Stream Assessment Report for Baker Creek Reaches 03100205000242, 03100205000246, 03100205000503, 03100205000525 in Hillsborough County, Florida

Date Assessed: February 10, 2014

Assessed by: David Eilers

Reviewed by: Jim Griffin

INTRODUCTION

This assessment was conducted to update existing physical and ecological data for Baker Creek on the Hillsborough County & City of Tampa Water Atlas. The project is a collaborative effort between the University of South Florida's Center for Community Design and Research and Hillsborough County Stormwater Management Section. The project is funded by Hillsborough County and the Southwest Florida Water Management District. The project has, as its primary goal, the rapid assessing of up to 150 lakes and stream segments in Hillsborough County during a five-year period. The product of these investigations will provide the County, property owners and the general public a better understanding of the general health of Hillsborough County lakes and streams, in terms of shoreline development, water quality, morphology (bottom contour, volume, area, etc.) and the plant biomass and species diversity. These data are intended to assist the County and its citizens to better manage lakes and streams.

Figure 1. General photograph of Baker Creek.

BACKGROUND

This report focuses on Baker Creek from its mouth at Lake Thonotosassa upstream to the barriers on the main channel beyond the split for the southwest canal and north-south canal as well as the first portion of the east branch that leads to Pemberton Creek to the barbed wire fence blocking the creek. With the exception of the eastern branch, Baker Creek is characterized as a shallow, steep bank constructed channel. The eastern branch of Baker Creek is a less constructed channel, also with steep banks.

The first section of the report provides the results of the overall morphological assessment of the stream. Primary data products include: a contour (bathymetric) map of the stream, area, volume and depth statistics, and the water level at the time of assessment. These data are useful for evaluating trends and for developing management actions such as plant management where depth and stream volume are needed.

The second section provides the results of the vegetation assessment conducted on the stream. These results can be used to better understand and manage vegetation in the stream. A list is provided with the different plant species found at various sites along the stream. Potentially invasive, exotic (non-native) species are identified in a plant list and the percent of exotics is presented in a summary table. Watershed values provide a means of reference.

The third section provides the results of the water quality sampling of the stream. Both field data and laboratory data are presented. The stream water quality will be assessed based on the Water Quality Standards for Streams that were fully approved on March 15, 2013. Please see a discussion of these standards and the approach used for Streams in the Stream Notes at the end of this report. The intent of this assessment is to provide a starting point from which to track changes in the stream, and where previous comprehensive assessment data is available, to track changes in the stream's general health. These data can provide the information needed to determine changes and to monitor trends in physical condition and ecological health of the stream.

Section 1: Stream Morphology

Bathymetric Map[i]. Table 1 provides the stream's morphologic parameters in various units. The bottom of the stream was mapped using a Lowrance LCX 28C HD or HDS 5 with Wide Area Augmentation System (WAAS)[ii] enabled Global Positioning System (GPS) with fathometer

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[i] A bathymetric map is a map that accurately depicts all of the various depths of a water body. An accurate bathymetric map is important for effective herbicide application and can be an important tool when deciding which form of management is most appropriate for a water body. Stream volumes, hydraulic retention time and carrying capacity are important parts of stream management that require the use of a bathymetric map.

[ii] WAAS is a form of differential GPS (DGPS) where data from 25 ground reference stations located in the United States receive GPS signals form GPS satellites in view and retransmit these data to a master control site and then to geostationary satellites. For more information, see end note 2.

(bottom sounder) to determine the boat's position, and bottom depth in a single measurement. The result is an estimate of the stream's area, mean and maximum depths, and volume and the creation of a bottom contour map (Figure 2 through 6). Besides pointing out the deeper fishing holes in the stream, the morphologic data derived from this part of the assessment can be valuable to overall management of the stream vegetation as well as providing flood storage data for flood models.

Table 1. Stream Morphologic Data (Area, Depth and Volume)

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	642,047.15	59,648.13	14.74		
Mean Depth	2.05	0.625			
Maximum Depth	9.8	2.99			
Volume (cubic)	827,434.01	23,430.32		19.00	6,189,679.09
Gauge (relative)	36.40	11.09			

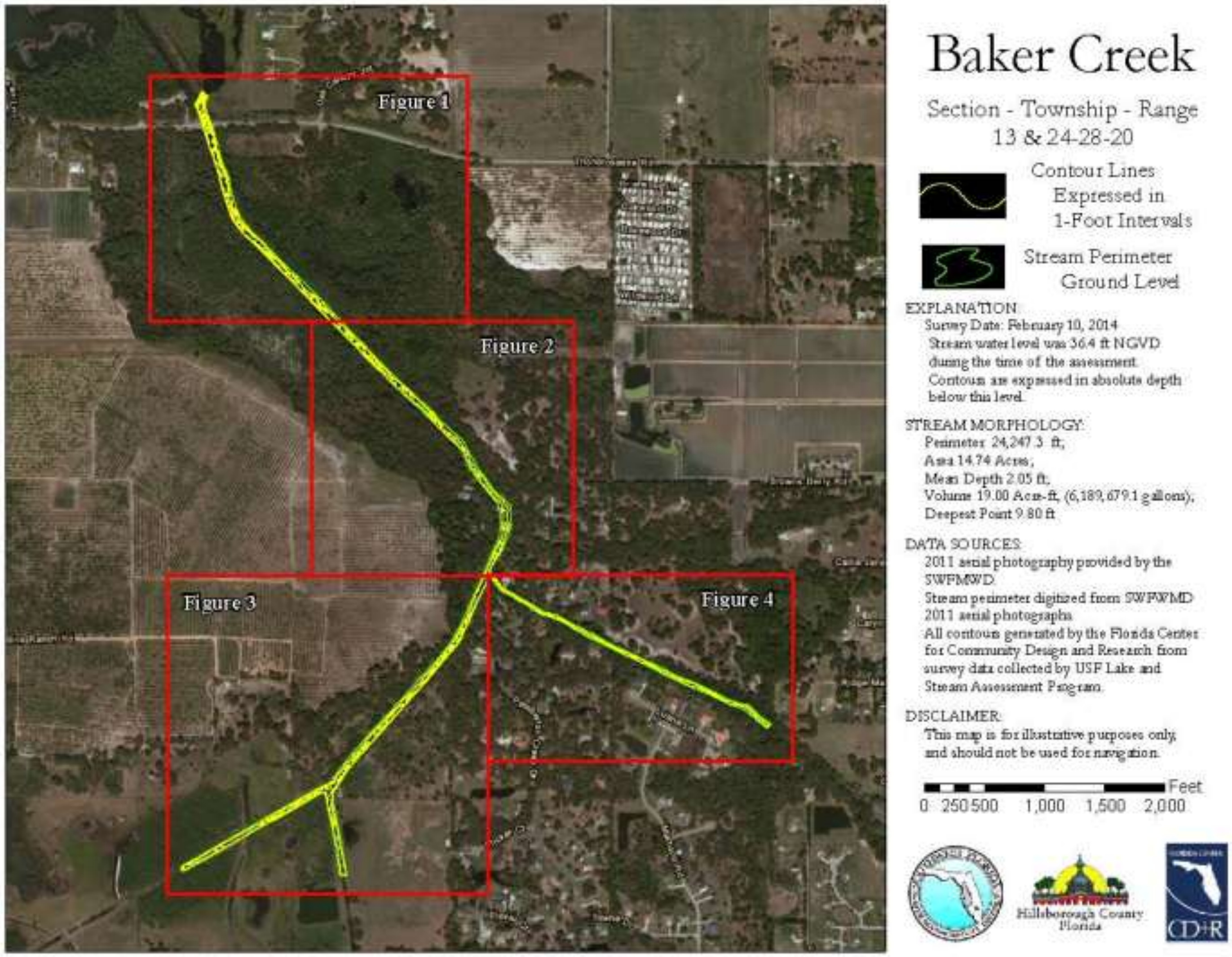

Figure 2. Overview of 1-Foot Bathymetric Contour Map for Baker Creek.

