Rocky Creek

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 (≤ 2) can be considered minimally disturbed." In the Florida framework, the maximum LDI index score is approximately 42.

Habitat/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, Fecal Coliform, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen.

Study Area

The Rocky Creek Sample Site is located downstream from the Veterans Expressway, near Citrus Park in Hillsborough County Florida was sampled on 5/1/17. The sampling site is located within the FDEP WBID 1507, which contains 7,077 acres of land. The watershed surrounding Rocky Creek is dominated by Residential (53.23%), Commercial/Industrial (7.6%), and Forest/Natural (21.54%) land uses. The Landscape Development Intensity Index of the watershed is 5.97. The LDI was also calculated for the 100 meter buffer around the stream in the WBID to capture the land use that has the largest potential to alter the stream. The buffer LDI value was 3.87 and was dominated by Residential (31.65%), Agriculture/Pasture (5.7%) and Forrest/Natural (52.4%) land uses.

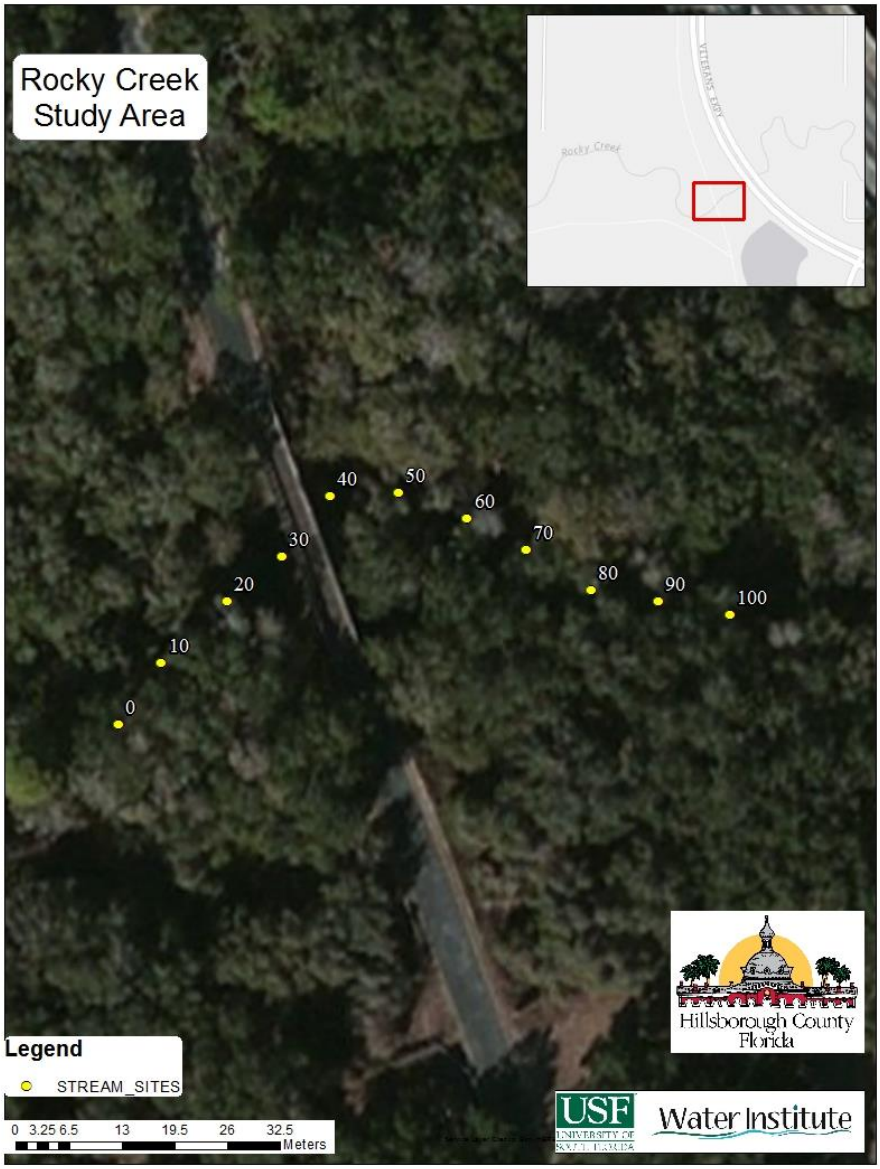

Figure 1. 2017 Rocky Creek Assessment Study Area Map

Habitat Assessment

Figure 2 Overview photograph of Rocky Creek sample site

Rocky Creek near Veterans Expressway received a suboptimal Habitat Assessment score of 108. Primary habitat components received suboptimal scores for Substrate Diversity, Water Velocity and Habitat Smothering, and a poor score for Substrate Availability (2.3% Snags and 2.9% Rock). Secondary habitat components received optimal scores for Artificial Channelization, Bank Stability and Riparian Buffer Zone Width while suboptimal scores were recorded for Riparian Zone Vegetation Quality.

During the Rapid Periphyton Survey, periphyton was observed in 82 of the 99 individual grab samples performed. Of the 82 grab samples with periphyton, 71 points were ranked 4-6 (71.7%) The average canopy cover in the 100 meter region was 61.9%. The Secchi Disk Depth was measured as 1.5 meters visible on bottom at the 10 meter mark. The average water depth at the time of the assessment was 0.5 meters. The dominant species in the periphyton community was *Lyngbya spp.*

The Linear Vegetation Survey identified 13 species rooted in the water at the time of the assessment. Three of these species are non-native, invasive species (*Alternanthera philoxeroides, Landoltia punctata* and *Salvinia minima*). There were a total of 66 species observations in the 100 meter

