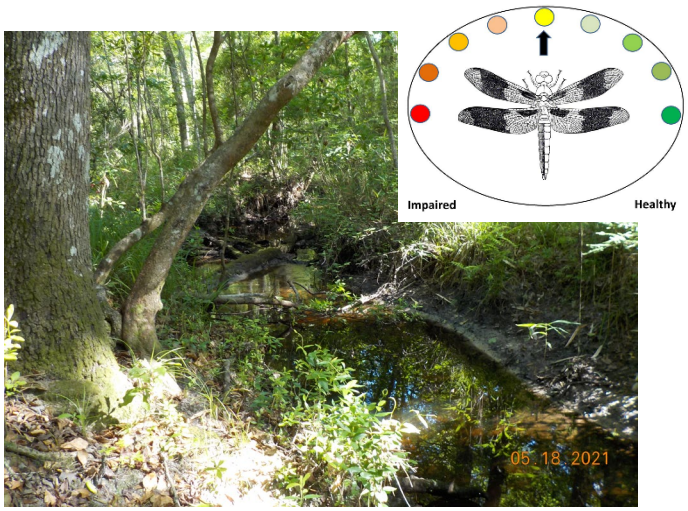
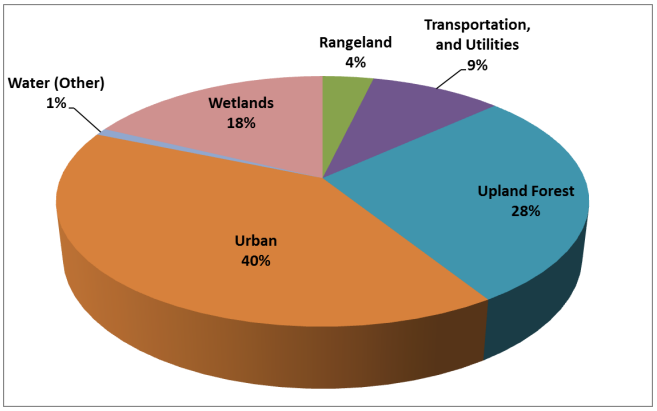
Waterbody: Gum Creek



Basin: Lake Munson

The urbanized Gum Creek system is located in central Leon County. Gum Creek meanders south through several wetlands, and eventually flows into Munson Slough.

As shown in the following pie chart, approximately 53% of the land uses in the 5,291-acre watershed are urban, utilities, transportation, and rangeland. Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.



Background

Healthy, well-balanced stream communities may be maintained with some level of human activity, but excessive human disturbance may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or other contaminants from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of exotic plants and animals. State water quality standards are designed to protect designated uses of the waters of the state (e.g., recreation, aquatic life, fish consumption), and exceedances of these standards are associated with interference of the designated use.

Methods

Surface water samples were collected to determine the health of Gum Creek and met the requirements of the FDEP.

Results

Nutrients

Tables 1 and 2 represent Gum Creek's annual geometric means of total nitrogen and total phosphorus. According to FDEP requirements, Numeric Nutrient Criteria (NNC) (expressed as an annual geometric mean) cannot be exceeded more than once in a three-year period. Due to low water conditions, beaver activity, and construction activity related to the Capital Circle southwest widening, the required number of samples could not always be collected from the Gum Creek stations. The lack of data means that FDEP requirements for determining Numeric Nutrient Criteria for some stations for several years could not be calculated. When the NNC criteria could be met, it was shown that no exceedances for nitrogen or phosphorus have occurred since 2006.

For illustrative purposes, individual data points were plotted to determine any possible trends (Figures 1 and 2). With few exceptions, individual values did not exceed the instream criteria for total phosphorus or total nitrogen.

Table 1. FDEP's total nitrogen criteria for streams applied to Gum Creek. Results in bold signify exceedances of the State criteria. Station GC2 is no longer sampled.

