# Flint 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

Flint Creek is located in northern Hillsborough County in the Hillsborough Bay Watershed. Its headwaters are located in Lake Thonotosassa. The outfall of Flint Creek is in the Hillsborough River. The assessment of Flint Creek was conducted on May 10, 2021. At the time of the assessment, the water levels were normal for the dry season. The Flint Creek WBID covers 2.98 square miles and is dominated by residential (38.7%), agricultural (20.6%) and natural (17.4%) land uses. The resulting calculated landscape development intensity index score was 4.21.

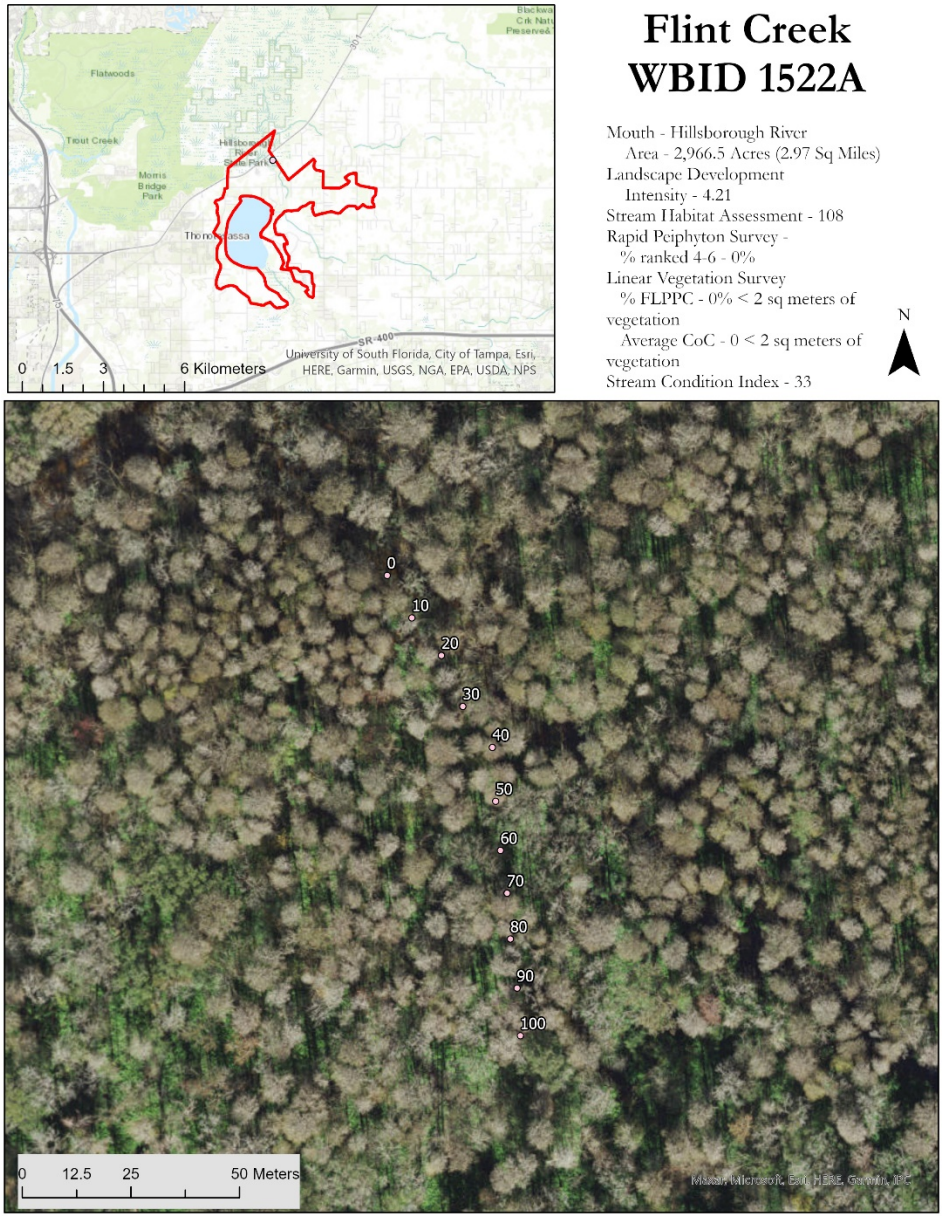


*Figure 1 2021 Flint Creek Study Area Map*

*Figure 2 Overview photograph of the Flint Creek Sample Site showing the typical habitat features*

