STREAM ECOSUMMARY

Suwannee River above and below confluence with Swift Creek

December 17, 2008

DEP conducted water quality and biological sampling in the Suwannee River, upstream and downstream of the confluence with Swift Creek in Hamilton County on December 17, 2008 and December 30, 2008, respectively, to assess attainment of designated uses. The sampling was done as part of the statewide nutrient gradient study. These sites were selected because of their potential differences in phosphorus concentrations due to the input of phosphorous mining effluent into Swift Creek. Overall, the water quality and macroinvertebrate community data indicated that the river met expectations for a healthy, well-balanced river.

Background

Although healthy, well-balanced stream and river communities may be maintained with some level of human activity, such 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 is 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 December 17, 2008 and December 30, 2008 by the DEP Northeast District Office. Surface water samples were collected for analysis of nutrients, chlorophyll a, color, turbidity and total suspended solids (TSS) 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) 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 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. Proposed biological health

assessment criteria state that a site is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of those scores is 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 Suwannee River at confluence with Swift Creek.

Site Information

The two sampling sites were located on the Suwannee River near White Springs. One site was upstream of Swift Creek and the other site was downstream of the confluence. Phosphorus inputs from Swift Creek to the Suwannee River are associated with phosphate mining. Additional phosphorus inputs, from Hunter and Roaring Creeks, are located upstream of the Swift Creek confluence and a third phosphorus source, Camp Branch, is downstream (Figure 2).

Roughly 37% of the Swift Creek watershed is occupied by phosphorous mining. Other land uses in the Suwannee River watershed in this area include pasture (5%), agriculture (4%) and residential (5%). Twenty-seven percent of the watershed is used for silviculture (a relatively benign land use) and 23% remains natural.

The upper section of the Suwannee River, where this study took place, has not been verified as impaired for any water quality constituents.

Results

Water Quality

The upstream water quality samples complied with all applicable water quality criteria (Table 1). The downstream water quality samples exceeded total nitrogen (TN) and total phosphorous (TP) limits. Tthe TP concentration was 8.6 times the upstream TP value. Note that compliance with nutrient criteria cannot be determined with a single sample; all concentrations are based on annual geometric means not to be surpassed more than once in a three year period. Additionally, information on flora and fauna is needed to assess the State's nutrient criteria.



Figure 2. Permitted phosphate mining stormwater and wastewater inputs in the Upper Suwannee.

Table 1. Water quality results in the Suwannee River up and downstream of Swift Creek, 12/17/2008 and 12/30/2008.

Analyte	12/17 Up stream	12/30 Down stream	Applicable Class III Water Quality Criteria
Field Temperature (°C)	14.52	15	
Field pH (SU)	4.64	6.68	
Field Dissolved Oxygen (mg/L)	9.4	9.46	>5.00
Field Specific Conductance (µS/cm)	66	216	≤1275 or 50% above background
Color (PCU)	300	200 **A**	
Chlorophyll a (µg/L)	0.55 **U**	0.61 **I**	
Phaeophytin a (µg/L)	0.24 **U**	1.1	
Total organic carbon (mg/L)	49	36	
Total suspended solids (mg/L)	4 **U**	4 **I**	
Turbidity (NTU)	0.75	1.8	≤29 NTUs above natural background
Total Phosphorus (mg/L)	0.14	1.2	0.30*
Nitrate+Nitrite (mg/L)	0.012 **I**	0.62	
Un-ionized ammonia (mg/L)	10^{-7} x 2.65 **I**	10^{-4} x 1.28	≤ 0.02
Total Kejldahl Nitrogen (mg/L)	1.6	1.7	
Total Nitrogen (mg/L)	1.612	2.32	1.87*

* Federally promulgated numeric nutrient criteria for the north central nutrient region

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

I The reported value is between the laboratory minimum detection limit (MDL) and the laboratory practical quantitative limit (PQL).

U sample analyzed but compound not detected.

Habitat Assessment

The stream and river habitat assessment scores were 99 and 100 (downstream, upstream), both in the "Suboptimal" range. Both sites had relatively small percentages (by aerial extent) of productive substrate (snags, leaf packs, roots and rock) which is typical for large river systems; and both sites had the same level of diversity in habitat types.

Stream Condition Index

The SCI scores for these sites were 55 and 63 for downstream and upstream, respectively, out of a possible 100 points, corresponding with a "Healthy" designation for both sites. The Upper Suwannee and its tributaries still maintain natural buffers. Residents generally practice Best Management Practices on their shoreline properties such as maintaining the natural riparian buffer, not relying on bulkheads, and not discharging waste into the waterways. These efforts have a direct impact on the quantity and quality of habitat and forage, as well as water quality.

Periphyton

The attached algal community in the stream consisted of 6.27 and 10.16% cyanobacteria (blue-green algae), 6.60 and 4.26% green algae, and 87.13 and 85.25% diatoms for downstream and upstream sites, respectively. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an over abundance of algae (especially filamentous algae) may reduce habitat quality (from smothering) and lead to excess organic matter production (and decomposition), which can harm fish and invertebrates. In this case, neither site was dominated by filamentous or harmful bloom causing algae.

Conclusions

Despite the elevated TP level, flora and fauna during this sampling appeared healthy in the Suwannee River, both upstream and downstream of Swift 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