STREAM ECOSUMMARY

Hillsborough River in Hillsborough River State Park, WBID 1443D, Hillsborough County, 5/19/2016 & 4/9/2018



Figure 1. Sampling reach along the Hillsborough River in Hillsborough River State Park in Hillsborough County.

Physical, chemical, and biological sampling was conducted at Hillsborough River in Hillsborough River State Park (WIN/STORET 24030044, SBIO HILSTP5REF) in Hillsborough County on 05/19/2016 and 04/09/2018 by FDEP Southwest Regional Operations Center. This stream was sampled as part of FDEP's EcoRegional Reference Stream Project. Overall, the macroinvertebrate community data indicated that the stream met expectations for a healthy, well-balanced stream; however, floral community data were inconclusive and total nitrogen was higher than the regional threshold on 4/9/2018.

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 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 sampling location on the Hillsborough River (Figure 1) is in the Hillsborough River State Park in the Hillsborough River Watershed (WBID 1443D, Figure 2). It is a 4th order stream draining the Southwestern Florida Flatwoods, a subecoregion of the Southern Coastal Plain ecoregion. The Hillsborough River flows into Tampa Bay and has a Landscape Development Intensity (LDI) Index score of 2.13. The LDI is calculated for the 100m 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 2.13 suggests minimal human activity in the 100m buffer surrounding the stream; with the WBID

not currently listed for any impairments on the Verified List of Impaired Waters. Additional information about this WBID is available in the TMDL Tracker application. (http://prodenv.dep.state.fl.us/DearTmdl/welcomehz.do).

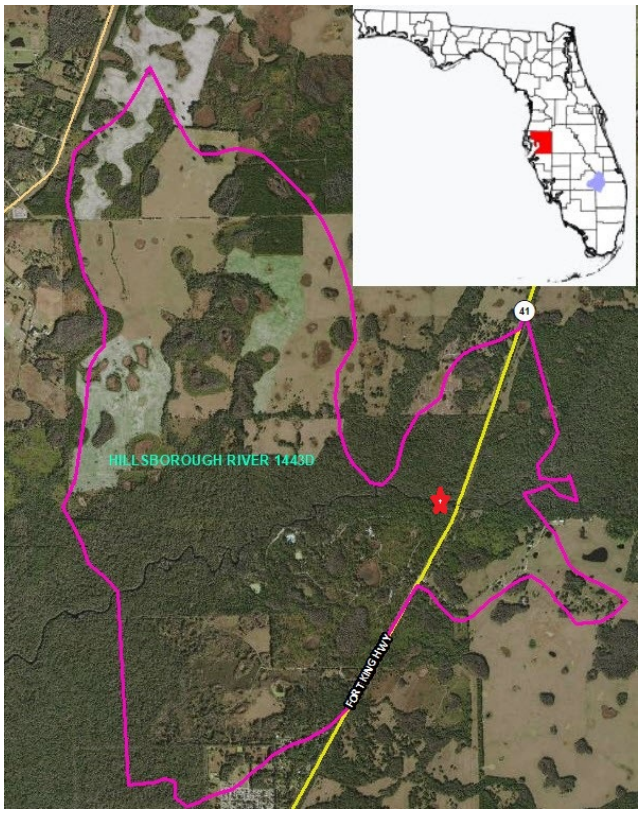


Figure 2. Location of Hillsborough River in Hillsborough River State Park (24030044) in Hillsborough County.

Methods

Water Quality

Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, fecal coliform, metals and pesticides following 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 West Central 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 considers 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 NNC evaluation 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 the Hillsborough River.

Results

Water Quality

The water quality results are shown in Table 1. Total nitrogen exceeded Class III acceptable levels on 4/9/18. This could be contributed to NPDES discharges upstream of the sampling point that have recently begun.

NNC Threshold Assessment

Based on these two sampling events, there is insufficient data to determine if the stream met the numeric nutrient thresholds for the Peninsula Bioregion. 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 total nitrogen threshold was exceeded during one event, additional nutrient sampling is needed to meet data sufficiency requirements to calculate and assess attainment of the nutrient threshold.

