



Vegetation Classification and Mapping of Land Additions at Richmond National Battlefield Park, Virginia

Addendum to Technical Report NPS/NER/NRTR—2008/128

Natural Resource Report NPS/NER/NRR—2015/903



ON THE COVER

Upper left: Coastal Plain Mixed Oak / Heath Forest. Upper right: Coastal Plain / Piedmont Acidic Seepage Swamp.
Lower left: Cultural Meadow with cannon. Photographs by: Gary P. Fleming. Lower right: Open Earthworks.
Photograph by: Karen D. Patterson.

Vegetation Classification and Mapping of Land Additions at Richmond National Battlefield Park, Virginia

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Abstract

In 2008, the Virginia Department of Conservation and Recreation, Division of Natural Heritage produced vegetation maps for Richmond National Battlefield Park, following the protocols of the USGS-NPS Vegetation Mapping Program. The 2008 report was part of a regional project to map and classify the vegetation in seven national parks in Virginia. Since 2008, the park has acquired an additional 1,627 acres of land within 20 individual parcels. This report is written as an addendum to the original report and documents the mapping of vegetation and other land-use classes for the 20 new land parcels at Richmond National Battlefield Park, with an updated vegetation map for the entire park.

The vegetation map of the new land parcels includes seventeen map classes, representing 13 associations from the United States National Vegetation Classification, one nonstandard, park-specific class, and three Anderson Level II land-use categories. The vegetation classification and map classes are consistent with the 2008 report. Vegetation-map classes for the new land parcels were identified through field reconnaissance, data collection, and aerial photo interpretation. Aerial photography from 2012 served as the base map for mapping the 20 new parcels, and field sampling was conducted in the summer of 2013.

Three new map classes for the Park were encountered and described during the study. These map classes include Coastal Plain Mesic Mixed Hardwood Forest and two types of Coastal Plain/Piedmont Floodplain Swamp Forest. The examples of Coastal Plain Mesic Mixed Hardwood Forest and Coastal Plain/Piedmont Floodplain Swamp (Green Ash – Red Maple Type) at Turkey Hill meet the criteria of size, condition, and landscape context to be considered a Natural Heritage exemplary natural community occurrence and should be targeted for protection and management as needed. The occurrence of Coastal Plain Mesic Mixed Hardwood Forest is further significant in being the northernmost known occurrence of its type throughout its range. New local and global descriptions for these three map classes are included as part of this report. Refinements were made to the vegetation field key to include the new map classes. The updated field key is part of this report. An updated table listing the number of polygons and total hectares for each of the 25 vegetation- map classes over the entire park is also included in the report.

A GIS coverage (shapefile) containing a vegetation map for the entire park with updated FGDC compliant metadata was completed for this project. The shapefile attribute table field names are the same as the 2008 product, with the exception of an additional field indicating the year each polygon was last edited.

The original 2008 report for Richmond National Battlefield Park and similar national park vegetation mapping projects can be accessed at the USGS-NPS Vegetation Mapping Program website: <http://biology.usgs.gov/npsveg/> and at <https://irma.nps.gov/App/Reference/Profile/654498>.

Keywords: vegetation association, vegetation classification, vegetation mapping, Richmond National Battlefield Park.

Introduction

Project Background

In 2008, the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VADNH) produced vegetation maps for Richmond National Battlefield Park (RICH), following the protocols of the USGS-NPS Vegetation Mapping Program (Patterson 2008). The 2008 report was part of a regional project to map and classify the vegetation in seven national parks in Virginia, including RICH. Vegetation data collected from the seven NPS units were combined with over 2,000 existing plot samples from throughout the Mid-Atlantic Piedmont and Coastal Plain. These data were used to refine the vegetation classification for the Mid-Atlantic region based on the United States National Vegetation Classification (USNVC) (FGDC 2008) and to produce accurate vegetation maps for each national park. These maps used aerial photography from 2001 and 2002 as base imagery and the final products covered lands within the park boundaries as of April 2004.

Since 2004, RICH has acquired an additional 659 hectares (1,627 acres) of land within 20 individual parcels. These lands include new park land, as well as lands owned by cooperators that are of interest to the park because they contain Civil War battlefields. In 2012, the National Park Service contracted with VADNH to map the vegetation on the new RICH parcels that were not included in the 2008 vegetation mapping project. This study is intended to be an addendum to the original report and all new maps use the vegetation classification developed for the 2008 report. The goal of the 2013 mapping effort at RICH is to produce an updated digital geospatial vegetation database for the park that includes the newly mapped parcels as well as the portions mapped in 2008. This updated dataset and associated information can be used to support a wide variety of natural resources assessment, management, and conservation activities.

The contract between NPS and VADNH also specifies that any new map classes present in the new parcels should be added to the vegetation field key and map class descriptions. Three new map classes were encountered and described during the study; Coastal Plain Mesic Mixed Hardwood Forest, Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type), and Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type). In addition, new information was collected for Coastal Plain / Piedmont Small Stream Floodplain Forest. New and updated local and global descriptions for the four map classes are included in Appendix B of this report. Refinements were made to the existing vegetation field key to describe the new types and the updated field key is included in Appendix A. See Patterson (2008) for the most up-to-date descriptions for all other map classes at RICH.

New Parcel Information

Prior to the new land additions, Richmond National Battlefield Park consisted of 570 ha (1,407 ac) in ten units spread out over Henrico, Hanover, and Chesterfield counties, Virginia, and the city of Richmond. The new parcels are located in six of the park's ten principal units and span the Northern Coastal Plain of Virginia. Figure 1 maps the location of new land parcels in relationship to the previously mapped park land.

The 20 parcels acquired for the park since 2004 add an additional 659 ha (1,627 ac) of land. The parcels are a combination of NPS owned lands and land owned by the Civil War Trust. The parcels range in size from 0.3 ha (0.8 ac) to large individual parcels measuring 97 ha (240 ac). Table 1 lists summary information for the new parcels, including number of parcels in each park unit, total acreage, and ownership information.

Table 1. Summary of land parcel information for new land additions at Richmond National Battlefield Park.

Location	Parcel count	Area (Ha)	Area (Acres)	Ownership
Totopotomoy Creek (Rural Plains)	1	58.1	143.5	NPS, Civil War Trust
Beaver Dam Creek	2	103.0	254.4	NPS
Watt House	5	155.7	384.7	NPS, Civil War Trust
Cold Harbor	3	19.6	48.4	NPS, Civil War Trust
Malvern Hill	8	318.5	787.1	NPS, Civil War Trust
Fort Harrison	1	3.7	9.1	NPS
TOTAL	20	658.6	1627.2	

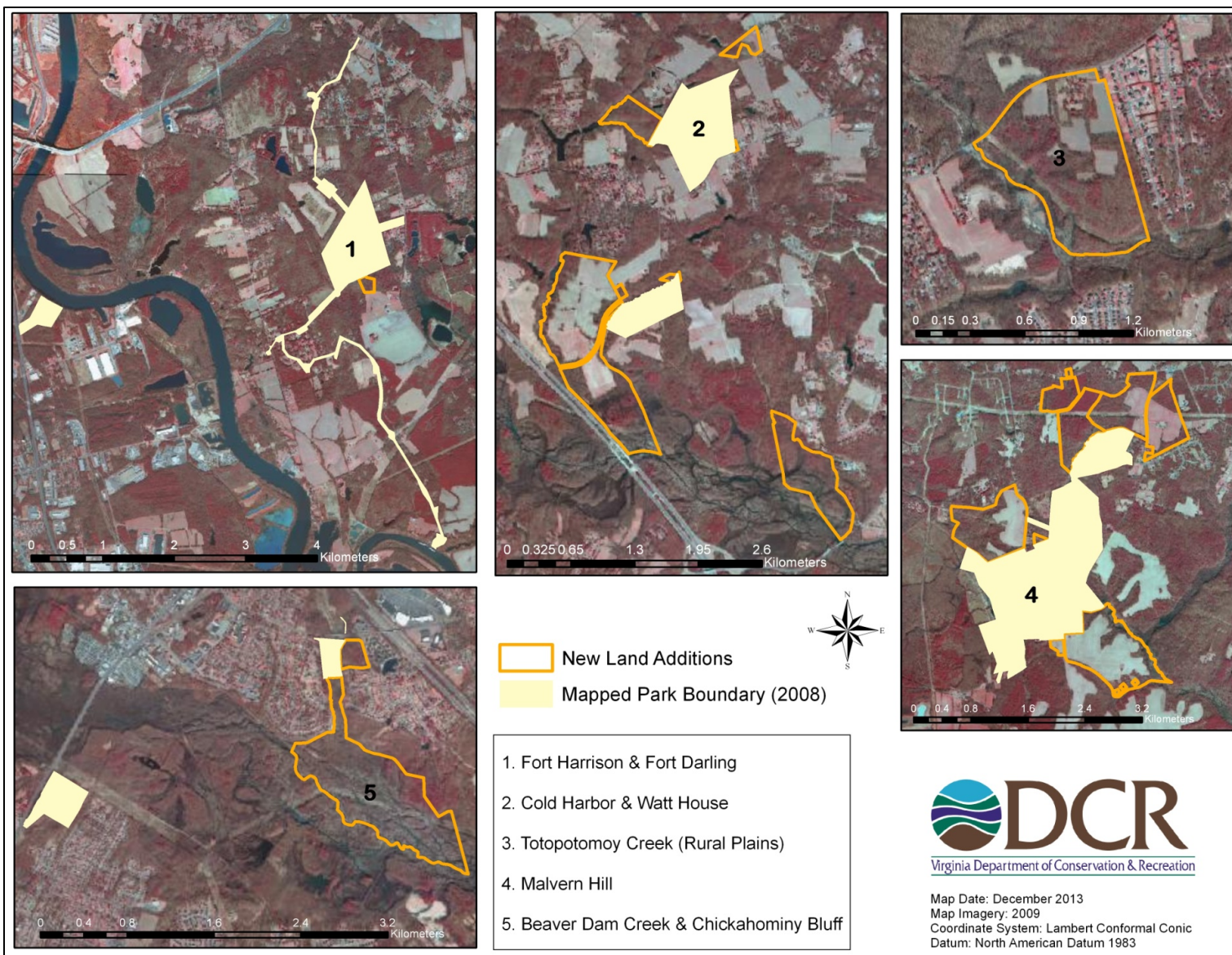


Figure 1. Map of new land parcels at Richmond National Battlefield Park.

Methods

Preliminary Data Collection and Review of Existing Information

The existing spatial data products from the 2008 vegetation mapping project were compiled with the new parcel layers to create a new geodatabase for the park using ESRI ArcMap 10.1 software. A set of 2012 fall, leaf-on photography, provided by NPS, was used as the base map for mapping. The 2009 leaf-off, color-infrared orthophotography from the Virginia Base Mapping Program (VBMP) was also used to inform the mapping. The 2009 imagery has a nominal scale of 1:200 with 1-ft pixel resolution.

A 20 parcel shapefile obtained from NPS was examined over the aerial photography to identify clear areas of homogeneous vegetation or land use and to prioritize sites for field data collection. Three parcels, identified as open meadows, agricultural areas, residential, or other built up land were classified to map class using photo-interpretation alone, because of the distinct photo-signature, and were thus not considered priorities for on-the-ground data collection. The remaining 17 parcels contained forested areas and were targeted for field surveys during the 2013 field season. NPS staff at RICH reviewed the 17 parcels and identified areas with private land restrictions and assisted VADNH Ecologists in gaining access.

Field Data Collection

VADNH Ecologists conducted field data collection on the new land additions in Richmond National Battlefield Park from May to August of 2013. The objectives of the fieldwork were to identify the dominant vegetation in each parcel using the field key developed for RICH in 2008 (Patterson 2008), and to collect any additional information needed (such as variation in vegetation or environment) to help attribute and edit the polygon line work in the new parcel layer.

VADNH ecologists collected 86 qualitative observation points throughout 18 parcels in the park. Preselected points were located in the field using a Garmin Rino 655t. At each point, the ecologists assigned the stand to a map class using the existing field key or took notes to describe any new types and/or vegetation transitions. When possible, the entire stand was traversed and additional points were collected to mark significant vegetation change within the stand. Quantitative plot data was not collected, though dominant or diagnostic species were usually noted, as well as any other site characteristics that may be helpful in classifying and mapping the vegetation, particularly in instances where a point could not be keyed unambiguously. Quantitative plot data was previously collected at one new parcel (Turkey Hill) in 2010 by VADNH ecologists. The four plots represent three new types documented and mapped for the park.

Initial map class assignments for observation points were typically made in the field with the help of the 2008 field key. This process allowed for additional field testing of the 2008 key and helped to identify any shortcomings. The key was edited and refined as needed as field work progressed. In addition, the three new types identified for the park were added to the field key following the conclusion of the field season. The revised field key is provided in this report and

should be used in conjunction with the map class descriptions found in the 2008 report (Patterson 2008) and the new descriptions in Appendix B of this report.

Vegetation Map Preparation

The updated vegetation map for RICH integrates spatial data from the 2008 mapping project with the vegetation polygons created from mapping the new parcels. Initial map preparation included dissolving all internal parcel boundary lines to create one polygon for each block of new parcels. The new parcel shapefile was then merged with the original 2008 vegetation map to create one seamless layer. The boundary of the 2008 map was considered the correct map boundary and any overlapping parcel boundaries were corrected to conform to this vegetation map boundary (as per NPS staff communication).

To ensure geometric integrity, the merged vegetation shapefile was subject to defined map topology rules. The cluster tolerance was set to 0.5 m (approximately one tenth of the desired positional accuracy). Topology rules were established such that polygons would neither overlap nor have gaps between them. Topology was repeatedly validated as editing proceeded.

VADNH ecologists delineated visible areas of homogeneous vegetation or land use, as well as other map classes, in the new parcel polygons using ArcMap 10.1 onscreen digitizing tools (ESRI 2012). Heads-up digitizing to split polygons and modify polygon boundaries was executed at a scale of 1:6000 or finer (typically at 1:2000). Differences in color, texture, density, and pattern were useful for distinguishing some map classes based on photo signature, but many were indistinguishable by photo signature alone. We also relied on elevation contours and field data for separating vegetation communities and assigning map classes.

Each new polygon was assigned to one of the map classes developed for RICH in the 2008 vegetation mapping project (Patterson 2008) or to one of the three new map classes identified during the project. The attribute table of the final vegetation map is consistent with the 2008 vegetation map, except for the addition of a 'YR_EDITED' field indicating the year each polygon was last edited (2008 or 2013).

After completion of a draft map, final quality control measures were implemented. A topology check was run to ensure no polygon gaps or overlaps, and a geometry check was run to ensure there were no self-intersections, empty features, or other spatial errors. Any polygons under 0.01 ha in size were individually inspected as possible spurious sliver polygons, and merged with adjacent polygons as needed.

Prior to the project it was determined that an accuracy assessment of the new vegetation polygons, as described in the NPS accuracy assessment protocols (Lea and Curtis 2010), was not necessary given the relatively small size and number of additional lands. A full accuracy assessment was carried out for the original 2008 vegetation map and the overall map accuracy for the final vegetation map was 85.9% (Patterson 2008). In some cases the new polygons are extensions of the original 2008 polygons and therefore initial field work covered much of the general area. In addition, the majority of the new parcels have less than 20 polygons per map class and cover a relatively small area (<10 ha).

Metadata Preparation

The final vegetation map is accompanied by detailed FGDC compliant metadata (FGDC 1998). Metadata are critical elements of each spatial dataset, allowing future users of the data to understand how the dataset was developed, appropriate uses, and to locate specific information within the spatial dataset. An updated metadata record for the new vegetation map was created using ESRI ArcGIS v.10.1. This process ensures that all elements required by the FGDC standard are included in the metadata files.

Results

Land parcels acquired since 2004 for Richmond National Battlefield Park add an additional 659 ha (1627 ac) of land to the park. This is a 16% increase in total park land mapped for a new total of 1224 ha (3025 ac). Table 2 shows the map classes identified and mapped on the RICH lands acquired since 2004 and provides a summary of the map class distribution and abundance.

The updated vegetation map for RICH has a total of 354 polygons and includes 24 vegetation map classes (Table 3). One hundred and seventy-one new vegetation polygons were delineated from the 20 land parcels (Table 2). This study identified and documented three new map classes in the park. The new types are Coastal Plain Mesic Mixed Hardwood Forest, Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type), and Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type).

Table 4 shows the 17 map classes identified and mapped on the new land parcels, the relationship of the map classes to standard classifications, and the relationship to the local and global descriptions presented in Appendix I of the 2008 report and Appendix B of this report. Thirteen of the 17 map classes were crosswalked to the finest level of the USNVC (association) and represent 4 upland forests, 5 wetland forests or shrublands, 3 successional forests/fields, and 1 planted plantation type. One of the 16 map classes, Successional Mixed Scrub, is described as a nonstandard, park-specific vegetation class, and three were crosswalked to the Anderson (Anderson et al. 1976) Level II classification. Polygons that were attributed with Anderson Level II class 14 (Transportation, Communication, and Utilities) are further attributed in the Comment field in the map attribute table to identify the finer feature they represent (road, utility line, etc). Particularly disturbed examples of Coastal Plain / Piedmont Small Stream Floodplain Forest that may not have the typical species composition and diversity are labeled as “disturbed” in the Comment field of the map attribute table.

The final vegetation map for Richmond National Battlefield Park is shown in Figures 2-4 and a summary of map class distribution and abundance is provided in Table 3. The mapping boundary was based on updated park boundary data obtained from Richmond National Battlefield Park in January 2012. The final vegetation map was clipped at the park boundary because areas outside the park were not surveyed and to conform to the 2008 map product. The updated association-level vegetation map with FGDC compliant metadata is provided as a shapefile with this report.

The revised field key for the vegetation classes at Richmond National Battlefield Park is provided in Appendix A of this report. All new vegetation types are incorporated into the revised key. In addition, 2013 field visits to existing types highlighted important species associates missing from the 2008 field key for certain wetland forests and upland deciduous forests. The additional species were added to the revised key and will help the user distinguish between similar vegetation types in the field.