Gum Creek	Instream Protection Criteria				
	TN (1.03 mg/L)				
Year	**GC1**	**GC2**	**GC3**	**GC4**	**GC2T**
2005	0.69	0.63	0.53	0.69	-
2006	**1.10**	0.89	-	0.57	-
2007-2008	-	-	-	-	-
2009	0.66	-	0.53	0.77	0.59
2010	0.93	-	0.82	1.03	0.75
2011-2012	-	-	-	-	-
2013	0.68	-	0.66	-	-
2014	-	-	-	-	-
2015	-	-	-	-	0.71
2016	-	-	0.59	-	-
2017	-	-	0.73	0.95	-
2018	0.56	-	0.65	0.74	-
2019	-	-	0.65	-	-
2020-2021	-	-	-	-	-

Table 2. FDEP's total phosphorus criteria for streams applied to Gum Creek. All results were within the State criteria. Station GC2 is no longer sampled.

Gum Creek	Instream Protection Criteria				
	TP (0.18 mg/L)				
Year	**GC1**	**GC2**	**GC3**	**GC4**	**GC2T**
2005	0.05	0.05	0.10	0.15	-
2006	0.11	0.13	0.08	0.09	-
2007-2008	-	-	-	-	-
2009	0.06	-	0.05	0.08	0.05
2010	0.05	-	0.05	0.07	0.04
2011-2012	-	-	-	-	-
2013	0.04	-	0.06	-	-
2014	-	-	-	-	-
2015	-	-	-	-	0.05
2016	-	-	0.05	-	-
2017	-	-	0.04	0.05	-
2018	0.05	-	0.05	0.07	-
2019	-	-	0.05	-	-
2020-2021	-	-	-	-	-

Dissolved Oxygen (DO)

As Figure 3 shows, Gum Creek station GC2T periodically failed to meet the Class III criteria for DO. Station GC4 failed to meet the limit once over the period of record. Due to beaver activity, the flow at station GC2T is often stagnant or flowing very slowly, leading to low DO levels.

Fecal Coliforms and Escherichia coli (E. coli)

The *E. coli* water quality limit of > 10% threshold value of 410 in 10% or more of samples in a 30-day period was occasionally exceeded during the sampling period (Figure 4). There has not been an exceedance since 2017.

Stream Condition Index and Habitat Assessment

The Habitat Assessment Score for station GC1 (126) was in the Suboptimal/Optimal category while station GC3 (76) was in the Suboptimal/Marginal and GC4 (106) was in the Marginal category (Table 3). The Stream Condition Index (SCI) scores (Table 4) for stations GC1 (60) and GC3 (39) indicates the presence of a stream biological community that is Healthy. The SCI score for station GC4 (68) was in the Exceptional category.

Station GC1

The results of the Habitat Assessment score for Station GC1 characterize the stream habitat between high Suboptimal and low Optimal. The SCI score at station GC1 indicates the presence of a stream biological community that is Healthy, scoring within the mid to upper Healthy category. The last time a SCI was performed on this site was January of 2018. During that event, the station scored in the low end of the Healthy category with a score of 38 after experiencing some drought related lack of flow. This station hosts a surprisingly large quantity of aquatic moss covering much of the substrate, though much of this habitat was not in the water in 2021 and could not be sampled.

The macroinvertebrate community at GC1 was not dominated by any single species or trophic group. Asellid isopods (detritus feeders), filter feeding blackflies (Simuliidae) and caddis flies (*Cheumatopsyche* sp.) were abundant. From the total taxa collected, five are listed as sensitive taxa and five are listed as very tolerant. No Plecoptera (stoneflies) were noted in the SCI. *Caenis punctata* was the only Ephemeropteran (mayflies) collected. The Trichoptera (caddisflies) were represented by a single taxon,

the filter feeding *Cheumatopsyche* sp. The EPT score for the station is two.

Station GC3

The results of the Habitat Assessment score for Station GC3 characterize the stream habitat as between high Marginal and low Suboptimal. As a result of the total stream channel modification, this station contains relatively little habitat outside of a few tree falls creating leaf packs, some root material, a few snags, and rock (as a minor but key habitat). It is clear that habitat conditions are easily altered by heavy rain events. The SCI score at GC3 indicates the presence of a stream biological community that is Healthy, albeit scoring on the low end of the Healthy category.

