Characterization of Elevation, Soils, and Vegetation Relationships in the Riparian Corridors of Horse and Charlie Creeks

May 2012

Prepared for

Southwest Florida Water Management District

Prepared by

HSW Engineering, Inc.

Table of Contents

LIST OF APPENDIXES

LIST OF FIGURES

LIST OF TABLES

Citation:
HSW Engineering, Inc. 2012. Characterization of elevation, soils, and vegetation relationships in the riparian corridors of Horse and Charlie Creeks. Tampa, Florida. Prepared for the Southwest Florida Water Management District, Brooksville, Florida.

EXECUTIVE SUMMARY

The Southwest Florida Water Management District (SWFWMD) is charged with the development of processes and rules for establishing and implementing minimum flows and levels (MFLs) for priority water bodies as required by Sections 373.042 and 373.0421 of the Florida Statutes. MFLs are set for water bodies to prevent significant harm to water resources or ecosystems as a result of water withdrawals. The water management districts are required, under Florida Statute 373.042, to develop a priority list of water bodies for which they will establish MFLs and to plan for periodic updates as new information becomes available.

The law provides further that MFLs shall be calculated using the best available information. Revised in 1997, the law now requires that when establishing MFLs, changes and structural alterations to watersheds, surface waters and aquifers shall also be considered [Chap. 373.0421(1)(a), (1)b, FS]. The current State Water Policy includes additional guidance for the establishment of MFLs, providing that consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows and levels, and environmental values associated with coastal, estuarine, aquatic, and wetland ecology.

The purpose of this project was to produce accurate technical data on the composition and distribution of plant communities and the occurrence of hydric soils and other hydrologic indicators within transects selected in the study areas of Horse and Charlie Creeks. Thirteen transects through the creek floodplains were established, 6 on Horse Creek and 7 on Charlie Creek. This report summarizes a study of the relationships of hydric soils, vegetative communities, and elevations of these factors within the floodplain of these creeks, in Hillsborough, Manatee, Polk, Hardee, Highlands, and DeSoto Counties.

Vegetation was sampled using a modified point-centered quarter (PCQ) method. Soils were sampled using U. S. Army Corps of Engineers and Florida Department of Environmental Quality soil sampling methods to determine the presence of hydric soil field indicators.

The Florida Natural Areas Inventory (NWI) ecological community classification system was used as a guide to assigning community types to the assemblages of plant species observed along the 13 transects. Using this system, the floodplain vegetation along the transects was grouped into three wetland communities: Floodplain Swamp, Bottomland Forest, and Hydric Hammock, and a drier ‘Upland Hammock’ community. The floodplain had high species richness within the three inter-grading wetland plant communities. The width of each community within the floodplain varied in relationship to the incision of the creek channels, the presence of secondary channels lateral to the main creek channels, and the relative elevations of the communities.

Floodplain Swamp and Bottomland Forest had all occurrences of hydric soils, except three samples in areas of Hydric Hammock that were related to possible backflow channels or side-slope seepages.

Elevated lichen lines and elevated water stain lines were the predominant hydrologic indicators on Horse and Charlie Creeks, and were interpreted as indicating the approximate flood high water elevation at each transect location relative to the creek channel bottom elevation.

1.0 PURPOSE

The Southwest Florida Water Management District (hereafter referred to as the "District" or "SWFWMD") is charged with the development of processes and rules for the establishment and implementation of minimum flows and levels (MFLs) for priority water bodies as required by Sections 373.042 and 373.0421 of the Florida Statutes. MFLs are set for water bodies to prevent significant harm to water resources or ecosystems as a result of water withdrawals, mostly for public supply water systems. The water management districts are required, under Florida Statute 373.042, to develop a priority list of water bodies for which they will establish MFLs and to plan for periodic updates as new information becomes available.

MFLs are developed using relevant abiotic and biotic information. The geographic location, climate, physiography, land use, and hydrogeology (surface and ground water) of the Horse and Charlie Creek study areas were described in Lee et al. (2010) and Lewelling (1997). The presence or absence of hydric soils, the species composition of vegetative communities, and the relative dominance of trees or other plants within those communities and their elevational relationships within the floodplain are important factors used to develop MFLs and were considered in this report.

Horse and Charlie Creeks are two of the six main tributaries of the Peace River of Florida (Figure 1). The current District priority list projects establishment of minimum flows for Horse and Charlie Creeks in calendar year 2012. The purpose of this study was to relate the ground surface elevations and selected hydrologic indicators of the floodplains of the Charlie and Horse Creeks with the soil moisture classes and vegetative classes in the study areas relative to the creek channels to support the SWFWMD in establishing MFLs for Horse and Charlie Creeks. The District may use this information along with creek hydraulic information (e.g., HEC-RAS model results) to evaluate potential impacts of flow reduction on the floodplain ecosystem.

This report presents the methods used to obtain ground surface, hydrologic, and topographic indicator elevation data, identify distinctive vegetative communities and their distribution patterns within the study area, classify soils, hydrologic indicators, and topographic variables, and summarize relationships among these environmental and ecological variables.

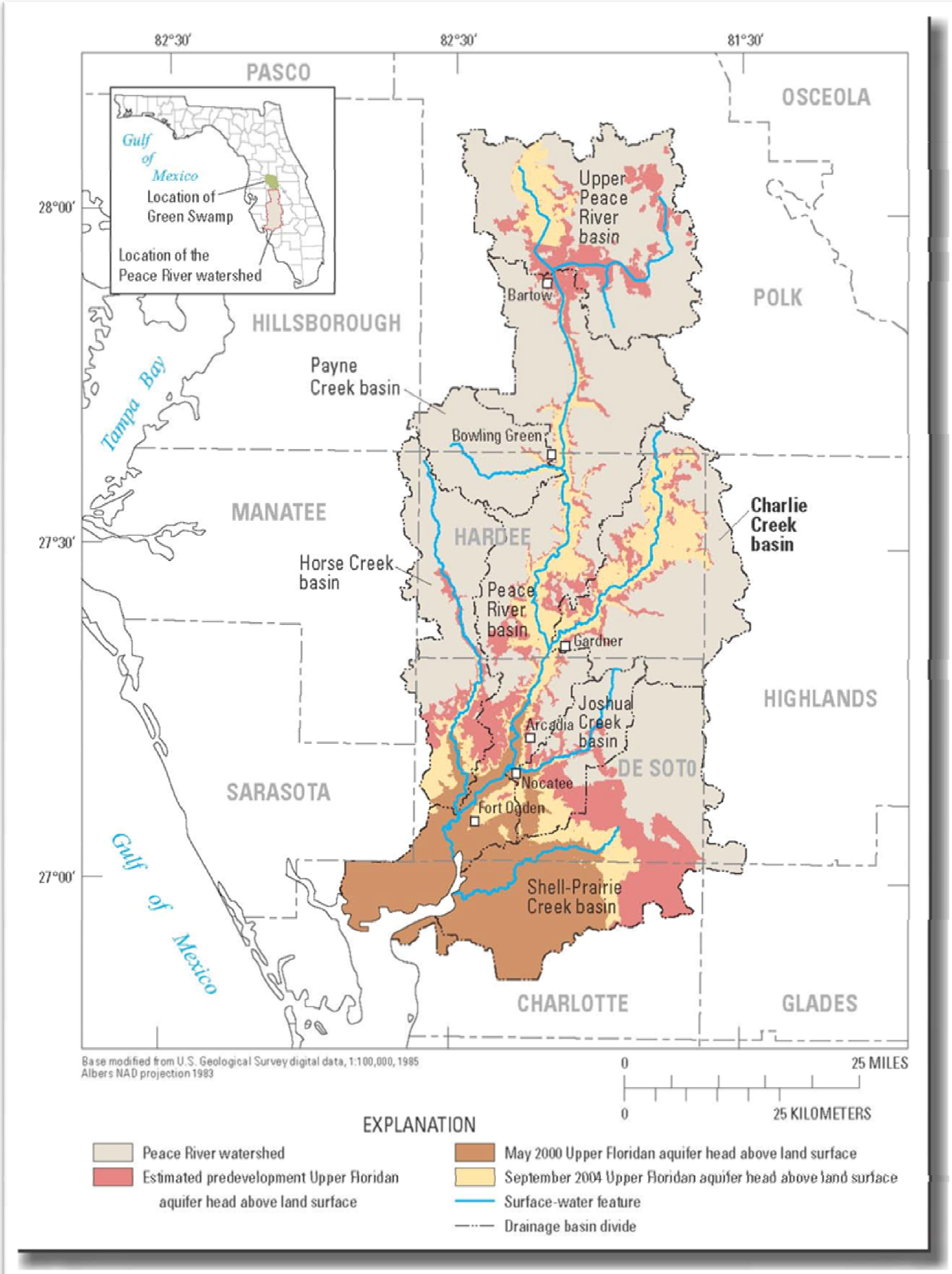


Figure 1. The Peace River watershed and its principal basins in west-central Florida.

(Citation source: Lee et al. 2010. Map scale may not be identical to the original due to the formatting.)

2.0 METHODS

Sampling methods for this study were selected to provide data needed to depict the soils and vegetative associations characteristic of the wetland communities lying within the study areas in Horse and Charlie Creeks.

2.1 Study Area

Horse Creek is the largest tributary of the Peace River and drains the western part of the Peace River Basin (Figure 1). Beginning at the "four corners," where the counties of Hillsborough, Manatee, Polk and Hardee meet, it joins the Peace River in southwest DeSoto County, with a length of about 40 miles and a drainage area of about 240 square miles. The largest portion of the basin is within the western halves of Hardee and DeSoto Counties, with a small portion in eastern Manatee County. The extreme northern part of the basin lies in southeast Hillsborough and southwest Polk countries, and has been largely strip-mined for phosphate (Lewelling 1997).

The Charlie Creek basin occupies the eastern third of Hardee County, overlapping into southern Polk, western Highlands, and northern DeSoto Counties (Figure 1). The creek itself is the major tributary to the Peace River between Zolfo Springs and Acadia and contributes over half of the intermediate annual inflow to this reach of the river (PBSJ 2007). It drains the east-central portion of the Peace River watershed with a drainage area of about 330 square miles. Charlie Creek is the least developed tributary basin of the Peace River watershed (Lee et al. 2010).

2.2 Field Methods

2.2.1 Transect Selection Procedure

Using the site selection criteria specified by the District, HSW and SWFWMD collaborated to identify suitable transects in the two study areas. During this screening process, HSW inspected the study area, visited the PHABSIM (physical habitat simulation) sites established by others within the study reaches, reviewed SWFWMD's available soils and vegetation mapping information, and evaluated potential transect sites by assessing vegetation, soils, and convenient access to study areas.

In coordination with the District, HSW chose representative wetland communities which best characterized the floodplain of the targeted creek corridor, then distributed the transects among communities based on the relative dominance of the communities within the study area. Transect selection was completed and submitted to SWFWMD for review. SWFWMD approved the transect locations. Seven transects in Charlie Creek (Figure 2), i.e., 1, 2, 2.5, 4.5, 5, 6, and 7, and six transects in Horse Creek (Figure 2), i.e., 1, 2, 3, 4, 5, and 6, were selected. The 13 transects crossed the creek corridors and floodplains and were positioned perpendicular to the creek channels.

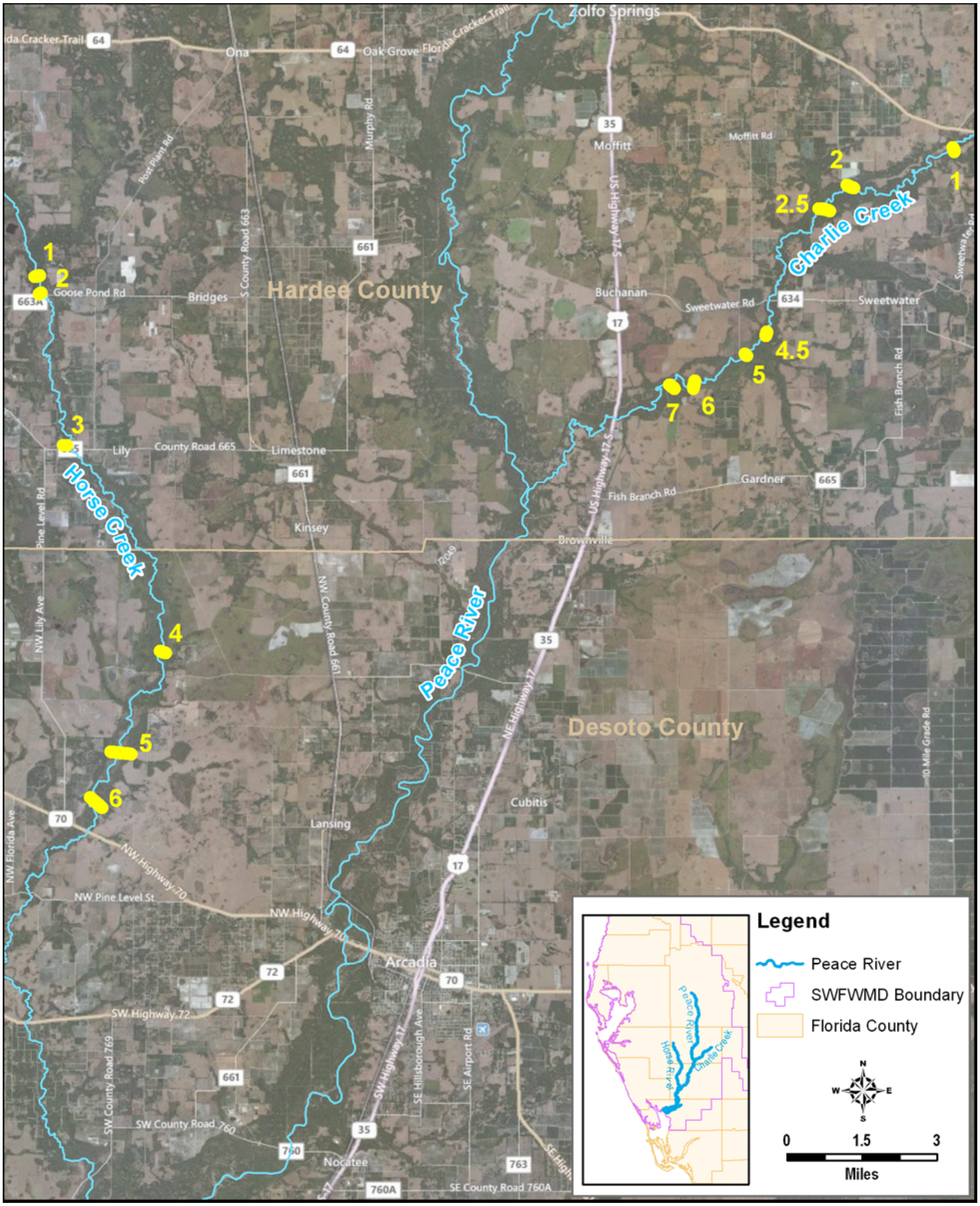


Figure 2. Location of transects on the Horse and Charlie Creeks of the Peace River, Florida.

2.2.2 Elevation Surveys

The SWFWMD Survey Department established the alignments of the 13 transects. After the transects were established and surveyed, HSW sampled soils and vegetation using the methods described below.

Prominent topographic features (e.g. scarps, levees, depressions) in the study area that appeared to be influencing creek flow and water retention were noted and surveyed. Key hydrologic indicators of previous flood events or ordinary high water were also recorded if found along transects. The height of the indicator from the ground surface was measured, marked, and included in the elevation surveys. The possible indicators generally included:

- aquatic mosses or liverworts (moss collars) – typically above the water level, in shaded, forested floodplains that experience prolonged, seasonal inundation

- drift lines and rafted debris – vegetative detritus, mud discoloration on vegetation, and trash deposited in discrete lines at the upper height of a flood or intense rain event

- elevated lichen lines – indicative of the ordinary or seasonal high water line

- adventitious roots – physiological adaptation by trees and shrubs to increase oxygenation in submergent conditions

- trunk buttresses (cypress, tupelo or other species) – morphological plant adaptation to increase root oxygenation in hydrophytes, indicative of approximate submergent conditions

- water marks – water marks are created by the staining effect of a sustained water elevation that produces discoloration on a tree trunk from high water

Elevations were surveyed by SWFWMD at necessary intervals along transects to characterize conspicuous elevation changes. Associated northing and easting coordinates were recorded as reference points for comparing with vegetation and soils data.

2.2.3 Vegetation Sampling

Vegetation class (plant community) identification, nomenclature, and characterization in the study corridor were based on plant species importance. A modified point-centered quarter (PCQ) method was used to sample the tree, shrub, and ground cover plant species along the transects (Cottam and Curtis 1956, Mitchell 2007). Vegetation sampling stations were located at quasi-random points distributed on each transect among vegetative communities identified by conspicuous changes in vegetation composition, topography, or soils. The number of samples recorded per transect varied with the transect length and the number of community types present on the transect.

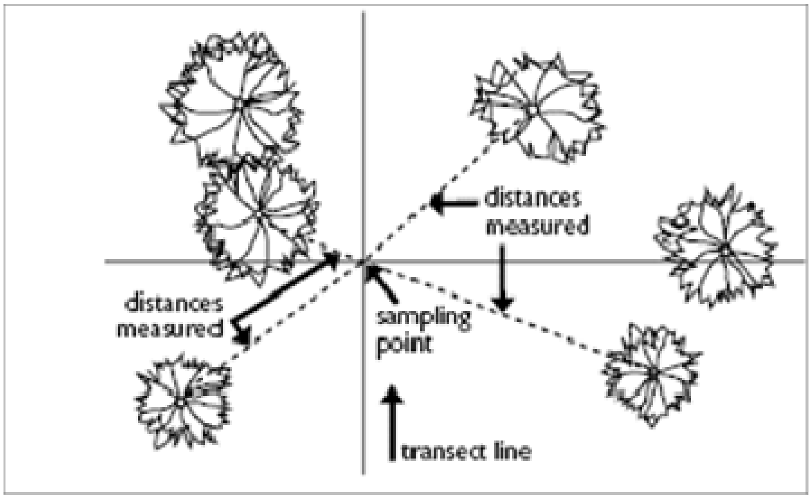


Figure 3. PCQ quadrat layout for each vegetation station.

At each sampling point, a quadrat (Figure 3) was established by placing two 1-meter PVC poles at right angles to each other to establish the 4 quarters of the quadrat. In each quarter, five metrics of vegetation data were recorded:

- species identification - trees, shrubs, forbs, and grasses were identified to the lowest taxonomic level possible, generally to species.
- distance to the nearest tree and shrub (feet).
- diameter of the nearest tree at breast height (DBH, inches; a height of 137 cm (59.7 inches) from ground level). Trees were defined as woody species with a diameter > 2.54 cm (1 inch) at DBH.
- dominant shrub vegetation - the number of each shrub species and % cover (within 1 meter of PCQ center, all four directions). Shrubs were defined as woody plants shorter than 50 cm (19.7 inches) with a diameter < 2.54 cm (1 inch). Shrub DBH was not measured.
- dominant ground cover - the dominant species composition and % cover (within 1 meter of PCQ center, all four directions). Ground cover was defined as herbaceous forbs and grasses and woody seedlings (Mueller-Dombois and Ellenberg 1974).

At each PCQ site, the basal area and frequency of trees were used to calculate the relative importance value (IV) of trees, and this measure of relative species dominance was used to determine the plant community type.

The National Wetland Inventory Region 2 plant list (http://plants.usda.gov/wetinfo.html) and the Florida Department of Environmental Protection vegetative index (plant list) lists (http://www.dep.state.fl.us/water/wetlands/delineation/vegindex/vegindex.htm) of facultative, facultative wet, and obligate plants were used to determine the wetland indicator status of plant species. The status was recorded to facilitate future comparisons of dominant species with reference standard wetlands to determine percent species concurrence (after Uranowski et al. 2003). The following assumptions were made:

- A vegetation community had specific hydrologic requirements and features regardless of where they occurred along the length of Horse and Charlie Creeks of the Peace River, since the number of transects that could be sampled was limited by the study design for each segment. Any reference and conclusions made based on these community types follow a linear path along the creek regardless of the linear spacing of the transects. Therefore, the inference space of this study over which recommendations apply includes all occurrences of sampled vegetation communities within the study area along the sampled reach of the two Creeks.

- The PCQ method of vegetation data collection for woody species, which relies on an assumption that a central point in the vicinity of the vegetation sampled is at a representative elevation for surrounding samples, was applicable to the vegetative communities in the study area. However, if the local topography is highly variable, then the survey elevations for the grouped vegetation samples may not be representative of the hydrology affecting any individual tree or shrub specimen.

2.2.4 Soil Sampling

The U. S. Army Corps of Engineers "Wetlands Delineation Manual" defines a hydric soil as 'saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part' (Environmental Laboratory 1987). The Florida Department of Environmental Protection "The Florida Wetlands Delineation Manual" (Chapter 62.340 F.A.C.) states: Hydric soils are formed by either inundation or saturation for long periods of time, generally inundation for 7 consecutive days, or saturation for at least 20 consecutive days (Florida Department of Environmental Protection 1992). These definitions and NRCS hydric soil field indicators (Land Resource Region U) were used in evaluating soil samples in the study area (NRCS 1991, NRCS 2006).

Soils were collected adjacent to point-centered quarter (PCQ) sites where vegetation was identified. At each PCQ site, three soil samples were taken from soil pits excavated to a minimum depth of 50 cm (19.69 inches). For each soil sample, the presence of soil horizons and the texture of each horizon were described, and the hydric soil field indicators (type and depth of stratification and % organic coating) were recorded.

2.3 Data Handling and Analysis

2.3.1 Data Handling

Data were recorded on field sheets and entered into Excel databases.

2.3.2 Elevation Surveys / Mapping

Using Microsoft Excel, survey elevation data (feet-NAVD88) for each transect were plotted against the transect distance to construct the topographic profiles of each transect. The wetted perimeter (linear feet) of each transect, subdivided within each vegetation community, was plotted against the transect distance to show the linear feet of vegetation classes along the wetted perimeter of each profile.

The elevations of topographic features and hydrologic indicators were compiled in a Microsoft Excel database, then plotted on the transect profiles. Elevations were evaluated relative to the surrounding vegetative communities to interpret a record of the recurrent local ordinary high water and flood heights. The elevated lichen lines and water stain lines on trees were interpreted as the most reliable indicators of past flood events, although they did not occur in all transects. The minimum, maximum, median, and mean elevation was calculated for each transect within each creek.

2.3.3 Soils

The physical properties (soil texture, moisture content, presence of muck or peat), and hydric soil test indicator of each soil sample was compiled in a Microsoft Excel database. Each soil sample was classified as one of five possible soil moisture regimes: not hydric, or hydric and saturated or flooded, and/or with muck or peat soils present and/or absent. The minimum, maximum, median, and mean elevation was calculated for each transect within each creek, then compared with the surrounding vegetative community. Median relative elevations were compared using a Wilcoxson signed rank test to confirm differences in soils elevations.

2.3.4 Vegetation

Importance Values — Tree metrics [basal area (m^2/ha), density (trees/ha), and frequency] for each tree species measured at each PCQ site in each transect were used to calculate the species' importance value (IV), i.e., the relative dominance of a species within and between communities.

Shrubs — Presence and numbers of each shrub species were noted as ancillary confirmation of the vegetative communities, but IVs were not calculated since DBH was not measured and basal area was not calculated for shrubs.

Ground Cover — Presence and numbers of each ground cover species (herbaceous grasses and forbs, and shrub seedlings) were noted as ancillary confirmation of vegetative communities.

Community Descriptions — The Florida Natural Area Inventory (FNAI) provides general descriptions of Florida's vegetative communities (FNAI 2010). Within the Freshwater Forested Wetlands Natural Community group, Floodplain Swamp (FS) is within the Cypress/Tupelo sub-group, while Bottomland Forest (BF) and Hydric Hammock (HH) are included in the Hardwood sub-group. These communities were analogous to the seasonally and/or temporarily flooded palustrine forested wetlands category in the National Wetlands Inventory classification system (Cowardin et al. 1978). Within the Hardwood Forested Uplands Natural Community group, Upland Hardwood Forest occurred on a few transects upslope of wetland communities. This deciduous hardwood forest type occurs on mesic soils on slopes above river floodplains. The FNAI plant community descriptions were used as a guide in classifying the assemblages of plant species observed along the 13 transects into homogenous plant communities. Plant communities were described based on the IVs of each tree species, supplemented by an evaluation of the shrub and ground cover species. The type descriptions were compared to the species composition of the sampled communities. These descriptions were interpreted based on professional training and experience with similar communities in west-central Florida. Community boundaries were defined as one-half the distance between PCQ sites known to lie within a plant community. Common and scientific names of plants are included in Appendix B.

The minimum, maximum, median, and mean elevation was calculated for each community on each transect, and cumulatively within creek. Median relative elevations of the vegetative communities were compared using a Wilcoxson signed rank test to confirm differences in relative elevation between the plant communities.

3.0 RESULTS

The species composition and extent of the vegetative communities lying within the floodplain of Horse and Charlie Creeks were strongly influenced by their topoedaphic positions.

3.1 Horse Creek

3.1.1 Elevations

The channel gradient of Horse Creek was approximately 1.59 feet/mile, estimated based on a median elevation difference of 21.70 ft over a creek distance of about 13.65 miles between transects 1 and 6 (Table 1). Median relative elevations (elevation relative to the channel bottom elevation) ranged from 3.12 (transect 2) to 6.84 feet (transect 6) on Horse Creek.

Table 1. Elevation and distance along the Horse Creek transects (elevations in feet-NAVD88).

Transect	Transect Length (ft)	Maximum Elevation	Channel Bottom Elevation	Maximum Relative Elevation	Median Elevation	Median Relative Elevation	Number of Elevation Data Points
1	552	59.49	52.06	7.43	56.82	4.76	44
2	273	60.80	52.89	7.91	56.01	3.12	30
3	404	56.27	46.01	10.26	51.54	5.53	38
4	654	44.53	37.64	6.89	42.42	4.78	43
5	2,182	40.50	33.38	7.12	37.91	4.53	83
6	1,663	37.96	28.28	9.68	35.12	6.84	74

Elevation profiles of each transect show the location of the primary creek channel, secondary flow channels, off-channel depressional areas or disconnected wetlands, and the distance each vegetative community extended across the transect (Appendix C). Secondary flow channels occurred lateral to the main channel in some transects. Irregular elevations occurred across the floodplain indicative of dynamic erosion and material deposition, producing meandering channels lateral to the primary channel at some locations. Deposited material or previous earthmoving or erosion within the floodplain also created low berms isolating portions of the floodplain from the creek at lower flows in other locations. As an example, Figure 4 shows the elevation profile and associated vegetative community boundaries of transect 5 on Horse Creek.

