

Pemberton Creek

Methods

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2011 Hillsborough County aerial, Land Use/ Land Cover (LULC) and Watershed boundary layers courtesy of the Southwest Florida Water Management District, Landscape Development Intensity (LDI) Index values were calculated for each watershed following the procedures of Reiss & Brown 2012 (Reiss & Brown. 2012. Landscape Development Intensity (LDI) Index User's Manual. H.T. Odum Center for Wetlands, University of Florida. March 2012). According to Reiss and Brown "The LDI represents a human disturbance gradient for wetland systems. The LDI is an integrated measure of human activity, combining the effects from air and water pollutants, physical damage, changes in the suite of environmental conditions ... on the structure and processes of landscapes and ecosystems... Natural, undeveloped LU/LC classes have a LDI index value of zero. 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>

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

Pemberton Creek located in Hillsborough County Florida was sampled at two localities on the 29th of October, 2014 near the city of Dover Florida. The first sampling locality is located off of McIntosh road at: 28.0283959 N and 82.2447411 W. The second sampling locality is located off of Fritzke road at: 28.0286196 N and 82.2178435 W. Pemberton Creek discharges into Lake Thonotosassa. The watershed surrounding Pemberton Creek is dominated by Residential (36.1%), Natural Land/Open Water (23.7%), Industrial/Commercial (17.7%), and Pasture/Livestock (5.5%) land uses. The Landscape Development Intensity Index of the watershed is 27.37.

