

CVE Master Management

Total Lake Assessment

Sample date: 7/7/2016

Report Date: 7/19/2016

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Lab and Field Biologist



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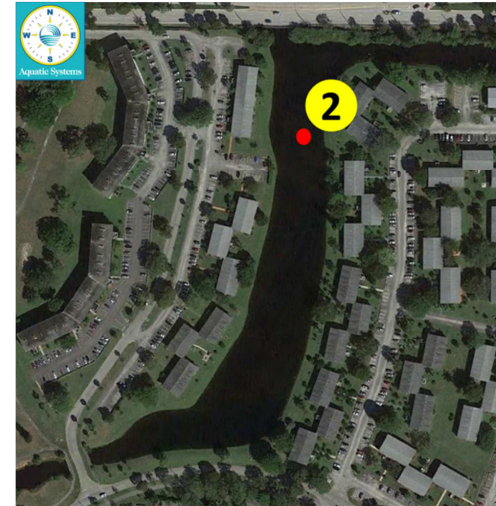
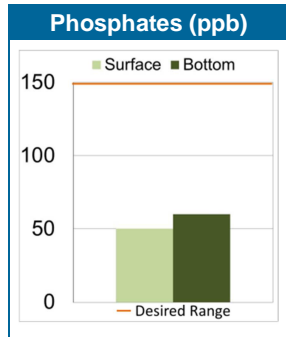
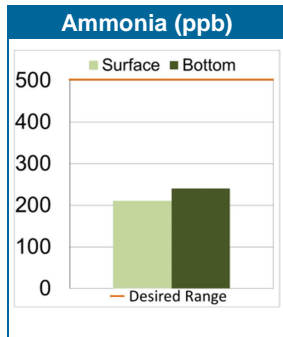
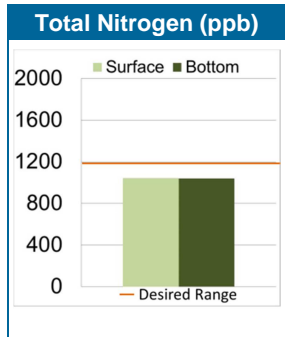
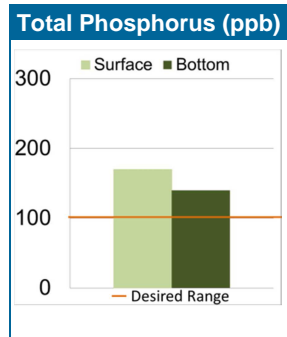


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Total Assessment Water Quality Data: CVE Master Management

Test	Desired Range	Site 2		This lake is:
		Surface	Bottom	
Nutrients - Total Phosphorus	< 100 ppb	170	140	Borderline
Nutrients - Total Nitrogen	400-1200 ppb	1040	1040	Normal
Nutrients – Ammonia	< 500 ppb	210	240	Normal
Nutrients – Phosphates	< 150 ppb	50	60	Normal



Basic Lake Information	
Measured	Calculated Approximation
Perimeter Ft: 3100	Volume-Gal.: 12,000,000
Surface Acres: 4.6	Total Acre Ft: 37
Depth: 9.5	

The TN/TP Ratio is: 6.7

When the TN/TP ratio is less than 10 the lake strongly favors growth of cyanobacteria algae blooms that may produce toxins and display a pea soup appearance and/or forms surface mats. Water column phosphorus needs to be reduced.

The trophic lake health index is: 78.2

Eutrophic lakes have a TSI of 41-100 and usually have intermittent plankton algae blooms, fair water clarity, muck accumulation, occasional odor, moderate dissolved oxygen levels, dense submersed plant growth and algae mats.

Observations

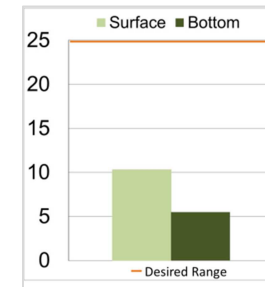
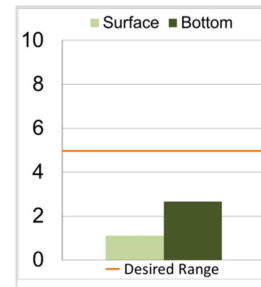
Water quality analysis reveals that Site 2 is experiencing slightly elevated phosphorus levels. Lakes with high nutrient concentrations are likely to experience algal blooms. Phosphorus, in particular, is often the limiting nutrient that fuels algal growth. Since algae use these nutrients for food, algae abundance is often correlated with nutrient availability.

Dissolved Oxygen (ppm)	Temperature (°F)	Redox (mV)	Indicates this lake is:
			<p>The dissolved oxygen and temperature profile shows the water column is stratified into separate water temperature layers resulting in reduced oxygen concentrations at lower depths often leading to fish kills, algae blooms, muck accumulation and foul odors.</p>

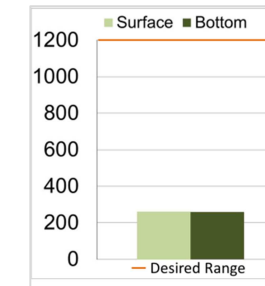
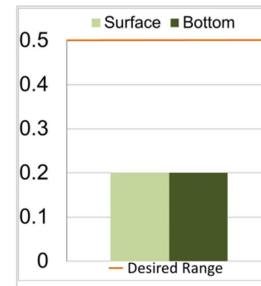
- Recommendations for This Lake**
- Aeration for Destratification
 - Watershed Management
 - On-going water quality monitoring

