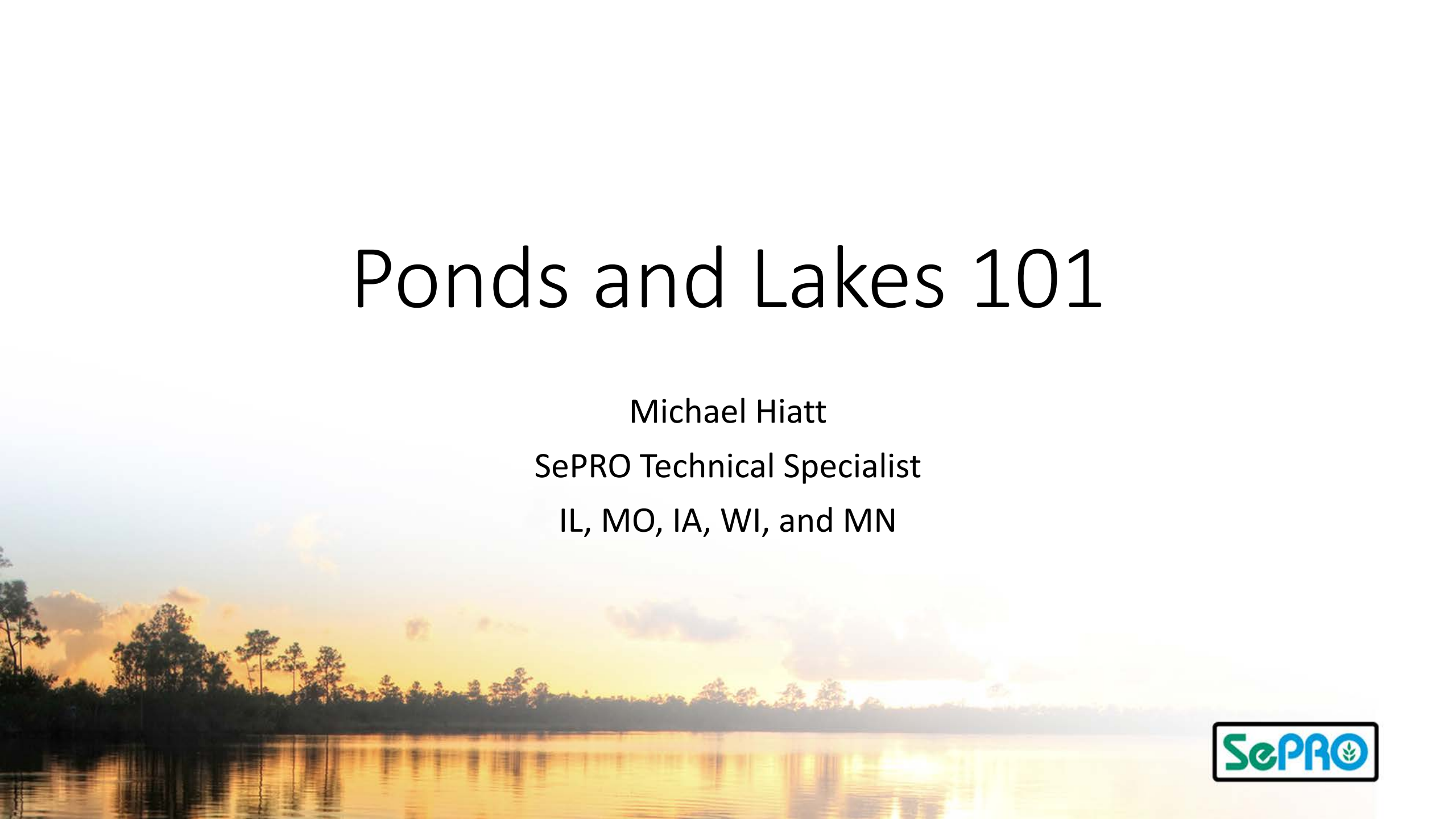
Ponds and Lakes 101

Michael Hiatt

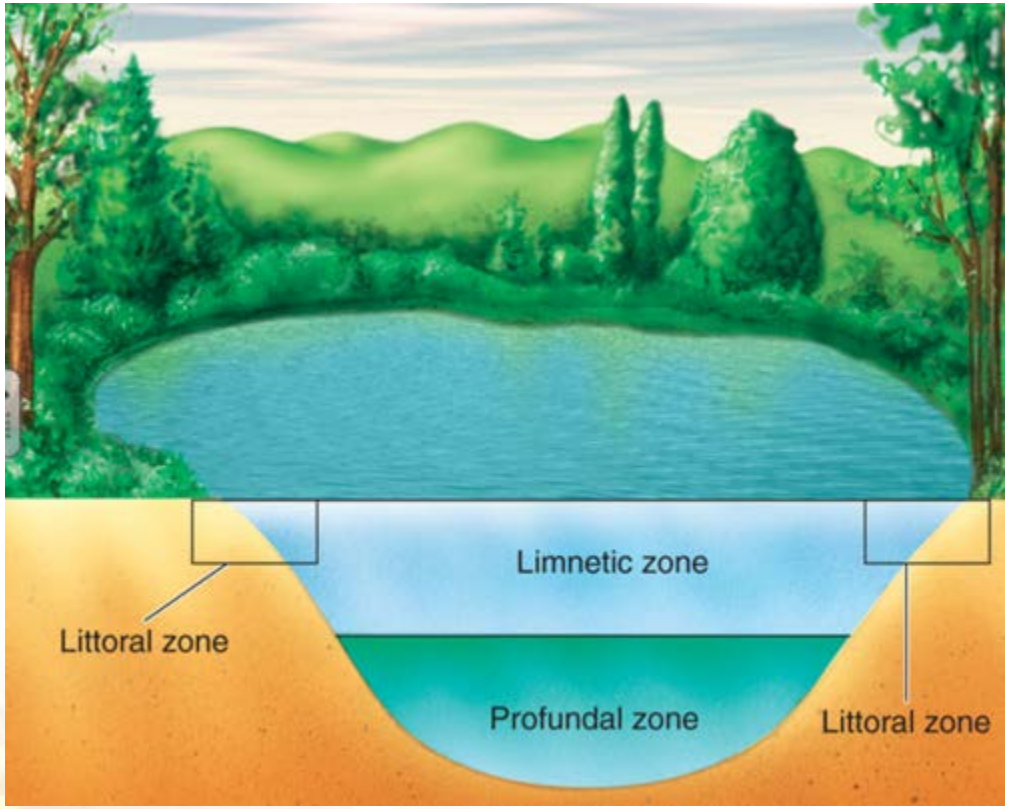
SePRO Technical Specialist

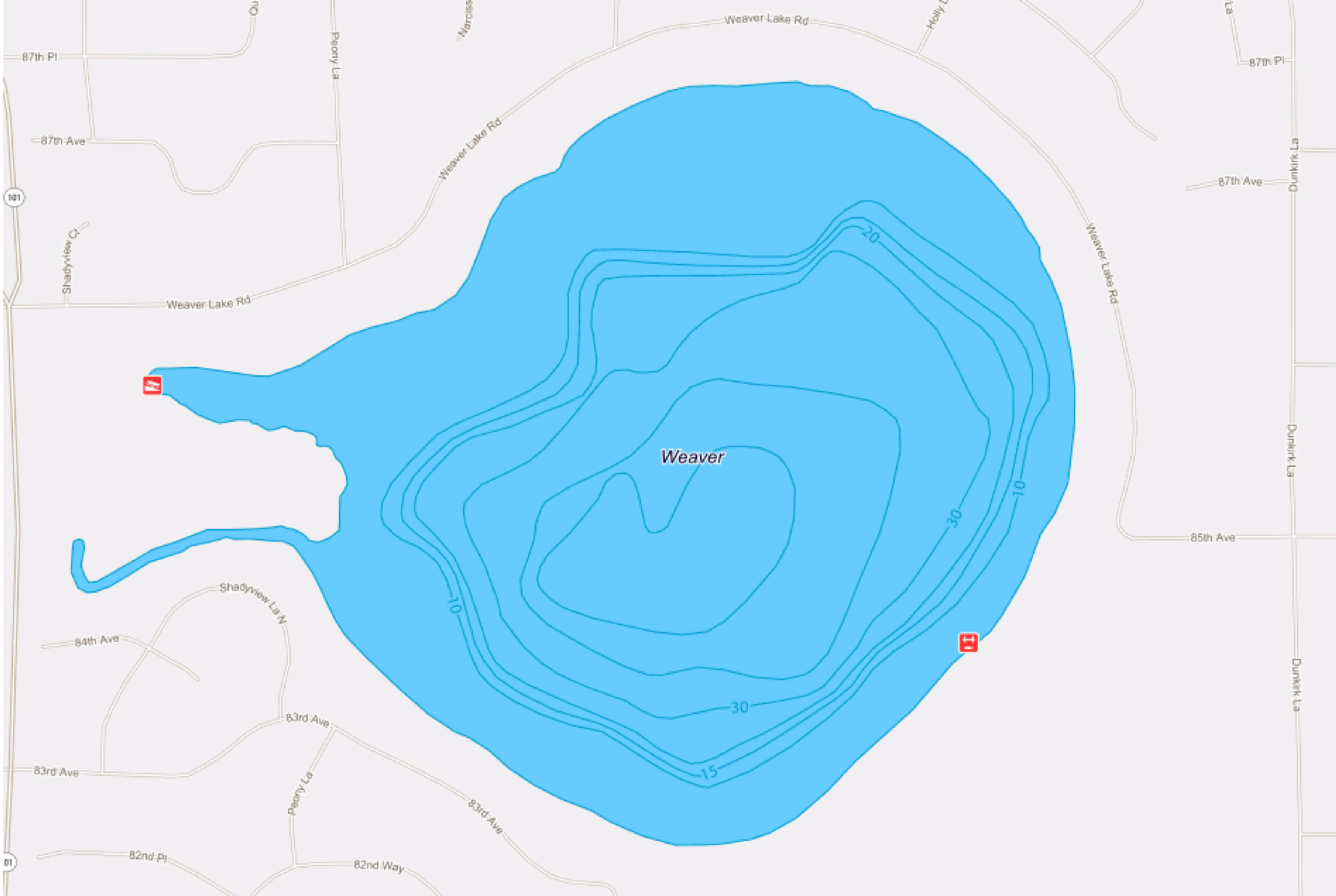
IL, MO, IA, WI, and MN



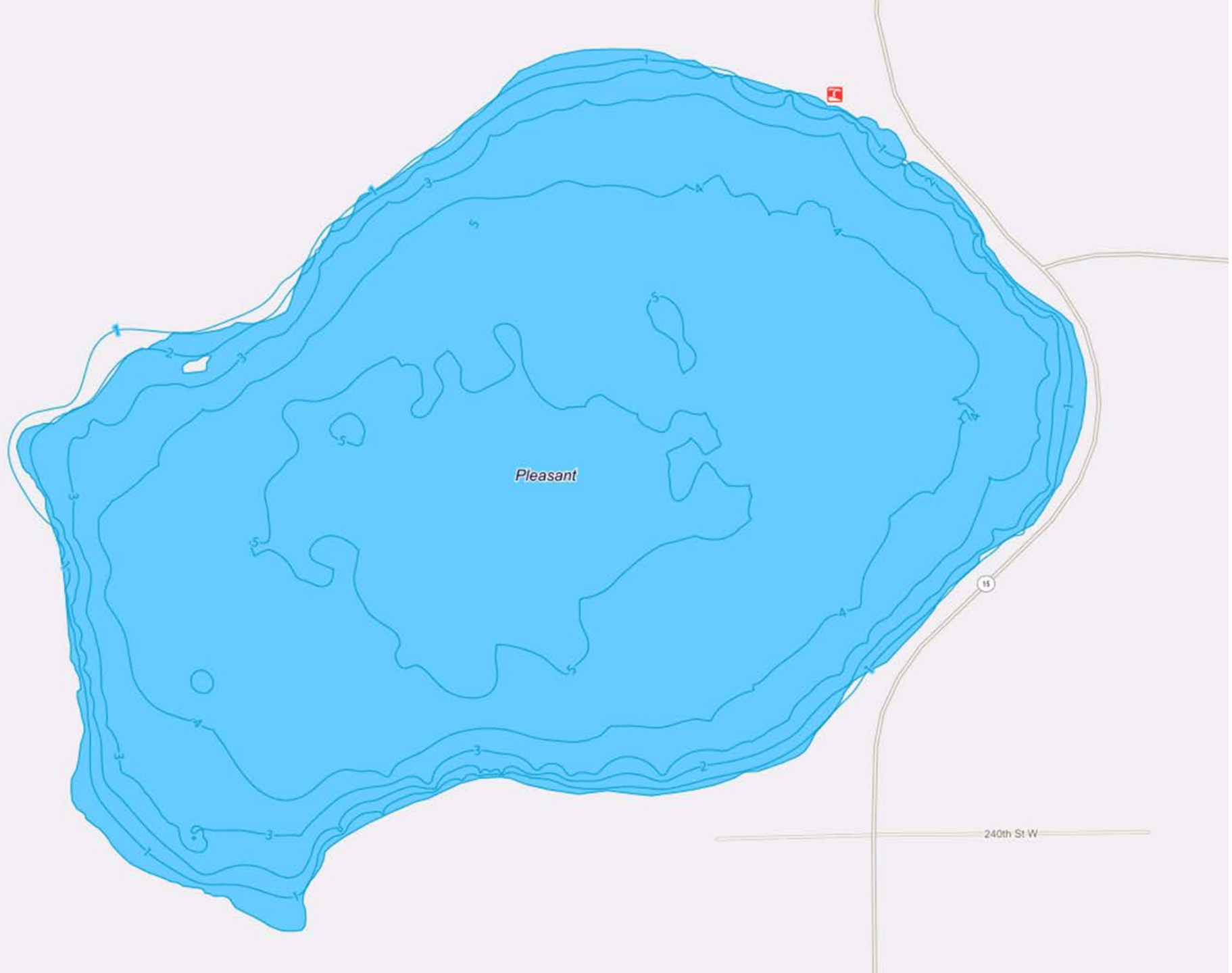
Zones

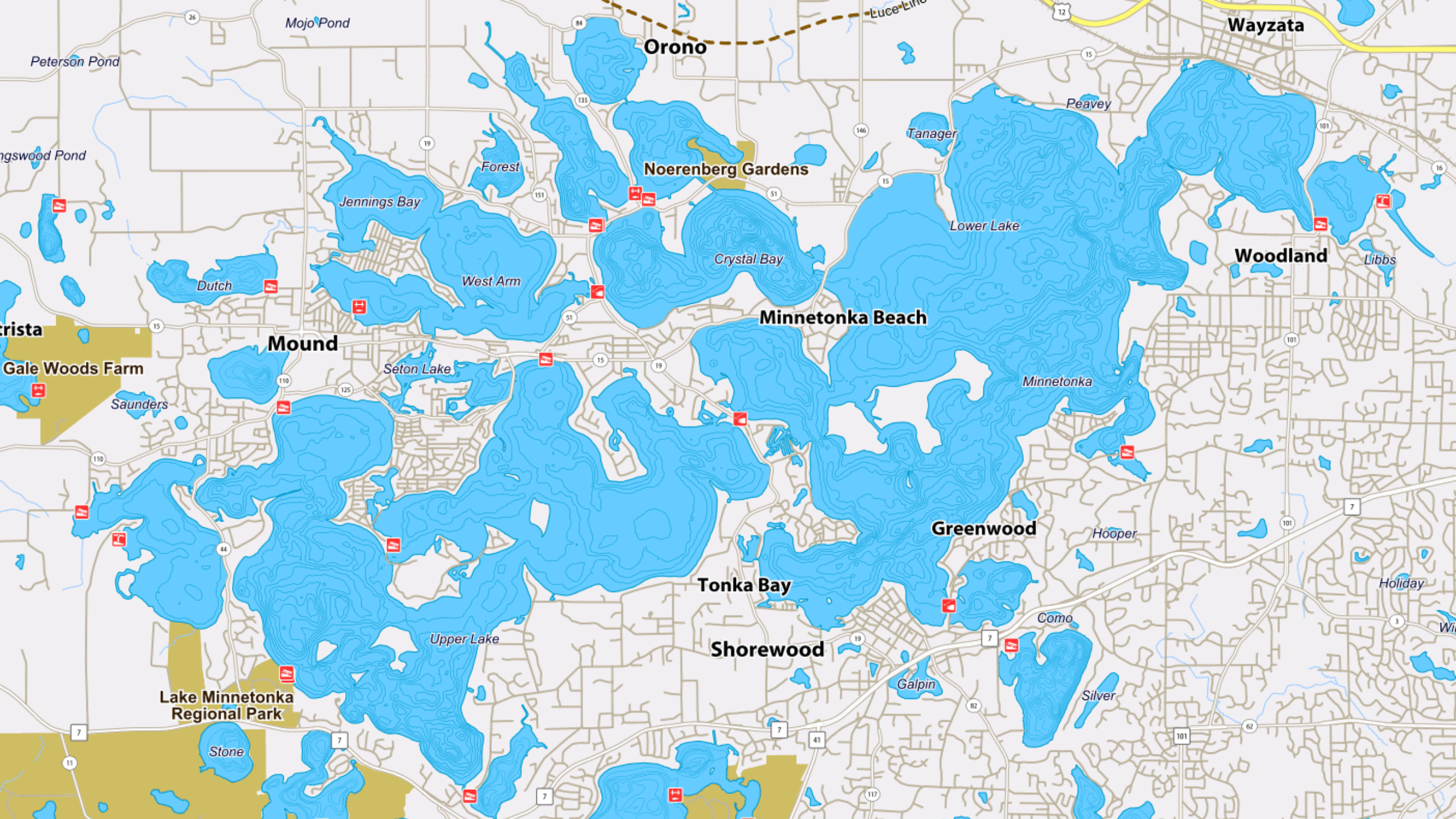
- Littoral
  - Shallow, near-shore. Weed growth
- Limnetic
  - Openwater. Plenty of light
