

# Silver Lake Watershed Management Plan



F. X. Browne, Inc.



# Ponds and Lakes

# Eutrophication

**Trophic**...means food or energy level

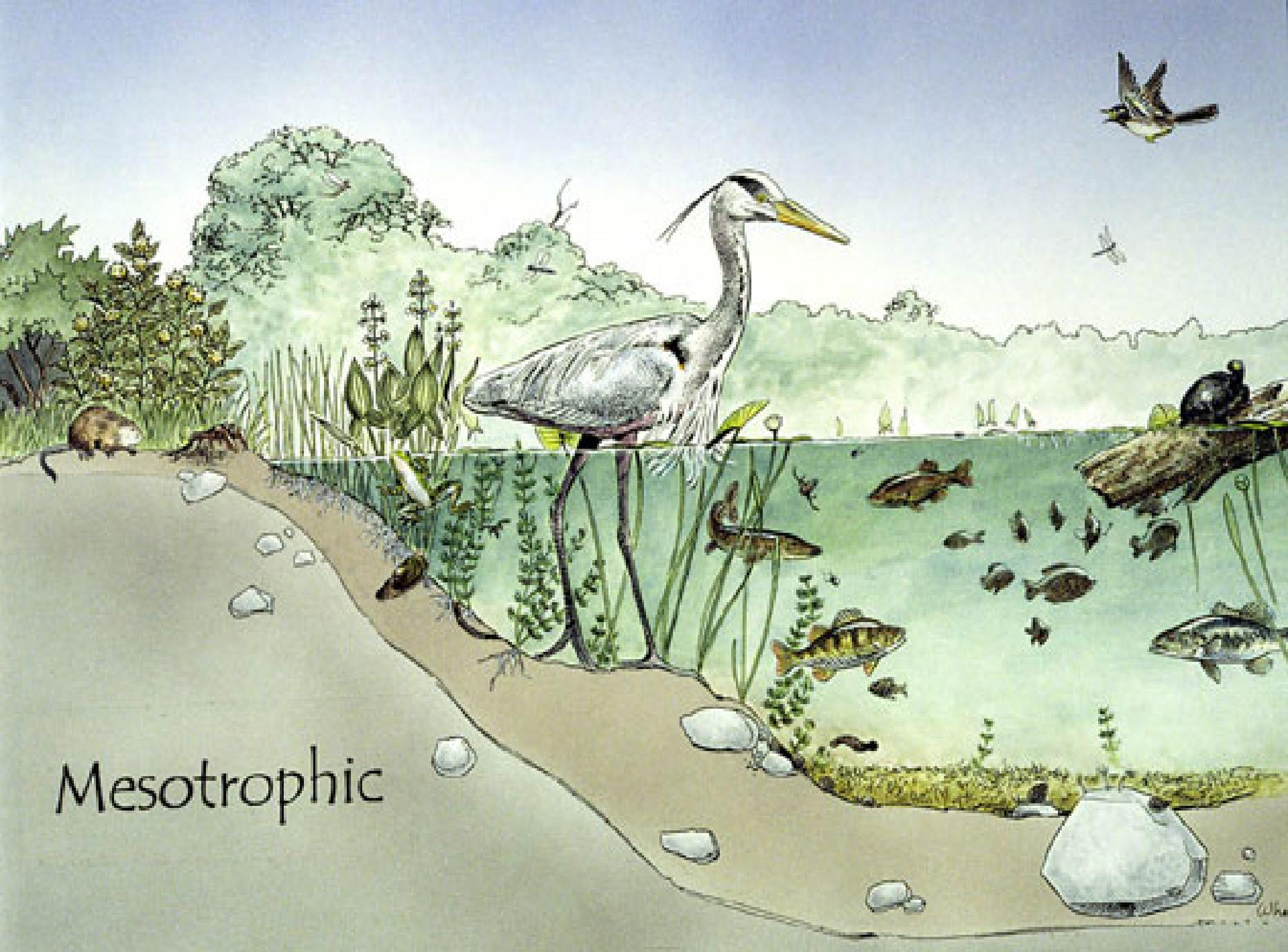
**Oligotrophic**...ecologically young lake with low nutrients, low populations of algae and macrophytes (aquatic plants), usually high levels of dissolved oxygen, and a fair fishery.

**Mesotrophic**...ecologically middle-aged lake with medium nutrients, medium populations of algae and macrophytes, usually somewhat lower dissolved oxygen in lower waters of lake, and a pretty good fishery.

**Eutrophic**...ecologically old lake with high nutrients, high populations of algae and/or macrophytes, usually depleted dissolved oxygen in lower waters of lake, and a poor fishery.



Oligotrophic



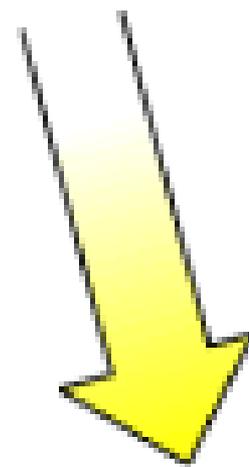
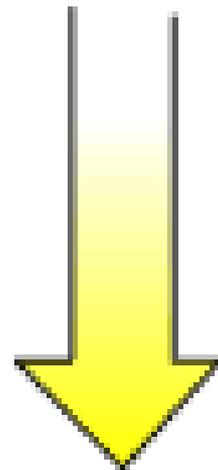
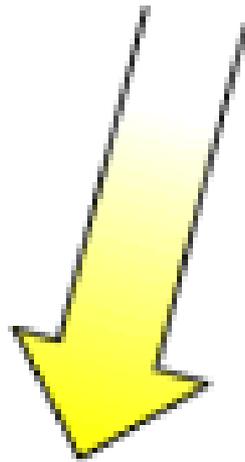
Mesotrophic



Eutrophic

# EUTROPHICATION

excess fertility leading to excessive plant growth



**OPEN-WATER ALGAE**  
(phytoplankton)

**ATTACHED ALGAE**  
(periphyton)

**HIGHER PLANTS**  
(macrophytes)

# Lake Succession

Natural aging of a lake; lake gradually fills in, becomes wetland/bog, and eventually becomes a forest.

Cultural eutrophication...aging of the lake is quickened by man's activities, including:

- Development

- Agriculture

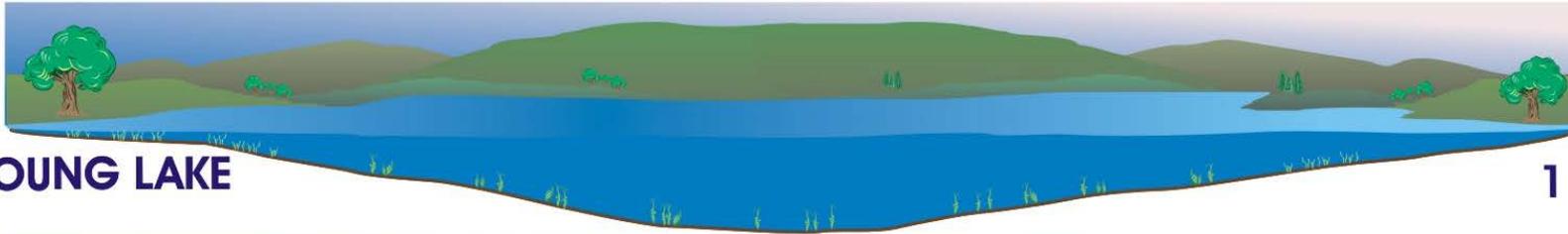
- Forestry Activities

- Wastewater

- Roads/Highways/Streets

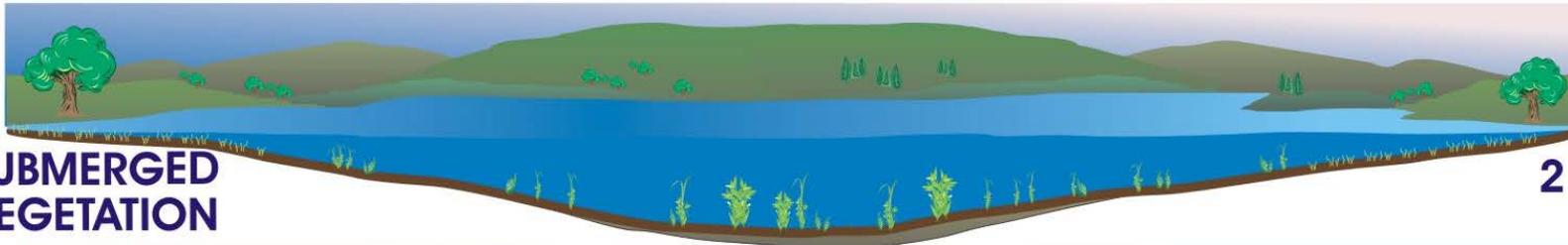
# LAKE SUCCESSION

TIME



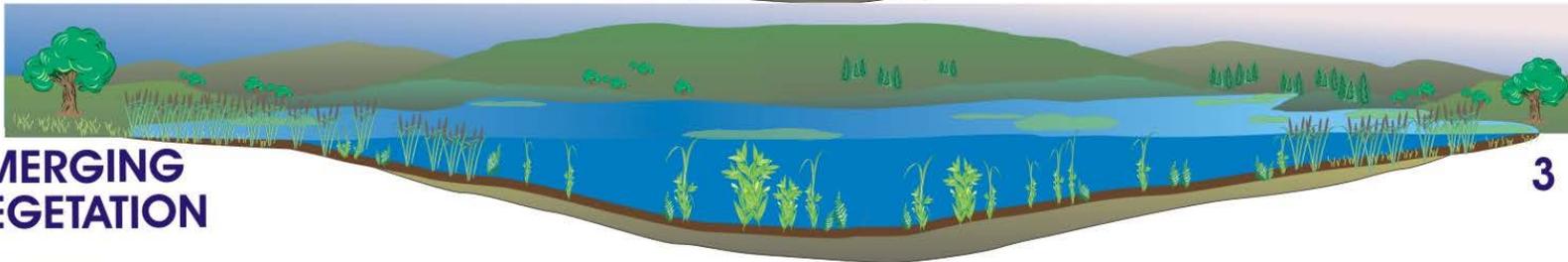
**YOUNG LAKE**

1



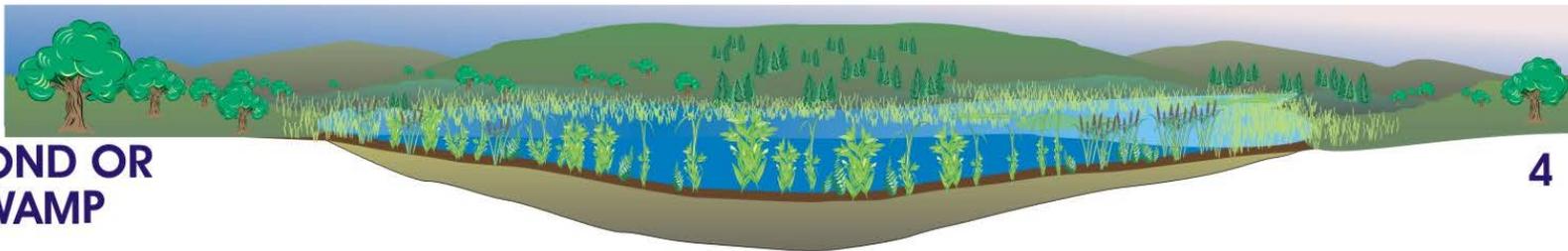
**SUBMERGED VEGETATION**

2



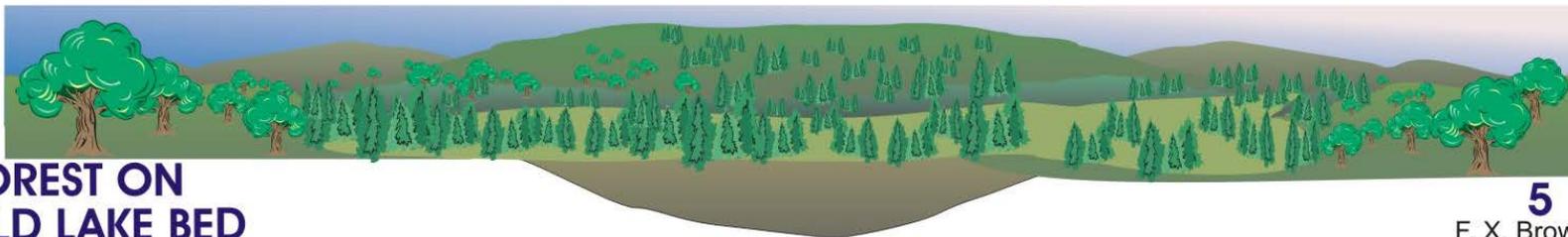
**EMERGING VEGETATION**

3



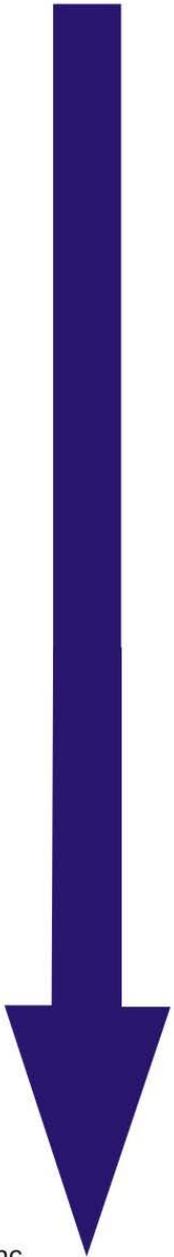
**POND OR SWAMP**

4



**FOREST ON OLD LAKE BED**

5



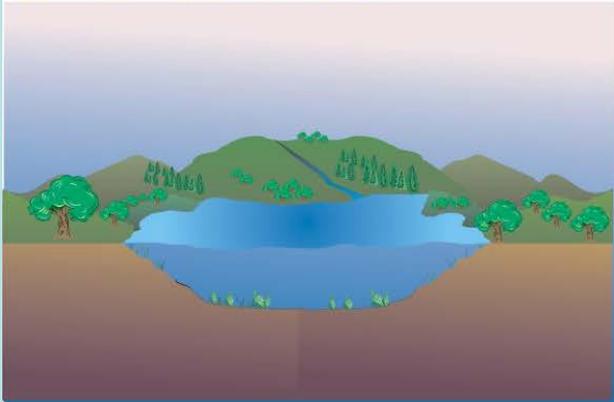
# LAKE AGING

## NATURAL



**TIME**

**MAN INDUCED**



**URBAN AND INDUSTRIAL RUNOFF**

**FERTILIZERS AND PESTICIDES**



**SEDIMENT**



# Scope of Work

- 1. Review of Past Data and Reports**
- 2. Phytoplankton Monitoring**
- 3. Bathymetric Survey and Sediment Testing**
- 4. Macrophyte Survey**
- 5. Watershed Investigations**
- 6. Update Watershed Management Plan**
- 7. Meetings**