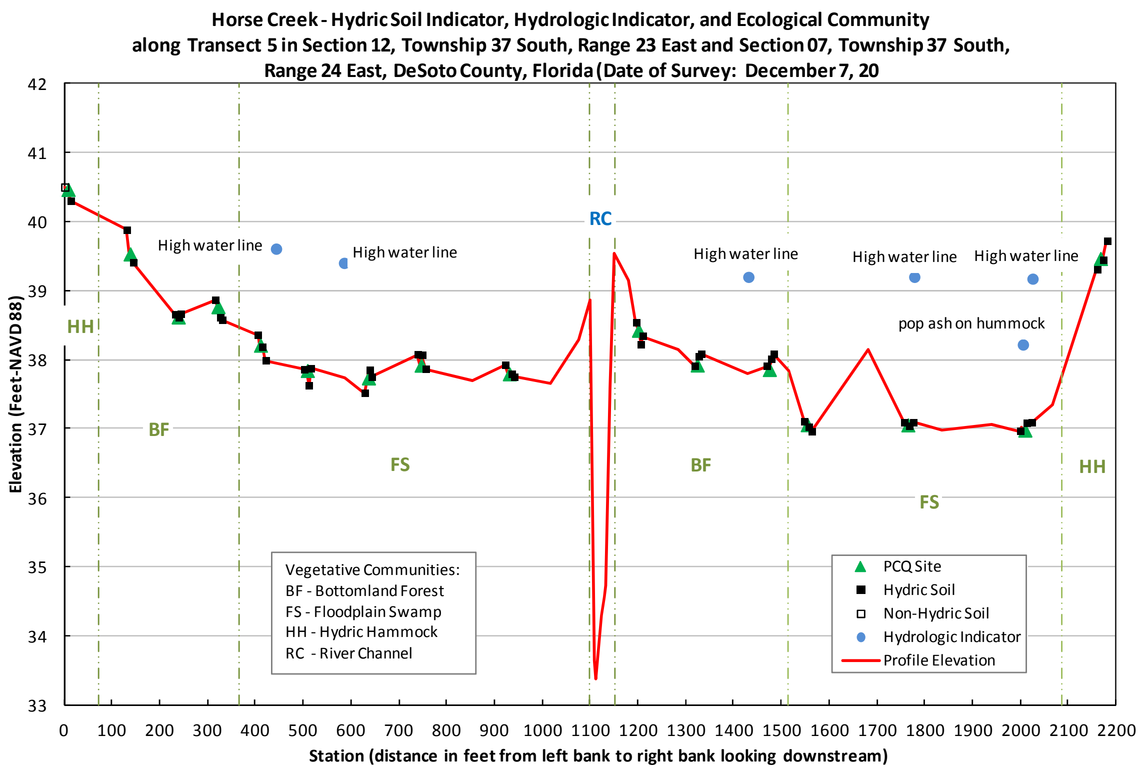


Figure 4. Elevation profile of soils, hydrologic indicators, and vegetation communities along Horse Creek transect 5.

Hydrologic indicators occurred at elevations ranging about 5 to 10 feet above the channel bottom on Horse Creek, and all of them were in the floodplain swamp and bottomland forest vegetation communities (Table 2).

Table 2. Median relative hydrologic indicator elevations by transect and community type for Horse Creek.

Vegetation Class	Horse Creek Transect					
	1	2	3	4	5	6
Floodplain Swamp	58.36	57.89	51.65		39.19	
Bottomland Forest	58.35				39.19	38.38
Hydric Hammock						
Upland Hammock						
Channel bottom Elevation	52.06	52.89	46.01	37.64	33.28	28.28

Shaded cells indicate no data.

3.1.2 Soils

Several dominant soil groups were identified and described in the Horse Creek basin by the Soil Conservation Service (U.S. Department of Agriculture, 1984, 1989, and 1990). "The Pomona-

Floridana-Popash association occurs along the upper Horse Creek channel and includes much of the Brushy Creek drainage basin. This group consists of flat, poorly drained, and very poorly drained soils. The Smyrna-Myakka-Ona and Smyrna-Myakka-Immokalee associations occur predominantly in Hardee and De Soto Counties, and are generally identical soil groups, except where the dark colored subsoil occurs (U.S. Department of Agriculture 1990). These soils occur along the central and southern parts of the Horse Creek basin, and are characterized by flat, poorly-drained soils that are sandy throughout. The soil group Bradenton-Felda-Chobee, which occurs along the area immediately adjacent to the main channel of Horse Creek, from below State Road 64 (Figure 2) to just above the mouth, are flat, poorly to very poorly drained, and are sandy to a depth of 20 to 40 inches. Because the dominant soil groups in the Horse Creek basin generally are poorly drained, infiltration of rainwater to the water table in the surficial aquifer is reduced, limiting the amount of water available to support baseflow. Soil saturation is common throughout the basin in areas identified by standing water. The Arents-Hydraquents-Neilhurst soils group presently (1995) occurs in isolated areas of the extreme upper basin. This group is made up of soils that have been strip-mined for phosphate" (Lewelling 1997).

Hydric soils (all classes) occurred at lower elevations in all transects, within floodplain swamp and bottomland hardwood communities, and at two sites (transects 2 and 5) within the drier hydric hammock communities (Table 3). On transect 2, the median elevation of hydric soils within the hydric hammock community occurred approximately 2.0 feet above the median hydric soil elevation in floodplain swamp. On transect 5, hydric soils occurred at 1.83 feet above the median floodplain swamp hydric soil elevation, and the reason the hydric hammock soils showed sustained wetness was not clear because the transects terminated at the left and right terminal PCQ sites.

The difference in median relative elevation of hydric soils (all classes) between floodplain swamp and bottomland hardwood ranged from -0.56 feet (transect 3) to 1.82 feet (transect 1), and 1.83 feet (transect 5) to 2.16 (transect 2) between floodplain swamp and hydric hammock (Table 3).

All hydric soil samples occurred at lower median elevations than the non-hydric soil samples for the same transect (Table 4 and Figure 5). Non-hydric soils occurred at the ends of transects, generally at or higher than the boundary of the transition bottomland hardwood to the hydric hammock or upland hammock community. Along transects 2, 4, and 5 the soils transition occurred from floodplain swamp to hydric hammock because of the quick transition in elevation.

Cumulatively, hydric soils, flooded (saturated), with muck or peat were at the lowest elevations in transect 5; hydric soils, not flooded, with muck or peat lay slightly higher in transects 1, 2, and 5; hydric soils, flooded, without muck or peat, occurred about 1 foot higher; and non-hydric soils occurred at the highest elevations (Table 4 and Figure 5). Based on a Wilcoxon signed rank test (Appendix I), the hydric versus non-hydric soils median elevations differed significantly ($p < 0.05$).

Table 3. Median elevation (ft-NAVD88) of hydric soils by vegetation class along the Horse Creek transects.

Transect	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
1	54.87	56.69		
2	54.92		57.08	
3	51.90	51.34		
4	40.43	42.16		
5	37.75	38.54	39.58	
6	34.75	35.48		

* Shaded cells indicate absence of conditions.

Table 4. Median elevation of hydric and non-hydric soils along the Horse Creek transects.

Transect	Hydric										Non-Hydric	
	Not Flooded		Flooded (saturated)		With Muck or Peat		With Muck or Peat and Flooded		All Hydric			
1	56.96	(6)	55.82	(1)	54.87	(3)			56.40	(10)	58.82	(4)
2	56.96	(6)			54.64	(5)			55.49	(11)	57.68	(3)
3	51.42	(9)							51.42	(9)	55.52	(3)
4	42.00	(11)							42.00	(11)	43.10	(13)
5	38.08	(33)			37.99	(9)	37.08	(3)	38.01	(45)	40.50	(1)
6	35.17	(21)							35.17	(21)	36.92	(6)

* Shaded cells indicate absence of conditions. Number in parentheses is number of soil samples.

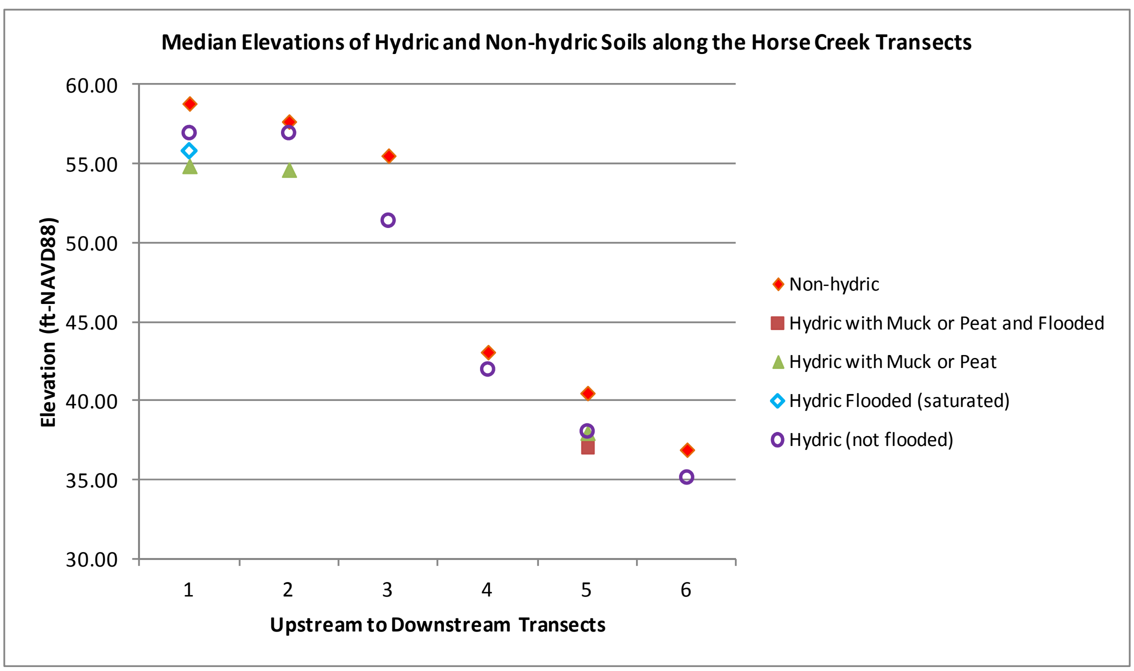


Figure 5. Median elevations of hydric and non-hydric soils along the Horse Creek transects.

3.1.3 Vegetation Communities

3.1.3.1 Vegetation Classes

Importance values — Three wetland communities (vegetation classes) were identified: floodplain swamp, bottomland forest, hydric hammock, plus a drier upland hammock community, not represented equally, on each of the 6 transects of the Horse Creek study corridor (Table 5, IV calculations for each vegetative class are included in Appendix D).

Floodplain Swamp — Floodplain Swamp (FS) was found at lowest elevations within the creek floodplain at eight PCQ locations, and 10 tree species were found within the community. The dominant trees found in this community were usually buttressed hydrophytic trees such as cypress and tupelo occurring in lower elevation areas mostly adjacent to stream channels and low areas; the understory and ground cover were generally very sparse.

Trees with OBL to FAC wetland indicator status ratings dominated the community including pop ash (42.78), which had the highest importance value, accompanied by bald cypress (36.71), water locust (27.95), and laurel oak (14.29). American elm (6.46) and buttonbush (6.00) were the least important trees in this community. Buttonbush was included as a tree instead of a shrub because a few plants had stems ≥ 1"DBH.

Bottomland Forest — Bottomland Forest (BF) was identified at nine PCQ stations, and 13 tree species were found within the community. Bottomland Forest was characterized as a low-lying, closed-canopy forest of tall, straight trees with either a dense shrubby understory and little ground cover, or an open understory and ground cover of ferns, herbs, and grasses.

The community was dominated by trees with OBL to FACU+ wetland indicator status ratings including live oak (100.71), which had the highest importance value, accompanied by cabbage palms (78.57), water locust (22.06), laurel oak (21.33), and American elm (15.42).

Hydric Hammock — Hydric hammock (HH) was identified at seven PCQ sites, and six tree species were found within the community. Hydric Hammock was characterized as a well-developed hardwood and cabbage palm forest with a variable understory often dominated by palms and ferns. This community was dominated by trees with FACW to FACU+ wetland indicator status ratings including live oak, which had the highest importance value (153.39), accompanied by laurel oak (83.26), and cabbage palms (39.79). Water oak (5.75) was the least important tree in this community.

Upland Hammock — Upland hammock was mixed hardwood forested upland, dominated by laurel oak (129.65), live oak (73.09), and sweetgum (52.52), with a few American elm (25.50).

Table 5. Importance values of tree species within vegetation communities on the Horse Creek.

Status[1]	Species	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
FACW	American elm	6.46	15.42		25.50
OBL	bald cypress	36.71	14.03		
OBL	buttonbush	6.00	2.76		19.24
FAC	cabbage palm	27.30	78.57	39.79	
FACW	laurel oak	14.29	21.33	83.26	129.65
FACU+	live oak	40.16	100.71	153.39	73.09
FAC	persimmon			5.85	
OBL	pop ash	116.68	19.63	11.97	
OBL	swamp tupelo	10.30			
FAC+	sweetgum		8.71		52.52
OBL	water locust	27.95	22.06		
FAC	water oak			5.75	
FAC-[2]	honey locust	14.15	3.70		
FAC	groundsel tree		2.68		
FACW+	viburnum		5.60		
FACW-	swamp dogwood		4.80		

Notes: Shaded cells indicate species were not present within community; [1]USFWS Region 2 wetland indicator status; [2]USF Atlas of Vascular Plants FDEP designation FACW.

Indicator categories:

Indicator Code	Wetland Type	Comment
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified. If a species does not occur in wetlands in any region, it is not on the National List.
NA	No agreement	The regional panel was not able to reach a unanimous decision on this species.
NI	No indicator	Insufficient information was available to determine an indicator status.
NO	No occurrence	The species does not occur in a region.

Note: the facultative category can be modified by a positive (+) or negative (-) sign: the (+) sign indicates a frequency towards the wetter end of the category (more frequently found in wetlands) and the (-) sign indicates a frequency towards the drier end of the category (less frequently found in wetlands).

3.1.3.2 Elevations and Vegetation Classes

Within the Horse Creek floodplain, floodplain swamp occurred typically closest to the creek at the lowest elevation, although it also occurred in low areas separated from the creek channel by higher areas of bottomland forest or hydric hammock adjacent to the channel. The sequence of communities occurring from the channel outward to the end of the transect was affected by ridges of higher material that appeared to separate and impound lower areas within the transects. Generally, the highest elevations at the margin of the floodplain furthest from the creek had hydric hammock or the few occurrences of upland hammock (Table 6). Between transects the elevational differences were highly variable, which indicated that the vegetative communities occurred in varying widths within each transect parallel to the creek channel gradient and the width of each community changed transversely across the transects. Based on a Wilcoxon signed ranks test (Appendix I), the median relative elevation of the floodplain swamp vegetation classes differed significantly with that of bottomland forest and hydric hammock ($p < 0.05$).

Table 6. Vegetation community median, average, minimum, and maximum elevations along the Horse Creek transects (elevation in feet-NGVD88).

Transect	Vegetation Community Type	Total Number of PCQ Sites	Median Elevation	Average Elevation	Minimum Elevation	Maximum Elevation
1	Floodplain Swamp	1	54.82	54.82	54.82	54.82
	Bottomland Forest	3	56.91	56.88	56.54	57.20
	Hydric Hammock	1	58.92	58.92	58.92	58.92
2	Floodplain Swamp	3	55.19	55.13	54.20	56.01
	Hydric Hammock	2	57.60	57.60	57.19	58.00
3	Floodplain Swamp	2	52.03	52.03	51.34	52.73
	Bottomland Forest	1	51.29	51.29	51.29	51.29
	Upland Hammock	1	56.27	56.27	56.27	56.27
4	Floodplain Swamp	1	41.03	41.03	41.03	41.03
	Bottomland Forest	3	42.38	42.20	41.83	42.38
	Hydric Hammock	4	43.49	43.42	42.62	44.08
5	Floodplain Swamp	8	37.77	37.58	36.98	38.21
	Bottomland Forest	6	38.53	38.52	37.86	39.54
	Hydric Hammock	2	39.97	39.97	39.47	40.47
6	Floodplain Swamp	2	34.64	34.64	34.29	34.99
	Bottomland Forest	6	35.43	35.53	34.71	36.43
	Upland Hammock	2	37.10	37.10	37.09	37.11

The difference in median relative elevation between the floodplain swamp and bottomland forest, bottomland forest and hydric hammock was 3.39 feet and 3.60 feet, respectively (Table 7).

Table 7. Aggregated median elevations and differences in elevation between vegetation communities along the Horse Creek (elevation in feet-NGVD88).

Elevation	FS	BF	UH	HH	BH-FS	UH-BF	UH-FS	HH-FS	HH-BF	HH-UH
Median	46.53	42.38	46.69	50.55	-4.15	0.16	4.31	4.02	8.17	3.86
Median relative elevation	3.89	5.15	9.54	6.22	1.26	5.65	4.39	2.33	1.07	-3.32

FS = Floodplain Swamp; BF = Bottomland Forest; HH= Hydric Hammock; UH = Upland Hammock

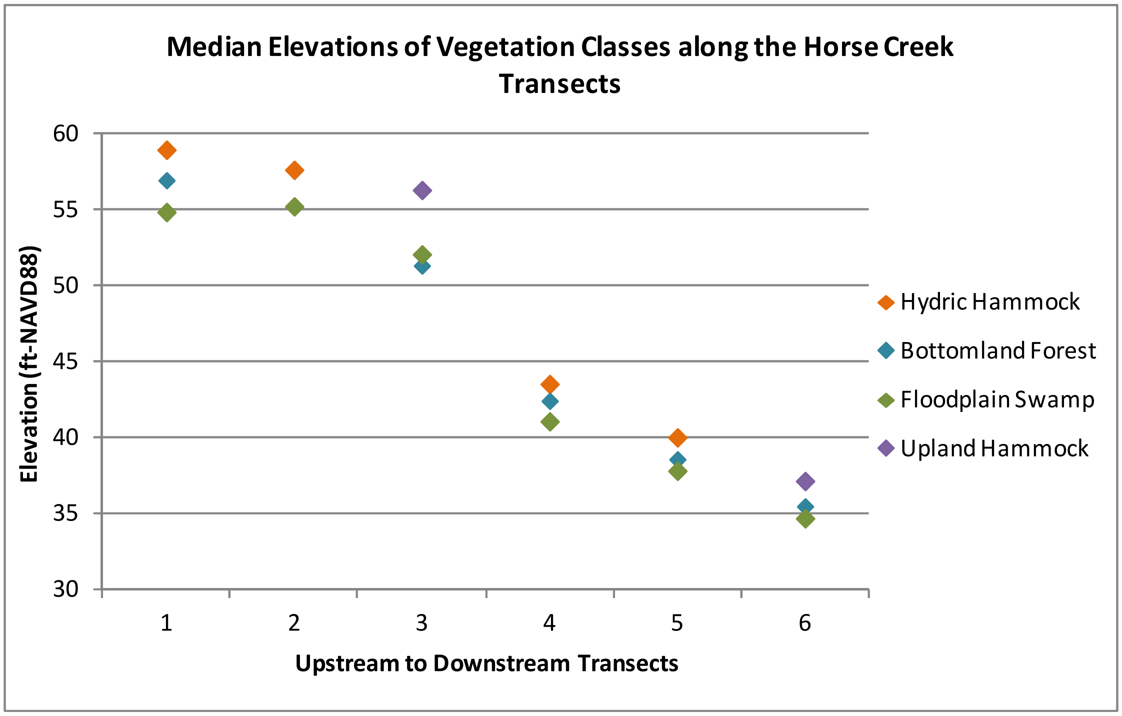


Figure 6. Median elevations of vegetation classes along the Horse Creek transects.

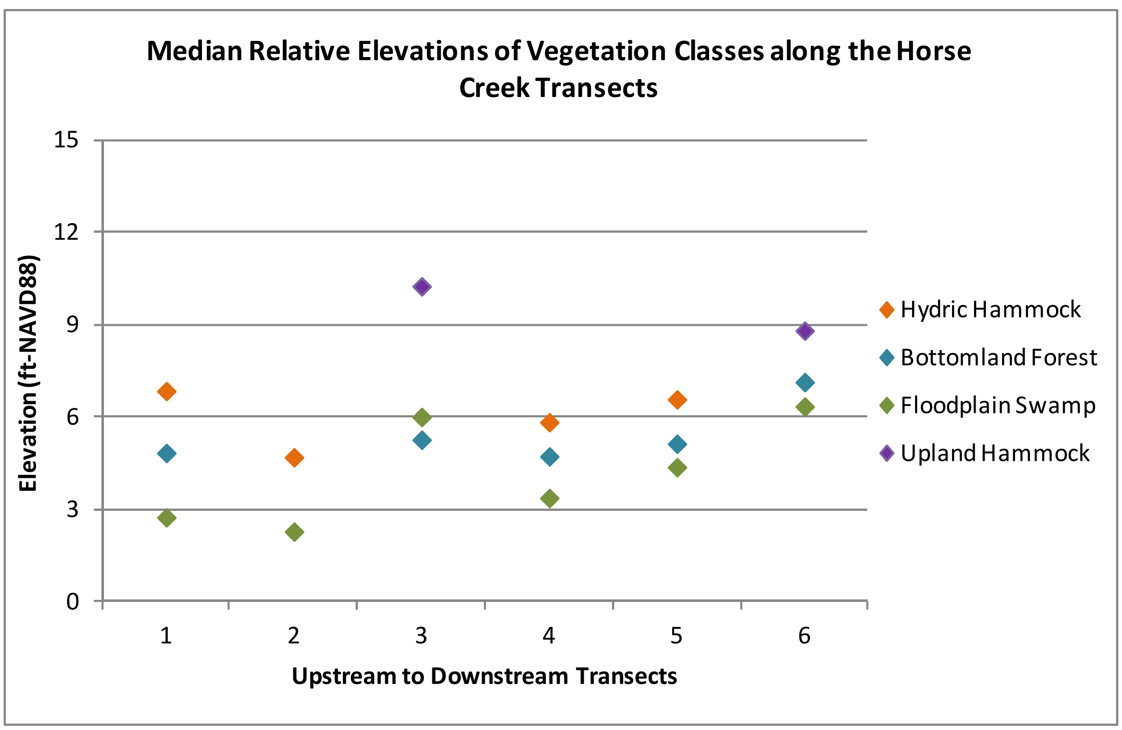


Figure 7. Median relative elevations of vegetation classes along the Horse Creek transects.

3.1.3.3 Wetted Perimeter

Floodplain swamp and bottomland hardwood are the vegetation communities likely to be affected most by changes in water level occurring at lower levels within the floodplain (Table 10, individual plots are included in Appendix E). Total wetted perimeter is the relationship between the linear wetted length of a transect versus the creek stage and increases with creek stage. For example, in transect 6 of the Horse Creek, if the creek stage were level with the median elevation for the bottomland forest class, then 229 feet of floodplain swamp and 681 feet of bottomland forest would be inundated at and below the median elevation of the bottomland forest class (Table 8).

Typically, a sigmoidal wetted perimeter curve evinces a large increase in habitat across a small elevation gradient within a floodplain. Changes in wetted perimeter are also typically greater over more gradual changes in elevation than across steeper gradients.

Table 8. Wetted perimeter (linear feet) by vegetative class along the Horse Creek transects.

Transect	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
1	133	151		
2	98		NA	
3	103	143		NA
4	70	NA	NA	
5	789	928	NA	
6	229	681		609

Notes: Shaded cells indicate absence of vegetation class; NA = not available because the median elevation of the vegetation class is outside of the wetted perimeter range; transects 1 to 6 are from upstream to downstream.

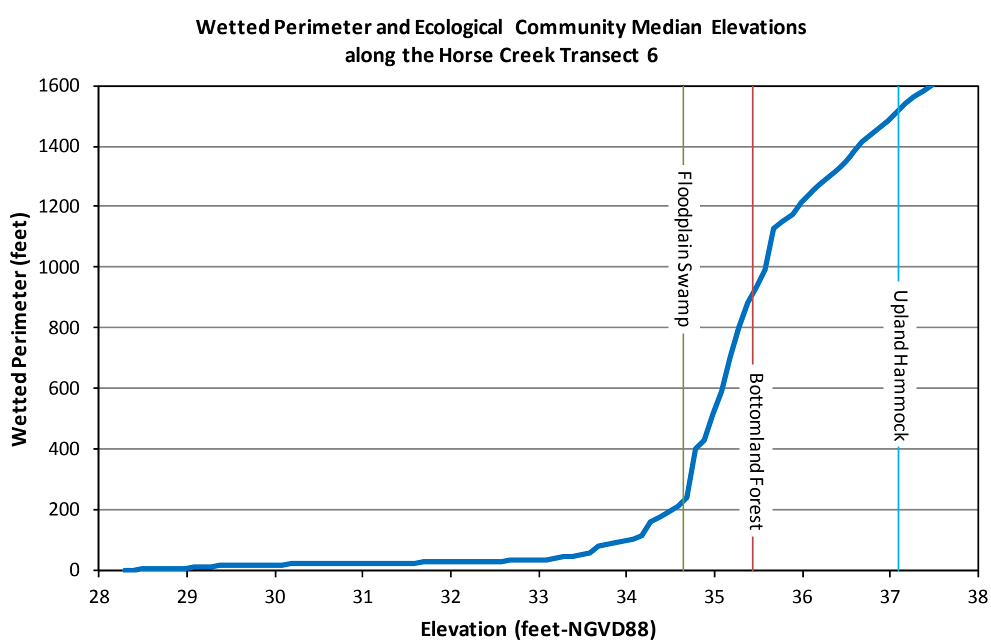


Figure 8. Wetted perimeter and ecological community median elevations along Horse Creek transect 6.