- Profundal
  - Below effective light penetration





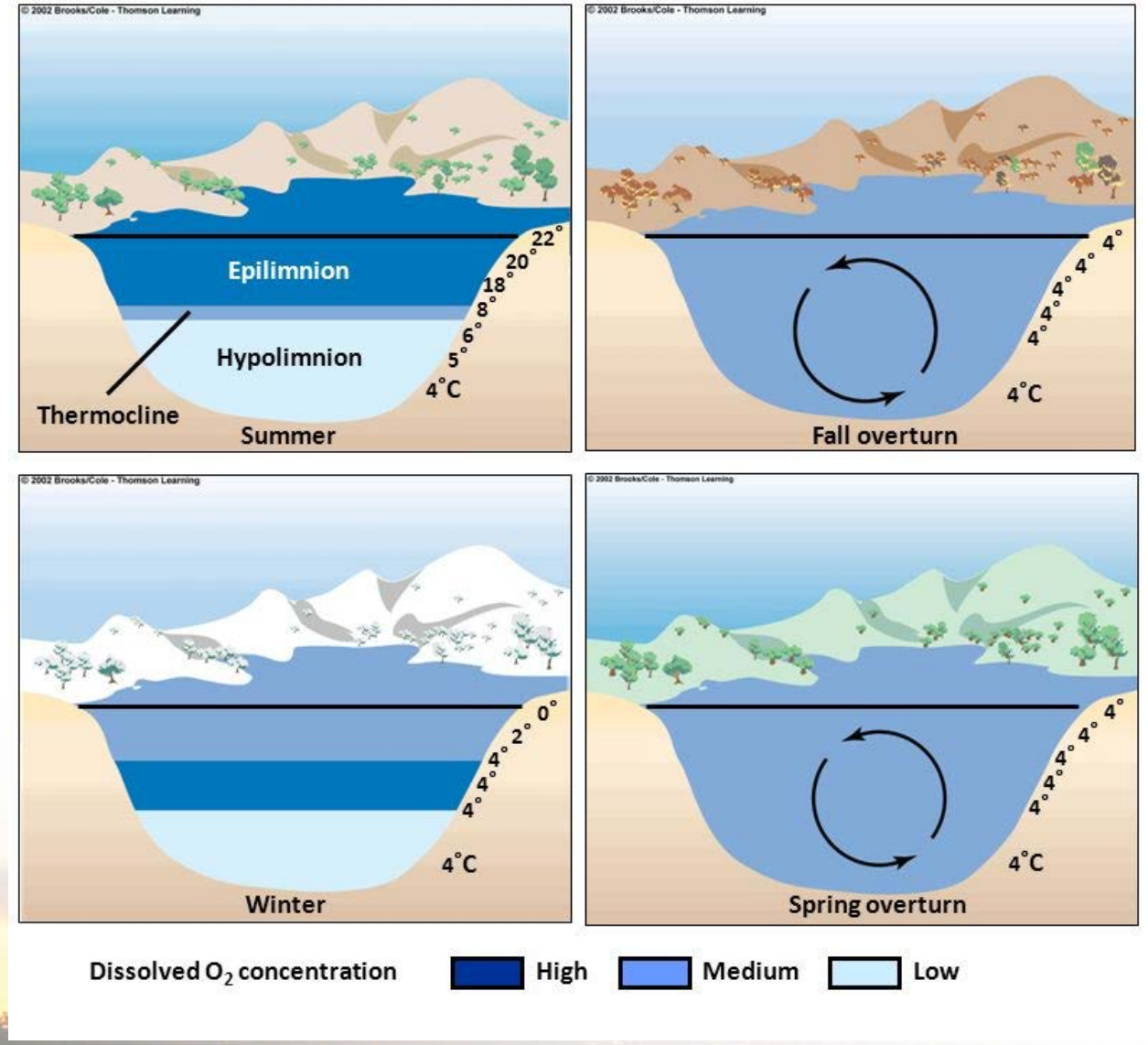
Weaver
Weaver Lake Rd
Weaver Lake Rd
Weaver Lake Rd
Weaver Lake Rd
87th Pl
87th Ave
87th Pl
87th Ave
Peony La
Shadyview Ct
101
Dunkirk La
Dunkirk La
Dunkirk La
85th Ave
Shadyview La N
84th Ave
83rd Ave
83rd Ave
83rd Ave
Peony La
82nd Pl
82nd Way
10
20
30
10
30
10
30
15


