



Mango Drain

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 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

Mango Drain is located in east-central Hillsborough County. Its headwaters are located in a small pond north of Dove Field PI and the outfall of Mango Drain is in the Tampa Bypass Canal. The assessment of Mango Drain was conducted on January 9, 2019. At the time of the assessment, the water levels were normal. The Mango Drain WBID covers 8.10 square miles and is dominated by residential (49.5%), commercial (14.9%), natural (12.1%) and industrial (4.1%) land uses. The resulting calculated landscape development intensity index score was 6.60.

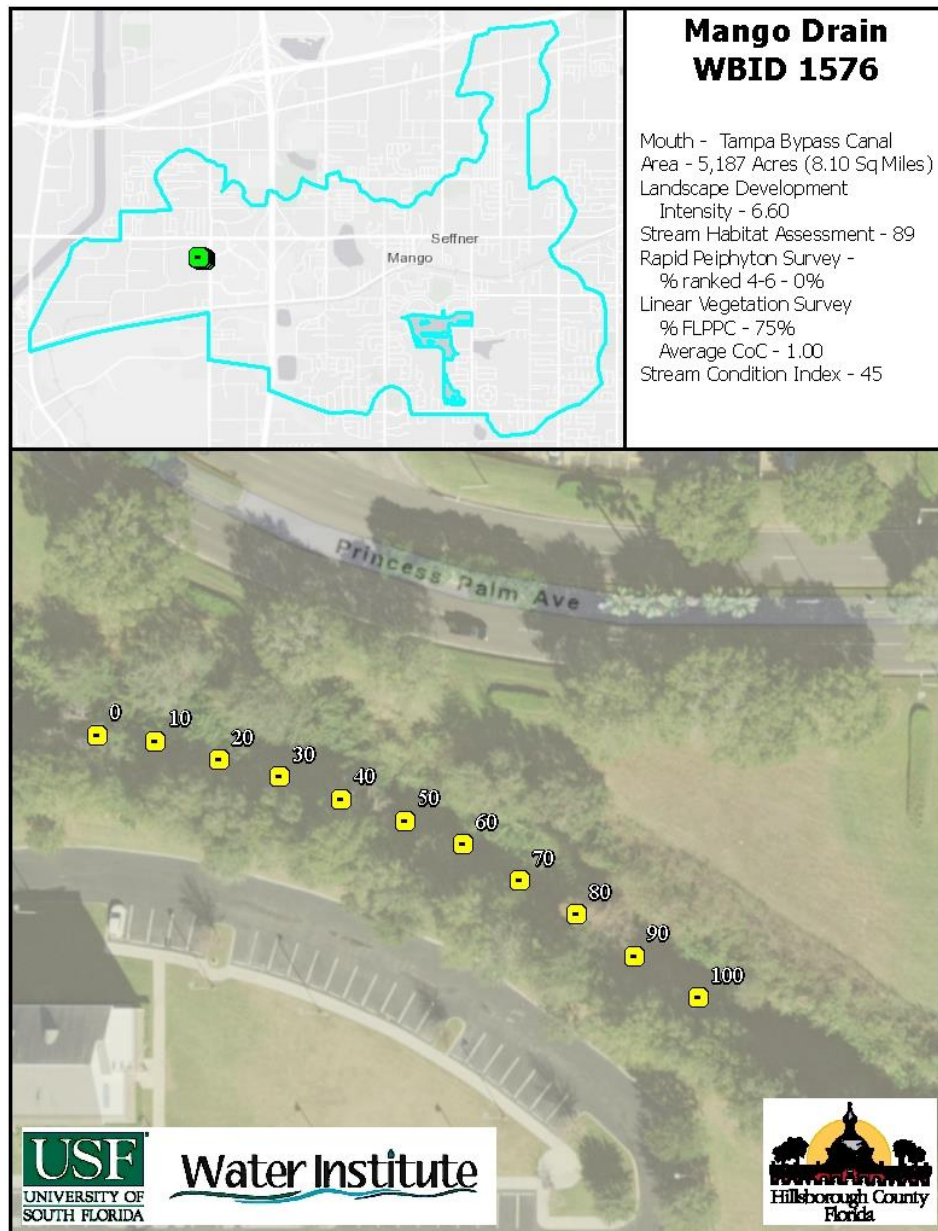


Figure 1 2019 Mango Drain Study Area Map

Habitat and Vegetation Assessment



The region of Mango Drain where the assessment was conducted is in a dominant residential and commercial area downstream from Falkenburg Rd. The region was moderately shaded with a mean canopy cover measurement of 75.9%. Mango Drain averaged 0.33 meters in depth, approximately 4.0 meters wide with a flow of 0.55 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 and Substrate Diversity (Presence of four major productive habitats (snags, roots, rocks, macrophytes)). Marginal scores were achieved for Substrate Availability and Habitat Smothering (Low overall percentage of productive habitats and some of the productive habitats were affected by sand smothering). Minor habitats included leaf, sand and silt deposits. The total score for the primary habitat components was a 55 out of 80.

The secondary habitat components of the FDEP Habitat Assessment focus on the surrounding features of the stream. Mango Drain flows through an area of commercial and residential use. Mango Drain has a narrow corridor to flow through in the urban environment. At the water level at the time of assessment, Mango Drain was low on its banks revealing the eroded sand banks from the wet season. The secondary habitat components scored in the suboptimal category for Bank Stability. Riparian Buffer Width and Riparian Zone Vegetation Quality scored in the marginal category due to a limited buffer width and several nonnative invasive species. Artificial Channelization scored in the poor category due to obvious alterations to the stream banks and removal of sinuosity. The riparian buffer zone surrounding the stream was dominated by *Schinus terebinthifolius*, *Quercus* and *Sambucus nigra*. The buffer averaged 5 meters and contained a mixture of invasive species and species indicative of disturbance. The vegetation in