## Habitat and Vegetation Assessment

The region of Flint Creek where the assessment was conducted is in a natural region upstream from the US Highway 301 Bridge. The region was heavily shaded with a mean canopy cover measurement of 88.1%. Flint Creek averaged 0.4 meters in depth, approximately 4.3 meters wide with a flow of 0.09 m/s.

The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the suboptimal category for Habitat Smothering (sufficient pools but many of the productive habitats were affected by sand smothering). Water Velocity (0.09 m/s), Substrate Diversity (Presence of two major productive habitats (snags, roots)) and Substrate Availability (9% of stream are productive habitats) were scored as marginal. Minor habitats included sand and silt deposits. The total score for the primary habitat components was a 35 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 surrounded by expansive floodplain forest), Artificial Channelization, Riparian Zone Vegetation Quality (both banks showing moderate levels of disturbance shown in the species present) and Riparian Buffer Zone Width (greater than 18 meters of buffer). The secondary habitat components received a score of 73 out of 80. The resulting FDEP Habitat Assessment score was a 108.

*Table 1 Scoring Summary for the Stream Habitat Assessment*

| Metric | Score |
|---|---|
| **Primary Habitat Components** | |
| Substrate Diversity | 7 |
| Substrate Availability | 8 |
| Water Velocity | 9 |
| Habitat Smothering | 11 |
| **Primary Score** | **35** |
| **Secondary Habitat Components** | |
| Artificial Channelization | 17 |
| Bank Stability - Right Bank | 10 |
| Bank Stability - Left Bank | 10 |
| Riparian Buffer Zone Width - Right Bank | 9 |
| Riparian Buffer Zone Width - Left Bank | 9 |
| Riparian Zone Vegetation Quality - Right Bank | 9 |
| Riparian Zone Vegetation Quality - Left Bank | 9 |
| **Secondary Score** | **73** |
| **Habitat Assessment Score** | **108** |

Periphyton was not encountered during the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 88.1% reducing available light for periphyton to flourish.

The FDEP Linear Vegetation Survey encountered less than 2 $m^2$ of herbaceous species rooted in Flint Creek at the time of the assessment. The vegetation surrounding the creek was dominated by *Saururus cernuus, ruellia simplex* and *Syngonium podophyllum* beneath a canopy of *Taxodium.*

*Table 1 Linear Vegetation Survey Results – Flint 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 2$m^2$* | | | | | | | | | | | | |

*Figure 3 Snags were the most abundant major productive habitat in Flint 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 Flint Creek was 33 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. Both subsamples contained few total taxa with only 9 taxa in subsample A and 8 in subsample B.

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

*Table 2 SCI metric summaries for Flint Creek*

| SCI Metric | Raw Totals | SCI scores | Adjusted SCI scores |
|---|---|---|---|
| **Total Taxa** | 9.00 | -2.50 | 0.00 |
| **Total Ephemeroptera** | 0.00 | 0.00 | 0.00 |
| **Total Trichoptera** | 1.00 | 1.43 | 1.43 |
| **% Filter Feeders** | 14.97 | 3.32 | 3.32 |
| **Total Clingers** | 2.00 | 2.86 | 2.86 |
| **Total Long-lived Taxa** | 0.00 | 0.00 | 0.00 |
| **% Dominance** | 41.40 | 4.52 | 4.52 |
| **% Tanytarsini** | 14.01 | 7.97 | 7.97 |
| **Total Sensitive Taxa** | 0.00 | 0.00 | 0.00 |
| **% Very Tolerant Individuals** | 1.27 | 9.70 | 9.70 |

