STREAM ECOSUMMARY

Sand Creek at C.R. 415, April 27, 2010

DEP conducted water quality and biological sampling at Sand Creek at C.R. 415 in Volusia County on April 27, 2010. Sand Creek was sampled as part of the strategic monitoring plan for the Upper East Coast basin to verify potential dissolved oxygen, alkalinity, biological, and pH impairments. Overall, the water quality and macroinvertebrate community data indicated that the stream met expectations for a healthy, well-balanced stream.

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 (F.A.C.), 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.

Methods

This stream was sampled for SCI on April 27, 2010 by the DEP Central District Office. Surface water samples were collected on several occasions throughout the year for analysis of nutrients, chlorophyll-*a*, phaeophytin-*a*, turbidity, alkalinity, true color, chloride, sulfate, algal growth potential, and biochemical oxygen demand; following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/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). The Stream Condition Index (SCI) was sampled per DEP SOP 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 7200, 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 SCI's, 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).

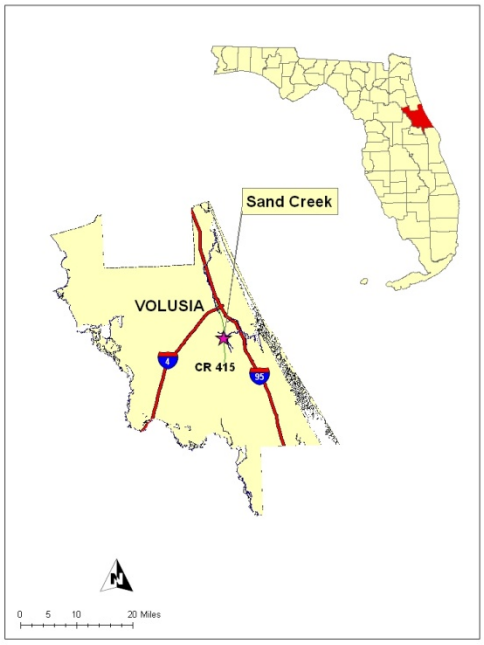


Figure 1. Location of Sand Creek in Volusia County.

Site Information

Sand Creek is a first order stream that originates from a large area of wetlands to the west. The creek flows east through agricultural areas and low density neighborhoods and ultimately empties into Spruce Creek. Sand Creek was sampled downstream of C.R. 415 (see Figure 1). In this area, the average width of the stream was 2.5 meters and the average depth was 0.7 meters. The site had an average velocity of 0.17

m/s. The stream bottom consisted of sand, silt and muck. Periphyton was observed in the stream reach. The shoreline plant community consisted of cypress, oak, red maple, dahoon holly, cabbage palm, saw palmetto, southern watergrass, swamp fern, and rushes (see Figure 2). The presence of three FLEPPC exotic invasive plant species, torpedo grass, Chinese tallowtree, and caesarweed, indicates that the native plant community has been altered (www.FLEPPC.org).



Figure 2. Stream Condition Index transect at Sand Creek on 4/27/2010.

This was the first SCI conducted at Sand Creek. Sand Creek at C.R. 415 has been sampled in the past using the BioRecon rapid assessment (sampled per DEP SOP FS 7410 and calculated per DEP SOP LT7100). The BioRecon is a screening tool for the SCI and also uses macroinvertebrate community metrics to evaluate stream health. The results for these samples were "Healthy" in 1999 and "Impaired" in 2005.

Results

Water Quality

The water quality samples complied with applicable water quality criteria (Table 1). The dissolved oxygen (DO), pH, alkalinity, total nitrogen, and total phosphorus values met the water quality standards outlined in Chapter 62-302, F.A.C. (see Table 1).

Table 1. Water quality results from 4/27/2010 at Sand Creek (STORET #: 27010538).

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	20.4		
Field pH (SU)	6.7		Within Range
Field Dissolved Oxygen (mg/L)	7.19		$\geq$ 5.0 mg/L
Field Specific Conductance (µmhos/cm)	146		Not to exceed 50% of background or 1275 µmhos/cm
Secchi Depth (m)	0.3		
Algal Growth Potential (mg/L)	1.94	A	
Alkalinity (mg $CaCO_3$/L)	3.3		Shall not be depressed below 20 mg $CaCO_3$/L
Turbidity (NTU)	1.8		
Chloride (mg/L)	26		
Sulfate (mg/L)	6.8		
True Color (PCU)	500		
Chlorophyll-*a* (µg/L)	1.3	I	
Phaeophytin-*a* (µg/L)	0.59	I	
Biochemical Oxygen Demand (mg/L)	1.3	I	
Total Phosphorus (mg/L)	0.047		$\leq$ 0.12 mg/L *
Nitrate+Nitrite (mg/L)	0.012		
Ammonia (mg/L)	0.040		
Total Kjeldahl Nitrogen (mg/L)	1.4		
Total Nitrogen (mg/L)	1.4		$\leq$ 1.54 mg/L *