3.2 Charlie Creek

3.2.1 Elevations

The Charlie Creek channel gradient was about 1.73 feet/mile, estimated based on a median elevation difference of 18.20 ft over a creek distance of about 10.5 miles between transects 1 and 7 (Table 9). Median relative elevations (elevation relative to the channel bottom elevation) ranged from 7.34 (transect 1) to 12.22 feet (transect 5) on Charlie Creek.

Table 9. Elevation and distance along the Charlie Creek transects (elevations in feet-NAVD88).

Transect	Transect Length (ft)	Maximum Elevation	Channel Bottom Elevation	Maximum Relative Elevation	Median Elevation	Median Relative Elevation	Number of Elevation Data Points
1	487	53.50	44.76	8.74	52.10	7.34	44
2	807	49.27	37.93	11.34	46.35	8.42	54
2.5	1,192	47.07	36.45	10.62	45.55	9.10	72
4.5	456	43.19	29.41	13.78	40.66	11.25	53
5	259	45.84	27.08	18.76	39.30	12.22	44
6	848	39.97	25.85	14.12	35.84	9.99	73
7	730	41.29	23.57	17.72	33.39	9.82	76

Elevation profiles of each transect show the location of the primary creek channel, secondary flow channels, off-channel depressional areas or disconnected wetlands, and the distance each vegetative community extended across the transect (Appendix F). Secondary flow channels occurred lateral to the main channel in some transects. Irregular elevations indicative of dynamic erosion and material deposition occurred across the floodplain, producing meandering channels lateral to the primary channel at some locations. Deposited material or previous earthmoving or erosion within the floodplain also created low berms, isolating portions of the floodplain from the creek at lower flows in other locations. As an example, Figure 9 shows the elevation profile and associated vegetative community boundaries of transect 1 on Charlie Creek.

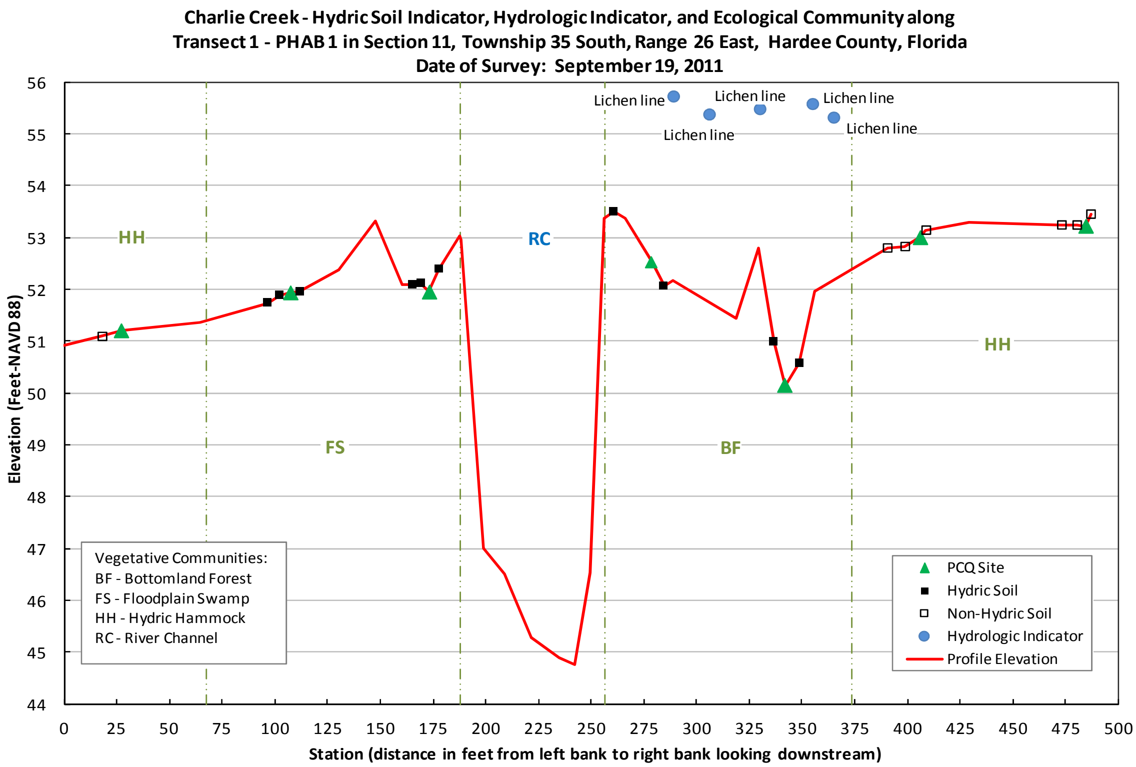


Figure 9. Elevation profile of soils, hydrologic indicators, and vegetation communities along Charlie Creek transect 1.

Hydrologic indicators occurred at elevations ranging about 10.14 to 13.64 feet above the channel bottom, within the floodplain swamp and bottomland forest vegetation communities (Table 10).

Table 10. Median relative hydrologic indicator elevations by transect and community type for Charlie Creek.

Vegetation Class	Charlie Creek Transect						
	1	2	2.5	4.5	5	6	7
Floodplain Swamp		51.25		43.05			35.12
Bottomland Forest	55.48		50.09				33.71
Hydric Hammock							
Upland Hammock							
Channel bottom	44.76	37.93	36.45	29.41	27.08	25.85	23.57

Note: shaded cells indicate no data.

3.2.2 Soils

Charlie creek basin is located within Southern Florida Flatwoods subecoregion of the Southern Coastal Plain, which is characterized by low, flat topography, over which water movement to natural streams, wetlands and ponds is very slow. The soils are relatively poorly drained, acidic and sandy. Much of the native pine flatwoods have been replaced by pasture and rangeland, spreading urbanization, citrus groves, and extensive phosphate mining (EPA 2010). Charlie Creek corridor is also characterized by the most frequently flooded sandy and loamy Bradenton-Felda-Chobee soils that typify the Peace River corridor upstream to Bartow (PBSJ 2007).

Hydric soils (all classes) occurred distributed at lower elevations in all transects, within floodplain swamp and bottomland hardwood communities, and on transects 2, possibly a backflow channel, 4.5, possibly a seepage, and 5, possibly a seepage, within the drier hydric hammock communities (Table 11, Figure 10). On transect 2, hydric soils occurring within the hydric hammock community were below the approximate elevation of elevated lichen lines closer to the creek channel. On transects 4.5 and 5, hydric soils occurred at two sites moving up-slope, and were likely related to an area where subsurface seepage increased the soil moisture sufficiently that the soil met one of the hydric soil tests.

Table 11. Median elevation (ft-NAVD88) of hydric soils by vegetation class along the Charlie Creek transects.

Transect	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
1	52.02	51.53		
2	43.39	46.37	47.54	
2.5	42.05	45.92		
4.5	36.46		41.11	37.06
5			40.17	
6	33.56	34.45		
7	33.38	35.68		

* Shaded cells indicate absence of conditions.

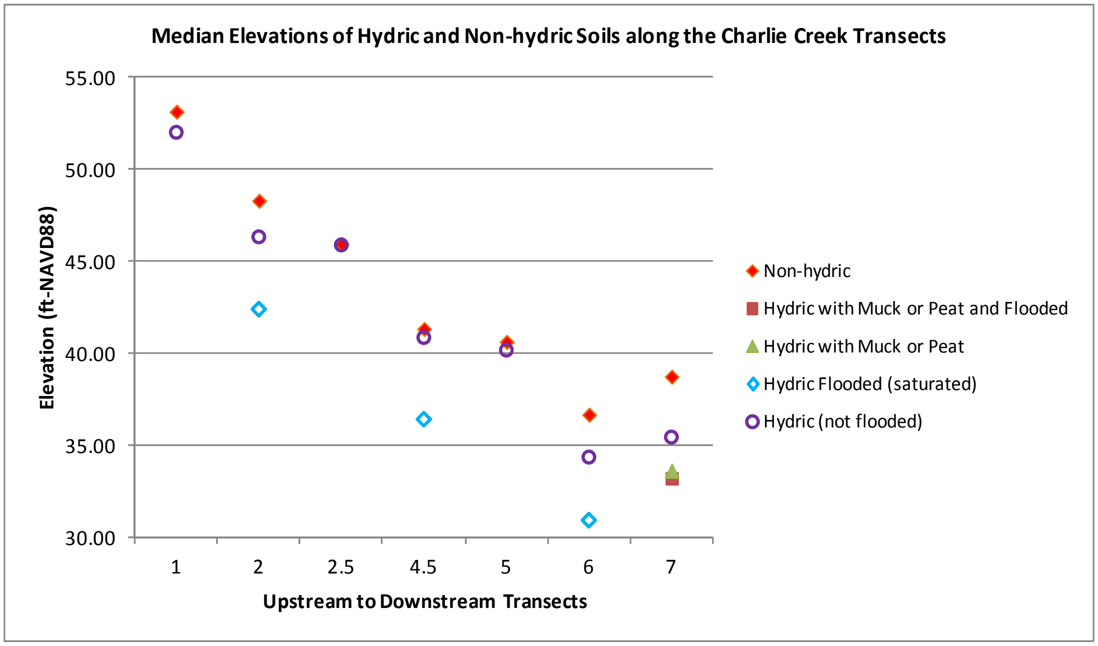
Cumulatively, hydric soils, flooded (saturated), with muck or peat were at the lowest elevations; hydric soils, not flooded, with muck or peat lay slightly higher; hydric soils, flooded, without muck or peat occurred at higher elevations; and non-hydric soils occurred at the highest elevations (Table 12). Based on a Wilcoxon signed rank test (Appendix I), the median elevations of the grouped hydric versus non-hydric soils differed significantly ($p < 0.05$).

Table 12. Median elevation of hydric and non-hydric soils along the Charlie Creek transects

Transect	Hydric										Non-Hydric	
	Not Flooded		Flooded (saturated)		With Muck or Peat		With Muck or Peat and Flooded		All Hydric			
1	52.01	(10)							52.01	(10)	53.15	(7)
2	46.33	(15)	42.39	(2)					46.23	(17)	48.31	(6)
2.5	45.89	(24)							45.89	(24)	45.96	(11)
4.5	40.85	(3)	36.41	(2)					37.15	(5)	41.33	(13)

5	40.17	(2)							40.17	(2)	40.63	(10)
6	34.35	(8)	30.91	(2)					34.24	(10)	36.67	(12)
7	35.44	(5)			33.62	(1)	33.21	(5)	33.62	(11)	38.74	(6)

* Shaded cells indicate absence of conditions. Number in parentheses is number of soil samples.



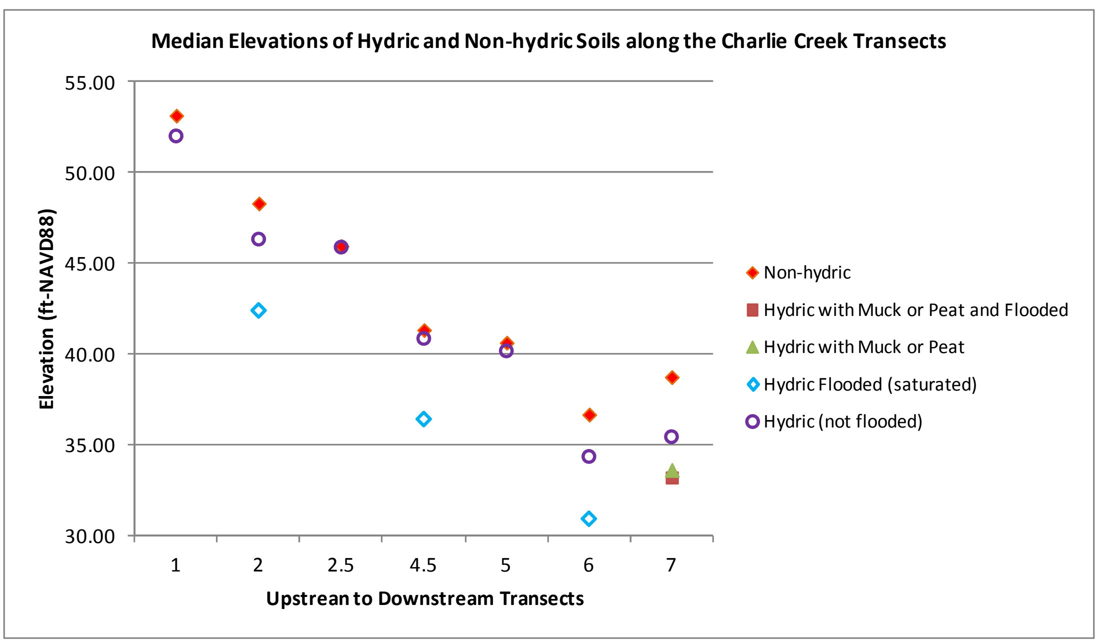


Figure 10. Median elevations of hydric and non-hydric soils along the Charlie Creek transects.

3.2.3 Vegetation Communities

3.2.3.1 Vegetation Classes

Importance values — Four wetland communities (vegetation classes) were identified: floodplain swamp, bottomland forest, hydric hammock, plus a drier upland hammock community, not represented equally, on each of the 7 transects of the Charlie Creek study corridor (Table 13, IV calculations for each vegetative class are included in Appendix D).

Floodplain Swamp — Floodplain Swamp (FS) was found generally closest to the creek channel or in deep depressions in 11 PCQ locations and 9 tree species were found within the community. The dominant trees had OBL to FACU+ wetland indicator status ratings including pop ash (121.81), which had the highest importance value, accompanied by bald cypress (75.89), cabbage palms (60.43, a facultative tree that has a very broad hydrologic tolerance), and laurel oak (12.24), as sub-dominants.

Bottomland Forest — Bottomland Forest (BF) was identified at 23 PCQ station locations, and 11 tree species occurred, dominated by trees with OBL to FACU+ wetland indicator status ratings including cabbage palms (82.25), which had the highest importance value, laurel oak (99.16), accompanied by live oak (61.89), pop ash (31.38), and sweetgum (20.56) as sub-dominants.

Hydric Hammock — Hydric Hammock (HH) was identified at 18 PCQ station locations and 6 tree species were found within the community. Hydric Hammock is characterized as a well-developed hardwood and cabbage palm forest with a variable understory often dominated by palms and ferns. This community was dominated by trees with FACW to FACU+ wetland indicator status ratings including cabbage palm (121.83), which had the highest importance value, with live oak (93.28), laurel oak (47.59), and sweetgum (17.50) as sub-dominants. The species richness was similar to the floodplain swamp community.

Upland Hammock — Upland Hammock (UH) was identified at 18 PCQ station locations, and 6 tree species. This community was dominated by trees with FACW to FACU+ wetland indicator status ratings including laurel oak (85.40), with sub-dominants including sweetgum (58.32), cabbage palm (43.86), and live oak (34.85).

Table 13. Importance values of tree species within vegetation communities on Charlie Creek.

Status[1]	Species	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
OBL	bald cypress	75.89	11.76		
FACW	bay				7.34
OBL	buttonbush	4.67			
FAC	cabbage palm	60.43	132.76	121.83	43.86
OBL	Carolina willow		7.23		
FACW	laurel oak	12.24	114.14	47.59	85.40
FACU+	live oak	10.17	61.89	93.28	34.85
FACU	pignut hickory		3.51		
OBL	pop ash	121.81	31.38		
OBL	red maple		3.68		
FAC+	sweetgum	4.72	20.56	17.50	58.32
OBL	water locust	5.50			
FACW	viburnum		5.07		

Status[1]	Species	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
FACW	possumhaw	4.58	3.47	11.24	15.68
FACU	wild orange			8.56	

Notes: Blank cells indicate species were not present; [1] USFWS Region 2 wetland indicator status.

Indicator categories:

Indicator Code	Wetland Type	Comment
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified. If a species does not occur in wetlands in any region, it is not on the National List.
NA	No agreement	The regional panel was not able to reach a unanimous decision on this species.
NI	No indicator	Insufficient information was available to determine an indicator status.
NO	No occurrence	The species does not occur in that region.

Note: The facultative category can be modified by a positive (+) or negative (-) sign: the (+) sign indicates a frequency towards the wetter end of the category (more frequently found in wetlands) and the (-) sign indicates a frequency towards the drier end of the category (less frequently found in wetlands).

3.2.3.2 Elevations and Vegetation Classes

In all transects, the vegetative communities were separated by elevation, with floodplain swamp lying closest to the creek at the lowest elevation or at the lowest elevations of off-channel depressions, bottomland forest lying between floodplain swamp and hydric hammock at an intermediate elevation or at an intermediate elevation relative to the creek top-of-bank, and hydric hammock or upland hammock lying at the highest elevations at the margin of the floodplain furthest from the creek or on elevated ridges nearer to the creek (Tables 14 and 15). Between transects, the elevational differences were highly variable, which indicated that the vegetative communities occurred in varying widths within each transect parallel to the creek channel gradient and the width of each community changed transversely across the transects. Based on a Wilcoxon signed rank test (Appendix I), there is a significant difference between the median relative elevations of floodplain swamp and bottomland forest, floodplain swamp and hydric hammock, and floodplain swamp and upland hammock ($p < 0.05$).

Table 14. Vegetation community median, average, minimum, and maximum elevations along the Charlie Creek transects (elevation in feet-NGVD88)

Transect	Vegetation Community Type	Total Number of PCQ Sites	Median Elevation	Average Elevation	Minimum Elevation	Maximum Elevation
1	Floodplain Swamp	2	51.94	51.94	51.94	51.95
	Bottomland Forest	2	51.34	51.34	50.15	52.54
	Hydric Hammock	3	53.00	52.48	51.20	53.22
2	Floodplain Swamp	3	43.41	43.41	43.17	43.66
	Bottomland Forest	2	46.16	46.16	46.12	46.20
	Hydric Hammock	4	48.33	48.25	47.36	49.00
2.5	Floodplain Swamp	1	41.95	41.95	41.95	41.95
	Bottomland Forest	11	45.83	45.74	43.74	47.02
4.5	Floodplain Swamp	1	36.04	36.04	36.04	36.04
	Bottomland Forest	1	39.84	39.84	39.84	39.84
	Hydric Hammock	2	41.29	41.29	40.93	41.66
	Upland Hammock	3	41.44	41.64	40.62	42.85
5	Bottomland Forest	1	35.59	35.39	35.39	35.39
	Hydric Hammock	3	40.81	40.88	40.42	41.41
	Upland Hammock	1	45.74	45.74	45.74	45.74
6	Floodplain Swamp	1	33.08	33.08	33.08	33.08
	Bottomland Forest	5	35.71	34.66	30.93	36.37
	Hydric Hammock	4	38.36	38.35	36.72	39.97
7	Floodplain Swamp	3	33.52	33.08	30.91	34.81
	Bottomland Forest	1	36.23	36.23	36.23	36.23
	Hydric Hammock	2	38.56	38.56	38.53	38.58
	Upland Hammock	1	41.29	41.29	41.29	41.29

The difference in median relative elevation between the floodplain swamp and bottomland forest, and bottomland forest and hydric hammock was 2.48 feet and 2.82 feet, respectively (Table 17).

Table 15. Aggregated median elevations and differences in elevation between vegetation communities along the Charlie Creek (elevation in feet-NGVD88)

Elevation	FS	BF	UH	HH	BH-FS	UH-BF	UH-FS	HH-FS	HH-BF	HH-UH
Median	39.00	39.84	41.44	41.05	0.84	2.44	1.60	2.05	1.21	-0.39
Median relative elevation	6.91	9.38	17.72	12.20	2.48	10.82	8.34	5.29	2.82	-5.53

FS = Floodplain Swamp; BF = Bottomland Forest; UH = Upland Hammock; HH= Hydric Hammock

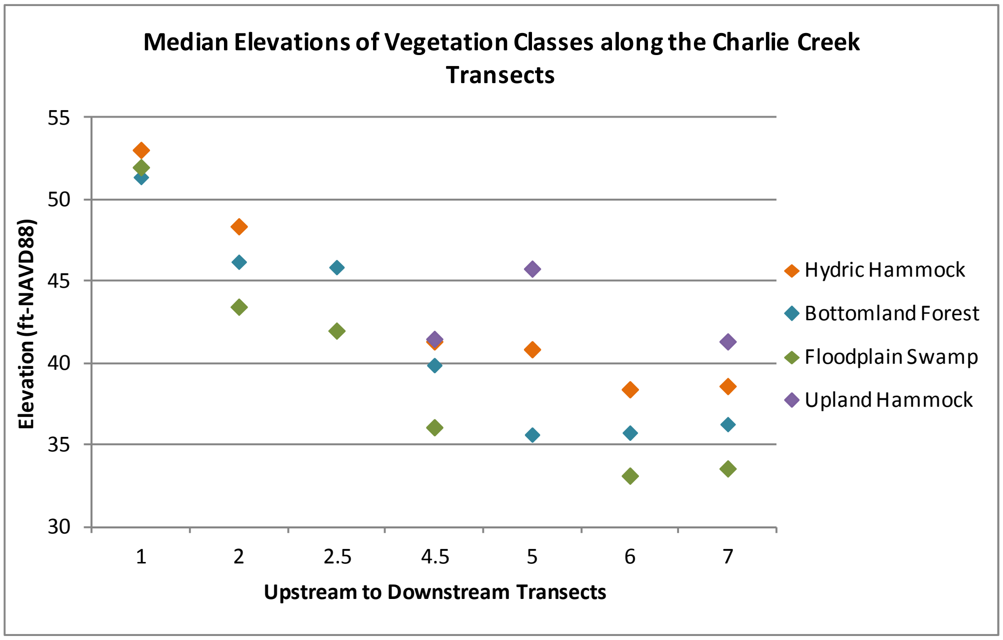


Figure 11. Median elevations of vegetation classes along the Charlie Creek transects.

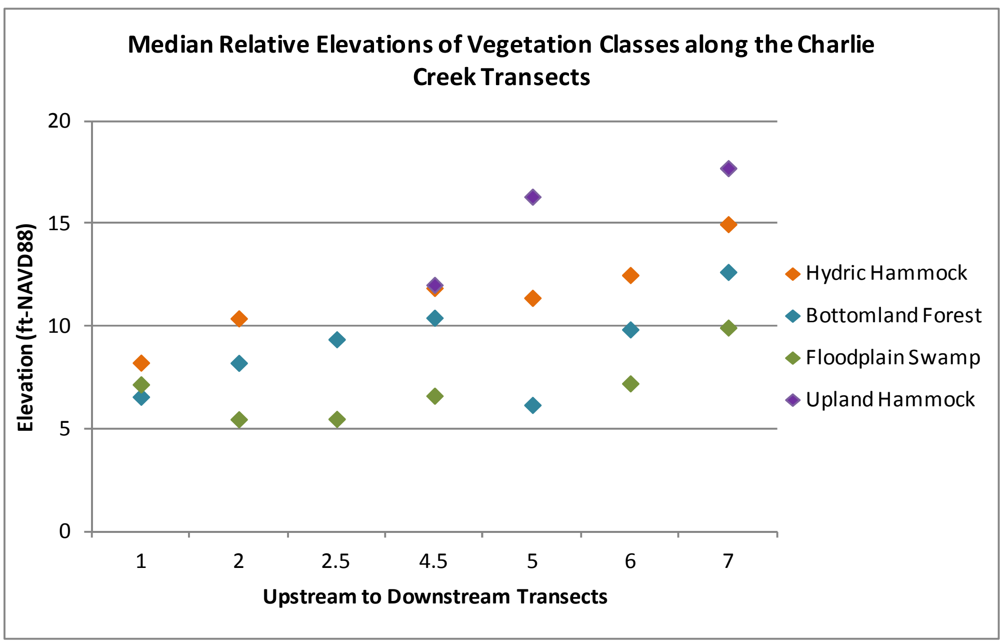


Figure 12. Median relative elevations of vegetation classes along the Charlie Creek transects.

3.2.3.3 Wetted Perimeter

Floodplain swamp and bottomland hardwood are the vegetation communities most likely to be affected by changes in water level occurring at lower levels within the floodplain (Table 18, individual plots are included in Appendix E). Total wetted perimeter is the relationship between the linear wetted length of a transect versus the creek stage, and increases with creek stage.

For example, in transect 2, if the creek stage were level with the median elevation for the bottomland forest class, then 130 feet of floodplain swamp and 163 feet of bottomland forest would be inundated at and below the median elevation of the bottomland forest class. If the creek stage were to rise to the median elevation of the hydric hammock class, then 403 feet of hydric hammock, plus all the bottomland forest and all the floodplain swamp would be inundated (Table 16).

Typically, a sigmoidal wetted perimeter curve evinces a large increase in habitat across a small elevation gradient within a floodplain. Changes in wetted perimeter are also typically greater over more gradual changes in elevation than across steeper gradients.

Table 16. Wetted perimeter (linear feet) by vegetative class along the Charlie Creek transects.

Transect	Floodplain Swamp	Bottomland Forest	Hydric Hammock	Upland Hammock
1	NA	NA	NA	
2	130	163	403	
2.5	78	NA		
4.5	64	75	NA	NA
5		67	106	NA
6	151	255	NA	
7	306	271	NA	NA

Notes: Shaded cells indicate absence of vegetation class; NA = not available because the median elevation of the vegetation class is outside of the wetted perimeter range; transects 1 to 7 are from upstream to downstream.