the stream itself was dominated by a mixture of invasive and native species with 6 non-native invasive species. The secondary habitat components received a score of 34 out of 80. The resulting FDEP Habitat Assessment score was an 89.

Periphyton was not encountered during the 85 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 76.45% limiting available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered ten herbaceous species in Mango Drain. *Colocasia esculenta*, *Hygrophila polysperma*, *Myriophyllum aquaticum*, *Ludwigia peruviana*, *Alternanthera philoxeroides* and *Hydrilla verticillata* are non-native invasive species. *Hydrilla* and *Hygrophila* are typically transmitted from upstream sources. *Hygrophila* was the only species with a high enough biomass to be abundant, predominately between meters 60 and 80.

Table 1 Linear Vegetation Survey Results – Mango Drain

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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 Mango Drain was 45 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 % Filter Feeder metrics in both subsamples. Neither subsample contained any sensitive taxa or Long Lived Taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Mango Drain.

Table 2 SCI metric summaries for Mango Drain

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	18.00	1.25	1.25
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	54.05	12.41	10.00
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	48.65	3.07	3.07
% Tanytarsini	50.00	11.56	10.00
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	9.46	5.88	5.88
SCI Sum	39.34		
Final SCI score	43.72		

SCI Metric		Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa		21.00	2.50	2.50
Total Ephemeroptera		1.00	2.00	2.00
Total Trichoptera		2.00	2.86	2.86
% Filter Feeders		46.58	10.67	10.00
Total Clingers		4.00	5.71	5.71
Total Long-lived Taxa		0.00	0.00	0.00
% Dominance		43.84	4.03	4.03
% Tanytarsini		43.84	11.19	10.00
Total Sensitive Taxa		0.00	0.00	0.00
% Very Tolerant Individuals		14.38	4.92	4.92
SCI Sum	42.02			
Final SCI score	46.69			

