Hanna Lake Outlet

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 Pro. Using this software with 2023 Hillsborough County aerial, 2020 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 one sampling location 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

Hanna Lake Outlet is located in north-central Hillsborough County in the Hillsborough Bay Watershed. Its headwaters are located in Hanna Lake in Hillsborough County. The outfall of Hanna Lake Outlet is in Cypress Creek. The assessment of Hanna Lake Outlet was conducted on March 27th, 2024 and, at that time, the water levels were low but normal for the dry season. The Hanna Lake Outlet WBID covers 1.14 sq. miles and is dominated by residential (53.8%) and forest/natural (30.7%) land uses. The resulting calculated landscape development intensity index score was a 4.67.

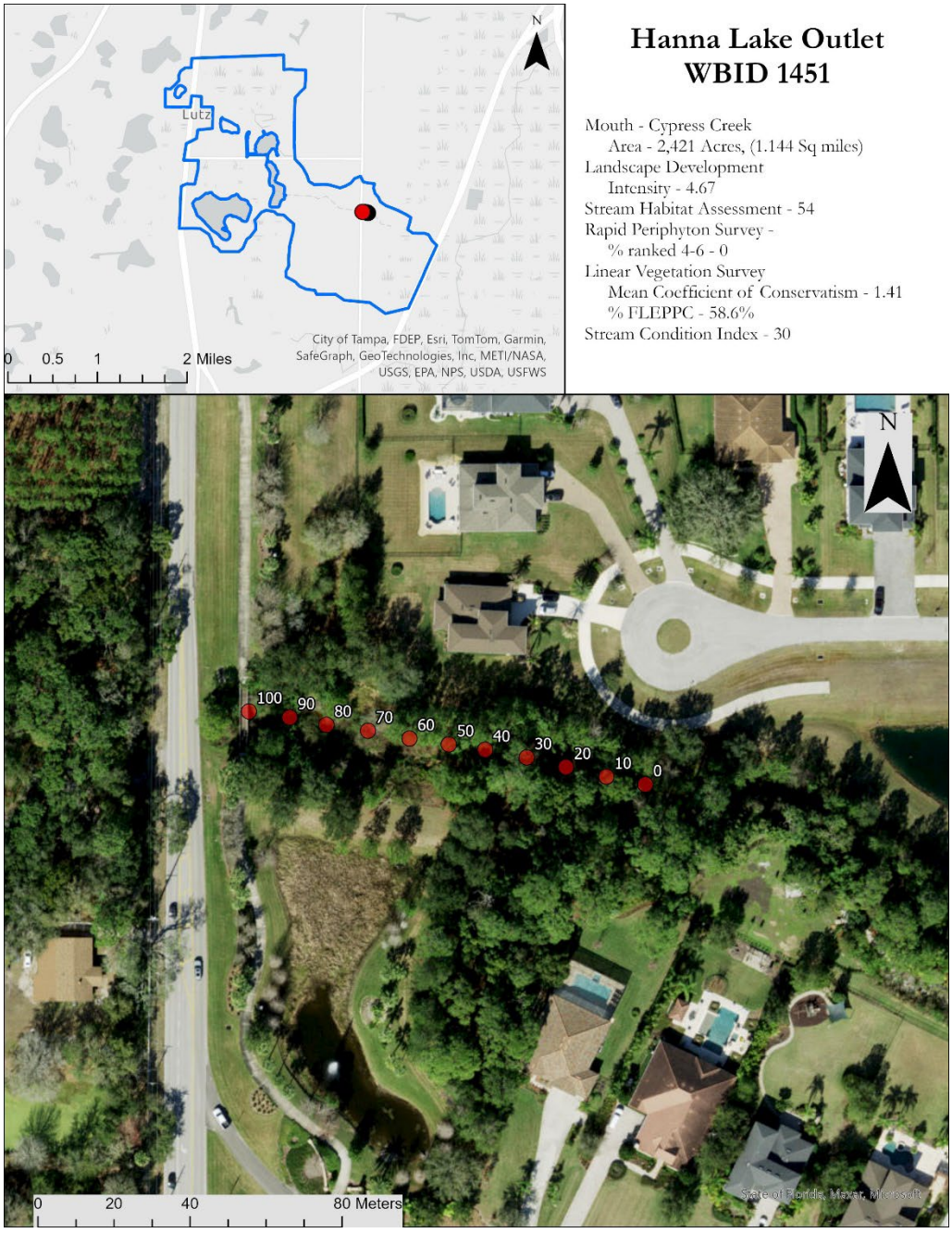

Figure 1 2024 Hanna Lake Outlet Study Area Map

Figure 2 Photograph of the Hanna Lake Outlet Sample Site showing steep banks and low water conditions.

Habitat and Vegetation Assessment

The region of Hanna Lake Outlet where the assessment was conducted is adjacent to the Cordoba Estates Living Community just off of Livingston Avenue. The region was moderately shaded with a mean canopy cover measurement of 77.5%. Hanna Lake Outlet averaged 0.1 meters in depth and approximately 1.03 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) and the poor category for Habitat Smothering (adequate number of stable pools with many productive habitats affected by sand smothering). Substrate Diversity was scored in the marginal category for having two major productive habitats (snag, leaf packs) present in the stream. Substrate Availability was scored as poor for having major productive habitats in just over 5% of the stream. Minor habitats included roots/undercut banks and sand deposits. The total score for the primary habitat components was a 24 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 marginal category for Artificial Channelization (straightened with a small degree of sinuosity developed within the channelized area), Riparian Buffer Zone Width for the left and right banks (6 to 12 meters with human