KINGS LAKE HOMEOWNERS ASSOCIATION, INC.

Lake Quality Assessment Report

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

January 26, 2021

January 26, 2021

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

Dear Ms. Joyce Sissum,

Earth Tech Environmental, LLC is pleased to submit this Lake Quality Assessment Report for the referenced property. This water sampling was conducted in material compliance with the Florida Department of Environmental Protection's Standard Operating Procedures.

Please feel free to contact us if you have any questions.

Andrew McAuley
Senior Environmental Specialist
Earth Tech Environmental, LLC

Jeremy Sterk
Earth Tech Environmental, LLC

TABLE OF CONTENTS

APPENDICES

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.

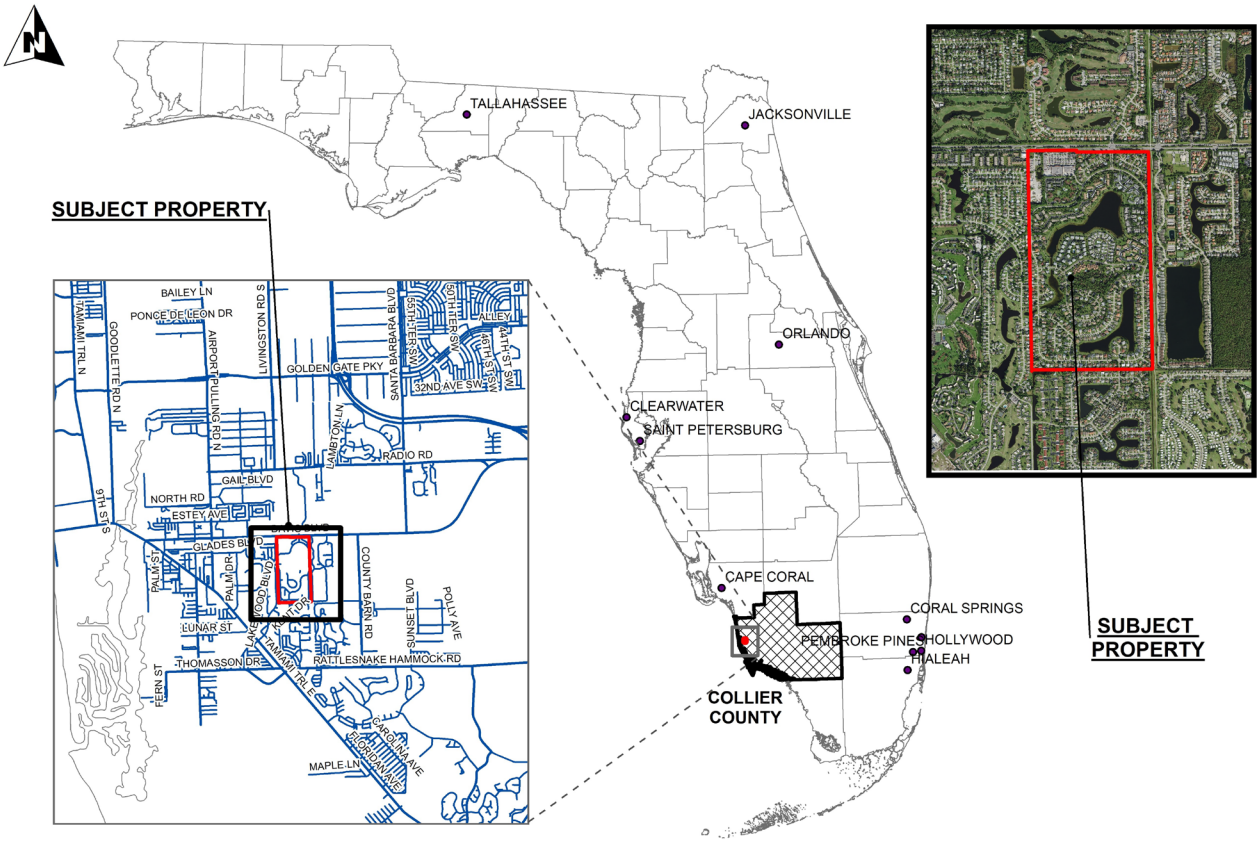

Figure 1. *Location Map*

1.1 Purpose

The purpose of this Lake Quality Assessment (assessment) is to conduct a physical lake assessment and nutrient sampling of the four lakes in the community. Fieldwork for this assessment was conducted on December 17 and 21, 2020 and January 5, 2021.

1.2 Scope of Services

This assessment conducted by ETE included, but was not limited to, the following services:

- conducting water quality assessment of the Subject Property to collect water samples and transfer of collected samples to a Florida certified laboratory for analysis, Benchmark EnviroAnalytical, Inc. (NELAC Certification #E84167).
- evaluation of lakes for existing and potential littoral zone plantings, including mapping of current littoral beds by species and coverage along with mapping of potential additional littoral areas or recommendations.
- note the presence of exotic vegetation, fish, and wildlife observations.
- discuss current lake management and property management activities and how they could be altered for lake water quality improvements.
- discuss potential algae control options that do not involve copper sulfate.
- evaluate water circulation options such as aerators or fountains.
- preparation of this written report presenting the sampling findings, analysis, and a summary of conclusions and recommendations for long term lake management.

2.0 SITE DESCRIPTION

This section presents a general overview of the Subject Property and any onsite improvements.

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, and Lake 4 (Dutchess Lake), 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 4 flow into Lake 3. From Lake 3 , the stormwater lake system flows off of the Subject Property to the adjoining property to the west (Lakewood Community).

Figure 2. *Overall Aerial Map*

2.1 Historical documentation

This section discusses previous lake assessment reports provided by others that ETE reviewed.

Kings Lake Study Report (September 2011) was conducted by Hagan Engineering for Kings Lake Homeowners Association, Inc. The report includes construction history, maintenance history, current conditions (July 2011), and recommendations for each of the lakes. Lake excavation and construction began in 1974 and was completed in 1985. Mechanical harvesting, chemical treatments and biological treatments have been utilized for aquatic weed management. In 1984, the lakes began receiving twice monthly weed treatment and additional treatments as needed. In 1995, grass carp were introduced to the lake system to manage nuisance aquatic plants which have reportedly helped reduce the amount of chemical treatment. In July 2011, surveys were conducted of each lake that located the lake tract boundaries and the control elevation contour around the lakes. Recommendations from this assessment were as follows:

Lake 1, Kings Lake (reference lake 3, Hagan Engineering report)

- Address aquatic weed issues more aggressively with chemical treatment.
- Budget and save for a lake bank stabilization project that would remove material from the bottom of the lake and reapply to the lake bank.

Lake 2, Prince Lake (reference lake 2, Hagan Engineering report)

- Inadequate water depth has resulted in significant aquatic weed problem; this could be addressed by continuing aggressive treatment or by excavating lake to achieve more depth.
- Vacuum excavation program could be used to address lake de-silting and remove muck from the lake bottom.

Lake 4, Dutchess Lake (reference Lake 1, Hagan Engineering report)

- Current treatment program should continue, and it is not necessary to budget for lake bank stabilization or muck removal.

