



# Curiosity Creek

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

David Eilers | USF Water Institute | January 23, 2018

# 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, 2011 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 ( $\leq 2$ ) 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

Curiosity Creek is located in north central Hillsborough County. Its headwaters are located in a swamp south of Lake Magdalene Blvd and the outfall of Curiosity Creek is in an unnamed lake south of W Country Club Dr. The assessment of Curiosity Creek was conducted on January 23, 2018. At the time of the assessment, the water levels were average for the dry season. The primary land use in the Curiosity Creek watershed is residential (62%), commercial (16%), natural (9.3%) and Institutional (3.7%). The resulting Landscape Development Intensity Index is 7.51.

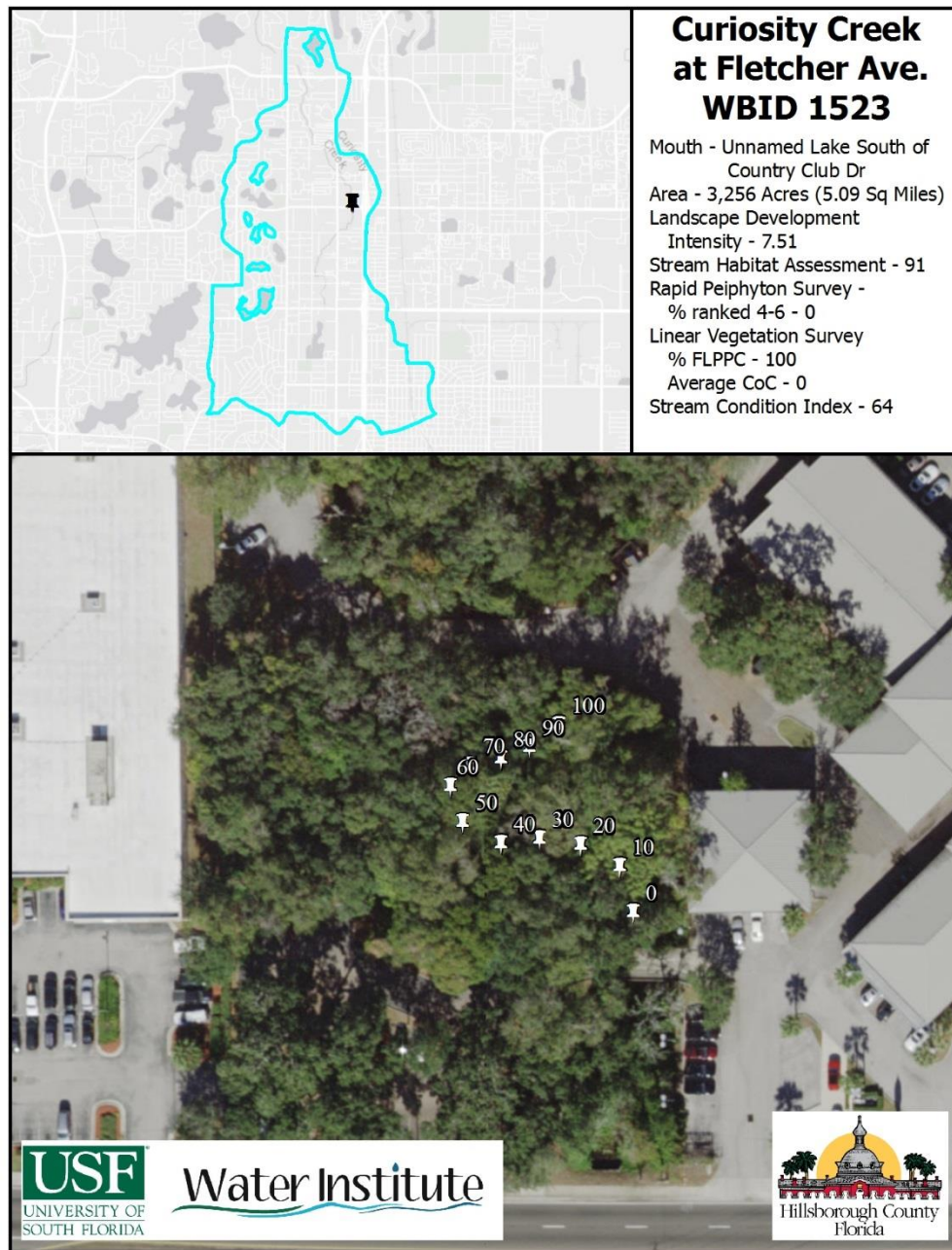


Figure 1 2018 Curiosity Creek Study Area Map

## Habitat and Vegetation Assessment



*Figure 2 Overview photograph of Curiosity Creek at Fletcher Ave Sample Site*

The FDEP Habitat Assessment is split into primary and secondary habitat components. The primary habitat components focus on the in stream habitat and factors. The secondary habitat components focus on the surrounding lands and vegetation.

The primary habitat components scored in the suboptimal category for Substrate Diversity (three major productive habitats) and Water Velocity (0.11 m/s). Marginal scores were achieved for the Substrate Availability (7.8% major productive habitat) and Habitat Smothering (not having the required number of stable pools and sand/silt smothering). The major productive



habitats were snags (4.4%), Roots (1.3%) and Leaf Packs (2.1%). The resulting primary habitat component score was a 38 out of 80.

The secondary habitat components scored in the optimal category for Bank Stability with both banks meeting the three requirements. Suboptimal scores were achieved for Artificial Channelization (showing good sinuosity with some evidence of prior channelization) and Riparian Zone Buffer Width (averaging approximately 12 meters of riparian buffer on each bank). Marginal scores were noted for Riparian Zone Vegetation Quality as the species found indicated obvious disruption to the region. The secondary habitat component score for Curiosity Creek was a 53 out of 80. The total score for the FDEP Habitat Assessment was a 91 out of 160.