Pleasant
15
240th St W

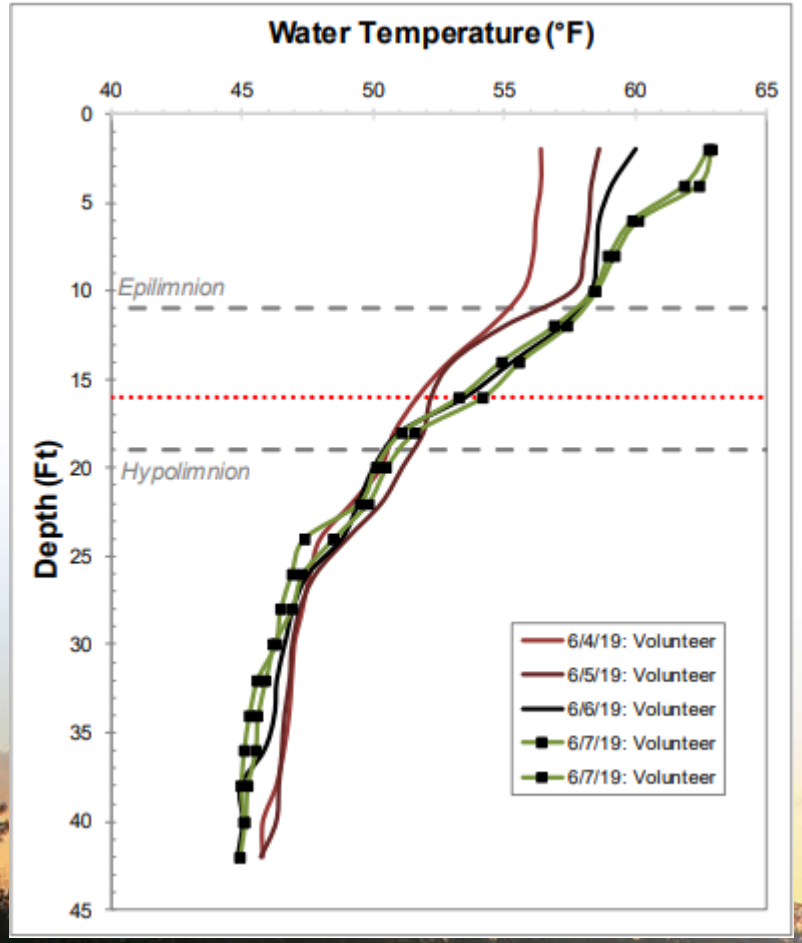

Mojo Pond
Peterson Pond
Orono
Wayzata
Peavey
Tanager
Forest
Noerenberg Gardens
Jennings Bay
Lower Lake
Crystal Bay
Woodland
Libbs
Dutch
West Arm
Minnetonka Beach
Mound
Gale Woods Farm
Seton Lake
Minnetonka
Saunders
Greenwood
Hooper
Tonka Bay
Holiday
Como
Upper Lake
Shorewood
Galpin
Silver
Lake Minnetonka
Regional Park
Stone

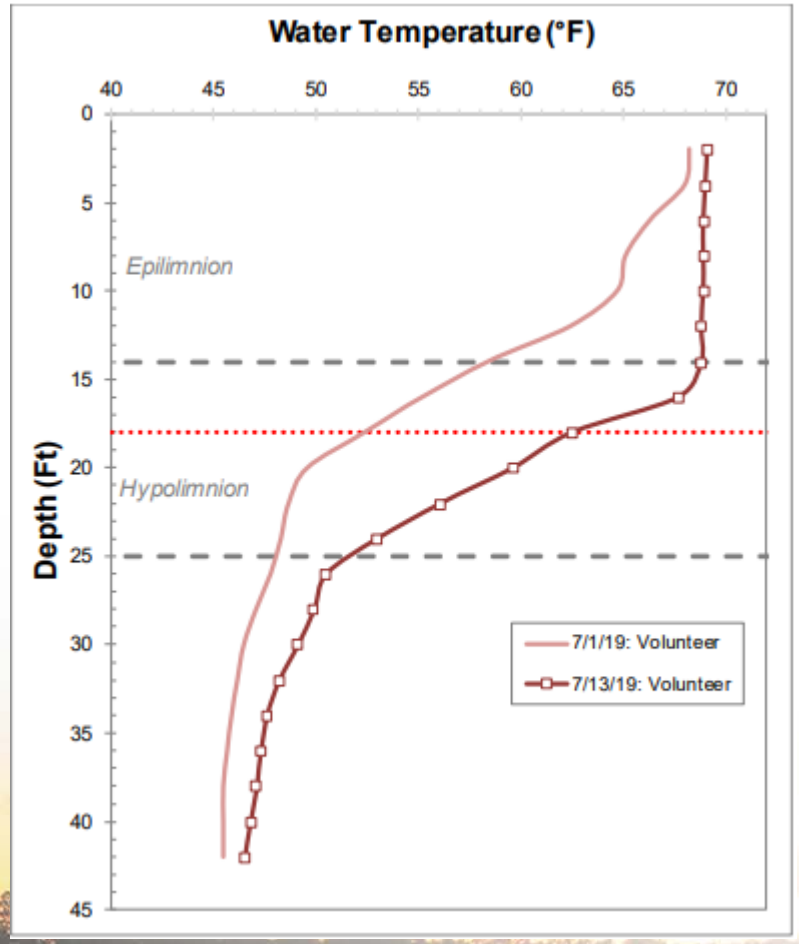
Stratification

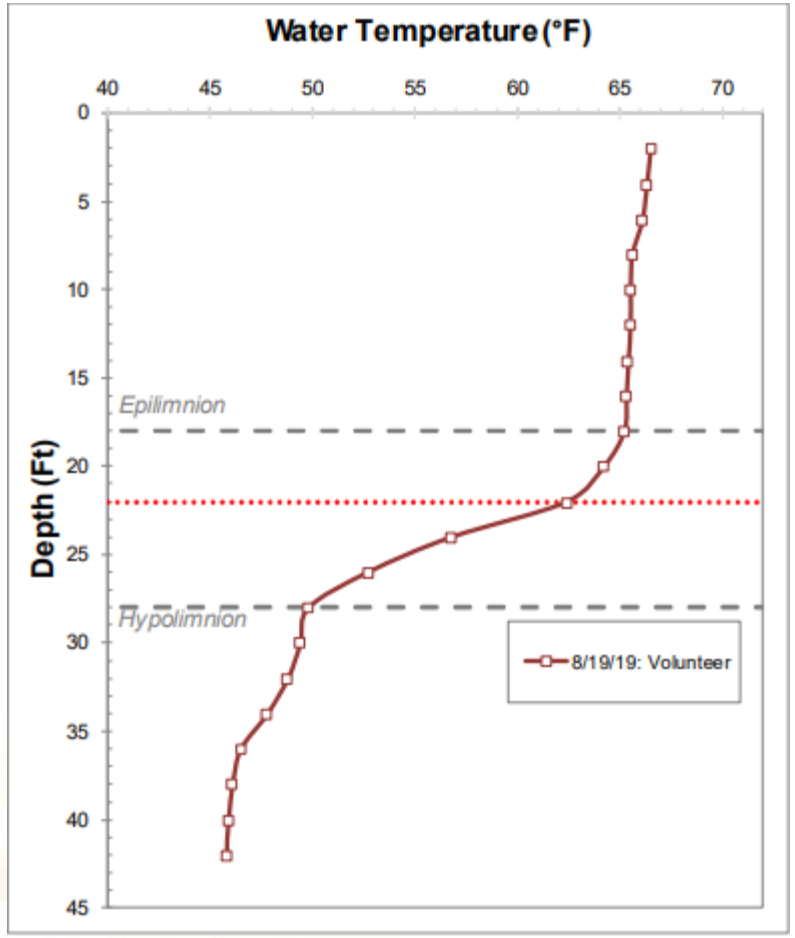
- Epilimnion
- Metalimnion/Thermocline
  - a steep temperature gradient in a body of water such as a lake, marked by a layer above and below which the water is at different temperatures.
- Hypolimnion



Stratification



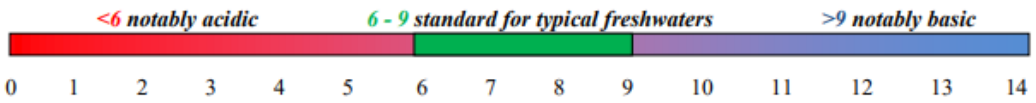




Water Body Health

- pH
- Hardness
- Alkalinity
- Conductivity
- Dissolved Oxygen
- Phosphorus
- Nitrogen
- Chlorphyll a
- Turbidity

pH: Measure of how acidic or basic the water is (pH 7 is considered neutral).



