Little Bullfrog Creek

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

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Methods

STUDY AREA ANALYISIS

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/11list.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

Little Bullfrog Creek is located in south-eastern Hillsborough County. Its headwaters are located in an unnamed swamp between Highway 672 and Big Bend Road and the outfall of Little Bullfrog Creek is in Bullfrog Creek. The assessment of Little Bullfrog Creek was conducted on February 12, 2019. At the time of the assessment, the water levels were normal for the end of the dry season. The Little Bullfrog Creek WBID covers 7.42 square miles and is dominated by residential (32.2%), natural (29.9%) and agricultural (14.4%) land uses. The resulting calculated landscape development intensity index score was 4.93.

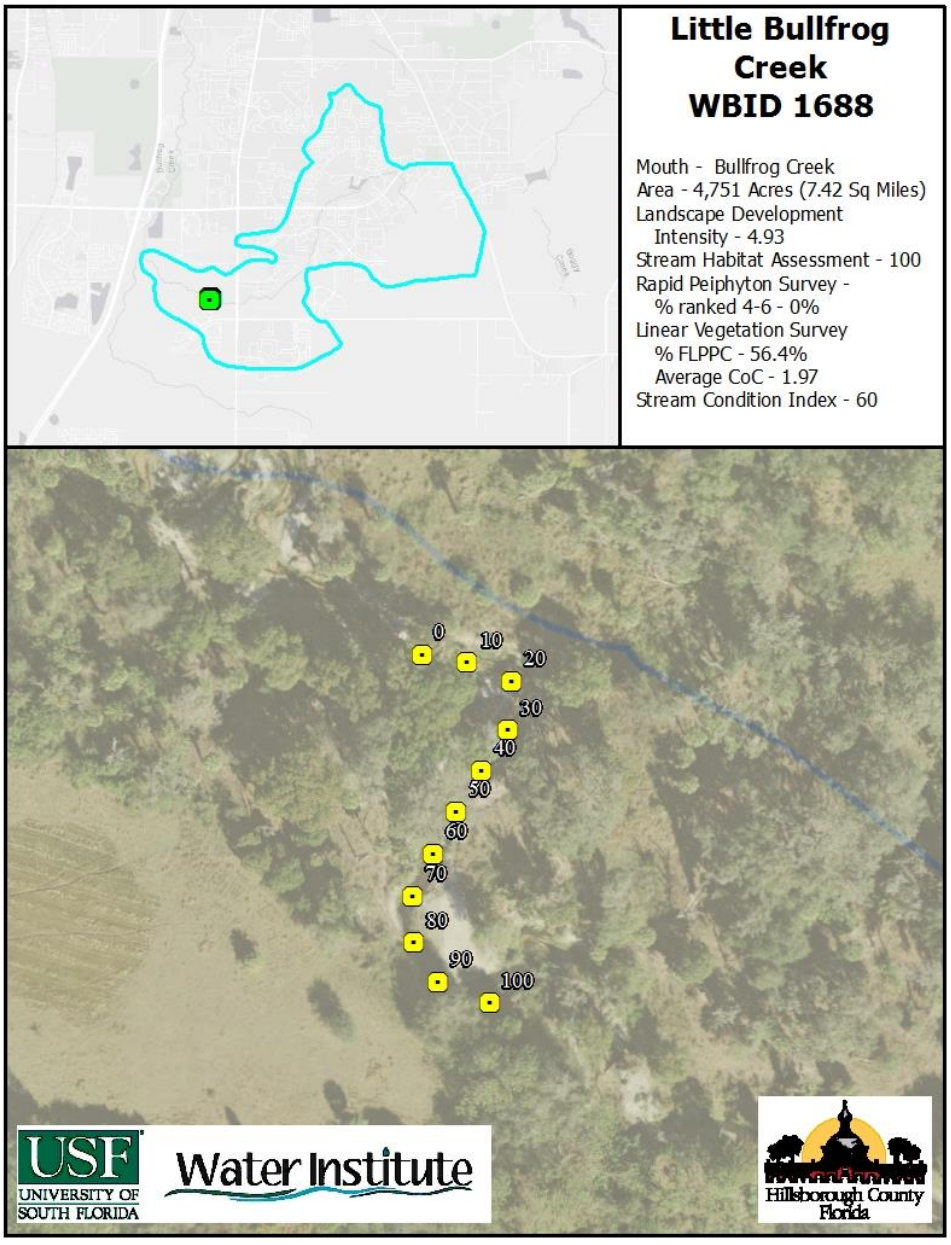

Figure 1 2019 Little Bullfrog Creek Study Area Map

Figure 2 Overview photograph of the Little Bullfrog Creek Sample Site

Habitat and Vegetation Assessment

The region of Little Bullfrog Creek where the assessment was conducted is in a developing residential area. The region was moderately shaded with a mean canopy cover measurement of 63.3%. Little Bullfrog Creek averaged 0.2 meters in depth, approximately 3.65 meters wide with a flow of 0.47 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 macrophytes)) and Water Velocity. Habitat Smothering (many of the productive habitats were affected by sand smothering) and Substrate Availability (3.65% of stream are productive habitats) were scored as poor. Minor habitats included sand and silt deposits. The total score for the primary habitat components was a 44 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 optimal category for Artificial Channelization and Riparian Buffer Zone Width. Bank Stability with many raw, eroded areas and Riparian Zone Vegetation Quality and scored in the marginal category due to collapsing, steep banks and several non-native invasive species. The riparian buffer zone surrounding the stream was greater than 18 meters and consisted of a mixture of native and invasive species indicative of disturbance. The vegetation in the stream itself was dominated by non-native species with 6 non-native invasive species out of 14 total species. The secondary habitat components received a score of 56 out of 80. The resulting FDEP Habitat Assessment score was an 100.

Periphyton was not encountered during the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 63.3% limiting available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered 14 herbaceous species in Little Bullfrog Creek. *Hydrilla verticillata*, *Alternanthera philoxeroides, Panicum maximum, Sphagneticola trilobata, Ludwigia peruviana* and *Urochloa mutica* are non-native invasive species. Only *Hydrilla* was abundant and dominant in the assessment region.

Table 1 Linear Vegetation Survey Results – Little Bullfrog 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	
Commelina virginica	4.67	1	1	1	1	1	1	1	1			8
Hydrilla verticillata	0	1	1	1	D	D	1	1				7
Alternanthera philoxeroides	0	1	1			1	1	1				5
Ludwigia peruviana	0						1	1	1		1	4
Panicum maximum	0	1							1			2
Rorippa teres	4.2	1					1					2
Saururus cernuus	6.5		1	1								2
Sphagneticola trilobata	0					1	1					2