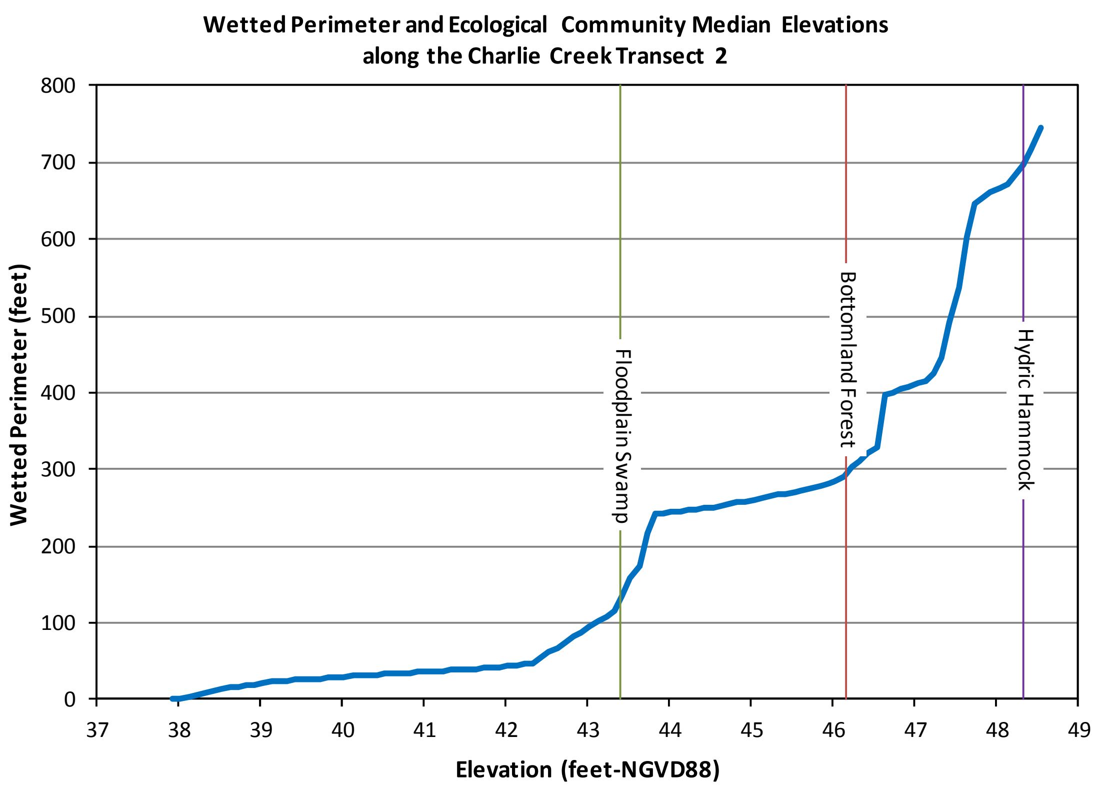


Figure 13. Wetted perimeter and ecological community median elevations along Charlie Creek transect 2.

4.0 CONCLUSIONS

4.1 Horse Creek

Horse Creek had an average topographic gradient of 1.59 ft/mile, and encompassed a relatively narrow floodplain with varying areas of forested wetlands along each transect. The floodplain profiles showed complex topography, which was consistent with site observations that secondary channels or backflow depressions were separated from the creek channel flow-way by areas of higher elevation.

Hydric soils were concentrated in the lower elevations within floodplain swamps and bottomland hardwood communities.

The floodplain vegetation was separated into three wetland communities using the FNAI plant community definitions: floodplain swamp, bottomland hardwood, and hydric hammock. Floodplain swamp was dominated by higher values of popash, water locust, and cabbage palm with low values of cypress and tupelo.

Water locust, laurel oak, American elm, mixed with cabbage palm and live oak, dominated bottomland forest.

Hydric hammock was dominated by live oak, laurel oak, and cabbage palm, with a low frequency of water oak.

Elevated lichen lines and water stain lines were noted as the most representative hydrologic indicators of prior prolonged inundation events, but were used minimally to interpret historic inundation because so few were found on each transect.

Significant observations regarding the vegetation communities were:

- The three communities were not present on all transects, and did not have the same wetted perimeter lengths on each transect.
- Floodplain swamp and bottomland hardwood had hydric soils consistently, with a few exceptions, while hydric hammock had non-hydric soils except for two or three sites with hydric soils probably sustained by backwater impoundment or side-slope seepage.
- Species richness was highest in bottomland hardwood and lower in hydric hammock and floodplain swamp.
- Hydric hammock had no cypress or tupelo.

Transects

1. Several hydrologic indicators occurred east of the top of bank of the creek channel within the flood plain and forest at about elev. 58.5 feet, indicating persistent high water levels around 4.5 feet above the lowest floodplain swamp elevation. The creek flow would exceed 59.5 feet to overtop the creek channel and inundate the area. Popash and buttonbush trees recorded at PCQ site 30101 occurred about one foot downslope of the sample site and were discounted in the community type characterization.

2. Persistent water stain lines were observed on two cypress trees approximately 3.0-4.0 feet above the lowest floodplain swamp elevation within depressions about 175 feet east of the creek channel, and the channel top of bank would have been over-topped by at least one foot of water to inundate the depressions where the cypress grew and produce the water stains.
3. PCQ site 30301 had buttonbush about six feet downhill (elev. 50.5 feet – near PCQ site 30302); it was discounted from the community type characterization.
4. The floodplain swamp on the east side of the creek channel was approximately two feet below the creek channel top of bank.
5. Elevated water stain lines were observed at approximately 39.5 feet, about 2.5 feet above the lowest floodplain swamp elevation in the floodplain.
6. Elevated water stain lines were observed on several cypress trees about 4.5 feet above the lowest floodplain swamp elevation in the floodplain.

4.2 Charlie Creek

Charlie Creek had an average topographic gradient of 1.73 ft/mile, and encompassed a relatively narrow floodplain with varying areas of forested wetlands along each transect. The floodplain profiles show complex topography, which is consistent with site observations that secondary channels or backflow depressions are separated from the creek channel flow-way by areas of higher elevation

The floodplain vegetation was separated into three communities using the FNAI plant community definitions: floodplain swamp, bottomland hardwood, and hydric hammock. Floodplain swamp was dominated by higher values of popash, cypress, and cabbage palm with low values of laurel oak, sweetgum, and water locust.

Bottomland forest was dominated by cabbage palm, laurel oak, live oak, pop ash, sweetgum, with a few bald cypress.

Hydric hammock was dominated by cabbage palm, live oak, laurel oak, and sweetgum.

Elevated lichen lines and water stain lines were noted as the most representative hydrologic indicators of prior prolonged inundation events, but were used minimally to interpret historic inundation because so few were found on each transect.

Significant observations regarding the vegetation communities were:

- The three communities were not present on all transects, and did not have the same wetted perimeter lengths on each transect.
- Floodplain swamp and bottomland hardwood had hydric soils consistently, with a few exceptions, while hydric hammock had non-hydric soils except for two or three sites with hydric soils probably sustained by side slope seepage.
- Species richness was highest in bottomland hardwood and lower in hydric hammock and floodplain swamp.
- Floodplain swamp had the greatest IV for cypress, with a few cypress present in bottomland hardwood.

- Hydric hammock had no cypress.

Transects

1. Elevated lichen lines on the north side of the creek were approx. 5.4 feet above the lowest elevation of the bottomland forest.
2. Elevated lichen lines on the north side of the creek were approx. 9.0 feet above the lowest elevation of the floodplain swamp.

2.5 Elevated lichen lines on the north side of the creek were approx. 8.5 feet above the lowest elevation of the floodplain swamp.

2.6 Elevated lichen lines on the south side of the creek were approx. 7.0 feet above the lowest elevation of the floodplain swamp.

5. The upper elevations of hydric hammock were approx. 5.0 feet below the elevation of the upland hammock.
6. Hydric hammock elevations ranged 5.0-9.0 feet above the lowest floodplain swamp elevations.
7. Elevated water stain lines were approx. 7.0 feet above the lowest floodplain swamp elevations.

5.0 REFERENCES

Cottam, G., and J. T. Curtis. 1956. The use of distance measures in phytosociological sampling. Ecology 373):451-460.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Wetlands Research Program Technical Report Y-87-1, U.S. Army Corps of Engineer Waterways Experiment Station, Vicksburg, MS 39180-6199.

Florida Department of Environmental Protection. 1992. Vegetative and Hydric Soil Field Indicators lists for Chapter 62-340, F.A.C. Wetland Evaluation and Delineation Section, Florida Department of Environmental Protection, Tallahassee, Florida. http://www.dep.state.fl.us/water/wetlands/delineation/docs/field_indicators_booklet.pdf. Accessed 23 February 2012.

Florida Department of Environmental Protection. 2011. Wetland vegetation index. http://www.dep.state.fl.us/water/wetlands/delineation/vegindex/vegindex.htm. Accessed 11/23/2011.

Florida Natural Areas Inventory (FNAI). 2010. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

HSW Engineering, Inc. 2012. Characterization of elevation, soils, and vegetation relationships in the riparian corridors of the North and South Prongs of the Alafia River. Tampa, Florida. Prepared for Southwest Florida Water Management District, Brooksville, Florida.

Lee, T.M., L.A. Sacks, and J.D. Hughes. 2010. Effect of Groundwater Levels and Headwater Wetlands on Streamflow in the Charlie Creek Basin, Peace River Watershed, West-Central Florida. Prepared in cooperation with the Southwest Florida Water Management District. Scientific Investigations Report 2010-5189. U.S. Department of the Interior and U.S. Geological Survey.

Lewelling, B.R. 1997. Hydrologic and Water-Quality Conditions in the Horse Creek Basin, West-Central Florida, October 1992-February 1995. Prepared in cooperation with the Southwest Florida Water Management District. Water-Resources Investigations Report 97-4077. U.S. Department of the Interior and U.S. Geological Survey.

Mitchell, K. 2007. Quantitative analysis by the point-centered quarter method. http://people.hws.edu/mitchell/PCQM.pdf. Accessed 12/1/2011.

Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. Wiley, New York.

PBSJ, 2007. FINAL REPORT for the Peace River Cumulative Impact Study Prepared for Florida Department of Environmental Protection, Bureau of Mine Reclamation and the Southwest Florida Water Management District. 5300 West Cypress Street, Suite 300 Tampa, Florida 33607-1712.

Uranowski, C., Z. Lin, M. DelCharco, C. Huegel, J. Garcia, I. Bartsch, M. S. Flannery, S. J. Miller, J. Bacheler, and W. Ainslie. 2003. A regional guidebook for applying the hydrogeomorphic approach to assessing wetland functions of low-gradient, blackwater riverine wetlands in peninsular Florida. ERDC/EL TR-03-3, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

U.S. Department of Agriculture, 1984, Soil Conservation Service, Soil survey of Hardee County, Florida, 139 p.

U.S. Department of Agriculture, 1989, Soil Conservation Service, Soil survey of De Soto County, Florida, 170 p.

U.S. Department of Agriculture, 1990, Soil Conservation Service, Soil survey of Polk County, Florida, 235 p.

United States Department of Agriculture (USDA), Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. USDA - Soil Conservation Service, Washington, D. C.

United States Department of Agriculture (USDA), Natural Resources Conservation Service. 1991.Hydric Soils of the United States. In cooperation with the National Technical Committee for Hydric Soils. USDA-SCS, Washington, DC.

United States Department of Agriculture (USDA), Natural Resources Conservation Service. 2011. Interpreting wetland indicator status. http://plants.usda.gov/wetinfo.html. Accessed 11/23/2011.

US EPA Region 4 (EPA Region 4). March 2010. TOTAL MAXIMUM DAILY LOAD (TMDL) For Fecal Coliforms In Little Charlie Creek (WBID 1774) and Thompson Branch (WBID 1844). 61 Forsyth Street SW Atlanta, Georgia 30303.

APPENDIX A

FIELD SHEETS

Horse Creek - Soils Data Field Sheets, Page 1 TRANSECT #: ______________________

All soils data for 1 transect. Each transect will have new soils sheet and numbering scheme.

Date: ____________ ***Minimum 50 cm (19.7 inches) depth for soil sample***

Staff: ____________ ***YELLOW FLAGS 36" labeled... Ex: First Sampling on Transect 1 is numbered: TR1-S1, TR1-S2, TR1-S3.***

Three (3) soil sampling points at each vegetation sampling station (V-staon):

- TR*S1 (soil sample 1 at each transect Vegetation location) is to be taken at 5 feet from center of PCQ in direction of transect entry.
- TR*-S2 (soil sample 2 at each transect Vegetation location) is to be taken at 5 feet in direction of transect exit terminus
- TR*-S3 (soil sample 3at each transect Vegetation location) is to be taken at 10 feet in direction of transect exit terminus.

TR*-S4 = FIRST soil sample at second vegetation station

SEQUENTIAL SOIL NUMBERING THROUGHOUT TRANSECT, per SWFWMD request versus using C & V designations

	SOIL INDEX (put check mark in 1 box for each sample)								
Soil Sample Flag (ex:T1-S1)	NOT Hydric	Hydric (NOT flooded)	Hydric, Flooded (Saturated)	Hydric with muck/peat	Hydric w/ muck/peat & Flooded (Saturated)	% Organic Coating	Soil Type	Texture - description	Prominent features: ex: scarps, levees

Horse Creek - Soils Data Field Sheets - PAGE 2 (continued from page 1)

Date: ____________________

Staff:

TRANSECT #: ____

	SOIL INDEX (put check mark in 1 box for each sample)								
Soil Sample Flag (ex:T1-S1)	NOT Hydric	Hydric (NOT flooded)	Hydric, Flooded (Saturated)	Hydric with muck/peat	Hydric w/ muck/peat & Flooded (Saturated)	% Organic Coating	Soil Type	Texture - description	Prominent features: ex: scarps, levees

ADDITIONAL NOTES:

Point Center Quarter (PCQ) VegetatonSampling Data Sheet : Alafia River South Prong

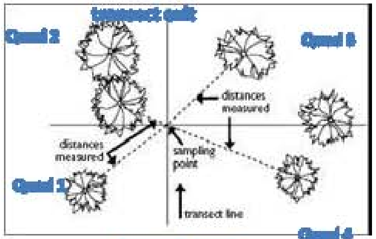
1 (one) Data Sheet for each Plant Community, in each Transect

Transect-Community PINK Flag ID: (ex: "10304) ______________

Date: ______________________

Staff: ______________________

QUADRANT LAYOUT : for each Veg Station (V)



WHITE FLAGS 36", at center of PCQ apparatus. Unique ID's start with "3". Ex: "30823" signify that it is PCQ Vegetation Sample, in transect #8, and is the 23rd PCQ Sample per that transect

** Hyrdologic Indicator - ORANGE SURVEY Tape. Unique ID's start with "7". "70101" signify that it is Hydrologic indicator, in transect #1, and is the 1st vegetation sample for that transect.*

PCQ Veg Station (min 3)	WHITE Flag ID # (starts with "3")	PCQ Quad #	Nearest Tree Species (from center)	Distance to Nearest Tree (ft)	Diameter Nearest Tree (in)	Nearest Shrub Species (from center)	Distance to Nearest Shrub (ft)	Dominant Shrub Vegetation Species Names and % Coverage (within 1 meter of PCQ center, all directions)	Dominant Herbaceous Vegetation Species Names and % Coverage (within 1 meter of PCQ center, all directions)	Hyrdrologic Indicator number and info (ex: 70101-moss collar)
V1		**1**								
		2								
		3								
		4								
V2		**1**								
		2								
		3								
		4								
V3		**1**								
		2								
		3								
		4								
V4		1								
		2								
		3								
		4								
V5		1								
		2								
		3								
		4								

*Sampling to start approx 15 feet into community (C) and every 50 feet. Minimum of 3 samples maximum of samples PER COMMUNITY

* Shrubs: plants shorter than 50cm (19.7 in), & diameter less than 2.54cm (1 in). Trees:plants with diameter > 2.54cm (1 inch), Tree diameter is measured 137 cm from ground(59.7 inches)

*Each Quarter of PCQ, species of nearest shrub and shrub distance to center of PCQ is measured.

Hydraulic Indicators: Insert Nail with attached ORANGE SURVEY TAPE in trees showing each indicator: cypress knees, lichen or moss lines, scarps, cypress buttress inflection

- If possible mark the EOW (Edge of Wetland) or water ward limit of saw palmettos
- Must mark the Lower elevation of moss collars on mature tree species

Put Additional Notes on Back if needed

APPENDIX B

VEGETATION SPECIES LIST

Common Name	Scientific Name	Common Name	Scientific Name
red maple	Acer rubrum	red mulberry	Morus rubra
peppervine	Ampelopsis arborea	wax myrtle	Myrica cerifera
Poaceae grass	Avena sativa	sword fern	Nephrolepsis exaltata
carpetgrass	Axonopus sp.	water tupelo	Nyssa aquatica
groundsel tree	Baccharis halimifolia	blackgum	Nyssa sylvatica
Alabama supple jack	Berchemia scandens	swamp tupelo	Nyssa sylvatica var. biflora
swamp fern	Blechnum serrulatum	woodsgrass	Oplismenus hirtellus
false nettle	Boehmeria cylindrica	royal fern	Osmunda regalis
American beautyberry	Callicarpa americana	skunk vine	Paederia foetida
Long's sedge	Carex longii	savannah picnic grass	Panicum gymnocarpum
warty sedge	Carex verrucosa	maidencane	Panicum hemitomon
ironwood	Carpinus caroliniana	switchgrass	Panicum virgatum
American hornbeam	Carpinus caroliniana	Virginia creeper	Parthenocissus quinquefolia
water hickory	Carya aquatica	Paspalum grass	Paspalum sp.
pignut hickory	Carya glabra	swamp bay	Persea palustris
sugarberry	Celtis laevigata	bay	Persea sp.
spadeleaf	Centella asiatica	slash pine	Pinus elliotti
buttonbush	Cephalanthus occidentalis	Carolina laurelcherry	Prunus caroliniana
Nuttall's thistle	Cirsium nuttallii	wild coffee	Pyschotria nervosa
tangerine	Citrus reticulata	laurel oak	Quercus laurifolia
sour orange	Citrus x aurantium	water oak	Quercus nigra
sweet orange	Citrus x aurantium	live oak	Quercus virginiana
sawgrass	Cladium jamaicense	inundated beakrush	Rhynchospora inundata
swamp dogwood	Cornus foemina	sawtooth blackberry	Rubus argutus
Bermuda grass	Cynodon dactylon	blackberry	Rubus sp.
ponysfoot	Dichondra sp.	curly dock	Rumex crispus
persimmon	Diospyros virginiana	dwarf palmetto	Sabal minor
tropical chickweed	Drymaria cordata	cabbage palm	Sabal palmetto
southern wood fern	Dryopteris ludoviciana	coastal rose gentian	Sabatia calycina
fireweed	Erechtites hieracifolia	Carolina willow	Salix caroliniana
dog fennel	Eupatorium capillifolium	elderberry	Sambucus nigra subsp.
false fennel	Eupatorium leptophyllum	Chinese tallow	Sapium sebiferum
pop ash	Fraxinus caroliniana	lizard's tail	Saururus cernuus
water locust	Gleditsia aquatica	Florida bully	Sideroxylon reclinatum
loblolly bay	Gordonia lasianthus	saw greenbrier	Smilax bona-nox
pennywort	Hydrocotyle umbellata	bald cypress	Taxodium distichum
myrtleleaf St John's-wort	Hypericum myrtifolium	Willdenow's fern	Thelypteris interrupta
four petal St John's-wort	Hypericum tetrapetalum	Thelypteris fern	Thelypteris sp.
dahoon holly	Ilex cassine	poison ivy	Toxicodendron radicans
inkberry	Ilex glabra	winged elm	Ulmus alata
cogongrass	Imperata cylindrica	American elm	Ulmus americana
Virginia sweetspire	Itea virginica	caesar weed	Urena lobata
red cedar	Juniperus virginiana	highbush blueberry	Vaccinium corymbosum
sweetgum	Liquidambar styraciflua	common blue violet	Viola sororia
bugleweed	Lycopus rubellus	possumhaw	Virburnum nudum
fetterbush	Lyonia lucida	muscadine grape	Vitis rotundifolia
southern magnolia	Magnolia grandiflora	Virginia chain fern	Woodwardia virginica
sweetbay	Magnolia virginiana	viburnum	Viburnum nudum
honey locust	Gleditsia triacanthos		

