



Halls Branch

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

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Methods

STUDY AREA ANALYSIS

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2020 Hillsborough County aerial, 2014 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/ulist.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

Halls Branch is located in south-eastern Hillsborough County. Its headwaters are located in an unnamed swamp between Highway 672 and Big Bend Road and the outfall of Little Bullfrog Creek is in Bullfrog Creek. The assessment of Little Bullfrog Creek was conducted on February 10, 2020. At the time of the assessment, the water levels were normal for the end of the dry season. The Halls Branch WBID covers 2.47 square miles and is dominated by agricultural (71.9%) and natural (26.7%) and land uses. The resulting calculated landscape development intensity index score was 5.55.



Halls Branch WBID 1684

Mouth - Alafia River South Prong
Area - 1,049 Acres (2.47 Sq Miles)
Landscape Development
Intensity - 5.55
Stream Habitat Assessment - 91
Rapid Peiphyton Survey -
% ranked 4-6 - 0%
Linear Vegetation Survey - < 2m²
% FLPPC - 52.94%
Average CoC - 2.52
Stream Condition Index - 50



Figure 1 2020 Halls Branch Study Area Map



Figure 2 Overview photograph of the Halls Branch Sample Site

Habitat and Vegetation Assessment

The region of Halls Branch where the assessment was conducted is in a natural buffer surrounded by agricultural land. The region was moderately shaded with a mean canopy cover measurement of 64.1%. Halls Branch averaged 0.1 meters in depth, approximately 1.9 meters wide with a flow of 0.36 m/s.

The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the optimal category for Water Velocity. Habitat Smothering (many of the productive habitats were affected by sand smothering) scored in the marginal category. Substrate Diversity (Presence of one major productive habitat (snags)) and Substrate Availability (3.7% of stream are productive habitats) were scored as poor. Minor habitats included fine roots, leaf packs/mats, sand and silt deposits. The total score for the primary habitat components was a 33 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 and Riparian Buffer Zone Width – Right Bank. Bank Stability with many raw, eroded areas and Riparian Zone Vegetation Quality and scored in the suboptimal category due to collapsing, steep banks and several non-native invasive species. The riparian buffer zone surrounding the stream was 8 meters on the left bank scoring as marginal. The vegetation in the stream itself was a mixture of native and non-native species. Aquatic vegetation was abundant in only the 0-10 meter section of the assessment. The secondary habitat components received a score of 58 out of 80. The resulting FDEP Habitat Assessment score was a 91.

Periphyton was not encountered during the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 64.1% limiting available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered less than 2 square meters of rooted aquatic vegetation in the 100m study area. 10 herbaceous species were observed in Halls Branch including *Urochloa mutica*, *Ludwigia peruviana* and *Commelina diffusa* which are non-native invasive species and *Orontium aquaticum* which is a sensitive species. Only *Urochloa mutica* was abundant and dominant in the 0-10 meter assessment region.

Table 1 Linear Vegetation Survey Results – Halls Branch

[illegible]



Figure 3 A mixture of species were observed along Halls Branch

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 Halls Branch was 50 out of a possible 100 points, corresponding with a “Healthy” designation, with the expected community of a healthy stream.

There were significant differences in the scoring metrics for the two samples. High scores were achieved for the % Tanytarsini and Very Tolerant Individuals in both samples. Both samples scored poorly for Total Trichoptera and Total Long Lived Taxa. Sample A additionally scored poorly for Total Sensitive Taxa and Total Ephemeroptera metrics. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Halls Branch.

Table 2 SCI metric summaries for Halls Branch Sample A (top) and Sample B (bottom)

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	17.00	0.83	0.83
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	27.52	6.24	6.24
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	32.89	6.22	6.22
% Tanytarsini	17.45	8.57	8.57
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	4.03	7.71	7.71

SCI Sum	38.72
Final SCI score	43.02

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	22.00	2.92	2.92
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	26.67	6.04	6.04
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	28.67	7.07	7.07
% Tanytarsini	22.67	9.31	9.31
Total Sensitive Taxa	2.00	2.86	2.86
% Very Tolerant Individuals	3.33	8.08	8.08

SCI Sum	50.84
Final SCI score	56.49

Table 3 SCI full results for Sample A

Stream Condition Index Results for Halls Branch SCIA																				
Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundanc e	Collapse d	Taxa Presence	Ephemeropt era	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	3	3	1	0	0	0	0	0	0		0	0	3	
Mollusca		Gastropoda	Heterobranchia	Hydrophila	Physidae	<i>Physa</i> spp.	2		0	0	0	0	0	0	0		0	0	0	Damaged and/or
Mollusca		Gastropoda	Heterobranchia	Hydrophila	Physidae	<i>Physa acuta</i>	1	3	1	0	0	0	0	0	0		0	0	3	
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	<i>Musciculum</i> spp.	1	1	1	0	0	0	0	1	0	0	0	0	0	
Arthropoda	Crustacea	Malacostrac	Eumalacostraca	Amphipoda	Dogielinotidae	<i>Hyalella azteca</i> sp.complex	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	<i>Labobaetis propinquus</i>	5	5	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Calopterygidae	<i>Calopteryx</i> spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsychidae</i> spp.	3		0	0	0	0	0	0	0		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	9	12	1	0	1	0	12	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Microcyllopus</i> spp.	49	49	1	0	0	0	0	0	0		0	0	0	39 larvae, 10 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Gyrinidae	<i>Dineutus</i> spp.	1	1	1	0	0	0	0	0	0		0	0	0	1 larva
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium halterale</i> group	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium scabenum</i> group	2	2	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium flavum</i>	36	36	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	26	26	1	0	0	0	26	1	0		26	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella xena</i>	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	<i>Atrichopogon</i> spp.	3	3	1	0	0	0	0	0	0		0	0	0	3 larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	2	2	1	0	0	0	2	1	0		0	1	0	2 larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera	Velidae	<i>Rhagovelia choreutes</i>	2	2	1	0	0	0	0	0	0		0	0	0	1 female, 1 male