study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 1.87 and the % FLEPPC metric for the study area was 42%.

Table 1 Linear Vegetation Survey Results

Taxa Name	C of C Score	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Total Occurrences
Alternanthera philoxeroides	0	1		1	1	1	1	1	1		1	8
Amaranthus australis	1								1			1
Chara	3.9						1	1				2
Ceratopteris thalictroides	2.93	1										1
Echinochloa crusgalli	0.22			1	1							2
Hydrocotyle umbellata	1.92		1					1	1	1		4
Landoltia punctata	0	1	1	1	1	1	1	1	1	1	1	10
Lemna	1	1	1	1	1	1	1	1	1	1	1	10
Ludwigia repens	3.2	1		1	1		1		1			5
Micranthemum umbrosum	5.66	1	1	1	1	1	1	1	1	1	1	10
Salvinia minima	0	1	1	1	1	1	1	1	1	1	1	10
Taxodium	7			1				1				2
Vallisneria americana	7				1							1
		7	**5**	**8**	**8**	**5**	**7**	**8**	**8**	**5**	**5**	**66**

Mean CoC	1.87
% FLEPPC	42.00%

Figure 3. Shoreline conditions 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 55 out of a possible 100 points, corresponding with a "Healthy" designation, with the expected community of a healthy stream.

The summary of the metric scores for aliquot A (top) and aliquot B (bottom) are shown in Table 2. Both samples were dominated by *Cheumatopsyche spp.* Sample A contained 32 total taxa, including 1 sensitive taxa and 10.74% very tolerant individuals. Sample B contained 26 total taxa, including 1 sensitive taxa and 3.33% very tolerant individuals. Neither sample contained a long-lived taxa.

Table 2 SCI metric summaries for Rocky Creek

	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	32.00	7.08	7.08
Total Ephemeroptera	3.00	6.00	6.00
Total Trichoptera	3.00	4.29	4.29
% Filter Feeders	21.81	4.91	4.91
Total Clingers	5.00	7.14	7.14
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	19.46	8.91	8.91
% Tanytarsini	3.36	4.33	4.33
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	10.74	5.59	5.59

SCI Sum	49.68
Final SCI score	55.20

	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	3.00	4.29	4.29
% Filter Feeders	27.00	6.12	6.12
Total Clingers	4.00	5.71	5.71
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	22.00	8.40	8.40
% Tanytarsini	6.67	5.99	5.99
Total Sensitive Taxa	1.00	1.43	1.43
% Very Tolerant Individuals	3.33	8.08	8.08

SCI Sum	48.60
Final SCI score	54.00

The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Rocky Creek.

