

National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania



Inventory of Avian Species at Fredericksburg and Spotsylvania National Military Park, Virginia

Technical Report NPS/NER/NRTR—2009/139



ON THE COVER

Palm warbler (*Dendroica palmarum*) (left) and scarlet tanager (*Piranga rubra*) (right) in Fredericksburg and Spotsylvania National Military Park.
Photographs by Nicolas Bircher.

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National Park Service

Mid-Atlantic Network
120 Chatham Lane
Fredericksburg, VA 22405

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Abstract

A comprehensive, year-round inventory of birds was conducted at Fredericksburg and Spotsylvania National Military Park (FRSP) in 2003-04. The inventory yielded 91.6% (109 of 119) of the total species projected to occur at the park. By season, 92.6% (88 of 95 species) of expected breeding species were detected, with 84.6% (11 of 13) of expected wintering bird species observed and 90.9% (10 of 11 species) of expected migratory species were documented. Additionally, six birds were detected that were not projected to occur at FRSP yielding a total of 115 species at the park. Relative abundance of bird species by habitat type was calculated for the 2003 breeding season. The most abundant species across all habitats were red-eyed vireo (*Vireo olivaceus*; 8.31%), American goldfinch (*Carduelis tristis*; 8.19%), eastern tufted titmouse (*Baeolophus bicolor*; 5.33%), blue-gray gnatcatcher (*Poliophtila caerulea*; 5.21%), and Carolina chickadee (*Poecile carolinensis*; 5.21%). Red-eyed vireo was most abundant within mature deciduous forest and forested wetland habitat, eastern tufted titmouse in mature deciduous forest, blue-gray gnatcatcher in scrub forest and forested wetland habitat, and Carolina chickadee in pine and mature deciduous forest. American goldfinch was abundant throughout FRSP. We determined which habitats contained the highest number of bird species and birds of conservation concern. Scrub-shrub forest and forested wetland habitat contained the greatest species richness (n = 68 and 60, respectively), the most neotropical migrants (n = 32 and 33, respectively), and the highest number of priority species (n = 14 each) compared to the remaining eight habitat types. Despite limited survey effort, grassland habitat contained a relatively high species richness (n = 50), a large number of neotropical migrants (n = 23), and priority species (n = 14). Of the 115 species detected at FRSP during 2003, none are federally or state listed as Threatened or Endangered. However, 27 species are recognized as federal species of conservation concern or priority species under national conservation initiatives. Eight species identified at FRSP including red-headed woodpecker (*Melanerpes erythrocephalus*), wood thrush (*Hylocichla mustelina*), prairie warbler (*Dendroica discolor*), worm-eating warbler (*Helmitheros vermivora*), Kentucky warbler (*Oporornis formosus*), blue-winged warbler (*Vermivora pinus*), Canada warbler (*Wilsonia canadensis*), and black-throated green warbler (*Dendroica virens*) were recognized by the United States Fish and Wildlife Service (USFWS) as Birds of Conservation Concern for the Southeastern Coastal Plain and Piedmont Bird Conservation Regions and/or USFWS Region 5. Besides being designated as birds of conservation concern by the USFWS, red-headed woodpecker, wood thrush, prairie warbler, worm-eating warbler, and Kentucky warbler are also ranked among the top tier species of conservation concern by Partners in Flight (PIF) within the mid-Atlantic Piedmont and mid-Atlantic Coastal Plain Regions of Virginia. An additional 19 species detected at the park are also ranked among PIF top tier of species.

Fredericksburg and Spotsylvania National Military Park hosts a bird community typical of the mosaic of fields and forests that characterize most of northeastern Virginia. Overall diversity is reduced somewhat by the lack of open water, so there are few opportunities for waterfowl, shorebirds, or wading birds. Likewise, the location of FRSP in the northern Piedmont and at the very inland edge of the northern Coastal Plain physiographic province may reduce the abundance of migrants that are biased toward more coastal or mountainous migration corridors. Grasslands habitat is quite extensive within the park and conversion of grasslands to native species can add to increases in biodiversity across multiple taxa. Native grass pastures provide a diverse mix of

foliage density and structure, characteristics favored by many grassland obligate species. Even so, the management regime of these fields should be evaluated based on the size and context of the field as obligate grassland species tend to be mostly area-sensitive species requiring fields larger than 6 ha (15 ac). Fields below that size are best managed as shrublands. Shrubland species tend to occupy smaller patches and regionally are in need of more management attention than most other avian species.

Fredericksburg and Spotsylvania National Military Park lies within the City of Fredericksburg and in the surrounding Orange, Spotsylvania, Caroline, and Stafford counties. Although the park is located near the City of Fredericksburg, all the eight units are influenced by the rapid-growth region and development accompanying the many travel corridors adjacent to the park, FRSP preserves and exemplifies the historical importance of the region and serves as an important natural area in the midst of increasing modern development. However, due to the proximity of FRSP to these anthropogenic influences and the accompanying rapid development, habitat loss surrounding the park could have a negative impact on the avifauna in the near future.

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Introduction

The National Park Service (NPS) has established the Inventory and Monitoring (I&M) Program to gather existing and new information about natural resources in the parks and to make that information easily available at different levels to park resource managers, the scientific community, and the public. For park managers to effectively maintain biological diversity and ecological health within their parks, they must have a basic knowledge of what natural resources exist in parks, as well as an understanding of the factors that may threaten them. One of the first goals of the I&M Program has been to establish baseline biological inventories for vascular plants and vertebrates in order to provide a reliable account of species at each park, with the inventory and monitoring results to be used as a fundamental tool for future park management.

This report presents the results of a baseline bird inventory conducted in 2003-04 at Fredericksburg and Spotsylvania National Military Park (FRSP), located in the City of Fredericksburg and in Orange, Spotsylvania, Caroline, and Stafford counties of northeastern Virginia. The primary objective of the project was to document at least 90% of birds expected to occur at FRSP, by confirming the existence of species and documenting year-round species diversity in the park. Local records, surveys, and published literature were used to develop a list of species expected to occur at FRSP (Kain 1987; Trollinger and Reay 2001). The list contains 119 species, of which, 95 species were expected to occur during breeding season, 13 as wintering species, and 11 to occur as transient migrants.

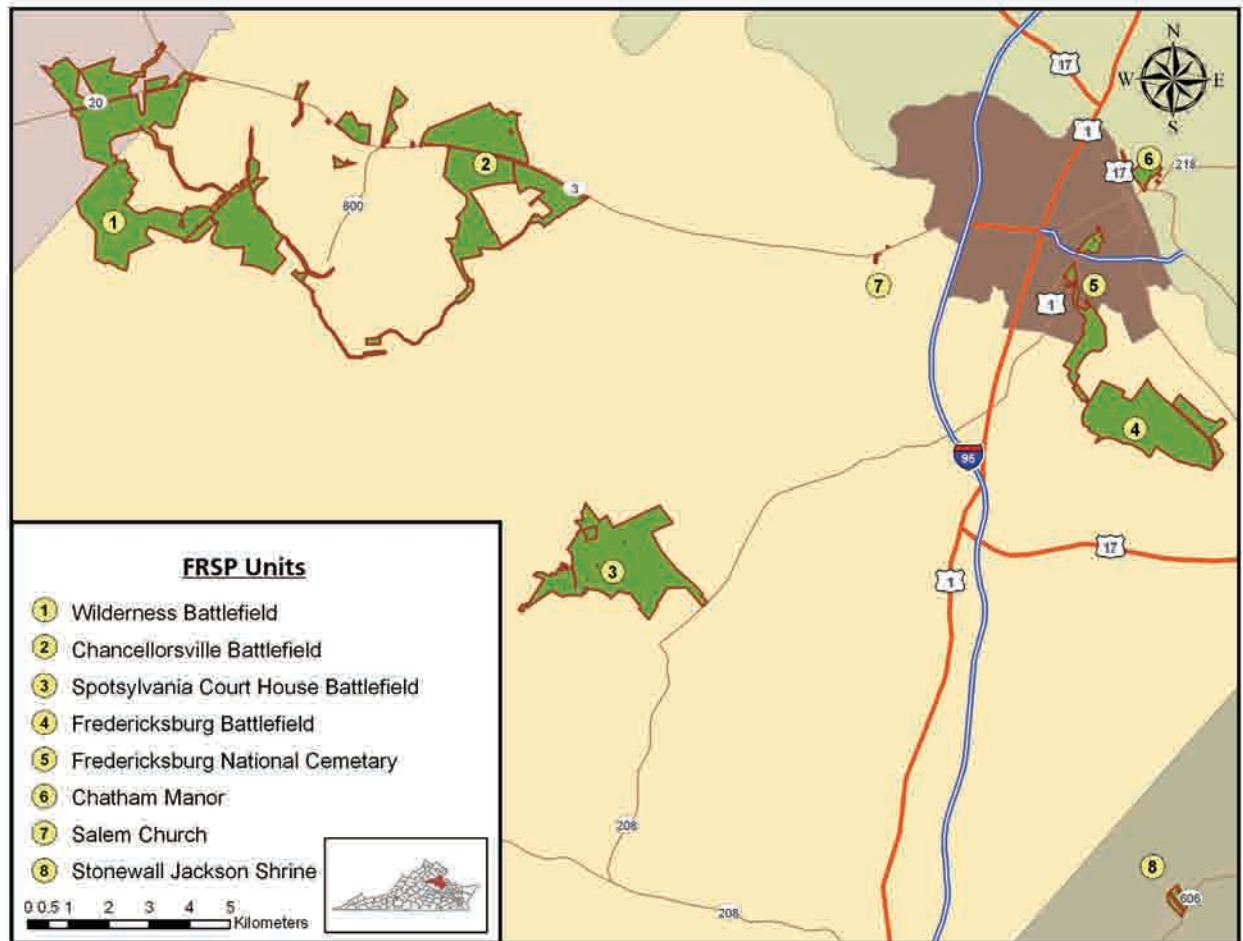
Study Area

Fredericksburg and Spotsylvania National Military Park (FRSP) is one of ten parks within the Northeast Region Mid-Atlantic Network (MIDN) of the National Park Service (NPS). The park was originally established in 1927 to commemorate four major engagements of the Civil War which included the battles of Fredericksburg, Spotsylvania Court House, Wilderness, and Chancellorsville (NPS 1986). Additionally, the original park boundary included the Fredericksburg National Cemetery. In 1933 responsibility for managing the park was transferred to the Department of the Interior. Since that time, protected acreage of the four battlefields has increased by several thousand acres and additional park units have been added to FRSP including the Stonewall Jackson Shrine in 1937, Salem Church in 1965, and Chatham Manor in 1977. Today the park serves as an important resource for public education and historic interpretation of battles and maneuvers employed by the Union and Confederate armies. It also preserves an important area of open space in the midst of increasing modern development.

The previously mentioned eight park units are located in the City of Fredericksburg and in Orange, Spotsylvania, Caroline, and Stafford counties, Virginia (Figure 1). Currently, the park encompasses 2,971 ha (7,342 ac) of land within the eight units which are dispersed over 285 km² (110 mi²) of the northern Piedmont and northern Coastal Plain physiographic provinces in northeastern Virginia (Taverna and Patterson 2008). Approximately 90% of the park is in the northern Piedmont physiographic province with the remaining 10% located in the northern Coastal Plain. Fredericksburg Battlefield and Stonewall Jackson Shrine are located on the western margin of the northern Coastal Plain of Virginia. The fall line dividing the two physiographic provinces runs roughly from Chatham Manor through Fredericksburg Battlefield, with Lee Drive being the line of demarcation (Kneipp 2003). The landscape of the Northern Piedmont is rolling to locally hilly, with elevations ranging from 30–150 m (100–500 ft) (Keys et al. 1995). The Northern Coastal Plain contains relatively flat to gently rolling terrain with broad wetlands and elevations ranging from 15–60 m (50–200 ft).