The new local and global descriptions for Coastal Plain Mesic Mixed Hardwood Forest, Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) and Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type) are provided in Appendix B of this report. The descriptions also include a photograph of each type as it typically occurs in

Richmond National Battlefield Park. All three types are rare for the park and the communities are declining throughout their range due to threats such as agriculture, development and beaver damage. Stands of both Coastal Plain / Piedmont Floodplain Swamp Forests were found and mapped along the Chickahominy River at Beaver Dam Creek and the SE end of Watt House, known as Turkey Hill (Figures 2 and 3). Coastal Plain Mesic Mixed Hardwood Forest is mapped on three upland islands within the large swamp complex at Turkey Hill (Figure 3). High quality stands of all three types are uncommon and therefore it is important for RICH staff to be aware of these new types and the location of the stands as they should be considered conservation priorities for the park.

A revised description for Coastal Plain / Piedmont Small Stream Floodplain Forest is also included in Appendix B. New heavily disturbed stands of the type were found during 2013 field visits and the local description and classification comments were updated to incorporate this new information. The updated description also includes a new photo showing a typical disturbed example at RICH. The local descriptions were reviewed for the remaining 13 map classes encountered in the new parcels and no additional changes were needed.

Since the completion of the original 2008 vegetation mapping project, and prior to this project, VA DNH collected quantitative plot data in the new parcel at Turkey Hill (Figure 3). Four 20x20m plots were established in the types representing Coastal Plain Mesic Mixed Hardwood Forest (1 plot), Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) (1 plot), and Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type) (2 plots). The data for the four plots are entered in the VADNH vegetation plot database as plots RNBP012, RNBP013, RNBP014, and RNBP015. A report from the VADNH vegetation plot database is included in this report as Appendix C. The VADNH plot data can be entered by park staff into the Richmond National Battlefield NPS PLOTS database to provide a long-term record of species and environmental characteristics at each plot sample location.

Table 2. Number of polygons and total mapped hectares for the land additions at Richmond National Battlefield Park.

Map Class	Number of polygons	Total mapped hectares
Acidic Oak - Hickory Forest	1	1.1
Mesic Mixed Hardwood Forest	14	45.4
Coastal Plain Mesic Mixed Hardwood Forest	3	10.8
Coastal Plain Mixed Oak / Heath Forest	6	35.3
Coastal Plain / Piedmont Acidic Seepage Swamp	2	0.6
Coastal Plain / Piedmont Small Stream Floodplain Forest	18	34.6
Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type)	9	21.9
Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type)	18	41.4
Beaver Wetland Complex	17	66.9
Cultural Meadow	22	196.6
Successional Mixed Scrub	10	26.4
Successional Tuliptree Forest	15	87.8
Loblolly Pine – Hardwood Forest	12	32.3
Loblolly Pine Plantation	3	28.9
Other Urban or Built-up Land	2	2.0
Transportation, Communications, and Utilities	14	23.0
Residential	5	3.2
TOTAL	171	658.4

Table 3. Number of polygons and total mapped hectares for the 24 vegetation map classes in the 2013 updated map for Richmond National Battlefield Park.

Map Class	Number of polygons	Total mapped hectares
Acidic Oak - Hickory Forest	15	46.3
Mesic Mixed Hardwood Forest	32	125.4
Coastal Plain Mesic Mixed Hardwood Forest	3	10.8
Coastal Plain Mixed Oak / Heath Forest	16	106.1
Coastal Plain / Piedmont Acidic Seepage Swamp	9	9.7
Coastal Plain / Piedmont Small Stream Floodplain Forest	23	38.7
Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type)	9	21.9
Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type)	18	41.4
Non-Riverine Saturated Forest	6	26.8
Non-Riverine Saturated Forest - pine subtype	4	5.8
Beaver Wetland Complex	23	117.6
Successional Shrub Swamp	1	0.5
Forested Earthworks	11	25.0
Open Earthworks	4	4.7
Cultural Meadow	40	277.8
Successional Mixed Scrub	13	29.6
Successional Black Walnut Forest	1	0.6
Successional Red-cedar Forest	2	1.0
Successional Tuliptree Forest	28	135.9
Loblolly Pine – Hardwood Forest	24	70.7
Loblolly Pine Plantation	6	66.7
Other Urban or Built-up Land	10	11.2
Transportation, Communications, and Utilities	36	42.5
Residential	20	7.4
TOTAL	354	1224

Table 4. Vegetation-map classes and corresponding USNVC associations (Natureserve 2007) or other classification mapped in the land additions at Richmond National Battlefield Park. All map class names are consistent with the 2008 park vegetation map.

Map Class	USNVC Association (association code)	Regional Vegetation Name or Land-use Class* (name source)
Acidic Oak - Hickory Forest	<i>Quercus alba</i> - <i>Quercus rubra</i> - <i>Carya alba</i> / <i>Cornus florida</i> / <i>Vaccinium stamineum</i> / <i>Desmodium nudiflorum</i> Piedmont Forest (CEGL008475)	Acidic Oak - Hickory Forest (Fleming et al. 2006)
Mesic Mixed Hardwood Forest	<i>Fagus grandifolia</i> - <i>Quercus (alba, rubra)</i> - <i>Liriodendron tulipifera</i> / (<i>Ilex opaca</i> var. <i>opaca</i>) / <i>Polystichum acrostichoides</i> Forest (CEGL006075)	Mesic Mixed Hardwood Forest (Fleming et al. 2006)
Coastal Plain Mesic Mixed Hardwood Forest	<i>Fagus grandifolia</i> – <i>Quercus nigra</i> Forest (CEGL007211)	Southern Coastal Plain Mesic Mixed Hardwood Forest (Fleming et al. 2010)
Coastal Plain Mixed Oak / Heath Forest	<i>Quercus alba</i> - <i>Quercus falcata</i> - (<i>Carya pallida</i>) / <i>Gaylussacia frondosa</i> Forest (CEGL006269)	Coastal Plain Mixed Oak / Heath Forest (Fleming et al. 2006)
Coastal Plain / Piedmont Acidic Seepage Swamp	<i>Acer rubrum</i> - <i>Nyssa sylvatica</i> - <i>Magnolia virginiana</i> / <i>Viburnum nudum</i> var. <i>nudum</i> / <i>Osmunda cinnamomea</i> - <i>Woodwardia areolata</i> Forest (CEGL006238)	Coastal Plain / Piedmont Acidic Seepage Swamp (Fleming et al 2006).
Coastal Plain / Piedmont Small Stream Floodplain Forest	<i>Liquidambar styraciflua</i> - <i>Liriodendron tulipifera</i> / <i>Lindera benzoin</i> / <i>Arisaema triphyllum</i> Forest (CEGL004418)	Coastal Plain / Piedmont Small-Stream Floodplain Forest (Fleming et al 2006)
Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type)	<i>Quercus (phellos, palustris, michauxii)</i> - <i>Liquidambar styraciflua</i> / <i>Cinna arundinacea</i> Forest (CEGL006605)	Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) (Fleming et al. 2006)
Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type)	<i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> / <i>Saururus cernuus</i> Forest (CEGL006606)	Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash - Red Maple Type) (Fleming et al. 2006)
Beaver Wetland Complex	<i>Alnus serrulata</i> Swamp Shrubland (CEGL005082)	Beaver Wetland Complex (park-specific name)
Cultural Meadow	<i>Dactylis glomerata</i> - <i>Phleum pratense</i> - <i>Festuca spp.</i> - <i>Solidago spp.</i> Herbaceous Vegetation (CEGL006107)	Cultural Meadow (park-specific name)
Successional Mixed Scrub	Not defined - nonstandard, park-specific vegetation class	Successional Mixed Scrub (park-specific name)
Successional Tuliptree Forest	<i>Liriodendron tulipifera</i> - <i>Quercus spp.</i> Forest (CEGL007221)	Successional Tuliptree Forest (park-specific name)

*Equivalent to the Common name (Park-specific) as used in detailed descriptions of Appendix I of Patterson 2008

Table 4. Vegetation-map classes and corresponding USNVC associations (Natureserve 2007) or other classification mapped in the land additions at Richmond National Battlefield Park. All map class names are consistent with the 2008 park vegetation map (continued).

Map Class	USNVC Association (association code)	Regional Vegetation Name or Land-use Class* (name source)
Loblolly Pine - Hardwood Forest	<i>Pinus taeda</i> - <i>Liquidambar styraciflua</i> Semi-natural Forest (CEGL008462)	Loblolly Pine - Hardwood Forest (park-specific name)
Loblolly Pine Plantation	<i>Pinus taeda</i> Planted Forest (CEGL007179)	Loblolly Pine Plantation (NatureServe 2007)
Other Urban or Built-up Land	Not defined - Anderson land-use class	Other Urban or Built-up Land (17) (Anderson et al. 1976)
Transportation, Communications, and Utilities	Not defined - Anderson land-use class	Transportation, Communications, and Utilities (14) (Anderson et al. 1976)
Residential	Not defined - Anderson land-use class	Residential (11) (Anderson et al. 1976)

*Equivalent to the Common name (Park-specific) as used in detailed descriptions of Appendix I of Patterson 2008

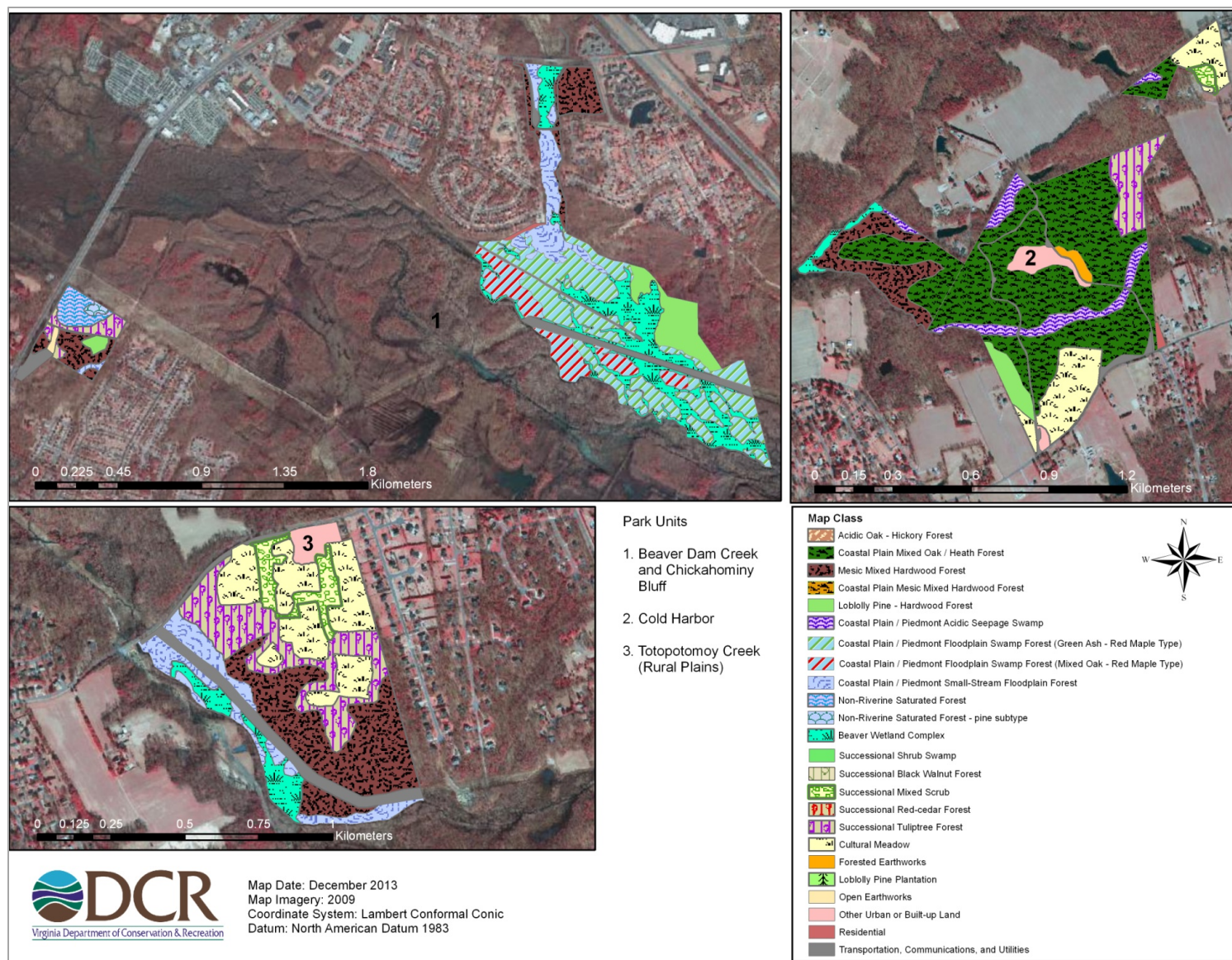


Figure 2. Vegetation and Anderson Level II map classes for three units in Richmond National Battlefield Park.

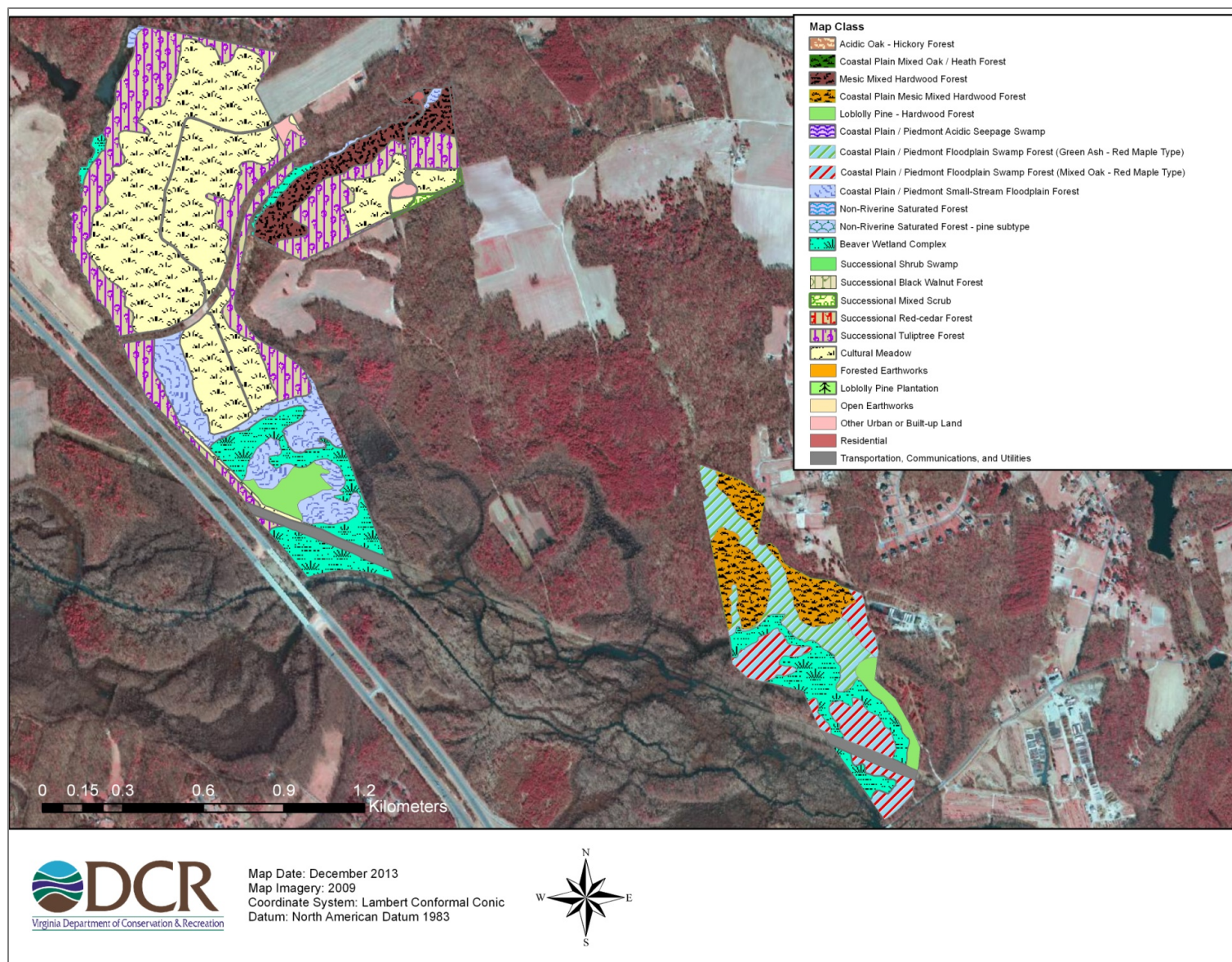


Figure 3. Vegetation and Anderson Level II map classes for Watt House and Turkey Hill in Richmond National Battlefield Park.