activity nearby), and Bank Stability for the right bank (armorment was the only requirement met for optimal bank stability). Bank Stability for the left bank (no stability requirements met), and Riparian Zone Vegetation Quality (less than 25% of riparian zone is undisturbed for both banks) are scored in the poor category. The secondary habitat components received a score of 30 out of 80. The resulting FDEP Habitat Assessment score was a 54.

Table 1 Scoring Summary for the Stream Habitat Assessment

Metric	Score
Primary Habitat Components	
Substrate Diversity	6
Substrate Availability	5
Water Velocity	10
Habitat Smothering	3
Primary Score	**24**
Secondary Habitat Components	
Artificial Channelization	7
Bank Stability - Right Bank	4
Bank Stability - Left Bank	3
Riparian Buffer Zone Width - Right Bank	5
Riparian Buffer Zone Width - Left Bank	5
Riparian Zone Vegetation Quality - Right Bank	3
Riparian Zone Vegetation Quality - Left Bank	3
Secondary Score	**30**
Habitat Assessment Score	**54**

Periphyton was encountered during 1 of the 99 samples taken during the Rapid Periphyton Survey. This sample was ranked 3 for being between >1 mm and 6 mm in length. The tree canopy in the assessment area averaged 77.5% reducing available light for periphyton to flourish.

The FDEP Linear Vegetation Survey encountered greater than two square meters of rooted herbaceous vegetation in Hanna Lake Outlet at the time of the assessment. As a result, the metric for mean coefficient of conservatism was a 1.41 and the Percent FLEPPC was 58.6%.

Table 2 Linear Vegetation Survey Results – Hanna Lake Outlet

Taxon	CofC Score	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Occurrence
Colocasia esculenta	0	p	d	p	p	p		p	p	d	d	9
Ludwigia peruviana	0		p			p	d	p	p	p		6
Ludwigia palustris	4.77					p	p	p				3
Alternanthera philoxeroides	0	p	p									2
Hydrocotyle	2			p						p		2
Ludwigia repens	3.2	p	p									2
Persicaria hydropiperoides	2.5					d		p				2
Commelina diffusa	2.02		p									1
Commelina virginica	4.67		p									1
Persicaria glabra	4.5						p					1

Figure 3 A photograph of leaf pack (major productive habitat) in Hanna Lake Outlet.

Figure 4 Hanna Lake Outlet was very overgrown with Ludwigia.