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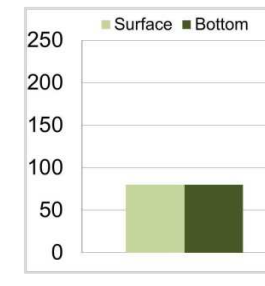
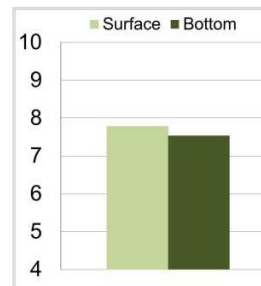
Water Clarity Readings					Turbidity (NTU)	Chlorophyll a (ppb)
Test	Desired Range	Site 2		This lake is:	Surface	Bottom
		Surface	Bottom			
Secchi Depth	≥ 4 Feet	6		Normal		
Turbidity	≤ 5 NTU	1.10	2.66	Normal		
Color	≤ 300 ppm	55	68	Normal		
Total Dissolved Solids	< 500 ppm	155.3	157.6	Normal		
Total Suspended Solids	< 10 ppm	3.0	4.0	Normal		
Particulate Organic Matter	% organic matter	20	100	High		
Chlorophyll a (ppb)	< 25 ppb	10.3	5.5	Normal		



Salt Readings					Salinity (‰)	Conductivity (µS/cm)
Test	Desired Range	Site 2		This lake is:	Surface	Bottom
		Surface	Bottom			
Chloride	≤ 350 ppm	39	39	Normal		
Salinity	< 0.5 (‰)	0.2	0.2	Normal		
Conductivity	≤ 1200 µS/cm	261	259	Normal		



Acid and Base					Readings pH	Total Alkalinity (ppm)
Test	Desired Range	Site 2		This lake is:	Surface	Bottom
		Surface	Bottom			
pH	6.5 - 8.5	7.78	7.54	Normal		
Total Alkalinity	> 80 ppm	80	80	Normal		
Total Hardness	> 80 ppm	250	250	Normal		



Bacteria Readings				
Test	Desired Range	Site 2		* Please refer to the Aquatic Glossary for further information concerning coliform levels
		Surface	Bottom	
Fecal Coliform	<200 CFU/100mL	9		

Trophic State Index (TSI)

A Trophic State Index (TSI) provides a single quantitative result for the purpose of classifying and ranking lakes in terms of water quality.

Nutrients such as phosphorus are usually the limiting resource for algae and plant abundance and therefore are used in creating a TSI reference number. Generally, the higher the lakes TSI the greater the likelihood of elevated nutrient levels, increased algae problems and decreased water clarity.

Most of Florida's geology provides for very nutrient rich sediments which cause lakes to have naturally high primary productivity and be naturally eutrophic.

Oligotrophic (<30): Very low biological productivity - Clear Water, bottom, well oxygenated, few plants and animals

Mesotrophic (30-40): Low to medium biological productivity - moderately clear water, abundant plant growth

Eutrophic (50-70): High biological productivity - fair water clarity, muck accumulation, dense plant growth and algae mats

Hypereutrophic (>70): Very high productivity - plankton algae blooms, low oxygen, fish kills, poor water clarity and quality, limited submersed plant growth, muck accumulation, bottom and surface algae mats dominate

TN/TP Ratio

The TN/TP ratio can provide a useful clue as to the relative importance of nitrogen or phosphorus toward the abundance of algae in a waterbody.

In general, the lower the TN/TP ratio the more cyanobacteria bacteria will be present (i.e., Microcystis) and the higher the TN/TP ratio the more desirable green algae will be present.

Studies done on TN/TP ratios have found good agreement in predicting the type of algae present (Schindler et al., 2008; Yoshimasa Amano et al., 2008).

Nutrient Tested	Desired Range	Issues with high levels	Likely causes of high levels
Total Phosphorus	<100 ppb	>100 ppb can cause excessive aquatic weeds and algae	Reclaimed water discharge, landscape fertilizer runoff and agricultural drainage, phosphorus laden bottom sediments
Total Nitrogen	400-1200 ppb	>1200 ppb can cause excessive aquatic weeds and algae	Landscape fertilizer runoff
Ammonia	<500 ppb	>500 ppb can be toxic to fish and animals	Organic decomposition, landscape/fertilizer runoff, and anoxic conditions (low oxygen)

Dissolved Oxygen

The most critical indicator of a lake's health and water quality.

- Oxygen is added to aquatic ecosystems by aquatic plants and algae through photosynthesis and by diffusion at the water's surface and atmosphere interface.
- Oxygen is required for fast oxidation of organic wastes including bottom muck.
- When the oxygen is used up in the bottom of the lake, anaerobic bacteria continue to breakdown organic materials, creating toxic gasses such as hydrogen sulfide.
- For a healthy game-fish population, oxygen levels should not go below 4.0 ppb

Secchi depth

A mechanical test to judge water clarity, accomplished by lowering a black and white disk into the water and recording the point at which it can no longer be seen.

- Higher values indicate greater water clarity.
- Nutrient rich lakes tend to have Secchi depths less than 9 feet and highly enriched sites less than 3 feet.

Coliform criteria category	Total Coliform (CFU/100mL)	Fecal Coliform (CFU/100mL)
Good	Less than or equal to 1000 as a monthly average	0 -199
Moderate		200-799
Poor	Less than 2400 at any time	>800