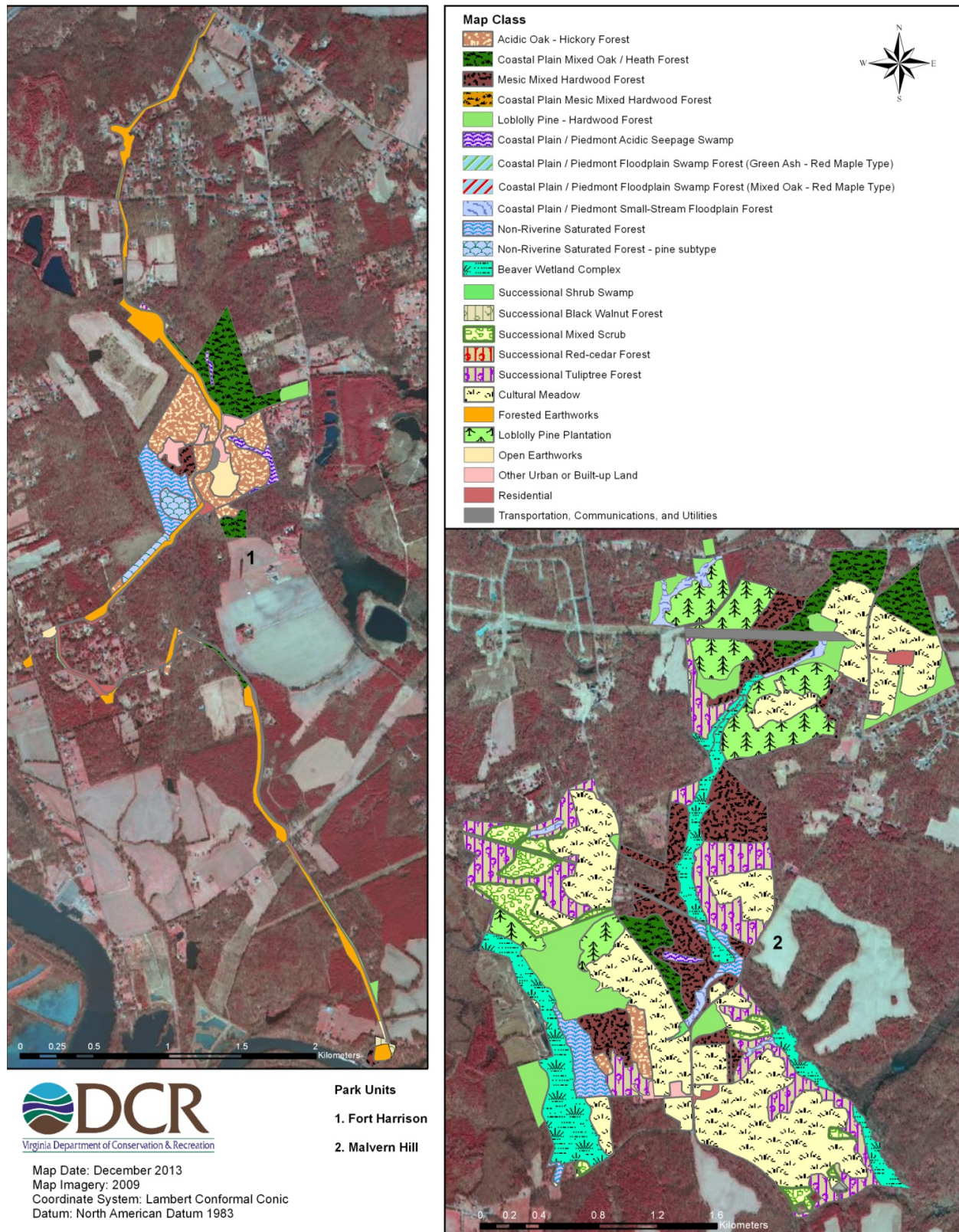


Figure 4. Vegetation and Anderson Level II map classes for Fort Harrison and Malvern Hill in Richmond National Battlefield Park.

Discussion

This study at Richmond National Battlefield Park identified the vegetation in 20 new land parcels spread throughout six of the park's ten principal units. Vegetation in the parcels was mapped using the classification developed in Patterson (2008), except for the three new vegetation types encountered during the study which were mapped using USNVC associations. The 24 map classes for the park represent thirteen USNVC associations, three Anderson Level II land-use classes (Anderson et al. 1976), and one nonstandard, park-specific vegetation class (Table 4). Included below is a discussion of the vegetation-map classes delineated in the new land parcels. Full descriptions of all 24 vegetation-map classes found at RICH, including environmental characteristics and species composition, are included in Appendix B of this report and Appendix I of Patterson (2008).

In the context of this study and Patterson (2008), late successional forests are mature forests found in the least disturbed areas in the park. These native vegetation associations or “natural communities” have the most stable species composition, with a greater diversity of native flora than other map classes representing disturbed or cultural vegetation. In the new land parcels, seven map classes represent late-successional vegetation, and together they cover 24% of the land in the new parcels (157 ha [388 ac]). The addition of these lands increases the total cover of late-successional vegetation in the park to 394 ha (974 ac), or 32% of total land cover (Table 3).

These map classes can be broadly characterized based on different environmental settings as upland forests (four map classes) and forested wetlands (three map classes). The upland forest map classes are Acidic Oak - Hickory Forest, Mesic Mixed Hardwood Forest, Coastal Plain Mesic Mixed Hardwood Forest, and Coastal Plain Mixed Oak / Heath Forest. The upland forest types previously mapped at RICH (Patterson 2008) are common throughout their range and are associated with the well-drained, low fertility, acidic soils found throughout the park.

Coastal Plain Mesic Mixed Hardwood Forest is a new upland forest type for the park and it is mapped as 3 stands covering a total of 11 hectares. In RICH, it is only known to occur on slightly elevated areas within the large swamp complex at Turkey Hill on the Chickahominy River (Figure 3). The vegetation abruptly changes to Coastal Plain / Piedmont Floodplain Swamp Forest in the wet areas surrounding this forest. Coastal Plain Mesic Mixed Hardwood Forest can be distinguished from Mesic Mixed Hardwood Forest by its location on the upland “islands” within a larger swamp complex and the presence of *Quercus michauxii* (swamp chestnut oak) and *Clethra alnifolia* (sweet pepperbush) in the stands. This community is largely restricted to the Embayed region of the Mid-Atlantic and there are few protected occurrences giving it a global conservation rank G3¹ (state rank S2S3). The overall extent of the community is declining and threats include development, agriculture, and logging. The example at Turkey Hill meets the criteria of size, condition, and landscape context to be considered a Natural Heritage exemplary natural community occurrence and should be targeted for protection and management as needed. The occurrence is further significant in being the northernmost known occurrence of its type throughout its range.

¹ See Appendix E of Patterson (2008) for definitions of global and state conservation ranks.

Forested wetlands in the new land parcels cover 15% of the total area (99 ha, 245 ac) and include four map classes. These map classes include Coastal Plain / Piedmont Small Stream Floodplain Forest, Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type), Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type) and the non-alluvial wetland of Coastal Plain / Piedmont Acidic Seepage Swamp that occurs away from active floodplains.

Coastal Plain / Piedmont Small Stream Floodplain Forest is a common floodplain forest throughout the region and in RICH it occurs on well-drained floodplains of perennial streams with relatively acidic soil. The majority of examples of this type in the park are disturbed and the most severely degraded stands have likely lost most of the native floodplain herbs. The new parcels significantly increased the cover of Coastal Plain / Piedmont Small Stream Floodplain Forest at RICH; overall cover increased from 4 ha (10 ac) to 39 ha (95 ac). The largest new stand (8 ha [20 ac]) occurs at Watt House in a heavily disturbed site along the Chickahominy River (Figure 3). This stand and a number of other examples at RICH transition into beaver disturbed wetlands. Beaver disturbance and the invasion of nonnative invasive plant species have severely altered the integrity of this type throughout its range.

Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) is a poorly drained floodplain swamp forest that often occurs in the backswamps of broad alluvial floodplains. This wetland forest type is rare for the park and has a global conservation rank of G3G4 (NatureServe 2007). At RICH it only occurs along the alluvial plain of the Chickahominy River where soil drainage is impeded and the floodplain is wide enough to support the association. It is mapped at Beaver Dam Creek and Turkey Hill and covers a total of 22 ha (54 ac) (Figures 2 and 3). High-quality examples of this community are uncommon throughout the range of the association. In Virginia it appears to be limited to the inner Coastal Plain and extreme outer Piedmont in northern and central Virginia. Not all the stands of this forest in Richmond National Battlefield were observed on the ground and further inventory should be done to assess the quality of the stands. However, because of the conservation status of this community, all examples of this native plant association should be targets for conservation and management. Further expansion of beaver wetlands could alter the hydrology of these habitats, resulting in tree death and the conversion of these forests to Beaver Wetland Complex. Other threats include invasion by nonnative invasive plant species.

Coastal Plain / Piedmont Floodplain Swamp (Green Ash – Red Maple Type) is similar to the Mixed Oak – Red Maple type in that it also occurs in backswamps along the Chickahominy River. It is uncommon in the park and has a global conservation rank of G3G4 (NatureServe 2012). The backswamps occupied by this type are typically separated from the main river channel (up to ca. 700m) and have relatively deep and prolonged seasonal flooding with hummock-and-hollow microtopography. It is distinguished from the Mixed Oak – Red Maple type by being seasonally flooded with deep muck and standing water prevalent and with canopies dominated by more flood-tolerant *Fraxinus pennsylvanica* (green ash) and/or *Acer rubrum* (red maple). The herbaceous layer is also distinct in that it is often dominated by *Saururus cernuus* (Lizard's tail). At RICH it occurs in the wettest areas of Beaver Dam Creek and Turkey Hill and covers a total of 41 ha (101 ac) (Figures 2 and 3). The type is fairly widespread in the backswamps of Virginia's Northern Coastal Plain. Beaver impoundments are the principal threat to this vegetation and many stands have been destroyed or altered. The

example of Coastal Plain / Piedmont Floodplain Swamp (Green Ash – Red Maple Type) at Turkey Hill meets the criteria of size, condition, and landscape context to be considered a Natural Heritage exemplary natural community occurrence and should be targeted for protection and management as needed. However, beaver threaten this occurrence and have impacted large areas of the floodplain closer to the river.

Coastal Plain / Piedmont Acidic Seepage Swamp is an uncommon (G3?) Coastal Plain wetland habitat that is vulnerable to destruction by indirect development impacts such as siltation, canopy removal, and subsequent non-native species invasions. Seven stands of this type were previously mapped in Cold Harbor, Fort Harrison, and Malvern Hill, with an average size of about 1.2 ha (3 ac). Two additional small stands were mapped along the edge of new parcels at Cold Harbor (Figure 2). Both stands are fairly disturbed and described as such in the ‘Comment’ field of the vegetation map attribute table. One is a 0.4 ha (1 ac) stand located off of Powhite Creek, just south of a beaver disturbed wetland complex, and the second is a 0.3 ha (0.7 ac) stand located directly south of a residential road near Route 633.

The remaining nine map classes in the new parcels in RICH represent early successional/transitional vegetation or cultural map classes (Table 2). With the addition of the new parcels, these stands now cover 759 ha (1876 ac), or 62% of the entire park. Much of this increase is due to the extent of Cultural Meadows throughout the new parcels. Cultural Meadow includes all mowed or maintained fields in the park, such as fields under agricultural use. Nearly 30% of the land in the new parcels is mapped as Cultural Meadow (197 ha [487 ac] out of 658 ha [1626 ac]; Table 2). The eight remaining successional and cultural map classes cover 270 ha (667 ac) of land in the new parcels.

Conclusion

The updated vegetation map for Richmond National Battlefield Park is a useful model of the distribution of vegetation communities across the park landscape. The new map, along with the revised vegetation field key and local descriptions, can be used by the park to help guide the management of forest resources, to provide vegetation information for monitoring programs, and to assist in training park staff about existing vegetation communities. It is possible that additional map classes may be discovered if further field work is done in the park or additional land parcels are acquired. In such cases, new data can be used to update the map, the list of map class descriptions, and the vegetation field key.

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Appendix A – Revised field key to the vegetation map classes at Richmond National Battlefield Park.

1a	Land is covered by vegetation not maintained by mowing or active cultivation, without buildings, paved areas, or human-created earthworks.	2
1b	Land use includes buildings, paved areas, human-created earthworks, or vegetation maintained by mowing or active cultivation.	24
2a	Vegetation of uplands: vegetation not influenced by flooding or groundwater.	3
2b	Vegetation of wetlands: vegetation of swamps, floodplains, or groundwater seepage.	15
3a	Forested vegetation: vegetation dominated by trees (tall, single-stemmed woody plants) with canopy coverage of at least 25%.	4
3b	Non-forested vegetation: dominated by shrubs (shrublands or scrubby vegetation, short trees or multi- trunked woody plants) or herbaceous plants.	14
4a	Mostly deciduous forest: evergreen trees make up less than 30% of overall polygon (canopy).	5
4b	Evergreen or mixed evergreen-deciduous forest: Evergreen trees make up greater than 30% of the overall polygon (canopy).	11

UPLAND DECIDUOUS FORESTS

5a	Vegetation dominated by early successional or ruderal species such as tuliptree (<i>Liriodendron tulipifera</i>), sweetgum (<i>Liquidambar styraciflua</i>), red maple (<i>Acer rubrum</i>), black walnut (<i>Juglans nigra</i>); exotic species can be common to dominant such as tree-of-heaven (<i>Ailanthus altissima</i>), princess tree (<i>Paulownia tomentosa</i>), Nepalese browntop (<i>Microstegium vimineum</i>); stands may be very young or mature, but trees are usually even-aged (i.e. of the same age class).	6
5b	Vegetation dominated by deciduous trees such as oaks (<i>Quercus</i> spp.), hickories (<i>Carya</i> spp.), American beech (<i>Fagus grandifolia</i>), and/or tuliptree (<i>Liriodendron tulipifera</i>); stands are middle to late successional in age, diverse in woody species composition, often with mixed age classes.	8
6a	Short (less than 20m), scrubby forests dominated by a mix of successional and exotic species; occurring along edges of roadways and Cultural Meadows.	Successional Mixed Scrub
6b	Well developed (tall) forests; dominated by deciduous trees.	7
7a	Forest dominated by black walnut (<i>Juglans nigra</i>), sweetgum (<i>Liquidambar styraciflua</i>), and common hackberry (<i>Celtis occidentalis</i>); herbs include Nepalese browntop (<i>Microstegium vimineum</i>) and eastern bottlebrush grass (<i>Elymus hystrix</i>).	Successional Black Walnut Forest
7b	Forest dominated by tuliptree (<i>Liriodendron tulipifera</i>), and/or sweetgum (<i>Liquidambar styraciflua</i>), sometimes with co-dominance by red maple	

- (*Acer rubrum*); Vines can cover large areas, draping over trees and shrubs and dominating canopy openings; herb layer often characterized by vines or a carpet of stilt grass (*Microstegium vimineum*). **Successional Tuliptree Forest**
- 8a Forests of xeric sites with canopies dominated with variable combinations of white oak (*Quercus alba*), black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), and southern red oak (*Quercus falcata*), and with huckleberries (*Gaylussacia* spp.) and blueberries (*Vaccinium* spp.), leaf litter, or vines dominating the ground layer; few to no herbaceous species present. **Coastal Plain Mixed Oak / Heath Forest**
- 8b Forests of submesic to mesic sites with canopies dominated by oaks (*Quercus* spp.), American beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), and / or sweetgum (*Liquidambar styraciflua*) and with hickories (*Carya* spp.) often prominent. Heath shrubs are not dominant in understory 9
- 9a Submesic forests of rolling uplands and lower slopes dominated by mixtures of oaks (*Quercus* spp.) and hickories (*Carya* spp.); low shrub / herb layer patchy or sparse in cover, but diverse in species with mixtures of woody seedlings, vines, ericaceous shrubs, sedges, grasses, and forbs. **Acidic Oak - Hickory Forest**
- 9b Forests of mesic slopes and ravines OR elevated upland ‘islands’ within larger swamp complexes. Stands are dominated by various mixtures of American beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), and oaks (*Quercus* spp.); little to no ericaceous shrub cover and herb layer sparse..... 10
- 10a Forests of mesic slopes and ravines dominated by various mixtures of American beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), white oak (*Quercus alba*), and/or northern red oak (*Quercus rubra*); characteristic associates are mockernut hickory (*Carya alba*), and American holly (*Ilex opaca* var. *opaca*) **Mesic Mixed Hardwood Forest**
- 10b Forests located on elevated upland ‘islands’ within larger swamp complexes along the Chickahominy River. Forests dominated by American beech (*Fagus grandifolia*), swamp chestnut oak (*Quercus michauxii*), and tuliptree (*Liriodendron tulipifera*) with a prominent understory / shrub layer of American holly (*Ilex opaca* var. *opaca*), sweet pepperbush (*Clethra alnifolia*), and occasional sweetleaf (*Symplocos tinctoria*)..... **Coastal Plain Mesic Mixed Hardwood Forest**

UPLAND EVERGREEN OR MIXED EVERGREEN-DECIDUOUS FORESTS

- 11a Forests of loblolly pine (*Pinus taeda*) with or without other tree species 12
- 11b Forests of eastern redcedar (*Juniperus virginiana* var. *virginiana*) with or without other species; bordering fields and residences. **Successional Red-cedar Forest**
- 12a Early successional or planted evergreen forests of loblolly pine (*Pinus taeda*) without deciduous trees in the canopy (uppermost stratum); young successional hardwoods may occur in the shrub layer, polygon signature is fine textured (i.e. evergreen with small tree crowns), trees often in

- rows. **Loblolly Pine Plantation**
- 12b Forests ranging from mostly evergreen to mixed evergreen-deciduous; canopies mixtures of loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), tuliptree (*Liriodendron tulipifera*), and/or oaks (*Quercus* spp.). 13
- 13a Forest tree canopy with variable mixtures of loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), and/or tuliptree (*Liriodendron tulipifera*); sometimes with southern red oak (*Quercus falcata*); lacking dense ericaceous shrubs; associated species are often weedy or exotic. **Loblolly Pine - Hardwood Forest**
- 13b Forests of xeric sites with canopies dominated by loblolly pine (*Pinus taeda*) with variable combinations of white oak (*Quercus alba*), black oak (*Quercus velutina*), and southern red oak (*Quercus falcata*), and with huckleberries (*Gaylussacia* spp.) and blueberries (*Vaccinium* spp.), leaf litter, or vines dominating the ground layer; few to no herbaceous species present. **Coastal Plain Mixed Oak / Heath Forest**

