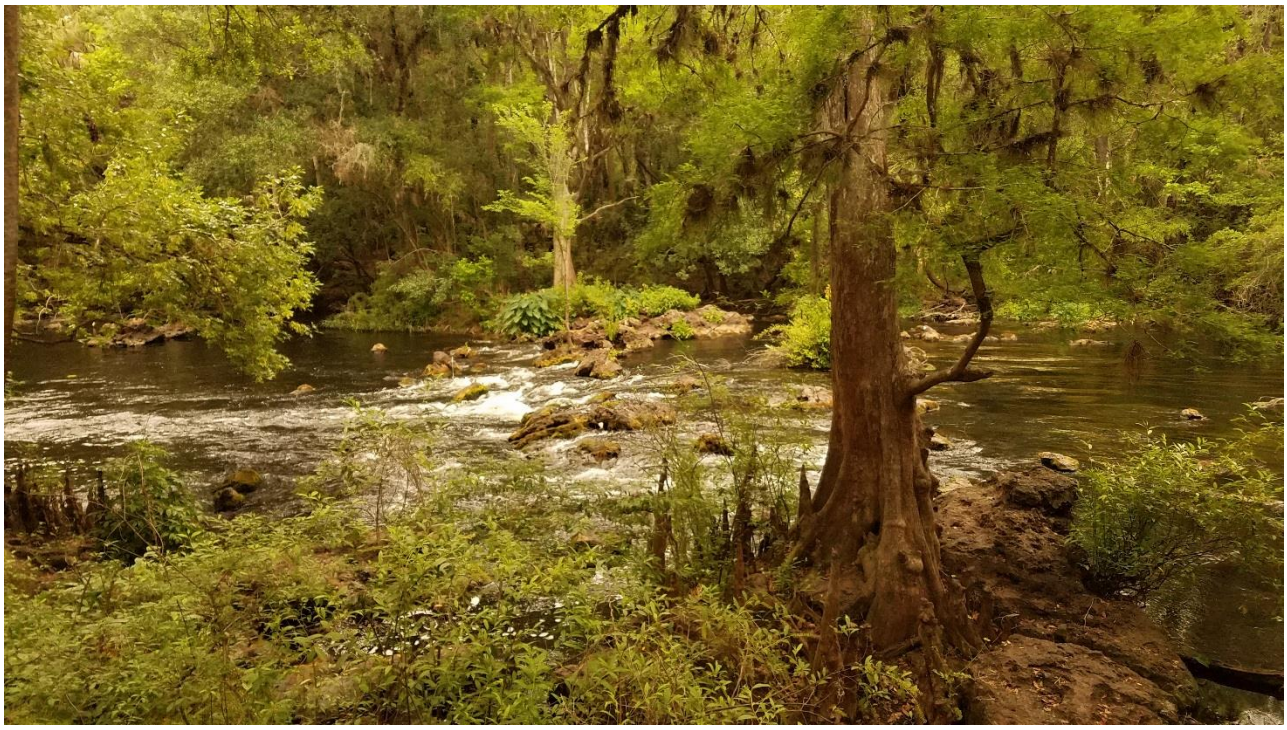

Hillsborough River 1443D

STREAM HABITAT ASSESSMENT, STREAM CONDITIONS INDEX, LINEAR VEGETATION SURVEY, RAPID PERIPHYTON SURVEY AND WATER QUALITY

David Eilers | USF Water Institute | April 23, 2018

Methods

STUDY AREA ANALYISIS

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2016 Hillsborough County aerial, 2011 Land Use/ Land Cover (LULC) and Watershed boundary (WBID) layers courtesy of the Florida Department of Environmental Protection. The Landscape Development Intensity Index (LDI) was calculated for the WBID containing the stream. From FDEP "The Landscape Development Intensity index (LDI) is an estimate of how much humans have altered an area of interest around a waterbody. Various land use types (low density residential, row crops, industrial and natural) are assigned coefficients of land use intensity based on estimates of the amount of human energy that is put into those land use types.