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 Hanna Lake Outlet was 30 out of a possible 100 points, corresponding with a "Category 3 - Impaired" designation, with noticeable loss of taxonomic diversity from the expected community of a healthy stream. Both 2024 subsamples contained low total taxa with 13 in subsample A and 18 in subsample B. High scores (above 7.0) were achieved for the % Tanytarsini in both samples. Low scores (less than 3.0) were achieved for the Total Taxa, Total Ephemeroptera, Total Trichoptera, Total Long-lived taxa, % Dominance and Toatl Sensitive taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Hanna Lake Outlet.

Table 2 SCI metric summaries for Hanna Lake Outlet Sample A (top) and Sample B (bottom)

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	23.36	5.27	5.27
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	59.87	0.83	0.83
% Tanytarsini	22.37	9.27	9.27
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	10.53	5.64	5.64

SCI Sum	26.72
Final SCI score	29.68

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	18.00	1.25	1.25
Total Ephemeroptera	0.00	0.00	0.00
Total Trichoptera	1.00	1.43	1.43
% Filter Feeders	20.20	4.53	4.53
Total Clingers	3.00	4.29	4.29
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	52.98	2.20	2.20
% Tanytarsini	16.56	8.43	8.43
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	14.57	4.89	4.89

SCI Sum	27.02
Final SCI score	30.02

Table 3 SCI full results for Sample A

Stream Condition Index Results for Lake Hanna Outlet 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
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Dero nivea*	1	1	1	0	0	0	0	0	0		0	0	1
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Hebetancylus excentricus*	7	7	1	0	0	0	0	0	0		0	0	7
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda		Senticaudata spp.	2		0	0	0	0	0	0	0		0	0	0
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella* spp.	89	91	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Libellulidae	*Libellula* spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	2	2	1	0	1	0	2	1	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	3	3	1	0	0	0	0	1	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus* spp.	1	1	1	0	0	0.5	0	0	0		1	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus buckleyi*	1	1	1	0	0	0.5	0	0	0		1	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense* group	8	8	1	0	0	0	0	0	0		0	0	8
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus* spp.	10		0	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	22	32	1	0	0	0	32	1	0		32	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Dicrotendipes* spp.	1	1	1	0	0	0.5	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Corynoneura* spp.	3	3	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera		Heteroptera spp.	1	1	1	0	0	0	0	0	0		0	0	0

Table 4 SCI full results for Sample B

Stream Condition Index Results for Lake Hanna Outlet SCIB

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
Platyhelminthes						Platyhelminthes spp.	2	2	1	0	0	0	0	0	0		0	0	0
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Dero nivea*	1	1	1	0	0	0	0	0	0		0	0	1
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Physidae	*Physa acuta*	1	1	1	0	0	0	0	0	0		0	0	1
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Hebetancylus excentricus*	6	6	1	0	0	0	0	0	0		0	0	6
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Planorbidae	*Ferrissia fragilis*	5	5	1	0	0	0	0	0	0		0	0	0
Mollusca		Gastropoda	Caenogastropoda		Thiaridae	*Melanoides tuberculata*	1	1	1	0	0	0	0	0	0		0	0	1
Mollusca		Bivalvia	Autobranchia	Sphaeriida	Sphaeriidae	Sphaeriidae spp.	3	3	1	0	0	0	3	0	0		0	0	0
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Hyalellidae	*Hyalella* spp.	80	80	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	*Cheumatopsyche* spp.	1	1	1	0	1	0	1	1	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	*Stenelmis* spp.	3	3	1	0	0	0	0	1	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	1		0	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Ablabesmyia mallochi*	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Labrundinia pilosella*	3	3	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum* spp.	1		0	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum scalaenum* group	2	2	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense* group	11	12	1	0	0	0	0	0	0		0	0	12
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus* spp.	1		0	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Rheotanytarsus exiguus* group	23	25	1	0	0	0	25	1	0		25	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Dicrotendipes* spp.	3	3	1	0	0	1.5	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Orthocladiinae spp.	1	1	1	0	0	0	0	0	0		0	0	0
Arthropoda	Hexapoda	Insecta	Pterygota	Heteroptera	Mesoveliidae	*Mesovelia* spp.	1	1	1	0	0	0	0	0	0		0	0	1

Water Quality Assessment

Long-term water quality data is available for Hanna Lake Outlet. The data that is available was collected by the Florida Department of Environmental Protection on a quarterly cycle since 2022. The 2024 USF Water Institute Assessment values fall within the range of the previous data collections. Table 6 provides a summary of the Physical/Chemical conditions recorded at the site.

