



Curiosity Creek

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 and the samples collected by Hillsborough County Public Works.

Study Area

Curiosity Creek is located in northern Hillsborough County in the Hillsborough River Watershed. Its headwaters are located in an unnamed swamp south of Lake Magdalene Boulevard. The outfall of Curiosity Creek is in an unnamed lake south of W Country Club Drive. The assessment of Curiosity Creek was conducted on April 29, 2021. At the time of the assessment, the water levels were normal for the dry season. The Curiosity Creek WBID covers 3.22 square miles and is dominated by residential (62.8%), commercial (15.4%) and natural (8.1%) land uses. The resulting calculated landscape development intensity index score was 7.56.

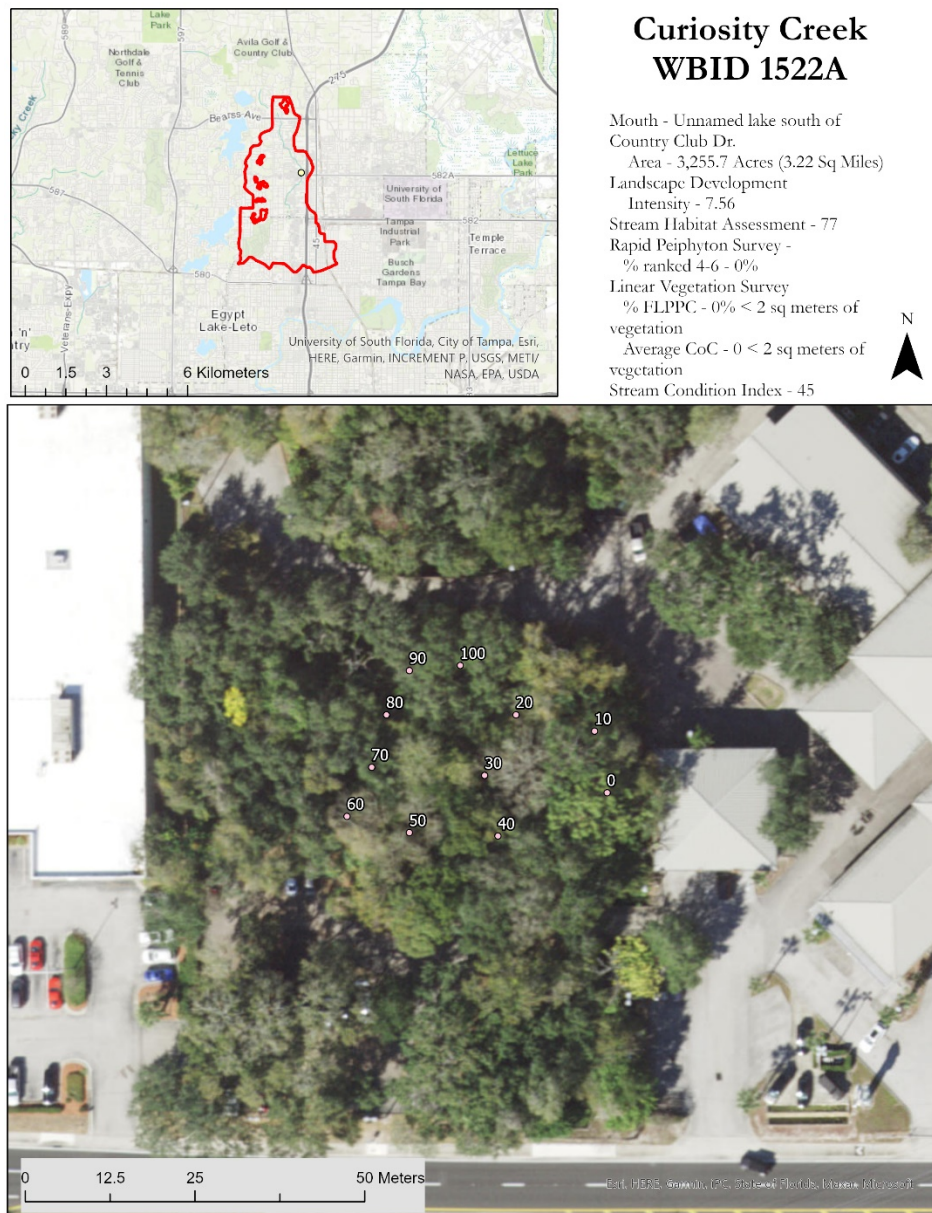


Figure 1 2021 Curiosity Creek Study Area Map



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

Habitat and Vegetation Assessment

The region of Curiosity Creek where the assessment was conducted is in an easement between a car dealership and a gun range in a commercial district where the creek crosses Fletcher Avenue. The region was heavily shaded with a mean canopy cover measurement of 90.4%. Curiosity Creek averaged 0.2 meters in depth, approximately 1.55 meters wide with a flow of 0.1 m/s.

The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the marginal category for Water Velocity (0.1 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 (snags)) and Substrate Availability (2.3% of stream are productive habitats) were scored as poor. Minor habitats included fine roots, leaf packs/mats and sand and silt deposits. The total score for the primary habitat components was a 28 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 as the area was sinuous in the small natural easement. Bank Stability (both banks with raw eroded areas and areas of steep bank slopes), Riparian Zone Vegetation Quality (right bank showing moderate levels of disturbance shown in the species present) and Riparian Buffer Zone Width (Right Bank with approximately a 15 meter buffer) scored in the suboptimal category. Riparian Buffer Zone Width (Left Bank with approximately a 6 meter buffer) and Riparian Zone Vegetation Quality (left bank showing high levels of disturbance shown in the species present) scored in the marginal category. The secondary habitat components received a score of 49 out of 80. The resulting FDEP Habitat Assessment score was a 77.

