

Lake Seminole Reasonable Assurance Update

2014



07/24/2015

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Lake Seminole Reasonable Assurance Plan Update – 2014

The Lake Seminole Reasonable Assurance Plan (RAP) was developed by Pinellas County in 2007 to set forth actions to reduce nutrient loading to Lake Seminole and restore the lake's water quality. An update was submitted to the Florida Department of Environmental Protection (FDEP) in 2011 outlining the progress made towards the goals set forth in the original RAP. This document is the second update to the original RAP and includes a brief overview of progress since 2007 and a detailed description of management actions undergone from 2011 to date.

Monitoring Summary

Pinellas County monitors water quality, phytoplankton, and vegetation in Lake Seminole. Monitoring results and trend analyses are described in the following sections.

Water Quality

Annually, Pinellas County samples at two random locations in each lobe (north and south) of Lake Seminole eight times per year, for a total of 32 samples per year. Sampling follows a stratified random design developed by Janicki Environmental (2003). Site locations for 2011 to 2013 are shown in Figure 1 and parameters monitored are listed in Table 1.

Lake Seminole RAP water quality goals are expressed as annual means for chlorophyll-a (chl-a) and the Trophic State Index (TSI). The targets are 30 µg/L chlorophyll-a and a TSI of 60. Annual means for chlorophyll-a, total nitrogen (TN), total phosphorus (TP), and TSI were calculated for the north and south lobes from the Pinellas County ambient water quality database and are presented in Tables 2 and 3. In general, nutrients and TSI trends have been decreasing as shown in Figure 2 and described in the trend analyses in the following section. However, in 2012 there was a significant increase in mean chl-a, TN and TSI for Lake Seminole. This is due to elevated TN and chl-a levels during the first three sampling events of the year in January, March, and May. The events occurred during a drier than usual dry season when the area received only 9.12 inches of rain from October to May compared to the 18.37 average for the period (SWFWMD, 2015). During this period, temperatures were also unseasonably warm resulting in lake water temperatures several degrees warmer than average for the time of year. This unusual weather pattern resulted in increased residence time and algae blooms in the lake and was the most likely contributor to the elevated annual means. Other months in 2012 had water quality results more in line with the decreasing trend and 2013 data indicate a return to this trend (Table 4).

Although water quality goals for Lake Seminole are based on the chlorophyll-a and TSI targets agreed upon in the RAP, data was also compared to the state numeric nutrient criteria using data from the IWR database. The database includes data from both Pinellas County and the FDEP, but the majority of

samples are from the County. The number of samples varies by year and parameter (Table 4). Color data indicates a long-term color geometric mean of 46.59 PCUs for the planning period from 2005 to 2013. Based on this assessment, the lake classification for Lake Seminole is “Color > 40 PCU”, which coincides with the State’s numeric nutrient criteria of 20 µg/L chlorophyll-a, 1.27 mg/L total nitrogen, and 0.05 mg/L total phosphorus. Annual geometric means for Lake Seminole calculated by the FDEP using the IWR database are presented in Table 5. Chlorophyll-a, total nitrogen, and total phosphorus exceeded criteria every year during the planning period, however, Pinellas County data shows a decreasing trend in nutrients over the past ten years as described in the following section.

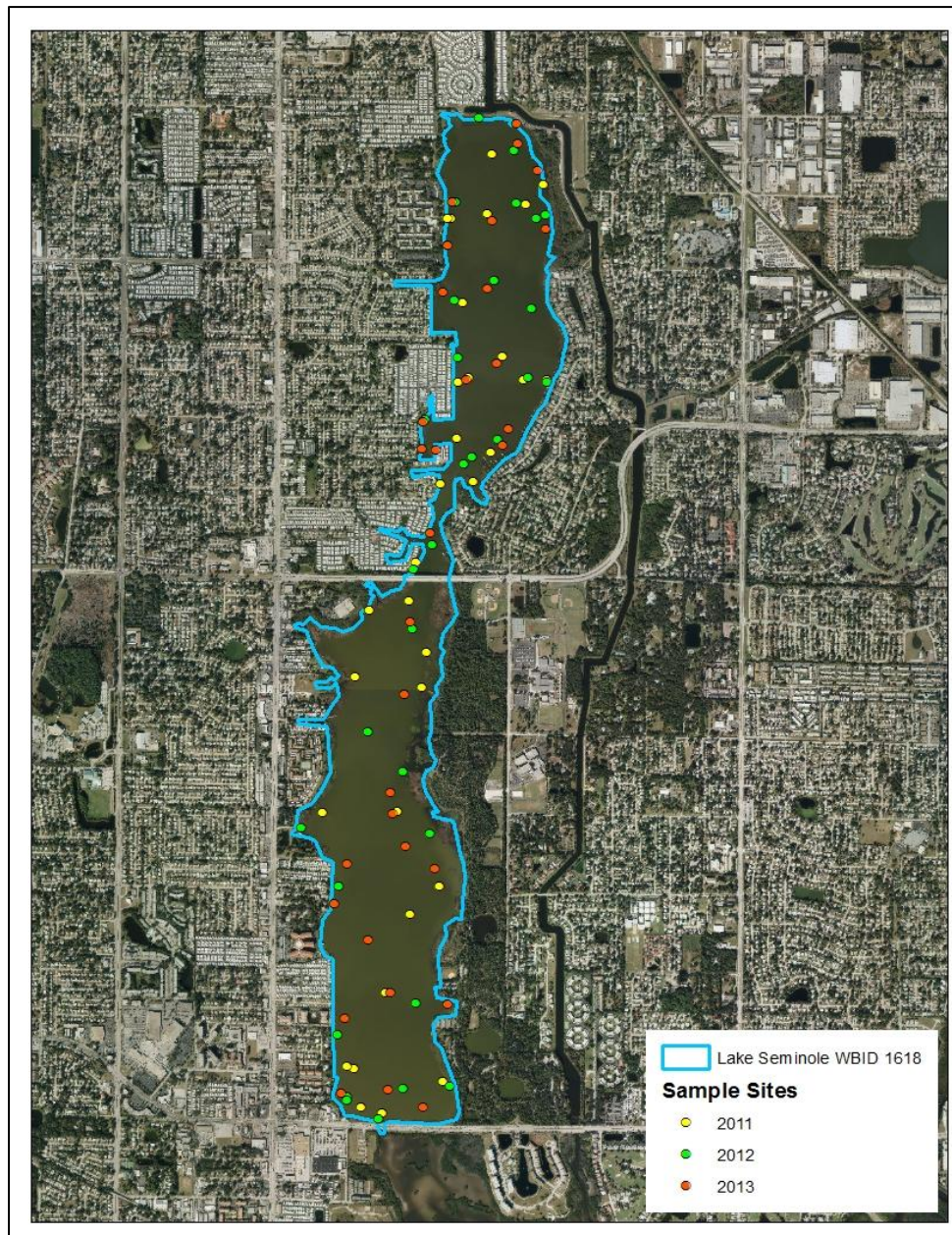


Figure 1. Lake Seminole sampling locations (2011-2013)

Table 1. Lake Seminole water quality monitoring parameters.

