STREAM ECOSUMMARY

Smith Creek @ CR 375

WBID 1147, Wakulla County

July 27, 2017 and April 25, 2019



Figure 1. Sampling reach along Smith Creek in Wakulla County.

Physical, chemical, and biological sampling was conducted at Smith Creek (STORET/WIN 22020064, Smith*Ref) in Wakulla County on July 27, 2017 and April 25, 2019 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 Smith Creek sampling location (Figure 1) is located in western Wakulla County in the Ochlockonee – St. Marks Watershed (WBID 1147, Figure 2). It is a second order stream draining the Gulf Coast Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. Smith Creek flows into the Ochlockonee River and has a Landscape Development Intensity (LDI) Index score of 1.1. 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 1.1 suggests minimal human activity in the 100m buffer surrounding the stream. The reference site location is upstream of a bridge crossing. In 2019, the bridge was undergoing construction, and the site was moved further upstream, about 50-100 meters, to avoid the section closest to bridge construction. The WBID is not currently listed on the Verified List of Impaired Waters (posted list check 6/2/2020). 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).

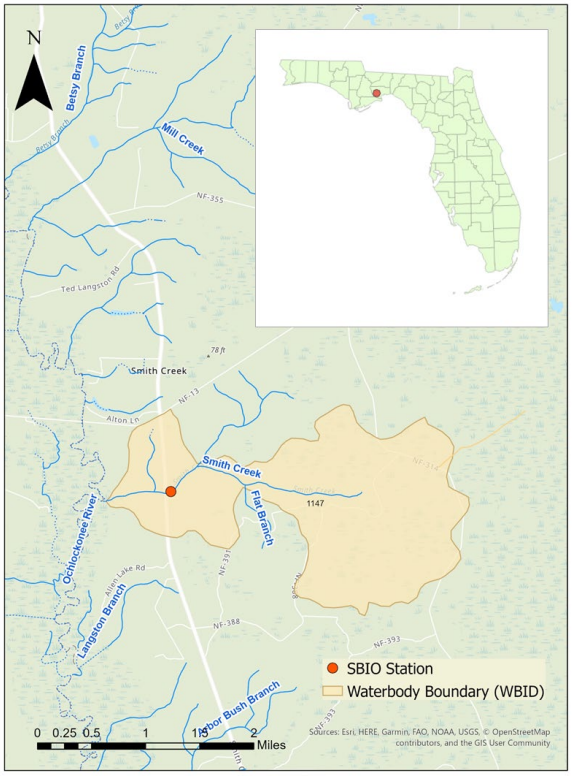


Figure 2. Location of Smith Creek in Wakulla County.

Methods

Water Quality

Surface water samples were collected for analysis of chlorophyll, alkalinity, color, herbicides, pesticides, sucralose and nutrients in 2017 and 2019. Samples were also collected for *Escherichia coli (E. coli)* and metals in 2019. All sampling followed 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 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 incorporates 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 numeric nutrient standard for streams, as described above, and 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 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 Smith Creek.

Results

Water Quality

The water quality results are shown in Table 1. There were no detections of sucralose in water quality samples from either event. There were detections of 2,4-D (herbicide) and imidacloprid (pesticide) in 2017, and metals (arsenic and iron) and *E. coli* in 2019, but all were well below water quality criteria. Neither metals nor *E. coli* were collected in 2017.

Significant changes in alkalinity and color were noted between the 2017 and 2019 sampling events. The low alkalinity (4.2 mg $CaCO_3$/L) and high color (490 PCU) could potentially be explained by seasonal differences in water source. During summer months, the stream is dominated by surface water runoff, while during spring, the dominant water source is groundwater.

NNC Threshold Assessment

Based on these two sampling events, the stream met the total phosphorus (TP) numeric nutrient thresholds for the Panhandle West, but exceed the total nitrogen (TN) numeric nutrient threshold in 2017; 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 TN thresholds were exceeded, and the TP thresholds were met, 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). There were no instances of attached algae (0%) during either sampling event. No aquatic plants were observed during either sampling event (< 2m^2). The chlorophyll *a* results from 7/27/2017 and 4/25/2019 were below the laboratory detection limits; however, the threshold represents annual geometric mean concentrations (minimum of four samples). Therefore, even though the chlorophyll *a* threshold was met, additional samples may 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 July 27, 2017 and April 25, 2019 at Smith Creek.

