STREAM ECOSUMMARY

Rock Creek below Faircloth Branch at Torreya State Park
March 6, 2012

FDEP conducted biological & water quality sampling at Rock Creek in Liberty County (Figure 1) on March 6, 2012 to assess attainment of designated uses.



Figure 1. Rock Creek in Torreya State Park SCI site March 6, 2012.

This site had been chosen as a possible Stream Condition Index (SCI) Benchmark site since Torreya State Park was one of the original nine Florida parks created in the 1930's. Also, bioassessment sampling was of interest to the park manager. Benchmark sites have consistently high SCI scores and are being used to assure compliance with Quality Assurance objectives. The biological data indicated the Rock Creek macroinvertebrate community was a Healthy Stream with a SCI score of 67. This score just missed the SCI "Excellent" Category (68-100).

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. FDEP 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. FDEP 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 March 6, 2012 by the FDEP Northwest District Office. Surface water samples were collected per FDEP Standard Operating Procedures (SOPs 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 FDEP SOP FS7420 and calculated per FDEP 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 FDEP 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 FDEP 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)

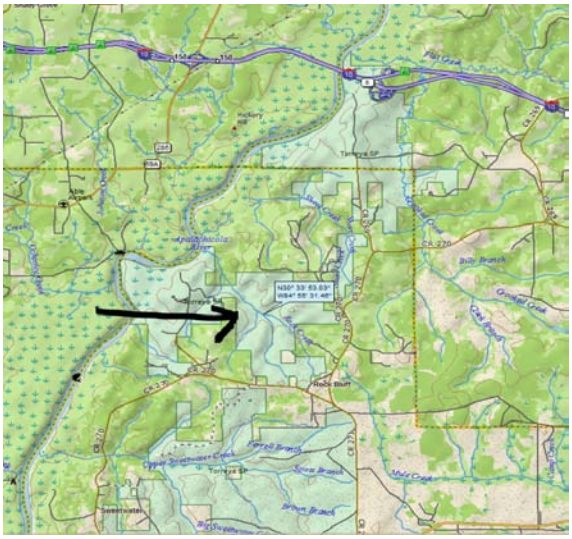


Figure 2. Location of Rock Creek in Torreya State Park in Liberty County.

Site Information

This site, a third order stream (STORET #31010068) in Torreya State Park (Lat/Long N30° 33′ 53″ W-84° 55′ 31.46″) is located 8 miles north of Bristol in Liberty County. Rock Creek is in Ecoregion 65h in the Tifton Uplands of the Southeastern Plains and flows to the Apalachicola River and ultimately Apalachicola Bay. The following is from the Torreya State Park (TSP) management plan http://www.dep.state.fl.us/parks/planning/parkplans/TorreyaStatePark.pdf. "When Torreya State Park was first developed, it consisted in part of lands that had been logged heavily, like so many other Civilian Conservation Corps parks of the 1930's. The CCC not only built parks, it also worked to save the land and to halt disastrous erosion, the bane of the South in the early 20th century. At Torreya, one major eroded area was the hillside overlooking Rock Creek." During 2003-2004 the clay mine pit that discharged sediments at the head of Rocky Creek was closed and restored by Torreya State Park.

Results

Water Quality

The water quality samples complied with water quality criteria except for total phosphorus (Table 1). The total phosphorus (0.29 mg/l) exceeded the proposed numeric TP criterion (0.06 mg/l). Additional sampling is needed to further evaluate compliance with the TP criterion, which is expressed as an annual geometric mean not to be exceeded more than once in a three year period. Possible TP sources include low density residential septic tank leachate, runoff from hog pens, and fertilizers. Small patches of filamentous algae was observed on March 24, 2009 upstream of the Rock Creek east tributary (Figure 3). During 2011, fine grain particle carbon deposition was observed on stream habitats at the upstream western tributary, Faircloth Branch. The fine organic material washed into the stream after a controlled burn removed ground cover on a beech forest slope. Beech forests are climax communities, which are intolerant to fire and historically would have a very low burn frequency.