Water Quality Indicators	
Aluminum	Phytoplankton Taxonomy
Ammonia	Secchi Disk Depth
Chlorophyll-a, b, c, and Phaeophytin Concentration	Total Kjeldahl Nitrogen
Color	Total Nitrogen
Conductivity	Total Phosphorus
Dissolved Oxygen Concentration	Total Suspended Solids
Nitrite-Nitrate	Transmissivity
Orthophosphate	Turbidity
pH	Water Temperature

Table 2. Lake Seminole north annual mean TSI and nutrient concentrations.

Year	TSI	TN (mg/L)	TP (mg/L)	Chl-a (µg/L)
2003	78.7	2.95	0.12	102.0
2004	78.5	2.56	0.11	117.8
2005	82.6	3.47	0.13	146.0
2006	81.9	2.87	0.09	83.4
2007	84.4	3.96	0.34	93.9
2008	78.3	3.13	0.11	99.8
2009	83.8	3.63	0.09	115.9
2010	73.4	2.64	0.09	64.6
2011	72.0	2.13	0.09	61.7
2012	85.4	3.19	0.10	120.6
2013	74.4	2.38	0.08	81.1

Table 3. Lake Seminole south annual mean TSI and nutrient concentrations.

Year	TSI	TN (mg/L)	TP (mg/L)	Chl-a (µg/L)
2003	84.4	2.96	0.10	110.8
2004	84.1	2.77	0.09	122.7
2005	83.7	3.35	0.09	113.2
2006	85.7	3.62	0.08	171.1
2007	82.9	3.04	0.09	105.7
2008	83.0	3.26	0.09	104.6
2009	82.0	3.70	0.08	115.5
2010	77.8	2.60	0.07	75.1
2011	73.9	2.26	0.06	64.9
2012	81.5	2.96	0.08	110.0
2013	78.2	2.41	0.07	84.6

Table 4. Lake Seminole 2012 chl-a and TN means.

Sampling Period	Chl- a (µg/L)		TN (µg/L)	
	2012	2003 – 2013 mean	2012	2003 – 2013 mean
1	103.8	94.8	2.91	3.09
2	172.7	124.2	4.32	3.38
3	174.3	136.2	4.30	3.52
4	115.8	129.6	3.18	3.31
5	58.4	88.9	2.05	2.63
6	62.4	77.2	1.77	2.16
7	76.7	88.1	2.12	2.39
8	77.2	92.0	2.26	2.83

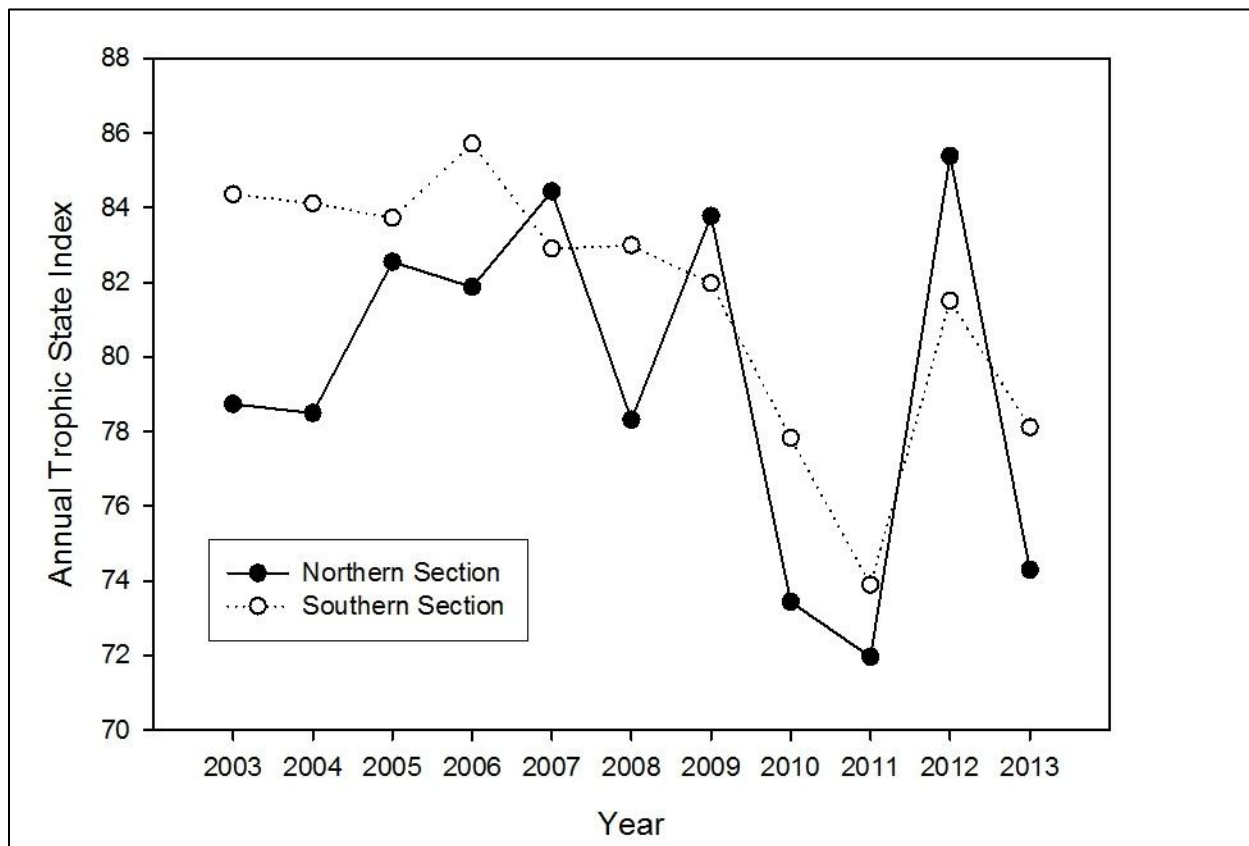


Figure 2. Lake Seminole TSI (2003 to 2013).

Table 5. Number of Lake Seminole samples per year.

Year	Chl-a (n)	TN (n)	TP (n)
2005	33	54	54
2006	19	21	21
2007	35	35	35
2008	45	45	45
2009	46	46	46
2010	24	28	28
2011	20	28	32
2012	31	31	31
2013	16	16	16

Table 5. Lake Seminole annual geometric means for nutrients.