Stormwater Lake Evaluation and Recommendations for Kings Lake (October 2020) was conducted by Collier County Pollution Control for Kings Lake Homeowners Association. The report includes background history, onsite evaluations, evaluation of downstream waterways, site specific and general recommendations. At the time of lake construction (1974-1985) littoral plantings were not required for the four man-made stormwater detention lakes. Lake 2 previously had six aerators, yet Collier County Pollution Control reports aerators and floating islands have since been abandoned or removed. It is unknown if the aerators and floating islands improved water quality. In 1994 pollution complaints revealed an algae bloom and in 1996 a bloom with dead fish occurred. Onsite evaluations were conducted in December 2018, February 2020, and August 2020. It was indicated that all lakes have growth of the native aquatic plants *Chara* and spikerush. Recommendations from this assessment were as follows:

Site- Specific, Lake Management Recommendations

- Develop a consistent water quality testing and trend analysis program for long-term monitoring. Monthly water quality parameters should be requested from your lake contractor.

- Continue mechanical harvesting of nuisance aquatic plants such as *Chara* and *Hydrilla (Hydrilla verticillata).*
- Use aquatic dyes for chemical treatment (when mechanical harvesting is not possible).
- A total 30% cover of each lake should consist of varied aquatic plants to achieve optimum water quality and lake health, including littoral plantings.
- Discourage residents from feeding waterfowl populations.
- Identify properties with lake bank erosion and incentivize homeowners to implement landscape buffers or raingardens.
- Utilize Collier County Mosquito Control for assistance with mosquito concerns and mosquitofish (*Gambusia affinis*) are available to stock into the lake system.

Site- Specific, Landscape Management Recommendations

- Irrigation overspray was observed, which is in violation with the local irrigation ordinance and is the primary cause of algae in lakes. Common area irrigation areas should be maintained by irrigation contractors to minimize overspray.
- Invasive and/or nonnative plants should be replaced with Florida Friendly Landscaping™ (FFL).
- As required by the Collier County Fertilizer and Urban Landscaping Ordinance No. 2019-18, verify that the fertilizer application has zero phsophorous or a recent soil test shows that phosphorous is needed for the area.
- As required by the Fertilizer Ordinance, every individual fertilizer applicator (landscape professionals applying fertilizer in common and sinlge family homes) must be certified in Green Industry Best Management Practices (GI-BMP). It can be verified at www.dontoverfeed.com. Additionally, Kings Lake Management staff should have the GI-BMP certification.
- Install pet waste disposal locations that include pet waste bags and trash receptacles to promote proper disposal of community pet waste.
- Provide oversight and incentivization for improved landscaping practices for single family homes.

3.0 ASSESSMENT METHODOLOGY

This section presents a general overview of the fieldwork methodology utilized for this assessment. ETE conducted three assessments during the fieldwork.

- Littoral Assessment Methodology – Assess the lake banks for existing littoral plants or lack thereof.
- Water Quality Assessment Methodology – Laboratory Analysis of collected water samples to determine the levels of nutrients in each lake.
- Water Quality Assessment Methodology – Field measurements of water at sample locations to determine the current aquatic environment.

3.1 Littoral Assessment Methodology

Each lake bank was walked in its entirety to survey the extent of existing littoral plants. Observations of the current conditions such as existing littoral planting areas, vegetative species, and stormwater drains were recorded using a GeoTrimble 7X. Wildlife utilization was also recorded during this assessment. It is noted that this littoral assessment was conducted during the dry season (October through May); therefore, the water levels were lower compared to the wet season (June through September).

A littoral plant can be defined as any emergent aquatic plant along a lake shoreline. These littoral zones provide several key benefits:

- They provide key habitat for wading birds, fish, and other aquatic invertebrate to forage or to find refuge within.
- Littoral plants act as a filter marsh to improve water quality.
- They help stabilize lake shorelines, which can prevent dangerous and ongoing erosion problems.
- Littoral plants can provide an aesthetically pleasing view with flowers and textures.

3.2 Water Quality Assessment Methodology (Laboratory Analysis)

To assess water quality conditions in the onsite lakes, a total of ten (10) grab samples from onsite lakes were collected at approximately one foot below the surface. The samples were placed in a cooler of ice, documented on a chain of custody, and submitted to a NELAP Certified Laboratory to be analyzed for Nitrate, Nitrite, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Nitrate + Nitrite, and Total Nitrogen. A complete laboratory package can be found in Appendix A. Results were compared to the Florida Trophic State Index for Lakes according to the Florida Trophic State Index Calculation Method 1996 FDEP 305(B) Report which can be found in Appendix B.

Nutrients associated with the biological cycle within lakes such as Total Nitrogen and Phosphorus are typically the most common cause of extensive algal blooms. High concentrations of these nutrients allow algae to thrive.

The Trophic State Index for Lakes (TSI) as developed by the Florida Department of Environmental Protection (FDEP) may be used to quantify biological productivity. 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

Lake water is related to the tropic state of water as follows:

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

Tropic State Index for Lakes as follows:

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

3.3 Water Quality Assessment Methodology (Field Measured Parameters)

Additional field parameters were collected at a series of locations in each lake including pH, temperature, specific conductivity, and dissolved oxygen (DO) utilizing a YSI Probe Plus Meter. At each sample location depth to bottom of lake as well as visibility were also recorded. Field parameters were collected at the bottom, mid-column, and surface intervals for the deeper portions of the lakes and bottom and surface intervals at shallower portions of the lakes.

DO readings can be interpreted using the following criteria:

<u>Dissolved Oxygen Levels for Warm Water Organisms:</u>

- 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

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.

The FDEP criteria range for pH is 6.5 – 8.5.

4.0 RESULTS

This section details the results of the littoral assessment and water quality testing conducted on each of the four lakes.

4.1 Lake 1 – Kings Lake

This section discusses the results from Lake 1.

Lake 1 - Littoral Assessment

Lake 1 consists of approximately 6,523 linear feet of lake bank (see Figure 3 below). During the littoral assessment it is estimated that approximately 4,160 linear feet, or roughly 64% of the lake bank, is covered with spikerush (*Eleocharis cellulosa*) and scattered bald cypress (*Taxodium distichum*). In some of the littoral areas torpedograss (*Panicum repens*), which is a Category 1 invasive exotic species according to the Florida Exotic Pest Plant Council's (FLEPPC), was noted between the spikerush and the lake bank. Evidence of mechanical harvesting of the torpedograss was noted in some of these areas. Chara (*Characeae spp.*) was noted in the shallower portions of the lake including the shoreline and the bottom near the southwest connection to Lake 2.

Figure 3. *Lake 1 - Littoral Assessment Ma*

Lake 1 - Water Quality Assessment (Laboratory Analysis)

Four (4) samples were obtained from Lake 1 and sent to a NELAP certified laboratory to be analyzed for Nitrate, Nitrite, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Nitrate + Nitrite, and Total Nitrogen (see Figure 4 below). The results are listed in the table below. In comparing the laboratory data for Total Phosphorus and Total Nitrogen to Florida Trophic State Index (TSI) for Lakes each samples Trophic State Classification can be defined as:

- L1-S1: Total Phosphorus (0.016 mg/L) has a TSI of 30-40 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.749 mg/L) has a TSI of 50-59 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L1-S2: Total Phosphorus (0.011 mg/L) has a TSI of 30-40 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.700 mg/L) has a TSI of 50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L1-S3: Total Phosphorus (0.161 mg/L) has a TSI of 70-80 which classifies it as Hyper-Eutrophic and indicates Poor water quality. Total Nitrogen (0.666 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L1-S4: Total Phosphorus (0.154 mg/L) has a TSI of 70-80 which classifies it as Hyper-Eutrophic and indicates Poor water quality. Total Nitrogen (0.657 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.

