STREAM ECOSUMMARY

Flat Creek

WBID 487, Gadsden County

December 16, 2015 and July 27, 2017



Figure 1. Sampling reach along Flat Creek in Gadsden County.

Physical, chemical, and biological sampling was conducted at Flat Creek (STORET 31010142, FltRef) in Gadsden County on December 16, 2015 and July 27, 2017 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. Overall, the water quality and macroinvertebrate community data indicated that the stream met 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 waterbody has exceeded applicable water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality criteria are designed to protect designated uses of the waters of the state (*e.g.,* recreation, aquatic life use support), and exceedances of these criteria 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 Flat Creek sampling location (Figure 1) is in northwest Gadsden County in the Flat Creek Watershed (WBID 487, Figure 2). It is a third order stream draining the Tifton Uplands, a subecoregion of the Southern Coastal Plain ecoregion. Flat Creek flows into the Apalachicola River and has a Landscape Development Intensity (LDI) Index score of 1.3. The LDI is calculated for the 100 m buffer of the waterbody for 10 km upstream of the point of

interest. The LDI quantifies the intensity of human activity in the surrounding watershed 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 1.3 suggests minimal human activity in the 100m buffer surrounding the stream. The WBID is currently listed for fecal coliforms on the Verified List of Impaired Waters (posted list checked 7/18/2019). Additional information about this WBID is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/tmdlReportAction.do?method=report)

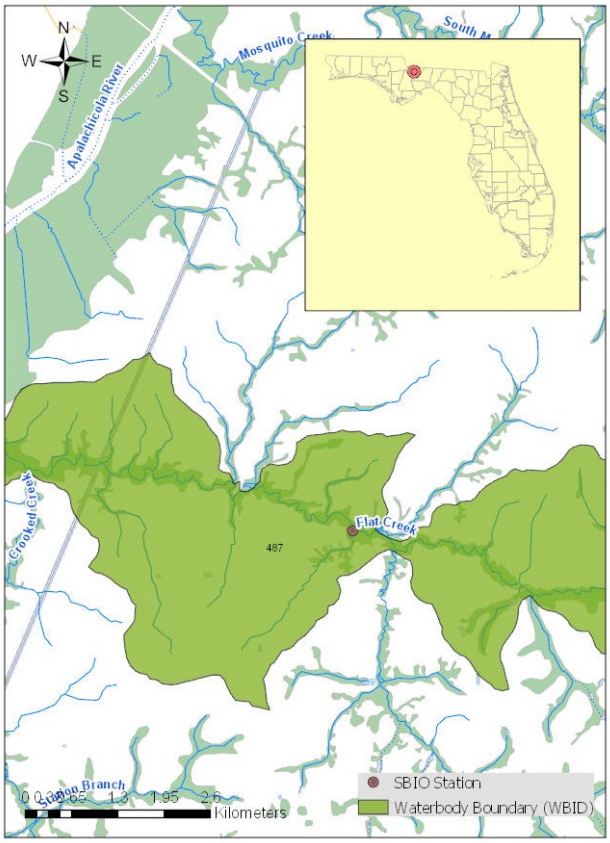


Figure 2. Location of Flat Creek in Gadsden County.

Methods

Water Quality

Surface water samples were collected for analysis of chlorophyll *a,* alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, total Kjeldahl nitrogen, and microbiology following DEP Standard Operating Procedures (SOPs, see https://floridadep.gov/dear/quality-assurance/content/dep-sops 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). Results were compared with applicable Class III water quality criteria contained in 62-302, F.A.C., including nutrients, dissolved oxygen, and other indicators.

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) are not exceeded more than once in a three-year period. The nutrient thresholds are region-specific. This sampling site is in the Panhandle West nutrient region. The floral and faunal measures 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 bioregion. This site is in the Panhandle region for DO criteria assessment. Percent saturation takes into account factors such as temperature, atmospheric pressure, and salinity.

