STREAM ECOSUMMARY

Welaunee Creek, WBID 3419A

Jefferson County

December 6, 2017 & December 18, 2019



Figure 1. Sampling reach along Welaunee Creek in Jefferson County.

Physical, chemical, and biological sampling was conducted at Welaunee Creek (STORET/WIN 22040022, SBIO WEL*REF) in Jefferson County on December 6, 2017 and December 18, 2019 by members of the Aquatic Ecology and Quality Assurance Section (AEQAS) 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 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 is 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

Welaunee Creek (Figure 1) is in Jefferson County, Florida, south of US 27, in the Aucilla River Watershed (WBID 3419A, Figure 2). It is a second order stream draining the Tifton Upland/Tallahassee Hills, a subecoregion of the Southern Coastal Plain ecoregion. Welaunee Creek is a tributary of the Aucilla River that flows into the Gulf of Mexico and

has a Landscape Development Intensity (LDI) Index score of 1.2. 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 1.2 suggests minimal human activity in the 100m buffer surrounding the stream. The WBID is currently not listed for any information on the Impaired Waters Verified List. Additional information about this WBID is available in the Water Quality Assessments, TMDLs, and BMAPs map application (https://fdep.maps.arcgis.com/home/webmap/viewer.html?webmap=1b4f1bf4c9c3481fb2864a415fbeca77)

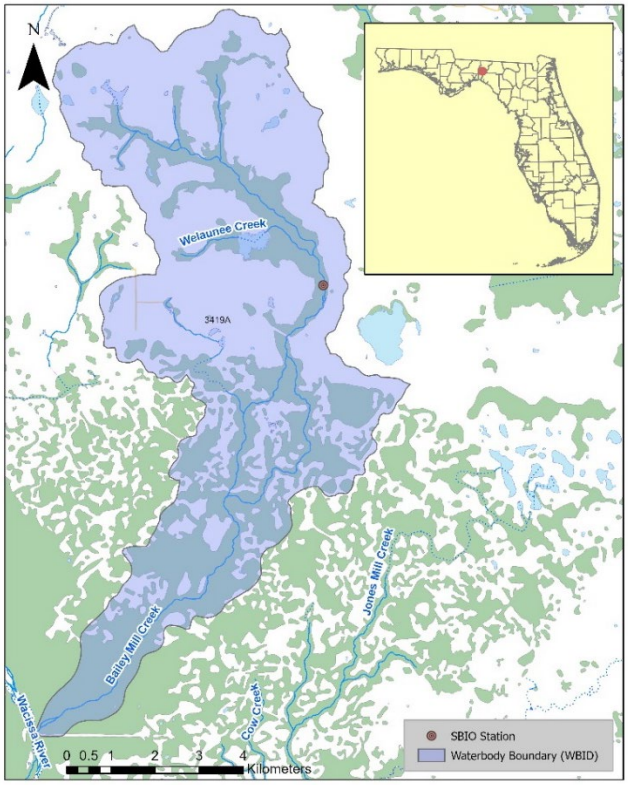


Figure 2. Location of Welaunee Creek in Jefferson County.

Methods

Water Quality

Surface water samples were collected for analysis of chlorophyll-*a*, turbidity, alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, total Kjeldahl nitrogen, *Escherichia coli (E. coli),* sucralose and genetic markers, metals, herbicides, total organic carbon, total dissolved solids, and total suspended solids in 2017. Samples were also collected for pesticides in 2019. All sampling followed DEP Standard Operating Procedures (SOPs, see https://floridadep.gov/dear/quality-assurance/content/dep-sopsfor 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 (NNC) 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 East 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 West bioregion, 38 percent in the Peninsula and Everglades bioregions, or 34 percent in the Northeast and Big Bend bioregions.

This site is in the Big Bend region for DO criteria assessment. Percent saturation considers 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 (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 NNC evaluation for streams, as described above, and serves as a biological health assessment tool in 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 Welaunee Creek.

Results

Water Quality

During the 2017 sampling event, there was a malfunction with the field meter. While dissolved oxygen measurements were the only observed parameter affected, the decision was made to "J"-qualify all field parameters on December 6, 2017. *E. coli* exceeded the applicable Class III water quality criteria in 2017 and 2019. Bacteriological thresholds are based on a monthly geometric mean or lower percentile of data based on a minimum of 10 samples taken over a 30-day period. Therefore, even though the thresholds were exceeded, additional bacteriological sampling is needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard. The remaining water quality parameters did not exceed the water quality criteria. Sucralose and most of the pesticide and herbicide results were below the method detection limit for both sampling events.