NON-FORESTED VEGETATION

- 14a Vegetation dominated by herbs; trees and shrubs, if present, occur at less than 25% cover; open fields dominated by a dense mix of native and European grasses and forbs or planted with an agricultural crop. **Cultural Meadow**
- 14b Dense thicket of tall shrubs or vines, or combination of both; bordering roads and meadows; typical species can include both nonnative species: tree of heaven (*Ailanthus altissima*), princess tree (*Paulownia tomentosa*), Japanese honeysuckle (*Lonicera japonica*), and native species: eastern redcedar (*Juniperus virginiana* var. *virginiana*), winged elm (*Ulmus alata*), eastern poison ivy (*Toxicodendron radicans*), frost grape (*Vitis vulpina*), and blackberries (*Rubus* spp.). **Successional Mixed Scrub**

WETLAND VEGETATION

- 15a Wetland vegetation dominated by shrubs and small trees. 16
- 15b Wetland vegetation dominated by trees with a forest canopy. 17
- 16a Wetland vegetation of broad flooded areas, dominated by shrubs and small trees, with herbaceous openings and often with standing dead trees; typical species include red maple (*Acer rubrum*), hazel alder (*Alnus serrulata*), common buttonbush (*Cephalanthus occidentalis*), black willow (*Salix nigra*), occurring with wetland herbs. **Beaver Wetland Complex**
- 16b Wetland vegetation of small disturbed drainages; dominated by dense, scrubby vegetation, approximately 10 meters tall with American sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and hazel alder (*Alnus serrulata*). **Successional Shrub Swamp**
- 17a Wetland forest with a mainly evergreen canopy of loblolly pine (*Pinus taeda*); associated species can include red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), pin oak (*Quercus palustris*), and willow oak (*Quercus phellos*). **Non-Riverine Saturated Forest - pine subtype**
- 17b Wetland forest with canopy dominated by deciduous trees. 18

- 18a Forests that are typically narrow features associated with temporarily flooded stream banks, sandy stream terraces, or saturated ravine bottoms / draws; hydric oaks, if present, are not typically common or dominant. 19
- 18b Forests on broad flats, poorly drained floodplains areas, backswamps or associated with beaver flooded wetlands; soils permanently saturated to seasonally flooded..... 21
- 19a Vegetation associated primarily with banks or floodplains of small streams, including mature stands and early successional, even-aged stands..... 20
- 19b Forests of narrow ravine bottoms or stream headwaters saturated with groundwater seepage; substrate sandy to mucky, with hummock and hollow microtopography and patches of peat mosses (*Sphagnum* spp.); canopy characterized by red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and black gum (*Nyssa sylvatica*); hydric oaks may be present but are not common; shrub layer often includes possumhaw (*Viburnum nudum*), sweetbay (*Magnolia virginiana*), coastal sweetpepperbush (*Clethra alnifolia*), or swamp doghobble (*Leucothoe racemosa*); herb layer is a dense mixture of graminoids, ferns, and forbs. **Coastal Plain / Piedmont Acidic Seepage Swamp**
- 20a Forests of banks or floodplains of small streams, receiving at least occasional stream flooding; canopy is dominated by combinations of red maple (*Acer rubrum*), tuliptree (*Liriodendron tulipifera*), and sweetgum (*Liquidambar styraciflua*), occurring with river birch (*Betula nigra*), American sycamore (*Platanus occidentalis*), black willow (*Salix nigra*); typical herbs are common ladyfern (*Athyrium filix-femina*), New York fern (*Thelypteris noveboracensis*), and netted chainfern (*Woodwardia areolata*), and smallspike false nettle (*Boehmeria cylindrica*). **Coastal Plain / Piedmont Small-Stream Floodplain Forest**
- 20b Successional forest that develops following clearcutting or other disturbance along well-drained alluvial floodplains of small streams and other temporarily flooded areas; canopy typically even-aged and dominated by the early-successional species *Liriodendron tulipifera* (tuliptree) and/or *Liquidambar styraciflua* (sweetgum). *Acer rubrum* (red maple) often codominates in canopy and subcanopy. Herbs often a dense layer of *Microstegium vimineum* (Nepalese browntop) or a tangle of *Smilax rotundifolia* (roundleaf greenbrier), *Lonicera japonica* (Japanese honeysuckle), and/or *Rubus* spp. (blackberry) **Coastal Plain / Piedmont Small-Stream Floodplain Forest (Disturbed Stand)**
- 21a Forests on broad flats with saturated or very shallowly seasonally flooded hydrology; not associated with the main stream channel and never inundated by overland flooding, although water table is at or near the surface during most of the growing season; canopy characterized by mixtures of red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and loblolly pine (*Pinus taeda*) with hydric oaks such as cherrybark oak (*Quercus pagoda*), willow oak (*Quercus phellos*), pin oak (*Quercus palustris*), and swamp chestnut oak (*Quercus michauxii*) are usually present either in the canopy, subcanopy, or shrub layers; the ground may be mostly bare, covered with matted leaf litter and mud, with scattered patches of wetland grasses and sedges. **Non-Riverine Saturated Forest**
- 21b Forests on broad terraces usually seasonally flooded by overland flow; canopy varying from closed to open with standing dead trees 22

22a	Open to very open forests with standing dead trees prominent; red maple (<i>Acer rubrum</i>) and black willow (<i>Salix nigra</i>) are typical dominants; other trees and shrubs can include river birch (<i>Betula nigra</i>), sweetgum (<i>Liquidambar styraciflua</i>), American sycamore (<i>Platanus occidentalis</i>), common alder (<i>Alnus serrulata</i>) and buttonbush (<i>Cephalanthus occidentalis</i>).	Beaver Wetland Complex
22b	More or less closed canopy forests dominated by mixed hardwoods, including red maple (<i>Acer rubrum</i>), sweetgum (<i>Liquidambar styraciflua</i>), swamp tupelo (<i>Nyssa biflora</i>), green ash (<i>Fraxinus pennsylvanica</i>), and wet-site oaks.....	23
23a	Habitat flooded relatively deeply and/or for prolonged parts of the growing season; overstory dominated by red maple (<i>Acer rubrum</i>), green ash (<i>Fraxinus pennsylvanica</i>), and/or swamp tupelo (<i>Nyssa biflora</i>); herb layer dominated by hydrophytic forbs, especially lizard's-tail (<i>Saururus cernuus</i>), false nettle (<i>Boehmeria cylindrica</i>), and/or arrow arum (<i>Peltandra virginica</i>).....	
 Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type)	
23b	Habitat only shallowly seasonally flooded over short periods; hydrophytic oaks such as swamp white oak (<i>Quercus michauxii</i>), willow oak (<i>Quercus phellos</i>), and cherrybark oak (<i>Q. pagoda</i>) dominant or co-dominant in canopy; herb layer usually dominated by hydrophytic sedges and grasses.....	
 Coastal Plain / Piedmont Floodplain Swamp (Mixed Oak – Red Maple Type)	

LAND-USE CLASSES AND CULTURAL VEGETATION

24a	Land use includes buildings or paved areas with or without maintained lawns and plantings.	25
24b	Land use with no buildings or paved areas; vegetation maintained by mowing or active cultivation.	27
25a	Land use is primarily single family dwellings; including houses, outbuildings, and maintained lawns and plantings.	Residential
25b	Land use is for park maintenance, recreation, or transportation corridors.	26
26a	Land use is primarily a transportation corridor with paved roadways, parking areas, and mowed roadsides.	
 Transportation, Communications, and Utilities	
26b	Land use includes park structures for maintenance or recreation with associated maintained lawns and plantings	Other Urban or Built-up Land
27a	Area is forested with trees.	28
27b	Area with less than 10% cover by trees.	29
28a	Park land with historic human-created earthworks with cover by trees.	Forested Earthworks
28b	Park land with forest cover and with maintained grassland below, associated with park interpretation.	Other Urban or Built-up Land
29a	Open, non-forested park land with historic human-created earthworks.	Open Earthworks
29b	Open, non-forested park land without historic human-created earthworks.	30

- 30a Non-forested areas maintained by mowing for use as a utility
corridor. **Transportation, Communications, and Utilities**
- 30b Non-forested areas maintained by mowing or planted in crops. **Cultural meadow**

Appendix B – New and revised local descriptions for Richmond National Battlefield Park.

COMMON NAME (PARK-SPECIFIC): COASTAL PLAIN / PIEDMONT FLOODPLAIN SWAMP FOREST (MIXED OAK - RED MAPLE TYPE)

SYNONYMS

USNVC English Name: (Willow Oak, Pin Oak, Swamp Chestnut Oak) - Sweetgum / Sweet Woodreed Forest
USNVC Scientific Name: *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest
USNVC Identifier: CEGL006605

LOCAL INFORMATION

Environmental Description: Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) is a floodplain swamp forest occurring in depressions and backswamps of broad alluvial floodplains. This association is poorly drained and often has standing water and saturated soil conditions. Soils are mainly poorly drained loams or clay loams.

Vegetation Description: The tree canopy is dominated by *Quercus michauxii* (swamp chestnut oak), *Quercus phellos* (willow oak), *Acer rubrum* (red maple), and *Liquidambar styraciflua* (sweetgum), with *Nyssa sylvatica* (blackgum) a frequent subcanopy species. *Quercus alba* (white oak) can occur as a canopy associate on well-drained hummocks of this association. The shrub layer varies in cover and is typically comprised of *Carpinus caroliniana* (American hornbeam), *Viburnum dentatum* (southern arrowwood), *Ilex verticillata* (common winterberry), and *Ilex opaca* var. *opaca* (American holly). Typical vines include *Smilax rotundifolia* (roundleaf greenbrier) (often dominant in the low-shrub layer), *Toxicodendron radicans* (eastern poison ivy), and *Parthenocissus quinquefolia* (Virginia creeper). The herb layer is often dense and is characterized by *Chasmanthium laxum* (slender woodoats), *Carex* spp. (sedges), *Lycopus virginicus* (Virginia water horehound), *Thelypteris noveboracensis* (New York fern), *Symphyotrichum lateriflorum* (calico aster), and *Glyceria striata* (fowl mannagrass). More disturbed areas typically have cover of exotic species such as *Lonicera japonica* (Japanese honeysuckle) and *Microstegium vimineum* (Nepalese browntop).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Quercus phellos</i> (willow oak)
Herb (field)	Graminoid	<i>Carex</i> spp. (sedges)

Characteristic Species: *Quercus michauxii* (swamp chestnut oak), *Quercus phellos* (willow oak), *Acer rubrum* (red maple), *Viburnum dentatum* (southern arrowwood), *Carex* spp. (sedges).

Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Lonicera japonica</i> (Japanese honeysuckle)	-	plant	invasive nonnative
<i>Microstegium vimineum</i> (Nepalese browntop)	-	plant	invasive nonnative

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
VA	S3?	B	C	Coastal Plain / Piedmont Swamp Forest	Fleming et al. 2006

Local Range: Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) only occurs along the alluvial plain of the Chickahominy River where soil drainage is impeded and the floodplain is wide enough to support the association. It is mapped at Beaver Dam Creek and the SE end of Watt House, known as Turkey Hill. It covers a total of 22 hectares and is mapped as 9 polygons.

Classification Comments: Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) can be distinguished from Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type) by the dominance of hydric oak species in the canopy and dense graminoid herb layer. It is also typically located on slightly higher sites with better drained soil. Unlike Coastal Plain / Piedmont Small-Stream Floodplain Forest, this forest is not associated with active floodplains and is located well away from the main stream channel. Areas heavily impacted by beavers may be transitional in structure and composition to Beaver Wetland Complex.

Other Comments: High-quality examples of this community are uncommon throughout the range of the association. In Virginia it appears to be limited to the inner Coastal Plain and extreme outer Piedmont in northern and central Virginia. Not all the stands of this forest in Richmond National Battlefield were observed on the ground and further inventory should be done to assess the quality of the stands. However, because of the conservation status of this community, all examples of this native plant association should be targets for conservation and management. In Richmond National Battlefield Park, expansion of beaver wetlands could alter the hydrology of these habitats, resulting in tree death and the conversion of these forests to Beaver Wetland Complex. Other threats include invasion by nonnative invasive plant species.

Local Description Authors: K. Taverna.

Plots: None. See Inventory notes below.

Richmond National Battlefield Park Inventory Notes: Since the completion of the original vegetation mapping project (Patterson 2008), and prior to this project, VADNH collected quantitative data in the Turkey Hill stand. The data are entered in the VADNH vegetation plot database (RNBP015). A report from this database is included in this report so that the data can be entered by Park staff into the Richmond National Battlefield NPS PLOTS database.

GLOBAL INFORMATION

USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Seasonally flooded cold-deciduous forest (I.B.2.N.e.)
Alliance	<i>Quercus (phellos, laurifolia)</i> Seasonally Flooded Forest Alliance (A.327)
Alliance (English name)	(Willow Oak, Diamondleaf Oak) Seasonally Flooded Forest Alliance
Association	<i>Quercus (phellos, palustris, michauxii)</i> - <i>Liquidambar styraciflua</i> / <i>Cinna arundinacea</i> Forest
Association (English name)	(Willow Oak, Pin Oak, Swamp Chestnut Oak) - Sweetgum / Sweet Woodreed Forest
Ecological System(s):	Central Appalachian Stream and Riparian (CES202.609)

Central Appalachian River Floodplain (CES202.608)
Atlantic Coastal Plain Small Brownwater River Floodplain Forest
(CES203.250)
Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
Northern Atlantic Coastal Plain Stream and River (CES203.070)

GLOBAL DESCRIPTION

Concept Summary: This floodplain swamp forest occurs in backswamps and topographic depressions within alluvial floodplains of large streams and small rivers. Along smaller headwater streams, it may occur in low, poorly drained floodplains with braided channels and depressions. The overstory is dominated by variable mixtures of *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple). The proportion of the latter two species typically increases with disturbance. The understory is commonly quite open and contains young *Acer rubrum* (red maple), several climbing vines, *Carpinus caroliniana* (American hornbeam), *Ilex opaca* var. *opaca* (American holly), *Asimina triloba* (pawpaw), *Viburnum dentatum* (southern arrowwood), *Ilex verticillata* (common winterberry), and other species. The herb layer is usually well-developed, with a prominent graminoid component. Common herbaceous patch-dominants include *Cinna arundinacea* (sweet woodreed), *Carex debilis* var. *debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Glyceria striata* (fowl mannagrass), and *Carex tribuloides* (blunt broom sedge).

Environmental Description: This floodplain swamp forest occurs in backswamps and topographic depressions within alluvial floodplains of large streams and small rivers. Along smaller headwater streams, it may occur in low, poorly drained floodplains with braided channels and depressions. Sites are probably overflowed annually, and depressions retain standing water well into the growing season. Soils are somewhat to very poorly drained loams or clay loams that are strongly to extremely acidic and infertile.

Vegetation Description: The overstory is dominated by variable mixtures of *Quercus phellos* (willow oak), *Quercus palustris* (pin oak), *Quercus michauxii* (swamp chestnut oak), *Liquidambar styraciflua* (sweetgum), and *Acer rubrum* (red maple). The proportion of the latter two species typically increases with disturbance. Other canopy associates include *Fraxinus pennsylvanica* (green ash), *Nyssa sylvatica* (blackgum), *Ulmus americana* (American elm), *Quercus pagoda* (cherrybark oak), *Quercus lyrata* (overcup oak), and *Betula nigra* (river birch). Climbing vines of *Smilax rotundifolia* (roundleaf greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (eastern poison ivy), and *Campsis radicans* (trumpet creeper) are common and characteristic. The subcanopy and shrub layers tend to be open and composed of young recruitment of *Acer rubrum* (red maple), along with *Carpinus caroliniana* (American hornbeam) (usually dominant), *Ilex opaca* var. *opaca* (American holly), *Asimina triloba* (pawpaw), *Euonymus americanus* (strawberry bush), *Viburnum dentatum* (southern arrowwood), *Ilex verticillata* (common winterberry), and *Lindera benzoin* (northern spicebush). The herb layer is usually well-developed, with a prominent graminoid component. Common herbaceous patch-dominants include *Cinna arundinacea* (sweet woodreed), *Carex debilis* var. *debilis* (white edge sedge), *Carex intumescens* (greater bladder sedge), *Glyceria striata* (fowl mannagrass), and *Carex tribuloides* (blunt broom sedge). Additional characteristic herbs include *Boehmeria cylindrica* (smallspike false nettle), *Arisaema triphyllum* (Jack in the pulpit), *Lycopus virginicus* (Virginia water horehound), *Athyrium filix-femina* ssp. *asplenoides* (asplenium)

ladyfern), *Impatiens capensis* (jewelweed), *Leersia virginica* (whitegrass), *Onoclea sensibilis* (sensitive fern), *Symphyotrichum lateriflorum* (calico aster), and *Rubus hispidus* (bristly dewberry). Many other species occur at low constancy and cover. Mean species richness of 47 Maryland and Virginia plot samples was 38 taxa per 400 square meters.

Most Abundant Species: Information not available.

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is found in the Chesapeake Bay region. It is most characteristic of the Coastal Plain but also extends into the extreme eastern part of the Piedmont.

States/Provinces: DE?, MD, NJ?, PA, VA.

Federal Lands: DOD (Fort Belvoir); NPS (Fredericksburg-Spotsylvania, National Capital-East, Petersburg, Prince William, Richmond).

CONSERVATION STATUS

Rank: G3G4 (23-Feb-2007).

Reasons: This is a moderately-well-distributed forest type. Some examples are at least partly protected in national parks. More information on threats is needed.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: This association is supported by analysis of a 1250-plot regional dataset assembled for the NCR and mid-Atlantic national parks vegetation mapping project. In that analysis, this type was represented by a group of 37 Maryland and 10 northern Virginia plots.

Similar Associations: Information not available.

Related Concepts:

- *Acer rubrum* - *Liquidambar styraciflua* - *Quercus* (*palustris*, *phellos*) Seasonally Flooded Forest (Patterson pers. comm.)

SOURCES

Description Authors: D. Thompson and L. A. Sneddon, mod. G. P. Fleming.

References: Eastern Ecology Working Group n.d., Fleming et al. 2001, Harrison 2004, Harrison and Stango 2003, Patterson pers. comm., Thomson et al. 1999.



