STREAM ECOSUMMARY

Sandy Creek

Bay County, WBID 1111

January 22, 2015 and January 14, 2016



Figure 1. Sampling reach along Sandy Creek in Bay County.

Physical, chemical, and biological sampling was conducted at Sandy Creek (STORET 32030002, Nickname Sandy22Ref) in Bay County on January 22, 2015, and January 14, 2016, by members of the Aquatic Ecology and Quality Assurance section of the DEP Tallahassee Office. This stream was sampled as part of the 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 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 whether human activities have resulted in a waterbody exceeding 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 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 Sandy Creek sampling location is about 15 miles east of Panama City in the Sandy Creek Watershed (WBID 1111, Figure 2). It is a fourth order stream draining the Gulf Coast Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. Sandy Creek flows into the East Bay of Saint Andrew Bay and has a Landscape Development Intensity (LDI) Index score of 1.41. The LDI quantifies the intensity of human activity in the surrounding area. Normalized on a scale from 1 to 10, a natural landscape has a coefficient of 1.0 and a central business district has a coefficient of 10.0. This site's score of 1.41 suggests minimal human activity in the area surrounding the stream. The WBID is currently listed for fecal coliforms on the Impaired Waters Verified List

(1/27/2014). While WBID 1111 has been identified as a Verified Impaired WBID, a TMDL has not been adopted. Additional information about this WBID is available in the TMDL Tracker application (http://webapps.dep.state.fl.us/DearTmdl/tmdlReportAction.do?method=report).

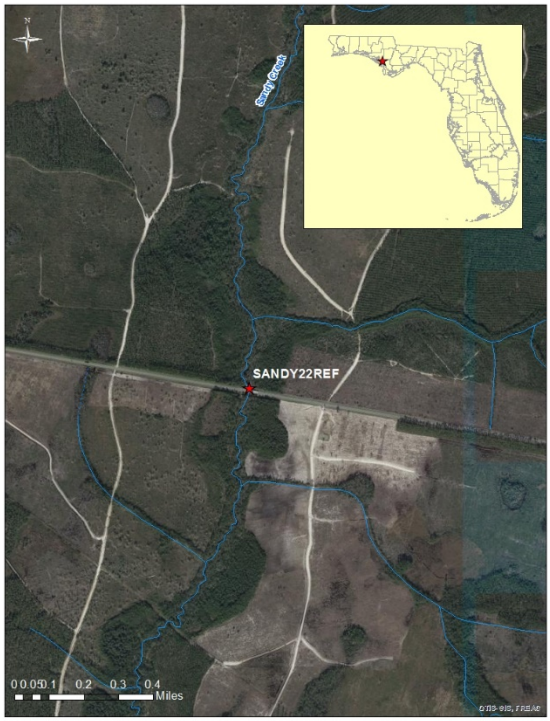


Figure 2. Location of Sandy Creek in Bay County.

Methods

Water Quality
Surface water samples were collected for analysis of chlorophyll-*a*, turbidity, alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, total Kjeldahl nitrogen, and microbiology, total organic carbon, total dissolved solids, and total suspended solids following DEP Standard Operating Procedures (SOPs, see http://www.dep.state.fl.us/water/sas/sop/index.htm 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). 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 Index score (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 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, which includes Sandy Creek. Percent saturation takes into account temperature, atmospheric pressure, and salinity.

It is preferable to assess daily average freshwater DO criterion 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*," date 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 $\geq$ 40 are considered "Healthy" (as long as neither of the latest two SCI scores were < 35) with scores $\geq$ 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.

As one of the original EcoRegional Reference Sites, this location has been sampled for the SCI 14 times between 1992 and 2016. Earlier versions of the SCI were applied for all but the last two samples and scored in the Excellent category. This report will focus on the two most recent samples as they use the most updated versions of the SCI calculations (SCI_2012).

Results

Water Quality

The water quality results are shown in Table 1. Based on these two sampling events, the stream met the nutrient thresholds for the Panhandle West; 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 samples may be needed to meet data sufficiency requirements to calculate and assess attainment of the water quality standard.

Fecal coliforms were detected in both sampling events; however, thresholds were not exceeded. The presence of fecal coliforms can be from a variety of natural and anthropogenic sources. Additional markers, sucralose and HF183-qPCR, were analyzed 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 waste water treatment or septic system discharge. Sucralose was detected in the 1/22/2015 sampling event. HF183-qPCR is a genetic marker used to determine the source of fecal coliforms. Neither sucralose nor HF183-qPCR were detected in the most recent 1/14/2016 sampling event.

