STREAM ECOSUMMARY

Chipola River

WBID 51D, Calhoun County

November 2, 2017 and October 2, 2019



Figure 1. Sampling reach along the Chipola River in Calhoun County in 2017.

Physical, chemical, and biological sampling were conducted on the Chipola River (STORET 31020012, SBIO NICKNAME Chipo*Ref) in Calhoun County on November 2, 2017 and October 2, 2019 by members of the Aquatic Ecology and Quality Assurance Section (AEQAS) of the DEP Tallahassee Office. This stream was sampled as a 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 did not meet expectations for a healthy, well-balanced stream.

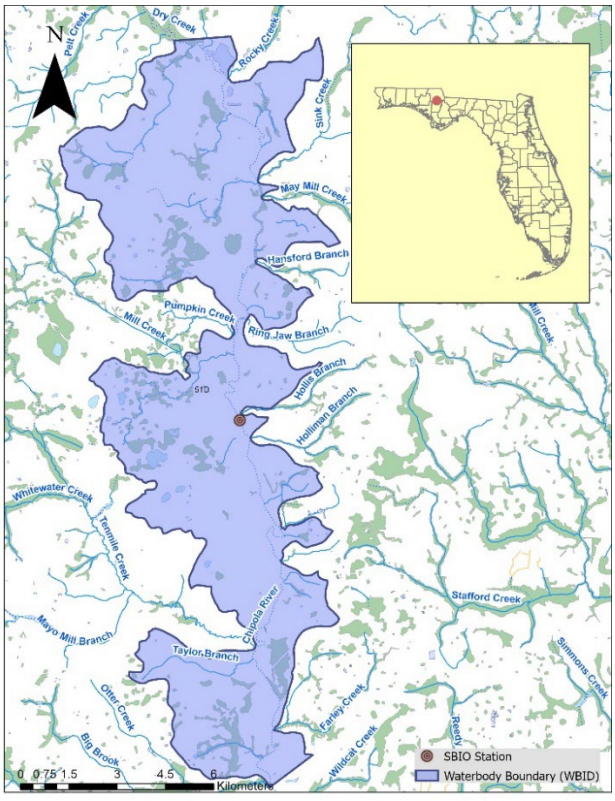
Background

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 Chipola River sampling location (Figure 1) is in Calhoun County, Florida, in the Chipola River Watershed (WBID 51D, Figure 2) within the Apalachicola-Chipola Basin. It is a sixth order river draining the Marianna Plains, a subecoregion of the Southern Coastal Plain ecoregion. The Chipola River is a tributary of Apalachicola River that flows into Apalachicola Bay and has a Landscape Development

Intensity (LDI) Index score of 1.5. 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 1.5 suggests minimal human activity in the 100m buffer surrounding the stream. During the 2018 hurricane season, the site was affected during Hurricane Michael's track through North Florida. The WBID is currently on the Impaired Waters Study List for biology (Stream Condition Index) and total nitrogen (posted list checked 11/17/2021, https://floridadep.gov/dear/watershed-assessment-section/content/assessment-lists). Additional information about this WBID is available in the Water Quality Assessments, TMDL, and BMAPs map application (https://fdep.maps.arcgis.com/home/webmap/viewer.html?webmap=1b4f1bf4c9c3481fb2864a415fbeca77)



Methods

Water Quality

Surface water samples were collected in 2017 and 2019 for analysis of chlorophyll-*a*, turbidity, alkalinity, color, ammonia, nitrate+nitrite, total phosphorus, total Kjeldahl nitrogen, *Escherichia coli (E. coli),* sucralose and genetic markers, metals, herbicides, total organic carbon, total dissolved solids, and total suspended solids. In 2019 only, pesticide samples were also collected. All sampling followed DEP Standard Operating Procedures (SOPs, see https://floridadep.gov/dear/quality-assurance/content/dep-sopsfor 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 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 considers 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 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 the Chipola River.

Results

Water Quality

The water quality results are shown in Table 1. Exceedances of the total nitrogen threshold occurred in the system (Panhandle West threshold = 0.67 mg/L) and each visit's TN value was at least 1.6 mg/L. Sucralose was detected although it does not have a water quality standard threshold. It passes through wastewater and septic treatment systems without degradation, so its presence can be used as a tracer for treated wastewater or septic system discharge.

Arsenic was detected in 2019 but is well below the water quality standard.

NNC Threshold Assessment

Based on these two sampling events, the stream did not meet the numeric nutrient threshold for total nitrogen in the Panhandle West region; 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 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. In 2019, there was less than $2m^2$ plant cover observed for the LVS, which differs from the LVS in 2017 which showed *Vallisneria americana* and *Fontinalis* present in the stream with a coverage of 15%. During the 2019 visit there was 0% coverage of aquatic vegetation and an increase in sand substrate of 21.5%, and a reduction of rock and shell rubble of 35%. The RPS result in 2017 was between 20 and 25% cover of attached algae with ranks 4-6, and therefore an algal sample was collected. The dominant taxa were not found to be toxin producing.

Table 1. Water quality results from November 2, 2017 and October 2, 2019 at Chipola River.

