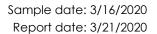
# Harbor Isle City of St. Petersburg

# **Water Quality Analysis**



Produced by: Sam Sardes Weed Science Director

Sampling Map 2
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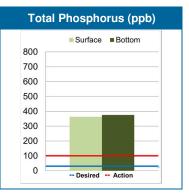


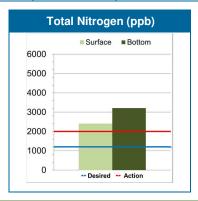


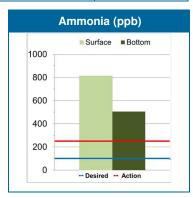
# Water Quality Data: Harbor Isle, Site #1

Date: 3/16/2020

Site Readings							
Test	Desired Range	Action Level	Surface	Bottom	This lake is:		
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	362	375	High		
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	2399	3208	High		
Nutrients – Ammonia	< 100 ppb	>250 ppb	813	506	High		
Clarity – Turbidity	< 5 NTU	NA	2.45	8.99	High		
Salinity	< 0.5 ppt	NA	5.4	6.2	High		
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	4.5		Low		









The TN/TP Ratio is: 7.61

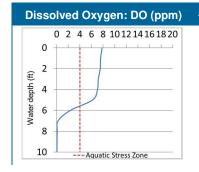
When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

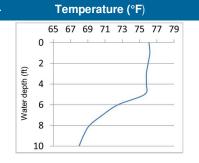
The trophic lake health index is: 84

 Oligtrophic
 Mesotrophic
 Eutrophic
 Hypereutrophic

 0
 30
 60
 90
 120

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.





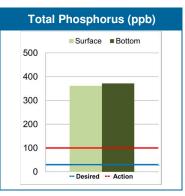
# Indicates that this lake is:

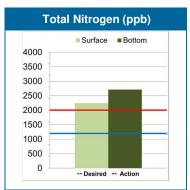
Stratified: The dissolved oxygen and temperature profile shows the water column is stratified into separate water temperature layers resulting in reduced oxygen concentrations at lower depths. It is recommended to monitor oxygen levels closely, particularly with seasonal changes.

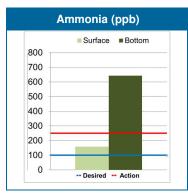
# Water Quality Data: Harbor Isle, Site #2

Date: 3/16/2020

Site Readings							
Test	Desired Range	Action Level	Surface	Bottom	This lake is:		
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	361	372	High		
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	2237	2713	High		
Nutrients – Ammonia	< 100 ppb	>250 ppb	157	642	High		
Clarity – Turbidity	< 5 NTU	NA	2.22	6.26	High		
Salinity	< 0.5 ppt	NA	6.1	6.2	High		
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	4.5		Low		







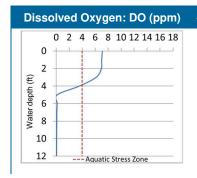


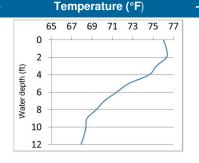
The TN/TP Ratio is: 6.75

When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

The trophic lake health index is: 83	Oligtrophic	Mesotrophic	Eutr	rophic	Hypereutrophic
The trophic take health muck is. 00	0	30	60	90	120

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.





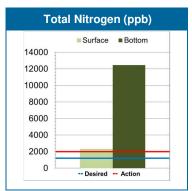
#### Indicates that this lake is:

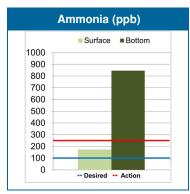
Stratified: The dissolved oxygen and temperature profile shows the water column is stratified into separate water temperature layers resulting in reduced oxygen concentrations at lower depths. This often leads to fish kills, algae blooms, muck accumulation and foul odors. Aquatic Stress Zone= Florida Department of Environmental Protection (FDEP) dissolved oxygen criteria for Class III waters.