Analyte	Result 7/27/17	Result 4/25/19	Applicable Class III Water Quality Criteria
Field Temperature (°C)	24.4	16.4	
Field pH (SU)	7.2	8.6 J	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	80	81	*67%
Field Specific Conductance (µmhos/cm)	36 J	87	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	4.2	37	Shall not be depressed below 20 (or if natural alkalinity is low, shall not be reduced by more than 25%)
Color (PCU)	490	86	N/A
Total Phosphorus (mg/L) as P	0.030	0.041	**Panhandle West: 0.06
Nitrate+Nitrite (mg/L) as N	0.004 U	0.007 I	0.35 for spring vents only
Ammonia (mg/L) as N	0.005 I	0.011	***3.27 and 0.93
Total Kjeldahl Nitrogen (mg/L) as N	0.72	0.27	N/A
Total Nitrogen (mg/L) as N	0.724	0.277	**Panhandle West: 0.67
2,4-D (µg/L)	0.0033 I	0.002 U	N/A
Imidacloprid (µg/L)	0.018	0.002 U	N/A
Arsenic (µg/L)	Not collected	0.34	≤ 50
Iron (mg/L)	Not collected	0.45	≤ 1.0
Escherichia coli Bacteria (MPN/100 mL)	Not collected	27.9	≤ 410 Counts / 100 mL

* 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.

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

J – Indicates that the reported value was estimated.

U -Indicates that the compound was analyzed for but not detected.

Table 2. Floral and faunal assessment results from July 27, 2017 and April 25, 2019 at Smith Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 7/27/17 SBIO# 77780	Result 4/25/19 SBIO# 79856
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	0.82 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	80	77

U – Indicates that the compound was analyzed for but not detected.

Habitat Assessment

The stream and river habitat assessment scores were 122 and 109, which are in the suboptimal range. The typical velocity measured was 0.11 and 0.15 m/s, respectively, 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 achieved an average of 80% saturation. The average width within the assessment stretch was 3.75 m. The banks were well-armored, but relatively steep in sections, potentially leading to instability during high flow events. The bank stability scores, as a result, were in the suboptimal range. Three productive habitats were noted in 2017: woody debris, leaf packs, and roots which comprised roughly 12% of the stream area. Woody debris and roots were the two productive habitats present in 2019 which comprised roughly 5% of the stream area; there was not $2m^2$ of leaf material in 2019 to be considered major productive habitat, but leaves were sampled as part of the minor habitat.

Faunal Assessment (SCI)

The average SCI score for this site was 79 out of a possible 100 points, corresponding with an "Exceptional" (≥64) designation (Table 2). Smith Creek has only been sampled three times, with the most recent SCI version including the two sampling events discussed in this report. Additionally, the site was sampled on 3/18/2015 and received an SCI score of 70.

In the July 27, 2017 SCI sample, *Chimarra* sp. (Trichoptera) was identified as the dominant taxon and comprised roughly 13% of all taxa. In the April 25, 2019 sampling event, T*anytarsus* sp. d Epler (Chironomidae) was identified as the dominant taxon and comprised roughly 18% of all taxa.

On average, 15 sensitive taxa were identified in both the July 27, 2017 and April 25, 2019 SCI samples.

Conclusions

Sampling at Smith Creek indicates that the stream met applicable State Water Quality Criteria. Total nitrogen concentrations exceeded numeric nutrient thresholds in 2017, but the numeric nutrient standard for streams was achieved overall. Higher TN and TKN concentrations are associated with observed high color in 2017 and are presumably from presence of wetlands in the watershed. Increased surface water runoff from rain events can potentially cause these observed increases in color and TN.

Habitat Assessment data indicated a suboptimal 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.



Figure 3. Bridge construction at Smith Creek on April 25, 2019.

Bridge construction was on-going during the April 25, 2019 sampling event (Figure 3). While the site is located upstream of the bridge, construction location and activities have the potential to impact portions of the upstream reach. Further monitoring of this site is recommended.

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

Sarah Noble
850-245-8533
Sarah.noble@floridadep.gov

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

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