Little Alafia River below Medard Reservoir

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

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

The Little Alafia River is located in the town of Lithia, Hillsborough County Florida and was sampled below the railroad tracks off of Lithia Pinecrest Road on 3/27/2017. The sample site lies below the Medard reservoir and is contained within the FDEP WBID 1592. The watershed surrounding the Little Alafia is dominated by Field/Pasture (25.30%), Residential (16.30%), Agricultural (12.0%), and Forest/Natural (9.50%) land use. The Landscape Development Intensity Index of the watershed is 5.01. The Landscape Development Index of the 100 meters surrounding the Little Alafia River in WBID 1592 was 1.82 with the majority of land use being comprised of Natural land (79.2%) and Agricultural (12.7%).

Figure 1. 2017 Little Alafia River Assessment Study Area Map

Habitat Assessment

Little Alafia River below Medard Reservoir

Figure 2 Overview photograph of Little Alafia River below Medard Reservoir sample site

Little Alafia received a Habitat Assessment score of 103. Primary habitat components received marginal scores for Substrate Diversity and Substrate Diversity, due to the presence of only two major productive habitats (8.68% Snags, 1.1% Leaf Packs/Mats), and received suboptimal scores for water Velocity and Habitat Smothering. Secondary habitat components received optimal for Artificial Channelization, Bank Stability (right bank), and Riparian Buffer Zone Width (left bank), and received suboptimal scores for Bank Stability (left bank) and Riparian Buffer Zone Width (right bank). Riparian Zone Vegetation Quality scored in the suboptimal range.

During the Rapid Periphyton Survey, periphyton was observed in 5 of the 99 individual grab samples performed. Three of these five points ranked 4-6 in algal mat thickness and were located between the 40-50 meter marks. The average canopy cover in the 100 meter region was 85.82%. The Secchi Disk Depth was measured as 1.5 meters visible on bottom at the 50 meter mark. The average water depth at the time of the assessment was 0.4 meters.

The Linear Vegetation Survey identified 4 species rooted in the water at the time of the assessment. Three of these species are non-native, invasive species shown in bold in Table 1. The remaining species is native to this region. None of the Macrophytes were observed to be dominant or co-dominant in the Linear Vegetation Survey, and the vegetation community along this sample location did not show evidence of frequent disturbance. There were a total of 5 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 1.852 and the % FLEPPC metric for the study area was 20%. The FDEP sets thresholds of > 2.5 for Mean CoC and < 25% for % FLEPPC.

Table 1 Linear Vegetation Survey Results – Little Alafia below Medard Reservoir

Plant Species	C of C Score	Sample Site										
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Observations / Species
Boehmeria cylindrica	5						1					1
Commelina diffusa	2.02	1	1									2
Echinochloa crusgalli	0.22						1					1
Pistia stratiotes	0				1							1
Total Observations/ Station		1	1	0	1	0	2	0	0	0	0	5
Total Observations	5											
Mean CoC	1.852											
% FLEPPC	20%											

Figure 3. Overview of Little Alafia River below Medard Reservoir showing typical shoreline vegetation

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 Little Alafia River below Medard Reservoir was 26 out of a possible 100 points, corresponding with an "Impaired" designation, with disruption to 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 *Hyalella azteca* sp. complex Sample A contained 23 total taxa, including no sensitive taxa and 28.38% very tolerant individuals. Sample B contained 22 total taxa, including no sensitive taxa and 32.24% very tolerant individuals. Both samples contained no long-lived taxa.

Table 2 SCI metric summaries for Little Alafia River below Medard Reservoir

	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	23.00	3.33	3.33
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	8.11	1.72	1.72
Total Clingers	2.00	2.86	2.86
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	37.84	5.23	5.23
% Tanytarsini	4.73	5.13	5.13
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	28.38	3.30	3.30

SCI Sum	24.44
Final SCI score	27.15

	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	22.00	2.92	2.92
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	5.92	1.21	1.21
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	40.79	4.64	4.64
% Tanytarsini	3.29	4.28	4.28
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	32.24	2.99	2.99

SCI Sum	21.76
Final SCI score	24.18

The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Little Alafia River below Medard Reservoir.

Little Alafia SCIA
Stream Condition Index (SCI)
Samples Collected 03/27/2017
Project #: 6063170278

Stream Condition Index Results for Little Alafia SCIA

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
Platyhelminthes				Platyhelminthes spp.	1	1	1										
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	4	4	1										
Annelida	Clitellata	Tubificida	Naididae	*Nais pardalis*	10	10	1										10
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	Glossiphoniidae spp.	7	7	1										7
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis*	2	2	1										2
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	8	8	1										
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	5	5	1										
Mollusca	Gastropoda		Thiaridae	*Melanoides tuberculata*	12	12	1										12
Arthropoda	Malacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	56	56	1							56			
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	6	6	1		1		6	1					
Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Oxyethira* spp.	1	1	1		1								
Arthropoda	Insecta	Diptera	Chironomidae	*Chironomus* spp.	1	1	1										1
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus* spp.	3	3	1			1.5					3		
Arthropoda	Insecta	Diptera	Chironomidae	*Cryptochironomus* spp.	1	1	1										1
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum scalaenum* group	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	9	9	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum illinoense* group	7	7	1										7
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	4	4	1				4	1			4		
Arthropoda	Insecta	Diptera	Chironomidae	*Dicrotendipes* spp.	1	1	1			0.5							
Arthropoda	Insecta	Diptera	Chironomidae	*Paracladopelma* spp.	2	2	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Corynoneura* spp.	2	2	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum beckae*	2	2	1										2
Arthropoda	Insecta	Diptera	Ceratopogonidae	*Atrichopogon* spp.	3	3	1										

