STREAM ECOSUMMARY

Alexander Springs Creek at CR 445
2012

DEP conducted water quality and biological sampling at Alexander Springs Creek downstream of County Road 445 in Lake County on January 26 and November 1, 2012. Alexander Springs Creek was sampled as part of the strategic monitoring plan for the Middle St. Johns basin to verify potential dissolved oxygen and biological impairments. Overall, the water quality and macroinvertebrate community data indicated that the stream met expectations for a healthy, well-balanced stream; however, Rapid Periphyton Survey (RPS) results revealed an abundance of attached algae. Based on the extremely low nutrients and the minimally disturbed nature of the watershed and springshed of this reference waterbody, the Department concluded that the algae represented are not due to nutrient enrichment.

Background

Although healthy, well-balanced stream and river communities may be maintained even with some level of human disturbance, human activities may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or pesticides from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP has methods to evaluate if human activities have resulted in the condition where a particular waterbody has exceeded water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality standards are designed to protect designated uses of the waters of the state (*e.g.,* recreation, aquatic life support), and exceedances of these standards are associated with interference with the designated use. The Stream Condition Index (SCI) assesses how closely the macroinvertebrate community (*e.g.,* aquatic insects, clams, crayfish) of a stream resembles the macroinvertebrate community of an undisturbed or "reference" condition. The Stream and River Habitat Assessment evaluates the availability and quality of habitat for macroinvertebrates, and can help diagnose the cause of a low SCI score. The Rapid Periphyton Survey and Linear Vegetation Survey provide an assessment of the attached algae and plant community within the stream.

Methods

This stream was sampled on January 26 and November 1, 2012 by DEP Central District Office biologists. Surface water samples were collected for analysis of nutrients, chlorophyll-*a*, phaeophytin-*a*, color, turbidity, alkalinity, and chloride, and samples were collected following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/qa/sops.htm for details). Sampling and analyses met FDEP quality assurance/ quality control standards (see http://www.dep.state.fl.us/water/sas/qa/index.htm). A water quality duplicate sample and field blank were collected at the same time as the January 26 water quality samples. The Stream Condition Index (SCI) was sampled per DEP SOP

Figure 1. Location of Alexander Springs Creek at CR 445 in Lake County.

FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting macroinvertebrates via 20 D-frame dipnet sweeps (0.5 m in length) in the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, and identified to the lowest practical taxonomic level. The SCI is composed of ten metrics, eight of which decrease in response to human disturbance, with two metrics (% very tolerant and % dominant) increasing in response to human disturbance. According to DEP SOP LT 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. As part of numeric nutrient criteria development, DEP and EPA have concluded that a balanced faunal community is achieved if 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.
The Stream and River Habitat Assessment was conducted per DEP SOP FT 3100. The Habitat Assessment is a rapid field method in which a sampler scores eight in-stream and riparian components to estimate the influence of habitat factors on the resident aquatic organisms. Habitat Assessment scores range from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (120-160 points), Suboptimal (80-119 points), Marginal (40-79 points), and Poor (11-39 points).
The Rapid Periphyton Survey (RPS) was conducted per DEP SOP FS 7230. The RPS quantifies the extent and abundance of attached algae in a 100 m stream reach. The Linear Vegetation Survey (LVS) was conducted per DEP SOP FS 7320. The LVS documents the submersed, floating, and emergent plant species growing within each 10 m segment of a 100 m stream reach.

Site Information

Alexander Springs Creek is located in northern Lake County and is part of the middle St. Johns basin (Figure 1). The watershed and springshed are dominated by natural forest, with minimal impacts from humans other than recreational uses. Water originates at Alexander Springs and travels twelve miles to the St. Johns River just south of Lake Dexter. FDEP biologists performed Habitat Assessment, Stream Condition Index, Rapid Periphyton Survey and a Linear Vegetation Survey and collected water quality samples downstream of the CR 445 Bridge on January 26 and November 1, 2012. (Figure 2). In this area, the average width of the stream was 70 meters and the average depth was 1 meter. The sample site had an average velocity of 0.25 m/s during both sample events. The stream bottom consisted primarily of sand, silt and native submersed vegetation comprised of *Vallisneria americana* (eel grass), *Najas guadalupensis* (southern naiad) and a small amount of *Ceratophyllum demersum* (coon tail). The shoreline tree community consisted of *Juniperus virginiana* (red cedar), *Acer rubrum* (red maple), *Sabal palmetto* (sabal palmetto), *Nyssa biflora* (swamp tupelo), *Taxodium* (cypress tree) and *Salix caroliniana* (Carolina willow).

