



Delaney Creek at Maydell

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 2020 Hillsborough County aerial, 2017 Land Use/ Land Cover (LULC) and Waterbody ID (WBID) layers courtesy of the Florida Department of Environmental Protection (FDEP). The Landscape Development Intensity Index (LDI) was calculated for the WBID containing the stream. From FDEP

(<https://floridadep.gov/dear/bioassessment/content/bioassessment-ldi-hdg-bcg>) “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 FDEP 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 FDEP 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 (LVS). 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 Table LVI 1000-1 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 in FDEP LVI 1000-1.

STREAM CONDITION INDEX ASSESSMENT

The Stream Condition Index (SCI) was sampled and calculated per DEP SOP SCI 1000. . 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 SCI 1000, the SCI scores greater than 35 are considered healthy. Proposed biological health assessment criteria state that a WBID is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of the most recent 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 Hillsborough County Public Utilities 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. Results will be discussed in the Florida Department of Environmental Protection's Numeric Nutrient Criteria framework and combined with the monthly sampling from the Hillsborough County Environmental Protection Commission Monthly sampling data.

Study Area

Delaney Creek is located in central Hillsborough County in the Hillsborough Bay Watershed. Its headwaters are located northeast of Lumsden Road and Palus Dr in Brandon, FL. The outfall of Delaney Creek is in Hillsborough Bay. The assessment of Delaney Creek was conducted on April 8, 2021. At the time of the assessment, the water levels were normal for the dry season. The Delaney Creek WBID covers 7.49 square miles and is dominated by residential (51.5%), commercial (16.3%) and natural (7.7%) land uses. The resulting calculated landscape development intensity index score was 6.77.