Habitat Assessment

The stream and river habitat assessment scores for the two sampling events were both 124, 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 92% saturation. The average width within the assessment stretch was 6 m. The banks were relatively steep, potentially leading to instability during high flow events. The bank stability scores, as a result, were in the Marginal range. Four productive habitats were noted: woody debris, roots, leaf packs, and aquatic macrophytes, which together comprised roughly 4% of the stream area.

Table 1. Water quality results from January 22, 2015 and January 14, 2016 at Sandy Creek.

Analyte	Result 1/22/15	Result 1/14/16	Applicable Class III Water Quality Criteria
Field Temperature (°C)	15.31	12.44	
Field pH (SU)	4.8	3.66	
Field Dissolved Oxygen (% saturation)	89.4	94.0	*Panhandle West: 67.3% and 67.8%

Analyte	Result 1/22/15	Result 1/14/16	Applicable Class III Water Quality Criteria
Field Specific Conductance (µmhos/cm)	42	38	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	2.2 I	0.65 U	
Color (PCU)	35 A	76	N/A
Total Phosphorus (mg/L) as P	0.005 I	0.004 I	**Panhandle West: 0.06 mg/L
Nitrate+Nitrite (mg/L) as N	0.021	0.029	0.35 mg/L for spring vents only
Ammonia (mg/L) as N	0.002 I	0.044	***7.20 mg/L and 8.66 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.12 I	0.28	N/A
Total Nitrogen (mg/L) as N	0.14	0.31	**Panhandle West: 0.67 mg/L
Sucralose (µg/L)	0.87	0.01 U	
Fecal Coliforms – Membrane Filter (cfu/100 mL)	40 Q	18 BQ	≤ 400 Counts / 100 mL
HF183-qPCR (GEU/100 mL)	N/A	9.50E+03 U	

* Instantaneous DO criterion calculated per DO Saturation Calculator.

** 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

A – Value reported is the average of two or more determinations.
B - Results based upon colony counts outside the acceptable range.
I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
Q - Sample held beyond the accepted holding time.
U – Indicates that the compound was analyzed for but not detected.

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. The attached algal community in the stream was sparse. Only a few instances of algal filaments over 6 mm in length were recorded in two RPS samples. The stream is moderately shaded (42% coverage), and the instances of algal filaments were observed only in the least shaded section. Some growth of algae (typically diatoms) is expected in a fully functioning stream, but an overabundance of algae (especially filamentous algae) may reduce habitat quality (from smothering) and lead to excess organic matter production (and decomposition), which can harm fish and invertebrates. Only two aquatic plants were observed during either sampling event, *Myriophyllum* sp. and *Sagittaria* sp. A Coefficient of Conservancy (C of C) score of 4.77 has been identified for *Myriophyllum* (native) and was the only score used to calculate the LVS C of C metric, as *Sagittaria* could not be identified to species. *Sagittaria* requires identification to species for CC assignment. Both taxa were determined to be native and neither was on the Florida Exotic Pest Plant Council (FLEPPC) list. Chlorophyll *a* was not detected in the two samples collected from the stream. These results show that the site attains the floral component of the NNC.

Table 2. Floral and faunal assessment results from January 22, 2015 and January 14, 2016 at Sandy Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 1/22/15 Visit ID 74081	Result 1/14/16 Visit ID 75456
LVS C of C	Site average ≥2.5	4.77	4.77
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	5	0
Chlorophyll *a* (corrected; µg/L)	< 3.2 µg/L. If 3.2 to 20 µg/L, site specific evaluation	0.55 U	0.69 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	69	52

Stream Condition Index (Fauna)
The average SCI score for this site was 61 out of a possible 100 points, corresponding with a "Healthy" designation (Table 2). In the January 22, 2015, SCI sample, 7 *Trichoptera* taxa were identified including *Hydroptila* sp., the dominant taxon. *Hydroptila* sp. was also the dominant taxon and one of 6 *Trichoptera* taxa in the January 14, 2016, SCI sample. The presence and richness of *Trichoptera* (caddisflies) have historically been shown to decrease with human disturbance. In the January 22, 2015, SCI sample, 12 sensitive taxa were identified, and 13 sensitive taxa were identified in the January 14, 2016, SCI sample.

Conclusions

Sampling at Sandy Creek indicates that the stream met applicable State Water Quality Criteria. However, the status of WBID 1111 on the Verified Impaired Water list for fecal coliforms is cause for further study of Sandy Creek even though the two most recent sampling events did not show fecal coliform exceedances. A minimum of 30 samples with 0 exceedances must be collected in order to remove WBID 1111 from the Impaired Waters Verified List.

Habitat Assessment data indicated a near optimal physical condition of the creek with little disturbance in the watershed. SCI data indicated the presence of a "healthy" macroinvertebrate community with sensitive and long-lived taxa that are indicative of good water quality conditions. The LVS and RPS 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:
http://www.dep.state.fl.us/water/bioassess/index.htm