Figure 3. Baker Creek Bathymetry Inset Map 1

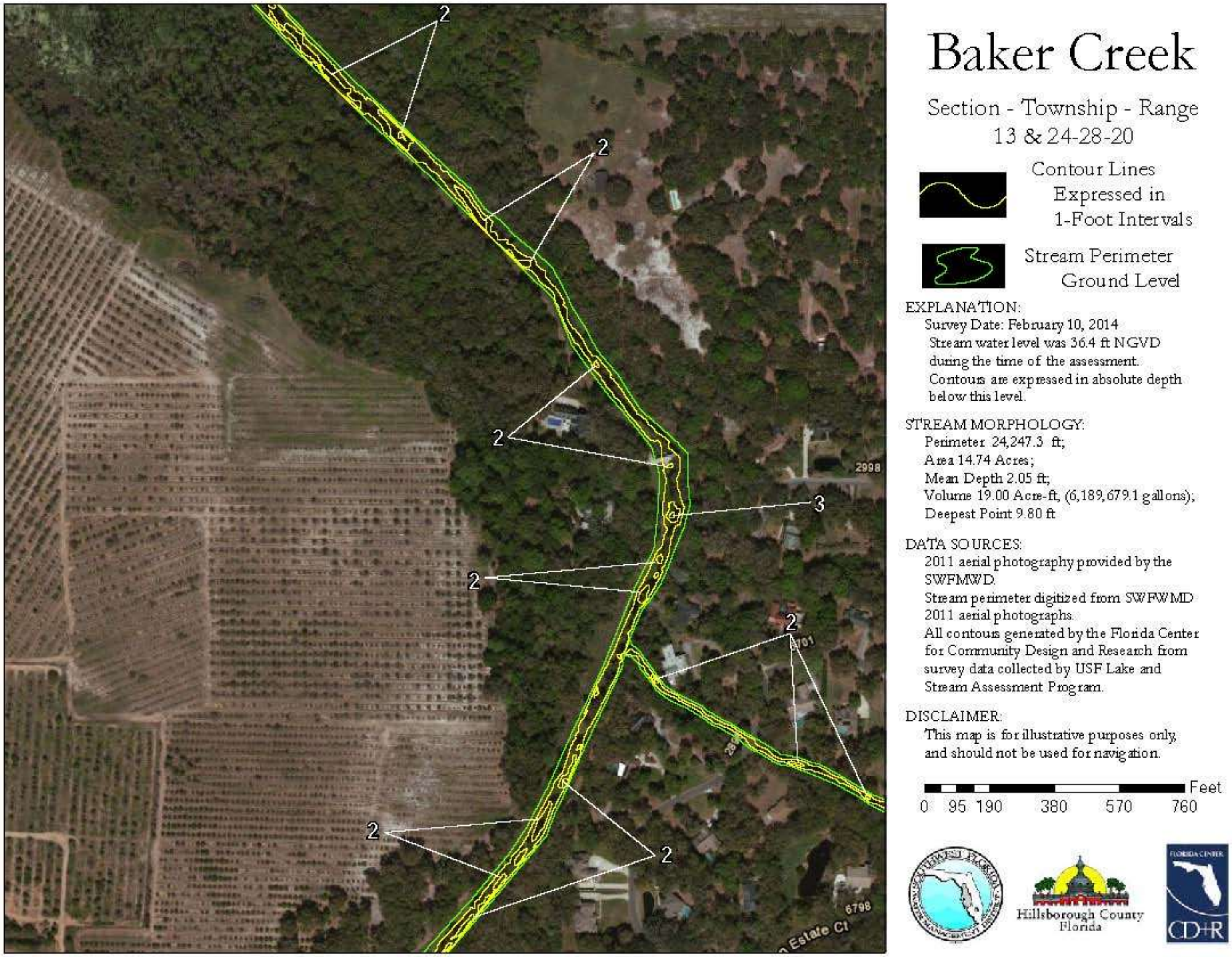

Figure 4. Baker Creek Bathymetry Inset Map 2

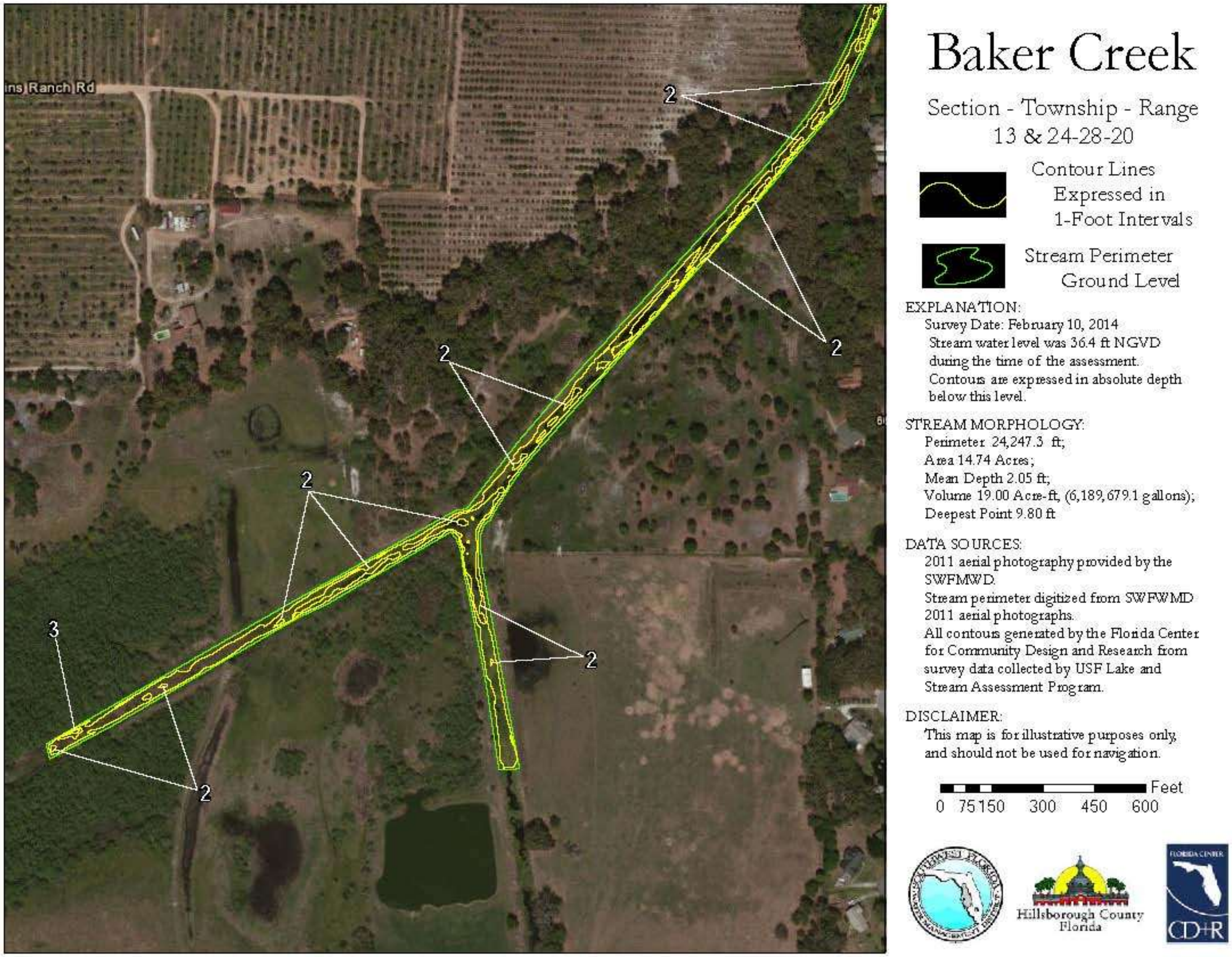

Figure 5. Baker Creek Bathymetry Inset Map 3

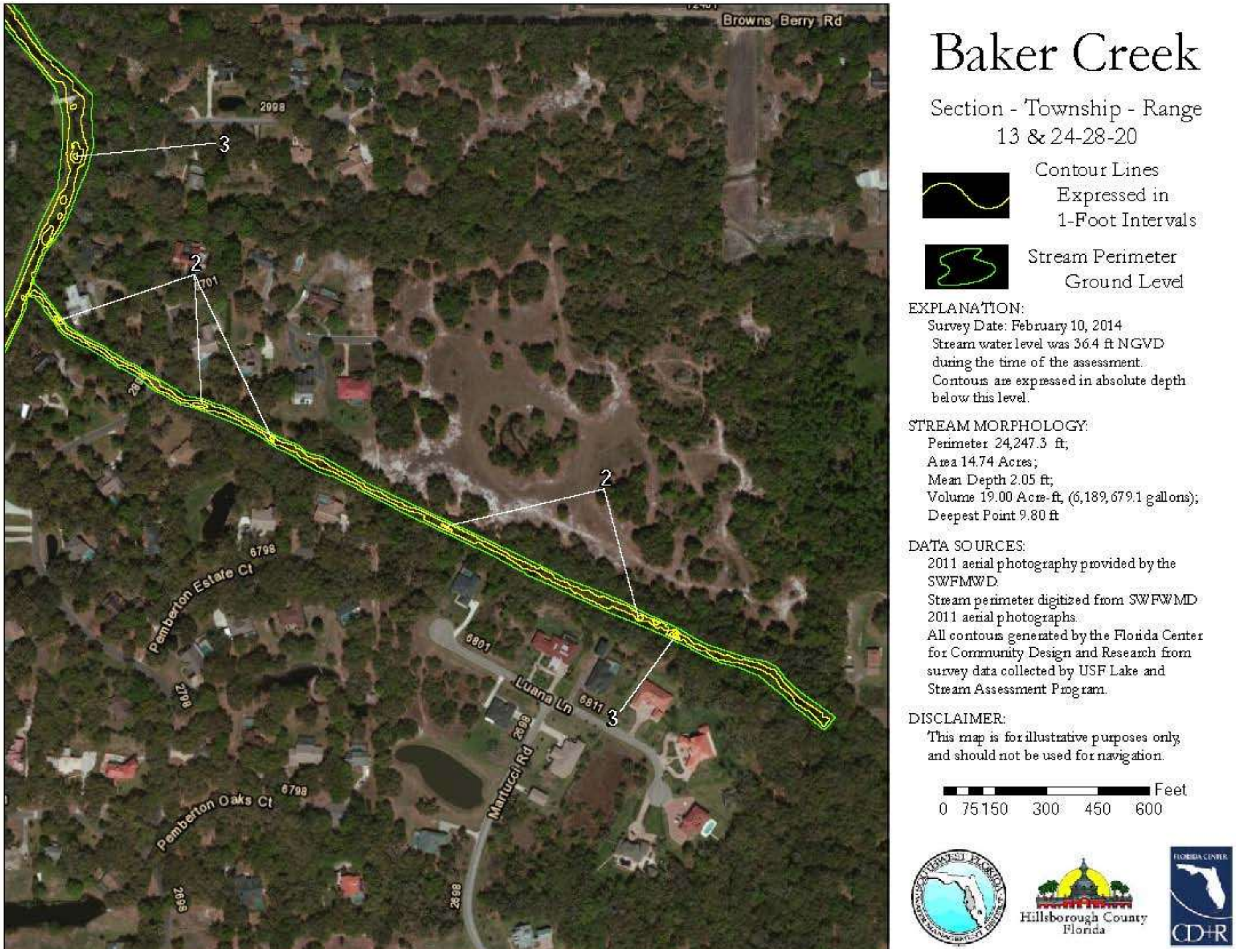

Figure 6. Baker Creek Bathymetry Inset Map 4

Section 2: Stream Ecology (Vegetation)

The stream's apparent vegetative cover and shoreline detail are evaluated using the latest stream aerial photograph as shown in and by use of WAAS-enabled GPS. Submerged vegetation is determined from the analysis of bottom returns from the Lowrance 28c HD or HDS 5 combined GPS/fathometer described earlier. As depicted in Figure 7, 18 vegetation sites have been assessed for in ~200 meter regions measured from the center of the stream. The vegetation assessment regions are set up from the downstream extent and work to the upstream extent. The region beginning and ending points are set using GPS and then loaded into a GIS mapping program (ArcGIS) for display. Each region is sampled in the three primary vegetative zones (emergent, submerged and floating)[iii]. The latest high resolution aerial photos are used to provide shore details (docks, structures, vegetation zones) and to calculate the extent of surface vegetation coverage. The primary indices of submerged vegetation cover and biomass for the stream, percent area coverage (PAC) and percent volume inhabited (PVI), are determined by transiting the stream by boat and employing a fathometer to collect "hard and soft return" data. These data are later analyzed for presence and absence of vegetation and to determine the height of vegetation if present. The PAC is determined from the presence and absence analysis of 100 sites in the stream and the PVI is determined by measuring the difference between hard returns (stream bottom) and soft returns (top of vegetation) for sites (within the 100 analyzed sites) where plants are determined present.

The data collected during the site vegetation sampling include vegetation type, exotic vegetation, predominant plant species and submerged vegetation biomass. The total number of species from all sites is used to approximate the total diversity of aquatic plants and the percent of invasive-exotic plants on the stream (Table 2). The Watershed value in Table 2 only includes lakes and streams sampled during the lake and stream assessment project begun in May of 2006. These data will change as additional lakes and streams are sampled. Table 3through Table 5 detail the results from the 2013 aquatic plant assessment for the stream. These data are determined from the 18 sites used for intensive vegetation surveys. The tables are divided into Floating Leaf, Emergent and Submerged plants and contain the plant code, species, common name of species and the calculated percent occurrence (number sites species is found/number of sites) and type of plant (Native, Non-Native, Invasive, Pest). In the "Type" category, the codes N and E0 denote species native to Florida. The code E1 denotes Category I invasive species, as defined by the Florida Exotic Pest Plant Council (FLEPPC); these are species "that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives." The code E2 denotes Category II invasive species, as defined by FLEPPC; these species "have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species." Use of the term invasive indicates the plant is commonly considered invasive in this region of Florida. The term "pest" indicates a plant (native or non-native) that has a greater than 55% occurrence in the stream and is also considered a problem plant for this region of Florida, or is a non-native invasive that is or has the potential to be a problem plant in the stream and has at least 40% occurrence. These two terms are somewhat subjective; however, they are provided to give stream property owners some

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[iii] See end note 3.

guidance in the management of plants on their property. Please remember that to remove or control plants in a wetland (stream shoreline) in Hillsborough County the property owner must secure an Application To Perform Miscellaneous Activities In Wetlands permit from the Environmental Protection Commission of Hillsborough County and for management of in-stream vegetation outside the wetland fringe (for streams with an area greater than ten acres), the property owner must secure a Florida Department of Environmental Protection Aquatic Plant Removal Permit.

Table 2. Total Diversity, Percent Exotics, and Number of Pest Plant Species

Parameter	Stream	Watershed
Number of Vegetation Assessment Sites	18	103
Total Plant Diversity (# of Taxa)	98	164
% Non-Native Plants	30	14.02
Total Pest Plant Species	1	19

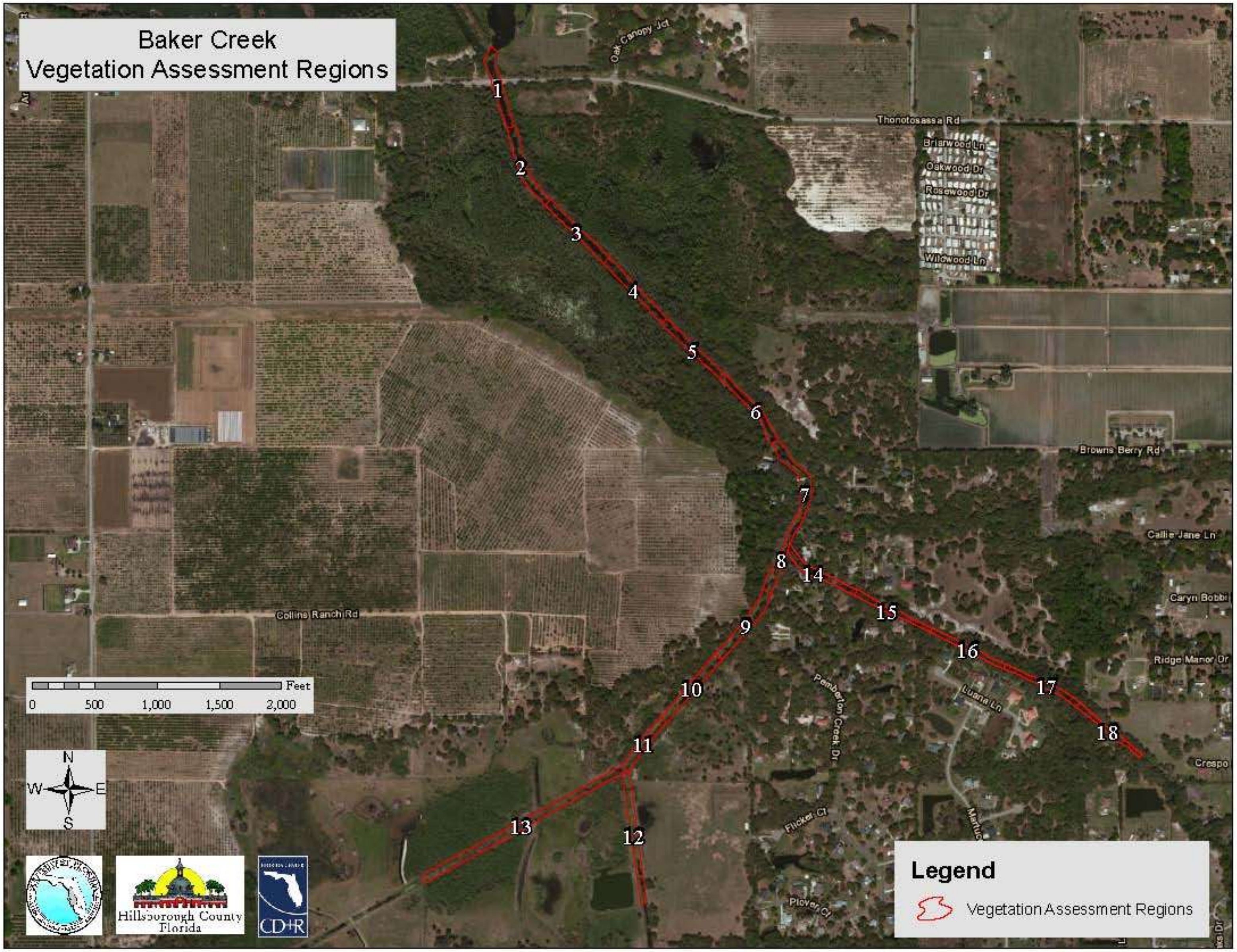


Figure 7. Baker Creek Vegetation Assessment Region Map

Figure 8. Shoreline vegetation community at the confluence of the eastern branch.