Analyte	Result 11/2/17	Result 10/2/19	Class III Criteria
Field Temperature (°C)	17.9	25.5	N/A
Field pH (SU)	6.69	7.73	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	91.2 J	83.3	* Panhandle West: 69.54 and 67.8
Field Specific Conductance (µmhos/cm)	263.9	268.8	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	124	124	Shall not be depressed below 20
Color (PCU)	5.1 I	4.7 I	N/A
Total Phosphorus (mg/L) as P	0.013	0.017	**Panhandle West: 0.06
Nitrate+Nitrite (mg/L) as N	1.7	1.4	0.35 for spring vents only
Ammonia (mg/L) as N	0.005 I	0.034	***5.90mg/L and 1.83mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.2 I	0.23	N/A
Total Nitrogen (mg/L) as N	1.9	1.63	**Panhandle West: 0.67
E. Coli Bacteria (MPN/100mL)	48	6.3 AJ	<410 Count/100mL
Sucralose (µg/L)	0.049	0.047	
Arsenic (µg/L)	Not collected	0.050	≤ 50

* 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.

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

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

J – Indicates that the reported value was estimated.

Table 2. Floral and faunal assessment results from November 2, 2017 and October 2, 2019 at Chipola River.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 11/2/17 SBIO 78116	Result 10/2/19 SBIO 80527
LVS C of C	Site average ≥ 2.5	7	Pass (<2m^2)
LVS FLEPPC (%)	Site average ≤ 25%	0	Pass (<2m^2)
RPS (%)	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	21	7
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	0.58 I	1.2 I
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	69	34

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

Habitat Assessment

The stream and river habitat assessment scores were 151 and 138, 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 enough water velocity to maintain high dissolved oxygen concentrations in the stream; in this case the dissolved oxygen saturation was 91.2% and 83.3%. The average width within the assessment stretch was 40 m. The river showed no sign of artificial channelization or spoil banks. The banks were mostly rock and received Optimal or Suboptimal scores for bank stability with few eroded areas. Both banks showed a Riparian Buffer Zone Width of 18m or greater. However, the Riparian Zone Vegetation Quality which scored 20 points in 2017, scored 12 points in 2019. This lower score is attributed to dog fennel moving into the buffer zone and trees were shown to have damage from Hurricane Michael in October 2018 (Figures 3 and 4). In 2019, three productive habitats were noted: snags, leaf packs, and rocks which comprised roughly 48% of the stream area. As noted above, aquatic vegetation was not available as a productive habitat in 2019.



Figure 3. Chipola River left bank in 2017.



Figure 4. Chipola River left Bank in 2019.

Faunal Assessment (SCI)

The average SCI score for this site was 52 out of a possible 100 points. However, as the SCI score was 34 in 2019, the stream cannot be given a healthy designation as the average must be greater than 40 and neither of the two most recent SCI scores less

than 35 (Table 2). These results are within the range of previous scores for this site, which ranged from 69 to 34 (most recent version of SCI only, from 2008-2015). While the average SCI was designated "Healthy," the lower score of 34 in 2019 may have been the result of the loss of in-stream vegetation due to effects of Hurricane Michael in 2018. In 2017, Substrate Diversity, Habitat Smothering, and Riparian Zone Vegetation Quality all scored in the Optimal range, but in 2019 all three of these categories slipped to the Suboptimal range. In 2019, increased observations of dog fennel and fallen trees were present in the buffer zones with Hurricane Michael in 2018 as a possible cause. Paired with the loss of the aquatic vegetation, these observations may have caused enough disturbance to lower the SCI score in 2019. With regards to the taxa observed in the stream, there was a significant shift with the SCI score dropping from 69 to 34. The lack of vegetation reduced the available habitat, which caused a shift in the community structure. The shift in structure included the percentage dominant taxa (*Hydroptilla* sp.) increasing from 17% to 36%, reduced total taxa richness, fewer long-lived taxa and a lower percentage of *Rheotanytarsini* sp. within the system, reducing the SCI score.

Conclusions

Sampling at Chipola River indicates that the river did not meet applicable State Water Quality Criteria for total nitrogen and biological integrity.

The SCI results indicated that the Chipola River scored in the Impaired category for biological health. Effects from Hurricane Michael and Tropical Storm Alberto in 2018 likely contributed to the SCI score of 34 for the 2019 sampling event. Even though the average score is above the threshold of $\geq$40, the SCI results do not meet the second part of the threshold of neither score <35. Notes from the visit state that all *Vallisneria americana* was completely gone from the site, and no aquatic plants were observed in the system in 2019. There was also a visible start of algae growth, with some longer strands on the RPS in 2017, though upon return in 2019 there were no strands found which could have been removed from Hurricane Michael the previous year. There were total nitrogen exceedances for both the 2017 and 2019 sampling events. The complete loss of the main habitat type between 2017 and 2019, resulted in a significant shift in the macroinvertebrate community (e.g. fewer total taxa, no Tanytarsini taxa, few long-lived and sensitive taxa), resulting in a low SCI score. The Department will follow up with future sampling events to determine whether the vegetation has become reestablished at the site and whether the macroinvertebrate community has recovered from the impacts from Hurricane Michael.

Contact and resources for more information:

Chandler Hammond
850-245-8473
Chandler.Hammond@FloridaDEP.gov

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

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