Rocky Creek Lower Segment

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

David Eilers, Bailey Cooper & Alyssa Schultz| USF Water Institute | January 14, 2020

Methods

STUDY AREA ANALYISIS

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2020 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

Rocky Creek lower segment is located in northwestern Hillsborough County. Its headwaters are located in Lake Carlton and the outfall of Rocky Creek is in Old Tampa Bay. The assessment of Rocky Creek was conducted on January 14, 2019 near Wilsky Rd. At the time of the assessment, the water levels were normal for the end of the dry season. The lower Rocky Creek WBID covers 11.8 square miles and is dominated by residential (52.0%) and natural (19.8%) land uses. The resulting calculated landscape development intensity index score was 6.39.

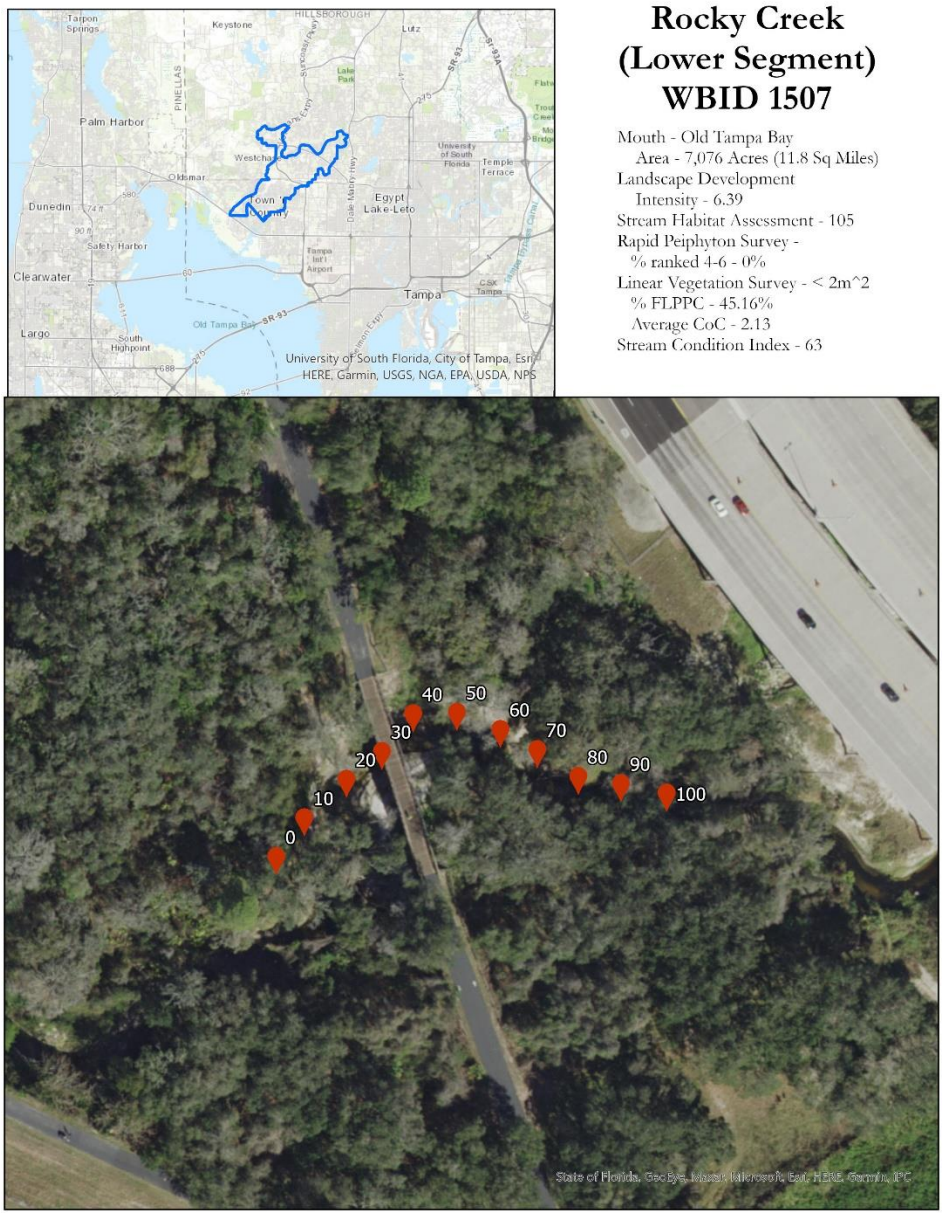

Figure 1 2020 Lower Rocky Creek Study Area Map

Figure 2 Overview photograph of the Lower Rocky Creek Sample Site

Habitat and Vegetation Assessment

The region of Rocky Creek where the assessment was conducted is in a natural easement among a highly developed residential area. The region was moderately shaded with a mean canopy cover measurement of 47.5%. Rocky Creek averaged 0.4 meters in depth, approximately 6.8 meters wide with a flow of 0.36 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. Habitat Smothering (sufficient stable pools with some of the productive habitats affected by sand smothering) scored in the suboptimal range. Substrate Diversity (Presence of two major productive habitats (snags, rocks)) was scored as marginal. Substrate Availability (3.1% of stream are productive habitats) was scored as poor. Minor habitats included roots, leaf packs/mats, macrophytes, 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 suboptimal category for Artificial Channelization, Riparian Buffer Zone Width (right bank), Bank Stability and Riparian Zone Vegetation Quality. Riparian Buffer Zone Width scored in the optimal range for the left bank. The riparian buffer zone surrounding the stream was greater than 18 meters on the left bank and 15 meters on the right bank. The Riparian Buffer Vegetation consisted of a mixture of native and invasive species indicative of disturbance. The vegetation in the stream itself was contained multiple non-native species with 2 non-native invasive species out of 7 total species. The secondary habitat components received a score of 61 out of 80. The resulting FDEP Habitat Assessment score was a 105.

Periphyton was not encountered during the 76 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 47.5% partially limiting available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered less than two square meters of herbaceous aquatic vegetation in the study area. 7 herbaceous species in Rocky Creek were observed in total rooted in the wetted part of the stream. *Alternanthera philoxeroides* and *Urochloa mutica* are non-native invasive species in Florida.

Table 1 Linear Vegetation Survey Results – Lower Rocky 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	
Alternanthera philoxeroides	0	1	1	1	1		1	1	1	1	1	9
Micranthemum umbrosum	5.66	1	1	1	1		1	1	1			7
Urochloa mutica	0						1	1	1	1	1	5
Eleocharis (submersed viviparous but unable to ID to species)	3				1			1	1			3
Hydrocotyle umbellata	1.92						1		1		1	3
Ludwigia repens	3.2						1	1	1			3
Mikania scandens	1.95										1	1