The LDI is calculated by multiplying each land use coefficient by the percentage of the area of interest occupied by that land use, and then summing the results. The Florida Department of Environmental Protection (DEP) uses the LDI as a tool to estimate potential land use impacts on streams, lakes, and wetlands. LDI values less than two (≤ 2) can be considered minimally disturbed." In the Florida framework, the maximum LDI index score is approximately 42.

HABITAT AND VEGETATION ASSESSMENT

For small streams that are not easily navigated by Jonboat for bathymetric mapping and vegetation analysis, Hillsborough County requested the implementation of the Florida Department of Environmental Protection methods for Stream and River Habitat Assessment (FT 3100) (http://www.dep.state.fl.us/water/sas/sop/sops.htm) using forms FD 9000-3, FD 9000-4 and FD 9000-5, Rapid Periphyton Survey (FS 7230) using form FD 9000-25 and Linear Stream Vegetation Survey (FS 7320) using form FD 9000-32. These methods were utilized on two sampling locations on each stream, typically near access points along roadways.

Stream and River Habitat Assessment per FT3100 receives a score calculated in Form FD 9000-5. This score results from the ranking of the primary habitat components (substrate diversity, substrate availability, water velocity and habitat smothering) and secondary habitat components (Artificial channelization, bank stability, riparian buffer zone width and riparian zone vegetation quality). The maximum score possible in this method is a 160.

Two metrics are utilized in the Linear Vegetation Survey. The Mean Coefficient of Conservatism (CoC) applies a score of 0-10 to each species based on its ecological tolerances and fidelity to pre-settlement conditions. Species with higher scores show a high fidelity to native, undisturbed habitats and are typically sensitive to alterations. Available CoC scores can be obtained from LT 7000 from the Florida Department of

Environmental Protection at: http://www.dep.state.fl.us/water/sas/sop/sops.htm. The Percent Florida Exotic Pest Plant Council (% FLEPPC) metric calculates the percent invasive exotics as the number of occurrences of FLEPPC Category I or II in the 100 m reach divided by the total number of taxa occurrences in the 100 m reach. The FLEPPC list can be found at: http://www.fleppc.org/list/11list.html

STREAM CONDITION INDEX ASSESSMENT

The Stream Condition Index (SCI) was sampled per DEP SOP FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting macroinvertebrates via 20 D-frame dipnet sweeps (0.5 m in length) in the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, and identified to the lowest practical taxonomic level. The SCI is composed of ten metrics, eight of which decrease in response to human disturbance, with two metrics (% very tolerant and % dominant) increasing in response to human disturbance. According to DEP SOP LT 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. Proposed biological health assessment criteria state that a site is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of those scores is less than 35.

WATER QUALITY ASSESSMENT

Physical water quality samples were taken using a Eureka Manta Sub-2 multiprobe pre and post calibrated daily. Measurements taken with this device include: depth, conductivity, pH, Dissolved Oxygen (mg/l and % Saturation) and salinity. Chemical water parameters were collected and preserved on ice by USF Water Institute staff and analyzed at the Environmental Protection Commission of Hillsborough County Laboratory. Analysis include; Chlorophyll (a, b, c, t and corrected), Alkalinity, Color, E. Coli, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen.

Study Area

Hillsborough River 1443D is located in northern Hillsborough County. Its headwaters are located in the Green Swamp in northern Polk County. The outfall of Hillsborough River is in Hillsborough Bay. The assessment of Hillsborough River was conducted on April 23, 2018. At the time of the assessment, the water levels were seasonally normal. The Hillsborough River watershed is dominated by natural (68.8%), Agriculture (17.4%) and field/pasture (7.8%) land uses. The calculated landscape development intensity index was a 1.82.

