STREAM ECOSUMMARY

Unnamed Branch at Bridgeway Road
February and November, 2012

DEP conducted water quality and biological sampling at Unnamed Branch at Bridgeway Road in Orange County on February 14 and November 19, 2012. Unnamed Branch was sampled as part of the strategic monitoring plan for the Middle St. Johns River Basin to verify potential dissolved oxygen impairment. Overall, the water quality and macroinvertebrate community data indicated that the stream met expectations for a healthy, well-balanced stream; however, aquatic habitat conditions were not optimal.

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), 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. The Rapid Periphyton Survey provides an assessment of the attached algae within the stream.

Methods

This stream was sampled on February 14 and November 19, 2012 by DEP Central District Office biologists. Surface water samples were collected for analysis of nutrients, chlorophyll-*a*(corrected), phaeophytin-*a*, true color, turbidity, alkalinity, chloride, fluoride, sulfate, organic carbon, biological oxygen demand and fecal coliform bacteria in accordance with 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

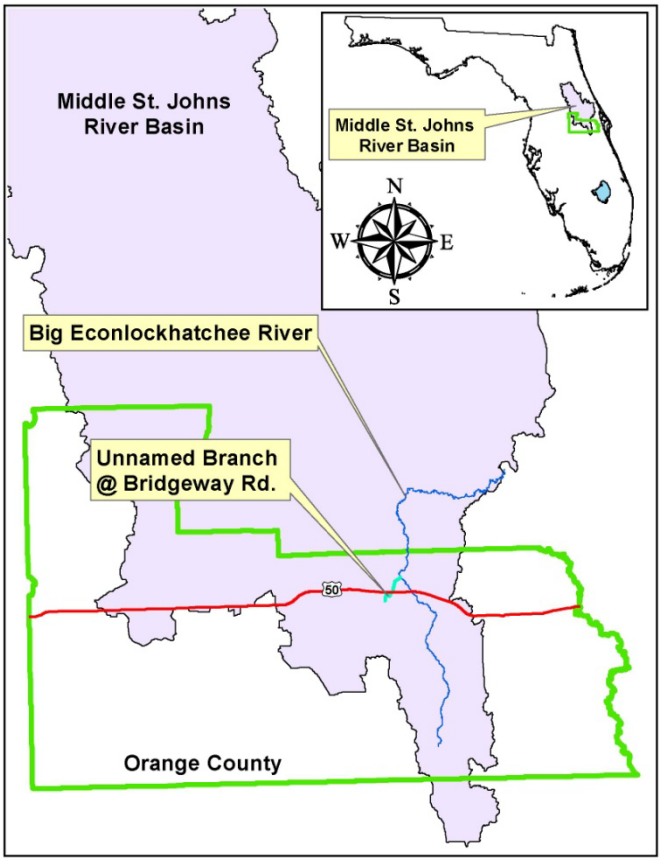


Figure 1. Location of Unnamed Branch at Bridgeway Rd. in Orange County

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. 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).

The Rapid Periphyton Survey (RPS) was conducted per DEP SOP FS 7230. The RPS quantifies the extent and abundance of attached algae in a 100 m stream reach.

