Stream Assessment Report for English Creek Reaches 03100204002682 and 03100204002687 in Hillsborough County, Florida

Date Assessed: August 6-7, 2012
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Reviewed by: Jim Griffin

INTRODUCTION

This assessment was conducted to update existing physical and ecological data for English Creek on the Hillsborough County & City of Tampa Water Atlas. The Lake and Stream Assessment 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. 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. English Creek Upstream from Highway 60

BACKGROUND

This report focuses on English Creek from Highway 60 to Old Mulberry Road. This region covers portions of reaches 03100204002682 and 03100204002687 which consists of 2 stream segments[i] (please see maps, Figures 2-11). In this region, English Creek is characterized by a narrow sinuous channel with many fallen trees and brush growing over the stream.

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 is 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 tidal streams in the Stream Assessment 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[ii].

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)[iii] enabled Global Positioning System (GPS) with fathometer (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 Figure 8). 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.

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[i] A stream segment is a stream length that can be conveniently mapped and assessed during a single assessment period.

[ii] 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.

[iii] 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 3.

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

Parameter	Feet	Meters	Acres	Acre-Ft	Gallons
Surface Area (sq)	496,955.2	46,168.65	11.41		
Mean Depth	2.39	0.73			
Maximum Depth	15.16	4.62			
Volume (cubic)	936,076.6	26,506.74		21.49	7,002,387.79
Gauge (relative)	65.69	20.02			