Figure B1. Coastal Plain / Piedmont Floodplain Swamp Forest (Mixed Oak – Red Maple Type) at Richmond National Battlefield Park. June 2010.

COMMON NAME (PARK-SPECIFIC): COASTAL PLAIN / PIEDMONT FLOODPLAIN SWAMP FOREST (GREEN ASH - RED MAPLE TYPE)

SYNONYMS

USNVC English Name: Red Maple - Green Ash / Lizard's-tail Forest

USNVC Scientific Name: *Acer rubrum* - *Fraxinus pennsylvanica* / *Saururus cernuus* Forest

USNVC Identifier: CEG006606

LOCAL INFORMATION

Environmental Description: Coastal Plain / Piedmont Floodplain Swamp (Green Ash – Red Maple Type) occurs on poorly drained areas along small streams and in backswamps along the outer edges of large floodplains. These bottomlands have pronounced seasonal flooding and hummock-and-hollow microtopography. During the growing season, when these areas are not flooded, deep, mucky soils are exposed and the water table is just below the ground surface. Leaf litter typically covers the hummocks, while depressions are water or muck filled.

Vegetation Description: These broad-leaved deciduous forests are typically co-dominated by medium-diameter *Fraxinus pennsylvanica* (green ash), *Acer rubrum* (red maple), and *Nyssa biflora* (swamp tupelo). Areas with a longer hydroperiod have larger trees with the largest being 40-60 cm DBH. Common associates include *Liquidambar styraciflua* (sweetgum) and *Quercus palustris* (pin oak). Shrubs have patchy cover, with *Ilex opaca* var. *opaca* (American holly) most common on tree-base hummocks and *Viburnum nudum* (possumhaw) common in hollows.

Other shrubs include *Clethra alnifolia* (sweet pepperbush), *Ilex verticillata* (common winterberry), and *Smilax rotundifolia* (roundleaf greenbrier). Herbaceous composition varies with microhabitats. Hummocks usually support *Boehmeria cylindrica* (smallspike false nettle), *Chasmanthium laxum* (slender woodoats), *Cinna arundinacea* (sweet woodreed), *Pilea pumila* (Canadian clearweed), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (jewelweed), and many hydrophytic sedges *Carex* spp. (sedges) like *Carex crinita* (fringed sedge), *Carex gracillima* (graceful sedge), *Carex granularis* (limestone meadow sedge), *Carex intumescens* (greater bladder sedge), *Carex laevivaginata* (smoothsheath sedge), *Carex lupulina* (hop sedge), *Carex lurida* (shallow sedge), *Carex oxylepis* (sharp scale sedge), *Carex stipata* (owlfruit sedge), *Carex styloflexa* (bent sedge), and *Carex tribuloides* (blunt broom sedge). Hollows are usually dominated by *Saururus cernuus* (lizard's tail), with associates such as *Peltandra virginica* (green arrow arum), *Rumex verticillatus* (swamp dock), *Triadenum walteri* (greater marsh St. Johnswort), and in more disturbed areas, *Juncus effusus* (common rush) and *Mikania scandens* (climbing hempvine).

Coastal Plain / Piedmont Floodplain Swamp (Green Ash – Red Maple Type) occurs on poorly drained areas, but some areas mapped may be cut off from former natural flooding regimes due to the presence of roads, ditching, or beaver activities. Stands impacted by beaver flooding typically have many dead trees and vast areas of the exotic, invasive plant, *Murdannia keiskei* (marsh dewflower).

Most Abundant Species:

Stratum

Tree canopy

Lifeform

Broad-leaved deciduous tree

Species

Acer rubrum (red maple),

Formation	Seasonally flooded cold-deciduous forest (I.B.2.N.e.)
Alliance	<i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Seasonally Flooded Forest Alliance (A.316)
Alliance (English name)	Red Maple - Green Ash Seasonally Flooded Forest Alliance
Association	<i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> / <i>Saururus cernuus</i> Forest
Association (English name)	Red Maple - Green Ash / Lizard's-tail Forest
Ecological System(s):	Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520). Northern Atlantic Coastal Plain Stream and River (CES203.070).

GLOBAL DESCRIPTION

Concept Summary: This red maple swamp community of the Mid-Atlantic Coastal Plain of the Chesapeake Bay and Piedmont regions occurs on poorly drained to very poorly drained soils on flats and along watercourses that are seasonally to semipermanently flooded. The organic horizon is of variable depth and overlies sandy or silt clay loam soils. This swamp has pronounced hummock-and-hollow microtopography. The tree canopy is closed to partially open and dominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash). Other canopy associates may include *Nyssa sylvatica* (blackgum), *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Quercus lyrata* (overcup oak), *Quercus phellos* (willow oak), *Quercus lyrata* (overcup oak), and *Populus heterophylla* (swamp cottonwood). The shrub layer includes *Lindera benzoin* (northern spicebush), *Leucothoe racemosa* (swamp doghobble), *Ilex verticillata* (common winterberry), *Viburnum* spp. (viburnums), and *Fraxinus pennsylvanica* (green ash) saplings. The herb layer is characterized by *Saururus cernuus* (lizard's tail), *Peltandra virginica* (green arrow arum), *Boehmeria cylindrica* (smallspike false nettle), *Triadenum walteri* (greater marsh St. Johnswort), *Cinna arundinacea* (sweet woodreed), *Pilea pumila* (Canadian clearweed), *Impatiens capensis* (jewelweed), *Osmunda regalis* (royal fern), *Leersia oryzoides* (rice cutgrass), *Leersia virginica* (whitegrass), *Glyceria striata* (fowl mannagrass), *Rumex verticillatus* (swamp dock), *Carex* spp. (sedges), and *Polygonum arifolium* (halberdleaf tearthumb).

Environmental Description: This swamp forest occurs in backswamps, watercourses, flats and depressions that are flooded for significant portions of the growing season. These areas receive some nutrient inputs from adjacent uplands or overland flooding and have soils that are moderately calcareous. The substrate is deep muck with a pronounced hummock-and-hollow microtopography.

Vegetation Description: This forest type is characterized by a well-developed tree canopy codominated by *Acer rubrum* (red maple) and *Fraxinus pennsylvanica* (green ash) in variable proportions. Other canopy associates may include *Nyssa sylvatica* (blackgum), *Quercus phellos* (willow oak), *Quercus lyrata* (overcup oak), *Ulmus americana* (American elm), and *Populus heterophylla* (swamp cottonwood). At the southern end of the range, *Nyssa biflora* (swamp tupelo) and *Taxodium distichum* (bald cypress) may be minor associates. The shrub layer is of variable cover but usually not dense. The most common species are *Lindera benzoin* (northern spicebush), *Leucothoe racemosa* (swamp doghobble), *Vaccinium corymbosum* (highbush blueberry), *Ilex verticillata* (common winterberry), *Carpinus caroliniana* (American hornbeam), *Rosa palustris* (swamp rose), and *Viburnum dentatum* (southern arrowwood). Other shrub associates may include *Rhododendron viscosum* (swamp azalea), *Cephalanthus occidentalis* (common buttonbush), *Alnus serrulata* (hazel alder), and *Cornus amomum* (silky dogwood). The herb layer is diverse and generally characterized by abundant *Saururus cernuus* (lizard's tail), typically in hollows. Other associates are many and varied but generally include *Peltandra virginica* (green arrow arum), *Impatiens capensis* (jewelweed), *Pontederia cordata*

(pickerelweed), *Boehmeria cylindrica* (smallspike false nettle), *Glyceria* spp. (mannagrasses), *Cinna arundinacea* (sweet woodreed), *Bidens connata* (purplestem beggarticks), *Thelypteris palustris* (eastern marsh fern), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Carex stricta* (upright sedge), *Carex lurida* (shallow sedge), *Carex crinita* (fringed sedge), *Triadenum walteri* (greater marsh St. Johnswort), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Pilea pumila* (Canadian clearweed), *Carex tribuloides* (blunt broom sedge), *Polygonum punctatum* (dotted smartweed), *Polygonum arifolium* (halberdleaf tearthumb), *Cicuta maculata* (spotted water hemlock), *Leersia oryzoides* (rice cutgrass), *Galium obtusum* (bluntleaf bedstraw), and others. Vines may include *Toxicodendron radicans* (eastern poison ivy), *Smilax rotundifolia* (roundleaf greenbrier), *Campsis radicans* (trumpet creeper), and *Parthenocissus quinquefolia* (Virginia creeper). Mosses are generally sparse to absent, except on logs and tree bases above the high-water line.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Fraxinus pennsylvanica</i> (green ash)
Herb (field)	Forb	<i>Saururus cernuus</i> (lizard's tail)

Characteristic Species: *Acer rubrum* (red maple), *Bidens connata* (purplestem beggarticks), *Boehmeria cylindrica* (smallspike false nettle), *Carex crinita* (fringed sedge), *Carex lurida* (shallow sedge), *Carex stricta* (upright sedge), *Carex tribuloides* (blunt broom sedge), *Carpinus caroliniana* (American hornbeam), *Cicuta maculata* (spotted water hemlock), *Cinna arundinacea* (sweet woodreed), *Fraxinus pennsylvanica* (green ash), *Galium obtusum* (bluntleaf bedstraw), *Ilex verticillata* (common winterberry), *Impatiens capensis* (jewelweed), *Leersia oryzoides* (rice cutgrass), *Leucothoe racemosa* (swamp doghobble), *Lindera benzoin* (northern spicebush), *Lobelia cardinalis* (cardinalflower), *Lycopus virginicus* (Virginia water horehound), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Peltandra virginica* (green arrow arum), *Pilea pumila* (Canadian clearweed), *Polygonum arifolium* (halberdleaf tearthumb), *Polygonum punctatum* (dotted smartweed), *Pontederia cordata* (pickerelweed), *Rosa palustris* (swamp rose), *Saururus cernuus* (lizard's tail), *Thelypteris palustris* (eastern marsh fern), *Triadenum walteri* (greater marsh St. Johnswort), *Vaccinium corymbosum* (highbush blueberry), *Viburnum dentatum* (southern arrowwood).

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This red maple - green ash swamp community occurs in the Coastal Plain of the Chesapeake Bay region and rarely in the adjacent Piedmont from New Jersey to central Virginia.

States/Provinces: DE, MD, NJ, VA.

Federal Lands: DOD (Fort Belvoir); NPS (Colonial, National Capital-East, Richmond); USFWS (Chesapeake Marshlands, Great Swamp).

CONSERVATION STATUS

Rank: G3G4 (14-Feb-2012).

Reasons: This association is geographically restricted to the Mid-Atlantic Coastal Plain and in limited areas of the Piedmont. It occurs in small patches, generally less than 20 acres. As of December 2011, it is ranked as S3 in Maryland and S3S4 in Virginia, where it is reportedly widespread in the backswamps of the Coastal Plain. In New Jersey, this type is documented from Great Swamp on the transition from Inner Coastal Plain to Piedmont. This type also is likely to

occur in Delaware but its classification requires further resolution there. Beaver impoundments have been observed to threaten this vegetation.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 1 - Strong.

Comments: Classification is supported by analysis of a 1250-plot regional dataset compiled for the NCR and MAR national parks vegetation mapping projects. In that analysis, this association was represented by 23 Maryland and Virginia plots.

Similar Associations:

- *Acer (rubrum, saccharinum)* - *Fraxinus pennsylvanica* - *Ulmus americana* / *Boehmeria cylindrica* Forest (CEGL006548).

Related Concepts:

- *Fraxinus pennsylvanica* - *Acer rubrum* / *Cinna arundinacea* - *Saururus cernuus* - *Boehmeria cylindrica* Forest (VDNH 2003) =

SOURCES

Description Authors: D. Thompson, J. Meininger, L. A. Sneddon, mod. L. A. Sneddon and G. P. Fleming.

References: Bowman 2000, Breden et al. 2001, Eastern Ecology Working Group n.d., Fleming 2001, Harrison 2004, Harrison and Stango 2003, Meininger 1998, Thomson et al. 1999, VDNH 2003.



Figure B2. Coastal Plain / Piedmont Floodplain Swamp Forest (Green Ash – Red Maple Type) at Richmond National Battlefield Park. June 2010.

**COMMON NAME (PARK-SPECIFIC): COASTAL PLAIN MESIC MIXED
HARDWOOD FOREST**

SYNONYMS

USNVC English Name: American Beech – Water Oak Forest
USNVC Scientific Name: *Fagus grandifolia* – *Quercus nigra* Forest
USNVC Identifier: CEG007211

LOCAL INFORMATION

Environmental Description: Coastal Plain Mesic Mixed Hardwood Forest occurs on slightly elevated areas within a large swamp complex on the Chickahominy River. The vegetation abruptly changes to Coastal Plain / Piedmont Floodplain Swamp Forest in the wet areas surrounding this forest. Soils are black silty loam with some sand.

Vegetation Description: Forests dominated by *Fagus grandifolia* (American beech), with lesser amounts of *Quercus michauxii* (swamp chestnut oak), *Quercus alba* (white oak) and *Liriodendron tulipifera* (tuliptree). The largest trees are 40-70 cm DBH. Subcanopy associates include *Nyssa sylvatica* (blackgum) and *Acer rubrum* (red maple). Stands typically have a prominent understory / shrub layer of *Ilex opaca* var. *opaca* (American holly), with individuals over 35 cm DBH. Other characteristic shrub species are *Clethra alnifolia* (sweet pepperbush), and *Symplocos tinctoria* (sweetleaf). Additional shrub species include *Carpinus caroliniana* (American hornbeam), *Vaccinium fuscatum* (black highbush blueberry), and low-shrub cover of *Vitis rotundifolia* (muscadine) and *Smilax rotundifolia* (roundleaf greenbrier). The herb layer is sparse, but can be quite diverse, with a variety of ferns (*Woodwardia areolata* (netted chainfern), *Osmunda regalis* var. *spectabilis* (royal fern), *Osmunda cinnamomea* var. *cinnamomea* (cinnamon fern), *Thelypteris noveboracensis* (New York fern)), graminoids (*Chasmanthium laxum* (slender woodoats), *Carex albicans* var. *australis* (whitetinge sedge), *Carex abscondita* (thicket sedge)), and forbs (*Medeola virginiana* (Indian cucumber), *Goodyera pubescens* (downy rattlesnake plantain), *Mitchella repens* (partridge berry), *Uvularia sessilifolia* (sessile bellwort), and *Epifagus virginiana* (beech drops)).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	<i>Fagus grandifolia</i> (American beech) <i>Quercus michauxii</i> (swamp chestnut oak)
Shrub	Broad-leaved deciduous shrub	<i>Clethra alnifolia</i> (sweet pepperbush)

Characteristic Species: *Fagus grandifolia* (American beech), *Quercus michauxii* (swamp chestnut oak), *Ilex opaca* var. *opaca* (American holly), *Clethra alnifolia* (sweet pepperbush), and *Symplocos tinctoria* (sweetleaf).

Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Lonicera japonica</i> (Japanese honeysuckle)	-	plant	invasive nonnative

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
VA	S2S3*	U	3	Southern Coastal Plain Mesic Mixed Hardwood Forest	Fleming and Patterson 2011a

Local Range: Coastal Plain Mesic Mixed Hardwood Forest occurs at the Watt House unit, on upland islands within a large swamp complex on the Chickahominy River. It is mapped as 3 polygons covering a total of 11 hectares.

Classification Comments: Coastal Plain Mesic Mixed Hardwood Forest can be distinguished from Mesic Mixed Hardwood Forest by its location on upland “islands” within a larger swamp complex and the presence of *Quercus michauxii* (swamp chestnut oak) and *Clethra alnifolia* (sweet pepperbush) in the stands. The Virginia state name for this association is: *Fagus grandifolia* - *Quercus* (*alba*, *nigra*, *michauxii*) / *Symplocos tinctoria* - (*Stewartia malacodendron*) Forest.

Other Comments: This community is largely restricted in Virginia to the Embayed region of the Mid-Atlantic and there are few protected occurrences. The overall extent of the community is declining and threats include development, agriculture, and logging. The example at Turkey Hill meets the criteria of size, condition, and landscape context to be considered a Natural Heritage exemplary natural community occurrence and should be targeted for protection and management as needed. It also represents the northernmost known occurrence of the type.

Local Description Authors: K. Taverna.

Plots: None. See Inventory Notes below.

Richmond National Battlefield Park Inventory Notes: Since the completion of the original vegetation mapping project (Patterson 2008), and prior to this project, VA DNH collected quantitative data in the Turkey Hill stand. The data are entered in the VA DNH vegetation plot database (RNBP012). A report from this database is included in this report so that the data can be entered by Park staff into the Richmond National Battlefield NPS PLOTS database.