Lake 1 - Kings Lake									
					Sample ID	L1-S1	L1-S2	L1-S3	L1-S4	* Water Quality
					Date Sampled	12/21/20	12/21/20	12/21/20	12/21/20	
Parameter	Procedure	Units	MDL	PQL		Results	Results	Results	Results	
Nitrate Nitrogen	300.0	MG/L	0.020	0.080		0.071 I	0.069 I	0.070 I	0.069 I	-
Nitrite Nitrogen	300.0	MG/L	0.020	0.080		0.020 U	0.020 U	0.020 U	0.020 U	-
Total Kjeldahl Nitrogen (TKN)	351.2	MG/L	0.05	0.20		0.569	0.613	0.593	0.588	-
Total Phosphorus as P	365.3	MG/L	0.008	0.032		0.016 I	0.011 I	0.161	0.154	Good - Poor
Nitrate + Nitrite as N	SYSTEA EASY	MG/L	0.006	0.024		0.180	0.087	0.07	0.069	-
Total Nitrogen	SYSTEA+351	MG/L	0.05	0.20		0.749	0.700	0.666	0.657	Good

MG/L: Milligrams per Liter
MDL: Method Detection Limit
PQL: Practical Quantitative Limit (4xMDL)
I: Reported value is between the laboratory MDL and PQL
U: Analyte analyzed but not detected at the value indicated
***Water Quality:** According to Florida Trophic State Index Calculations Method 1996 FDEP 305(B) Report

Figure 4. *Lake 1 – Water Quality Sampling Location Map*

<u>Lake 1 - Water Quality Assessment (Field Measured Parameters)</u>

Seven (7) locations were selected to assess Lake 1 for DO, pH, Temperature, Specific Conductivity, and Visibility (see Figure 4 above). The results are listed in the table below. All the field parameters fall within a relatively normal range, with the exception of Dissolved Oxygen (DO). The average DO level for Lake 1 is 4.38 mg/L, which is below the general criteria. Overall lake visibility was relatively good, the deepest portion on the lake was noted at L1-S7 (12.5’ deep) in the northern portion of Lake 1 and gets shallower to the southwest near the connection to Lake 2.

Lake 1 – Kings Lake (Field Measured Parameters)						
Sample ID	**Visibility (ft)**	**Sample Depth (ft)**	**DO (mg/L)**	**pH**	**Temperature (°F)**	**Sp. Cond (uS/cm)**
L1-S1	4	2	5.43	8.17	69.9	774
		4	5.26	8.20	69.4	771
L1-S2	9	1	4.25	8.19	71.2	778
		4.5	4.39	8.17	70.9	776
		9	4.55	8.19	70.7	775
L1-S3	8.5	1	4.44	8.20	71.0	779
		4.5	4.21	8.19	70.8	777
		9	4.11	8.19	70.6	776
L1-S4	7	1	4.51	8.20	71.6	784
		6	4.55	8.18	71.3	786
		11.5	4.43	8.19	70.8	779
L1-S5	7	1	4.30	8.19	71.4	785
		5	4.23	8.14	71.4	786
		10	4.24	8.13	71.2	785
L1-S6	6	1	4.36	8.16	71.5	785
		6	4.40	8.13	71.0	785
		11.5	3.85	8.11	70.8	783
L1-S7	6	1	4.50	8.18	71.4	785
		6	4.33	8.13	71.1	786
		12.5	3.27	8.01	70.9	790
Highest			**5.43**	**8.20**	**71.6**	**790**
Lowest			**3.27**	**8.01**	**69.4**	**771**
Average			**4.38**	**8.16**	**70.95**	**781**

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

The FDEP criteria range for pH is 6.5 – 8.5

4.2 Lake 2 – Prince Lake

This section discusses the results from Lake 2.

Lake 2 - Littoral Assessment

Lake 2 consists of approximately 2,668 linear feet of lake bank (see Figure 5 below). During the littoral assessment it is estimated that approximately 848 linear feet, or roughly 32% of the lake bank, is covered with spikerush and scattered bald cypress. Torpedograss, which is a Category 1 invasive exotic species according to the Florida Exotic Pest Plant Council's (FLEPPC), was noted along parts of the lake bank including the areas where littoral plants are present. The bottom of Lake 2 consists almost entirely of Chara throughout.

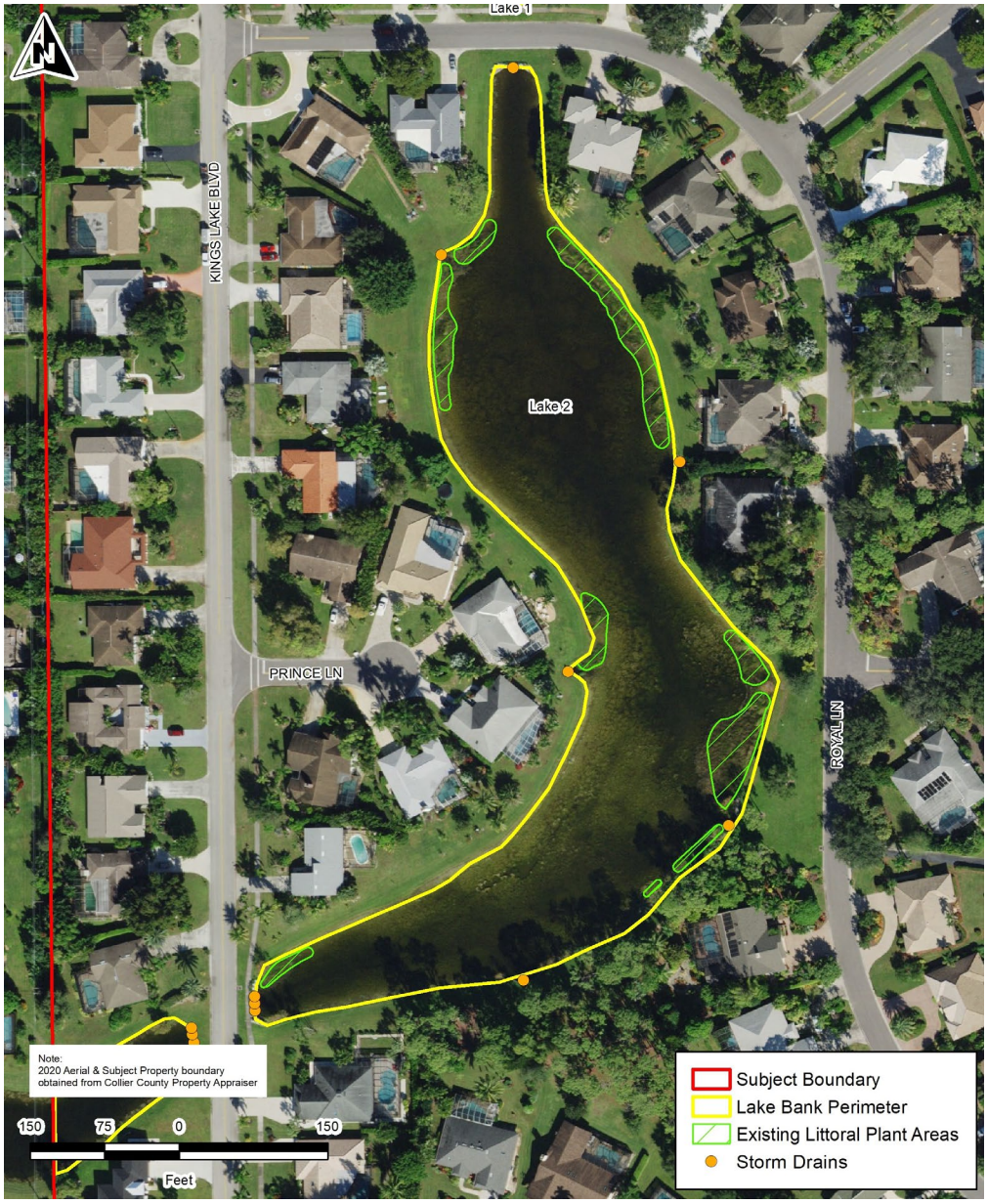

Figure 5. *Lake 2 - Littoral Assessment Map*

Lake 2 - Water Quality Assessment (Laboratory Analysis)

