Baker Creek

Methods

Study Area Analysis

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 an 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

Baker Creek is located in Hillsborough County, Florida and was sampled at two locations on November 7, 2014. The first sampling location is located at US Highway 92 near Plant City at: 28.0132728 N and 82.2568693 W. The second location is located at MLK Boulevard with at 27.9868516 N and 82.2590939 W. Baker Creek discharges into Lake Thonotosassa. The watershed surrounding Baker Creek is dominated by Residential (47%), Natural Land/Open Water (15.15%), Pasture/Livestock (12.5%), and Crops/Tree Plantations (9.25%) land uses. The Landscape Development Intensity Index of the watershed is 26.97.

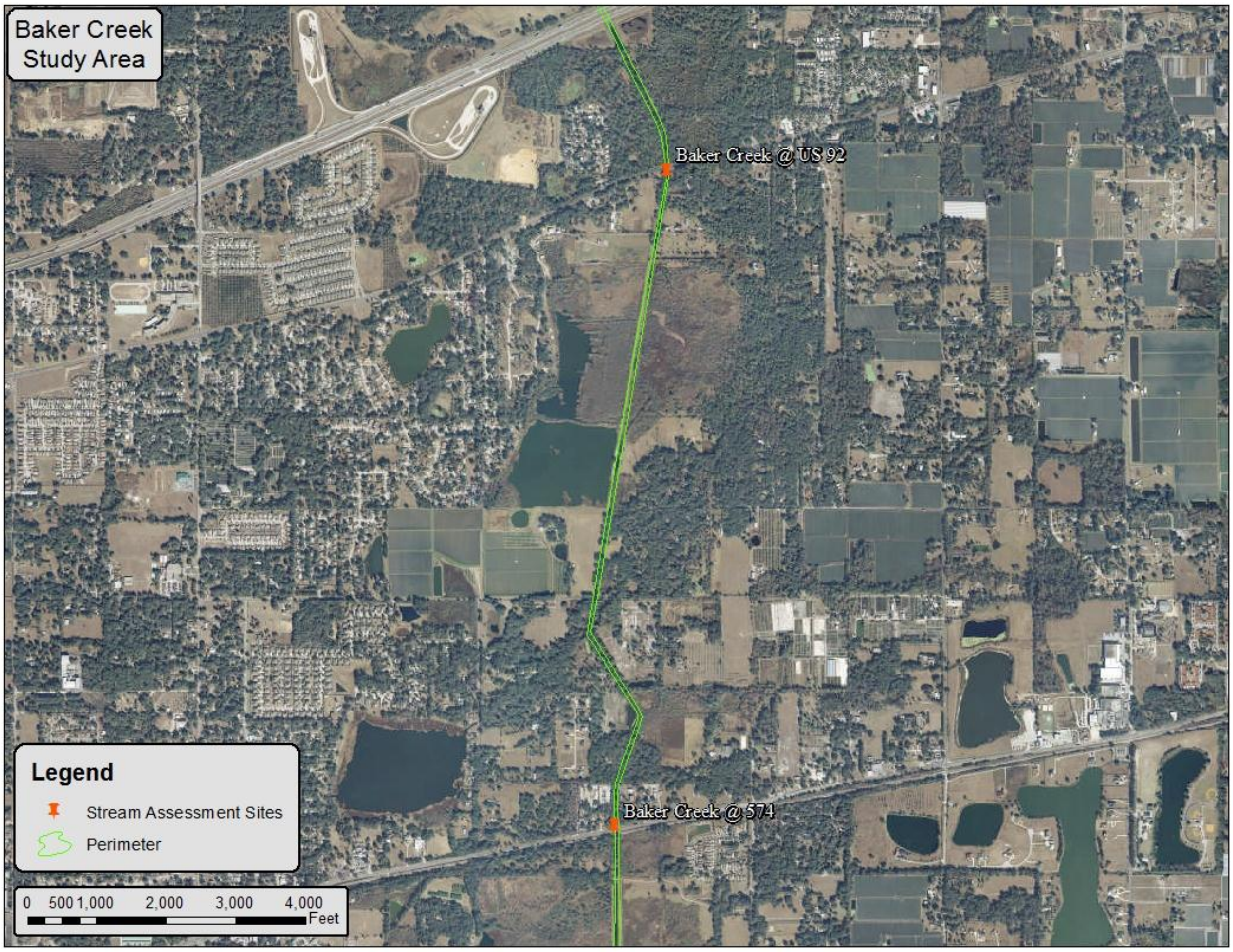

Figure 1 2014 Baker Creek Assessment Study Area Map

Habitat Assessment

Baker Creek at US Highway 92

Figure 2 Overview photograph of Baker Creek at US Highway 92 sample site

Baker Creek at US 92 received a habitat assessment score of 97. The conditions contributing to this score are due to poor substrate diversity, marginal substrate availability, marginal habitat smothering, and marginal channelization. The observed lack of stable pools within the transect was most likely due to habitat smothering by silt, and the creek showed evidence of artificial straightening as there was not as much sinuosity as one would expect from a normal Coastal Plain flow regime. Bankful was >60% throughout the creek, slope was <60 degrees through the majority of the creek, and armoring was optimal. Some undercutting was noted at the 10 m, 20 m, and 80 m marks and nearly 50% of the right bank contained exposed roots. Water velocity was measured at the 80 and 10 meter marks and had a velocity of (.14 m/s) and (.05 m/s) respectively. The riparian buffer zone width was >18 m and the riparian zone vegetation quality exhibited 80% surface cover of normal plant community. A metallic smell was observed emanating from the water.