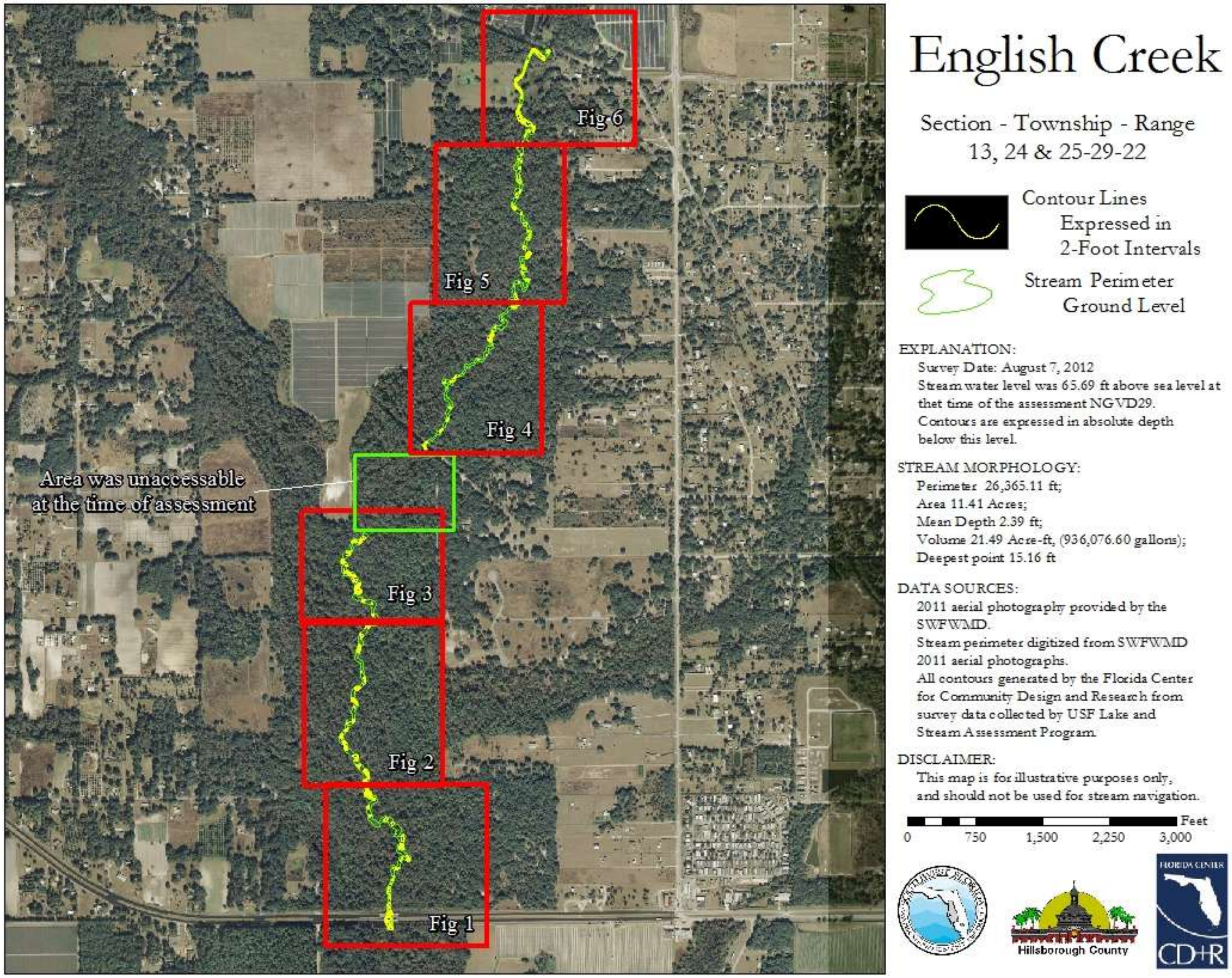

Figure 2. 2012 2-Foot Bathymetric Contour Overview Map For English Creek

Figure 3. English Creek Bathymetric Contour Map Inset Figure 1

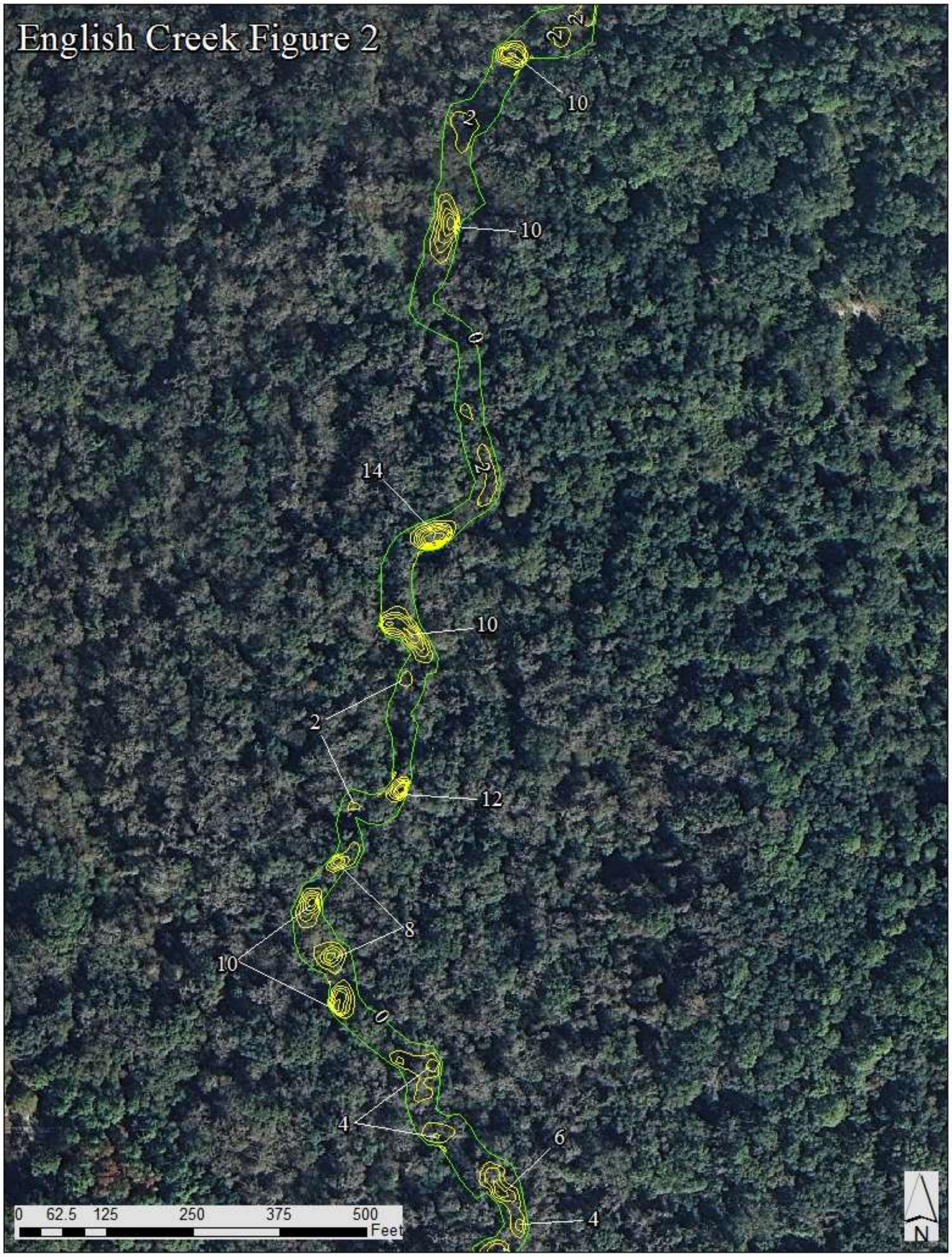

Figure 4. English Creek Bathymetric Contour Map Inset Figure 2

Figure 5. English Creek Bathymetric Contour Map Inset Figure 3

Figure 6. English Creek Bathymetric Contour Map Inset Figure 4.

Figure 7. English Creek Bathymetric Contour Map Inset Figure 5.

Figure 8. English Creek Bathymetric Contour Map Inset Figure 6.

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 9 and Figure 10, 11 regions in reach 03100204002682 and 5 regions in reach 03100204002687 have been assessed for vegetation in ~250 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)[iv]. 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 (

[iv] See end note 3.

Table 2). The Watershed value in Table 2 only includes lakes and streams sampled during the stream assessment project begun in May of 2006. These data will change as additional lakes

and streams are sampled.

