



Bellows Lake Outlet (East Lake Outlet)

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

David Eilers | USF Water Institute | January 9, 2019

Methods

STUDY AREA ANALYSIS

The watershed containing Bellows Lake Outlet was analyzed using ESRI ArcGIS 10.6. Using this software with 2017 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/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

Bellows Lake Outlet is located in central Hillsborough County south of Interstate 4 and West of Interstate 75. Its headwaters are located on the eastern shoreline of Bellows Lake and the outfall of Bellows Lake Outlet is in the Tampa Bypass Canal. The assessment of Bellows Lake Outfall was conducted on January 9, 2019. At the time of the assessment, the water levels were near seasonal low. The Bellows Lake Outlet WBID covers 1.82 square miles and is dominated residential (32.9%), commercial (18.3%), industrial (11.2%) and transportation (7.5%). The resulting calculated landscape development intensity index score was 3.87.

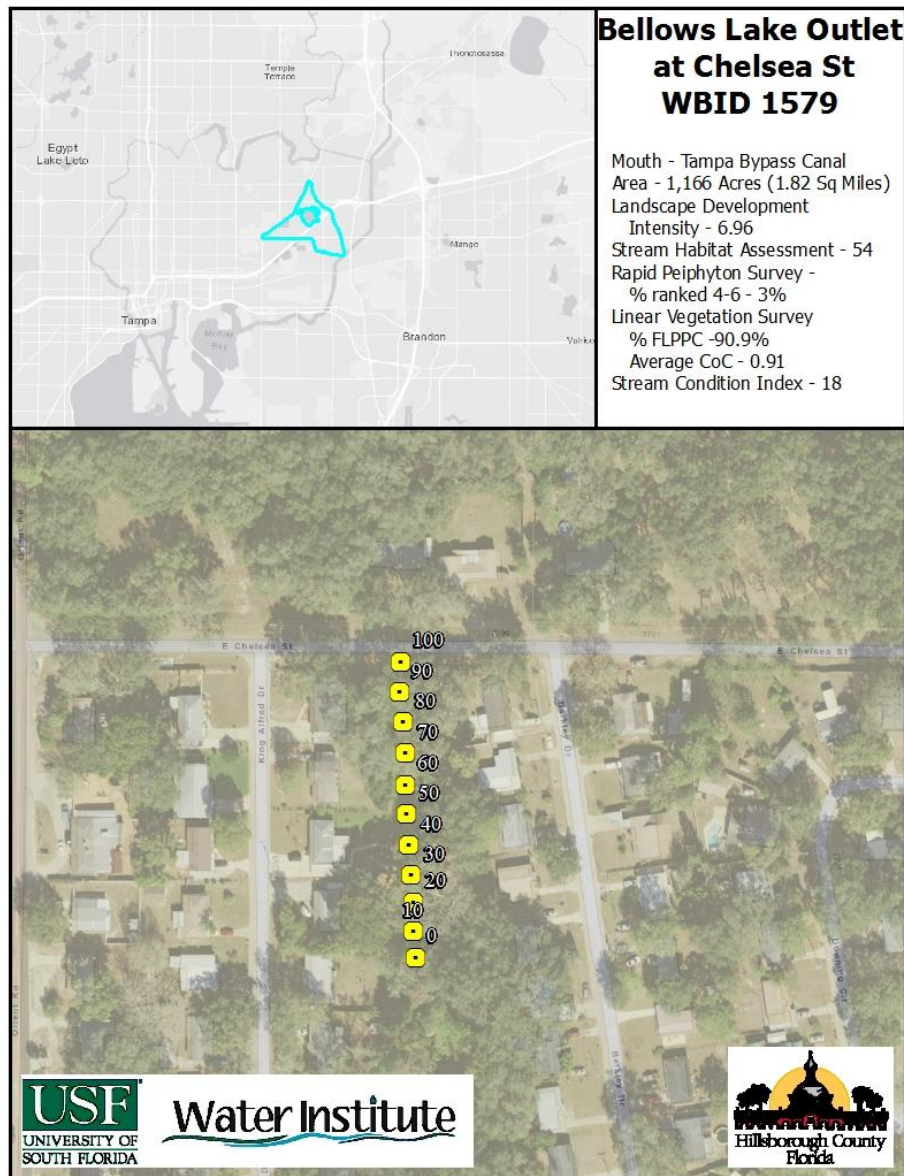


Figure 1 2019 Bellows Lake Outlet Study Area Map

Habitat and Vegetation Assessment



Figure 2 Overview photograph of Bellows Lake Outlet at Chelsea St Sample Site

The region of Bellows Lake Outlet where the assessment was conducted is in a dominant residential area. The region was moderately shaded with a mean canopy cover measurement of 75.4%. Bellows Lake Outlet averaged 0.20 meters in depth, approximately 3.25 meters wide with a flow of 0.25 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 Water Velocity. Substrate Diversity and Substrate Availability scored in the marginal category due to two major productive habitat (Snags and Rock) comprising 10.8% of the stream area. Habitat Smothering scored in the Poor category due to insufficient pools and sand smothering all habitats. Minor habitats included aquatic leaf mats, silt and sand. The total score for the primary habitat components was a 31 out of 80.