Hardness: Measure of the concentration of divalent cations, primarily consisting of calcium and magnesium in typical freshwaters. *0-60 mg/L as $CaCO_3$ soft; 61-120 moderately hard; 121-180 hard; > 181 very hard*

Alkalinity- Measure of the buffering capacity of water, primarily consisting of carbonate, bicarbonate and hydroxide in typical freshwaters. Waters with lower levels are more susceptible to pH shifts.
≤ 50 mg/L as $CaCO_3$ low buffered; 51-100 moderately buffered; 101-200 buffered; > 200 high buffered

Conductivity- Measure of the waters ability to transfer an electrical current, increases with more dissolved ions.
< 50 uS/cm relatively low concentration may not provide sufficient dissolved ions for ecosystem health; 50-1500 typical freshwaters; > 1500 may be stressful to some freshwater organisms, though not uncommon in many areas

Dissolved Oxygen- amount of diatomic oxygen dissolved in the water.
< 2 mg/L likely toxicity with sufficient exposure duration; < 5 stressful to many aquatic organisms; ≥ 5 able to support most fish and invertebrates

Phosphorus: Essential nutrient often correlating to growth of algae in freshwaters.

Total Phosphorus (TP) is the measure of all phosphorus in a sample as measured by persulfate strong digestion and includes: inorganic, oxidizable organic and polyphosphates. This includes what is readily available, potential to become available and stable forms.
<12 µg/L oligotrophic; 12-24 µg/L mesotrophic; 25-96 µg/L eutrophic; > 96 µg/L hypereutrophic

Free Reactive Phosphorus (FRP) is the measure of inorganic dissolved reactive phosphorus (PO_4^{-3}, HPO_4^{-2}, etc.). This form is readily available in the water column for algae growth.

Nitrogen: Essential nutrient that can enhance growth of algae.

Total N is all nitrogen in the sample (organic N^+ and Ammonia) determined by the sum of the measurements for Total Kjeldahl Nitrogen (TKN) and ionic forms.

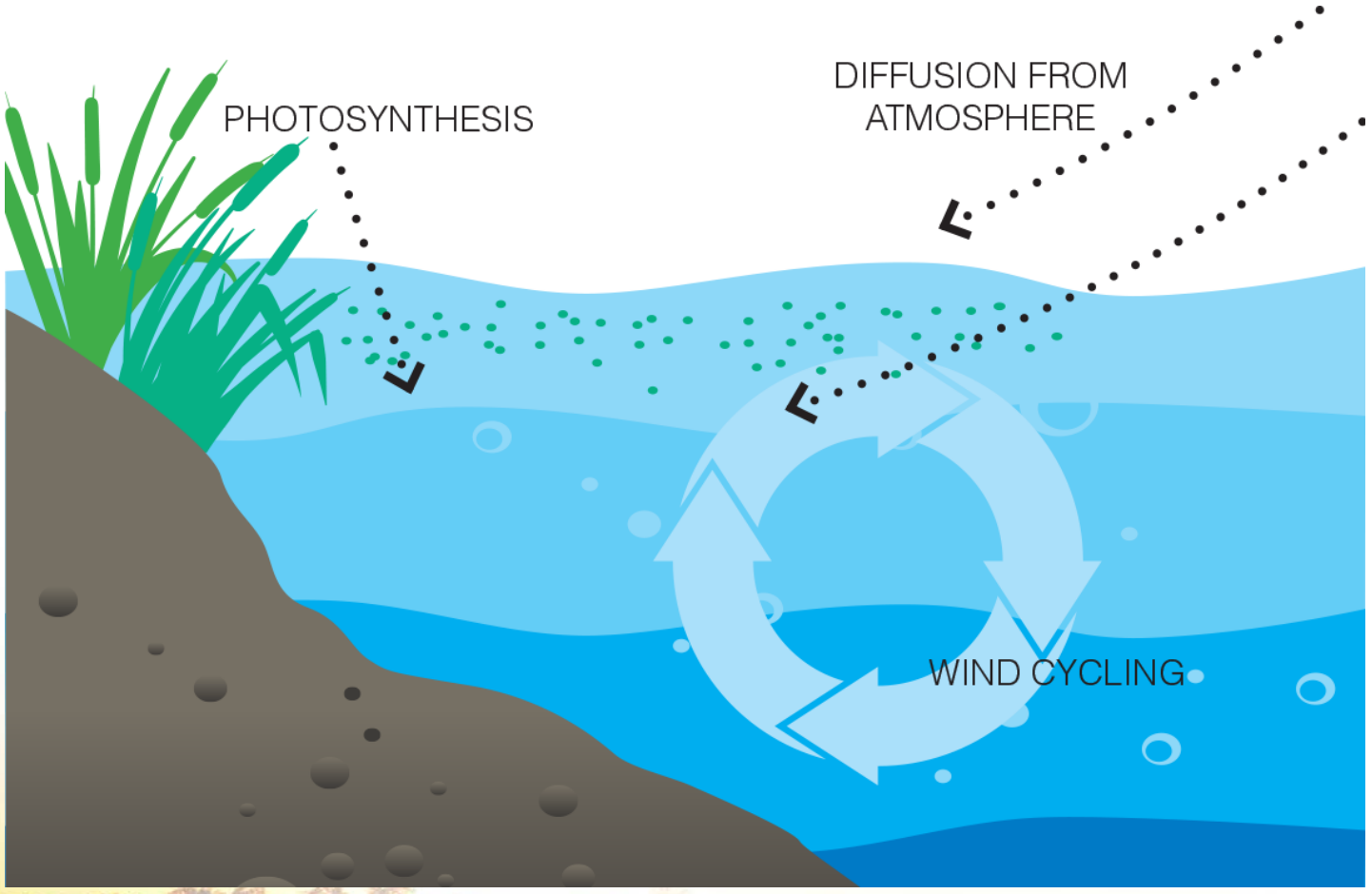
Nitrites and Nitrates are the sum of total oxidized nitrogen, often readily free for algae uptake.
< 1 mg/L typical freshwater; 1-10 potentially harmful; >10 possible toxicity, above many regulated guidelines

Chlorophyll *a*: primary light-harvesting pigment found in algae and a measure of the algal productivity and water quality in a system.
0-2.6µg/L oligotrophic; 2.7-20 µg/L mesotrophic; 21-56 µg/L eutrophic; > 56 µg/L hypereutrophic

Turbidity- Measurement of water clarity. Suspended particulates (algae, clay, silt, dead organic matter) are the common constituents impacting turbidity.
< 10 NTU drinking water standards and typical trout waters; 10-50 NTU moderate; > 50 NTU potential impact to aquatic life.