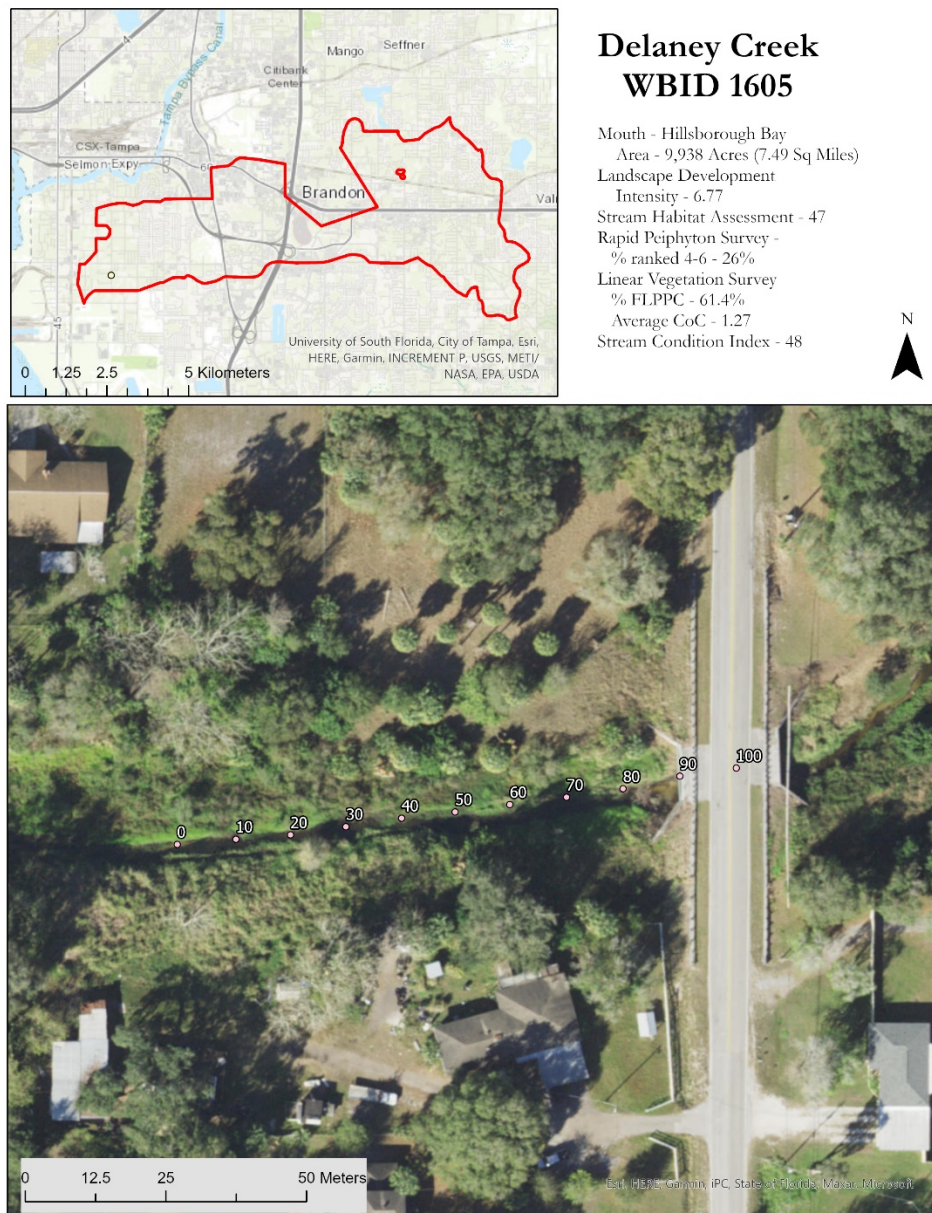


Figure 1 2021 Delaney Creek Study Area Map



Figure 2 Overview photograph of the Delaney Creek Sample Site showing the typical habitat features

Habitat and Vegetation Assessment

The region of Delaney Creek where the assessment was conducted is in an easement downstream from the Maydell Avenue Bridge. The region was open with a mean canopy cover measurement of 23.8%. Delaney Creek averaged 0.3 meters in depth, approximately 3.2 meters wide with a flow of 0.15 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 (0.09 m/s). Habitat Smothering (insufficient pools and many of the productive habitats were affected by sand smothering). Substrate Diversity (Presence of one major productive habitats (rock)) and Substrate Availability (1.2% of stream are productive habitats) were scored as poor. Minor habitats included roots, leaf packs/mats, submerged aquatic vegetation and sand and silt deposits. The total score for the primary habitat components was a 20 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 Riparian Buffer Zone Width (left bank with 15 meters of buffer). Bank Stability (both banks with raw eroded areas and high banks) and Riparian Buffer Zone Width (right bank had a 6 meter buffer) both scored in the marginal category. Artificial Channelization and Riparian Zone Vegetation Quality (both banks showing high levels of disturbance shown in the species present) scored in the poor category. The secondary habitat components received a score of 27 out of 80. The resulting FDEP Habitat Assessment score was a 47.

Table 1 Scoring Summary for the Stream Habitat Assessment

Metric		Score
Primary Habitat Components		
	Substrate Diversity	3
	Substrate Availability	2
	Water Velocity	12
	Habitat Smothering	3
	Primary Score	20
Secondary Habitat Components		
	Artificial Channelization	3
	Bank Stability - Right Bank	4
	Bank Stability - Left Bank	5
	Riparian Buffer Zone Width - Right Bank	4
	Riparian Buffer Zone Width - Left Bank	7
	Riparian Zone Vegetation Quality - Right Bank	2
	Riparian Zone Vegetation Quality - Left Bank	2
	Secondary Score	27
Habitat Assessment Score		47

Periphyton was encountered during the 99 samples taken during the Rapid Periphyton Survey. 26% of periphyton samples were classified as rank 4-6 (>6mm to >10cm). This is above the threshold set by FDEP and indicates an imbalance of flora in the stream. The tree canopy in the assessment area averaged 23.8% allowing available light for periphyton to flourish.

The FDEP Linear Vegetation Survey encountered abundant herbaceous species rooted in Delaney Creek at the time of the assessment. The vegetation in the creek was dominated by *Alternanthera philoxeroides*, *Ludwigia grandiflora* and *Polygonum glabrum* (*Pesicaria glabra*) .

Table 2 Linear Vegetation Survey results – Delaney Creek

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>Alternanthera philoxeroides</i>	0	C	D	D	C	1	1	1	1			8
<i>Landoltia punctata</i>	0	1	1	1	1	1	1	1	1			8
<i>Lemna</i>	1	1	1	1	1	1	1	1	1			8
<i>Urochloa mutica</i>	0	1	1	1	1	1	1	1				7
<i>Ludwigia grandiflora</i>	4	C	1		1	1	1	D				6
<i>Polygonum glabrum</i>	4.5	1		1	C	D	D			1		6
<i>Hygrophila polysperma</i>	0					1	1	1	1	1		5
<i>Sphagneticola trilobata</i>	0		1			1	1	1				4
<i>Commelina diffusa</i>	2.02		1	1	1							3
<i>Ludwigia octovalvis</i>	2			1								1
<i>Pontederia cordata</i>	5.38				1							1



Figure 3 Ludwigia grandiflora was a dominant species in Delaney Creek.

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 Delaney Creek was 48 out of a possible 100 points, corresponding with an “Category 2 - Healthy” designation, with some loss of taxonomic diversity from the expected community of a healthy stream. Both subsamples contained moderate total taxa with 21 taxa in subsample A and 26 in subsample B. The most recent previous SCI value was collected on 5/16/2016 with a value of 40.