Year	Chl-a (µg/L)	TN (mg/L)	TP (mg/L)
2005	118	3.15	0.10
2006	96	3.33	0.06
2007	99	2.77	0.09
2008	90	3.17	0.09
2009	115	3.62	0.06
2010	67	2.55	0.07
2011	49*	2.02	0.06
2012	94	2.67	0.06
2013	91	3.14	0.09

*Laboratory QA/QC problems resulted in several qualified results that were removed for this calculation.

Water Quality Trends

Janicki Environmental recently completed a time series trend analysis for Pinellas County data collected from 2003 to 2013 using the seasonal Kendall Tau Test for Trend. This analysis took into account both seasonality and autocorrelation. Results for Lake Seminole are displayed in Table 5 and Figures 3 through 10. The adjusted p-value represents the correction for serial correlation. This analysis detected a statistically significant ($p\text{-value} \leq 0.05$) decreasing trend in total nitrogen and total phosphorus in the northern portion of the lake (SA) and a decreasing trend in chlorophyll-a and total nitrogen in the southern portion of the lake (SB) (Janicki 2014).

Table 6. Results of Lake Seminole trend analysis.

Lake Segment	Parameter	P Value	Adjusted P	Trend Direction	Slope
SA	Chl-a	0.022	0.214	No Trend	-2.525
SB	Chl-a	0.000	0.000	Decreasing	-4.000
SA	Secchi disk	0.016	0.295	No trend	0.0083
SB	Secchi disk	0.025	0.236	No trend	0.0056
SA	TN	0.017	0.159	No trend	0.0664
SB	TN	0.001	0.027	Decreasing	-0.0805
SA	TP	0.000	0.000	Decreasing	-0.005
SB	TP	0.000	0.000	Decreasing	-0.0036

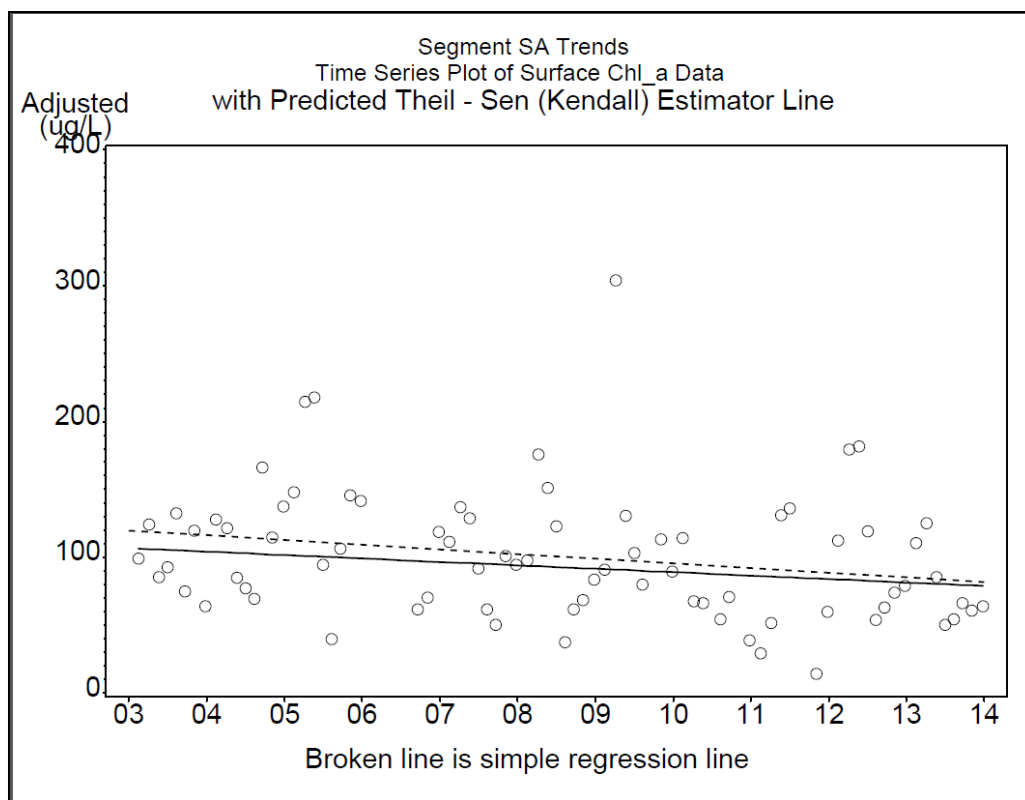


Figure 3. Lake Seminole north chlorophyll-a time series plot.

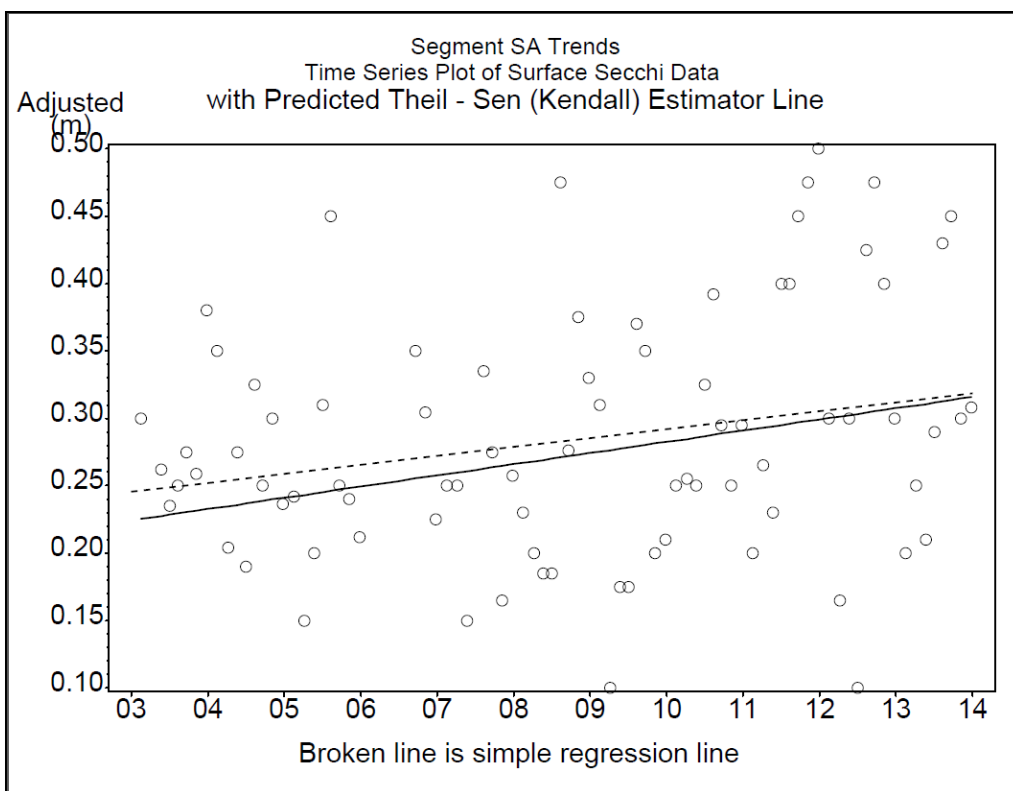


Figure 4. Lake Seminole north secchi depth time series plot.

