

National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania



Appomattox Court House National Historical Park Avian Inventory

Technical Report NPS/NER/NRTR—2007/088



ON THE COVER

Red-tailed hawk (*Buteo jamaicensis*), yellow warbler (*Dendroica petechia*), and brown-headed cowbird (*Molothrus ater*).
Photographs by: Larry Lynch (birder6@juno.com) and Dana Bradshaw.

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Table of Contents

	Page
Figures	v
Tables	vii
Appendixes	ix
Abstract	xi
Acknowledgments	xiii
Introduction	1
Background	1
Study Area	3
Habitat Types	4
Methodology	7
Expected Species List Development	7
Site Selection and Unit Descriptions	7
Field Surveys	8
Results	11
Inventory Results	11
Species Relative Abundance Data	11
Nocturnal Surveys	18
Discussion	19
Species Inventory	19
Species of Special Concern	19
Habitat Associations	20
Seasonal Variation	22

Table of Contents (continued)

	Page
Summary and Management Recommendations	27
Encroachment and Visitor Access	27
Grassland Management	27
Invasive Species Monitoring and Control	28
Literature Cited	31

Figures

	Page
Figure 1. NPS map of the park and its surroundings.	3
Figure 2. Aerial photo showing point counts and survey transects.	9
Figure 3. Grassland obligate species per 100 meters in the winter at Appomattox Court House National Historical Park.	17
Figure 4. Grassland obligate species by management regime, based on a minimum of 3 survey points of each treatment type at Appomattox Court House National Historical Park.	17

Tables

	Page
Table 1. Total species detected by seasonal status at Appomattox Court House National Historical Park during inventories conducted in 2002–2003.	12
Table 2. Relative abundance of species by habitat type at Appomattox Court House National Historical Park by habitat type.	15
Table 3. Summary statistics for habitat type relative abundance data for avian inventories conducted at Appomattox Court House National Historical Park, Va, from 2002–2003.	16
Table 4. Species of management concern and their status at Appomattox Court House National Historical Park during inventories in 2002–2003.	21
Table 5. Partners in Flight priority species detected at Appomattox Court House National Historical Park during inventories in 2002–2003.	21

Appendixes

	Page
Appendix A. List of species expected and detected at Appomattox Court House National Historical Park, VA, during inventories in 2002–2003.	35
Appendix B. UTM coordinates (NAD83) and descriptions of habitat context of avian survey point locations at Appomattox Court House National Historical Park, VA, 2002–2003.	39
Appendix C. Species list and conservation status of birds detected at Appomattox Court House National Historical Park during inventories in 2002–2003.	41

Abstract

A comprehensive, year-round inventory of birds was conducted at Appomattox Court House National Historical Park (APCO) in 2002 and 2003. The inventory yielded 99 species, documenting over 90% of the species expected to occur. Only one listed species was detected—the bald eagle (*Haliaeetus leucocephalus*), although it does not nest in the Park. A total of 20 additional species observed are recognized as state species of special concern, federal species of conservation concern, or priority species under national conservation initiatives. Several species of special concern benefit from the park's program to convert some pastureland to native, warm-season grasses. This program serves as a model for mid-Atlantic parks and should be recognized as a valid management tool for increasing biodiversity.

Acknowledgments

This project would not have been possible without initial involvement by Bryan Watts in early discussions with the NPS on establishing I&M survey protocols. Anne Womack secured the contractual arrangement for William and Mary, and Mark Roberts administered the contract throughout. I would like to thank Beth Johnson and Sara Stevenson for early coordination and support in this effort, and Jim Comiskey for working closely with me to see the effort through. I also appreciate the efforts from Kristina Callahan with finalizing the project database and assisting with map production and other GIS efforts. Locally, I want to thank Brian Eick for information and assistance with the set-up phase, as well as valuable insight into the draft reports. I owe a great deal of gratitude to Mike Wilson for his analytical support and to Jessica and Julie Bradshaw for their assistance in compiling historical survey data. Thanks to Larry Lynch (birder6@juno.com) for the use of the red-tailed hawk and yellow warbler photographs. And finally, I greatly appreciate the tireless efforts of Fenton Day and Matthew Smith at covering field surveys at APCO in conjunction with all their other park surveys that were simultaneously underway all over the state.

Introduction

Background

The National Park Service has established the Inventory and Monitoring Program (I&M) 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 plant and vertebrate species in order to provide reliable species lists—a fundamental tool for management.

This report presents the results of a baseline bird inventory conducted at Appomattox Court House National Historical Park (APCO), located adjacent to the town of Appomattox in central Virginia. The primary project objective was to document at least 90% of birds expected to occur at the Park, by confirming the existence of species expected from published data, 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 in the park (Kain 1987; Trollinger and Reay 2001). The list is composed of 108 species, of which, 86 species were expected to occur during breeding season, 13 wintering species, and 9 to occur only as transient migrants.

Study Area

Appomattox Court House National Historical Park (APCO) is a moderate-sized park, within the Northeast Region Mid-Atlantic Network of parks. It encompasses some 705 ha (1,742 ac) in one independent land unit almost centered in the state of Virginia. The park lies in the headwater region of the Appomattox River watershed with over 13 km (8 mi) of the Appomattox River traversing it. Located 5 km (3 mi) northeast of the town of Appomattox and 29 km (18 mi) east of the city of Lynchburg, APCO lies within the Piedmont physiographic region (Figure 1). Elevations range from 183 m (600 ft) above sea level near the river to approximately 253 m (830 ft) along the western park boundary. A state primary road, Virginia Route 24, bisects the park near the midpoint along an east-west axis. Wooded habitats comprised about 70% of the land area within APCO, with the remaining 30% in mostly open fields (including the historic village). The forested components comprised all seral stages of both pine and hardwood forest. In 2003, 230 ha (574 ac) of the park were maintained in open lands. Of that amount, 76 ha (187 ac) were maintained in cool-season hay, 40 ha (99 ac) were maintained as lawn, 80 ha (199 ac) were maintained as pastureland, 28 ha (69 ac) were in the process of being converted to native warm-season grass, and 8 ha (20 ac) were cut yearly for electric transmission line right-of-way.

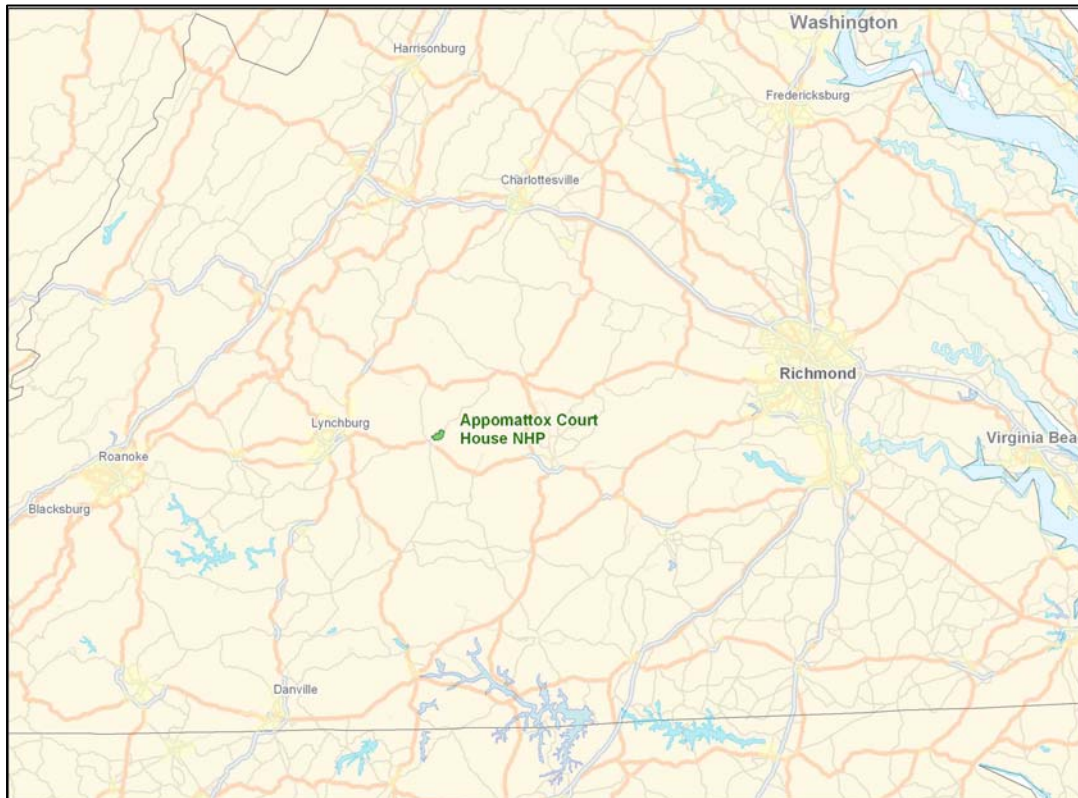


Figure 1. NPS map of the park and its surroundings.

Habitat Types

Residential

Residential refers to the central Court House area and historic village characterized predominantly by mowed lawns and sparse or widely spaced trees. It was not a common habitat type; however, it harbors a unique bird community relative to the more natural habitats.

Forest/Field Edge

The forest/field edge habitat references the interface between open and forested habitats. It refers primarily to a “hard” edge, where a grassland meets a forest, 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 most often 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.

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 APCO were grassland habitats, the majority of them fescue-dominated cattle pastures and hay fields, with two fields recently converted to warm-season grasses including broomsedge (*Andropogon virginicus*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), and switchgrass (*Panicum virgatum*).

Forested Wetland

Forested wetlands at APCO were largely relegated to relatively narrow floodplain corridors along the banks of the Appomattox River as it flowed through otherwise upland deciduous forest. The river at this location is only 2–5 m (6–16 ft) wide in most places and less than 0.5 m (1.6 ft) deep, flowing through a well-carved channel. The forested wetland is a somewhat marginal habitat in many cases, referring more to a riparian forest dominated by tulip poplar (*Liriodendron tulipifera*) and green ash (*Fraxinus pennsylvanica*) with black walnut (*Juglans nigra*), sycamore (*Platanus occidentalis*), and red maple (*Acer rubrum*). The subcanopy and shrub layer were also dominated by wetland facultative species including canopy species saplings along with eastern redbud (*Cercis canadensis*), American hornbeam (*Carpinus caroliniana*), and spicebush (*Lindera benzoin*).

Scrub/Shrub

Scrub/shrub habitat refers to the early successional habitat following grasslands, where the vegetation is dominated by woody shrubs, with less than 10% in grasses and less than 10% in pole-sized timber. This habitat category, in this case, had a higher percentage of sapling trees than shrubs, with sweetgum (*Liquidambar styraciflua*), tulip poplar and loblolly pine (*Pinus taeda*) saplings interspersed with blackberry (*Rubus* sp.), sumac (*Rhus* sp.), and Japanese honeysuckle (*Lonicera japonica*).