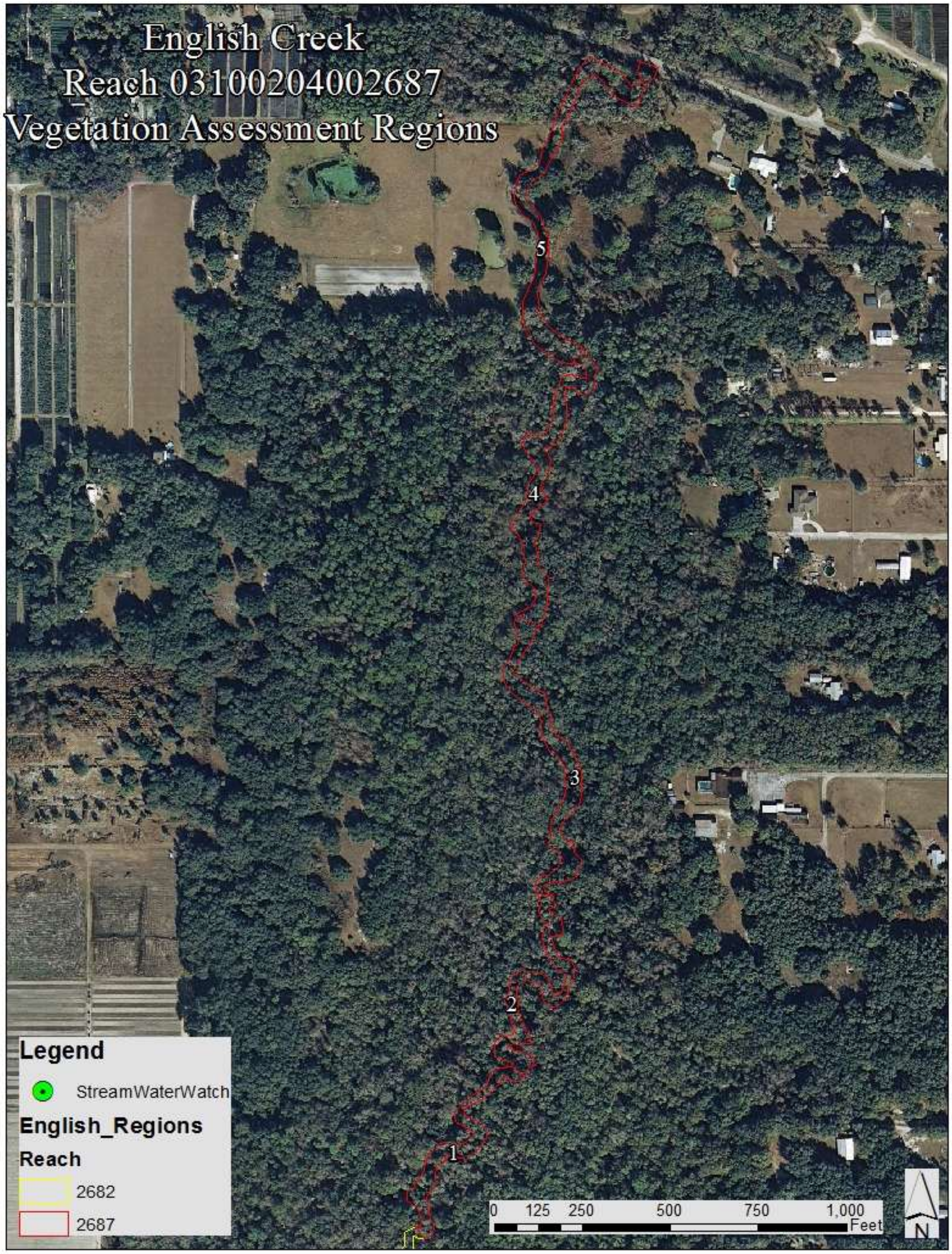

Figure 10. English Creek Reach 03100204002687 Vegetation Assessment Region Map

and Table detail the results from the 2012 aquatic plant assessment for the stream. These data are determined from the 16 regions used for intensive vegetation surveys. The tables are divided into Floating Leaf, Emergent and Submerged plants and contain the plant code, species, common name and presence (indicated by a 1) or absence (indicated by a blank space) of species and the calculated percent occurrence (number sites species is found/number of sites) and type of plant (Native, Non-Native, Invasive, Pest). No floating leaf or submerged species were observed during the assessment. 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 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	Lake	Watershed
Number of Vegetation Assessment Regions	**11**	**159**
Total Plant Diversity (# of Taxa)	**56**	**160**
% Non-Native Plants	**19.64%**	**19.38%**
Total Pest Plant Species	**4**	**9**

