



KINGS LAKE HOMEOWNERS ASSOCIATION, INC.

Lake Management Plan

SECTION 7 TOWNSHIP 50 RANGE 26
COLLIER COUNTY, FLORIDA



Prepared For:

Kings Lake Homeowners Association, Inc
c/o Joyce Sissum
Southwest Property Management
1044 Castello Drive, Suite 206
Naples, FL 34103



Prepared By:



Earth Tech Environmental, LLC
10600 Jolea Avenue
Bonita Springs, FL 34135
239.304.0030
www.eteflorida.com

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GLOSSARY OF TERMS OR CONCEPTS:

LAKE MANAGER (LM): contractor that is hired to manage the lake system.

HOA: Homeowners Association (Kings Lake Community)

LITTORAL ZONE: the shallow zone of a lake where there is sufficient light penetrating to the bottom to support growth of plants.

NATIVE: refers to the geographic region from which a species (plant or animal) originates.

NON-NATIVE: refers to a species that is present in a geographic region that it is not originated from.

FIELD MEASURED PARAMETERS: water quality parameters that are measured in the field by the LM. These should include but are not limited to Dissolved Oxygen, pH, temperature, specific conductivity, and visibility.

DISSOLVED OXYGEN (DO): is a measure of how much oxygen is dissolved in the water; the amount of oxygen available to living aquatic organisms. Dissolved oxygen readings are very temperature-dependent (colder water holds more oxygen), so keep in mind that they are a snapshot of the water's condition at that moment. Surface readings are almost always higher due to the interaction of air and water at the water's surface. DO readings can be interpreted using the following criteria:

Dissolved Oxygen Levels for Warm Water Organisms:

- D.O. should be above 5 mg/L
- 4-5 mg/L may cause stress in fish
- Widespread D.O. below 2.0 mg/L can result in fish kills

PH: is a measure of how acidic/basic water is. The range of pH is from 0-14; pH of 7 being neutral, pH of less than 7 indicates acidity, and pH of more than 7 indicates base.

TEMPERATURE: water temperature influences biological activity/growth and water chemistry.

SPECIFIC CONDUCTIVITY: is a measure of the water's ability to conduct electricity, which provides a measure of what is dissolved in water. Higher conductivity values indicate that there are more chemicals dissolved in the water. Conductivity is related to the salinity of water.

VISIBILITY: a measure of water transparency or turbidity in bodies of water.

LABORATORY ANALYSIS: water quality samples that are collected in the field by the LM to be sent to a State Certified Laboratory to be analyzed for results. Typically, these parameters are not easily or accurately measured in the field without very expensive equipment.

TOTAL PHOSPHORUS AS P: Includes the total amount of all forms of phosphorus in the water- dissolved and in particulate form.

AMMONIA: Ammonia (NH₃⁺) is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a water body at elevated concentrations and indirect effects on aquatic life, ammonia causes direct toxic effects on aquatic life.

NITRITE: Nitrite (NO₂) is typically an intermediate product when ammonia is transformed into nitrate by microscopic organisms and is therefore seldom elevated in waters for long periods of time.

NITRATE: Nitrate (NO₃), a mobile form of Nitrogen (N), is commonly found in ground and surface waters. Nitrate is generally the dominant form of N where total N levels are elevated. Nitrate and other forms of N in water can be from natural sources, but when N concentrations are elevated, the sources are typically associated with human activities.

NITRATE + NITRITE AS N: is a lab measurement that is the sum of Nitrate (NO₃) and Nitrite (NO₂) dissolved in water.

TOTAL NITROGEN: there are 3 forms of nitrogen that are typically found in water bodies (ammonia, nitrates & nitrites). Nitrogen is an essential nutrient for plants and animals. However, an excess amount of nitrogen in a waterway may lead to low levels of dissolved oxygen and negatively alter various plant life and organisms. Total Nitrogen is the sum of total Kjeldahl nitrogen (TKN), nitrate, and nitrite.

TOTAL KJELDAHL NITROGEN (TKN): is a lab measurement for Nitrogen that is the sum of ammonia plus organically bound nitrogen dissolved in the water.