# Silver Lake Watershed Characteristics

**Table 2.1**  
**Morphometric and Hydrologic Characteristics of Silver Lake**

Watershed Area	10,216 acres
Lake Surface Area	831 acres
Lake Volume	5,995 million gallons
Average Depth	22.6 feet
Maximum Depth	36 feet
Retention Time	1.2 years
Drainage Basin Area: Lake Surface Area Ratio	12.3:1

# Silver Lake Land Use (percent)

**Table 2.2**  
**Land Use/Land Cover in Silver Lake Watershed**

<b>Land Use Category</b>	<b>Acres</b>	<b>Percent of Watershed</b>
Open Water (excl. Silver Lake)	9	<b>0.09%</b>
Hay and Pasture	3,846	<b>37.65%</b>
Cropland	3,297	<b>32.27%</b>
Low Intensity Development	754	<b>7.38%</b>
High Intensity Development	9	<b>0.09%</b>
Forest	2,210	<b>21.63%</b>
Wetlands	91	<b>0.89%</b>
<b>Total</b>	<b>10,216</b>	<b>100.00%</b>

# Lake Monitoring

- **Collection of Water Samples for CSLAP Analysis by SLA Volunteers**
  - ....**Chemistry**
  - ....**Phytoplankton – Sent To Ken Wagner**
- **Temperature-Dissolved Oxygen Profile**
- **pH and Conductivity Profiles**
- **Bathymetric and Sediment Thickness Survey**
- **Sediment Samples**
- **Macrophyte Survey**