The park consists of approximately 525 ha (1,300 ac) of managed fields and 2,080 ha (5,137 ac) of forest (primarily oak-hickory), including much riparian habitat (Davis et al. 2006). Forests are dominated by oaks (*Quercus* spp.), hickories (*Carya* spp.), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), dogwood (*Cornus* spp.), and Virginia (*Pinus virginiana*) and shortleaf pines (*P. echinata*). Wetlands occupy approximately 223 ha (550 ac). The Rappahannock, Ni, and Po rivers, along with their tributaries, are the prevailing aquatic features at the park. Numerous streams and swamps divide the gently rolling topography of the park. Chancellorsville Battlefield lies on the divide separating the watershed of the Rappahannock River from the Po and the Ni rivers, and Spotsylvania Court House Battlefield lies between the drainage areas of the Po and the Ni rivers (Kneipp 2003). Together, the streams of the park total about 32 km (20 mi) of permanent streams and 32 km (20 mi) of intermittent streams (Davis et al. 2006). The Rappahannock River runs primarily along the eastern end of the park and is directly adjacent to the Chatham Manor boundary. Wilderness Run and Keatons Run in Wilderness Battlefield flow into the Rapidan River to the northwest, a major tributary to the Rappahannock River. The Ni River and its tributaries are located in the south-central region of the park and flow from the Chancellorsville Battlefield south along the eastern side of the Spotsylvania Court House Battlefield. The Po River flows along the western

Figure 1. Map of Fredericksburg and Spotsylvania National Military Park, Virginia.



edge of Spotsylvania Court House Battlefield. Tributaries to the Po River originate in both the southern end of the Wilderness Battlefield and the Spotsylvania Court House Battlefield. The elevation of FRSP gradually decreases heading across the Piedmont and into the Coastal Plain from west to east. Elevations range from roughly 140 m (460 ft) near the western boundary of Wilderness Battlefield, to near sea level along the Rappahannock River below Chatham Manor (Taverna and Patterson 2008).

Habitat Types

Mixed Forest

Mixed forest is land covered by vegetation yielding $\geq 25\%$ canopy coverage that contains no buildings or paved roads. The vegetation is dominated by trees defined as single stemmed woody plants > 6 m tall. Mixed forest dominates most of the mature forests at FRSP and is comprised of loblolly (*Pinus taeda*), Virginia, and shortleaf pine, American beech (*Fagus grandifolia*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*), and tulip poplar. Other species include sweetgum, green ash (*Fraxinus pennsylvanica*), and several hickory species. Subcanopies are comprised of canopy species as well as black gum (*Nyssa sylvatica*), red maple, and flowering dogwood (*Cornus florida*). Common shrub and ground species are ironwood (*Carpinus caroliniana*), American holly (*Ilex opaca*), lowbush blueberry (*Vaccinium angustifolium*), Allegheny blackberry (*Rubus allegheniensis*), greenbriar (*Smilax* spp.), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), maple-leaf viburnum (*Viburnum acerifolium*), and Japanese honeysuckle (*Lonicera japonica*) (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007; Barry et al. 2008; Taverna and Patterson 2008).

Mature Deciduous Forest

Mature deciduous forest is land covered by vegetation yielding $> 25\%$ canopy coverage that contains no buildings or paved roads. The vegetation is dominated by trees defined as single stemmed woody plants > 6 m tall. Oaks (including white, scarlet [*Quercus coccinea*], southern red [*Q. falcata*], willow [*Q. phellos*], northern red, black [*Q. velutina*], and chestnut [*Q. prinus*]) and hickories dominate the overstory with American beech, red maple, green ash, sweetgum, and tulip poplar as co-dominants, depending on site conditions and hydrology. Flowering dogwood, American holly, sassafras (*Sassafras albidum*), and ironwood double as shrub and sub-canopy species, with canopy species saplings rounding out the suite. The shrub layer is more open in these forested tracts because of the lack of light penetration to the ground under the dense canopies, but lowbush blueberry, Allegheny blackberry, greenbriar, Virginia creeper, poison ivy, maple-leaf viburnum, and Japanese honeysuckle are common understory and ground species (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007; Barry et al. 2008; Taverna and Patterson 2008).

Forested Wetland

Forested wetlands at FRSP occur primarily along floodplain forests dominated by deciduous trees and contain poorly drained saturated soils. The floodplain canopy is dominated by a mix of red maple, tulip poplar, sweetgum, willow oak, pin oak (*Quercus palustris*), river birch (*Betula nigra*), green ash, black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), slippery elm

(*Ulmus rubra*), loblolly pine, and/or several oak species depending on age and microclimate conditions. Shrubs include ironwood, American holly, and common spicebush (*Lindera benzoin*), boxelder (*Acer negundo*), common hackberry (*Celtis occidentalis*), possumhaw (*Viburnum nudum*), sweetbay (*Magnolia virginiana*), and coastal sweet pepperbush (*Clethra alnifolia*) as dominants. Trumpet vine (*Campsis radicans*), grape (*Vitis* spp.), and Japanese honeysuckle are often found along the edges (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007; Taverna and Patterson 2008).

Scrub - Shrub Forest

Scrub - shrub habitats at FRSP are typically comprised of either regenerating woody species or successional grasslands that have become dominated by woody species. They contain dense stands of young successional trees of variable composition, including tulip poplar, Virginia pine, red maple, white oak, eastern redcedar (*Juniperus virginiana*), sweetgum, black gum, hickories, flowering dogwood, tree of heaven (*Ailanthus altissima*), white mulberry (*Morus alba*), paper-mulberry (*Broussonetia papyrifera*), winged elm (*Ulmus alata*), hackberrys (*Celtis* spp.), and sumacs (*Rhus* spp.). Vines include poison ivy, Japanese honeysuckle, grapes, and blackberries (*Rubus* spp.) (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007; Taverna and Patterson 2008).

Pine Forest and Plantation

The majority of the pine forest at FRSP is Virginia pine dominant evergreen forest, often occurring with a variety of deciduous trees and shortleaf pines. Older stands may exhibit an emergent canopy of senescent pines with a main canopy of deciduous trees and a poorly developed herbaceous layer often dominated by fan clubmoss (*Lycopodium digitatum*) (Taverna and Patterson 2008). The bulk of the pine plantation component at FRSP is comprised of regenerating pine stands found in homogeneous age classes. They span the entire range of age classes, but most are in the 20–30 year stage.

Grassland

Grassland implies any pasture, agriculture, or fallow field at less than shrub stage (having less than 5% woody vegetation), excluding lawns. Most of the open habitats at FRSP are grassland habitats, the majority of them fescue (*Festuca* spp.) dominated hay fields that also contain broomsedge (*Andropogon virginicus*), timothy (*Phleum pratense*), redtop (*Agrostis gigantea*), deer tongue (*Panicum clandestinum*), and other grasses (Poaceae) (Barry et al. 2008). Other common vascular plants in fields include clovers (*Trifolium* spp.), asters (*Aster* spp.), goldenrods (*Solidago* spp.), milkweeds (*Asclepias* spp.), poison ivy, and Japanese honeysuckle.

Scrub Forest

Scrub forest habitat at FRSP is typically comprised of regenerating woody species or successional grasslands that have become dominated by woody species. Unlike scrub - shrub habitat, scrub forest is dominated by an overstory tree layer with an accompanying dense understory of young successional trees of variable composition, including tulip poplar, Virginia pine, red maple, white oak, eastern redcedar, sweetgum, black gum, hickories, flowering

dogwood, tree of heaven, white mulberry, paper-mulberry, winged elm, hackberrys, and sumacs. Vines include poison ivy, Japanese honeysuckle, grapes, and blackberries.

Forest/Field Edge

The forest/field edge habitat references the interface between forested and grassland habitats. It refers primarily to a “hard” edge, where forest meets grassland, with little or no transitional habitat. This is not a standard habitat for classifying birds, but was useful for associating with transient birds that might be observed along edges in migration, for raptors, and for facultative grassland birds that opportunistically take advantage of grassland resources but remain associated most closely with the forest.

Forest/Scrub Edge

The forest/scrub edge habitat references the interface between forested and scrub/shrub habitats. It refers primarily to a “soft” edge, where forest meets scrub/shrub, and is not as abrupt as the clear distinction between forest and field habitats. This is not a standard habitat for classifying birds, but was useful for associating with transient birds that might be observed along edges in migration and raptors that opportunistically take advantage of forest edge habitats.

Scrub-Shrub Wetland

Scrub/shrub wetland habitat is dominated by understory woody vegetation including black willow (*Salix nigra*), loblolly pine, bald cypress (*Taxodium distichum*), red maple, and alders (*Alnus* spp.). Accompanying the shrub vegetation are herbaceous plants such as cutgrass (*Leersia oryzoides*), broadleaf arrowhead (*Sagittaria latifolia*), wild iris (*Iris* sp.), and sedges (Barry et al. 2008; Taverna and Patterson 2008).

Methodology

Expected Species List Development

Before field surveys were initiated, an expected bird species list for the park was generated from several sources (Appendix A). An initial breeding species list was assembled from The Virginia Breeding Bird Atlas Project 1985–1989 (Trollinger and Reay 2001). Virginia Breeding Bird Atlas data was compiled from survey areas that included USGS 7 ½ minute topo maps containing all the eight units of FRSP. Additional data were collected using results from over 20 years of data from the four nearest Breeding Bird Survey routes that surround FRSP in all directions. Likewise, over 10 years of Christmas Bird Count (CBC) data from the area was evaluated for winter birds. Finally, field guide range maps (Peterson 1980; Sibley 2000) were consulted, along with years of combined local knowledge of the area avifauna by professional colleagues. These lists were consolidated and edited to reflect only those species that would be subject to occur within the habitats known to exist at FRSP. Likewise, a list of spring and fall migrants expected to utilize habitats at FRSP was assembled from the same field guides and local knowledge, in addition to data on wintering locations and migration routes (Faaborg and Terborgh 1980; Degraaf and Rappole 1995; Dunn and Garrett 1997). A total of 119 species was expected to occur at FRSP, of which 95 species were expected during the breeding season, 13 species in winter, and 11 species to occur as transient migrants (Appendix A). Seasonal separation was determined as follows: birds expected during the breeding season included all resident birds and any temperate or neotropical migrants known to breed at, or close to, FRSP. Winter birds included only those birds unique to the winter season; typically temperate migrants that do not also breed at the latitude of FRSP. Transient migrants included only those migrants utilizing FRSP as a “refueling,” or stopover area, en route to points north or south, with no evidence of breeding or wintering presence at the park.

Site Selection

The avian inventory began with a review of recent aerial imagery, from which park boundaries and habitat types were evaluated. Imagery used was 2000 color-infrared digital orthophoto imagery rendered using Mr Sid compression. The imagery was provided by the NPS along with the most current park unit boundary shapefiles. Upon examination of the imagery, all significant habitat types were noted for each park unit, along with size and distribution of each. Any trails, roads, or other access points were noted as well, for use in establishing the most efficient survey routes. Potential survey points were laid out on the imagery to give the most effective coverage of available habitats. These points were uploaded to handheld GPS units and taken in the field for ground truthing. Once in the field, observers selected a point on the ground that best approximated the photo location and collected a final GPS location with the handheld unit that would serve as the official survey point (Appendixes B-D).