CHLOROPHYLL-A: is a measure of the amount of algae growing in a waterbody. It can be used to classify the trophic condition of a waterbody. Although algae are a natural part of freshwater ecosystems, too much algae can cause aesthetic problems such as green scums and bad odors, and can result in decreased levels of dissolved oxygen.

TROPHIC STATE: Describes the overall productivity (the amount of plants or algal growth) within a lake. The productivity can range from very unproductive to highly productive and has implications for the physical, biological, and chemical conditions of the lake.

TROPHIC STATE INDEX: Laboratory parameter results for Chlorophyll, Total Phosphorus, and Total Nitrogen can be compared to the Florida Trophic State Index for Lakes according to the Florida Trophic State Index Calculation Method 1996 FDEP 305(B) Report. The Trophic State Index for Lakes (TSI) as developed by the Florida Department of Environmental Protection (FDEP) may be used to quantify biological productivity. Florida Trophic State Index for Lakes is scored using the following parameters:

Water Quality	FDEP Trophic State Index (TSI)	Chlorophyll (CHLA) micrograms per liter (µg/L)	Total Phosphorus (TP) milligrams of phosphorus per liter (mgP/L)	Total Nitrogen (TN) milligrams of nitrogen per liter (mgN/L)
Good	0	0.3	0.003	0.06
	10	0.6	0.005	0.10
	20	1.3	0.009	0.16
	30	2.5	0.01	0.27
	40	5.0	0.02	0.45
	50	10.0	0.04	0.70
Fair	60	20.0	0.07	1.2
	70	40	0.12	2.0
Poor	80	80	0.20	3.4
	90	160	0.34	5.6
	100	320	0.58	9.3

Trophic State Index (TSI)	Trophic State Classification	Water Quality
0-59	Oligotrophic through Mid-Eutrophic	Good
60-69	Mid-Eutrophic through Eutrophic	Fair
70-100	Hyper Eutrophic	Poor

Using this method waterbodies can be classified into four categories:

- Oligotrophic- lowest biological activity
- Mesotrophic- moderate biological activity
- Eutrophic- high biological activity
- Hyper Eutrophic- very high biological activity

1.0 INTRODUCTION

Southwest Property Management contracted Earth Tech Environmental, LLC (ETE) to provide environmental consulting services for the Kings Lake Homeowner’s Association, Inc. (HOA) located on the south side of Davis Boulevard approximately 1.34 miles east of Airport Pulling Road in Collier County (see Figure 1). ETE has conducted water quality assessment of the Kings Lake Community’s (Subject Property) four man-made stormwater retention lakes. The total lake assessment area is approximately 38.79 acres. The Subject Property consists of both single-family residential development and multi-family unit residential development. The community contains four man-made stormwater retention lakes; Lake 1 (Kings Lake), Lake 2 (Prince Lake), Lake 3 (Dutchess Lake), and Lake 4, which can be seen in Figure 2 below. The stormwater system on the Subject Property is designed to direct all surface water runoff from the roads and impervious surfaces towards the lake system. In a general sense, Lake 1 flows into Lake 2, Lakes 2 and 3 flow into Lake 4. From Lake 4, the stormwater lake system flows off the Subject Property to the adjoining property to the west (Lakewood Community).