Table 3. List of Floating Zone Aquatic Plants Found

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
NLM	**Nuphar advena**	**Spatterdock, Yellow Pondlily**	**83**	**N E0**
SMA	**Salvinia minima**	**Water Spangles, Water Fern**	**77**	**E1**
SPY	**Spirogyra spp.**	**Filamentous Algae, Algal Mats**	**72**	**N E0 P**
PSS	**Pistia stratiotes**	**Water Lettuce**	**72**	**E1 P**
ECS	**Eichhornia crassipes**	**Water Hyacinth**	**66**	**E1 P**
LEN	**Lemna spp.**	**Duckweed**	**66**	**N E0**

Figure 9. Typical vegetation community structure of Baker Creek.

Table 4. List of Submerged Zone Aquatic Plants Found.

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
AAF	Ambrosia artemisiifolia	Common Ragweed	100	N E0
PMM	Panicum maximum	Guineagrass	100	E0
QLA	Quercus laurifolia	Laurel Oak; Diamond Oak	100	N E0
SAM	Sambucus nigra subsp. Canadensis	Elderberry	100	N E0
ULA	Urena lobata	Caesar's-weed	94	E1 P
QNA	Quercus nigra	Water Oak	88	N E0
HYE	Hydrocotyle umbellata	Manyflower Marshpennywort, Water Pennywort	88	N E0
BMA	Urochloa mutica	Para Grass	88	E1 P
CEA	Colocasia esculenta	Wild Taro	88	E1 P
SPO	Sabal palmetto	Sabal Palm, Cabbage Palm	83	N E0
AAS	Amaranthus australis	Southern Water Hemp	77	N E0
APS	Alternanthera philoxeroides	Alligator Weed	77	E2
MAM	Myriophyllum aquaticum	Parrot Feather	77	E0 P
LPA	Ludwigia peruviana	Peruvian Primrosewillow	72	E1
COM	Commelina spp.	Dayflower	66	N E0
BAA	Bidens alba	White Beggar-ticks, Romerillo	61	N E0
RBA	Ruellia simplex	Britton's Wild Petunia	61	E1
SCA	Salix caroliniana	Carolina Willow	50	N E0

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
WTA	**Sphagneticola trilobata**	**Creeping Oxeye; Wedelia**	**50**	**E2**
CCA	**Cinnamomum camphora**	**Camphor-tree**	**44**	**E1**
ACE	**Acer rubrum**	**Southern Red Maple**	**38**	**N E0**
CYO	**Cyperus odoratus**	**Fragrant Flatsedge**	**33**	**N E0**
EUP	**Eupatorium capillifolium**	**Dog Fennel**	**33**	**N E0**
THA	**Thelypteris spp.**	**Shield ferns**	**33**	**N E0**
NEA	**Nephrolepis exaltata**	**Sword Fern, Wild Boston Fern**	**27**	**N E0**
PAR	**Paspalum repens**	**Water Paspalum**	**27**	**N E0**
CAA	**Centella asiatica**	**Asian Pennywort, Coinwort, Spadeleaf**	**22**	**N E0**
CAM	**Crinum americanum**	**Swamp lily**	**22**	**N E0**
PIN	**Pinus spp.**	**Pine Tree**	**22**	**N E0**
SSM	**Sapium sebiferum**	**Chinese Tallow Tree**	**16**	**E1**
SLT	**Sagittaria latifolia**	**Wapato, Common Arrowhead, Broadleaf Arrowhead, Duck Potato**	**16**	**N E0**
DBA	**Dioscorea bulbifera**	**Air Potato**	**16**	**E1**
OCA	**Osmunda cinnamomea**	**Cinnamon Fern**	**16**	**N E0**
LOS	**Ludwigia octovalvis**	**Mexican Primrosewillow, Long-stalked Ludwigia**	**16**	**N E0**
LIQ	**Liquidambar styraciflua**	**Sweetgum**	**11**	**N E0**

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
FCA	**Fraxinus caroliniana**	**Carolina Ash, Water Ash, Pop Ash**	**11**	**N E0**
EAA	**Eclipta alba**	**Yerba De Tajo**	**11**	**N E0**
ERH	**Erechtites hieraciifolia**	**Fireweed**	**11**	**N E0**
CFO	**Cornus foemina**	**Swamp Dogwood, Stiff Dogwood**	**11**	**N E0**
PHS	**Polygonum hydropiperoides**	**Mild Waterpepper; Swamp Smartweed**	**11**	**N E0**
SAU	**Saururus cernuus**	**Lizard's Tail**	**11**	**N E0**
WAX	**Myrica cerifera**	**Southern Bayberry; Wax Myrtle**	**11**	**N E0**
TYP	**Typha spp.**	**Cattails**	**5**	**N E0**
STS	**Schinus terebinthifolius**	**Brazilian Pepper**	**5**	**E1**
SRS	**Serenoa repens**	**Saw Palmetto**	**5**	**N E0**
SMI	**Smilax spp.**	**Catbriar, Greenbriar**	**5**	**N E0**
SHA	**Sesbania herbacea**	**Danglepod Sesban**	**5**	**N E0**
CAQ	**Carya aquatica**	**Water Hickory**	**5**	**N E0**
BOC	**Boehmeria cylindrica**	**Bog Hemp, False Nettle**	**5**	**N E0**
BHA	**Baccharis halimifolia**	**Groundsel Tree; Sea Myrtle**	**5**	**N E0**
BLS	**Blechnum serrulatum**	**Swamp fern, Toothed Midsorus Fern**	**5**	**N**

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
EWI	**Echinochloa walteri**	**Coast Cockspur Grass (hairy)**	**5**	**N E0**
ICE	**Ilex cassine**	**Dahoon Holly**	**5**	**N E0**
JES	**Juncus effusus subsp. Solutus**	**Soft Rush**	**5**	**N E0**
PDF	**Polygonum glabrum**	**Denseflower Knotweed**	**5**	**N E0**
PHN	**Panicum hemitomon**	**Maidencane**	**5**	**N E0**

Table 5. List of Submerged Zone Aquatic Plants Found

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
HPA	**Hygrophila polysperma**	**East Indian Hygrophila, Indian Swampweed**	**38**	**E1**
HVA	**Hydrilla verticillata**	**Hydrilla, waterthyme**	**5**	**E1**

Figure 10. Typical vegetation community found along the eastern branch of Baker Creek.

Table 5. List of All Plants and Sample Sites

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Common Ragweed	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18	100	Emergent
Elderberry	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18	100	Emergent
Guineagrass	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18	100	Terrestrial
Laurel Oak; Diamond Oak	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18	100	Emergent
Caesar's-weed	1,2,3,4,5,6,7,8,9,10,11,12,13,15,16,17,18	94	Emergent
Manyflower Marshpennywort, Water Pennywort	1,2,3,4,5,6,7,8,9,10,11,12,13,15,17,18	88	Emergent
Para Grass	1,2,3,4,5,6,7,8,9,10,11,12,13,16,17,18	88	Emergent
Water Oak	1,2,3,4,5,6,7,8,9,10,11,14,15,16,17,18	88	Emergent
Wild Taro	1,2,3,4,5,6,7,8,9,10,11,14,15,16,17,18	88	Emergent
Sabal Palm, Cabbage Palm	1,2,3,4,5,8,9,10,12,13,14,15,16,17,18	83	Terrestrial
Spatterdock, Yellow Pondlily	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	83	Floating
Alligator Weed	1,2,4,5,6,7,8,9,10,11,12,13,17,18	77	Emergent
Parrot Feather	1,2,3,4,5,6,7,8,9,10,11,12,13,14	77	Emergent
Southern Water Hemp	1,2,3,4,5,6,7,8,9,10,11,12,13,15	77	Emergent
Water Spangles, Water Fern	1,2,3,4,5,6,7,8,9,10,11,12,13,14	77	Floating
Filamentous Algae, Algal Mats	1,2,3,4,5,6,7,8,9,10,11,12,13	72	Floating
Peruvian Primrosewillow	1,2,3,4,5,6,8,9,10,11,13,14,15	72	Emergent
Water Lettuce	1,2,3,4,5,6,7,8,9,10,11,12,13	72	Floating
Dayflower	1,2,3,4,5,6,7,14,15,16,17,18	66	Emergent
Duckweed	1,2,3,4,5,6,7,8,9,10,11,14	66	Floating
Water Hyacinth	1,2,3,4,5,6,7,8,9,10,11,12	66	Floating
Britton's Wild Petunia	3,4,5,6,7,8,14,15,16,17,18	61	Terrestrial
White Beggar-ticks, Romerillo	1,2,3,4,5,6,8,15,16,17,18	61	Terrestrial
Carolina Willow	8,10,11,12,13,14,15,16,17	50	Emergent
Creeping Oxeye; Wedelia	2,3,4,5,6,7,8,14,16	50	Emergent

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Camphor-tree	**3,8,9,10,13,14,15,16**	**44**	**Emergent**
East Indian Hygrophila, Indian Swampweed	**6,8,9,10,11,12,13**	**38**	**Submersed**
Southern Red Maple	**1,2,3,8,16,17,18**	**38**	**Emergent**
Dog Fennel	**8,9,10,11,12,13**	**33**	**Emergent**
Fragrant Flatsedge	**5,6,7,8,9,10**	**33**	**Emergent**
Shield ferns	**8,9,15,16,17,18**	**33**	**Emergent**
Sword Fern, Wild Boston Fern	**7,8,9,14,15**	**27**	**Terrestrial**
Water Paspalum	**1,2,10,11,12**	**27**	**Emergent**
Asian Pennywort, Coinwort, Spadeleaf	**15,16,17,18**	**22**	**Emergent**
Pine Tree	**14,15,17,18**	**22**	**Emergent**
Swamp lily	**1,2,16,17**	**22**	**Emergent**
Air Potato	**16,17,18**	**16**	**Emergent**
Chinese Tallow Tree	**10,11,13**	**16**	**Emergent**
Cinnamon Fern	**4,15,16**	**16**	**Emergent**
Mexican Primrosewillow, Long-stalked Ludwigia	**1,2,7**	**16**	**Emergent**
Wapato, Common Arrowhead, Broadleaf Arrowhead, Duck Potato	**2,3,7**	**16**	**Emergent**
Carolina Ash, Water Ash, Pop Ash	**3,4**	**11**	**Emergent**
Fireweed	**10,11**	**11**	**Terrestrial**
Lizard's Tail	**1,2**	**11**	**Emergent**
Mild Waterpepper; Swamp Smartweed	**5,6**	**11**	**Emergent**
Southern Bayberry; Wax Myrtle	**2,7**	**11**	**Emergent**
Swamp Dogwood, Stiff Dogwood	**3,14**	**11**	**Emergent**
Sweetgum	**15,17**	**11**	**Emergent**
Yerba De Tajo	**8,13**	**11**	**Emergent**
Bog Hemp, False Nettle	**9**	**5**	**Emergent**

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Brazilian Pepper	**13**	**5**	**Emergent**
Catbriar, Greenbriar	**8**	**5**	**Emergent**
Cattails	**2**	**5**	**Emergent**
Coast Cockspur Grass (hairy)	**6**	**5**	**Emergent**
Dahoon Holly	**11**	**5**	**Emergent**
Danglepod Sesban	**1**	**5**	**Emergent**
Denseflower Knotweed	**8**	**5**	**Emergent**
Groundsel Tree; Sea Myrtle	**13**	**5**	**Emergent**
Hydrilla, waterthyme	**15**	**5**	**Submersed**
Maidencane	**8**	**5**	**Emergent**
Saw Palmetto	**7**	**5**	**Terrestrial**
Soft Rush	**15**	**5**	**Emergent**
Swamp fern, Toothed Midsorus Fern	**17**	**5**	**Emergent**
Water Hickory	**8**	**5**	**Emergent**

Discussion of Vegetation Assessment Results

These reaches of Baker Creek vary in terms of vegetation communities. The main north-south orientated reaches of Baker Creek have been heavily modified and straightened with steep banks. The majority of the water depth is very shallow with a mean of 2.05 feet and the stream width is wide enough to prevent complete shading by shoreline tree species allowing submerged vegetation to thrive in areas. The submerged vegetation communities are dominated by non-native invasive species such as Hydrilla (*hydrilla verticillata)*, East Indian Hygrophila (*hygrolphila polysperma)* and Parrot Feather (*myriophyllum aquaticum).* Large amounts of filamentous algae were observed upstream of the confluence with the eastern branch. Guinea Grass (*panicum maximum*) dominates much of the shoreline of this portion of Baker Creek. Invasive floating leaved vegetation included Water Hyacinth (*eichhornia crassipes)* and Water Lettuce (*pistia stratiodes*).