APPENDIX C

HORSE CREEK TRANSECT ELEVATION PROFILES

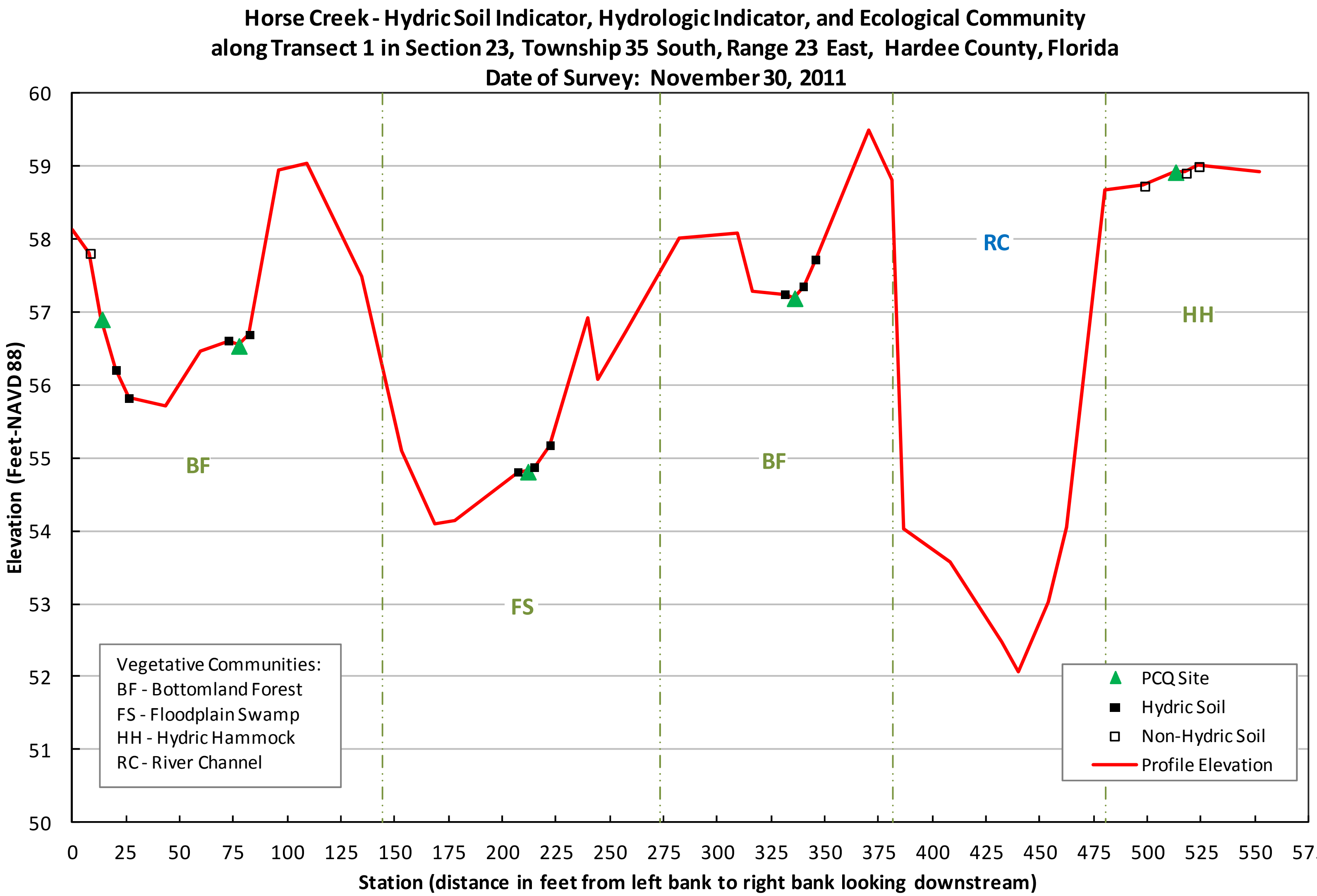


Figure C-1. Elevation profile for Horse Creek transect 1

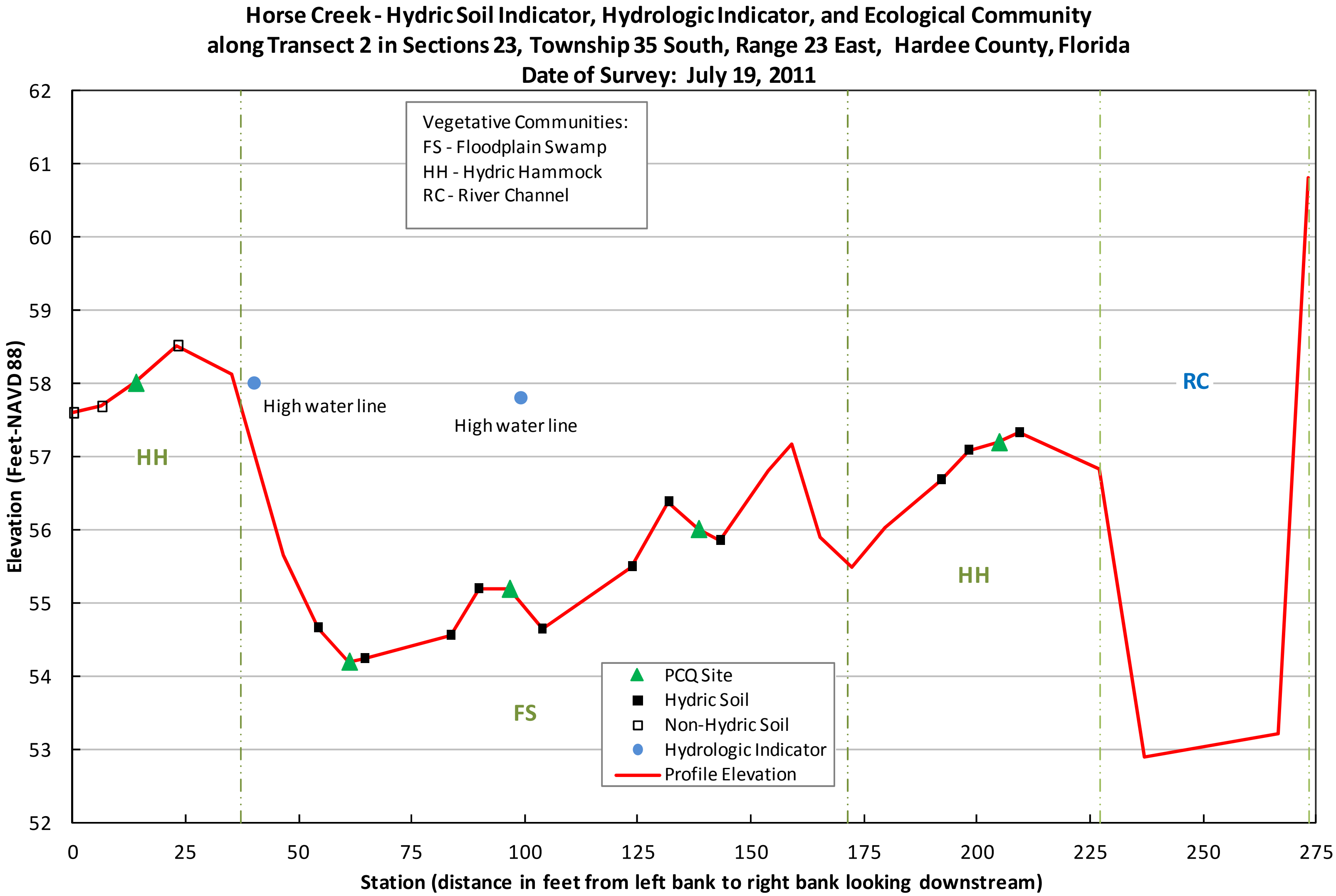


Figure C-2. **Elevation profile for Horse Creek transect 2**

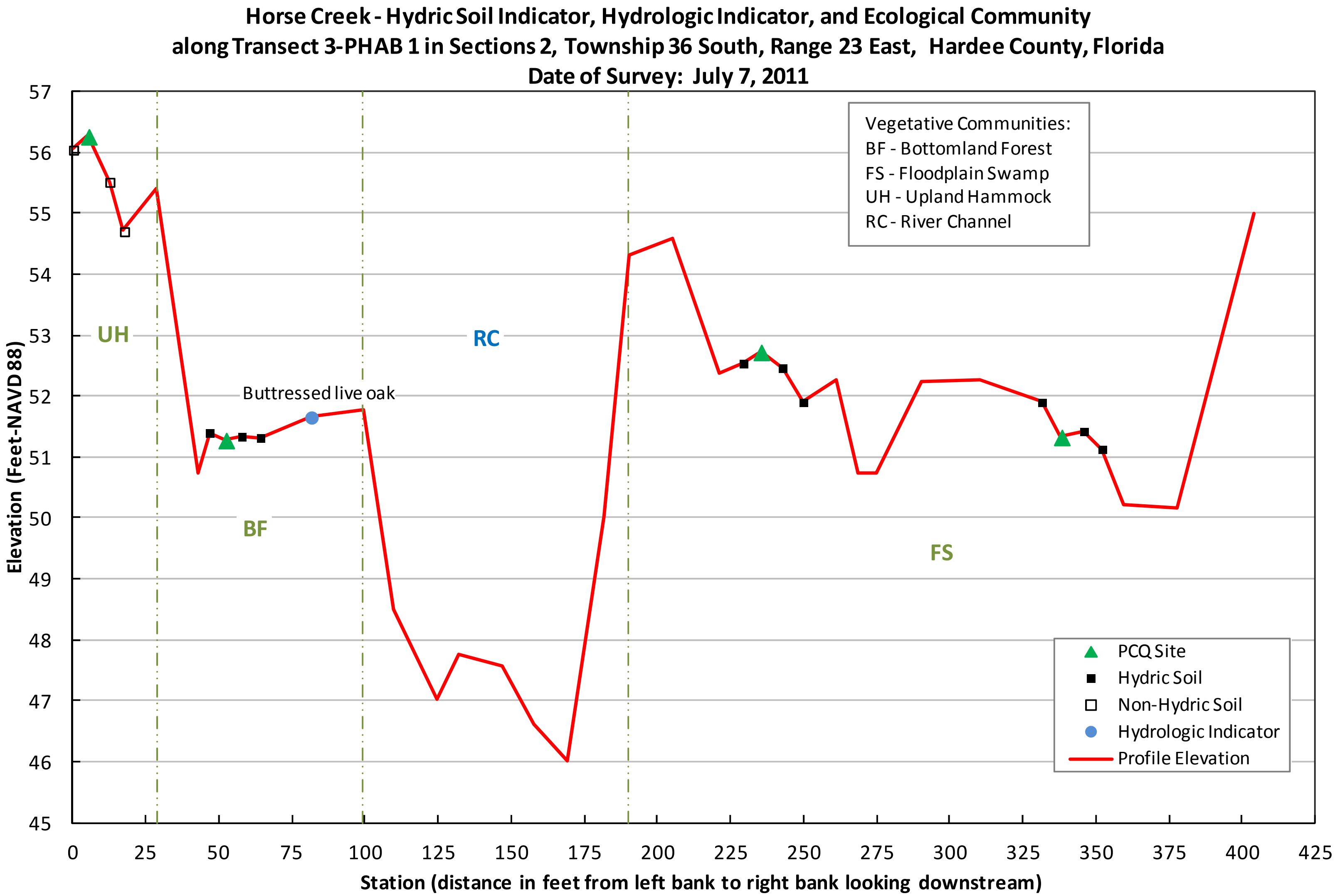


Figure C-3. **Elevation profile for Horse Creek transect 3**

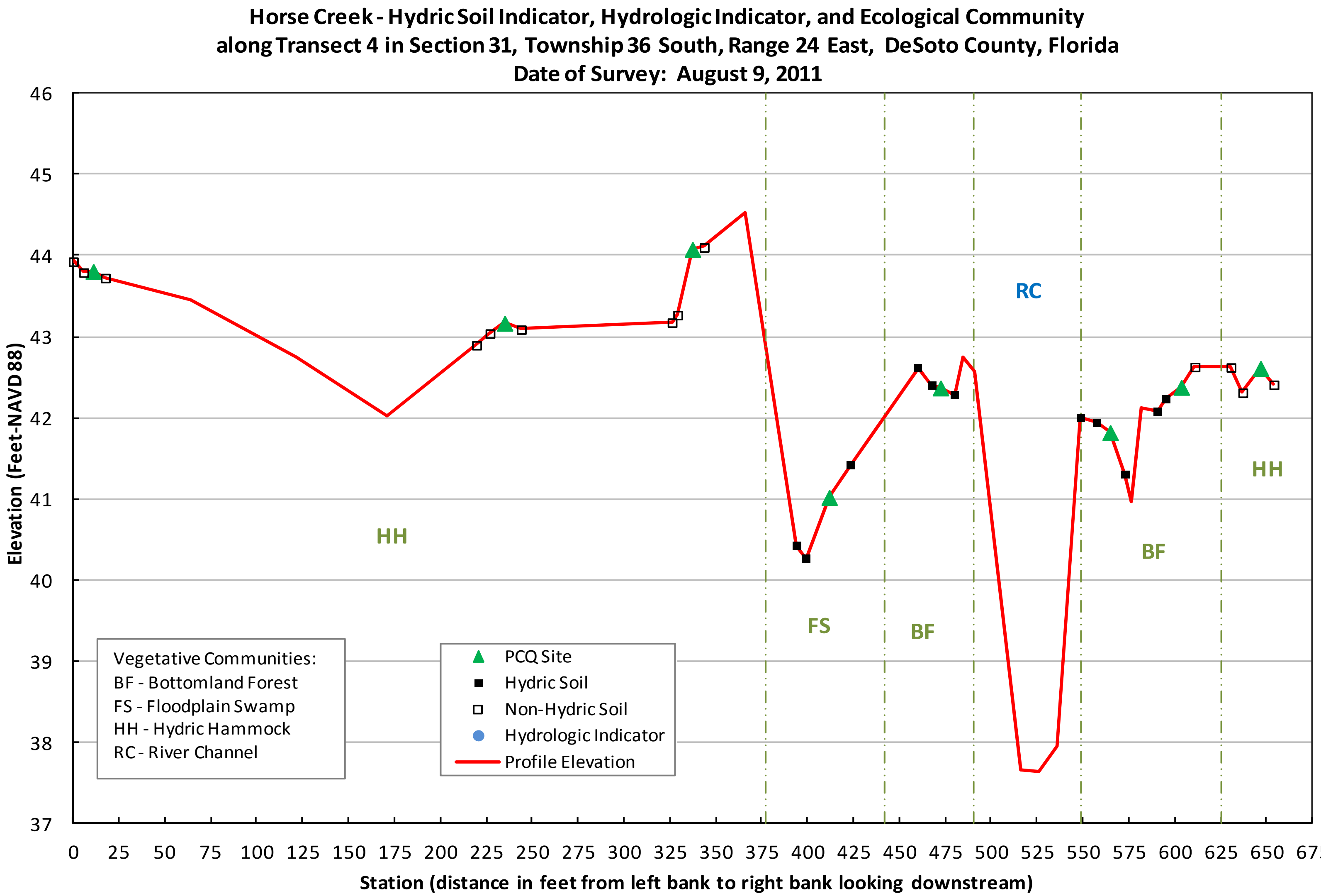


Figure C-4. **Elevation profile for Horse Creek transect 4**

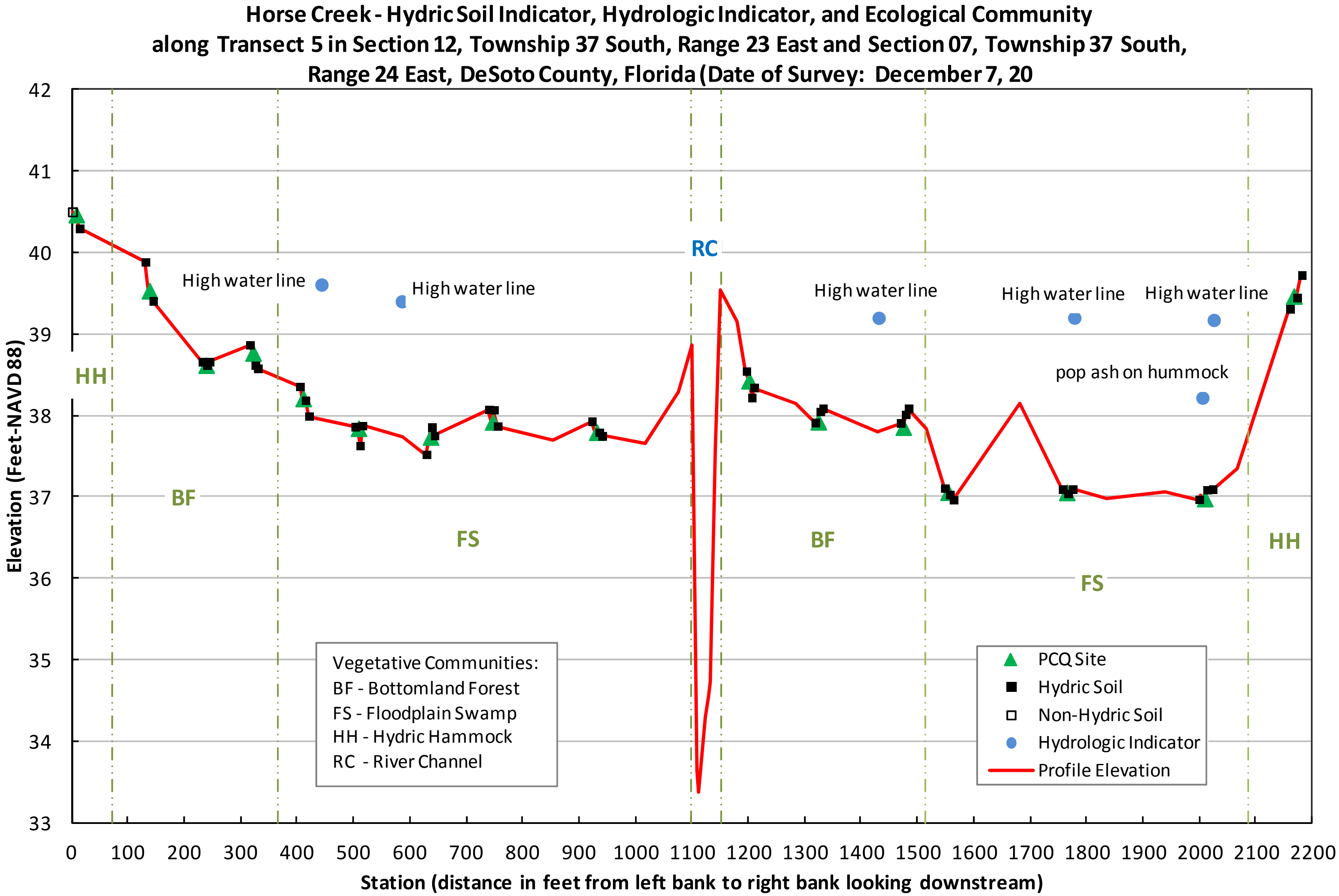


Figure C-5. **Elevation profile for Horse Creek transect 5**

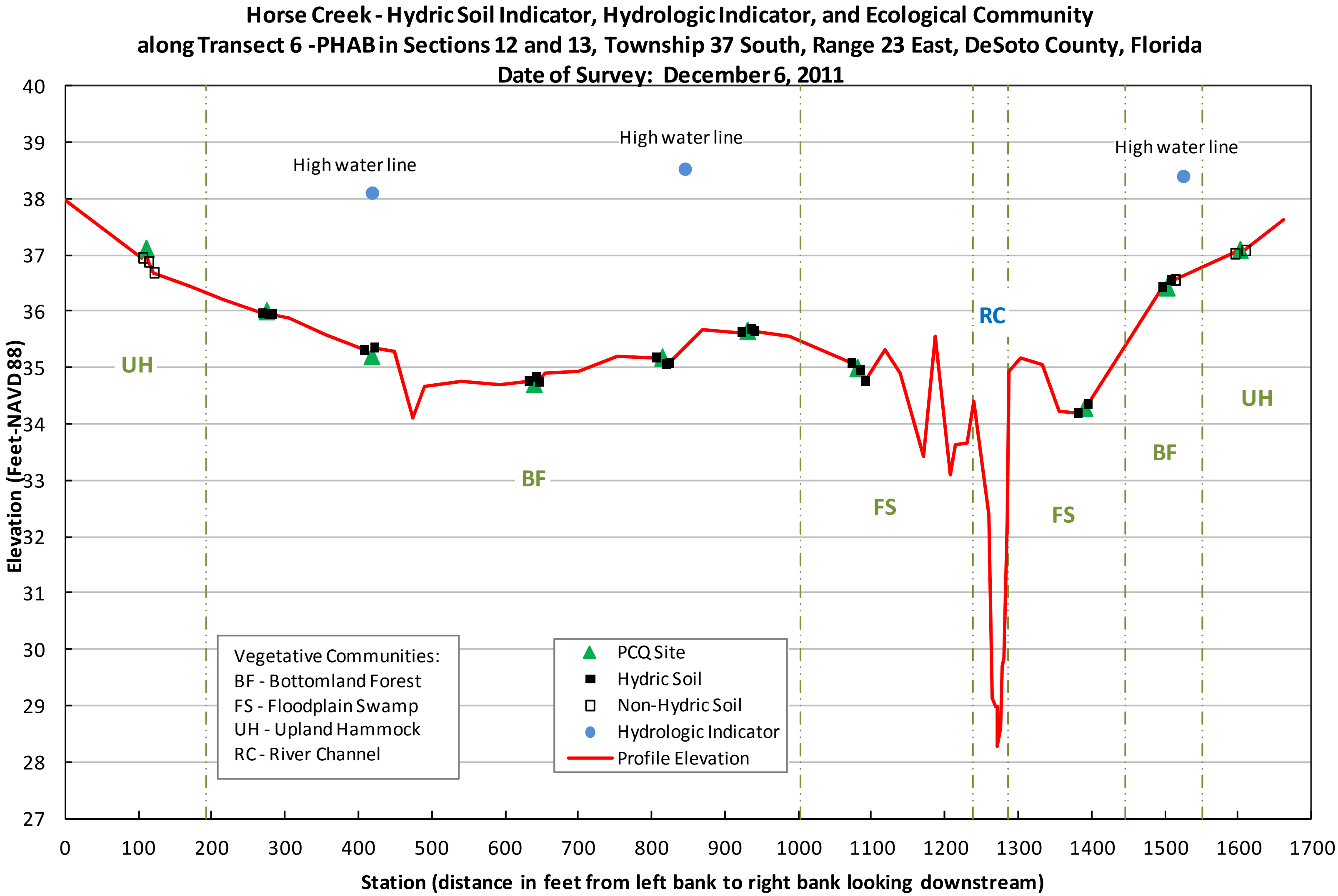


Figure C-6. **Elevation profile for Horse Creek transect 6**

APPENDIX D

HORSE CREEK IMPORTANCE VALUES OF TREE SPECIES
BY VEGETATION CLASS

Table D-1. Importance values of tree species for floodplain swamp vegetation community for the Horse Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
american elm	Ulmus americana	2	6.00	0.08	0.02	52.09	2.94	0.04	0.58	2.94	2.94	6.46
buttonbush	Cephalanthus occidentalis	2	2.75	0.03	0.00	52.09	2.94	0.01	0.12	2.94	2.94	6.00
cabbage palm	Sabal palmetto	6	14.17	0.18	0.10	156.28	8.82	0.61	9.65	8.82	8.82	27.30
laurel oak	Quercus laurifolia	4	8.88	0.11	0.04	104.18	5.88	0.16	2.53	5.88	5.88	14.29
live oak	Quercus virginiana	5	25.20	0.32	0.32	130.23	7.35	1.61	25.45	7.35	7.35	40.16
pop ash	Fraxinus caroliniana	24	15.48	0.20	0.12	625.11	35.29	2.91	46.09	35.29	35.29	116.68
swamp tupelo	Nyssa sylvatica var. biflora	3	7.83	0.10	0.03	78.14	4.41	0.09	1.48	4.41	4.41	10.30
water locust	Gleditsia aquatica	9	4.53	0.06	0.01	234.41	13.24	0.09	1.48	13.24	13.24	27.95
bald cypress	Taxodium distichum	9	11.92	0.15	0.07	234.41	13.24	0.65	10.24	13.24	13.24	36.71
honey locust	Gleditsia triacanthos	4	8.63	0.11	0.04	104.18	5.88	0.15	2.39	5.88	5.88	14.15

Table D-2. Importance values of tree species for bottomland forest vegetation community for the Horse Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
american elm	Ulmus americana	5	7.30	0.09	0.03	118.07	6.67	3.19	2.08	6.67	6.67	15.42
buttonbush	Cephalanthus occidentalis	1	3.50	0.04	0.01	23.61	1.33	0.15	0.10	1.33	1.33	2.76
cabbage palm	Sabal palmetto	20	12.70	0.16	0.08	472.27	26.67	38.58	25.23	26.67	26.67	78.57
laurel oak	Quercus laurifolia	5	14.30	0.18	0.10	118.07	6.67	12.23	8.00	6.67	6.67	21.33
live oak	Quercus virginiana	17	20.41	0.26	0.21	401.43	22.67	84.66	55.37	22.67	22.67	100.71
pop ash	Fraxinus caroliniana	7	4.19	0.05	0.01	165.30	9.33	1.47	0.96	9.33	9.33	19.63
sweetgum	Liquidambar styraciflua	3	5.50	0.07	0.02	70.84	4.00	1.09	0.71	4.00	4.00	8.71
water locust	Gleditsia aquatica	8	3.42	0.04	0.01	188.91	10.67	1.12	0.73	10.67	10.67	22.06

groundsel tree	Baccharis halimifolia	1	1.40	0.02	0.00	23.61	1.33	0.02	0.02	1.33	1.33	2.68
viburnum	Viburnum nudum	2	4.13	0.05	0.01	47.23	2.67	0.41	0.27	2.67	2.67	5.60
bald cypress	Taxodium distichum	4	10.38	0.13	0.05	94.45	5.33	5.15	3.37	5.33	5.33	14.03
honey locust	Gleditsia triacanthos	1	11.50	0.15	0.07	23.61	1.33	1.58	1.03	1.33	1.33	3.70
Swamp dogwood	Cornus foemina	1	16.50	0.21	0.14	23.61	1.33	3.26	2.13	1.33	1.33	4.80

Table D-3. Importance values of tree species for hydric hammock vegetation community for the Horse Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
cabbage palm	Sabal palmetto	4	14.63	0.19	0.11	209.44	11.43	22.69	16.93	11.43	11.43	39.79
laurel oak	Quercus laurifolia	12	7.87	0.10	0.03	628.31	34.29	19.69	14.69	34.29	34.29	83.26
live oak	Quercus virginiana	15	15.10	0.19	0.12	785.38	42.86	90.69	67.67	42.86	42.86	153.39
persimmon	Diospyros virginiana	1	2.60	0.03	0.00	52.36	2.86	0.18	0.13	2.86	2.86	5.85
pop ash	Fraxinus caroliniana	2	3.70	0.05	0.01	104.72	5.71	0.73	0.54	5.71	5.71	11.97
water oak	Quercus nigra	1	1.25	0.02	0.00	52.36	2.86	0.04	0.03	2.86	2.86	5.75

Table D-4. Importance values of tree species for upland hammock vegetation community for the Horse Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
american elm	Ulmus americana	1	10.00	0.13	0.05	142.77	8.33	7.23	8.83	8.33	8.33	25.50
buttonbush	Cephalanthus occidentalis	1	5.40	0.07	0.01	142.77	8.33	2.11	2.58	8.33	8.33	19.24
laurel oak	Quercus laurifolia	5	10.24	0.13	0.05	713.83	41.67	37.91	46.32	41.67	41.67	129.65
live oak	Quercus virginiana	2	15.00	0.19	0.11	285.53	16.67	32.54	39.75	16.67	16.67	73.09
sweetgum	Liquidambar styraciflua	3	3.08	0.04	0.00	428.30	25.00	2.06	2.52	25.00	25.00	52.52