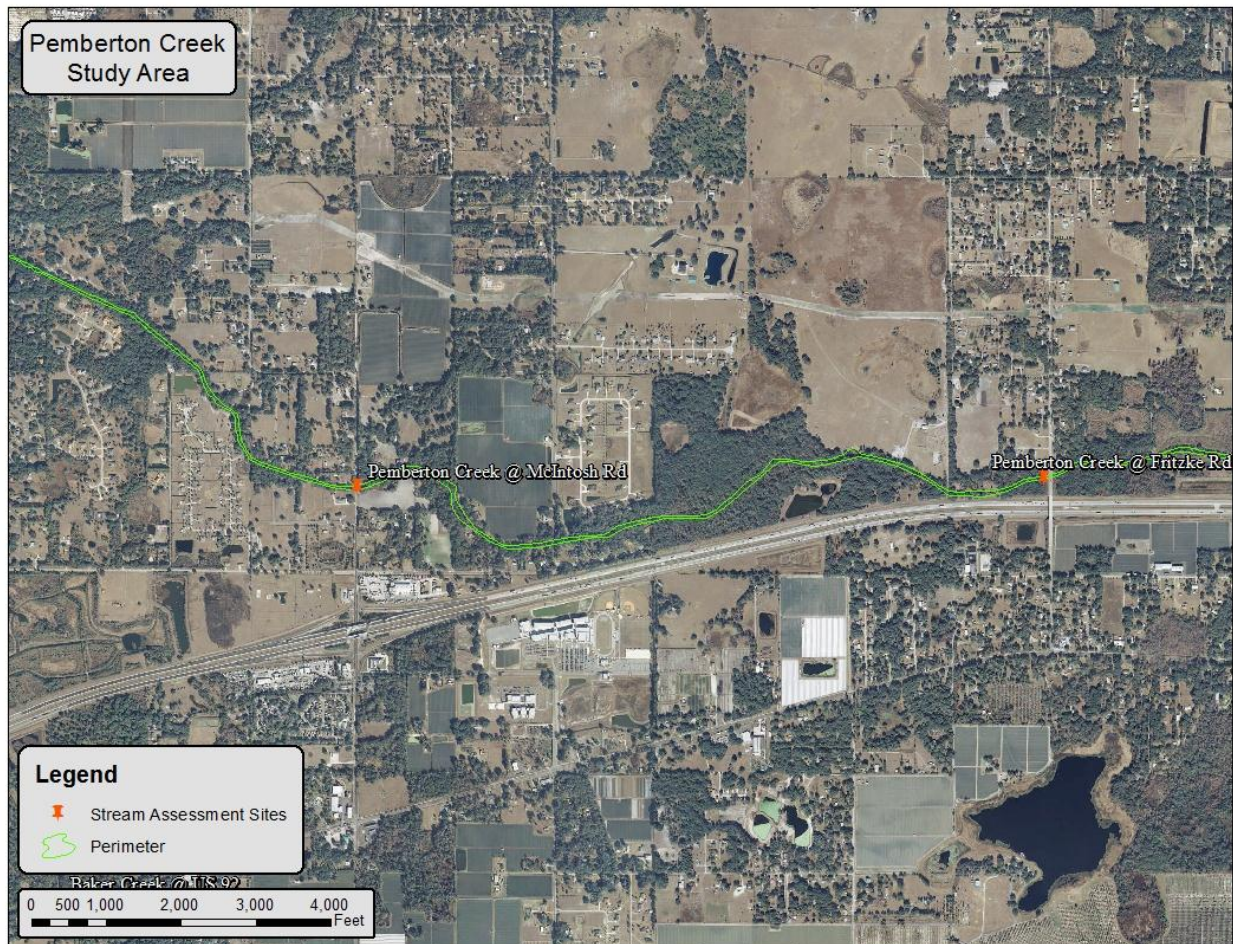


Figure 1 2014 Pemberton Creek Assessment Study Area Map

Habitat Assessment

Pemberton Creek at McIntosh Road

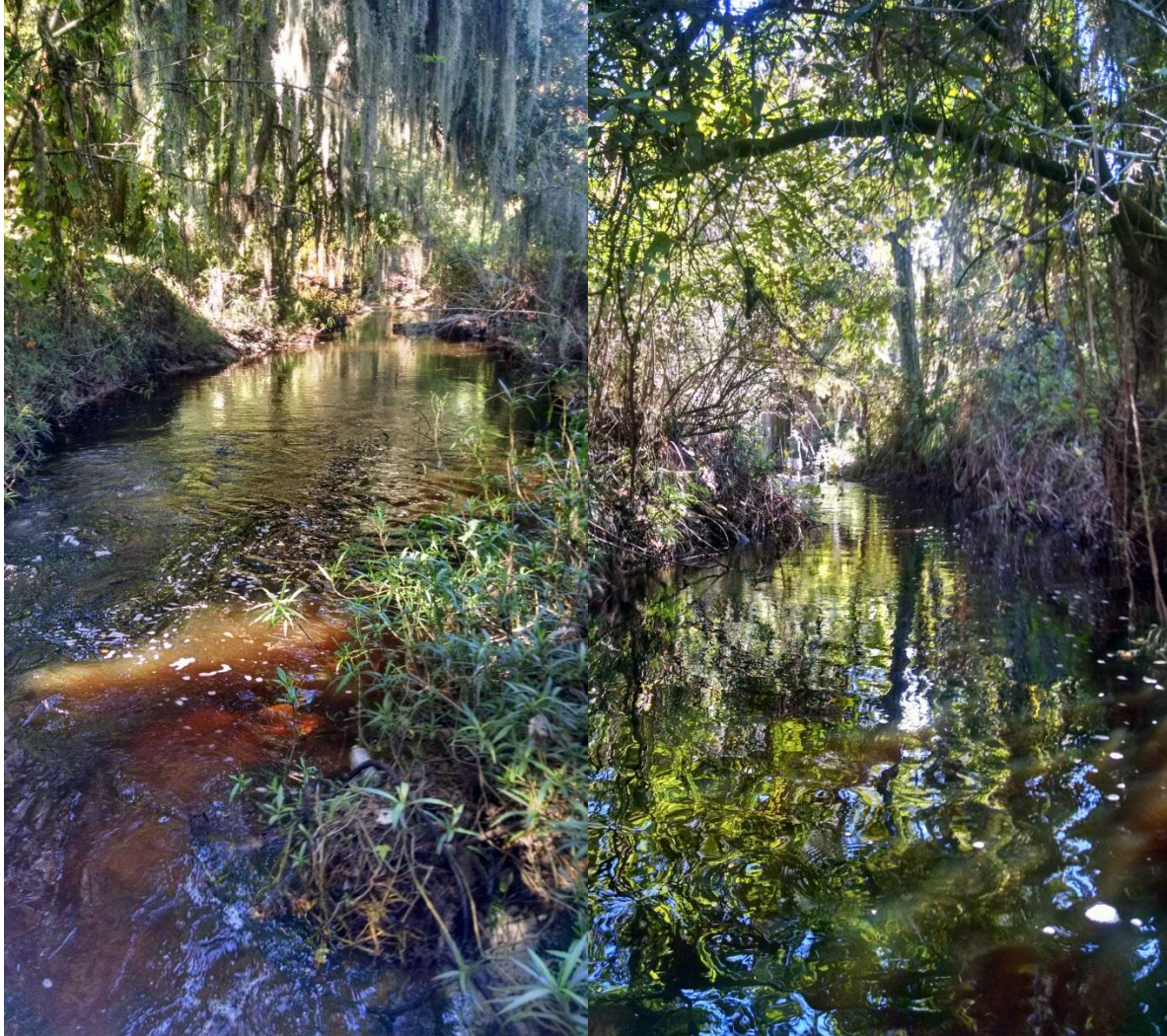


Figure 2 Overview photographs of Pemberton Creek at McIntosh Road sample site

Pemberton creek at McIntosh road received a habitat assessment score of 122 due to good substrate diversity and availability and a lack of habitat smothering by sand and silt. Plant communities are noteworthy due to domination by non-native plant species. Conditions along the banks were good for the most part. Bankfull was $>60\%$ of bank height and armoring vegetation was present along each bank. The downside to bank stability was that slope angle was $>60^\circ$. A number of productive habitats were observed from an abundance of rock to productive pools, snags and fine root habitats. Water velocity was measured at the 75 meter mark and determined to be slightly suboptimal (0.21 m/s) at the time of assessment. The riparian buffer zone was approximately 10 m on each side of the creek for each bank.

The Linear Vegetation Survey identified 7 species rooted in the water at the time of the assessment. The majority of these species (4) are non-native, invasive species. The remaining 3 species are native to this region. Of the plants present in each site, no one plant was clearly dominant over the other species present. There were a total of 28 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 1.21 and the % FLEPPC metric for the study area was 82.14%.

Plant Species	Sample Site										Observations /Species	CoC
	0-10 m	10-20 m	20-30 m	30-40 m	40-50 m	50-60 m	60-70 m	70-80 m	80-90 m	90-100 m		
<i>Colocasia esculenta</i>	1	1	1	1	1		1	1	1	1	9	0
<i>Ruellia simplex</i>	1	1	1		1		1	1	1	1	8	0
<i>Ludwigia peruviana</i>				1	1		1	1			4	0
<i>Crinum americanum</i>								1	1	1	3	9
<i>Salvinia minima</i>				1				1			2	0
<i>Lemna spp.</i>				1							1	1
