



### FDEP Stream Nutrient Assessment

## Nutrient Assessment of the Santa Fe River between O'Leno State Park and Highway 47 WBID 3605C

### Background

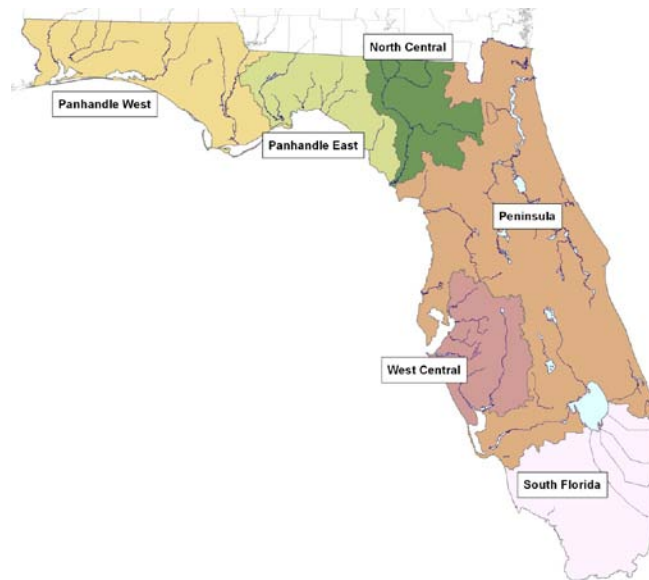
Nutrients are a natural part of the environment, but can occur in excess due to anthropogenic activity in watersheds or springsheds. The expression of nutrients in aquatic ecosystems is also dependent upon natural factors, such as light penetration, hydraulic residence time, presence of herbivore grazers and other food web interactions, and habitat considerations. The existing narrative nutrient criterion in paragraph 62-302.530(47)(b), F.A.C., states that “in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.” A method for numerically interpreting this narrative nutrient criterion is provided in Rule 62-302.531, F.A.C. However, this rule is not yet in effect because it is awaiting approval by the Environmental Protection Agency (EPA).

The Department’s rules when approved by EPA would use the Nutrient Thresholds for Total Phosphorus and Total Nitrogen in **Table 1** in combination with biological information. Nutrient is interpreted as being achieved in a stream segment if:

- Information on chlorophyll *a* levels, algal mats or blooms, nuisance macrophyte growth, and changes in algal species composition do not indicate an imbalance in flora or fauna; AND EITHER
- The average score of at least two temporally independent SCIs performed at representative locations and times is 40 or higher, with neither of the two most recent SCI scores less than 35 (*i.e.*, no faunal imbalances), OR
- The Nutrient Thresholds (expressed as annual geometric means) in **Table 1** are not exceeded more than once in a three year period (see **Figure 1** for regions).

**Table 1.** Reference Stream-based Nutrient Thresholds.

Nutrient Region	Total Phosphorus Threshold	Total Nitrogen Threshold
Panhandle West	0.06 mg/L	0.67 mg/L
Panhandle East	0.18 mg/L	1.03 mg/L
North Central	0.30 mg/L	1.87 mg/L
Peninsula	0.12 mg/L	1.54 mg/L
West Central	0.49 mg/L	1.65 mg/L
South Florida	No numeric nutrient threshold. The narrative criterion in paragraph 62-302.530(47)(b), F.A.C., applies. <sup>1</sup>	



**Figure 1.** Stream nutrient regions.

The Thresholds in Table 1 are the Federal (EPA) numeric nutrient criteria promulgated in the State of Florida on December 6<sup>th</sup>, 2010. While these thresholds are currently on remand pursuant to a ruling by the Northern District of Florida, they have since been incorporated into Florida rules which are awaiting EPA approval. The Federal standards do not contain associated measures for the biological condition (like the algae condition) of streams.