Mature Mixed Forest

Mature mixed forest stands at APCO generally refer to declining stands of Virginia pine (*Pinus virginiana*) yielding to maturing hardwoods. Overall stand ages were less than 75 years. Although Virginia pine was prominent in the canopy, deciduous trees were typically dominant. Common canopy and subcanopy species included tulip poplar, red maple, white oak (*Quercus alba*), flowering dogwood (*Cornus florida*), and black locust (*Robinia pseudoacacia*). Midstory and understory species included deerberry (*Vaccinium stamineum*), coral berry (*Symphoricarpos orbiculatus*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*).

Young Mixed Forest

The young mixed forest generally consists of the same species assemblages as the mature mixed forest; these stands differed by having higher stem density and much more prominent midstory. This was essentially a regenerating forest in the pole timber stage with canopy species now clearly showing separation from midstory shrub species.

Mature Hardwood Forest

The mature hardwood forest is dominated by mature hardwoods. It differs from the mixed forest in its age structure, homogeneity, and vegetation structure. Mature hardwood stands typically have low densities of understory, and a moderate midstory, but provide broad canopies and are typically rich in hard mast production. Typical species at APCO included a broad diversity of oaks (*Quercus* sp.) and hickories (*Carya* sp.), followed by tulip poplar, red maple, and black gum (*Nyssa sylvatica*).

Methodology

Expected Species List Development

Before field surveys were initiated, an expected species list for the park was generated from several sources. An initial breeding species list was assembled from The Virginia Breeding Bird Atlas Project 1985–1989 (Trollinger and Reay 2001). Data were compiled from a survey area that extended five USGS 7 ½ minute topo maps wide by five topos high that was centered on APCO. Additional data were collected using results from over 20 years of data from the five nearest Breeding Bird Survey routes that surround APCO in all directions (one route runs directly adjacent to the Park). 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 APCO. Likewise, a list of spring and fall migrants expected to utilize habitats at APCO were 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 108 species was expected to occur at APCO; of which, 86 species were expected during the breeding season, 13 species were expected during winter, and 9 species were expected to occur as transient migrants only (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, APCO. Winter birds included only those birds unique to the winter season; typically temperate migrants that do not also breed at the latitude of APCO. Transient migrants included only those migrants utilizing APCO as a “refueling” (stopover) area en route to points north or south, with no evidence of breeding or wintering presence at the park.

Site Selection and Unit Descriptions

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 show 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.

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.

Field Surveys

In order to effectively inventory bird communities at APCO, a number of sampling techniques were conducted during different times of the year. All techniques employed standardized methodologies, but often multiple techniques were used during a single season to maximize species detection probabilities.

Breeding Season Surveys

The primary inventory objective was to determine which bird species occurred at APCO 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 27 points distributed among all major habitat types were sampled over the course of the survey period (Figure 2; Appendix B.) All breeding season surveys were initiated at sunrise and terminated not later than 4 hrs 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 a single breeding season, referenced in this project as 1 June–15 July. 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 Statistica v7.0 (Statsoft Inc. 1984–2003) and presented in tabular form representing relative abundance for species detected by habitat type for each of the primary habitat categories.

Migration Surveys

A secondary objective of this project was to assess bird use of the park during migration and winter to better develop a year-round profile of bird diversity at APCO. Although migration survey work requires intensive effort to develop meaningful data on bird density and distribution, this project concentrated more on diversity and general abundance of migrants during peak periods of migration. 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 and its habitats for areas of

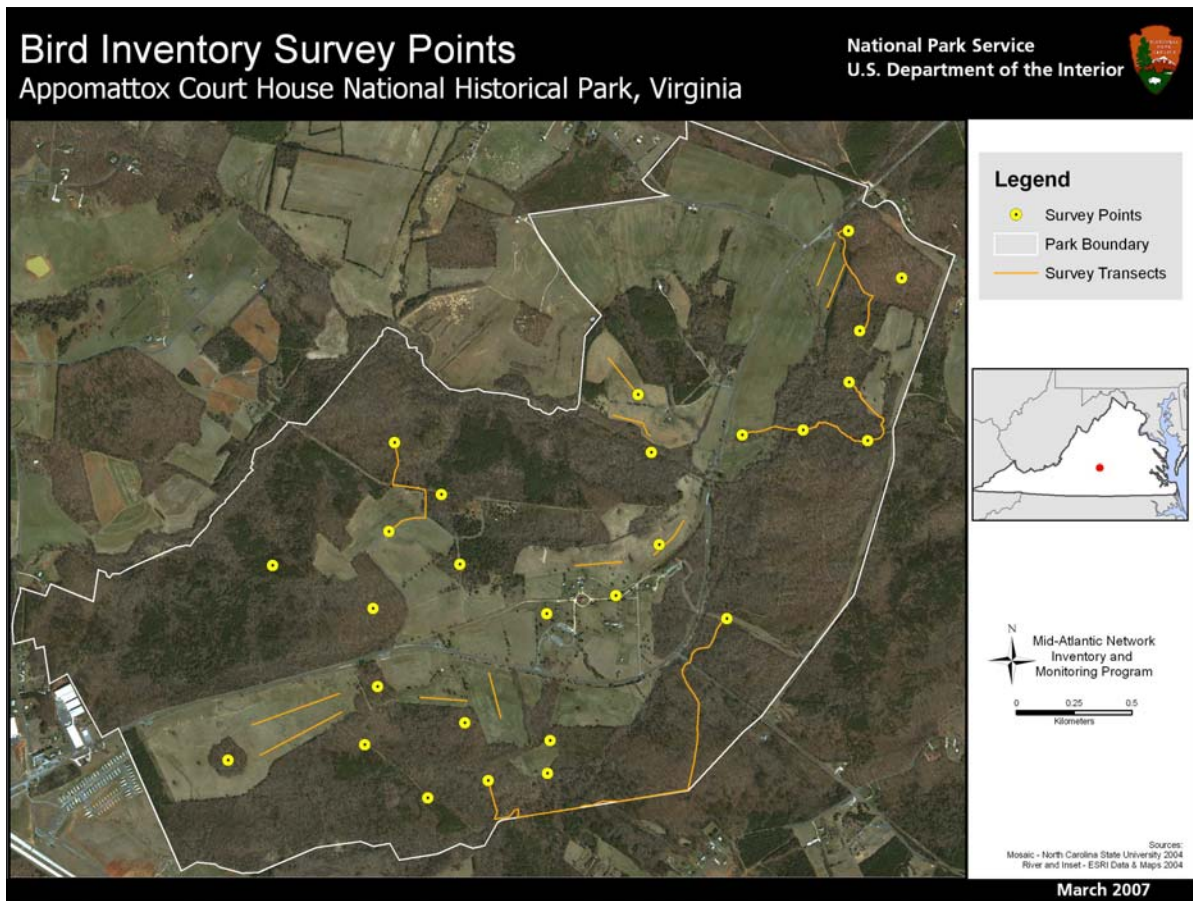


Figure 2. Aerial photo showing point counts and survey transects.

significant importance to migrants as foraging or staging areas during peak times of migration (to the extent possible from available effort). For this purpose, multiple survey methods were employed. One method made use of the existing point counts, where a subset of the original points was surveyed during different periods of migration. For additional survey effort, transects were walked between survey points recording all birds detected to either side of the transect (Figure 2). Migration surveys for passerines were conducted during the first 4 hrs after sunrise. The migration periods were recognized as 15 March–31 May and 15 August–15 November, although the bulk of the migration survey effort was undertaken between 15 April–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 all techniques again: point counts, transects, and area searches.

Winter data were not collected for analysis, but only for building a winter species profile. An initial survey was conducted at each permanent survey point as the points were originally established in January 2002. Surveys were conducted throughout the day, with emphasis on the first 5 hrs after sunrise. Additional transect surveys were conducted within specific habitat types (forested wetlands, shrub/scrub, and residential habitats) during the following winter in an effort to detect new wintering species. All winter surveys were conducted between 15 November–15 March.

Grassland Surveys

In addition to the presence of point counts in some of the agricultural fields and open areas, transect surveys were also conducted in all open fields that exceeded 1 ha (2.4 ac) in size. Transects were used to supplement breeding season point counts in order to help locate grassland species that sing infrequently. Surveys involved walking the long axis of the field within 50 m (164 ft) of an edge, and then a second transect at least 100 m (328 ft) from the edge or through the center of the field, whichever was furthest from an edge. Transects were used as the primary survey method in grassland habitats for winter and fall migration surveys, mainly to determine presence/absence of birds, rather than density.

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 APCO. As a result, night surveys were conducted using taped playbacks of conspecific calls for each species of interest. Chuck-will's-widows (*Caprimulgus carolinensis*) 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 (*Tyto alba*), 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 (0.6 mi).

Results

Inventory Results

A total of 99 species was detected during the 2-year inventory (Table 1). Of these, 72 species were confirmed or suspected of breeding within the park, based on repeated observations within appropriate habitat during the breeding season. An additional 10 species known to breed within the region were also observed in the park during breeding season. Another six species were detected as transients only during the spring and/or fall migration. And a final 11 species were detected as wintering birds only. These results represent 94% of the species expected to occur during the breeding season, 56% of the migration period species, and 85% of the wintering season species. A total of 90% (97 of 108) of the total species expected to occur were documented during this survey effort. Two additional species that were not expected to occur were observed as well, bringing the total to 99 species.

Species Relative Abundance Data

Relative abundance data was calculated for all breeding season survey points by habitat type¹. Data included was limited to that collected within the 50 m (164 ft) survey radius due to the relatively small size of habitat patches and subsequent attempt to reduce the influence from extraneous habitats.

An overview of the avian species composition of APCO, by habitat, is provided in Table 2. The two most abundant species across nearly all habitats were red-eyed vireo and northern cardinal; with red-eyed vireos dominant within all mature forested habitats, and cardinals dominant in the young forest and edge habitats. Residential habitats were characterized primarily by the presence of European starlings and chipping sparrows, and grasslands by indigo buntings and blue grosbeaks. The species profile for the shrub/scrub habitats showed white-eyed vireo and eastern towhee to be most abundant.

Forested habitats contained the greatest species richness and the highest number of priority species of any of the habitat types, with little difference in species richness between hardwood, mixed forest, and forested wetlands (Table 3). Shrub/scrub habitats showed the least number of species. Grasslands were relatively high in species richness, reflective of the different management regimes at APCO. Grasslands are either fescue dominated, leased hay fields, mowed visitor use and developed zone areas, leased pasturelands for cattle grazing, or are in the process of being restored to native warm-season grass species. Each of these regimes expressed a different compliment of birds. Although the sample sizes are too small to show significance, Figures 3 and 4 illustrate what was observed at APCO with grassland surveys across all management regimes, using point counts in the breeding season and transects during winter. Only grassland obligate species were considered in this illustration.

