

National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania



Inventory of Avian Species at Booker T. Washington National Monument, Virginia

Technical Report NPS/NER/NRTR—2009/137



ON THE COVER

Great crested flycatcher (*Myiarchus crinitus*).
Photograph by Nicolas Bircher.

Inventory of Avian Species at Booker T. Washington National Monument

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National Park Service

Mid-Atlantic Network
120 Chatham Lane
Fredericksburg, VA 22405

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U.S. Department of the Interior
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Northeast Region
Philadelphia, Pennsylvania

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Abstract

A comprehensive, year-round inventory of birds was conducted at Booker T. Washington National Monument (BOWA) in 2003. The inventory yielded over 76% (90 of 118) of the total species projected to occur at the park. By season, 64.4% (58 of 90 species) of expected breeding species were detected, with 64.7% (11 of 17) of expected wintering bird species observed and 81.8% (9 of 11 species) of expected migratory species documented. Relative abundance of bird species by habitat type was calculated for the 2003 breeding season. The four most abundant species across all habitats were chipping sparrow (*Spizella passerina*), American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*) and red-eyed vireo (*Vireo olivaceus*); with chipping sparrows dominant within edge and grassland habitats, American robin prevalent in edge and mixed forest habitats, red-eyed vireo dominant in mature deciduous forest habitat, and northern cardinals abundant in all habitats throughout BOWA. Combining point count and area survey data from the 2003 breeding season, we determined which habitats contained the highest number of bird species and birds of conservation concern. Mixed coniferous and deciduous forest contained the greatest species richness ($n = 47$) and the highest number of priority species ($n = 6$) with grasslands being relatively high in species richness ($n = 40$) and priority species ($n = 5$). Of the 92 species detected at BOWA during 2003, none are federally listed as Threatened or Endangered. However, 15 species are recognized as state species of special concern, federal species of conservation concern, or priority species under national conservation initiatives. Six birds were identified as special concern the State of Virginia, seven species were ranked among Partners in Flight top tier of species within the mid-Atlantic Piedmont, and whip-poor-will (*Caprimulgus vociferous*) and wood thrush (*Hylocichla mustelina*) were recognized by Partners in Flight and the United States Fish and Wildlife Service as Birds of Conservation Concern for Bird Conservation Region 29 and United States Fish and Wildlife Service Region 5.

The avifauna at BOWA was influenced, at least partially, by the near absence of open water, limited amount of early successional forestland, and by grasslands that have a history of management for agricultural uses. 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 are 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 are collectively in need of more management attention than most other avian species, especially at BOWA as a number of early successional species were not detected during the 2003 breeding season.

Although the park is outside the rapid-growth region of the Coastal Plain and away from the more highly visited hiking areas of the mountains, it preserves and exemplifies the region's rural, historical character in the midst of increasing modern development along the Route 122 corridor. Due to the proximity of BOWA to Smith Mountain Lake and the accompanying rapid development, habitat loss on all sides of the park could very well impact avifauna at the park in the near future.

Acknowledgments

This project would not have been possible without Dana Bradshaw who oversaw design and implementation, and prepared the reports for several of the parks in the Mid-Atlantic and Northeast Coastal and Barrier networks that served as the model for this report. Bryan Watts provided initial early discussions with the National Park Service on establishing Inventory and Monitoring survey protocols. Anne Womack secured the contractual arrangement for William and Mary, and Mark Roberts administered the contract throughout. Beth Johnson, Sara Stevens, and James Comiskey provided coordination and support. Kristina Callahan provided support with finalizing the project database and Sarah Wakamiya assisted with map production and other Geographic Information System efforts. Locally, Timbo Sims and the other staff at Booker T. Washington National Monument provided on-site assistance and expertise on park resources during the set-up phase of the project. Mike Wilson provided analytical support, and Jessica and Julie Bradshaw compiled historical survey data. Nicolas Bircher provided photographs for the report cover. Thanks to Brad Ross for drafting and editing the report. And finally, thanks to the tireless efforts of Fenton Day and Bill and Anne Tucker for conducting the field surveys at Booker T. Washington National Monument. In addition, we are deeply grateful to Bill and Anne Tucker who provided a checklist of bird species that they have documented in the park over the past 20 years.