The macroinvertebrate community at GC3 expressed a moderate to strong taxa dominance. In both vials the two most numerically dominant taxa were the freshwater snail *Micromenetus dilatatus* and the amphipod *Hyalella azteca* complex. Of the 307 macroinvertebrates collected in both vials, *Micromenetus dilatatus* (considered very tolerant) accounted for 95 (30.9%) individuals and *Hyalella azteca* complex accounted for 52 (16.9%) of the individuals. The top four most numerous taxa in both vials account for 71.3% of all individuals sorted. From the total taxa collected, two are listed as sensitive taxa by the FDEP while three are listed as very tolerant. The Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxa (EPT) are widely regarded as the groups of aquatic insects that contain a large number of pollution sensitive taxa. The EPT score for GC3 is three. No Plecoptera (stoneflies) were noted in the SCI. Two Trichopteran and one Ephemeropteran species were collected but none are FDEP listed “sensitive” species. The single Ephemeropteran species, *Caenis diminuta*, is widely regarded as one of the two most tolerant of the mayfly species in Florida.

Station GC4

The results of the Habitat Assessment score for Station GC4 characterize the stream habitat in the high part of the Marginal category. The 2021 habitat assessment score increased compared to the previous event for three reasons: First, an increase in water velocity; second, the recruitment of invasive riparian species into the nearly denuded left bank; and third, the inclusion of a second major habitat. While two major habitats are present, the overwhelming habitat abundance was aquatic macrophytes. The dominant macrophytes in the system were *Alternanthera philoxeroides* followed by *Myriophyllum aquaticum*. Due to the lack of habitat, several sweeps had to be reapportioned in to the major and minor habitats that are present. Eight of the 20 sweeps collected were portioned into the aquatic macrophytes. Four sweeps were portioned into snags/woody debris, two sweeps were portioned into roots/undercut banks, one sweep was portioned into leaf packs/mats, three sweeps were portioned into sand, one sweep was portioned into silt/mud, and one sweep was portioned into long strand algae. All the habitats outside of aquatic macrophytes were sediment influenced to varying degrees and in low abundance. It is clear from vegetative and erosional signatures that habitat conditions are routinely altered by runoff from heavy rain events. Surprisingly, the SCI score at GC4 indicates the presence of a stream biological community in the Exceptional category, albeit scoring on the low end of that category. This is likely due to the variety of invertebrates found within the aquatic macrophyte sweeps.

The macroinvertebrate community at GC4 was dominated by dipterans, particularly of the genus *Simulium* and *Rheotanytarsus* with a moderate dominance expressed by the taxa Simulium sp. and *Rheotanytarsus exiguus* grp. Of the 298 individuals collected within the two sample vials, 91(30.5%) were *Simulium* sp. and 52(17.4%) were *Rheotanytarsus exiguus* grp. From the total taxa collected, five are listed as sensitive taxa by the FDEP, while seven

are listed as very tolerant. The Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxa (EPT) are widely regarded as the groups of aquatic insects that contain a large number of pollution sensitive taxa. No Plecoptera (stoneflies) were noted in the SCI. Three Ephemeropteran species and two Trichopteran taxa were collected but none are FDEP listed "sensitive" species, although of note is the presence of a single mature specimen of the Baetidae mayfly *Acentrella alachua*, which based upon data from the southcentral portion of the peninsula is one of the most sensitive taxa to dissolved oxygen concentrations below 5.0 mg/l. The EPT score for the site is five.

For more information about the SCI and Habitat Assessment, click Here.

Conclusions

Apart from Station GC1's total nitrogen levels exceeding the state criteria in 2006, Gum Creek met the nutrient thresholds in the East Panhandle Region. Station GC2T periodically failed to meet the Class III criteria for DO. Station GC4 failed to meet the limit once over the period of record. the *E. coli* water quality limit of > 10% threshold value of 410 in 10% or more of samples in a 30-day period was occasionally exceeded during the sampling period. There has not been an *E. coli* exceedance since 2017.

The Habitat Assessment Score for station GC1 was in the Suboptimal/Optimal category while station GC3 was in the Suboptimal/Marginal and GC4 was in the Marginal category. The SCI scores for stations GC1 and GC3 indicates the presence of a stream biological community that is Healthy. The SCI score for station GC4 was in the Exceptional category.