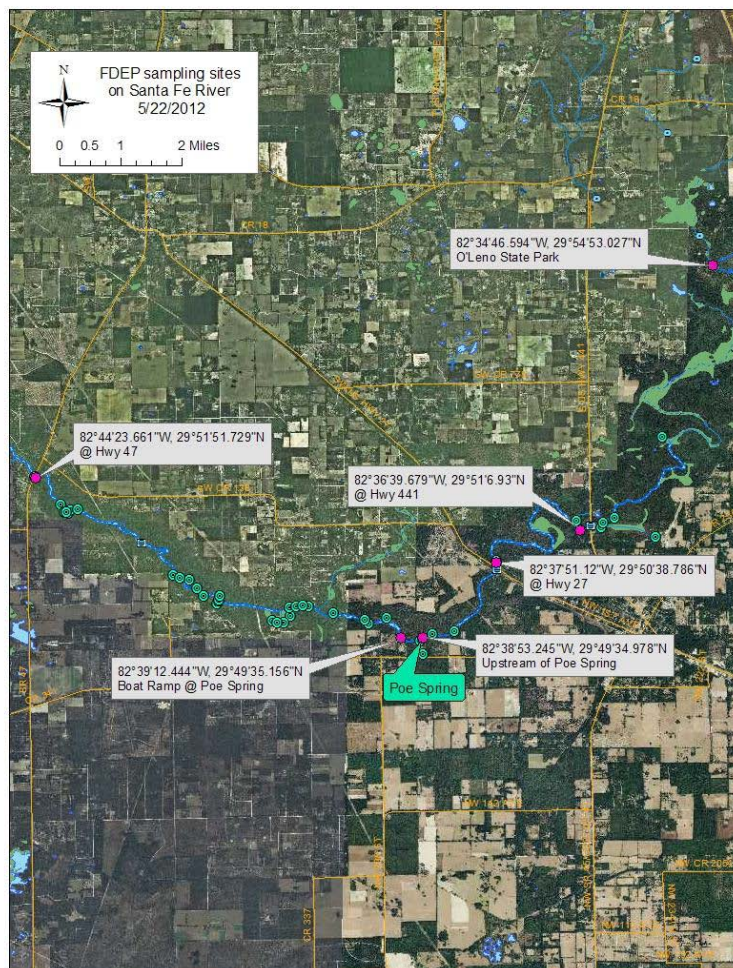
This report evaluates both the Total Nitrogen & Total Phosphorus conditions and the biological conditions of the Santa Fe River.

<sup>1</sup> Chlorophyll *a* impairment thresholds in the IWR will continue to be used to assess South Florida flowing waters.

## Sampling and Analytical Methods

In addition to retrieving historic data for the river from the Impaired Waters Rule database (Run 45), the Santa Fe River (North Central Nutrient Region) was sampled on 5-22-12 at 6 stations between O'Leno State Park and Highway 47 (**Figure 2**) in response to an algal bloom report, following procedures outlined in the Quality Assurance Rule (Chapter 62-160, F.A.C.). At each station, water quality samples were collected for nutrients, chlorophyll, Sucralose, and microcystin LR, and biological samples were collected for phytoplankton and algal mat taxonomic analysis. Standard metered parameters (dissolved oxygen, pH, specific conductance, temperature) were recorded. Biological sampling performed in 2011 consisted of the Linear Vegetation Survey (LVS), Rapid Periphyton Survey (RPS), and Stream Condition Index (SCI). RPS, LVS, Habitat Assessment (HA), and SCI methods are available at <http://www.dep.state.fl.us/water/sas/sop/sops.htm>:

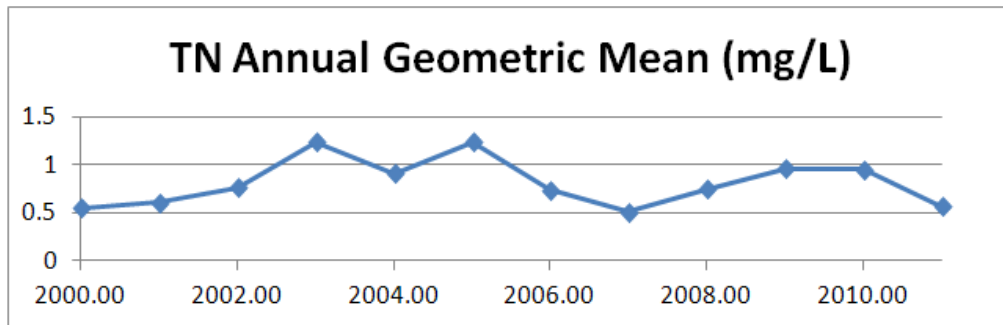
- RPS: DEP SOP FS 7230;
- LVS : DEP SOP FS 7320;
- HA: DEP SOP FT 3100; and
- SCI: DEP SOP SCI 1000.



