STREAM ECOSUMMARY

Boggy Creek below Arthur Brown Road
March 24, 2010

FDEP conducted Stream Condition Index (SCI) biological and water quality sampling at Boggy Creek below Arthur Brown Road (Figure 1) in Escambia County on March 24, 2010 to assess attainment of designated uses requested by Florida's TMDL monitoring program. Overall, the macro-invertebrate community and water quality data indicated that the stream did meet not expectations for a healthy, well-balanced stream.



Figure 1. SCI site for Boggy Creek below Arthur Brown Road, March 24, 2010..

Background

Although healthy, well-balanced stream and river communities may be maintained with some level of human activity, such activities may result in water body 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 February 23, 2010 (water quality only), and March 24, 2010 (water quality and biological assessment), by the FDEP Northwest District Office following FDEP 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 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).

Site Information

This site (Lat/Long N30° 53′ 10.5″ W-87° 29′ 48.5″) is located at Walnut Hill, 14 miles southwest of Century (Figure 2). Boggy Creek at this location was a 3rd order stream and drains the Southern Pine Plains and Hills ecoregion (65f). Boggy Creek drains to the Perdido River and Bay. Its headwaters originate in former wetlands drained for row crop production and impounded for catfish ponds on the Walnut Hill plateau. The stream channel (Figure 1) has been dredged and straightened to facilitate draining the wetlands and lowering the water table for agricultural



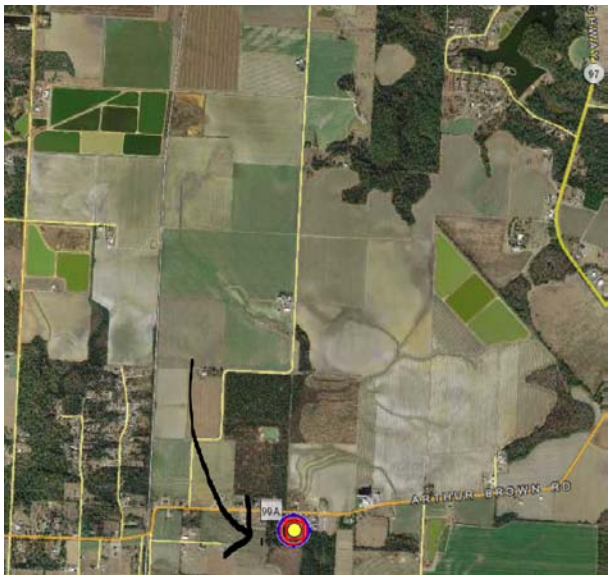


Figure 2. Location of Boggy Creek below Arthur Brown Road in Escambia County.

use. In 2011, a local homeowner had concerns that Walnut Hill area streams were dry because agricultural practices interfered with the natural flows. The TMDL Water Body Identification (WBID) 135 is listed for impaired biology and fecal coliforms. In addition to Boggy Creek, McDavid Creek, Pine Barren Creek and branches of Brushy Creek originate in the Walnut Hill area. Ecosummaries have been previously prepared on these 11 stream sites in the Walnut Hill area: McDavid Creek Tung Oil Road, Breastworks Branch Breastworks Road, Hall

Branch Breastworks Road, Hall Branch Hanks Road, Little Pine Barren Creek Kansas Road, Little Pine Barren Creek County Road 97, Little Pine Barren Creek County Road 99, Pine Barren Creek County Road 4, Bratt Branch County Road 168, Sandy Hollow Creek at Sandy Hollow Road, Beaverdam Creek at Dortch Road, and all have attributed biological impairment with anthropogenic non-point sources (including sediment inputs from dirt road).

Results

Water Quality

The nutrient samples collected during this survey did not comply with water quality criteria (Table 1), but note that compliance with the criteria are based on annual geometric means. Total nitrogen (2.05 mg/l, 1.13 mg/l) and total phosphorus samples (0.12 mg/l, 0.071 mg/l) for February and the March water quality sample dates did not meet nutrient criteria. Fertilizer from surrounding farm fields and ponds is a likely source of the nutrient enrichment. The pH increased 1.59 standard units from 5.54 in February to 7.13 in March, which exceeded the standard no change over one standard unit). Agricultural lime application was probable possible source of the elevated pH, as the calcium concentration also increased, and alkalinity doubled. Analyte concentrations are notably lower in the Perdido River upstream from the Boggy Creek watershed (Table 2), suggesting that Boggy Creek concentrations are elevated above background.