Thank you for your interest in maintaining the quality of Leon County's water resources. Please feel free to contact us if you have any questions.

Contact and resources for more information

www.LeonCountyWater.org

Click here to access the results for all water quality stations sampled in 2021.

Click here for a map of the watershed – Sample Stations GC1, GC2T, GC3 and GC4.

Johnny Richardson, Water Resource Scientist
(850) 606-1500
Richardsonjo@leoncountyfl.gov

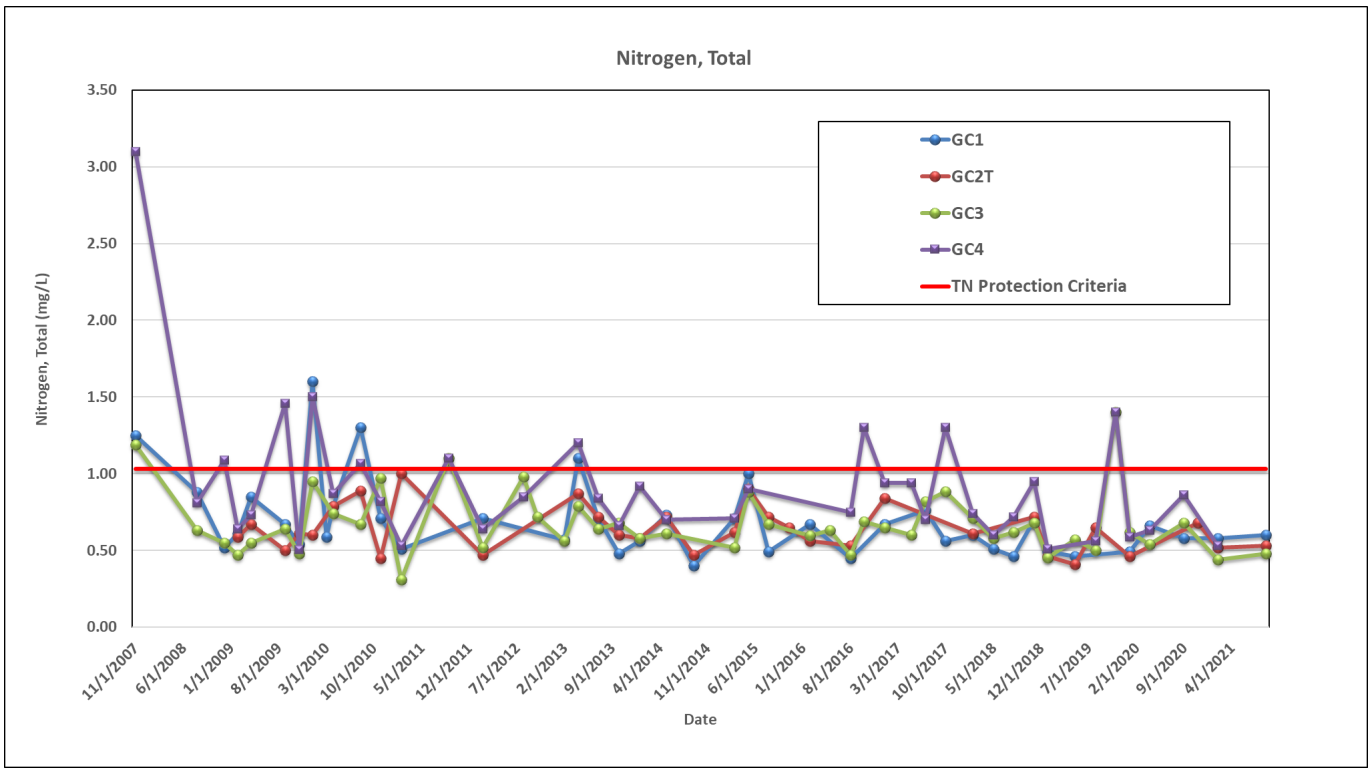


Figure 1. Total Nitrogen results for Gum Creek.