Table 1 Scoring Summary for the Stream Habitat Assessment

Metric		Score
Primary Habitat Components		
	Substrate Diversity	4
	Substrate Availability	2
	Water Velocity	10
	Habitat Smothering	4
	Primary Score	28
Secondary Habitat Components		
	Artificial Channelization	16
	Bank Stability - Right Bank	6
	Bank Stability - Left Bank	6
	Riparian Buffer Zone Width - Right Bank	7
	Riparian Buffer Zone Width - Left Bank	4
	Riparian Zone Vegetation Quality - Right Bank	6
	Riparian Zone Vegetation Quality - Left Bank	4
	Secondary Score	49
Habitat Assessment Score		77

Periphyton was not encountered during the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 90.4% reducing available light for periphyton to flourish.

The FDEP Linear Vegetation Survey encountered less than 2 m² of herbaceous species rooted in Curiosity Creek at the time of the assessment. The vegetation surrounding the creek was dominated by *Ruellia simplex* beneath a canopy of *Quercus*.

Table 1 Linear Vegetation Survey Results – Curiosity 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>Less than 2m²</i>												



Figure 3 Small snags were the most abundant major productive habitat in Curiosity 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 Curiosity Creek was 45 out of a possible 100 points, corresponding with a “Category 2 Healthy” designation, with some loss of taxonomic diversity from the expected community of a healthy stream. Both subsamples contained diverse total taxa with 36 taxa in subsample A and 33 in subsample B.

High scores (scores above 7.0) were achieved for the Total Taxa, % Dominance and % Tanytarsini in both subsamples. Low scores (less than 3.0) were achieved for the Total Ephemeroptera, Total Trichoptera, Total Clingers and Total Sensitive Taxa in both subsamples. In addition, Sample B received low scores for Total Long-Lived Taxa. Neither subsample contained Ephemeroptera taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Curiosity Creek.