Two (2) samples were obtained from Lake 2 and sent to a NELAP certified laboratory to be analyzed for Nitrate, Nitrite, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Nitrate + Nitrite, and Total Nitrogen (see Figure 6 below). The results are listed in the table below. In comparing the laboratory data for Total Phosphorus and Total Nitrogen to Florida Trophic State Index (TSI) for Lakes each samples Trophic State Classification can be defined as:

- L2-S1: Total Phosphorus was not detected above the laboratory's MDL (0.008 mg/L) therefore is classified as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.520 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L2-S2: Total Phosphorus was not detected above the laboratory's MDL (0.008 mg/L) therefore is classified as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.782 mg/L) has a TSI of 50-59 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.

Lake 2 - Princess Lake							
				Sample ID	L2-S1	L2-S2	* Water Quality
				Date Sampled	12/21/20	12/21/20	
Parameter	Procedure	Units	MDL	PQL	Results	Results	
Nitrate Nitrogen	300.0	MG/L	0.020	0.080	0.020 U	0.024 I	-
Nitrite Nitrogen	300.0	MG/L	0.020	0.080	0.020 U	0.020 U	-
Total Kjeldahl Nitrogen (TKN)	351.2	MG/L	0.05	0.20	0.507	0.753	-
Total Phosphorus as P	365.3	MG/L	0.008	0.032	0.008 U	0.008 U	Good
Nitrate + Nitrite as N	SYSTEA EASY	MG/L	0.006	0.024	0.013 I	0.029	-
Total Nitrogen	SYSTEA+351	MG/L	0.05	0.20	0.520	0.782	Good

MG/L: Milligrams per Liter
MDL: Method Detection Limit
PQL: Practical Quantitative Limit (4xMDL)
I: Reported value is between the laboratory MDL and PQL
U: Analyte analyzed but not detected at the value indicated
***Water Quality:** According to Florida Trophic State Index Calculations Method 1996 FDEP 305(B) Report

Figure 6. *Lake 2 – Water Quality Sampling Location Map*

<u>Lake 2 - Water Quality Assessment (Field Measured Parameters)</u>

Three (3) locations were selected to assess Lake 2 for DO, pH, Temperature, Specific Conductivity, and Visibility (see Figure 6 above). The results are listed in the table below. All the field parameters fall within a relatively normal range. Lake 2 is relatively shallow throughout (1' – 4' deep) with good visibility.

Lake 2 – Prince Lake (Field Measured Parameters)						
Sample ID	**Visibility (ft)**	**Sample Depth (ft)**	**DO (mg/L)**	**pH**	**Temperature (°F)**	**Sp. Cond (us/cm)**
L2-S1	3	1	6.25	8.26	68.8	679
L2-S2	2	1	6.99	8.19	69.9	695
L2-S3	4	1	6.56	8.16	70.1	730
		4	6.20	8.18	70.0	735
Highest			**6.99**	**8.26**	**70.1**	**735**
Lowest			**6.20**	**8.16**	**68.8**	**679**
Average			**6.50**	**8.20**	**69.7**	**710**

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

The FDEP criteria range for pH is 6.5 – 8.5

4.3 Lake 3

This section discusses the results from Lake 3.

Lake 3 - Littoral Assessment

Lake 3 consists of approximately 465 linear feet of lake bank within the Kings Lake property boundary, this lake continues on to the adjoining property to the west (see Figure 7 below). During the littoral assessment no littoral plants were noted along the lake bank. The bottom of Lake 3 consists almost entirely of Chara throughout. Scattered patches of torpedograss, which is a Category 1 invasive exotic species according to the Florida Exotic Pest Plant Council's (FLEPPC), were observed along the lake bank. Small amounts of algae were noted near the outfall from Lake 2. One resident on the south side of the lake is having construction done on the back of their house, a silt fence was noted collapsed and fill material is eroding down the lake bank and into the lake.

Figure 7. *Lake 3 - Littoral Assessment Map*

Lake 3 - Water Quality Assessment (Laboratory Analysis)

One (1) sample was obtained from Lake 3 and sent to a NELAP certified laboratory to be analyzed for Nitrate, Nitrite, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Nitrate + Nitrite, and Total Nitrogen (see Figure 8 below). The results are listed in the table below. In comparing the laboratory data for Total Phosphorus and Total Nitrogen to Florida Trophic State Index (TSI) for Lakes each samples Trophic State Classification can be defined as:

- L3-S1: Total Phosphorus (0.024 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.504 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.

Lake 3						
				Sample ID	L3-S1	* Water Quality
				Date Sampled	12/21/20	
Parameter	Procedure	Units	MDL	PQL	Results	
Nitrate Nitrogen	300.0	MG/L	0.020	0.080	0.024 I	-
Nitrite Nitrogen	300.0	MG/L	0.020	0.080	0.020 U	-
Total Kjeldahl Nitrogen (TKN)	351.2	MG/L	0.05	0.20	0.469	-
Total Phosphorus as P	365.3	MG/L	0.008	0.032	0.024 I	Good
Nitrate + Nitrite as N	SYSTEA EASY	MG/L	0.006	0.024	0.035	-
Total Nitrogen	SYSTEA+351	MG/L	0.05	0.20	0.504	Good

MG/L: Milligrams per Liter
MDL: Method Detection Limit
PQL: Practical Quantitative Limit (4xMDL)
I: Reported value is between the laboratory MDL and PQL
U: Analyte analyzed but not detected at the value indicated
***Water Quality:** According to Florida Trophic State Index Calculations Method 1996 FDEP 305(B) Report

Figure 8. *Lake 3 – Water Quality Sampling Location Map*

Lake 3 - Water Quality Assessment (Field Parameters)

One (1) location was selected to assess Lake 3 for DO, pH, Temperature, Specific Conductivity, and Visibility (see Figure 8 above). The results are listed in the table below. All the field parameters fall within a relatively normal range. Lake 3 is relatively shallow throughout (1' – 4' deep) with good visibility.

Lake 3 (Field Parameters)						
Sample ID	**Visibility (ft)**	**Sample Depth (ft)**	**DO (mg/L)**	**pH**	**Temperature (°F)**	**Sp. Cond (us/cm)**
L3-S1	3	1	6.02	8.26	68.8	674
		3	5.92	8.22	68.7	679
Highest			**6.02**	**8.26**	**68.8**	**679**
Lowest			**5.92**	**8.22**	**68.7**	**674**
Average			**5.97**	**8.24**	**68.75**	**677**

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

The FDEP criteria range for pH is 6.5 – 8.5

4.4 Lake 4 – Dutchess Lake

This section discusses the results from Lake 4.