During the FDEP Linear Vegetation Survey, only one species was identified growing in the wet portion of the stream. *Ruellia simplex*, a non-native invasive species, was abundant in the surrounding banks and floodplain. The resulting metrics were 0 for Mean coefficient of conservatism and 100% for % FLEPPC species.

*Table 1 Linear Vegetation Survey Results – Curiosity Creek at Fletcher Ave.*

Plant Species	Sample Site										Observations/ Species	CoC
	0-10m	10-20m	20-30m	30-40m	40-50m	50-60m	60-70m	70-80m	80-90m	90-100m		
<i>Ruellia simplex</i>	1	1	1	1	1			1	1	1	8	0
Observations/station	1	1	1	1	1	0	0	1	1	1	8	
Total Observations	10											
Mean CoC	0											
% FLEPPC	100%											

The FDEP Rapid Periphyton Survey did not encounter any periphyton in the 99 samples. The average canopy coverage in the assessment region was 95% corresponding to a heavily shaded system.



*Figure 3 Picture of Ruellia simplex on 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 48 out of a possible 100 points, corresponding with a “Healthy” designation, with the expected community of a healthy stream.

Neither Subsample contained any Long Lived Taxa or Sensitive Taxa indicating potential desiccation of heavy pollution event in the past year. High scores were achieved in both samples for the % Filter Feeders, % Tanytarsini, % Dominance and % Very tolerant Individual metrics. 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 Subsample A (top) and Subsample B (bottom)*

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	1.00	1.43	1.43
% Filter Feeders	50.00	11.47	10.00
Total Clingers	2.00	2.86	2.86
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	30.41	6.72	6.72
% Tanytarsini	30.41	10.14	10.00
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	6.76	6.63	6.63
SCI Sum	42.55		
Final SCI score	47.28		

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	24.00	3.75	3.75
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	42.47	9.71	9.71
Total Clingers	2.00	2.86	2.86
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	25.34	7.73	7.73
% Tanytarsini	23.97	9.46	9.46
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	4.79	7.36	7.36
SCI Sum	44.30		
Final SCI score	49.22		