| | |
|---|---|
| SCI Sum | 29.79 |
| Final SCI score | 33.10 |

| SCI Metric | Raw Totals | SCI scores | Adjusted SCI scores |
|---|---|---|---|
| **Total Taxa** | 8.00 | -2.92 | 0.00 |
| **Total Ephemeroptera** | 0.00 | 0.00 | 0.00 |
| **Total Trichoptera** | 0.00 | 0.00 | 0.00 |
| **% Filter Feeders** | 21.28 | 4.79 | 4.79 |
| **Total Clingers** | 1.00 | 1.43 | 1.43 |
| **Total Long-lived Taxa** | 0.00 | 0.00 | 0.00 |
| **% Dominance** | 39.19 | 4.96 | 4.96 |
| **% Tanytarsini** | 20.95 | 9.08 | 9.08 |
| **Total Sensitive Taxa** | 0.00 | 0.00 | 0.00 |
| **% Very Tolerant Individuals** | 2.70 | 8.48 | 8.48 |

| | |
|---|---|
| SCI Sum | 28.74 |
| Final SCI score | 31.93 |

## *Table 3 SCI full results for Sample A*

**Stream Condition Index Results for Flint 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 | *Limnodrilus hoffmeisteri* | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | |
| Mollusca | | Gastropoda | Caenogastropoda | Littorinimorpha | Hydrobiidae | Hydrobiidae spp. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Maybe F. floridana |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | | Senticaudata spp. | 2 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Heads only; like Hyalella |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | Hyalellidae | *Hyalella azteca* sp. complex | 64 | 65 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Max1 dissected; damaged/not H. wakulla |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | Hyalellidae | *Hyalella wakulla* | 62 | 63 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Max1 dissected |
| Arthropoda | Hexapoda | Insecta | Pterygota | Trichoptera | Hydropsychidae | *Cheumatopsyche* spp. | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | | 0 | 0 | 0 | |
| Arthropoda | Hexapoda | Insecta | Pterygota | Diptera | | Diptera spp. | 1 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Pupa = 1, damaged |
| 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 | *Rheotanytarsus* spp. | 21 | 22 | 1 | 0 | 0 | 0 | 22 | 1 | 0 | | 22 | 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 | *Goeldichironomus* spp. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | |

## *Table 4 SCI full results for Sample B*

**Stream Condition Index Results for Flint Creek 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 | Specimen Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annelida | | Clitellata | Oligochaeta | Tubificida | Naididae | *Dero* spp. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | Damaged |
| Mollusca | | Gastropoda | Caenogastropoda | Littorinimorpha | Hydrobiidae | Hydrobiidae spp. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Maybe F. floridana |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | | Senticaudata spp. | 3 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Heads only; like Hyalella |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | Hyalellidae | *Hyalella azteca* sp. complex | 56 | 58 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | MX1 dissected; damaged/not H. wakulla |
| Arthropoda | Crustacea | Malacostraca | Eumalacostraca | Amphipoda | Hyalellidae | *Hyalella wakulla* | 52 | 53 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | MX1 dissected |
| Arthropoda | Hexapoda | Insecta | Pterygota | Diptera | Chironomidae | Chironomidae spp. | 3 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | Pupae = 3, 1 broken in half |
| Arthropoda | Hexapoda | Insecta | Pterygota | Diptera | Chironomidae | *Rheotanytarsus* spp. | 28 | 31 | 1 | 0 | 0 | 0 | 31 | 1 | 0 | | 31 | 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 | *Goeldichironomus* spp. | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 2 | |
| Arthropoda | Hexapoda | Insecta | Pterygota | Diptera | Chironomidae | *Polypedilum beckae* | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | |

## Water Quality Assessment

Long-term water quality data is available for Flint Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission. Values for the physical water parameters begin in 1989 and continue through 2021. Values for the laboratory water parameters begin in 1989 through 2021. The 2021 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 Flint Creek Physical Water Quality (Field)*

| Flint Creek | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Date** | **Depth (m)** | **Temp (°C)** | **pH** | **DO (mg/L)** | **DO (% Sat)** | **Cond (UMHO/cm)** | **Salinity (PPT)** | **Secchi Depth (m)** |
| 5/10/2021 | 0.25 | 24.58 | 7.03 | 2.58 | 30.6 | 215 | 0.1 | 0.5 |
| Mean POR | 0.65 | 22.01 | 7.22 | 3.03 | 31.82 | 289 | 0.17 | 0.53 |