Lake 4 - Littoral Assessment

Lake 4 consists of approximately 5,673 linear feet of lake bank (see Figure 9 below). During the littoral assessment it is estimated that approximately 320 linear feet, or roughly 5-6% of the lake bank, is covered with spikerush (*Eleocharis cellulosa*). In some of the littoral areas torpedograss (*Panicum repens*), which is a Category 1 invasive exotic species according to the Florida Exotic Pest Plant Council's (FLEPPC), was noted between the spikerush and the lake bank. Evidence of mechanical harvesting of the torpedograss was noted in some of these areas.

Figure 9. *Lake 4 - Littoral Assessment Map*

Lake 4 - Water Quality Assessment (Laboratory Analysis)

Three (3) samples were obtained from Lake 4 and sent to a NELAP certified laboratory to be analyzed for Nitrate, Nitrite, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, Nitrate + Nitrite, and Total Nitrogen (see Figure 10 below). The results are listed in the table below. In comparing the laboratory data for Total Phosphorus and Total Nitrogen to Florida Trophic State Index (TSI) for Lakes each samples Trophic State Classification can be defined as:

- L4-S1: Total Phosphorus (0.018 mg/L) has a TSI of 30-40 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.728 mg/L) has a TSI of 50-59 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L4-S2: Total Phosphorus (0.026 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.746 mg/L) has a TSI of 50-59 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.
- L4-S3: Total Phosphorus (0.024 mg/L) has a TSI of 40-50 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality. Total Nitrogen (0.751 mg/L) has a TSI of 50-59 which classifies it as Oligotrophic through Mid-Eutrophic and indicates Good water quality.

Lake 4 - Dutchess Lake								
				Sample ID	L4-S1	L4-S2	L4-S3	* Water Quality
				Date Sampled	12/21/20	12/21/20	12/21/20	
Parameter	Procedure	Units	MDL	PQL	Results	Results	Results	
Nitrate Nitrogen	300.0	MG/L	0.020	0.080	0.085	0.084	0.086	-
Nitrite Nitrogen	300.0	MG/L	0.020	0.080	0.020 U	0.020 U	0.020 U	-
Total Kjeldahl Nitrogen (TKN)	351.2	MG/L	0.05	0.20	0.625	0.642	0.647	-
Total Phosphorus as P	365.3	MG/L	0.008	0.032	0.018 I	0.026 I	0.024 I	Good
Nitrate + Nitrite as N	SYSTEA EASY	MG/L	0.006	0.024	0.103	0.104	0.104	-
Total Nitrogen	SYSTEA+351	MG/L	0.05	0.20	0.728	0.746	0.751	Good

MG/L: Milligrams per Liter
MDL: Method Detection Limit
PQL: Practical Quantitative Limit (4xMDL)
I: Reported value is between the laboratory MDL and PQL
U: Analyte analyzed but not detected at the value indicated
***Water Quality:** According to Florida Trophic State Index Calculations Method 1996 FDEP 305(B) Report

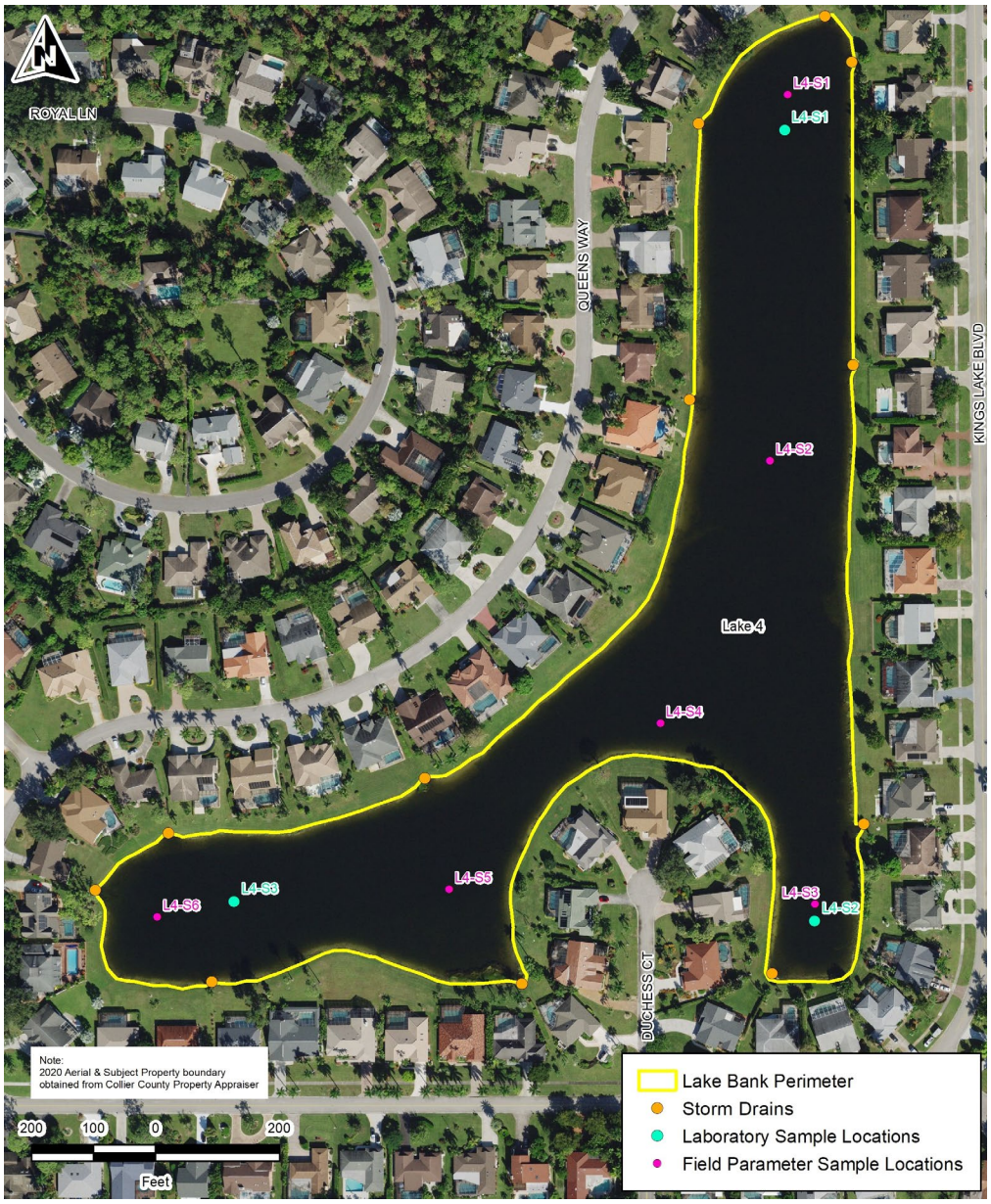

Figure 10. *Lake 4 – Water Quality Sampling Location Map*

Lake 4 - Water Quality Assessment (Field Parameters)

Six (6) locations were selected to assess Lake 4 for DO, pH, Temperature, Specific Conductivity, and Visibility (see Figure 10 above). The results are listed in the table below. All the field parameters fall within a relatively normal range. Overall lake visibility was relatively good, the deepest portion on the lake was noted at L4-S1 (17’ deep) in the northern portion.