Table 1. Total species detected by seasonal status at Appomattox Court House National Historical Park during inventories conducted in 2002–2003.

#	Species	Migration status	APCO status ¹
1	great blue heron	temperate migrant	breeds locally
2	green heron	neotropical migrant	breeds locally
3	wood duck	temperate migrant	breeder
4	turkey vulture	neotropical migrant	breeds locally
5	black vulture	neotropical migrant	breeds locally
6	northern harrier	temperate migrant	winter visitor
7	Cooper's hawk	temperate migrant	breeder
8	red-shouldered hawk	temperate migrant	breeder
9	red-tailed hawk	temperate migrant	breeder
10	bald eagle	resident	breeds locally
11	American kestrel	temperate migrant	winters/may breed locally
12	northern bobwhite	resident	breeder
13	wild turkey	resident	breeder
14	killdeer	temperate migrant	breeds locally
15	American woodcock	temperate migrant	breeds locally
16	mourning dove	temperate migrant	breeder
17	yellow-billed cuckoo	neotropical migrant	breeder
18	great horned owl	resident	breeder
19	barred owl	resident	breeder
20	eastern screech owl	resident	breeder
21	chimney swift	neotropical migrant	breeder
22	ruby-throated hummingbird	neotropical migrant	breeder
23	red-bellied woodpecker	resident	breeder
24	yellow-bellied sapsucker	temperate migrant	winter visitor
25	downy woodpecker	resident	breeder
26	hairy woodpecker	resident	breeder
27	northern flicker	temperate migrant	breeder
28	pileated woodpecker	resident	breeder
29	eastern wood-pewee	neotropical migrant	breeder
30	Acadian flycatcher	neotropical migrant	breeder
31	eastern phoebe	neotropical migrant	breeder
32	great crested flycatcher	neotropical migrant	breeder
33	eastern kingbird	neotropical migrant	breeder
34	red-eyed vireo	neotropical migrant	breeder
35	white-eyed vireo	neotropical migrant	breeder
36	yellow-throated vireo	neotropical migrant	breeder
37	blue jay	temperate migrant	breeder
38	American crow	resident	breeder
39	northern rough-winged swallow	neotropical migrant	breeds locally
40	barn swallow	neotropical migrant	breeder
41	tufted titmouse	resident	breeder
42	Carolina chickadee	resident	breeder
43	white-breasted nuthatch	resident	breeder
44	brown creeper	temperate migrant	winter visitor
45	Carolina wren	resident	breeder

Table 1. Total species detected by seasonal status at Appomattox Court House National Historical Park during inventories conducted in 2002–2003 (continued).

#	Species	Migration status	APCO status ¹
46	winter wren	temperate migrant	winter visitor
47	golden-crowned kinglet	temperate migrant	winter visitor
48	ruby-crowned kinglet	temperate migrant	winter visitor
49	blue-gray gnatcatcher	neotropical migrant	breeder
50	eastern bluebird	temperate migrant	breeder
51	American robin	temperate migrant	breeder
52	wood thrush	neotropical migrant	breeder
53	hermit thrush	temperate migrant	winter visitor
54	gray catbird	temperate migrant	breeder
55	northern mockingbird	resident	breeder
56	brown thrasher	temperate migrant	breeder
57	European starling	resident	breeder
58	cedar waxwing	temperate migrant	breeder
59	northern parula	neotropical migrant	breeder
60	yellow warbler	neotropical migrant	breeder
61	chestnut-sided warbler	neotropical migrant	transient only
62	Cape May warbler	neotropical migrant	transient only
63	black-throated blue warbler	neotropical migrant	transient only
64	yellow-rumped warbler	temperate migrant	transient only
65	black-throated green warbler	neotropical migrant	transient only
66	prairie warbler	neotropical migrant	breeder
67	pine warbler	temperate migrant	breeder
68	yellow-throated warbler	neotropical migrant	breeder
69	worm-eating warbler	neotropical migrant	breeder
70	black-and-white warbler	neotropical migrant	breeder
71	American redstart	neotropical migrant	breeds locally
72	ovenbird	neotropical migrant	breeder
73	Louisiana waterthrush	neotropical migrant	breeder
74	Kentucky warbler	neotropical migrant	breeder
75	common yellowthroat	temperate migrant	breeder
76	hooded warbler	neotropical migrant	breeder
77	yellow-breasted chat	neotropical migrant	breeder
78	summer tanager	neotropical migrant	breeder
79	scarlet tanager	neotropical migrant	breeder
80	northern cardinal	resident	breeder
81	rose-breasted grosbeak	neotropical migrant	transient only
82	blue grosbeak	neotropical migrant	breeder
83	indigo bunting	neotropical migrant	breeder
84	eastern towhee	temperate migrant	breeder
85	field sparrow	temperate migrant	breeder
86	chipping sparrow	temperate migrant	breeder
87	grasshopper sparrow	temperate migrant	breeder
88	savannah sparrow	temperate migrant	winter visitor
89	white-throated sparrow	temperate migrant	winter visitor
90	song sparrow	temperate migrant	breeder

Table 1. Total species detected by seasonal status at Appomattox Court House National Historical Park during inventories conducted in 2002–2003 (continued).

#	Species	Migration status	APCO status ¹
91	dark-eyed junco	temperate migrant	winter visitor
92	eastern meadowlark	temperate migrant	breeder
93	brown-headed cowbird	temperate migrant	breeder
94	red-winged blackbird	temperate migrant	breeder
95	common grackle	temperate migrant	breeder
96	Baltimore oriole	neotropical migrant	breeds locally
97	orchard oriole	neotropical migrant	breeder
98	house finch	resident	breeder
99	American goldfinch	temperate migrant	breeder

¹APCO Status:

Breeds locally - no evidence of breeding at APCO, but the species was observed at APCO and is known to breed locally within the region based on BBS and/or Breeding Bird Atlas data.

Breeder - documented breeding, or observed repeatedly in appropriate habitat during breeding season.

Winter visitor - occurs during winter only, or observed only during winter (for species that may actually be resident in other nearby areas.)

Transient only - observed as a migratory transient only; not present during breeding or wintering season.

Table 2. Relative abundance of bird species at Appomattox Court House National Historical Park by habitat type (shown as a percent).

Species	Mig. status	Habitat type ¹							
		MH	MxF	FW	YngFor	Edge	S/S	Grass	Resid.
red-eyed vireo	N	18.293	14.286	15.788	8.772	5.882			1.449
wood thrush	N	9.756	2.041	8.553					
tufted titmouse	R	7.927	8.163	1.974	3.509	7.843		3.226	1.449
American crow	R	7.317	6.803	1.974	1.754	1.961		9.677	4.348
blue jay	T	6.098	7.483		1.754				
eastern wood-pewee	N	4.268	1.361	1.974	1.754	1.961			
ovenbird	N	4.268	1.361		1.754		5.263		
northern cardinal	R	3.659	10.884	8.553	19.298	17.647	10.526	6.452	1.449
Carolina chickadee	R	3.659	4.762	1.974	7.018	3.922	5.263		0.725
Carolina wren	R	3.049	4.082	5.263		5.882	2.632	1.613	2.174
white-breasted nuthatch	R	3.049	4.082	1.974					
American goldfinch	T	2.439	5.442	4.605		1.961	5.263	4.839	
indigo bunting	N	2.439	3.401	3.947	14.035	7.843		12.903	2.899
blue-gray gnatcatcher	N	2.439	2.721	5.921	5.263	5.882	5.263		
scarlet tanager	N	2.439	1.361	3.289					
downy woodpecker	R	2.439	1.361	0.658		1.961	2.632		0.725
red-bellied woodpecker	R	2.439	1.361	0.658		1.961			
brown-headed cowbird	R	2.439		0.658			7.895		
chipping sparrow	T	1.829				1.961		4.839	10.145
yellow-billed cuckoo	N	1.220	3.401	1.316			2.632		
summer tanager	N	1.220	2.721		7.018		2.632		
pileated woodpecker	R	1.220	0.680	3.289					
Kentucky warbler	N	1.220							
common grackle	T	0.610	2.721				2.632	3.226	1.449
Acadian flycatcher	N	0.610	0.680	8.553					
hairy woodpecker	R	0.610	0.680						
northern parula	N	0.610		2.632					
yellow-throated vireo	N	0.610		1.974					
hooded warbler	N	0.610			5.263				
worm-eating warbler	N	0.610							
wild turkey	R	0.610							
eastern towhee	T		2.721		1.754		15.790	1.613	
house finch	R		1.361						4.348
American robin	T		1.361		1.754				5.797
northern bobwhite	R		1.361					1.613	
common yellowthroat	T		0.680	1.316		5.882		8.065	0.725
northern flicker	T		0.680	0.658		1.961		1.613	
yellow-throated warbler	N			5.263					
Louisiana waterthrush	N			3.289					
great crested flycatcher	N			2.632		1.961	2.632		
brown thrasher	T			0.658		1.961		1.613	
wood duck	T			0.658					
European starling	R								38.406
eastern bluebird	T					5.882		6.452	6.522
mourning dove	T				5.263				5.797
northern mockingbird	R					1.961			5.072
eastern meadowlark	T					3.922		6.452	2.899
grasshopper sparrow	T							6.452	1.449

Table 2. Relative abundance of bird species at Appomattox Court House National Historical Park by habitat type (shown as a percent) (continued).

Species	Mig. status	Habitat type ¹							
		MH	MxF	FW	YngFor	Edge	S/S	Grass	Resid.
orchard oriole	N				1.754				0.725
blue grosbeak	N					1.961		11.290	0.725
cedar waxwing	T								0.725
white-eyed vireo	N				7.018		23.684		
ruby-throated hummingbird	N				3.509	1.961	2.632		
eastern phoebe	N				1.754				
yellow warbler	N					5.882			
field sparrow	T							6.452	
prairie warbler	N						2.632		
barn swallow	N							1.613	

¹ Habitat types:

MH = Mature hardwood forest

MxF = Mature mixed forest

FW = Forested wetland

YngFor = Young mixed forest

Edge = Forest/field edge

S/S = Scrub/Shrub

Grass = Grassland

Resid. = Residential, open habitat

Table 3. Summary statistics for habitat type relative abundance data for avian inventories conducted at Appomattox Court House National Historical Park, VA, from 2002–2003.