Rather than a random distribution of points, this project used points that were subjectively selected to encompass both edge and interior components of each distinct habitat type, where applicable. This technique was used to better assess bird diversity within specific habitat types as an aid to long-term management. In addition, some of the habitat units were small, which, when evaluated in terms of a 250 m (820 ft) separation between survey points (Ralph 1993),

made it important to be sure that key habitats were sampled. Therefore, the habitat type was a primary consideration in point selection.

The FRSP Units

Because of the tremendous size disparity in the different land units at FRSP, number of survey points and sampling effort were matched to unit size. The Wilderness and Chancellorsville battlefields are the largest units and received the most survey points ($n = 29$ and 24 , respectively), whereas Chatham Manor and Stonewall Jackson are two of the smaller units and required less sampling effort ($n = 4$ and 3 survey points, respectively) (Appendixes B-D).

Field Surveys

In order to effectively inventory bird communities at FRSP, 91 survey points were distributed throughout seven of the eight park units and the points were visited during different times of the year. All techniques employed standardized methodologies, but often incidental encounters were recorded to maximize species detection probabilities.

Breeding Season Surveys

The primary inventory objective was to determine which bird species occurred at FRSP during the breeding season. This was accomplished through a standardized point count methodology using 10 minute periods to record all birds seen or heard in all directions from a fixed survey point (Ralph 1993). Count data were segregated within this 10 minute period into consecutive segments of 3, 2, 2, and 3 minutes. Count data were also recorded relative to distance intervals, recognizing all birds detected within a radius of 50 m (164 ft) from the count center and those beyond 50 m (164 ft). This data recording methodology allows for better comparison with other survey data from other times and/or places and provides data for generating density estimates for species detected within a fixed radius. A total of 91 points distributed among all major habitat types were sampled over the course of the survey period (Appendixes B-D). All breeding season surveys were initiated at sunrise and terminated not later than 4 hours after sunrise. Surveys assumed reasonably fair weather and light winds. No surveys were undertaken in heavy rain or winds exceeding an average of 15 mph. Each point was surveyed twice during 1 June–15 July 2003. Species detected between point counts were compiled separately and used only to supplement the overall species list. Likewise, birds observed as “fly-overs” during the count period were not used in the density estimates, but were recorded as part of the overall species list.

Relative abundance was calculated for all species detected within the 50 m (164 ft) radius count circle. This value was calculated as the total number of individuals of a species detected within the 50 m (164 ft) radius of a point divided by the total number of individuals of all species detected within 50 m (164 ft) of a point for all point counts conducted during the breeding season. The value is shown as a percentage in the data tables. The data were analyzed using Microsoft Excel 2007 Statistical Software and presented in tabular form representing relative abundance for species detected by habitat type.

Migration Surveys

A secondary objective of this project was to assess bird use of respective park units during migration and winter to better develop a year round profile of bird diversity at FRSP. Although migration survey work requires intensive effort to develop meaningful data on bird density and distribution, we concentrated on diversity and general abundance of migrants during peak periods of migration for this project. The number of available observers was not adequate to undertake a systematic methodology to capture the entirety of bird migration. As a result, data was not collected for detailed analysis, but rather to evaluate the park units and their habitats for areas of significant importance to migrants as foraging or staging areas during peak times of migration. For this purpose, we made use of the existing point counts, where a subset of the original points was surveyed during different periods of migration. Migration surveys for passerines were conducted during the first 4 hours after sunrise. The migration periods were recognized as 15 March to 31 May and 15 August to 15 November, although the bulk of the migration survey effort was undertaken between 15 April and 15 May, which covers the peak of the spring passerine migration in eastern Virginia.

Winter Surveys

Winter surveys were conducted similar to those during migration. Given the tendencies of birds to form mixed-species foraging flocks during winter and adopt a more nomadic existence, there is tremendous heterogeneity in bird distribution across a given habitat (Morse 1970). As a result, winter survey work made use of point counts within seven of the eight units. Winter data were not collected for analysis, only for building a winter species profile. Surveys were conducted throughout the day, with the emphasis on the first 5 hours after sunrise. All winter surveys were conducted between 15 November 2003 and 15 March 2004.

Audio-Playback Surveys

Several species groups are not readily detected by conventional passerine survey techniques. Among those are nocturnal species and birds of prey. Among the nocturnal species, nightjars and owls are the two groups of relevance at FRSP. As a result, night surveys were conducted using taped playbacks of conspecific calls for each species of interest. Chuck-will's-widows and whip-poor-wills were surveyed from roadsides adjacent to suitable habitats. The survey sequence employed a 2 minute period of listening followed by 30 seconds of playbacks, 2 minutes of listening, 30 seconds of playback, and a final 2 minutes of listening. This sequence was followed for both species at each stop. The same protocol was followed on a second date but with the species reversed. Surveys were conducted only on calm nights with clear skies and at least some moonlight.

Owls were surveyed from roadsides and/or forest interior locations, depending on habitat conditions. Four species were targeted: great horned owl, barred owl, barn owl, and eastern screech owl. The same sequence of playing and listening was done for owls as for nightjars. Distance between survey points for both owls and nightjars was a minimum of 1 km (1,093 yd).

Results

Inventory Results

A total of 115 species was detected during the 2-year inventory at FRSP (Appendixes A and E). Just less than 91.6% (109 of 119) of the species that were expected to occur at the park were documented during the 2003-04 inventory effort. Of these, 88 were confirmed or suspected of breeding within or in close proximity to the park based on observations within appropriate habitat during the breeding season. These species represent 92.6% (88 of 95 species) that could possibly occur at FRSP during the breeding season. In addition, 84.6% (11 of 13 species) of expected wintering bird species were detected between 15 November and 15 March. Another 90.9% (10 of 11) of expected transient species were identified during spring and/or fall migration. Double-crested cormorant, ring-billed gull, and broad-winged hawk were observed during breeding or winter seasons but initially were not expected to occur at FRSP. Additionally, three transient warbler species (Nashville, chestnut-sided, and Canada warbler) not expected to occur at the park were recorded during migration, bringing the total to 115 species for FRSP.

Nocturnal Surveys

Nocturnal surveys were conducted only for barn owls and nightjars. The remaining owl species were detected incidentally or during point count surveys. No whip-poor-wills or chuck-will's-widows were detected, nor were any barn owls.

Species Relative Abundance Data

Relative abundance of bird species by habitat type was calculated for the 2003 breeding season (Appendix F). We used point count survey data collected within a 50 m (164 ft) radius of the point center due to the relatively small size of habitat patches combined with the desire to reduce the influence of extraneous habitats. The most abundant species across all habitats were red-eyed vireo (8.31%), American goldfinch (8.19%), eastern tufted titmouse (5.33%), blue-gray gnatcatcher (5.21%), and Carolina chickadee (5.21%). The two most abundant neotropical migrants (red-eyed vireo and blue-gray gnatcatcher) and resident avian species (eastern tufted titmouse and Carolina chickadee) all were associated with forested habitat. In particular, red-eyed vireo was most abundant within mature deciduous forest and forested wetland habitat, eastern tufted titmouse in mature deciduous forest, blue-gray gnatcatcher in scrub forest and forested wetland habitat, and Carolina chickadee in pine and mature deciduous forest. American goldfinch was the most prominent temperate migrant at the park and was abundant throughout FRSP. American goldfinch constituted nearly six percent of the individuals detected in each of the ten habitat types located within the park.

Species by Habitat Type

Utilizing point count data and incidental sightings from the 2003 breeding season, we determined which habitats contained the highest number of bird species and birds of conservation concern at FRSP (Table 1). Scrub-shrub forest and forested wetland habitat contained the greatest species richness ($n = 68$ and 60 , respectively), the most neotropical migrants ($n = 32$ and 33 ,

respectively), and the highest number of priority species (n = 14 each) compared to the remaining eight habitat types, even though they received less survey effort (n = 14 and 15 survey points, respectively) than mixed forest (n = 21) or mature deciduous forest (n = 17) (Appendix B). Despite limited survey effort (n = 6 survey points), grassland habitat contained a relatively high species richness (n = 50) and large number of neotropical migrants (n = 23) and the most priority species (n = 14). Grassland habitat is comprised of pasture, agriculture, or fallow field at less than shrub stage (having less than 5% woody vegetation) dominated by fescue, orchard grass, timothy and goldenrod. Each of these regimes contained a slightly different compliment of birds leading to their relatively high species richness. Scrub forest and scrub-shrub wetland yielded the least overall number of species (n = 27 each), neotropical migrants (n = 13 and 14, respectively), and priority species (n = 3 and 7, respectively), however, each of these two habitats were not well represented within the park and received little survey effort (n = 3 and 2 survey points, respectively).

Table 1. Number of bird species by migratory guild and habitat type for avian inventories conducted during the breeding season of 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia.

Habitat Type	No. Species	Neotropical Migrants	Temperate Migrants	Permanent Residents	Priority Species ^a
Mixed Forest	49	21	14	14	10
Mature Deciduous Forest	47	22	10	15	10
Forested Wetland	60	33	13	14	14
Scrub-Shrub Forest	68	32	17	19	14
Pine Forest and Plantation	31	12	8	11	4
Grassland	50	23	15	12	14
Scrub Forest	27	13	7	7	3
Forest/Field Edge	38	18	6	14	7
Forest/Scrub Edge	32	18	7	7	8
Scrub-Shrub Wetland	27	14	8	5	7

^a Priority species – birds listed as species of conservation concern by the United States Fish and Wildlife Service, the State of Virginia, or Partners in Flight.

Species of Special Concern

Of the 115 species detected at FRSP during 2003 and 2004, none are listed as Endangered or Threatened Species either federally or by the state of Virginia (Virginia Department of Game and Inland Fisheries 2008; United States Fish and Wildlife Service 2009). However, 27 species were identified as special concern or priority species by the United States Fish and Wildlife Service or Partners in Flight (Watts 1999; United States Fish and Wildlife Service 2008; Kearney 2003; Table 2). Five additional species detected at FRSP are recognized as a Species of Special Concern in Virginia: brown creeper, winter wren, golden-crowned kinglet, hermit thrush, and magnolia warbler (Virginia Department of Game and Inland Fisheries 2008). The Special Concern designation applies only to breeding populations of these species; therefore, it does not apply to these species detected at FRSP. Brown creepers breed in the conifer forests of northern and western Virginia and winter wrens, golden-crowned kinglets, and hermit thrushes breed in only the high elevation conifer forests of Virginia's mountain region (Sibley 2000; Trollinger and Reay 2001). All four species occur statewide during the winter. Magnolia Warbler breed only in high elevation conifer forests of the mountain region of Virginia and are a transient species using FRSP as a stopover location during migration.

Eight species, red-headed woodpecker, wood thrush, prairie warbler, worm-eating warbler, Kentucky warbler, blue-winged warbler, Canada warbler, and black-throated green warbler were recognized by the United States Fish and Wildlife Service (USFWS) as Birds of Conservation Concern (BCC) for the Southeastern Coastal Plain (BCR27) and Piedmont Bird Conservation Regions (BCR29) and/or USFWS Region 5 (R5) (United States Fish and Wildlife Service 2008; Table 2). The first five of these eight species are more important for conservation and management consideration due to their breeding status within the park. Two different conservation area designations are used by USFWS to identify BCC within their document. The first consideration is a more ecologically based classification of Bird Conservation Regions. These regions were developed as part of the North American Bird Conservation Initiative (North American Bird Conservation Initiative 2007). FRSP lies mainly within the Piedmont (BCR 29) but all or portions of the Chatham Manor, Fredericksburg Battlefield and National Cemetery, and Stonewall Jackson Shrine units also reside in the Southeastern Coastal Plain (BCR 27). The second conservation area designation is the USFWS Regional list. FRSP resides in Region 5, which runs north from Virginia through New England. Birds included in either of these lists are deemed priorities for conservation actions and the lists will be consulted for actions taken on Federal and State lands, and for research, monitoring and management funding in accordance with Executive Order 13186 ["Responsibilities of Federal Agencies to Protect Migratory Birds"] (United States Fish and Wildlife Service 2002).