# Watershed Investigations

Three days of field investigations

....**GPS**

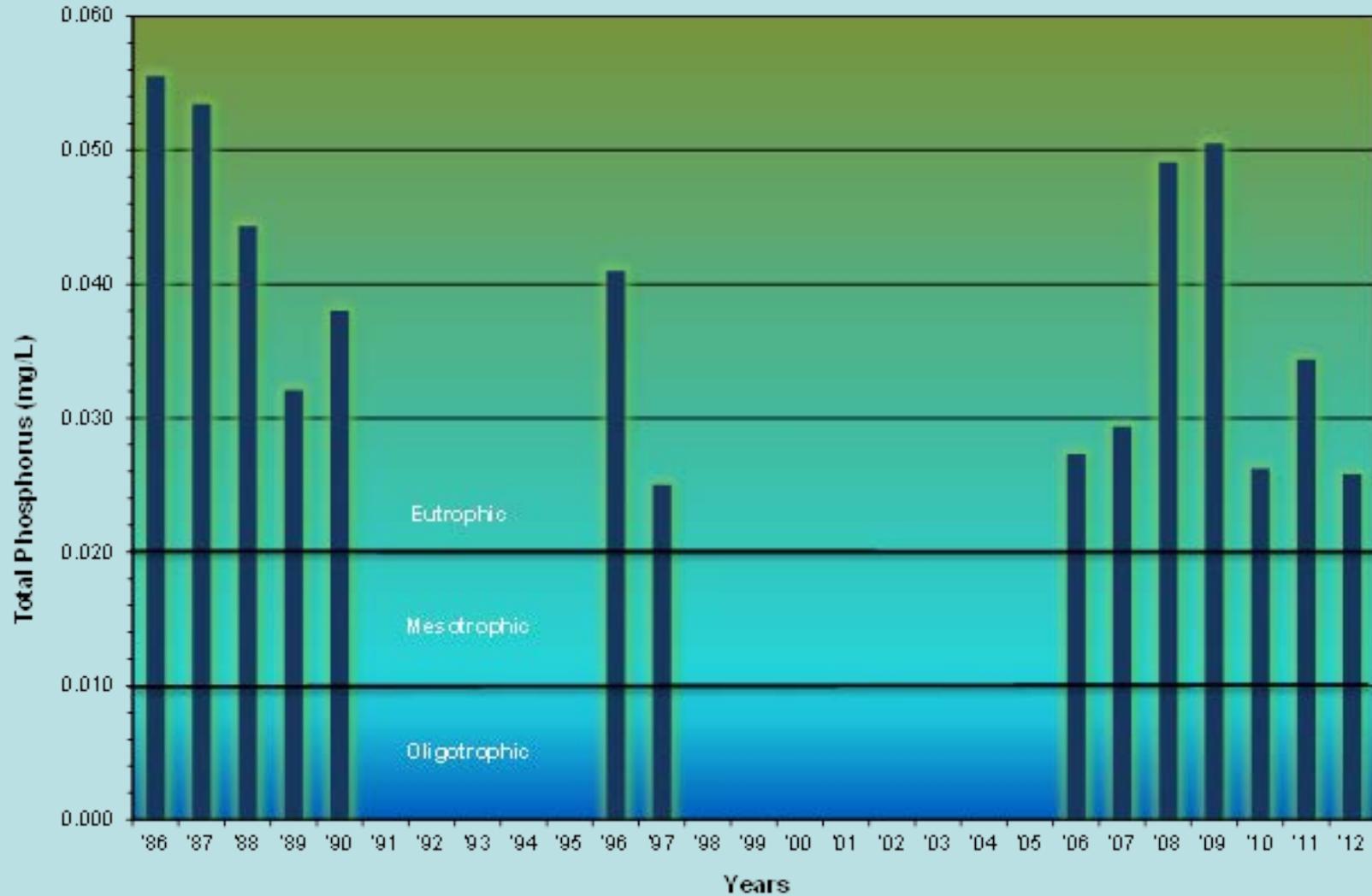
....**Photographs**

....**Narrative of Problem**

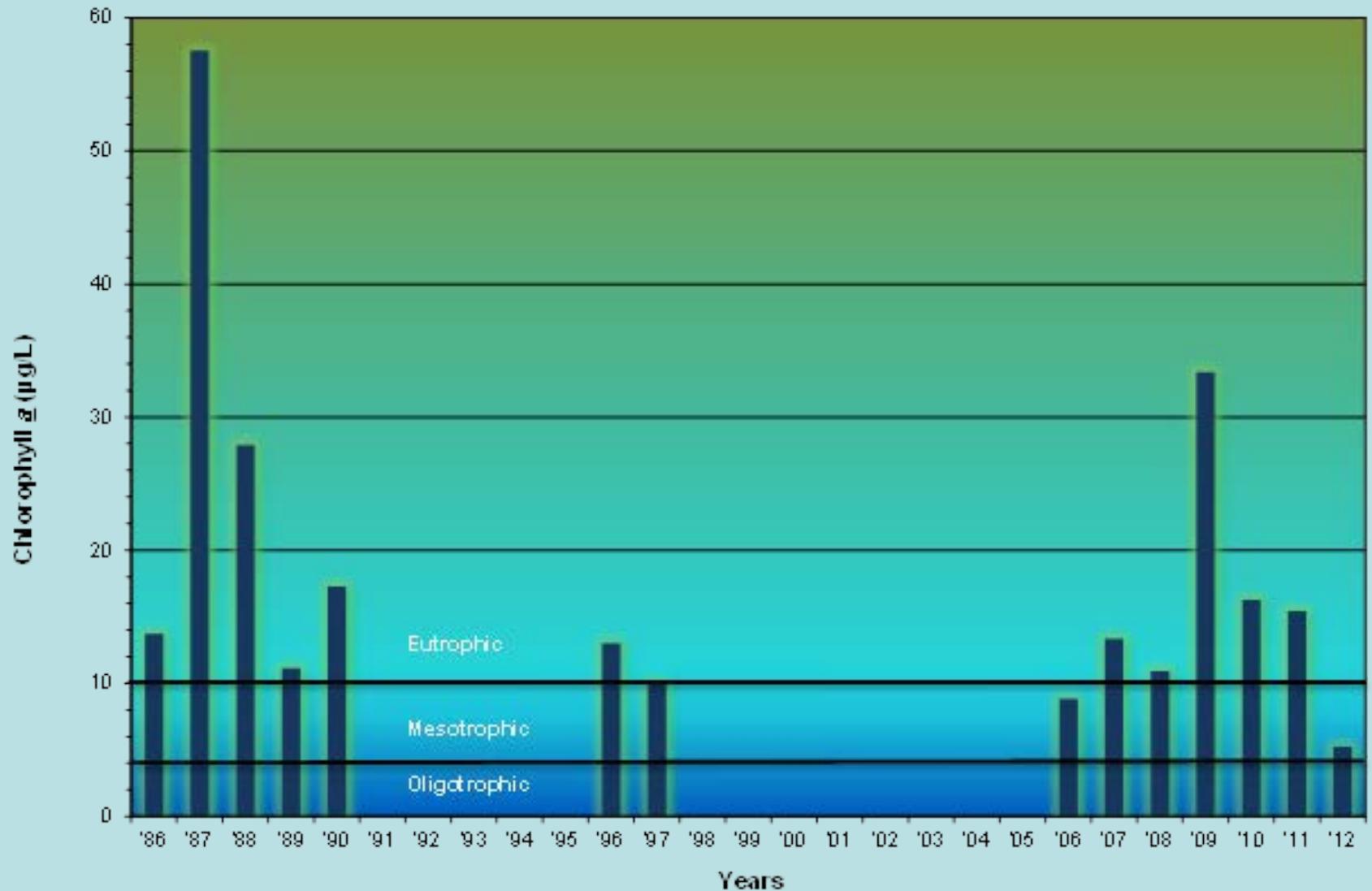
....**Developed List and Map of Problem  
Areas**