Table 1. Water quality results from February 23 and March 24, 2010 at Boggy Creek

Analyte	Result 2/23/10	Result 3/24/10	Remark	Class III Water Quality Criteria
Field Temperature (°C)	9.75	13.67		
Field pH (SU)	5.54	7.13		1 (SU) over background
Field Dissolved Oxygen (mg/L)	11.3	10.4		≥5.0
% Dissolved Oxygen Saturation	99.5			
Specific Conductance (µmhos/cm)	70	88		Not to exceed 50% of background or 1275 µmhos/cm
Alkalinity (mg $CaCO_3$/L)	6.9	12		
Turbidity	55	na		Not to exceed 29 over background
TDS (mg/l)	67	na		
TSS (mg/l)	14	na		
Color (PCU)	160	na		
Chloride (mg/l)	7.4	13		
Calcium (mg/l)	6.74	7.03		
Sulfate (mg/l)	8.8	7.2		
Fecal Coliform#/100ml	260	na		
Chlorophyll a (µg/L)	3.3	na		
Total Phosphorus (mg/L)	0.12	0.071		* ≥0.06 mg/L
Nitrate+Nitrite (mg/L)	1.6	0.51		
Ammonia (mg/L)	0.02	0.014		
Total Kejldahl Nitrogen (mg/L)	0.45	0.62		
Total Nitrogen (mg/L)	2.05	1.13		* ≥0.67 mg/L
Organic Carbon (mg/L	2.8	4.7		
Biochemical Oxygen Demand	0.60	na		

Table 2. Water quality results from January 5, 2012 at Perdido River below Barrineau Park Road.

Analyte	Result	Remark	Class III Water Quality Criteria
Field Temperature (°C)	10.38		
Field Dissolved Oxygen (mg/L)	10.46		≥5.0
% Dissolved Oxygen Saturation	93.5		
Specific Conductance (µmhos/cm)	30		Not to exceed 50% of back-ground or 1275 µmhos/cm
Alkalinity (mg $CaCO_3$/L)	2	I	
Color (PCU)	15	Q	

Chloride (mg/l)	4.3		
Calcium (mg/l)	1.1		
Sulfate (mg/l)	1.8		
Turbidity (NTU)	1.5	AQ	
Total Dissolved solids (mg/l)	28		
Total Suspended Solids (mg/l)	3	I	
Total Phosphorus (mg/L)	0.013		*≤0.06 mg/L
Nitrate+Nitrite (mg/L)	0.33		
Ammonia (mg/L)	0.01	U	
Total Kejldahl Nitrogen (mg/L)	0.08	U	
Total Nitrogen (mg/L)	0.41		*≤0.67 mg/L
Organic Carbon (mg/L	2.1	I	

A – Average of two values
I – Result was between the method detection limit (MDL) and the
Q – Sample was analyzed beyond its holding time
practical quantitation limit (PQL)
U – Compound was analyzed for but not detected
* F.A.C. Chapter 62-302 Surface Water Quality Standards. Criteria are applicable to the annual geometric means. – DRAFT
na – not analyzed per SCI sample requirements

Habitat Assessment

The stream and river habitat assessment score was 42 placing it in the "Marginal" range. Water Velocity, Habitat Smothering, Artificial Channelization, Bank Stability, Riparian Zone Buffer Width and Riparian Vegetation Quality rated poor. Substrate Diversity rated suboptimal. Substrate Availability, rated marginal. The stream reach was surrounded by cotton row crop and converted to a channelized muddy ditch lined by Chinese privet, an exotic invasive. The watershed is flashy and flood prone from severe runoff due to lack of forest/vegetative cover. The high water mark was 1.9 meters documented by garbage bags, disposable diapers, and cotton boles caught on the privet.

Stream Condition Index

The SCI score for this site was 19 out of a possible 100 points, corresponding with a "Not Healthy" designation. The dominant species were the worm, *Nais* (20%) and snail, *Physa* (18%), both pollution-tolerant organisms. The percent of very tolerant species in sample was 40%. The EPT, mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) made up only 1.7 % of the sample. The only EPT were 2 caddislies (*Orthotrichia* and *Oecetis persimilis*). The EPT are the more sensitive orders of the stream community. They may comprise up to 50% of the aquatic macroinvertebrate in the healthiest Panhandle streams. The stoneflies, the most sensitive to pollution, historically dominated the north Escambia County headwater creeks. Two of the once most common stonefly genera, *Leuctra* and *Tallaperla* fed on leaves of the former streamside beech/magnolia forest. Boggy Creek's stream community structure in its headwaters has been altered from the more sensitive EPT to very tolerant species such as worms, snails, and true flies (Diptera). A follow up SCI was not able to be scheduled during the time frame for the Perdido TMDL basin study. This was due lack of continuous stream flow from a combination of drought, water withdrawal for agriculture irrigation, and hydrological modifications (wetland filling, impoundments, ditching to lower water table, and stream channelization [Figure 1]).

Periphyton

Attached algae were common in the stream, consisting primarily of filamentous cyanobacteria (blue-green algae), with some filamentous green algae. Algal growth was limited by turbid water conditions (Figure 1). 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.

Follow-up sampling will be done during the next scheduled Perdido TMDL basin study rotation to collect additional biological data.

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