During the Rapid Periphyton Survey, periphyton was not observed in the 99 individual grab samples performed. The average canopy cover in the 100 meter region was 16.23%. The Secchi Disk Depth was measured at 2' at the 100 meter mark. The average water depth at the time of the assessment was 3'.

The Linear Vegetation Survey identified 12 species rooted in the water at the time of the assessment. The majority of these species (8) are non-native, invasive species. The remaining 4 species are native to this region. From the distribution of species observed, none were clearly dominant in any of the 10 m sections. There were a total of 65 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 0.68 and the % FLEPPC metric for the study area was 75.38%. Of the plants present within each study site, no one plant was clearly dominant over other species present.

Table 1 Linear Vegetation Survey Results - Baker Creek @ US Highway 92

Plant Species	Sample Site										Observations /Species	CoC
	0-1 m	10-20m	20-30m	30-40m	40-50m	50-60m	60-70m	70-80m	80-90m	90-100m		
Alternanthera philoxeroides	1	1	1	1	1	1	1	1	1	1	10	0
Eichhornia crassipes	1	1		1	1	1	1	1	1	1	9	0
Urochloa mutica	1			1	1	1	1	1	1	1	8	0
Nuphar lutea var. advena	1	1	1		1		1	1	1		7	3.5
Salvinia minima	1	1	1	1	1	1	1				7	0
Pistia stratoides	1			1	1	1	1		1		6	0
Hygrophila polysperma	1	1	1	1		1					5	0
Commelina spp.	1		1	1	1						4	2.02
Ludwigia peruviana			1		1				1		3	0
Polygonum hydropiperoides					1	1				1	3	2.5
Hydrocotyl umbellata	1									1	2	2
Colocasia esculenta	1										1	0
Observations/Station	10	5	6	7	9	7	6	4	6	5		

Total Observations	65
Mean CoC	0.68
%FLEPPC	75.38

Baker Creek at Martin Luther King Jr Blvd

Figure 3 Overview photograph of Baker Creek at Martin Luther King Jr Blvd

Baker Creek at MLK received a habitat assessment score of 102. The conditions contributing to this score are due to marginal habitat smothering, marginal artificial channelization, and marginal riparian zone width and vegetation quality. A suboptimal number of stable pools were observed and there was evidence of artificial channelization with a small degree of sinuosity. Bank stability is optimal with bankful >60% of bank height and slope <60 degrees. Good substrate diversity was observed including snags observed in every 10 m section. A good number of leaf packs were observed and the water was observed to have a metallic scent. Substrate availability was optimal. Water velocity was suboptimal and was measured at both the 80 m transect at (.16 m/s) and the 10 m transect at (.20 m/s). The riparian buffer width was between 6 m and 12 m, and the riparian zone vegetation quality was 25% to 50% undisturbed.

During the Rapid Periphyton Survey, periphyton was not observed in the 99 individual grab samples performed. The average canopy cover in the 100 meter region 78.34%. The Secchi Disk Depth was measured 1.75’ and visible on the bottom at the 100 meter mark. The average water depth at the time of the assessment was 1.5’.

The Linear Vegetation Survey identified 11 species rooted in the water at the time of the assessment. The majority of these species (8) are non-native, invasive species. The remaining 3 species are native to this region. Wild Taro (*Colocasia esculenta*) was the dominant species in the linear vegetation survey (see Figure 4). The vegetation community along this sample location showed evidence of frequent disturbance resulting in the dominance by pioneering species. There were a total of 57 species observations in the 100 meter study area. The mean Coefficient of Conservatism (CoC) metric for the study area was 0.76 and the % FLEPPC metric for the study area was 75.44%. Native vegetation along the creek was sparse. Of the plants present within each study site, Colocasia esculenta was clearly dominant over other species present.