Table 3 SCI full results for Sample A

Little Alafia SCIB
Stream Condition Index (SCI)
Samples Collected 03/27/2017
Project #: 6063170278

Stream Condition Index Results for Little Alafia 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.	5												
Annelida	Clitellata	Tubificida	Naididae	*Limnodrilus hoffmeisteri*	1	6	1										6
Annelida	Clitellata	Tubificida	Naididae	*Nais pardalis*	9	9	1										9
Annelida	Clitellata	Tubificida	Naididae	*Nais pseudobtusa*	1	1	1										
Annelida	Clitellata	Arhynchobdellida	Erpobdellidae	*Erpobdella tetragon*	1	1	1										
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	Glossiphoniidae spp.	7	7	1										7
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis*	10	10	1										10
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	9	9	1										
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	4	4	1										
Mollusca	Gastropoda		Thiaridae	*Melanoides tuberculata*	12	12	1										12
Arthropoda	Malacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	62	62	1							62			
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	5	5	1		1		5	1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Stenelmis* spp.	1	1	1					1					
Arthropoda	Insecta	Coleoptera	Dryopidae	Dryopidae spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus* spp.	2	2	1			1					2		
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum scalaenum* group	2	2	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	8	8	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum illinoense* group	1	1	1										1
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	3	3	1				3	1			3		
Arthropoda	Insecta	Diptera	Chironomidae	*Glyptotendipes* spp.	3	3	1										3
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum beckae*	1	1	1										1
Arthropoda	Insecta	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	1	1	1										
Arthropoda	Insecta	Diptera	Ceratopogonidae	*Atrichopogon* spp.	3	3	1										

Table 4 SCI full results for Sample B

Water Quality Assessment

Limited long-term water quality data is available for Little Alafia River below Medard Reservoir. The data that is available was collected by the Hillsborough County Environmental Protection Commission, Florida Department of Environmental Protection and US Geological Survey. Values for the physical water parameters begin as early as 1967 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 2017 USF Water Institute Assessment fall within the range of the previous data collections with most values below the mean period of record values. This is partially due to the USF Water Institute Assessment occurring 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 Little Alafia Physical Water Quality (Field)

Depth (m)	Temp (c)	pH	DO (mg/L)	DO (% Sat)	Cond (umho/cm)	Salinity (ppt)	TDS (mg/L)	Secchi Depth (m)	Sample Site
0.69	20.43	9.16	2.98	32.8	435.1	0.21	278.5		Below Medard
	23.28	7.56	7.14	80.9	311.4	0.16	176.6	0.51	Mean POR

The chemical water quality analysis for Little Alafia is shown in Table 6 along with period of record mean values for the past three years for available parameters. Total Phosphorous values were above the nutrient region threshold developed by FDEP of 0.49 mg/l. Total Nitrogen values were also above the nutrient region threshold developed by FDEP of 1.65 mg/l. Chlorophyll-a values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l. For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora

Table 6 Little Alafia Below Medard Laboratory Water Quality

Parameter	Trestle	POR Mean Value	Units
Alkalinity	241.0	108.3	mg/LCaCO3
Nitrates/Nitrites	0.278		mg/L
Fecal Coliform	287	1,872	#/100 ml
Enterococci	1,260	2,281	#/100 ml
Chlorophyll a	5.8	42.8	ug/L
Chlorophyll b	2.6	2.3	ug/L
Chlorophyll c	0.8	2.2	ug/L
Chlorophyll t	7.5		ug/L
Chlorophylla Corr	3.4	28.4	ug/L
Chlorophyll-pheo	6.6		ug/L
Ammonia	0.897	0.375	mg/L
Kjeldahl Nitrogen	1.812	1.664	mg/L
Total Nitrogen	2.090	3.068	mg/L
Total Phosphorus	0.441	1.114	mg/L
Color(345)F.45	10.4	41.0	Pt/Co

Conclusion

The Little Alafia River below Medard Reservoir region that was assessed during this study shows impairment based on water quality. The system also shows impairment in the vegetation communities through the linear vegetation survey results average Coefficient of Conservatism metric being below 2.5. The habitat assessment performed on the sample site shows habitat is sufficient for biotic use with a score in the optimal range. The SCI values for the assessment indicates an impaired stream 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		Trestle	Mean POR	Threshold
Total Phosphorous (mg/l)		0.441	1.114	< 0.49
Total Nitrogen (mg/l)		2.09	3.068	< 1.65
RPS (% Rank 4-6)		3%		< 25%
LVS	Avg C of C	1.852		≥ 2.5
	FLEPPC %	20.00%		< 25%
Chlorophyll (µg/l)		3.4	28.4	< 20 µg/l
Habitat Assessment		103		> 34
SCI		26		> 34