APPENDIX E

HORSE CREEK WETTED PERIMETER AND ECOLOGICAL COMMUNITY MEDIAN ELEVATIONS

Figure E-1
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 1

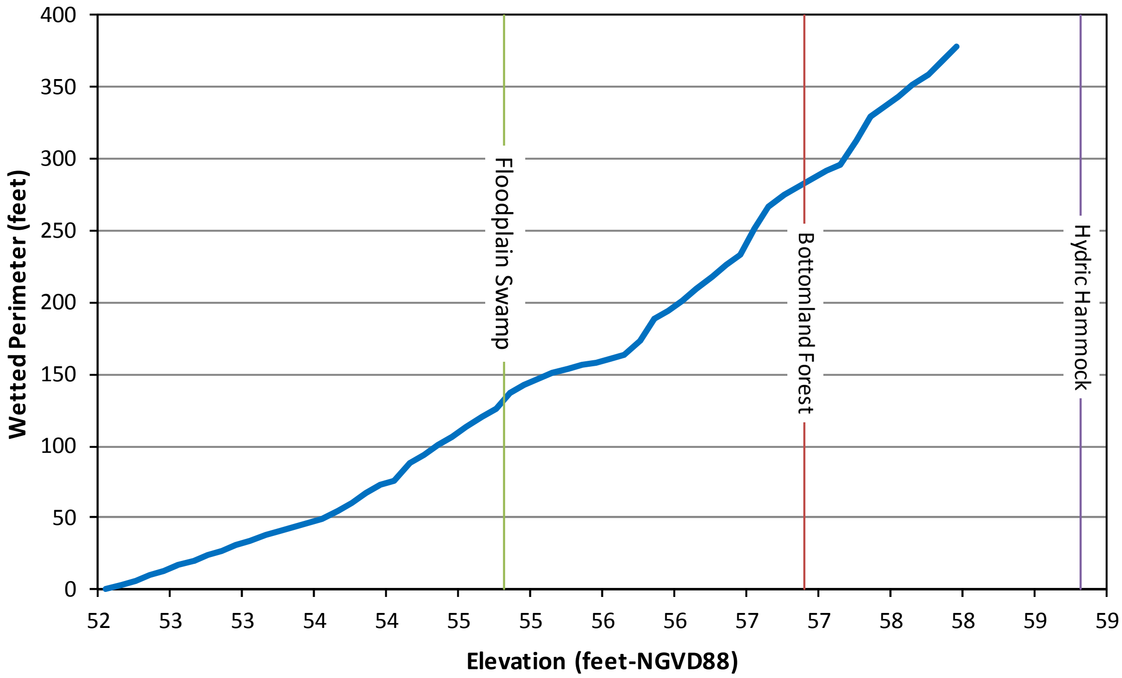


Figure E-2
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 2

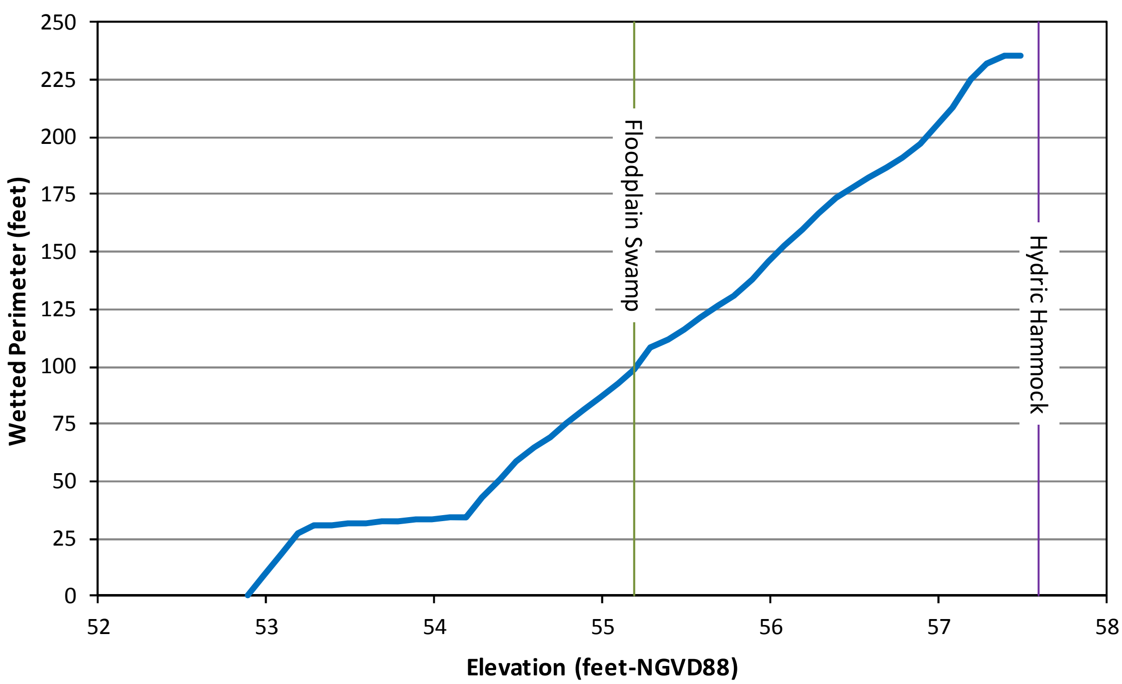


Figure E-3
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 3

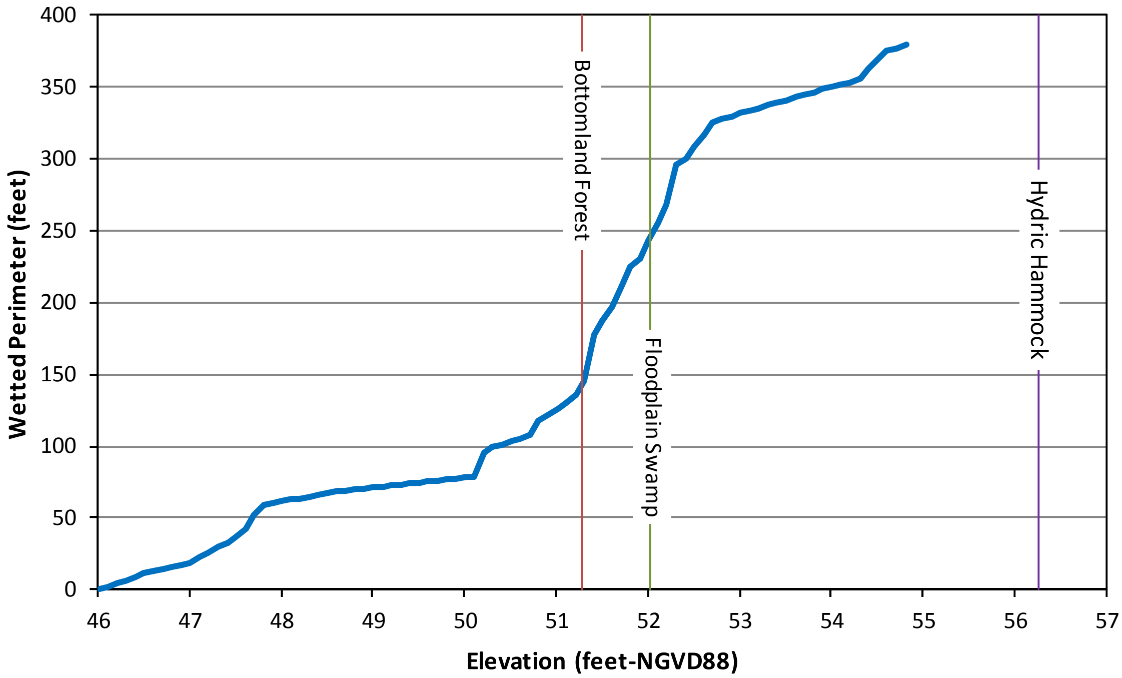


Figure E-4
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 4

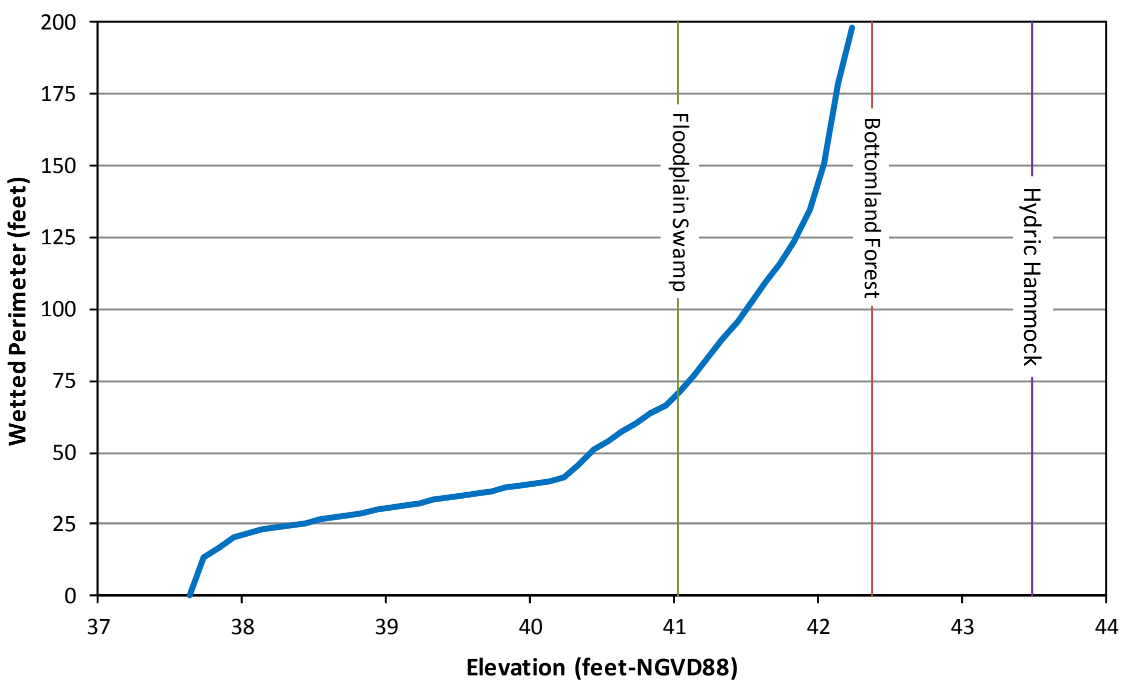


Figure E-5
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 5

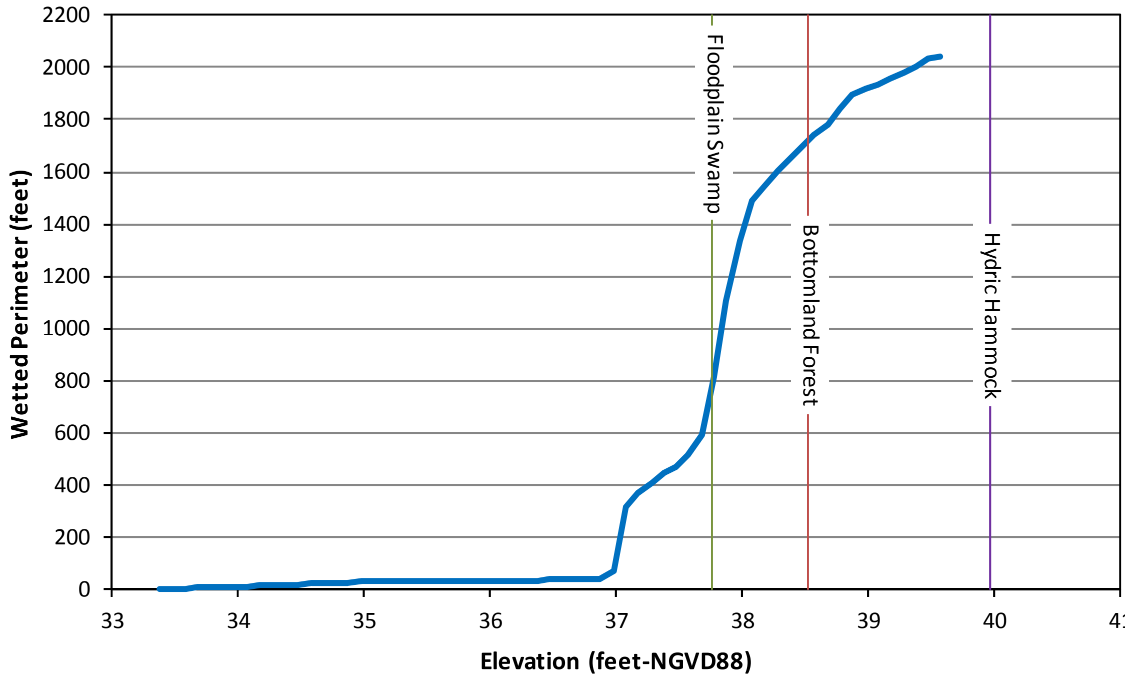
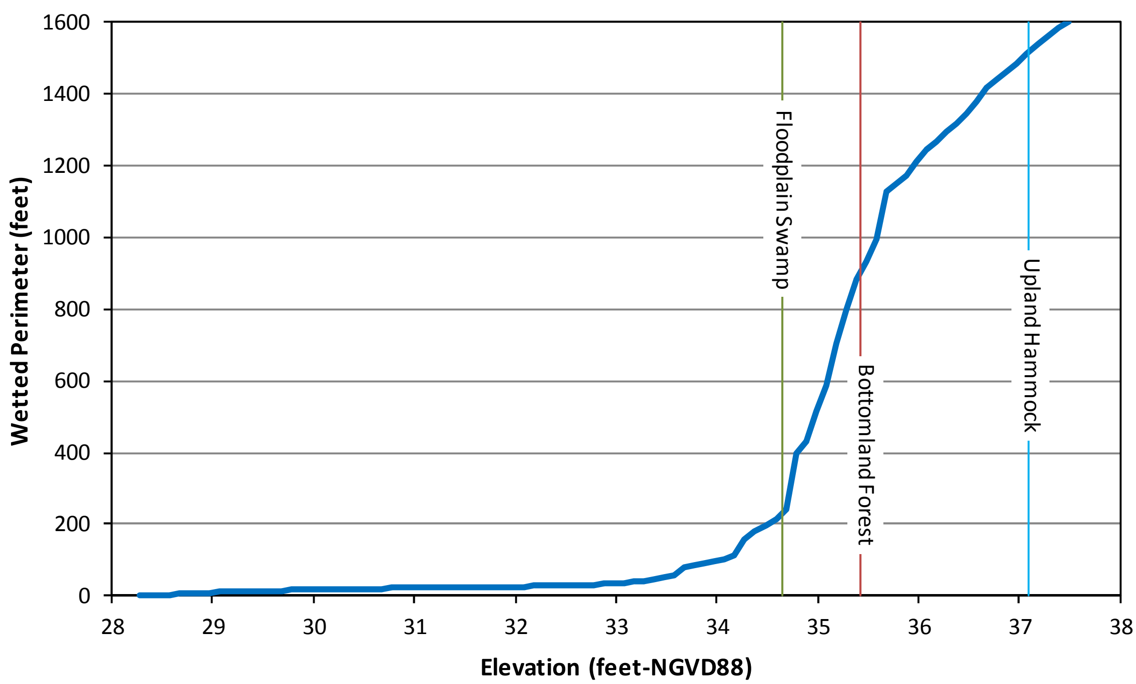


Figure E-6
Wetted Perimeter and Ecological Community Median Elevations along the Horse Creek Transect 6