Table 6 Hanna Lake Outlet Physical Water Quality (Field)

WATER QUALITY	Depth (m)	Temp (°C)	pH (SU)	D.O. (MG/L)	D.O. Sat (%)	Cond. (µmhos/cm)	Salinity (PPT)	SECCHI (m)
Top:								1.0
Mid:	0.15	19.2	7.18	3.67	38.7	704	0.35	
Bottom:								
Meter ID:	90							

VOB

Total Depth

0.25

The chemical water quality analysis for Hanna Lake Outlet is shown in Table 7 with geometric mean values for the previous 3 years for available parameters. 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 geometric mean value of 0.13 mg/L (2022), 0.47 mg/L (2023) and 0.47 mg/L (2024). Total Nitrogen values exceeded the nutrient region threshold developed by FDEP of 1.65 mg/L in each of the previous three year period with a mean value of 1.80 mg/L (2022), 6.13 mg/L (2023) and 4.92 mg/L (2024). Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for 2022 6.28 µg/l and below this range for 2023 and 2024 (2.38 µg/l in 2023, 1.50 µg/l in 2024). 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 3-year dataset with E. Coli having a geometric mean of 373.4 colonies/100 ml, 1,841.8 for the 2024 dataset.

Table 7 Hanna Lake Outlet Water Quality (Laboratory)

Parameter	2022	2023	2024	Period of Record	Units
E. Coli	156.5	536.1	1841.8	373.4	#/100 ml
Chlorophyll-a	7.81	2.54	1.83	4.07	µg/L
Chlorophyll-a Corrected	6.28	2.38	1.50	3.46	µg/L
Ammonia	0.209	3.410	1.647	0.805	mg/L
Kjeldahl Nitrogen	1.627	5.026	4.234	2.868	mg/L
Total Nitrogen	1.802	6.125	4.916	3.313	mg/L
Nitrates/Nitrites	0.090	0.777	0.499	0.260	mg/L
Total Phosphorous	0.130	0.473	0.469	0.257	mg/L

Conclusion

Lake Hanna Outlet at Livingston Avenue is located in a predominantly residential watershed. At the time of the habitat assessment, the water levels were low, but normal for the dry season. The 100 meter region where the assessment was conducted was characterized by an altered channel with steep banks and overgrowth by non-native species. Snag and leaf pack were the most common productive habitats present. The Habit Assessment resulted in a poor score of 54. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with the Mean CofC score and Percent FLEPPC metrics both being exceeded. Hanna Lake Outlet met the metrics for the rapid periphyton survey with 0% of samples being ranked between 4 and 6 due in part to the moderate canopy coverage in the region. The recent water quality record for Hanna Lake Outlet showed concentrations of Chlorophyll-a corrected (2022) and Total Nitrogen (2022-2024) above the FDEP thresholds. The results of the SCI sampling indicate that the stream is "impaired" based on the macroinvertebrate community. Table 8 summarizes the results of the nutrient sampling, floristic sampling, habitat assessment and SCI.

Table 8 Summary of Water Quality, Floristic Surveys and Habitat Assessments

Measure		Hanna Lake Outlet	2022	2023	2024	Threshold
Total Phosphorous (mg/l)			0.130	0.473	0.470	< 0.49
Total Nitrogen (mg/l)			1.802	6.125	4.916	< 1.65
RPS (% Rank 4-6)		0%				< 25%
LVS	**Avg C of C**	1.41				≥ 2.5
	FLEPPC %	58.6%				< 25%
Chlorophyll-a Corrected (µg/l)			6.28	2.38	1.50	< 20 µg/l
Habitat Assessment		54				> 34
SCI		30				> 34