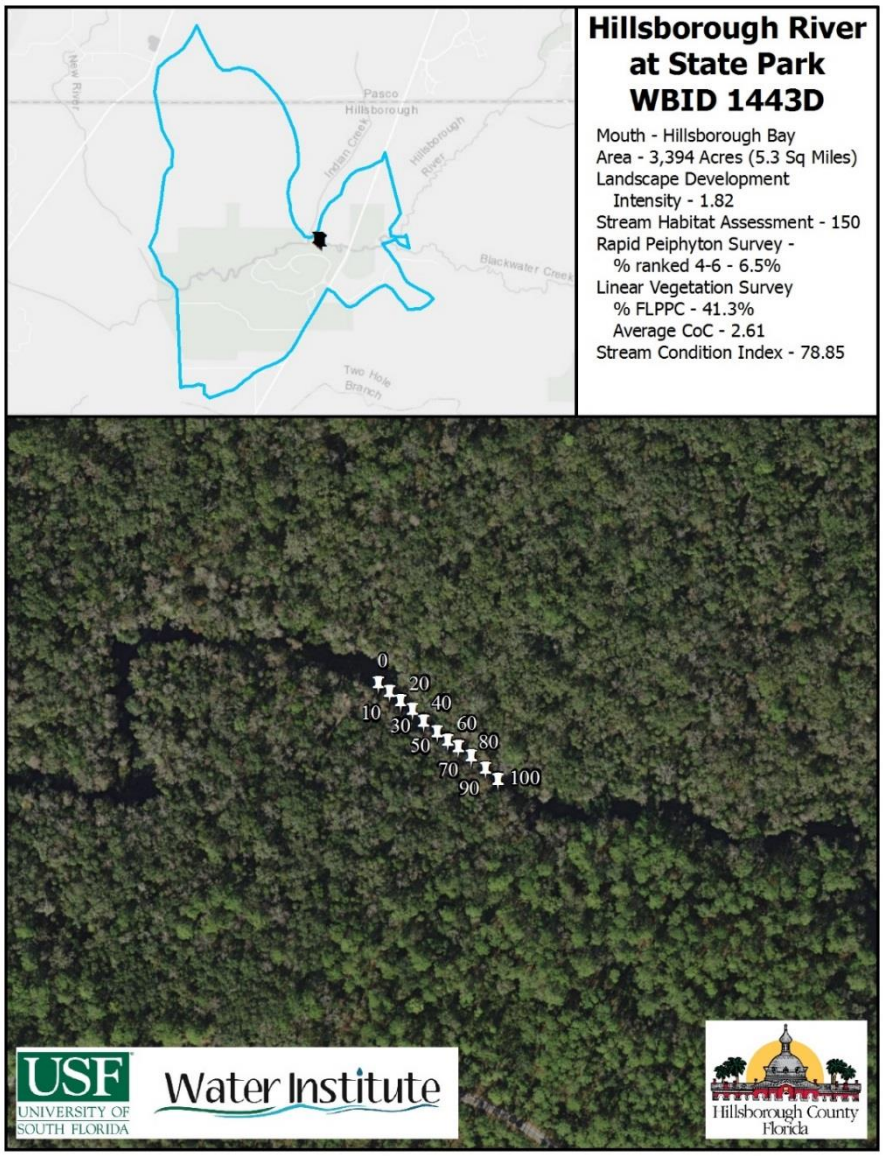

Figure 1 2018 Hillsborough River Study Area Map

Habitat and Vegetation Assessment

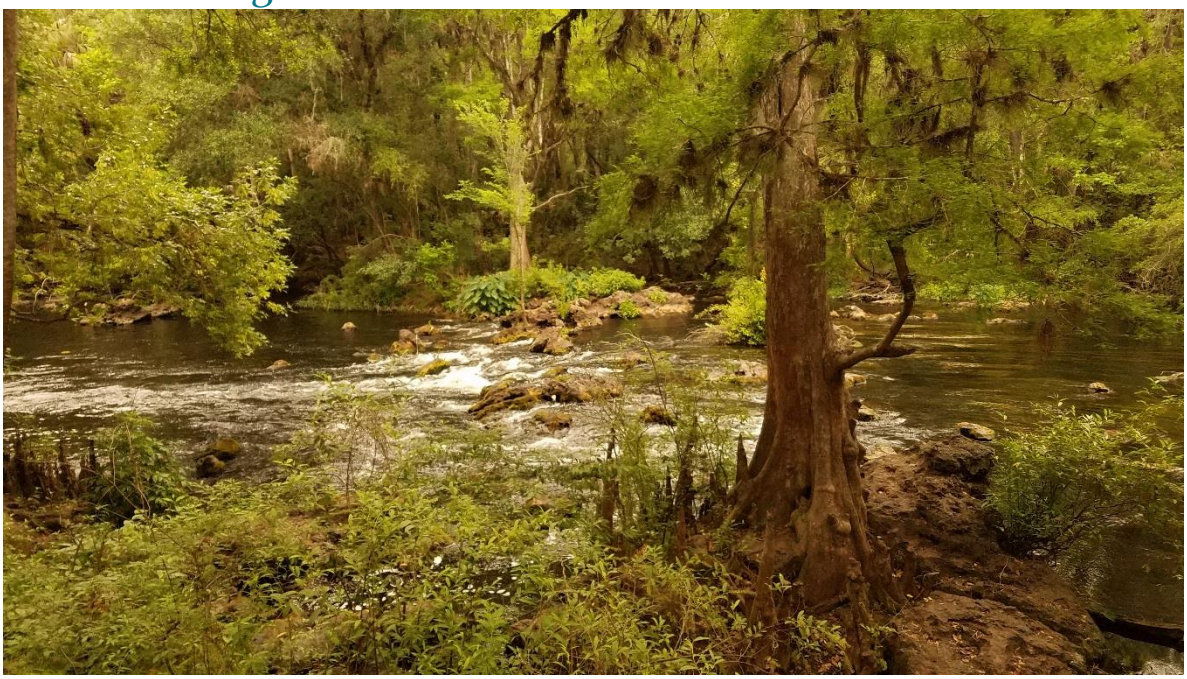

Figure 2 Overview photograph of the Hillsborough River 1443D Sample Site

The area surrounding the sample site is part of the Hillsborough River Preserve and features a natural setting. The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the optimal category for substrate diversity, substrate availability and water velocity. 70.05% of the surface area of the assessment region occupied by four types of major productive habitat (64.6% Rock, 3.0% Snag, 1.7% Roots and 0.75% Macrophytes). Minor habitats included leaf packs, sand and shell/rock rubble. Suboptimal scores were achieved for Habitat Smothering due to >25% of habitats affected by *Frontilalis*. The total score for the primary habitat components was a 73 out of 80.

The secondary habitat components of the FDEP Habitat Assessment focus on the surrounding features of the stream. The secondary habitat components scored in the optimal category for Artificial Channelization, Bank Stability, Riparian Buffer Width and Riparian Zone Vegetation Quality. As part of the preserve, the assessment region is surrounded by expansive forested floodplains. The vegetation in the stream itself was a mixture of native and non-native invasive species likely from an upstream source. The secondary habitat components received a score of 77 out of 80. The resulting FDEP Habitat Assessment score was a 150.

Periphyton was observed in the assessment region of Hillsborough River. A total of 5 of the 77 periphyton samples were classified as being ranked 4-6 (6mm – >10cm). The

canopy cover in the assessment region averaged 75%. The results of the rapid periphyton survey does not indicate an imbalance in the community.

The FDEP Linear Vegetation Survey indicated an imbalance in the vegetative community. A total of ten species were identified rooted in the stream that qualify for the Linear Vegetation Survey. Of these, only three species are non-native to Florida. *Vallisneria americana* was dominant in one of the vegetation regions where it comprised of 8% of the total surface area of the region. The calculated metrics for the Linear Vegetation Survey were 2.35 for the mean Coefficient of Conservatism and 44.19% for the Percent FLEPPC metric. Both of these metrics do not meet the thresholds.

