Turkey 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 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.

Study Area

Turkey Creek is located in eastern Hillsborough County in the Hillsborough Bay Watershed. Its headwaters are located southeast of Dr. King Blvd and Sydney Dover Road. The outfall of Turkey Creek is in the Alafia River. The assessment of Turkey Creek was conducted on April 22, 2021. At the time of the assessment, the water levels were normal for the dry season. The Turkey Creek WBID covers 14.4 square miles and is dominated by residential (25.2%), reclaimed (20.6%), natural (18.5%) and agricultural (13.0%) land uses. The resulting calculated landscape development intensity index score was 5.36.

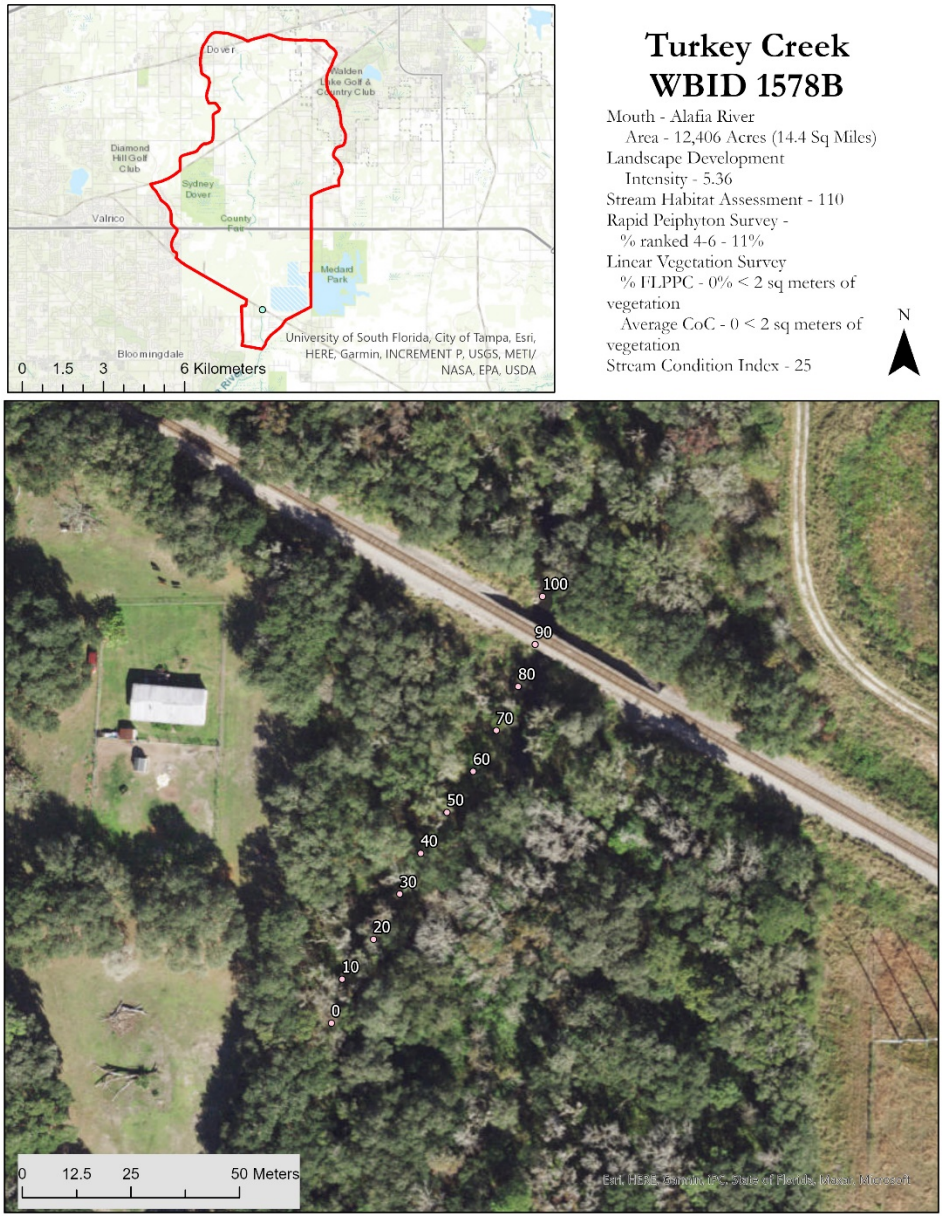

Figure 1 2021 Turkey Creek Study Area Map

Figure 2 Overview photograph of the Turkey Creek Sample Site showing the exposed limestone features