Site Information

Unnamed Branch is located in Orange County and is part of the Middle St. Johns River Basin. Water flows from Unnamed Branch into the Econlockhatchee River near County Road 420(Lake Pickett Road). The surrounding land use consists of about 75% residential, 15% forest/natural, and 10% commercial. FDEP biologists performed Habitat Assessment, Stream Condition Index, Rapid Periphyton Survey and collected water quality samples downstream of Bridgeway Rd. on February 14 and November 19, 2012 (Figure 2). In this area, the average width of the stream was 2 meters and the average depth was 0.35 meters. The maximum observed velocity at this site was 0.13 m/s in February and 0.17 m/s in November. The stream bottom consisted primarily of sand, silt and exposed roots originating from trees within the stream channel and on stream banks. The shoreline tree and shrub community consisted of *Taxodium* (cypress tree), *Acer rubrum* (red maple), *Sabal palmetto* (sabal palmetto), *Quercus* (oak), *Itea virginica* (Virginia willow), *Ilex cassine* (Dahoon holly), and *Myrica cerifera* (wax myrtle). Other plants included *Saururus cernuus* (lizard's tail), *Colocasia esculenta* (wild taro), *Peltandra* (arrow arum), *Symphyotrichum carolinianum* (climbing aster), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* var. *spectabilis* (royal fern), *Urena lobata* (caeserweed), *Hydrocotyle* (marshpennywort) and vines including *Toxicodendron radicans (*poison ivy), *Mikania scandens* (climbing hempvine), and *Smilax*. The presence of two FLEPPC Category 1 exotic invasive plant species, *Colocasia esculenta* (wild taro), and *Urena lobata* (caeserweed), indicates that the native plant community has been altered. This was the first time biological assessments were performed at this location on Unnamed Branch.



Figure 2. Unnamed Branch downstream of Bridgeway Rd.

Results

Water Quality

The water quality samples collected on February 14 and November 19, 2012, complied with all applicable water quality criteria (Table 1) in Chapter 62-302, Florida Administrative Code. **(**Note that compliance with numeric nutrient criteria involve an annual geometric mean not to be exceeded more than once in any three year period). Another water quality sample was taken on January 25, 2012. An SCI was scheduled to be performed the same day but was postponed because of unusually high turbidity. The source of turbidity was investigated and determined to be a near-by road construction. The same analytes were sampled as the February and November events with the addition of metals.

Table 1. Water quality results from1/25/2012, 2/14/2012, and 11/19/2012 for Unnamed Branch at Bridgeway Rd.

Analyte	Result 1/25/12	Result 2/14/12	Result 11/19/12	Class III Fresh Water Quality Criteria
Field Temperature (°C)	17.4	14.5	17.1	
Field pH (SU)	7.8	7.5	8.3	
Field Dissolved Oxygen (mg/L)	7.44	9.19	7.90	$\geq$ 5.0
Field Specific Conductance (µmhos/cm)	209	207	193	Not to exceed 50% over background or 1275 µmhos/cm
Secchi Depth (m)	0.3	> 0.3	> 0.5	
Alkalinity (mg $CaCO_3$/L)	73	69	66	Shall not be depressed below 20
Turbidity (NTU)	32	1.7	1.5 A	$\leq$ 29 above natural

				background conditions
Total Dissolved Solids (mg/L)	133 A	142 A	121	
Total Suspended Solids (mg/L)	17	2 U	3 I	
Chloride (mg/L)	16	16	17	
Fluoride (mg/L)	0.081 I	0.077 I	0.081 I	≤ 10.0
Sulfate (mg/L)	6.8	7.1	5.8	
True Color (PCU)	49	42	51	
Chlorophyll-*a* (corrected) (µg/L)	3.7	0.81 I	0.55 U	
Phaeophytin-*a* (µg/L)	0.80 I	0.40 U	0.40 I	
Organic Carbon (mg C/L)	11	9.2	10	
Total Phosphorus (mg/L)	0.089	0.014	0.027	≤ 0.12*
Nitrate+Nitrite (mg/L)	0.034	0.045	0.15	
Ammonia (mg/L)	0.016 I	0.018 I	0.017 I	
Total Kjeldahl Nitrogen (mg/L)	0.83	0.36	0.48	
Total Nitrogen (mg/L)	0.86	0.41	0.63	≤ 1.54*
Orthophosphate	0.008 I	0.004 I	0.014	
Biological Oxygen Demand (mg/L)	0.81 IJ	0.36 I	0.27 IJ	
Fecal Coliform-Membrane Filter (cfu/100mL)	238 B	134 B	250	Membrane filter counts shall not exceed 400 in 10% of the samples, nor exceed 800 on any one day.
Hardness (mg/L)	85.8			
Calcium (mg/L)	29.6			
Iron (µg/L)	480			≤ 1000
Magnesium (mg/L)	2.88			
Potassium (mg/L)	1.9			
Sodium (mg/L)	9.0			
Zinc (µg/L)	5.0 U			≤ 105.2038**
Arsenic (µg/L)	0.50 I			≤ 50
Cadmium (µg/L)	0.05 U			≤ 0.2415**
Chromium (µg/L)	2.0			≤ 75.9988**
Copper (µg/L)	4.96			≤ 8.1821**
Lead (µg/L)	1.36			≤ 2.6169**
Nickel (µg/L)	0.81 I			≤ 45.8104**
Silver (µg/L)	0.025 U			≤ 0.07