Stream Condition Index Results for Curiosity Creek SCA

Phylum	Class	Order	Family	Taxa	Abundance	Abundance	Abundance	Taxa Presence	Taxa	ephemeroptera	Trichoptera	Taxa 50% filter	100% filter	Clinger Taxa	long lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very tolerant individuals
Armenida	Ctenelata	Tubificida	Naididae	Tubificinae spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Armenida	Ctenelata	Lumbriculida	Lumbriculidae	Lumbriculus cf. variegatus	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Armenida	Ctenelata	Rhyacodrilidae	Glossiphoniidae	Hebidrilus elongatus	3	3	1	1	0	0	0	0	0	0	0	0	0	0	3
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	21	21	1	1	0	0	0	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Hygrophila	Physidae	Physella culensis	2	2	1	1	0	0	0	0	0	0	0	0	0	0	2
Mollusca	Gastropoda	Hygrophila	Planorbidae	Planorbella scabris	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	11	11	1	1	0	0	0	0	11	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Eupero cubensis	2	2	1	1	0	0	0	0	2	0	0	0	0	0	0
Arthropoda	Malacostraca	Amphipoda	Dogielinidae	Hyalella azteca sp. complex	34	34	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Ephemeroptera	Beetidae	Beetidae spp.	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche spp.	15	15	1	1	0	1	0	0	15	1	1	0	0	0	0
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Ecdytus ochroleus	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Coleoptera	Scirtidae	Scirtes spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum holzeri group	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum flavum	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum limosense group	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Arthropoda	Insecta	Diptera	Chironomidae	Rhectantrusus exigus group	43	45	1	1	0	0	0	0	45	1	0	45	45	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Abdusomyia molochi	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Geddesiellus spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1
Arthropoda	Insecta	Diptera	Chironomidae	Stenochironomus spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Gynostomus spp.	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Arthropoda	Insecta	Leptodactera	Cumidae	Neurogasteris stenosialis	1	1	1	1	0	0	0	0	1	0	0	0	0	0	1

Table 3 SCI full results for Sample A

Curiosity Creek SCB  
Stream Condition Index (SCI)  
Samples Collected 01/23/2018  
Project #: 6063120278

Stream Condition Index Results for Curiosity Creek SCB

Phylum	Class	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	ephemeroptera Taxa	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	long-lived Taxa	Dominant Taxa	Tampanini	Sensitive Taxa	Very Tolerant Individuals
Platyhelminthes				Platyhelminthes spp.	1	1	1	0	0	0	0	0	0		0	0	0
Nemertea	Ecneph	Hoplomenetia	Terastomatidae	Prostoma spp.	1	1	1	0	0	0	0	0	0		0	0	1
Annelida	Cirrellia	Ophiopora	Sargenophiliidae	Sargenophilus spp.	1	1	1	0	0	0	0	0	0		0	0	0
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	18	18	1	0	0	0	0	0	0		0	0	0
Mollusca	Gastropoda	Planorbidae	Planorbello scolitis		2	2	1	0	0	0	0	0	0		0	0	2
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeridae spp.	5	5	1	0	0	0	5	0	0		0	0	0
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Eugera culensis	1	1	1	0	0	0	1	0	0		0	0	0
Arthropoda	Malacostraca	Amphipoda	Dogielinoidea	Hyalella azteca sp. complex	37	37	1	0	0	0	0	0	0		37	0	0
Arthropoda	Insecta	Ephemeroptera	Barbetidae	Labiobetis frontalis	1	1	1	1	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	4	4	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Trichoptera	Trichoptera spp.		1		0	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Chenutapsycha spp.	21	22	1	0	1	0	22	1	0		0	0	0
Arthropoda	Insecta	Coleoptera	Dryopidae	Dryopidae spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Coleoptera	Scirtidae	Scirtes spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Chironomidae	Chironomidae spp.		2		0	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Tomyrus buckleyi		2	2	1	0	0	1	0	0	0		2	0	0
Arthropoda	Insecta	Diptera	Polypedilum flavum		4	4	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum lilienae group	1	1	1	0	0	0	0	0	0		0	0	1
Arthropoda	Insecta	Diptera	Chironomidae	Rhectomyia exilis group	31	33	1	0	0	0	33	1	0		33	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Abdusmyia mallochii	2	2	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Geddeschironomus spp.	1	1	1	0	0	0	0	0	0		0	0	1
Arthropoda	Insecta	Diptera	Chironomidae	Pentaneura incognita	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Stenochironomus spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Pseudodolopha spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Cammonurus spp.	3	3	1	0	0	0	0	0	0		0	0	0
Arthropoda	Insecta	Diptera	Chironomidae	Larva spp.	2	2	1	0	0	0	0	0	0		0	0	2