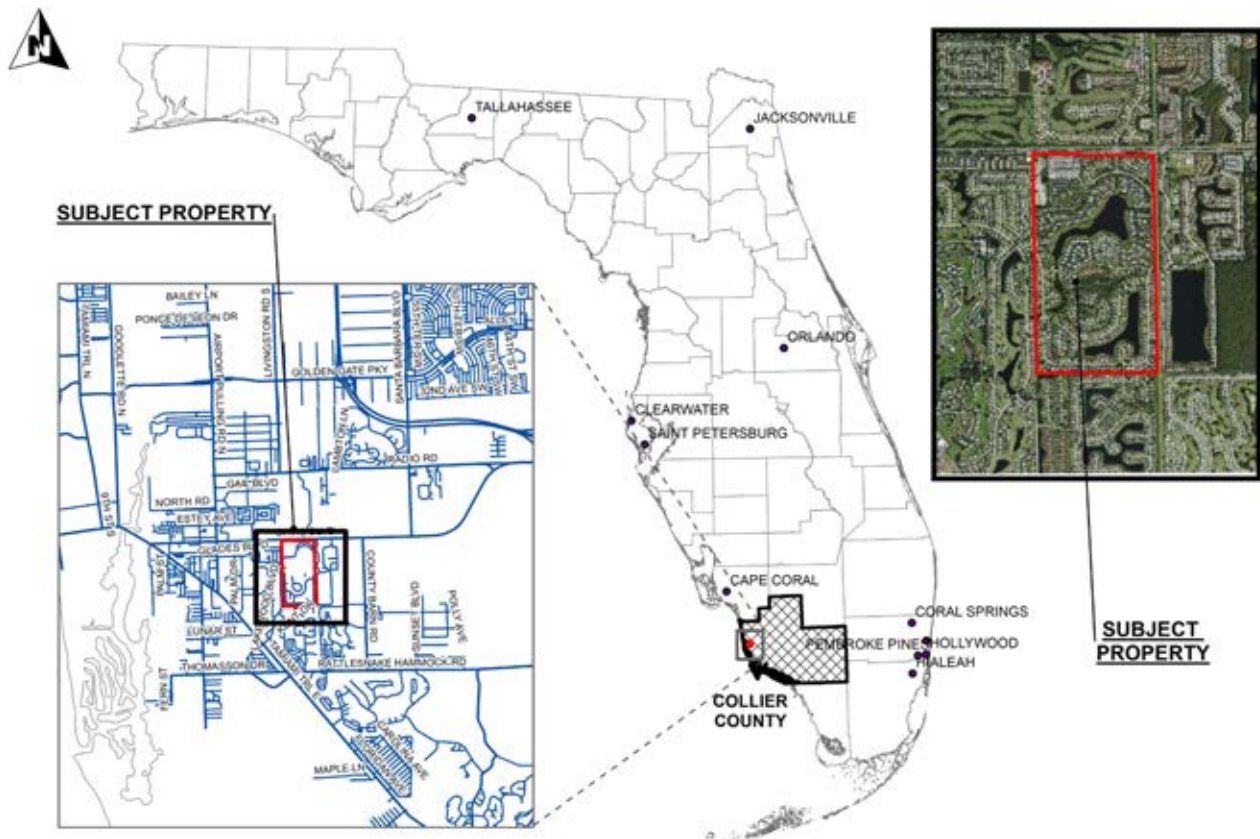


Figure 1. Location Map

1.1 Purpose

The purpose of this Lake Management Plan (LMP) is to develop a long-term management framework for the King’s Lake Community lake system (see Figure 2 below). ETE assumes that the intention of this LMP is to improve the physical appearance and ecological functioning of the lakes within the community and to increase overall residential approval of the lake systems. Preliminary physical lake assessment, historical reports, and water quality sampling of the four lakes in the community have contributed to this

plan. This LMP has been produced through coordination with Kings Lake HOA and informed by acquiring objective information about the Kings Lake system. The LMP has been divided into tasks and responsibilities for Kings Lake HOA and the Lake Manager.



Figure 2. Overall Aerial Map

2.0 LAKE MANAGER RESPONSIBILITIES

The lake manager is the HOA's representative in the field. The LM is responsible for assessing the condition of the lakes and communicating their observations to the HOA. Part of that communication should include a recommended course of action in response to situations that arise (algal blooms, fish kills, etc.). Once the HOA and LM are in agreement on a course of action, it's the LM's responsibility to implement it. The anticipated lines of communication and approach are shown in (Figure 3).

Fieldwork will be implemented by the Lake Manager. To proactively manage the lake system and obtain long-term comparable data, all samples will follow the same collection procedure and consistency. The following are the required assessment criteria:

- Physical Assessment– Assess the lake banks and littoral zone conditions.
- Water Quality Assessment (Field Measured Parameters)– Monthly sampling events to capture the field measurements of water at sample locations.
- Water Quality Assessment (Laboratory Analysis)– Quarterly sampling events for laboratory Analysis of collected water samples.