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 at Booker T. Washington National Monument (BOWA), located in Franklin County, Virginia about 40 km (25 mi) southeast of Roanoke. The primary objective of the project was to document at least 90% of birds expected to occur at BOWA, 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 BOWA (Kain 1987; Trollinger and Reay 2001). The list contains 118 species, of which, 90 species were expected to occur during breeding season, 17 as wintering species, and 11 to occur as transient migrants.

Study Area

Booker T. Washington National Monument (BOWA) is one of ten parks within the Northeast Region Mid-Atlantic Network (MIDN) of the National Park Service (NPS). The site was established as a national park in 1956 to preserve and protect the birth site and childhood home of Booker T. Washington. Booker T. Washington went on to become one of the most influential African Americans of the late 19th and early 20th centuries as an activist, educator, and founder of Tuskegee Institute (National Park Service 2000). Besides serving as a national monument, the park also preserves and exemplifies the region's rural, historical character in the midst of increasing modern development along the Route 122 corridor. The park is a 97-ha (239-ac) single land unit within the Moneta SW United States Geological Survey (USGS) 7.5 minute topographic quadrangle map from Franklin County, Virginia approximately 40 km (25 mi) southeast of Roanoke and 18 km (11 mi) northeast of Rocky Mount (Mitchell 2006; Patterson 2008). BOWA is located within the Lynchburg Belt subsection of the southern Piedmont of Virginia (Keys et al. 1995). Topography in this area is comprised of gently rolling hills, with the landscape varying from ravines and stream floodplains at 250 m (820 ft) to rock terraces approximately 305 m (1,000 ft) elevation (Pagels et al. 2005; Mitchell 2006; Patterson 2008).

The vegetation of the Piedmont Plateau has been altered by a long history of clearing, agriculture, logging, and other anthropogenic disturbances (Patterson 2008). The province as well as the park contains a patchwork of secondary forests, pastures, and fields used for the production of feed grains or tobacco. Most Piedmont forests have a history of repeated cutting, or have regenerated on former agricultural lands, some of which were abandoned more than 150 years ago. Currently, mature and successional mixed pine and hardwood forests cover just over 67.5% of the park (Appendixes A-B). Grassland or cultural meadow spans approximately 27.3% of the park and is comprised of pasture and hay fields. Developed land including the Visitors' Center, administrative offices, farm buildings, parking lots and roadways covers the remaining 5.2% of the park. Areas surrounding the buildings and travel corridors are maintained as a well-manicured lawn. These and other non-pasture fields are maintained (mowed) once or twice a year. The park functions as a late 1800s era demonstration farm, where several domestic species of livestock are raised in pens and fields.

The entire park has hydrological links to the Atlantic Ocean via the Roanoke and Chowan river basins (Mitchell 2006; Patterson 2008). A number of small streams exist within BOWA, including Gill's Creek and three of its tributaries. Gill's Creek, the largest surface water resource in BOWA is a non-navigable stream that traverses approximately 1.1 km (0.7 mi) of the park. The creek enters from the north, delineating the park's western boundary, and exits through the southeastern corner of the park. A section of the Jack-O-Lantern Branch is the largest of the three tributaries and drains the demonstration farm area of BOWA. Two additional streams enter the park from outside sources. The first enters a forested area along the north boundary and flows into Gill's Creek. The other joins the Jack-O-Lantern Branch on the park's southern boundary.

Habitat Types

Animal Feedlot - Paddock

The animal feedlot – paddock area is land-use dominated by farm buildings, animal pens for grazing, maintained lawns and plantings. Areas surrounding the farm buildings are maintained as a well-manicured lawn. These and other non-pasture fields are maintained (mowed) once or twice a year.

Forest/Field Edge

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

Grasslands or cultural meadows include open area at less than shrub successional stage (having less than 5% woody vegetation but may contain scattered shrubs or trees) dominated by herbaceous vegetation consisting of grasses and forbs and includes any pasture, agriculture, or fallow field; excluding lawns. Dominant herbaceous vegetation in the grasslands includes fescue (*Festuca* spp.), orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), and goldenrod (*Solidago* spp.) (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007).

Mature Deciduous Forest

Mature deciduous 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. Tree species include various oaks (*Quercus* spp.), hickories (*Carya* spp.), tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), and other hardwoods (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007).