Figure 2. Alexander Springs Creek below CR 445 bridge

Results

Water Quality

The water quality samples collected on January 26 and November 1, 2012, complied with all applicable water quality criteria (Table 1) in Chapter 62-302, Florida Administrative Code. Nutrient values, which were very low, were also compared to numeric nutrient thresholds for streams that were adopted in December 2011, but which are not yet in effect (note that compliance with numeric nutrient criteria involve an annual geometric mean not to be exceeded more than once in any three year period). Quality assurance duplicate samples were all within acceptable range and field blanks were all below detection limits for all analytes. Lower dissolved oxygen values can occur naturally in spring runs, but were not evident in the 2012 samples.

Table 1. Water quality results from 1/26/2012 and 11/1/2012 for Alexander Springs Creek.

Analyte	Result 1/26/12	Quality Assurance Duplicate 1/26/12	Result 11/1/12	Class III Fresh Water Quality Criteria
Field Temperature (°C)	23.1		22.5	
Field pH (SU)	8.3		8.4	
Field Dissolved Oxygen (mg/L)	6.93		6.91	≥ 5.0
Field Specific Conductance (µmhos/cm)	1,111		1,122	Not to exceed 50% over background or 1275 µmhos/cm
Secchi Depth	> 1		> 1	

(m)				
Alkalinity (mg $CaCO_3$/L)	83	83	86	
Turbidity (NTU)	0.35	0.35	0.30	
Total Dissolved Solids (mg/L)	528	542	544	
Total Suspended Solids (mg/L)	3 I	3 I	2 U	
Chloride (mg/L)	250	250	260	
Fluoride (mg/L)	0.13	0.12	0.12	≤ 10
Sulfate (mg/L)	61	61	66	
True Color (PCU)	2.5 U	2.5 U	9.7	
Chlorophyll-*a* (µg/L)	0.98 I	0.69 I	0.65 I	
Phaeophytin-*a* (µg/L)	0.54 I	0.40 U	0.40 U	
Organic Carbon (mg C/L)	1.0 U	1.0 U	1.2	
Total Phosphorus (mg/L)	0.048	0.048	0.047	≤ 0.12*
Nitrate+Nitrite (mg/L)	0.012	0.012	0.012	
Ammonia (mg/L)	0.010 U	0.011 I	0.010 U	
Total Kjeldahl Nitrogen (mg/L)	0.080 U	0.080 U	0.10 I	
Total Nitrogen (mg/L)	< 0.09	<0.09	0.11	≤ 1.54*

* F.A.C. Chapter 62-302 Surface Water Quality Standards

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

U - Indicates that the compound was analyzed for but not detected.

Habitat Assessment

The Stream and River Habitat Assessment score was 140 on January 26, 2012, and 133 on November 1, 2012. Both scores reflect an overall "Optimal" condition. Two major productive macroinvertebrate habitats were identified in both assessments: aquatic vegetation and snags (fallen branches). Roots originating from the stream banks were also present and sampled, but were not in enough abundance to consider a major habitat. Less than 25% of the productive habitats were smothered with sand or silt scoring in "Optimal" category during January sampling. In November, Habitat Smothering scored in "Suboptimal" category. The stream had an adequate diversity of depths, and showed little evidence of physical alterations. The bank stability, riparian zone buffer width and vegetation quality components all scored in the "Optimal" category, indicating that upland disturbance is low in this watershed.

Stream Condition Index

The SCI scores for this site were 63 and 54, corresponding with a "Healthy" designation. In the January 26, 2012, SCI sample, three pollution-sensitive mayflies *Heptageniidae, Tricorythodes albilineatus* and *Acerpenna pygmaea* were represented along with pollution-sensitive caddisflies *Lype diversa* and Triaenodes, and isopod *Caecidotea*. The long-lived shrimp *Palaemonetes* was also present. *Odontomyia*, a soldier fly larva, midge *Polypedilum illinoense,* and snails *Planorbella* and *Micromenetus*, considered very tolerant of poor water quality, were present in low abundance.