Red-headed woodpecker, wood thrush, prairie warbler, worm-eating warbler, and Kentucky warbler, breeding species recognized as BCC by the USFWS are also ranked among the top tier species of conservation concern by Partners in Flight (PIF) within the mid-Atlantic Piedmont (PIF10) and mid-Atlantic Coastal Plain Regions (PIF44) (Watts 1999; Kearney 2003). Species scoring 19 or higher (out of 30) in the PIF prioritization scheme indicate species of high regional or continental concern. Prairie warbler is associated with early successional habitat during the breeding season and was abundant at FRSP (n = 23). We documented prairie warbler within all units of the park. Wood thrush, worm-eating warbler, and Kentucky warbler are species of mixed forest containing patches of dense understory that are suffering from forest fragmentation,

winter habitat loss, and nest parasitism (Terres 1980; Degraaf and Rappole 1995; Roth et al. 1996; Trollinger and Reay 2001). Despite general commonness of wood thrush, Breeding Bird Survey data suggests it continues to decline in numbers (Watts 1999). Wood thrush was fairly common (n = 113) during the 2003 breeding season within appropriate forested habitat, whereas the other forest associates (worm-eating and Kentucky warbler n = 2 and 4, respectively) and red-headed woodpecker (n = 2) were uncommon or rare at FRSP.

An additional 19 species are also ranked among PIF top tier of species (scoring higher than 19) within the mid-Atlantic Piedmont and mid-Atlantic Coastal Plain (Watts 1999; Kearney 2003). A complete list of PIF priority species detected at FRSP and their corresponding scores for these physiographic areas are shown in Table 2. Northern bobwhite, eastern kingbird, brown thrashers and field sparrows are species of idle grasslands and shrubby habitats, while gray catbird and eastern towhee are found in early successional, brushy areas (Carey et al 1994; Trollinger and Reay 2001). Concern for these species stems from loss of habitat due to natural succession or conversion of grassland and brushy areas to other land uses. Northern bobwhite (n = 7), eastern kingbird (n = 16) and gray catbird (n = 9) were relatively uncommon compared to other early successional bird species of concern including brown thrashers (n = 24), field sparrows and eastern towhee (n = 47 each). Nine of the 19 species, hairy woodpecker (n = 31), eastern-wood pewee (n = 101), yellow-throated vireo (n = 29), Carolina chickadee (n = 141), northern parula (n = 35), pine warbler (n = 41), scarlet tanager (n = 56), Acadian flycatcher (n = 102), and Louisiana waterthrush (n = 21) are forest obligate birds with the latter two associated with forested stream habitats (Sibley 2000; Trollinger and Reay 2001). Being one of the largest parks within the MIDN (2,971 ha) and encompassing an extensive area with eight units dispersed over 285 km², FRSP provides important habitat for these forest breeders as evidenced by their relative abundance within the park.

Table 2. Bird species of conservation concern detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia.

Species	Residency Status	Locations ^a	Conservation Status ^b
green heron	Breeding	CH,SJ	PIF 10 - 20
northern bobwhite	Breeding	SP,WI	PIF10-20
yellow-billed cuckoo	Breeding	CH,FR,SJ,SP,WI	PIF44-19
chimney swift	Breeding	CH,CM,FR,SP,WI	PIF10-20, PIF44-20
red-headed woodpecker	Breeding	CH	R5
hairy woodpecker	Breeding	CH,CM,FR,SP,WI	PIF44-19
eastern wood-pewee	Breeding	CH,CM,FR,SJ,SP,WI	PIF44-21
Acadian flycatcher	Breeding	CH,FR,SJ,SP,WI	PIF10-22, PIF44-21
eastern kingbird	Breeding	CH,CM,FR,SJ,SP,WI	PIF44-19
yellow-throated vireo	Breeding	CH,FR,SJ,SP,WI	PIF44-23
Carolina chickadee	Breeding	CH,CM,FR,SP,WI	PIF44-19

Table 2. Bird species of conservation concern detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Species	Residency Status	Locations ^a	Conservation Status ^b
wood thrush	Breeding	CH,FR,SP,WI	BCR27, BCR29, R5, PIF10-23, PIF44-25
gray catbird	Breeding	CH,FR,SP,WI	PIF44-20
brown thrasher	Breeding	CH,FR,SJ,SP,WI	PIF44-20
northern parula	Breeding	CH,CM,SJ,SP,WI	PIF44-20
blue-winged warbler	Migratory	SP	BCR29, R5, PIF10-21
black-throated green warbler	Migratory	FR,SP	BCR27
pine warbler	Breeding	CH,FR,SP,WI	PIF44-19
prairie warbler	Breeding	CH,CM,FR,SJ,SP,WI	BCR27, BCR29, R5, PIF10-23, PIF44-25
worm-eating warbler	Breeding	FR,WI	R5, PIF10-20, PIF44-24
Louisiana waterthrush	Breeding	CH,SJ,SP,WI	PIF10-21, PIF44-22
Kentucky warbler	Breeding	CH,SP,WI	BCR29, R5, PIF10-23
Canada warbler	Migratory	WI	R5, PIF10-20
scarlet tanager	Breeding	CH,FR,SP,WI	PIF10-22, PIF44-22
rose-breasted grosbeak	Migratory	CH,FR,SP	PIF44-21
eastern towhee	Breeding	CH,FR,SJ,SP,WI	PIF10-19, PIF44-20
field sparrow	Breeding	CH,FR,SJ,SP,WI	PIF10-20, PIF44-22

^a Locations refer to the park units where each species was detected. Unit abbreviations are as follows: CH = Chancellorsville Battlefield; CM = Chatham Manor; FR = Fredericksburg Battlefield and National Cemetery; SJ = Stonewall Jackson Shrine; SP = Spotsylvania Court House Battlefield; WI = Wilderness Battlefield.

^b Conservation status includes United States Fish and Wildlife Service Birds of Conservation Concern for Bird Conservation Regions 27 (BCR27) and 29 (BCR29) and USFWS Region 5 (R5) and Partners in Flight priority species for regions 10 (PIF10-score) and 44 (PIF44-score) with corresponding score.

Discussion

Species Inventory

The 2003-04 bird inventory documented over 91.5% (109 of 119) of the total species projected to occur at the park. By season, 92.6% (88 of 95 species) of expected breeding species were detected, with 90.9% (10 of 11) of expected migratory species observed. The results were least promising for wintering bird species with 84.6% (11 of 13 species) of expected species documented. These possible shortfalls may reflect either or both inadequate survey effort (single season of surveys) and/or an unrealistic expected species list for a park divided into eight units dispersed over 285 km². Multiple surveys per season conducted for more than a single year would provide a more accurate and extensive account of bird species present throughout the park. Additionally, multiple years of surveys would lend a better opportunity to detect the presence of species, especially during the winter and migratory seasons which received less survey effort than did the breeding season.

Nocturnal Surveys

Nocturnal surveys were conducted only for barn owls and nightjars at FRSP, since none of these species were detected during diurnal surveys. None of these three species were detected using playback surveys, although all probably occur within or near the park as appropriate agricultural or grassland habitat for barn owl or common nighthawks and open woodlands for whip-poor-will exist in Fredericksburg and Orange, Spotsylvania, Caroline, and Stafford counties, Virginia. Eastern screech, great-horned and barred owl were documented during point-count surveys or incidentally prior to conducting the tape-playback surveys.

Habitat Associations

As is commonly seen in the Coastal Plain and adjacent portions of the Piedmont, forested wetland and scrub/shrub forest display the highest species diversity, the highest number of neotropical migratory species and the highest number of priority species (Bradshaw 2008). This is tied to the presence of water in forest wetlands, increased insect availability, and overall heterogeneity of the habitat affording opportunities for more species to occupy and exploit the available resources (Wharton et al 1981; Pashley and Barrow 1993). Additionally, forest habitats harbor greater species diversity than other habitats based on the foliage diversity and spatial complexity of the habitat affording opportunities for more species to exploit (MacArthur and MacArthur 1961). At FRSP, most scrub/shrub forest habitats were small habitat blocks that were heavily influenced by species from adjacent habitats and in this context, scrub habitats harbored species from multiple habitat types.

Likewise, another critical habitat in the region, the grasslands especially in the Chancellorsville Battlefield and Spotsylvania Court House Battlefield units, had a relatively high species diversity profile including grassland-obligate species such as grasshopper sparrow and eastern meadowlark. Overall abundance of grassland obligate birds tends to be higher in restored native grass fields as compared to homogeneous, fescue dominated fields that are routinely mowed or livestock grazed pastures (Watts 2000; Kentucky Department of Fish and Wildlife Resources 2004). Native grass pastures provide a diverse mix of foliage density and structure, and these

characteristics are favored by many of the grassland obligate species. Overall numbers of grassland obligate species are higher in these fields even though overall diversity may not be maximized as fewer generalists such as European starling and house finch tend to occur (Watts 1996). However, some of the open, pasture-type battlefields at the park are comprised of fescue dominated hay fields, a sod-forming grass that excludes access to the bare soil beneath and typically results in low diversity herbaceous vegetation stands that provide little value to grassland obligate birds (Kentucky Department of Fish and Wildlife Resources 2004). In winter, rain and snow tend to flatten it in waves, leaving little room for cover beneath. This can preclude use of these fields by grassland-obligate species like the savannah sparrow and minimize foraging opportunities for a number of other grassland users such as meadowlarks, finches, and blackbirds (Askins 1993).

Seasonal Variation

The survey results for FRSP were acceptable relative to documenting the high percentage of expected species for each season. However, one problem that complicated this issue was the difficulty in generating an appropriate list of expected species. There is a paucity of data on the range boundaries of species that have affinities for more coastal areas or more mountainous habitats, but that still occur in the Piedmont. Examples include red-headed woodpecker and prothonotary warbler for primarily coastal species and house wren for more mountainous species, all of which also occur in the Piedmont (Trollinger and Reay 2001). The same uncertainty was present for estimating an expected list of migrants. Eastern migrants tend toward one of two geographic routes depending on their point of origin (Faaborg and Terborgh 1980; Degraaf and Rappole 1995). Birds from the Caribbean Islands typically move north through the Florida panhandle and have more of a coastal bias through Virginia. Birds from Central and South America typically enter the U.S. along the Gulf Coast and tend to follow the Appalachians northward. Although spring migration is a broad front migration, only a small percentage of the mountain migrants are typically observed in the Coastal Plain. However, there is almost no data on the overlap of mountain or coastal migrants in the Piedmont. The ability to resolve this profile at FRSP exceeded the limitations of the survey effort available to this project. So the expected species lists, and subsequent detection percentages, must account for this information deficiency.

Breeding Season

The results of the breeding season inventory at FRSP were mostly as expected. The diversity was typical of the mosaic of early successional and mixed forest land that dominates most of Virginia. A number of species were not detected that had been anticipated, highlighted by open or grassland habitat associates such as American kestrel and killdeer, species that prefer to breed in close proximity to water exemplified by tree swallow, northern-rough winged swallow and prothonotary warbler, and early successional forest species including American woodcock and yellow warbler (Ehrlich et al. 1988; Trollinger and Reay 2001). The amount of open grassland especially within the Chancellorsville, Spotsylvania Court House and Wilderness Battlefield units exceeds the amount of suitable foraging area for American kestrel and breeding area for killdeer (Smallwood and Bird 2002). It is possible that there are no adequate nest sites in proximity to the foraging areas at FRSP, or that the grassland quality does not support a viable prey population for the kestrels. Fredericksburg and Spotsylvania National Military Park may

not afford suitable sites for nesting or wintering kestrels, but it is still likely that the species will be observed visiting the park, given its year-round presence in neighboring areas. Additional survey effort likely would reveal both species either within or adjacent to the park.