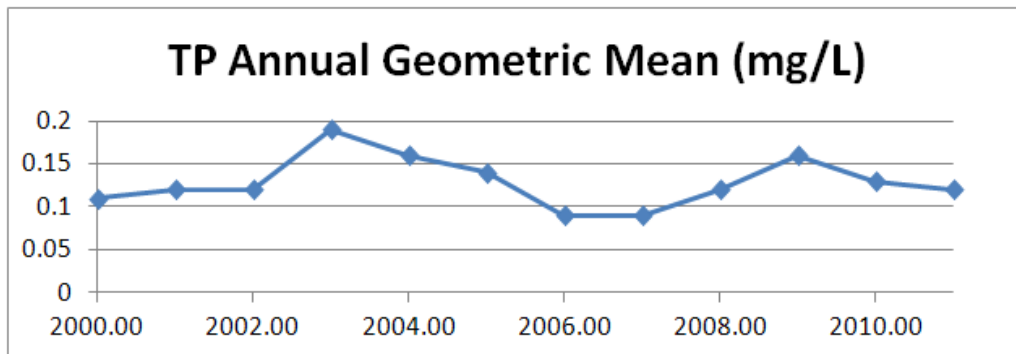
**Figure 2.** Aerial Imagery 2004-2009 aerial photograph of Santa Fe River from O'Leno State Park to Highway 47. Flow is from the east to west.

**Results and Discussion**

This segment of the Santa Fe River attains the applicable regional stream nutrient thresholds, with all samples below the thresholds (**Figures 2 and 3**). However, the FDEP adopted measures of floral health indicate that there is evidence of imbalance in flora and fauna (**Table 2**). For example, thick periphyton growth greater than 6 mm (RPS rank 4-6) was observed in 92% of the observations, a result that is much higher than the upper end of the reference site distribution (**Figure 5**).



**Figure 3.** TN concentrations in the Santa Fe River from 2000 to 2011. The reference-based *TN threshold of 1.87 mg/L* has never been exceeded.



**Figure 4.** TP concentrations in the Santa Fe River from 2000 to 2011. The reference-based *TP threshold of 0.3 mg/L* has never been exceeded.



**Figure 5.** Photograph of Santa Fe River near Highway 47 (taken 5-22-12). Note abundant periphyton growth.

Because this algal growth has been persistent, occurring in two temporally independent samplings, these RPS results indicate an unbalanced population of aquatic flora.

In algal mat samples from 5/22/12, the dominant algal taxa differed among the 6 sampling sites. The dominant taxa were a blue-green alga (cyanobacteria), *Scytonema* sp., two green algal genera, *Spirogyra* sp. and *Oedogonium* sp., and a yellow-green alga, *Vaucheria* sp. Although *Vaucheria* and *Spirogyra* are often found in enriched spring vents, *Scytonema* sp., can be abundant in extremely oligotrophic conditions (*e.g.*, the Everglades, see Everglades Technical Support Document at <http://www.dep.state.fl.us/water/wqssp/everglades/pctsd.htm>).

Bloom conditions were not apparent in the phytoplankton samples collected on 5/22/12; however the sample was processed for full identification and enumeration (taxa lists in Appendix B). Results of the water column phytoplankton identifications showed low overall algal densities. Algal densities were highest at the US 441 bridge site, but the sample was dominated by diatoms and, to a lesser degree, *Spirogyra* sp., not blue-green algae. *Anabaena circinalis* was detected in some of the water column samples, but not in large amounts. Diatom analysis for the water column samples has not yet been completed. Microcystin LR was undetected in water samples collected at all 6 stations during the bloom response sampling on 5/22/12 (Appendix A).