APPENDIX F

CHARLIE CREEK TRANSECT ELEVATION PROFILES

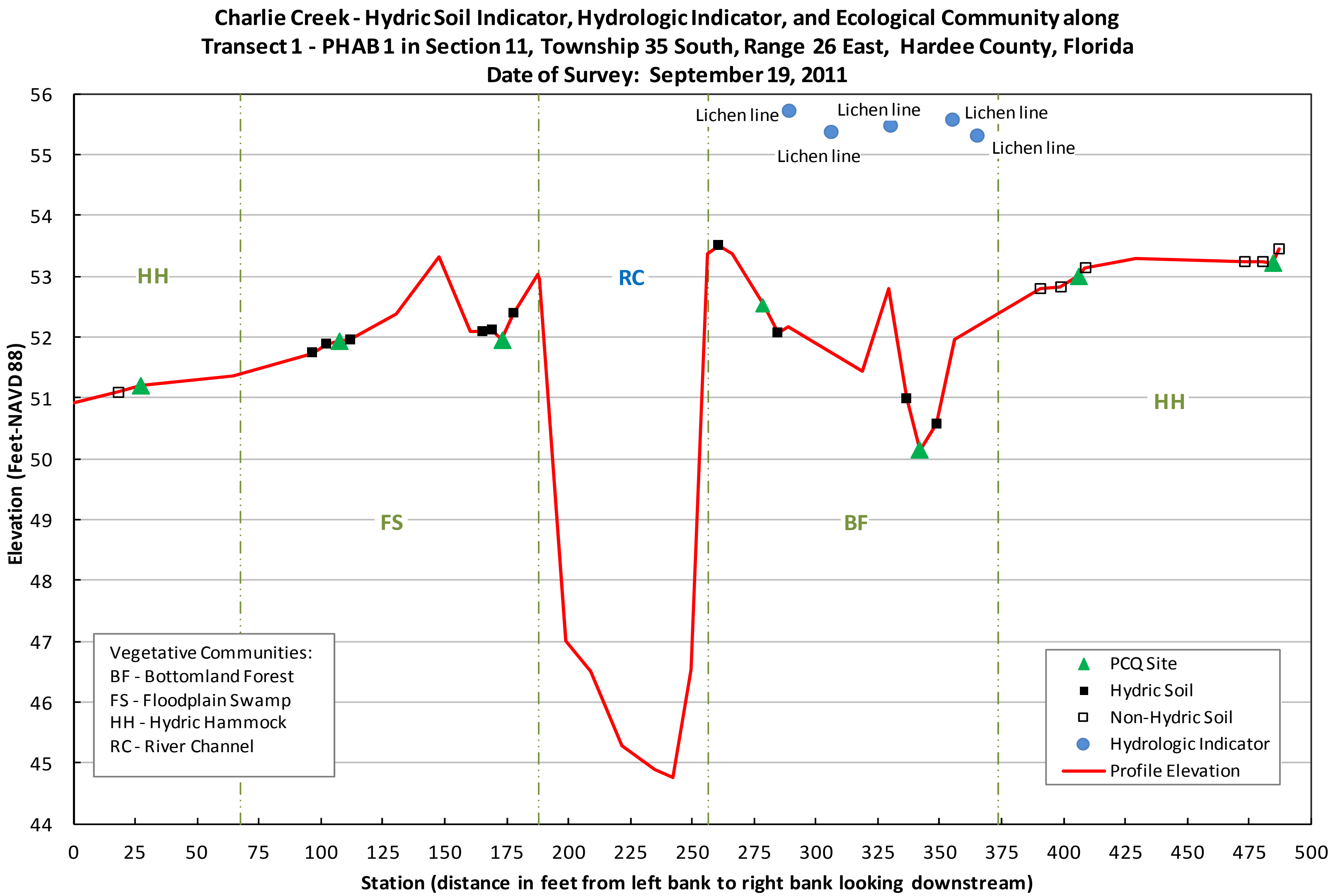


Figure F-1. **Elevation profile for Charlie Creek transect 1**

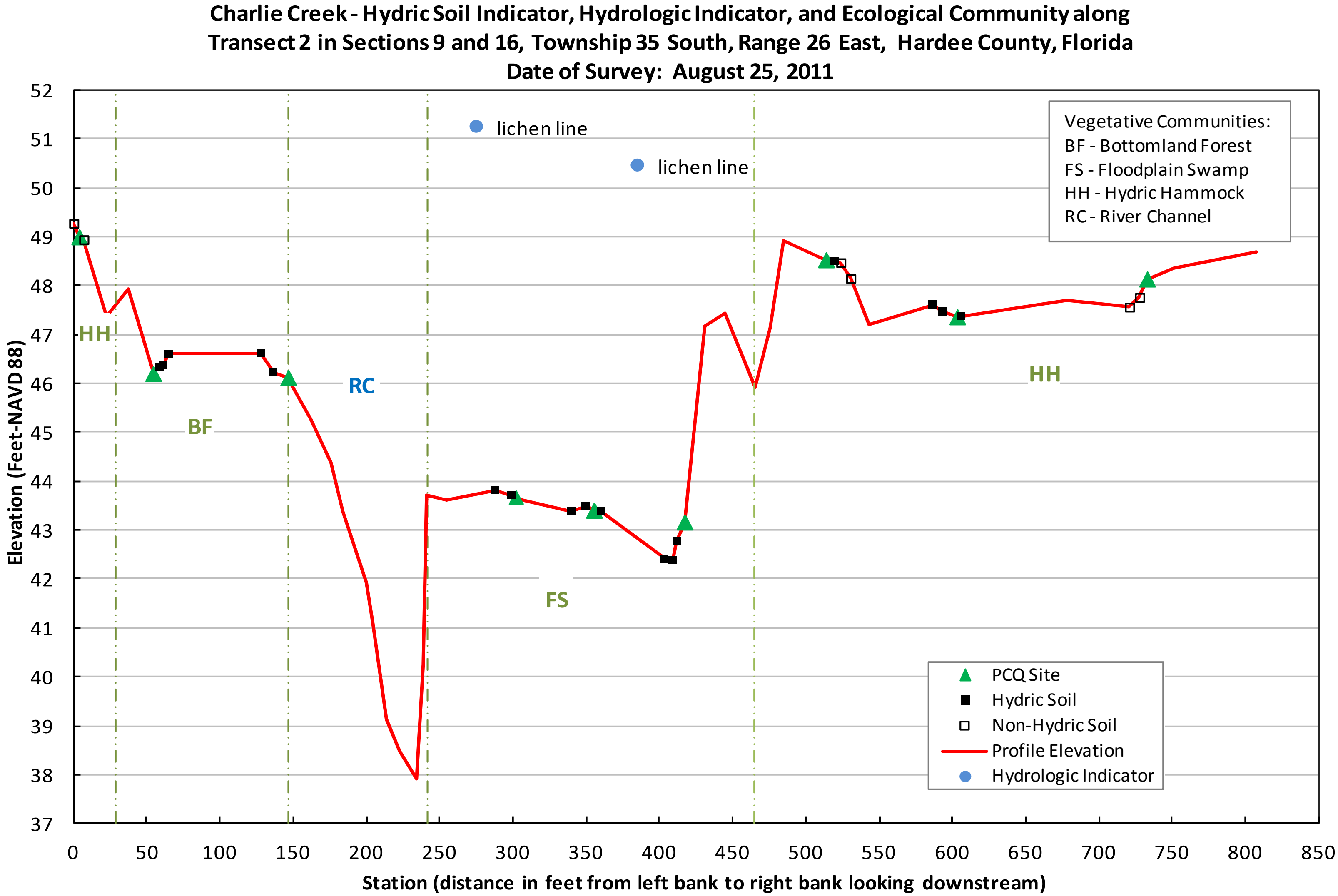


Figure F-2. Elevation profile for Charlie Creek transect 2

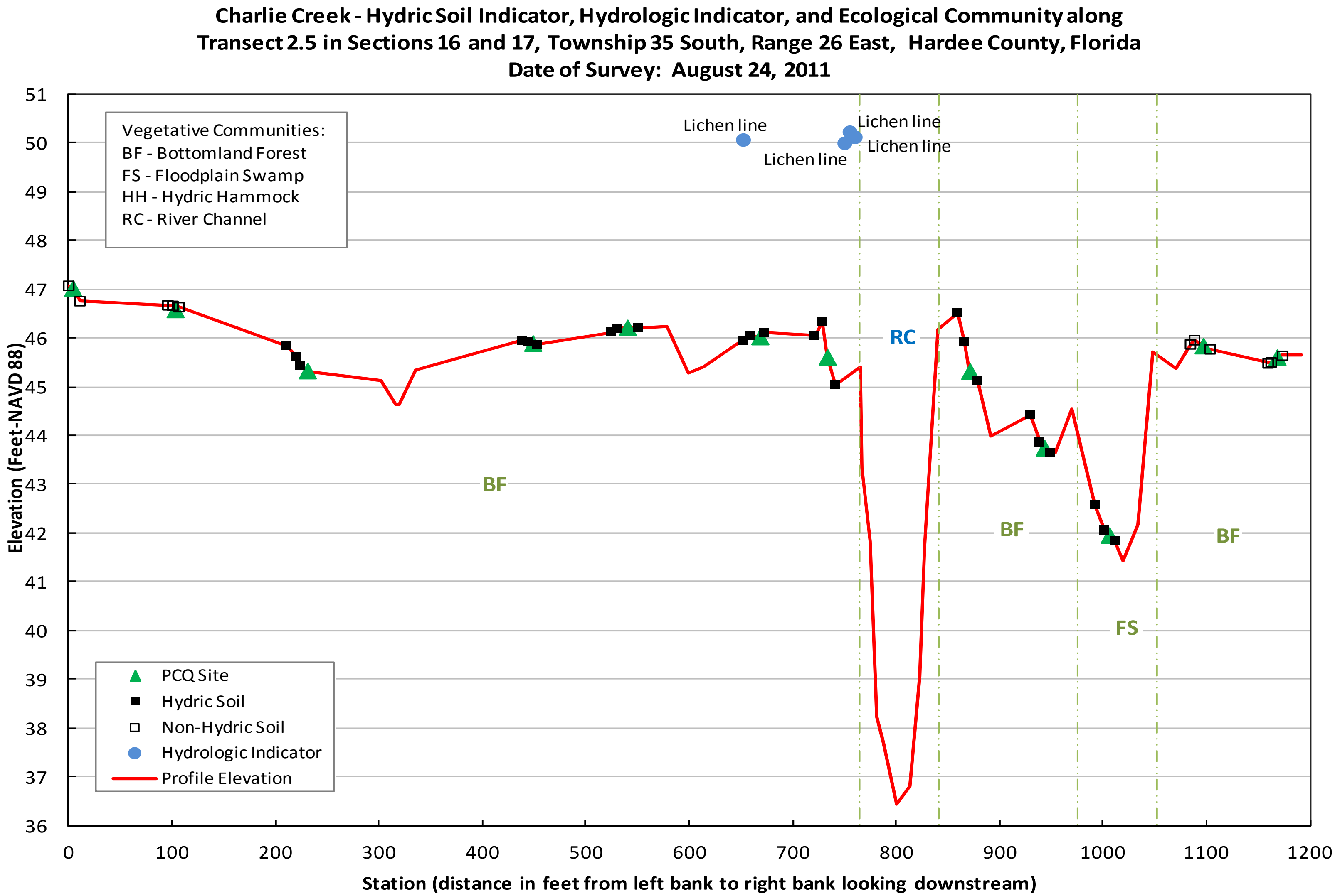


Figure F-3. **Elevation profile for Charlie Creek transect 2.5**

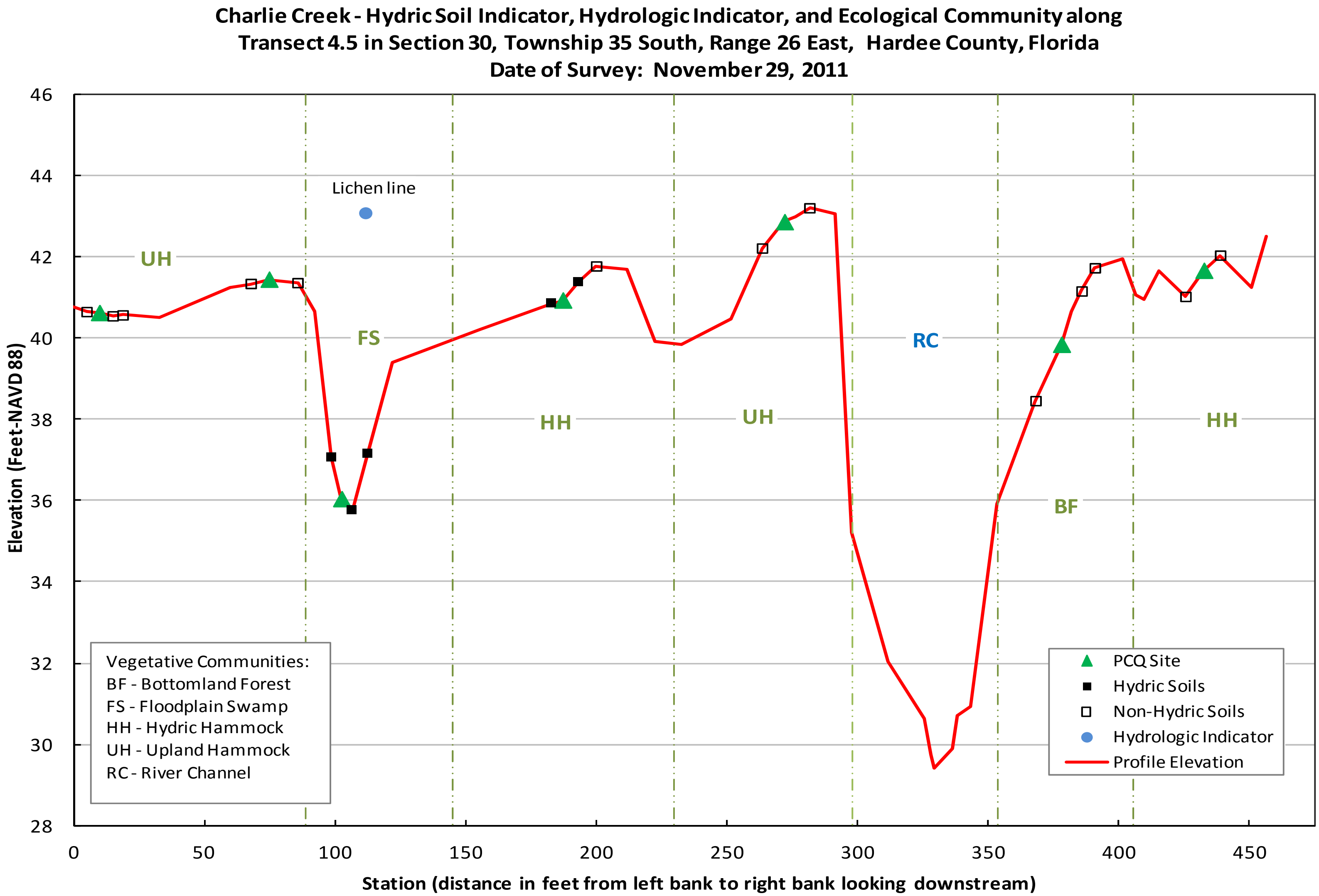


Figure F-4. Elevation profile for Charlie Creek transect 4.5

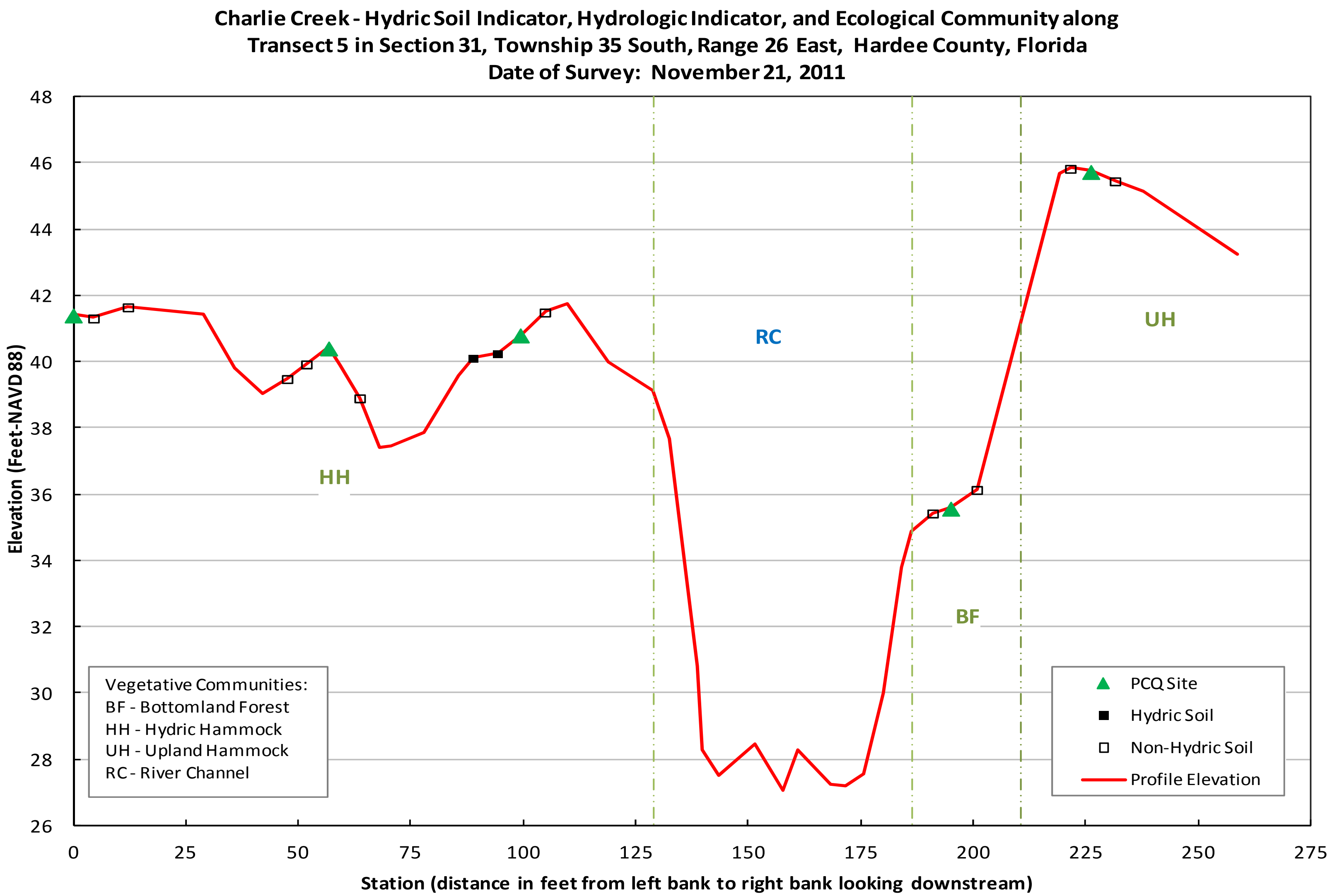


Figure F-5. **Elevation profile for Charlie Creek transect 5**

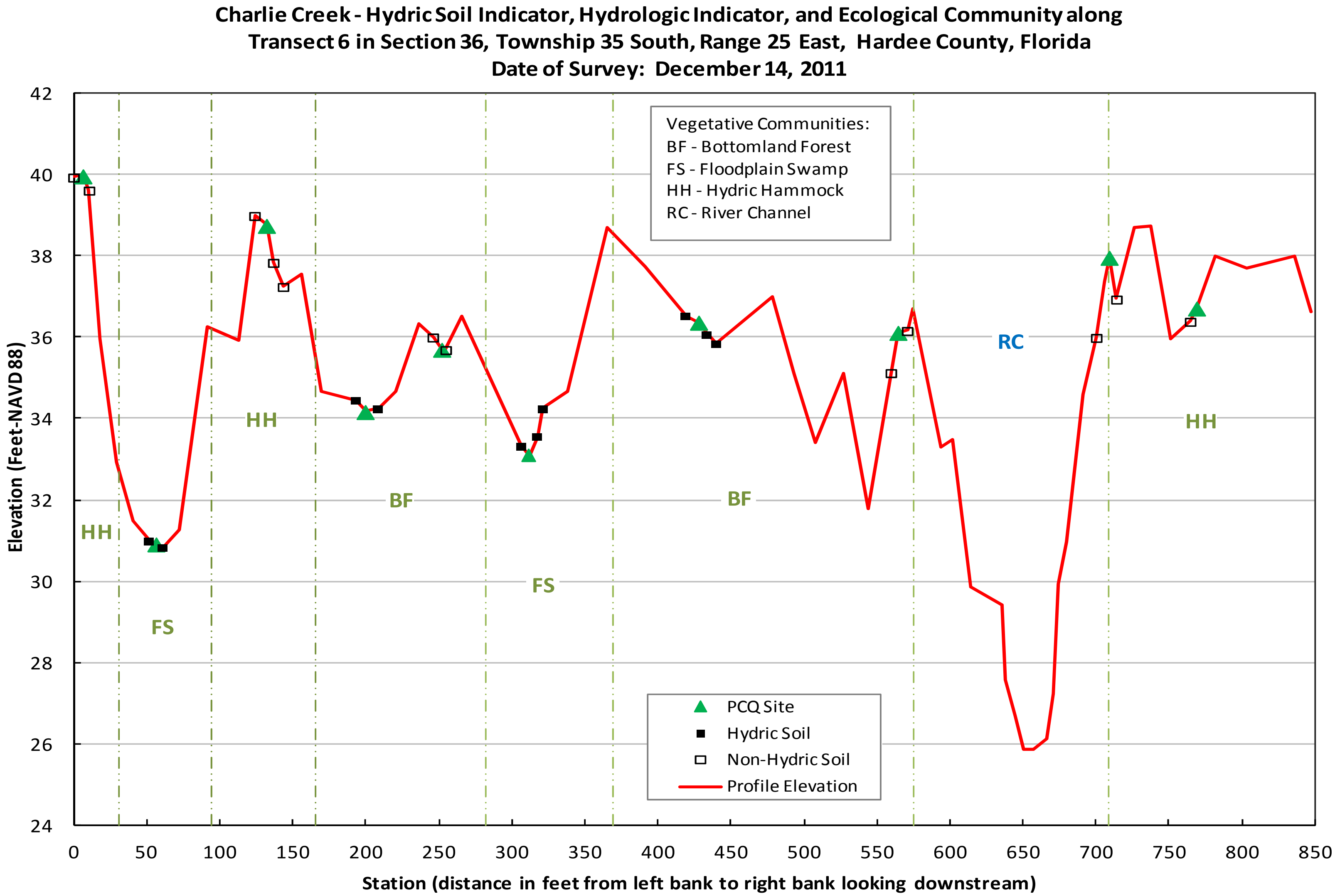


Figure F-6. **Elevation profile for Charlie Creek transect 6**

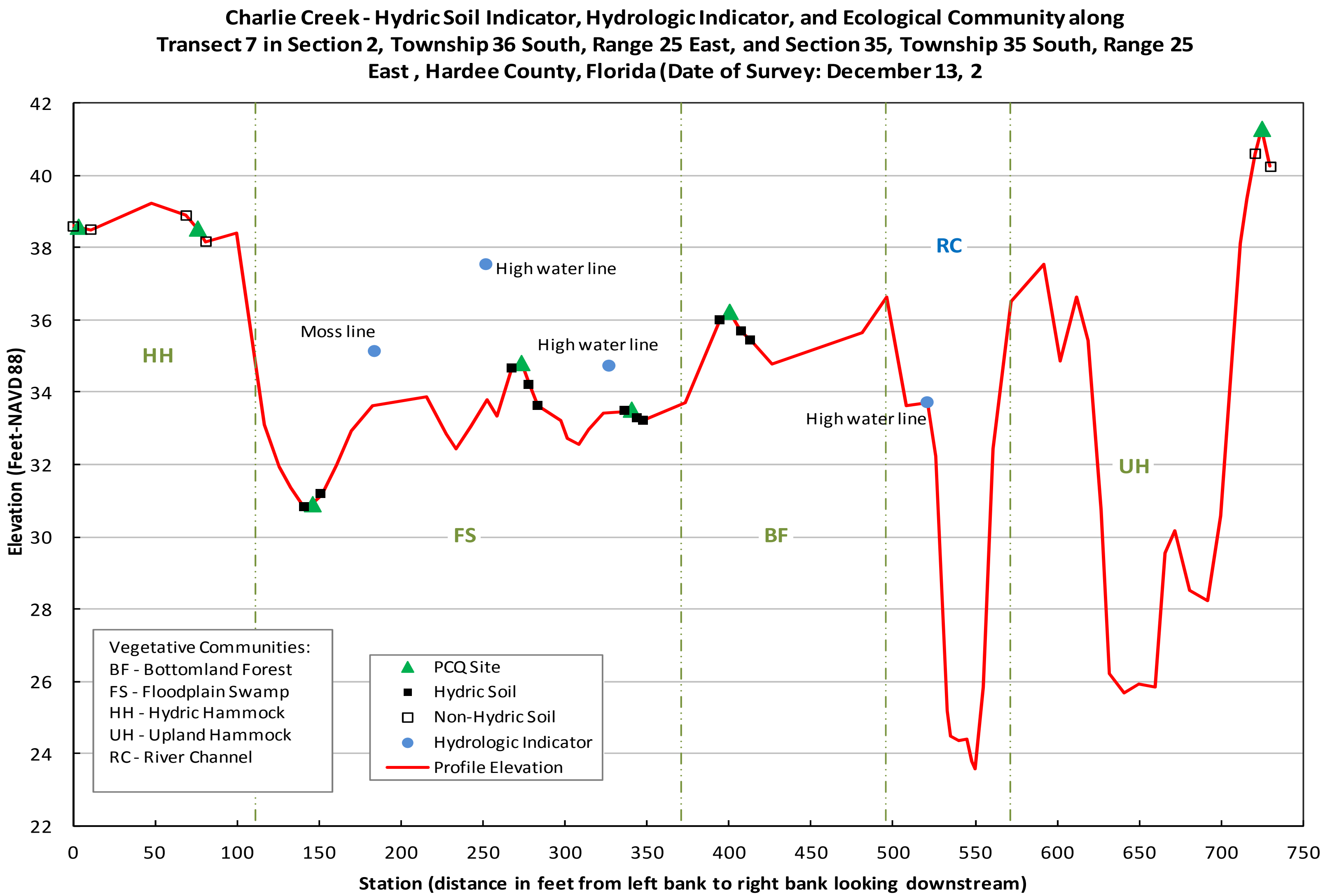


Figure F-7. **Elevation profile for Charlie Creek transect 7**

APPENDIX G

CHARLIE CREEK IMPORTANCE VALUES OF TREE SPECIES
BY VEGETATION CLASS

Table G-1. Importance values of tree species for floodplain swamp vegetation community for the Charlie Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
bald cypress	Taxodium distichum	8	15.94	0.20	0.13	91.98	18.18	11.83	39.52	18.18	18.18	75.89
buttonbush	Cephalanthus occidentalis	1	2.50	0.03	0.00	11.50	2.27	0.04	0.12	2.27	2.27	4.67
cabbage palm	Sabal palmetto	8	12.44	0.16	0.08	91.98	18.18	7.21	24.07	18.18	18.18	60.43
laurel oak	Quercus laurifolia	2	9.00	0.11	0.04	23.00	4.55	0.94	3.15	4.55	4.55	12.24
live oak	Quercus viginiana	1	17.00	0.22	0.15	11.50	2.27	1.68	5.62	2.27	2.27	10.17
pop ash	Fraxinus caroliniana	21	8.03	0.10	0.03	241.46	47.73	7.89	26.36	47.73	47.73	121.81
sweetgum	Liquidambar styraciflua	1	3.00	0.04	0.00	11.50	2.27	0.05	0.18	2.27	2.27	4.72
water locust	Gleditsia aquatica	1	7.00	0.09	0.02	11.50	2.27	0.29	0.95	2.27	2.27	5.50
possumhaw	Ilex decidua	1	1.25	0.02	0.00	11.50	2.27	0.01	0.03	2.27	2.27	4.58

Table G-2. Importance values of tree species for bottomland forest vegetation community for the Charlie Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
bald cypress	Taxodium distichum	2	17.50	0.22	0.16	12.76	4.55	1.98	4.89	2.27	2.33	11.76
cabbage palm	Sabal palmetto	29	11.96	0.15	0.07	184.98	65.91	13.40	33.13	32.95	33.72	132.76
carolina willow	Salix caroliniana	2	4.75	0.06	0.01	12.76	4.55	0.15	0.36	2.27	2.33	7.23
laurel oak	Quercus laurifolia	27	9.96	0.13	0.05	172.22	61.36	8.64	21.38	30.68	31.40	114.14
live oak	Quercus virginiana	9	20.76	0.26	0.22	57.41	20.45	12.53	30.97	10.23	10.47	61.89
pignut hickory	Carya glabra	1	3.00	0.04	0.00	6.38	2.27	0.03	0.07	1.14	1.16	3.51
pop ash	Fraxinus caroliniana	8	7.81	0.10	0.03	51.03	18.18	1.58	3.90	9.09	9.30	31.38
red maple	Acer rubrum	1	5.50	0.07	0.02	6.38	2.27	0.10	0.24	1.14	1.16	3.68
sweetgum	Liquidambar styraciflua	5	9.20	0.12	0.04	31.89	11.36	1.37	3.38	5.68	5.81	20.56
viburnum	Viburnum nudum	1	14.30	0.18	0.10	6.38	2.27	0.66	1.63	1.14	1.16	5.07
possumhaw	Ilex decidua	1	2.00	0.03	0.00	6.38	2.27	0.01	0.03	1.14	1.16	3.47

Table G-3. Importance values of tree species for hydric hammock vegetation community for the Charlie Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
cabbage palm	Sabal palmetto	30	12.43	0.16	0.08	274.22	41.67	21.47	38.49	57.69	41.67	121.83
laurel oak	Quercus laurifolia	10	15.45	0.20	0.12	91.41	13.89	11.05	19.81	19.23	13.89	47.59
live oak	Quercus virginiana	19	16.03	0.20	0.13	173.67	26.39	22.59	40.51	36.54	26.39	93.28
sweetgum	Liquidambar styraciflua	6	4.08	0.05	0.01	54.84	8.33	0.46	0.83	11.54	8.33	17.50
wild orange	Citrus x aurantium	3	3.00	0.04	0.00	27.42	4.17	0.12	0.22	5.77	4.17	8.56
possumhaw	Ilex decidua	4	2.00	0.03	0.00	36.56	5.56	0.07	0.13	7.69	5.56	11.24

Table G-4. Importance values of tree species for upland hammock vegetation community for the Charlie Creek

Common Name	Scientific Name	Count of Quadrats	Avg Diameter (in)	Avg Radius Species (m)	Avg Basal Area (m^2)	ABS Density (trees/ha)	REL Density (%)	ABS Cover (dominance) (m^2/ha)	REL Cover Species (%)	ABS Frequency	REL Frequency (%)	Importance Value
bay	Persea sp.	1	1.00	0.01	0.00	14.05	2.27	0.01	0.07	1.14	5.00	7.34
cabbage palm	Sabal palmetto	2	15.00	0.19	0.11	28.10	4.55	3.20	29.31	2.27	10.00	43.86
laurel oak	Quercus laurifolia	9	5.83	0.07	0.02	126.46	20.45	2.18	19.95	10.23	45.00	85.40
live oak	Quercus virginiana	3	8.17	0.10	0.03	42.15	6.82	1.42	13.03	3.41	15.00	34.85
sweetgum	Liquidambar styraciflua	3	13.67	0.17	0.09	42.15	6.82	3.99	36.50	3.41	15.00	58.32
possumhaw	Ilex decidua	2	2.95	0.04	0.00	28.10	4.55	0.12	1.13	2.27	10.00	15.68