# Results of Study

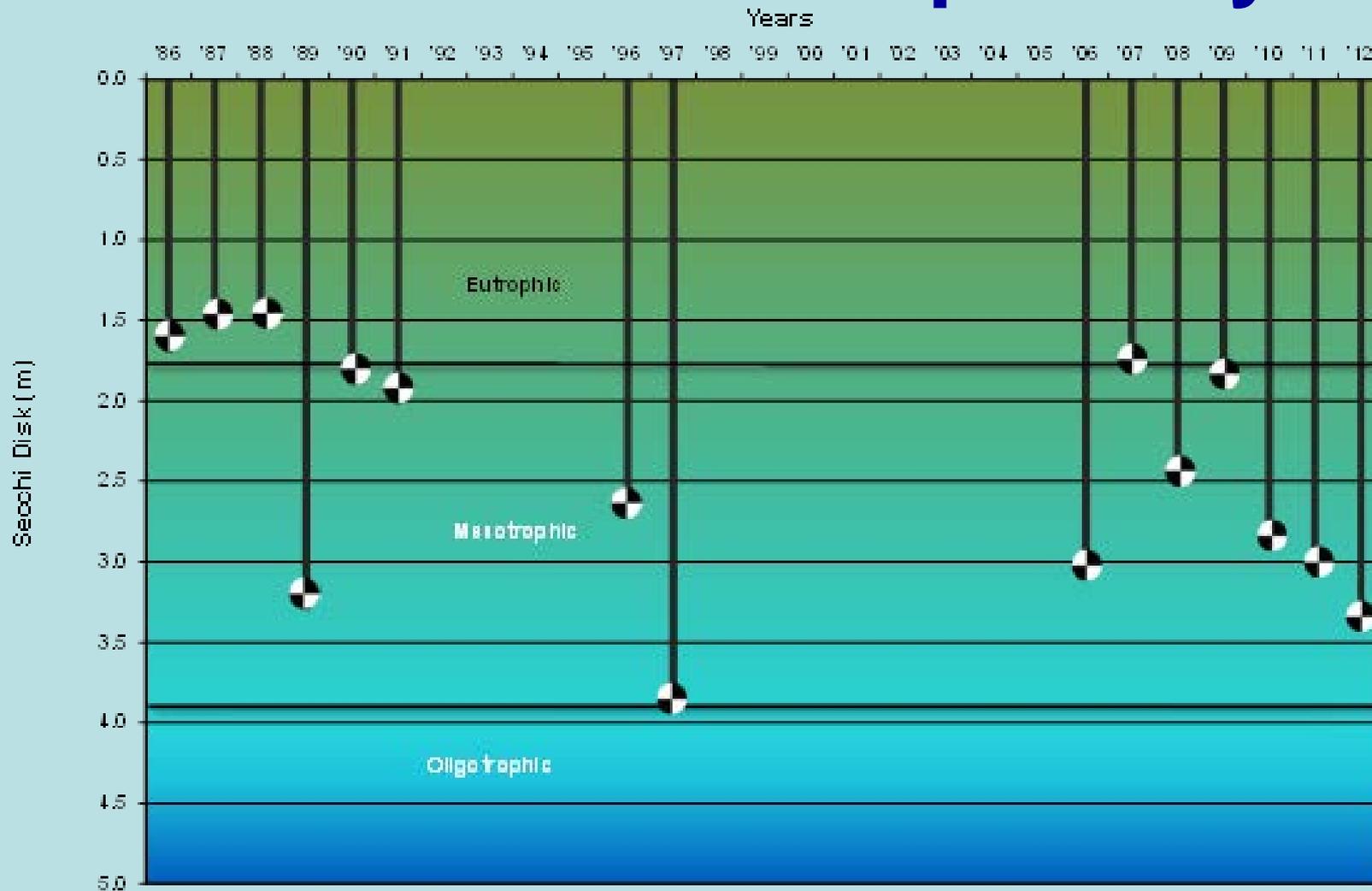
# Total Phosphorus



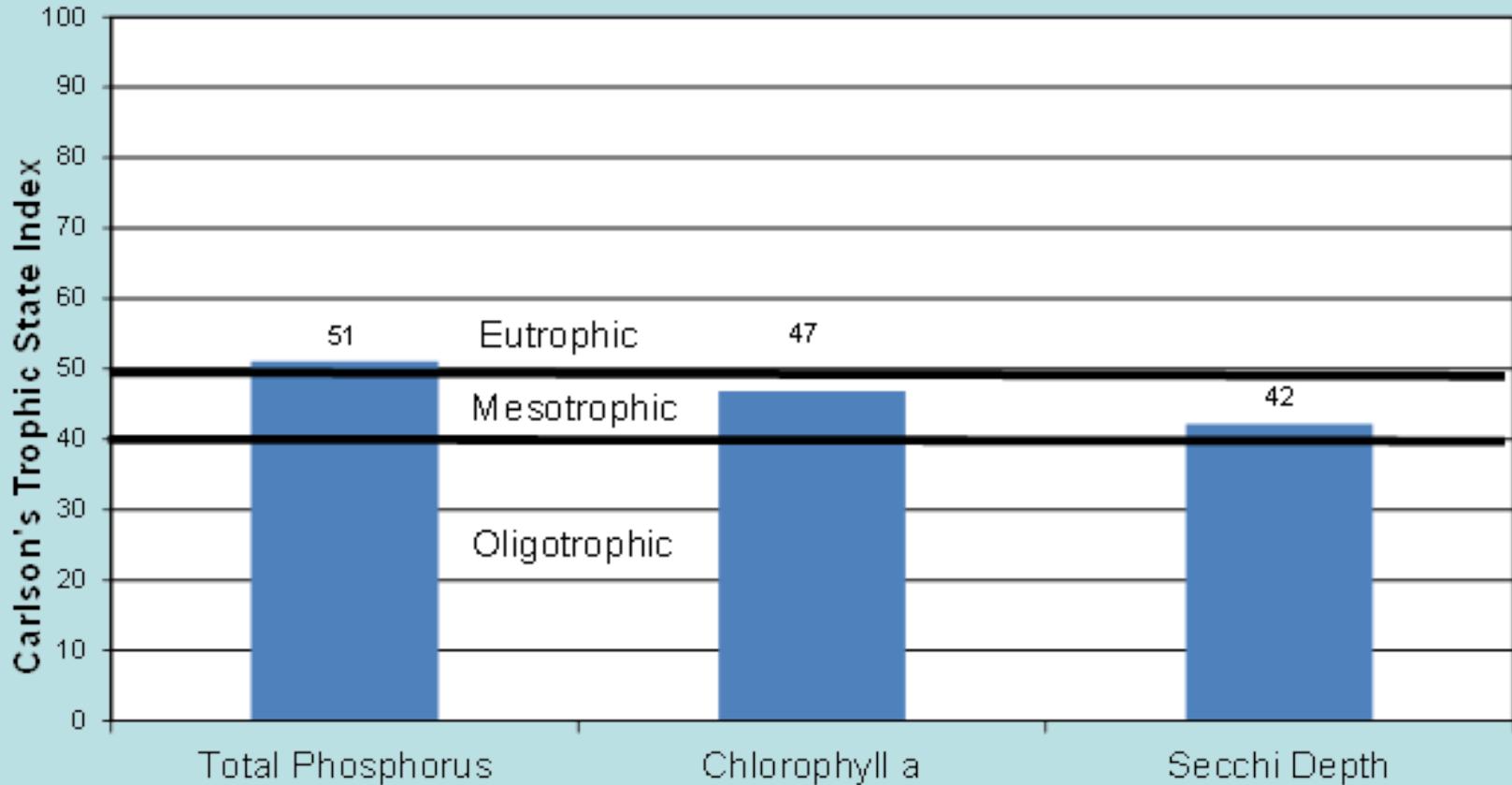
# Chlorophyll a



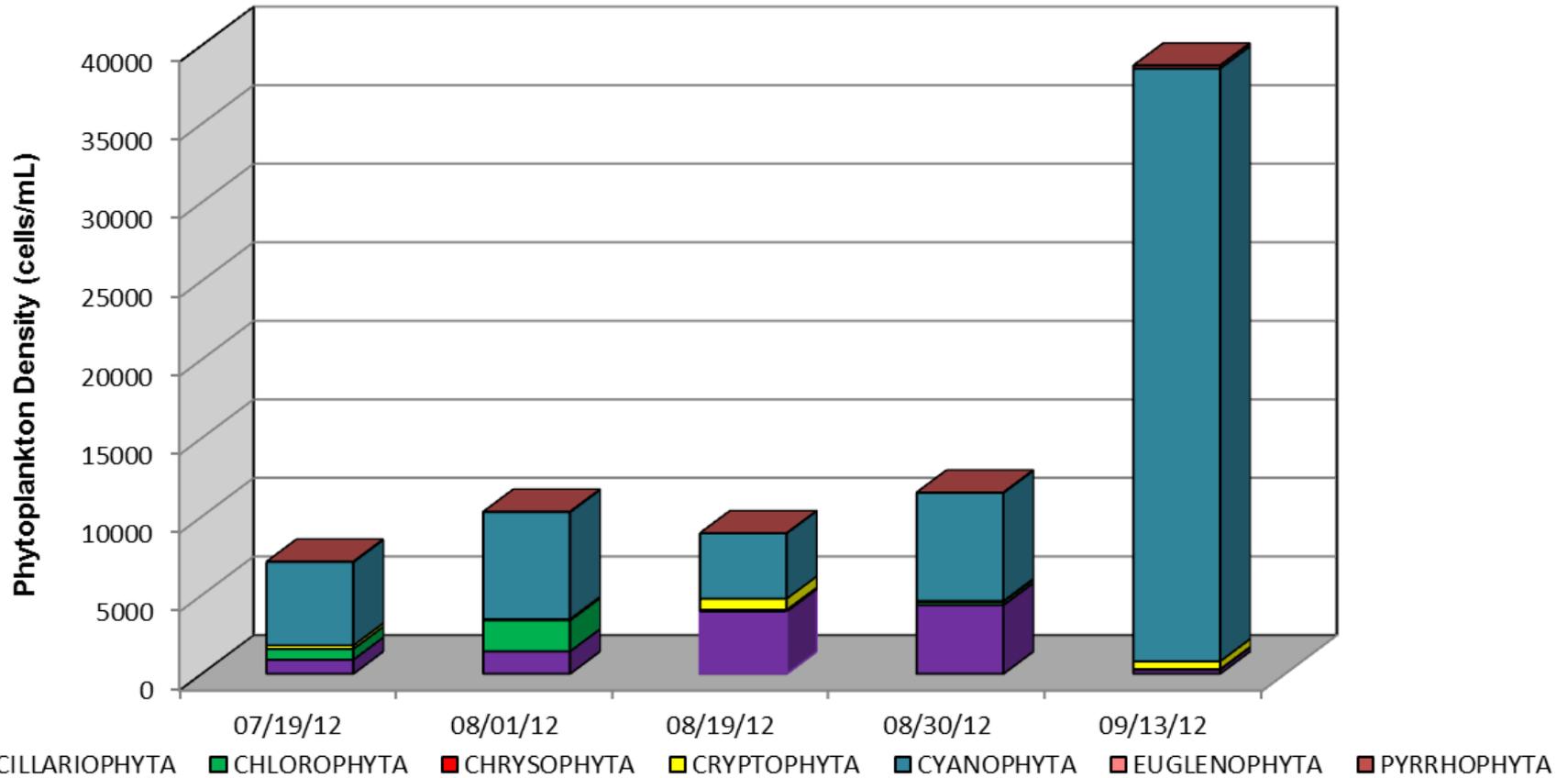
# Secchi Disk Transparency



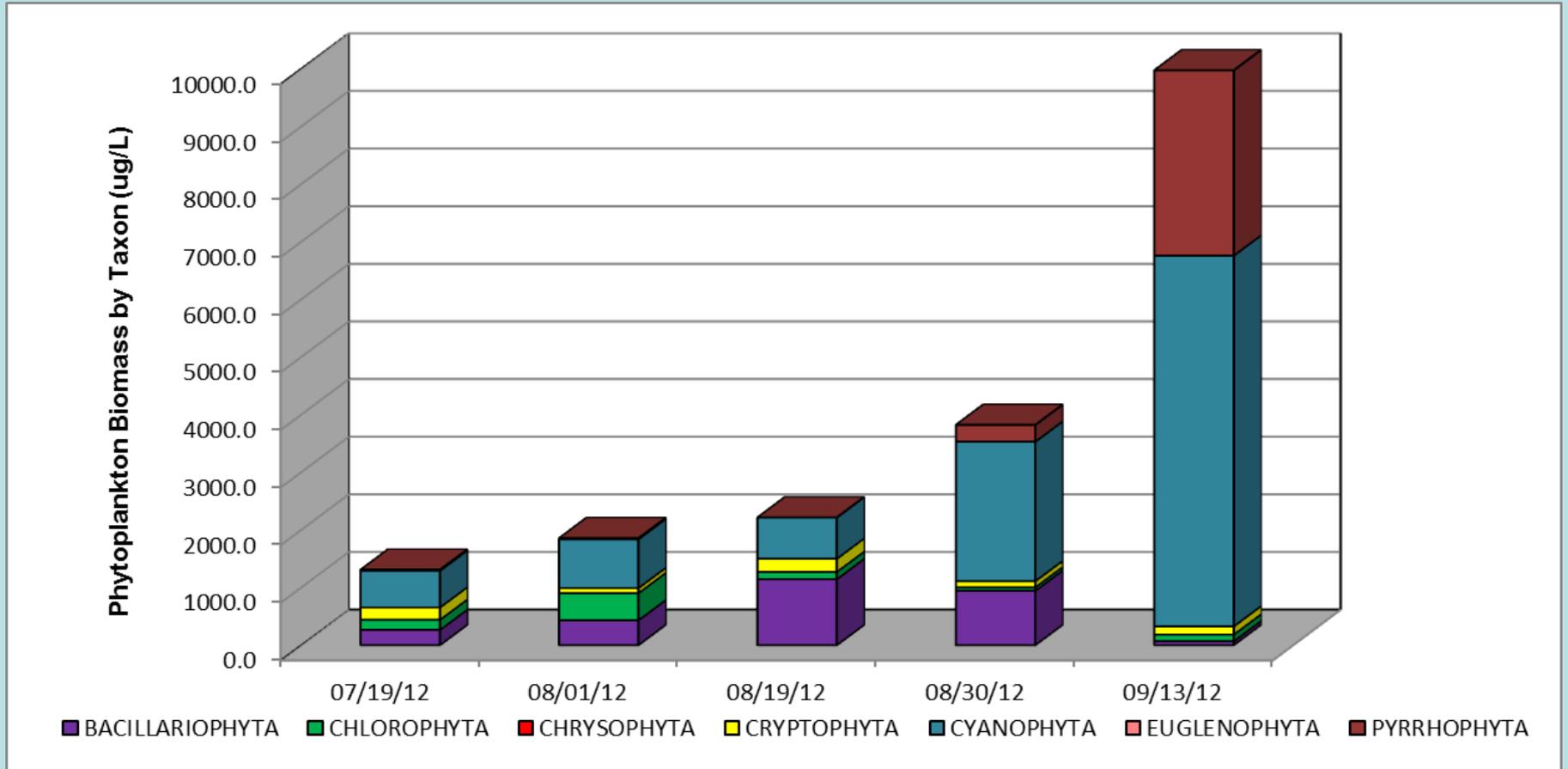