Mixed Coniferous and Deciduous Forest

Mixed forest is defined as land covered by vegetation with no buildings or paved roads. The vegetation consists of trees, small trees and/or shrubs. Virginia (*Pinus virginiana*), loblolly (*Pinus taeda*), and table mountain pine (*Pinus pungens*) are the dominant coniferous species, while various oaks, hickory, tulip poplar, red maple, and other hardwoods dominate the deciduous forest component (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007).

Riparian Forest

Riparian forests are associated with floodplains and stream terraces. The vegetation is often dense and exotic species may form high cover. These forests are dominated by tree species

including black walnut (*Juglans nigra*), tuliptree (*Liriodendron tulipifera*), American hornbeam (*Carpinus caroliniana*), and American sycamore (*Platanus occidentalis*) (Anderson et al. 1976; Fleming et al. 2006; NatureServe 2007).

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 centered on the Moneta SW USGS 7.5 minute quadrangle map from Franklin County, Virginia. Additional data were collected using results from over 20 years of data from adjacent Breeding Bird Survey routes that surround BOWA. Finally, field guide range maps (Peterson 1980; Sibley 2000) were consulted, along with previously published bird inventories of Appomattox Court House National Historical Park and Petersburg National Battlefield (Bradshaw 2007; 2008). These lists were consolidated and edited to reflect only those species that would be subject to occur within the habitats known to exist at BOWA. Likewise, a list of spring and fall migrants expected to utilize habitats at BOWA were assembled from the same sources, as well as data on wintering locations and migration routes (Faaborg and Terborgh 1980; Degraaf and Rappole 1995; Dunn and Garrett 1997). A total of 118 species was expected to occur at BOWA; of which, 90 species could be expected during the breeding season, 17 species expected only as winter residents, and 11 species expected to occur only as transient migrants (Appendix C). 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 within or in close proximity to BOWA. Winter birds included only those birds not breeding but residing in the park during the winter season; typically temperate migrants that do not breed at the latitude of BOWA. Transient migrants included only those species utilizing BOWA as a stopover area en route to areas to the 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 boundary shapefiles. Upon examination of the imagery, all significant habitat types were noted, 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 Global Position System (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 Universal Transverse Mercator (UTM) coordinates with the handheld GPS unit to serve as the official survey point.

Rather than a random distribution of points, this project used points that were subjectively selected based on habitat types in order to incorporate both edge and interior components of each available habitat type. 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.

Field Surveys

In order to effectively inventory bird communities at BOWA, both point count and area search techniques were used during all three times of the year. Both techniques employed standardized methodologies and were used during a single season to maximize species detection probabilities. However, nightjars and owls are not readily detected by point count or area search techniques, so we employed audio-playback surveys to attempt to identify these cryptic species.

