Halls Branch Creek

Methods

Study Area Analysis

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/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, Fecal Coliform, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen.

Study Area

Halls Branch Creek is a small stream with its headwaters located southeast of Virgil Hall Road and outfalls to the South Prong Alafia River in Hillsborough County Florida. The sample site selected for the study was located immediately upstream of the Virgil Hall Road and was assessed on May 4, 2017. Halls Branch Creek is located in FDEP WBID 1684 which contains 1,049 acres of land. The watershed surrounding Halls Branch Creek is dominated by Natural Land/Open Water (15.9%), Residential (15.0%) and Agricultural (11.7%) land uses. The Landscape Development Intensity Index of the watershed is 5.63. The 100 meter buffer immediately surrounding the stream had a Landscape Development Intensity Index of 3.76 with Reclaimed Lands (32.9%) being the dominant land use.

Figure 1. 2017 Halls Branch Creek at Virgil Hall Road Assessment Study Area Map

Habitat Assessment

Figure 2 Overview photograph of the Halls Branch Creek sample site

Halls Branch Creek at Virgil Hall Road received a Habitat Assessment score of 101 due to Optimal scores for Artificial Channelization and Bank Stability. Suboptimal scores were recorded for Water Velocity, Riparian Buffer Zone Width and Riparian Zone Vegetation Quality. Marginal scores were achieved for Substrate Diversity, Substrate Availability and Habitat Smothering.

The major productive habitats found at the sample site were Snags (4.1%) and Roots/Undercut Banks (7.0%). The water velocity was measured at the 20 meter mark and averaged 0.18m/s. Sand Smothering was observed on the snags and root habitats.

During the Rapid Periphyton Survey, periphyton was not observed in the 99 individual grab samples performed. The average canopy cover in the 100 meter region was 86%. The Secchi Disk Depth was measured as 1.2m at the 50 meter mark. The average water depth at the time of the assessment was .25m.

The Linear Vegetation Survey identified 8 species rooted in the water at the time of the assessment. One of these species are classified as non-native, invasive species. The remaining 6 species are native to this region. The vegetation community along this sample location showed little evidence of frequent disturbance. There were a total of 31 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 2.99 and the % FLEPPC metric for the study area was 32%.

Table 1 Linear Vegetation Survey Results – Halls Branch

Plant Species	Sample Site										Obsevations/ Species	CoC
	0-10m	10-20m	20-30m	30-40m	40-50m	50-60m	60-70m	70-80m	80-90m	90-100m		
Acer rubrum							1				1	4.65
Cicuta maculata	1								1	1	3	4.54
Hydrocotyle umbellata							1		1	1	3	1.92
Ludwigia peruviana	1	1	1	1	1	1	1	1	1	1	10	0
Orontium aquaticum						1					1	8.39
Polygonum hydropiperoides	1										1	2.5
Sambucus nigra	1				1		1		1		4	1.48
Saururus cernuus	1		1	1	1	1	1		1	1	8	6.5
Observations/station	5	1	2	2	3	3	5	1	5	4	31	

Total Observations	31
Mean CoC	2.99
% FLEPPC	32%

Figure 3. ***The Halls Branch Creek sampling site was difficult to access due to dense growth of vegetation along its banks***

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 Creek was 42 out of a possible 100 points, corresponding with a "Healthy" designation, with the expected community of a healthy stream.

The summary of the metric scores for aliquot A (top) and aliquot B (bottom) are shown in Table 2. Both samples were dominated by *Microcylloepus spp.* Sample A contained 28 total taxa, including 3 sensitive taxa and 6.85% very tolerant individuals. Sample B contained 22 total taxa, including 1 sensitive taxa and 8.84% very tolerant individuals. Sample B also contained a long-lived taxa *Corbicula spp.*

Table 2 SCI metric summaries for Halls Branch Creek

	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	28.00	5.42	5.42
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	3.00	4.29	4.29
% Filter Feeders	20.21	4.54	4.54
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	34.93	5.81	5.81
% Tanytarsini	1.37	2.54	2.54
Total Sensitive Taxa	3.00	4.29	4.29
% Very Tolerant Individuals	6.85	6.60	6.60

SCI Sum	42.62
Final SCI score	47.35

	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	22.00	2.92	2.92
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	12.93	2.84	2.84
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	51.02	2.60	2.60
% Tanytarsini	2.72	3.86	3.86
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	8.84	6.03	6.03

SCI Sum	32.16
Final SCI score	35.73

The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Halls Branch Creek.