GLOBAL INFORMATION

USNVC CLASSIFICATION

Physiognomic Class	Forest (1)
Physiognomic Subclass	Temperate and Boreal Forest (1.B.)
Formation	Warm Temperate Forest (1.B.1)
Division	Southeastern North American Warm Temperate Forest (1.B.1.NA.)
Macrogroup	Southern Mesic Mixed Broadleaf Forest (M008)
Group	Southern Mesic Beech – Oak - Mixed Deciduous (G166)
Association	<i>Fagus grandifolia</i> – <i>Quercus nigra</i> Forest (CEGL007211)
Association (English name)	American Beech – Water Oak Forest
Ecological System(s):	Southern Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

GLOBAL DESCRIPTION

Concept Summary: Mesic mixed hardwood forests of the Mid-Atlantic Coastal Plain dominated by *Fagus grandifolia* and *Quercus nigra* with limited *Quercus alba*. This community grades into drier zones in which *Quercus falcata*, *Pinus echinata*, and *Pinus taeda* are common. *Vaccinium* sp. and *Arundinaria gigantea* are important in the shrub layer. An additional example has a canopy dominated by *Fagus grandifolia*, *Liriodendron tulipifera*, and *Quercus nigra*. The understory is diverse and contains *Ostrya virginiana*, *Carpinus caroliniana*, and *Cornus florida*. *Symplocos tinctoria* and *Callicarpa americana* are common shrubs in this example. Another occurrence of this vegetation which has been documented from Richland County in South Carolina is dominated by *Fagus grandifolia*, *Quercus nigra*, and *Liquidambar styraciflua*. Other canopy species that may be present include *Nyssa sylvatica*, *Quercus alba*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, *Ulmus alata*, *Acer rubrum*, and *Liriodendron tulipifera*. *Pinus taeda* may also be present particularly in occurrences with a history of disturbance. *Ilex opaca* dominates the subcanopy with *Carpinus caroliniana* and *Cornus florida* present. The well-developed shrub layer contains a variety of species, including *Euonymus americanus*,

Rhododendron canescens, *Vaccinium elliotii*, *Vaccinium pallidum*, *Gaylussacia dumosa*, *Gaylussacia frondosa*, *Symplocos tinctoria*, *Arundinaria gigantea*, *Asimina triloba*, *Callicarpa americana*, and others. The herbaceous layer ranges from sparse to moderately well-developed and among the species that occur are *Osmunda cinnamomea*, *Polystichum acrostichoides*, *Mitchella repens*, *Chasmanthium sessiliflorum* (= *Chasmanthium laxum* var. *sessiliflorum*), *Malaxis unifolia*, *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Dichanthelium boscii*, *Goodyera pubescens*, *Carex debilis*, *Carex abscondita*, and *Tipularia discolor*. The vine/liana stratum is sparse and can contain *Parthenocissus quinquefolia*, *Smilax bona-nox*, *Toxicodendron radicans*, *Bignonia capreolata*, and *Smilax tamnoides* (= *Smilax hispida*) among others. The South Carolina example occurs on middle to lower convex slopes. Examples of this association seem to be extremely limited, as most similar sites have substantial amounts of *Quercus alba*. Vegetation which may pertain to this association from Chowan and Gates counties in North Carolina is described as being dominated by *Fagus grandifolia*, with *Quercus nigra* important on the moister sands.

Environmental Description: These forests occur on mesic slopes and upland flats in the Mid-Atlantic Coastal Plain (TNC 1998b). In Congaree Swamp National Monument, this forest type occurs in the uplands of the northwestern portion of the park, on middle to lower convex slopes (TNC 1998b). This community grades into drier zones in which *Quercus falcata*, *Pinus echinata*, and *Pinus taeda* are common. This vegetation occurs on slight rises in nonriverine swamps (swamp islands). These small-patch occurrences range throughout eastern North Carolina and Virginia. Examples are documented at Great Dismal Swamp NWR and Northwest River, Virginia.

Vegetation Description: Stands of these mesic mixed hardwood forests are dominated by *Fagus grandifolia* and *Quercus nigra*, with limited *Quercus alba*. Other canopy species that may be present include *Nyssa sylvatica*, *Quercus alba*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, *Quercus falcata*, *Ulmus alata*, *Acer rubrum*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*, the latter two of which may share dominance. *Pinus taeda* may also be present particularly in occurrences with a history of disturbance. The understory is diverse and may contain *Ilex opaca* (which may dominate), *Ostrya virginiana*, *Carpinus caroliniana*, *Oxydendrum arboreum*, and *Cornus florida*. The well-developed shrub layer contains a variety of species, including *Symplocos tinctoria*, *Callicarpa americana*, *Arundinaria gigantea*, *Euonymus americanus*, *Rhododendron canescens*, *Vaccinium elliotii*, *Vaccinium pallidum*, *Gaylussacia dumosa*, *Gaylussacia frondosa*, *Stewartia malacodendron*, *Styrax grandifolius*, *Asimina triloba*, and others. The herbaceous layer ranges from sparse to moderately well-developed and among the species that occur are *Osmunda cinnamomea*, *Polystichum acrostichoides*, *Mitchella repens*, *Chasmanthium sessiliflorum* (= *Chasmanthium laxum* var. *sessiliflorum*), *Malaxis unifolia*, *Arisaema triphyllum*, *Athyrium filix-femina* ssp. *asplenioides*, *Dichanthelium boscii*, *Goodyera pubescens*, *Carex debilis*, *Carex abscondita*, and *Tipularia discolor*. The vine/liana stratum is sparse and can contain *Parthenocissus quinquefolia*, *Smilax bona-nox*, *Toxicodendron radicans*, *Bignonia capreolata*, and *Smilax tamnoides* (= *Smilax hispida*), among others. The exotic species *Lonicera japonica* may be present in examples of these forests. Vegetation which may pertain to this association from Chowan and Gates counties in North Carolina is described as being dominated by *Fagus grandifolia*, with *Quercus nigra* important on the moister sands.

Most Abundant Species: Information not available.

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Upland

DISTRIBUTION

Range: These forests are currently known from the Coastal Plain of North Carolina, South Carolina, and Virginia.

States/Provinces: NC, SC, VA.

Federal Lands: NPS (Congaree Swamp, Richmond); USFWS (Great Dismal Swamp)

CONSERVATION STATUS

Rank: G3 (27-March-1998).

Reasons:

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 3 – Weak.

Comments: Examples of this association seem to be extremely limited, as most similar sites have substantial amounts of *Quercus alba*.

Similar Associations:

- *Fagus grandifolia* - *Quercus alba* - (*Acer barbatum*) / Mixed Herbs Forest (CEGL007206)

Related Concepts:

- *Fagus grandifolia* - *Quercus (alba, michauxii, pagoda)* / *Stewartia malacodendron* Forest (Fleming and Patterson 2003) =
- *Fagus grandifolia* - *Quercus (alba, michauxii, pagoda)* / *Stewartia malacodendron* Forest (Fleming et al. 2006) =
- Mesic Mixed Hardwood Forest (Fleming et al. 2001)

SOURCES

Description Authors: M.P. Schafale and A.S. Weakley, mod. J. Teague



Figure B3. Coastal Plain Mesic Mixed Hardwood Forest at Richmond National Battlefield Park. June 2010.

**COMMON NAME (PARK-SPECIFIC): COASTAL PLAIN / PIEDMONT SMALL-
STREAM FLOODPLAIN FOREST**

SYNONYMS

USNVC English Name: Sweetgum - Tuliptree / Northern Spicebush / Jack-in- the-
Pulpit Forest

USNVC Scientific Name: *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera*
benzoin / *Arisaema triphyllum* Forest

USNVC Identifier: CEG004418

LOCAL INFORMATION

Environmental Description: Coastal Plain / Piedmont Small-Stream Floodplain Forest is a deciduous forest found on small stream floodplains and sandy floodplain terraces. In Richmond National Battlefield Park, this forest is of limited extent and occurs mostly as small, disturbed stands.

Vegetation Description: The canopy can have varying combinations of *Acer rubrum* (red maple), *Liriodendron tulipifera* (tuliptree), and *Liquidambar styraciflua* (sweetgum), occurring with other typical floodplain associates such as *Betula nigra* (river birch), *Platanus occidentalis* (American sycamore), *Salix nigra* (black willow), *Quercus phellos* (willow oak), *Quercus michauxii* (swamp chestnut oak), and occasionally *Fagus grandifolia* (American beech). Vines such as *Campsis radicans* (trumpet creeper), *Toxicodendron radicans* (eastern poison ivy), *Vitis vulpina* (frost grape), and the exotic *Lonicera japonica* (Japanese honeysuckle) are commonly found climbing into the canopy trees. Typical species of the shrub layer are *Carpinus caroliniana* (American hornbeam), *Clethra alnifolia* (coastal sweetpepperbush), *Ilex opaca* var. *opaca* (American holly), *Liquidambar styraciflua* (sweetgum), and *Ulmus rubra* (slippery elm). The herb layer in the disturbed floodplain forests of Richmond National Battlefield Park is often dominated by the exotic grass *Microstegium vimineum* (Nepalese browntop) with a scattering of other herbs typical of floodplain habitats. Forbs such as *Phytolacca americana* (American pokeweed) and *Polygonum caespitosum* var. *longisetum* (oriental ladythumb), the grasses *Cinna arundinacea* (sweet woodreed), *Dichanthelium clandestinum* (deertongue) and *Elymus virginicus* (Virginia wildrye), and ferns such as *Athyrium filix-femina* (common ladyfern), *Thelypteris noveboracensis* (New York fern), and *Woodwardia areolata* (netted chainfern) can be found in these floodplain forests.

Canopy dominants can vary from stand to stand but always include at least some of the typical floodplain species mentioned above.

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Acer rubrum</i> (red maple), <i>Liriodendron tulipifera</i> (tuliptree)

Characteristic Species: *Acer rubrum* (red maple), *Athyrium filix-femina* (common ladyfern), *Cinna arundinacea* (sweet woodreed), *Liriodendron tulipifera* (tuliptree), *Platanus occidentalis* (American sycamore), *Salix nigra* (black willow).

Other Noteworthy Species:

<u>Species</u>	<u>GRank</u>	<u>Type</u>	<u>Note</u>
<i>Lonicera japonica</i> (Japanese honeysuckle)	-	plant	invasive nonnative
<i>Microstegium vimineum</i> (Nepalese browntop)	-	plant	invasive nonnative

Subnational Distribution with Crosswalk Data:

<u>State</u>	<u>SRank</u>	<u>Rel</u>	<u>Conf</u>	<u>SName</u>	<u>Reference</u>
VA	SNR*	B	1	Coastal Plain / Piedmont Floodplain Forest	.

Local Range: Stands of this forest are found at Totopotomoy Creek (Rural Plains), Beaver Dam Creek, Chickahominy Bluff, Gaines Mill (Watt House), and at Malvern Hill. In total, it is mapped as 23 polygons, ranging in size from 0.3 to 8 hectares (0.7 to 20 acres) and covering a total of 39 hectares (96 acres).

Classification Comments: This community is distinguished by its temporarily flooded hydrology and by occurring on floodplains of small creeks and streams. It has better drained soil than Non-Riverine Saturated Forest, which has a seasonally flooded hydrology and occurs on broad flat topographic features that are not part of the active floodplain.

Very disturbed examples may be confused with Successional Tuliptree Forest. Coastal Plain / Piedmont Small Stream Floodplain Forest can be distinguished from Successional Tuliptree Forest by its location along small streams and the prevalence of species more typical of floodplain habitats such as *Platanus occidentalis* (American sycamore), *Carpinus caroliniana* (American hornbeam), *Arisaema triphyllum* (Jack in the pulpit), *Osmunda* spp. (osmunda species), and *Boehmeria cylindrica* (smallspike false nettle).

Other Comments: The majority of examples of Coastal Plain / Piedmont Small Stream Floodplain Forest in the park are disturbed. The most severely degraded stands have likely lost most of the native floodplain herbs. Stands typically have an even-aged canopy dominated by the early-successional species *Liriodendron tulipifera* (tuliptree) and/or *Liquidambar styraciflua* (sweetgum). The ground layer can be dense *Microstegium vimineum* (Nepalese browntop) or a tangle of *Smilax rotundifolia* (roundleaf greenbrier), *Lonicera japonica* (Japanese honeysuckle), and *Rubus* sp. (a blackberry).

Local Description Authors: K. D. Patterson and K. Taverna

Plots: None.

Richmond National Battlefield Park Inventory Notes: Information not available.

GLOBAL INFORMATION

USNVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	<i>Liquidambar styraciflua</i> - (<i>Liriodendron tulipifera</i> , <i>Acer rubrum</i>) Temporarily Flooded Forest Alliance (A.287)
Alliance (English name)	Sweetgum - (Tuliptree, Red Maple) Temporarily Flooded Forest Alliance
Association	<i>Liquidambar styraciflua</i> - <i>Liriodendron tulipifera</i> / <i>Lindera benzoin</i> / <i>Arisaema triphyllum</i> Forest
Association (English name)	Sweetgum - Tuliptree / Northern Spicebush / Jack-in-the-Pulpit Forest
Ecological System(s):	Northern Atlantic Coastal Plain Stream and River (CES203.070). Southern Piedmont Small Floodplain and Riparian Forest (CES202.323).

GLOBAL DESCRIPTION

Concept Summary: These low-elevation forests develop along relatively acidic soils on small streams in the Coastal Plain of Maryland and Virginia, extending west across the Virginia and North Carolina Piedmont to the Cumberland Plateau and Ridge and Valley. The topographic features of floodplains can heavily influence the individual makeup of examples of this

association. The canopy, subcanopy, shrub, and herbaceous layers often are well-developed. Dominant canopy species always include *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), while *Acer barbatum* (southern sugar maple) and *Acer rubrum* var. *rubrum* (red maple) may also make up significant amounts of the canopy. This community type exists as a continuum between two subtypes, i.e., the tuliptree subtype and the sweetgum subtype. In some examples, only one or the other dominates the canopy. However, in many examples, both are equally dominant. Common species in the canopy and understory include *Ilex opaca* var. *opaca* (American holly), *Aesculus sylvatica* (painted buckeye), *Carpinus caroliniana* ssp. *caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Juglans nigra* (black walnut), *Morus rubra* var. *rubra* (red mulberry), *Ostrya virginiana* var. *virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pinus echinata* (shortleaf pine), *Prunus serotina* var. *serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra* var. *rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Ulmus alata* (winged elm), *Juniperus virginiana* var. *virginiana* (eastern redcedar), *Nyssa sylvatica* (blackgum), *Fraxinus americana* (white ash), *Halesia tetraptera* var. *tetraptera* (mountain silverbell), *Arundinaria gigantea* ssp. *gigantea* (giant cane), *Cornus florida* (flowering dogwood), *Platanus occidentalis* (American sycamore), *Betula nigra* (river birch), and *Fraxinus pennsylvanica* (green ash). *Euonymus americanus* (strawberry bush), *Lindera benzoin* var. *benzoin* (northern spicebush), and *Corylus americana* (American hazelnut) are common and dominant in the shrub layer. The herbaceous layer is species-rich and often has good sedge development. The exotics *Microstegium vimineum* (Nepalese browntop), *Ligustrum sinense* (Chinese privet), and *Lonicera japonica* (Japanese honeysuckle) are common in this community.

Environmental Description: These forests develop along small streams. Soils are relatively acidic and relatively well-drained. Topographic differences from one floodplain to another, such as gradient and height above the creek, as well as floodplain microtopography (i.e., depositional landforms such as natural levees and sloughs) may influence the variation of vegetation within this association. However, in most floodplains supporting this type, the distinct alluvial landforms are poorly developed or occur at very small scales.

Vegetation Description: The canopy, subcanopy, shrub, and herbaceous layers of stands of this association are often well-developed. Dominant canopy species always include *Liquidambar styraciflua* (sweetgum) and *Liriodendron tulipifera* (tuliptree), while *Acer barbatum* (southern sugar maple) (in the southern part of the range) and *Acer rubrum* var. *rubrum* (red maple) may also make up significant amounts of the canopy. This community type exists as a continuum between two subtypes, i.e., the tuliptree subtype and the sweetgum subtype. In some examples, only one or the other dominates the canopy. However, in many examples, both are equally dominant. Other common species in the canopy and understory include *Ilex opaca* var. *opaca* (American holly), *Aesculus sylvatica* (painted buckeye), *Carpinus caroliniana* ssp. *caroliniana* (American hornbeam), *Cornus florida* (flowering dogwood), *Fagus grandifolia* (American beech), *Juglans nigra* (black walnut), *Morus rubra* var. *rubra* (red mulberry), *Ostrya virginiana* var. *virginiana* (hophornbeam), *Oxydendrum arboreum* (sourwood), *Pinus echinata* (shortleaf pine), *Prunus serotina* var. *serotina* (black cherry), *Quercus alba* (white oak), *Quercus rubra* var. *rubra* (northern red oak), *Ulmus rubra* (slippery elm), *Ulmus americana* (American elm), *Ulmus alata* (winged elm), *Juniperus virginiana* var. *virginiana* (eastern redcedar), *Nyssa sylvatica* (blackgum), *Fraxinus americana* (white ash), *Halesia tetraptera* var. *tetraptera* (mountain silverbell), *Arundinaria gigantea* ssp. *gigantea* (giant cane), and *Fraxinus*

pennsylvanica (green ash). Scattered individuals of *Platanus occidentalis* (American sycamore) and *Betula nigra* (river birch) may also occur in some stands. *Euonymus americanus* (strawberry bush), *Lindera benzoin* var. *benzoin* (northern spicebush), and *Corylus americana* (American hazelnut) are common and dominant in the shrub layer. Other shrub species that may be present include *Viburnum acerifolium* (mapleleaf viburnum), *Viburnum nudum* var. *nudum* (possumhaw), *Viburnum prunifolium* (blackhaw), *Viburnum rufidulum* (rusty blackhaw), *Hamamelis virginiana* (American witchhazel), *Asimina triloba* (pawpaw), and *Ilex decidua* (possumhaw), among others. On the most acidic sites of the Maryland Coastal Plain, *Clethra alnifolia* (coastal sweetpepperbush), *Vaccinium corymbosum* (highbush blueberry), and *Magnolia virginiana* (sweetbay) may be present. Vines are prominent and include *Vitis rotundifolia* (muscadine), *Apios americana* (groundnut), *Campsis radicans* (trumpet creeper), *Aristolochia macrophylla* (pipevine), *Bignonia capreolata* (crossvine), *Dioscorea quaternata* (fourleaf yam), *Gelsemium sempervirens* (evening trumpetflower), *Parthenocissus quinquefolia* (Virginia creeper), *Campsis radicans* (trumpet creeper), *Passiflora lutea* (yellow passionflower), *Smilax bona-nox* (saw greenbrier), *Smilax glauca* (cat greenbrier), *Smilax hugeri* (Huger's carrionflower), *Smilax rotundifolia* (roundleaf greenbrier), and *Toxicodendron radicans* ssp. *radicans* (eastern poison ivy). The herbaceous layer is species-rich and often has good sedge development. Common species in this layer include *Thalictrum thalictroides* (rue anemone), *Trillium cuneatum* (little sweet Betsy), *Arisaema triphyllum* (Jack in the pulpit), *Asplenium platyneuron* var. *platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Carex* spp. (sedges), *Carex impressinervia* (ravine sedge), *Carex striatula* (lined sedge), *Cinna arundinacea* (sweet woodreed), *Elymus virginicus* (Virginia wildrye), *Galium circaezans* (licorice bedstraw), *Geum canadense* (white avens), *Medeola virginiana* (Indian cucumber), *Polystichum acrostichoides* (Christmas fern), and *Scutellaria integrifolia* (helmet flower), among many others. *Thelypteris noveboracensis* (New York fern) is a common patch-dominant in the northern part of the range and the Uwharrie Mountains of North Carolina. The exotics *Microstegium vimineum* (Nepalese browntop), *Ligustrum sinense* (Chinese privet), and *Lonicera japonica* (Japanese honeysuckle) are common in this community. Other exotics that colonize quickly in disturbed and fragmented versions of this association include *Wisteria sinensis* (Chinese wisteria), *Rosa multiflora* (multiflora rose), *Clematis terniflora* (sweet autumn virginibower), *Hedera helix* (English ivy), and *Elaeagnus* sp. (an elaeagnus).

