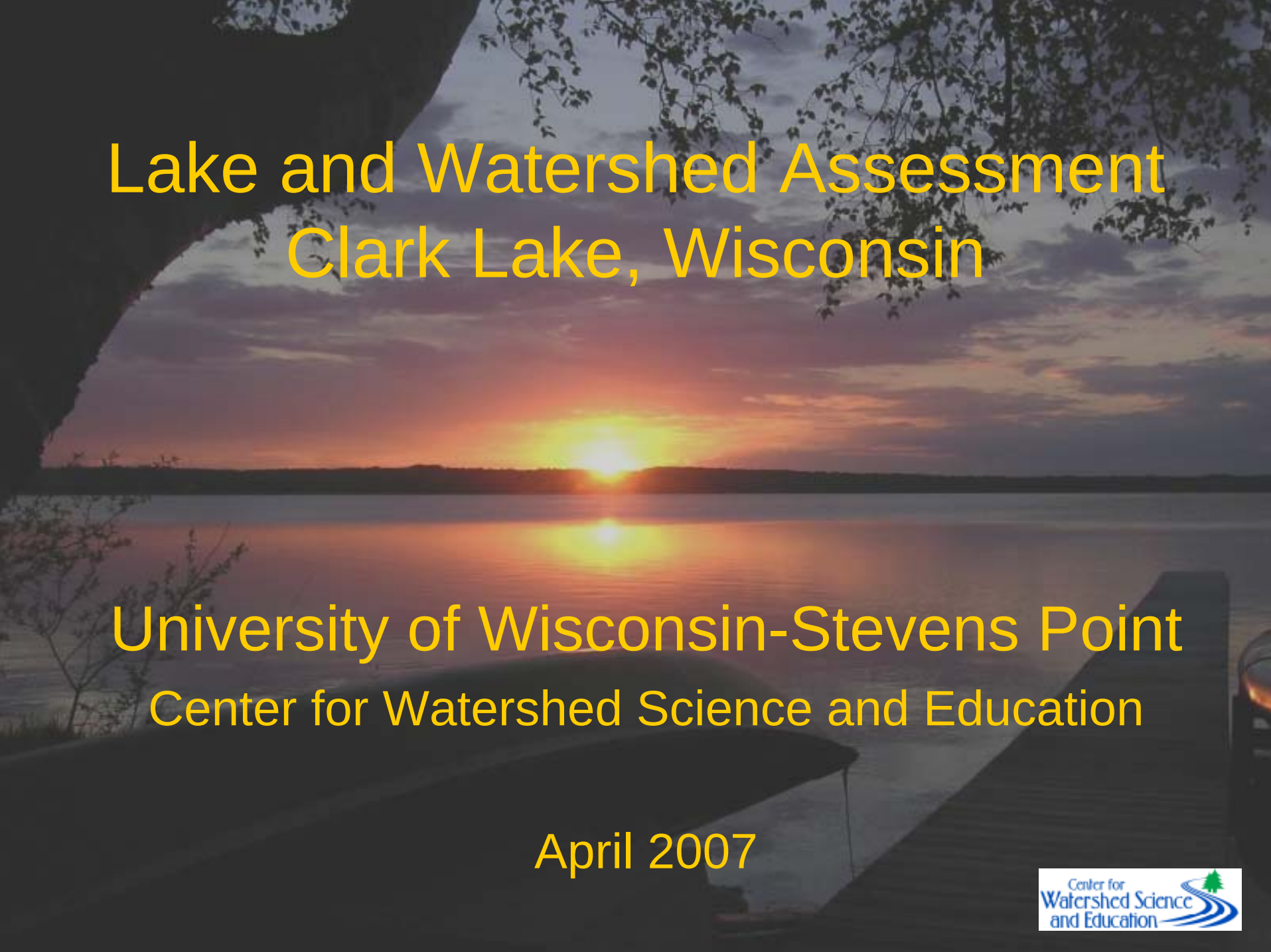


Lake and Watershed Assessment
Clark Lake, Wisconsin

University of Wisconsin-Stevens Point

Center for Watershed Science and Education

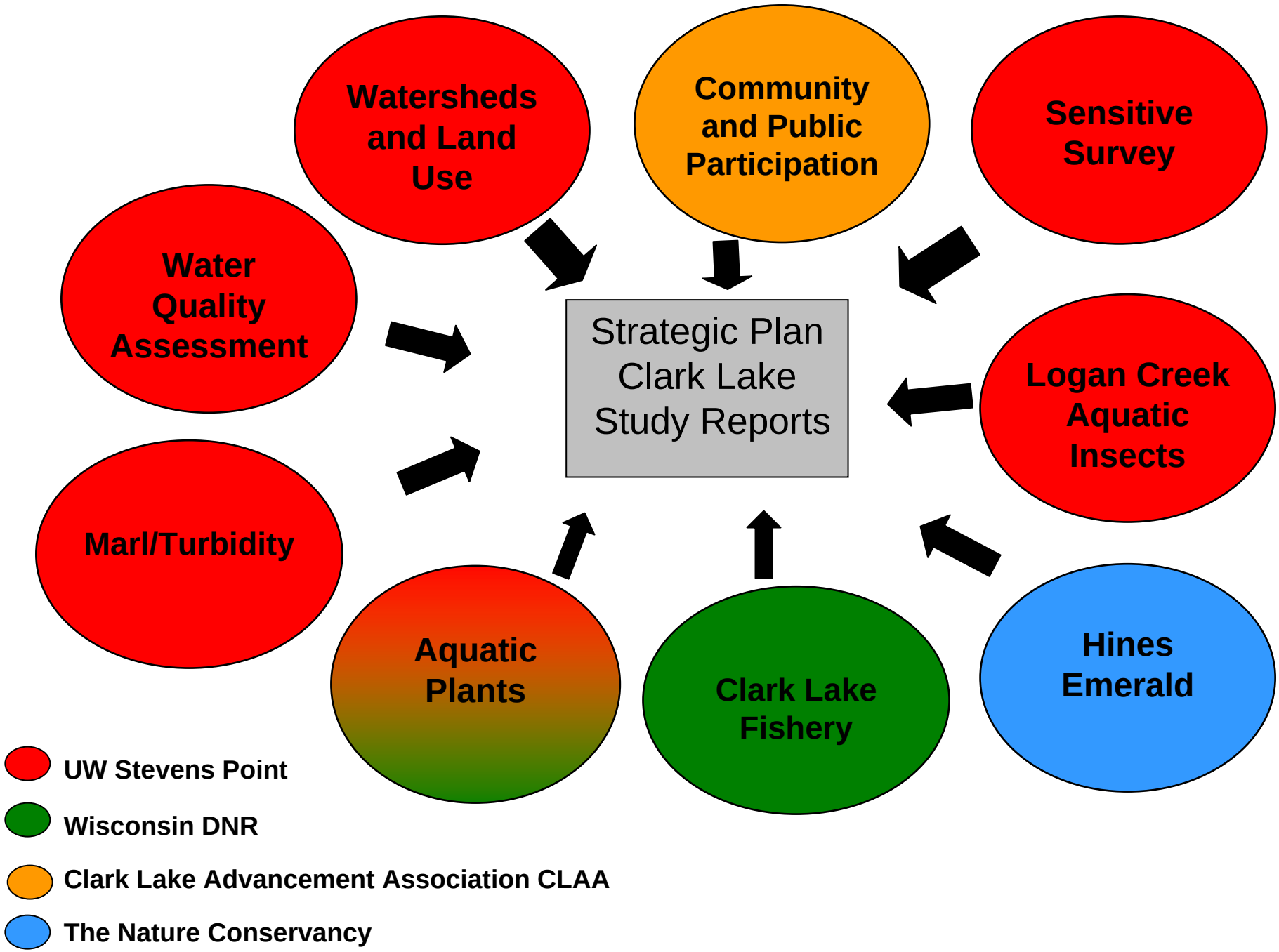
April 2007

Project Background

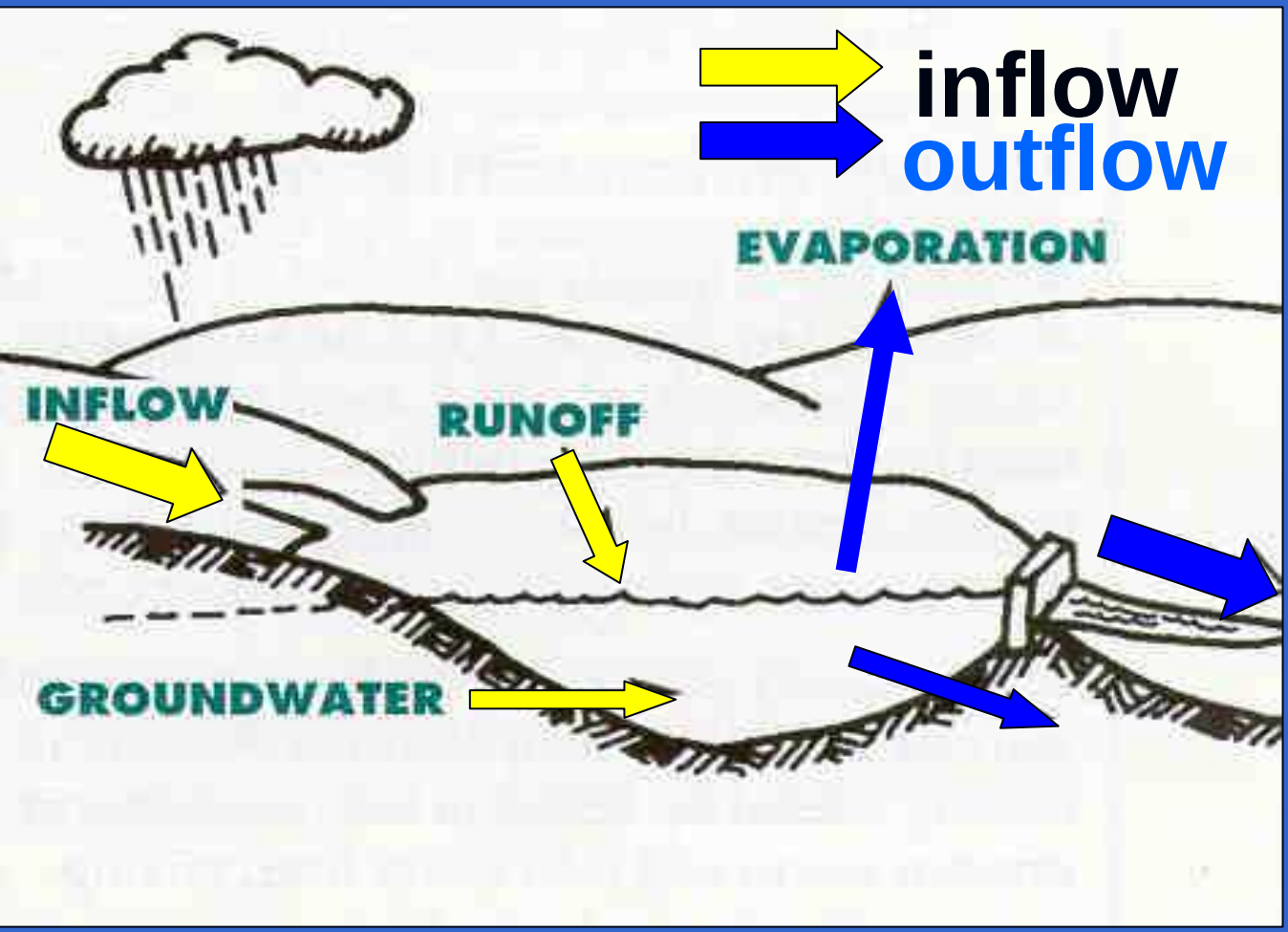
- Clark Lake users saw a need to examine

    1. Reduced water clarity
    2. Reduced aquatic plant levels
    3. Increased use and development

- Evaluate Clark Lake and its watershed and involve the community


Watersheds and Land Use
Community and Public Participation
Sensitive Survey
Water Quality Assessment
Strategic Plan Clark Lake Study Reports
Logan Creek Aquatic Insects
Marl/Turbidity
Aquatic Plants
Clark Lake Fishery
Hines Emerald
UW Stevens Point
Wisconsin DNR
Clark Lake Advancement Association CLAA
The Nature Conservancy

