Hillsborough River

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

David Eilers, Lauren Kier, Megan Dunne | USF Water Institute | May 12, 2021

Methods

STUDY AREA ANALYISIS

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2020 Hillsborough County aerial, 2017 Land Use/ Land Cover (LULC) and Waterbody ID (WBID) layers courtesy of the Florida Department of Environmental Protection (FDEP). The Landscape Development Intensity Index (LDI) was calculated for the WBID containing the stream. From FDEP (https://floridadep.gov/dear/bioassessment/content/bioassessment-ldi-hdg-bcg) "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 FDEP 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 FDEP 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 (LVS). 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 Table LVI 1000-1 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 in FDEP LVI 1000-1.

STREAM CONDITION INDEX ASSESSMENT

The Stream Condition Index (SCI) was sampled and calculated per DEP SOP SCI 1000. . 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 SCI 1000, the SCI scores greater than 35 are considered healthy. Proposed biological health assessment criteria state that a WBID is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of the most recent 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 Hillsborough County Public Utilities 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. Results will be discussed in the Florida Department of Environmental Protection's Numeric Nutrient Criteria framework and combined with the monthly sampling from the Hillsborough County Environmental Protection Commission Monthly sampling data.

Study Area

Hillsborough River above Hillsborough River Reservoir is located in northern Hillsborough County in the Hillsborough Bay Watershed. Its headwaters are located in the Green Swamp. The outfall of Hillsborough River is in Hillsborough Bay. The assessment of Hillsborough River was conducted on May 12, 2021. At the time of the assessment, the water levels were normal for the dry season. The Hillsborough River above Hillsborough River Reservoir WBID covers 8.53 square miles and is dominated by residential (46.9%), natural (21.5%) and commercial (8.6%) land uses. The resulting calculated landscape development intensity index score was 6.01.