Figure 3 Rock habitat along Rocky 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 Rocky Creek was 63 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 Total Clingers, % Dominance and % Very Tolerant individuals in both Samples. Sample A also had high scores for Total Ephemeroptera, whereas Sample B had high scores for % Filter Feeders. Both samples scored poorly for Total Taxa. Sample A score poorly for Total Trichoptera as well. Both subsamples contained sensitive taxa and 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 Rocky Creek Sample A (top) and Sample B (bottom)

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	19.00	1.67	1.67
Total Ephemeroptera	4.00	8.00	8.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	27.33	6.19	6.19
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	26.67	7.47	7.47
% Tanytarsini	9.33	6.87	6.87
Total Sensitive Taxa	3.00	4.29	4.29
% Very Tolerant Individuals	3.33	8.08	8.08

SCI Sum	54.47
Final SCI score	60.52

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	18.00	1.25	1.25
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	2.00	2.86	2.86
% Filter Feeders	34.42	7.84	7.84
Total Clingers	6.00	8.57	8.57
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	20.78	8.64	8.64
% Tanytarsini	8.44	6.60	6.60
Total Sensitive Taxa	3.00	4.29	4.29
% Very Tolerant Individuals	1.30	9.67	9.67

SCI Sum	59.06
Final SCI score	65.62

Table 3 SCI full results for Sample A

Stream Condition Index Results for Rocky Creek at Wilsky SCIA

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed	Taxa Presence	Ephemeroptera	Trichoptera	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Ancylidae	Ancylidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged, no shell
Mollusca		Gastropoda	Caenogastropoda	Littorinimorp	Hydrobiidae	*Pyrgophorus platyrachis*	4	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	Crustace	Malacostraca	Eumalacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Baetidae	Baetidae spp.	17		0	0	0	0	0	0	0		0	0	0	Damaged, not A. pygmaea or L.
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Baetidae	*Labiobaetis frondalis*	1	1	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Baetidae	*Acerpenna pygmaea*	6	6	1	1	0	0	0	0	0		0	1	0	
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Baetidae	*Baetis intercalaris*	11	28	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Heptageniidae	Heptageniidae spp.	1		0	0	0	0	0	0	0		0	0	0	Damaged; immature
Arthropoda	Hexapod	Insecta	Pterygota	Ephemeropte	Heptageniidae	*Stenacron interpunctatum*	1	2	1	1	0	0	0	1	0		0	1	0	
Arthropoda	Hexapod	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged and immature
Arthropoda	Hexapod	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	2		0	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Arthropoda	Hexapod	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	15	17	1	0	1	0	17	1	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	2	2	1	0	0	0	0	0	0		0	0	0	2 adults
Arthropoda	Hexapod	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	4	4	1	0	0	0	0	1	0		0	0	0	4 larvae
Arthropoda	Hexapod	Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	17	17	1	0	0	0	0	0	0		0	0	0	10 larvae, 7 adults
Arthropoda	Hexapod	Insecta	Pterygota	Diptera		Diptera spp.	1		0	0	0	0	0	0	0		0	0	0	1 pupa, no posterior end
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	3		0	0	0	0	0	0	0		0	0	0	3 pupae
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus buckleyi*	1	1	1	0	0	1	0	0	0		1	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum scalaenum*	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	37	40	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense*	1	1	1	0	0	0	0	0	0		0	0	1	
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus*	12	13	1	0	0	0	13	1	0		13	0	0	
Arthropoda	Hexapod	Insecta	Pterygota	Diptera	Simuliidae	*Simulium* spp.	9	9	1	0	0	0	9	1	0		0	1	0	7 larvae, 2 adults