The daily average freshwater DO criteria is preferentially assessed using daily average values calculated from full days of diel (collected over a 24 hour period) monitoring data. If diel monitoring data are not available (as was the case for this report),

instantaneous samples are used to assess the DO criterion by comparing the instantaeous value with a time-of-day-specific translation of the daily average criterion (subsection 62-303.420(9), F.A.C.).

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. 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.

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 were < 35) with scores ≥ 64 considered "Exceptional." The SCI is part of the numeric nutrient standard for streams, as described above, and also serves as a biological health assessment tool in Chapter 62-303, F.A.C., DEP's Impaired Waters Rule.

Evaluation of Stream Exclusions for Applying Nutrient Criteria

When assessing a stream for compliance with numeric nutrient criteria (NNC) in Rule 62-302.531, F.A.C., it is important to note that several waterbody types are excluded from the stream definition in Rule 62-302.200(36), F.A.C. These include lake-like portions of rivers (where the lake NNC apply) and ditches/canals used for water management purposes, non-perennial streams, wetlands, and tidally fluctuating areas (where the narrative criterion, "no imbalances in natural populations of aquatic flora or fauna," continues to apply). The NNC in Rule 62-302.531, F.A.C., were applicable to Flat Creek.

Results

Water Quality

The water quality results are shown in Table 1. Fecal coliforms and *Escherichia coli* (*E. coli*) were collected in the 12/16/2015 sampling event; fecal coliforms were detected outside the acceptable range of colony counts, however, the sample for *E. coli* was lost or not performed. Bacteriological samples were not collected on 7/27/2017.

Additional markers, sucralose and a human fecal genetic marker HF183-qPCR, were analyzed for samples collected on 12/16/2015 and 7/27/2017 to further evaluate water quality. Sucralose passes through waste-water and septic treatment systems without degradation, so its presence can be used as a tracer for treated wastewater or septic system discharge. Sucralose was not collected on 12/16/2015 and was not detected in the 7/27/2017 sampling event. HF183-qPCR is a genetic marker used to determine if humans are the source of fecal coliforms. HF183-qPCR was not detected on 12/16/2015, but was detected on 7/27/2017; however, the reported value was greater than or equal to the laboratory

method detection limit but less than the laboratory practical quantitation limit.

NNC Threshold Assessment

Based on these two sampling events, the stream met the Total Nitrogen (TN) numeric nutrient thresholds for the Panhandle West, but exceeded the Total Phosphorus (TP) numeric nutrient thresholds; 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 TP thresholds were exceeded, and the TN thresholds were met, additional nutrient samples are be needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard.

Floral Assessment

Results of the floral metrics show that this site is within the reference stream distribution and therefore attains the floral component of the NNC (Table 2). There were no instances of attached algae (0%) during either sampling event. Aquatic plants were observed during the December 16, 2015 event, but no exotic plants were observed and the coefficient of conservatism (CofC) score was 2.94 which achieves the LVS components of the stream floral metrics. No aquatic plants were observed during the July 27, 2017 sampling event. The chlorophyll *a* values collected on 12/16/2015 and 7/27/2017 met thresholds; however, the threshold represents annual geometric mean concentrations (minimum of four samples). Therefore, even though the chlorophyll *a* threshold was met, additional samples are be needed to meet data sufficiency requirements to calculate and assess attainment of the floral metrics. All floral measures must pass for the stream to attain the NNC.

Table 1. Water quality results from 12/16/2015 and 7/27/2017 at Flat Creek.

Analyte	Result [12/16/15]	Result [7/27/17]	Applicable Class III Water Quality Criteria
Field Temperature (°C)	12.62	25.5	
Field pH (SU)	6.44 J	6.84	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	101	99	* Panhandle: 67%
Field Specific Conductance (µmhos/cm)	58 J	52.8 J	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	11	15	Shall not be depressed below 20
Color (PCU)	38	29 A	N/A
Total Phosphorus (mg/L) as P	0.17	0.22	**Panhandle West: 0.06 mg/L
Nitrate+Nitrite (mg/L) as N	0.35	0.34	0.35 for spring vents only
Ammonia (mg/L) as N	0.017	0.018	*** 8.56 mg/L and 3.49 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.21	0.31	N/A
Total Nitrogen (mg/L) as N	0.56	0.65	**Panhandle West: 0.67 mg/L
HF 183-qPCR (GEU/100 mL)	0.00019 U	370 I	
Sucralose	Not collected	0.010 U	
Fecal Coliforms (cfu/100 mL)	700 B	Not collected	

* Instantaneous DO criterion calculated per DO Saturation Calculator and adjusted for time of day.