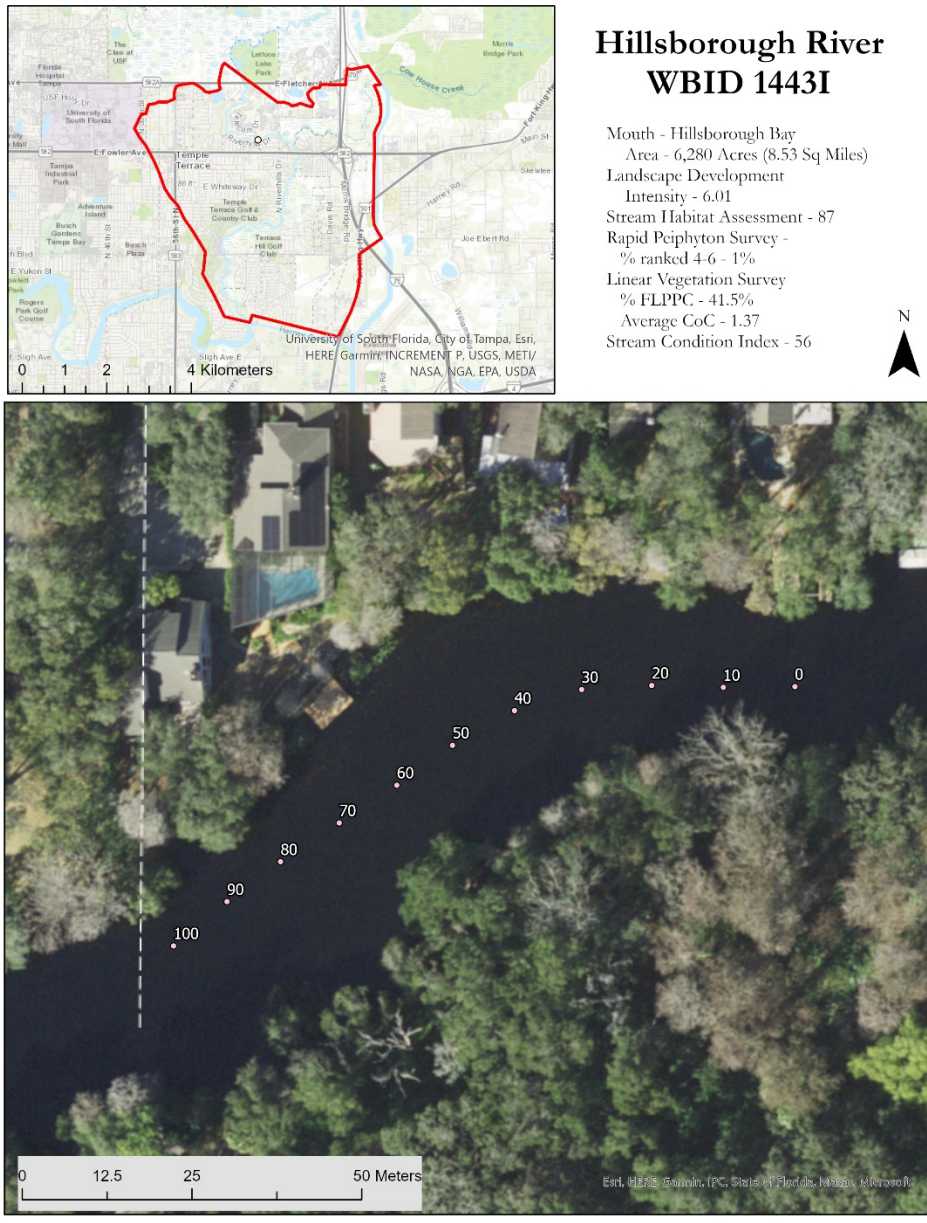

Figure 1 2021 Hillsborough River Study Area Map

Figure 2 Overview photograph of the Hillsborough River Sample Site showing the typical habitat features

Habitat and Vegetation Assessment

The region of Hillsborough River where the assessment was conducted is in a residential region upstream from the Fowler Avenue Bridge. The region was open with a mean canopy cover measurement of 0.0% in part due to the regions wide stream width. Hillsborough River averaged 2.4 meters in depth, approximately 30 meters wide with a flow of 0.07 m/s.

The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the suboptimal category for Habitat Smothering (sufficient pools but many of the productive habitats were affected by sand smothering) and Substrate Diversity (Presence of three major productive habitats (snags, rocks, roots)). Water Velocity (0.07 m/s) was scored as marginal. Substrate Availability (1.46 % of stream are productive habitats) was scored as poor. Minor habitats included sand and silt deposits. The total score for the primary habitat components was a 35 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 Bank Stability (right bank with few raw eroded areas) and Artificial Channelization. Riparian Zone Vegetation Quality (left bank showing moderate levels of disturbance shown in the species present) and Riparian Buffer Zone Width (left bank had 15 meters of buffer) scored as suboptimal. Bank Stability of the left bank (several raw eroded areas and steep banks) and Riparian Zone Vegetation Quality of the right bank scored as marginal. The Riparian Buffer Zone Width of the right bank scored as poor due to the alterations of homeowners. The secondary habitat components received a score of 52 out of 80. The resulting FDEP Habitat Assessment score was an 87.

Table 1 Scoring Summary for the Stream Habitat Assessment

Metric	Score
Primary Habitat Components	
Substrate Diversity	11
Substrate Availability	3
Water Velocity	8
Habitat Smothering	13
Primary Score	**35**
Secondary Habitat Components	
Artificial Channelization	16
Bank Stability - Right Bank	9
Bank Stability - Left Bank	4
Riparian Buffer Zone Width - Right Bank	3
Riparian Buffer Zone Width - Left Bank	8
Riparian Zone Vegetation Quality - Right Bank	4
Riparian Zone Vegetation Quality - Left Bank	8
Secondary Score	**52**
Habitat Assessment Score	**87**

Periphyton was encountered during the 99 samples taken during the Rapid Periphyton Survey. Only 1% of samples were classified as ranks 4-6.The tree canopy in the assessment area averaged 0.0% allowing sufficient light for periphyton to flourish however most bottom depths were deeper than the secchi depth preventing establishment of periphyton on substrates.

The FDEP Linear Vegetation Survey encountered greater than 2 m^2 of herbaceous species rooted in Hillsborough River at the time of the assessment. The vegetation in Hillsborough River was dominated by *Nuphar luteum.* Several non-native invasive species were also observed. The resulting metrics for Mean Coefficient of Conservatism was 1.37 and % FLEPPC was 41.5%, both exceeding FDEP criteria indicating an imbalance of flora.