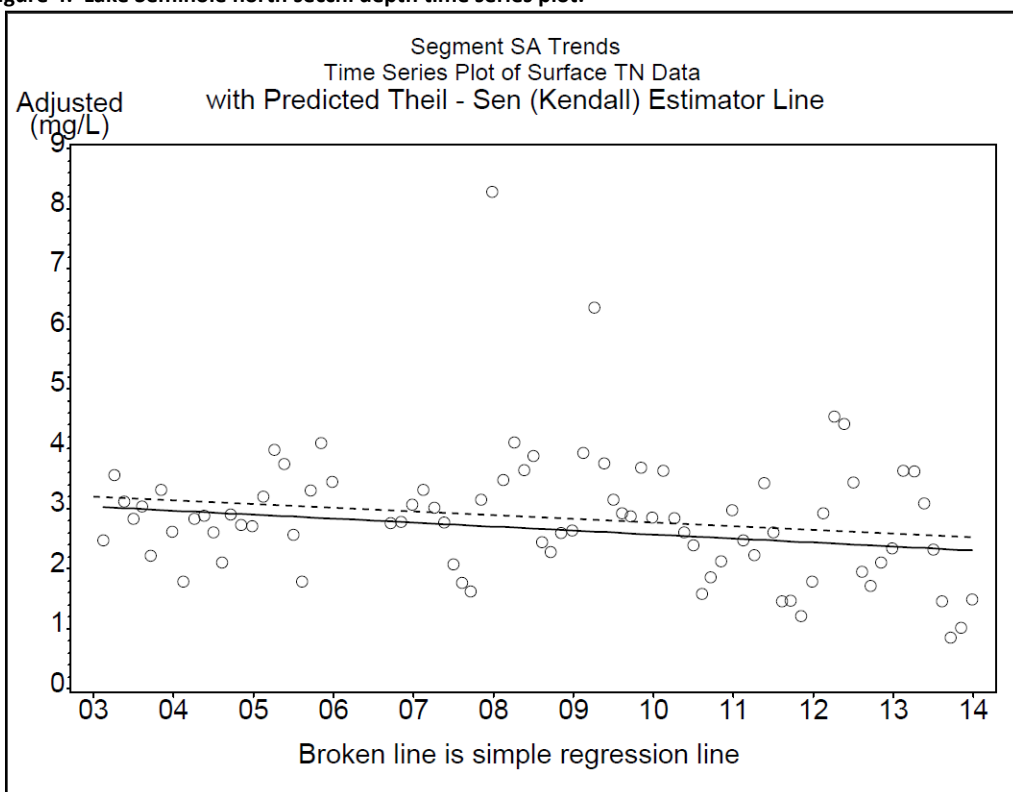


Figure 5. Lake Seminole north total nitrogen time series plot.

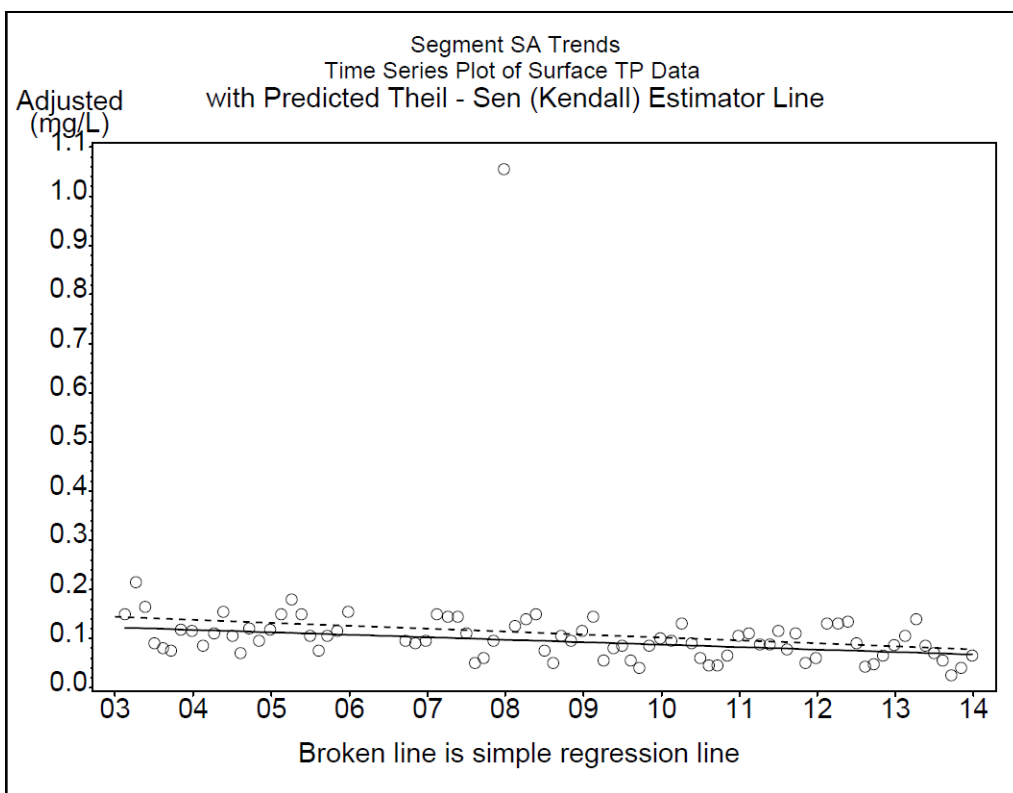


Figure 6. Lake Seminole north total phosphorus time series plot.