The secondary habitat components of the FDEP Habitat Assessment focus on the surrounding features of the stream. Bellows Lake Outlet flows through a residential area surrounded by commercial and industrial area. In this region, Bellows Lake Outlet has been heavily modified and straightened. The secondary habitat components scored in the suboptimal category for Bank Stability primarily due to the constructed nature of its banks. Artificial

Channelization, Riparian Buffer Width and Riparian Zone Vegetation Quality all scored in the poor category. The riparian buffer zone surrounding the stream was less than 5 meters on both banks and consisted of non-native species. The secondary habitat components received a score of 23 out of 80. The resulting FDEP Habitat Assessment score was a 54 which is at the lower extent of the marginal classification.

Periphyton was encountered in the upper extent of the assessment (from meter 90-100) resulting in 3 of the 99 samples taken during the Rapid Periphyton Survey being classified as rank 4-6. This occurred primarily on the concrete riprap immediately downstream from the culvert under Chelsea St. The tree canopy in the assessment area averaged 75.4% limiting available sunlight.

The FDEP Linear Vegetation Survey encountered nine herbaceous species in Bellows Lake Outlet. The majority are non-native invasive species. Only *Urochola mutica* was observed in high density (greater than 1 m² in a 10m region).

Table 1 Linear Vegetation Survey Results – Bellows Lake Outlet

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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 Bellows Lake Outlet was 18 out of a possible 100 points, corresponding with a “Impaired” designation, lacking the expected community of a healthy stream.

High scores were achieved for the % Dominance metric in both subsamples. Neither subsamples contained a sensitive taxa, Ephemeroptera or Trichoptera. A single long-lived taxa *Pomacea paludosa* (Florida Apple Snail) was observed in subsample B. This is likely indicating that the system is ephemeral or has had extreme pollution events recently. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Bellows Lake Outlet

Table 2 SCI metric summaries for Bellows Lake Outlet Subsample A (top) and Subsample B (bottom)

SCI Metric		Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa		19.00	1.67	1.67
Total Ephemeroptera		0.00	0.00	0.00
Total Trichoptera		0.00	0.00	0.00
% Filter Feeders		1.30	0.14	0.14
Total Clingers		1.00	1.43	1.43
Total Long-lived Taxa		0.00	0.00	0.00
% Dominance		20.13	8.77	8.77
% Tanytarsini		0.65	1.47	1.47
Total Sensitive Taxa		0.00	0.00	0.00
% Very Tolerant Individuals		65.58	1.25	1.25
SCI Sum	14.73			
Final SCI score	16.37			

SCI Metric		Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa		20.00	2.08	2.08
Total Ephemeroptera		0.00	0.00	0.00
Total Trichoptera		0.00	0.00	0.00
% Filter Feeders		1.56	0.20	0.20
Total Clingers		1.00	1.43	1.43
Total Long-lived Taxa		1.00	3.33	3.33
% Dominance		24.38	7.93	7.93
% Tanytarsini		0.63	1.43	1.43
Total Sensitive Taxa		0.00	0.00	0.00
% Very Tolerant Individuals		80.00	0.76	0.76
SCI Sum	17.16			
Final SCI score	19.07			

Table 3 SCI full results for Sample A

[illegible]