Table 2 Results of the Linear Vegetation Survey for the Hillsborough River sample site. "D" indicates a dominant species in the region

Taxa Name	C of C Score	Sample Site										Total Occurrences
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	
Lemna	1	1	1	1	1	1	1	1	1	1	1	10
Nuphar luteum	3.5	D	D	D	D	D	D	D	D	D	D	10
Salvinia minima	0	1	1	1	1	1	1	1	1	1	1	10
Alternanthera philoxeroides	0		1		1	1	1	1			1	6
Hydrocotyle umbellata	1.92				1	1						2
Mikania scandens	1.95					1						1
Panicum repens	0					1						1
Pontederia cordata	5.38									1		1

Figure 3 Nuphar luteum was common in the Hillsborough River sample site

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 56 out of a possible 100 points, corresponding with a "Category 2 Healthy" designation, with minor loss of taxonomic diversity from the expected community of a healthy stream. Both subsamples contained moderate total taxa with 41 taxa in subsample A and 38 in subsample B.

High scores (scores above 7.0) were achieved for the Total Taxa and % Dominance metrics in both subsamples. Low scores (less than 3.0) were achieved for the % Filter Feeders and Total Sensitive Taxa metrics in both samples. Total Long Lived Taxa scored low in Sample B. 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 Sample A (top) and Sample B (bottom)

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	41.00	10.83	10.00
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	4.00	5.71	5.71
% Filter Feeders	4.58	0.90	0.90
Total Clingers	4.00	5.71	5.71
Total Long-lived Taxa	2.00	6.67	6.67
% Dominance	13.07	10.19	10.00
% Tanytarsini	1.96	3.19	3.19
Total Sensitive Taxa	2.00	2.86	2.86
% Very Tolerant Individuals	18.95	4.27	4.27

SCI Sum	55.31
Final SCI score	61.46

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	38.00	9.58	9.58
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	3.00	4.29	4.29
% Filter Feeders	3.45	0.64	0.64
Total Clingers	4.00	5.71	5.71
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	27.59	7.28	7.28
% Tanytarsini	2.76	3.89	3.89
Total Sensitive Taxa	2.00	2.86	2.86
% Very Tolerant Individuals	11.72	5.39	5.39

SCI Sum	45.65
Final SCI score	50.72

Table 3 SCI full results for Sample A

Stream Condition Index Results for Hillsborough River SCIA

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	Sensitive Taxa	Very Tolerant Individuals	Specimen Notes
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais variabilis*	7	7	1	0	0	0	0	0	0		0	0	7	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais pardalis*	4	4	1	0	0	0	0	0	0		0	0	4	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Slavina appendiculata*	2	2	1	0	0	0	0	0	0		0	0	0	
Annelida		Clitellata	Hirudinida	Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis* sp. comple	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Hirudinida	Rhynchobdellida	Glossiphoniidae	*Placobdella phalera*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Amnicolidae	*Amnicola dalli*	13	13	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Ancylidae	Ancylidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Menetus dilatatus*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Planorbella scalaris*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Caenogastropoda	Architaenioglossa	Viviparidae	*Viviparus georgianus*	1	1	1	0	0	0	0	0	0		0	0	0	Oversized vial
Mollusca		Bivalvia	Autobranchia	Venerida	Cyrenidae	*Corbicula* spp.	1	1	1	0	0	0	1	0	1		0	0	0	Oversized vial
Mollusca		Bivalvia	Autobranchia	Sphaeriida	Sphaeriidae	*Musculium* spp.	3	3	1	0	0	0	3	0	0		0	0	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda		Isopoda spp.	1		0	0	0	0	0	0	0		0	0	0	Head only; like Caecidotea
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Asellidae	*Caecidotea* spp.	5	6	1	0	0	0	0	0	0		0	1	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Senticaudata spp.	1		0	0	0	0	0	0	0		0	0	0	Head only; Like Hyalella
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella azteca* sp. complex	19	20	1	0	0	0	0	0	0		0	0	0	MX1 dissected; damaged/not H. wakulla
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella wakulla*	13	13	1	0	0	0	0	0	0		0	0	0	MX1 dissected
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Palaemonidae	*Palaemon* spp.	1	1	1	0	0	0	0	0	1		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera		Ephemeroptera spp.	1		0	0	0	0	0	0	0		0	0	0	Head only; Like Caenis
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	*Caenis* spp.	6	7	1	1	0	0	0	0	0		0	0	0	Early instars; like C. punctata/diminuta
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	*Callibaetis floridanus*	2	2	1	1	0	0	0	0	0		0	0	0	By mouthparts and SCIB
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	7	7	1	1	0	0	0	1	0		0	1	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata		Anisoptera spp.	2	2	1	0	0	0	0	0	0		0	0	0	Early instars; larger Corduliidae by PM groove
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	*Enallagma* spp.	2	2	1	0	0	0	0	0	0		0	0	0	No caudal lamellae
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	Leptoceridae spp.	1	1	1	0	1	0	0	0	0		0	0	0	Early instar; Nectop. or Triaenodes
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	*Oecetis* sp. A	1	1	1	0	1	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	Hydroptilidae spp.	1		0	0	0	0	0	0	0		0	0	0	Pupa = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	*Hydroptila* spp.	2	3	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	*Neotrichia* spp.	1	1	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	Larva = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	2	2	1	0	0	0	0	1	0		0	0	0	Larva = 1, Adult = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	1		0	0	0	0	0	0	0		0	0	0	Pupa = 1 damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	1		0	0	0	0	0	0	0		0	0	0	Pupa = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus* spp.	3	3	1	0	0	1.5	0	0	0		3	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense* group	1	1	1	0	0	0	0	0	0		0	0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Coelotanypus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Ablabesmyia mallochi*	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Ablabesmyia rhamphe* group	11	12	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tribelos fuscicorne*	4	4	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Dicrotendipes* spp.	3	3	1	0	0	1.5	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum beckae*	11	12	1	0	0	0	0	0	0		0	0	12	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Parachironomus* spp.	3	3	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Beardius* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	Ceratopogonidae spp.	1		0	0	0	0	0	0	0		0	0	0	Pupa = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	*Bezzia/Palpomyia* spp.	3	4	1	0	0	0	0	0	0		0	0	0	Larvae = 3