Table 4 SCI full results for Sample B

Stream Condition Index Results for Rocky Creek at Wilsky SCIB

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	2	2	1	0	0	0	0	0	0		0	0	2	
Mollusca		Bivalvia	Heterodonta	Veneroida	Corbiculidae	*Corbicula* spp.	2	2	1	0	0	0	2	0	1		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	23		0	0	0	0	0	0	0		0	0	0	Damaged, not A. pygmaea
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	*Acerpenna pygmaea*	8	8	1	1	0	0	0	0	0		0	1	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	*Baetis intercalaris*	9	32	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	5	5	1	1	0	0	0	1	0		0	1	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged and immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	22	22	1	0	1	0	22	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	Philopotamidae spp.	1	1	1	0	1	0	1	1	0		0	0	0	1 pupa
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	2	2	1	0	0	0	0	0	0		0	0	0	2 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	4	4	1	0	0	0	0	1	0		0	0	0	3 larvae, 1 adult
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	12	12	1	0	0	0	0	0	0		0	0	0	8 larvae, 4 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	2		0	0	0	0	0	0	0		0	0	0	2 damaged pupae, not Simuliidae or Forcipomyia spp.
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	7		0	0	0	0	0	0	0		0	0	0	7 pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	25	31	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	10	13	1	0	0	0	13	1	0		13	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Pentaneura inconspicua*	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	*Forcipomyia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	1 larva
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	*Simulium* spp.	15	15	1	0	0	0	15	1	0		0	1	0	12 larvae, 3 pupae
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Hygrobatidae	*Hygrobates* spp.	1	1	1	0	0	0	0	0	0		0	0	0	

Water Quality Assessment

Long-term water quality data is available for the lower segment of Rocky Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission (2005- 2020) and the Florida Department of Environmental Protection (2017-2020). 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 Lower Rocky Creek Physical Water Quality (Field)

Lower Rocky Creek								
Date	**Depth (m)**	**Temp (°C)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
1/30/20	0.1	16.5	6.8	7.83	79.9	255	0.12	4.9
Mean POR		23.8	6.92	5.45	53.3	202.8	0.10	0.9

The chemical water quality analysis for Rocky 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 0.050 mg/L (2005-2020). The three year geometric mean value for Total Phosphorous was 0.064 mg/L. Total Phosphorous values for the sample from this assessment were 0.084 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 0.789 mg/L for the period of record (2005-2020). The three year geometric mean value for Total Nitrogen was 0.772 mg/L. The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.872 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 (2.96 µg/l 2005-2020), and below the site specific evaluation range for the most recent 3-years of samples (2.63 µg/l). For sites with Chlorophyll-a values in this range, the assessment is indicative of conditions reflecting a balance in flora.

Elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 293 colonies/100 ml, 663/100 ml for Enterococci.

Table 6 Lower Rocky Creek Water Quality (Laboratory)

Parameter	Rocky Creek	POR Mean	Units
Alkalinity	65.4		mg/LCaCO3
Color(345)F.45	50	59.2	Pt/Co
E. Coli	488	293	#/100 ml
Enterococci	313	663	#/100 ml
Chlorophyll a	3.2	3.3	ug/L
Chlorophyll b	< 1	1.1	ug/L
Chlorophyll c	< 1	0.7	ug/L
Chlorophyll t	3.20		ug/L
Chlorophylla Corr	1.6	3.0	ug/L
Chlorophyll-pheo	2.6		ug/L
Ammonia	0.074		mg/L
Kjeldahl Nitrogen	0.619	0.735	mg/L
Total Nitrogen	0.872	0.789	mg/L
Nitrates/Nitrites	0.253	0.048	mg/L
Total Phosphorus	0.084	0.050	mg/L

Conclusion

Lower Rocky Creek near Wilsky Rd is located in a predominantly residential area with a natural corridor surrounding the stream. 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 105. Less than two square meters of herbaceous aquatic vegetation was observed during the Linear Vegetation Survey. Rocky 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 Lower Rocky Creek showed acceptable concentrations of Chlorophyll-a, 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		Lower Rocky Creek	3-Year Mean	Threshold
Total Phosphorous (mg/l)		0.084	0.064	< 0.49
Total Nitrogen (mg/l)		0.872	0.772	< 1.65
RPS (% Rank 4-6)		0%		< 25%
LVS	**Avg C of C**	< 2m^2		≥ 2.5
	FLEPPC %	< 2m^2		< 25%
Chlorophyll (µg/l)		1.6	3.1	< 20 µg/l
Habitat Assessment		105		> 34
SCI		63		> 34