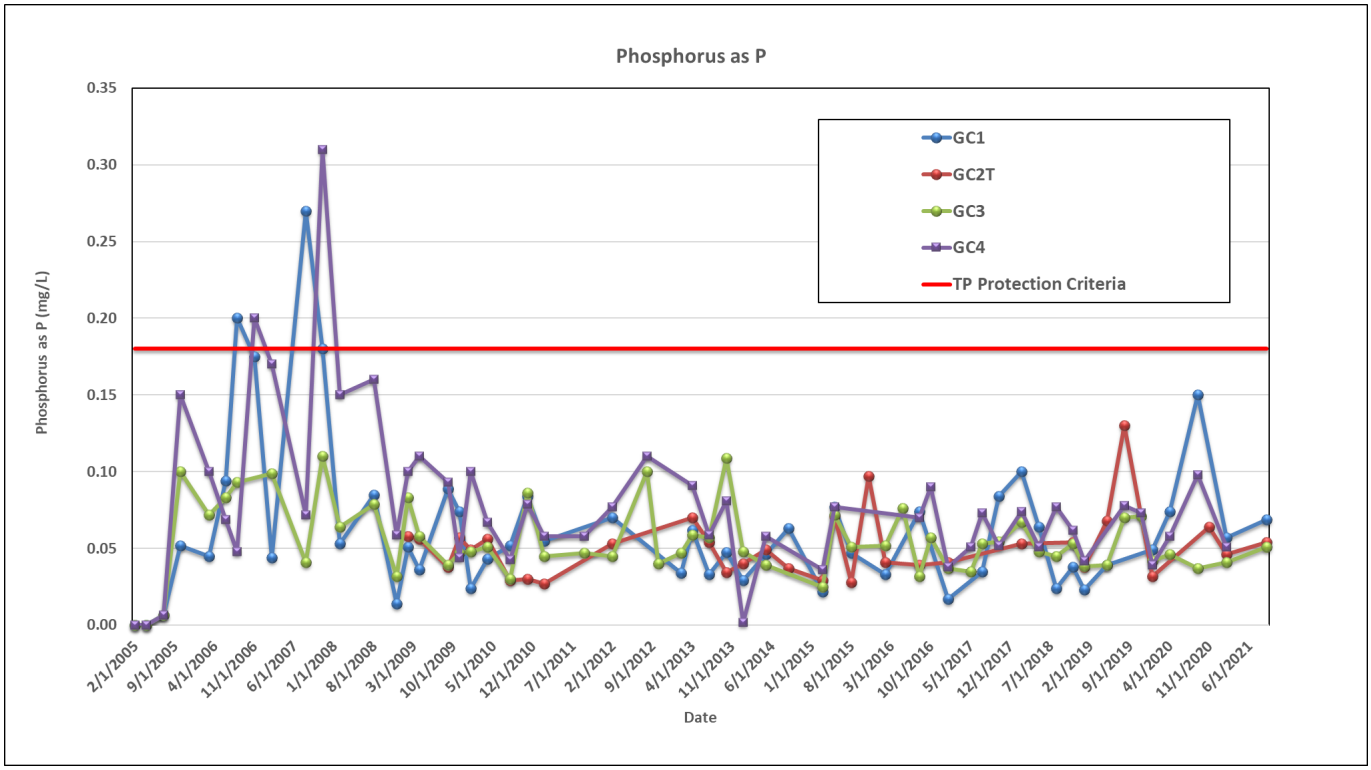


Figure 2. Total Phosphorus results for Gum Creek.

