STREAM ECOSUMMARY

Little Tomoka River at Breakaway Trail, April 20, 2010

DEP conducted water quality and biological sampling at the Little Tomoka River in Volusia County on April 20, 2010. The Little Tomoka River was sampled as part of the strategic monitoring plan for the Upper East Coast basin to verify potential dissolved oxygen, alkalinity, pH, and iron 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 on April 20, 2010 by the DEP Central District Office. Surface water samples were collected for analysis of algal growth potential, biochemical oxygen demand, nutrients, chlorophyll-*a*, phaeophytin-*a*, color, turbidity, alkalinity, sulfate and chloride; 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 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).

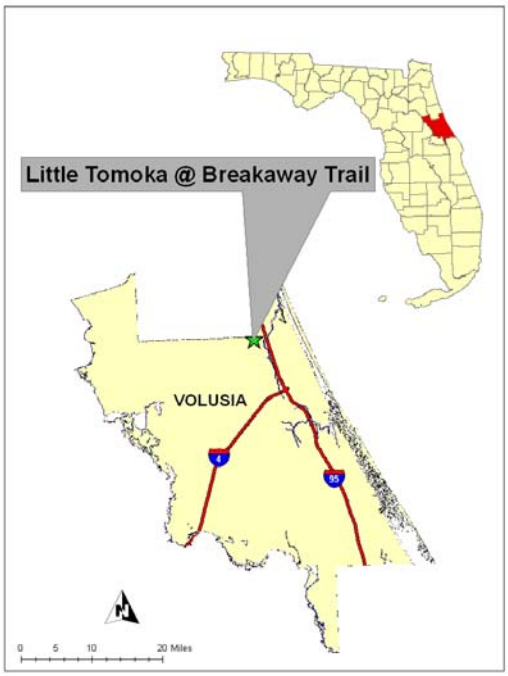


Figure 1: Location of the Little Tomoka River in Volusia County

Site Information

The Little Tomoka River was sampled upstream of the Breakaway Trail bridge (See Figure 1). In this area, the average width of the stream was 3 meters and the average

depth was 0.4 meters. The sample site had an average velocity of 0.17 m/s. The stream bottom consisted mostly of sand with some silt and muck. Some periphyton was observed throughout the stream reach. The shoreline plant community consisted of sweetgum, oak, elm, cabbage palm, saw palmetto, lizard's tail, and grasses (See Figure 2). No exotic invasive plant species were identified during this assessment (www.FLEPPC.org).

This sample was the second SCI conducted at the Little Tomoka River at Breakaway Trail. In 2000, the Stream Condition Index scored "Excellent." In addition, six BioRecon assessments were conducted from 1997 to 2003 and consistently scored "Healthy." The BioRecon is a screening tool for the SCI and also uses macroinvertebrate community metrics to evaluate stream health (sampled per DEP SOP FS 7410 and calculated per DEP SOP LT7100).

Results

Water Quality

The water quality samples collected on April 20, 2010, complied with applicable water quality criteria. 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).

This site was visited five additional times throughout 2010 to collect additional water quality data. The stream was flowing throughout the year, with lowest flows during early summer and fall months due to low precipitation. The DO ranged from 1.71 mg/L to 9.5 mg/L with three of the six measurements not meeting Chapter 62-302, F.A.C., limit of $\geq$ 5.0 mg/L. The low DO readings were associated with periods of low water levels and low stream flow during months of June, October and November. Samples collected during those months were also characterized by high conductivity (514 -679 µmhos/cm), high alkalinity (168 – 259 mg $CaCO_3$/L) and color results of 15 – 80 PCU. During February and April sampling events, when the water level was higher, the DO was always over 5 mg/L, water color was much darker (500 PCU), alkalinity results were lower, ranging from 15 – 80 mg/L, and conductivity was also lower, ranging from 125 to 225 µmhos/cm. Higher flows, associated with darker waters, had also elevated concentration of organic nitrogen.
The total nitrogen and total phosphorus geometric means for samples collected in 2010 were 0.95 mg/L and 0.03 mg/L, consecutively, both meeting the surface water criteria.