Clark Lake – Impounded Drainage Lake

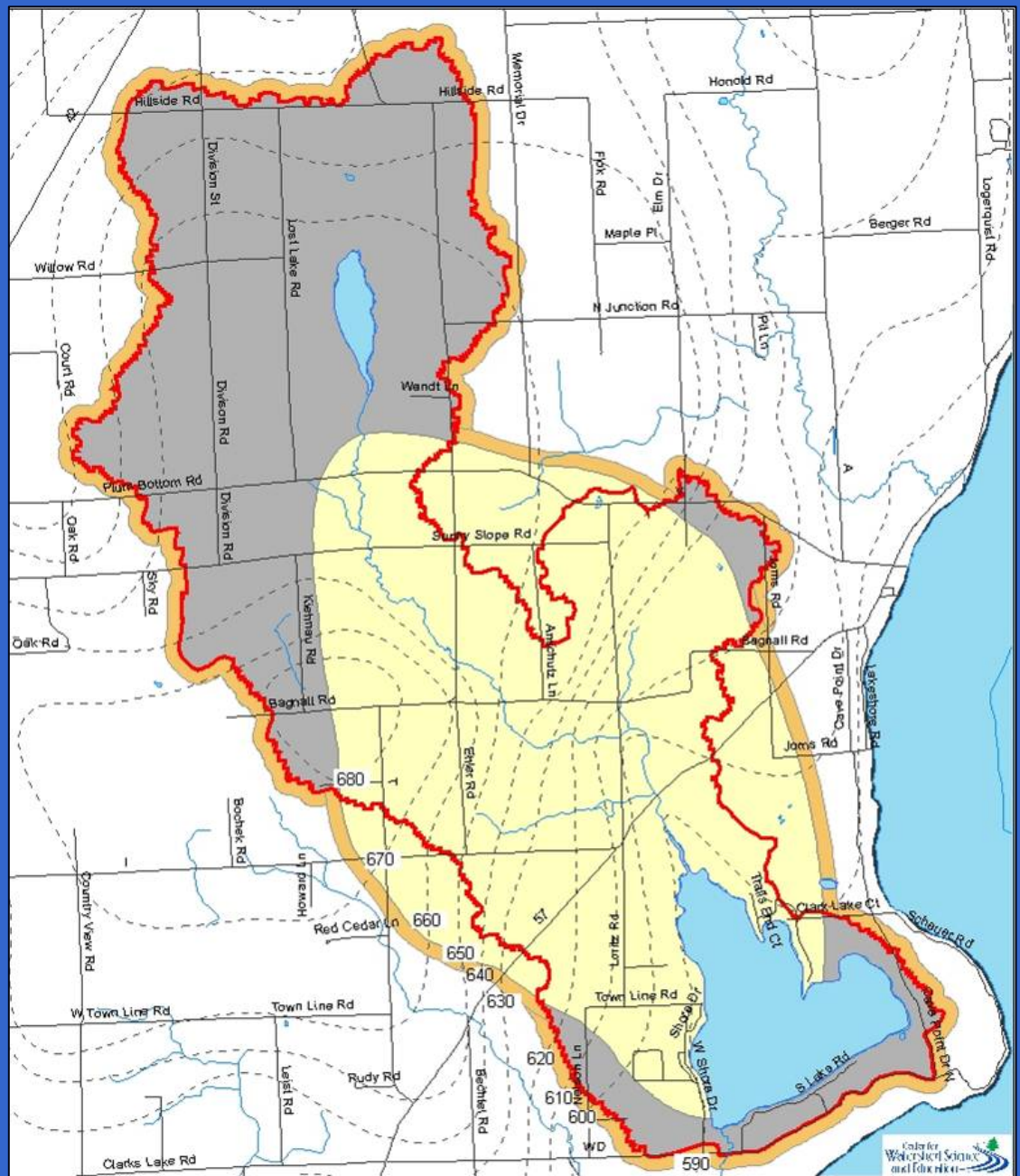


866 Acres

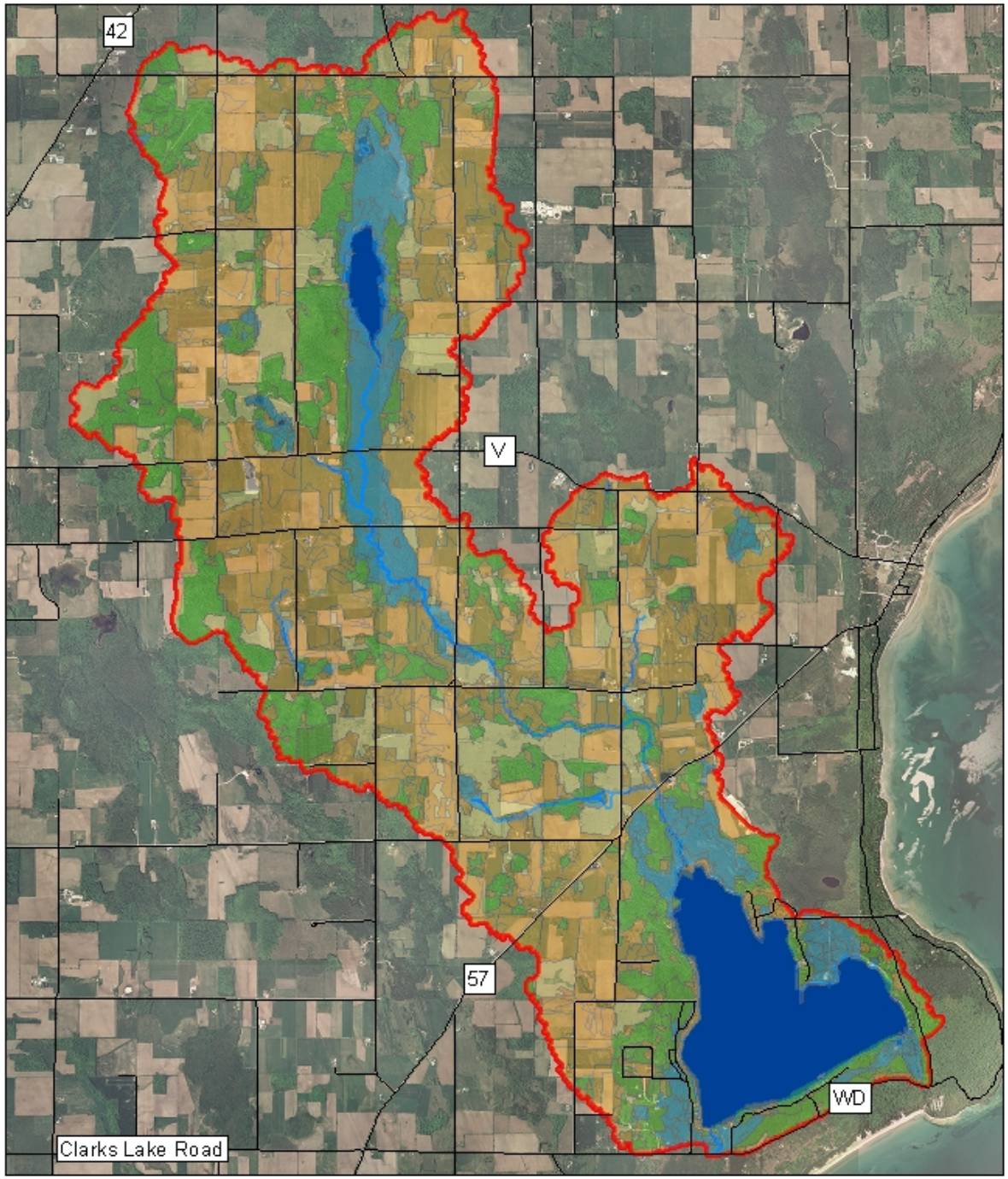
Max Depth
22 feet

Average Depth
7 feet

Contributing Area



Water quality depends on land uses throughout the watershed



Landuse in the Clark Lake Watershed

Landuse	% Landcover
Agriculture	50%
Forest	20%
Grassland	12%
Wetland	10%
Open Water	8%
Barren	< 1%

Stream
Road
Watershed Boundary

Center for Watershed Science and Education

More Impervious Surface = More Runoff

In a forest, rain soaks into the ground and is taken up by tree roots or moves down through the soil into the groundwater.

When rain falls on impervious surfaces, it cannot soak into the ground and instead becomes stormwater runoff.

Water Quantity in Logan Creek Base Flow Depletion

Many streams draw from groundwater

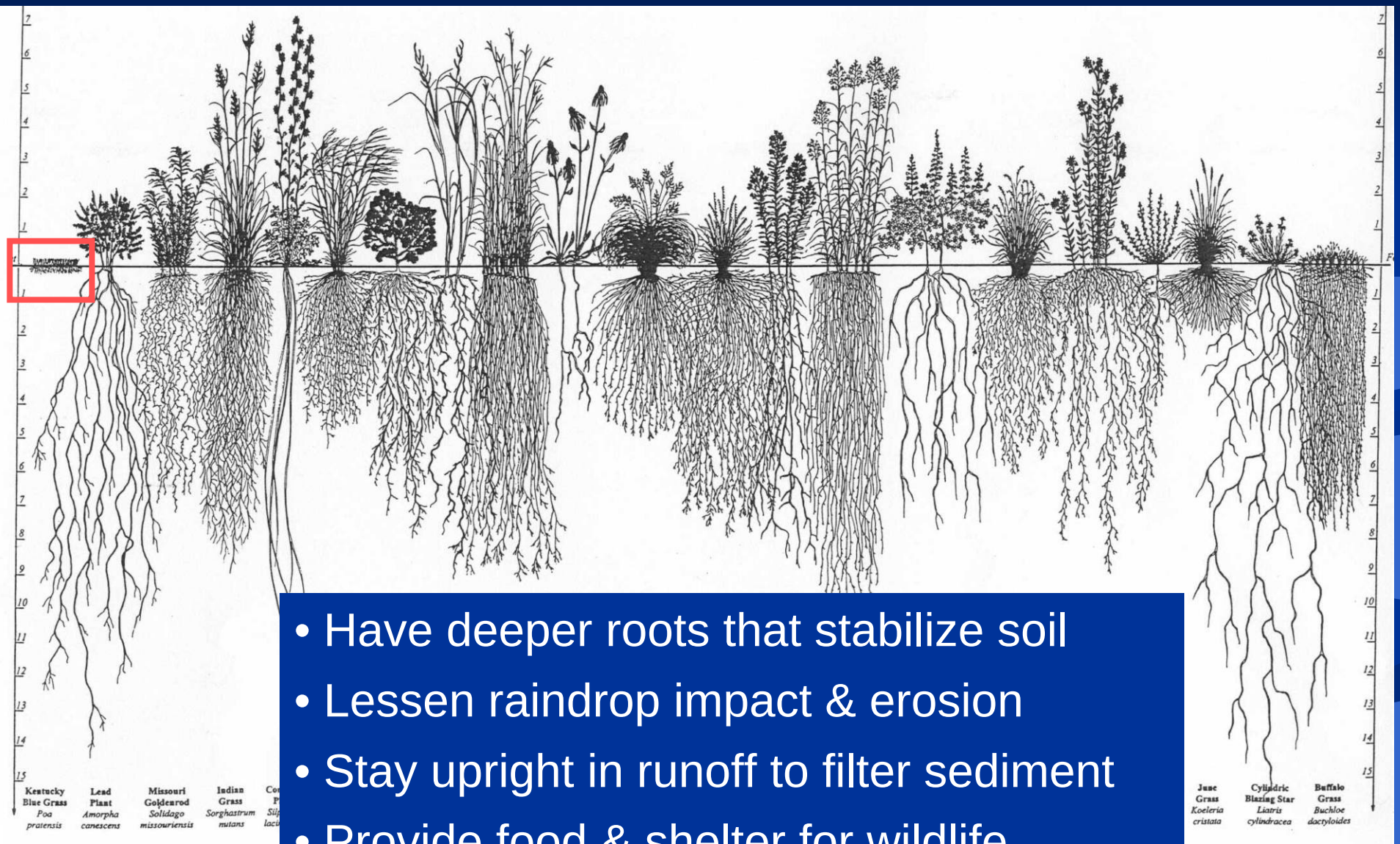