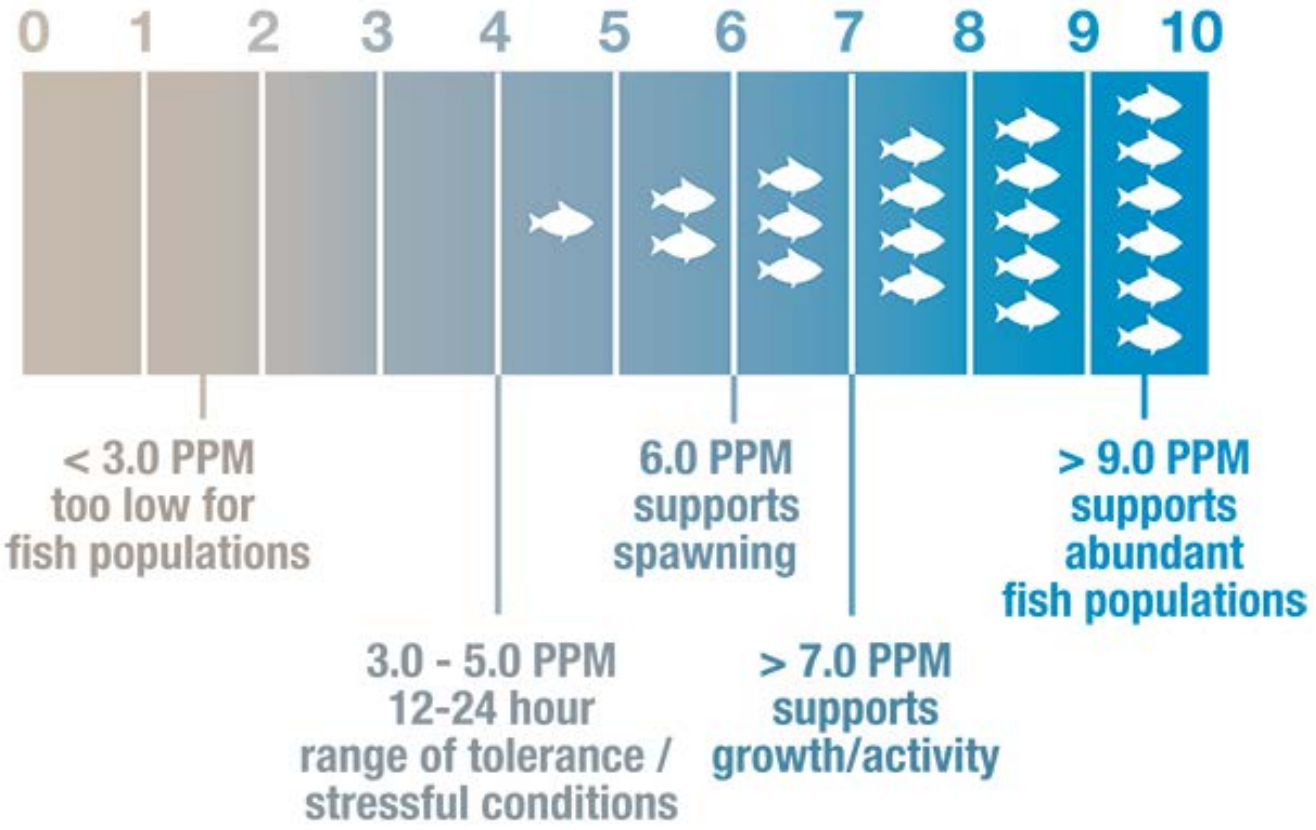
Dissolved Oxygen

- 2 Main Sources
  - Atmospheric mixing
  - Photosynthesis



RANGE OF TOLERANCE FOR DISSOVED OXYGEN IN FISH

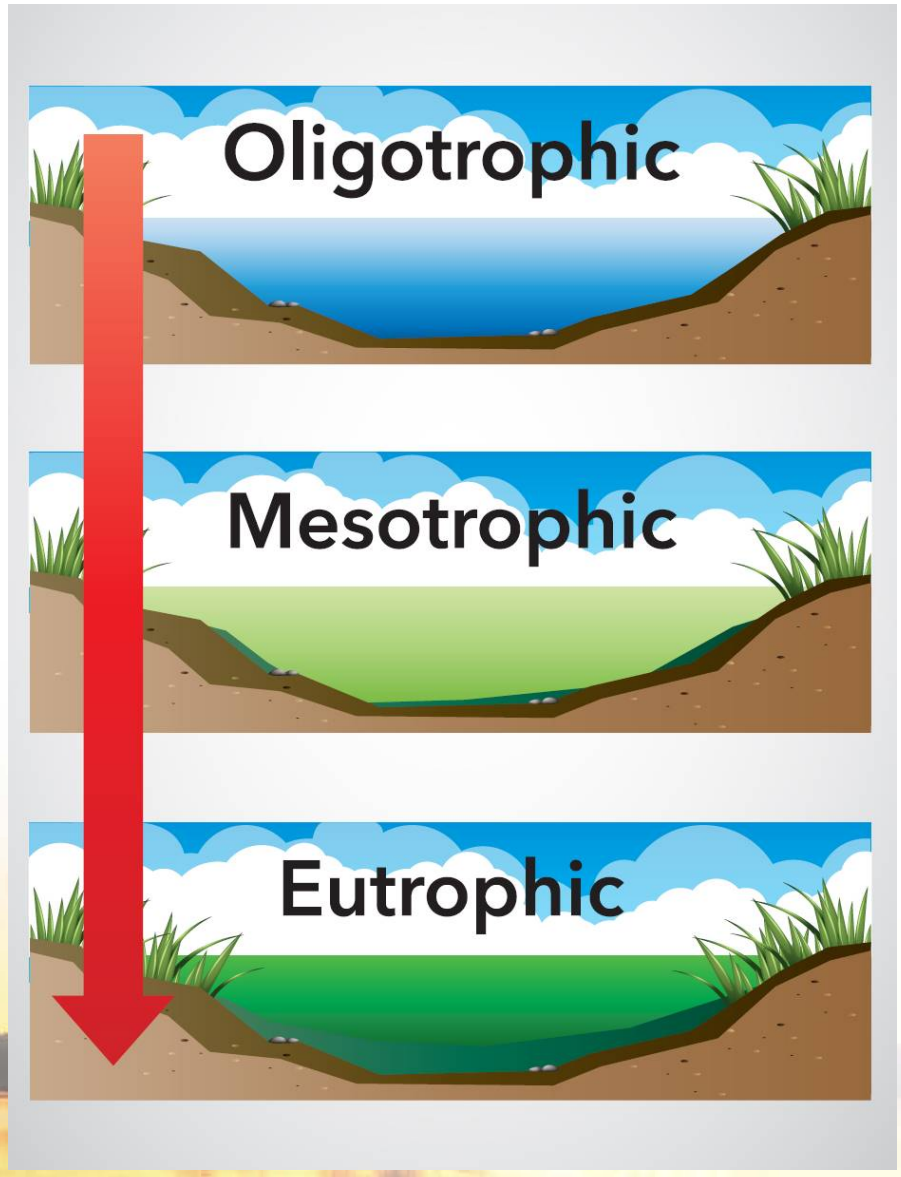
PARTS PER MILLION (PPM) DISSOLVED OXYGEN



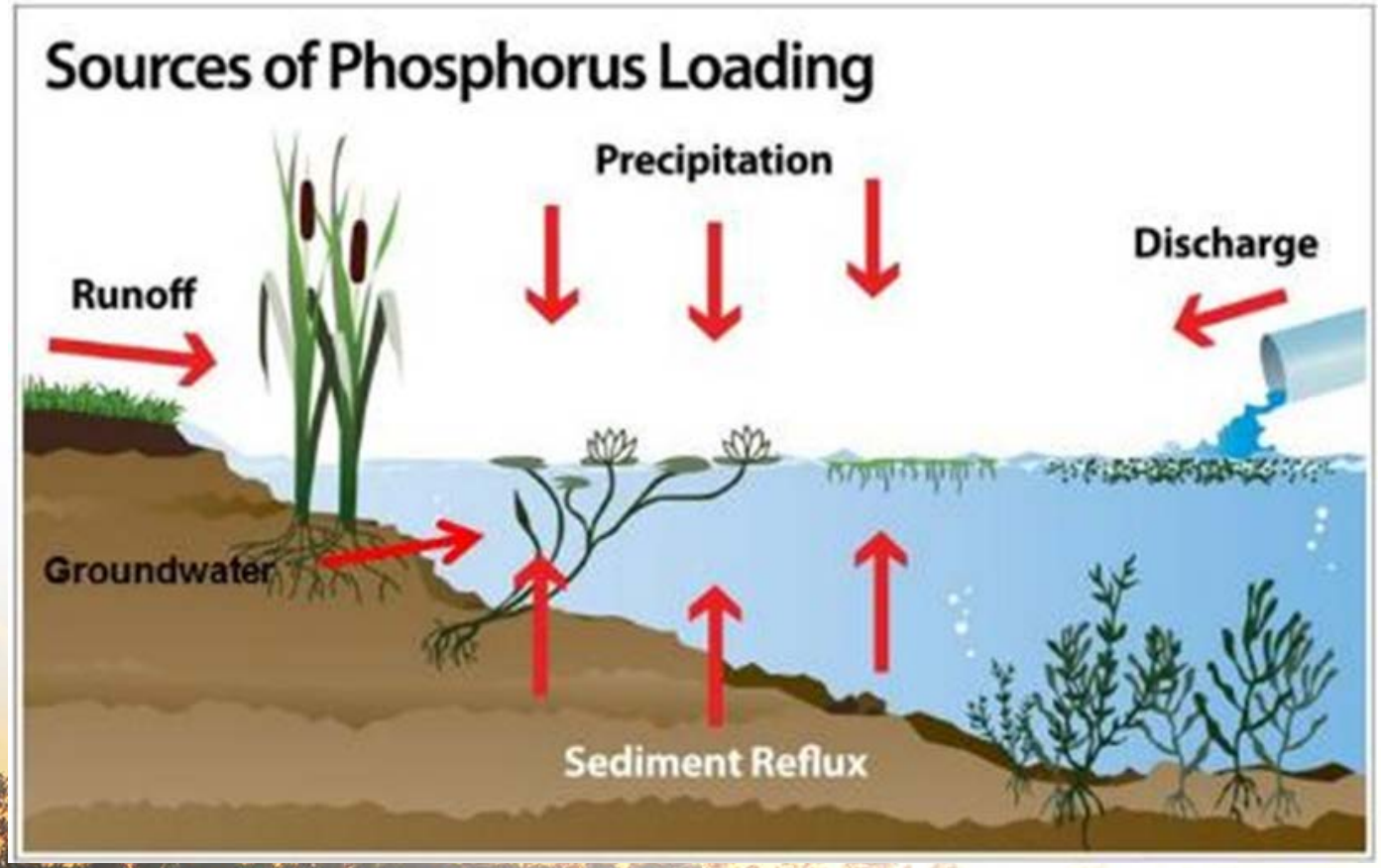
SePRO

Nutrients

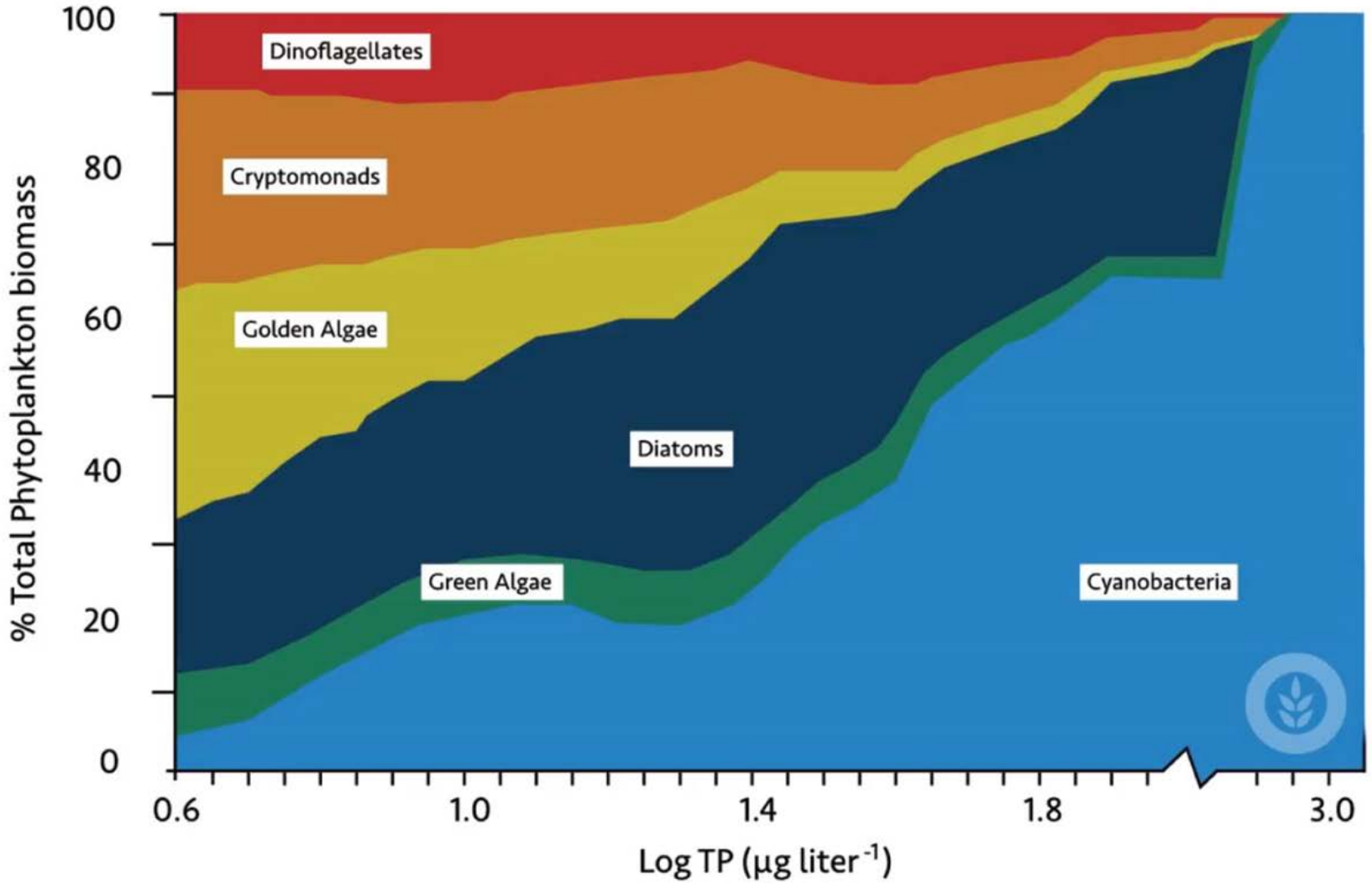
- Phosphorus
- Nitrogen



Phosphorus