Table 4 SCI full results for Sample B



## Water Quality Assessment

Limited long-term water quality data is available for Curiosity Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission, Florida LAKEWATCH and the Florida Department of Environmental Protection. Values for the physical water parameters begin in 2005 and continue through 2012. Values for the laboratory water parameters begin in 2005 but end in 2009, aside from the sample taken along with this assessment. The 2018 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)
1/23/18	0.33	14.15	6.21	7.45	71.4	206	0.09	0.75
Mean POR		23.62	7.11	4.46	53.15	240	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. 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 0.125 mg/L (2005-2009). Total Phosphorous values for the sample from this assessment were 0.081 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 0.509 mg/L (2005-2009). The Total Nitrogen value from the assessment was also below the threshold with a concentration of 0.516 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 sample (2.9) and the period of record (2.7 µg/l 2005-2009). For sites with Chlorophyll-a values in this range, the assessment is does not reflect an imbalance in flora. Elevated biomass of the bacterial parameters was observed in both the sample for this assessment and the long term dataset.

*Table 6 Curiosity Creek Water Quality (Laboratory)*

<b>Parameter</b>	<b>Curiosity Creek</b>	<b>POR Mean</b>	<b>Units</b>
Alkalinity	60.0	N/A	mg/LCaCO <sub>3</sub>
Nitrates/Nitrites	0.102	0.088	mg/L
E. Coli	720	N/A	#/100 ml
Enterococci	2300	6084	#/100 ml
Chlorophyll a	2.8	3.11	ug/L
Chlorophyll b	5.1	N/A	ug/L
Chlorophyll c	0.7	N/A	ug/L
Chlorophyll t	7.8	N/A	ug/L
Chlorophylla Corr	2.9	2.70	ug/L
Chlorophyll-pheo	3.2	N/A	ug/L
Ammonia	0.077	0.050	mg/L
Kjeldahl Nitrogen	0.414	0.592	mg/L
Total Nitrogen	0.516	0.509	mg/L
Total Phosphorus	0.081	0.125	mg/L
Color(345)F.45	85.4	26.89	Pt/Co



## Conclusion

Curiosity Creek is located with some buffer of natural, undeveloped land surrounding it in an urban landscape. The stream itself showed moderate alterations to the stream flow, buffer and banks in the region assessed. At the time of the habitat assessment, the water levels were low, corresponding to the end of the dry season, however sufficient habitat for macroinvertebrates was observed. Due to these factors, the Habit Assessment resulted in a Suboptimal score of 91. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Curiosity Creek not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Curiosity Creek met standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6. The historical water quality record for Curiosity Creek showed acceptable concentrations of Total Phosphorous and Total Nitrogen but showed elevated biomass for Bacteria. The results of the SCI sampling indicate that the stream is not impaired 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	Mean POR	Threshold
Total Phosphorous (mg/l)		0.081	0.125	< 0.49
Total Nitrogen (mg/l)		0.516	0.509	< 1.65
RPS (% Rank 4-6)		0		< 25%
LVS	Avg C of C	0		≥ 2.5
	FLEPPC %	100.00%		< 25%
Chlorophyll (µg/l)		2.9	2.7	< 20 µg/l
Habitat Assessment		91		> 34
SCI		48		> 34