Impervious surfaces can block water from contributing to groundwater supply

This can result in lower stream flows during dry weather

Near Shore Potential Impacts to Water Quality and Habitat

- Use of fertilzer (lawn, garden, agriculture)
- Septic effluent
  - Designed to remove pathogens
  - Designed to recharge to groundwater
  - 16% of septic systems around Clark Lake were constructed more than 30 years ago.
- Removal of shoreland vegetation
  - Filters runoff water
  - Habitat
  - 35 feet from water with 30 foot view corridor

Native plants…



- Have deeper roots that stabilize soil
- Lessen raindrop impact & erosion
- Stay upright in runoff to filter sediment
- Provide food & shelter for wildlife

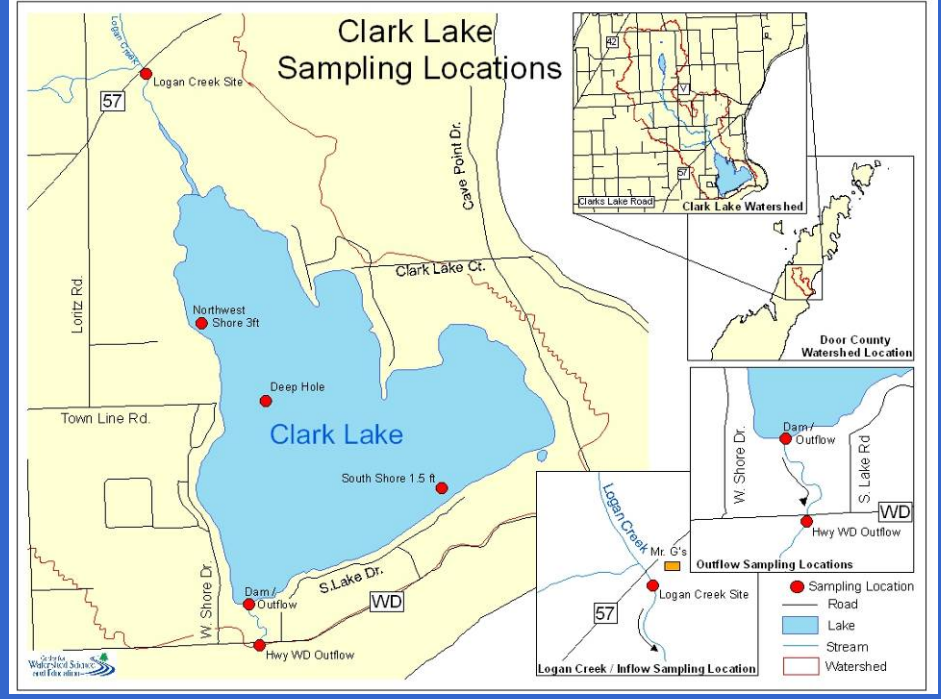
Water Quality measures collected from Clark Lake, Logan Creek, and Lost Lake