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

* * Criteria dependent on Hardness

A - Value reported is the mean of two or more determinations.

B - Results based on colony counts outside the acceptable range.

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

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

Habitat Assessment

The Stream and River Habitat Assessment score was 105 on February 14, 2012 and 96 on November 19, 2012. Both scores reflect an overall "Suboptimal" condition. Two major productive macroinvertebrate habitats were identified in the February sample event: roots originating from stream banks, and snags (fallen branches). Only one major habitat, roots, was sampled in the November sample event. At that time snags were sampled as a minor habitat because of heavy silt smothering. Leaf packs were also present and sampled in both events, but were not in enough abundance to be considered a major habitat. The substrate diversity and availability changed from "Marginal" in February to "Poor" in November due to low total percentages of available habitat for the entire stream segment surveyed. More than 25% of the productive habitats were smothered with sand or silt scoring in the "Suboptimal" category during February and November sampling. The stream showed some signs of channelization, but had mostly recovered exhibiting some sinuosity and an adequate diversity of depths. The bank stability and riparian zone buffer width components scored in the "Optimal" category for the left bank and the "Suboptimal" category for the right bank, due to a nearby stormwater pond with mowed edges. Riparian zone quality is consistent on the left bank with an "Optimal" score for both events, but the right bank received a "Suboptimal" score in February because disruption in the plant community was observed.

Stream Condition Index

The SCI scores for this site were 45 and 37 corresponding with a low end of "Healthy" designation. In the February 14, 2012 SCI sample, the pollution-sensitive taxa *Maccaffertium sp.,* a mayfly, and *Triaenodes sp.,* a caddisfly were present. Some snails and midges that are very tolerant to pollution were also present. The Asian clam *Corbicula fluminea,* a long-lived, exotic invasive clam species that can substantially alter benthic environments, was also identified in this sample.

In the November 19, 2012 SCI sample, pollution-sensitive mayflies in the Heptageniidae family, including *Maccaffertium exiguum,* were found. Other pollution sensitive species found include *Triaenodes sp.,* a caddisfly, and *Simulium sp*., a blackfly larva. The very tolerant snail, *Pyrgophorus platyrachis,* was also encountered.

The macroinvertebrates collected in these samples represent the expected macroinvertebrate diversity for a healthy stream community.

Rapid Periphyton Survey

Periphyton was observed in low abundance on January 14 and November 19, 2012. Most sample points in both assessments had periphyton filaments with lengths of 6 mm or less. DEP SOP FS 7240 states that if the percentage of total sample points with a thickness rank of > 6 mm is more than 20%, an algal sample should be collected for identification. Only 3.4% of the total sample points in February had an algal thickness rank of > 6 mm and only 5% of the total sample points in November had an algal thickness rank of > 6 mm, therefore algal filaments were not collected or identified.

Conclusion

Unnamed Branch, as sampled on February 14 and November 19, 2012, met State Water Quality Criteria. Stream Condition Index data indicated the presence of a "healthy" macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. Overall, the SCI and Water Quality Data indicate that Unnamed Branch @ Bridgeway Rd. met expectations for a healthy, well-balanced stream despite less than optimal habitat.

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

Implementation of Florida's Numeric Nutrient Standards
http://www.dep.state.fl.us/water/wqssp/nutrients/docs/nnc_implementation.pdf