Most Abundant Species:

<u>Stratum</u>	<u>Lifeform</u>	<u>Species</u>
Tree canopy	Broad-leaved deciduous tree	<i>Liquidambar styraciflua</i> (sweetgum), <i>Liriodendron tulipifera</i> (tuliptree)

Characteristic Species: *Arisaema triphyllum* (Jack in the pulpit), *Asplenium platyneuron* (ebony spleenwort), *Botrychium virginianum* (rattlesnake fern), *Campsis radicans* (trumpet creeper), *Carex striatula* (lined sedge), *Cinna arundinacea* (sweet woodreed), *Corylus americana* (American hazelnut), *Elymus virginicus* (Virginia wildrye), *Euonymus americanus* (strawberry bush), *Galium circaezans* (licorice bedstraw), *Geum canadense* (white avens), *Lindera benzoin* (northern spicebush), *Liquidambar styraciflua* (sweetgum), *Liriodendron tulipifera* (tuliptree), *Medeola virginiana* (Indian cucumber), *Polystichum acrostichoides* (Christmas fern), *Scutellaria integrifolia* (helmet flower), *Smilax rotundifolia* (roundleaf greenbrier), *Thalictrum thalictroides* (rue anemone), *Toxicodendron radicans* (eastern poison ivy), *Trillium cuneatum* (little sweet Betsy).

Other Noteworthy Species:

Species	GRank Type	Note
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Carex impressinervia (ravine sedge)

G1G2

plant

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is found in the Chesapeake Bay Lowlands, the Piedmont, and other low-elevation interior ecoregions (e.g., parts of the Cumberland Plateau and Ridge and Valley). It is defined as being absent from the Mid-Atlantic Coastal Plain of southeastern Virginia, the Carolinas, and Georgia. Its status in the Upper East Gulf Coastal Plain is unknown.

States/Provinces: GA, MD, NC, SC?, TN, VA.

Federal Lands: DOD (Fort Belvoir); NPS (Chickamauga-Chattanooga, Colonial, Cowpens, Fredericksburg-Spotsylvania, Guilford Courthouse, Kings Mountain, National Capital-East, Petersburg, Prince William, Richmond, Thomas Stone); USFS (Uwharrie).

CONSERVATION STATUS

Rank: G4 (15-Feb-2007).

Reasons: This community is widespread from the Coastal Plain of Maryland and Virginia through the Piedmont of Virginia and North Carolina to the Cumberland Plateau. Very few streams supporting this type have impoundments or diversions, and most are protected by wetland regulations. However, few, if any, pristine examples remain, and all are highly threatened by invasive exotic species that have colonized most of the remaining examples of this association.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 3 - Weak.

Comments: At Chickamauga-Chattanooga National Military Park, this association was observed on Lookout Creek, but no plot data were taken. Low-quality occurrences of this type may look very similar to some occurrences of *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330). The presence of higher quality patches of native herbs and stands of native shrubs such as *Lindera benzoin* (northern spicebush) is the best way to distinguish these two types. In addition, stands of CEGL007330 will generally be more even-aged and single species-dominated than this association (CEGL004418).

Similar Associations:

- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330)--occurs in the same habitat but is a highly impacted version of this forest that occurs on old farm fields and other second-growth areas.
- *Liquidambar styraciflua* Forest (CEGL007216).
- *Liriodendron tulipifera* - *Acer (rubrum, negundo)* - (*Platanus occidentalis*) / *Carpinus caroliniana* / *Polygonum virginianum* Forest (CEGL006492).

Related Concepts:

- *Liquidambar styraciflua* - *Quercus palustris* / *Carpinus caroliniana* / *Carex intumescens* Forest (Meininger and McCarthy 1998) ?
- Maple-Gum Association of the Western Shore District (Shreve et al. 1910) B

SOURCES

Description Authors: R. K. Peet, mod. R. White, M. Pyne, G. P. Fleming.

References: Fleming et al. 2001, Meininger and McCarthy 1998, Naczi et al. 2002, Peet et al. unpubl. data 2002, Schafale and Weakley 1990, Shreve et al. 1910, Southeastern Ecology Working Group n.d.



Figure B4. Coastal Plain / Piedmont Small-Stream Floodplain Forest at Richmond National Battlefield Park. May 2007. NAD 1983 / UTM easting 301043, northing 4143686.



Figure B5. Heavily disturbed example of Coastal Plain / Piedmont Small-Stream Floodplain Forest at Richmond National Battlefield Park. Photograph from Watt House on May 13, 2013.

Appendix C – Quantitative plot data and summary information for Turkey Hill vegetation plots collected by VA Division of Natural Heritage.

VIRGINIA DIVISION OF NATURAL HERITAGE - VEGETATION PLOT COVER FORM

Plot RBNP012 **Plot Size (sq. m)** 400 **Plot Dimensions (m)** 13.33 x 30 m
Plot Type releve **Relative Stand Size** large **Species Richness** 31
PLOT LOCATION / DOCUMENTATION **Photo Documentation?** yes
Surveyor Gary Fleming **Contributor** Gary Fleming **Date** 2010-06-15 **Source Code** F10FLE36VAUS
Physiographic Province NC **State** VA **County** Hanover **USGS Quad** Seven Pines 3707753
Survey Site Turkey Hill **Project** Inventory - Coastal Plain
Conservation Site **Managed Area** Richmond National Battlefield Park
Latitude 373335.71 **Longitude** 771633.81 **UTMN** 4159424 **UTME** 298966 **UTM Zone** 18
Location determined by GPS
Estimated Accuracy Confident computed pos. within 10 m of true pos. **GPS File Name** 014
GPS Unit Garmin Rino
Feature Type point **Number of** 350 **Precision (m)** 4

VEGETATION STRUCTURE

Physiognomy	Forest	Dominant Leaf			Deciduous
	Total Cover (%)	Stratum Height (m)	Leaf Type or Growth Form	Phenology or Growth Habit	
Tree	85	36	Broad - leaved	Deciduous	
Shrub	15	6	Broad - leaved	Deciduous	
Herb	10	0.5	Pteridophyte	Perennial Herb	
Bryophyte	1		Bryophyte		

TOPOGRAPHY

Elevation (m) 19 **Aspect (deg)** flat **Slope (deg)** 0 **Slope Shape** Vertical **Horizontal** Straight
Topographic Position plain/level/bottom **Landform** undulating/flat plain
Landform **Terrain Shape** **Hummock %** **Hollow %**
Hummock Height (cm)

SURFACE SUBSTRATE (%)

Bedrock	Litter / Organic Matter	99	Mineral Soil /
Boulders and Stones	Decaying Wood	1	Other
Gravel and Cobbles	(Bryophytes and Lichens)		

GEOLOGY

Geologic Map Unit Chesapeake Group **Geologic Map Code** Tc
Geologic Time Unit Tertiary **Geologic Map Reference** 1993 Geologic Map of Virginia

HYDROLOGY AND SOIL DATA

Soil Moisture Regime mesic **Hydrologic Regime** terrestrial (upland)
Soil Drainage moderately well drained **Soil Description**

Inundation never

0-2 cm leaf litter
2-6 cm root mat / organic matter
6-16+ cm very dark brown / black silty loam with a little sand

Halinity

Refractometer Measurement (ppt)

Soil Series Chapanoke silt loam

Interquartile Range

Mean Soil Depth (cm)

(,)

Soil Reference Source U.S.Department of Agriculture, N.R.C.S. 2006. Soil Survey Geographic (SSURGO) database for available counties in Virginia

Cation Exchange Capacity (meq/100g) 23.41 **Ca (ppm)** 92 **B (ppm)** 0.25

Base Saturation (%) 4.39

pH 3.6 **Mg (ppm)** 24

Fe (ppm) 439

Bulk Density (g/100cc)

Organic Matter (%) 28.85

Ca:Mg Ratio 3.8

Mn (ppm) 2 **Sand (%)**

Est. N release (lb/acre) 130

K (ppm) 62

Cu (ppm) 0.40 **Silt (%)**

Soluble S (ppm) 28

Na (ppm) 48

Zn (ppm) 1.86 **Clay (%)**

Easily Extractable P (ppm) 31

Al (ppm) 763

DISTURBANCE

Other **Comments** pit and mound topography - tip up mounds?

QUALITATIVE DESCRIPTION

Plot Narrative This site is a slightly elevated "island" within a large swamp complex along the Chickahominy River. It supports a mesic hardwood forest dominated by medium- to large-diameter *Fagus grandifolia*, along with some oaks (*Quercus michauxii* in the plot), *Liriodendron tulipifera*, and *Nyssa sylvatica*. In its environmental setting and composition that includes *Q. michauxii*, *Symplocos tinctoria*, and *Clethra alnifolia*, this stand is reminiscent of swamp "island" forests in the Dismal Swamp and elsewhere in far southeastern Virginia.

SUPPLEMENTAL DATA

Plot RNBP012

ADDITIONAL SURVEYORS AND SITE

Date	Additional Surveyors	Survey Comments
2010-06-15	Karen Patterson, Kristen Allen	

PHOTOS

Date	Photographer	Film Roll	Frame Number(s)	Bearing	Photo Type
2010-06-15	Gary Fleming		digital		

COMPOSITIONAL DATA**Plot** RNB012

Species	Cover	Species	Cover
Fagus grandifolia	8		
Ilex opaca var. opaca	6		
Quercus michauxii	6		
Clethra alnifolia	5		
Acer rubrum	4		
Liriodendron tulipifera	4		
Woodwardia areolata	4		
Liquidambar styraciflua	3		
Medeola virginiana	3		
Nyssa sylvatica	3		
Vaccinium fuscatum	3		
Carex abscondita	2		
Carex physorhyncha	2		
Carpinus caroliniana	2		
Chasmanthium laxum	2		
Magnolia virginiana	2		
Mitchella repens	2		
Osmunda spectabilis	2		
Osmundastrum cinnamomeum var. cinnamomeum	2		
Parathelypteris noveboracensis	2		
Quercus falcata	2		
Smilax rotundifolia	2		
Symplocos tinctoria	2		
Vaccinium formosum	2		
Vitis rotundifolia var. rotundifolia	2		
Epifagus virginiana	1		
Goodyera pubescens	1		
Smilax glauca	1		
Uvularia sessilifolia	1		
Vaccinium pallidum	1		
Viburnum nudum	1		

Ecological Community Group Mesic Mixed Hardwood Forest

WOODY COVER AND TREE DATA Plot RNB012 Plot Size (sq. m) 400 Stem Inference Area for Saplings (sq. m) 400
 Stem Inference Area for Trees (sq. m) 400 Minimum Tree Size (cm) 2.5

Woody Cover by Stratum (m)							Tree Abundance by Diameter Class (cm)													
0-	0.5-	6-	10-	20-	35-	Species	0-	1-	2.5-	5-	10-	15-	20-	25-	30-	35-	40-	(dbh in cm)		
3	6	6	7	8	6	TOTAL														
1	3	3	4			Acer rubrum			1	2	1	1								
	2					Carpinus caroliniana														
3	4					Clethra alnifolia														
	4	3	6	7	6	Fagus grandifolia				2	2	1	1	2			41	50	65	73
	3	5	4			Ilex opaca var. opaca			2	4	2			1			1			
2	2	3				Liquidambar styraciflua				1										
1	2			4		Liriodendron tulipifera					1					1				
2	2					Magnolia virginiana														
2	2		3			Nyssa sylvatica														
	2					Quercus falcata														
1			3	6		Quercus michauxii											42	45		
1						Smilax glauca														
2		2				Smilax rotundifolia														
2	2					Symplocos tinctoria														
	2					Vaccinium formosum														
2	3					Vaccinium fuscatum														
1						Vaccinium pallidum														
1						Viburnum nudum														
2						Vitis rotundifolia var. rotundifolia														

VIRGINIA DIVISION OF NATURAL HERITAGE - VEGETATION PLOT COVER FORM

Plot RNB013 **Plot Size (sq. m)** 400 **Plot Dimensions (m)** 13.33 x 30 m
Plot Type releve **Relative Stand Size** large **Species Richness** 47
PLOT LOCATION / DOCUMENTATION **Photo Documentation?** yes
Surveyor Gary Fleming **Contributor** Gary Fleming **Date** 2010-06-15 **Source Code** F10FLE36VAUS
Physiographic Province NC **State** VA **County** Hanover **USGS Quad** Seven Pines 3707753
Survey Site Turkey Hill **Project** Inventory - Coastal Plain
Conservation Site **Managed Area** Richmond National Battlefield Park
Latitude 373337.08 **Longitude** 771629.96 **UTMN** 4159464 **UTME** 299061 **UTM Zone** 18
Location determined by GPS
Estimated Accuracy Confident computed pos. within 10 m of true pos. **GPS File Name** 015
GPS Unit Garmin Rino
Feature Type point **Number of** 190 **Precision (m)** 4

VEGETATION STRUCTURE

Physiognomy	Forest	Dominant Leaf		Deciduous
	Total Cover (%)	Stratum Height (m)	Leaf Type or Growth Form	Phenology or Growth Habit
Tree	80	33	Broad - leaved	Deciduous
Shrub	40	6	Broad - leaved	Deciduous
Herb	80	1	Forb	Perennial Herb
Bryophyte	3		Bryophyte	

TOPOGRAPHY

Elevation (m) 20 **Aspect (deg)** flat **Slope (deg)** 0 **Slope Shape** Vertical Straight
Horizontal Concave
Topographic Position plain/level/bottom **Landform** backswamp/slough/oxbow
Landform **Terrain Shape** **Hummock %** 20 **Hollow %** 80
Hummock Height (cm)

SURFACE SUBSTRATE (%)

Bedrock	Litter / Organic Matter	98	Mineral Soil /
Boulders and Stones	Decaying Wood	2	Other
Gravel and Cobbles	(Bryophytes and Lichens)	3	

GEOLOGY

Geologic Map Unit Chesapeake Group **Geologic Map Code** Tc
Geologic Time Unit Tertiary **Geologic Map Reference** 1993 Geologic Map of Virginia

HYDROLOGY AND SOIL DATA

Soil Moisture Regime subhydric	Hydrologic Regime non-tidal - seasonally flooded
Soil Drainage very poorly drained	Soil Description
Inundation regularly for < 6 months	0-10 cm silty muck 10+ cm muck with clay
Halinity	
Refractometer Measurement (ppt)	
Soil Series Wehadkee silt loam	Mean Soil Depth (cm)
Interquartile Range	(,)

Soil Reference Source U.S.Department of Agriculture, N.R.C.S. 2006. Soil Survey Geographic (SSURGO) database for available counties in Virginia

Cation Exchange Capacity (meq/100g)	17.38	Ca (ppm)	319	B (ppm)	0.26
Base Saturation (%)	20.28				
pH	4.4	Mg (ppm)	163	Fe (ppm)	373
Organic Matter (%)	12.10	Ca:Mg Ratio	2.0	Mn (ppm)	9
Sand (%)	18.07				
Est. N release (lb/acre)	126	K (ppm)	127	Cu (ppm)	1.54
Silt (%)	43.49				
Soluble S (ppm)	41	Na (ppm)	57	Zn (ppm)	5.86
Clay (%)	38.44				
Easily Extractable P (ppm)	87			Al (ppm)	1118

DISTURBANCE

Exotic Plants

Other Comments

QUALITATIVE DESCRIPTION

Plot Narrative Plot is representative of forest vegetation in a large backswamp along the Chickahominy River. Sample site is located ca. 700 meters from the main river channel along one of several very broad floodplain depressions or sloughs. The site is seasonally flooded; on the sampling date, mucky soils were mostly exposed and the water table was just below the ground surface. Leaf litter covers the hummocks and covers less area in hollows. The forest is co-dominated by medium-diameter *Fraxinus pennsylvanica*, *Acer rubrum*, and *Nyssa biflora*; the *Nyssa* have swollen bases and narrow leaves, thus identified as *N. biflora*. Shrubs have patchy cover, with *Ilex opaca* most common on tree-base hummocks and *Viburnum nudum* common in hollows. The herb layer is characterized by dense, nearly continuous colonies of *Saururus cernuus*, in full flower on the sampling date.

