STREAM ECOSUMMARY

Blue Cypress Creek at Rollins Ranch
WBID 3133, Indian River County
December 1, 2021 and April 5, 2022



Figure 1. Sampling reach along Blue Cypress Creek in Indian River County.

Physical, chemical, and biological sampling was conducted at Blue Cypress Creek in Indian River County (27.714542, -80.853505) on December 1, 2021 and April 5, 2022 by the Department of Environmental Protection (DEP) Division of Environmental Assessment and Restoration (DEAR) Southeast Field Office. This stream was sampled as part of Strategic Monitoring Program. Water quality standards were met, except for total phosphorus and chlorophyll *a*. The 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 Blue Cypress Creek sampling location (Figure 1) is located northeast of Yeehaw Junction on Rollins Ranch in the Upper St. Johns Watershed (WBID 3133, Figure 2). It is a first order stream draining the Eastern Florida Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. Blue Cypress Creek flows into Blue Cypress Lake and has a Landscape Development Intensity (LDI) Index score of 1.94. 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 1.94 suggests minimal human activity in the 100m buffer surrounding the stream. The WBID is currently listed as impaired for total phosphorus 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).

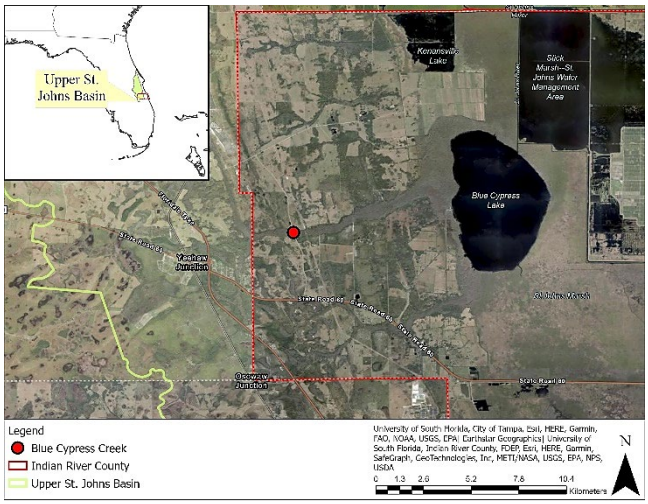


Figure 2. Location of Blue Cypress Creek in Indian River County.

Methods

Water Quality

Surface water samples were collected for analysis of nutrients, chlorophyll a, color, alkalinity, metals, pesticides, human markers and tracers. All sampling was conducted following DEP Standard Operating Procedures (SOPs, for details see https://floridadep.gov/dear/quality-assurance/content/dep-sops and met 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 Peninsular 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 Peninsula 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 (subsection 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 (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 Blue Cypress Creek.

Results

Water Quality

The water quality results are shown in Table 1. Total phosphorus was exceeded in the April 2022 sampling event. Total nitrogen met the applicable criteria during both events but was lower in the April 2022 sampling event compared to December 2021. All metals met surface water criteria.

A total of 109 analytes including pesticides, herbicides, and other chemicals were sampled in December 2021. Analytes detected were: hexazinone (8.0 ng/L), bromacil (0.77 ng/L I), brentazon (0.0024 ng/L), and imazapyr (0.0083 ng/L I). During the April 2022 sampling event the following analytes were detected: hexazinone (11 ng/L), brentazon (0.0020 ng/L), atrazine (23 ng/L), metolachlor (1.3 ng/L I), oxadiazon (0.78 ng/L I), and simazine (0.51 ng/L). In addition, a sunscreen ingredient, octinoxate was detected at 42 ng/L I during April sampling. There are currently no surface water criteria for the above listed chemicals. Values reported as "I" qualified were greater than or equal

to the laboratory method detection limit but less than the laboratory practical quantification limit.

NNC Threshold Assessment

Based on these two sampling events, the stream exceeded the numeric nutrient thresholds for the peninsula for total phosphorus on one occasion; 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 for total phosphorus in April 2022, 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 components needed for NNC (Table 2). In both sampling events the LVS was not conducted due to minimal plant coverage and per the NNC implementation document, there is no floral imbalance attributed to aquatic vascular plants.

RPS ranks between 4-6 were less than the 25% algal impairment threshold in 2021 and 2022 (Table 2).

In 2021, chlorophyll *a* was below the method detection limit, but was within a range of uncertainty for compliance with NNC (3.2 to 20 µg/L) in 2022. This would typically trigger a site-specific evaluation, however, there is an existing TMDL for total phosphorous that should address the underlying nutrient enrichment contributing to elevated chlorophyll *a* levels in this system.

Table 1. Water quality results from December 01, 2021 and April 05, 2022 at Blue Cypress Creek.