In Lake Sampling

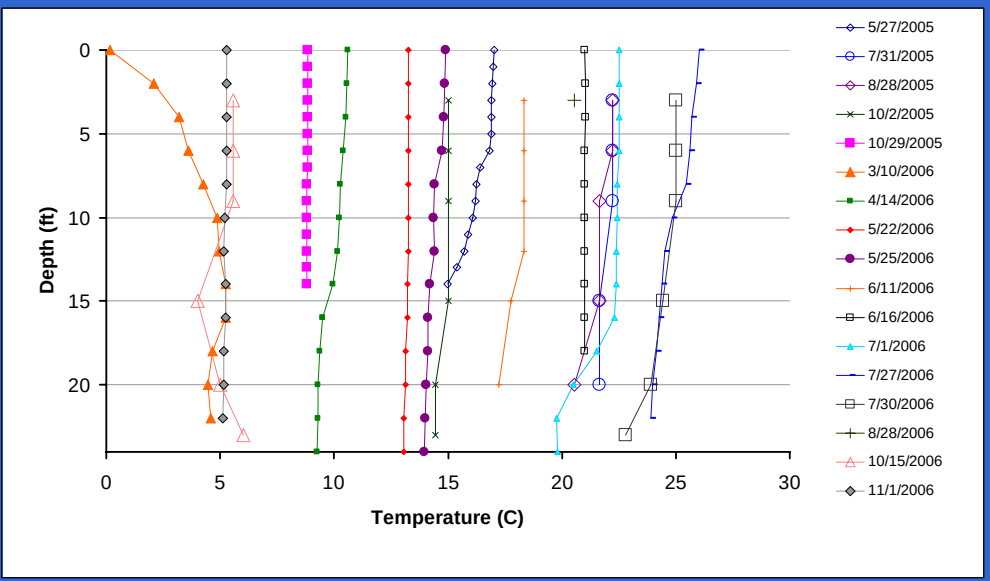
- Phosphorus
- Nitrogen
- Dissolved Oxygen
- Temperature
- Chloride
- Conductivity
- pH
- Hardness
- Water Clarity

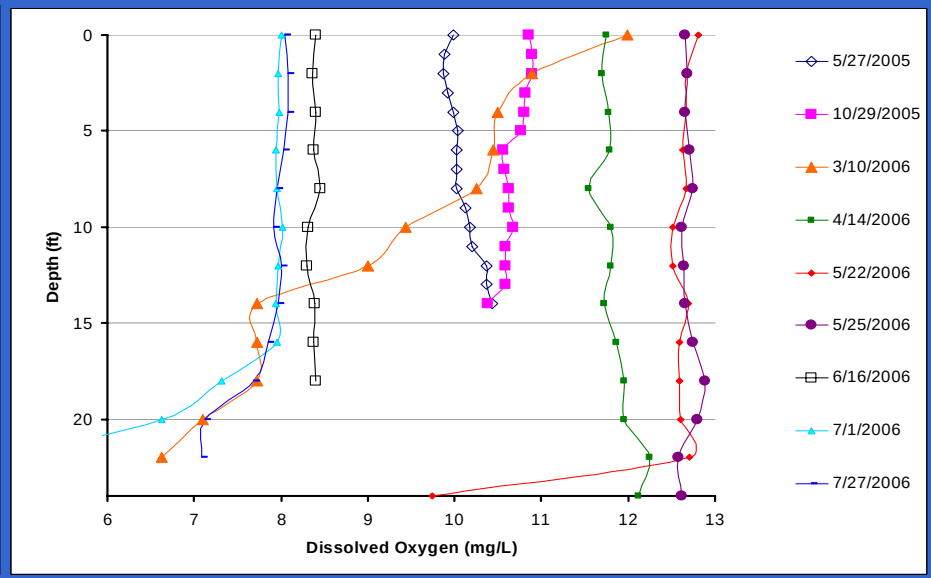
Tributary Sampling

- Phosphorus
- Nitrogen
- Temperature
- Chloride
- Volume
- Water height



Clark Lake is mixed

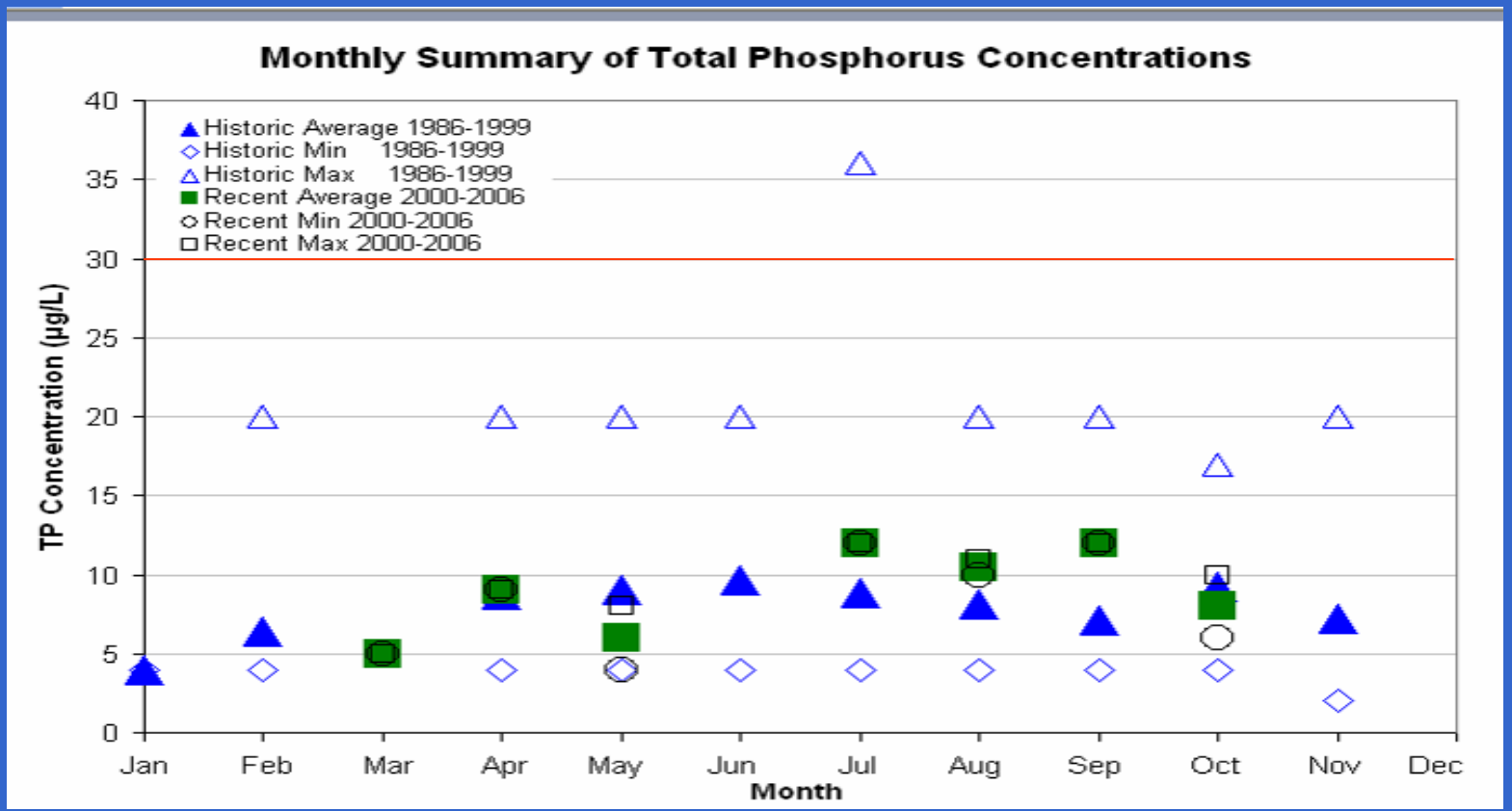




Phosphorus is needed for growth by algae and aquatic plants.