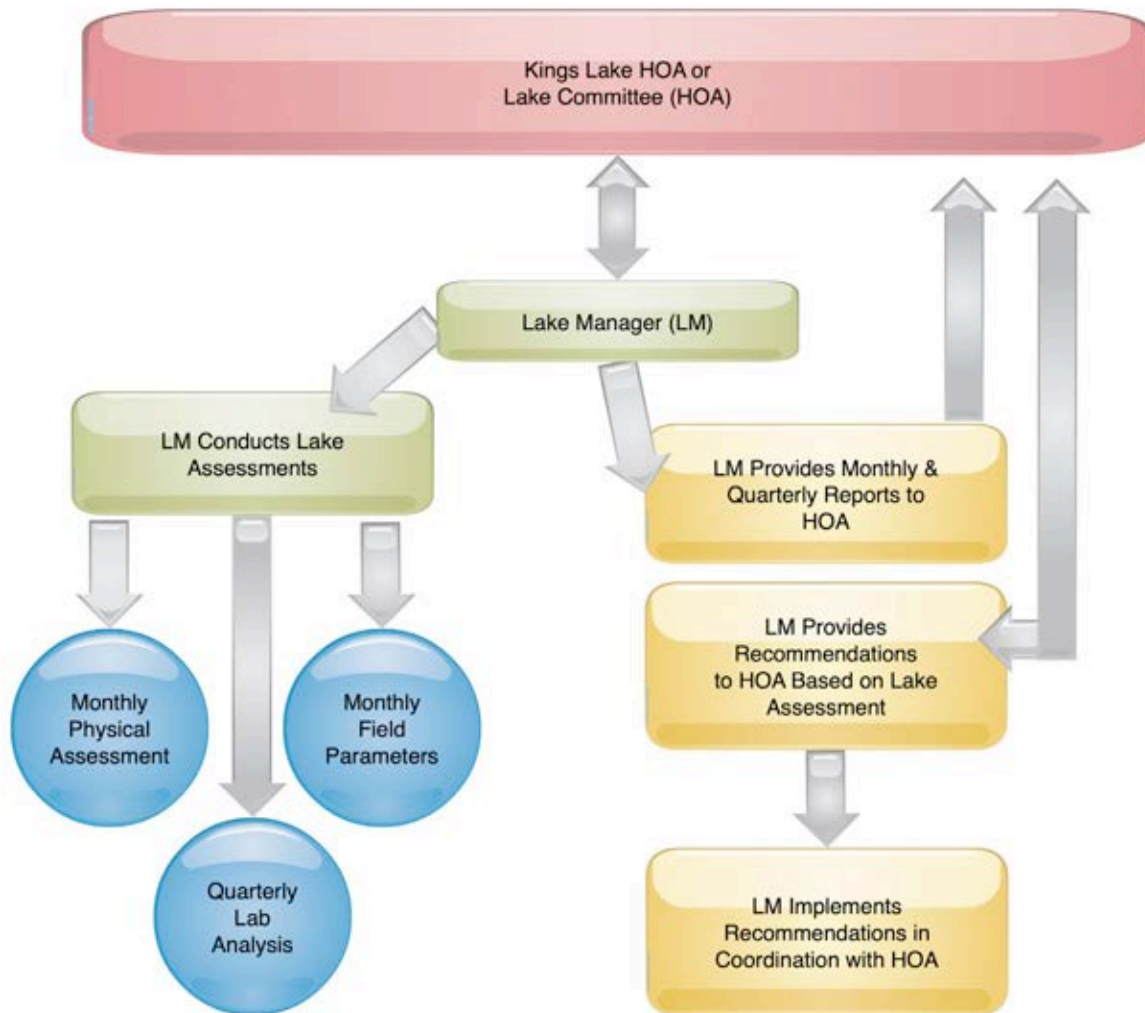


Figure 3. Lake Management Responsibilities

2.1 Monthly Lake Manager Duties

Physical Assessment: A littoral zone assessment should be conducted every month by the LM. Each lake bank should be walked in its entirety to survey and record observations of the current conditions. The assessment should include, but are not limited to, mapping the littoral areas, determining species present (native and non-native), and making note of wildlife utilization. The Lake Manager should provide a report of the monthly littoral assessment monitoring event to the Kings Lake Community HOA and provide any recommendations if necessary.