Habitat type	# Species	Neotropical	Temperate	Resident	Priority species ¹
Mature hardwood	31	15	4	12	5
Mature mixed	29	10	7	12	6
Forested wetland	28	13	5	10	4
Young mixed	19	11	4	4	2
Field/Forest Edge	23	8	7	8	2
Scrub/Shrub	16	8	3	5	1
Grassland	19	3	11	5	1
Residential	22	4	9	9	2

¹ Priority species - species listed as state or federal T&E species; species of conservation concern under USFWS guidelines; or priority species under Partners in Flight regional rankings.

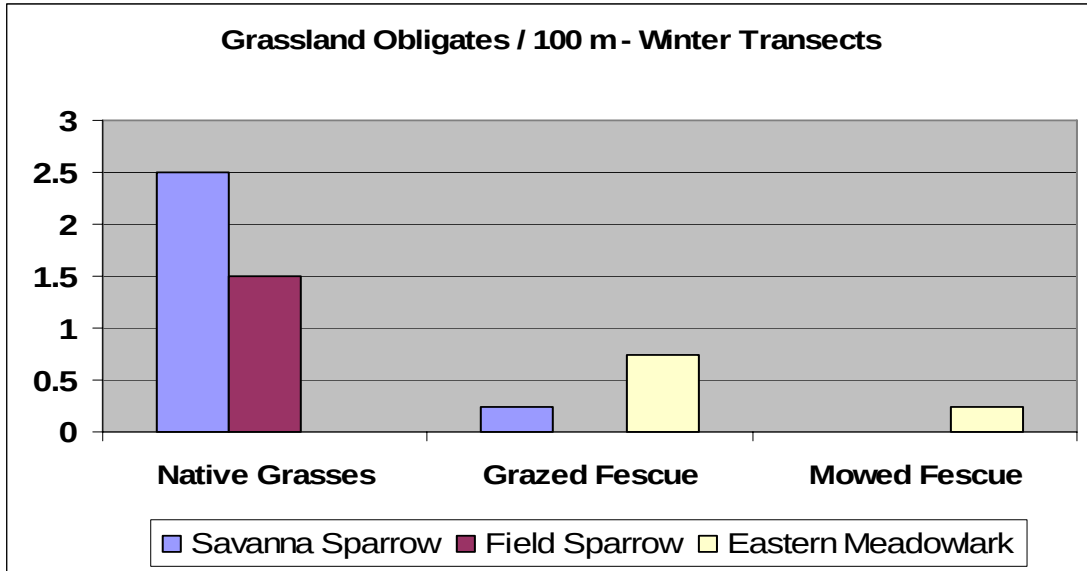


Figure 3. Grassland obligate species per 100 meters of transect in the winter at Appomattox Court House National Historical Park. Each treatment type is based on a minimum of four 100 meter transects.

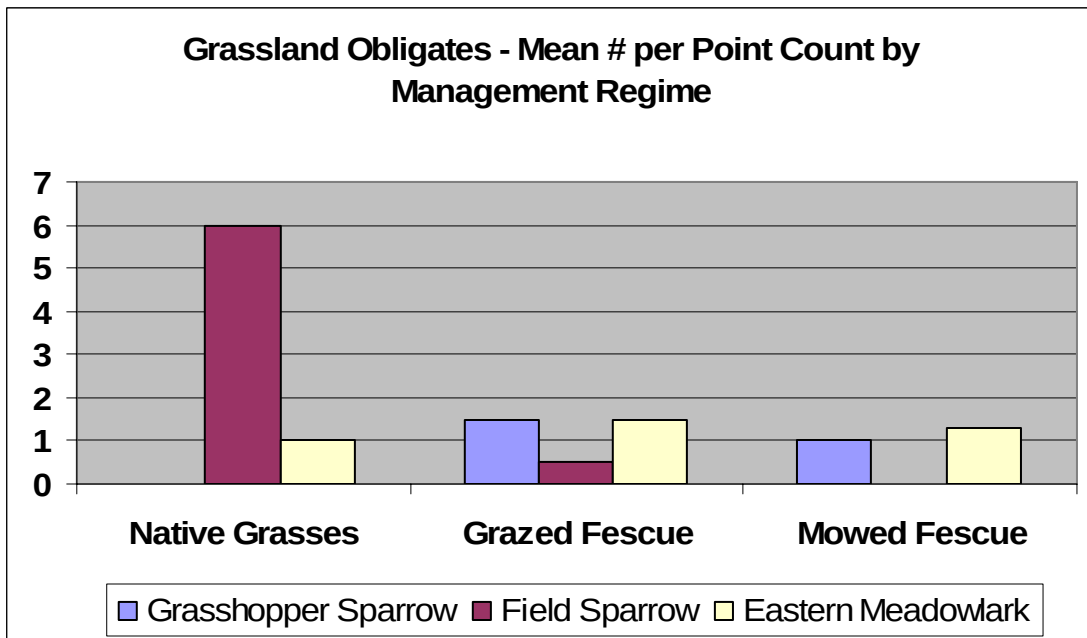


Figure 4. Grassland obligate species by management regime, based on a minimum of 3 survey points of each treatment type at Appomattox Court House National Historical Park.

Nocturnal Surveys

Nocturnal surveys were conducted only for barn owls and nightjars at APCO, since the three expected owl species were detected during diurnal surveys. No barn owls were detected, although this species probably still occurs in agricultural areas within the county. And no nightjars were detected, despite following protocols of moderate to high moon intensity for surveys (Wilson and Watts 2006).

Discussion

Species Inventory

Results of the species inventory conducted at APCO represent 90% of the species that were expected to occur in the park. By season, the results were more complete for the breeding season than for other seasons, with 94% of expected species documented. Among expected wintering species, 85% were detected, with only 56% of the expected migration period species observed. These shortfalls may reflect either inadequate survey effort or an unrealistic expected species list. It is impossible to adequately track species diversity throughout the migration period without at least a weekly effort. For this project, personnel constraints only allowed for four to five survey visits throughout both migration periods. Likewise, APCO lies almost in the center of the Piedmont region of Virginia; as such, it tends to miss many of the species that have either a coastal or a mountain influence to their migration track.

Species of Special Concern

Of the species detected, only the bald eagle is a federally listed species (Appendix C). It is currently recognized as “threatened” on both the state and federal list of Threatened and Endangered (T&E) species (VDGIF 2006). Bald eagles are in the process of being de-listed from the federal list of T&E Species as of summer 2007 (USFWS 2007). The eagle at APCO was an immature, observed only once in late March 2002. As an immature, it would not yet be exercising any site fidelity, and was likely just wandering the landscape, as this species is subject to do prior to maturity (Stalmaster 1987).

Five additional species detected at APCO are recognized as a species of Special Concern in Virginia: northern harrier, brown creeper, winter wren, golden-crowned kinglet, and hermit thrush. The Special Concern designation applies only to the breeding population of these species; therefore, it does not apply to the birds detected at APCO. Northern harriers breed in extensive coastal marshes of the Chesapeake Bay region, and occasionally occur in grassland/marsh systems in the interior Coastal Plain (Watts and Rottenborn 2001). None of the grassland habitats at APCO are large enough, or of suitable quality, to support this species during the breeding season, although harriers are a common wintering species across the region (Kain 1987). Brown creepers breed in the conifer forests of northern and western Virginia and winter wrens, golden-crowned kinglets, and hermit thrushes breed in Virginia in only the high elevation conifer forests of the mountain region (Trollinger and Reay 2001). All five species occur statewide during the winter.

Another four species, the wood thrush, prairie warbler, worm-eating warbler, and Kentucky warbler, were recognized by the U.S. Fish and Wildlife Service as Birds of Conservation Concern (BCC; USFWS 2002; Table 4 and Table C). These species were compiled from two different source lists within that document. The first consideration was given to the more ecological list as defined by the appropriate Bird Conservation Region (BCR). These regions were developed as part of the North American Bird Conservation Initiative (NABCI 2007). APCO lies within the Piedmont BCR (BCR 29). The second source list was the USFWS Regional list, of which APCO resides in Region 5, which runs north from Virginia through New

England. Birds included in these lists are deemed priorities for conservation actions and the list 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”] (USFWS 2002).

Two species were recognized as a species of conservation concern within both the Piedmont Region (BCR 29) and the USFWS Region 5: wood thrush and prairie warbler. The wood thrush is a mixed forest nesting species that is suffering from forest fragmentation, winter habitat loss, and nest parasitism (Roth et al 1996). Despite its general commonness Breeding Bird Survey data suggests it continues to decline in numbers (Watts 1999). Prairie warblers were uncommon in appropriate habitat at APCO. They are a scrub/shrub nesting species found in regenerating clearcuts and young second-growth habitats lacking closed canopies (Nolan et al 1999).

Two additional species were recognized as species of Conservation Concern within USFWS Region 5 only: worm-eating warbler and Kentucky warbler. The worm-eating warbler is rare in central Virginia as a nesting species (Trollinger and Reay 2001) and was detected at only one location at APCO. It is an area-sensitive species and is suffering from habitat loss and fragmentation in both its breeding and wintering ranges (Hanners and Patton 1998). The Kentucky warbler is another declining species within the region. Found in moist or wetland forests with a healthy understory, this species was also detected in only one location at APCO. Kentucky warblers may be declining at least locally from the spread of invasive species that impact its nesting habitat (see Summary and Management Recommendations section).

Fourteen species are also ranked among Partners in Flight’s (PIF) top tier of species within the mid-Atlantic Piedmont (Kearney 2003). Species scoring 19 or higher (out of 30) in the PIF prioritization scheme indicate species of high regional or continental concern; a complete list of PIF priority species for this physiographic area that were detected at APCO is shown in Table 5. Two of these species were already referenced in the USFWS Species of Management Concern list: wood thrush and worm-eating warbler. The wood thrush is a mixed forest nesting species that is suffering from forest fragmentation, winter habitat loss, and nest parasitism. Despite its commonness, the Breeding Bird Survey data suggests it continues to decline in numbers (Roth et al 1996). The species was common within appropriate habitat types at APCO. The worm-eating warbler is more common in the northern Piedmont and mountains of Virginia and occurs very locally elsewhere in the state in appropriate habitat (Trollinger and Reay 2001). One singing male was detected in both late spring and mid-summer from one survey point; this likely represented a nesting pair. The field sparrows are a generally common species of idle grasslands and shrubby habitats. Concern for this species stems from loss of habitat due to natural succession or conversion to other uses (Carey et al 1994). Its presence at APCO was tied primarily to the restored grassland sites that maintained more of a brushy character than the cattle pastures and other grasslands.

Habitat Associations

Forested habitats, in general, all stood out nearly equally in the evaluation of species relative abundance. There was no appreciable difference in the three mature forest habitat types; all showing high species diversity, high numbers of neotropical migrants, and the highest proportion of priority species. In general, forest habitats harbor greater species diversity than other habitats

Table 4. Species of conservation concern and their status at Appomattox Court House National Historical Park during inventories in 2002–2003.