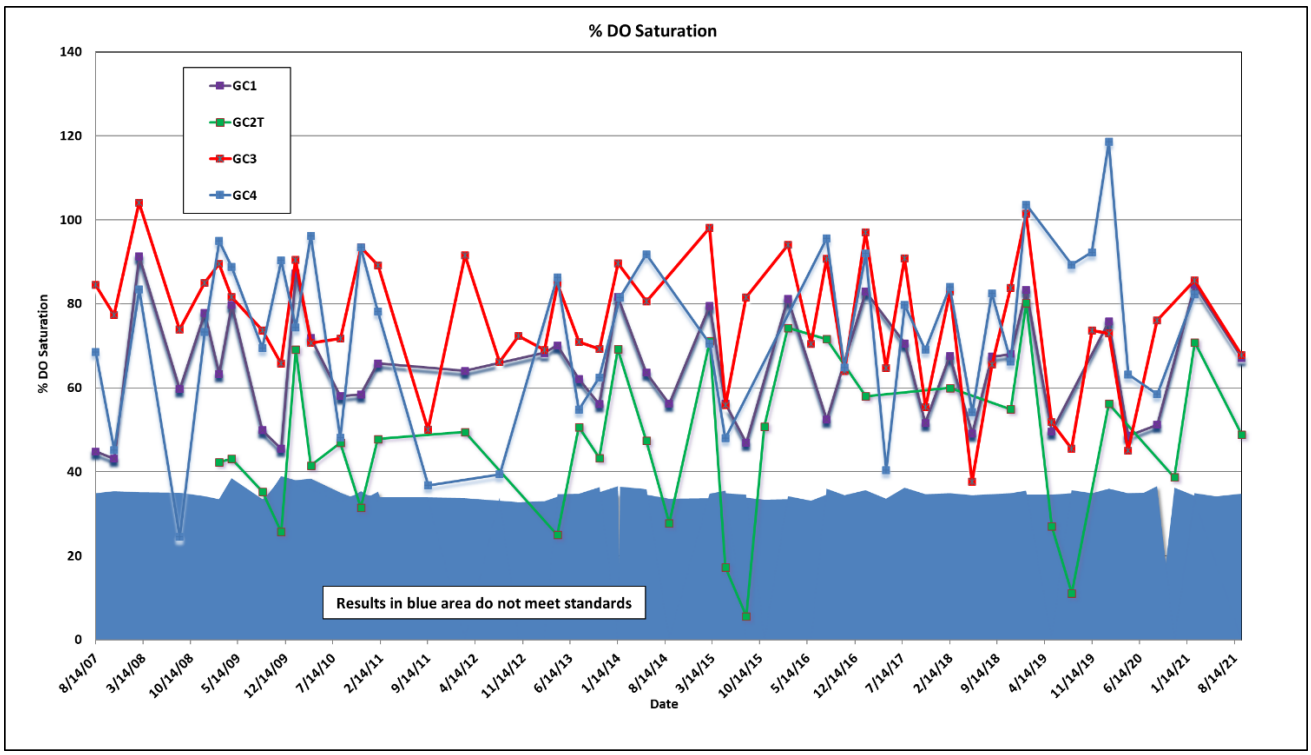


Figure 3. Dissolved Oxygen Percent Saturation results for Gum Creek.