Water Quality Assessment (Field Measured Parameters): Samples for field parameters should be collected monthly utilizing a YSI or similar device. Sampling should occur at the locations shown in (Appendix A). For each sampling location, readings will be taken at lake bottom, mid-column, and surface intervals for the deeper portions of the lakes and bottom and surface intervals at shallower portions of the lakes. Collecting field parameter data monthly will provide current and consistent insight into the aquatic environment. It is recommended to conduct additional field parameter sampling when significant rain or storm events occur. The LM should collate this data into a master spreadsheet and provide a report of the monthly field parameters to the Kings Lake Community HOA and provide any recommendations if necessary.

2.2 Quarterly Lake Manager Duties

Water Quality Assessment (Laboratory Analysis): Samples for laboratory analysis should be collected on a quarterly basis. For each quarterly laboratory sampling event, the LM will collect water samples from six (6) sample sites across the Kings Lake System. Sampling should occur at the locations shown in Appendix A. The samples should be placed in a cooler of ice, documented on a chain of custody, and submitted to a NELAP Certified Laboratory for analysis of the following parameters: Total Phosphorus as P, Total Nitrogen, Chlorophyll-a, Total Kjeldahl Nitrogen (TKN), Nitrate + Nitrite as N, Nitrate, and Nitrite. The Lake Manager should collate this data into a master spreadsheet and provide a report of the quarterly laboratory analysis to the Kings Lake Community HOA and provide any recommendations if necessary. Lab results should be compared to the Trophic State Index table and a score assigned to each lake after each testing event. This will provide a quantitative score that can assist tracking trends over time.

2.3 Ongoing Lake Manager Duties and Guidelines

As stated previously, the LM is the HOA representative in the field. In between assessment and sampling events, the LM will be available to respond to issues that may arise in the lakes and determine an appropriate course of action moving forward. The most common issues are:

Algal Blooms: if the LM is notified of an algal bloom within a particular lake or series of lakes, they will attempt to determine the root cause. This may involve reviewing recent sampling data, conducting new sampling, or making visual observations. The LM will communicate the situation to the HOA along with their recommended solution based on professional judgement. Solutions to algal blooms may involve short term (spraying, dyes, chemical treatments) or long-term (littoral plantings). The LM will assist the HOA in cost-benefit analysis comparisons of different approaches.

Fish Kills: if the LM is notified of a fish kill in a particular location, they will attempt to determine the root cause. This may involve conducting new sampling (most like Dissolved Oxygen) or making visual observations. The LM will communicate the situation to the HOA along with their recommended solution

based on professional judgement. As with algal blooms, solutions to fish kills may involve short term (killing excessive algae) or long-term (littoral plantings, aeration). Often algal blooms and fish kills are linked, so they need to be attached jointly. The LM will assist the HOA in cost-benefit analysis comparisons of different approaches.

Exotic Vegetation Removal in Lakes

The HOA has determined a policy to remove the exotic vegetation recruitment in the community lakes. Torpedo grass has been an ongoing problem in the littoral zones. Torpedo grass is a Category 1 invasive plant as defined by the Florida Exotic Pest Plant Council (FLEPPC). It is required to be removed by most governmental agencies as part of permitting activities. In established communities, it is generally up to the HOA to decide whether to continue maintenance treatments.

3.0 HOME OWNERS ASSOCIATIONS RESPONSIBILITIES

As the governing body for the Kings Lake community, the HOA will need to assist the LM by educating residents, enforcing rules that are already in place, and making decisions about recommendations that the LM brings before them. This section outlines the responsibilities for the Kings Lake HOA that are recommended in this plan.

3.1 Education & Prevention Items

Discourage Feeding Wildlife

To discourage residents from feeding wildlife, implement signage around the lake system that educates residents of the concerns with increased wildlife and HOA rules regarding this. Increased waterfowl population leads to bacteria pollution in the water body and results in excessive foraging in littoral zones (which can be particularly damaging to new planting areas). Feeding of wildlife often encourages a higher density of individual waterfowl or animals within the community than the habitats would normally support. This increases waste deposition in the lakes and increases biological activity.

Proper Disposal of Pet Waste

During rainfall events, pet waste left on lawns or common areas will wash directly into the nearest lake. Pet waste contains Nitrogen and Phosphorus that will encourage growth of harmful algae. To encourage residents to dispose of pet waste properly, install pet waste receptacles that include waste bags for convenient use. Active enforcement of pick-up rules by community members may be required to “shame” people into proper compliance.

