



Moore Lake Drain

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

David Eilers, Stephanie Lawlor | USF Water Institute | March 15, 2019

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, 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

Moore Lake Drain is located in eastern Hillsborough County. Its headwaters are located in an unnamed swamp north of Martin Luther King Blvd and the outfall of Moore Lake Drain is in Pemberton Creek. The assessment of Moore Lake Drain was conducted on March 15, 2019. At the time of the assessment, the water levels were normal for the end of the dry season. The Moore Lake Drain WBID covers 2.53 square miles and is dominated by residential (32.4%), natural (32.2%) and agricultural (32.3%) land uses. The resulting calculated landscape development intensity index score was 4.26.

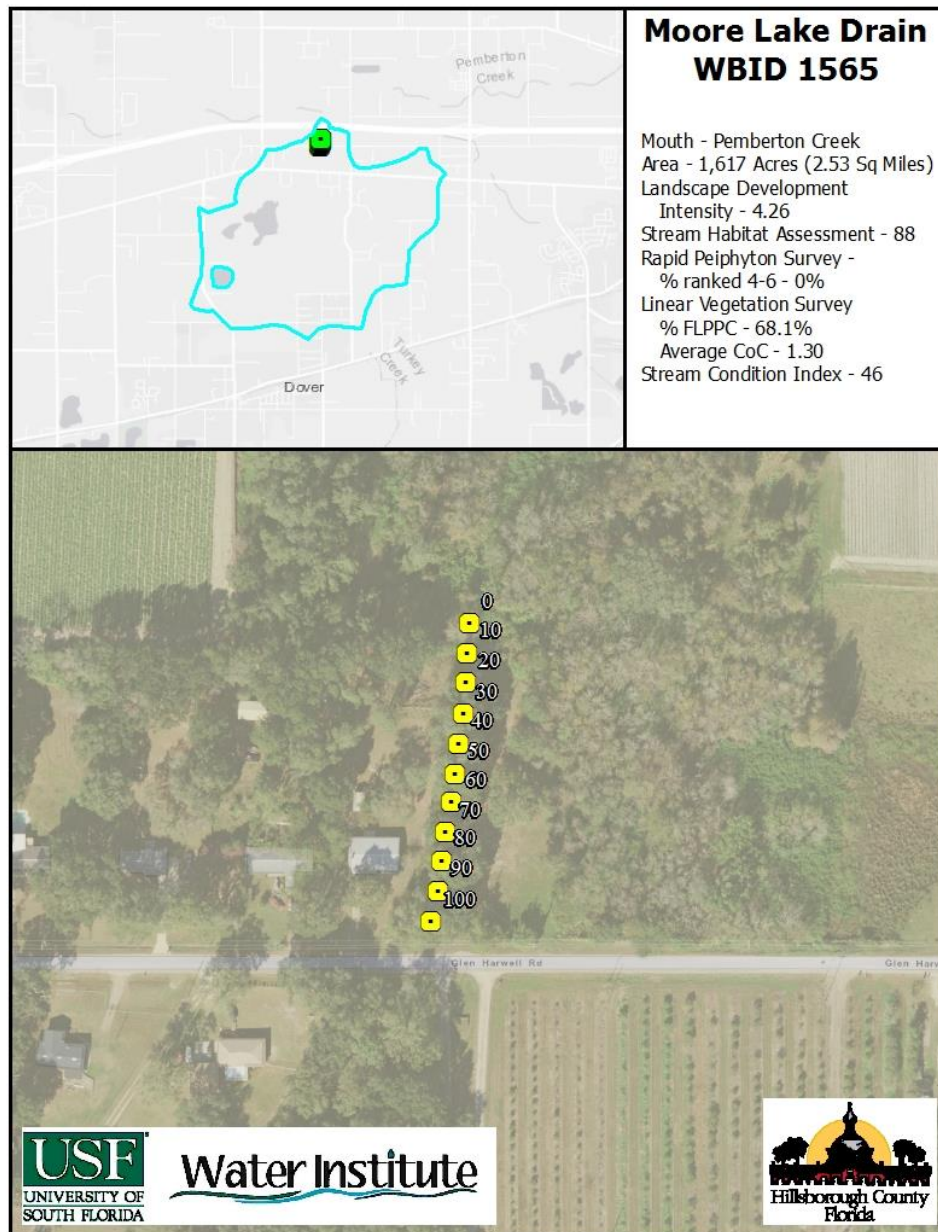


Figure 1 2019 Moore Lake Drain Study Area Map



Figure 2 Overview photograph of the Moore Lake Drain Sample Site

Habitat and Vegetation Assessment

The region of Moore Lake Drain where the assessment was conducted is in a dominant residential and agricultural area. The region was moderately shaded with a mean canopy cover measurement of 75.5%. Moore Lake Drain averaged 0.3 meters in depth, approximately 3.5 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 optimal category for Substrate Diversity (Presence of four major productive habitats (snags, roots, leaf and rocks)). Water Velocity and Habitat Smothering (some of the productive habitats were affected by sand smothering) scored in the suboptimal category. Substrate Availability (7.3% of stream are productive habitats) was

scored as marginal. Minor habitats included macrophytes, sand and silt deposits. The total score for the primary habitat components was a 49 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 suboptimal category for Bank Stability with some raw, eroded areas. Artificial Channelization, Riparian Zone Vegetation Quality and Riparian Buffer Zone Width scored in the marginal category due to a mechanically straightened stream bed and riparian vegetation dominated by non-native invasive species. The riparian buffer zone surrounding the stream was 10 meters on the left bank and consisted of a mixture of native and invasive species indicative of