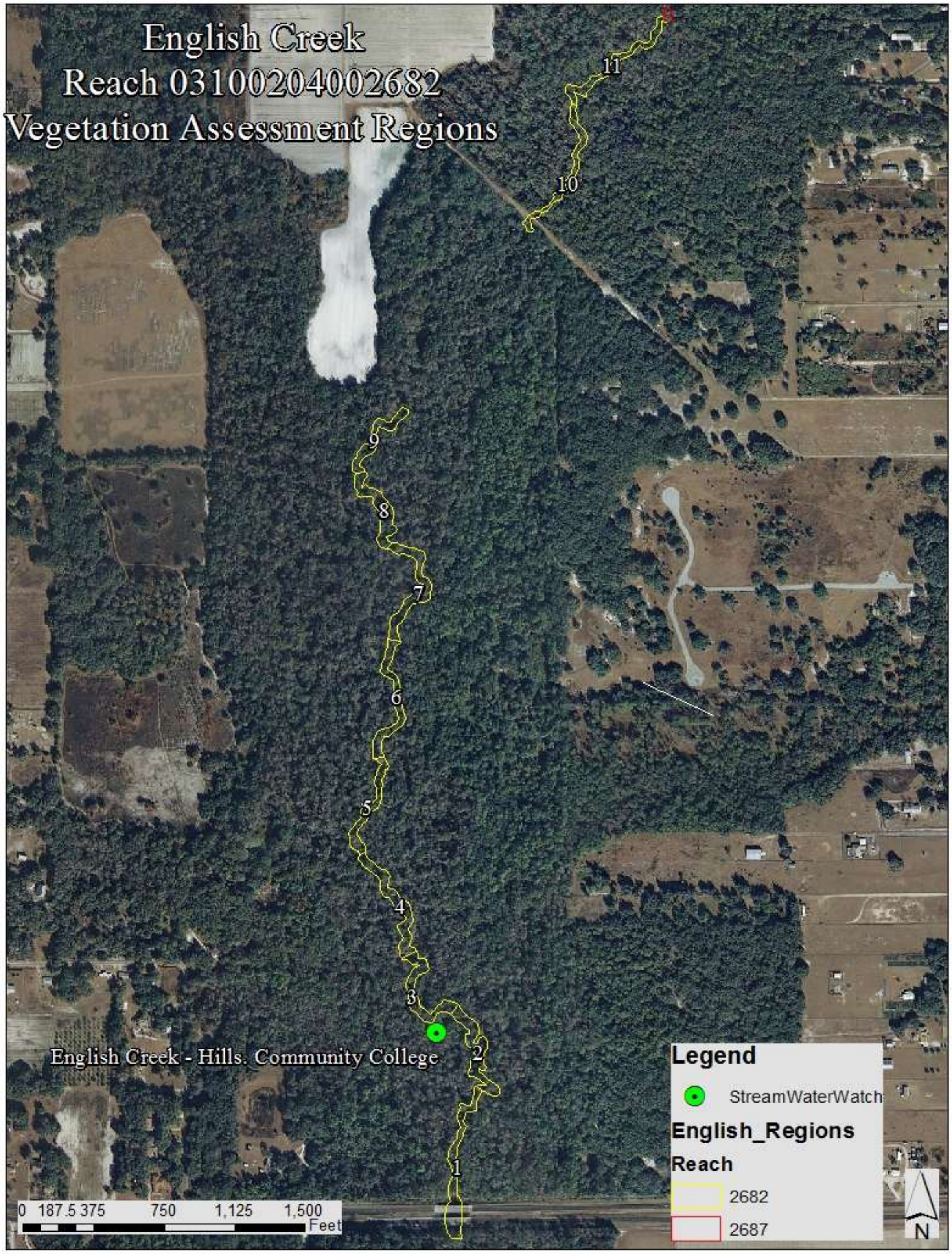

Figure 9. English Creek Reach 03100204002682 Vegetation Assessment Region Map

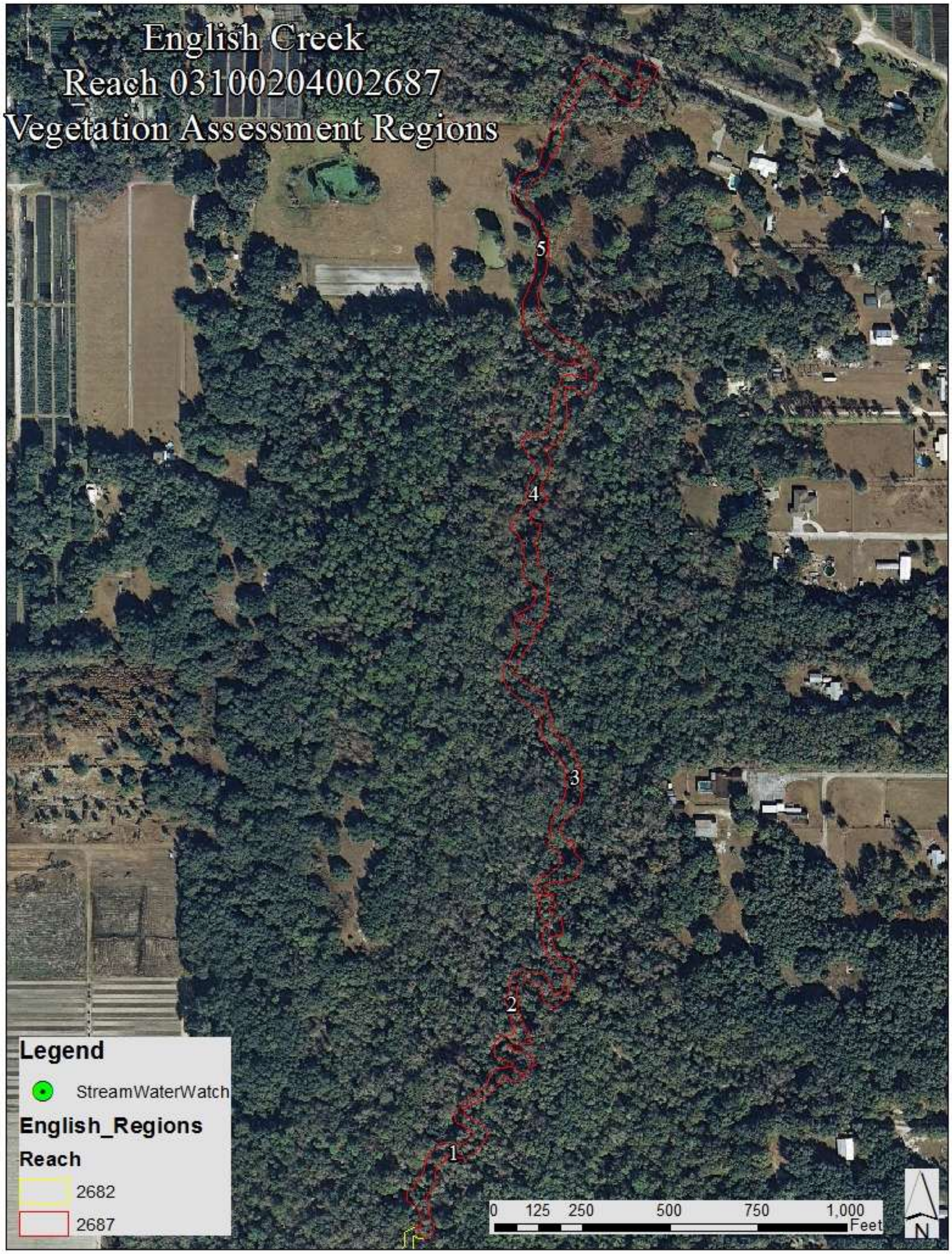

Figure 10. English Creek Reach 03100204002687 Vegetation Assessment Region Map

Figure 11. Typical Vegetation Communities along English Creek Upstream from HWY 60

Table 3. List of Emergent Zone Aquatic Plants Found for English Creek Reach 03100204002682

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
FCA	***Fraxinus caroliniana***	**Carolina Ash, Water Ash, Pop Ash**	**100%**	**N, E0**
OCA	***Osmunda cinnamomea***	**Cinnamon Fern**	**100%**	**N, E0**
QLA	***Quercus laurifolia***	**Laurel Oak; Diamond Oak**	**100%**	**N, E0**
CAQ	***Carya aquatica***	**Water Hickory**	**90%**	**N, E0**
SMI	***Smilax spp.***	**Catbriar, Greenbriar**	**90%**	**N, E0**
TDM	***Taxodium distichum***	**Bald Cypress**	**81%**	**N, E0**
TRS	***Toxicodendron radicans***	**Poison Ivy**	**81%**	**N, E0**
HCI	***Hypoxis curtissii***	**Swamp Stargrass, Common Yellow Stargrass**	**81%**	**N, E0**
LIQ	***Liquidambar styraciflua***	**Sweetgum**	**81%**	**N, E0**
CFO	***Cornus foemina***	**Swamp Dogwood, Stiff Dogwood**	**72%**	**N, E0**
COM	***Commelina spp.***	**Dayflower**	**72%**	**N, E0**
ACE	***Acer rubrum***	**Southern Red Maple**	**63%**	**N, E0**
UAA	***Ulmus americana***	**American Elm; Florida Elm**	**63%**	**N, E0**
CAM	***Crinum americanum***	**Swamp lily**	**63%**	**N, E0**
VRA	***Vitis rotundifolia***	**Muscadine Grape**	**63%**	**N, E0**
HYE	***Hydrocotyle umbellata***	**Manyflower Marshpennywort, Water Pennywort**	**54%**	**N, E0**
PAN	***Panicum spp.***	**Panic Grasses**	**54%**	**E0**
LRS	***Ludwigia repens***	**Creeping Primrosewillow, Red Ludwigia**	**45%**	**N, E0**

Plant Species Code	Scientific Name	Common Name	Percent Occur-rence	Type
APS	***Alternanthera philoxeroides***	**Alligator Weed**	**45%**	**E2,P**
COS	***Cephalanthus occidentalis***	**Buttonbush**	**45%**	**N, E0**
ULA	***Urena lobata***	**Caesar's-weed**	**45%**	**E1,P**
SAM	***Sambucus nigra subsp. Canadensis***	**Elderberry**	**36%**	**N, E0**
CEA	***Colocasia esculenta***	**Wild Taro**	**36%**	**E1,P**
PHS	***Polygonum hydropiperoides***	**Mild Waterpepper; Swamp Smartweed**	**36%**	**N, E0**
MVA	***Magnolia virginiana***	**Sweetbay Magnolia**	**27%**	**N, E0**
BOC	***Boehmeria cylindrica***	**Bog Hemp, False Nettle**	**27%**	**N, E0**
SCA	***Salix caroliniana***	**Carolina Willow**	**27%**	**N, E0**
SRS	***Serenoa repens***	**Saw Palmetto**	**18%**	**N, E0**
AAA	***Ampelopsis arborea***	**Peppervine**	**18%**	**N, E0**
PLA	***Pueraria montana var. lobata***	**Kudzu Vine**	**18%**	**E1**
LJM	***Lygodium japonicum***	**Japanese Climbing Fern**	**18%**	**E1,P**
MEL	***Melaleuca quinquenervia***	**Punk Tree, Melaleuca**	**9%**	**E1**
ICA	***Imperata cylindrica***	**Cogon Grass**	**9%**	**E1**
ICE	***Ilex cassine***	**Dahoon Holly**	**9%**	**N, E0**
ITE	***Itea virginica***	**Virginia Willow; Virginia Sweetspire**	**9%**	**N, E0**
PPP	***Pleopeltis polypodioides var. michauxiana***	**Resurrection Fern**	**9%**	**N, E0**
QNA	***Quercus nigra***	**Water Oak**	**9%**	**N, E0**
NEA	***Nephrolepis exaltata***	**Sword Fern, Wild Boston Fern**	**9%**	**N, E0**
PCA	***Pontederia cordata***	**Pickerel Weed**	**9%**	**N, E0**
BHA	***Baccharis halimifolia***	**Groundsel Tree; Sea Myrtle**	**9%**	**N,**