3.2 Landscape Management or Landscaping Related Items

Landscape Installation & Maintenance

It is important to fully understand the relationship between landscape maintenance practices and the overall health of the lake system. It is imperative that the HOA establish community-wide landscaping installation and maintenance guidelines for the residents and any landscaping companies that conduct work within the community. These guidelines should encourage planting of Florida native vegetation, which will require less water and maintenance. The maintenance guidelines should include the following:

1. Maintenance of irrigation systems to stop irrigation overspray into lakes or hard surfaces. In addition to wasting water, irrigation overspray results in constant run-off into community lakes. Ongoing violations of the County irrigation ordinance should be reported to Utility Code Enforcement at (239) 252-2380 or Collier 311.

2. Actively verify that landscape professionals that are applying fertilizer are Green Industries Best Management Practices (GI-BMP) trained. Green Industries Best Management Practices (GI-BMPs) is an educational program for people working in lawn-care and landscape maintenance. The GI-BMP program teaches environmentally safe landscaping practices that help conserve and protect Florida's ground and surface waters.
3. Implement an incentive program that will encourage private homeowners to create rain gardens or landscape buffers between homes.
4. If chemical treatment of algae is required, do not use copper-based algaecides unless there is no other option.
5. If possible, avoid chemical treatment of native and non-native plants near the shoreline. A common "cycle" seen in community lakes is landscape maintenance companies spraying vegetation along the lake shore and killing beneficial plants either intentionally or by accident with overspray.
6. Establish an approved chemical list for herbicides/pesticides. The community should have control of what is being sprayed on lawns, common areas, and lakes.
7. Prevent grass clippings from entering the lake system. Educate homeowners and landscape companies to not blow grass clipping into the lakes. If possible, encourage bagging or mulching of grass clippings.
8. If residents do not wish to have littoral plants in front of their property, encourage them to allow a 1 foot buffer of uncut grass along the shoreline. This will create a barrier and prevent grass clippings from entering the lake during landscaping activities. It also assists in treating fertilizer run-off into the lakes from yards.

3.3 Community-wide Decision\Direction Items

Littoral Zones

The HOA should determine a direction regarding littoral zones. This direction item is tied to the torpedo grass issue. Obviously, deciding to extensively remove torpedo grass means that large areas of the littoral zones throughout the lakes will require extensive replanting. Regardless of the approach, for optimum lake health and water quality, 30% total cover of each lake should be made up of aquatic plants. The graphic below (Figure 4) provided by Lee County breaks a littoral zone into corresponding planting zones (A,B,C,D). Littoral plants are categorized according to zone based on the amount of standing water they can tolerate. Zone A is the farthest in the water, while Zone D is on the upland part of the lake bank. Ideally littoral zones should be diverse, containing at least 3 different species. Potential species for each planting zone are listed below. Test plots should be conducted prior to a large replanting effort to assess the survivability of various aquatic vegetation species. Locations of test plots are best chosen by the contractor responsible for the planting.