Species	Status at APCO	Abundance at APCO	Management status ¹
northern harrier	winters	rare	SC- State
bald eagle	breeds in region	rare	Thr. – State
brown creeper	winters	uncommon	SC – State
winter wren	winters	uncommon	SC – State
golden-crowned kinglet	winters	common	SC – State
wood thrush	breeds	common	BCC – BCR 29 & USFWS R5
hermit thrush	winters	common	SC – State
prairie warbler	breeds	rare	BCC – BCR 29 & USFWS R5
worm-eating warbler	breeds	rare	BCC – USFWS Region 5
Kentucky warbler	breeds	rare	BCC – USFWS Region 5

¹Management Status:

SC - Special Concern

Thr - Threatened

BCC - USFWS Birds of Conservation Concern

BCR 29 - Piedmont Region

USFWS Region 5 – VA, WV, MD, DE, PA, NJ, NY, CT, MA, RI, VT, NH, ME

Table 5. Partners in Flight priority species¹ detected at Appomattox Court House National Historical Park during inventories in 2002–2003.

Priority species	PIF score	Status	Abundance at APCO
green heron	20	breeds	rare
northern bobwhite	20	breeds	uncommon
American woodcock	23	winters	rare
eastern screech owl	20	breeds	uncommon
chimney swift	20	breeds	uncommon
Acadian flycatcher	22	breeds	common
wood thrush	23	breeds	common
prairie warbler	23	breeds	uncommon
worm-eating warbler	20	breeds	rare
Louisiana waterthrush	21	breeds	uncommon
Kentucky warbler	23	breeds	rare
scarlet tanager	22	breeds	common
eastern towhee	19	breeds	common
field sparrow	20	breeds	uncommon

¹PIF priority species taken from Kearny (2003).

based on the foliage diversity and spatial complexity of the habitat affording more opportunities for more species to exploit (MacArthur and MacArthur 1961). Normally, forested wetlands would show greater species diversity over the other forested habitats based on the presence of water and its incumbent ties to increased insect availability (Wharton et al 1981; Pashley and Barrow 1993). This was not the case at APCO, probably because the forested wetlands were limited to rather narrow corridors along the banks of the Appomattox River, rather than a bottomland hardwood environment; this habitat was predominantly a riparian forest with limited amounts of wetland vegetation. As such, the species community had a greater affinity to an edge community than to a true floodplain forest community.

Next to the forested habitats, the edge and the residential habitats yielded the second highest species abundance totals. Because of the openness of the historic village, the large grassland areas, and the proximity to the town of Appomattox, APCO harbored a large number of generalist species, inflating the diversity numbers for those habitats. Northern mockingbirds, European starlings, brown-headed cowbirds, house finches, and other generalist species were abundant at APCO and found in large numbers in association with edge habitats and developed areas in the park.

Grasslands at APCO yielded higher than expected species abundance totals, high proportions of migrant species, and relatively high numbers of priority species. This stemmed from the diversity of grassland management regimes at APCO collectively yielding relatively high diversity. Homogeneous fescue-dominated fields that were routinely mowed were almost vacant of birds year round except in more remote areas where mowing schedules were less frequent. Fescue is a sod-forming grass that excludes access to the bare soil beneath; thus, it typically results in a monoculture stand of virtually no value to birds (Watts 2000; KDFWR 2004). Cattle grazed pastures were more heterogeneous, had greater structural complexity, and harbored a higher bird diversity. The increased presence of insects, in association with the juxtaposition of almost bare ground (from grazing) and brushy areas created a more diverse habitat for open land species. Species diversity was higher, but so were the numbers of generalist species. Overall abundance of birds was still less than the restored native grass fields. The native grass pastures provided a diverse mix of foliage density and structure. These characteristics are favored by many of the grassland obligate species and overall bird numbers were higher in these fields, although species diversity was lower (Watts 1996). There were fewer generalist species such as starlings, house finches, and blackbirds.

Seasonal Variation

The survey results for APCO were somewhat erratic, relative to documenting the high percentage of expected species for each season. 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 (*Melanerpes erythrocephalus*) and prothonotary warblers (*Protonotaria citrea*) for primarily coastal species and broad-winged hawk 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 the 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 APCO exceeded the limitations of the survey effort available to this project. So the expected species lists, and subsequent detection percentages, must be considered in view of this information deficiency.

Breeding Season

The results of the breeding season inventory at APCO was mostly as expected. The diversity was typical of the mosaic of agricultural and mixed forest land that dominates most of Virginia. Four species were not detected that had been anticipated: broad-winged hawk, whip-poor-will, purple martin, and house wren. Broad-winged hawks are very secretive and tend to occur in large contiguous mixed forest habitats, typically away from human disturbance (Goodrich et al 1996). The species has been documented breeding in Appomattox County (Trollinger and Reay 2001) and should be expected to be seen at the Park, if not breeding, at least in migration. Whip-poor-wills appear to be declining in eastern Virginia from levels present as recent as 10–15 years ago (personal obs.). Their distribution in the state appears to be increasingly localized. Wilson and Watts (in press) documented a landscape level link with the distribution of this species. They suggest the species has an affinity for edge habitats at the forest/regeneration ecotone, where the species nests in the forest, but prefers foraging over the more open regeneration habitat. The regeneration forest at APCO is likely too old to afford this edge profile adjacent to any of the forest patches there. Whip-poor-wills may ultimately be found at APCO, but were not detected during this survey period. Purple martins are another declining species, showing long-term declines that have become even more evident since 1980 (Peterjohn and Sauer 1995). Even more notable is that this species in eastern North America now nests almost exclusively in man-made houses, a transition that was nearly complete even before 1900 (Brown 1997). But there are no martin houses at APCO. The habitat there is ideal for purple martins and this species would probably respond if houses were erected. Purple martins are still likely to be detected moving through during migration, if not nesting. House wrens were more abundant in the mountains and northern Piedmont of Virginia, and very localized elsewhere in the state in the 1985–1989 Breeding Bird Atlas project of Virginia (Trollinger and Reay 2001). The habitats at APCO are conducive to this species, but its overall distribution and diminished population outside the mountains probably account for its absence there. This is another species that may not yet nest at APCO, but could in the future, and should still be expected occasionally during migration.

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. As a result, the expected species list may have

been too encompassing for some species groups and too restrictive for others. Three of the species initially expected to occur as migrants were not detected: Blue-headed vireo, northern waterthrush (*Seiurus noveboracensis*), and Swainson's thrush. The Blue-headed vireo is a species that winters from the Carolina coasts through Central America and nests in high altitude, mostly conifer forests, from the southern Appalachians up and across the boreal forests of Canada (James 1998). It is subject to be seen anywhere in the state in migration, although Kain (1987) lists it as an uncommon, and early, transient through the Piedmont. Still, it likely occurs at APCO in most years, although it may have been missed in the gap between the winter surveys and the start of the migration surveys which targeted peak migration times.

The northern waterthrush winters from the West Indies and Mexico down into northern South America and moves northward along a broad front in spring migration (Dunn and Garrett 1997). Unlike the Louisiana waterthrush, the northern is most likely found in migration associated with more swampy, or stagnant areas of water, rather than streams and creeks (Parnell 1969). It is for this reason that the species may not have been appropriate as an expected species at APCO. The habitats most conducive to northern waterthrush are not prevalent at APCO, and after surveys were started it was apparent that the likelihood of encountering this species was probably small based on the lack of preferred habitats.

Swainson's thrush is a common migrant throughout most of the U.S., from wintering grounds as far south as Argentina (Mack and Yong 2000). Kain (1987) lists it as common through the Piedmont of Virginia in migration, and it is unusual that this species was not detected at APCO. A paucity of survey effort in conjunction with a very dynamic, broad front migration were likely the reasons for the detection miss.

The one detected migrant species that was not expected was chestnut-sided warbler. Wintering in Mexico and Central America, this species tends toward more of a mountainous route through Virginia in spring, where it also nests in second-growth habitats (Dunn and Garrett 1997). Kain (1987) notes that the species is more common in the northern and western Piedmont in spring migration nearer the mountains, and uncommon elsewhere. The prevalence of suitable habitat at APCO, in addition to the more central Piedmont location, probably made the detection of chestnut-sided warbler a more probable circumstance than originally suspected.

Winter

For the winter season there were no unexpected species, although three species that had been expected were not detected (sharp-shinned hawk, swamp sparrow, and fox sparrow). Sharp-shinned hawks winter throughout Virginia and nest in the mountains (Bildstein and Meyer 2000). They are somewhat secretive, although quite often can be seen hunting birds along edges in parks and back yards where they may stake out a bird feeder for regular visits (Klem 1981). Because of the constant juxtaposition of fields and forests at APCO, with lots of edge habitat, this species should have been an occasional component of the landscape but was not detected. This is most likely due to observers overlooking perched birds, when accipiters are most often detected darting along wooded edges.

Two sparrows were not detected that had been anticipated at APCO. The swamp sparrow winters throughout Virginia, but has an affinity for swampy or marshy habitats (Mowbray 1997);

lack of such habitats at APCO probably accounted for its absence during winter surveys. However, there are a few shrubby wetland edges along the banks of the Appomattox River in the northern sections of the Park that were not adequately surveyed. This species may be present in very small numbers in those areas. The fox sparrow can also be found wintering throughout Virginia and tends to prefer thickets and underbrush, particularly along wood edges or stream banks (Terrill 1968). Kain (1987) reports its winter distribution in Virginia as a gradient from more common along the coast to nearly rare in the mountains. This species likely occurs at APCO most winters, but was not detected during this inventory.

Summary and Management Considerations

In summary, APCO hosts a bird community typical of the mosaic of fields and forests that characterize most of Virginia's rural areas. Overall diversity is reduced somewhat by the lack of open water, so there are few opportunities for waterfowl, shorebirds, or wading birds. Likewise, APCO's presence in the central Piedmont 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, natural disturbances and their effects, or management concerns; each are discussed more fully below.

Encroachment and Visitor Access Issues

APCO lies in the central Piedmont region of Virginia, in a relatively quiet part of the state. State Route 24, that bisects APCO, is not a primary highway, connecting Route 60 out of Richmond with Route 460 in Appomattox. The park is outside the rapid-growth region of the Coastal Plain and away from the more highly visited hiking areas of the mountains. In this context, it is relatively well protected from the overt disturbance associated with high-use public areas and does not appear to be subject to encroachment issues from surrounding land uses. As for visitor access, most of it appears to be associated with the historic village and some of the walking trails in the open areas. During the survey period there were no other pedestrians detected on the interior forest trails; this serves the avian community well, reducing potential disturbance to nesting and foraging birds, as well as minimizing refuse in the park that may invite ground predators.