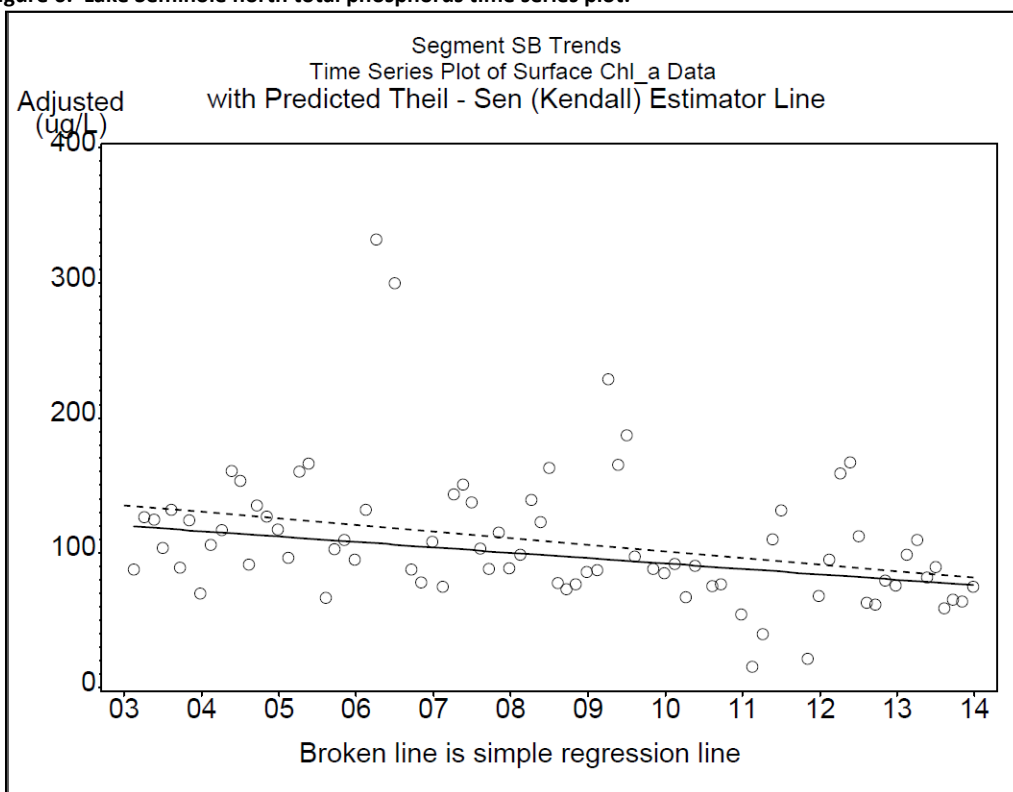


Figure 7. Lake Seminole south chlorophyll-a time series plot.

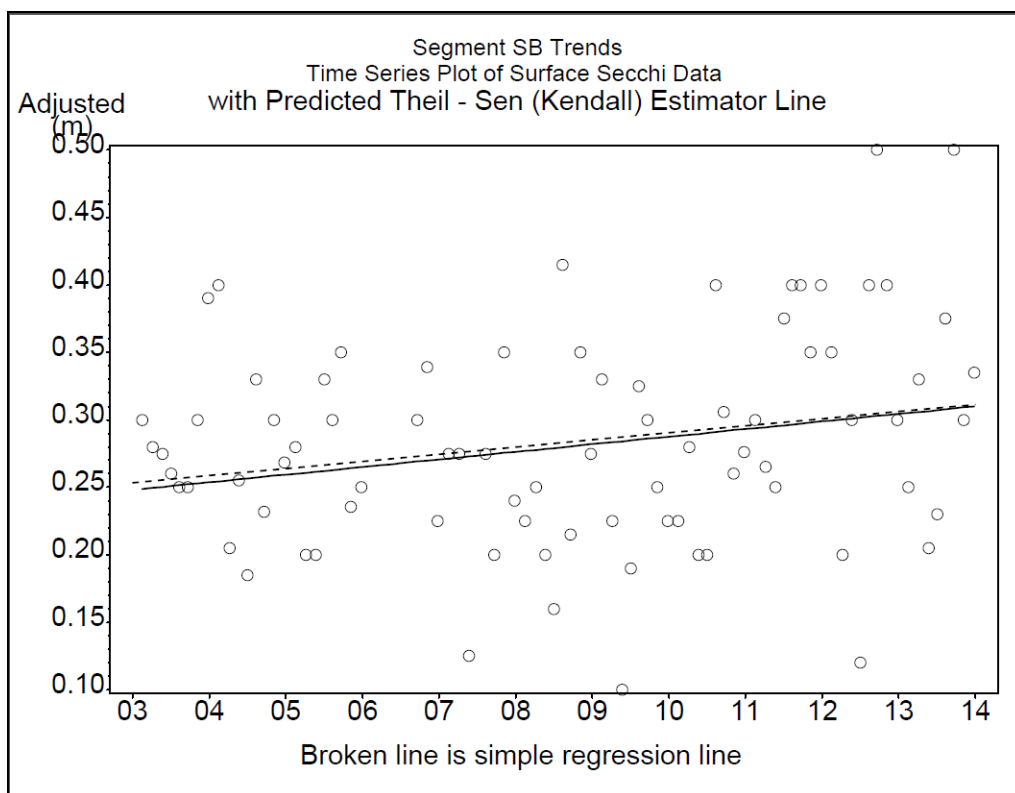


Figure 8. Lake Seminole south secchi depth time series plot.

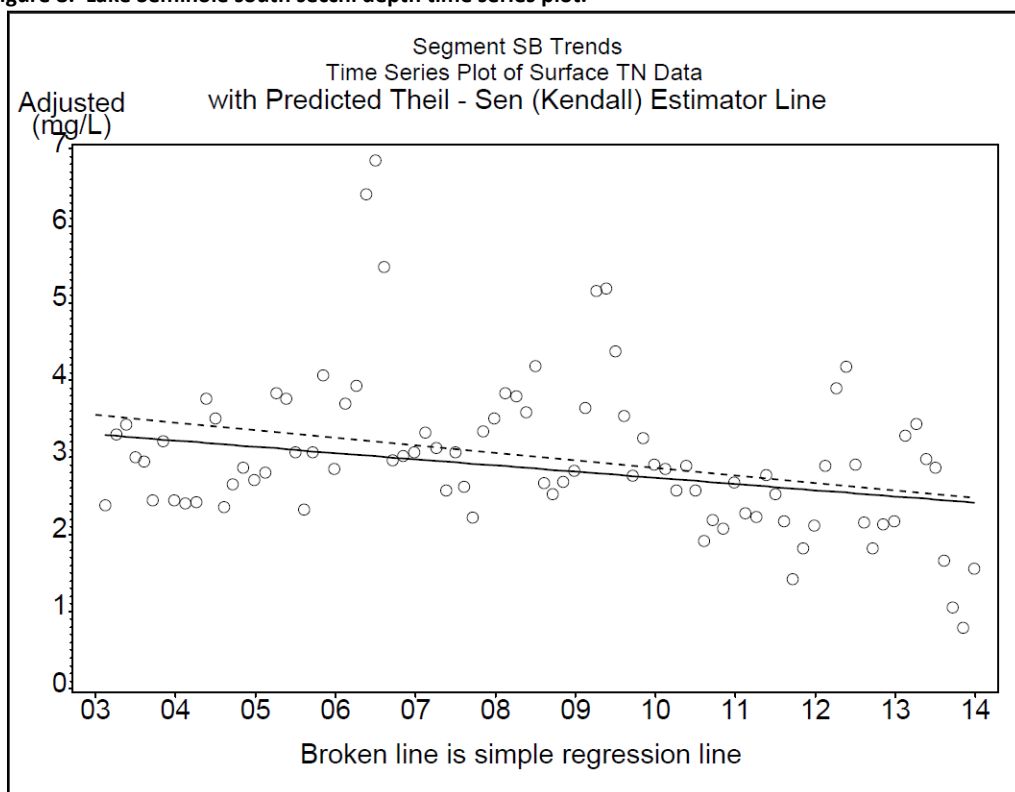


Figure 9. Lake Seminole south total nitrogen time series plot.