The eastern branch of Baker Creek has more sinuosity, is narrower, shallower and is nearly completely shaded by the surrounding trees. The shading in this reach has greatly reduced the biomass of submerged vegetation species as well as floating leaved vegetation species. Emergent vegetation species are dominated by the Oaks, (*quercus laurifolia, quercus nigra*) and their shading effects. Wild Taro (c*olocassia esculenta*) and Wild Petunia (*ruellia simplex*) were common along the shorelines.

Section 3: Long-term Ambient Water Chemistry

A critical element in any stream assessment is the long-term water chemistry data set. These data are obtained from several data sources that are available to the Water Atlas and are managed in the Water Atlas Data Download and graphically presented on the water quality page for streams in Hillsborough County. The Stream Name, Water Quality Page can be viewed at http://www.hillsborough.wateratlas.usf.edu/river/waterquality.asp?wbodyid=8&wbodyatlas=river

A primary source of stream water chemistry in Hillsborough County is the Routine Monitoring Sampling by the Hillsborough County Environmental Protection Commission. Other source data are used as available; however these data can only indicate conditions at time of sampling.

These data are displayed and analyzed on the Water Atlas as shown in Figure 71 through Figure 20 for Baker Creek. The figures are graphs of: (1) the overall water quality index (WQI)[iv], which is a method commonly used to characterize the productivity of a stream, and may be thought of as a stream's ability to support plant growth and a healthy food source for aquatic life; (2) the chlorophyll *a* concentration, which indicates the stream's algal concentration, and (3) the stream's Secchi Disk depth which is a measure of water visibility and depth of light penetration. These data are used to evaluate a stream's ecological health and to provide a method of ranking streams and are indicators used by the US Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP) to determine a stream's level of impairment. The

[iv] See WQI discussion in Stream Assessment Notes at end of report.

chlorophyll a and Secchi Disk depth graphs include benchmarks which indicate the median values for the various parameters for a large number of Streams in Florida expressed as percentiles.

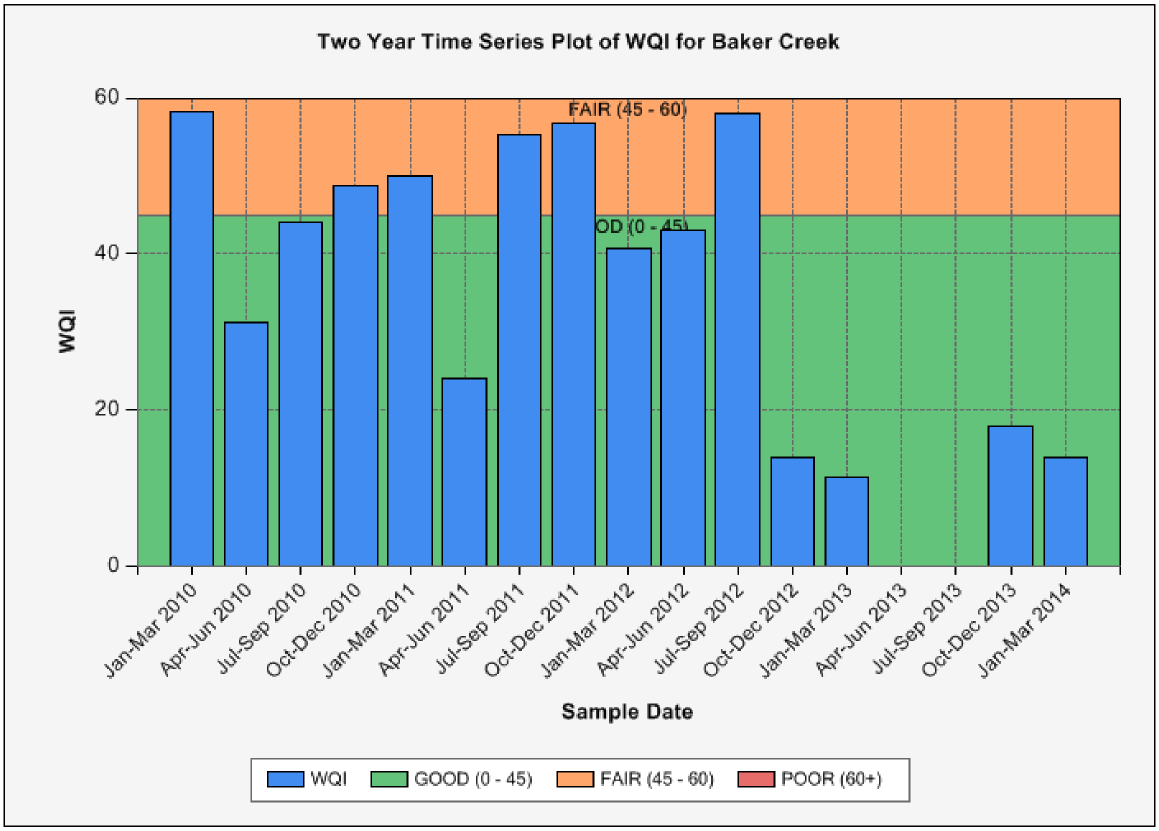


Figure 71. Recent Water Quality Index (WQI) graph for Baker Creek reach 03100205000246[v]

[v] Graph source: Hillsborough County Water Atlas. For an explanation of the Good, Fair and Poor benchmarks, please see the notes at the end of this report. For the latest data go to: http://www.hillsborough.wateratlas.usf.edu/graphs20/graph_it.aspx?wbodyid=18&data=WQI&datatype=WQ&waterbodyatlas=river&ny=10&bench=1

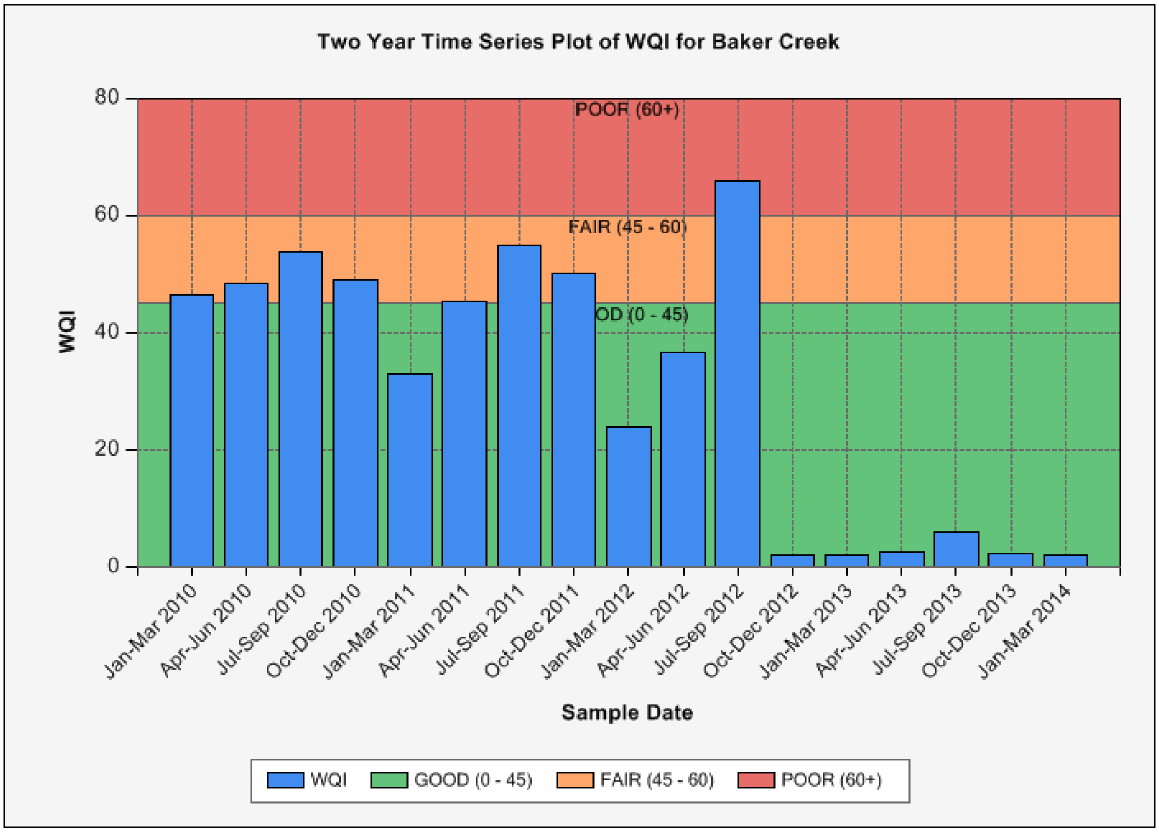


Figure 82 Recent Water Quality Index (WQI) graph for Baker Creek reach 03100205000503[vi]

[vi] Graph source: Hillsborough County Water Atlas. For an explanation of the Good, Fair and Poor benchmarks, please see the notes at the end of this report. For the latest data go to: http://www.hillsborough.wateratlas.usf.edu/graphs20/graph_it.aspx?wbodyid=18&data=WQI&datatype=WQ&waterbodyatlas=river&ny=10&bench=1

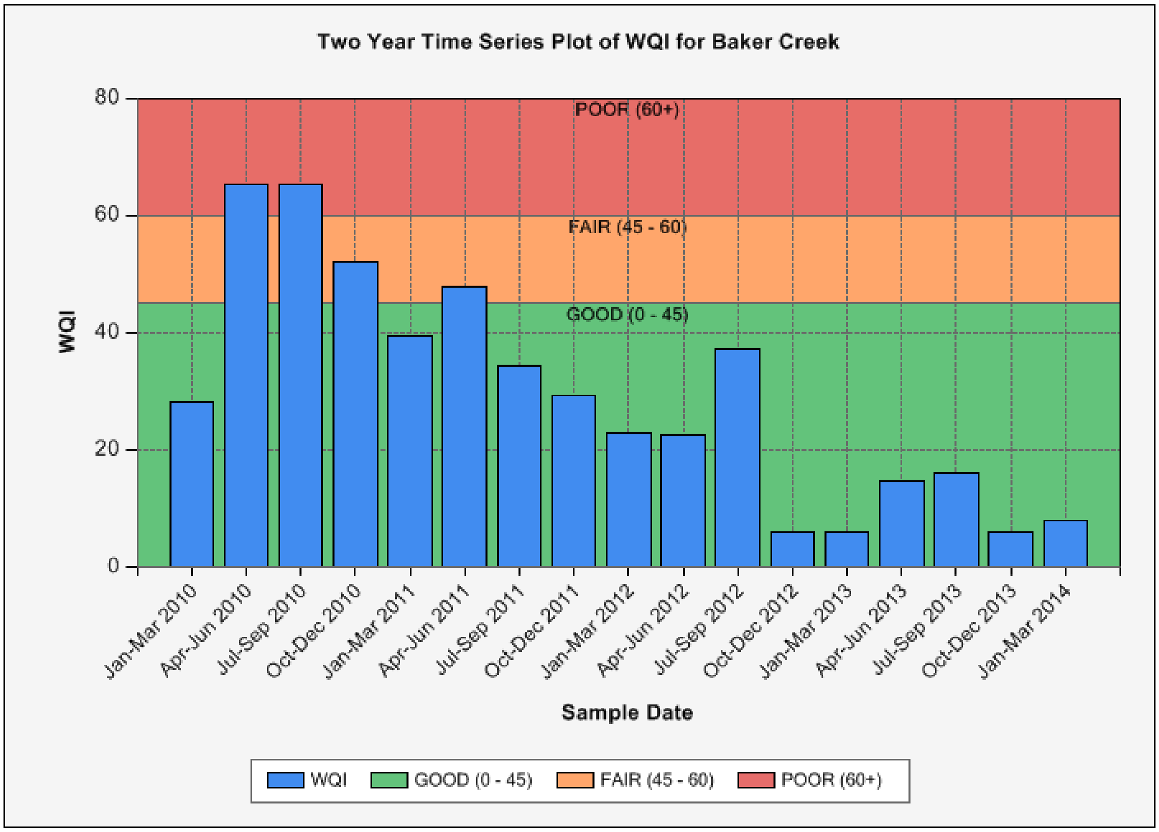


Figure 93 Recent Water Quality Index (WQI) graph for Baker Creek reach 03100205000525[vii]