Floral Assessment

Results of the floral metrics show that this site is not within the reference stream distribution and therefore does not attain the floral component of the NNC (Table 2). All floral measures must pass for the stream to attain the NNC. The site met the "LVS C of C" score but exceeded the "LVS FLEPPC (%)" component of the floral assessment on both 5/19/16 and 4/9/18. This was due to invasive exotics being present in the system, such as: *Alternanthera philoxeroides, Colocasia esculenta, Eichhornia crassipes, Hydrilla verticillata, and Landoltia punctate*. The site met the RPS and chlorophyll *a* thresholds.

Table 1. Water quality results from 5/19/16 and 4/9/18 at Hillsborough River in Hillsborough River State Park

Analyte	Result 5/19/16	Result 4/9/18	Applicable Class III Water Quality Criteria
Field Temperature (°C)	24.4	23.3	N/A
Field pH (SU)	7.5	8.33	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	88.5	86.2	*Peninsula and Everglades: 38%
Field Specific Conductance (µmhos/cm)	407	448	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	159	165	Shall not be depressed below 20
Color (PCU)	14	11	N/A
Total Phosphorus (mg/L) as P	0.12	0.26	** West Central: 0.49 mg/L
Nitrate+Nitrite (mg/L) as N	1.2	1.5	0.35 mg/L for spring vents only
Ammonia (mg/L) as N	0.005	0.005	***2.05, 2.62
Total Kjeldahl Nitrogen (mg/L) as N	0.37	0.28	N/A
Total Nitrogen (mg/L) as N	1.58	1.79	** West Central: 1.65 mg/L

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

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

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

Table 2. Floral and faunal assessment results from 5/19/2016 and 4/9/2018 at Hillsborough River in Hillsborough River State Park

Floral/Faunal Metric	Evidentiary Threshold of No Imbalances	Result 5/19/16 Sample [SBIO# 76169]	Result 4/9/18 Sample [SBIO# 78361]
LVS C of C	Site average ≥ 2.5	3.28	2.68
LVS FLEPPC (%)	Site average ≤ 25%	29	38
RPS (%)	≤ 25% rank 4-6 (algae > 6 mm thick) coverage. If 20 to 25 % rank 4-6 coverage, evaluate algal species	0	1
Chlorophyll *a* (corrected; µg/L)	< 3.2 ug/L. If 3.2 to 20 ug/L, site specific evaluation	1.8	1.3
SCI	Average ≥ 40	65	76

Habitat Assessment

The stream and river habitat assessment scores were 149 (5/19/16) and 156 (4/9/2018), 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 dissolved oxygen was at 83% saturation. The average width within the assessment stretch was 25 m (Figure 3). The banks were low with a gradual slope, providing a good connection with the floodplain and were well-armored to help protect the banks from erosion. The bank stability scores, as a result, were in the optimal range. Four productive habitats were noted: woody debris, roots, aquatic vegetation and rocks which comprised roughly 48% of the stream area.

Faunal Assessment (SCI)

The average SCI score of the two most recent assessments for this site was 71 out of a possible 100 points, corresponding with an "Exceptional" (≥64) designation (Table 2). These results are within the range of previous scores for this site, which ranged from 63 to 81 (from 2008-2018). The Hillsborough River at this location (WBID 1443D) is an exceptionally healthy stream system in terms of the stream faunal community. The stream contains a good volume of productive habitats including roots, snags, rocks, and aquatic vegetation. It has good sinuosity, plenty of flow, shows no signs of artificial channelization, has good bank stability, and little habitat smothering (e.g. silt or algae). These water quality and stream attributes are optimal for aquatic invertebrates and other animals using these waters.



Figure 3. Looking across the bank at Hillsborough River State Park.

Conclusions

The sampling results at Hillsborough River in the Hillsborough River State Park indicate that the stream met several of the applicable State Water Quality Criteria, with additional monitoring warranted to fully evaluate the TN nutrient threshold. While the presence of a few exotic species is not surprising, the persistence or expansion of these species should be monitored. Habitat assessment data indicated an optimal physical condition of the river 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 indicated the vascular plant community is consistent with expectations for sites with some degree of disturbance.

Even with the FLEPPC threshold not being met, the site as a whole is in good condition based on the other water chemistry and biological results.

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

Southwest Florida Regional Operation Center (SW ROC):
Matthew Bearden: 813-470-5951
matthew.bearden@floridadep.gov
Ben Paswater: 813-470-5767
Benjamin.paswater@floridadep.gov

DEP biological assessment resources: http://www.dep.state.fl.us/water/bioassess/index.htm