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

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	36.00	8.75	8.75
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	18.42	4.12	4.12
Total Clingers	0.00	0.00	0.00
Total Long-lived Taxa	2.00	6.67	6.67
% Dominance	22.37	8.33	8.33
% Tanytarsini	25.66	9.66	9.66
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	11.84	5.37	5.37

SCI Sum	45.75
Final SCI score	50.83

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	33.00	7.50	7.50
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	15.61	3.47	3.47
Total Clingers	1.00	1.43	1.43
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	27.39	7.32	7.32
% Tanytarsini	22.29	9.26	9.26
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	10.83	5.57	5.57

SCI Sum	35.98
Final SCI score	39.98

Table 3 SCI full results for Sample A

Stream Condition Index Results for Curiosity Creek SCIA																					
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	
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Limnodrilus hoffmeisteri</i>	1	1	1	0	0	0	0	0	0	0	0	0	1		
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Aulodrilus pigueti</i>	1	1	1	0	0	0	0	0	0	0	0	0	0		
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	2	2	1	0	0	0	0	0	0	0	0	0	2		
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Dero</i> spp.	2	2	1	0	0	0	0	0	0	0	0	0	2	1 damaged, 1 no posterior end	
Annelida		Citellata	Oligochaeta	Tubificida	Naididae	<i>Slavina appendiculata</i>	6	6	1	0	0	0	0	0	0	0	0	0	1		
Annelida		Citellata	Hirudinida	Rhynchobdellida	Glossophariidae	<i>Helobdella stagnalis</i> sp. complex	1	1	1	0	0	0	0	0	0	0	0	0	1		
Mollusca		Gastropoda	Littorinomorpha	Hydrobiidae	Pygospioninae	<i>Pygospion ptyrachis</i>	1	1	1	0	0	0	0	0	0	0	0	0	1	Damaged	
Mollusca		Gastropoda	Heterobranchia	Hydrobiidae	Ancylidae	<i>Ancylidae</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0	Damaged, no shell
Mollusca		Gastropoda	Heterobranchia	Hydrobiidae	Ancylidae	<i>Hebetancylus excentricus</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1	
Mollusca		Gastropoda	Heterobranchia	Hydrobiidae	Planorbidae	<i>Menetus dilatatus</i>	2	2	1	0	0	0	0	0	0	0	0	0	2		
Mollusca		Gastropoda	Heterobranchia	Hydrobiidae	Planorbidae	<i>Planorbella trivolvis</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1	
Mollusca		Gastropoda	Heterobranchia	Hydrobiidae	Planorbidae	<i>Planorbella scalaris</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	1	
Mollusca		Bivalvia	Autobranchia	Veneridae	Cyrenidae	<i>Corbicula</i> spp.	1	1	1	0	0	0	0	1	0	1	0	0	0	0	
Mollusca		Bivalvia	Autobranchia	Sphaeriidae	Sphaeriidae	<i>Sphaeriidae</i> spp.	6	6	1	0	0	0	0	6	0	0	0	0	0	0	Damaged and/or immature, not E. cubensis
Mollusca		Bivalvia	Autobranchia	Sphaeriidae	Sphaeriidae	<i>Eupera cubensis</i>	1	1	1	0	0	0	0	1	0	0	0	0	0	0	
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Decapoda	<i>Senticaudata</i> spp.	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0 dead; like Hyalella
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Decapoda	<i>Hyalella</i> sp. complex	16	16	1	0	0	0	0	0	0	0	0	0	0	0	0 Max1 dissected; damaged/not H. wakulla
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Decapoda	<i>Hyalella wakulla</i>	33	34	1	0	0	0	0	0	0	0	0	0	0	0	0 Max1 dissected
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Cambaridae	<i>Cambaridae</i> spp.	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0 Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Anisoptera spp.	<i>Anisoptera</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0 Early instar; Cordulid/Ubellulid
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	<i>Coenagrionidae</i> spp.	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0 Early instar/damaged, 2 = not Argia
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	<i>Oecetis</i> sp. A	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0 Reference collection
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Microcyloepus</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0 Adult = 1
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomidae</i> spp.	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0 Pupae = 3
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomus</i> spp.	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	6	6	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum scolabenum</i> group	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	8	8	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Ablabesmyia mallochii</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tribelos fuscicornis</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
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	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Corynoneura</i> spp.	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Paratanytarsus</i> spp.	29	31	1	0	0	15.5	0	0	0	0	0	31	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Labrundinia</i> spp.	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Stempellinia imbricata</i>	1	1	1	0	0.5	0	0	0	0	0	0	1	0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	<i>Atrichopogon</i> spp.	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0 Larvae = 3
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera	Naucoridae	<i>Pelocoris</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Hexapoda	Collembola				<i>Collembola</i> spp.	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0