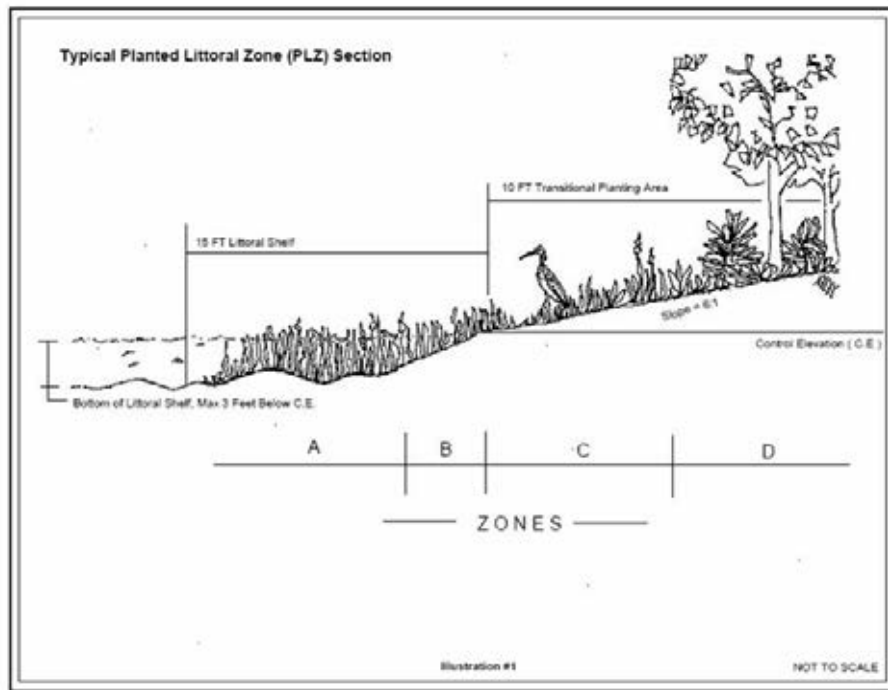


Figure 3. Littoral Planting Zones

Zone D: (Upland Bank)

<u>Common Name</u>	<u>Scientific Name</u>
Cordgrass	<i>Spartina bakeri</i>
Live Oak	<i>Quercus virginiana</i>
Muhly Grass	<i>Muhlenbergia capillaries</i>

Zone C: (0" - 3" Below Normal Water Level)

<u>Common Name</u>	<u>Scientific Name</u>
Maidencane	<i>Panicum hemitomom</i>
Soft rush	<i>Juncus effesus</i>
Swamp Lily	<i>Crinum americanum</i>
Golden Canna	<i>Canna flaccida</i>
Bald Cypress	<i>Taxodium distichum</i>

Zone B: (3" - 12" Below Normal Water Level)

<u>Common Name</u>	<u>Scientific Name</u>
Arrowhead	<i>Sagittaria lancifolia</i>
Bulrush	<i>Scirpus spp.</i>
Spikerush	<i>Eleocharis spp.</i>
Blueflag Iris	<i>Iris virginicus</i>

Zone A: (12" - 24" Below Normal Water Level)

<u>Common Name</u>	<u>Scientific Name</u>
Spikerush	<i>Eleocharis spp.</i>
Pickerelweed	<i>Pontederia cordata</i>
Bulrush	<i>Scirpus spp.</i>
Salt Jointgrass	<i>Paspalum vaginatum</i>

4.0 REFERENCES

Collier County Property Appraiser, 2020.
<http://www.collierappraiser.com>

Florida Administration code, Chapter 62-302 Surface Water Quality Standards, February 17, 2016.
<https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-302>

Joe Hand (2004), *Typical Water Quality Values for Florida's Lakes, Streams, and Estuaries*.
http://polk.wateratlas.usf.edu/upload/documents/JoeHand_TypicalWQ_ValuesDraftFinalEdits10-26-04.pdf

Florida Trophic State Index Calculation Method 1996 FDEP 305(B) Report

APPENDIX A
Sampling Locations & Littoral Assessment Maps



Note:
2020 Aerial & Subject Property boundary
obtained from Collier County Property Appraiser

- Lake Bank Perimeter
- Existing Littoral Plant Areas
- Storm Drains
- Laboratory Sample Locations
- Field Parameter Sample Locations

Project <p style="text-align: center;">Kings Lake HOA Collier County, Florida</p>	Map Type <p style="text-align: center;">Aerial Map - Lake 1</p>	Date <p style="text-align: center;">03/03/21</p>
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Note:
2020 Aerial & Subject Property boundary
obtained from Collier County Property Appraiser

- Lake Bank Perimeter
- Existing Littoral Plant Areas
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- Laboratory Sample Locations
- Field Parameter Sample Locations

Project **Kings Lake HOA
Collier County, Florida**

Map Type **Aerial Map - Lake 2**

Date **03/03/21**





ROYAL LN

QUEENS WAY






CHESS CT

KINGS LAKE BLVD

Note:
2020 Aerial & Subject Property boundary
obtained from Collier County Property Appraiser

200 100 0 200

Feet

-  Lake Bank Perimeter
-  Existing Littoral Plant Areas
-  Storm Drains
-  Laboratory Sample Locations
-  Field Parameter Sample Locations