[vii] Graph source: Hillsborough County Water Atlas. For an explanation of the Good, Fair and Poor benchmarks, please see the notes at the end of this report. For the latest data go to: http://www.hillsborough.wateratlas.usf.edu/graphs20/graph_it.aspx?wbodyid=18&data=WQI&datatype=WQ&waterbodyatlas=river&ny=10&bench=1

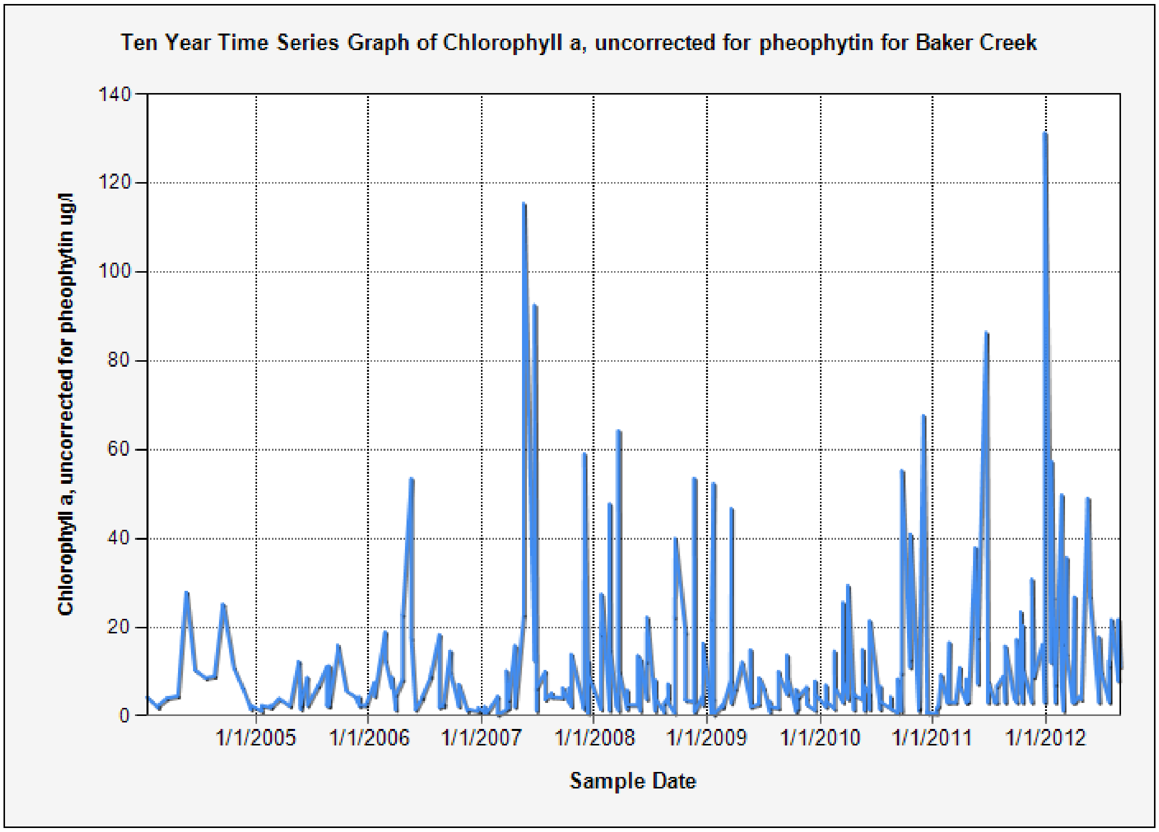


Figure 104. Recent Chlorophyll a graph for Baker Creek[viii]

[viii] Graph Source: Hillsborough County Water Atlas. For the latest data go to http://www.hillsborough.wateratlas.usf.edu/graphs20/graph_it.aspx?wbodyid=18&data=Chla_ugl&datatype=WQ&waterbodyatlas=river&ny=10&bench=1

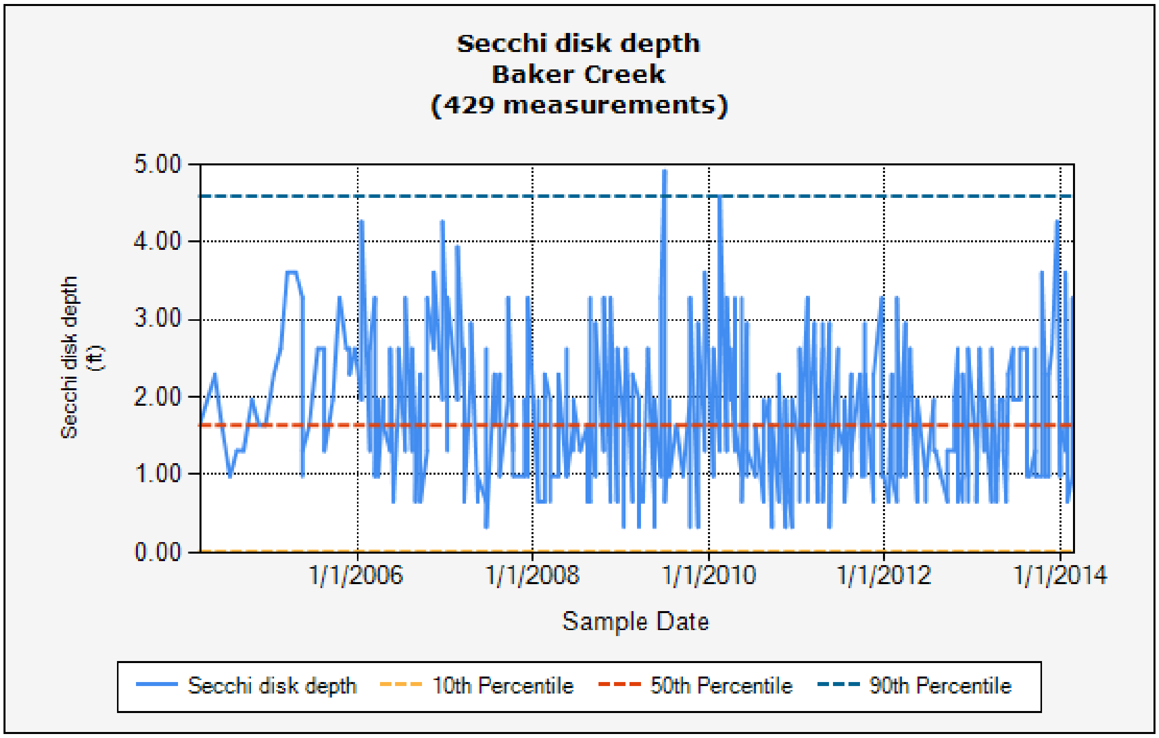


Figure 115. Recent Secchi Disk graph for Baker Creek[ix]

Stream Numeric Nutrient Criteria. November 30, 2012 the USEPA accepted the majority of the FDEP proposed NNCs which included an NNC for streams. The NNC for freshwater streams is provided in Table 6 and the Stream Assessment Notes at the end of this report, and for the Tampa Bay area (considered West Central) total phosphorous must be less than or equal to 0.49 mg/L and total nitrogen must be less than or equal to 1.65 mg/L to meet the criteria and chlorophyll a must be at or below 20 µg/L not be considered impaired.

[ix] Graph Source: Hillsborough County Water Atlas. For the latest data go to http://www.hillsborough.wateratlas.usf.edu/graphs20/graph_it.aspx?wbodyid=18&data=secchi_ft&datatype=WQ&waterbodyatlas=stream&ny=10&bench=1

Table 6 Stream Numeric Nutrient Criteria

Nutrient Watershed Region	Total Phosphorus Nutrient Threshold[1]	Total Nitrogen Nutrient Threshold[1]
Panhandle West	0.06 mg/L	0.67 mg/L
Panhandle East	0.18 mg/L	1.03 mg/L
North Central	0.30 mg/L	1.87 mg/L
Peninsular	0.12 mg/L	1.54 mg/L
West Central	0.49 mg/L	1.65 mg/L
South Florida	No numeric nutrient threshold. The narrative criterion in paragraph 62-302.530(47)(b), F.A.C., applies.	No numeric nutrient threshold. The narrative criterion in paragraph 62-302.530(47)(b), F.A.C., applies.

[1]These values are annual geometric mean concentrations not to be exceeded more than once in any three calendar year period.

Baker Creek, a freshwater creek that flows into Lake Thonotosassa, has three long-term data stations whose three-year geometric mean for Total Nitrogen, Total Phosphorus and Chlorophyll are as shown below in Tables 7-9.

Baker Creek at Thonotosassa Road	Total Phosphorous mg/l	Total Nitrogen mg/l	Chlorophyll-a Corrected µg/l
Period of Record Geomean	0.610	1.386	5.001
2011 Geomean	0.358	0.881	6.039
2012 Geomean	0.401	0.842	6.098
2013 Geomean	0.451	1.000	6.252

Table 7. Baker Creek at Thonotosassa Road Data as Geometric Mean of Values

Baker Creek at McIntosh Road	Total Phosphorous mg/l	Total Nitrogen mg/l	Chlorophyll-a Corrected µg/l
Period of Record Geomean	0.377	0.933	2.810
2011 Geomean	0.408	0.931	3.400
2012 Geomean	0.321	0.768	8.616
2013 Geomean	0.329	0.824	4.231

Table 8 Baker Creek at McIntosh Road Data as Geometric Mean of Values

Baker Creek at Muck Pond Road	Total Phosphorous mg/l	Total Nitrogen mg/l	Chlorophyll-a Corrected µg/l
Period of Record Geomean	0.527	1.392	7.550
2011 Geomean	0.675	1.392	10.064
2012 Geomean	0.568	1.481	9.321
2013 Geomean	0.593	1.359	10.103

Table 9 Baker Creek at Muck Pond Road Data as Geometric Mean of Values

Using the Numeric Nutrient Criteria, Baker Creek at Thonotosassa Road would not be considered impaired for annual geomean exceedance of Total Phosphorous, Total Nitrogen or Chlorophyll-a Corrected however, Baker Creek at Thonotosassa Road would be impaired by number of individual sample exceedances for Total Phosphorous (13), Total Nitrogen (4) and Chlorophyll-a Corrected (4) in the past three years.

Baker Creek at McIntosh Road would be considered impaired for number of individual sample exceedances for Total Phosphorous (12), Total Nitrogen (3) and Chlorophyll-a Corrected (5) in the past three years.

Baker Creek at Muck Pond Road would be considered impaired for geomean exceedance of Total Phosphorous at Muck Pond Road for 2011, 2012 and 2013. In addition, Baker Creek at Muck Pond Road would be impaired by number of exceedances for Total Phosphorous (24), Total Nitrogen (14) and Chlorophyll-a Corrected (6) in the past three years.