Table 1 Linear Vegetation Survey Results – Pemberton Creek

Taxa Name	C of C Score	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Total Occurrences
Hydrocotyle umbellata	1.92	1	1	1	1	1	1		1	1	1	9
Alternanthera philoxeroides	0		1	1		1	1	1	1		1	7
Colocasia esculenta	0		1	1	1	1	1		1			6
Eichhornia crassipes	0			1	1	1	1		1	1		6
Cicuta maculata	4.54	1		1	1	1		1				5
Boehmeria cylindrica	5	1		1			1			1		4
Crinum americanum	9				1			1				2
Osmunda regalis	7.6	1						1				2
Lemna	1						1					1
Vallisneria americana	7						d					1

Total Occurrences	43
% FLEPPC	44.19%
Mean CofC	2.35

Figure 3 Typical shoreline of the assessment region for Hillsborough River

Stream Condition Index

The analysis of the SCI sample involves splitting the sample into 2 aliquots for analysis. The SCI metrics are then calculated on each separately. The final SCI score is an average of the two scores. The SCI score for Hillsborough River was 78.85 out of a possible 100 points, corresponding with an "Exceptional" designation, with the expected community of a healthy stream.

Metric summaries are shown for both subsamples in Table 2. Both samples received high scores for Total Trichoptera, Total Clingers, % Dominance and Total Sensitive Taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Hillsborough River.

Table 2 SCI metric summaries for Hillsborough River subsample A (top) and subsample B (bottom)

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	30.00	6.25	6.25
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	7.00	10.00	10.00
% Filter Feeders	38.24	8.73	8.73
Total Clingers	9.00	12.86	10.00
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	18.95	9.01	9.01
% Tanytarsini	7.19	6.18	6.18
Total Sensitive Taxa	6.00	8.57	8.57
% Very Tolerant Individuals	11.11	5.51	5.51
SCI Sum	70.26		
Final SCI score	78.07		

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	28.00	5.42	5.42
Total Ephemeroptera	2.00	4.00	4.00
Total Trichoptera	6.00	8.57	8.57
% Filter Feeders	40.13	9.17	9.17
Total Clingers	8.00	11.43	10.00
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	19.11	8.98	8.98
% Tanytarsini	10.83	7.27	7.27
Total Sensitive Taxa	6.00	8.57	8.57
% Very Tolerant Individuals	7.64	6.36	6.36
SCI Sum	71.66		
Final SCI score	79.63		

Table 3 SCI full results for Sample A

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera Taxa	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini Taxa	Sensitive Taxa	Very Tolerant Individuals	Specimen Notes
Nemertea		Enopla		Hoplonemertea	Tetrastemmatidae	Prostoma spp.	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Nais communis	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Nais pardalis	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda				Gastropoda spp.	1	0	0	0	0	0	0	0	0		0	0	0	no shell present
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	Planorbella scalaris	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	4	0	0	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	Pyrgophorus platyrachis	8	1	1	0	0	0	0	0	0		0	0	13	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	Hyalella azteca sp.complex	11	11	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	Caenis diminuta	2	2	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	Caenis maccafferti	1	1	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	2	2	1	1	0	0	0	1	0		0	1	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera		Trichoptera spp.	1	0	0	0	0	0	0	0	0		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Cheumatopsyche spp.	4	4	1	0	1	0	4	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsyche rossi	2	2	1	0	1	0	0	1	0		0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Hydroptilidae spp.	3	3	1	0	1	0	0	0	0		0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Hydroptila spp.	8	8	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Neotrichia spp.	6	6	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Mayatrichia ayama	2	2	1	0	1	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	Chimarra spp.	29	29	1	0	1	0	29	1	0		0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Elmidae spp.	1	0	0	0	0	0	0	0	0		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Dubiraphia spp.	4	4	1	0	0	0	0	0	0		0	0	0	larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Stenelmis spp.	5	5	1	0	0	0	0	1	0		0	0	0	larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Microcylloepus spp.	7	8	1	0	0	0	0	0	0		0	0	0	5 larvae, 2 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	2	0	0	0	0	0	0	0	0		0	0	0	damaged, pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	1	0	0	0	0	0	0	0	0		0	0	0	pupa
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Tanytarsus spp.	2	2	1	0	0	1	0	0	0		2	0	0	Not T. buckleyi
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Tanytarsus buckleyi	4	5	1	0	0	2.5	0	0	0		5	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Polypedilum scalaenum group	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Polypedilum flavum	5	7	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Rheotanytarsus exiguus group	4	4	1	0	0	0	4	1	0		4	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Tvetenia spp.	4	4	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Rheocricotopus robacki	2	2	1	0	0	0	0	0	0		0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Cricotopus or Orthocladius	3	3	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simulium spp.	18	18	1	0	0	0	18	1	0		0	1	0	larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	Hemerodromia spp.	2	2	1	0	0	0	0	0	0		0	1	0	larvae
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Hygrobatidae	Hygrobates spp.	1	1	1	0	0	0	0	0	0		0	0	0	