In the November 1, 2012, SCI sample, two pollution-sensitive mayflies *Stenacron,* and *Tricorythodes albilineatus* were encountered as well as the long-lived shrimp *Palaemonetes*. Very tolerant taxa encountered were *Odontomyia*, midges *Polypedilum illinoense, Larsia,* and *Cricotopus,* and snails *Micromenetus* and *Planorbella.*

The macroinvertebrates collected in these samples represent the expected macroinvertebrate diversity for a healthy stream community.

Linear Vegetation Survey

In both 2012 surveys, seven out of ten sections were dominated by the beneficial, submersed native plant *Vallisneria americana* (eel grass; Figure 3). The three remaining sections were co-dominated with *Vallisneria americana* and *Najas guadalupensis* (southern naiad), another beneficial submersed native plant. Other emergent and floating plants encountered included *Nuphar* (cow lily), *Hydrocotyle* (penny-wort), *Lemna* (duck weed), *Azolla* (mosquito fern), *Pontedaria cordata* (pickerel weed), *Paspalidium geminatum* (Kissimmee grass), *Cicuta maculata* (water hemlock), *Typha* (cattail), and *Schoenoplectus* (bulrush). *Pistia stratiodes* (water lettuce), an exotic invasive plant, was present during both sampling events and the exotic duckweed *Landoltia punctata* (formerly *Spirodela punctata*) was identified in the November sampling event. Coverage of aquatic macrophytes on the January 26, 2012 sampling event was greater than 50% in 7 out of 10 sections, and greater than 25% in the remaining three. On November 1, 2012 the coverage of aquatic macrophytes was greater than 50% in all sections.

Rapid Periphyton Survey

Periphyton was observed in abundance on January 26 and November 1, 2012. Nearly all sample points in both

assessments had filaments of periphyton greater than 6 mm, and up to >10 cm. DEP SOP FS 7240 states that if the percentage of total sample points with a thickness rank of > 6 mm is more than 20%, an algal sample should be collected for identification. Ninety percent of the total sample points in January had an algal thickness rank of > 6 mm. Eighty-nine percent of the total sample points in November had an algal thickness rank of > 6 mm. Algal samples were collected and identified.

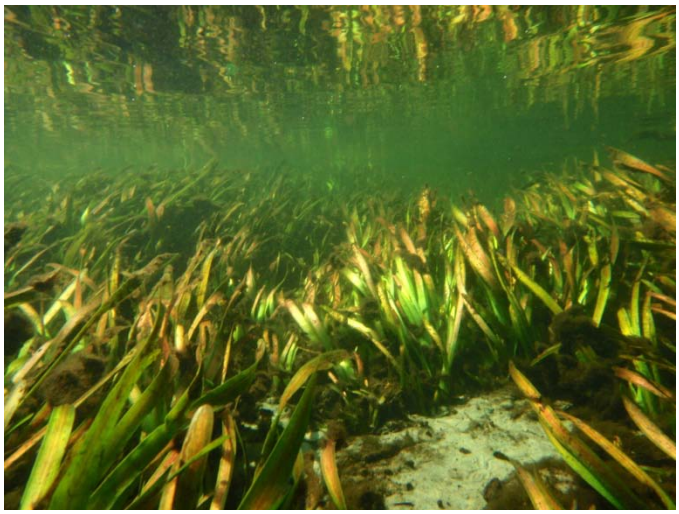

Figure 3. *Vallisneria americana* (eelgrass) in the sampling reach at Alexander Springs Creek.

