STREAM ECOSUMMARY

Sopchoppy River below Monkey Creek

Wakulla County, WBID 998

September 3, 2015 and December 15, 2016



Figure 1. Sampling reach along the Sopchoppy River below Monkey Creek in Wakulla County on September 3, 2015.

Physical, chemical, and biological sampling were conducted at the Sopchoppy River below Monkey Creek (STORET 22020050, SopRef) in Wakulla County on September 3, 2015 and December 15, 2016 by members of the Aquatic Ecology and Quality Assurance section of the DEP Tallahassee Office. This river 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 rivers and to monitor the water quality and biological community health of these systems through time. Overall, the water quality and macroinvertebrate community data indicated that the stream met all water quality standards and the expectations for a healthy, well-balanced stream.

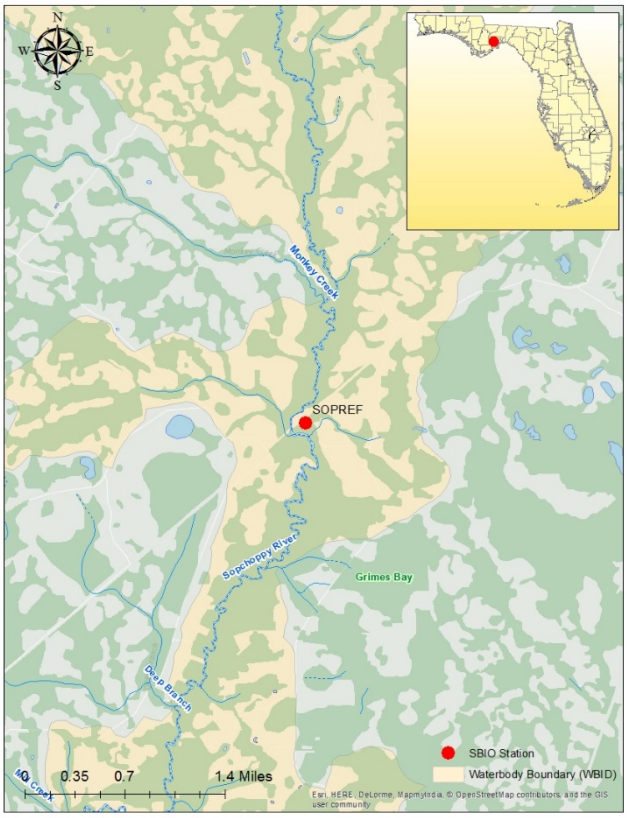


Figure 2. Location of Sopchoppy River sampling point in Wakulla County.

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 Sopchoppy River is in the Gulf Coast Flatwoods subecoregion of the Southern Coastal Plain ecoregion and drains extensive wetlands and forested lands on the western half of Wakulla County. The river basin covers 165 mi^2 and is almost entirely within the Apalachicola National Forest. This Sopchoppy River site (Figures 1 and 2) has a Landscape Development Intensity (LDI) Index score of 1.13. 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.

The WBID is currently not listed for any impairments on the Impaired Waters Verified List (10/21/16). Additional information about this WBID is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/tmdlReportAction.do?method=report)

Methods

Water Quality

Surface water samples were collected for chlorophyll-*a*, turbidity, alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, and total Kjeldahl nitrogen, 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). Results were compared with applicable Class III water quality criteria contained in 62-302, F.A.C., including nutrients, dissolved oxygen, and other indicators.

Numeric Nutrient Criteria

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 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, 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 factors in 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" (if 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 Sopchoppy River.

Results

Water Quality

The water quality results are shown in Table 1. The dissolved oxygen percent saturation on December 15, 2016 was 65%, which is below the Panhandle West time-of-day- criteria of 67%. The water velocity was appreciably lower in December 2016 compared to September 2015 (0.09 m/s vs. 0.13 m/s) and may explain the reduced level of dissolved oxygen in the river on this date. Conductivity complied with Class III criteria during both sampling events, but was three times higher in December 2016 (154 µmhos/cm) compared to September 2015 (47 µhos/com). All other parameters complied with Class III water quality criteria.

NNC Threshold Assessment and Floral Assessment

The total phosphorus threshold (0.06 mg/L) was exceeded on December 15, 2016 (0.078 mg/L) and the total nitrogen threshold (0.67 mg/L) was exceeded on September 3, 2015 (0.91 mg/L). The nutrient values are used in combination with floral and faunal information, which, as shown in Table 2, passed their respective thresholds. Additional sampling may be required to determine whether this represents an exceedance of the annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three-calendar year period or if a change in the floral or faunal communities is noted with on-going sampling. Currently, however, based on these two sampling events, the stream met the numeric nutrient thresholds for the Panhandle West (Tables 1 and 2).

Table 1. Water quality results from September 3, 2015 and December 15, 2016 at the Sopchoppy River.