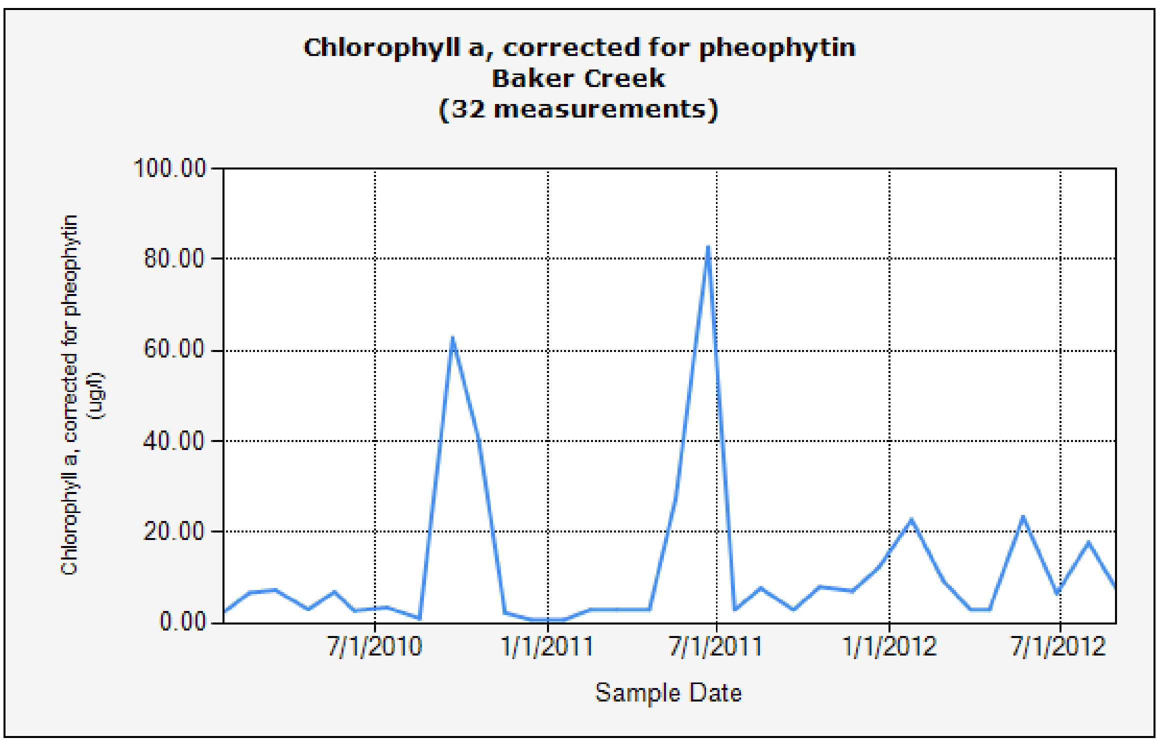


Figure 126. Chlorophyll-a Corrected sample values for Baker Creek at Thonotosassa Road

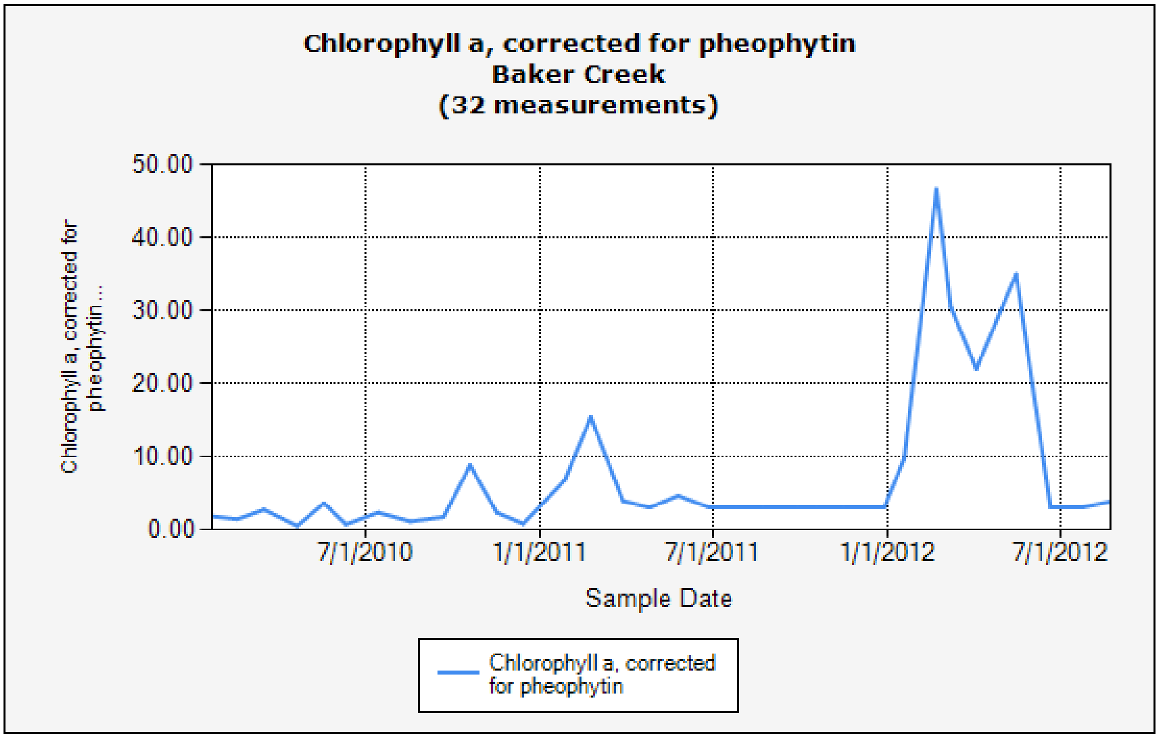


Figure 17. Chlorophyll-a Corrected sample values for Baker Creek at McIntosh Road

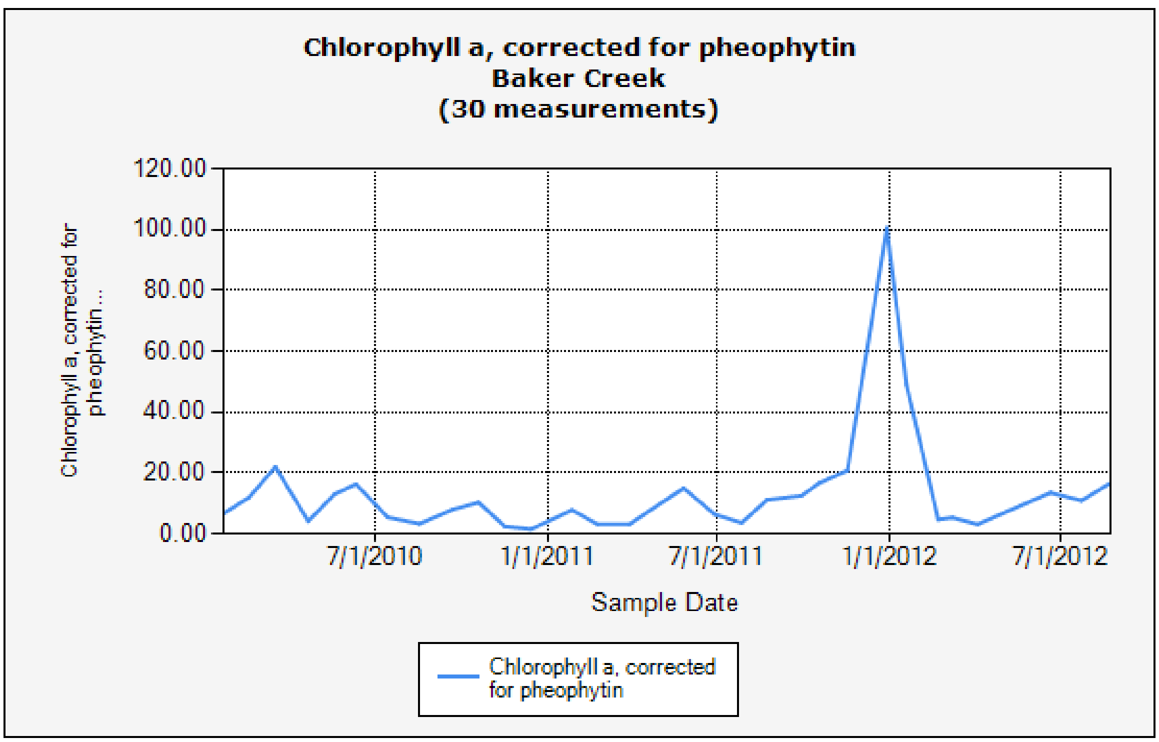


Figure 18 Chlorophyll-a Corrected sample values for Baker Creek at Muck Pond Road