Table 4 SCI full results for Sample B

Stream Condition Index Results for Lake Bellows Outlet 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
Platyhelminthes		Citellata	Oligochaeta	Tubificida	Naididae	Platyhelminthes spp.	2	2	1	0	0	0	0	0	0	0	0	0	0	
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1	1	0	0	0	0	0	0	0	0	0	0	0	0 Damaged and/or immature
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Limnodrilus hoffmeisteri</i>	1	2	1	0	0	0	0	0	0	0	0	0	0	2
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	40	39	1	0	0	0	0	0	0	0	0	0	0	39
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Nais parvialis</i>	4	4	1	0	0	0	0	0	0	0	0	0	0	4
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Dero pectinaria</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Stylaria fossilaria</i>	4	4	1	0	0	0	0	0	0	0	0	0	0	4
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Ancylidae	Ancylidae spp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Ancylidae	<i>Hydrobia ulterius</i>	3	4	1	0	0	0	0	0	0	0	0	0	0	4 Damaged, immature
Mollusca		Gastropoda	Caenogastropoda	Ampullariidae	Pomacea	<i>Pomacea paludosa</i>	1	1	1	0	0	0	0	0	0	1	0	0	0	0
Mollusca		Bivalvia	Heterodonta	Sphaeriidae	Sphaeriidae	<i>Sphaeriidae</i> spp.	1	1	1	0	0	0	1	0	0	0	0	0	0	1 Damaged
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	<i>Hyalella azteca</i> sp. complex	19	19	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomidae</i> spp.	2	1	0	0	0	0	0	0	0	0	0	0	0	0 pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomus</i> spp.	9	9	1	0	0	0	0	0	0	0	0	0	0	9
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum limnense</i> group	13	13	1	0	0	0	0	0	0	0	0	0	0	13
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exigius</i> group	1	1	0	0	0	0	0	1	0	0	1	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Glyptotendipes</i> spp.	14	15	1	0	0	0	0	0	0	0	0	0	0	15
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	1	1	1	0	0	0.5	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Goeidichironomus</i> spp.	4	4	1	0	0	0	0	0	0	0	0	0	0	4 Not G. holoprasinus
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Goeidichironomus holoprasinus</i>	5	5	1	0	0	0	0	0	0	0	0	0	0	5
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum bedae</i>	29	29	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemannella</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parachironomus carinatus</i>	2	2	1	0	0	0	0	0	0	0	0	0	0	0

Water Quality Assessment

Long-term water quality data is available for Bellows Lake Outlet. The data that is available was collected by the Hillsborough County Environmental Protection Commission and the Florida Department of Environmental Protection. Values for the physical water parameters begin in 2004 and continue through present. Values for the laboratory water parameters begin in 2004 through present including the sample taken along with this assessment. Table 5 provides a summary of the Physical/Chemical conditions recorded at the site.

Table 5 Bellows Lake Outlet Physical Water Quality (Field)

Bellows Lake Outlet								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
1/9/2019	0.1	14.92	7.339	8.84	86	133.5	0.06	0.2 VOB
Mean POR		22.26	7.27	4.01	44.10	298.7		

The chemical water quality analysis for Bellows Lake Outlet is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a mean value of 0.127 mg/L (2004-2019). The three year geometric mean of Total Phosphorous was 0.118 mg/L. Total Nitrogen values were above the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 1.867 mg/L (2004-2019). The three year geometric mean of Total Nitrogen was 2.116 mg/L. Chlorophyll-a corrected values exceed the site specific evaluation range of 3.2 µg/l to 20 µg/l for the period of record (53.15 µg/l 2004-2019, 84.7 µg/l 2017-2019). The narrative nutrient standard at 62-302.531(2)(c) is not achieved. Elevated biomass of the bacterial parameters was observed in the long term dataset.

Table 6 Bellows Lake Outlet Water Quality (Laboratory)

Parameter	Bellows Lake Outlet	POR Mean	Units
Alkalinity	58.0		mg/LCaCO ₃
Nitrates/Nitrites	0.011	0.019	mg/L
E. Coli	5000	3881	#/100 ml
Enterococci	1700	2316	#/100 ml
Chlorophyll a	142.1	85.86	ug/L
Chlorophyll b	0.5	2.6	ug/L
Chlorophyll c	6.2	3.03	ug/L
Chlorophyll t	148.3	91.49	ug/L
Chlorophylla Corr	125.0	53.15	ug/L
Chlorophyll-pheo	19.6		ug/L
Ammonia	0.042	0.060	mg/L
Kjeldahl Nitrogen	1.439	1.830	mg/L
Total Nitrogen	1.440	1.867	mg/L
Total Phosphorus	0.062	0.127	mg/L
Color(345)F.45	16.1	29.75	Pt/Co

Conclusion

Bellows Lake Outlet is located in an urban area dominated by residential, industrial and commercial land uses. The stream itself was heavily altered in the region assessed. 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 an marginal score of 54. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Bellows Lake Outlet not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Bellows Lake Outlet did meet standards for the rapid periphyton survey with 3% of samples being ranked between 4 and 6. The historical water quality record for Bellows Lake Outlet showed acceptable concentrations of Total Phosphorous for 2017-2019, however the numeric nutrient criteria was exceeded for Total Nitrogen. Chlorophyll-a corrected values indicated that the system is impaired by nutrients. The results of the SCI sampling indicate that the stream is “impaired” 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		Bellows Lake Outlet 2017-2019	Mean POR	Threshold
Total Phosphorous (mg/l)		0.118	0.053	< 0.49
Total Nitrogen (mg/l)		2.116	1.088	< 1.65
RPS (% Rank 4-6)		3.00%		< 25%
LVS	Avg C of C	0.93		≥ 2.5
	FLEPPC %	90.70%		< 25%
Chlorophyll (µg/l)		84.7	3.45	< 20 µg/l
Habitat Assessment		54		> 34
SCI		18		> 34