** Annual geometric numeric nutrient threshold for Panhandle West nutrient region, used in combination with information on flora and fauna.

*** Total ammonia criterion calculated per Total Ammonia Nitrogen Calculator, for single sample maximum.

J – Indicates that the reported value was estimated.

A – Value reported is the arithmetic mean (average) of two or more determinations.
U – Indicates that the compound was analyzed for but not detected.
I – The report value is between the laboratory method detection limit and the laboratory quantitation limit.
B – Results based upon colony counts outside the acceptable range.

Table 2. Floral and faunal assessment results from 12/16/2015 and 7/27/2017 at Flat Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 12/16/15 SBIO 75347	Result 7/27/17 SBIO 77781
LVS C of C	Site average ≥ 2.5	2.94	Pass (<2m^2)
LVS FLEPPC (%)	Site average ≤ 25%	0%	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%	0%
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	1.1 I	1.6 I
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	76	71

I – The report value is between the laboratory method detection limit and the laboratory quantitation limit.

Habitat Assessment

The stream and river habitat assessment scores were 129 and 130, which are in the optimal range. The typical velocity measured was 0.33 m/s, which resulted in an optimal score for stream flow. Fish and aquatic insects require sufficient water velocity to maintain high dissolved oxygen concentrations in the stream; in this case the average dissolved oxygen was 97% saturation. The average width within the assessment stretch was 5 m. The banks were well-armored, and low with a gradual slope, providing a good connection with the floodplain. The bank stability scores, as a result, were in the optimal range. Three productive habitats were noted: woody debris, leaf packs, and roots, which comprised roughly 8% of the stream area.

Faunal Assessment (SCI)

The average SCI score for this site was 74 out of a possible 100 points, corresponding with an "Exceptional" designation (Table 2). Flat Creek has only been sampled three times with the most recent SCI version (2012) including the two sampling events discussed in this report. The site was also sampled on April 2, 2015 and received an SCI score of 70.

In the December 16, 2015 SCI sample, *Eurylophella doris* (Ephemeroptera) was identified as the dominant taxon and comprised roughly 17% of all taxa. In the July 27, 2017 sampling event, *Rheotanytarsus exiguous* (Diptera) was identified as the dominant taxon and comprised roughly 24% of all taxa.

In the December 16, 2015 SCI sample, 15 sensitive taxa were identified, and 11 sensitive taxa were identified in the July 27, 2017 SCI sample.

Conclusions

Sampling at Flat Creek indicates that the stream met applicable State Water Quality Criteria. Total phosphorus concentrations were elevated compared to reference-based standards, but the nutrient standard was achieved overall. While an LDI of 1.3 and primary surrounding land uses of forested and coniferous plantations suggest minimal human activity in the watershed, elevated total phosphorus concentrations and current fecal coliforms listing on

the Verified List of Impaired Waters for the WBID suggest potential human influence in the watershed. Additional monitoring will be conducted to assess the inconclusive microbiology results and elevated total phosphorus concentrations.

Habitat Assessment data indicated a near optimal physical condition of the creek with little disturbance in the watershed. Stream Condition Index data indicated the presence of an "exceptional" macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. The Linear Vegetation Survey and Rapid Periphyton Survey indicated vascular plant and algal communities, respectively, that are consistent with expectations for minimally disturbed sites.

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

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Contact and resources for more information

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DEP biological assessment resources:
https://floridadep.gov/dear/bioassessment

Freshwater Algal Bloom information:
https://floridadep.gov/dear/algal-bloom