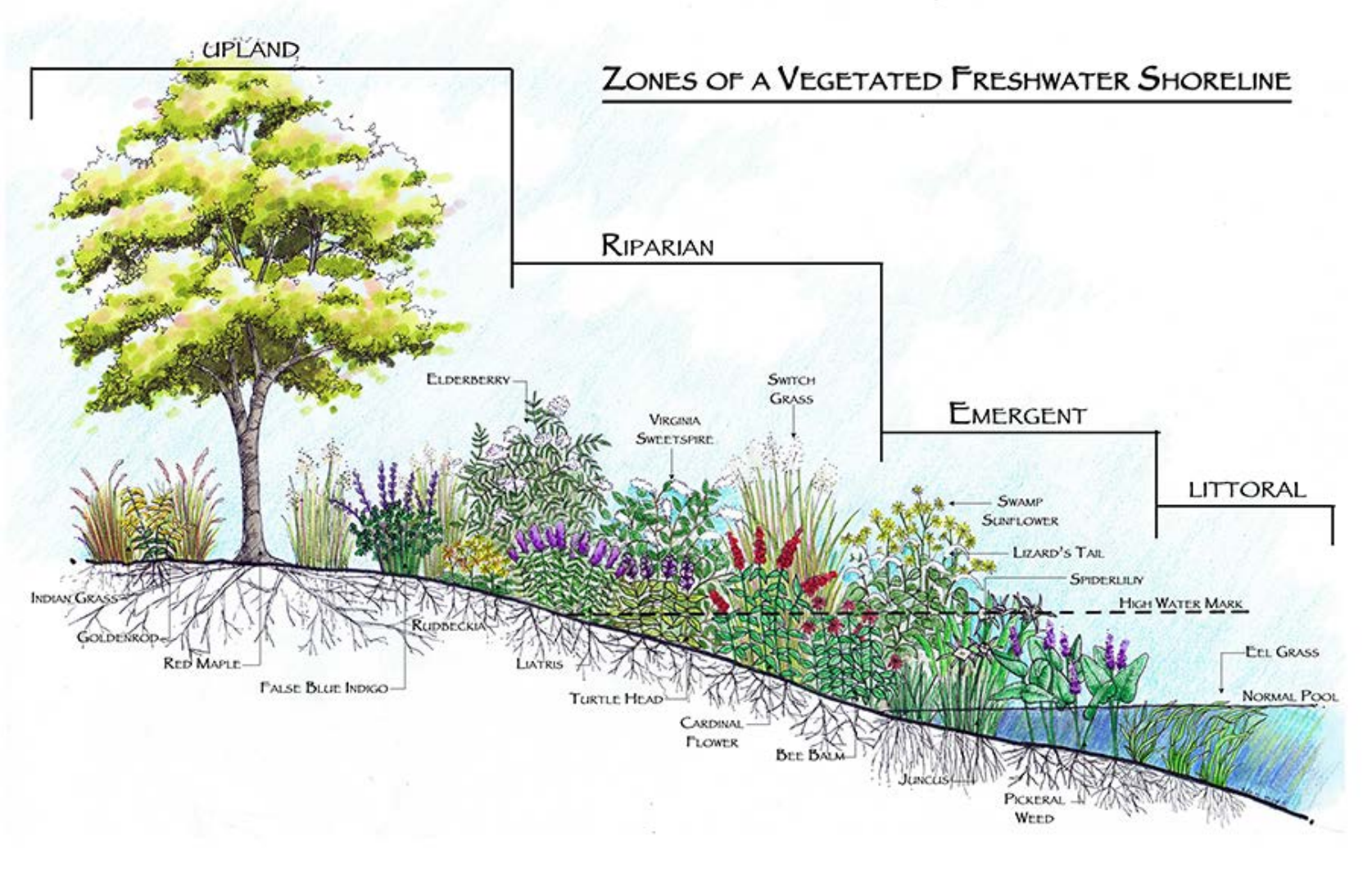

Sources of Phosphorus Loading
Precipitation
Discharge
Runoff
Groundwater
Sediment Reflux

Algae Presence by Phosphorus Concentration

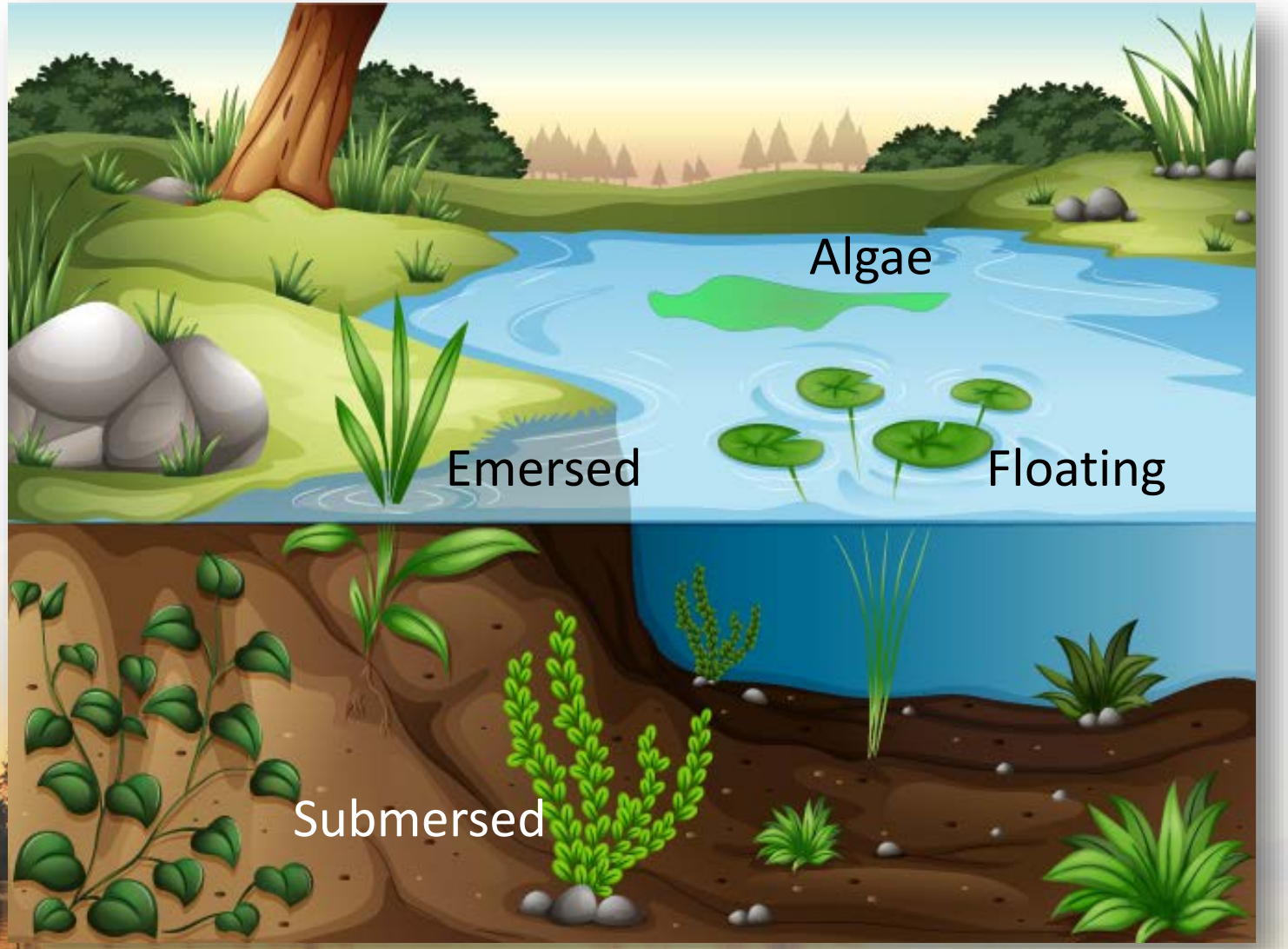


Watson SB, McCauley E, Downing JA 1997. Patterns in phytoplankton taxonomic composition across temperate lakes of different nutrient status. *Limnology and Oceanography* 42: 487–495.