Table 3 SCI full results for Sample A

Stream Condition Index Results for Mango Lake Drain SCIA

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais pardalis</i>	6	6	1	0	0	0	0	0	0	0	0	0	6	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Stylaria fossularis</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	
Mollusca		Gastropoda	Heterobranchia	Hydrophila	Ancylidae	Ancylidae spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	Damaged, no shell
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	<i>Pyrgophorus platyrachis</i>	3	3	1	0	0	0	0	0	0	0	0	0	3	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	<i>Amnicola dalli</i>	8	8	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	<i>Hyalella azteca</i> sp. complex	16	16	1	0	0	0	0	0	0	0	0	0	0	
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	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	7	7	1	0	1	0	7	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	<i>Neotrichia</i> spp.	2	2	1	0	1	0	0	1	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Micromyalus</i> spp.	8	8	1	0	0	0	0	0	0	0	0	0	0	8 larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomus</i> spp.	1	1	0	0	0	0	0	0	0	0	0	0	0	pupa, no posterior end
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironominae</i> spp.	1	1	0	0	0	0	0	0	0	0	0	0	0	pupa
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	1	1	1	0	0	0.5	0	0	0	0	1	0	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium flavum</i>	9	9	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium illinoense</i>	5	5	1	0	0	0	0	0	0	0	0	0	5	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i>	69	72	1	0	0	0	72	1	0	0	72	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Corynoneura</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Nanocladius</i> spp.	3	3	1	0	0	0	0	0	0	0	0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Paratanytarsus</i> spp.	1	1	1	0	0	0.5	0	0	0	0	1	0	0	

Table 4 SCI full results for Sample B

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Water Quality Assessment

Long-term water quality data is available for Mango Drain. The data that is available was collected by the Hillsborough County Environmental Protection Commission. Values for the physical water parameters begin in 2005 and continue through present. Values for the laboratory water parameters begin in 2005 through present including 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 Mango Drain Physical Water Quality (Field)

Mango Drain								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
1/30/19	0.3	14.6	7.86	9.24	89.2	159	0.07	1.1 VOB
Mean POR		22.52	7.18	2.36	27.34	329	0.16	0.77

The chemical water quality analysis for Mango 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 0.193 mg/L (2005-2019). The three year geometric mean of Total Phosphorous was 0.214 mg/L. Total Phosphorous values for the sample from this assessment were 0.253mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value 1.075 mg/L (2005-2019). The three year geometric mean of Total Nitrogen was 0.867 mg/L. The Total Nitrogen value from the assessment was below the threshold with a concentration of 1.187 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 (12.76 µg/l 2005-2018), and within the site specific evaluation range for the most recent three year geomean (9.33 µg/l). Four samples in the previous 3 years have exceeded 20 µg/l. For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora. Slightly elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 375 colonies/100 ml, 473/100 ml for Enterococci.

Table 6 Mango Drain Water Quality (Laboratory)

Parameter	Mango Drain	POR Mean	Units
Alkalinity	44.0		mg/LCaCO ₃
Nitrates/Nitrites	0.116	0.083	mg/L
E. Coli	520	375	#/100 ml
Enterococci	480	473	#/100 ml
Chlorophyll a	29.1	16.02	ug/L
Chlorophyll b	2.2	2.23	ug/L
Chlorophyll c	1.3	1.44	ug/L
Chlorophyll t	32.6	19.53	ug/L
Chlorophylla Corr	22.3	12.76	ug/L
Chlorophyll-pheo	10.2	5.33	ug/L
Ammonia	0.062	0.067	mg/L
Kjeldahl Nitrogen	1.071	0.969	mg/L
Total Nitrogen	1.187	1.075	mg/L
Total Phosphorus	0.253	0.193	mg/L
Color(345)F.45	40.7	41.02	Pt/Co

Conclusion

Mango Drain at Falkenburg Rd is located in an urban residential and commercial setting. 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 a suboptimal score of 89. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Mango Drain not meeting the metric for Average Coefficient of Conservatism or Percent FLEPPC. Mango 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 Mango Drain 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		Mango Drain	Mean POR	Threshold
Total Phosphorous (mg/l)		0.253	0.193	< 0.49
Total Nitrogen (mg/l)		1.187	1.075	< 1.65
RPS (% Rank 4-6)		0%		< 25%
LVS	Avg C of C	1.00		≥ 2.5
	FLEPPC %	75.0%		< 25%
Chlorophyll (µg/l)		22.3	12.76	< 20 µg/l
Habitat Assessment		89		> 34
SCI		45		> 34