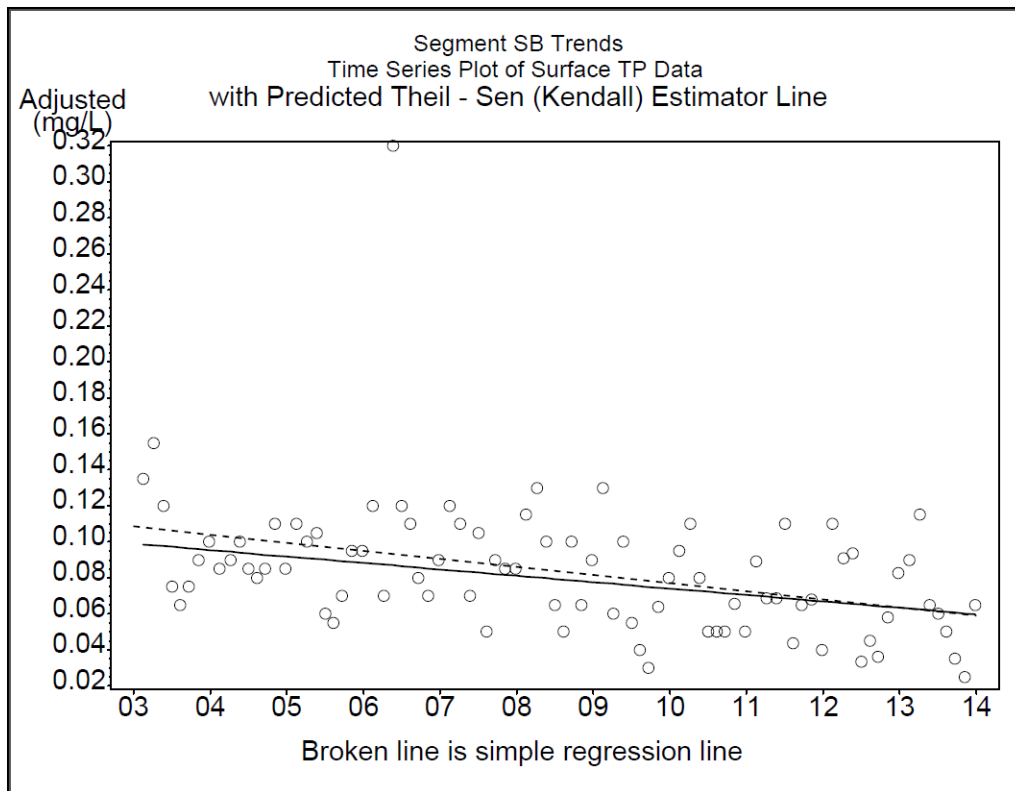


Figure 10. Lake Seminole south total phosphorous time series plot.

These trends indicate water quality is improving in Lake Seminole. In comparison to other Pinellas County waterbodies, out of 57 monitoring stations in waters across the County, only one other had decreasing trends in chlorophyll-a, eight others had decreasing trends in total nitrogen, sixteen other stations had decreasing trends in total phosphorus, and no other waterbody in Pinellas County exhibited decreasing trends in all three nutrient parameters (Janicki 2014). This indicates the water quality improvement in Lake Seminole is not common across the County and is likely the result of completed and ongoing management actions outlined in the Reasonable Assurance Plan. These trends are an indication of the effectiveness of this RAP.

Phytoplankton Community

Phytoplankton samples are collected during ambient water quality monitoring and returned to the Natural Resources Laboratory for preservation, identification, and enumeration. The dominant phytoplankton phylum in Lake Seminole is Cyanophyta, blue-green algae. From 2003 through 2012, blue-green algae consisted of 91 to 94 percent of the entire lake phytoplankton population. The dominant genera of blue green algae in the lake are Planktorhrix, Raphidiosis, and Cylindrospermopsis. In 2013 the amount of blue-green algae dropped a small amount to 88 percent of the lake phytoplankton population. There were no differences seen in the percent of Cyanophyta in Lake Seminole during the wet or dry season.

Plant Community

Pinellas County developed a biological monitoring program in 2014 which includes the Lake Vegetation Survey (LVI), Stream Condition Index (SCI), Rapid Periphyton Survey (RPS), and Linear Vegetation Survey (LVS). Staff conducting the monitoring and taxonomy are FDEP certified for these methods and follow FDEP SOPs. An LVI will be conducted on Lake Seminole once per year. The first LVI was completed on Lake Seminole on 7/9/2014 with a score of 49 indicating the lake supports a healthy, well-balanced plant community.

Field observations indicate an increasing trend over the last 2 years in the abundance of Illinois Pondweed (*Potamogeton illinoensis*) and Tape Grass (*Vallisneria americana*). Many areas previously barren of vegetation or covered in Hydrilla are now inhabited by one or both of these native species of submerged aquatic plants. This has been noted by County staff through field visits to the lake and the numerous calls the County has received from residents who live on the lake inquiring about vegetation (pondweed and tape grass mainly) that they have not previously seen in proximity to their property.

Fish Community

Based on recent electrofishing sampling conducted by FFWCC, the lake supports a healthy community of fishes (Ray Watson, personal communication). A majority of the fishes in the lake are of the sunfish family (i.e. bluegill, crappie, redear, bass, etc.) and several killifish species. Several invasive species are found in the lake, mainly Blue Tilapia, a few cichlid species and armored catfish. Lake Seminole exhibits a healthy largemouth bass population. The community structure shows strong recruitment of age-0 bass with a good proportion of those fish living through to sexual maturity.

Management Actions

The proposed management actions in the RAP are categorized into structural, management, legal, policy, compliance and enforcement, and public education strategies. The status of each management action is listed below. See the original RAP document for a detailed description of each component.