The chemical water quality analysis for Flint 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 below the nutrient region threshold developed by FDEP of 0.49 mg/L with a geometric mean value of 0.412 mg/L (2019), 0.445 mg/L (2020) and 0.407 mg/L (2021). Total Phosphorous values for the sample from this assessment were 0.614 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L for the previous three year period with a mean value of 1.498 mg/L (2019), 1.385 mg/L (2020) and 1.621 mg/L (2021). The Total Nitrogen value from the assessment was above the threshold with a concentration of 3.920 mg/L. Chlorophyll-a corrected values fall above the site specific evaluation range of 3.2 µg/l to 20 µg/l for the most recent 3-years of samples (48.2 µg/l in 2019, 39.6 µg/l in 2020, 30.4 µg/l in 2021). For sites with Chlorophyll-a values in this range, the assessment is indicating conditions reflecting an imbalance in flora.
A slightly elevated biomass of the bacterial parameters was observed in the 3-year dataset with E. Coli having a geomean of 117.9 colonies/100 ml, 244.4/100 ml for Enterococci.

*Table 6 Flint Creek Water Quality (Laboratory)*

| Parameter | Flint Creek 5/10/2021 | POR Mean (1989-2021) | Units |
|---|---|---|---|
| Alkalinity | 71.5 | N/A | mg/LCaCO3 |
| Color(345)F.45 | 120 | N/A | Pt/Co |
| E. Coli | 86 | 198.1 | #/100 ml |
| Enterococci | 157 | 416.1 | #/100 ml |
| Chlorophyll a | 40.5 | 57.9 | ug/L |
| Chlorophyll b | 1 | 3.5 | ug/L |
| Chlorophyll c | 1.7 | 3.3 | ug/L |
| Chlorophyll t | 42.2 | 65.4 | ug/L |
| Chlorophylla Corr | 3.5 | 54 | ug/L |
| Chlorophyll-pheo | 60.3 | 20.4 | ug/L |
| Ammonia | 0.871 | 0.141 | mg/L |
| Kjeldahl Nitrogen | 3.7 | 1.759 | mg/L |
| Total Nitrogen | 3.92 | 1.905 | mg/L |
| Nitrates/Nitrites | 0.212 | 0.087 | mg/L |
| Total Phosphorus | 0.614 | 0.405 | mg/L |

# Conclusion

Flint Creek at US Highway 301 is located in a predominantly natural 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 108. Disruption to the vegetation community was not observed in the results of the Linear Vegetation Survey with Flint Creek having below 2 square meters of rooted herbaceous vegetation. Flint Creek did meet standards for the rapid periphyton survey with 0% of samples being ranked between 4 and 6 due to the heavy canopy coverage in the region. The recent water quality record for Flint Creek showed concentrations of Total Phosphorous and Total Nitrogen below the FDEP thresholds but the Chlorophyll-a corrected values exceeded 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 | | Flint Creek | 2019 | 2020 | 2021 | Threshold |
|---|---|---|---|---|---|---|
| **Total Phosphorous (mg/l)** | | 0.614 | 0.412 | 0.445 | 0.407 | < 0.49 |
| **Total Nitrogen (mg/l)** | | 3.920 | 1.4948 | 1.385 | 1.621 | < 1.65 |
| **RPS (% Rank 4-6)** | | 0 | | | | < 25% |
| **LVS** | **Avg C of C** | N/A | | | | ≥ 2.5 |
| | **FLEPPC %** | N/A | | | | < 25% |
| **Chlorophyll-a Corrected (µg/l)** | | 3.5 | 48.2 | 39.6 | 30.4 | < 20 µg/l |
| **Habitat Assessment** | | 108 | | | | > 34 |
| **SCI** | | 33 | | | | > 34 |