Northern rough-winged and tree swallows are common migrants and breeders throughout the state and tend to breed in open habitat near water (Ehrlich et al. 1988). It is surprising that these species as well as prothonotary warbler were not detected given the presence of the Ni, Po, and Rappahannock Rivers and their tributaries within and adjacent to the park. Prothonotary warbler breeds in swampy lowland or floodplain forest which is readily available at FRSP (Petit 1999). Northern rough-winged swallow often migrates far inland from the coast, however, and may not be as prevalent along the coast as are many other swallows (DeJong 1996). These species still should be detected, albeit not frequently, within the park and likely went undetected due to inadequate survey effort.

American woodcock and yellow warbler tend to be habitat generalists but both prefer mixed forest with dense understory growth in close proximity to open habitat and water (Ehrlich et al. 1988; Trollinger and Reay 2001). These habitat parameters exist within the park and with further investigation, both species likely will be detected at FRSP in the future.

Migration

There is very little data available on the migration profile of birds through the Piedmont. As referenced earlier, the coastal routes of Caribbean migrants and the mountain routes of Central and South American migrants probably both result in a certain amount of “spill-over” through the Piedmont, but there is little data on the magnitude of this occurrence or the likelihood of which species might be more predisposed to it. Even so, surveys during migration were extremely productive at FRSP, with all but one of the expected migratory species was detected in 2003. We were unable to detect the presence of northern waterthrush during either spring or fall migration. Northern waterthrush tend to utilize forested swampland similar to their desired breeding habitat during spring and fall migration. The park contains ample forest wetland and floodplain forest areas and with further survey effort during the spring and fall northern waterthrush likely will be detected at FRSP.

The significance of the migration survey work at the park was the observation of three warbler species that had not been expected. Researchers encountered Nashville, chestnut-sided, and Canada warbler during spring migration, all of which are more commonly associated with the Ridge and Valley migration corridor based on their migration origin in the tropics (Faaborg and Terborgh 1980; Degraaf and Rappole 1995).

Winter

Two sparrow species common to this region, savannah and fox sparrow were absent from the survey. The winter distribution in Virginia of savannah sparrow is a gradient from more common along the coast to nearly absent in the mountains. The absence of savannah sparrows is most likely tied to the quality of grassland habitats at FRSP. This species requires a mosaic of bare ground with grassy to weedy patches, or open grasslands with lots of interstitial bare ground available (Wheelwright and Rising 1993; Watts 1996). A number of the grasslands at the park

are predominantly fescue-dominated, sod forming grasses that generate dense mats of vegetation with virtually no bare ground exposed. Savannah sparrows could be incorporated into the avifauna of FRSP with active grassland management. Fox sparrow is frequently associated with dense understory vegetation and could be detected with further survey effort of scrub-shrub habitat during the winter months.

Summary and Management Considerations

In summary, FRSP hosts a bird community typical of the mosaic of fields and forests that characterize most of northeastern Virginia. Overall diversity is reduced somewhat by the lack of open water, so there are few opportunities for waterfowl, shorebirds, or wading birds. Likewise, FRSP's presence in the northern Piedmont and at the very inland edge of the northern Coastal Plain physiographic province may reduce the abundance of migrants that are biased toward more coastal or mountainous migration corridors. For the most part, however, the habitats that are present contain the expected species and there are few issues that would seem to threaten this situation. Common to most parks, the most significant concerns would likely be threats from encroachment or visitor-associated effects or habitat management concerns.

Encroachment and Visitor Access Issues

Fredericksburg and Spotsylvania National Military Park lies within the City of Fredericksburg and in surrounding Orange, Spotsylvania, Caroline, and Stafford counties in the northern Piedmont and northern Coastal Plain physiographic provinces of northeastern Virginia. Although three park units are centered in the City of Fredericksburg, all eight units are influenced by the rapid-growth region and development accompanying the travel corridors created by interstate 95, state routes 1 and 17, and routes 3, 20 and 208, FRSP preserves and exemplifies the historical importance of the region and serves as an important natural area in the midst of increasing modern development. However, due to the proximity of FRSP to these anthropogenic influences and the accompanying rapid development, habitat loss on all sides of the park could have a negative impact on the avifauna in the near future.

Grassland Management

Grasslands habitat is quite extensive (> 515 ha, 1273 ac) especially within the Chancellorsville, Wilderness and Spotsylvania Court House Battlefield units of the park (Taverna and Patterson, 2008). As referenced earlier, restored native grass fields tend to be more heavily occupied by grassland bird species than other grassland management treatments. Mowed fields dominated by fescue tend to be devoid of bird diversity and livestock-grazed pastures, although harboring a diverse bird community, tend to attract more generalist species and not obligate grassland associates.

Managing fields to promote native species will ultimately add to increases in biodiversity across multiple taxa. Even so, the management regime of these fields should be evaluated based on the size and context of the field (Watts 1996, Peterjohn 2006a). Fieldwork completed in 1996 in the Coastal Plain of Virginia and Maryland showed that the variation in patch size relative to management regime yielded significantly different results in bird diversity (Watts et al 1997). Grassland species tend to be mostly area-sensitive species (Askins 1993). Fields less than about 6 ha (15 ac) rarely harbor grassland bird species; therefore, restoring fields to native species should be directed primarily at areas meeting these size requirements. Fields below a 6 ha size threshold are best managed as shrublands (Peterjohn 2006b). Shrubland species tend to occupy smaller patches and are collectively in need of more management attention regionally than other avian species suites, even though early successional, shrub habitat birds were well represented

during the 2003 breeding season (Watts 1996). The Center for Conservation Biology produced a grassland management publication for Colonial National Historical Park in 1999 (Watts 2000) and USGS Patuxent Wildlife Research Center developed similar publications for grasslands and shrublands in several NPS units in Maryland and Pennsylvania (Peterjohn 2006a, 2006b). These publications consider grassland quality, size, and context, relative to avian species diversity, and discussed opportunities for conversion of fescue dominated grasslands to more conducive habitats for bird use. The economics of grassland conversion were also discussed. These publications should be consulted for grassland management in all Mid-Atlantic Region parks.

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Appendix A. List of species expected to occur and detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia.

Common Name	Scientific Name	Migratory Status	Expected	Detected
double-crested cormorant	<i>Phalacrocorax auritus</i>	temperate migrant		X
great blue heron	<i>Ardea herodias</i>	temperate migrant	X	X
green heron	<i>Butorides virescens</i>	neotropical migrant	X	X
Canada goose	<i>Branta canadensis</i>	temperate migrant	X	X
wood duck	<i>Aix sponsa</i>	temperate migrant	X	X
mallard	<i>Anas platyrhynchos</i>	temperate migrant	X	X
black vulture	<i>Coragyps atratus</i>	neotropical migrant	X	X
turkey vulture	<i>Cathartes aura</i>	neotropical migrant	X	X
osprey	<i>Pandion haliaetus</i>	temperate migrant	X	X
sharp-shinned hawk ^a	<i>Accipiter striatus</i>	temperate migrant	X	X
Cooper's hawk	<i>Accipiter cooperii</i>	temperate migrant	X	X
red-shouldered hawk	<i>Buteo lineatus</i>	temperate migrant	X	X
broad-winged hawk	<i>Buteo platypterus</i>	neotropical migrant		X
red-tailed hawk	<i>Buteo jamaicensis</i>	temperate migrant	X	X
American kestrel	<i>Falco sparverius</i>	temperate migrant	X	
wild turkey	<i>Meleagris gallopavo</i>	resident	X	X
northern bobwhite	<i>Colinus virginianus</i>	resident	X	X
killdeer	<i>Charadrius vociferus</i>	temperate migrant	X	
American woodcock	<i>Scolopax minor</i>	temperate migrant	X	
ring-billed gull	<i>Larus delawarensis</i>	temperate migrant		X
mourning dove	<i>Zenaida macroura</i>	temperate migrant	X	X
rock dove	<i>Columbialivia</i>	resident	X	X
yellow-billed cuckoo	<i>Coccyzus americanus</i>	neotropical migrant	X	X
eastern screech owl	<i>Otus asio</i>	resident	X	X
great horned owl	<i>Bubo virginianus</i>	resident	X	X
barred owl	<i>Strix varia</i>	resident	X	X
chimney swift	<i>Chaetura pelagica</i>	neotropical migrant	X	X
ruby-throated hummingbird	<i>Archilochus colubris</i>	neotropical migrant	X	X
belted kingfisher	<i>Ceryle alcyon</i>	temperate migrant	X	X
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	temperate migrant	X	X
red-bellied woodpecker	<i>Melanerpes carolinus</i>	resident	X	X
yellow-bellied sapsucker ^a	<i>Sphyrapicus varius</i>	temperate migrant	X	X
downy woodpecker	<i>Picoides pubescens</i>	resident	X	X
hairy woodpecker	<i>Picoides villosus</i>	resident	X	X

Appendix A. List of species expected to occur and detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected
northern flicker	<i>Colaptes auratus</i>	temperate migrant	X	X
pileated woodpecker	<i>Dryocopus pileatus</i>	resident	X	X
eastern wood-pewee	<i>Contopus virens</i>	neotropical migrant	X	X
Acadian flycatcher	<i>Empidonax virescens</i>	neotropical migrant	X	X
eastern phoebe	<i>Sayornis phoebe</i>	neotropical migrant	X	X
great crested flycatcher	<i>Myiarchus crinitus</i>	neotropical migrant	X	X
eastern kingbird	<i>Tyrannus tyrannus</i>	neotropical migrant	X	X
white-eyed vireo	<i>Vireo griseus</i>	neotropical migrant	X	X
yellow-throated vireo	<i>Vireo flavifrons</i>	neotropical migrant	X	X
blue-headed vireo	<i>Vireo solitarius</i>	temperate migrant	X	X
red-eyed vireo	<i>Vireo olivaceus</i>	neotropical migrant	X	X
blue jay	<i>Cyanocitta cristata</i>	temperate migrant	X	X
American crow	<i>Corvus brachyrhynchos</i>	resident	X	X
fish crow	<i>Corvus ossifragus</i>	resident	X	X
purple martin	<i>Progne subis</i>	neotropical migrant	X	X
tree swallow	<i>Tachycineta bicolor</i>	neotropical migrant	X	
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	neotropical migrant	X	
barn swallow	<i>Hirundo rustica</i>	neotropical migrant	X	X
Carolina chickadee	<i>Poecile carolinensis</i>	resident	X	X
eastern tufted titmouse	<i>Baeolophus bicolor</i>	resident	X	X
white-breasted nuthatch	<i>Sitta carolinensis</i>	resident	X	X
brown creeper ^a	<i>Certhia americana</i>	temperate migrant	X	X
Carolina wren	<i>Thryothorus ludovicianus</i>	resident	X	X
house wren	<i>Troglodytes aedon</i>	temperate migrant	X	X
winter wren ^a	<i>Troglodytes troglodytes</i>	temperate migrant	X	X
golden-crowned kinglet ^a	<i>Regulus satrapa</i>	temperate migrant	X	X
ruby-crowned kinglet ^a	<i>Regulus calendula</i>	temperate migrant	X	X
blue-gray gnatcatcher	<i>Polioptila caerulea</i>	neotropical migrant	X	X
eastern bluebird	<i>Sialia sialis</i>	temperate migrant	X	X
American robin	<i>Turdus migratorius</i>	temperate migrant	X	X
wood thrush	<i>Hylocichla mustelina</i>	neotropical migrant	X	X
veery ^b	<i>Catharus fuscescens</i>	neotropical migrant	X	X
Swainson's thrush ^b	<i>Catharus ustulatus</i>	neotropical migrant	X	X
hermit thrush ^a	<i>Catharus guttatus</i>	temperate migrant	X	X