Only one of the trails is in a sensitive area for birds. The main trail that runs through the forest parallel to Route 24 on the south side includes approximately 0.5 km (0.3 mi) of distance along the bank of the Appomattox River in some of the low floodplain forest area. This encompasses the most sensitive habitat for uncommon nesting species such as Kentucky warbler and Louisiana waterthrush. There have been numerous literature surveys suggesting that disturbances from human recreation (i.e., hiking, jogging, and even photography) clearly have at least temporary effects on the behavior and movement of birds (Boyle and Samson 1985; Bennett and Zuelke 1999). Once again, however, it is unlikely that visitor access into the interior forest areas of APCO will ever be of a magnitude to appreciably impact the avian community; therefore, encroachment and visitation issues should not be considered a management concern at this time.

Grassland Management

Grasslands at APCO are unusually diverse due to the different management regimes and context within the park. As referenced earlier, the restored native grass fields tended to be more heavily occupied by grassland bird species than any of the other grassland management treatments. Fescue (*Festuca* sp.) dominated mowed fields were essentially biological deserts, except in areas that were less frequently maintained. Cattle-grazed pastures, although harboring a more diverse

bird community, tended to attract more generalist species and were only sparsely populated by birds.

The use of cows as a management tool should be evaluated closely in the future. They facilitate the invasion of cowbirds into the landscape and reduce structural diversity, hindering use by most grassland-obligate birds (Bock et al 1993). Evidence shows that cows will predate bird nests, and have been shown taking eggs and young (Nack and Ribic 2005). In addition, cows at APCO have no dedicated water source outside of the existing tributaries to the Appomattox River. This no doubt contributes to erosion, sedimentation, and at least a local reduction in water quality, which could affect stream biodiversity and ultimately the health of the avian community and other taxa that depend on those resources (Bock 2002; Kauffman 2002).

The conversion of other fields to 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). 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 those areas greater than 6 ha (15 ac). Fields below that size threshold are best managed as shrublands. Shrubland species tend to occupy smaller patches and are collectively in need of more management attention than most other avian species suites (Watts 1996). The Center for Conservation Biology produced a grassland management publication for Colonial National Historical Park in 1999 (Watts 2000). The publication considered 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. This publication should be consulted for grassland management in all Mid-Atlantic Region parks.

Invasive Species Monitoring and Control

Invasive species are abundant and problematic across much of APCO, although the Park has an active control program for most species. Populations of privet (*Ligustrum* spp.) and multiflora rose (*Rosa multiflora*) have been significantly reduced over the last five years. One of the more aggressive exotics, however, is a grass species, *Microstegium vimineum*, commonly referred to as Nepalese browntop or Japanese stiltgrass. Extensive populations occurred in the park during 2003 and it has continued to spread unchecked; it is a prolific seed disperser, capable of exploiting disturbed areas more quickly than most native plants. The seeds of this plant are extremely small and are thought to be spread via a multitude of natural and anthropogenic media; from the coats and feet of mammals and birds to the shoes and clothes of pedestrians, automobile tires, wind, and rain. As a result, natural storm events, cattle grazing, and pedestrian use of the park all provide an ideal venue for the spread of this nonnative species. It occurs and proliferates under more varied environmental conditions than any other invasive species, including all parts of the state, all soils, and almost all hydrologic and sun exposure conditions. The seeds remain viable in the soil for 5–7 years, making it virtually impossible to eradicate once established (Tu 2000).

Of particular concern with this pest species is its effect on biodiversity; although it has been shown to displace communities of native species, very little information exists on its impacts to wildlife (Barden 1987). Anecdotal evidence suggests that its growth form and tendency to overtake native species may create problems for ground-nesting and foraging birds (D. Bradshaw, pers. obs.). It creates a dense mat of vegetation from approx. 20–60 cm (8–24 in) in height, which appears to compromise the habitat for ground-nesting birds. The presence of very limited numbers of Kentucky warblers and worm-eating warblers may be influenced by the rapid spread of this species, since both are ground nesters.

Literature Cited

- Askins, R. A. 1993. Population trends in grassland, shrubland, and forest birds in eastern North America. *Current Ornithology* 11:1–34.
- Barden, L. 1987. Invasion of *Microstegium vimineum* (Poaceae), an exotic, annual, shade-tolerant, C-4 grass, into a North Carolina floodplain. *The American Midland Naturalist* 118 (1):40–45.
- Bennett, K. A., and E. Zuelke. 1999. The effects of recreation on birds: a literature review. Delaware Natural Heritage Program, Smyrna, DE 19977.
- Bildstein, K. L., and K. Meyer. 2000. Sharp-shinned Hawk (*Accipiter striatus*). In *The Birds of North America*, No. 482 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Bock, C. E. 2002. Birds and bovines: Effects of livestock grazing on birds in the West. Pages 217–219 in G. Wuerthner and M. Matteson, eds. *Welfare ranching: The subsidized destruction of the American West*. Island Press, Washington D.C.
- Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. Effects of livestock grazing on neotropical migratory landbirds in western North America. Pages 296–309 in D. M. Finch and P. W. Stangel, eds. *Status and management of neotropical migratory birds*. General Technical Report RM-229. U. S. Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.
- Boyle, S. A., and F. B. Samson. 1985. Effects of non-consumptive recreation on wildlife: a review. *Wildl. Soc. Bull.* 13:110–116.
- Brown, C. R. 1997. Purple Martin (*Progne subis*). In *The Birds of North America*, No. 287 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.
- Carey, M., D. E. Burhans, and D. A. Nelson. 1994. Field Sparrow (*Spizella pusilla*). In *The Birds of North America*, No. 103. A. Poole and F. Gill, Eds. Philadelphia: The Academy of Natural Sciences. The American Ornithologists' Union. Washington, DC.
- Degraaf, R. M., and J. H. Rappole. 1995. *Neotropical Migratory Birds: Natural History, Distribution, and Population Change*. Comstock Publishing. 676 pp.
- Dunn, J. L., and K. L. Garrett. 1997. *A field guide to the warblers of North America*. Houghton Mifflin. Boston, MA. 656 pp.
- Faaborg, J. R., and J. W. Terborgh. 1980. Patterns of migration in the West Indies. Pages 157–163 in Keast, A. and E. S. Morton, Eds. *Migrant birds in the Neotropics: Ecology, Behavior, Distribution, and Conservation*. Smithsonian Institution Press. Washington, DC.

- Goodrich, L. J., S. C. Crocoll, and S. E. Senner. 1996. Broad-winged Hawk (*Buteo platypterus*). In *The Birds of North America*, No. 218. A. Poole and F. Gill, eds. The Academy of Natural Sciences. Philadelphia, PA. The American Ornithologists' Union. Washington, DC.
- Hanners, L. A. and S. R. Patton. 1998. Worm-eating Warbler (*Helminthos vermivorus*). In *The Birds of North America*, No. 367 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- James, R. D. 1998. Blue-headed Vireo (*Vireo solitarius*). In *The Birds of North America*, No. 379. A. Poole and F. Gill, eds. The Birds of North America, Inc. Philadelphia, PA.
- Kain, T. 1987. Annotated Checklist of the Birds of Virginia: Third edition. Virginia Society of Ornithology. Charlottesville, VA. 124 pp.
- Kauffman, J. B. 2002. Lifeblood of the West: Riparian zone, biodiversity, and degradation by livestock. Pages 175–176 in G. Wuertner and M. Matteson, eds. *Welfare ranching: The subsidized destruction of the American West*. Island Press. Washington DC.
- Kearney, R. F. 2003. Partners in Flight Landbird Conservation Plan. Physiographic Area 10: Mid-Atlantic Coastal Plain (Version 1.0). American Bird Conservancy. The Plains, VA. 51 pp.
- Kentucky Department of Fish and Wildlife Resources (KDFWR). 2004. Fescue Eradication. Online educational brochure. Frankfort, KY.
- Klem, D. 1981. Avian predators hunting birds near windows. *Proc. Penn. Acad. Sci.* 55:90–92.
- MacArthur, R. H., and J. W. MacArthur. 1961. On bird species diversity. *Ecology* 42:594–598.
- Mack, E. D., and W. Yong. 2000. Swainson's Thrush (*Catharus ustulatus*). In *The Birds of North America*, No. 540. A. Poole and F. Gill, eds. The Birds of North America, Inc. Philadelphia, PA.
- Mowbray, T. B. 1997. Swamp Sparrow (*Melospiza georgiana*). In *The Birds of North America*, No. 279. A. Poole and F. Gill, eds. The Academy of Natural Sciences. Philadelphia, PA. The American Ornithologists' Union. Washington, DC.
- Morse, D. H. 1970. Ecological aspects of some mixed-species foraging flocks of birds. *Ecological Monographs*. Vol. 40, No.1:119–168.
- NABCI. 2007. Bird Conservation Regions (BCRs). (<http://www.nabci-us.org/bcrs.html>) North American Bird Conservation Initiative.
- Nack, J. L., and C. A. Ribic. 2005. Apparent predation by cattle at grassland bird nests. *Wilson Bull.* Vol. 117: 55–62.

- Nolan, V., Jr., E. D. Ketterson, and C. A. Buerkle. 1999. Prairie Warbler (*Dendroica discolor*). In *The Birds of North America*, No. 455 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Parnell, J. F. 1969. Habitat relations of the Parulidae during spring migration. *Auk* 86:505–521.
- Pashley, D. N., and W. C. Barrow. 1993. Effects of land use practices on Neotropical migratory birds in bottomland hardwood forests. Pages 315–320 in Finch, D. M., and P. W. Stangel. Eds. Status and management of Neotropical migratory birds. USDA Forest Service Gen. Tech. Rep. RM-229. Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 422 pp.
- Peterjohn, B. G., and J. R. Sauer. 1995. Purple Martin population trends from the North American Breeding Bird Survey, 1966–1994. *Purple Martin Update* 6(2):2–8.
- Peterson, R. T. 1980. A field guide to the birds: eastern edition. Houghton Mifflin Co. Boston, MA. 384 pp.
- Ralph, C. J. 1993. Designing and implementing a monitoring program and the standards for conducting point counts. Pages 204–207 in Finch, D. M., and P. W. Stangel, Eds. Status and management of Neotropical migratory birds. USDA Forest Service Gen. Tech. Rep. RM-229. Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 422 pp.
- Roth, R. R., M. S. Johnson, and T. J. Underwood. 1996. Wood Thrush (*Hylocichla mustelina*). In *The Birds of North America*, No. 246. A. Poole and F. Gill, eds. The Academy of Natural Sciences. Philadelphia, PA. The American Ornithologist's Union. Washington, DC.
- Sibley, D. A. 2000. National Audubon Society. The Sibley Guide to Birds. Alfred A. Knopf, Inc. New York, NY. 544 pp.
- Stalmaster, M. V. 1987. The Bald Eagle. Universe Publishing Co. New York, NY.
- Trollinger, J. B., and K. K. Reay. 2001. The Virginia breeding bird atlas project: 1985–1989. Virginia Department of Game and Inland Fisheries and Virginia Society of Ornithology. Richmond, VA. 229 pp.
- Terrill, L. M. 1968. Eastern Fox Sparrow. Pp. 1395–1415 in Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows and their allies. O. L. Austin, Jr., ed. U.S. Natl. Mus. Bull. 237, Pt. 3.
- Tu, Mandy. 2000. Element Stewardship Abstract for *Microstegium vimineum* (<http://tncweeds.ucdavis.edu/esadocs/documents/micrvim.html>). The Nature Conservancy's Wildlands Invasive Species Team. Dept. of Vegetable Crops & Weed Sciences. University of California. Davis, CA.