Urochloa mutica	0						1	1				2
Acrostichum danaeifolium	5.79			1								1
Conoclinium coelestinum	4.37								1			1
Hydrocotyle umbellata	1.92										1	1
Ludwigia leptocarpa	3					1						1
Rumex verticillatus	3.17			1								1
Mean CoC	1.974615											
% FLEPPC	0.564103											

Figure 3 Eroded banks along Little Bullfrog 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 Little Bullfrog Creek was 60 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 in Sample A and % Filter Feeders, Total Clingers, % Dominance and % Very Tolerant Individuals in both subsamples. Both subsamples contained sensitive taxa and sample B contained Long Lived Taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Little Bullfrog Creek.

Table 2 SCI metric summaries for Little Bullfrog Creek

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	17.00	0.83	0.83
Total Ephemeroptera	2.00	4.00	4.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	54.78	12.58	10.00
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	21.66	8.47	8.47
% Tanytarsini	21.66	9.18	9.18
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	3.82	7.82	7.82

SCI Sum	51.73
Final SCI score	57.47

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	19.00	1.67	1.67
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	44.52	10.19	10.00
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	20.00	8.80	8.80
% Tanytarsini	9.68	6.97	6.97
Total Sensitive Taxa	2.00	2.86	2.86
% Very Tolerant Individuals	4.52	7.48	7.48

SCI Sum	55.67
Final SCI score	61.86

Table 3 SCI full results for Sample A

Stream Condition Index Results for Little Bullfrog Creek @ 301 SCIA

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Nemertea		Enopla		Hoplonemertea	Tetrastemmatidae	*Prostoma* spp.	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Slavina appendiculata*	1	1	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropo	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	3		0	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropo	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	1	4	1	0	0	0	0	0	0		0	0	4	
Mollusca		Gastropoda	Caenogastropo		Thiaridae	*Melanoides tuberculata*	1	1	1	0	0	0	0	0	0		0	0	1	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	7	7	1	1	0	0	0	0	0		0	0	0	Damaged and/or immature, not L. propinquus
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	*Labiobaetis propinquus*	3	3	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	*Argia* spp.	2	2	1	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	1		0	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	21	22	1	0	1	0	22	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	*Neotrichia* spp.	1	1	1	0	1	0	0	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	larva
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	3	3	1	0	0	0	0	1	0		0	0	0	2 larvae, 1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	22	22	1	0	0	0	0	0	0		0	0	0	9 larvae, 13 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	5		0	0	0	0	0	0	0		0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	21	23	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus*	31	34	1	0	0	0	34	1	0		34	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	*Simulium* spp.	30	30	1	0	0	0	30	1	0		0	1	0	22 larvae, 8 pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera	Veliidae	*Rhagovelia choreutes*	1	1	1	0	0	0	0	0	0		0	0	0	male