NNC Threshold Assessment

Based on these two sampling events, the stream met the numeric nutrient thresholds for the Panhandle East; 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. Thus, 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.

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). All floral measures must pass for the stream to attain the NNC. There were no instances of attached algae (0%) and no aquatic plants were observed during the 2017 or 2019 sampling events. In 2017, the chlorophyll *a* value was 45 µg/L, which exceeded the chlorophyll *a* criterion; however, the criterion represents annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three-year calendar period. Thus, even though the criterion was exceeded 2017, additional sampling is needed to meet data sufficiency requirements to calculate and assess attainment of the chlorophyll *a* floral measure of the NNC. According to laboratory personnel, analysts could only filter a small volume of the sample, suggesting the presence of algae or other debris that may have resulted in the elevated result.

Table 1. Water quality results from December 6, 2017 and December 18, 2019 at Welaunee Creek.

Analyte	Result 12/06/17	Result 12/18/19	Applicable Class III Water Quality Criteria
Field Temperature (°C)	18.3 J	12.9	N/A
Field pH (SU)	5.58 J	5.8	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	0.3 J	75.2	* Big Bend Time of day Criterion: 33%
Field Specific Conductance (µmhos/cm)	78 J	67	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	18	7.2	Shall not be depressed below 20
Color (PCU)	74 A	130	N/A
Total Phosphorus (mg/L) as P	0.12	0.14	** 0.18mg/L
Nitrate+Nitrite (mg/L) as N	0.042	0.19	0.35 mg/L For spring vents only
Ammonia (mg/L) as N	0.009	0.008	***5.94 mg/L and 8.41 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.51	0.73	N/A
Total Nitrogen (mg/L) as N	0.55	0.92	** 1.03 mg/L
E. Coli Bacteria (MPN/100mL)	1050	2419.6 J	<410 Count/100mL

* Instantaneous DO criterion calculated per DO Saturation Calculator

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

*** Total ammonia criterion calculated per https://floridadep.gov/dear/water-quality-standards-program/documents/total-ammonia-nitrogen-calculator%C2%A0

A – Value reported is the arithmetic mean (average) of two or more determinations.

J – Indicates that the reported value was estimated.

Table 2. Floral and faunal assessment results from December 6, 2017 and December 18, 2019 at Welaunee Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 12/6/17 SBIO 78228	Result 12/18/19 SBIO 80614
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	0
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	45	1.6 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	93	86

U – Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.

Habitat Assessment

The stream and river habitat assessment scores were 115 (2017) and 123 (2019), which are in the suboptimal and optimal range, respectively. The typical velocity measured was 0.11 m/s in 2017, which resulted in a suboptimal score and greater than 0.33 m/s in 2019 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 dissolved oxygen was 75.2% saturation in 2019. The average width within the assessment stretch was 3.5 m. Welaunee Creek banks have gradual slopes and are well armored. The banks showed slight evidence of erosion in some areas, but overall, the banks scores were in the optimal range. Three productive habitats were noted: woody debris, leaf packs, and roots which comprised roughly 10% of the stream area.



Faunal Assessment (SCI)

The average SCI score for this site was 90 out of a possible 100 points, corresponding with a "Exceptional" (≥64), designation (Table 2). These results are within the range of previous scores for this site, which ranged from 67 to 89 (most recent version of SCI only, from 2014-2015).

In the December 6, 2017 SCI sample, *Polypedilum aviceps* (Diptera) was the dominant taxon and comprised roughly 23% of all taxa. In December 18, 2019, *P. aviceps* and *Simulium* sp. (Diptera) were the dominant taxa and comprised roughly 17% of all taxa.

In the December 6, 2017 SCI sample, 15 sensitive taxa and 3 long-lived taxa were identified, and 14 sensitive taxa and 4 long-lived taxa were identified in the December 18, 2019 SCI sample.

Conclusions

Sampling at Welaunee Creek (Figure 3) indicates that the stream met applicable State Water Quality Criteria. *E. coli* exceeded applicable criteria in 2017 and 2019; however, additional sampling is needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard.

While chlorophyll *a* exceeded the criterion in 2017, additional sampling is needed to meet data sufficiency requirements to calculate and assess attainment of the chlorophyll *a* floral measure of the NNC for Welaunee Creek. Chlorophyll *a* data collected in 2014, 2015, and 2019 indicate no imbalance of chlorophyll *a* (1.5 I µg/L, 1.5 I µg/L, and 1.6 U µg/L, respectively). Further, there was no periphyton or algal smothering observed at Welaunee Creek in 2017.

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 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 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.

Contact and resources for more information

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