- U. S. Fish and Wildlife Service. 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, VA. 99 pp.
- U. S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; draft post-delisting monitoring plan for the bald eagle (*Haliaeetus leucocephalus*) and proposed information collection. Federal Register, Vol. 72, No. 130, July 9, 2007. Office of the Federal Register, Washington DC.
- VDGIF. 2006. Special status faunal species in Virginia. Official agency species status list. Virginia Department of Game and Inland Fisheries, Richmond, VA. 3 pp.
- Watts, B. D. 1996. Landscape configuration and diversity hotspots in wintering sparrows. *Oecologia* 108:512–517.
- Watts, B. D. 1999. Mid-Atlantic Coastal Plain bird conservation plan: Version 1.0. Partners in Flight, American Bird Conservancy, The Plains, VA. 77 pp.
- Watts, B. D. 2000. Management of park fields to enhance the natural resources value and biodiversity of Colonial National Historical Park. Center for Conservation Biology Technical Report CCBTR-00-08. College of William and Mary. Williamsburg, VA.
- Watts, B. D., M. D. Wilson, and D. S. Bradshaw. 1997. Habitat requirement of early successional bird communities: management implications for the mid-Atlantic region. Center for Conservation Biology Technical Report CCBTR-97-03. College of William and Mary. Williamsburg, VA. 62 pp.
- Watts, B. D., and S. C. Rottenborn. 2001. Breeding status of the northern harrier in coastal Virginia. *The Raven*, Vol. 72(2):153–157.
- Wharton, C. H., V. W. Lambou, J. Newsom, P. V. Winger, L. L. Gaddy, and R. Mancke. 1981. The fauna of bottomland hardwoods in southeastern United States. *In* Wetlands of Bottomland Hardwood Forests. J. R. Clark and J. Benforado, eds. Elsevier, Amsterdam. pp. 87–100.
- Wilson, M. D. and B. D. Watts. 2006. Effect of moonlight on detection of Whip-poor-wills: Implications for long-term monitoring strategies. *J. Field Ornithol.* 77(2):207–211.
- Wilson, M. D. and B. D. Watts. (In press). The influence of landscape configuration on the distribution and abundance of the Whip-poor-will.

Appendix A. List of species expected and detected at Appomattox Court House National Historical Park, VA, during inventories in 2002–2003.

#	Species	Taxonomic name	Status	Expected	Detected
1	great blue heron	<i>Ardea herodias</i>	breeding	expected	detected
2	green heron	<i>Butorides virescens</i>	breeding	expected	detected
3	wood duck	<i>Aix sponsa</i>	breeding	expected	detected
4	turkey vulture	<i>Cathartes aura</i>	breeding	expected	detected
5	black vulture	<i>Coragyps atratus</i>	breeding	expected	detected
6	northern harrier	<i>Circus cyaneus</i>	winter	expected	detected
7	sharp-shinned hawk	<i>Accipiter striatus</i>	transient	expected	not detected
8	Cooper's hawk	<i>Accipiter cooperii</i>	breeding	expected	detected
9	red-shouldered hawk	<i>Buteo lineatus</i>	breeding	expected	detected
10	broad-winged hawk	<i>Buteo platypterus</i>	breeding	expected	not detected
11	red-tailed hawk	<i>Buteo jamaicensis</i>	breeding	expected	detected
12	bald eagle	<i>Haliaeetus leucocephalus</i>	breeding	not expected	detected
13	American kestrel	<i>Falco sparverius</i>	winter	expected	detected
14	northern bobwhite	<i>Colinus virginianus</i>	breeding	expected	detected
15	wild turkey	<i>Meleagris gallopavo</i>	breeding	expected	detected
16	killdeer	<i>Charadrius vociferus</i>	breeding	expected	detected
17	American woodcock	<i>Scolopax minor</i>	breeding	expected	detected
18	mourning dove	<i>Zenaidura macroura</i>	breeding	expected	detected
19	yellow-billed cuckoo	<i>Coccyzus americanus</i>	breeding	expected	detected
20	great horned owl	<i>Bubo virginianus</i>	breeding	expected	detected
21	barred owl	<i>Strix varia</i>	breeding	expected	detected
22	eastern screech owl	<i>Otus asio</i>	breeding	expected	detected
23	whip-poor-will	<i>Caprimulgus vociferus</i>	breeding	expected	not detected
24	chimney swift	<i>Chaetura pelagica</i>	breeding	expected	detected
25	ruby-throated hummingbird	<i>Archilochus colubris</i>	breeding	expected	detected
26	red-bellied woodpecker	<i>Melanerpes carolinus</i>	breeding	expected	detected
27	yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	winter	expected	detected
28	downy woodpecker	<i>Picoides pubescens</i>	breeding	expected	detected
29	hairy woodpecker	<i>Picoides villosus</i>	breeding	expected	detected
30	northern flicker	<i>Colaptes auratus</i>	breeding	expected	detected
31	pileated woodpecker	<i>Dryocopus pileatus</i>	breeding	expected	detected
32	eastern wood-pewee	<i>Contopus virens</i>	breeding	expected	detected
33	Acadian flycatcher	<i>Empidonax virescens</i>	breeding	expected	detected
34	eastern phoebe	<i>Sayornis phoebe</i>	breeding	expected	detected
35	great crested flycatcher	<i>Myiarchus crinitus</i>	breeding	expected	detected
36	eastern kingbird	<i>Tyrannus tyrannus</i>	breeding	expected	detected
37	red-eyed vireo	<i>Vireo olivaceus</i>	breeding	expected	detected
38	white-eyed vireo	<i>Vireo griseus</i>	breeding	expected	detected
39	yellow-throated vireo	<i>Vireo flavifrons</i>	breeding	expected	detected
40	blue-headed vireo	<i>Vireo solitarius</i>	transient	expected	not detected
41	blue jay	<i>Cyanocitta cristata</i>	breeding	expected	detected
42	American crow	<i>Corvus brachyrhynchos</i>	breeding	expected	detected
43	purple martin	<i>Progne subis</i>	breeding	expected	not detected
44	northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	breeding	expected	detected
45	barn swallow	<i>Hirundo rustica</i>	breeding	expected	detected
46	tufted titmouse	<i>Baeolophus bicolor</i>	breeding	expected	detected
47	Carolina chickadee	<i>Poecile carolinensis</i>	breeding	expected	detected
48	white-breasted nuthatch	<i>Sitta carolinensis</i>	breeding	expected	detected
49	brown creeper	<i>Certhia americana</i>	winter	expected	detected
50	Carolina wren	<i>Thryothorus ludovicianus</i>	breeding	expected	detected

Appendix A. List of species expected and detected at Appomattox Court House National Historical Park, VA, during inventories in 2002–2003 (continued).

#	Species	Taxonomic name	Status	Expected	Detected
51	house wren	<i>Troglodytes aedon</i>	breeding	expected	not detected
52	winter wren	<i>Troglodytes troglodytes</i>	winter	expected	detected
53	golden-crowned kinglet	<i>Regulus satrapa</i>	winter	expected	detected
54	ruby-crowned kinglet	<i>Regulus calendula</i>	winter	expected	detected
55	blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	breeding	expected	detected
56	eastern bluebird	<i>Sialia sialis</i>	breeding	expected	detected
57	American robin	<i>Turdus migratorius</i>	breeding	expected	detected
58	wood thrush	<i>Hylocichla mustelina</i>	breeding	expected	detected
59	Swainson's thrush	<i>Catharus ustulatus</i>	transient	expected	not detected
60	hermit thrush	<i>Catharus guttatus</i>	winter	expected	detected
61	gray catbird	<i>Dumetella carolinensis</i>	breeding	expected	detected
62	northern mockingbird	<i>Mimus polyglottos</i>	breeding	expected	detected
63	brown thrasher	<i>Toxostoma rufum</i>	breeding	expected	detected
64	European starling	<i>Sturnus vulgaris</i>	breeding	expected	detected
65	cedar waxwing	<i>Bombycilla cedrorum</i>	breeding	expected	detected
66	northern parula	<i>Parula americana</i>	breeding	expected	detected
67	yellow warbler	<i>Dendroica petechia</i>	breeding	expected	detected
68	chestnut-sided warbler	<i>Dendroica pensylvanica</i>	transient	not exp	detected
69	Cape May warbler	<i>Dendroica tigrina</i>	transient	expected	detected
70	black-throated blue warbler	<i>Dendroica caerulescens</i>	transient	expected	detected
71	yellow-rumped warbler	<i>Dendroica coronata</i>	transient	expected	detected
72	black-throated green warbler	<i>Dendroica virens</i>	transient	expected	detected
73	prairie warbler	<i>Dendroica discolor</i>	breeding	expected	detected
74	pine warbler	<i>Dendroica pinus</i>	breeding	expected	detected
75	yellow-throated warbler	<i>Dendroica dominica</i>	breeding	expected	detected
76	worm-eating warbler	<i>Helmitheros vermivorus</i>	breeding	expected	detected
77	black-and-white warbler	<i>Mniotilta varia</i>	breeding	expected	detected
78	American redstart	<i>Setophaga ruticilla</i>	breeding	expected	detected
79	ovenbird	<i>Seiurus aurocapillus</i>	breeding	expected	detected
80	Louisiana waterthrush	<i>Seiurus motacilla</i>	breeding	expected	detected
81	Kentucky warbler	<i>Oporornis formosus</i>	breeding	expected	detected
82	common yellowthroat	<i>Geothlypis trichas</i>	breeding	expected	detected
83	hooded warbler	<i>Wilsonia citrina</i>	breeding	expected	detected
84	yellow-breasted chat	<i>Icteria virens</i>	breeding	expected	detected
85	summer tanager	<i>Piranga rubra</i>	breeding	expected	detected
86	scarlet tanager	<i>Piranga olivacea</i>	breeding	expected	detected
87	northern cardinal	<i>Cardinalis cardinalis</i>	breeding	expected	detected
88	rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	transient	expected	detected
89	blue grosbeak	<i>Guiraca caerulea</i>	breeding	expected	detected
90	indigo bunting	<i>Passerina cyanea</i>	breeding	expected	detected
91	eastern towhee	<i>Pipilo erythrophthalmus</i>	breeding	expected	detected
92	field sparrow	<i>Spizella pusilla</i>	breeding	expected	detected
93	chipping sparrow	<i>Spizella passerina</i>	breeding	expected	detected
94	grasshopper sparrow	<i>Ammodramus savannarum</i>	breeding	expected	detected
95	savannah sparrow	<i>Passerculus sandwichensis</i>	winter	expected	detected
96	white-throated sparrow	<i>Zonotrichia albicollis</i>	winter	expected	detected
97	fox sparrow	<i>Passerella iliaca</i>	winter	expected	not detected
98	song sparrow	<i>Melospiza melodia</i>	breeding	expected	detected
99	swamp sparrow	<i>Melospiza georgiana</i>	winter	expected	not detected
100	dark-eyed junco	<i>Junco hyemalis</i>	winter	expected	detected

Appendix A. List of species expected and detected at Appomattox Court House National Historical Park, VA, during inventories in 2002–2003 (continued).