Average chlorophyll *a* for this stream segment was 1 µg/L per year from 2005 to 2011, which is indicative of an unenriched and balanced phytoplankton community. During the most recent bloom response sampling event on 5/22/12, an instantaneous value of 43 µg/L was observed at Highway 441 (Table 2 on the next page), likely due to drought conditions and very low water velocities (0 m/sec); lower chlorophyll *a* values were measured at the 5 other sites along the Santa Fe River sampled the same day. A single high chlorophyll *a* sample is inconclusive regarding nutrient enrichment conditions.

The two most recent temporally independent SCIs each scored 34 (on 4/6/2011 and 10/19/2011). Both values were less than the minimum acceptable score of 35 and the minimum average acceptable score



of 40, indicating faunal impairment. The HA scores associated with SCIs were 130 and 131, respectively. The RPS results suggest that algal smothering of substrates was a potential cause for the failing SCIs.

**Table 2.** Floral measures. The thresholds were based on the distribution of a population of minimally disturbed Benchmark sites sampled by the Department as part of Numeric Nutrient Criteria development. These are not codified thresholds of impairment, but can be used as evidence towards an overall conclusion.

Floral Metric	Evidentiary Threshold	Test Site Value	Indicate Balance?
LVS C of C	> 2.5	3.8	Yes
LVS FLEPPC	< 25%	15%	Yes
RPS	< 25% rank 4-6 coverage	92%, persistent	No
Chlorophyll	< 20 ug/L; 3.2 to 20 ug/L = site specific	Annual average of 1 ug/L per year from 2005 to 2011.	Yes, however, instantaneous values of 43 ug/L recently observed
Algal Autecology	No adverse shifts in dominant taxa	<i>Scytonema</i> sp., <i>Spirogyra</i> sp., <i>Vaucheria</i> sp.	Inconclusive ( <i>Scytonema</i> sp. is low nutrient indicator)
Floral Weight of Evidence Summary	Following the provisions in Rule 62-302.531, the narrative nutrient criterion in paragraph 62-302.530(47)(b) is NOT achieved.		

### Additional Considerations

The Santa Fe River in this area has significant ground water inputs, including the O'Leno River Rise, Poe Springs, Devil's Eye Spring, Ginny Spring, and Three Sisters Springs. Due to anthropogenic nitrogen enrichment (*e.g.*, septic tank leachate or fertilizer inputs) in these spring's recharge areas, elevated nitrate-nitrite levels have been observed in the main stem of the river, averaging from 0.4 mg/L to 0.54 mg/L since 1991. These nitrate levels are significantly higher than those found in minimally disturbed systems. Additionally, Sucralose (an artificial sweetener that passes through the human body undigested) was detected in samples in the vicinity of Poe Springs, indicating that the elevated nitrate-nitrite levels were influenced by a human waste source. The sum of these chemical and geomorphological considerations indicate anthropogenically enriched nutrient conditions, which in turn contributed to the imbalanced algal measures. Low flow conditions can exacerbate the adverse effects of nutrient enrichment, which also contributes to the Santa Fe's current condition.

### Conclusions

Although the regional nutrient thresholds have not been exceeded for the past eleven years, the evidence provided by the biological measurements (particularly the RPS and SCI) indicate that nutrient water quality standards are not attained. The currently applicable water quality standard states that "in

no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.” In this assessment, the Department concludes that nutrient concentrations are causing an imbalance in both flora and fauna.

It should not be assumed that the Federal standards applicable to the Santa Fe River will ultimately override State adopted standards. State rules will continue to apply, so the consistent attainment of the Federal Total Phosphorus & Total Nitrogen thresholds does not mean that existing (or increased) nutrient conditions are acceptable. Regardless of the outcome of newly adopted federal or state water quality standards, the Department anticipates that the narrative standard above will continue to apply to waterbodies at a minimum. Therefore, the algal conditions, and associated faunal conditions, will continue to be representative of nutrient enriched conditions and nutrient reduction in the Santa Fe will continue to be necessary.

