Harbor Isle
City of St. Petersburg
Water Quality Analysis

Sample date: 1/21/2020
Report date: 2/10/2020

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Weed Science Director

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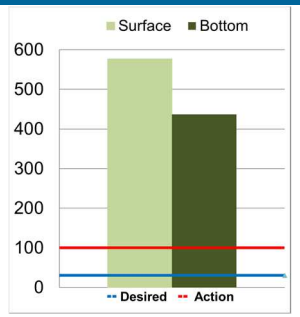
Water Quality Data: Harbor Isle, Site #1

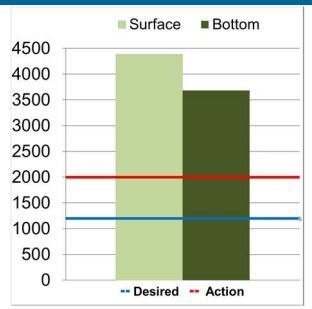
Date: 1/27/2020

Site Readings					
Test	**Desired Range**	**Action Level**	**Surface**	Bottom	**This lake is:**
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	577	437	**High**
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	4387	3682	**High**
Nutrients – Ammonia	< 100 ppb	>250 ppb	1087	1094	**High**
Clarity – Turbidity	< 5 NTU	NA	23.2	16.1	**High**
Salinity	< 0.5 ppt	NA	5.9	5.9	**High**
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	2		**Low**

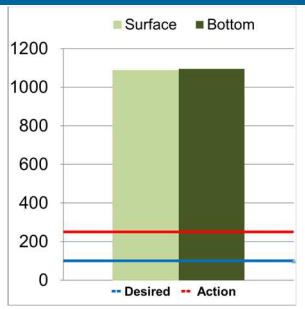
Total Phosphorus (ppb)



Total Nitrogen (ppb)

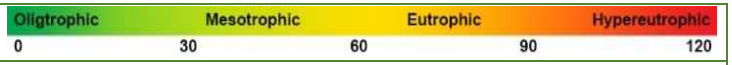


Ammonia (ppb)

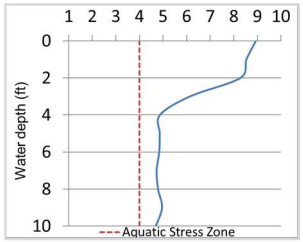
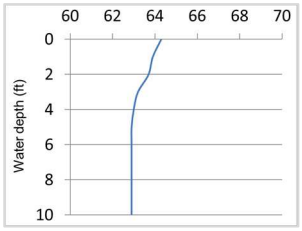


The TN/TP Ratio is: 7.96	When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

The trophic lake health index is: 91



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.

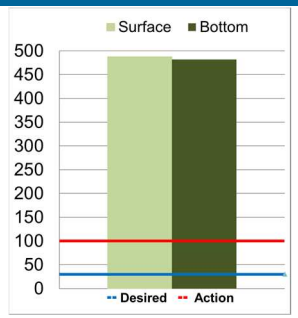
Dissolved Oxygen: DO (ppm) +	**Temperature (°F) -**	**Indicates that this lake is:**
		Reduced Oxygen with Depth: The oxygen profile suggests that oxygen levels decrease with depth It is recommended to monitor oxygen levels closely, particularly with seasonal changes. Aquatic Stress Zone= Florida Department of Environmental Protection (FDEP) dissolved oxygen criteria for Class III waters.

Water Quality Data: Harbor Isle, Site #2

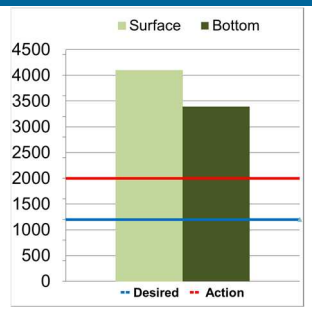
Date: 1/27/2020

Site Readings					
Test	**Desired Range**	**Action Level**	**Surface**	Bottom	**This lake is:**
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	488	482	**High**
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	4093	3390	**High**
Nutrients – Ammonia	< 100 ppb	>250 ppb	375	1249	**High**
Clarity – Turbidity	< 5 NTU	NA	10.3	8.87	**High**
Salinity	< 0.5 ppt	NA	5.9	5.9	**High**
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	2		**Low**

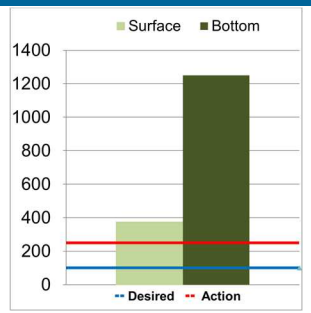
Total Phosphorus (ppb)



Total Nitrogen (ppb)



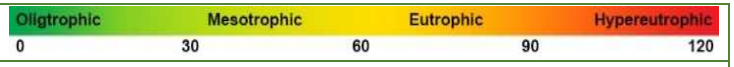
Ammonia (ppb)



The TN/TP Ratio is: 7.71

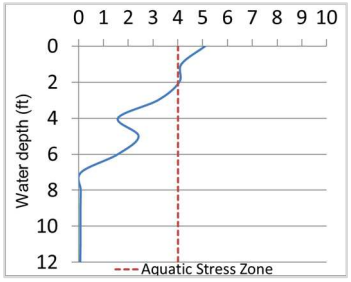
When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

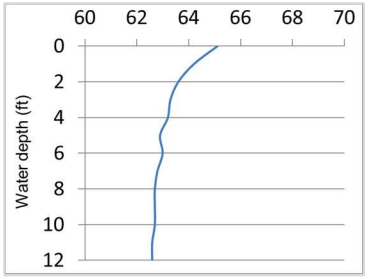
The trophic lake health index is: 89



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.

