STREAM ECOSUMMARY

McBride Slough
WBID 1028, Wakulla County
February 6, 2019 and October 26, 2020



Figure 1. Sampling reach along McBride Slough in Wakulla County.

Physical, chemical, and biological sampling were conducted at McBride Slough (STORET/WIN 22030062, SBIO McBri*Ref) in Wakulla County on February 6, 2019 and October 26, 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 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 McBride Slough sampling location (Figure 1) is located north of Edward Ball Wakulla Springs State Park, off Highway 267. The sampling site is in the McBride Slough Watershed (WBID 1028, Figure 2), within the Gulf Coast Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. It is a first order stream that flows into the Wakulla River 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 not currently listed for any parameters on the Verified List of Impaired Waters. 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).

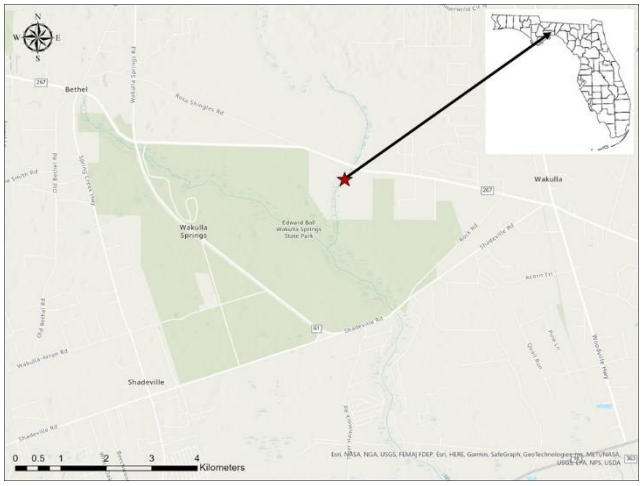


Figure 2. Location of McBride Slough in Wakulla County.

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 (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 of at least two temporally independent Stream Condition Index (SCI) scores 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 accounts for 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 (HA) 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 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 McBride Slough.

Results

Water Quality

The water quality results are shown in Table 1. Based on the laboratory results, water quality criteria were met for all of the parameters. Pesticides and herbicides were not detected during either sampling event.

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. 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). No FLEPPC or other nonnative plants or algae were observed at the McBride Slough sampling location. All floral measures must pass for the stream to attain the NNC.

Table 1. Water quality results from February 6, 2019 and October 26, 2020 at McBride Slough.

Analyte	Result 2/6/19	Result 10/26/20	Applicable Class III Water Quality Criteria
Field Temperature (°C)	19.0	20.9	N/A
Field pH (SU)	7.21	7.47	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	40.7	37.5	* 33% and 35%
Field Specific Conductance (µmhos/cm)	354.1	364.2	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	172	171 A	Shall not be depressed below 20
Color (PCU)	N/A	2.5 U	N/A
Total Phosphorus (mg/L) as P	0.027	0.025	** 0.18
Nitrate+Nitrite (mg/L) as N	0.33	0.25	0.35 for spring vents only
Ammonia (mg/L) as N	0.02	0.006	***4.56 and 3.37
Total Kjeldahl Nitrogen (mg/L) as N	0.16	0.12	N/A
Total Nitrogen (mg/L) as N	0.49	0.37	** 1.03

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

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

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

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

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 February 6, 2019 and October 26, 2020 at McBride Slough.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 2/6/19 Sample 79208	Result 10/26/20 Sample 81625
LVS C of C	Site average ≥ 2.5	5.1	5.08
LVS FLEPPC (%)	Site average ≤ 25%	0	0
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	0.82 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	56	50

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

Habitat Assessment

The stream and river HA scores were 138 and 139, which are in the optimal range. The typical velocity measured was 0.25 m/s, which resulted in a 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 40.7% saturation in 2019 and 37.5% saturation in 2020. The average width within the assessment stretch was 3 to 4 m. The banks were well armored and low with a gradual slope which provides a good connection with the floodplain. The bank stability scores, as a result,

were in the optimal range. Two major productive habitats were noted: woody debris and aquatic vegetation which comprised roughly 10% and 50% of the stream area, respectively (Figure 3). During both sampling events, there were 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. No artificial channelization was evident and good quality vegetation in the riparian zone resulted in optimal scores for these parameters. Finally, the width of the riparian vegetation buffer zone was greater than 18 meters for the left bank resulting in an optimal score, but an area of recent clear cut around the 30 m mark of the 100 m transect on the right bank resulted in a suboptimal score for the right bank.

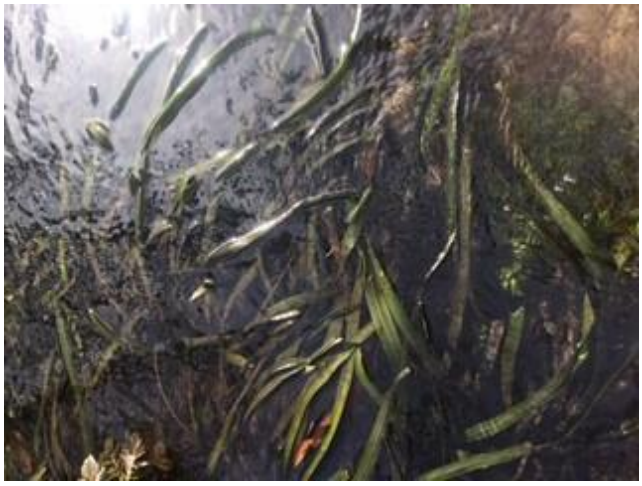


Figure 3. Example of typical density of aquatic macrophyte, *Sagittaria kurziana*, in McBride Slough.

Faunal Assessment (SCI)

The SCI score for this site was 56 in 2019 and 50 in 2020 out of a possible 100 points, corresponding with a "Healthy" designation (Table 2). These results are lower than previous scores for this site, which ranged from 67 to 71 (most recent version of SCI only, from 2015-2016). Future sampling events will continue to monitor the SCI community to ensure expectations of a healthy stream are met. Total taxa in 2019 and 2020 were 25 and 23, respectively. In minimally disturbed streams, we expect low values for percent very tolerant organisms, but high values for percent filter feeders. Values for percent very tolerant and percent filter feeders in the McBride Slough sampling site were 3.6% and 37% in 2019, and 3.4% and 72.4% in 2020, respectively. Sensitive taxa, clinger taxa, and Ephemeroptera taxa are expected in minimally disturbed streams such as McBride Slough. In 2019, there were 3 Ephemeroptera taxa, 3 sensitive taxa, and 4 clinger taxa. In 2020, there were 2 Ephemeroptera taxa, 3 sensitive taxa, and 5 clinger taxa. However, we also expect long lived taxa and Trichoptera taxa in minimally disturbed streams. In 2019 there was 1 long-lived taxon and 1 Trichoptera taxon. In 2020 there was 0 long lived taxa and 1 Trichoptera taxon. More long-lived and Trichopteran taxa are expected in minimally disturbed streams.

Conclusions

Sampling at McBride Slough indicates that the stream met applicable State Water Quality Criteria.

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 clinger 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