#	Species	Taxonomic name	Status	Expected	Detected
101	eastern meadowlark	<i>Sturnella magna</i>	breeding	expected	detected
102	brown-headed cowbird	<i>Molothrus ater</i>	breeding	expected	detected
103	red-winged blackbird	<i>Agelaius phoeniceus</i>	breeding	expected	detected
104	common grackle	<i>Quiscalus quiscula</i>	breeding	expected	detected
105	Baltimore oriole	<i>Icterus galbula</i>	breeding	expected	detected
106	orchard oriole	<i>Icterus spurius</i>	breeding	expected	detected
107	house finch	<i>Carpodacus mexicanus</i>	breeding	expected	detected
108	American goldfinch	<i>Carduelis tristis</i>	breeding	expected	detected

Appendix B. UTM coordinates (NAD83) and description of habitat context of avian survey point locations at Appomattox Court House National Historical Park, VA, 2002–2003.

Pt #	X Coord.	Y Coord.	Habitat
1	696293	4140627	mature hardwood forest
2	696524	4140424	mature hardwood forest
3	696342	4140194	young mixed forest
4	696296	4139972	mature hardwood forest
5	696376	4139718	forested wetland
6	696097	4139765	forested wetland
7	695833	4139743	forest - field edge
8	695766	4138949	young mixed forest
9	694631	4138498	mature hardwood forest
10	694733	4138249	mature hardwood forest
11	694990	4138279	forested wetland
12	695001	4138421	forest - field edge
13	694472	4138173	scrub - shrub
14	694199	4138404	forest - scrub edge
15	694254	4138655	mature hardwood forest
16	693606	4138337	mature hardwood forest
17	694234	4138994	mature hardwood forest
18	693799	4139180	mature mixed forest
19	694303	4139328	grassland
20	694611	4139185	mature mixed forest
21	694530	4139488	forested wetland
22	694327	4139710	mature mixed forest
23	694987	4138971	residential
24	695286	4139050	residential
25	695474	4139271	grassland
26	695440	4139667	forested wetland
27	695382	4139918	grassland

Appendix C. Species list and conservation status of birds detected at Appomattox Court House National Historical Park during inventories in 2002–2003.

#	species	Taxonomic Name	Fed.	State	PIF Score
1	great blue heron	<i>Ardea herodias</i>			
2	green heron	<i>Butorides virescens</i>			20
3	wood duck	<i>Aix sponsa</i>			
4	turkey vulture	<i>Cathartes aura</i>			
5	black vulture	<i>Coragyps atratus</i>			
6	northern harrier	<i>Circus cyaneus</i>		SC	
7	Cooper's hawk	<i>Accipiter cooperii</i>			
8	red-shouldered hawk	<i>Buteo lineatus</i>			
9	red-tailed hawk	<i>Buteo jamaicensis</i>			
10	bald eagle	<i>Haliaeetus leucocephalus</i>		LT	
11	American kestrel	<i>Falco sparverius</i>			
12	northern bobwhite	<i>Colinus virginianus</i>			20
13	wild turkey	<i>Meleagris gallopavo</i>			
14	killdeer	<i>Charadrius vociferus</i>			
15	American woodcock	<i>Scolopax minor</i>			23
16	mourning dove	<i>Zenaida macroura</i>			
17	yellow-billed cuckoo	<i>Coccyzus americanus</i>			
18	great horned owl	<i>Bubo virginianus</i>			
19	barred owl	<i>Strix varia</i>			
20	eastern screech owl	<i>Otus asio</i>			20
21	chimney swift	<i>Chaetura pelagica</i>			20
22	ruby-throated hummingbird	<i>Archilochus colubris</i>			
23	red-bellied woodpecker	<i>Melanerpes carolinus</i>			
24	yellow-bellied sapsucker	<i>Sphyrapicus varius</i>			
25	downy woodpecker	<i>Picoides pubescens</i>			
26	hairy woodpecker	<i>Picoides villosus</i>			
27	northern flicker	<i>Colaptes auratus</i>			
28	pileated woodpecker	<i>Dryocopus pileatus</i>			
29	eastern wood-pewee	<i>Contopus virens</i>			
30	Acadian flycatcher	<i>Empidonax virescens</i>			22
31	eastern phoebe	<i>Sayornis phoebe</i>			
32	great crested flycatcher	<i>Myiarchus crinitus</i>			
33	eastern kingbird	<i>Tyrannus tyrannus</i>			
34	red-eyed vireo	<i>Vireo olivaceus</i>			
35	white-eyed vireo	<i>Vireo griseus</i>			
36	yellow-throated vireo	<i>Vireo flavifrons</i>			
37	blue jay	<i>Cyanocitta cristata</i>			
38	American crow	<i>Corvus brachyrhynchos</i>			
39	northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>			
40	barn swallow	<i>Hirundo rustica</i>			
41	tufted titmouse	<i>Baeolophus bicolor</i>			
42	Carolina chickadee	<i>Poecile carolinensis</i>			
43	white-breasted nuthatch	<i>Sitta carolinensis</i>			
44	brown creeper	<i>Certhia americana</i>		SC	
45	Carolina wren	<i>Thryothorus ludovicianus</i>			

Appendix C. Species list and conservation status of birds detected at Appomattox Court House National Historical Park during inventories in 2002–2003 (continued).

#	species	Taxonomic Name	Fed.	State	PIF Score
46	winter wren	<i>Troglodytes troglodytes</i>		SC	
47	golden-crowned kinglet	<i>Regulus satrapa</i>		SC	
48	ruby-crowned kinglet	<i>Regulus calendula</i>			
49	blue-gray gnatcatcher	<i>Polioptila caerulea</i>			
50	eastern bluebird	<i>Sialia sialis</i>			
51	American robin	<i>Turdus migratorius</i>			
52	wood thrush	<i>Hylocichla mustelina</i>	BCC		23
53	hermit thrush	<i>Catharus guttatus</i>		SC	
54	gray catbird	<i>Dumetella carolinensis</i>			
55	northern mockingbird	<i>Mimus polyglottos</i>			
56	brown thrasher	<i>Toxostoma rufum</i>			
57	European starling	<i>Sturnus vulgaris</i>			
58	cedar waxwing	<i>Bombycilla cedrorum</i>			
59	northern parula	<i>Parula americana</i>			
60	yellow warbler	<i>Dendroica petechia</i>			
61	chestnut-sided warbler	<i>Dendroica pensylvanica</i>			
62	Cape May warbler	<i>Dendroica tigrina</i>			
63	black-throated blue warbler	<i>Dendroica caerulescens</i>			
64	yellow-rumped warbler	<i>Dendroica coronata</i>			
65	black-throated green warbler	<i>Dendroica virens</i>			
66	prairie warbler	<i>Dendroica discolor</i>	BCC		23
67	pine warbler	<i>Dendroica pinus</i>			
68	yellow-throated warbler	<i>Dendroica dominica</i>			
69	worm-eating warbler	<i>Helmitheros vermivorus</i>	BCC		20
70	black-and-white warbler	<i>Mniotilta varia</i>			
71	American redstart	<i>Setophaga ruticilla</i>			
72	ovenbird	<i>Seiurus aurocapillus</i>			
73	Louisiana waterthrush	<i>Seiurus motacilla</i>			21
74	Kentucky warbler	<i>Oporornis formosus</i>	BCC		23
75	common yellowthroat	<i>Geothlypis trichas</i>			
76	hooded warbler	<i>Wilsonia citrina</i>			
77	yellow-breasted chat	<i>Icteria virens</i>			
78	summer tanager	<i>Piranga rubra</i>			
79	scarlet tanager	<i>Piranga olivacea</i>			22
80	northern cardinal	<i>Cardinalis cardinalis</i>			
81	rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>			
82	blue grosbeak	<i>Guiraca caerulea</i>			
83	indigo bunting	<i>Passerina cyanea</i>			
84	eastern towhee	<i>Pipilo erythrophthalmus</i>			19
85	field sparrow	<i>Spizella pusilla</i>			20
86	chipping sparrow	<i>Spizella passerina</i>			
87	grasshopper sparrow	<i>Ammodramus savannarum</i>			
88	savannah sparrow	<i>Passerculus sandwichensis</i>			
89	white-throated sparrow	<i>Zonotrichia albicollis</i>			
90	song sparrow	<i>Melospiza melodia</i>			

Appendix C. Species list and conservation status of birds detected at Appomattox Court House National Historical Park during inventories in 2002–2003 (continued).

#	species	Taxonomic Name	Fed.	State	PIF Score
91	dark-eyed junco	<i>Junco hyemalis</i>			
92	eastern meadowlark	<i>Sturnella magna</i>			
93	brown-headed cowbird	<i>Molothrus ater</i>			
94	red-winged blackbird	<i>Agelaius phoeniceus</i>			
95	common grackle	<i>Quiscalus quiscula</i>			
96	Baltimore oriole	<i>Icterus galbula</i>			
97	orchard oriole	<i>Icterus spurius</i>			
98	house finch	<i>Carpodacus mexicanus</i>			
99	American goldfinch	<i>Carduelis tristis</i>			

Abbreviations: Fed. = Federal list of threatened and endangered species

BCC = Birds of Conservation Concern

LT = Listed Threatened

State = State list of threatened and endangered species

SC = Special Concern.

PIF Score = Partners in Flight Prioritization Score: Species with scores 19 or higher are considered to be of either high continental or regional concern.

As the nation's primary conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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