Excess Phosphorus is responsible for excessive plant growth in many Wisconsin lakes.

Phosphorus concentrations in these lakes and streams are LOW



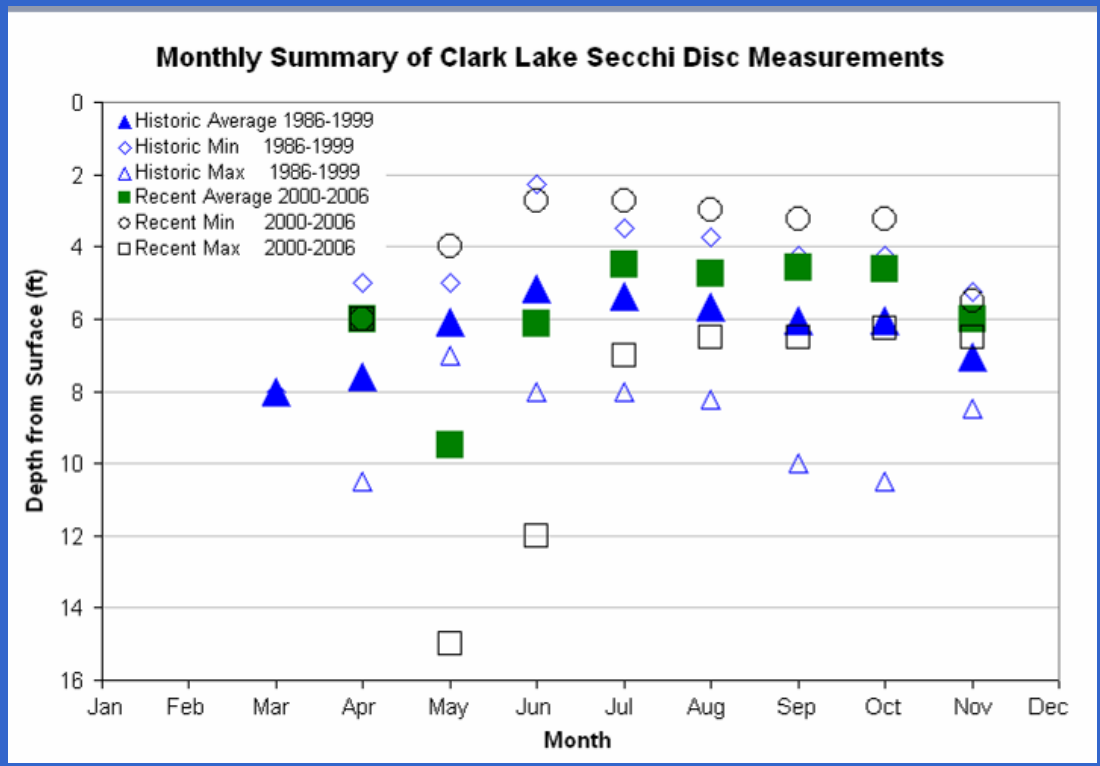
Water Clarity Monitoring

- Turbidity and wind data
- Volunteer secchi and traffic monitoring
- Wave/Wind modeling
- Recreational boating experimentation

Water Clarity Varies throughout the Year and from Year to Year

Water Clarity can be affected by

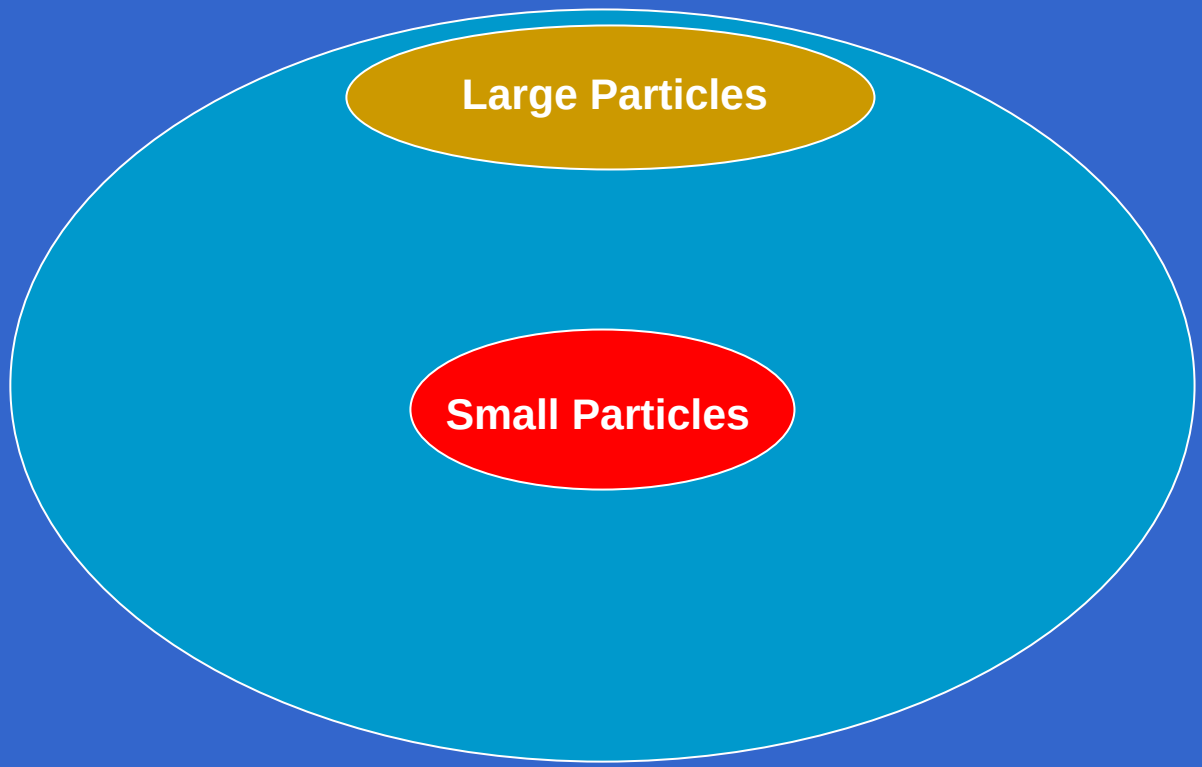
- Algae
- Particles
- Water Color
- Zebra Mussels