Plant Species Code	Scientific Name	Common Name	Percent Occur-rence	Type
				E0
ACS	***Symphyotrichum carolinianum***	**Climbing Aster**	**9%**	**N, E0**
CYD	***Cyperus distinctus***	**Swamp Flatsedge**	**9%**	**N, E0**
DBA	***Dioscorea bulbifera***	**Air Potato**	**9%**	**E1**
DIO	***Diospyros virginiana***	**Common Persimmon**	**9%**	**N, E0**
EUP	***Eupatorium capillifolium***	**Dog Fennel**	**9%**	**N, E0**
CMA	***Cicuta maculata var. mexicana***	**Spotted Water Hemlock**	**9%**	**N, E0**
CNM	***Chasmanthium nitidum***	**Shiny Wood Oats**	**9%**	**N, E0**
HTM	***Hypericum tetrapetalum***	**Fourpetal St. John's-Wort**	**9%**	**N, E0**
SLT	***Sagittaria latifolia***	**Wapato, Common Arrowhead, Broadleaf Arrowhead, Duck Potato**	**9%**	**N, E0**
SPO	***Sabal palmetto***	**Sabal Palm, Cabbage Palm**	**9%**	**N, E0**

Figure 12. Wil**d Taro, *Colocasia esculenta*, was a commonly occurring non-native invasive species.**

Table 4. List of Emergent Zone Aquatic Plants Found for English Creek Reach 03100204002687.

Plant Species Code	Scientific Name	Common Name	Percent Occurrence	Type
ACE	***Acer rubrum***	**Southern Red Maple**	**100%**	**N, E0**
APS	***Alternanthera philoxeroides***	**Alligator Weed**	**100%**	**E2,P**
BOC	***Boehmeria cylindrica***	**Bog Hemp, False Nettle**	**100%**	**N, E0**
COM	***Commelina spp.***	**Dayflower**	**100%**	**N, E0**
FCA	***Fraxinus caroliniana***	**Carolina Ash, Water Ash, Pop Ash**	**100%**	**N, E0**
HCI	***Hypoxis curtissii***	**Swamp Stargrass, Common Yellow Stargrass**	**100%**	**N, E0**
HYE	***Hydrocotyle umbellata***	**Manyflower Marshpennywort, Water Pennywort**	**100%**	**N, E0**
LIQ	***Liquidambar styraciflua***	**Sweetgum**	**100%**	**N, E0**
LJM	***Lygodium japonicum***	**Japanese Climbing Fern**	**100%**	**E1,P**
OCA	***Osmunda cinnamomea***	**Cinnamon Fern**	**100%**	**N, E0**
PPP	***Pleopeltis polypodioides var. michauxiana***	**Resurrection Fern**	**100%**	**N, E0**
QLA	***Quercus laurifolia***	**Laurel Oak; Diamond Oak**	**100%**	**N, E0**
SMI	***Smilax spp.***	**Catbriar, Greenbriar**	**100%**	**N, E0**
SPO	***Sabal palmetto***	**Sabal Palm, Cabbage Palm**	**100%**	**N, E0**
SRS	***Serenoa repens***	**Saw Palmetto**	**100%**	**N, E0**
TRS	***Toxicodendron radicans***	**Poison Ivy**	**100%**	**N, E0**
UAA	***Ulmus americana***	**American Elm; Florida Elm**	**100%**	**N, E0**
VRA	***Vitis rotundifolia***	**Muscadine Grape**	**100%**	**N, E0**
ULA	***Urena lobata***	**Caesar's-weed**	**80%**	**E1,P**

Plant Species Code	Scientific Name	Common Name	Percent Occur-rence	Type
ITE	***Itea virginica***	**Virginia Willow; Virginia Sweetspire**	**80%**	**N, E0**
CEA	***Colocasia esculenta***	**Wild Taro**	**80%**	**E1,P**
CNM	***Chasmanthium nitidum***	**Shiny Wood Oats**	**80%**	**N, E0**
CAM	***Crinum americanum***	**Swamp lily**	**60%**	**N, E0**
COS	***Cephalanthus occidentalis***	**Buttonbush**	**60%**	**N, E0**
CRS	***Campsis radicans***	**Trumpet Vine**	**40%**	**N, E0**
PAN	***Panicum spp.***	**Panic Grasses**	**40%**	**E0**
PFO	***Paederia foetida***	**Skunkvine, Stinkvine**	**20%**	**E1**
QNA	***Quercus nigra***	**Water Oak**	**20%**	**N, E0**
LPA	***Ludwigia peruviana***	**Peruvian Primrosewillow**	**20%**	**E1**
LRS	***Ludwigia repens***	**Creeping Primrosewillow, Red Ludwigia**	**20%**	**N, E0**
FAA	***Forestiera acuminata***	**Eastern Swampprivet**	**20%**	**N, E0**
IVA	***Iris virginica***	**Southern Blue Flag**	**20%**	**N, E0**
CFO	***Cornus foemina***	**Swamp Dogwood, Stiff Dogwood**	**20%**	**N, E0**
BRP	***Broussonetia papyrifera***	**Paper Mulberry**	**20%**	**E2**

Figure 13. English Creek is characterized by a sinuous channel with many fallen trees.

Table 5. List of All Plants and Sample Sites for English Creek Reach 03100204002682

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Carolina Ash, Water Ash, Pop Ash	1,2,3,4,5,6,7,8,9,10,11	100	Emergent
Cinnamon Fern	1,2,3,4,5,6,7,8,9,10,11	100	Emergent
Laurel Oak; Diamond Oak	1,2,3,4,5,6,7,8,9,10,11	100	Emergent
Catbriar, Greenbriar	1,3,4,5,6,7,8,9,10,11	90	Emergent
Water Hickory	1,2,3,4,5,6,7,8,9,11	90	Emergent
Bald Cypress	1,2,3,4,5,6,7,8,11	81	Emergent
Poison Ivy	1,2,3,4,5,6,7,8,11	81	Emergent
Swamp Stargrass, Common Yellow Stargrass	1,4,5,6,7,8,9,10,11	81	Emergent
Sweetgum	1,2,4,5,7,8,9,10,11	81	Emergent
Dayflower	2,4,5,6,7,8,9,11	72	Emergent
Swamp Dogwood, Stiff Dogwood	1,2,3,4,5,6,7,11	72	Emergent
American Elm; Florida Elm	1,2,6,7,8,10,11	63	Emergent
Muscadine Grape	1,4,6,7,8,10,11	63	Emergent
Southern Red Maple	4,6,7,8,9,10,11	63	Emergent
Swamp lily	1,2,3,4,7,8,9	63	Emergent
Manyflower Marshpennywort, Water Pennywort	1,2,6,7,10,11	54	Emergent
Panic Grasses	1,2,4,5,10,11	54	Emergent
Alligator Weed	1,3,4,10,11	45	Emergent
Buttonbush	1,2,4,7,10	45	Emergent
Caesar's-weed	1,2,4,6,10	45	Emergent
Creeping Primrosewillow, Red Ludwigia	2,4,5,8,10	45	Emergent
Elderberry	4,5,6,7	36	Emergent
Mild Waterpepper; Swamp Smartweed	2,4,5,6	36	Emergent
Wild Taro	1,2,4,5	36	Emergent
Bog Hemp, False Nettle	7,10,11	27	Emergent
Carolina Willow	1,2,4	27	Emergent
Sweetbay Magnolia	2,3,8	27	Emergent
Japanese Climbing Fern	6,10	18	Terrestrial
Kudzu Vine	2,4	18	Terrestrial
Peppervine	1,10	18	Emergent
Saw Palmetto	10,11	18	Terrestrial
Air Potato	10	9	Emergent