Rocky Creek SCIA
Stream Condition Index (SCI)
Samples Collected 05/01/2017
Project #: 6063170278

Stream Condition Index Results for Rocky Creek SCIA

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	Tanytarsini	Sensitive Taxa	Very Tolerant Individuals
Annelida	Clitellata	Tubificida	Naididae	*Dero flabelliger*	1	1	1										1
Annelida	Clitellata	Tubificida	Naididae	*Dero trifida*	4	4	1										4
Annelida	Clitellata	Tubificida	Naididae	*Allonais inaequalis*	1	1	1										
Annelida	Clitellata	Tubificida	Naididae	*Stylaria lacustris*	3	3	1										
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis*	3	3	1										3
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	*Helobdella papillata*	2	2	1										2
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	1	1	1										
Mollusca	Gastropoda	Hygrophila	Physidae	*Physella cubensis*	3	3	1										3
Mollusca	Gastropoda	Hygrophila	Planorbidae	*Planorbella* spp.	3	3	1										3
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	6	6	1										
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	*Amnicola dalli*	20	20	1										
Arthropoda	Malacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	4	4	1										
Arthropoda	Insecta	Ephemeroptera	Caenidae	*Caenis* spp.	1	1	1	1									
Arthropoda	Insecta	Ephemeroptera	Baetidae	*Baetis intercalaris*	11	11	1	1									
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Heptageniidae spp.	2												
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	*Maccaffertium* spp.	1	3	1	1				1				1	
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	1	1	1										
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	29	29	1		1		29	1		29			
Arthropoda	Insecta	Trichoptera	Hydroptilidae	Oxyethira spp.	10	10	1		1								
Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Hydroptila* spp.	6	6	1		1			1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Dubiraphia* spp.	3	3	1										
Arthropoda	Insecta	Coleoptera	Elmidae	*Stenelmis* spp.	6	6	1					1					
Arthropoda	Insecta	Coleoptera	Elmidae	*Microcylloepus* spp.	5	5	1										
Arthropoda	Insecta	Coleoptera	Hydrophilidae	*Crenitulus suturalis*	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus buckleyi*	3	3	1			1.5					3		
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	8	8	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	2	2	1				2	1			2		
Arthropoda	Insecta	Diptera	Chironomidae	*Ablabesmyia mallochi*	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Pentaneura inconspicua*	3	3	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Labrundinia* spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	2	2	1										
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	1	1	1										
Arthropoda	Insecta	Heteroptera	Veliidae	*Rhagovelia* spp.	1	1	1										

Table 3 SCI full results for Sample A

Rocky Creek SCIB
Stream Condition Index (SCI)
Samples Collected 05/01/2017
Project #: 6063170278