Halls Branch SCIA
Stream Condition Index (SCI)
Samples Collected 05/04/2017
Project #: 6063170278

Stream Condition Index Results for Halls Branch SCIA

Table 3 SCI full results for Sample A

Phylum	Class	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
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	*Prostoma* spp.	3	3	1										3
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	3	3	1										
Annelida	Clitellata	Tubificida	Naididae	*Dero trifida*	2	2	1										2
Annelida	Clitellata	Tubificida	Naididae	*Allonais inaequalis*	1	1	1										
Mollusca	Gastropoda			Gastropoda spp.	2												
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	3	4	1										
Mollusca	Gastropoda	Hygrophila	Physidae	Physidae spp.	3	4	1										
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	3	3	1				3						
Arthropoda	Insecta	Ephemeroptera	Baetidae	*Pseudocloeon ephippiatum*	1	1	1	1									
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	2	2	1										
Arthropoda	Insecta	Trichoptera	Leptoceridae	Leptoceridae spp.	1												
Arthropoda	Insecta	Trichoptera	Leptoceridae	*Oecetis avara*	2	3	1		1								
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	19	19	1		1		19	1					
Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Neotrichia* spp.	2	2	1		1			1					
Arthropoda	Insecta	Coleoptera	Elmidae	Elmidae spp.	3												
Arthropoda	Insecta	Coleoptera	Elmidae	*Stenelmis* spp.	1	1	1					1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Microcylloepus* spp.	48	51	1							51			
Arthropoda	Insecta	Coleoptera	Hydrophilidae	*Crenitulus suturalis*	2	2	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus* spp.	1	1	1			0.5					1		
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum scalaenum* group	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	24	24	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	1	1	1				1	1			1		
Arthropoda	Insecta	Diptera	Chironomidae	*Pentaneura inconspicua*	3	3	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Corynoneura* spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Rheocricotopus* spp.	1	1	1									1	
Arthropoda	Insecta	Diptera	Ceratopogonidae	Ceratopogonidae spp.	1	1	1										
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	2	2	1										
Arthropoda	Insecta	Diptera	Simuliidae	*Simulium* spp.	1	1	1				1	1				1	
Arthropoda	Insecta	Diptera	Empididae	*Hemerodromia* spp.	3	3	1									1	
Arthropoda	Insecta	Lepidoptera	Crambidae	*Neargyractis slossonalis*	5	5	1				5						5

Halls Branch SCIB
Stream Condition Index (SCI)
Samples Collected 05/08/2017
Project #: 6063170278

Stream Condition Index Results for Halls Branch SCIB

Phylum	Class	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
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	1	1	1										
Annelida	Clitellata	Tubificida	Naididae	*Dero trifida*	3	3	1										3
Annelida	Clitellata	Tubificida	Naididae	*Slavina appendiculata*	1	1	1										
Annelida	Clitellata	Enchytraeida	Enchytraeidae	Enchytraeidae spp.	3	3	1										
Mollusca	Gastropoda	Hygrophila	Physidae	*Physella cubensis*	3	3	1										3
Mollusca	Bivalvia	Veneroida	Corbiculidae	*Corbicula* spp.	2	2	1				2		1				
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	3	3	1				3						
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	1	1	1	1									
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	3												
Arthropoda	Insecta	Odonata	Coenagrionidae	*Argia* spp.	1	4	1										
Arthropoda	Insecta	Trichoptera	Leptoceridae	Leptoceridae spp.	1												
Arthropoda	Insecta	Trichoptera	Leptoceridae	*Oecetis* spp.	3	4	1		1								
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	10	10	1		1		10	1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Stenelmis* spp.	1	1	1					1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Microcylloepus* spp.	75	75	1							75			
Arthropoda	Insecta	Coleoptera	Gyrinidae	*Dineutus* spp.	2	2	1										
Arthropoda	Insecta	Diptera		Diptera spp.	2												
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	15	16	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	4	4	1				4	1			4		
Arthropoda	Insecta	Diptera	Chironomidae	*Pentaneura inconspicua*	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Corynoneura* spp.	2	2	1										
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	1	1	1										
Arthropoda	Insecta	Diptera	Empididae	*Hemerodromia* spp.	2	2	1									1	
Arthropoda	Insecta	Lepidoptera	Crambidae	*Petrophila santafealis*	6	7	1										7