Lake 4 – Dutchess Lake (Field Parameters)						
Sample ID	**Visibility (ft)**	**Sample Depth (ft)**	**DO (mg/L)**	**pH**	**Temperature (°F)**	**Sp. Cond (uS/cm)**
L4-S1	7	1	6.09	8.48	70.8	675
		8	5.99	8.43	70.7	675
		17	4.02	8.30	69.6	677
L4-S2	5.5	1	6.28	8.53	70.8	673
		7	6.07	8.54	70.7	673
		14	5.38	8.52	70.5	674
L4-S3	5.5	1	5.84	8.53	70.8	673
		6	5.87	8.52	70.6	673
		12	5.88	8.53	70.5	672
L4-S4	6.5	1	5.84	8.51	70.8	673
		6	5.66	8.50	70.8	673
		12	5.82	8.51	70.7	673
L4-S5	7	1	6.20	8.55	70.8	672
		6	6.21	8.56	70.7	672
		12.5	6.19	8.57	70.7	672
L4-S6	7	1	6.30	8.61	71.0	671
		5.5	6.55	8.58	70.9	671
		11	6.10	8.55	70.8	672
Highest			**6.55**	**8.61**	**70.9**	**677**
Lowest			**4.02**	**8.30**	**69.6**	**671**
Average			**5.91**	**8.52**	**70.7**	**673**

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

The FDEP criteria range for pH is 6.5 – 8.5

4.5 Wildlife Observations

During this assessment wildlife utilizing the lakes within Subject Property were noted. The following table illustrate the species observed during this assessment.

Wildlife Observations		
COMMON NAME	**SCIENTIFIC NAME**	**OBSERVATIONS**
Birds		
American Crow	*Corvus brachyrhynchos*	**DV**
Anhinga	*Anhinga*	**DV**
Turkey Vulture	*Cathartes aura*	**DV**
White Ibis	*Eudocimus albus*	**DV**
Common gallinule	*Gallinula galeata*	**DV**
Little blue heron	*Egretta caerulea*	**DV**
Red-shouldered hawk	*Buteo lineatus*	**DV**
Muscovy duck	*Cairina moschata*	**DV**
Great egret	*Ardea alba*	**DV**
Reptiles		
Softshell turtle	*Apalone ferox*	**DV**
Mammals		
River otter	*Lontra canadensis*	**DV**
Fish		
Large-mouth bass	*Micropterus salmoides*	**DV**
Bluegill	*Lepomis macrochirus*	**DV**

5.0 LAKE SPECIFIC DISCUSSION & RECOMMENDATIONS

This section discusses the results of the littoral and water quality assessments and provides lake specific recommendations.

5.1 Lake 1 – Kings Lake

Approximately 64% of the lake bank consists of littoral plants (rule of thumb target is 30%). These littoral plant areas are monocultures consisting of spike rush. In the zones between the littoral plant areas and the shoreline torpedograss is recruiting in its own monoculture. Evidence of mechanical harvesting was observed. ETE recommends continuing to treat the torpedograss, either by chemical or mechanical means. The HOA should consider replanting the treated areas with native species to outcompete the torpedograss in the future.

Areas of dense spikerush could also be mechanically harvested and replanted with a variety of aquatic vegetation-this will aid in the overall lake health and provide a pleasing landscape for the residents. Test plots should be conducted prior to a large replanting effort to assess the survivability of various aquatic vegetation species.

The water quality assessment indicated relatively low levels of DO across the lake and slightly elevated levels of Phosphorus in the eastern portion of the lake. ETE recommends installing an aeration system in Lake 1 to increase the levels of DO.

5.2 Lake 2 – Prince Lake

Approximately 32% of the lake bank consists of littoral plants. These littoral plant areas are monocultures consisting of spike rush. In the zones between the littoral plant areas and the shoreline torpedograss is recruiting in its own monoculture. Evidence of mechanical harvesting was observed. ETE recommends

continuing to treat the torpedograss, either by chemical or mechanical means. The HOA should consider replanting the treated areas with native species to outcompete the torpedograss in the future.

Areas of dense spikerush could also be mechanically harvested and replanted with a variety of aquatic vegetation-this will aid in the overall lake health and provide a pleasing landscape for the residents. Test plots should be conducted prior to a large replanting effort to assess the survivability of various aquatic vegetation species. Chara was noted throughout the bottom of Lake 2 and the recent harvesting should be repeated if growth becomes excessive or a nuisance in the future.

The water quality assessment showed that the lake has relatively good water quality as indicated by the trophic index scores.

5.3 Lake 3

A portion of Lake 3 falls within the Subject Property and continues off the property to the east. Lake 3 does not have any noticeable littoral plant areas, however patchy areas of torpedograss were noted along the lake bank. The torpedograss should be treated and replaced with native aquatic vegetation, this will aid in the overall lake health and provide a pleasing landscape for the residents. If the banks are not too steep, test plots could be conducted to ensure the survivability of various aquatic vegetation species.

Small areas of algae were observed near the outfall from Lake 2. Chara was noted throughout the bottom of Lake 3 and could be harvested if growth becomes excessive or a nuisance in the future.

The silt fence along the shoreline of the resident on the south side of the lake who is under construction should be replaced and maintained to avoid eroded materials entering the lake.

The water quality assessment showed that the lake has relatively good water quality as indicated by the trophic index scores.

5.4 Lake 4 – Dutchess Lake

Approximately 5-6% of the lake bank consists of littoral plants, well below target percentages. As with the other lakes, the littoral plant areas are monocultures consisting of spike rush. In the zones between the littoral plant areas and the shoreline torpedograss is recruiting, evidence of treatment was observed. ETE recommends continuing to treat the torpedograss, either by chemical or mechanical means. The HOA should consider replanting the treated areas with native species to outcompete the torpedograss in the future.

The water quality assessment showed that the lake has relatively good water quality as indicated by the trophic index scores.

6.0 GENERAL RECOMMENDATIONS

Based on the historical information reviewed, the littoral assessment, and the water quality assessment (laboratory and field measured parameters), the following recommendations are suggested to improve and maintain the overall health of the lake system. It is important to fully understand the relationship between landscape maintenance practices and the overall health of the lake system, therefore these recommendations should be presented and discussed with the residents of the community.

- Improve, expand, and diversify the littoral zones throughout the community with a variety of native aquatic vegetation and keep the littoral zones free of exotic vegetation (torpedograss). Ideally, littoral areas should be made up of at least three (3) native aquatic species.
- Provide some photographs of heathy littoral zones from other communities or natural areas to educate residents on the visual potential of diverse native littoral plants beds.
- 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.
- Consider aeration systems in the lakes to aid in increasing the amount of DO, Lake 1 could especially benefit from this.
- Implement a water quality sampling program to monitor the changes in nutrient trends over time. This should include a combination of laboratory nutrient sampling and field parameter sampling. The sampling should be on regular intervals and track the same parameters each time. Occasional sampling should occur immediately after summer storm events to track nutrient spikes in the lakes as a result of run-off.
- Establish community-wide landscaping installation and maintenance guidelines for the residents and any landscaping companies that conduct work within the community.
    - Avoid chemical treatment of native plants near the shoreline
    - Establish an approved chemical list for herbicides/pesticides
    - Prevent grass clippings from entering the lake system
    - Avoid overwatering and irrigation overspray
- Follow the Site- Specific, Landscape Management Recommendations as outlined in the Collier County Pollution Control Report
- Discourage residents from feeding the wildlife within the community
- Ensure residents and/or contractors are utilizing silt fences when residential construction activities are occurring to stop debris from entering the lakes.

7.0 ENVIRONMENTAL PROFESSIONAL STATEMENT

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in § 312.10 of CFR 312 and I have the specific qualifications based on education, training, and experience to assess a property as required for this report.