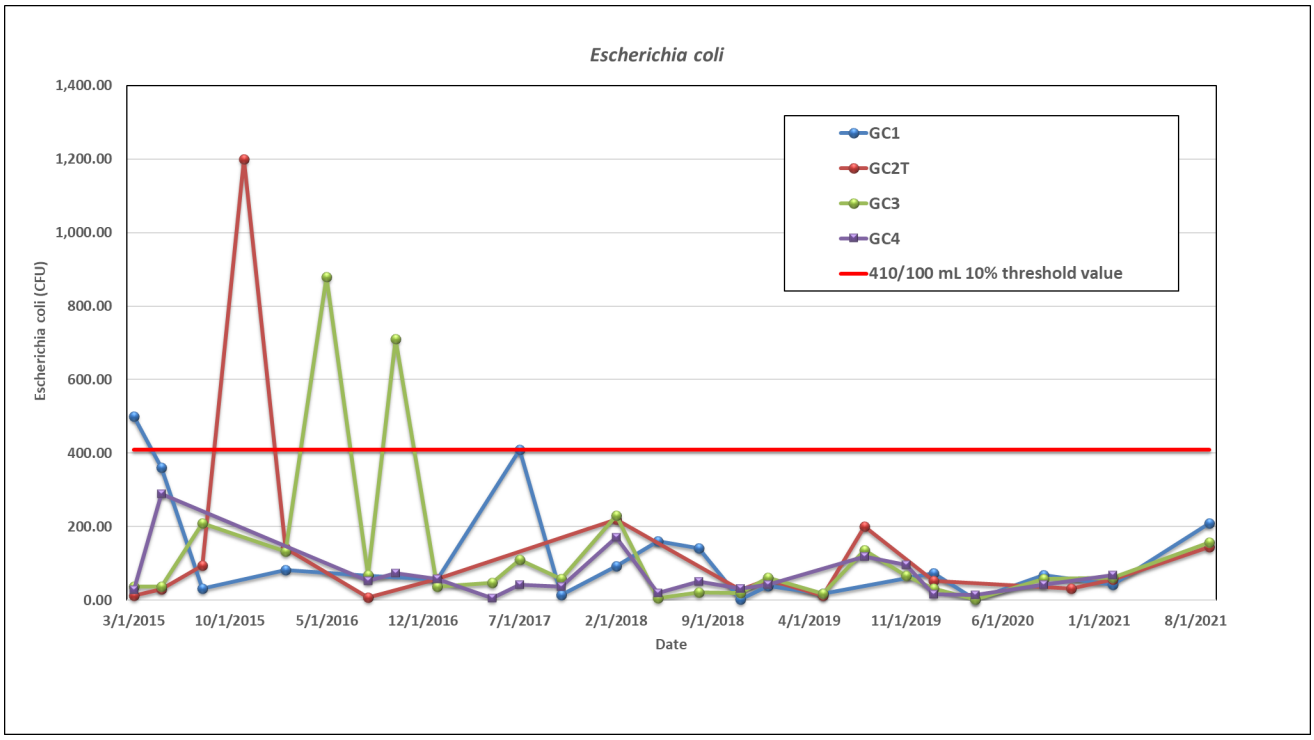


Figure 4. *Escherichia coli* results for Gum Creek.

Table 3. Habitat Assessment results for Gum Creek.

Gum Creek Stations	**GC1 Score**	**Category**	**GC3 Score**	**Category**	**BC4 Score**	**Category**
Substrate Diversity	13	Suboptimal	13	Suboptimal	10	Marginal
Substrate Availability	9	Marginal	6	Marginal	6	Marginal
Water Velocity	12	Suboptimal	7	Suboptimal	8	Marginal
Habitat Smothering	18	Optimal	6	Suboptimal	15	Suboptimal
Artificial Channelization	18	Optimal	5	Optimal	14	Suboptimal
Bank Stability	8, 8	Suboptimal, Suboptimal	6, 6	Optimal, Optimal	7, 8	Suboptimal, Suboptimal
Riparian Zone Width	10, 10	Optimal, Optimal	7, 8	Optimal, Optimal	10, 10	Optimal, Optimal
Riparian Vegetation Quality	10, 10	Optimal, Optimal	6, 6	Optimal, Optimal	9, 9	Optimal, Optimal
Final Habitat Assessment Score	**126**		**76**		**106**	
Interpretation	**Suboptimal/Optimal**		**Suboptimal/Marginal**		**Suboptimal**	

Table 4. Stream Condition Index results for Gum Creek.

Gum Creek Stations	**GC1 Vial 1**	**GC1 Vial 2**	**GC3 Vial 1**	**GC3 Vial 2**	**GC4 Vial 1**	**GC4 Vial 2**
Stream Condition Index Metrics Scores						
Total Taxa	3.48	3.91	0.87	1.74	6.09	6.52
Ephemeroptera Taxa	2	2	2	2	0	2
Trichoptera Taxa	1.43	1.43	1.43	2.86	2.86	2.86
% Filter Feeder	7.23	7.67	5.40	5.11	1.58	1.92
Long-lived Taxa	3.33	3.33	3.33	3.33	0	6.67
Clinger Taxa	6.25	6.25	3.75	3.75	2.5	6.25
% Dominance	9.31	8.99	5.37	7.77	5.49	6.35
% Tanytarsini Taxa	7.46	8.76	7.89	7.22	7.55	5.92
Sensitive Taxa	5	4	1	1	6	8
% Tolerant Taxa	7.65	7.68	1.25	2.28	8.19	7.23
SCI Vial Score	59.03	60.03	35.88	41.18	44.72	59.67
Stream Condition Index Score	**60**		**39**		**52**	
Score Interpretation	**Healthy**		**Healthy**		**Healthy**	