Regardless of this assessment, the Department had previously concluded that the Santa Fe River was nutrient enriched. To that end, the Department adopted a reduction plan called a Basin Management Action Plan, in February, 2012. <http://www.dep.state.fl.us/water/watersheds/docs/bmap/sfr-nutrient-bmap-final.pdf>

**Appendix A. Water Chemistry Results.**

Date_Sampled	Field_Sample_ID	Component	Value	Qualifier	Units_Word_Result	MDL	PQL
5/22/2012 13:20	AT O'LENO STATE PARK	Chlorophyll-a, Corrected	3.2		ug/L	0.55	1.7
5/22/2012 13:20	AT O'LENO STATE PARK	Phaeophytin-a	1.3		ug/L	0.4	1.2
5/22/2012 13:20	AT O'LENO STATE PARK	NO2NO3-N	0.004	U	mg N/L	0.004	0.01
5/22/2012 13:20	AT O'LENO STATE PARK	Kjeldahl Nitrogen	0.63		mg N/L	0.08	0.2
5/22/2012 13:20	AT O'LENO STATE PARK	Total-P	0.037		mg P/L	0.004	0.01
5/22/2012 13:20	AT O'LENO STATE PARK	O-Phosphate-P	0.013		mg P/L	0.004	0.01
5/22/2012 13:20	AT O'LENO STATE PARK	Ammonia-N	0.023		mg N/L	0.01	0.02
5/22/2012 13:20	AT O'LENO STATE PARK	Sucralose	0.0097	U	ug/L	0.0097	0.049
5/22/2012 13:20	AT O'LENO STATE PARK	Microcystin LR	1	U	ug/L	1	4
5/22/2012 13:20	AT O'LENO STATE PARK	Dissolved Oxygen	4.53		mg/L		
5/22/2012 13:20	AT O'LENO STATE PARK	pH	7.35				
5/22/2012 13:20	AT O'LENO STATE PARK	Sample Depth	0.2		m		
5/22/2012 13:20	AT O'LENO STATE PARK	Specific Conductance	239.2		umhos/cm		
5/22/2012 13:20	AT O'LENO STATE PARK	Temperature	21.8		C		
5/22/2012 18:45	AT HWY 441	Chlorophyll-a, Corrected	43		ug/L	1.1	3.4
5/22/2012 18:45	AT HWY 441	Phaeophytin-a	31		ug/L	0.8	2.4
5/22/2012 18:45	AT HWY 441	Total-P	0.85		mg P/L	0.005	0.05
5/22/2012 18:45	AT HWY 441	Ammonia-N	0.065		mg N/L	0.01	0.02
5/22/2012 18:45	AT HWY 441	Kjeldahl Nitrogen	6.2	A	mg N/L	0.4	1
5/22/2012 18:45	AT HWY 441	O-Phosphate-P	0.025		mg P/L	0.004	0.01
5/22/2012 18:45	AT HWY 441	NO2NO3-N	0.008	U	mg N/L	0.008	0.02
5/22/2012 18:45	AT HWY 441	Sucralose	0.0097	U	ug/L	0.0097	0.049
5/22/2012 18:45	AT HWY 441	Microcystin LR	1	U	ug/L	1	4
5/22/2012 18:45	AT HWY 441	Dissolved Oxygen	18.54		mg/L		
5/22/2012 18:45	AT HWY 441	pH	9.17				
5/22/2012 18:45	AT HWY 441	Sample Depth	0.2		m		
5/22/2012 18:45	AT HWY 441	Specific Conductance	472		umhos/cm		
5/22/2012 18:45	AT HWY 441	Temperature	32.2		C		
5/22/2012 17:00	AT HWY 27	Phaeophytin-a	1	I	ug/L	0.4	1.2