Structural

1. Excavate organic peat sediments from shoreline areas.

Two segments of sediment (60 total acres) were excavated as reported in the 2011 update. No additional work has been completed since this time and no additional shoreline excavation is anticipated due to the upcoming sediment removal project.

2. Restore priority wetland and upland habitats.

The management actions set forth in the 2007 RAP were complete as of the 2011 update. However, exotic and invasive species removal in the basin is an ongoing management activity. The most recent work occurred on the County-owned Management Area, located at the northeast corner of the lake. The project consists of both wetland and upland habitat restoration. The wetland work includes nearly a half acre of exotic plant removal. The upland portion of the project consists of over an acre of mechanical exotic plant removal, continued exotic treatment, and native plantings.

3. Install stage and flow measurement instrumentation on the Lake Seminole Outfall Control Structure.

Installation of stage measurement instrumentation was complete in 2006. All data is available from the USGS website (www.usgs.gov). The station ID is 0230889. The site measures stage, but does not include flow.

4. Construct enhanced regional stormwater treatment facilities in priority sub-basins.

Sub-basin 1

Sub-basin 1 has been in operation since 2012. The system had typical early operational problems but those have been corrected and the system is now operational, per design. Monitoring of operational efficiencies for both the wet and dry season will occur in 2015 and analysis will be provided in the next update.

By-pass Canal

The By-pass Canal treatment facility has been in operation since 2012. The system has had mechanical issues and was struck by lightning, but the issues have been fixed and the system is now operational, per design. Monitoring of operational efficiencies will occur in 2015 and analysis will be provided in the next update.

Sub-basin 3

Sub-basin 3 has been in operation since late 2013. The system was struck by lightning in mid-2014, but has since been repaired and is currently operational, per design. Monitoring of operational efficiencies for both the wet and dry season will occur in 2015 and analysis will be available in the next update.

Sub-basin 6

Sub-basin 6 is currently in the testing phase and will be operational by June 2015. Monitoring of operational efficiencies for both the wet and dry season will occur after the system is online and analysis will be available in the next update.

Sub-basin 2

Sub-basin 2 will be constructed in 2015 and is anticipated to be operational by early 2016. The project is currently at the 90% design phase and all required permits have been issued. Monitoring of operational efficiencies for both the wet and dry season will occur after the system is complete. Analysis will be available in the next update.

Sub-basin 7

The sub-basin 7 system has not been constructed because the existing site had insurmountable design and permitting issues. The County will monitor the lake throughout the implementation of the other five regional facilities and the dredging project. If it is determined the lake will not achieve the water quality goals without the additional load reductions the County will look for other alternatives.

5. Divert Seminole Bypass Canal flows to improve lake flushing and dilution.

The Bypass Canal Alum Treatment system is currently operational and rainy season diversion of flows into Lake Seminole is scheduled to occur summer 2015. Previously conducted small scale test diversions were successful. A more in-depth analysis will be available in the next update.

6. Dredge organic silt sediments from submerged areas

The County began the design of the Lake Seminole Restoration Project in 2010 with an aim to remove accumulated nutrient-laden sediments from the lake. The project received permits in late 2013 from FDEP, ERP# 52-0205092-003, and ACOE, Nationwide 27# SAJ-2013-01392 (NW-CMW). The design was complete in early 2014 and the project went out to bid in April 2014. The County did not receive a qualified bid response and the decision was made to make changes to the project requirements based on feedback from potential bidders. The County finalized the redesign and rebid the project in July 2015. The County anticipates awarding a bid in the fall of 2015. Project duration is anticipated to be 4 to 5 years.

Management

1. Mechanically harvest nuisance aquatic vegetations.

The County has suspended the mechanical harvesting program on Lake Seminole as recommended in the watershed plan. Nuisance aquatic vegetation on Lake Seminole has decreased in recent years and currently, a total of only 20-50 acres per year requires management. Removal is generally needed only on small dispersed areas ranging from less than 0.1 to 1.0 acre, which makes mechanical harvesting difficult and chemical treatment the preferred management approach. In the future, mechanical harvesting may be utilized for larger nuisance vegetation management operations, where feasible.

2. Improve treatment efficiency of existing stormwater facilities.

In 2014, the County hired a Stormwater Compliance Engineering Specialist for site plan compliance and enforcement. The Natural Resources Division is currently developing an inventory of all stormwater facilities in the Lake Seminole watershed. Lake Seminole has been designated as the number one priority basin for proactive site plan compliance reviews. Once the stormwater inventory is complete, the facilities will be prioritized for inspections. The owners of any facilities deemed out of compliance with site plans will be notified and the County will work cooperatively with the owners to develop and implement an improvement plan. Problems with facilities permitted by the Southwest Florida Water Management District (SWFWMD) will be forwarded to SWFWMD for follow up. One facility has been inspected in the Lake Seminole watershed in response to a complaint. A commercial pond at Seminole Blvd and Walsingham Rd, approximately half a mile west of Lake Seminole, was found out of compliance

due to erosion and a blocked outfall structure. The owners are currently working on correcting the issues.

Financial incentives for owners to bring stormwater facilities into compliance include eligibility for Surface Water Assessment fee credits or participation in the County's Adopt-a-Pond program. In 2013, the County adopted a Surface Water Assessment fee to fund stormwater management programs. Property owners that can demonstrate onsite treatment are eligible for up to a 75% mitigation credit. In 2014, as a result of the adoption of the Surface Water Assessment fee, the County reinstated the Adopt-a-Pond program. The Adopt-a-Pond program partners with residents to design, implement, and maintain a five year management plan for privately owned ponds. County supported activities include invasive plant removal, native plantings, pond clean up events, and neighborhood outreach and education. Ponds must be in compliance with all site plans and permits to be eligible for the program.

3. Biomanipulate sport fish populations.

No work has occurred on this topic since the 2011 update. Florida Fish and Wildlife Conservation Commission (FFWCC) staff has indicated a preference to see how the lake responds to the operation of the alum systems and sediment removal prior to any further biomanipulation efforts.

4. Implement an enhanced lake level fluctuation schedule.

A lake level fluctuation schedule will be implemented following sediment removal.

5. Inactivate phosphorus through whole lake alum applications (if warranted by monitoring results).

A whole lake alum application or other means of sediment inactivation will only be utilized if other restoration projects do not result in significant water quality improvements.

Legal

1. Adopt a resolution designating the Lake Seminole Watershed as a "Nutrient Sensitive Watershed".

The 2008 Pinellas County Comprehensive plan Surface Water Element Objective 1.5 states that "Pinellas County shall show measureable improvements in the quality of County waters, as a result of management activities, and the development and implementation of watershed management plans." To address this objective, Policy 1.5.6 includes the establishment of a Nutrient Sensitive Watershed designation for the Lake Seminole Watershed (2008). The County is currently developing a new Stormwater Manual, which includes Low Impact Development design options for development and redevelopment and establishes the required stormwater quality performance standards. Concurrently, the County is updating the associated sections of the Land Development Code. The Manual and Code will include a section on the adoption of special basin criteria allowing for more stringent criteria as needed in designated basins.