Iron values ranged from 0.40 mg/L to 1.50 mg/L and did not show correlations to other parameters. In June 2011, the *Ground Water and Springs Protection Section* at DEP Bureau of Watershed Restoration issued a report for the Upper East Coast Basin, *Evaluation of Potential Ground Water/Geologic Influences on Iron in Surface Water*. It was determined that elevated iron concentrations are due to natural conditions. As part of the evaluation, the ground water contribution of the total discharge of streams in the Upper East Coast Basin was assessed. Within the Halifax River Unit (Little Tomoka River belongs to Halifax River Unit) the base flow analysis showed that ground water is an average of 55% of the total discharge. Such a high contribution of ground water would explain the elevated conductivity and alkalinity in surface water during low rain conditions.

Table 1. Water quality results from April 20, 2010 at the Little Tomoka River (STORET #: 27010583).

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	19.9		
Field pH (SU)	7.4		Within Range
Field Dissolved Oxygen (mg/L)	7.62		$\geq$ 5.0 (mg/L)
Field Specific Conductance (µmhos/cm)	225		Not to exceed 50% of background or 1275 µmhos/cm
Secchi Depth (m)	0.2		
Algal Growth Potential (mg/L)	4.57		
Alkalinity (mg $CaCO_3$/L)	80	A	Shall not be depressed below 20 mg $CaCO_3$/L
Turbidity (NTU)	2.7		
Chloride (mg/L)	27		
Sulfate (mg/L)	2.2		
True Color (PCU)	500		
Chlorophyll-*a* (µg/L)	0.55	UJ	
Phaeophytin-*a* (µg/L)	0.40	UJ	
Biochemical Oxygen Demand (mg/L)	1.2	I	
Total Phosphorus (mg/L)	0.044		$\leq$ 0.12 mg/L *
Nitrate+Nitrite (mg/L)	0.059		
Ammonia (mg/L)	0.054		
Total Kjeldahl Nitrogen (mg/L)	1.4		
Total Nitrogen (mg/L)	1.5		$\leq$ 1.54 mg/L *

* F.A.C. Chapter 62-302 Surface Water Quality Standards. Criteria are applicable to the annual geometric means. - 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.

J - The QC standard exceeded the acceptance limits.

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



Figure 2. Stream Condition Index transect at the Little Tomoka River on April 20, 2010.

Habitat Assessment

The Stream and River Habitat Assessment score was 110, which is in the "Suboptimal" category. There were two productive macroinvertebrate habitats sampled: the fallen trees (snags) and roots originating from the stream banks. Substrate availability scored in the marginal category due to a low total percent habitat of 6% for the entire stream segment surveyed, and over 25% of the productive habitats were smothered with sand or silt. Otherwise, the stream had natural sinuosity and showed little evidence of physical alterations. The bank stability, riparian zone buffer width and vegetation quality components all scored perfect scores in the optimal category indicating that riparian disturbance is low in this watershed.

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 macroinvertebrate groups were present including mayflies, caddisflies, damselflies, black flies, and aquatic beetles. The Asian clam, an exotic invasive clam species that can substantially alter benthic environments, was identified in this sample. Otherwise, the macroinvertebrates collected in this sample represent the expected community for a healthy macroinvertebrate community.

Conclusions

Although the water quality sample from this sampling event met all applicable water quality criteria, continuous sampling confirmed that the Little Tomoka River undergoes intermittent low dissolved oxygen levels, and broad range of alkalinity, conductivity, and iron concentrations. The Little Tomoka River drains naturally tannic water from a large area of surrounding wetlands. Wetlands have naturally low dissolved oxygen and, in tannic systems, have naturally low pH. As the low pH water enters the creek from the upstream wetlands, the alkalinity will go down accordingly as the buffering capacity is lost. The changes in DO, alkalinity, conductivity, and organic nitrogen over time may be a result of the different sources of water that the creek is receiving. Low alkalinity periods may indicate a wetland-dominated flow while periods with higher alkalinity may be periods of higher groundwater influence in addition to stormwater runoff. The SCI and Habitat Assessment data indicate that the Little Tomoka River is functioning at as healthy, well-balanced stream.

Follow up on the Little Tomoka River

Another Habitat Assessment and Stream Condition Index were conducted on the Little Tomoka River on August 19, 2010. The Habitat Assessment score was 113, in the "Suboptimal" category, and the SCI score was 42, corresponding with the "Healthy" designation. These data confirm that the Little Tomoka River is a healthy, well-balanced stream despite intermittent low dissolved oxygen levels, low pH, low alkalinity, and high iron levels.

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