5/22/2012 17:00	AT HWY 27	Chlorophyll-a, Corrected	14		ug/L	0.55	1.7
5/22/2012 17:00	AT HWY 27	NO2NO3-N	0.004	U	mg N/L	0.004	0.01
5/22/2012 17:00	AT HWY 27	O-Phosphate-P	0.034		mg P/L	0.004	0.01
5/22/2012 17:00	AT HWY 27	Ammonia-N	0.01	U	mg N/L	0.01	0.02
5/22/2012 17:00	AT HWY 27	Total-P	0.064		mg P/L	0.005	0.05
5/22/2012 17:00	AT HWY 27	Kjeldahl Nitrogen	0.43		mg N/L	0.08	0.2
5/22/2012 17:00	AT HWY 27	Sucralose	0.053		ug/L	0.0097	0.049
5/22/2012 17:00	AT HWY 27	Microcystin LR	1	U	ug/L	1	4
5/22/2012 17:00	AT HWY 27	Dissolved Oxygen	10.01		mg/L		
5/22/2012 17:00	AT HWY 27	pH	8.36				
5/22/2012 17:00	AT HWY 27	Sample Depth	0.3		m		
5/22/2012 17:00	AT HWY 27	Specific Conductance	439.7		umhos/cm		
5/22/2012 17:00	AT HWY 27	Temperature	27.2		C		
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Phaeophytin-a	0.4	U	ug/L	0.4	1.2
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Chlorophyll-a, Corrected	2.4		ug/L	0.55	1.7
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	O-Phosphate-P	0.059		mg P/L	0.004	0.01
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Total-P	0.063		mg P/L	0.005	0.05
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	NO2NO3-N	0.2		mg N/L	0.004	0.01
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Kjeldahl Nitrogen	0.26		mg N/L	0.08	0.2
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Ammonia-N	0.022		mg N/L	0.01	0.02
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Microcystin LR	1	U	ug/L	1	4
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Sucralose	0.12	J	ug/L	0.0096	0.048
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Dissolved Oxygen	3.12		mg/L		
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	pH	7.3				
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Sample Depth	0.2		m		
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Specific Conductance	427.3		umhos/cm		
5/22/2012 16:00	UPSTREAM OF POE SPRINGS	Temperature	24.1		C		
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Phaeophytin-a	1.1	I	ug/L	0.4	1.2
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Chlorophyll-a, Corrected	5.4	A	ug/L	0.55	1.7
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Kjeldahl Nitrogen	0.23		mg N/L	0.08	0.2

5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	O-Phosphate-P	0.055		mg P/L	0.004	0.01
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Ammonia-N	0.01	I	mg N/L	0.01	0.02
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	NO2NO3-N	0.099		mg N/L	0.004	0.01
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Total-P	0.062		mg P/L	0.005	0.05
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Sucralose	0.15		ug/L	0.0096	0.048
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Microcystin LR	1	U	ug/L	1	4
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Dissolved Oxygen	4.99		mg/L		
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	pH	7.31				
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Sample Depth	0.2		m		
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Specific Conductance	419.9		umhos/cm		
5/22/2012 15:00	BOAT RAMP @ POE SPRINGS	Temperature	24.1		C		
5/22/2012 18:00	AT HWY 47	Chlorophyll-a, Corrected	0.96	I	ug/L	0.55	1.7
5/22/2012 18:00	AT HWY 47	Phaeophytin-a	0.86	I	ug/L	0.4	1.2
5/22/2012 18:00	AT HWY 47	NO2NO3-N	0.87		mg N/L	0.02	0.05
5/22/2012 18:00	AT HWY 47	Ammonia-N	0.017	I	mg N/L	0.01	0.02
5/22/2012 18:00	AT HWY 47	Kjeldahl Nitrogen	0.27		mg N/L	0.08	0.2
5/22/2012 18:00	AT HWY 47	O-Phosphate-P	0.045		mg P/L	0.004	0.01
5/22/2012 18:00	AT HWY 47	Total-P	0.051		mg P/L	0.005	0.05
5/22/2012 18:00	AT HWY 47	Sucralose	0.065		ug/L	0.0095	0.048
5/22/2012 18:00	AT HWY 47	Microcystin LR	1	U	ug/L	1	4
5/22/2012 18:00	AT HWY 47	Dissolved Oxygen	7.96		mg/L		
5/22/2012 18:00	AT HWY 47	pH	7.69				
5/22/2012 18:00	AT HWY 47	Sample Depth	0.3		m		
5/22/2012 18:00	AT HWY 47	Specific Conductance	371.8		umhos/cm		
5/22/2012 18:00	AT HWY 47	Temperature	24		C		