Shoreline Health



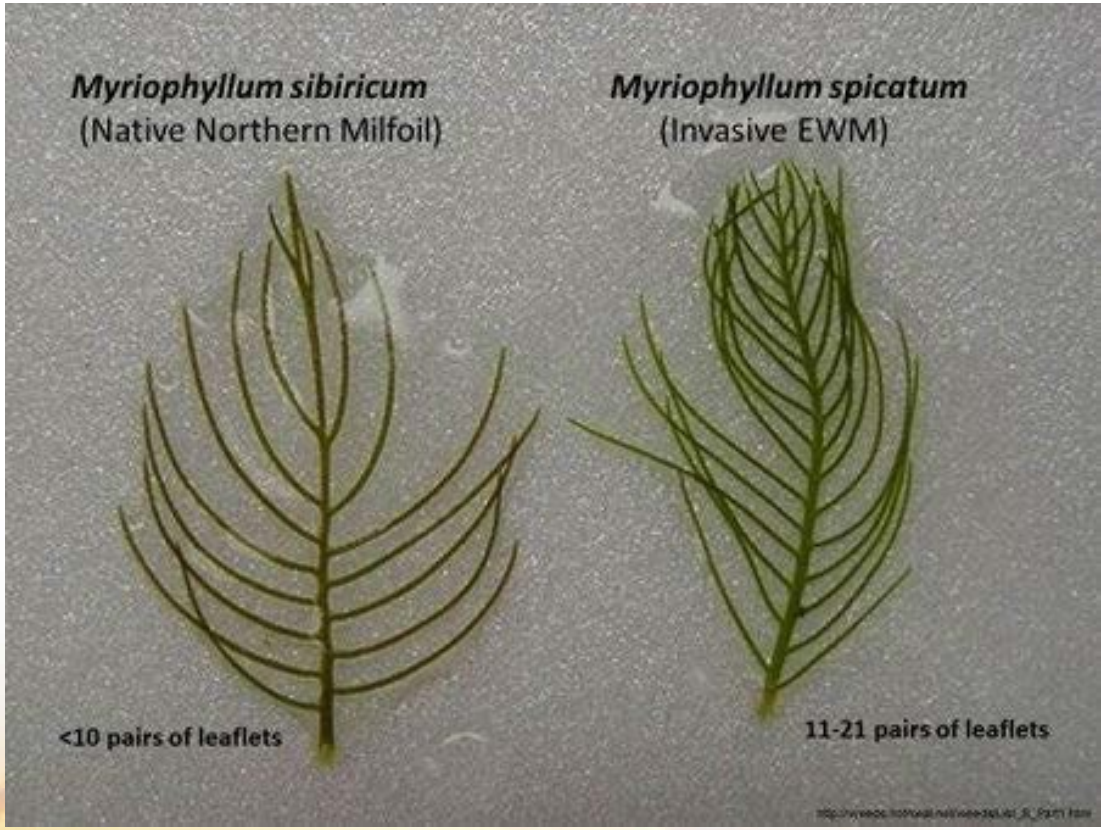
Aquatic Vegetation



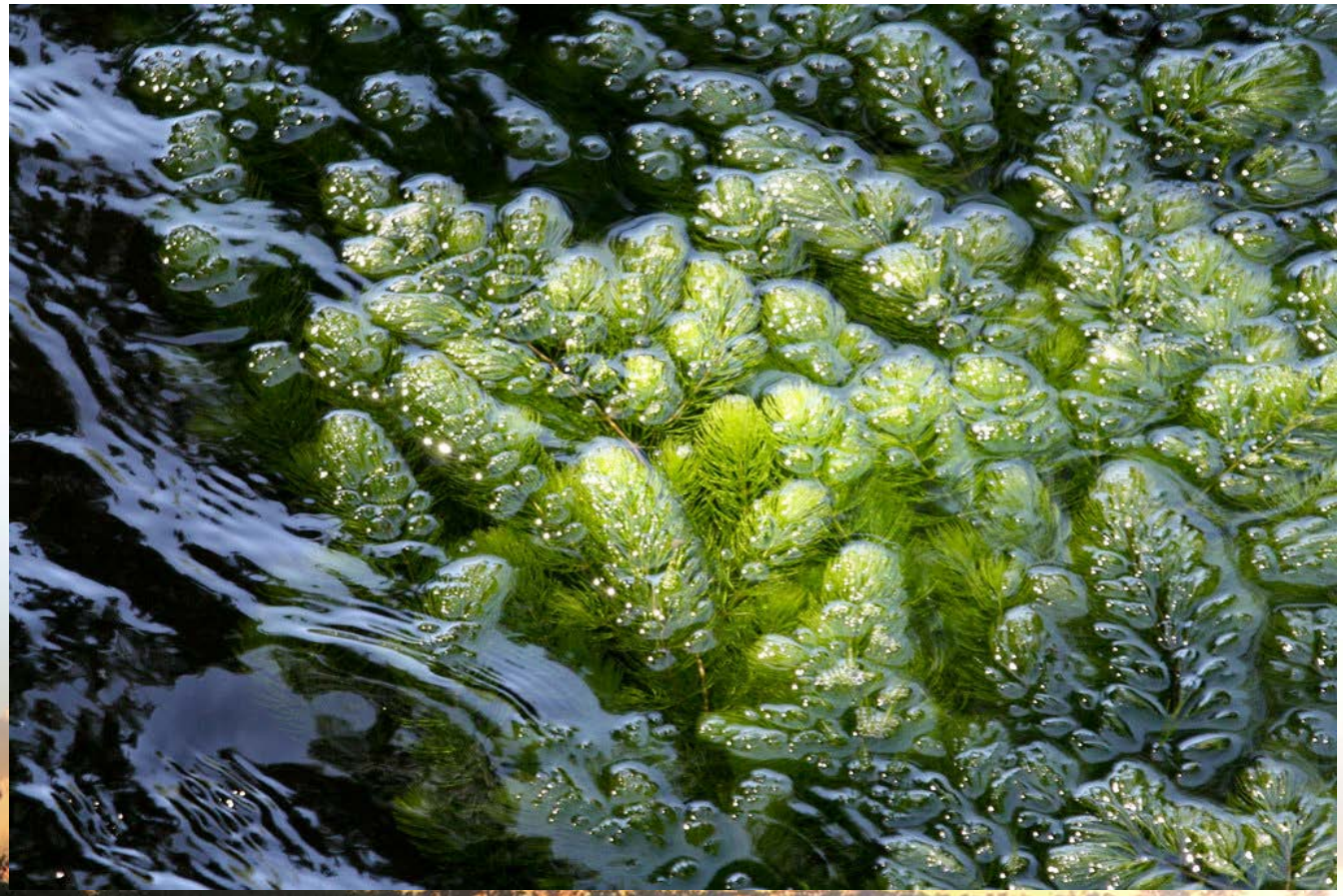
Plant ID

Plant ID

Plant ID


Myriophyllum sibiricum
(Native Northern Milfoil)
Myriophyllum spicatum
(Invasive EWM)
<10 pairs of leaflets
11-21 pairs of leaflets

Plant ID



Plant ID

Plant ID

Plant ID

Plant ID

INVASIVE

Michael J. Grodowitz, U.S. Army Engineer Research and Development Center

Christian Fischer, www.commons.wikimedia.org

NATIVE

Paul Skawinski, Aquatic Plants of the Upper Midwest

HYDRILLA

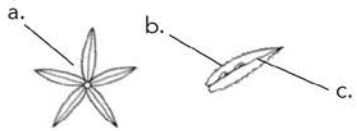
Hydrilla verticillata

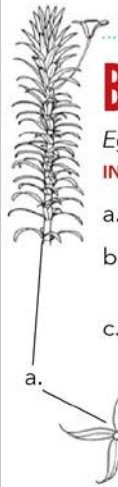
INVASIVE

a. whorls of ***more than*** 3 leaves

b. leaves often have ***visibly toothed*** edge

c. leaf vein often has ***small visible spines***





BRAZILIAN ELODEA

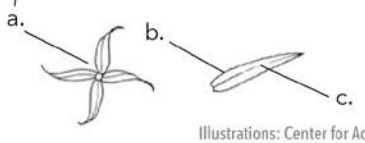
Egeria densa

INVASIVE

a. whorls of ***more than*** 3 leaves

b. leaves do ***not*** have visibly toothed edge

c. leaf vein is ***smooth*** underneath



Illustrations: Center for Aquatic and Invasive Plants, University of Florida

AMERICAN ELODEA

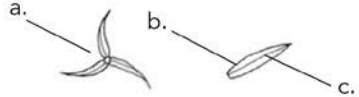
Elodea canadensis

NATIVE

a. whorls of ***exactly*** 3 leaves

b. leaves do ***not*** have visibly toothed edge

c. leaf vein is ***smooth*** underneath



Plant ID

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Najas guadalupensis
Photo by Brian Nelson
Copyright 1998 Florida Department of Environmental Protection