<i>Micranthemum glomeratum</i>								1			1	5.85
Observations/Station	2	2	2	4	3	0	3	6	3	3	28	
Total Observations	28											
Mean CoC	1.21											
% FLEPPC	82.14											

Pemberton Creek at Fritzke Road



Figure 3 Overview photograph of Pemberton Creek at Fritzke Road, note the high presence of productive rock habitat.

Pemberton creek near Fritzke road received a habitat assessment score of 134 due to good substrate diversity and availability and a lack of habitat smothering by sand and silt. Plant communities are noteworthy due to domination by non-native species. Conditions along the banks were good for the majority of the assessment area. In some places bankfull was <60% of bank height and in other spots the bank slope was >60° approaching an angle of near vertical in some sections. A number of productive habitats were observed from an abundance of rock to productive pools, snags and fine root habitats. Water velocity was optimal at 0.33 m/s measured at the 50 meter mark. The riparian buffer zone was approximately 50 m along each bank except for a section along the right bank where human habitation was present.

During the Rapid Periphyton Survey, no periphyton was observed. The average canopy cover in the 100 meter region was 91.42%. The Secchi Disk Depth was measured as 0.75' and visible on the bottom at the 90 meter mark. The average water depth in the study area was 1.25' at the time of the assessment.

The Linear Vegetation Survey identified 7 species rooted in the water at the time of the assessment. The majority of these species (6) are non-native, invasive species. The remaining species (*Woodwardia virginica*) is native to this region. Brittons Wild Petunia (*Ruellia simplex*) was the dominant species in all 10 sites of the Linear Vegetation Survey. There were a total of 26 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 0.27 and the % FLEPPC metric for the study area was 92.31%. Native vegetation along the creek was very sparse.