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Climbing Aster	**10**	**9**	**Emergent**
Cogon Grass	**10**	**9**	**Terrestrial**
Common Persimmon	**6**	**9**	**Emergent**
Dahoon Holly	**10**	**9**	**Emergent**
Dog Fennel	**5**	**9**	**Emergent**
Fourpetal St. John's-Wort	**1**	**9**	**Emergent**
Groundsel Tree; Sea Myrtle	**4**	**9**	**Emergent**
Pickerel Weed	**8**	**9**	**Emergent**
Punk Tree, Melaleuca	**7**	**9**	**Emergent**
Resurrection Fern	**11**	**9**	**Emergent**
Sabal Palm, Cabbage Palm	**11**	**9**	**Terrestrial**
Shiny Wood Oats	**11**	**9**	**Terrestrial**
Spotted Water Hemlock	**4**	**9**	**Emergent**
Swamp Flatsedge	**7**	**9**	**Emergent**
Sword Fern, Wild Boston Fern	**2**	**9**	**Terrestrial**
Virginia Willow; Virginia Sweetspire	**7**	**9**	**Emergent**
Wapato, Common Arrowhead, Broadleaf Arrowhead, Duck Potato	**2**	**9**	**Emergent**
Water Oak	**6**	**9**	**Emergent**

Table 6. List of All Plants and Sample Sites for English Creek Reach 03100204002687

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Alligator Weed	1,2,3,4,5	100	Emergent
American Elm; Florida Elm	1,2,3,4,5	100	Emergent
Bog Hemp, False Nettle	1,2,3,4,5	100	Emergent
Carolina Ash, Water Ash, Pop Ash	1,2,3,4,5	100	Emergent
Catbriar, Greenbriar	1,2,3,4,5	100	Emergent
Cinnamon Fern	1,2,3,4,5	100	Emergent
Dayflower	1,2,3,4,5	100	Emergent
Japanese Climbing Fern	1,2,3,4,5	100	Terrestrial
Laurel Oak; Diamond Oak	1,2,3,4,5	100	Emergent
Manyflower Marshpennywort, Water Pennywort	1,2,3,4,5	100	Emergent
Muscadine Grape	1,2,3,4,5	100	Emergent
Poison Ivy	1,2,3,4,5	100	Emergent
Resurrection Fern	1,2,3,4,5	100	Emergent
Sabal Palm, Cabbage Palm	1,2,3,4,5	100	Terrestrial
Saw Palmetto	1,2,3,4,5	100	Terrestrial
Southern Red Maple	1,2,3,4,5	100	Emergent
Swamp Stargrass, Common Yellow Stargrass	1,2,3,4,5	100	Emergent
Sweetgum	1,2,3,4,5	100	Emergent
Caesar's-weed	1,3,4,5	80	Emergent
Shiny Wood Oats	1,2,3,4	80	Terrestrial
Virginia Willow; Virginia Sweetspire	1,2,4,5	80	Emergent
Wild Taro	1,2,3,4	80	Emergent
Buttonbush	1,2,3	60	Emergent
Swamp lily	1,3,4	60	Emergent
Panic Grasses	1,2	40	Emergent
Trumpet Vine	1,3	40	Emergent
Creeping Primrosewillow, Red Ludwigia	1	20	Emergent
Eastern Swampprivet	5	20	Emergent
Paper Mulberry	1	20	Emergent
Peruvian Primrosewillow	4	20	Emergent
Skunkvine, Stinkvine	1	20	Terrestrial
Southern Blue Flag	1	20	Emergent

Plant Common Name	Found at Sample Sites	Percent Occurrence	Growth Type
Swamp Dogwood, Stiff Dogwood	**4**	**20**	**Emergent**
Water Oak	**3**	**20**	**Emergent**

Discussion of Vegetation Assessment Results

The highest diversity of species found in the English Creek study area was in reach 03100204002687 Region 1. In this region 30 species were identified. 23.33% of these species were non-native to Florida and 5 species were considered pest plants for this reach. Reach 03100204002682 regions 3 and 9 had the fewest number of species identified with 10 species each but also the fewest number of non-native species with 1 species in region 3 and none in region 9 and 1 pest plant species present.

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 English Creek Water Quality Page can be viewed at http://www.hillsborough.wateratlas.usf.edu/river/waterquality.asp?wbodyid=33&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 Figures 14, 15 and 16 for English Creek. The figures are graphs of: (1) the overall water quality index (WQI)[v], 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; (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. These and other parameters (primary nutrients) are used by the US Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP) to determine the level of impairment of a freshwater stream. The 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.