Table 1. Water quality results from March 6, 2012 at Rock Creek in Torreya State Park.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	15.98		
Field pH (SU)	7.2		
Field Dissolved Oxygen (mg/L)	9.66		≥5.0
% Dissolved Oxygen Saturation	98		
Specific Conductance (µmhos/cm)	48		Not to exceed 50% of background or 1275 µmhos/cm
Alkalinity (mg $CaCO_3$/L)	7.5		
Color (PCU)	21		
TDS (mg/l)	38		
TSS (mg/l)	12		
Calcium (mg/l)	5.27		
Turbidity (NTU)	7.6		
Sulfate (mg/l)	5.3		
Chlorophyll a (µg/L)	0.66		
Total Phosphorus (mg/L)	0.29		*0.06 mg/L
Nitrate+Nitrite (mg/L)	0.059		
Ammonia (mg/L)	0.016	I	
Total Kejldahl Nitrogen (mg/L)	0.19		
Total Nitrogen (mg/L)	0.265		*0.67 mg/L
Organic Carbon (mg/L	3.6	I	

I – Result was between the method detection limit (MDL) and the practical quantitation limit (PQL)
* F.A.C. Chapter 62-302 Surface Water Quality Standards. Criteria are applicable to the annual geometric means. - DRAFT

Habitat Assessment

The stream and river habitat assessment score was 119, the top of the "Suboptimal" range. Water Velocity, Artificial Channelization, Riparian Zone Buffer Width, and Riparian Vegetation Quality rated "Optimal". The forest was re-growth from clear-cutting during the 1930's. A beech and white oak was observed in the sample reach with many more observed along the stream at other sites. The endangered Florida Torreya and Florida yew were observed at this site in the past, but now were not present. However, a Florida yew was seen upstream, and a planted Florida Torreya was noticed both upstream and downstream along Rock Creek. Substrate Diversity and Bank Stability rated "Suboptimal". Bare banks and bank sloughing was observed upstream. Habitat Smothering was rated as "Marginal" with severe sand and slight silt). Limestone bedrock with gravel was buried under sand. A washed out culvert that had replaced an old bridge crossing was observed just above the site. New riprap along County Road 270 had been placed to prevent additional gully creation from the road's stormwater runoff. Substrate Availability (3%) rated "Poor" with 96% of the substrate consisting of sand (Figure 1). From the TSP management plan "All of the ravines and slope forests at Torreya State Park are exceptionally prone to destructive erosion which not only destroys slopes but more importantly adversely impacts streams through siltation ".

Stream Condition Index

The SCI score for this site was 67 out of a possible 100 points, corresponding with a "Healthy" designation. Sediments including those from the now restored former clay mine in the headwaters limited substrate availability. The EPT, mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) made up 57 % of the samples. The EPT are the more sensitive orders of the stream community. They may comprise 50% of the aquatic macroinvertebrate in the healthiest Panhandle streams. Stoneflies, the most sensitive to pollution, were 21% of the sample, enhanced by the 98% dissolved oxygen saturation. However, the caddisflies, which usually represent the bulk of the EPT, were only 6%. This may reflect the lack of root habitat (0.3%), potentially related to sand deposition and channel widening (Figure 1). FDEP is a partner with Florida Agriculture and Mechanical University (FAMU) studying steephead EPT at this site and with Dr. Richard Baumann of the Monte L. Bean Natural History Museum studying the species distribution of the stonefly *Amphinemura*.

Periphyton

The attached algal community in the stream was rare, consisting of cyanobacteria (blue-green algae), on limestone and diatoms on wood. However, mats of green filamentous algae were common to abundant in the East Branch of Rock Creek during March 2009 (Figure 3). 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

sedimentation, potentially harming fish and invertebrates.



Figure 3. **Rock Creek east tributary filamentous green algae March 24, 2009.**

The historical logging of the forest has contributed to a lack of in-stream large woody material to provide adequate aquatic wildlife habitat. Only 1.4% woody material was observed in the 100-meter sample reach. Research by the University of Georgia has suggested that up to 40% woody material was found naturally in southeastern blackwater Coastal Plain streams (Wallace & Benke, 1984). Addition of large coniferous logs using standard fluvial geomorphologic techniques (Rosgen, 1993) may potentially enhance the Rock Creek fish and wildlife biodiversity and productivity.

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Thank you for your interest in conserving 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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FDEP biological assessment resources:
http://www.dep.state.fl.us/water/bioassess/index.htm