High scores (scores above 7.0) were achieved for the % Very Tolerant Individuals in both subsamples. In addition, high scores for % Tanytarsini were achieved in Sample A. Low scores (less than 3.0) were achieved for the Total Taxa (sample A), Total Ephemeroptera (sample A), Total Trichoptera (sample B), Total Long Lived Taxa (both samples) and Total Sensitive Taxa (both samples). Neither subsample contained, Long-Lived or Sensitive Taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Delaney Creek.

Table 2 SCI metric summaries for Delaney Creek Sample A (top) and Sample B (bottom)

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	4.00	5.71	5.71
% Filter Feeders	22.26	5.01	5.01
Total Clingers	4.00	5.71	5.71
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	40.00	4.80	4.80
% Tanytarsini	11.61	7.46	7.46
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	1.29	9.68	9.68

SCI Sum	42.88
Final SCI score	47.64

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	26.00	4.58	4.58
Total Ephemeroptera	2.00	4.00	4.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	26.42	5.98	5.98
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	35.22	5.76	5.76
% Tanytarsini	8.81	6.71	6.71
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	0.63	10.53	10.00

SCI Sum	44.18
Final SCI score	49.09

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Water Quality Assessment

Long-term water quality data is available for Delaney Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission. Values for the physical water parameters begin in 1981 and continue through 2021. Values for the laboratory water parameters begin in 1981 through 2021. The 2021 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 Delaney Creek Physical Water Quality (Field)

Delaney Creek								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
4/8/2021	0.2	19.47	7.48	7.80	84.0	433.3	0.21	1.0 VOB
Mean POR	0.5	23.18	7.36	2.72	67.9	483.7	0.25	0.48

The chemical water quality analysis for Delaney Creek is shown in Table 6 along with mean values for the period of record for available parameters. The previous 3-year geometric mean values for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a geometric mean value of 0.170 mg/L (2019), 0.229 mg/L (2020) and 0.182 mg/L (2021). Total Phosphorous values for the sample from this assessment were 0.140 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L for the previous three year period with a mean value of 0.742 mg/L (2019), 0.839 mg/L (2020) and 0.771 mg/L (2021). The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.622 mg/L. Chlorophyll-a corrected values fall below the site specific evaluation range of 3.2 µg/l to 20 µg/l for the most recent 3-years of samples with a geometric mean value of 2.87 µg/l (4.73 µg/l in 2019, 2.29 µg/l in 2020, 1.40 µg/l in 2021). For sites with Chlorophyll-a values in this range, the assessment is indicating conditions reflecting an balance in flora.

An elevated biomass of the bacterial parameters was observed in the 3-year dataset with E. Coli having a geomean of 799 colonies/100 ml, 1,462 colonies/100 ml for Enterococci.

Table 6 Delaney Creek Water Quality (Laboratory)

Parameter	Delaney Creek 4/8/2021	POR Mean (1981- 2021)	Units
Alkalinity	195	111.1	mg/LCaCO ₃
Color(345)F.45	50	52.3	Pt/Co
E. Coli	148	808	#/100 ml
Enterococci	313	932	#/100 ml
Chlorophyll a	7.0	4.50	ug/L
Chlorophyll b	1.0	1.83	ug/L
Chlorophyll c	1.3	1.65	ug/L
Chlorophyll t	8.3	4.88	ug/L
Chlorophylla Corr	1.0	3.81	ug/L
Chlorophyll-pheo	11.3	7.66	ug/L
Ammonia	< 0.073	0.099	mg/L
Kjeldahl Nitrogen	0.650	0.989	mg/L
Total Nitrogen	0.650	1.272	mg/L
Nitrates/Nitrites	< 0.043	0.166	mg/L
Total Phosphorus	0.119	0.343	mg/L

Conclusion

Delaney Creek at Maydell Avenue is located in a predominantly residential area. The stream has been severely altered in this region. 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 47. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Delaney Creek having failed the metrics for Mean Coefficient of Conservatism and % FLEPPC. Delaney Creek did not meet standards for the rapid periphyton survey with 26% of samples being ranked between 4 and 6 due to the lack of canopy coverage in the region. The recent water quality record for Delaney Creek showed concentrations of Chlorophyll-a corrected, Total Phosphorous and Total Nitrogen below the FDEP thresholds. The results of the SCI sampling indicate that the stream is “healthy” based on the macroinvertebrate community. Elevated bacterial biomass was seen in the past three years of samples. 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		Delaney Creek	2019	2020	2021	Threshold
Total Phosphorous (mg/l)		0.119	0.170	0.229	0.182	< 0.49
Total Nitrogen (mg/l)		0.650	0.742	0.839	0.771	< 1.65
RPS (% Rank 4-6)		26%				< 25%
LVS	Avg C of C	1.27				≥ 2.5
	FLEPPC %	61.4%				< 25%
Chlorophyll-a Corrected (µg/l)		1.0	4.72	2.29	1.40	< 20 µg/l
Habitat Assessment		47				> 34
SCI		48				> 34