Table 4 SCI full results for Sample B

Stream Condition Index Results for Little Bullfrog Creek @ 301SCIB

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais communis*	1	1	1	0	0	0	0	0	0		0	0	1	
Annelida		Clitellata	Oligochaeta	Lumbriculida	Lumbriculidae	*Eclipidrilus palustris*	1	1	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastrop	Littorinimorph	Hydrobiidae	Hydrobiidae spp.	3		0	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastrop	Littorinimorph	Hydrobiidae	*Pyrgophorus platyrachis*	1	4	1	0	0	0	0	0	0		0	0	4	
Mollusca		Bivalvia	Heterodonta	Veneroida	Corbiculidae	*Corbicula* spp.	1	1	1	0	0	0	1	0	1		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeropter	Baetidae	Baetidae spp.	2		0	0	0	0	0	0	0		0	0	0	Damaged, not L.
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeropter	Baetidae	*Labiobaetis propinquus*	3	3	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeropter	Baetidae	*Baetis intercalaris*	2	4	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeropter	Heptageniidae	Heptageniidae spp.	1	1	1	1	0	0	0	1	0		0	1	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionida	Coenagrionidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged, not Argia spp.
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionida	*Argia* spp.	2	2	1	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychida	*Cheumatopsyche* spp.	22	22	1	0	1	0	22	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	4	4	1	0	0	0	0	1	0		0	0	0	4 larvae
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	30	30	1	0	0	0	0	0	0		0	0	0	15 larvae, 15 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	29	29	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense* group	2	2	1	0	0	0	0	0	0		0	0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus*	15	15	1	0	0	0	15	1	0		15	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Pentaneura inconspicua*	2	2	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	*Simulium* spp.	31	31	1	0	0	0	31	1	0		0	1	0	23 larvae, 8 pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera	Veliidae	*Rhagovelia choreutes*	1	1	1	0	0	0	0	0	0		0	0	0	female

Water Quality Assessment

Long-term water quality data is available for Little Bullfrog Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission 2005-2019. Values for the physical water parameters begin in 2005 and continue through 2019. Values for the laboratory water parameters begin in 2005 through 2019. 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 Little Bullfrog Creek Physical Water Quality (Field)

Little Bullfrog Creek								
Date	**Depth (m)**	**Temp (°C)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
3/14/19	0.1	20.62	8.1	8.0	87.4	256.3	0.12	0.4 VOB
Mean POR		21.74	7.42	7.36	84.01	334.8	0.16	0.3

The chemical water quality analysis for Little Bullfrog Creek is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean and 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 mean value of 0.161 mg/L (2005-2019). The three year geometric mean value for Total Phosphorous was 0.180 mg/L. Total Phosphorous values for the sample from this assessment were 0.274 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 1.062 mg/L for the period of record (2005-2019). The three year geometric mean value for Total Nitrogen was 0.925 mg/L. The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.761 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 (2.98 µg/l 2005-2019), and in the site specific evaluation range for the most recent 3-years of samples (4.2 µg/l) . For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting a inbalance in flora. Elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 738 colonies/100 ml, 2,520/100 ml for Enterococci.

Table 6 Little Bullfrog Creek Water Quality (Laboratory)

Parameter	Little Bullfrog Creek	POR Mean	Units
Alkalinity	50.0		mg/LCaCO3
Nitrates/Nitrites	0.131	0.198	mg/L
E. Coli	3,000	738	#/100 ml
Enterococci	6,700	2,520	#/100 ml
Chlorophyll a	2.0	3.04	ug/L
Chlorophyll b	0.5	1.41	ug/L
Chlorophyll c	0.4	0.82	ug/L
Chlorophyll t	2.0	4.45	ug/L
Chlorophylla Corr	4.1	2.98	ug/L
Chlorophyll-pheo	5.4	2.72	ug/L
Ammonia	0.081	0.058	mg/L
Kjeldahl Nitrogen	0.630	0.799	mg/L
Total Nitrogen	0.761	1.062	mg/L
Total Phosphorus	0.274	0.161	mg/L
Color(345)F.45	33.9		Pt/Co

Conclusion

Little Bullfrog Creek at Highway 301 is located in a predominantly developing residential area. 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 100. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Little Bullfrog Creek not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Little Bullfrog Creek did meet standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6. The historical water quality record for Little Bullfrog Creek showed acceptable concentrations of Total Phosphorous and Total Nitrogen in the long term dataset. 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		Little Bullfrog Creek	Mean POR	Threshold
Total Phosphorous (mg/l)		0.274	0.161	< 0.49
Total Nitrogen (mg/l)		0.761	1.062	< 1.65
RPS (% Rank 4-6)		0%		< 25%
LVS	**Avg C of C**	1.97		≥ 2.5
	FLEPPC %	56.4%		< 25%
Chlorophyll (µg/l)		4.1	2.98	< 20 µg/l
Habitat Assessment		100		> 34
SCI		60		> 34