Depth water clarity = depth that aquatic plants can grow

Marl Production

Helps to protect the water quality in Lost and Clark Lakes and Logan Creek

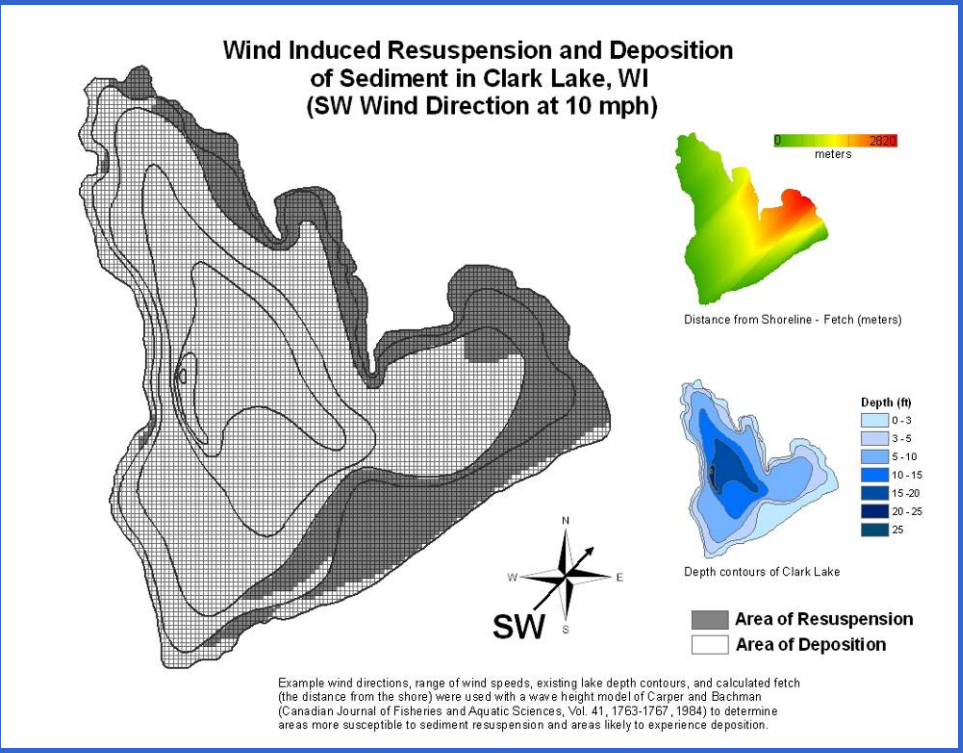


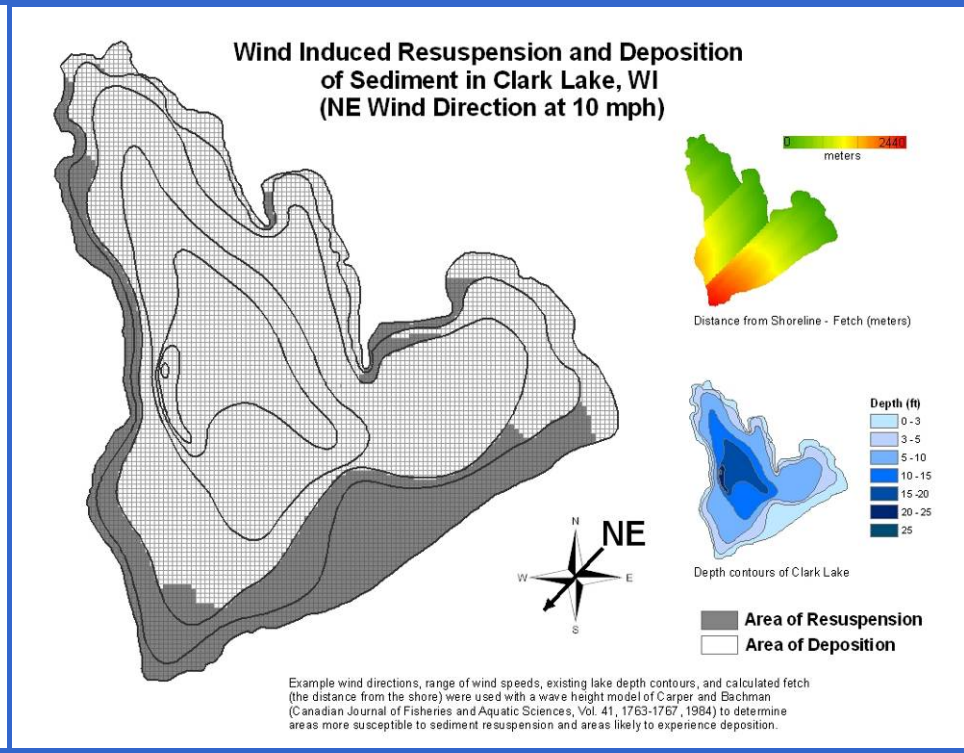
Larger particles tend to settle in shallow areas and smaller particles in deeper areas

Wind and Watercraft Redistribute Particles

Smaller particles located away from their normal settling zones can keep remixing into the water effecting:

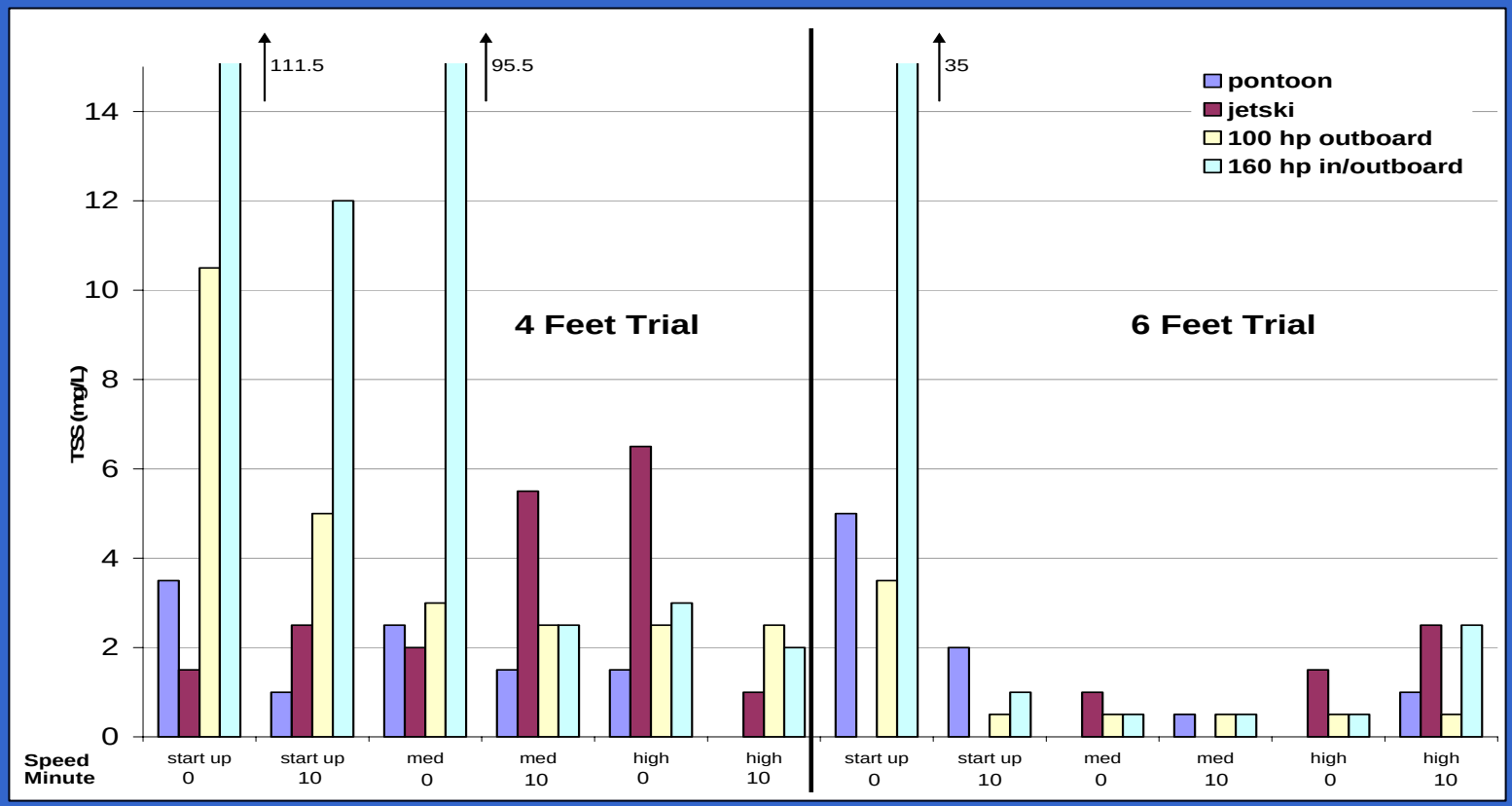
1) Water clarity
2) Redistribution and amount of marl (small sized particles) in shallows





Motorized Boating

Large watercraft have the potential to resuspend and reactivate marl when in the startup or non-planing speeds



Water Clarity Recommendations

- Continue monitoring water clarity
- Reestablish submergent and emergent vegetation in shallows
- Minimize use of motorized watercraft in less than 4 feet of water.
  - Speeds less than no wake or idle

Water Quality/Quantity Recommendations

- Currently phosphorus is not problematic
- Use precautions when planning new development in watershed
  - Maximize infiltration
  - Use caution with use of chemicals and nutrients within the watershed
  - Minimize percent impervious surfaces in new developments
  - All shoreland areas should be consistent with the Door County Shoreland Zoning ordinance
- Older septic systems are likely failing and should be replaced
- Continue water quality monitoring
- Provide information to riparian and watershed landowners

Aquatic Plant Survey Summary

- Identified more species
  - 10 previously unidentified
  - 6 absent in transect survey
- Increased abundance and diversity in deeper depths
- Decrease of aq. plants in shallower depths
- Eurasian water-milfoil less dominant
- Diverse, abundant, and ecologically significant part of the lake - North Bay of Clark Lake
- Endangered species identified– spotted pondweed

Invasive and Exotic

- Zebra Mussel

- Eurasian Water Milfoil and Curly Leaf Pondweed

- DNR Clean Boats Clean Waters program
  - identify and monitor aquatic invasive species
- Removal of aquatic vegetation by landowners should be limited
- Continued Monitoring for EWM, Curly Leaf Pondweed

Aquatic Plant Recommendations

- Removal of aquatic vegetation should be limited
  - Reduce opportunities for establishment of invasive species
- Replace riprap/concrete shoreline w/ native vegetation
  - Beneficial to water quality, wildlife, and shoreline stabilization
- Establish no-wake or no-motor zone in the north bay of Clark Lake and into Logan Creek
  - Diverse, abundant, and ecologically significant part of the lake
- Re-establish submergent and emergent aquatic plants.