Table 2 Linear Vegetation Survey Results - Pemberton Creek @ Fritzke Road

Plant Species	Sample Site										Observations /Species	CoC
	0-10 m	10-20 m	20-30 m	30-40 m	40-50 m	50-60 m	60-70 m	70-80 m	80-90 m	90-100 m		
<i>Ruellia simplex</i>	D	D	D	D	D	D	D	D	D	D	10	0
<i>Colocasia esculenta</i>		1	1				1	1	1	1	6	0
<i>Hygrophila polysperma</i>	1				1	1				1	4	0
<i>Ludwigia peruviana</i>									1	1	2	0
<i>Woodwardia virginica</i>				1				1			2	3.5
<i>Alternanthera philoxeroides</i>										1	1	0
<i>Salvinia minima</i>								1			1	0
Observations/station	2	2	2	2	2	2	2	4	3	5	26	
Total Observations	26											
Mean CoC	0.27											
% FLEPPC	92.31											



Figure 4 *Ruellia simplex* covering the banks along the Fritzke Road sampling site.

Water Quality Assessment

Limited long-term water quality data is available for Pemberton Creek. The data that is available was collected by the Hillsborough County Environmental Protection Commission in 2012 and 2013. Values for the 2014 USF Water Institute Assessment fall within the range of the previous data collections with the exception of Total Nitrogen. Table 3 provides a summary of the Physical/Chemical conditions recorded at both sites.

Table 3 Pemberton Creek Water Quality (Field)

Pemberton Creek @ McIntosh Road							
Depth (m)	T (°C)	pH	DO mg/L	DO Sat %	Cond. (UMHO/cm)	Salinity (ppt)	Secchi Depth (ft)
0.01	20.92	7.6	8.62	92.7	242.6	0.11	1.5'
0.05	20.93	7.58	8.62	92.7	242.6	0.11	
Pemberton Creek @ Fritzke Road							
Depth (m)	T (°C)	pH	DO mg/L	DO Sat %	Cond. (UMHO/cm)	Salinity (ppt)	Secchi Depth (ft)
0.77	21.27	7.47	7.84	84.8	237.3	0.11	0.75' (vob)

The chemical water quality analysis for the Delaney Creek Tributary is shown in Table 4 along with geometric mean values for the past two years for available parameters. Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/l. Total Nitrogen values were also below the nutrient region threshold developed by FDEP of 1.65 mg/l. Chlorophyll-a values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l. For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora.

Table 4 Pemberton Creek Water Quality (Laboratory)

Pemberton Creek				
Parameter	McIntosh Road	Fritzke Road	Pemberton Creek 2012 Geomean	Pemberton Creek 2013 Geomean
Ammonia	0.075 mg/L	0.096 mg/L		
Nitrates/Nitrites	0.484 mg/L	0.444 mg/L		
Kjeldahl Nitrogen	0.766 mg/L	0.840 mg/L	0.530	
Total Nitrogen	1.250 mg/L	1.284 mg/L	0.360	
Total Phosphorous	0.411 mg/L	0.383 mg/L		
Alkalinity	85.0 mg/LCaCO ₃	84.0 mg/LCaCO ₃		
Chlorophyll - a	3.1 ug/L	3.1 ug/L		
Chlorophyll - a Corrected	3.0 ug/L	3.0 ug/L		
Color	100.2 Pt/Co	112.8 Pt/Co	40.003	169.329
Fecal Coliform	440 #/100 ml	180 #/100 ml	509.551	
Enterococci	500 #/100 ml	480 #/100 ml		

Conclusion

The Pemberton Creek sites that were assessed during this study do not show impairment based on water quality alone. The system does show impairment in the vegetation communities through the linear vegetation survey results with a high percentage of non-native invasive species. The habitat assessment performed on the two sample sites scored each site a 122 and 134 for the McIntosh Road and Fritzke Road sample sites respectively. The scores reflect an optimal amount of diversity and availability in habitat for aquatic macroinvertebrates. These scores would have been higher had it not been for the high degree of non-native invasive plant species in each region.

Table 5 Summary of Water Quality, Floristic Surveys and Habitat Assessments

Measure		McIntosh	Fritzke	Threshold
Total Phosphorous (mg/l)		0.411	0.383	< 0.49
Total Nitrogen (mg/l)		1.25	1.284	< 1.65
RPS (% Rank 4-6)		0	0	< 25%
LVS	Avg C of C	1.21	0.27	≥ 2.5
	FLEPPC %	82.14%	92.31%	< 25%
Chlorophyll (µg/l)		3	3	< 20 µg/l
Habitat Assessment		122	134	