STREAM ECOSUMMARY

South Fork of Bear Creek

Bay County, WBID 1041

June 25, 2014 and May 4, 2016



Figure 1. Sampling reach along the South Fork of Bear Creek in Bay County.

Physical, chemical, and biological sampling was conducted at South Fork of Bear Creek (STORET 32030024, Nickname SFBearRef) in Bay County on June 25, 2014 and May 4, 2016 by members of the Aquatic Ecology and Quality Assurance section of the DEP Tallahassee Office. This stream was sampled as part of the DEP Ecoregional Reference Stream Survey, which was designed to provide baseline information about the state's highest quality streams and to monitor the water quality and biological community health of these streams through time. The water quality and macroinvertebrate community data indicated that the stream met all water quality standards and the expectations for a healthy, well-balanced stream.

Background

Healthy, well-balanced stream and river communities may be maintained with some level of human activity, but excessive human disturbance may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or other contaminants from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP evaluates 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 use support), and exceedances of these standards are associated with interference with the designated use. Additionally, DEP evaluates the health of floral (plants and algae) and faunal (animal) communities and conducts habitat assessments to diagnose potential physical impacts.

Site Description

The South Fork of Bear Creek sampling location (Figure 1) is about 15 miles northeast of Panama City in the Little Bear Creek (South Fork) Watershed (WBID 1041, Figure 2). It is a first order stream draining the Gulf Coast Flatwoods, a sub-ecoregion of the Southern Coastal Plain ecoregion. South Fork of Bear Creek is a tributary of Bear Creek that flows into Deer Point Lake and eventually into the North Bay of St. Andrews Bay. South Fork of Bear Creek has a Landscape Development Intensity (LDI) Index score of 1.43. The LDI quantifies the intensity of human activity in the surrounding area based on land use and land cover, and is normalized on a scale from 1 to 10, where a natural land use has a coefficient of 1.0 and a central business district has a coefficient of 10.0. This site's score of 1.43 suggests minimal human activity in the 100m buffer surrounding the stream.

The WBID is not listed for any parameters on the most recent Impaired Waters Verified List (1/27/14).



Figure 2. Location of South Fork of Bear Creek in Bay County.

Methods

Water Quality

Surface water samples were collected for chlorophyll-*a*, turbidity, alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, total Kjeldahl nitrogen, and microbiology, total organic carbon, total dissolved solids, and total suspended solids. All sampling followed DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/index.htm for details) and met the requirements of the FDEP Quality Assurance Rule, Chapter 62-160, F.A.C. (https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-160).

Chapter 62-302.531, F.A.C., provides that Numeric Nutrient Criteria are achieved in streams if: Information on chlorophyll *a* levels, algal mats or blooms, nuisance macrophyte growth, and changes in algal species composition do not indicate an imbalance in flora or fauna; AND EITHER

The average score of at least two temporally independent Stream Condition Indices (SCIs) is 40 or higher, with neither of the two most recent SCI scores less than 35, OR

The nutrient thresholds (expressed as annual geometric means; Table 1) are not exceeded more than once in a three-year period. The floral and faunal assessments are described below.

Dissolved Oxygen

Rule 62-302.533 (1), F.A.C., states that no more than 10 percent of the daily average percent dissolved oxygen (DO) saturation values shall be below 67 percent in the Panhandle West bioregion, which includes the South Fork of Bear Creek. Percent saturation takes into account temperature, atmospheric pressure, and salinity.

Habitat Assessment

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).

Floral Assessment

Evaluations of stream flora include the Rapid Periphyton Survey (RPS, DEP SOP FS 7230), community composition information associated with dominant algal taxa (where applicable), Linear Vegetation Survey (LVS, DEP SOP 7320), and chlorophyll *a*. The RPS assesses the extent and thickness of algae in the stream reach, while the LVS assesses how closely the in-stream plant community resembles a minimally disturbed condition. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an overabundance 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. Results are assessed as described beginning on page 8 of "*Implementation of Florida's Numeric Nutrient Standards*," dated April 2013, using evidentiary thresholds derived from a population of minimally disturbed reference sites (see Table 2).

Faunal Assessment

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 SCI was sampled and calculated per DEP SOP SCI 1000. For the SCI, ten measures of macroinvertebrate health are calculated and summed to yield a final score from 0-100. Average SCI scores ≥ 40 are considered "Healthy" (as long as neither of the latest two SCI scores was < 35) with scores ≥ 64 considered "Exceptional."

As one of the original Ecoregional Reference Sites, this location has been sampled for the Stream Condition Index (SCI) 13 times between 1992 and 2016. Earlier versions of the SCI were applied for all but the last two samples and scored in the Excellent category. This report focuses on the two most recent samples as they use the most updated versions of the SCI calculations (SCI_2012).