APPENDIX H

CHARLIE CREEK WETTED PERIMETER AND ECOLOGICAL COMMUNITY MEDIAN ELEVATIONS

Figure H-1
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 1

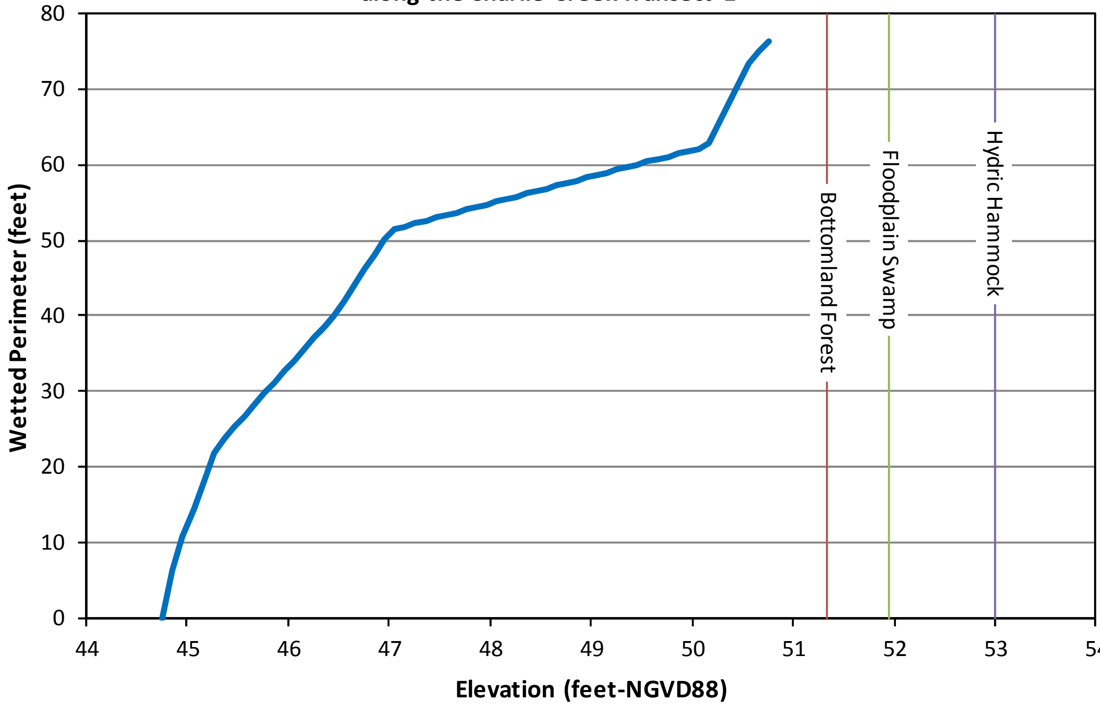


Figure H-2
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 2

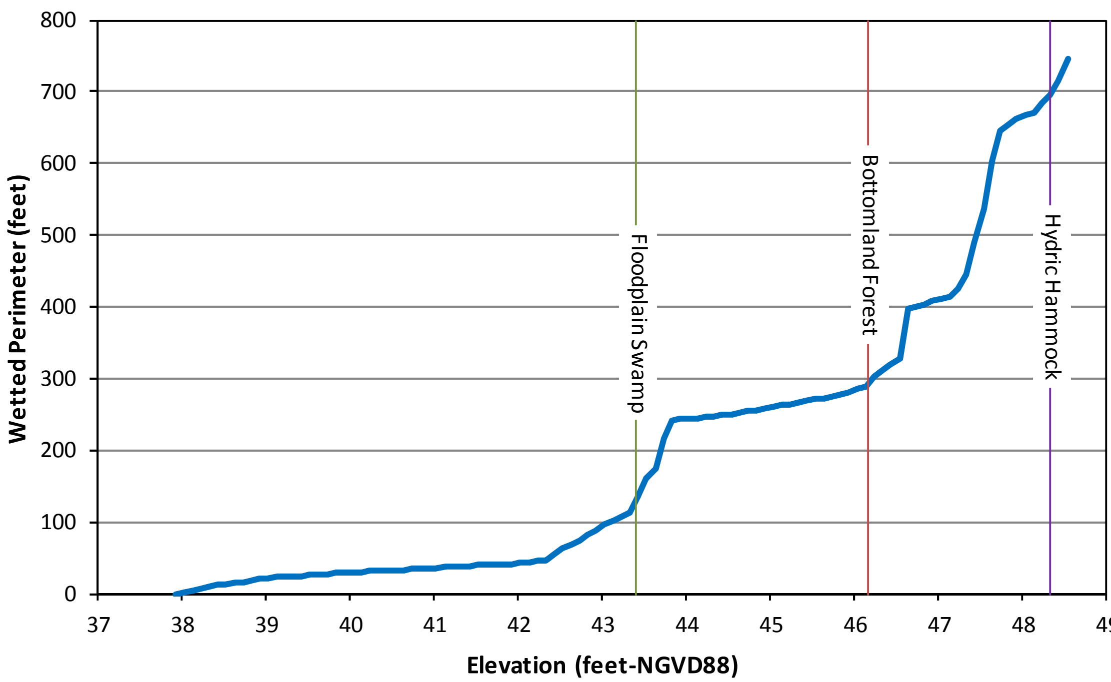


Figure H-3
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 2.5

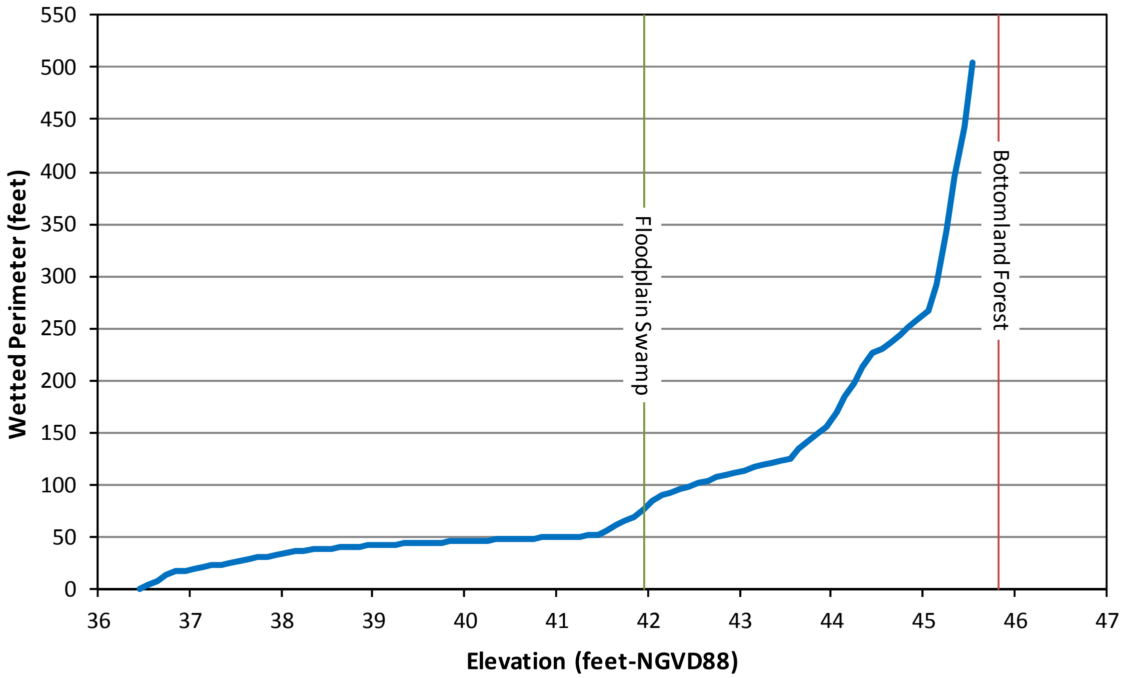


Figure H-4
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 4.5

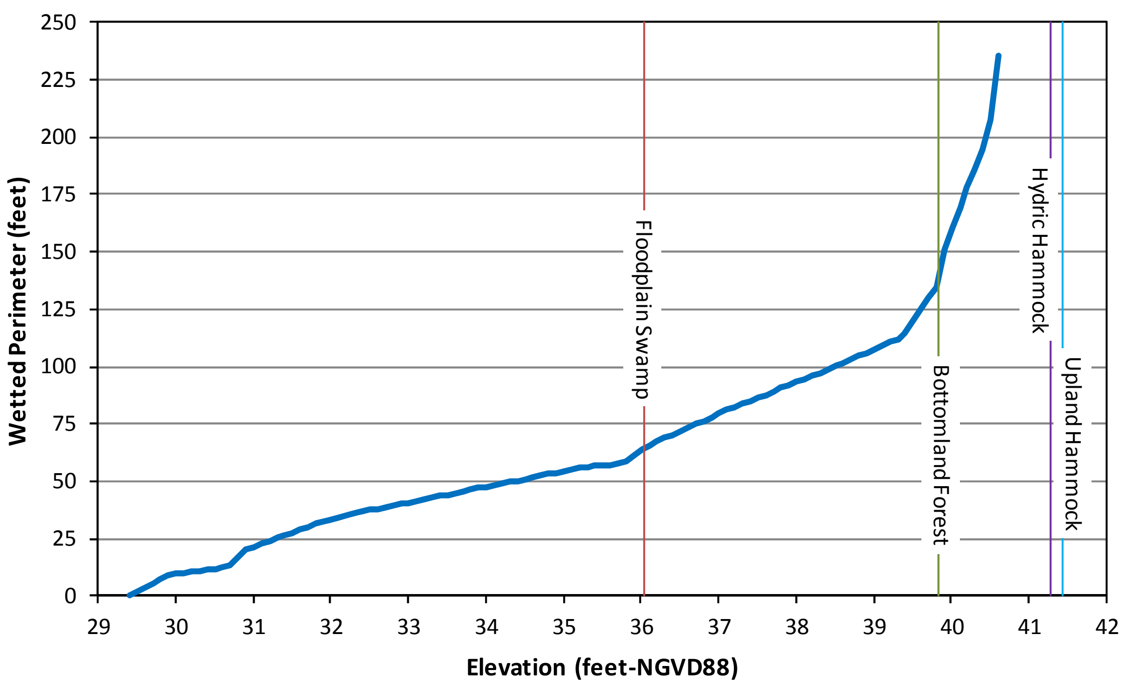


Figure H-5
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 5

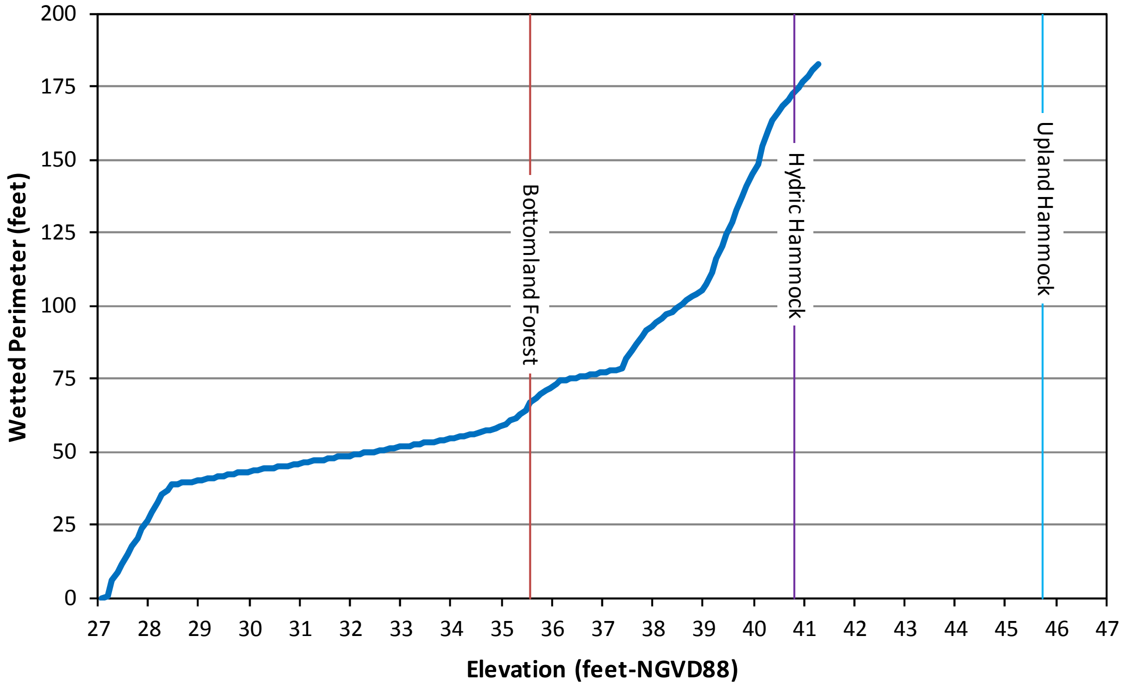


Figure H-6
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 6

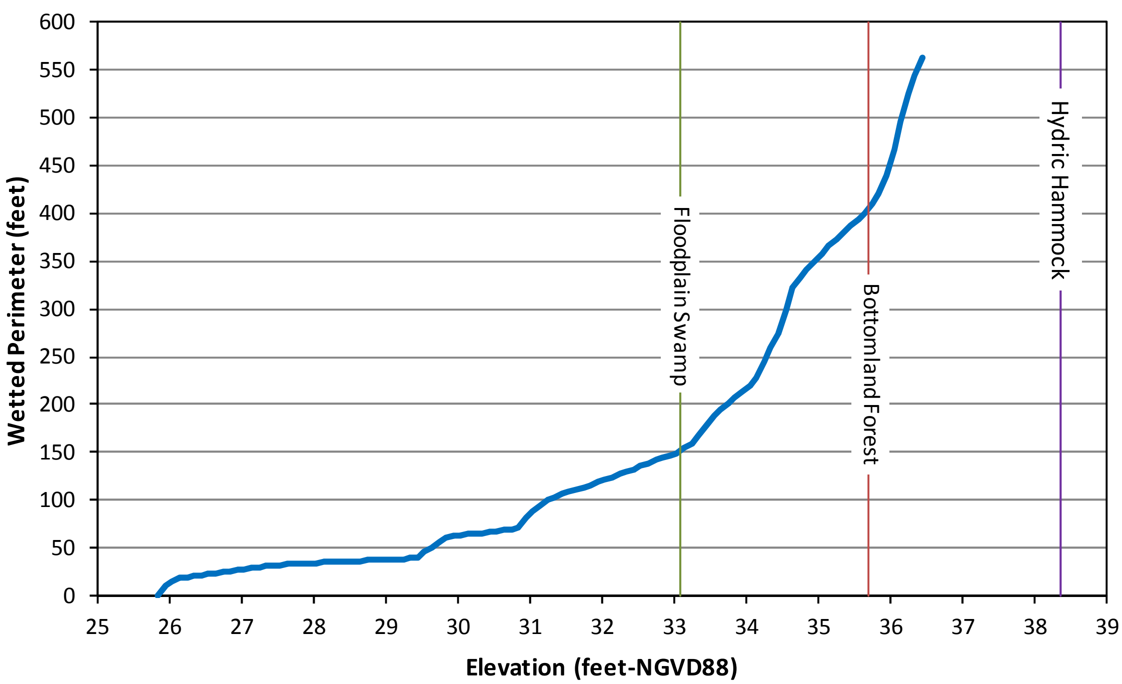
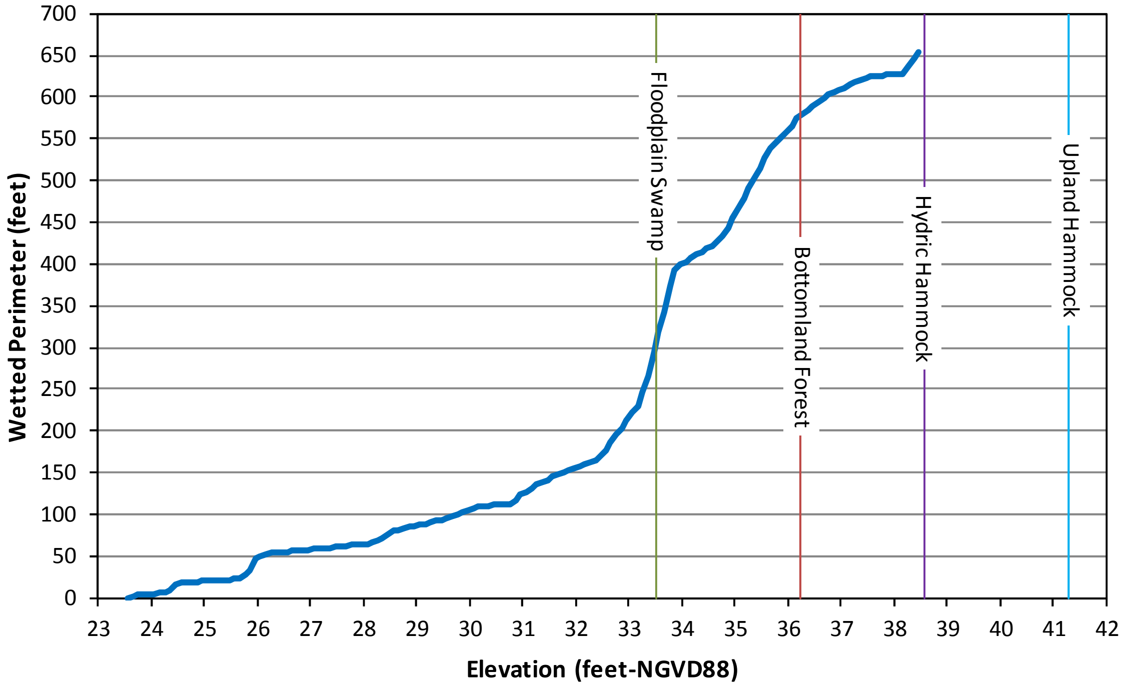


Figure H-7
Wetted Perimeter and Ecological Community Median Elevations along the Charlie Creek Transect 7



APPENDIX I

WILCOXON SIGNED RANK TEST

Wilcoxon Signed Rank Test for Horse Creek Soil Data

Warnings

There are not enough valid cases to perform the Wilcoxon Signed Ranks Test for Hydric_withMuckorPeatandFlooded - Hydric_Flooded_saturated. No statistics are computed.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Hydric_notflooded	6	46.7655	9.61502	35.17	56.96
Hydric_Flooded_saturated	1	55.8160	.	55.82	55.82
Hydric_withMuckorPeat	3	49.1653	9.68143	37.99	54.87
Hydric_withMuckorPeatandFlooded	1	37.0810	.	37.08	37.08
Non_hydric	6	48.7565	9.66551	36.92	58.82
Hydric	6	46.4150	9.20535	35.17	56.40

Ranks

		N	Mean Rank	Sum of Ranks
Hydric_Flooded_saturated - Hydric_notflooded	Negative Ranks	1[a]	1.00	1.00
	Positive Ranks	0[b]	.00	.00
	Ties	0[c]		
	Total	1		
Hydric_withMuckorPeat - Hydric_notflooded	Negative Ranks	3[d]	2.00	6.00
	Positive Ranks	0[e]	.00	.00
	Ties	0[f]		
	Total	3		
Hydric_withMuckorPeatandFlooded - Hydric_notflooded	Negative Ranks	1[g]	1.00	1.00
	Positive Ranks	0[h]	.00	.00
	Ties	0[i]		

a. Hydric_Flooded_saturated < Hydric_notflooded
b. Hydric_Flooded_saturated > Hydric_notflooded
c. Hydric_Flooded_saturated = Hydric_notflooded
d. Hydric_withMuckorPeat < Hydric_notflooded
e. Hydric_withMuckorPeat > Hydric_notflooded
f. Hydric_withMuckorPeat = Hydric_notflooded
g. Hydric_withMuckorPeatandFlooded < Hydric_notflooded
h. Hydric_withMuckorPeatandFlooded > Hydric_notflooded
i. Hydric_withMuckorPeatandFlooded = Hydric_notflooded
j. Non_hydric < Hydric_notflooded
k. Non_hydric > Hydric_notflooded
l. Non_hydric = Hydric_notflooded
m. Hydric_withMuckorPeat < Hydric_Flooded_saturated
n. Hydric_withMuckorPeat > Hydric_Flooded_saturated
o. Hydric_withMuckorPeat = Hydric_Flooded_saturated
p. Hydric_withMuckorPeatandFlooded < Hydric_withMuckorPeat
q. Hydric_withMuckorPeatandFlooded > Hydric_withMuckorPeat
r. Hydric_withMuckorPeatandFlooded = Hydric_withMuckorPeat
s. Non_hydric < Hydric_withMuckorPeat
t. Non_hydric > Hydric_withMuckorPeat
u. Non_hydric = Hydric_withMuckorPeat
v. Non_hydric < Hydric_withMuckorPeatandFlooded
w. Non_hydric > Hydric_withMuckorPeatandFlooded
x. Non_hydric = Hydric_withMuckorPeatandFlooded
y. Hydric < Non_hydric
z. Hydric > Non_hydric
aa. Hydric = Non_hydric

Ranks

		N	Mean Rank	Sum of Ranks
Hydric_withMuckor...	Total	1		
Non_hydric - Hydric_notflooded	Negative Ranks	0[j]	.00	.00
	Positive Ranks	6[k]	3.50	21.00
	Ties	0[l]		
	Total	6		
Hydric_withMuckorPeat - Hydric_Flooded_saturated	Negative Ranks	1[m]	1.00	1.00
	Positive Ranks	0[n]	.00	.00
	Ties	0[o]		
	Total	1		
Hydric_withMuckor PeatandFlooded - Hydric_withMuckorPeat	Negative Ranks	1[p]	1.00	1.00
	Positive Ranks	0[q]	.00	.00
	Ties	0[r]		
	Total	1		
Non_hydric - Hydric_withMuckorPeat	Negative Ranks	0[s]	.00	.00
	Positive Ranks	3[t]	2.00	6.00
	Ties	0[u]		
	Total	3		
Non_hydric - Hydric_withMuckor PeatandFlooded	Negative Ranks	0[v]	.00	.00
	Positive Ranks	1[w]	1.00	1.00
	Ties	0[x]		
	Total	1		
Hydric - Non_hydric	Negative Ranks	6[y]	3.50	21.00
	Positive Ranks	0[z]	.00	.00
	Ties	0[aa]		
	Total	6		

a. Hydric_Flooded_saturated < Hydric_notflooded
b. Hydric_Flooded_saturated > Hydric_notflooded
c. Hydric_Flooded_saturated = Hydric_notflooded
d. Hydric_withMuckorPeat < Hydric_notflooded
e. Hydric_withMuckorPeat > Hydric_notflooded
f. Hydric_withMuckorPeat = Hydric_notflooded
g. Hydric_withMuckorPeatandFlooded < Hydric_notflooded
h. Hydric_withMuckorPeatandFlooded > Hydric_notflooded
i. Hydric_withMuckorPeatandFlooded = Hydric_notflooded
j. Non_hydric < Hydric_notflooded
k. Non_hydric > Hydric_notflooded
l. Non_hydric = Hydric_notflooded
m. Hydric_withMuckorPeat < Hydric_Flooded_saturated
n. Hydric_withMuckorPeat > Hydric_Flooded_saturated
o. Hydric_withMuckorPeat = Hydric_Flooded_saturated
p. Hydric_withMuckorPeatandFlooded < Hydric_withMuckorPeat
q. Hydric_withMuckorPeatandFlooded > Hydric_withMuckorPeat
r. Hydric_withMuckorPeatandFlooded = Hydric_withMuckorPeat
s. Non_hydric < Hydric_withMuckorPeat
t. Non_hydric > Hydric_withMuckorPeat
u. Non_hydric = Hydric_withMuckorPeat
v. Non_hydric < Hydric_withMuckorPeatandFlooded
w. Non_hydric > Hydric_withMuckorPeatandFlooded
x. Non_hydric = Hydric_withMuckorPeatandFlooded
y. Hydric < Non_hydric
z. Hydric > Non_hydric
aa. Hydric = Non_hydric

Test Statistics[c]

	Hydric_with MuckorPeat - Hydric_ notflooded	Non_hydric - Hydric_ notflooded	Non_hydric - Hydric_with MuckorPeat	Hydric - Non_hydric
Z	-1.604[a]	-2.201[b]	-1.604[b]	-2.201[a]
Asymp. Sig. (2-tailed)	.109	.028	.109	.028

a. Based on positive ranks.

b. Based on negative ranks.

c. Wilcoxon Signed Ranks Test

Wilcoxon Signed Rank Test for Charlie Creek Soil Data

Warnings

There are not enough valid cases to perform the Wilcoxon Signed Ranks Test for Hydric_withMuckorPeat - Hydric_Flooded_saturated. No statistics are computed.
There are not enough valid cases to perform the Wilcoxon Signed Ranks Test for Hydric_withMuckorPeatandFlooded - Hydric_Flooded_saturated. No statistics are computed.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Hydric_notflooded	7	42.1464	6.32770	34.35	52.01
Hydric_Flooded_saturated	3	36.5720	5.74226	30.91	42.39
Hydric_withMuckorPeat	1	33.6220	.	33.62	33.62
Hydric_withMuckorPeatandFlooded	1	33.2080	.	33.21	33.21
Non_hydric	7	43.5404	5.83714	36.67	53.15
Hydric	7	41.3300	6.92094	33.62	52.01

Ranks

		N	Mean Rank	Sum of Ranks
Hydric_Flooded_saturated - Hydric_notflooded	Negative Ranks	3[a]	2.00	6.00
	Positive Ranks	0[b]	.00	.00
	Ties	0[c]		
	Total	3		
Hydric_withMuckorPeat - Hydric_notflooded	Negative Ranks	1[d]	1.00	1.00
	Positive Ranks	0[e]	.00	.00
	Ties	0[f]		
	Total	1		
Hydric_withMuckorPeatandFlooded - Hydric_notflooded	Negative Ranks	1[g]	1.00	1.00
	Positive Ranks	0[h]	.00	.00
	Ties	0[i]		

a. Hydric_Flooded_saturated < Hydric_notflooded
b. Hydric_Flooded_saturated > Hydric_notflooded
c. Hydric_Flooded_saturated = Hydric_notflooded
d. Hydric_withMuckorPeat < Hydric_notflooded
e. Hydric_withMuckorPeat > Hydric_notflooded
f. Hydric_withMuckorPeat = Hydric_notflooded
g. Hydric_withMuckorPeatandFlooded < Hydric_notflooded
h. Hydric_withMuckorPeatandFlooded > Hydric_notflooded
i. Hydric_withMuckorPeatandFlooded = Hydric_notflooded
j. Non_hydric < Hydric_notflooded
k. Non_hydric > Hydric_notflooded
l. Non_hydric = Hydric_notflooded
m. Hydric_withMuckorPeatandFlooded < Hydric_withMuckorPeat
n. Hydric_withMuckorPeatandFlooded > Hydric_withMuckorPeat
o. Hydric_withMuckorPeatandFlooded = Hydric_withMuckorPeat
p. Non_hydric < Hydric_withMuckorPeat
q. Non_hydric > Hydric_withMuckorPeat
r. Non_hydric = Hydric_withMuckorPeat
s. Non_hydric < Hydric_withMuckorPeatandFlooded
t. Non_hydric > Hydric_withMuckorPeatandFlooded
u. Non_hydric = Hydric_withMuckorPeatandFlooded
v. Hydric < Non_hydric
w. Hydric > Non_hydric
x. Hydric = Non_hydric

Ranks

		N	Mean Rank	Sum of Ranks
Hydric_withMuckor…	Total	1		
Non_hydric - Hydric_notflooded	Negative Ranks	0[j]	.00	.00
	Positive Ranks	7[k]	4.00	28.00
	Ties	0[l]		
	Total	7		
Hydric_withMuckor PeatandFlooded - Hydric_withMuckorPeat	Negative Ranks	1[m]	1.00	1.00
	Positive Ranks	0[n]	.00	.00
	Ties	0[o]		
	Total	1		
Non_hydric - Hydric_withMuckorPeat	Negative Ranks	0[p]	.00	.00
	Positive Ranks	1[q]	1.00	1.00
	Ties	0[r]		
	Total	1		
Non_hydric - Hydric_withMuckor PeatandFlooded	Negative Ranks	0[s]	.00	.00
	Positive Ranks	1[t]	1.00	1.00
	Ties	0[u]		
	Total	1		
Hydric - Non_hydric	Negative Ranks	7[v]	4.00	28.00
	Positive Ranks	0[w]	.00	.00
	Ties	0[x]		
	Total	7		

a. Hydric_Flooded_saturated < Hydric_notflooded
b. Hydric_Flooded_saturated > Hydric_notflooded
c. Hydric_Flooded_saturated = Hydric_notflooded
d. Hydric_withMuckorPeat < Hydric_notflooded
e. Hydric_withMuckorPeat > Hydric_notflooded
f. Hydric_withMuckorPeat = Hydric_notflooded
g. Hydric_withMuckorPeatandFlooded < Hydric_notflooded
h. Hydric_withMuckorPeatandFlooded > Hydric_notflooded
i. Hydric_withMuckorPeatandFlooded = Hydric_notflooded
j. Non_hydric < Hydric_notflooded
k. Non_hydric > Hydric_notflooded
l. Non_hydric = Hydric_notflooded
m. Hydric_withMuckorPeatandFlooded < Hydric_withMuckorPeat
n. Hydric_withMuckorPeatandFlooded > Hydric_withMuckorPeat
o. Hydric_withMuckorPeatandFlooded = Hydric_withMuckorPeat
p. Non_hydric < Hydric_withMuckorPeat
q. Non_hydric > Hydric_withMuckorPeat
r. Non_hydric = Hydric_withMuckorPeat
s. Non_hydric < Hydric_withMuckorPeatandFlooded
t. Non_hydric > Hydric_withMuckorPeatandFlooded
u. Non_hydric = Hydric_withMuckorPeatandFlooded
v. Hydric < Non_hydric
w. Hydric > Non_hydric
x. Hydric = Non_hydric

Test Statistics[c]

	Hydric_ Flooded_ saturated - Hydric_ notflooded	Non_hydric - Hydric_ notflooded	Hydric - Non_hydric
Z	-1.604[a]	-2.366[b]	-2.366[a]
Asymp. Sig. (2-tailed)	.109	.018	.018

a. Based on positive ranks.

b. Based on negative ranks.

c. Wilcoxon Signed Ranks Test

Wilcoxon Signed Ranks Test for Horse Creek Vegetation Data

Warnings

There are not enough valid cases to perform the Wilcoxon Signed Ranks Test for UplandHammock - HydricHammock. No statistics are computed.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
FloodplainSwamp	6	4.2033	1.69433	2.30	6.36
BottomlandForest	5	5.4340	.98383	4.74	7.15
HydricHammock	4	6.0025	.96164	4.71	6.86
UplandHammock	2	9.5400	1.01823	8.82	10.26

Ranks

		N	Mean Rank	Sum of Ranks
BottomlandForest - FloodplainSwamp	Negative Ranks	1[a]	1.00	1.00
	Positive Ranks	4[b]	3.50	14.00
	Ties	0[c]		
	Total	5		
HydricHammock - FloodplainSwamp	Negative Ranks	0[d]	.00	.00
	Positive Ranks	4[e]	2.50	10.00
	Ties	0[f]		
	Total	4		
UplandHammock - FloodplainSwamp	Negative Ranks	0[g]	.00	.00
	Positive Ranks	2[h]	1.50	3.00
	Ties	0[i]		
	Total	2		
HydricHammock - BottomlandForest	Negative Ranks	0[j]	.00	.00
	Positive Ranks	3[k]	2.00	6.00
	Ties	0[l]		
	Total	3		
UplandHammock - BottomlandForest	Negative Ranks	0[m]	.00	.00
	Positive Ranks	2[n]	1.50	3.00
	Ties	0[o]		
	Total	2		

a. BottomlandForest < FloodplainSwamp
b. BottomlandForest > FloodplainSwamp
c. BottomlandForest = FloodplainSwamp
d. HydricHammock < FloodplainSwamp
e. HydricHammock > FloodplainSwamp
f. HydricHammock = FloodplainSwamp
g. UplandHammock < FloodplainSwamp
h. UplandHammock > FloodplainSwamp
i. UplandHammock = FloodplainSwamp
j. HydricHammock < BottomlandForest
k. HydricHammock > BottomlandForest
l. HydricHammock = BottomlandForest
m. UplandHammock < BottomlandForest
n. UplandHammock > BottomlandForest
o. UplandHammock = BottomlandForest

Test Statistics[b]

	Bottomland Forest - Floodplain Swamp	Hydric Hammock - Floodplain Swamp	Upland Hammock - Floodplain Swamp	Hydric Hammock - Bottomland Forest	Upland Hammock - Bottomland Forest
Z	-1.753[a]	-1.826[a]	-1.342[a]	-1.604[a]	-1.342[a]
Asymp. Sig. (2-tailed)	.080	.068	.180	.109	.180

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

Wilcoxon Signed Ranks Test for Charlie Creek Vegetation Data

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
FloodplainSwamp	6	6.9950	1.64225	5.48	9.95
BottomlandForest	7	9.0457	2.26243	6.18	12.66
HydricHammock	6	11.5700	2.24334	8.24	14.99
UplandHammock	3	15.3600	2.96643	12.03	17.72

Ranks

		N	Mean Rank	Sum of Ranks
BottomlandForest - FloodplainSwamp	Negative Ranks	1[a]	1.00	1.00
	Positive Ranks	5[b]	4.00	20.00
	Ties	0[c]		
	Total	6		
HydricHammock - FloodplainSwamp	Negative Ranks	0[d]	.00	.00
	Positive Ranks	5[e]	3.00	15.00
	Ties	0[f]		
	Total	5		
UplandHammock - FloodplainSwamp	Negative Ranks	0[g]	.00	.00
	Positive Ranks	2[h]	1.50	3.00
	Ties	0[i]		
	Total	2		
HydricHammock - BottomlandForest	Negative Ranks	0[j]	.00	.00
	Positive Ranks	6[k]	3.50	21.00
	Ties	0[l]		
	Total	6		
UplandHammock - BottomlandForest	Negative Ranks	0[m]	.00	.00
	Positive Ranks	3[n]	2.00	6.00
	Ties	0[o]		
	Total	3		
UplandHammock - HydricHammock	Negative Ranks	0[p]	.00	.00
	Positive Ranks	3[q]	2.00	6.00
	Ties	0[r]		
	Total	3		

a. BottomlandForest < FloodplainSwamp
b. BottomlandForest > FloodplainSwamp
c. BottomlandForest = FloodplainSwamp
d. HydricHammock < FloodplainSwamp
e. HydricHammock > FloodplainSwamp
f. HydricHammock = FloodplainSwamp
g. UplandHammock < FloodplainSwamp
h. UplandHammock > FloodplainSwamp
i. UplandHammock = FloodplainSwamp
j. HydricHammock < BottomlandForest
k. HydricHammock > BottomlandForest
l. HydricHammock = BottomlandForest
m. UplandHammock < BottomlandForest
n. UplandHammock > BottomlandForest
o. UplandHammock = BottomlandForest
p. UplandHammock < HydricHammock
q. UplandHammock > HydricHammock
r. UplandHammock = HydricHammock

Test Statistics[b]

	Bottomland Forest - Floodplain Swamp	Hydric Hammock - Floodplain Swamp	Upland Hammock - Floodplain Swamp	Hydric Hammock - Bottomland Forest	Upland Hammock - Bottomland Forest	Upland Hammock - Hydric Hammock
Z	-1.992[a]	-2.023[a]	-1.342[a]	-2.201[a]	-1.604[a]	-1.604[a]
Asymp. Sig. (2-tailed)	.046	.043	.180	.028	.109	.109

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

APPENDIX J

SELECTED CREEK HABITAT PHOTOS

Figure J-1. Horse Creek floodplain swamp

Figure J-2. Horse Creek bottomland forest

Figure J-3. Horse Creek hydric hammock

Figure J-4. Horse Creek upland hammock (upper elevations above top of bank)

Figure J-5. Charlie Creek floodplain swamp

Figure J-6. Charlie Creek bottomland forest

Figure J-7. Charlie Creek hydric hammock