Table 4 SCI full results for Sample B

Stream Condition Index Results for Hillsborough River SCIB

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	Sensitive Taxa	Very Tolerant Individuals	Specimen Notes
Nemertea		Hoplonemertea		Monostilifera	Prostomatidae	*Prostoma* spp.	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais variabilis*	3	3	1	0	0	0	0	0	0		0	0	3	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais pardalis*	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Slavina evelinae*	1	1	1	0	0	0	0	0	0		0	0	0	
Annelida		Clitellata	Hirudinida	Arhynchobdellida	Erpobdellidae	*Erpobdella tetragon*	1	1	1	0	0	0	0	0	0		0	0	0	
Annelida		Clitellata	Hirudinida	Rhynchobdellida	Glossiphoniidae	*Placobdella phalera*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Amnicolidae	*Amnicola dalli*	40	40	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	4	4	1	0	0	0	0	0	0		0	0	4	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Floridobia floridana*	2	2	1	0	0	0	0	0	0		0	0	0	Reference collection
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Ancylidae	Ancylidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged, no shell
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	Planorbidae spp.	2	2	1	0	0	0	0	0	0		0	0	2	Damaged
Mollusca		Bivalvia	Autobranchia	Sphaeriida	Sphaeriidae	Sphaeriidae spp.	2	2	1	0	0	0	2	0	0		0	0	0	Damaged and/or immature
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Asellidae	*Caecidotea* spp.	4	4	1	0	0	0	0	0	0		0	1	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Senticaudata spp.	2		0	0	0	0	0	0	0		0	0	0	Heads only; Like Hyalella
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella azteca* sp. complex	25	26	1	0	0	0	0	0	0		0	0	0	MX1 dissected; damaged/not Hyalella wakulla
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella wakulla*	12	13	1	0	0	0	0	0	0		0	0	0	MX1 dissected
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	*Caenis* spp.	2	2	1	1	0	0	0	0	0		0	0	0	Early instars, like C. diminuta/punctata
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	*Callibaetis floridanus*	1	1	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	3	3	1	1	0	0	0	1	0		0	1	0	No 7th gill
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata		Anisoptera spp.	1	1	1	0	0	0	0	0	0		0	0	0	Early instar Cordulilid/Libellulid
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	No caudal lamellae
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	*Oecetis* sp. A	1	1	1	0	1	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	*Nectopsyche pavida*	1	1	1	0	1	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	*Hydroptila* spp.	2	2	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	2	2	1	0	0	0	0	1	0		0	0	0	Larvae = 2
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	2		0	0	0	0	0	0	0		0	0	0	Pupae = 2, damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	3		0	0	0	0	0	0	0		0	0	0	Pupae = 3
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus* spp.	2	3	1	0	0	1.5	0	0	0		3	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus* spp.	1	1	1	0	0	0	1	1	0		1	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Ablabesmyia rhamphe* group	7	10	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tribelos fuscicorne*	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Dicrotendipes* spp.	1	1	1	0	0	0.5	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum beckae*	4	5	1	0	0	0	0	0	0		0	0	5	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Pseudochironomus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Parachironomus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	*Bezzia/Palpomyia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	Larvae = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	*Probezzia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	Larva = 1
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Unionicolidae	*Koenikea* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Limnesiidae	*Limnesia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Chelicerata	Arachnida	Acari	Sarcoptiformes		Oribatida spp.	1	1	1	0	0	0	0	0	0		0	0	0	