disturbance. The right bank had a buffer averaging 6 meters and contained a mixture of invasive species and species indicative of disturbance. The vegetation in the stream itself was dominated by non-native species with 7 non-native invasive species. The secondary habitat components received a score of 39 out of 80. The resulting FDEP Habitat Assessment score was an 88.

Periphyton was not encountered during the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 75.5% limiting available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered 16 herbaceous species in Moore Lake Drain. *Colocasia esculenta*, *Alternanthera philoxeroides*, *Imperata cylindrica*, *Salvinia minima*, *Ludwigia peruviana*, *Commelina diffusa* and *Urochloa mutica* are non-native invasive species. Only *Colocasia* was abundant and dominant in the assessment region.

Table 1 Linear Vegetation Survey Results – Moore Lake Drain

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	
<i>Colocasia esculenta</i>	0	D	D	D	D	D	1	D	D	D	D	10
<i>Salvinia minima</i>	0	1	1	1	1	1		1	1	1	1	9
<i>Alternanthera philoxeroides</i>	0		1			1				1	1	4
<i>Hydrocotyle umbellata</i>	1.92	1	1	1				1				4
<i>Ludwigia peruviana</i>	0	1		1				1				3
<i>Urochloa mutica</i>	0	1						1	1			3
<i>Commelina diffusa</i>	2.02		1					1				2
<i>Hymenocallis</i>	6					1			1			2
<i>Sambucus nigra</i>	1.48	1	1									2
<i>Saururus cernuus</i>	6.5			1	1							2
<i>Boehmeria cylindrica</i>	5			1								1
<i>Dryopteris ludoviciana</i>	7								1			1
<i>Imperata cylindrica</i>	0					1						1
<i>Juncus effusus</i>	2	1										1
<i>Ludwigia repens</i>	3.2	1										1
<i>Rorippa teres</i>	4.2	1										1
Mean Coefficient of Conservatism	1.299574											
% FLEPPC	68.10%											



Figure 3 Example of the typical habitats observed in Moore Lake Drain.

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 Moore Lake Drain was 46 out of a possible 100 points, corresponding with a “Healthy” designation, with the expected community of a healthy stream.

High scores were achieved for the % Tanytarsini and % Dominance in both subsamples. Neither subsample contained sensitive taxa or Long Lived Taxa, potentially indicating either an acute pollution event or stream dessication within the past year. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Moore Lake Drain.