Stream Condition Index Results for Rocky Creek SCIB

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	Tanytarsini	Sensitive Taxa	Very Tolerant Individuals
Annelida	Clitellata	Tubificida	Naididae	*Stylaria lacustris*	2	2	1										
Annelida	Clitellata	Tubificida	Naididae	*Slavina appendiculata*	1	1	1										
Annelida	Clitellata	Rhynchobdellida	Glossiphoniidae	*Helobdella stagnalis*	1	1	1										1
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	7	7	1										
Mollusca	Gastropoda	Hygrophila	Physidae	*Physella cubensis*	4	4	1										4
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	Hydrobiidae spp.	10	10	1										
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	*Amnicola dalli*	18	18	1										
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	1	1	1				1						
Arthropoda	Malacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	6	6	1										
Arthropoda	Insecta	Ephemeroptera	Baetidae	*Baetis intercalaris*	11	11	1	1									
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	*Maccaffertium* spp.	1	1	1	1				1				1	
Arthropoda	Insecta	Odonata	Corduliidae	Corduliinae spp.	1	1	1										
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	4	4	1										
Arthropoda	Insecta	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	33	33	1		1		33	1		33			
Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Oxyethira* spp.	8	8	1		1								
Arthropoda	Insecta	Trichoptera	Hydroptilidae	*Hydroptila* spp.	4	4	1		1			1					
Arthropoda	Insecta	Coleoptera	Elmidae	Microcylloepus spp.	9	9	1										
Arthropoda	Insecta	Coleoptera	Chrysomelidae	Chrysomelidae spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus* spp.	3												
Arthropoda	Insecta	Diptera	Chironomidae	*Tanytarsus buckleyi*	5	8	1			4					8		
Arthropoda	Insecta	Diptera	Chironomidae	*Polypedilum flavum*	7	7	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	2	2	1				2	1			2		
Arthropoda	Insecta	Diptera	Chironomidae	*Ablabesmyia mallochi*	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Dicrotendipes* spp.	1	1	1			0.5							
Arthropoda	Insecta	Diptera	Chironomidae	*Pentaneura inconspicua*	7	7	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Stenochironomus* spp.	1	1	1										
Arthropoda	Insecta	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	1	1	1										

Table 4 SCI full results for Sample B

Water Quality Assessment

Limited long-term water quality data is available for Rocky Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission, United States Geological Survey, Florida LAKEWATCH and the Florida Department of Environmental Protection. Values for the physical water parameters begin in 2005 and continue through present. Values for the laboratory water parameters begin in 2005 but end in 2015, aside from the sample taken along with this assessment. The 2017 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 Rocky Creek Physical Water Quality (Field)

Rocky Creek								
Date	**Depth (m)**	**Temp (ºC)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
5/11/17	0.19	24.24	8.78	5.63	66.5	285	0.13	1.5
Mean POR		22.37	6.73	5.13	50.3	204.4	0.10	

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 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 0.046 mg/L (2005-2015). Total Phosphorous values for the sample from this assessment were 0.037 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 0.883 mg/L (2005-2015). The Total Nitrogen value from the assessment was well below the threshold with a concentration of 0.288 mg/L. Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for the most recent sample, but below this threshold for the period of record (2005-2015). For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting 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 Rocky Creek Water Quality (Laboratory)

Parameter	Rocky Creek	POR Mean	Units
Alkalinity	66.0	31.69	mg/LCaCO3
Nitrates/Nitrites	0.026		mg/L
Fecal Coliform	467	479	#/100 ml
Enterococci	540	872	#/100 ml
Chlorophyll a	41.7	5.17	ug/L
Chlorophyll b	2.6	0.85	ug/L
Chlorophyll c	2.0	0.62	ug/L
Chlorophyll t	43.7		ug/L
Chlorophylla Corr	15.2	4.21	ug/L
Chlorophyll-pheo	42.3		ug/L
Ammonia	0.051		mg/L
Kjeldahl Nitrogen	0.262	0.724	mg/L
Total Nitrogen	0.288	0.883	mg/L
Total Phosphorus	0.037	0.046	mg/L
Color(345)F.45	21.2	63.61	Pt/Co

Conclusion

Rocky Creek at Veterans Expressway 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 108. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Rocky Creek not meeting either metric for Average Coefficient of Conservatism or the Percent FLEPPC. Rocky

Creek also did not meet standards for the rapid periphyton survey with 71.7% of samples being ranked between 4 and 6. The dominant species in the periphyton community was *Lyngbya spp.* The historical water quality record for Rocky 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		Veterans Expressway	Mean POR	Threshold
Total Phosphorous (mg/l)		0.037	0.046	< 0.49
Total Nitrogen (mg/l)		0.288	0.883	< 1.65
RPS (% Rank 4-6)		71.7		< 25%
LVS	Avg C of C	1.87		≥ 2.5
	FLEPPC %	42.00%		< 25%
Chlorophyll (µg/l)		15.2	4.21	< 20 µg/l
Habitat Assessment		108		> 34
SCI		55		> 34