Appendix A. List of species expected to occur and detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected
gray catbird	<i>Dumetella carolinensis</i>	temperate migrant	X	X
northern mockingbird	<i>Mimus polyglottos</i>	resident	X	X
brown thrasher	<i>Toxostoma rufum</i>	temperate migrant	X	X
European starling	<i>Sturnus vulgaris</i>	resident	X	X
cedar waxwing	<i>Bombycilla cedrorum</i>	temperate migrant	X	X
northern parula	<i>Parula americana</i>	neotropical migrant	X	X
blue-winged warbler ^b	<i>Vermivora pinus</i>	neotropical migrant	X	X
Nashville warbler	<i>Vermivora ruficapilla</i>	neotropical migrant		X
yellow warbler	<i>Dendroica petechia</i>	neotropical migrant	X	
chestnut-sided warbler	<i>Dendroica pensylvanica</i>	neotropical migrant		X
magnolia warbler ^b	<i>Dendroica magnolia</i>	neotropical migrant	X	X
Cape May warbler ^b	<i>Dendroica tigrina</i>	neotropical migrant	X	X
black-throated blue warbler ^b	<i>Dendroica caerulescens</i>	neotropical migrant	X	X
yellow-rumped warbler ^a	<i>Dendroica coronata</i>	temperate migrant	X	X
black-throated green warbler ^b	<i>Dendroica virens</i>	neotropical migrant	X	X
pine warbler	<i>Dendroica pinus</i>	temperate migrant	X	X
prairie warbler	<i>Dendroica discolor</i>	neotropical migrant	X	X
palm warbler ^b	<i>Dendroica palmarum</i>	temperate migrant	X	X
blackpoll warbler ^b	<i>Dendroica striata</i>	neotropical migrant	X	X
yellow-throated warbler	<i>Dendroica dominica</i>	neotropical migrant	X	X
worm-eating warbler	<i>Helmitheros vermivora</i>	neotropical migrant	X	X
prothonotary warbler	<i>Protonotaria citrea</i>	neotropical migrant	X	
black-and-white warbler	<i>Mniotilta varia</i>	neotropical migrant	X	X
American redstart	<i>Setophaga ruticilla</i>	neotropical migrant	X	X
ovenbird	<i>Seiurus aurocapillus</i>	neotropical migrant	X	X
northern waterthrush ^b	<i>Seiurus noveboracensis</i>	neotropical migrant	X	
Louisiana waterthrush	<i>Seiurus motacilla</i>	neotropical migrant	X	X
Kentucky warbler	<i>Oporornis formosus</i>	neotropical migrant	X	X
common yellowthroat	<i>Geothlypis trichas</i>	temperate migrant	X	X
Canada warbler	<i>Wilsonia canadensis</i>	neotropical migrant		X
hooded warbler	<i>Wilsonia citrina</i>	neotropical migrant	X	X
yellow-breasted chat	<i>Icteria virens</i>	neotropical migrant	X	X
summer tanager	<i>Piranga rubra</i>	neotropical migrant	X	X
scarlet tanager	<i>Piranga olivacea</i>	neotropical migrant	X	X

Appendix A. List of species expected to occur and detected during 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected
northern cardinal	<i>Cardinalis cardinalis</i>	resident	X	X
rose-breasted grosbeak ^b	<i>Pheucticus ludovicianus</i>	neotropical migrant	X	X
blue grosbeak	<i>Guiraca caerulea</i>	temperate migrant	X	X
indigo bunting	<i>Passerina cyanea</i>	neotropical migrant	X	X
eastern towhee	<i>Pipilo erythrophthalmus</i>	temperate migrant	X	X
chipping sparrow	<i>Spizella passerina</i>	temperate migrant	X	X
field sparrow	<i>Spizella pusilla</i>	temperate migrant	X	X
savannah sparrow ^a	<i>Passerculus sandwichensis</i>	temperate migrant	X	
grasshopper sparrow	<i>Ammodramus savannarum</i>	temperate migrant	X	X
fox sparrow ^a	<i>Passerella iliaca</i>	temperate migrant	X	
song sparrow	<i>Melospiza melodia</i>	temperate migrant	X	X
swamp sparrow ^a	<i>Melospiza georgiana</i>	temperate migrant	X	X
white-throated sparrow ^a	<i>Zonotrichia albicollis</i>	temperate migrant	X	X
dark-eyed junco ^a	<i>Junco hyemalis</i>	temperate migrant	X	X
red-winged blackbird	<i>Agelaius phoeniceus</i>	temperate migrant	X	X
eastern meadowlark	<i>Sturnella magna</i>	temperate migrant	X	X
common grackle	<i>Quiscalus quiscula</i>	temperate migrant	X	X
brown-headed cowbird	<i>Molothrus ater</i>	temperate migrant	X	X
Baltimore oriole	<i>Icterus galbula</i>	neotropical migrant	X	X
orchard oriole	<i>Icterus spurius</i>	neotropical migrant	X	X
house finch	<i>Carpodacus mexicanus</i>	resident	X	X
American goldfinch	<i>Carduelis tristis</i>	temperate migrant	X	X
house sparrow	<i>Passer domesticus</i>	resident	X	X
TOTALS ^c			119	115

^a Species expected to occur only as a winter resident at the park.

^b Species expected to occur only as a transient migrant at the park.

^c Totals include 10 species expected to occur but not detected at the park and six species detected but not expected to occur at the park.

Appendix B. North American Datum 1983 (NAD83) Universal Transverse Mercator (UTM) coordinates and habitat descriptions for bird point count survey locations visited in 2003 and 2004 at Fredericksburg and Spotsylvania National Military Park, Virginia.

Locations^a	UTM-East	UTM-North	Habitat Description
CH-1	269210	4244166	Mixed Forest
CH-2	268974	4244332	Mixed Forest
CH-3	268327	4243999	Mature Deciduous Forest
CH-4	268634	4243878	Mixed Forest
CH-5	268364	4243476	Mixed Forest
CH-6	268169	4243310	Mixed Forest
CH-7	268316	4242598	Forested Wetland
CH-8	268479	4242808	Forested Wetland
CH-9	268914	4242781	Mixed Forest
CH-10	269134	4242921	Mixed Forest
CH-11	268551	4242353	Scrub Forest
CH-12	268585	4242088	Mixed Forest
CH-13	268414	4241881	Forested Wetland
CH-14	268403	4241564	Forested Wetland
CH-15	268541	4241181	Forested Wetland
CH-16	269102	4241173	Pine Forest or Plantation
CH-17	268940	4241376	Pine Forest or Plantation
CH-18	268479	4240601	Forested Wetland
CH-19	270036	4242942	Forested Wetland
CH-20	270290	4242910	Forested Wetland
CH-21	270358	4242717	Scrub Forest
CH-22	270757	4242563	Scrub-Shrub Wetland
CH-23	270561	4242387	Grassland
CH-24	266995	4243708	Grassland
CM-1	285482	4243187	Grassland (with Hedgerow)
CM-2	285256	4242997	Mature Deciduous Forest (Residential Woodlot)
CM-3	285186	4242750	Scrub-Shrub Forest
CM-4	284945	4243007	Scrub-Shrub Forest
FR-1	284176	4238633	Forest/Field Edge
FR-2	283925	4238760	Mature Deciduous Forest
FR-3	283629	4238659	Scrub-Shrub Forest
FR-4	283392	4238293	Scrub-Shrub Forest
FR-5	284271	4237717	Scrub-Shrub Forest
FR-6	284120	4237521	Scrub-Shrub Forest
FR-7	283927	4237046	Pine Forest or Plantation
FR-8	284194	4237080	Pine Forest or Plantation
FR-9	284472	4236878	Mature Deciduous Forest
FR-10	284543	4236613	Mature Deciduous Forest
FR-11	285767	4236803	Mature Deciduous Forest
FR-12	285774	4236538	Mature Deciduous Forest
FR-13	286674	4236333	Forest/Field Edge
FR-14	286699	4235868	Scrub-Shrub Wetland

Appendix B. North American Datum 1983 (NAD83) Universal Transverse Mercator (UTM) coordinates and habitat descriptions for bird point count survey locations visited in 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

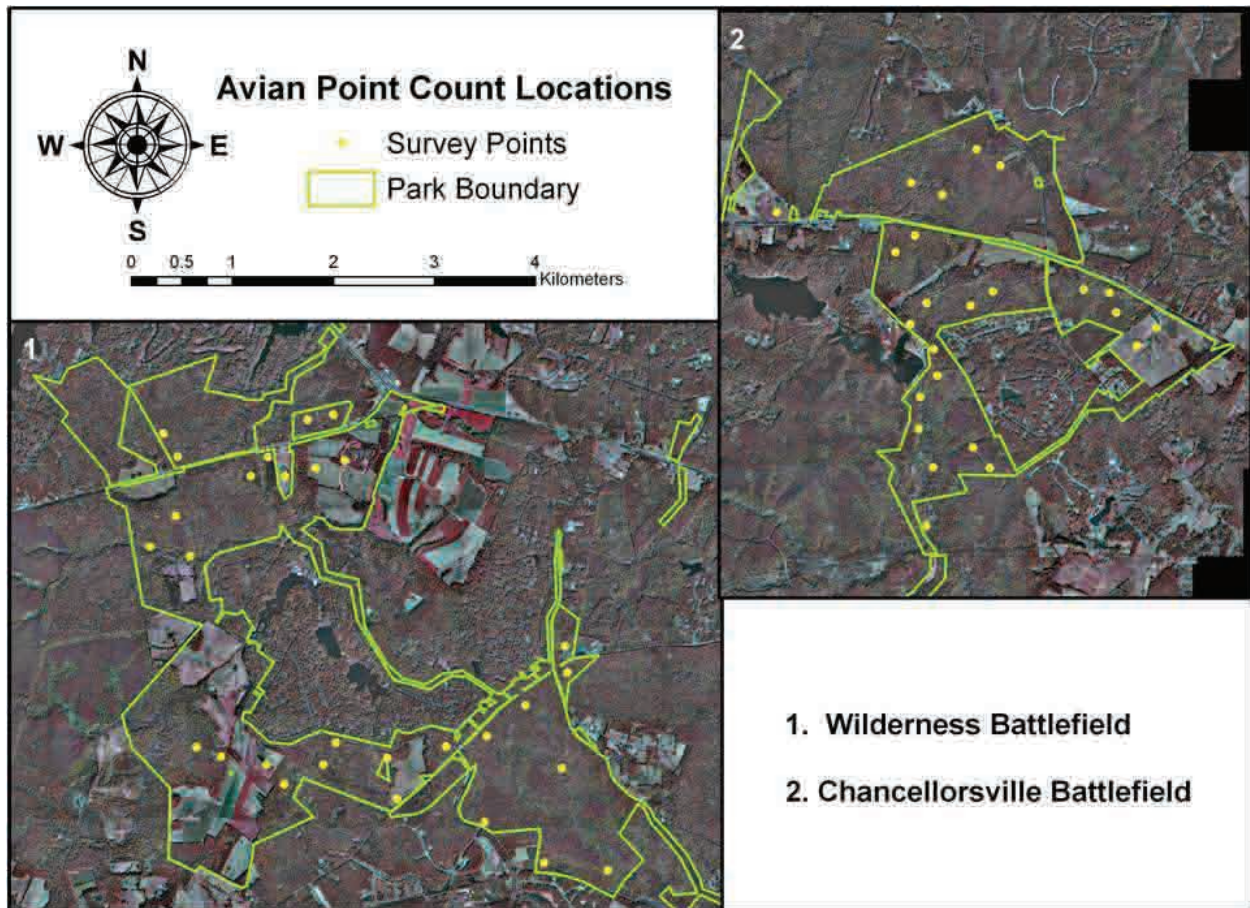
Locations^a	UTM-East	UTM-North	Habitat Description
SJ-1	286086	4225189	Forest/Field Edge
SJ-2	286188	4224864	Forest/Scrub Edge
SJ-3	285892	4224914	Forested Wetland
SP-1	271206	4232986	Scrub-Shrub Forest
SP-2	271184	4233257	Scrub-Shrub Forest
SP-3	271625	4233850	Mixed Forest
SP-4	271928	4233882	Mixed Forest
SP-5	272179	4233805	Mixed Forest
SP-6	271868	4233620	Mixed Forest
SP-7	271964	4233139	Pine Forest or Plantation
SP-8	272270	4233462	Grassland
SP-9	272401	4232961	Scrub Forest
SP-10	272638	4233418	Mature Deciduous Forest
SP-11	273020	4233415	Mixed Forest
SP-12	272640	4233745	Mature Deciduous Forest
SP-13	272478	4233997	Scrub-Shrub Forest
SP-14	273263	4233491	Mixed Forest
SP-15	273242	4232864	Forested Wetland
SP-16	273571	4232871	Forested Wetland
SP-17	271777	4234105	Pine Forest or Plantation
WI-1	259252	4245062	Mature Deciduous Forest
WI-2	259391	4244831	Mature Deciduous Forest
WI-3	260678	4245196	Mixed Forest
WI-4	260936	4245245	Mature Deciduous Forest
WI-5	261055	4244807	Scrub-Shrub Forest
WI-6	260762	4244718	Grassland (Agricultural Field)
WI-7	260456	4244637	Grassland
WI-8	260285	4244827	Forest/Scrub Edge
WI-9	260118	4244638	Pine Forest or Plantation
WI-10	259399	4244255	Mixed Forest
WI-11	259118	4243937	Forested Wetland
WI-12	259516	4243844	Forested Wetland
WI-13	259578	4241953	Mixed Forest
WI-14	259818	4241858	Mixed Forest
WI-15	260273	4241777	Scrub-Shrub Forest
WI-16	260448	4241588	Scrub-Shrub Forest
WI-17	260836	4241777	Mixed Forest
WI-18	260959	4241997	Mature Deciduous Forest
WI-19	261466	4241845	Mixed Forest
WI-20	261564	4241438	Scrub-Shrub Forest
WI-21	262050	4241962	Mixed Forest
WI-22	262456	4242063	Mature Deciduous Forest