Andrew McAuley
Senior Environmental Specialist
Earth Tech Environmental, LLC.

Jeremy Sterk, C.E.P. #16992037
Earth Tech Environmental, LLC.

8.0 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
Benchmark EnviroAnalytical, Inc. Analytical Test Report

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification #E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 20121418

Earth Tech Environmental
10600 Jolea Ave.
Bonita Springs, FL 34135

Andrew McAuley

Project Name : LAKE ASSESSMENT
Date Received : 12/22/2020
Time Received : 1538

Submission Number: 20121418
Sample Number: 001
Sample Description: L1-S1

Sample Date: 12/21/2020
Sample Time: 1130
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.071 I	MG/L	0.020	0.080	300.0	12/22/2020 17:56	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 17:56	PN
TOTAL KJELDAHL NITROGEN	0.569	MG/L	0.05	0.20	351.2	12/28/2020 11:32	IE
TOTAL PHOSPHORUS AS P	0.016 I	MG/L	0.008	0.032	365.3	01/06/2021 17:22	CC
NITRATE+NITRITE AS N	0.180	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:11	JF
TOTAL NITROGEN	0.749	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:11	IE/JF

Submission Number: 20121418
Sample Number: 002
Sample Description: L1-S2

Sample Date: 12/21/2020
Sample Time: 1120
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.069 I	MG/L	0.020	0.080	300.0	12/22/2020 18:07	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 18:07	PN
TOTAL KJELDAHL NITROGEN	0.613	MG/L	0.05	0.20	351.2	12/28/2020 11:33	IE
TOTAL PHOSPHORUS AS P	0.011 I	MG/L	0.008	0.032	365.3	01/06/2021 17:23	CC
NITRATE+NITRITE AS N	0.087	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:17	JF
TOTAL NITROGEN	0.700	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:17	IE/JF

Submission Number: 20121418
Sample Number: 003
Sample Description: L1-S3

Sample Date: 12/21/2020
Sample Time: 1110
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst

NITRATE NITROGEN	0.070 I	MG/L	0.020	0.080	300.0	12/22/2020	18:40	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020	18:40	PN
TOTAL KJELDAHL NITROGEN	0.593	MG/L	0.05	0.20	351.2	12/28/2020	11:34	IE
TOTAL PHOSPHORUS AS P	0.161	MG/L	0.008	0.032	365.3	01/06/2021	17:24	CC
NITRATE+NITRITE AS N	0.073	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020	10:12	JF
TOTAL NITROGEN	0.666	MG/L	0.05	0.20	SYSTEA+351	12/29/2020	10:12	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 004 **Sample Time:** 1100
Sample Description: L1-S4 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.069 I	MG/L	0.020	0.080	300.0	12/22/2020 19:02	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:02	PN
TOTAL KJELDAHL NITROGEN	0.588	MG/L	0.05	0.20	351.2	12/28/2020 11:42	IE
TOTAL PHOSPHORUS AS P	0.154	MG/L	0.008	0.032	365.3	01/06/2021 17:25	CC
NITRATE+NITRITE AS N	0.069	MG/L	0.006	0.024	SYSTEA EASY	01/06/2021 16:52	JF
TOTAL NITROGEN	0.657	MG/L	0.05	0.20	SYSTEA+351	01/06/2021 16:52	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 005 **Sample Time:** 1050
Sample Description: L2-S1 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:24	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:24	PN
TOTAL KJELDAHL NITROGEN	0.507	MG/L	0.05	0.20	351.2	12/28/2020 11:43	IE
TOTAL PHOSPHORUS AS P	0.008 U	MG/L	0.008	0.032	365.3	01/07/2021 12:44	CC
NITRATE+NITRITE AS N	0.013 I	MG/L	0.006	0.024	SYSTEA EASY	01/06/2021 16:53	JF
TOTAL NITROGEN	0.520	MG/L	0.05	0.20	SYSTEA+351	01/06/2021 16:53	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 006 **Sample Time:** 1040
Sample Description: L2-S2 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.024 I	MG/L	0.020	0.080	300.0	12/22/2020 19:36	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:36	PN
TOTAL KJELDAHL NITROGEN	0.753	MG/L	0.05	0.20	351.2	12/28/2020 11:44	IE
TOTAL PHOSPHORUS AS P	0.008 U	MG/L	0.008	0.032	365.3	01/06/2021 17:27	CC

NITRATE+NITRITE AS N	0.029	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020	10:25	JF
TOTAL NITROGEN	0.782	MG/L	0.05	0.20	SYSTEA+351	12/29/2020	10:25	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 007 **Sample Time:** 1030
Sample Description: L3-S1 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.024 I	MG/L	0.020	0.080	300.0	12/22/2020 19:47	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:47	PN
TOTAL KJELDAHL NITROGEN	0.469	MG/L	0.05	0.20	351.2	12/28/2020 11:46	IE
TOTAL PHOSPHORUS AS P	0.024 I	MG/L	0.008	0.032	365.3	01/06/2021 17:28	CC
NITRATE+NITRITE AS N	0.035	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:19	JF
TOTAL NITROGEN	0.504	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:19	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 008 **Sample Time:** 0955
Sample Description: L4-S1 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.085	MG/L	0.020	0.080	300.0	12/22/2020 19:58	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 19:58	PN
TOTAL KJELDAHL NITROGEN	0.625	MG/L	0.05	0.20	351.2	12/28/2020 11:47	IE
TOTAL PHOSPHORUS AS P	0.018 I	MG/L	0.008	0.032	365.3	01/06/2021 17:29	CC
NITRATE+NITRITE AS N	0.103	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:19	JF
TOTAL NITROGEN	0.728	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:19	IE/JF

Submission Number: 20121418 **Sample Date:** 12/21/2020
Sample Number: 009 **Sample Time:** 1000
Sample Description: L4-S2 **Sample Method:** Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.084	MG/L	0.020	0.080	300.0	12/22/2020 20:09	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 20:09	PN
TOTAL KJELDAHL NITROGEN	0.642	MG/L	0.05	0.20	351.2	12/28/2020 11:48	IE
TOTAL PHOSPHORUS AS P	0.026 I	MG/L	0.008	0.032	365.3	01/06/2021 17:30	CC
NITRATE+NITRITE AS N	0.104	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:10	JF
TOTAL NITROGEN	0.746	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:10	IE/JF

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification #E84167

Submission Number: 20121418
Sample Number: 010
Sample Description: L4-S3

Sample Date: 12/21/2020
Sample Time: 1010
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date/Time	Analyst
NITRATE NITROGEN	0.086	MG/L	0.020	0.080	300.0	12/22/2020 20:20	PN
NITRITE NITROGEN	0.020 U	MG/L	0.020	0.080	300.0	12/22/2020 20:20	PN
TOTAL KJELDAHL NITROGEN	0.647	MG/L	0.05	0.20	351.2	12/28/2020 11:49	IE
TOTAL PHOSPHORUS AS P	0.024 I	MG/L	0.008	0.032	365.3	01/06/2021 17:31	CC
NITRATE+NITRITE AS N	0.104	MG/L	0.006	0.024	SYSTEA EASY	12/29/2020 10:11	JF
TOTAL NITROGEN	0.751	MG/L	0.05	0.20	SYSTEA+351	12/29/2020 10:11	IE/JF