SUPPLEMENTAL DATA

Plot RNB013

ADDITIONAL SURVEYORS AND SITE

Date	Additional Surveyors	Survey Comments
2010-06-15	Karen Patterson	

PHOTOS

Date	Photographer	Film Roll	Frame Number(s)	Bearing	Photo Type
2010-06-15	Gary Fleming		digital		

COMPOSITIONAL DATA**Plot RNB013**

Species	Cover	Species	Cover
Acer rubrum	8	Pilea pumila	2
Saururus cernuus	8	Poa autumnalis	2
Fraxinus pennsylvanica	7	Scutellaria lateriflora	2
Ilex opaca var. opaca	6	Toxicodendron radicans	2
Nyssa biflora	6	Vaccinium formosum	2
Liquidambar styraciflua	5	Viola affinis	2
Viburnum nudum	5	Bidens frondosa	1
Clethra alnifolia	4	Carex radiata	1
Leersia oryzoides	4	Eutrochium fistulosum	1
Smilax rotundifolia	4	Lycopus virginicus	1
Carex seorsa	3	Vitis rotundifolia var. rotundifolia	1
Carex tribuloides	3		
Cinna arundinacea	3		
Ilex verticillata	3		
Ulmus americana	3		
Viburnum dentatum var. lucidum	3		
Arisaema triphyllum	2		
Boehmeria cylindrica	2		
Carex lonchocarpa	2		
Carex stipata var. stipata	2		
Carpinus caroliniana	2		
Chelone glabra	2		
Cicuta maculata var. maculata	2		
Dioscorea villosa	2		
Euonymus americanus	2		
Fagus grandifolia	2		
Glyceria striata var. striata	2		
Impatiens capensis	2		
Iris virginica	2		
Itea virginica	2		
Ludwigia palustris	2		
Lycopus rubellus	2		
Murdannia keisak	2		
Parthenocissus quinquefolia	2		
Peltandra virginica	2		
Persicaria virginiana	2		
Ecological Community Group		Coastal Plain / Piedmont Bottomland Forest	

WOODY COVER AND TREE DATA Plot
Stem Inference Area for Trees (sq. m) 400

RNBP013

Plot Size (sq. m) 400

Stem Inference Area for Saplings (sq. m) 400

Minimum Tree Size (cm) 2.5

Woody Cover by Stratum (m)						Tree Abundance by Diameter Class (cm)											
0-	0.5-	6-	10-	20-	35-	Species	0-	1-	2.5-	5-	10-	15-	20-	25-	30-	35-	40-
3	7	5	7	8		TOTAL											
2	4	4	6	7		Acer rubrum				4		1	3	3		60	
	2					Carpinus caroliniana			1								
2	4					Clethra alnifolia											
	2					Euonymus americanus											
1	2					Fagus grandifolia											
2		3		7		Fraxinus pennsylvanica			1			1		2	2	41	48
	6					Ilex opaca var. opaca			6	7							
2	3					Ilex verticillata											
	2					Itea virginica											
2			5			Liquidambar styraciflua							2				
				6		Nyssa biflora									1	51	53 56 63
2						Parthenocissus quinquefolia											
2	4					Smilax rotundifolia											
2						Toxicodendron radicans											
1				3		Ulmus americana									1		
	2					Vaccinium formosum											
2	3					Viburnum dentatum var. lucidum											
3	5					Viburnum nudum											
1						Vitis rotundifolia var. rotundifolia											

VIRGINIA DIVISION OF NATURAL HERITAGE - VEGETATION PLOT COVER FORM

Plot RBNP014 Plot Size (sq. m) 400 Plot Dimensions (m) 16 x 25 m
 Plot Type releve Relative Stand Size large Species Richness 49

PLOT LOCATION / DOCUMENTATION

Photo Documentation? yes

Surveyor Gary Fleming Contributor Gary Fleming Date 2010-06-15 Source Code F10FLE36VAUS

Physiographic Province NC State VA County Hanover USGS Quad Seven Pines 3707753

Survey Site Turkey Hill Project Inventory - Coastal Plain

Conservation Site Managed Area Richmond National Battlefield Park

Latitude 373330.96 Longitude 771623.80 UTMN 4159271 UTME 299208 UTM Zone 18

Location determined by GPS

Estimated Accuracy Confident computed pos. within 10 m of true pos. GPS File Name 017

GPS Unit Garmin Rino

Feature Type point Number of 316 Precision (m) 4

VEGETATION STRUCTURE

Physiognomy	Forest	Dominant Leaf		Deciduous
	Total Cover (%)	Stratum Height (m)	Leaf Type or Growth Form	Phenology or Growth Habit
Tree	75	30	Broad - leaved	Deciduous
Shrub	30	6	Broad - leaved	Deciduous
Herb	75	1	Graminoid	Perennial Herb
Bryophyte	1		Bryophyte	

TOPOGRAPHY

Elevation (m) 19 Aspect (deg) flat Slope (deg) 0 Slope Shape Vertical Straight
 Horizontal Concave

Topographic Position plain/level/bottom Landform backswamp/slough/oxbow

Landform Terrain Shape Hummock % 15 Hollow % 85
 Hummock Height (cm)

SURFACE SUBSTRATE (%)

Bedrock	Litter / Organic Matter	98	Mineral Soil /
Boulders and Stones	Decaying Wood	2	Other
Gravel and Cobbles	(Bryophytes and Lichens)	1	

GEOLOGY

Geologic Map Unit Alluvium Geologic Map Code al
 Geologic Time Unit Quaternary Geologic Map Reference 1993 Geologic Map of Virginia

HYDROLOGY AND SOIL DATA

Soil Moisture Regime hygric	Hydrologic Regime non-tidal - seasonally flooded
Soil Drainage somewhat poorly drained	Soil Description
Inundation regularly for < 6 months	0-5 cm medium brown silty muck 5-20+cm gray and brown silty clay with a little sand
Halinity	
Refractometer Measurement (ppt)	
Soil Series Wehadkee silt loam	Mean Soil Depth (cm)
Interquartile Range	(,)

Soil Reference Source U.S.Department of Agriculture, N.R.C.S. 2006. Soil Survey Geographic (SSURGO) database for available counties in Virginia

Cation Exchange Capacity (meq/100g)	18.30	Ca (ppm)	335	B (ppm)	0.22
Base Saturation (%)	17.63				
pH	4.0	Mg (ppm)	122	Fe (ppm)	381
Bulk Density (g/100cc)					
Organic Matter (%)	5.94	Ca:Mg Ratio	2.7	Mn (ppm)	6
Sand (%)	44.38				
Est. N release (lb/acre)	105	K (ppm)	110	Cu (ppm)	0.76
Silt (%)	20.04	Soluble S (ppm)	44	Na (ppm)	59
Zn (ppm)	2.11	Clay (%)	35.58		
Easily Extractable P (ppm)	38			Al (ppm)	1178

DISTURBANCE

Exotic Plants

Other Comments

QUALITATIVE DESCRIPTION

Plot Narrative This plot is similar to RNB013 but the habitat seems to be less wet, with a shorter hydroperiod. The forest here also appears younger, with a canopy consisting mostly of *Acer rubrum* and *Liquidambar styraciflua* with a few *Quercus palustris* also present. *Nyssa biflora* is fairly common in the understory, along with young *Acer* and *Liquidambar* recruitment. *Saururus cernuus*, while still attaining the highest cover among herbs, shares dominance with several hydrophytic sedges (*Carex tribuloides*, *C. lupulina*, *C. louisianica*, *C. seorsa*, *C. crinita*, *C. jorii*).

SUPPLEMENTAL DATA

Plot RNB014

ADDITIONAL SURVEYORS AND SITE

Date	Additional Surveyors	Survey Comments
2010-06-15	Karen Patterson	

PHOTOS

Date	Photographer	Film Roll	Frame Number(s)	Bearing	Photo Type
2010-06-15	Gary Fleming				digital

COMPOSITIONAL DATA**Plot** RNBPO14

Species	Cover	Species	Cover
Acer rubrum	8	Mikania scandens	2
Liquidambar styraciflua	7	Mimulus alatus	2
Saururus cernuus	7	Peltandra virginica	2
Carex tribuloides	6	Persicaria arifolia	2
Quercus palustris	6	Proserpinaca palustris	2
Carex louisianica	5	Quercus michauxii	2
Carex lupulina	5	Quercus phellos	2
Carex seorsa	5	Scirpus cyperinus	2
Nyssa biflora	5	Scutellaria lateriflora	2
Carex crinita	4	Toxicodendron radicans	2
Carex jorii	4	Viburnum dentatum var. lucidum	2
Cinna arundinacea	4	Bidens frondosa	1
Ilex verticillata	4	Commelina virginica	1
Smilax rotundifolia	4	Mitchella repens	1
Campsis radicans	3		
Leersia oryzoides	3		
Ludwigia palustris	3		
Murdannia keisak	3		
Persicaria hydropiperoides	3		
Ulmus americana	3		
Viburnum nudum	3		
Betula nigra	2		
Boehmeria cylindrica	2		
Carex lonchocarpa	2		
Carex lurida	2		
Carpinus caroliniana	2		
Cicuta maculata var. maculata	2		
Fraxinus pennsylvanica	2		
Galium obtusum ssp. obtusum	2		
Glyceria striata var. striata	2		
Itea virginica	2		
Juncus effusus	2		
Leersia virginica	2		
Lobelia cardinalis	2		
Lycopus rubellus	2		
Lycopus virginicus	2		

Ecological Community Group Coastal Plain / Piedmont Bottomland Forest

WOODY COVER AND TREE DATA

Plot RNB014

Plot Size (sq. m) 400

Stem Inference Area for Saplings (sq. m) 400

Stem Inference Area for Trees (sq. m) 400

Minimum Tree Size (cm) 2.5

Woody Cover by Stratum (m)						Tree Abundance by Diameter Class (cm)													
0-	0.5-	6-	10-	20-	35-	Species	0-	1-	2.5-	5-	10-	15-	20-	25-	30-	35-	40-	(dbh in cm)	
3	7	7	7	8		TOTAL													
2	6	6	6	7		Acer rubrum			12	7	4	2	2		1	2	47		
	2					Betula nigra													
3	2	2				Campsis radicans													
	2					Carpinus caroliniana			1										
	2					Fraxinus pennsylvanica			1										
	4					Ilex verticillata													
	2					Itea virginica													
	4	5	5	6		Liquidambar styraciflua			1	4	1	2	2	1		2	55		
	4	4	4			Nyssa biflora			1	1	1	3	1						
	2					Quercus michauxii			1										
2			5	5		Quercus palustris								1		2			
	2					Quercus phellos													
	4					Smilax rotundifolia													
	2					Toxicodendron radicans													
	3					Ulmus americana			2										
	2					Viburnum dentatum var. lucidum													
2	3					Viburnum nudum													

Plot	RNBP015	Plot Size (sq. m)	400	Plot Dimensions (m)	16 x 25 m
Plot Type	releve	Relative Stand Size	small	Species Richness	55
<u>PLOT LOCATION / DOCUMENTATION</u>				Photo Documentation?	yes
Surveyor	Gary Fleming	Contributor	Gary Fleming	Date	2010-06-15
Source Code					
F10FLE36VAUS					
Physiographic Province	NC	State	VA	County	Hanover
USGS Quad	Seven Pines	3707753			
Survey Site	Turkey Hill	Project Inventory - Coastal Plain			
Conservation Site	Managed Area Richmond National Battlefield Park				
Latitude	373311.66	Longitude	771612.54	UTMN	4158670
UTME	299471	UTM Zone	18		
Location determined by GPS					
Estimated Accuracy	Confident computed pos. within 10 m of true pos.			GPS File Name	018
GPS Unit Garmin Rino					
Feature Type	point	Number of	280	Precision (m)	4

VEGETATION STRUCTURE

Physiognomy	Forest		Dominant Leaf		Deciduous
	Total Cover (%)	Stratum Height (m)	Leaf Type or Growth Form	Phenology or Growth Habit	
Tree	75	31	Broad - leaved	Deciduous	
Shrub	10	6	Broad - leaved	Deciduous	
Herb	65	1	Graminoid	Perennial Herb	
Bryophyte	1		Bryophyte		

TOPOGRAPHY

Elevation (m)	18	Aspect (deg)	flat	Slope (deg)	0	Slope Shape	Vertical	Straight
Horizontal	Straight							
Topographic Position	plain/level/bottom			Landform	alluvial flat/alluvial terrace/floodplain			
Landform	Terrain Shape			Hummock % 25 Hollow % 75				
Hummock Height (cm)								

SURFACE SUBSTRATE (%)

Bedrock	Litter / Organic Matter	98	Mineral Soil /
Boulders and Stones	Decaying Wood	2	Other
Gravel and Cobbles	(Bryophytes and Lichens)	1	

GEOLOGY

Geologic Map Unit	Alluvium	Geologic Map Code	al
Geologic Time Unit	Quaternary	Geologic Map Reference	1993 Geologic Map of Virginia

HYDROLOGY AND SOIL DATA

Soil Moisture Regime	subhygric	Hydrologic Regime	non-tidal - temporarily flooded
Soil Drainage	somewhat poorly drained	Soil Description	
Inundation	infrequently		0-2 cm matted leaf litter (in depressions) 2-10+ cm brown-black sandy loam
Halinity			
Refractometer Measurement (ppt)			
Soil Series	Wehadkee silt loam	Mean Soil Depth (cm)	
Interquartile Range		()	

Soil Reference Source U.S.Department of Agriculture, N.R.C.S. 2006. Soil Survey Geographic (SSURGO) database for available counties in Virginia

Cation Exchange Capacity (meq/100g)	13.81	Ca (ppm)	255	B (ppm)	0.21
Base Saturation (%)	17.31				
pH	4.1	Mg (ppm)	83	Fe (ppm)	327
Bulk Density (g/100cc)					
Organic Matter (%)	8.97	Ca:Mg Ratio	3.1	Mn (ppm)	4
Sand (%)	75.65				
Est. N release (lb/acre)	120	K (ppm)	62	Cu (ppm)	0.66
Silt (%)	11.46	Soluble S (ppm)	36	Na (ppm)	60
Zn (ppm)	2.86	Clay (%)	12.89		
Easily Extractable P (ppm)	32			Al (ppm)	661

DISTURBANCE

Exotic Plants Grazing/Browsing

Other Comments Low cover by *Murdannia keisak*. Old beaver browse on stumps. *Viburnum* is stunted from deer browsing.

QUALITATIVE DESCRIPTION

Plot Narrative This plot documents a deciduous forest on a slightly elevated alluvial plain along the Chickahominy River. The soils here are better drained than other plots from this site. Overall, the environmental setting and vegetation are very similar to a site 3.75 km downstream (see plots HANO014, HENR003) on the Wilson property, where landowner reports that the terraces are temporarily inundated 4-5 times a year with shallow water persistent for a time after flooding. The canopy is composed of medium-diameter (40-60 cm) *Quercus phellos* and *Quercus michauxii*. The herb stratum is sedge-rich, with 10 species of *Carex* documented in this sample.

SUPPLEMENTAL DATA

Plot RBNP015

ADDITIONAL SURVEYORS AND SITE

Date	Additional Surveyors	Survey Comments
2010-06-15	Karen Patterson	

PHOTOS

Date	Photographer	Film Roll	Frame Number(s)	Bearing	Photo Type
2010-06-15	Gary Fleming				digital

COMPOSITIONAL DATA**Plot** RBNP015

Species	Cover	Species	Cover
Acer rubrum	7	Murdannia keisak	2
Quercus michauxii	7	Peltandra virginica	2
Quercus phellos	7	Symphyotrichum lateriflorum	2
Carex debilis	6	Vaccinium fuscatum	2
Carex intumescens var. intumescens	6	Vitis rotundifolia var. rotundifolia	2
Liquidambar styraciflua	6	Agalinis purpurea	1
Carex albolutescens	5	Apios americana	1
Carex crinita	5	Desmodium perplexum	1
Nyssa sylvatica	5	Euonymus americanus	1
Smilax rotundifolia	5	Galium obtusum ssp. obtusum	1
Carex tribuloides	4	Hypericum hypericoides	1
Carex typhina	4	Juncus acuminatus	1
Viburnum dentatum var. lucidum	4	Lespedeza cuneata	1
Carex jorii	3	Mikania scandens	1
Chasmanthium laxum	3	Persicaria arifolia	1
Ilex opaca var. opaca	3	Pinus taeda	1
Ilex verticillata	3	Smilax glauca	1
Ambrosia artemisiifolia	2	Smilax hispida	1
Bidens frondosa	2	Ulmus americana	1
Campsis radicans	2		
Carex lonchocarpa	2		
Carex louisianica	2		
Carex lupulina	2		
Carex seorsa	2		
Carpinus caroliniana	2		
Cephalanthus occidentalis	2		
Cinna arundinacea	2		
Dichanthelium clandestinum	2		
Dichanthelium dichotomum	2		
Dioscorea villosa	2		
Eubotrys racemosa	2		
Impatiens capensis	2		
Iris virginica	2		
Itea virginica	2		
Juncus effusus	2		
Mitchella repens	2		

Ecological Community Group Coastal Plain / Piedmont Bottomland Forest

WOODY COVER AND TREE DATA Plot RNB015
Stem Inference Area for Trees (sq. m) 400

Plot Size (sq. m) 400 Stem Inference Area for Saplings (sq. m) 400
Minimum Tree Size (cm) 2.5

Woody Cover by Stratum (m)							Tree Abundance by Diameter Class (cm)												
0-	0.5-	6-	10-	20-	35-	Species	0-	1-	2.5-	5-	10-	15-	20-	25-	30-	35-	40-	(dbh in cm)	
8	6	6	7	8		TOTAL													
2	2	6	6	4		Acer rubrum			1	1	2	4	2			1			
2	2					Campsis radicans													
2						Carpinus caroliniana													
2						Cephalanthus occidentalis													
2	2					Eubotrys racemosa													
1						Euonymus americanus													
1						Hypericum hypericoides													
2	3					Ilex opaca var. opaca			2										
2	3					Ilex verticillata													
2						Itea virginica													
2	3		5	4		Liquidambar styraciflua			2		1	2	1	1					
2			5			Nyssa sylvatica							2						
1						Pinus taeda													
2	2			7		Quercus michauxii					1				2		42	43	
1				7		Quercus phellos											40	41	44
1						Smilax glauca													
1						Smilax hispida													
3	5					Smilax rotundifolia													
1						Ulmus americana													
	2					Vaccinium fuscatum													
3	3					Viburnum dentatum var. lucidum													
2						Vitis rotundifolia var. rotundifolia													

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior



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