**Appendix B. Phytoplankton Taxa Lists.**

	Santa Fe River at O'Leno State Park	Santa Fe River at Hwy 441	Santa Fe River at Hwy 27	Santa Fe River upstream of Poe Springs	Santa Fe River Boat Ramp at Poe Springs	Santa Fe River at Hwy 47
<b>Bacillariophyta</b>						
<i>Rhizosolenia</i>	-	-	39	-	-	-
<i>Attheya</i>	-	-	13	-	-	-
Bacillariophyta	144	23,539	167	358	871	439
<b>Chlorophycota</b>						
<i>Ankistrodesmus falcatus</i>	25	310	-	-	-	-
<i>Characium falcatum</i>	5	-	-	-	-	-
<i>Chlamydomonas</i>	45	155	116	17	62	2
<i>Chlorella</i>	115	619	90	55	56	5
<i>Chlorococcum humicola</i>	10	-	39	7	-	-
<i>Chlorogonium elongatum</i>	5	-	13	3	-	-
<i>Debarya glyptosperma</i>	-	-	-	-	6	-
<i>Golenkinia paucispina</i>	-	-	13	-	-	-
<i>Oedogonium</i>	-	929	-	-	-	-
<i>Oocystis</i>	15	-	-	-	-	-
<i>Pediastrum duplex</i>	-	-	13	-	-	-
<i>Scenedesmus bijuga</i>	10	774	-	7	12	-
<i>Scenedesmus quadricauda</i>	-	774	-	-	6	-
<i>Schroederia judayi</i>	-	-	-	3	-	-
<i>Schroederia setigera</i>	-	-	77	-	-	-
<i>Selenastrum</i>	-	-	-	3	-	-
<i>Sorastrum spinulosum</i>	5	-	-	-	-	-
<i>Spirogyra</i>	-	9,601	-	-	19	-
<i>Westella botryoides</i>	-	155	13	3	-	-
<b>Chrysophyta</b>						
<i>Dinobryon sertularia</i>	-	-	1,494	248	187	-
<i>Mallomonas</i>	-	-	322	-	-	-
<b>Cryptophycophyta</b>						
<i>Chroomonas</i>	164	-	52	7	-	-
<i>Cryptomonas</i>	309	465	1,095	93	81	18
<b>Cyanophycota</b>						
<i>Anabaena</i>	120	4,801	-	45	180	-
<i>Anabaena circinalis</i>	-	-	232	83	81	20
<i>Anabaena planctonica</i>	-	-	26	-	-	-
<i>Calothrix</i>	-	929	-	-	19	-

<i>Chroococcus minutus</i>	5	-	-	-	-	-
<i>Cyanobium parvum</i>	10	-	-	-	-	-
<i>Geitlerinema acutissimum</i>	5	-	-	7	-	-
<i>Gloeocapsa</i>	5	-	-	-	-	-
<i>Jaaginema</i>	45	465	-	-	-	-
<i>Jaaginema gracile</i>	219	-	-	28	37	5
<i>Merismopedia warmingiana</i>	-	-	-	3	-	-
<i>Microcystis aeruginosa</i>	-	-	-	7	-	-
<i>Myxosarcina amethystina</i>	-	155	-	-	-	-
<i>Oscillatoria princeps</i>	-	465	-	-	44	-
<i>Planktolyngbya</i>	-	465	-	-	-	-
<i>Planktolyngbya limnetica</i>	-	1,239	-	-	31	-
<i>Planktothrix agardhii</i>	-	-	-	3	6	-
<i>Pseudanabaena mucicola</i>	30	-	-	-	25	-
<i>Rhabdogloea</i>	-	-	-	-	-	2
<i>Synechocystis</i>	95	929	26	41	112	10
<b>Euglenophycota</b>						
<i>Euglena</i>	-	-	26	-	-	-
<i>Euglena polymorpha</i>	-	-	-	-	6	-
<i>Lepocinclis</i>	15	-	13	-	6	-
<i>Trachelomonas</i>	-	-	-	-	-	2
<i>Trachelomonas dybowskii</i>	95	-	-	-	-	-
<b>Pyrrophytophyta</b>						
<i>Ceratium hirundinella</i>	15	-	-	-	-	-
<i>Glenodinium</i>	-	-	13	7	31	2
<b>Xanthophyta</b>						
<i>Ophiocytium capitatum</i>	-	-	-	7	-	-