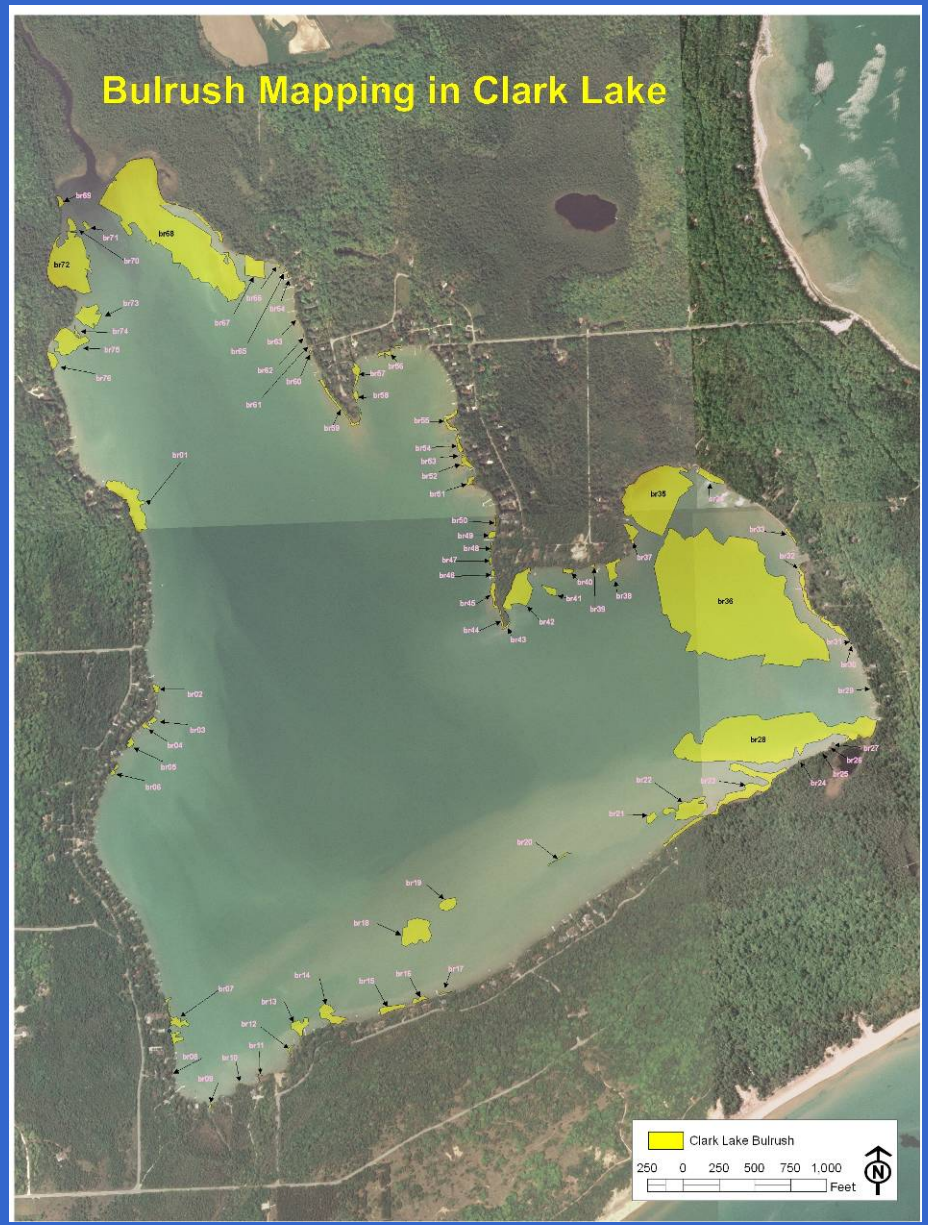
Fish Recommendations

Hardstem Bulrush

- Emergent found in:
  - Shallow marshes
  - Lakes and stream
- Prefer sandy and marly substrate
- Important food and habitat
  - Waterfowl and shorebirds
  - Muskrats and geese will eat rhizomes
  - Excellent nesting, spawning, and nursery habitat
- Reproduce
  - Seed
  - Rhizomes
    - Underground stem

Bulrush Mapping and Density Survey

- Mapping
  - Clark and Lost Lake
  - All beds
  - Areal extent and density (qualitative)
- Density Survey
  - Developed monitoring scheme
  - 5 beds in Clark Lake



Bulrush Monitoring Recommendation

- Density assessment
  - Annually
  - 5 bulrush beds established
  - Continue monitor health of beds
- Mapping
  - Not annually (5 years)
  - Used for comparison

Re-establish *Hardstem Bulrush* and other native shallow plant species

- Plant native bulrush nutlets and tubers
  - Lost Lake and dense stands within Clark Lake
- Reduce waves in newly planted beds
  - Explore the use of snow fencing
  - Lake-ward side of plantings to reduce wave action during early growth stage
- Deter boating activity
  - Submergent and emergent vegetation in shallows
- Drawdown - lower summer water level
  - promote development of young plants from seed
- Monitor annually to evaluate success

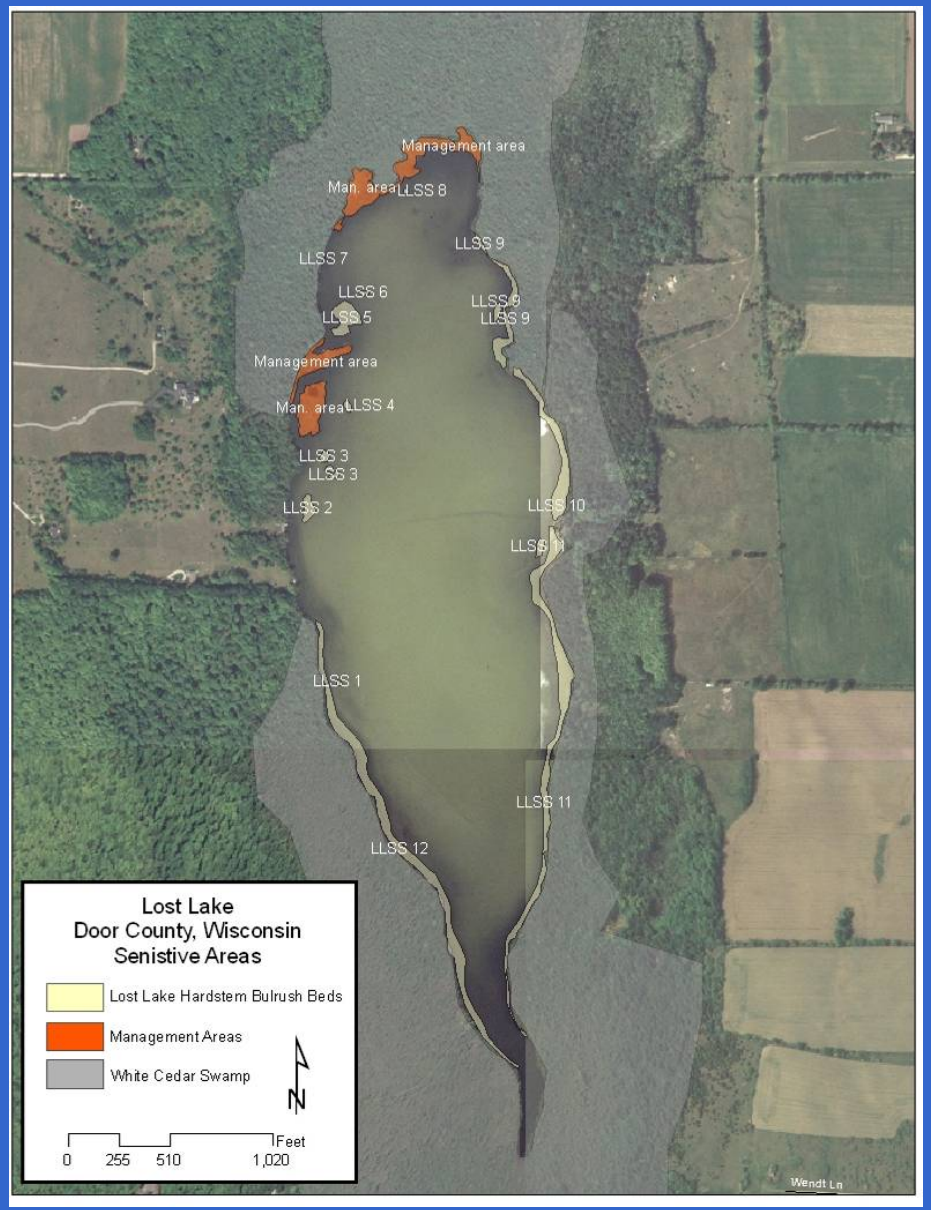
Sensitive Area

- **Important to aquatic and terrestrial organisms**
  - **Critical and unique habitat**
- **Health of watershed and Clark Lake**
  - **Water quality and quantity**
- **Easily affected by human activities**

Lost Lake Sensitive Areas

- Low lying white cedar wetland
- Dense and healthy hardstem bulrush beds.
- Healthy riparian areas
- Intact shorelines and aquatic vegetation beds