Table 4 SCI full results for Sample B

[illegible]

Water Quality Assessment

Long-term water quality data is not available for Curiosity Creek. The data that is available was collected by the USGS, FDEP and Hillsborough County Environmental Protection Commission between 1980 and 2012. Additional samples were taken in May, June and July of 2021 by Hillsborough County Public Works. 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 Curiosity Creek Physical Water Quality (Field)

Curiosity Creek								
Date	Depth (m)	Temp (°C)	pH	DO (mg/L)	DO (% Sat)	Cond (UMHO/cm)	Salinity (PPT)	Secchi Depth (m)
4/29/2021	0.16	24.64	7.16	3.56	42.4	220.9	0.1	0.5
Mean POR	0.2	23.31	6.97	4.42	53.6	221.3	0.11	0.3

The chemical water quality analysis for Curiosity Creek is shown in Table 6 along with mean values for the period of record for available parameters. The 2021 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 0.175 mg/L (2021) and 0.254 mg/L (period of record). Total Phosphorous values for the sample from this assessment were 0.177 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L for the 2021 samples with a mean value of 0.865 mg/L (2019) and 1.075 mg/L (period of record). The Total Nitrogen value from the assessment was below the threshold with a concentration of 1.040 mg/L. Chlorophyll-a corrected values fall below the site specific evaluation range of 3.2 µg/l to 20 µg/l for the 2021 samples (1.0 µg/l in 2021 and 3.07 µg/l period of record). For sites with Chlorophyll-a values in this range, the assessment is indicating conditions reflecting a balance in flora. An elevated biomass of the bacterial parameters was observed in the 2021 dataset with E. Coli having a geomean of 1,364 colonies/100 ml, 2,357/100 ml for Enterococci. This trend is also observed in the long term data set with period of record geometric mean value for Enterococci being 4,697/100 ml. These values indicate bacterial contamination of Curiosity Creek.

Table 6 Curiosity Creek Water Quality (Laboratory)

Parameter	Curiosity Creek 5/10/2021	POR Mean (1980- 2021)	Units
Alkalinity	81.6	65.4	mg/LCaCO ₃
Color(345)F.45	40	36.6	Pt/Co
E. Coli	7,750	1,364	#/100 ml
Enterococci	7,310	4,697	#/100 ml
Chlorophyll a	1.3	3.07	ug/L
Chlorophyll b	1.0	0.77	ug/L
Chlorophyll c	1.0	0.43	ug/L
Chlorophyll t	1.3	2.95	ug/L
Chlorophylla Corr	1	2.06	ug/L
Chlorophyll-pheo	2.30	4.85	ug/L
Ammonia	0.162	0.065	mg/L
Kjeldahl Nitrogen	0.923	0.604	mg/L
Total Nitrogen	1.040	1.075	mg/L
Nitrates/Nitrites	0.115	0.131	mg/L
Total Phosphorus	0.177	0.254	mg/L

Conclusion

Curiosity Creek at Fletcher Avenue is located in a natural easement in a commercial district. 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 77. Disruption to the vegetation community was not observed in the results of the Linear Vegetation Survey with Curiosity Creek having below 2 square meters of rooted herbaceous vegetation. Curiosity Creek did meet standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6 due to the heavy canopy coverage in the region. The recent water quality record for Curiosity 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 “Category 2 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		Curiosity Creek	2021	Threshold
Total Phosphorous (mg/l)		0.177	0.175	< 0.49
Total Nitrogen (mg/l)		1.040	0.865	< 1.65
RPS (% Rank 4-6)		0		< 25%
LVS	Avg C of C	N/A		≥ 2.5
	FLEPPC %	N/A		< 25%
Chlorophyll-a Corrected (µg/l)		1.0	2.06	< 20 µg/l
Habitat Assessment		77		> 34
SCI		45		> 34