Dissolved Oxygen: DO (ppm) + Temperature (°F) -





Indicates that this lake is:

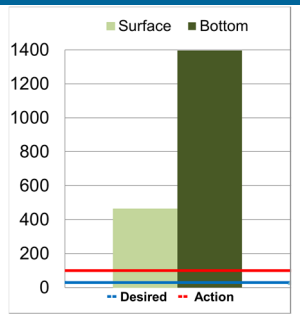
Reduced Oxygen & Temperature: The water column profiles show that oxygen and temperature both decrease slightly with depth. It is likely that this lake is in the process of stratifying.
This often leads to fish kills, algae blooms, muck accumulation and foul odors.
Aquatic Stress Zone= Florida Department of Environmental Protection (FDEP) dissolved oxygen criteria for Class III waters

Water Quality Data: Harbor Isle, Site #3

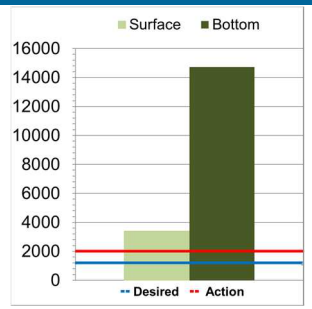
Date: 1/27/2020

Site Readings					
Test	**Desired Range**	**Action Level**	**Surface**	Bottom	**This lake is:**
Nutrients - Total Phosphorus	< 30 ppb	> 100 ppb	464	1396	**High**
Nutrients - Total Nitrogen	< 1200 ppb	>2000 ppb	3411	14716	**High**
Nutrients – Ammonia	< 100 ppb	>250 ppb	1781	8868	**High**
Clarity – Turbidity	< 5 NTU	NA	21.2	5.63	**High**
Salinity	< 0.5 ppt	NA	6.0	7.8	**High**
Water Clarity - Secchi Depth	≥ 4 Feet	N/A	2		**Low**

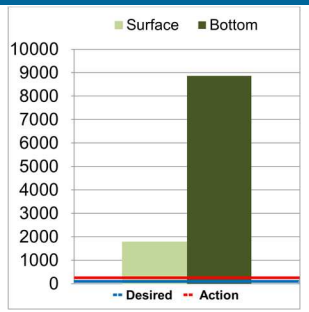
Total Phosphorus (ppb)



Total Nitrogen (ppb)



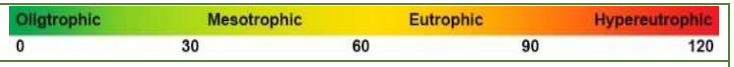
Ammonia (ppb)



The TN/TP Ratio is: 9.75

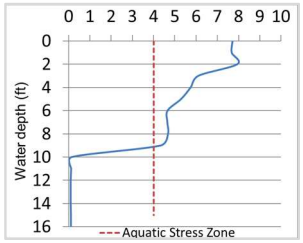
When the TN/TP ratio is < 75, the chances of having toxin producing cyanobacterial blooms (blue-green algae) as plankton or filamentous mats increase. Water column phosphorus needs to be reduced to promote more desirable algal groups.

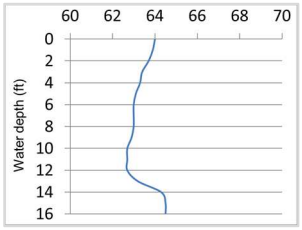
The trophic lake health index is: 104



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.

Dissolved Oxygen: DO (ppm) **+** **Temperature (°F)** **-**





Indicates that this lake is:

Reduced Oxygen with Depth: The oxygen profile suggests that oxygen levels decrease with depth.
It is recommended to monitor oxygen levels closely, particularly with seasonal changes.
Aquatic Stress Zone= Florida Department of Environmental Protection (FDEP) dissolved oxygen criteria for Class III waters.

Observations

For the first sampling event, it is evident that there is lots of room for improvement of the water quality. 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.

Phosphorus, ammonia, and turbidity levels are elevated at all three sampling sites. This is likely due to use of reclaimed nutrient rich water in the watershed. Over time, as oxygen levels raise and stabilize, ammonia levels should drop. This is due to ammonia being oxidized and converted into more beneficial forms of nitrogen that support healthy fisheries. The elevated phosphorus levels contribute to a very low nitrogen to phosphorus ratio. This means that if algae are present it is more likely to be cyanobacteria instead of green algae.

The elevated turbidity levels are likely due to large quantities of planktonic algae throughout the water column.

The oxygen levels were higher at the surface for sites 1 and 2. This is likely due to wind-blown algae adding additional oxygen to those areas of the water body.

It is important to note that for mitigation of phosphorus the technology available becomes more limited due to the salt content. While there are salt tolerant technologies, the toolbox becomes more limited.

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Water Quality Glossary

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 cause excessive aquatic weeds and algae	Reclaimed water discharge, landscape fertilizer runoff and agricultural drainage, phosphorus laden bottom sediments
Total Nitrogen	< 1200 ppb	>2000 ppb	>1200 ppb can cause excessive aquatic weeds and algae	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 Florida freshwaters in order to limit algae growth and water clarity issues. Keeping nutrients in this range help 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