Analyte	Result 9/3/15	Result 12/15/16	Applicable Class III Water Quality Criteria
Field Temperature (°C)	24.8	16.8	N/A
Field pH (SU)	5.8	5.5	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	76	65	*Panhandle Time-of-day Criterion: 67%
Field Specific Conductance (µmhos/cm)	47	154	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	83.5	69	Shall not be depressed below 20
Color (PCU)	520	130	N/A
Total Phosphorus (mg/L) as P	0.041	0.078	** 0.06 mg/L
Nitrate+Nitrite (mg/L) as N	0.004 U	0.004 U	0.35 mg/L for spring vents only
Ammonia (mg/L) as N	0.014	0.002 U	***3.91 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.91	0.31	N/A
Total Nitrogen (mg/L) as N	0.91	0.31	** 0.67 mg/L

* 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

U –Undetected.

Table 2. Floral and faunal assessment results from the Sopchoppy River on September 3, 2015 and December 15, 2016.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 9/3/15 SBIO# 74791	Result 12/15/16 SBIO# 77223
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	1%	8%
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	0.55 U	0.55 U
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	66	60

U – Undetected.

Habitat Assessment

The stream and river habitat assessment scores were 128 and 127, which are in the lower optimal range. The average velocity measured was 0.11 m/s, which resulted in a score that was on the lower end of the suboptimal range 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 76% and 65% saturation on September 3, 2015 and December 15, 2016, respectively. The average width within the assessment stretch was 8 m. The banks were well-armored, but relatively steep, potentially leading to instability during high flow events. Woody debris, roots, and rocks were noted during both sampling dates. Leaf mats were not as abundant in September

2015 as they were in December 2016 and consequently were sampled fewer times. There was roughly 9% productive habitat in 2015 compared to 15% in 2016; both scores are considered "Marginal."

Faunal Assessment (SCI)

The average SCI score for this site was 63 out of a possible 100 points, corresponding with a "Healthy" designation (Table 2). The current results are above the range of previous scores for this site, which ranged from 36 to 59 (most recent version of SCI only, 2006-2008). This portion of the Sopchoppy River has been sampled twelve times since 1992. Most of the samples were analyzed with an earlier version of the Stream Condition Index and cannot be directly compared to current scores. Earlier scores were rated as either "good" or "excellent" with one exception from 1994 when the sample rated as "poor." That sample was dominated by an organism that is a good water quality indicator (*Simulium* sp.), but can be numerically dominant. In that sample, *Simulium* comprised 71% of the organisms compared to an average contribution of 23% for the dominant taxon for samples at this location.

In addition to the two samples discussed in this report, three samples were analyzed with the current version of the SCI, one from 2006 and two from 2008. Those SCI scores were 38, 36, and 59, respectively. Although it is not clear what is responsible for the low scores, we suspect it may be related to hydrologic events. As can be seen from the USGS gauge and photo of the Sopchoppy River (Figures 3 and 4), water levels were low (below the gage operational minimum levels) for much of 2006 and 2007. At other times, spikes in water level above flood stage (~28 ft.) are not uncommon. Sites, such as the Sopchoppy River, that experience rapid and dramatic changes in water level, require additional caution when sampling to ensure antecedent hydrological conditions are conducive to supporting the expected macroinvertebrate communities.

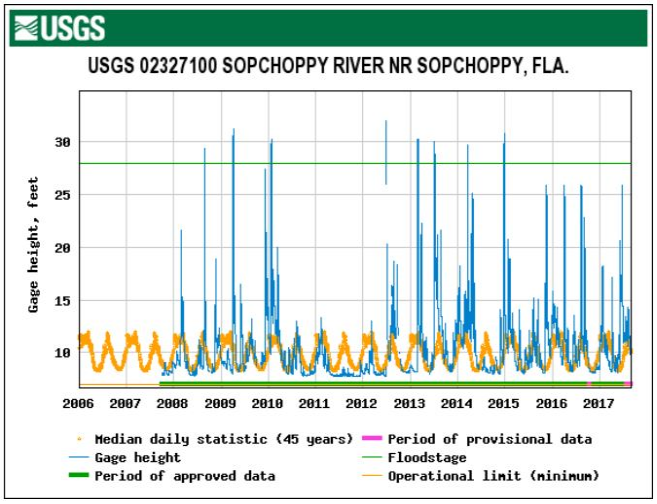


Figure 3. Hydrograph of water levels from 2006 through 2017 at the Sopchoppy River below Monkey Creek. (https://nwis.waterdata.usgs.gov/fl/nwis/)



Figure 4. Sopchoppy River below Monkey Creek on June 8, 2007 during a low water event. (photo from https://nwis.waterdata.usgs.gov/fl/nwis/)

Conclusions

While sampling at Sopchoppy River currently indicates that the stream meets applicable state water quality criteria, future monitoring of dissolved oxygen, total phosphorus and total nitrogen, specific conductance, and nuisance algae will be key to ensuring the river continues to meet applicable standards.

Habitat Assessment data indicated optimal physical conditions 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.

FDEP determined that the Sopchoppy River is minimally disturbed by humans, and that the slightly low DO is a natural condition. Evidence of benign land uses included the watershed Landscape Development Intensity Index (LDI) score of 1.13, which was confirmed by direct observations. The biological community was found to be healthy, indicating that the existing DO regime fully supports aquatic life uses. Therefore, in accordance with Rule 62-302.533(3), F.A.C., the evidence indicates that the DO standard is achieved.

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