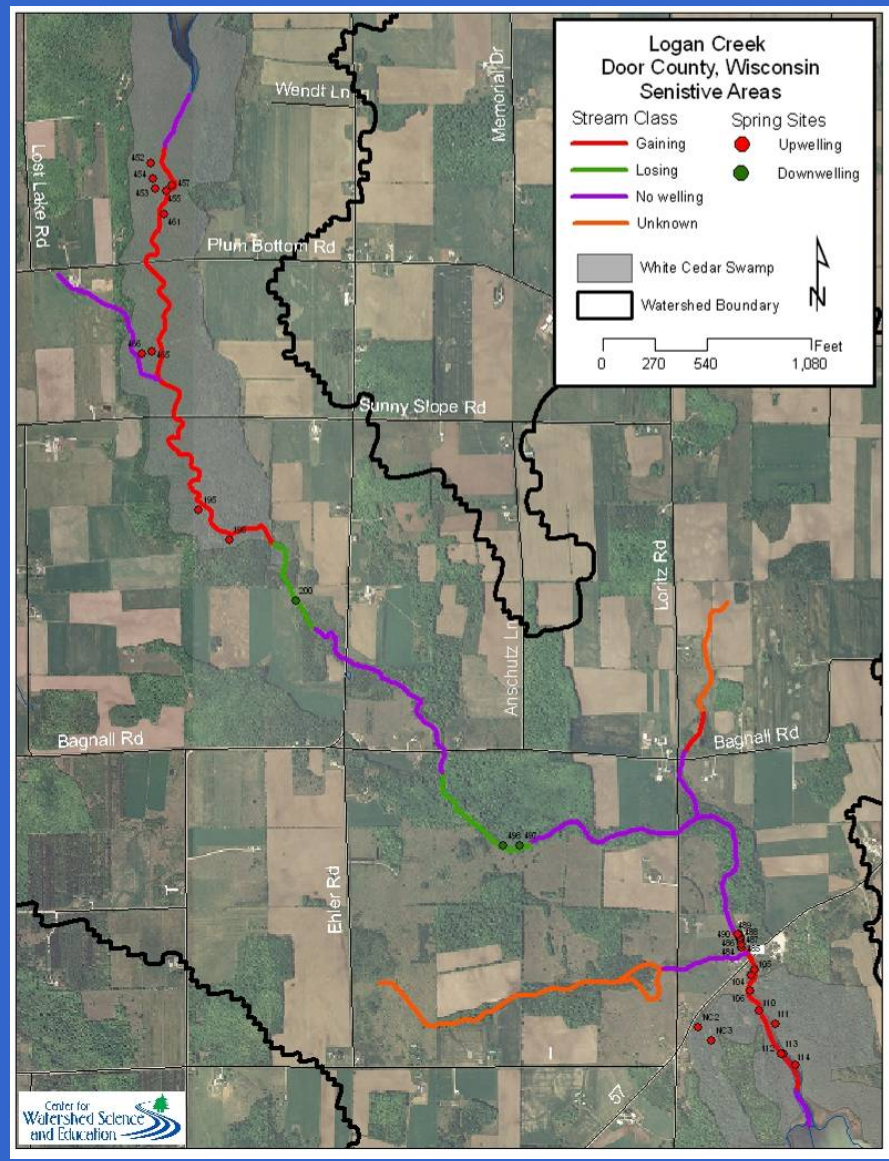
- Stands of hardstem bulrush and white cedar swamp should be considered for conservancy or other forms of protection.
- Cattail beds should be monitored and possibly controlled.



Logan Creek = Sensitive Area

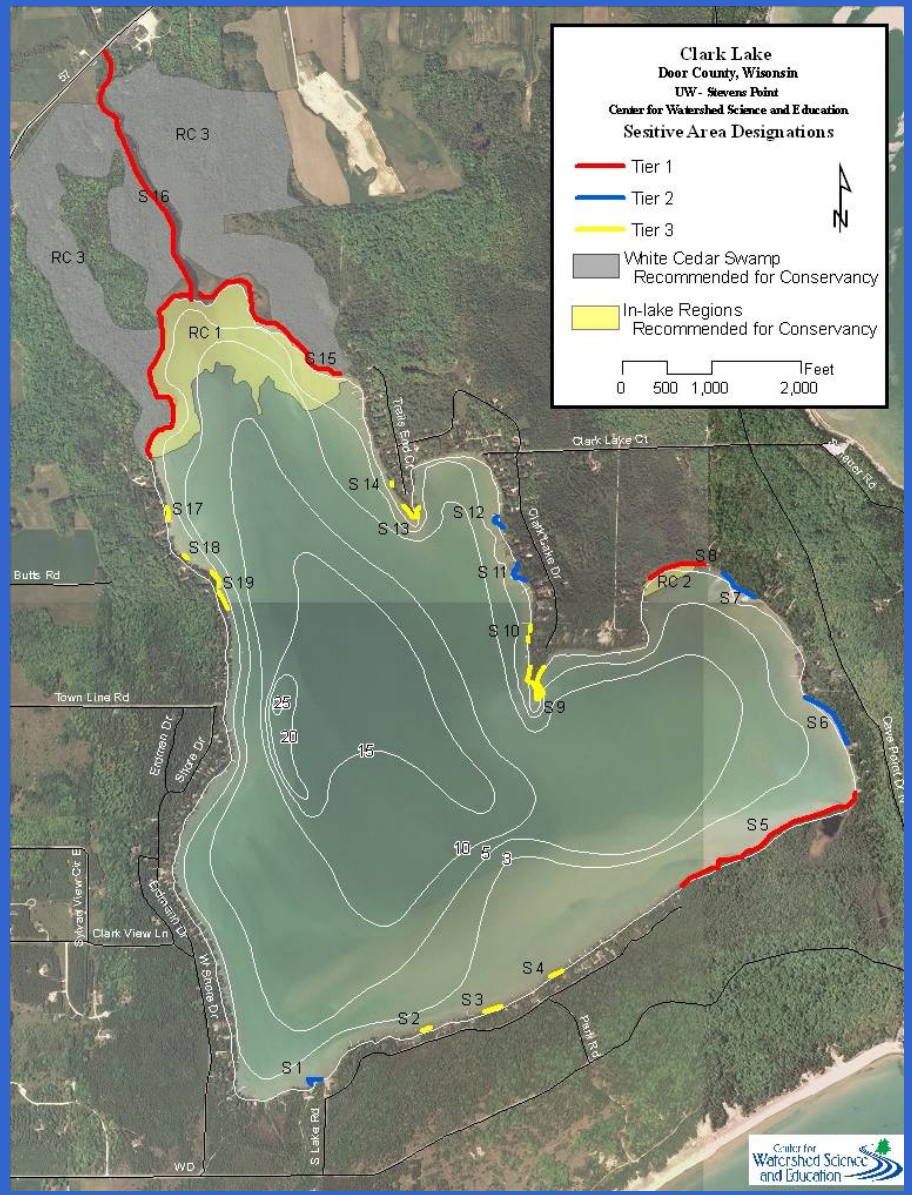
- Groundwater discharge area
- Critical and unique habitat
- White Cedar wetlands
- Critical to water quality/quantity

- Logan Creek and its riparian corridor are in good to excellent condition
- Consider for conservancy or other forms of protection.



Clark Lake Sensitive Areas

- Tier 3
  - Parcel-sized tracts of undeveloped shoreline
  - Riparian zones were in good condition
  - “Islands of habitat” amongst shorelines dominated by development.



Clark Lake Sensitive Areas

- Tier 2
  - Mid-sized, lowland tracts of undeveloped shoreline
  - Riparian areas exhibited healthy conditions with low lying areas adjacent to upland areas
  - All hardstem bulrush beds not included in Tier 1
- Tier 1
  - Large tracts White Cedar swamp
  - Dense and healthy hardstem bulrush beds
  - Large contiguous and diverse aquatic macrophytes beds
  - Endangered aquatic macrophyte
  - Groundwater seeps and springs

Water Level Management Recommendations

- Periodic summer drawdown
  - Compaction and consolidation of sediment
    - Increased water clarity and less sediment resuspension
  - Promotes growth of bulrush and other native plants

- Proper maintenance and operation of the dam
  - Provide adequate flow for fish and other aquatic biota.
  - Spring period (Trout)

Special Thanks

- Clark Lake Volunteers
- Clark Lake Advancement Association
- Door County
- Wisconsin DNR
- Ridges Conservancy
- University of Wisconsin, Stevens Point
  Center for Watershed Science and Education

Strategic Plan

- Identify and prioritize key issues from UWSP, DNR, and Nature Conservancy Study Recommendations
- Identify associated actions, participants, and timeline

EXAMPLE

Recommendation:

- ***Use precautions when planning new development in watershed…***
  - ***All shoreland areas should be consistent with the Door County Shoreland Zoning ordinance***

Issue/Goal: How do we get compliance with shoreland zoning ordinances?

Activity	**Who**	**Target Date**
1. Information Packets to existing and new riparian landowners	CLAA/Door County	2007-2010
2. Demonstration sites	CLAA/Door County	2008-2010
3. Develop shoreland booklet for landowners	Door County	2009