Appendix B. North American Datum 1983 (NAD83) Universal Transverse Mercator (UTM) coordinates and habitat descriptions for bird point count survey locations visited in 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

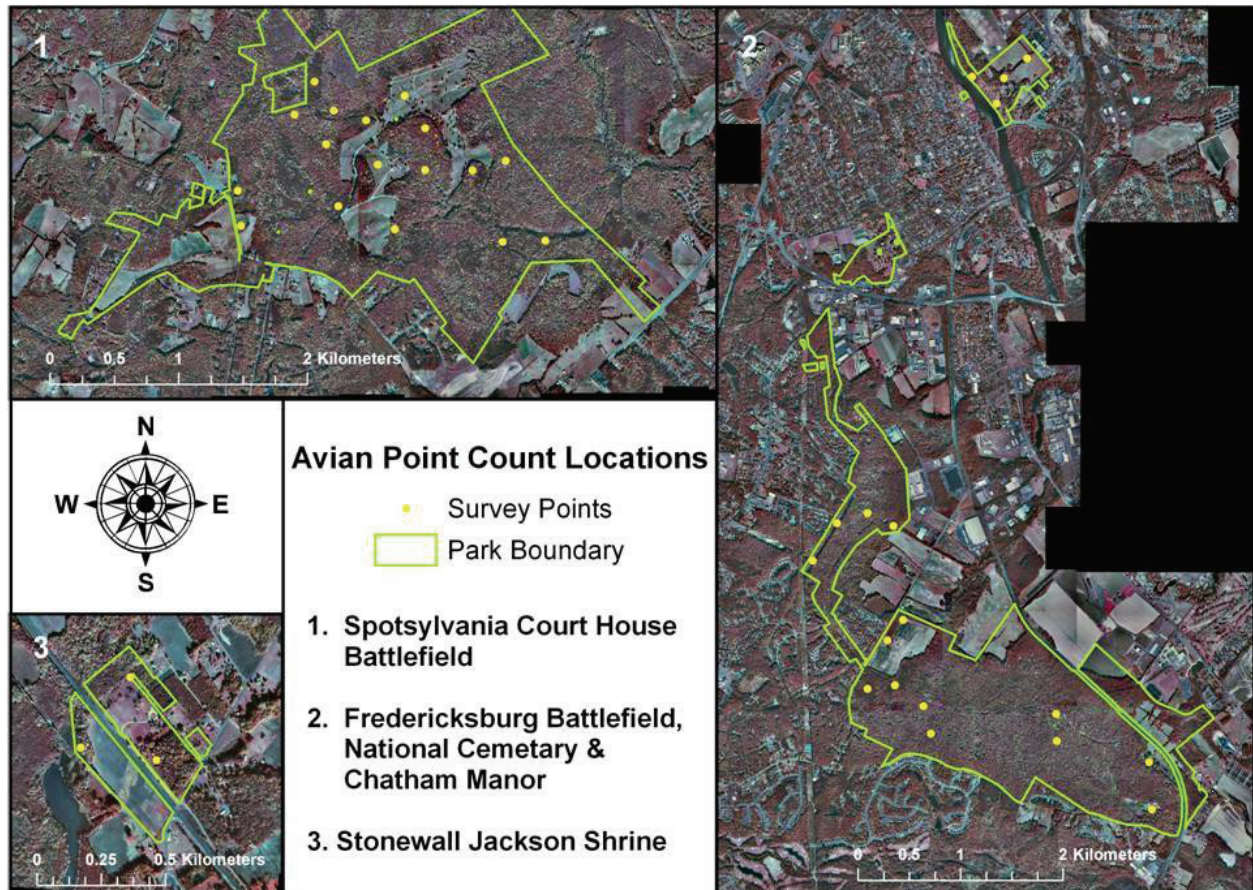
Locations^a	UTM-East	UTM-North	Habitat Description
WI-23	262839	4242365	Mature Deciduous Forest
WI-24	263253	4242694	Mature Deciduous Forest
WI-25	263230	4242955	Scrub-Shrub Forest
WI-26	263198	4241743	Forested Wetland
WI-27	262435	4241210	Mature Deciduous Forest
WI-28	263024	4240806	Forest/Scrub Edge
WI-29	263655	4240731	Forested Wetland

^a Locations are defined by the park unit and point number within each unit. For example CH-1 is bird point count survey location number one within the Chancellorsville Battlefield Unit of Fredericksburg and Spotsylvania National Military Park. The unit abbreviations are as follows: CH = Chancellorsville Battlefield; CM = Chatham Manor; FR = Fredericksburg Battlefield and National Cemetery; SJ = Stonewall Jackson Shrine; SP = Spotsylvania Court House Battlefield; WI = Wilderness Battlefield.

Appendix C. Aerial Photograph displaying bird point count survey locations at the Wilderness and Chancellorsville Battlefield Units of Fredericksburg and Spotsylvania National Military Park, Virginia.



Appendix D. Aerial Photograph displaying bird point count survey locations at the Spotsylvania Court House Battlefield, Fredericksburg Battlefield and National Cemetery, Chatham Manor, and Stonewall Jackson Shrine Units of Fredericksburg and Spotsylvania National Military Park, Virginia.



Appendix E. List of species detected during 2003 and 2004 by park unit^a and season^b at Fredericksburg and Spotsylvania National Military Park, Virginia.

Common Name	Park Unit					
	CH	CM	FR	SJ	SP	WI
double-crested cormorant	B,M					
great blue heron	B,M	W	W			
green heron	B			B		
Canada goose	B,M	W			B	
wood duck	B,M			B	B	B
mallard		B				
black vulture		W	W,M		W	B,W
turkey vulture	B,W	B,W	B,W,M	B	W,M	B,W
osprey	B					
sharp-shinned hawk	B				M	
Cooper's hawk			W			
red-shouldered hawk	B		B,W			B
broad-winged hawk					B	
red-tailed hawk	B		B,W,M		W	B,W
wild turkey	M				W,M	
northern bobwhite					M	B
ring-billed gull	M	W				
mourning dove	B	W	B,W,M	W	B,W,M	B
rock dove		W				
yellow-billed cuckoo	B		B	B	B	B
eastern screech owl	M		B		M	
great horned owl					M	B
barred owl		B		W	M	B,M
chimney swift	B	B	B		B,M	B
ruby-throated hummingbird	B		B		B	B
belted kingfisher	M	W		B	B,W	
red-headed woodpecker	B					
red-bellied woodpecker	B,W,M	B,W	B,W,M	B,W	B,W,M	B,W,M
yellow-bellied sapsucker	M	W	W			W,M
downy woodpecker	B,M		B,W,M		B,W,M	B,W,M
hairy woodpecker	B	W	B,W		B,W,M	B,M
northern flicker	B,W,M		B,W,M	B	B,W,M	B,M
pileated woodpecker	B,M		B,W,M	B	B,W,M	B,M

Appendix E. List of species detected during 2003 and 2004 by park unit^a and season^b at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Park Unit					
	CH	CM	FR	SJ	SP	WI
eastern wood-pewee	B	B	B	B	B,M	B,M
Acadian flycatcher	B,M		B	B	B,M	B,M
eastern phoebe	B,M	B	B	B	M	B,M
great crested flycatcher	B		B	B	B,M	B
eastern kingbird	B	B	B	B	B,M	B
white-eyed vireo	B,M		B	B	B,M	B
yellow-throated vireo	B		B	B	B,M	B,M
blue-headed vireo					M	
red-eyed vireo	B,M	B	B,M	B	B,M	B,M
blue jay	B,W,M		B,W,M		B,W,M	B,M
American crow	B,W,M	B,W	B,W,M	B,W	B,W,M	B,W,M
fish crow	B	B				B
purple martin	B		B		M	B
barn swallow	B	B	B		B,M	B
Carolina chickadee	B,W,M	B	B,W,M		B,W,M	B,W,M
eastern tufted titmouse	B,W,M	W	B,W,M	B,W	B,W,M	B,W,M
white-breasted nuthatch	B,W,M	W	B,W,M	B	B,W,M	B,W,M
brown creeper	W,M		W		W,M	W,M
Carolina wren	B,W,M	B,W	B,W,M	B,W	B,W,M	B,W,M
house wren			B		M	
winter wren	W		M		W	W
golden-crowned kinglet	W,M		W,M		W,M	W,M
ruby-crowned kinglet	M	M	M		M	M
blue-gray gnatcatcher	B,M		B	B	B,M	B,M
eastern bluebird	W,M		B,W	B	B,W,M	B,W
American robin	B,M	B,W	B,W	B,W	B,M	B,M
wood thrush	B,M		B		B,M	B,M
veery			M		M	
Swainson's thrush			M		M	M
hermit thrush	W,M		W		W,M	M
gray catbird	B,M		B		B,M	B,M
northern mockingbird	B	B	B,W	B,W	W	B
brown thrasher	B,M		B,M	B	B	B