# Water Quality Data: Harbor Isle, Site #3

Site Readings							
Test	Desired Range	Action Level	Surface	Bottom	This lake is:		
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	378	1311	High		
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	2304	12456	High		
Nutrients – Ammonia	< 100 ppb	>250 ppb	120	285	High		
Clarity – Turbidity	< 5 NTU	NA	1.74	6.48	High		
Salinity	< 0.5 ppt	NA	6.0	7.6	High		
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	4.5		Low		

# Total Phosphorus (ppb) Surface Bottom 1400 1200 1000 800 600 400 200 0 --- Desired --- Action



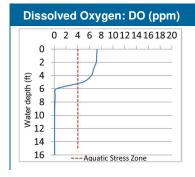


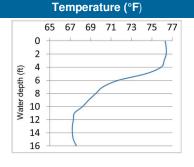
The TN/TP Ratio is: 8.74

When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

The trophic lake health index is: 101	Oligtrophic	Mesotrophic		Eutrophic	Hypereutrophic
	0	30	60	90	120

Hypereutrophic lakes have a TSI index greater than 100 and usually experience heavy plankton algae blooms, dangerously low dissolved oxygen levels, occasional fish kills, poor water clarity, odor, bottom muck and undesirable blue green algae mats dominate.





#### Indicates that this lake is:

Stratified: 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. It is recommended to monitor oxygen levels closely, particularly with seasonal changes.



Date: 3/16/2020

#### **Observations**

Salinity, total nitrogen, and total phosphorus have held fairly steady since last month. Ammonia values continue to come down at sites 1 and 3 but have increased at site 2.

The turbidity levels have decreased at the surface for all sites. This is likely due to the algae concentration lowering post treatment.

The stratification and thermocline are becoming stronger with increasing ambient temperatures and will likely continue throughout summer.

The surface dissolved oxygen levels have come back down into more normal levels at the surface of the lake. While the surface values have returned to a more normal range, there is still little to no oxygen at the bottom of the lake. It is likely that throughout the water column, oxygen levels crash overnight due to biological oxygen demand and lack of photosynthesis.

Nanobubble technology is a long-term slow approach. It may take up to several months for the oxygen levels to stabilize throughout the water column. This is confounded by the extreme BOD levels found in this lake because of the major algal bloom occurring. It is important to note that even after such a major algae treatment this lake did not have an extreme oxygen crash. This was likely aided by the nanobubble units.



#### 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.

Due to the dynamic nature of Florida's geology and differing climate zones, regional locations may differ slightly in what is considered a healthy water quality profile.

TSI Values	Trophic Status	Attributes
30-40	Oligotrophic	Clear water, few plants and algae, small bass
40-50	Mesotrophic	Water moderately clear, but increasing probability of anoxia, green algae are likely dominant, balanced fishery with medium sized bass
50-60	Eutrophic	Decreased transparency, occasional light algal blooms, lots of available food making for large bass
60-70	Eutrophic	Dominance of blue-green algae, algal scums possible, extensive macrophyte problems possible, higher probability of anoxia, fishery starting to decline
70-80	Hypereutrophic	Dominance of blue-green algae, frequent algal scums, higher probability of anoxia, stunted fishery
>80	Hypereutrophic	Algal scums, higher probability of anoxia, fish kills, few macrophytes, very poor water clarity

More information on data sources available upon request.

Nutrient Tested	Desired Range	Action Level	Issues with high levels	Likely causes of high levels
Total Phosphorus	< 30 ppb	> 100 ppb	>100 ppb can unbalance the ecosystem	Reclaimed water discharge, landscape fertilizer runoff and agricultural drainage, phosphorus laden bottom sediments
Total Nitrogen	< 1200 ppb	>2000 ppb	>1200 ppb can unbalance the ecosystem	Landscape fertilizer runoff
Ammonia	< 100 ppb	>250 ppb	>500 ppb can be toxic to fish and animals	Organic decomposition, landscape/fertilizer runoff, and anoxic conditions (low oxygen)

#### **Nutrient Thresholds**

The desired range is the threshold value recommended for freshwaters in order maintain a balanced ecosystem.

If nutrients are measured above the action level, it is likely that the nutrient levels may have a detrimental effect on aquatic life and long-term lake health. Action needs to be taken at this point to maintain a healthy ecosystem. Nutrients above the action level will require more maintenance.

#### 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).

### 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.

## 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