Habitat and Vegetation Assessment

The region of Turkey Creek where the assessment was conducted is in a natural easement downstream from reclaimed mine land near low density residential land uses. The region was moderately shaded with a mean canopy cover measurement of 63.5%. Turkey Creek averaged 0.4 meters in depth, approximately 5.15 meters wide with a flow of 0.26 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 (0.26 m/s). Habitat Smothering (sufficient pools but many of the productive habitats were affected by sand smothering) and Substrate Availability (20.1% of stream are productive habitats) were scored as suboptimal. Substrate Diversity (Presence of one major productive habitats (rocks)) scored in the poor category. Minor habitats included snags, roots, submerged aquatic vegetation, sand and silt deposits. The total score for the primary habitat components was a 48 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 Bank Stability (both banks with few raw eroded areas and fortified by natural limestone and Riparian Buffer Zone Width for the right bank (greater than 18 meters of buffer). Suboptimal scores were achieved for Artificial Channelization (evidence of previous alteration with spoil banks), Riparian Buffer Zone Width for the left bank (15 meters of buffer vegetation) and Riparian Zone Vegetation Quality (both banks showing moderate levels of disturbance shown in the species present). The secondary habitat components received a score of 62 out of 80. The resulting FDEP Habitat Assessment score was a 110.

Table 1 Scoring Summary for the Stream Habitat Assessment

Metric	Score
Primary Habitat Components	
Substrate Diversity	5
Substrate Availability	13
Water Velocity	16
Habitat Smothering	14
Primary Score	**48**
Secondary Habitat Components	
Artificial Channelization	13
Bank Stability - Right Bank	9
Bank Stability - Left Bank	9
Riparian Buffer Zone Width - Right Bank	10
Riparian Buffer Zone Width - Left Bank	8
Riparian Zone Vegetation Quality - Right Bank	7
Riparian Zone Vegetation Quality - Left Bank	6
Secondary Score	**62**
Habitat Assessment Score	**110**

Periphyton was encountered during the 99 samples taken during the Rapid Periphyton Survey. Periphyton was observed in classes 4-6 (< 6mm to > 10cm) in 11 of the grab samples. These higher value samples were predominately in meters 60 through 90 where the canopy coverage was reduced near the rail road trestle crossing (24% canopy coverage average in regions 60-80 compared to 78.25% in the rest of the study area). The tree canopy in the assessment area averaged 63.5%.

The FDEP Linear Vegetation Survey encountered less than 2 m^2 of herbaceous species rooted in Turkey Creek.

Table 1 Linear Vegetation Survey Results – Turkey 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	
Less than 2m^2												

Figure 3 The area around the railroad trestle had a reduction of canopy coverage and an increase in periphyton abundance.

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 Turkey Creek was 25 out of a possible 100 points, corresponding with an "Impaired" designation, with noticeable loss of taxonomic diversity from the expected community of a healthy stream. The most recent previous SCI for Turkey Creek was conducted on 5/31/2016 with a score of 26. Both subsamples contained few total taxa with only 16 taxa in subsample A and 13 in subsample B.

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

Table 2 SCI metric summaries for Turkey Creek

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	16.00	0.42	0.42
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	53.75	12.34	10.00
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	51.88	2.43	2.43
% Tanytarsini	0.63	1.43	1.43
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	30.00	3.17	3.17

SCI Sum	26.48
Final SCI score	29.42

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	13.00	-0.83	0.00
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	59.31	13.63	10.00
Total Clingers	2.00	2.86	2.86
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	59.31	0.94	0.94
% Tanytarsini	0.00	0.00	0.00
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	22.07	3.90	3.90

SCI Sum	19.13
Final SCI score	21.25

Table 3 SCI full results for Sample A

Stream Condition Index Results for Turkey 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		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Amnicolidae	*Amnicola dalli*	6	6	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	9	9	1	0	0	0	0	0	0		0	0	9	
Mollusca		Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Floridobia floridana*	1	1	1	0	0	0	0	0	0		0	0	0	
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Physidae	*Physa acuta*	35	35	1	0	0	0	0	0	0		0	0	35	
Mollusca		Bivalvia	Autobranchia	Venerida	Cyrenidae	*Corbicula* spp.	2	2	1	0	0	0	2	0	1		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	7		0	0	0	0	0	0	0		0	0	0	6 damaged and/or immature; 1 pupa
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	76	83	1	0	1	0	83	1	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	2	2	1	0	0	0	0	1	0		0	0	0	2 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	10	10	1	0	0	0	0	0	0		0	0	0	1 larva, 9 adults
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	1		0	0	0	0	0	0	0		0	0	0	1 pupa
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	2	2	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus* spp.	1	1	1	0	0	0	1	1	0		1	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Cricotopus bicinctus*	3	4	1	0	0	0	0	0	0		0	0	4	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Collembola				Collembola spp.	1	1	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Limnesiidae	*Limnesia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	