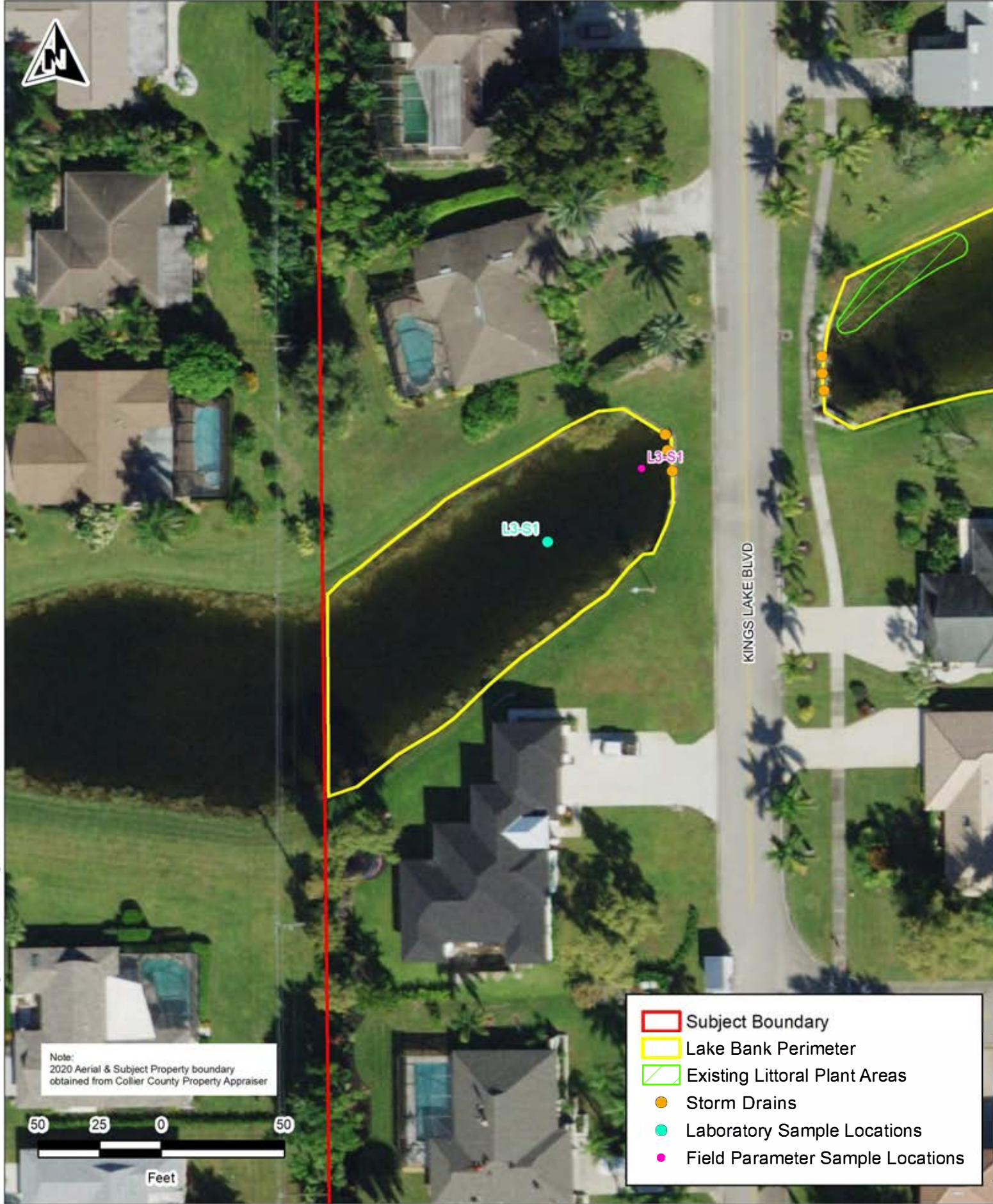
Project
Kings Lake HOA
Collier County, Florida

Map Type
Aerial Map - Lake 3

Date
03/03/21









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Note:
2020 Aerial & Subject Property boundary
obtained from Collier County Property Appraiser



-  Subject Boundary
-  Lake Bank Perimeter
-  Existing Littoral Plant Areas
-  Storm Drains
-  Laboratory Sample Locations
-  Field Parameter Sample Locations

Project Kings Lake HOA
Collier County, Florida

Map Type Aerial Map - Lake 4

Date 03/03/21



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