Dale D. Dixon / Laboratory Director — 01/11/2021 Date

Tülay Tanrisever - Technical Director/QC Officer

Kara Peterson - QA Officer

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.
B = Results based upon colony counts outside the ideal range.
H = Value based on field kit determination. Results may not be accurate.
I = Reported value is between the laboratory MDL and the PQL.
J1 = Estimated value. Surrogate recovery limits exceeded.
J2 = Estimated value. No quality control criteria exists for component.
J3 = Estimated value. Quality control criteria for precision or accuracy not met.
J4 = Estimated value. Sample matrix interference suspected.
J5 = Estimated value. Data questionable due to improper lab or field protocols.
K = Off-scale low. Value is known to be < the value reported.
L = Off-scale high. Value is known to be > the value reported.
N = Presumptive evidence of presence of material.
O = Sampled, but analysis lost or not performed.
Q = Sample held beyond accepted hold time.
T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.
U = Analyte analyzed but not detected at the value indicated.
V = Analyte detected in sample and method blank. Results for this analyte in associated samples may be biased high. Standard, Duplicate and Spike values are within control limits. Reported data are usable.
Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.
Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.
| = Data deviate from historically established concentration ranges.
? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the presence or absence of the analyte cannot be determined from the data.
* = Not reported due to interference.
Oil & Grease - If client does not send sufficient sample quantity for spike evaluation surface water samples are supplied by the laboratory.

NOTES:

MBAS calculated as LAS; molecular weight = 340.
PQL = 4xMDL.
ND = Not detected at or above the adjusted reporting limit.

COMMENTS:

For questions or comments regarding these results, please contact us at (941) 723-9986.

Results relate only to the samples.

Benchmark EnviroAnalytical, Inc
1711 12th Street East
Palmetto, FL. 34221
941-723-9986
941-723-6061

Client Name: **Earth Tech Environmental, LLC**
10600 Jolea Ave.
Bonita Springs FL 34135
Andrew McAuley 516-647-9699 / Office: 239-304-0030
andrew@eteflorida.com

Project Name: Lake Assessment*

Laboratory Submission # : 20121418

Station ID	Sample Matrix[2]	Sample Type[1]	Parameters, Preservative[4], Container Type[3]			Laboratory Sample #
			TKN (351.2) TP (365.3) NO_3-NO_2 (Systea Easy) TN (Calc.)	NO_3 NO_2 (300.0)	~~Fecal Coliform~~	
			1 x ½ Pint Plastic	1 x ½ Pint Plastic	1 x 100ml ~~Sterile~~ Plastic	
			1:4 H_2SO_4 pH~~<2~~	Plain	~~NaThio~~	
L1-S1	SW GW	G	Date & Time: 12/21/20 @ 1130			1
L1-S2	GW	G	Date & Time: " @ 1120			2
L1-S3	GW	G	Date & Time: " @ 1110			3
L1-S4	GW	G	Date & Time: " @ 1100			4
L2-S1	GW	G	Date & Time: " @ 1050			5
L2-S2	GW	G	Date & Time: " @ 1040			6
L3-S1	GW	G	Date & Time: " @ 1030			7

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), fresh surface warer (FSW), saline surface water (SSW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).** Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability
pH~~<2~~ Temperature: 0.8°C

1	Collector:	Date: 12/21/20	Time: 14:00	Received By:	Date: 12/22/20	Time: 8:45
2	Relinquished By:	Date: 12/22/20	Time: 1021	Received By:	Date: 12/22/20	Time: 1324
3	Relinquished By:	Date: 12/22/20	Time: 1535	Received By:	Date: 12/22/20	Time: 1535
4	Relinquished By:	Date:	Time:	Received By:	Date:	Time:
5	Relinquished By:	Date:	Time:	Received By:	Date:	Time:

* Per AM emails JM 12/22/20

Benchmark EnviroAnalytical, Inc
1711 12th Street East
Palmetto, FL. 34221
941-723-9986
941-723-6061

Client Name:
Earth Tech Environmental, LLC
10600 Jolea Ave.
Bonita Springs FL 34135
Andrew McAuley 516-647-9699 / Office: 239-304-0030
andrew@eteflorida.com

Project Name: Lake Assessment

Laboratory Submission # : 20121418

Station ID	Sample Matrix[2]	Sample Type[1]	Parameters, Preservative[4], Container Type[3]			Laboratory Sample #
			TKN (351.2) TP (365.3) NO_3-NO_2 (Systea Easy) TN (Calc.)	NO_3 NO_2 (300.0)	Fecal Coliform	
			1 x ½ Pint Plastic	1 x ½ Pint Plastic	1 x 100mL Sterile Plastic	
	Surface		1:4 H_2SO_4 pH<2	Plain	NaThio	
L4-S1	GW	G	Date & Time: 12/21/20 @ 1030 ~~0955~~			8
L4-S2	GW	G	Date & Time: " @ ~~0955~~ 1000			9
L4-S3	GW	G	Date & Time: " @ 1010			10
	GW	G	Date & Time:			
	GW	G	Date & Time:			
	GW	G	Date & Time:			
	GW	G	Date & Time:			

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), fresh surface warer (FSW), saline surface water (SSW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).** Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability
pH<2 ✓ Temperature: 0.8°C

* Taken from bottles NM

1	Collector:	Date: 12/21/20	Time: 1400	Received By:	Date: 12/22/20	Time: 8:45
2	Relinquished By:	Date: 12/22/20	Time:	Received By:	Date: 12/22/20	Time:
3	Relinquished By:	Date: 12/22/20	Time: 1538	Received By:	Date: 12/22/20	Time: 1538
4	Relinquished By:	Date:	Time:	Received By:	Date:	Time:
5	Relinquished By:	Date:	Time:	Received By:	Date:	Time:

* Per AM emails NM 12/22/20

Appendix B
Trophic State Index for Lakes

Trophic State Index for Lakes[1]

The Trophic State Index may be used to describe biological productivity. Using this method[1] 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

Lake water quality is related to the trophic state of water as follows:

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

Trophic State Index for Lakes as follows:

Water Quality	Trophic State Index	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

Notes:

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

Appendix C
Lake Assessment Photos

KINGS LAKE HOMEOWNERS ASSOCIATION, INC: Site Photographs

Photo 1: Lake 1 – View along the eastern shoreline, note spikerush and mechanically harvested torpedograss near the shoreline.

Photo 2: Lake 1 – View along the eastern shoreline, note spikerush and mechanically harvested torpedograss near the shoreline.

Photo 3: Lake 1 – View along the western shoreline, note spikerush and mechanically harvested torpedograss near the shoreline

Photo 4: Lake 1 – Typical view near the surface water outfalls into Lake 1.

Photo 5: Lake 1 – Small patch of spikerush along the shore of Lake 1 near the connection to Lake 2.

Photo 6: Lake 2 – View of spikerush and torpedograss along the southern shoreline of Lake 2.

Photo 7: Lake 2 - View of Chara spp. and exotic apple snail eggs near the connection to Lake 3.

Photo 8: Lake 3 – View of algae and exotic apple snail eggs near the connection to Lake 2.

Photo 9: Lake 3 - View along the southern shoreline of Lake 3, note collapsed silt fence and fill material eroding down lake bank into lake.

Photo 10: Lake 4 – View of torpedograss along the eastern shoreline of Lake 4.

Photo 11: Lake 4 – View of the southeastern shoreline of Lake 4, note spikerush with torpedograss between the shoreline.

Photo 12: Lake 4 – View along the southern shoreline of Lake 4, note spikerush with torpedograss between the shoreline.

Photo 13: Lake 4 – View of spikerush and grass clippings near the shoreline of Lake 4.