The dominant species in the algal sample collected on January 26 was *Rhizoclonium crassipellitum,* which belongs to the green algal Class Chlorophyceae. The genus *Rhizoclonium* is a filamentous, green algae widely distributed in fresh waters. The species *Rhizoclonium crassipellitum* is unbranched in the genus. The filaments are very coarse and wiry, usually twisted, entangled into algal mats. It is usually attached to a substrate but can be found free-floating in the water. While dominance of *Rhizoclonium* sp. and *Cladophora* sp*.,* at a stream where the RPS rank 4-6 > 20% may not be a desired condition, the lack of human disturbance in the system suggests that these taxa are occurring for reasons other than nutrient enrichment. The higher than expected algal cover may be related to an observed lack of grazers, especially the gastropod, *Pleurocera floridense*, which is generally abundant in spring runs, but was absent or present only in low numbers in Alexander Creek. The low abundance of *Pleurocera floridense* may potentially be related to the naturally elevated specific conductance (> 1,100 µmhos/cm) in Alexander Creek, since most streams with a good representation of this taxon have specific conductance levels <400 µmhos/cm.

There were some other filamentous green algae, *Cladophora glomerata* and *Oedogonium* sp., in the sample*.* There were also some filamentous cyanobacteria, *Plectonema wollei, Scytonema* sp., *Planktolyngbya* sp. and *Jaaginema* sp., mixed with the dominant species. Some small epiphytic cyanobacteria, *Leibleinia epiphytica* and *Heteroleibleinia kuetzingii*, were abundant on or mixed in with the dominant filaments*.* Many diatoms such as *Gomphonema* sp., *Melosira* sp. and *Fragilaria* sp. were present in sample*.*

The dominant algal taxon in the November 1, 2012, sample was *Plectonema wollei* (synonym *Lyngbya wollei*), which belongs to Class Cyanophyceae. Dominance of *Lyngbya wollei*, similarly to *Rhizoclonium* sp*.* and *Cladophora* sp*.,* at a stream where the RPS rank 4-6 > 20%, may not be desired condition, the lack of human disturbance in the system suggests that these taxa are occurring for reasons other than nutrient enrichment (*e.g*., decreased grazing pressure, as discussed above).

Other algae were present in the sample, including a few filamentous *Oscillatoria limosa* and many epiphytic cyanobacteria on the filaments of *Plectonema wollei,* such as *Leibleinia epiphytica* and *Heterobleibleinia kuetzingii.* There were many diatoms present in the sample including *Fragilariaceae, Fragilaria capucina, Synedra ulna, Melosira sp.* and *Terpsinoe americana. Plectonema wollei* is widely distributed in fresh water environments. *Plectonema wollei* can be abundant, or mixed with other filamentous algae, to form large mats in the water body. Of the taxa present in the sample, *Plectonema wollei* and and *Oscillatoria limosa* are known to be potential toxin producers. Toxin analysis was not performed on this sample.

Conclusion

Alexander Springs Creek, a reference quality waterbody, as sampled on January 26 and November 1, 2012, met applicable State Water Quality Criteria. Habitat Assessment data indicated a near optimal physical condition of the creek with little disturbance in the watershed. Stream Condition Index data indicated the presence of a “healthy” macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. The Linear Vegetation Survey found the presence of two exotic floating plants, but that native submersed plants dominated sampled sections. While periphyton was more abundant than other reference spring runs, the very low nutrients and minimally disturbed nature of the watershed suggests that the periphyton growth is not due to nutrient enrichment.

Known habitat factors that can influence algal abundance in spring runs are light, current, and grazers. Alexander Springs Creek has little tree canopy allowing for maximum light penetration to algal communities. Water current, measured at 0.25 m/s, constantly renews nutrients to benthic algae even though nutrients exist at low levels. Naturally occurring, high conductivity (1,111 µmhos/cm and 1,122 µmhos/cm) may make conditions unfavorable for those macroinvertebrate grazers that may be sensitive to conductivity (e.g., *Pleurocera floridense*). Reduced grazing pressure allows for the accrual of higher algal abundance compared to other reference quality streams, despite the extremely low nutrients in Alexander creek.

Thank you for your interest in maintaining the water quality of Florida's streams and rivers. Please feel free to contact us if you have any questions.

Contact and resources for more information

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DEP biological assessment resources:
http://www.dep.state.fl.us/water/bioassess/index.htm

Implementation of Florida's Numeric Nutrient Standards
http://www.dep.state.fl.us/water/wqssp/nutrients/docs/nnc_implementation.pdf