# Carlson's Trophic State Index

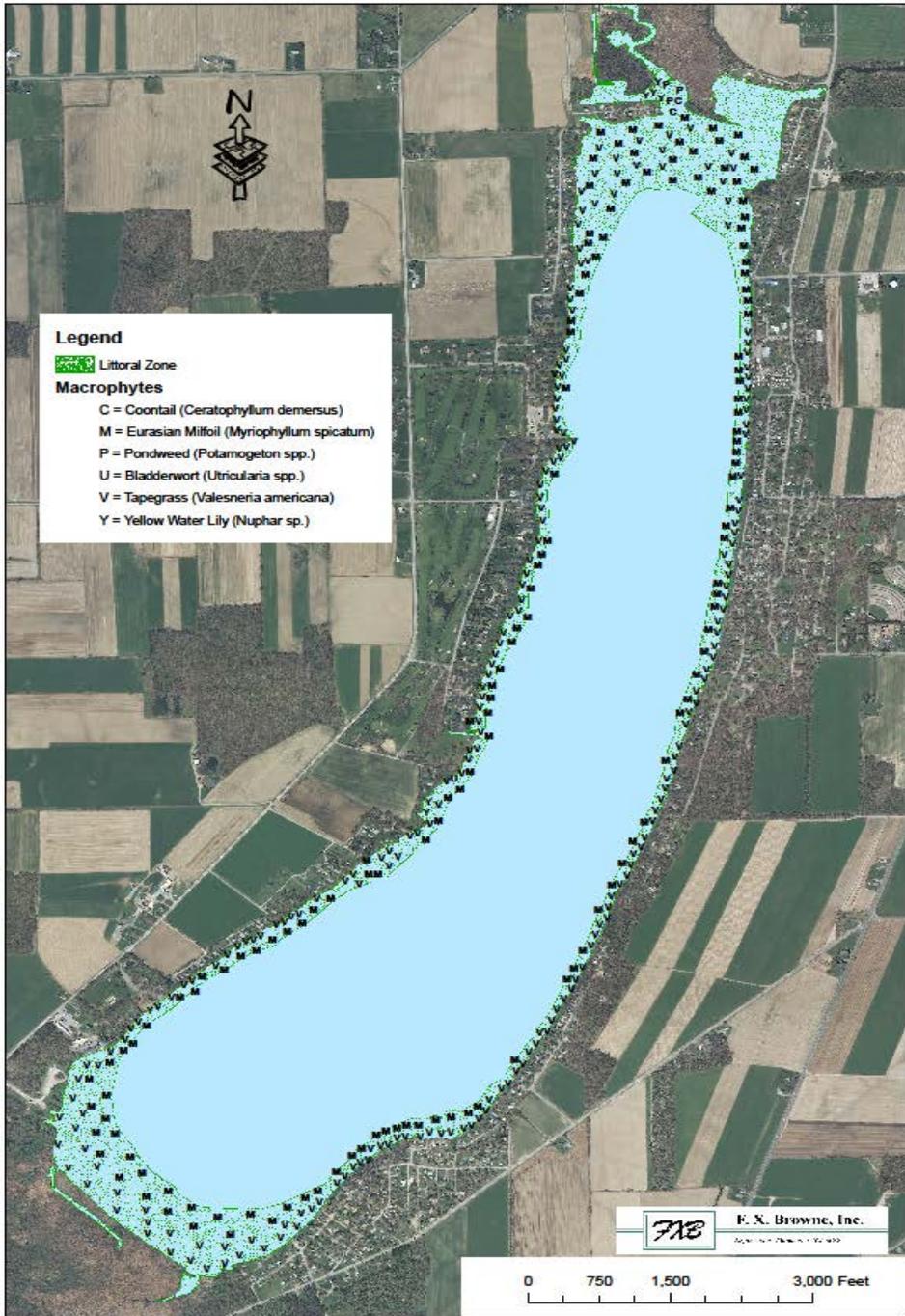


# Phytoplankton (Density)



# Phytoplankton (Biomass)





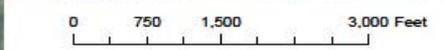
**Legend**

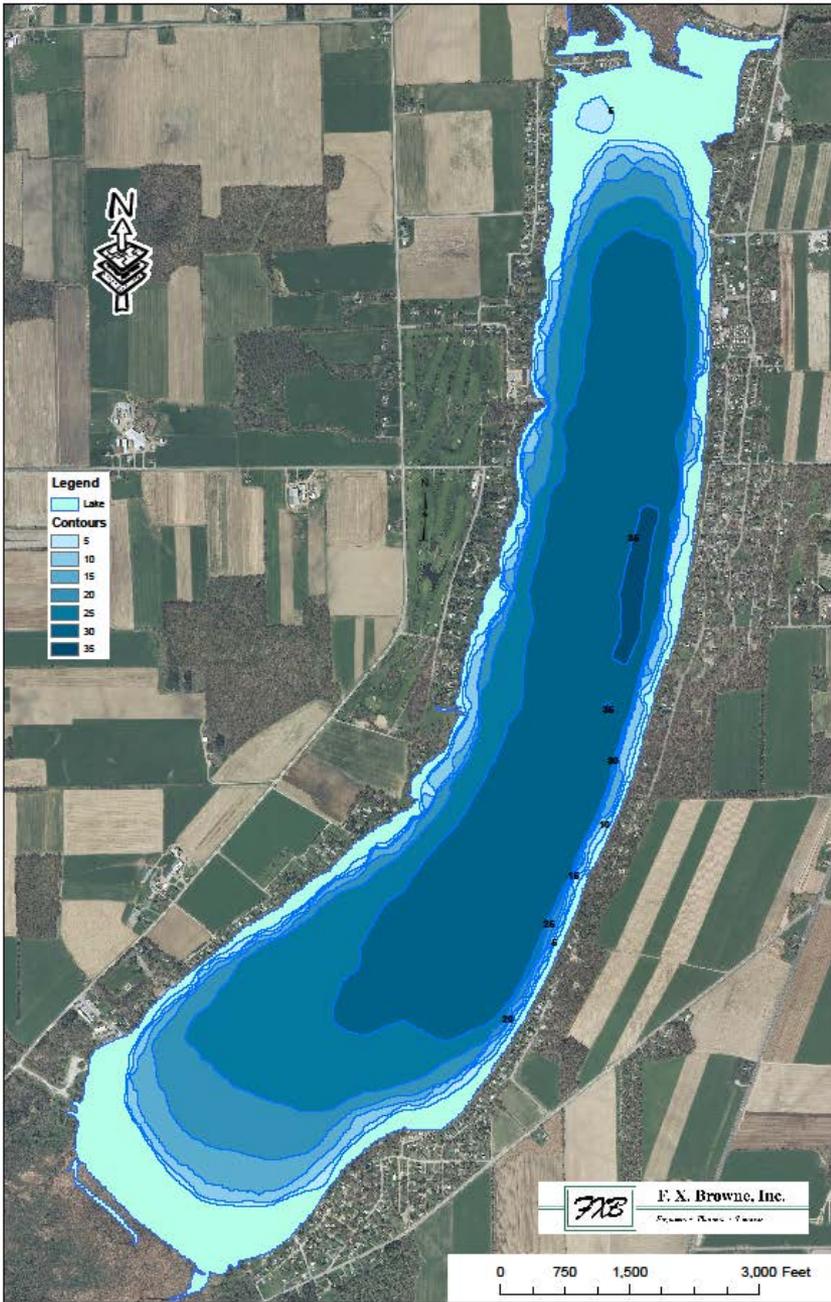
 Littoral Zone

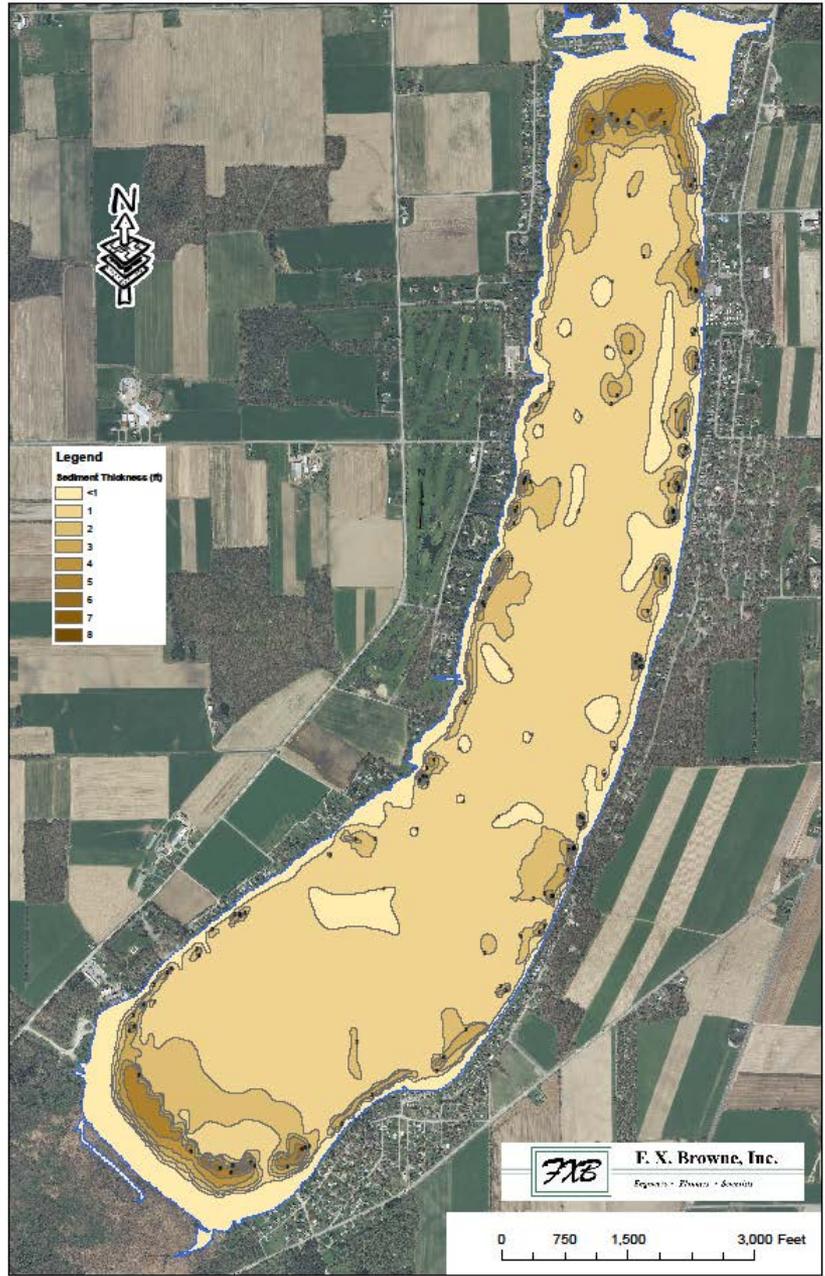
**Macrophytes**

C = Coontail (*Ceratophyllum demersus*)  
M = Eurasian Milfoil (*Myriophyllum spicatum*)  
P = Pondweed (*Potamogeton* spp.)  
U = Bladderwort (*Utricularia* spp.)  
V = Tapegrass (*Valesneria americana*)  
Y = Yellow Water Lily (*Nuphar* sp.)