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

A - Value reported is the arithmetic mean (average) of two or more determinations

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

From Febrauary 17, 2010 to March 1, 2011, additional water quality samples were collected at Sand Creek. The dissolved oxygen was measured eight times over the year and ranged from 3.19 mg/L to 12.01 mg/L. Two of the eight samples were below the Class III water quality criteria of greater than or equal to 5.0 mg/L. The low dissolved oxygen readings were associated with periods of low water levels and low stream flow. At that time, samples were collected from the slow-flowing, broader and deeper areas near the bridge. The DO was also measured on four occasions upstream of the SCI location. All results were above 5.0 mg/L. The alkalinity was measured seven times, with values ranging from non-detect to 3.3 mg/L during high flows and from 47 mg/L to 64 mg $CaCO_3$/L during low flows. A non-detect result means that the compound was analyzed for but not detected. The conductivity was measured eight times, ranging from 139 µmhos/cm to 152 µmhos/cm during high flows and from 306 umhos/cm to 403 umhos/cm during low flows. The pH was measured seven times and ranged from 4.8 to 7.5, with lower pH being associated with the high flow conditions. There was also a substantial difference in sample color between low and high flow conditions. Samples collected during high flows ranged from 400 PCU to 600 PCU where samples collected during low flows were between 60 PCU to 80 PCU.
Nutrient samples were analyzed seven times during that period. Total phosphorus (TP) sample results ranged from

0.029 mg/L to 0.047 mg/L during high flows to 0.05 mg/L to 0.088 mg/L during low flow periods. Total Kjeldahl nitrogen (TKN) sample results associated with the high flow/high color samples were higher (1.3 mg/L – 1.4 mg/L) than during low flow/low color conditions (0.65 mg/L – 1.0 mg/L) TKN consists of ammonia and organic nitrogen. Since ammonia results were fairly low (0.018 mg/L – 0.043 mg/L), organic nitrogen was a main constituent of TKN. Nitrate/nitrite (NOx) results varied from <0.004 mg/L to 0.085 mg/L. Total nitrogen (TN) results are calculated by adding TKN and NOx results.

Habitat Assessment

The Stream Habitat Assessment score was 102, which is in the mid-range of the "Suboptimal" category. Sand Creek had only two productive macroinvertebrate habitats: fallen trees (snags) and roots originating from the stream banks. Leaf packs caught in the down trees were sampled as a minor habitat due to low availability. Substrate availability scored in the marginal category due to a low total percent habitat of 10% for the entire stream segment surveyed. Over 25% of the productive habitats were smothered with sand or silt. The stream had natural sinuosity and showed little evidence of physical alterations. Bank stability scored in the optimal category. The Riparian Buffer Zone Width scored in the marginal category and the Vegetation Quality components scored in the suboptimal category due to encroaching lawns on both sides of the stream.

Stream Condition Index

The SCI score for this site was 57 out of a possible 100 points, corresponding with a "Healthy" designation. In this sample, many water quality sensitive species were present including mayflies, caddisflies, damselflies, black flies, and aquatic beetles. Overall, the SCI, Habitat Assessment, and water quality data indicate that Sand Creek at C.R. 415 met the expectations for a healthy, well-balanced stream.

Conclusions

Sand Creek is a low order, system. Changes in color, conductivity, alkalinity, pH, and nutrients over time may be a result of the different sources of water that the creek is receiving during low and high water events. During high flow conditions, the system is dominated by dark water with low alkalinity and low conductivity. This is characteristic of tannin-enriched waters draining from wetlands. The TKN results suggest that wetlands are the natural source of organic nitrogen. However, TP results which were higher during low flows, suggest that ground water is the major contributor of TP.

The two low DO measurements can be most likely attributed to the sampling location which was not representative of the flowing stream.

Past biological assessments may have failed due to poor stream flow or because the creek was sampled too soon after desiccation. Waiting at least a month after normal water level and flow returns, or six months if the stream was dry, provides enough time for the macroinvertebrate community to reestablish. Based on the Stream Condition Index, Habitat Assessment, and water quality data from April 27, 2010, Sand Creek at C.R. 415 appears to meet the expectations for a healthy, well-balanced stream.

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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http://www.dep.state.fl.us/central/Home/Watershed/default.htm

DEP Biological Assessment Resources:
http://www.dep.state.fl.us/water/bioassess/index.htm

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