pdf)

Boat Ramp

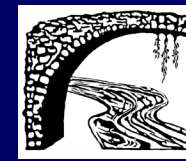
[https://files.dnr.state.mn.us/publications/waters/shoreline\\_ations\\_boat\\_ramps.pdf](https://files.dnr.state.mn.us/publications/waters/shoreline_ations_boat_ramps.pdf)

Riprap

[https://files.dnr.state.mn.us/publications/waters/shoreline\\_ations\\_riprap.pdf](https://files.dnr.state.mn.us/publications/waters/shoreline_ations_riprap.pdf)



# For More Information



Contact the WCD for a free site visit:

<http://www.mnwcd.org/site-visit-signup-form>

Brett Stolpestad  
Landscape Restoration Senior  
Technician

[bstolpestad@mnwcd.org](mailto:bstolpestad@mnwcd.org)  
651-330-8220 ext 24

WASHINGTON CONSERVATION DISTRICT

HOME THE DISTRICT EDUCATION LAND WETLANDS WATER TREE SALE

*Wondering whether a rain garden is a good fit for your yard? Struggling to identify an invasive species? Want to restore a prairie, but don't know where to start?*

**Find Your Watershed Map**  
This map was made with Google My Maps. Create your own.

**SITE VISIT SIGN-UP**

Sign up now to schedule a site visit in the spring. Site visits are scheduled Monday through Friday, 8am-4pm, from April to October, and usually last about one hour.

All residents of Washington County are eligible for a **free** site visit.

If you don't know what watershed you live in, you can use the Find Your Watershed Map to find out.