Public outreach is also a large part of this management strategy. County-wide public outreach efforts are described in the Public Education element below. Additional targeted outreach in the Lake Seminole

basin is expected to coincide with the Lake Seminole dredging project and will be included in a subsequent update.

Pinellas County adopted Florida's most restrictive fertilizer ordinance in 2010. Article VIII, Chapter 58 of the Pinellas County Code requires that residential fertilizer contain at least 50% slow-release nitrogen, a soil test be conducted to confirm the need for phosphorus before it can be applied, and restricts the application and sale of fertilizer containing nitrogen or phosphorus during the rainy season. It also requires training and certification for commercial applicators and establishes a 10-foot setback or buffer zone from the water. The ordinance is applicable County-wide, including all incorporated and unincorporated areas, which covers the entire Lake Seminole watershed.

2. Strengthen and standardize local ordinances for regulating stormwater treatment for redevelopment in the Lake Seminole Watershed.

As described in the previous section, the County is currently designing a Stormwater Manual and updating development codes for new development and redevelopment which will include Low Impact Development design options. The Pinellas County Stormwater Management Manual will function as a "tool box" of nonstructural and structural stormwater Best Management Practices (BMPs) that can be applied to a variety of redevelopment and development opportunities to satisfy regulatory standards. Many of the receiving waters in Pinellas County are impaired for certain pollutants so a net-benefit approach to reducing stormwater pollutant loadings discharged from the site will be a major focus of the manual and code updates.

Policy

1. Establish a Lake Seminole Watershed Management Area (WMA) through amendments to the Pinellas County, and cities of Largo and Seminole Comprehensive Plans.

The stormwater manual and land development code updates described in the previous two sections will allow for the adoption of special stormwater criteria in priority basins. Performance standards for redevelopment County-wide will exceed the requirements of SWFWMD. The next phase of the stormwater manual development will include working with municipalities to address inconsistencies in regulations. Municipalities have been informed of the County's progress on the new manual and code updates and will continue to be updated and encouraged to adopt the same standards and criteria.

Compliance and Enforcement

1. Expand and enforce restricted speed zones on Lake Seminole.

This management action was complete as of the 2011 update.

Public Education

1. Develop and implement a comprehensive public involvement program for the Lake Seminole Watershed.

No significant Lake Seminole Basin specific public outreach has been completed since the 2011 update, however, it is anticipated that additional basin and lakeshore property owner outreach will occur in conjunction with the upcoming dredge project. On the County-wide level, public outreach has significantly expanded since the 2011 update.

The County's Natural Resources website has been available to residents and visitors for several years. In 2010, the website was redesigned to coincide with the County's Watershed Education Campaign initiatives. The website can be found at www.pinellascounty.org/watershed. The site includes explanation of various monitoring and protection activities. An assortment of brochures regarding protection of water resources from stormwater pollution is available on the site. There are about twelve brochures available including general watershed protection and industry specific materials for construction activities, swimming pool maintenance and construction, landscape maintenance activities, restaurant BMPs, power-washing BMPs, painting BMPs, and commercial and industrial business BMPs.

In addition to being available on the website, printed brochures are used by staff during complaint response or proactive residential and commercial inspections, and are distributed to interested citizens through outreach events. There are also a variety of door hangers used by volunteers for proactive or complaint driven response distribution to communities. Some of these door hangers include, storm drain marking, pollution prevention, pet waste pollution prevention, erosion prevention, landscape maintenance, and fertilizer application for nutrient pollution prevention.

Public Service Announcements are also available for viewing on the website. Six videos have been created since 2012 that promote the Natural Resources motto of "Pinellas County is a Watershed, where we Live, Work, and Play". Each video advertizes how we live, work, and play in Pinellas County and how every activity has the potential to impact our waterways. In 2014, the videos ran on local cable network television (variety of channels) and in three local movie theaters on the lobby televisions and during the movie preview sessions. These videos, along with interactive banners and education messages, were also used for digital advertising outreach. In 2013 and 2014 the County advertised the Watershed Campaign on Facebook, Twitter, Tampa Bay Online, and BayNews 9 Online (local news affiliate).

Dozens of County communities have their own local newspapers which have weekly and monthly issues. In 2014, the Watershed Campaign poster was published in color in each of these newspapers as well as larger regional distribution newspapers on multiple occasions. Several of these newspapers are distributed throughout the Lake Seminole watershed basin (Suncoast News, Seminole Beacon, St. Pete Tribune, The Weekly Challenger, and Tampa Bay Times).

Storm drain marking placards and door hangers have been distributed for years to volunteers as requested throughout the County. Storm drain marking for the Seminole basin mainly occurred in 2011 and 108 storm drains were marked by volunteers.

Each spring the County partners with the City of Largo to provide the Lakes & Ponds Education Seminar. This half-day seminar is open to all interested citizens in Pinellas County. The event includes exhibitor displays and speaker presentations related to the function and maintenance of stormwater ponds in Pinellas County. Attendees also have the opportunity to take home materials (educational brochures, door hangers, and native plants) to assist them in managing their privately-owned stormwater ponds. The event has occurred annually since 2006.

In 2011, the County began to hold trainings for landscape industry personnel as described in the County Fertilizer Ordinance. The three-hour course is a requirement for certification in landscape Best Management Practices that every employee working in the landscape industry in Pinellas County must complete. Each year since 2011, between 1500 and 1600 individuals have attended the course. In addition to this course, the County offers Spill Prevention & Response Training, Illicit Discharge Training, and Sediment & Erosion Control Training for industry personnel including private and public organizations.

One outreach activity occurred since the previous update specific to the Lake Seminole watershed. Following a citizen complaint regarding pet waste, educational signage was installed at the County passive recreation area located at 113th St. N and 110th Ave. N, approximately a mile west of Lake Seminole. The signs, developed by the Tampa Bay Estuary Program and SWFWMD, highlight the amount of bacteria contained in pet feces and its potential harm to water quality. The signage encourages pet owners to pick up and dispose of their pet's waste.

1. Develop and implement a local citizens Lakewatch program for Lake Seminole.

The County has contacted the University of Florida/IFAS Lakewatch program and is discussing the feasibility of restarting the Lakewatch program on Lake Seminole that was discontinued in the mid 2000's. This program may not need to be reestablished as the County has an extensive water quality monitoring program in place on Lake Seminole. Discussion outcomes will be included in the next update.

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