Table 4 SCI full results for Sample B

Stream Condition Index Results for Halls Branch SCIB																				
Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	2	2	1	0	0	0	0	0	0	0	0	0	0	Damaged and/or immature
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	1	1	1	0	0	0	0	0	0	0	0	0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	<i>Caenis diminuta</i>	1	1	1	1	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	<i>Labioaetis propinquus</i>	6	6	1	1	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	1	1	1	1	0	0	0	0	1	0	0	1	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Gomphidae	Gomphidae spp.	2	2	1	0	0	0	0	0	0	0	0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	<i>Argia sedula</i>	1	1	1	0	0	0	0	0	0	0	0	0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	5	5	1	0	1	0	5	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Dubirapha</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	2	2	1	0	0	0	0	0	1	0	0	0	0	2 larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Microscylopus</i> spp.	40	40	1	0	0	0	0	0	0	0	0	0	0	32 larvae, 8 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Scirtidae	<i>Scirtes</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	1 larva
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	3	3	0	0	0	0	0	0	0	0	0	0	0	3 pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	1	1	1	0	0	1	0	0	0	0	0	1	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cryptochironomus</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium halterale</i> group	4	4	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium flavum</i>	41	43	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	32	33	1	0	0	0	33	1	0	0	33	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Stenochironomus</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Paracladopelma</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium beckae</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	1	1	1	0	0	0	1	1	0	0	0	1	0	1 larva
Arthropoda	Hexapoda	Insecta	Pterygota	Lepidoptera	Crambidae	<i>Langessa nomophilalis</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1 Reference collection

Water Quality Assessment

Long-term water quality data is available for Halls Branch. The data that is available was collected by the Hillsborough County Environmental Protection Commission (2005- 2020) and Florida Department of Environmental Protection (2000-2020). The 2019 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 Halls Branch Physical Water Quality (Field)

Halls Branch								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
2/13/20	0.1	22.1	7.4	7.47	84.8	217	0.1	1.2
Mean POR		21.3	7.18	6.73	73.7	281	0.13	0.3

The chemical water quality analysis for Halls Branch is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean and the previous 3-year geometric mean values for Total Phosphorous values exceeded the nutrient region threshold developed by FDEP of 0.49 mg/L with a mean value of 0.543 mg/L (2000-2020), but below the threshold for the three year geometric mean value for Total Phosphorous with 0.455 mg/L. Total Phosphorous values for the sample from this assessment were 0.400 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 1.438 mg/L for the period of record (2000-2020). The three year geometric mean value for Total Nitrogen was 1.030 mg/L. The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.982 mg/L. Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for the period of record (3.37 µg/l 2000-2020), and the most recent 3-years of samples (4.69 µg/l) . For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora. Elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 1,156 colonies/100 ml (including the extremely elevated sample with this assessment at 22,400/100ml) and 3,057/100 ml for Enterococci.

Table 6 Halls Branch Water Quality (Laboratory)

Parameter	Halls Branch	POR Mean	Units
Alkalinity	101	48.96	mg/LCaCO ₃
Color(345)F.45	80	64.8	Pt/Co
E. Coli	22,400	1,156	#/100 ml
Enterococci	1,100	3,057	#/100 ml
Chlorophyll a	3.5	4.07	ug/L
Chlorophyll b	<1	1.05	ug/L
Chlorophyll c	<1	0.5	ug/L
Chlorophyll t	3.5		ug/L
Chlorophylla Corr	2.3	3.37	ug/L
Chlorophyll-pheo	1.9		ug/L
Ammonia	0.053	0.043	mg/L
Kjeldahl Nitrogen	0.820	0.925	mg/L
Total Nitrogen	0.982	1.438	mg/L
Nitrates/Nitrites	0.162	0.398	mg/L
Total Phosphorus	0.400	0.543	mg/L

Conclusion

Halls Branch at Virgil Hall Rd is located in a predominantly agricultural land use 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 91. Less than 2 square meters of herbaceous aquatic vegetation was observed during the Linear Vegetation Survey. Halls Branch did meet standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6. The historical water quality record for Halls Branch showed elevated concentrations of Total Phosphorous and Total Nitrogen in the long term dataset however, both nutrients are below the Numeric Nutrient Criteria threshold for the most recent 3-year period. 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		Halls Branch	3-Year Mean	Threshold
Total Phosphorous (mg/l)		0.400	0.455	< 0.49
Total Nitrogen (mg/l)		0.982	1.030	< 1.65
RPS (% Rank 4-6)		0%		< 25%
LVS	Avg C of C	<2m ²		≥ 2.5
	FLEPPC %	<2m ²		< 25%
Chlorophyll (µg/l)		2.3	4.69	< 20 µg/l
Habitat Assessment		91		> 39
SCI		50		> 34