 F. X. Brown, Inc.







# Lake Problems

- **Excessive Algae (algal blooms)**
- **Excessive Macrophytes**
- **Dissolved Oxygen Depletion**

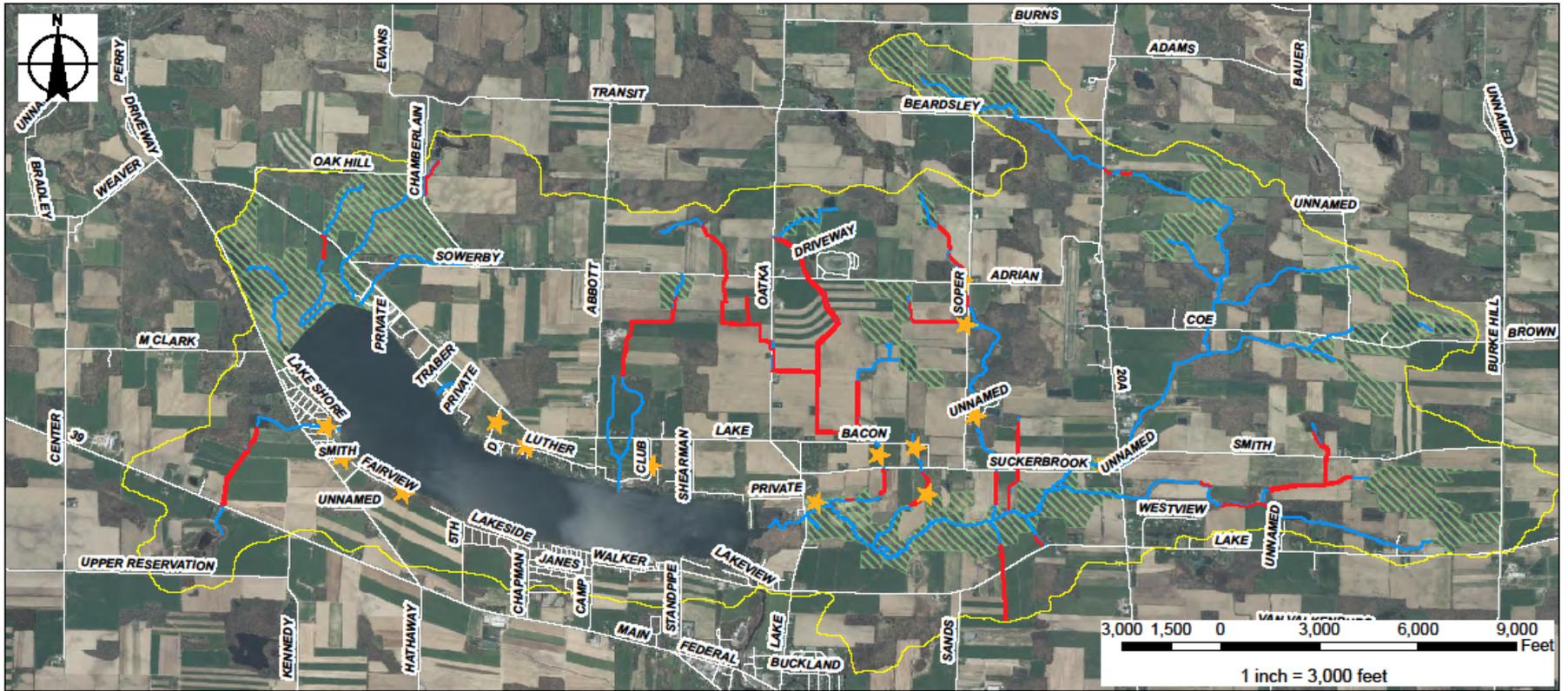
# Impacts of Eutrophication

- **Loss of Aesthetics**
- **Decrease in Recreational Value**
- **Decrease in Home Values**
- **Health Affects – due to toxins**

# Types of Problems in Silver Lake Watershed

- **Agriculture – Insufficient Buffers**
- **Insufficient stormwater controls for existing development**
- **Streambank erosion**

**Figure 4.1: Nutrient and Erosion Source Area Map**  
 Silver Lake Watershed, Wyoming County, New York



**F. X. Browne, Inc.**  
 Engineers • Planners • Scientists

Project No: NY1211-02  
 File Name: Watershed Pollutant Source Map.mxd  
 Drawn By: JMD  
 Checked By: MRM

**NOTES:**

1. Data accuracy is limited to the accuracy and scale of the original data sources
2. This map are part of the Lake and Watershed Management Plan Project and should be used in conjunction with the compiled text.

**SOURCES:**

1. Silver Lake watershed, roads, and streams were obtained from NYSDEC & NYS GIS Clearinghouse.
2. Aerial imagery from WMS server maintained by NY USGS.
3. All other shapefiles created by F. X. Browne, Inc.

**Legend**

- Silver Lake Watershed
- ★ Possible Erosion Source
- Deficient Riparian Buffer
- Streams
- Roads
- Preservation Areas











# Lake Management Plan

- **In-lake management and treatment**
- **Watershed management**
- **Public education and outreach**

# **In-Lake Management Recommendations**

- **Macrophyte Control**
  - **Renovate or other Herbicide**
  - **Harvesting**
- **Lake Aeration – Hyplimnetic**
- **Batch Alum Treatment**
- **Dredging (Spot or Total)**

# Watershed Management

- **The ultimate lake management approach**
- **Control nutrients and sediments from entering lake**
  - **Control soil erosion and stormwater**
  - **Control existing and new development and land uses**
  - **Control Streambank Erosion**
  - **Control wastewater**

# Watershed Management for New Development

- **Implement low impact development approach**
  - Reduce impervious area
  - Infiltrate and evaporate stormwater
  - Reduce volume of stormwater
  - Treat stormwater

# Homeowner Management Activities

- **Minimize use of lawn fertilizers**
- **Don't mow to the edge of lake – maintain vegetative buffer**
- **Wash cars on grass**



# Homeowner Management Activities

- Clean up Pet Wastes
- Don't Feed Waterfowl



# Homeowner Management Activities

- Consider Rain Gardens
- Install Rain Barrels



A flourishing rain garden.



This rain garden is two years old. Weeds have a hard time growing. Birds and butterflies are regular visitors to the garden.



# Agricultural BMPs

- Silver Lake Watershed Commission should work with WCSWCD and Farmers to continue implementation of Ag BMPs
- Encourage New Buffers and Enhanced Buffers

# Streambank Restoration





Marlene R. Martin, P.E.

F. X Browne, Inc

[www.fx Browne.com](http://www.fx Browne.com)