Analyte	Result 12/01/2021	Result 04/05/2022	Applicable Class III Water Quality Criteria
Field Temperature (°C)	15.6	21.8	N/A
Field pH (SU)	7.03	7.32	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	78.8%	72.4%	*43.05% and 39.80%
Field Specific Conductance (µmhos/cm)	151.1	218.8	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	35	71	Shall not be depressed below 20 (or if natural alkalinity is low, shall not be reduced by more than 25%)
Color (PCU)	250	120	N/A
Total Phosphorus (mg/L) as P	0.088	0.31	** Peninsula: 0.12
O-Phosphate-P (mg/L)	0.061	0.20	
Nitrate + Nitrite (mg/L) as N	0.016	0.12	0.35 for spring vents only
Ammonia (mg/L) as N	0.015	0.018	***6.19 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	1.1	0.23	N/A
Total Nitrogen (mg/L) as N	1.12	0.35	** 1.54
E. coli Bacteria (MPN/100 ML)	NA	90.8Q	≤410 Count/100 mL

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

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

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

Q – Sample held beyond normal holding time.

Table 2. Floral and faunal assessment results from December 1, 2021 and April 5, 2022 at Blue Cypress Creek.

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 12/01/2021 83565	Result 04/05/2022 83898
LVS C of C	Site average ≥ 2.5	<2m^2	<2m^2
LVS FLEPPC (%)	Site average ≤ 25%	<2m^2	<2m^2
RPS (%)	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	5%	11%
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	0.82U	10
Algal Community Composition	No adverse shifts in dominant taxa	N/A	N/A
SCI	Average ≥ 40	77	76

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

Habitat Assessment

The stream and river habitat assessment scores were 127 and 118, which are in the optimal to suboptimal range. The typical velocity measured was between 0.25 m/s and 0.21 m/s, which resulted in optimal and suboptimal scores 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 78.8% and 72.4% saturation. The average width within the assessment stretch was 6.0 m. The banks were well-armored with low, gradual slopes, providing a connection to the floodplain. Bank stability scores, as a result, were in the optimal range. There were two productive habitats noted: woody debris and roots which comprised less than 5% of the stream area. Riparian buffers on both banks were greater than 18.0 m, which resulted in an optimal score.

Faunal Assessment (SCI)

The SCI scores for this site were 77 and 76 (out of a possible 100 points), corresponding to an "Exceptional" (≥64) designation (Table 2). These results exceed the previous score for this site (69 in 2014). Figure 3 shows the individual SCI metrics for each sampling event.

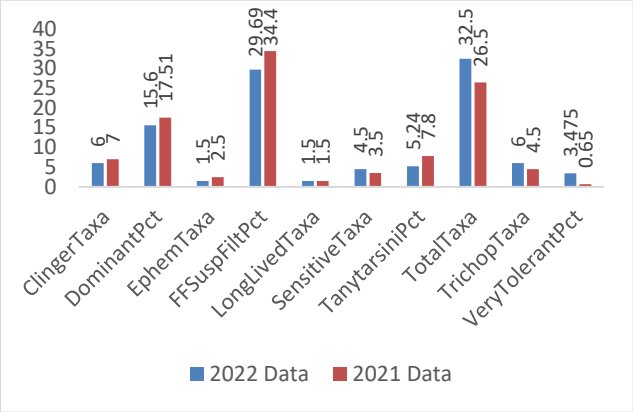


Figure 3. Stream Condition Index metric results from December 01, 2021, and April 05, 2022 at Blue Cypress Creek.

Conclusions

Sampling at Blue Cypress Creek indicates that the stream did not meet the applicable State Water Quality Criteria for total phosphorous during the April 5, 2022 sampling event. A previous water chemistry only sampling event occurred on March 8, 2022 in which the total phosphorus threshold was also exceeded (0.17 mg/L). These results, along with the elevated chlorophyll a in 2022, suggests a need for continued progress on the TMDL before nutrient reductions in the watershed are fully realized.

The Linear Vegetation Survey and Rapid Periphyton Survey indicated vascular plant and algal communities, respectively, that are consistent with expectations for minimally disturbed sites although algal abundance was greater in the RPS sample from 2022 compared to 2021.

Habitat Assessment data indicate near optimal physical conditions of the creek with little disturbance in the watershed. Stream Condition Index data indicated the presence of an "Exceptional" macroinvertebrate community. This is symptomatic of good water quality conditions.

DEP will continue to monitor the total phosphorus and chlorophyll a levels as the TMDL and Basin Management Action Plan is implemented. Currently, the elevated TP levels do not appear to be causing or contributing to undesirable changes in the biological communities in Blue Cypress Creek.

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

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