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

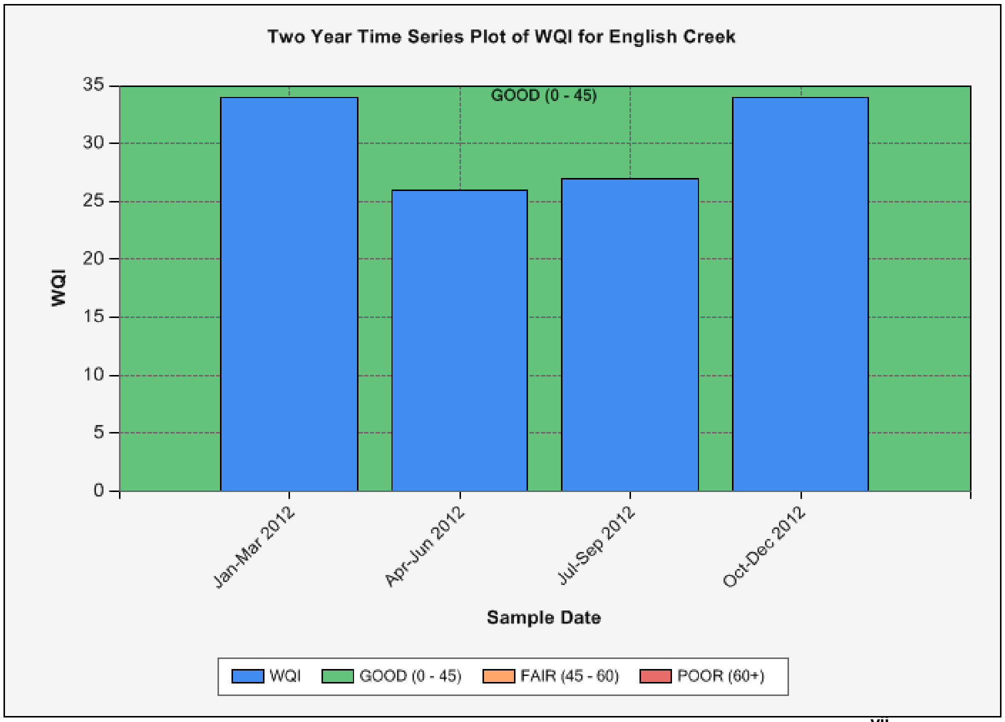


Figure 14. Recent Water Quality Index (WQI) graph for English Creek[vii]

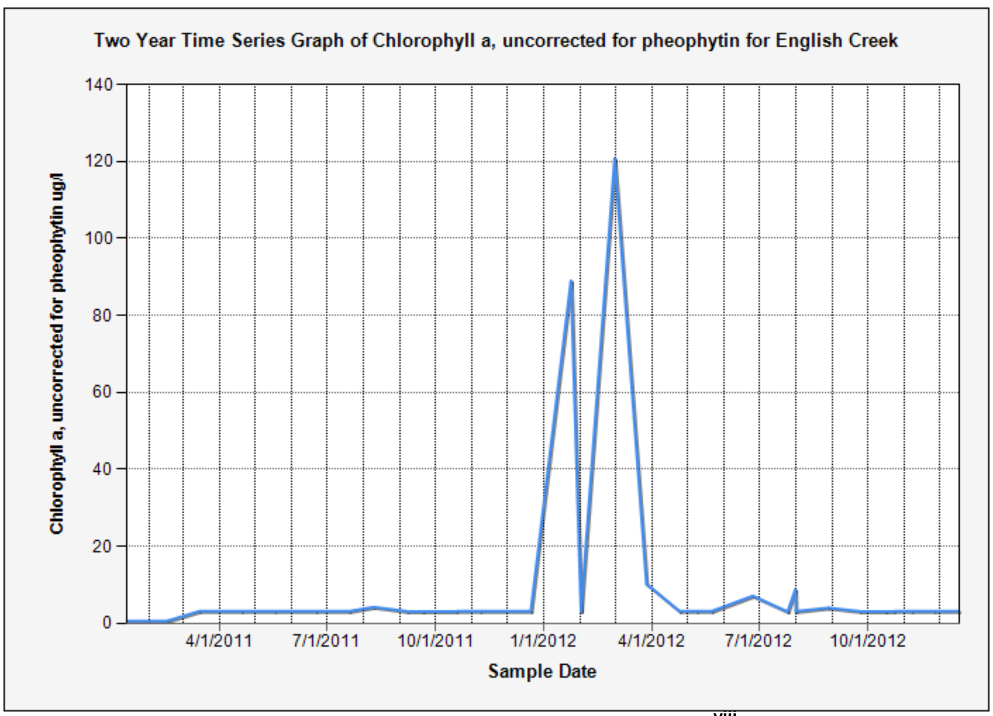


Figure 15. Recent Chlorophyll a graph for English Creek[viii]

[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={WBODY_ID}&data=WQI&datatype=WQ&waterbodyatlas=river&ny=10&bench=1

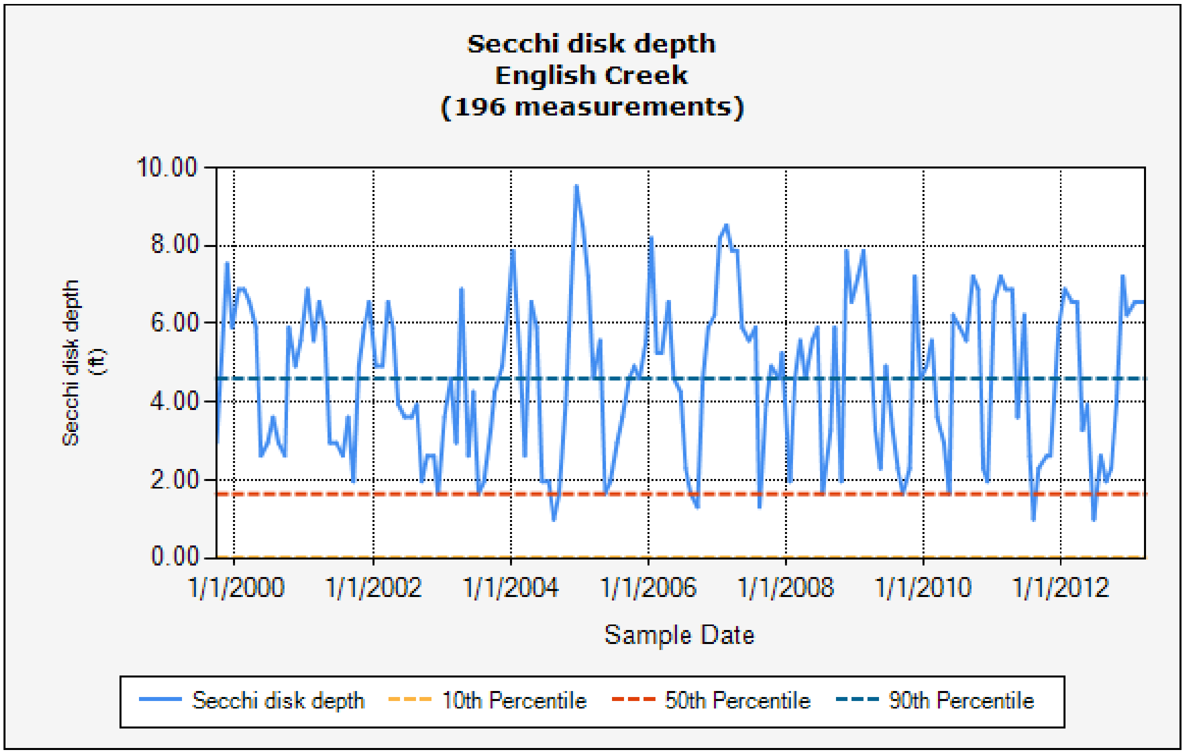


Figure 16. Recent Secchi Disk graph for English Creek[ix]

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

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

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 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 (Table 7) and chlorophyll a must be at or below 20 µg/L not be considered impaired.