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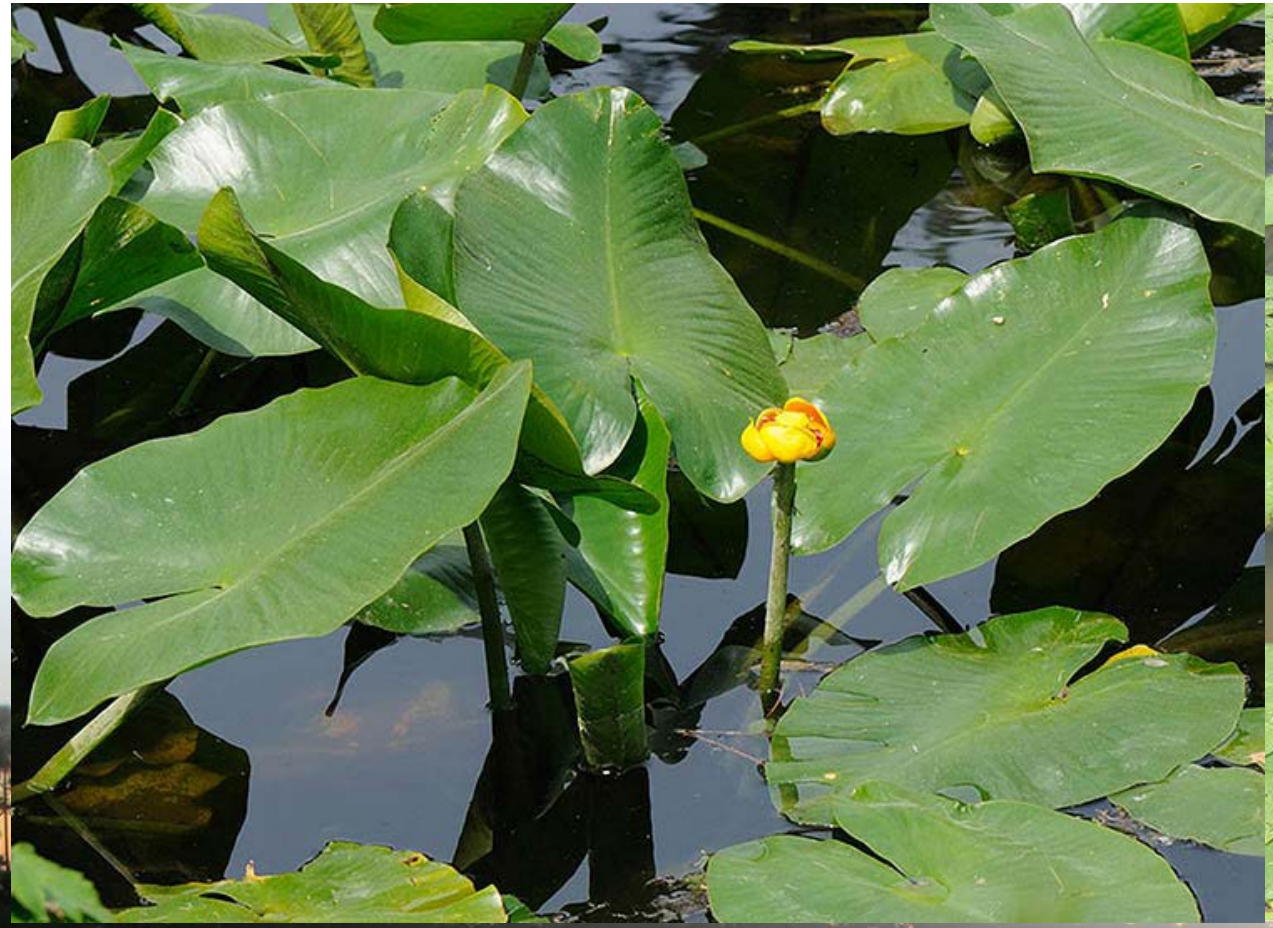

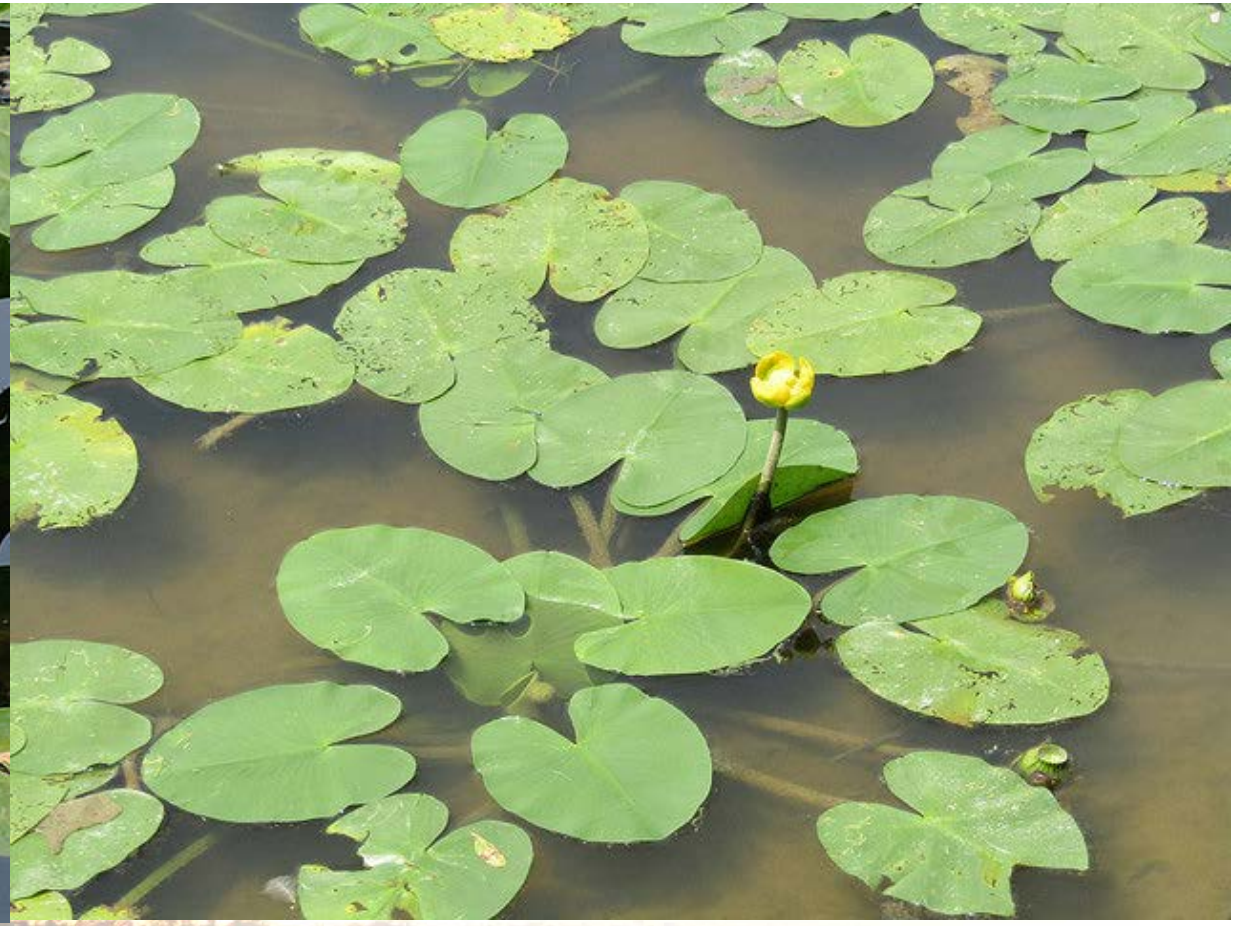

Plant ID

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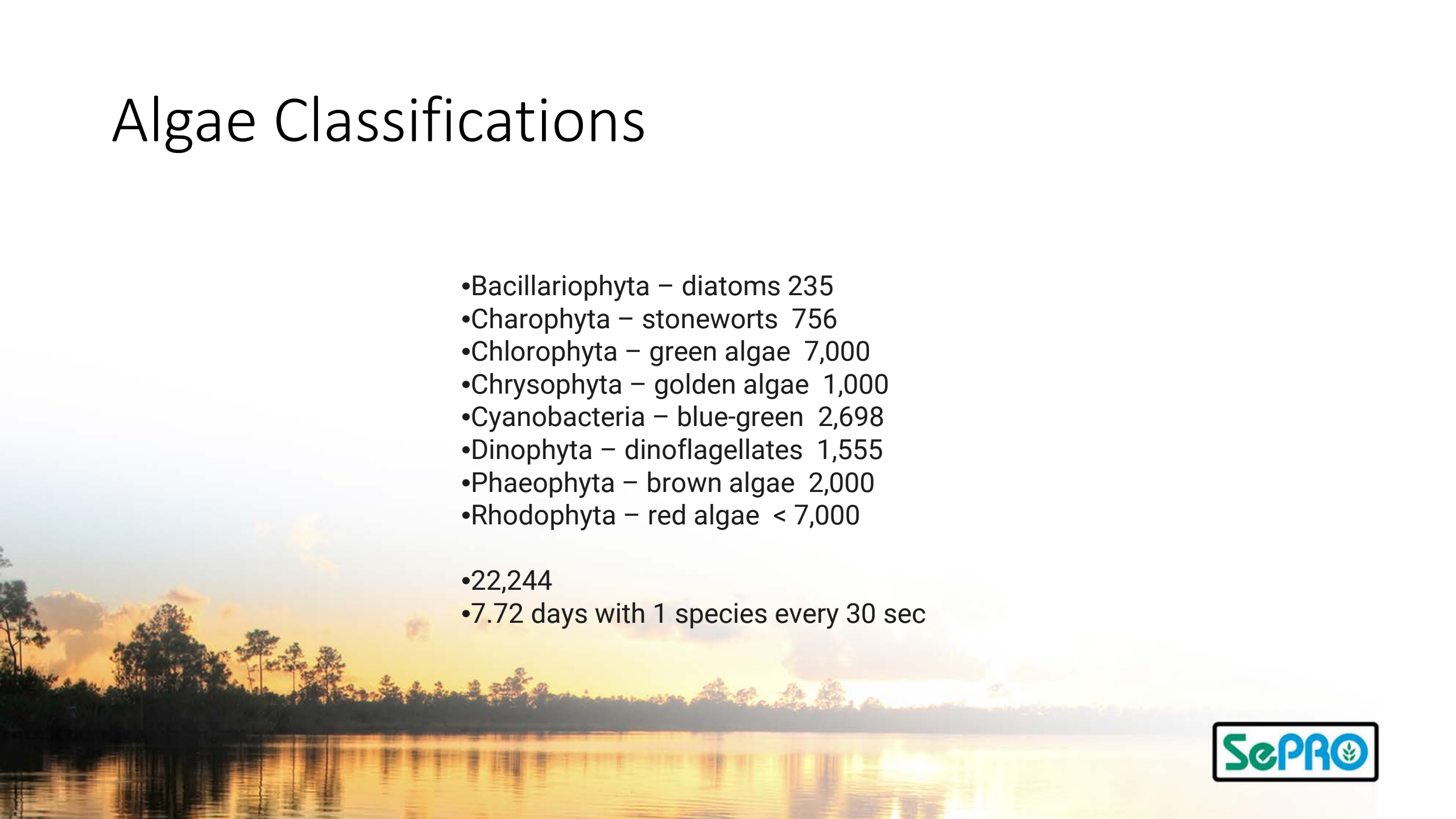
Algae Classifications



- Bacillariophyta – diatoms 235
- Charophyta – stoneworts 756
- Chlorophyta – green algae 7,000
- Chrysophyta – golden algae 1,000
- Cyanobacteria – blue-green 2,698
- Dinophyta – dinoflagellates 1,555
- Phaeophyta – brown algae 2,000
- Rhodophyta – red algae < 7,000

- 22,244
- 7.72 days with 1 species every 30 sec

Algae ID

Algae ID

Algae ID

Thank You!

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michaelh@sepro.com