Table 2 Linear Vegetation Survey Results - Baker Creek @ MLK Blvd

Plant Species	Sample Site										Observations /Species	CoC
	0-10 m	10-20m	20-30m	30-40m	40-50m	50-60m	60-70m	70-80m	80-90m	90-100m		
Colocasia esculenta	D	D	D	D	D	D	D	D	D	D	10	0
Alternanthera philoxeroides	1	1		1		1	1	1	1	1	8	0
Hygrophila polysperma	1	1			1	1	1	1	1		7	0
Myriophyllum aquaticum			1	1	1	1	1	1		1	7	0.98
Epipremium aureum			1	1	1	1	1			1	6	0
Saururus cernuus	1	1	1	1	1						5	6.5
Lemna spp.					1		1	1		1	4	1
Salvinia minima						1	1	1			3	0
Syngonium podophyllum				1	1		1				3	0
Ludwigia peruviana				1		1				1	3	0
Ruellia simplex						1					1	0
Observations/Station	3	3	3	6	6	7	7	5	2	5		

Total Observations	57
Mean CoC	0.76
%FLEPPC	75.44

Figure 4 Photo of the vegetation along Baker Creek @ MLK, note the heavy presence of Wild Taro (*Colocasia esculenta*)

Water Quality Assessment

Long-term water quality data is available for Baker Creek spanning the present to the past three years. The data available was collected by the Hillsborough County Environmental Protection Commission. Most of the values for the 2014 USF Water Institute Assessment fall within the range of the previous data collections (notable exceptions are: Ammonia, Nitrates/Nitrites, Total Nitrogen). Table 3 provides a summary of the Physical/Chemical conditions recorded at both sites. Of note in the physical water quality table is the overall low Dissolved oxygen in the system at the US Highway 92 sample site.

Table 3 Baker Creek Water Quality (Field)

Baker Creek @ US Highway 92							
Depth (m)	**T (ºC)**	**pH**	**DO mg/L**	**DO Sat %**	**Cond. (UMHO/cm)**	**Salinity (ppt)**	**Secchi Depth (ft)**
0.06	18.58	6.8	3.86	39.6	398.37	0.19	2'
Baker Creek @ Martin Luther King Jr Blvd							
Depth (m)	**T (ºC)**	**pH**	**DO mg/L**	**DO Sat %**	**Cond. (UMHO/cm)**	**Salinity (ppt)**	**Secchi Depth (ft)**
0.08	22.07	6.98	7.09	77.87	347.23	0.16	1.75' (vob)

The chemical water quality analysis for Baker Creek is shown in Table 4 along with geometric mean values for the past three years for available parameters. Total Phosphorous values were above the nutrient region threshold developed by FDEP of 0.49 mg/l. Total Nitrogen values were also above the nutrient region threshold developed by FDEP of 1.65 mg/l. Chlorophyll-a values were measured just above the site specific evaluation range of 3.2 µg/l to 20 µg/l for the US Hwy 92 sample site and were within the threshold for MLK. These results are interpreted as indicative of conditions reflecting an imbalance of flora. According to these results from the 2014 assessment and the previous three years of available water quality data, Baker Creek would be considered to have not met the requirements for the Numeric Nutrient Criteria and would be considered impaired.

Table 4 Baker Creek Water Quality (Laboratory)

Baker Creek					
Parameter	US Hwy 92	MLK	Baker Creek 2012 Geomean	Baker Creek 2013 Geomean	Baker Creek 2014 Geomean
Ammonia	.185 mg/L	.228 mg/L	0.072	0.063	0.030
Nitrates/Nitrites	1.069 mg/L	2.262 mg/L	0.035	0.698	0.483
Kjeldahl Nitrogen	1.492 mg/L	1.487 mg/L	1.042	1.118	0.927
Total Nitrogen	2.561 mg/L	3.749 mg/L	1.233	1.878	1.527
Total Phosphorous	.390 mg/L	.582 mg/L	0.711	0.676	0.587
Alkalinity	51.0 mg/LCaCO3	45.0 mg/LCaCO3	No Data	No Data	No Data
Chlorophyll - a	20.5 ug/L	12.6 ug/L	13.382	14.498	14.975
Chlorophyll - a Corrected	14.8 ug/L	9.2 ug/L	8.935	10.434	10.496
Color	46.7 Pt/Co	37.7 Pt/Co	56.355	53.168	42.826
Fecal Coliform	180 #/100 ml	600 #/100 ml	113.936	No Data	267.326
Enterococci	1100 #/100 ml	1260 #/100 ml	491.524	No Data	2589.054

Conclusion

The Baker Creek sites assessed in this study show impairment based on the results of water quality sampling. This interpretation is supported by the results of the linear vegetation survey which show a high percentage of non-native invasive species. The habitat assessment performed on the two sample sites indicates similar conditions at each site with overall habitat assessment scores of 97 and 104 for the US Hwy 92 site and the MLK site respectively. These scores though not optimal are indicative of decent diversity and amount of habitat for aquatic macroinvertebrates.

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

Measure		Hwy 92	MLK	Threshold
Total Phosphorous (mg/l)		0.39	0.582	< 0.49
Total Nitrogen (mg/l)		2.561	3.749	< 1.65
RPS (% Rank 4-6)		0	0	< 25%
LVS	Avg C of C	0.68	0.76	≥ 2.5
	FLEPPC %	75.38%	75.44%	< 25%
Chlorophyll (µg/l)		20.5	12.6	< 20 µg/l
Habitat Assessment		97	104	