Table 7 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.

English Creek, a freshwater creek that flows into Howell Branch Creek as a tributary to the North Prong of the Alafia River, has one long-term data stations whose three-year geometric mean for Total Nitrogen, Total Phosphorus and Chlorophyll are as shown below in Table 8. According to the Numeric Nutrient Criteria, English Creek would be considered impaired for the exceedance of Nitrogen and Phosphorous concentrations in each of the past three years.

Table 8 English Creek NNC data summary

English Creek at HWY 60	Total Phosphorous mg/l	Total Nitrogen mg/l	Chlorophyll-a Corrected µg/l
Period of Record Geomean	1.205	2.282	1.736
2010 Geomean	0.696	2.594	2.075
2011 Geomean	0.661	2.092	2.327
2012 Geomean	1.046	1.995	7.926

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 39 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.

Table 3. Water Quality Parameters (Laboratory) for English Creek

Parameter	Value	Mean Value
Total Phosphorus (ug/L)	**295.50**	**322.89**
Total Nitrogen (ug/L)	**1068.67**	**1182.17**
Chlorophyll a (ug/L)	**8.10**	**11.07**
TN/TP	**3.6**	**3.7**
Limiting Nutrient	**Nitrogen**	**Nitrogen**
Color (PCU)	**42.30**	**49.74**
Secchi disk depth (ft)	**2.75**	**2.19**

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 9 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.

Table 4 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 and twice for the surface measurement. These three locations cover the predominantly freshwater portion upstream, the mixing zone and the confluence with the receiving estuary.

Table 4. Water Chemistry Data Based on Manta Water Chemistry Probe for English Creek Reach 03100204002682

Sample Location	Sample Depth (m)	Time	Temp (deg C)	Conductivity (mS/cm3)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH
Bottom	0.75	8/8/2012 11:00:00 AM	25.91	0.281	73.24	6.07	7.18
Mean Value	0.56	8/8/2012 11:00:00 AM	26.01	0.219	77.70	6.43	7.51
Middle	0.56	8/8/2012 11:00:00 AM	29.95	0.274	79.06	6.55	7.18
Surface	0.26	8/8/2012 11:00:00 AM	26.30	0.281	81.83	6.74	8.75

Table 11. Water Chemistry Data Based on Manta Water Chemistry Probe for English Creek Reach 03100204002687

Sample Location	Sample Depth (m)	Time	Temp (deg C)	Conductivity (mS/cm3)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	pH
Bottom	0.70	8/8/2012 11:30:00 AM	26.27	0.266	77.87	6.41	7.07
Mean Value	0.53	8/8/2012 11:30:00 AM	26.27	0.266	78.29	6.44	7.06
Middle	0.51	8/8/2012 11:30:00 AM	26.28	0.266	78.52	6.46	7.06
Surface	0.33	8/8/2012 11:30:00 AM	26.28	0.266	78.62	6.47	7.06

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

English Creek is a small area (11.4-acre) stream that would be considered in the impaired category of streams based on water chemistry. It has a plant diversity of 56 species relative to the total watershed plant diversity of 160 species with about 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 good diversity of plant species. The primary pest plants in the stream include *Alternanthera philoxeroides, Lygodium japonicum, Urena lobata* and *Colocasia esculenta* .

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

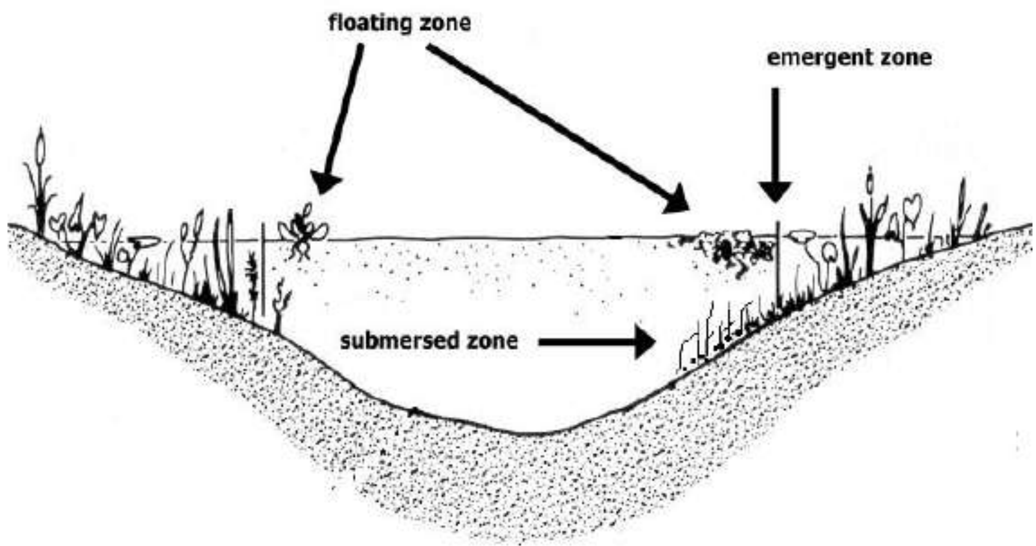
ditches, canals and other conveyances, or segments of conveyances, that are man-made, or predominantly channelized or predominantly physically altered and;

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:



An **adjusted chlorophyll a value** (µg/L) was calculated by modifying the methods of Canfield et al (1983). The total wet weight of plants in the stream (kg) was calculated by multiplying stream surface area (m^2) by PAC (percent area coverage of macrophytes) and multiplying the product by the biomass of submersed plants (kg wet weight m^2) and then by 0.25, the conversion for the 1/4 meter sample cube. The dry weight (kg) of plant material was calculated by multiplying the wet weight of plant material (kg) by 0.08, a factor that represents the average percent dry weight of submersed plants (Canfield and Hoyer, 1992) and then converting to grams. The potential phosphorus concentration (mg/m^3) was calculated by multiplying dry weight (g) by 1.41 mg TP g-1 dry weight, a number that represents the mean phosphorus (mg) content of dried plant material measured in 750 samples from 60 Florida lakes (University of Florida, unpublished data), and then dividing by stream segment volume (m^3) and then converting to µg/L (1000/1000). From the potential phosphorus concentration, a predicted chlorophyll a concentration was determined from the total phosphorus and chlorophyll a relationship reported by Brown (1997) for 209 Florida lakes. Adjusted chlorophyll a concentrations were then calculated by adding each lake's measured chlorophyll a concentration to the predicted chlorophyll a concentration.

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.