Table 2 SCI metric summaries for Moore Lake Drain

SCI Metric		Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa		23.00	3.33	3.33
Total Ephemeroptera		2.00	4.00	4.00
Total Trichoptera		2.00	2.86	2.86
% Filter Feeders		22.73	5.12	5.12
Total Clingers		2.00	2.86	2.86
Total Long-lived Taxa		0.00	0.00	0.00
% Dominance		24.68	7.86	7.86
% Tanytarsini		26.62	9.76	9.76
Total Sensitive Taxa		0.00	0.00	0.00
% Very Tolerant Individuals		9.74	5.82	5.82
SCI Sum	41.61			
Final SCI score	46.23			

SCI Metric		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		25.83	5.84	5.84
Total Clingers		2.00	2.86	2.86
Total Long-lived Taxa		0.00	0.00	0.00
% Dominance		23.84	8.03	8.03
% Tanytarsini		33.77	10.44	10.00
Total Sensitive Taxa		0.00	0.00	0.00
% Very Tolerant Individuals		5.96	6.90	6.90
SCI Sum	41.41			
Final SCI score	46.01			

Table 3 SCI full results for Sample A

[illegible]

Table 4 SCI full results for Sample B

[illegible]

Water Quality Assessment

Limited Long-term water quality data is available for Moore Lake Drain. The data that is available was collected by the Hillsborough County Environmental Protection Commission 2005-2009. Values for the physical water parameters begin in 2005 and continue through 2009. Values for the laboratory water parameters begin in 2005 through 2009 aside from the sample taken along with this assessment. 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 Moore Lake Drain Physical Water Quality (Field)

Moore Lake Drain								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
3/14/19	0.1	20.11	7.43	3.92	42.4	123.6	0.06	0.75
Mean POR		20.74	6.68	3.55	40.02	159	0.08	0.23

The chemical water quality analysis for Moore Lake Drain is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean and the sample for this assessment for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a mean value of 0.455 mg/L (2005-2019). Total Phosphorous values for the sample from this assessment were 0.448 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 1.266 mg/L (2005-2019). The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.909 mg/L. Chlorophyll-a corrected values fall below the site specific evaluation range of 3.2 µg/l to 20 µg/l for the period of record (1.79 µg/l 2005-2019), and in the site specific evaluation range for the most recent sample (4.1 µg/l) . For sites with Chlorophyll-a values in this range, the assessment is conclusive of conditions reflecting a balance in flora. Elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 280 colonies/100 ml, 1,533/100 ml for Enterococci.

Table 6 Moore Lake Drain Water Quality (Laboratory)

Parameter	Moore Lake Drain	POR Mean	Units
Alkalinity	22.0		mg/LCaCO ₃
Nitrates/Nitrites	0.706	0.163	mg/L
E. Coli	280	280	#/100 ml
Enterococci	1180	1533	#/100 ml
Chlorophyll a	2.0	2.14	ug/L
Chlorophyll b	0.5	0.68	ug/L
Chlorophyll c	0.4	0.42	ug/L
Chlorophyll t	2.0	2.93	ug/L
Chlorophylla Corr	4.1	1.79	ug/L
Chlorophyll-pheo	5.4	1.97	ug/L
Ammonia	0.011	0.064	mg/L
Kjeldahl Nitrogen	0.706	1.074	mg/L
Total Nitrogen	0.909	1.266	mg/L
Total Phosphorus	0.448	0.455	mg/L
Color(345)F.45	78.6	139.7	Pt/Co

Conclusion

Moore Lake Drain at Bethlehem Rd is located in a predominantly agricultural and residential area. The stream itself was altered in the past 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 a marginal score of 88. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Moore Lake Drain not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Moore Lake Drain did meet standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6. The historical water quality record for Moore Lake Drain is limited, but showed acceptable concentrations of Total Phosphorous and Total Nitrogen. 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		Moore Lake Drain	Mean POR	Threshold
Total Phosphorous (mg/l)		0.448	0.455	< 0.49
Total Nitrogen (mg/l)		0.909	1.266	< 1.65
RPS (% Rank 4-6)		0%		< 25%
LVS	Avg C of C	1.30		≥ 2.5
	FLEPPC %	68.1%		< 25%
Chlorophyll (µg/l)		4.1	1.79	< 20 µg/l
Habitat Assessment		88		> 34
SCI		46		> 34