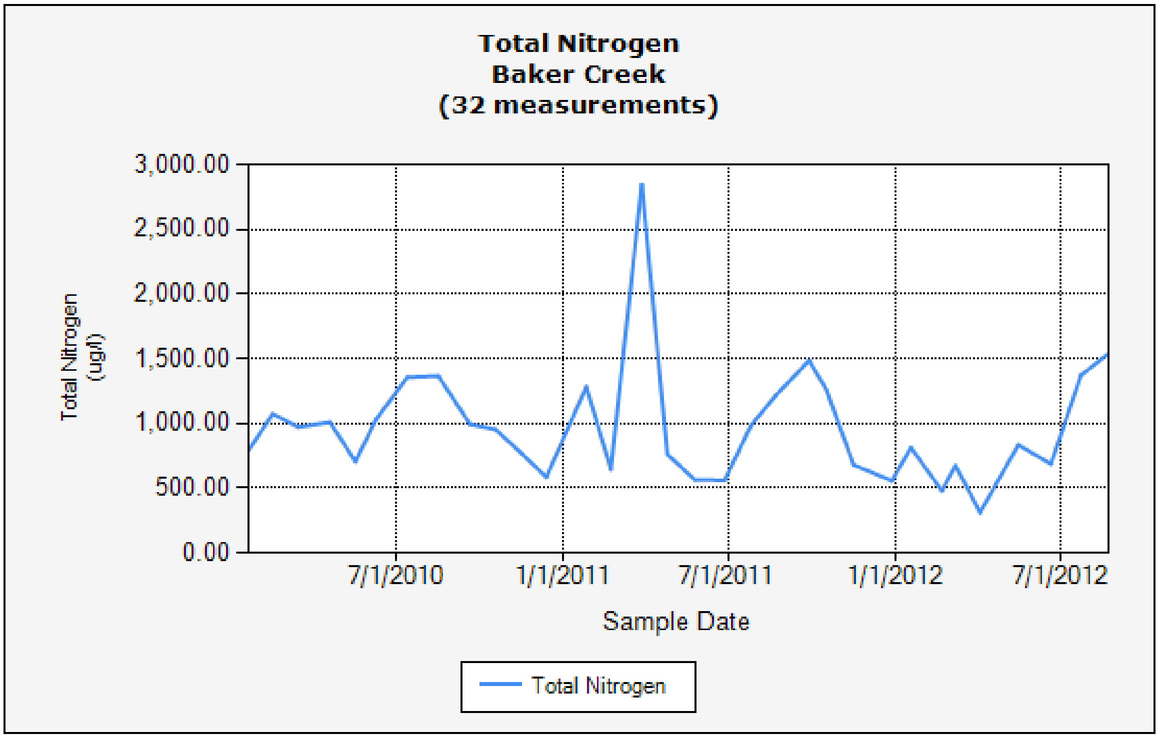


Figure 19 Total Nitrogen sample values for Baker Creek at Thonotosassa Road

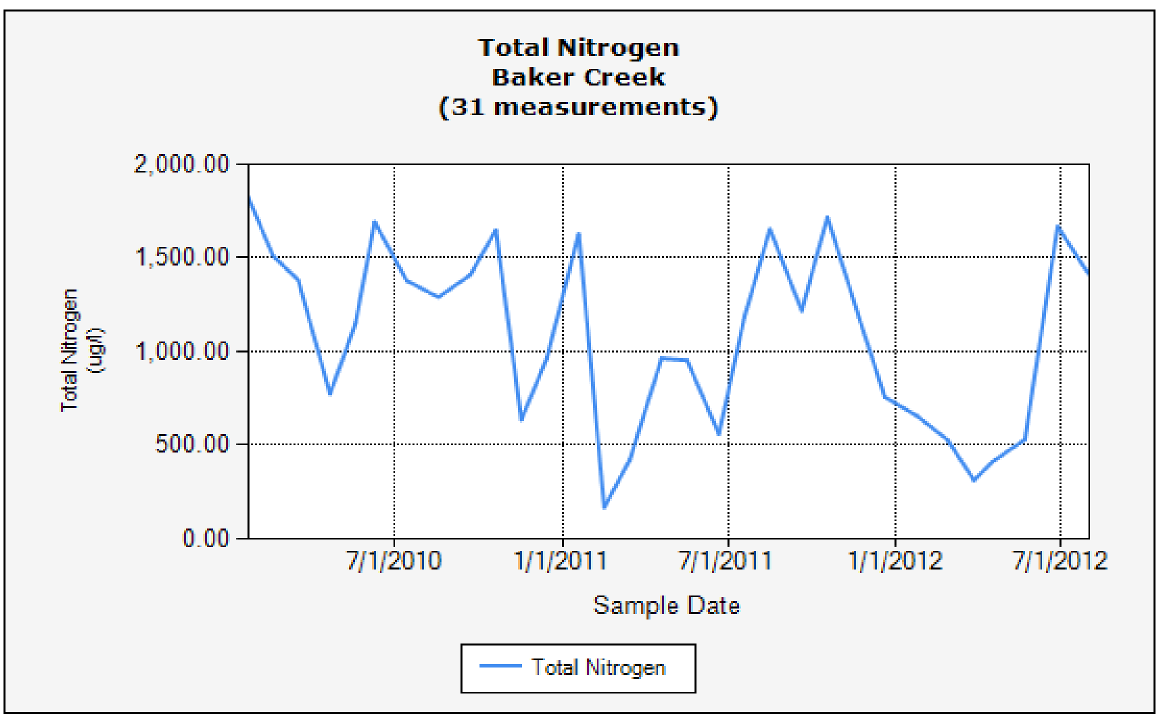


Figure 20 Total Nitrogen sample values for Baker Creek at McIntosh Road

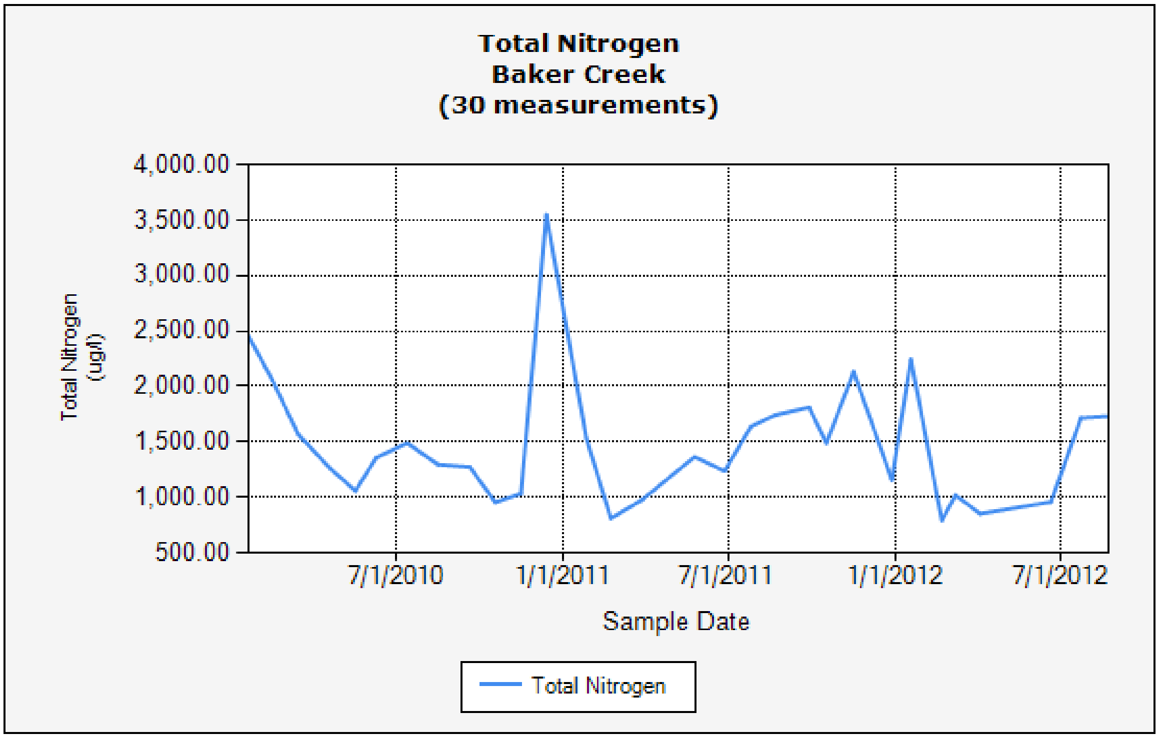


Figure 21 Total Nitrogen sample values for Baker Creek at Muck Pond Road

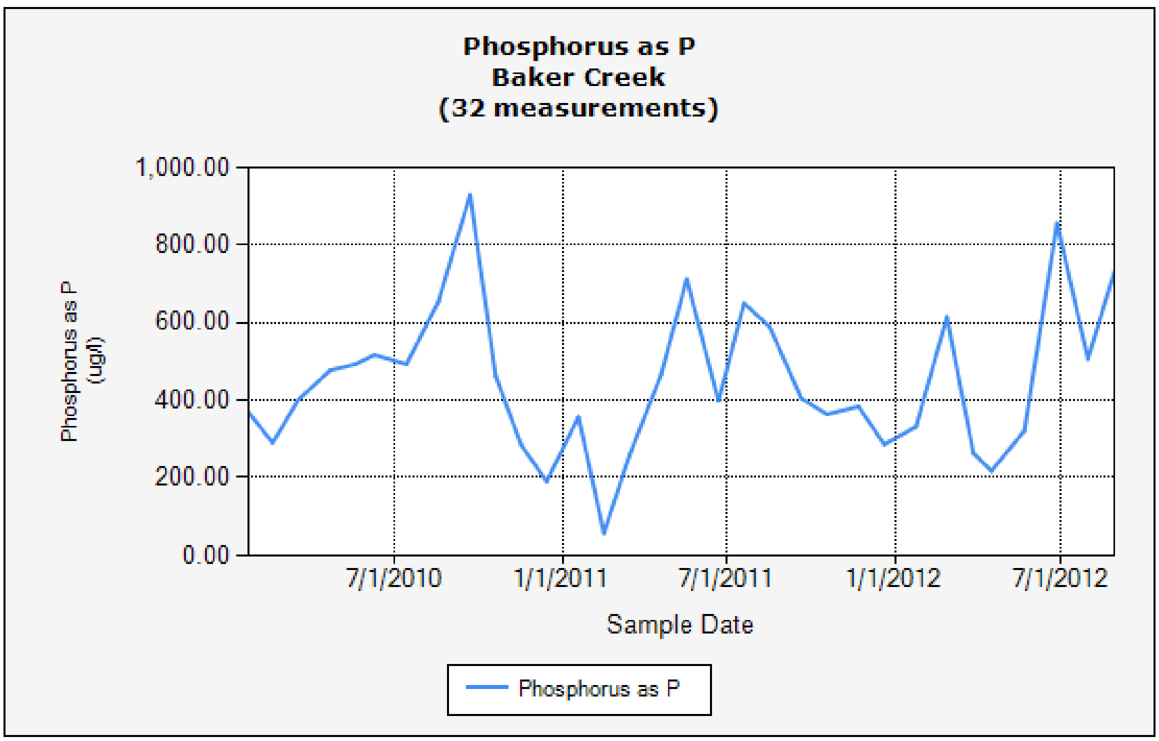


Figure 22 Total Phosphorous sample values for Baker Creek at Thonotosassa Road

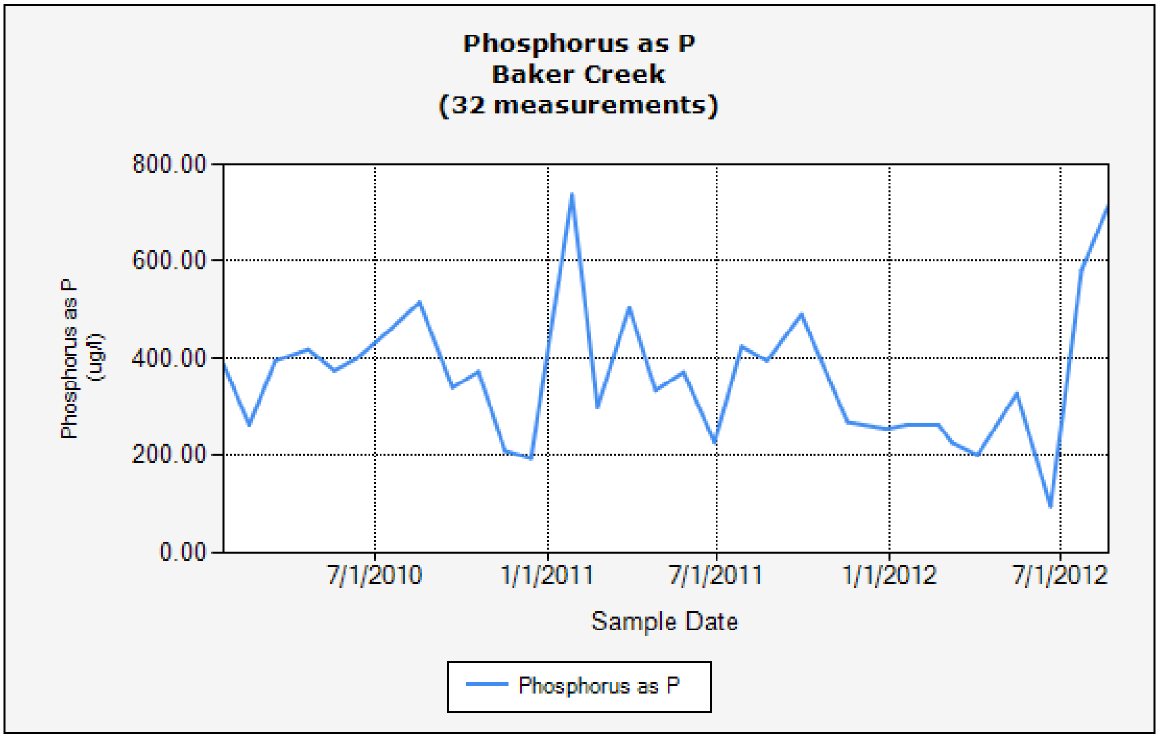


Figure 23 Total Phosphorous values for Baker Creek at McIntosh Road

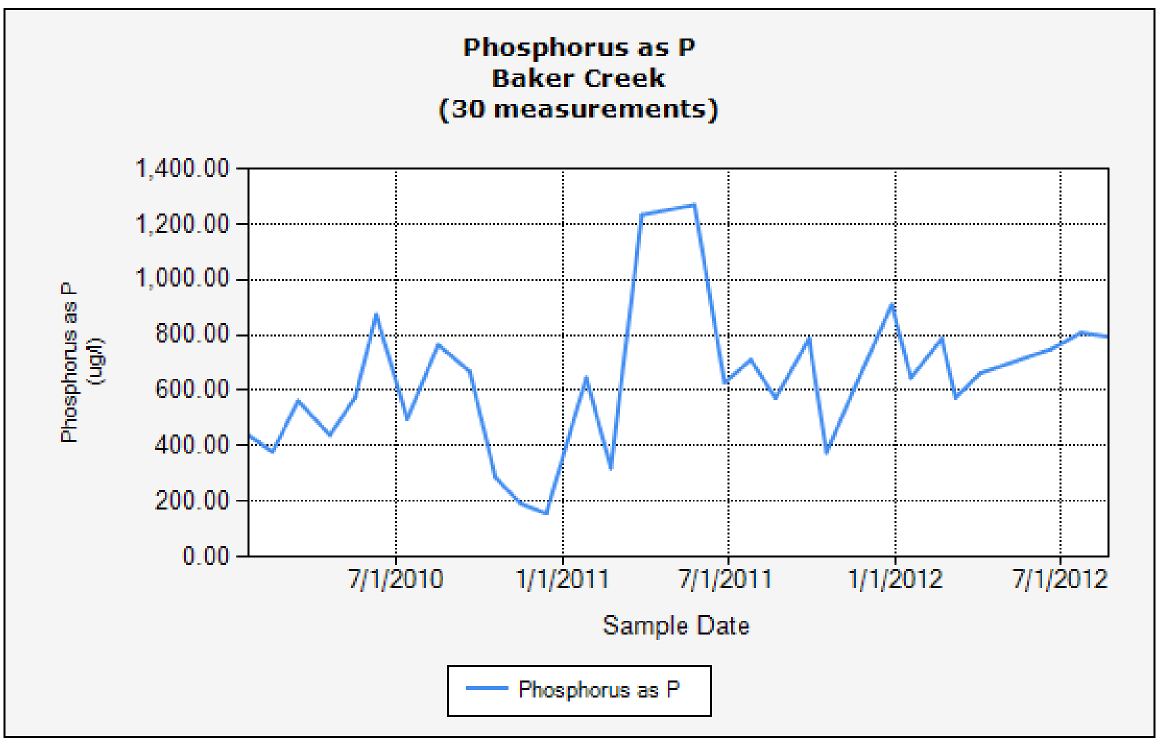


Figure 24 Total Phosphorous sample values for Baker Creek at Muck Pond Road

As part of the stream assessment the physical water quality and chemical water chemistry of a stream are measured. These data only indicate a snapshot of the stream's water quality; however they are useful when compared to the trend data available from Hillsborough County Environmental Protection Commission or other sources.

Table 10 contains the summary water quality data and index values and adjusted values calculated from these data. The total phosphorus (TP), total nitrogen (TN) and chlorophyll *a* water chemistry sample data are the results of chemical analysis of samples taken during the assessment and analyzed by the Hillsborough County Environmental Protection Commission laboratory.

The growth of plants (planktonic algae, macrophytic algae and rooted plants) is directly dependent on the available nutrients within the water column of a stream and to some extent the nutrients which are held in the sediment and the vegetation biomass of a stream. Additionally, algae and other plant growth are limited by the nutrient in lowest concentration relative to that needed by a plant. Plant biomass contains less phosphorus by weight than nitrogen so phosphorus is many times the limiting nutrient. When both nutrients are present at a concentration in the stream so that either or both may restrict plant growth, the limiting factor is called "balanced". The ratio of total nitrogen to total phosphorous, the "N to P" ratio (N/P), is used to determine the limiting factor. If N/P is greater than or equal to 30, the stream is considered phosphorus limited, when this ratio is less than or equal to 10, the stream is considered nitrogen limited and if between 10 and 30 it is considered balanced. Baker Creek is a nitrogen limited system meaning that an additional input of nitrogen would potentially increase the biomass of aquatic vegetation and algae.