Table 4 SCI full results for Sample B

Water Quality Assessment

Limited long-term water quality data is available for this tributary to the South Prong Alafia River. The data that is available was collected by the Hillsborough County Environmental Protection Commission, Florida Department of Environmental Protection and Florida Department of Environmental Protection. Values for the physical water parameters begin as early as 2000 and continue through present for some parameters. Values for the laboratory water parameters begin in 2005 but end in 2012, aside from the sample taken along with this assessment. The FDEP data is limited to 2013. The 2017 USF Water Institute Assessment fall within the range of the previous data collections with most values below the mean period of record values. It should be noted that the USF Water Institute Assessment occurred near the end of dry season when runoff is minimal. Table 5 provides a summary of the Physical/Chemical conditions recorded at the site.

Table 5 Halls Branch Creek Physical Water Quality (Field)

Halls Branch Creek at Virgil Hall Road								
Date	**Depth (m)**	**T (ºC)**	**pH**	**DO mg/L**	**DO Sat %**	**Cond. (UMHO/cm)**	**Salinity (ppt)**	**Secchi Depth (m)**
5/4/2017	0.12	22.52	8.32	7.31	83.6	299.2	0.14	0.6 Visible on Bottom
Mean POR		21.54	7.11	6.72	68.5	297.2	0.14	

The chemical water quality analysis for Halls Branch Creek is shown in Table 6 along with mean values for the period of record for available parameters. Total Phosphorous values were above the nutrient region threshold developed by FDEP of 0.49 mg/l for the mean value of the period of record (2005 – 2013) however, the sample corresponding to this assessment was below the threshold. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/l for both the sample from this assessment and period of record (2005-2013) values. Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for the most recent sample and the period of record (2005-2013). For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora. The results of sampling during the dry season can be seen in the significant variation of the Color parameter.

Table 6 Halls Branch Creek Water Quality (Laboratory)

Parameter	Virgil Hall Rd	POR Mean Value	Units
Alkalinity	122.0	46.5	mg/LCaCO3
Nitrates/Nitrites	0.257		mg/L
Fecal Coliform	1,360	1,923	#/100 ml
Enterococci	3,600	4,620	#/100 ml
Chlorophyll a	2.5	5.53	ug/L
Chlorophyll b	2.6	1.31	ug/L
Chlorophyll c	0.7	0.57	ug/L
Chlorophyll t	3.8		ug/L
Chlorophylla Corr	3.4	3.98	ug/L
Chlorophyll-pheo	6.6		ug/L
Ammonia	0.049	0.062	mg/L
Kjeldahl Nitrogen	0.633	1.023	mg/L
Total Nitrogen	0.890	1.648	mg/L
Total Phosphorus	0.329	0.639	mg/L
Color(345)F.45	45.5	69.7	Pt/Co

Conclusion

The region of Halls Branch Creek that was assessed during this study shows impairment based on Total Phosphorous concentrations for the period of record. Elevated values were observed in the bacteria sampling potentially indicating a stressed and potentially contaminated system. The system does not show impairment in the vegetation communities through the linear vegetation survey results with an acceptable percentage of non-native invasive species. The habitat assessment performed on the sample site shows adequate conditions for macroinvertebrates with a Habitat Assessment score of 101. The results of the SCI sampling indicate a healthy system. Table 7 Summarizes the water quality, floristic surveys, habitat assessment and SCI.

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

Measure		Virgil Hall Rd	POR Mean	Threshold
Total Phosphorous (mg/l)		0.329	0.639	< 0.49
Total Nitrogen (mg/l)		0.89	1.648	< 1.65
RPS (% Rank 4-6)		0		< 25%
LVS	Avg C of C	2.99		≥ 2.5
	FLEPPC %	32.00%		< 25%
Chlorophyll (µg/l)		3.4	3.98	< 20 µg/l
Habitat Assessment		101		> 34
Stream Condition Index		42		> 34