Table 4 SCI full results for Sample B

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera Taxa	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini Taxa	Sensitive Individuals	Very Tolerant Individuals	Specimen Notes
Nemertea		Enopla		Hoplonemertea	Tetrastemmatidae	Prostoma spp.	1	1	1	0	0	0	0	0	0	0	0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Nais communis	1	1	1	0	0	0	0	0	0	0	0	0	1	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	Pyrgophorus platyrachis	9	9	1	0	0	0	0	0	0	0	0	0	9	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	Amnicola dalli	4	4	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	Hyalella azteca sp. complex	15	15	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Cambaridae	Cambaridae spp.	1	1	1	0	0	0	0	0	1	0	0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Leptohyphidae	Tricorythodes albilineatus	2	2	1	1	0	0	0	0	0	0	0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Argia sedula	1	1	1	0	0	0	0	0	0	0	0	0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Calopterygidae	Hetaerina spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	no posterior end
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	Triaenodes spp.	3	3	1	0	1	0	0	0	0	0	0	1	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	4		0	0	0	0	0	0	0	0	0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Cheumatopsyche spp.	5	8	1	0	1	0	8	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsyche spp.	2	3	1	0	1	0	3	1	0	0	0	1	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Hydroptilidae spp.	2		0	0	0	0	0	0	0	0	0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Hydroptila spp.	3	4	1	0	1	0	0	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Neotrichia spp.	6	7	1	0	1	0	0	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	Chimarra spp.	30	30	1	0	1	0	30	1	0	0	0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Elmidae spp.	1		0	0	0	0	0	0	0	0	0	0	0	larva, immature
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Dubiraphia spp.	4	4	1	0	0	0	0	0	0	0	0	0	0	larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Stenelmis spp.	3	3	1	0	0	0	0	1	0	0	0	0	0	larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	Microcylloepus spp.	14	15	1	0	0	0	0	0	0	0	0	0	0	13 larvae, 1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Scirtidae	Scirtes spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	larva
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Tanytarsus buckleyi	8	8	1	0	0	4	0	0	0	8	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Polypedilum flavum	8	8	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Rheotanytarsus exiguus group	9	9	1	0	0	0	9	1	0	9	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Pentaneura inconspicua	2	2	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Tvetenia spp.	3	3	1	0	0	0	0	0	0	0	0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Rheocricotopus robacki	2	2	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Cricotopus or Orthocladius	2	2	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simulium spp.	9	9	1	0	0	0	9	1	0	0	1	0	0	larvae

Water Quality Assessment

Limited long-term water quality data is available for Hillsborough River. The data that is available was collected by the Hillsborough County Environmental Protection Commission, US Geological Survey and the Florida Department of Environmental Protection. Values for the physical water parameters begin in 1956 and continue through present. Values for the laboratory water parameters begin in 1973 and continue through present, including the sample taken along with this assessment. The 2018 USF Water Institute Assessment fall within the range of the previous data collections. Table 5 provides a summary of the Physical/Chemical conditions recorded at the site.

Table 5 Hillsborough River Physical Water Quality (Field)

Hillsborough River								
Date	**Depth (m)**	**Temp (°C)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
5/14/18	0.14	23.27	7.99	7.05	80.9	345	0.16	2.3
Mean POR		22.51	7.55	6.27	72.96%	331	0.29	1.34

The chemical water quality analysis for Hillsborough River is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean and the sample for this assessment for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a three year geometric mean value of 0.166 mg/L (2015- present). Total Phosphorous values for the sample from this assessment were 0.090 mg/L. The mean value for the period of record was 0.604 mg/L.

Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a three year geometric mean value of 1.546 mg/L (2015- present). The Total Nitrogen value from the assessment was above threshold with a concentration of 1.823 mg/L. The mean value for the period of record was 2.684 mg/L.

Chlorophyll-a corrected values fall below the site specific evaluation range of 3.2 µg/l to 20 µg/l for both the most recent sample (2.2 µg/l) and the period of record (2.80 µg/l 2005- present). For sites with Chlorophyll-a values in this range, the assessment does not show an imbalance in flora. Low biomass of the bacterial parameters was observed in both the sample for this assessment and the long term dataset.

The FDEP Numerical Nutrient Criteria focuses on the most recent three years of data. For Phosphorous the geometric mean for each year remains below the threshold of

0.49 mg/L with concentrations of 0.153 mg/L, 0.178 mg/L and 0.170 mg/L for 2015, 2016 and 2017. However, during this period 3 samples exceed the threshold (1 in each year).

For Total Nitrogen, the geometric mean for each year remains below the threshold of 1.65 mg/L with concentrations of 1.601 mg/L, 1.520 mg/L and 1.512 mg/L for 2015, 2016 and 2017. Thirteen individual samples exceeded the threshold value the past three years (6 in 2015, 5 in 2016, and 2 in 2017).

Parameter	Hillsborough River	POR Mean	Units
Alkalinity	168	112.4	mg/LCaCO3
Nitrates/Nitrites	1.707	1.250	mg/L
E. Coli	108		#/100 ml
Enterococci	610	152	#/100 ml
Chlorophyll a	4.4	4.47	ug/L
Chlorophyll b	5.1	1.67	ug/L
Chlorophyll c	0.7	2.34	ug/L
Chlorophyll t	7.8		ug/L
Chlorophylla Corr	4.0	2.80	ug/L
Chlorophyll-pheo	3.2		ug/L
Ammonia	0.008	0.175	mg/L
Kjeldahl Nitrogen	0.444	0.608	mg/L
Total Nitrogen	1.823	2.684	mg/L
Total Phosphorus	0.090	0.604	mg/L
Color(345)F.45	3.5	76.7	Pt/Co

Table 6 Hillsborough River Water Quality (Laboratory)

Conclusion

Hillsborough River 1443D is located in a substantial wilderness preserve limiting the disruptions to the in-stream and near-stream habitats. The stream itself showed no alterations to the stream flow, buffer and banks in the region assessed. At the time of the habitat assessment, the water levels were seasonally normal. Abundant habitat for macroinvertebrates was observed. Due to these factors, the Habit Assessment resulted in an Optimal score of 150. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Hillsborough River not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Hillsborough River did meet standards for the rapid periphyton survey with 6.5% of samples being ranked between 4 and 6. The historical water quality record for Hillsborough River showed long term elevated concentrations of Total Phosphorous and Total Nitrogen. Using the geometric mean concentrations for the previous three years, Total Phosphorous and Total Nitrogen concentrations are below the FDEP thresholds, however violations to the Total Phosphorous Numeric Nutrient Criteria with 3 samples exceeding the threshold in the previous three years. There were thirteen exceedances in the past three years for Total Nitrogen. The results of the SCI sampling indicate that the stream is "exceptional" based on the macroinvertebrate community. Table 7 Summarizes the results of the nutrient sampling, floristic sampling, habitat assessment and SCI.

Table 7 Summary of Water Quality, Floristic Surveys and Habitat Assessments

Measure		Hillsborough River	Mean POR	Threshold
Total Phosphorous (mg/l)		0.09	0.604	< 0.49
Total Nitrogen (mg/l)		1.823	2.684	< 1.65
RPS (% Rank 4-6)		6.50%		< 25%
LVS	Avg C of C	2.35		≥ 2.5
	FLEPPC %	44.19%		< 25%
Chlorophyll (µg/l)		4	2.3	< 20 µg/l
Habitat Assessment		150		> 34
SCI		78.71		> 34