Table 10. Water Quality Parameters (Laboratory) for Baker Creek

Parameter	Thonotosassa Rd	McIntosh Rd	Muck Pond Rd	Mean Value
Total Phosphorus (ug/L)	**295**	**272**	**308**	**291.7**
Total Nitrogen (ug/L)	**594**	**553**	**748**	**631.7**
Chlorophyll-a Corrected (ug/L)	**3.0**	**3.0**	**6.0**	**4.0**
TN/TP	**2.01**	**2.03**	**2.43**	**2.16**
Limiting Nutrient	**NItrogen**	**Nitrogen**	**Nitrogen**	**Nitrogen**
Color (PCU)	**45.9**	**51.7**	**42.0**	**46.53**
Fecal Coliform (Colonies/100ml)	**40**	**100**	**<20**	**53.3**
Enterococci (Colonies/100ml)	**900**	**360**	**880**	**713.3**
Secchi disk depth (ft)	**5.4**	**4.1**	**1.7**	**3.73**
Numeric Nutrient Criteria Status	**Impaired**	**Impaired**	**Impaired**	**Impaired**
Phosphorous NNC Criteria (ug/L)	**490**	**490**	**490**	**490**
Nitrogen NNC Criteria (ug/L)	**1650**	**1650**	**1650**	**1650**
2013 Geomean Phosphorous	**451.2**	**329.0**	**593.1**	**457.77**
2013 Geomean Nitrogen	**1000.0**	**824.0**	**1359.0**	**1061.0**
2012 Geomean Phosphorous	**400.8**	**343.0**	**568.1**	**437.3**
2012 Geomean Nitrogen	**841.8**	**843.8**	**1,481.3**	**1,055.6**
2011 Geomean Phosphorous	**357.8**	**408.1**	**674.6**	**480.2**
2011 Geomean Nitrogen	**880.8**	**931.3**	**1,392.3**	**1,068.1**
Period of Record Geomean Phosphorous	**603.7**	**376.8**	**527.1**	**502.5**
Period of Record Geomean Nitrogen	**1,374.7**	**932.9**	**1,392.0**	**1,233.2**

The color of a stream is also important to the growth of algae. Dark, tannic streams tend to suppress algal growth and can tolerate a higher amount of nutrient in their water column; while clear streams tend to support higher algal growth with the same amount of nutrients. The color of a stream, which is measured in a unit called the “cobalt platinum unit (PCU)” because of the standard used to determine color, is important because it is used by the State of Florida to determine stream impairment as explained earlier. Rivers, streams or other “flow through” systems tend to support lower algal growth for the same amount of nutrient concentration. All these factors are important to the understanding of your stream's overall condition. Table 10 includes many of the factors that are typically used to determine the actual state of plant growth in your stream. These data should be understood and reviewed when establishing a management plan for a stream; however, as stated above other factors must be considered when developing such a plan. Please contact the Water Atlas Program if you have questions about this part or any other part of this report.

Nutrient concentrations at the time of assessment were slightly below historical mean values. This concentration of nutrients is not high enough to cause impairment in Baker Creek at this time by the numeric nutrient criteria. However, Baker Creek is showing elevated nutrient levels in the samples associated with the assessment near Muck Pond Road.

Table 11 contains the field data taken in the upstream and downstream extents of the stream using a multi-probe (we use either a YSI 6000 or a Eureka Manta) which has the ability to directly measure the temperature, pH, dissolved oxygen (DO), percent DO (calculated from DO, temperature and conductivity). These data are listed for three levels in the stream where possible and at three locations, one near Muck Pond Road, one near McIntosh Road and one at Thonotosassa Road.

Table 11. Water Chemistry Data Based on Manta Water Chemistry Probe for Bullfrog Creek

Sample Location	Sample Depth (m)	Time	Temp (deg C)	Conductivity (mS/cm3)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH
Mean Value	1.76	3/4/2014 12:00:00 AM	20.71	0.304	100.97	9.49	7.08
Mean Value – McIntosh Rd	1.71	3/4/2014 12:00:00 AM	20.53	0.322	93.50	8.83	7.77
Surface - Thono Road	1.85	3/4/2014 12:12:00 PM	19.78	0.323	73.50	7.04	7.45
Mean Value - Thono Road	3.24	3/4/2014 12:14:00 PM	19.64	0.232	70.00	6.72	7.44
Middle - Thono Road	3.02	3/4/2014 12:14:00 PM	19.62	0.324	69.00	6.63	7.44
Bottom - Thono Road	4.85	3/4/2014 12:16:00 PM	19.53	0.323	67.50	6.50	7.43
Surface – Muck Pond Rd	1.00	3/4/2014 2:52:00 PM	20.76	0.304	96.80	9.10	7.17
Middle – Muck Pond	2.22	3/4/2014 2:53:00	20.52	0.304	101.50	9.58	7.07

Sample Location	Sample Depth (m)	Time	Temp (deg C)	Conductivity (mS/cm3)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH
Rd		PM					
Bottom – Muck Pond Rd	2.78	3/4/2014 2:55:00 PM	20.41	0.304	102.60	9.71	7.05
Surface-McIntosh Rd	1.13	3/4/2014 2:58:00 PM	20.54	0.322	93.40	8.82	7.77
Bottom – McIntosh Rd	2.30	3/4/2014 2:59:00 PM	20.53	0.322	93.60	8.84	7.77

To better understand many of the terms used in this report, we recommend that the reader visit the Hillsborough County & City of Tampa Water Atlas and explore the "Learn More" areas which are found on the resource pages. Additional information can also be found using the Digital Library on the Water Atlas website.

Section 4: Conclusion

Baker Creek is a small surface area (14.74-acre study area) stream that would be considered in the impaired category of streams based on water chemistry and the numeric nutrient criteria. It has a plant diversity of 98 species with about 54.0% percent of the open water areas containing submerged aquatic vegetation. Vegetation helps to maintain the nutrient balance in the stream as well as provide good fish habitat. The stream has few open water areas to support various types of recreation and has a fair diversity of plant species. The primary pest plant in the stream is *Pistia stratiodes, Spyrogyra spp., Eichhornia crassipes, Urena lobata, Urochola mutica, Colocassia esculenta,* and *Myrophyllum aquaticum*. Elevated populations of Enterococci bacteria were also found at the Muck Pond road and Thonotosassa Road sites.

This assessment was accomplished to assist stream property owners to better understand and manage their streams. Hillsborough County supports this effort as part of their Stream Waterwatch Program (SWW) and has developed guidelines for stream property owner groups to join the SWW and receive specific assistance from the County in the management of their stream. For additional information and recent updates please visit the Hillsborough County & City of Tampa Water Atlas website

Stream Assessment Notes

NOTE 1: The Water Quality Index (WQI) is used for streams, black waters (natural tea and coffee-colored waters), and springs, while the Trophic State Index (TSI) is used for lakes and estuaries. The WQI is calculated by averaging the values of most or all of the parameters within five water quality parameter categories: 1) water clarity (measured as turbidity and/or Secchi disk depth), 2) dissolved oxygen, 3) oxygen demanding substances (measured as biochemical oxygen, chemical oxygen demand and/or total organic carbon), 4) nutrients (measured as total nitrogen, nitrite plus nitrate, and/or total phosphorus), and 5) bacteria (total coliform and-or fecal coliform).

Water Atlas presents WQIs over the last four seasons (three month intervals). The WQI "value" for a waterbody is determined by averaging the values (data) of the aforementioned parameters for each "season" (Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec). These seasonal averages are then averaged to provide an overall "rating" or WQI. The term "confidence" expresses the degree of completeness of the index; in other words, "confidence" states how many parameter categories were used to calculate the Overall Water Quality Index.

Ranges of WQI values have been established to provide a general ranking of the waterbody (Figure 1.) WQI values may also include the 'Confidence' (Figure 2), which provides you with some relative idea as to how much information was used to calculate the WQI for that waterbody.

Note: The acronym WQI also stands for "Water Quality Inspection" in much of the DEP literature.

WQI	Rating
0-45	Good
45-60	Fair
>60	Poor

Figure 1. Water Quality Index (WQI) ranges and their designations.

WQI	Rating	Confidence	Season
30	Good	5/5	Winter (2000)
40	Good	3/5	Fall (2000)
30	Good	2/5	Summer (2000)
50	Fair	3/5	Summer (2000)

Figure 2. WQI rankings are provided with examples of Confidence values.

NOTE 2: Definition of a “Stream” from 62-302.531 Florida Administrative Code (FAC): “Stream” shall mean, for purposes of interpreting the narrative nutrient criterion in paragraph 62-302.530(47)(b), F.A.C., under paragraph 62-302.531(2)(c), F.A.C., a predominantly fresh surface waterbody with perennial flow in a defined channel with banks during typical climatic and hydrologic conditions for its region within the state. During periods of drought, portions of a stream channel may exhibit a dry bed, but wetted pools are typically still present during these conditions. Streams do not include:

non-perennial water segments where fluctuating hydrologic conditions, including periods of desiccation, typically result in the dominance of wetland and/or terrestrial taxa (and corresponding reduction in obligate fluvial or lotic taxa), wetlands, or portions of streams that exhibit lake characteristics (e.g., long water residence time, increased width, or predominance of biological taxa typically found in non-flowing conditions) or tidally influenced segments that fluctuate between predominantly marine and predominantly fresh waters during typical climatic and hydrologic conditions; or

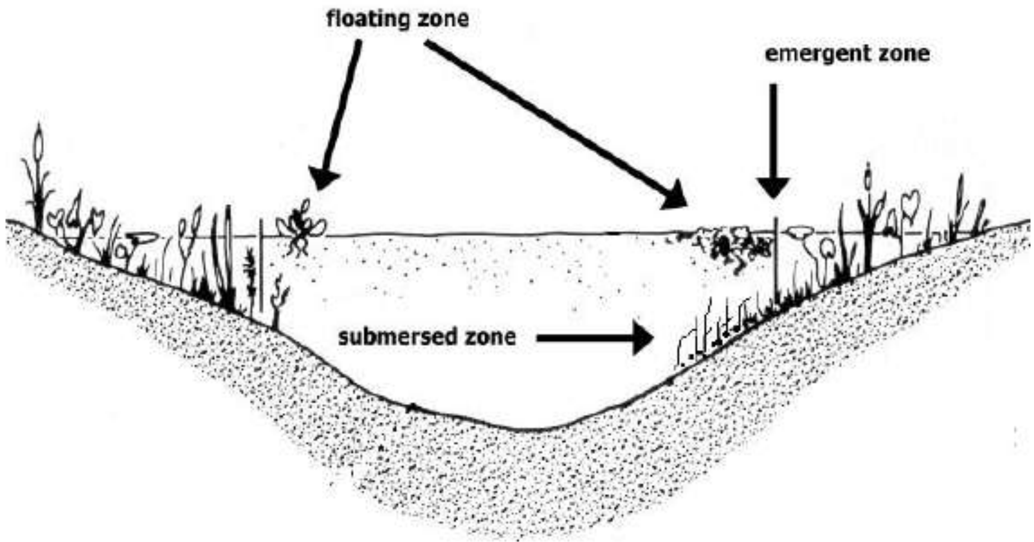
ditches, canals and other conveyances, or segments of conveyances, that are man-made, or predominantly channelized or predominantly physically altered and;

are primarily used for water management purposes, such as flood protection, stormwater management, irrigation, or water supply; and

have marginal or poor stream habitat or habitat components, such as a lack of habitat or substrate that is biologically limited, because the conveyance has cross sections that are predominantly trapezoidal, has armored banks, or is maintained primarily for water conveyance.

NOTE 3: The "Stream Condition Index (SCI)" shall mean a Biological Health Assessment that measures stream biological health in predominantly freshwaters using benthic macroinvertebrates, performed and calculated using the Standard Operating Procedures for the SCI in the document titled SCI 1000: *Stream Condition Index Methods* (DEP-SOP-003/11 SCI 1000) and the methodology in *Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer* (DEP-SAS-001/11), both dated 10-24-11, which are incorporated by reference herein. Copies of the documents may be obtained from the Department's website at http://www.dep.state.fl.us/water/wqssp/swq-docs.htm or by writing to the Florida Department of Environmental Protection, Standards and Assessment Section, 2600 Blair Stone Road, MS 6511, Tallahassee, FL 32399-2400. For water quality standards purposes, the Stream Condition Index shall not apply in the South Florida Nutrient Watershed Region.

Vegetation Zones: The three primary aquatic vegetation zones are shown below:



Wide Area Augmentation System (WAAS) is a form of differential GPS (DGPS) where data from 25 ground reference stations located in the United States receive GPS signals form GPS satellites in view and retransmit these data to a master control site and then to geostationary satellites. The geostationary satellites broadcast the information to all WAAS-capable GPS receivers. The receiver decodes the signal to provide real time correction of raw GPS satellite signals also received by the unit. WAAS-enabled GPS is not as accurate as standard DGPS which employs close by ground stations for correction, however; it was shown to be a good substitute when used for this type of mapping application. Data comparisons were conducted with both types of DGPS employed simultaneously and the positional difference was determined to be well within the tolerance established for the project.