Appendix E. List of species detected during 2003 and 2004 by park unit^a and season^b at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Park Unit					
	CH	CM	FR	SJ	SP	WI
European starling	B	B	W,M	B	B,W,M	B
cedar waxwing	B,M	B	B		B,W	B
northern parula	B,M	B		B	B,M	B,M
blue-winged warbler					M	
Nashville warbler					M	
chestnut-sided warbler						M
magnolia warbler					M	
Cape May warbler			M			
black-throated blue warbler	M				M	
yellow-rumped warbler	B,M	W	W,M		W,M	M
black-throated green warbler			M		M	
pine warbler	B		B		B,M	B,M
prairie warbler	B	B	B	B	B,M	B
palm warbler	M				M	M
blackpoll warbler					M	M
yellow-throated warbler	B			B	B	B
worm-eating warbler			B			B
black-and-white warbler	B,M				B,M	B
American redstart	B					B,M
ovenbird	B,M		B		B,M	B,M
Louisiana waterthrush	B			B	B	B,M
Kentucky warbler	B				B	M
common yellowthroat	B,M	B	B,M	B	B,M	B,M
Canada warbler						M
hooded warbler	B,M				B,M	M
yellow-breasted chat			B	B		B
summer tanager	B,M		B,M	B	B	B
scarlet tanager	B,M		B		B,M	B,M
northern cardinal	B,W,M	B	B,W,M	B	B,W,M	B,W,M
rose-breasted grosbeak	M		M		M	
blue grosbeak	B		B	B	B,M	B
indigo bunting	B	B	B,M	B	B,M	B

Appendix E. List of species detected during 2003 and 2004 by park unit^a and season^b at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Common Name	Park Unit					
	CH	CM	FR	SJ	SP	WI
eastern towhee	B,M		B,W,M	B,W	B,M	B,M
chipping sparrow	B	B	B	B	B,M	B
field sparrow	B		B,W,M	B,W	B,W,M	B
grasshopper sparrow	B					B
song sparrow	B,M	B,W	B,W	W	B,W,M	B,W
swamp sparrow	W,M			W		
white-throated sparrow	W,M	W	W,M	W	W,M	W,M
dark-eyed junco	M	W	W,M	W	W	W,M
red-winged blackbird	B	B			M	B
eastern meadowlark	B	B			B,M	B
common grackle	B,M	B	B,M	B	B,W,M	B,M
brown-headed cowbird	B,M	B	B	B	B,M	B,M
Baltimore oriole					M	
orchard oriole	B	B	B,M	B	B,M	B
house finch	M	B,W	B		B,M	B
American goldfinch	B,W,M	B	B,W,M	B	B,W,M	B,W,M
house sparrow		B	W			

^a Park unit abbreviations are as follows: CH = Chancellorsville Battlefield; CM = Chatham Manor; FR = Fredericksburg Battlefield and National Cemetery; SJ = Stonewall Jackson Shrine; SP = Spotsylvania Court House Battlefield; WI = Wilderness Battlefield.

^b Birds detected during 2003 and 2004 are identified by time period: B = breeding season 1 June - 15 July; W = winter season 15 November - 15 March; M = migratory seasons 15 March - 31 May and 15 August - 15 November.

Appendix F. Relative abundance of breeding birds (expressed as a percent) by habitat type for point count surveys conducted in 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia.

Species	Habitat Type ^a										Total
	MF	MDF	FW	SSF	PFP	GRA	SF	FFE	FSE	SSW	
red-eyed vireo	9.73	14.29	12.54	1.06	3.23	2.11	4.26	9.84	1.49	---	8.31
American goldfinch	6.57	6.38	6.12	11.27	19.35	9.47	6.38	8.20	5.97	12.90	8.19
eastern tufted titmouse	6.81	8.51	5.20	1.41	5.38	1.06	6.38	3.28	7.46	---	5.33
blue-gray gnatcatcher	5.35	6.99	9.79	1.06	---	---	10.64	3.28	4.48	3.23	5.21
Carolina chickadee	7.30	8.51	3.36	2.82	8.60	---	---	1.64	7.46	---	5.21
northern cardinal	2.19	1.22	3.06	7.04	6.45	2.11	---	6.56	10.45	6.45	3.67
common grackle	0.73	4.26	4.28	10.21	---	2.11	2.13	---	---	---	3.61
Acadian flycatcher	3.16	2.13	9.79	---	2.15	---	2.13	---	1.49	---	3.21
European starling	---	3.95	---	---	---	42.11	---	3.28	---	---	3.15
ovenbird	6.33	4.26	1.22	0.70	4.30	---	4.26	---	1.49	---	3.04
blue jay	3.89	6.38	---	2.46	4.30	---	---	3.28	---	---	2.87
brown-headed cowbird	3.89	1.52	1.83	3.52	---	4.21	4.26	3.28	1.49	6.45	2.75
eastern wood-pewee	5.60	2.74	1.22	0.70	3.23	---	---	4.92	2.99	---	2.64
Carolina wren	2.19	0.61	0.92	3.87	5.38	2.11	4.26	9.84	4.48	6.45	2.58
American robin	2.19	3.04	0.31	1.41	5.38	8.42	2.13	4.92	---	---	2.35
white-breasted nuthatch	2.43	5.47	2.14	0.35	---	---	---	1.64	---	---	2.12
red-bellied woodpecker	4.38	2.43	1.22	0.70	---	---	2.13	1.64	---	---	1.95
downy woodpecker	3.16	2.13	0.61	0.70	3.23	---	2.13	4.92	2.99	---	1.89
indigo bunting	0.24	---	0.31	5.99	---	2.11	2.13	6.56	7.46	3.23	1.83
cedar waxwing	0.73	0.61	0.31	4.58	5.38	---	4.26	---	1.49	6.45	1.66
wood thrush	2.19	3.04	1.53	0.70	1.08	---	---	3.28	---	---	1.66
scarlet tanager	1.22	3.95	1.22	---	---	---	2.13	---	7.46	---	1.60
common yellowthroat	0.24	---	1.83	4.23	---	1.06	---	1.64	1.49	9.68	1.43
northern parula	---	---	7.03	0.70	---	---	---	---	---	---	1.43
great crested flycatcher	2.43	1.82	0.31	0.35	---	---	4.26	3.28	2.99	---	1.38
pine warbler	1.95	---	1.22	0.35	11.83	---	---	---	---	---	1.38
eastern towhee	0.24	---	---	5.63	---	---	---	---	7.46	3.23	1.32
mourning dove	2.19	0.91	0.31	1.41	3.23	---	---	---	---	---	1.15
white-eyed vireo	---	---	1.53	3.17	---	1.06	---	---	1.49	6.45	1.03
black-and-white warbler	2.19	0.30	0.31	0.35	1.08	---	8.51	---	---	---	0.97
field sparrow	---	---	---	2.82	---	1.06	4.26	---	1.49	16.13	0.97
brown thrasher	0.24	---	0.31	2.46	2.15	---	2.13	1.64	2.99	3.23	0.92

Appendix F. Relative abundance of breeding birds (expressed as a percent) by habitat type for point count surveys conducted in 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Species	Habitat Type ^a										Total
	MF	MDF	FW	SSF	PFP	GRA	SF	FFE	FSE	SSW	
hooded warbler	0.97	---	2.75	---	---	---	6.38	---	---	---	0.92
hairy woodpecker	1.70	0.91	0.61	---	1.08	---	---	---	---	---	0.74
house finch	---	---	---	4.58	---	---	---	---	---	---	0.74
summer tanager	2.43	---	---	0.35	---	---	---	3.28	---	---	0.74
ruby-throated hummingbird	0.97	0.61	0.92	---	---	---	6.38	---	---	---	0.69
American crow	0.49	---	---	1.76	3.23	---	2.13	---	---	---	0.63
chipping sparrow	0.24	0.61	---	1.41	---	1.06	---	3.28	1.49	---	0.63
yellow-throated vireo	1.22	0.61	1.22	---	---	---	---	---	---	---	0.63
blue grosbeak	---	---	---	1.41	---	2.11	---	---	1.49	6.45	0.52
orchard oriole	---	---	0.31	1.76	---	---	---	3.28	1.49	---	0.52
prairie warbler	---	---	0.31	2.11	---	---	---	---	2.99	---	0.52
eastern phoebe	---	---	2.45	---	---	---	---	---	---	---	0.46
grasshopper sparrow	---	---	---	---	---	8.42	---	---	---	---	0.46
wood duck	---	---	2.45	---	---	---	---	---	---	---	0.46
yellow-billed cuckoo	0.49	---	0.61	---	---	---	2.13	---	2.99	3.23	0.46
northern flicker	0.73	0.30	0.61	0.35	---	---	---	---	---	---	0.40
Louisiana waterthrush	---	---	1.83	---	---	---	---	---	---	---	0.34
song sparrow	---	0.30	---	1.06	---	---	---	---	---	6.45	0.34
pileated woodpecker	0.24	0.61	0.61	---	---	---	---	---	---	---	0.29
yellow-breasted chat	---	---	---	1.41	---	---	---	---	1.49	---	0.29
eastern bluebird	---	---	---	0.70	---	2.11	---	---	---	---	0.23
gray catbird	---	---	0.31	0.70	---	---	---	---	1.49	---	0.23
eastern kingbird	0.24	---	---	0.35	---	---	---	1.64	---	---	0.17
eastern meadowlark	---	---	---	---	---	3.16	---	---	---	---	0.17
green heron	---	---	0.92	---	---	---	---	---	---	---	0.17
northern mockingbird	---	---	---	---	---	2.11	---	1.64	---	---	0.17
yellow-throated warbler	---	---	0.92	---	---	---	---	---	---	---	0.17
American redstart	---	---	0.31	---	---	---	2.13	---	---	---	0.11
Canada goose	---	---	0.61	---	---	---	---	---	---	---	0.11
red-headed woodpecker	---	---	0.61	---	---	---	---	---	---	---	0.11
red-winged blackbird	---	---	---	---	---	2.11	---	---	---	---	0.11
worm-eating warbler	---	0.30	0.31	---	---	---	---	---	---	---	0.11

Appendix F. Relative abundance of breeding birds (expressed as a percent) by habitat type for point count surveys conducted in 2003 at Fredericksburg and Spotsylvania National Military Park, Virginia (continued).

Species	Habitat Type ^a										Total
	MF	MDF	FW	SSF	PFP	GRA	SF	FFE	FSE	SSW	
belted kingfisher	---	---	0.31	---	---	---	---	---	---	---	0.06
barred owl	---	---	0.31	---	---	---	---	---	---	---	0.06
red-tailed hawk	0.24	---	---	---	---	---	---	---	---	---	0.06
great blue heron	---	---	0.31	---	---	---	---	---	---	---	0.06
turkey vulture	---	0.30	---	---	---	---	---	---	---	---	0.06
red-shouldered hawk	---	---	0.31	---	---	---	---	---	---	---	0.06
broad-winged hawk	---	---	---	---	---	---	2.13	---	---	---	0.06
yellow-rumped warbler	0.24	---	---	---	---	---	---	---	---	---	0.06

^a Habitat types include MF = Mixed Forest, MDF = Mature Deciduous Forest, FW = Forested Wetland, SSF = Scrub-Shrub Forest, PFP = Pine Forest and Plantation, GRA = Grassland, SF = Scrub Forest, FFE = Forest/Field Edge, FSE = Forest/Scrub Edge and SSW = Scrub-Shrub Wetland.

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Northeast Region

Natural Resource Stewardship and Science
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2878

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