Results

Water Quality

The water quality results are shown in Table 1. Based on these sampling events, the stream met the nutrient thresholds for the Panhandle West; however, the thresholds represent annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three calendar year period, and are used in combination with floral and faunal information. Therefore, even though the thresholds were not exceeded, additional nutrient sampling may be needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard. Recent rains prior to the June 25, 2014 sampling event resulted in higher water levels, lower pH and alkalinity, and higher levels of color, organic carbon, and total dissolved solids from surrounding wetlands and other natural lands compared to corresponding levels on May 4, 2016.

Habitat Assessment

The average stream and river habitat assessment score for the two sampling events was 132, which is in the mid-Optimal range. Typical velocity measured 0.28 m/s, which resulted in an optimal score for stream flow. Fish and aquatic insects require high dissolved oxygen concentrations, which are maintained by sufficient water velocity in a stream. For the 2014 and 2016 sampling events, the dissolved oxygen measured 83% and 84% saturation, respectively. The average width within the assessment stretch was 3m. The banks were well-armored, but relatively steep, potentially leading to instability during high flow events (Figure 3). The bank stability scores, as a result, were in the marginal range. Four productive habitats were noted: woody debris, leaf packs, rocks, and roots, which together comprised roughly 15% of the stream area; the majority of the habitat was limestone rock found near the upper end of the reach.



Figure 3. Stream banks at South Fork Bear Creek.

Table 1. Water quality results from June 25, 2014 and May 4, 2016 at South Fork Bear Creek.

Analyte	Result 6/25/14	Result 5/4/16	Applicable Class III Water Quality Criteria
Field Temperature (°C)	21.65	20.5	
Field pH (SU)	4.47	5.87	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	83	84	Panhandle West: no more than 10% of daily avg values below 67%
Field Specific Conductance (µmhos/cm)	93 J	42	50% above background or 1,275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	1.2 I	11	Shall not be depressed below 20
Color (PCU)	120	93	N/A
Total Phosphorus (mg/L) as P	0.009	0.008	*Panhandle West: 0.06 mg/L
Nitrate+Nitrite (mg/L) as N	0.023	0.04	0.35 mg/L for spring vents only
Ammonia (mg/L) as N	0.005	0.004 I	
Total Kjeldahl Nitrogen (mg/L) as N	0.43	0.18 I	N/A
Total Nitrogen (mg/L) as N	0.45	0.22	*Panhandle West: 0.67 mg/L

* Annual geometric numeric nutrient threshold for Panhandle West nutrient region, used in combination with information on flora and fauna.
I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J - Estimated value.
U - Indicates that the compound was analyzed for but not detected.

Floral Assessment

The results of floral surveys are shown in Table 2. The attached algal community in the stream was sparse. Only a few instances of algal filaments over 1 mm in length were recorded in two Rapid Periphyton Surveys, indicating that the stream achieves the floral component of the NNC. The stream was heavily shaded (96% covered), so thick algae growth would not be expected. No aquatic plants were observed during either sampling event; thus the site also achieves the LVS component of the NNC floral metrics.

Table 2. Floral and faunal assessment results from June 25, 2014, and May 4, 2016, at South Fork Bear Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 6/25/14 Visit ID 73135	Result 5/4/16 Visit ID 76155
LVS C of C	Site average ≥2.5	Pass (<2m^2)	Pass (<2m^2)
LVS FLEPPC	Site average ≤25%	Pass (<2m^2)	Pass (<2m^2)
RPS	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	0	1.01
Chlorophyll *a* (corrected; µg/L)	< 3.2 µg/L. If 3.2 to 20 µg/L, site specific evaluation	0.73 U	0.55 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	54	67

Stream Condition Index (Fauna)

The average SCI score for this site was 61 out of a possible 100 points, corresponding with a "Healthy" designation (Table 2). In the June 25, 2014, SCI sample, 11 sensitive taxa were identified including the black fly, *Simulium* sp., which was the dominant taxon. The riffle beetle, *Gonielmis* sp., was the dominant taxon, and was one of 13 sensitive taxa in the May 4, 2016, sample.

Conclusions

Sampling at South Fork Bear Creek indicates that the stream met applicable State Water Quality Criteria. Habitat Assessment data indicated a near optimal physical condition with little disturbance in the watershed. 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. The Linear Vegetation Survey and Rapid Periphyton Survey did not indicate nuisance vascular plant or algal growth due to nutrients.

Thank you for your interest in maintaining the water quality of Florida's aquatic resources. Please contact us if you have any questions.

Contact and resources for more information

Joy Jackson
850-245-8074
Joy.Jackson@dep.state.fl.us

DEP biological assessment resources:
http://www.dep.state.fl.us/water/bioassess/index.htm