Table 4 SCI full results for Sample B

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
Hoplonemertea		Monostilifera	Prostomatidae	*Prostoma* spp.	2	2	1	0	0	0	0	0	0		0	0	2	
Clitellata	Oligochaeta	Tubificida	Naididae	*Nais communis*	1	1	1	0	0	0	0	0	0		0	0	1	
Gastropoda	Caenogastropoda	Littorinimorpha	Amnicolidae	*Amnicola dalli*	7	7	1	0	0	0	0	0	0		0	0	0	
Gastropoda	Caenogastropoda	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	5	5	1	0	0	0	0	0	0		0	0	5	
Gastropoda	Heterobranchia	Hygrophila	Ancylidae	*Ferrissia fragilis*	3	3	1	0	0	0	0	0	0		0	0	0	
Gastropoda	Heterobranchia	Hygrophila	Physidae	*Physa acuta*	23	23	1	0	0	0	0	0	0		0	0	23	
Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Planorbella scalaris*	1	1	1	0	0	0	0	0	0		0	0	1	
Insecta	Pterygota	Trichoptera		Trichoptera spp.	2		0	0	0	0	0	0	0		0	0	0	Heads only; like Cheumatopsyche
Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	84	86	1	0	1	0	86	1	0		0	0	0	
Insecta	Pterygota	Coleoptera	Elmidae	*Dubiraphia* spp.	1	1	1	0	0	0	0	0	0		0	0	0	Adult = 1
Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	2	2	1	0	0	0	0	1	0		0	0	0	Adults = 2
Insecta	Pterygota	Coleoptera	Elmidae	*Microcylloepus* spp.	8	8	1	0	0	0	0	0	0		0	0	0	Larvae = 3, Adults = 5
Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	2		0	0	0	0	0	0	0		0	0	0	Pupae = 2
Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum flavum*	1	2	1	0	0	0	0	0	0		0	0	0	
Insecta	Pterygota	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	3	4	1	0	0	0	0	0	0		0	0	0	

Water Quality Assessment

Long-term water quality data is available for Turkey Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission. Values for the physical water parameters begin in 2016 and continue through 2021. Values for the laboratory water parameters begin in 2016 through 2021. 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 Turkey Creek Physical Water Quality (Field)

Turkey Creek								
Date	**Depth (m)**	**Temp (°C)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
4/22/21	0.3	21.31	7.16	8.02	89.6	227.6	0.11	1.2
Mean POR	0.3	22.36	7.53	7.76	89.42	359.3	0.17	0.288

The chemical water quality analysis for Turkey Creek is shown in Table 6 along with mean values for the period of record for available parameters. The previous 3-year geometric mean values for Total Phosphorous values were above the nutrient region threshold developed by FDEP of 0.49 mg/L with a geometric mean value of 0.709 mg/L (2005-2019). Total Phosphorous values for the sample from this assessment were 0.704 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 1.334 mg/L for the previous three year period (2019-2021). The Total Nitrogen value from the assessment was below the threshold with a concentration of 1.310 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 3-years of samples (2.40 µg/l). For sites with Chlorophyll-a values in this range, the assessment is indicating conditions reflecting a balance in flora.

A slightly elevated biomass of the bacterial parameters was observed in the 3-year dataset with E. Coli having a geomean of 236 colonies/100 ml, 358/100 ml for Enterococci.

Table 6 Turkey Creek Water Quality (Laboratory)

Parameter	Turkey Creek	POR Mean (2016-2021)	Units
Alkalinity	80.8	N/A	mg/LCaCO3
Color(345)F.45	60	N/A	Pt/Co
E. Coli	90.6	229	#/100 ml
Enterococci	179	640	#/100 ml
Chlorophyll a	4.2	3.34	ug/L
Chlorophyll b	1.3	0.96	ug/L
Chlorophyll c	1.3	0.71	ug/L
Chlorophyll t	6.8	4.3	ug/L
Chlorophylla Corr	1.0	3.49	ug/L
Chlorophyll-pheo	7.0	3.40	ug/L
Ammonia	< 0.073	0.019	mg/L
Kjeldahl Nitrogen	0.677	0.717	mg/L
Total Nitrogen	1.310	1.520	mg/L
Nitrates/Nitrites	0.637	0.619	mg/L
Total Phosphorus	0.704	0.784	mg/L

Conclusion

Turkey Creek at Durant Road is located downstream from a predominantly reclaimed 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 suboptimal score of 110. Disruption to the vegetation community was not observed in the results of the Linear Vegetation Survey with Turkey Creek having below 2 square meters of rooted herbaceous vegetation. Turkey Creek did meet standards for the rapid periphyton survey with 11% of samples being ranked between 4 and 6. The recent water quality record for Turkey Creek showed elevated concentrations of Total Phosphorous in above the FDEP thresholds. The results of the SCI sampling indicate that the stream is "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		Turkey Creek 4/22/21	3-Year Geometric Mean	2019 Geometric Mean	2020 Geometric Mean	2021 Geometric Mean	Threshold
Total Phosphorous (mg/l)		0.704	0.709	0.682	0.792	0.657	< 0.49
Total Nitrogen (mg/l)		1.31	1.437	1.587	1.34	1.328	< 1.65
RPS (% Rank 4-6)		11%					< 25%
LVS	**Avg C of C**	N/A					≥ 2.5
	FLEPPC %	N/A					< 25%
Chlorophyll-a Corrected (µg/l)		1	2.4	2.3	2.11	3.06	< 20 µg/l
Habitat Assessment		110					> 34
SCI		25					> 34