**Appendix C. Phytoplankton Metrics.**

**Phytoplankton Composition - Quantitative**

Santa Fe River Algal Bloom Response	Santa Fe River at O'Leno State Park	Santa Fe River at Hwy 441	Santa Fe River at Hwy 27	Santa Fe River upstream of Poe Springs	Santa Fe River Boat Ramp at Poe Springs	Santa Fe River at Hwy 47
Number of Taxa	24	18	21	22	21	10
Algal Density (number/mL)	1511	46769	3892	1035	1878	505
Percent Dominant Taxon	20.45	50.33	38.39	34.59	46.38	86.93
Dominant Taxon Name	Cryptomonas	Bacillariophyta	Dinobryon sertularia	Bacillariophyta	Bacillariophyta	Bacillariophyta
<b>Percentage Composition of Wet Algae</b>						
Blue-green algae	35.34	20.2	7.3	20.97	28.49	7.33
Green algae	15.55	28.47	9.61	9.47	8.57	1.39
Diatoms	9.53	50.33	5.63	34.59	46.38	86.93
Cryptophycophyta	31.3	0.99	29.47	9.66	4.31	3.56
Euglenophycota	7.28	0	1	0	0.64	0.4
Pyrrophycomphyta	0.99	0	0.33	0.68	1.65	0.4
Xanthophyta	0	0.0	0	0.7	0.0	0

**Appendix D. Water Chemistry Summary.**

Santa Fe River Algal Bloom Response	Class III Freshwater Criteria	At O'Leno State Park May 22, 2012	At Hwy 441 May 22, 2012	At Hwy 27 May 22, 2012	Upstream of Poe Springs May 22, 2012	Boat Ramp at Poe Springs May 22, 2012	At Hwy 47 May 22, 2012
<b>Organic Constituents (µg/L)</b>							
Sucralose	-	0.0097 U	0.0097 U	0.053	0.12 J	0.15	0.065
Microcystin LR		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
<b>Nutrients (mg/L)</b>							

Ortho-phosphate	-	0.013	0.025	0.034	0.059	0.055	0.045
Total Phosphorus	-	0.037	0.85	0.064	0.063	0.062	0.051
Total Ammonia	-	0.023	0.065	0.01 U	0.022	0.01 I	0.017 I
Un-ionized Ammonia	≤ 0.02 s	≤ 0.02 c	0.05 c	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c
Nitrate and Nitrite	-	0.004 U	0.008 U	0.004 U	0.2	0.099	0.87
Total Kjeldahl Nitrogen	-	0.63	6.2 A	0.43	0.26	0.23	0.27
Organic Nitrogen	-	0.607 c	6.135 c	0.425 c	0.238 c	0.22 c	0.253 c
Total Nitrogen	-	0.632 c	6.204 c	0.432 c	0.46 c	0.329 c	1.14 c
<b>General Physical and Chemical Parameters</b>							
Sample Depth (m)	-	0.2	0.2	0.3	0.2	0.2	0.3
Dissolved Oxygen (mg/L)	≥ 5.0	4.5	18.5	10.0	3.1	5.0	8.0
pH (SU)	6.0 - 8.5	7.4	9.2	8.4	7.3	7.3	7.7
Conductivity (µmhos/cm)	≤ 1,275	239.2	472.0	439.7	427.3	419.9	371.8
Temperature (°C)	-	21.8	32.2	27.2	24.1	24.1	24.0
Chlorophyll <i>a</i> (µg/L) - Corrected	-	3.2	43	14	2.4	5.4 A	0.96 I
Phaeophytin (µg/L)	-	1.3	31	1 I	0.4 U	1.1 I	0.86 I

Value exceeds the Class III Water Quality Criteria or permit limits

c - Value is calculated

A - Value reported is the mean of two or more determinations

I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit

J - Estimated value

U - Material analyzed for but not detected; value reported is the method detection limit