Water Quality Assessment

Long-term water quality data is available for Hillsborough River. The data that is available was collected by the Hillsborough County Environmental Protection Commission (2016-2021). Values for the physical water parameters begin in 2016 and continue through 2021. Values for the laboratory water parameters begin in 2016 through 2021. The 2021 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)**
5/12/2021	0.65	26.91	7.94	8.34	103.5	367.6	0.17	0.7
5/12/2021	1.07	26.88	7.97	8.17	101.3	367.7	0.17	
5/12/2021	1.99	26.83	7.94	8.18	101.4	367.8	0.17	
Mean POR	0.5	23.20	7.25	3.37	40.14	297.7	0.14	1.24

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. The previous 3-year geometric mean values for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a geometric mean value of 0.154 mg/L (2019), 0.184 mg/L (2020) and 0.141 mg/L (2021). Total Phosphorous values for the sample from this assessment were 0.122 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L for the previous three year period with a mean value of 0.805 mg/L (2019), 0.724 mg/L (2020) and 0.748 mg/L (2021). The Total Nitrogen value from the assessment was below the threshold with a concentration of 1.000 mg/L. Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for the most recent 3-years of samples (4.16 µg/l in 2019, 2.51 µg/l in 2020, 3.86 µg/l in 2021). For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora.

A slightly elevated biomass of the bacterial parameters was observed in the 3-year dataset with E. Coli having a geomean of 134.6colonies/100 ml, 98.5/100 ml for Enterococci.

Table 6 Hillsborough River Water Quality (Laboratory)

Parameter	Hillsborough River 5/12/2021	POR Mean (2016-2021)	Units
Alkalinity	168	N/A	mg/LCaCO3
Color(345)F.45	40	N/A	Pt/Co
E. Coli	35	112.4	#/100 ml
Enterococci	6.3	131.9	#/100 ml
Chlorophyll a	28.1	3.96	ug/L
Chlorophyll b	1.0	0.87	ug/L
Chlorophyll c	2.5	0.79	ug/L
Chlorophyll t	31.6	5.11	ug/L
Chlorophylla Corr	1.0	4.10	ug/L
Chlorophyll-pheo	44.5	3.77	ug/L
Ammonia	< 0.073	0.016	mg/L
Kjeldahl Nitrogen	1.790	0.645	mg/L
Total Nitrogen	1.000	0.826	mg/L
Nitrates/Nitrites	0.342	0.081	mg/L
Total Phosphorus	0.122	0.170	mg/L

Conclusion

Hillsborough River above the Hillsborough River Reservoir is located in a predominantly residential area. At the time of the habitat assessment, the water levels were low, corresponding to the middle of the dry season, however sufficient habitat for macroinvertebrates was observed. Due to these factors, the Habit Assessment resulted in a suboptimal score of 87. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Hillsborough River not meeting either the % FLEPPC nor the mean coefficient of conservatism metrics. Hillsborough River did meet standards for the rapid periphyton survey with 1% of samples being ranked between 4 and 6 due to the average depth being beyond the secchi depth in the region. The recent water quality record for Hillsborough River showed concentrations of Chlorophyll-a corrected, Total Phosphorous and Total Nitrogen below the FDEP thresholds. The results of the SCI sampling indicate that the stream is "healthy" 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	2019	2020	2021	Threshold
Total Phosphorous (mg/l)		0.122	0.154	0.184	0.141	< 0.49
Total Nitrogen (mg/l)		1.000	0.805	0.724	0.748	< 1.65
RPS (% Rank 4-6)		1%				< 25%
LVS	**Avg C of C**	1.37				≥ 2.5
	FLEPPC %	41.5%				< 25%
Chlorophyll-a Corrected (µg/l)		1.0	4.16	2.51	3.86	< 20 µg/l
Habitat Assessment		87				> 34
SCI		56				> 34