STREAM ECOSUMMARY

Black Creek @ CR 375
WBID 1024
Leon County
April 23, 2019 and November 9, 2020



Figure 1. Sampling reach along Black Creek @ CR 375 in Leon County.

Physical, chemical, and biological sampling was conducted at Black Creek @ CR 375 (STORET/WIN 22020063, SBIO Blk375*Ref) in Leon County on April 23, 2019 and November 9, 2020 by the DEP, Division of Environmental Assessment and Restoration (DEAR), Aquatic Ecology and Quality Assurance Section (AEQAS). 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 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

The Black Creek @ CR 375 sampling location (Figure 1) is located in the western portion of Leon County, within the Black Creek Watershed (WBID 1024, Figure 2) located within the Ochlockonee-St. Marks Basin. Black Creek is a 4th order stream draining the Gulf Coast Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. The Black Creek @ CR 375 site is a tributary that flows into Ochlockonee River and has a Landscape Development Intensity (LDI) Index score of 1.7. 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 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 1.7 suggests minimal human activity in the 100m buffer surrounding the stream. The WBID is currently listed for Fecal Coliform 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).

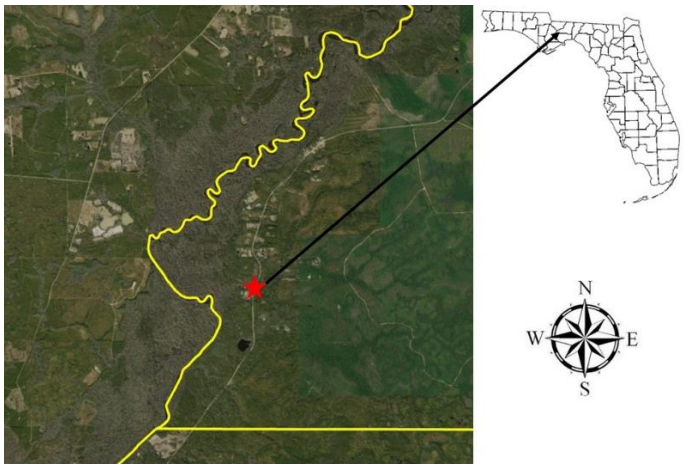


Figure 2. Location of Black Creek @ CR 375 in Leon County. Yellow line represents the Leon County border.

Methods

Water Quality

Surface water samples were collected for analysis of alkalinity, turbidity, chloride, color, fluoride, sulfate, total dissolved solids, total suspended solids, nutrients, chlorophyll, *Escherichia coli* (*E. coli*), pesticides, herbicides, sucralose, and metals 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 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 bioregion, 38 percent in the Peninsula and Everglades bioregions, or 34 percent in the Northeast and Big Bend bioregions. 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 (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 also 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 Black Creek @ 375.

Results

Water Quality

The water quality results are shown in Table 1. Alkalinity results varied between 2019 (1.5 $CaCO_3$/L) and 2020 (30 $CaCO_3$/L). The water quality standard for alkalinity is that values shall not be depressed below 20 $CaCO_3$/L. However, historically, alkalinity at the Black Creek @ CR 375 site ranges between 4.9 and 42. Thus, while 1.5 $CaCO_3$/L is below the water quality standard value of 20 $CaCO_3$/L, the system's historic alkalinity levels indicate alkalinity values below 20 $CaCO_3$/L may be due to natural conditions. However, natural background has not been determined. Alkalinity for this WBID is being placed on the Planning List for further investigation. The remaining water quality parameters did not exceed the water quality criteria.

NNC Threshold Assessment

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

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 >6mm (0%) during the 2019 or 2020 sampling events. No aquatic plants were observed and chlorophyll *a* was not detected during either sampling event. Therefore, the site achieves the RPS, LVS, and chlorophyll *a* components of the NNC floral metrics.

Table 1. Water quality results from April 23, 2019 and November 9, 2020 at Black Creek @ CR 375.

Analyte	Result 4/23/19	Result 11/9/20	Applicable Class III Water Quality Criteria
Field Temperature (°C)	18.0	20.6	
Field pH (SU)	5.79	7.67	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	85.6	88	* 70% and 67%
Field Specific Conductance (µmhos/cm)	30.0	75.2	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	1.5 I	30	Shall not be depressed below 20 (or if natural alkalinity is low, shall not be reduced by more than 25%)
Color (PCU)	380	160	N/A
Total Phosphorus (mg/L) as P	0.022	0.030	**0.18
Nitrate+Nitrite (mg/L) as N	0.004 I	0.004 U	0.35 for spring vents only
Ammonia (mg/L) as N	0.004 I	0.003 I	***6.05 and 2.84
Total Kjeldahl Nitrogen (mg/L) as N	0.74	0.35	N/A
Total Nitrogen (mg/L) as N	0.74	0.35	**1.03
E. coli	45. 7	193.5	≤ 410 Count/100 mL

* 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

I Qualifier: The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.

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

Table 2. Floral and faunal assessment results from April 23, 2019 and November 9, 2020 at Black Creek @ 375.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 4/23/19 Sample 79855	Result 11/9/20 Sample 81658
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	0.55 U	1.0 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	79	75

U Qualifier: 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 131 for both sampling events, which is in the Optimal range. The typical velocity measured was 0.31 m/s in 2019 and 0.2 m/s in 2020, which resulted in an optimal and suboptimal 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 86% saturation in 2019 and 88% saturation in 2020. The average width within the assessment stretch was 5 m. The banks were well armored. However, bank steepness varied throughout the 100 m stretch ranging from relatively steep, which could potentially lead to instability during high flow events, to low with a gradual slope, which provides a good connection with the floodplain. The bank stability scores, as a result, were in the suboptimal range. Three productive habitats were noted: woody debris, leaf packs, and roots which comprised roughly 15-16% of the stream area. During both sampling events, there was an adequate number of stable pools and less than 25% of habitats affected by sand, silt, or algae smothering, which resulted in scores within the optimal range. Finally, no artificial channelization was evident and good quality and width of the riparian zone resulted in optimal scores for these parameters.

Faunal Assessment (SCI)

The SCI score for this site was 79 in 2019 and 75 in 2020 out of a possible 100 points, corresponding with an "Exceptional" designation (Table 2). These results are within the range of previous scores for this site, which ranged from 68 to 77. Total taxa in 2019 and 2020 were 42 and 33, respectively. Number of sensitive taxa was 16 in 2019 and 13 in 2020. In 2019 there was 12 clinger taxa whereas in 2020 10 clinger taxa were identified. In minimally disturbed streams we expect higher numbers for total taxa, number of sensitive taxa, and number of clinger taxa compared to more disturbed systems. Alternatively, we would expect to see low values for percent very tolerant taxa in minimally disturbed streams. In 2019 the value for percent very tolerant taxa was 0.66%, and in 2020 the value was 0.32%.

While not a quantitative indicator of good water quality, it should be noted that an adult cormorant was observed fishing at the site in 2020 (Figure 3).



Figure 3. Cormorant observed at sampling site on November 9, 2020.

Conclusions

Sampling at Black Creek @ CR 375 indicates that the stream met applicable State Water Quality Criteria. Alkalinity was below 20 mg $CaCO_3$/L in 2019, but the low alkalinity was likely due to natural conditions. However, natural background has not been determined and alkalinity for this WBID is being placed on the Planning List for further investigation. Standards were achieved for all other water quality parameters collected for both sampling events.

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 indicative of good water quality conditions. The Linear Vegetation Survey and Rapid Periphyton Survey indicated vascular plant and algal

communities, respectively, 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

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