Breeding Season Surveys

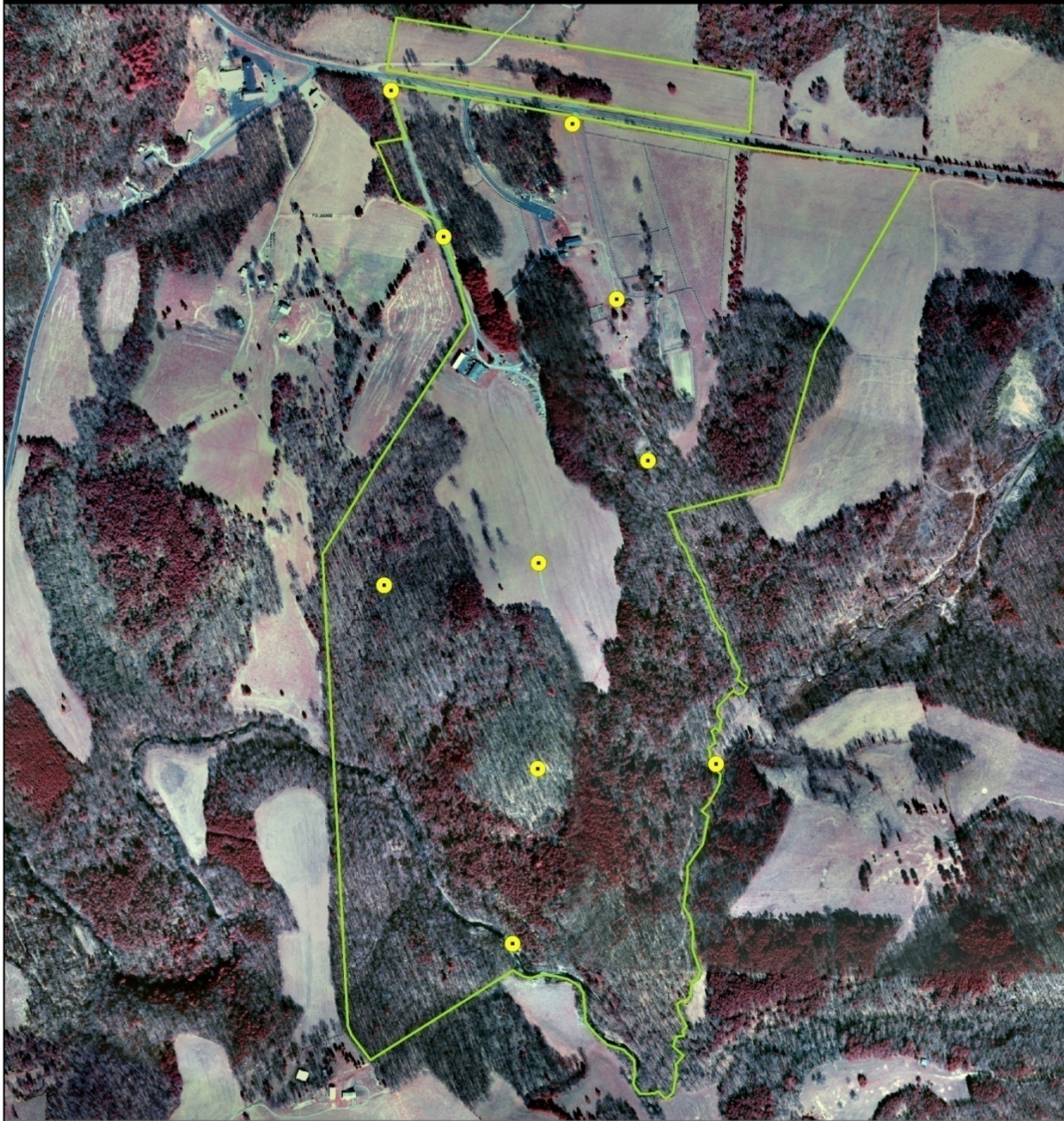
The primary inventory objective was to determine which bird species occurred at BOWA during the breeding season. This was accomplished through a standardized point count methodology using 10 minute periods to record all birds seen or heard in all directions from a fixed survey point (Ralph 1993). Count 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 50 m (164 ft) radius 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 ten points distributed among all major habitat types were surveyed twice (16 June and 9 July) during the 2003 breeding season, referenced in this project as 1 June - 15 July (Figure 1; Appendix D). All breeding season surveys were initiated at sunrise and terminated no 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. Species detected between point counts were compiled separately and used only to supplement the overall species list for BOWA. 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 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 for each of the primary habitat categories.

To supplement data collected during point count surveys, ten designated locations within the park were ‘area-searched’ using a comprehensive survey technique to assess and investigate all habitat types during each of the survey seasons (Appendix E). These units were searched completely during the breeding season (as well as the migration and winter seasons) to investigate all habitats present and record all birds seen or heard.

Avian Point Count Locations in Booker T. Washington National Monument

National Park Service
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Legend

- Survey Points
- Park Boundary



Mid-Atlantic Network
Inventory and Monitoring
Program

Sources:
Mosaic - North Carolina State University 2004
Inset - ESRI Data & Maps 2004

0 0.125 0.25 0.5
Kilometers



Figure 1. Aerial photograph displaying bird point count survey locations at Booker T. Washington National Monument, Virginia.

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 BOWA. Although migration surveys require intensive effort to develop meaningful data on bird density and distribution, we 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 significant importance to migrants as foraging or staging areas. For this purpose, point count and area survey methods were employed. 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 in order to cover 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 count survey and area search techniques. 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 February 2003. All winter surveys were conducted 15 November–15 March and occurred throughout the day, with emphasis on the first 5 hrs after sunrise.

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 BOWA. However, whip-poor-will and common nighthawk (scientific names are listed in Appendix C) were detected during point count and area searches, respectively. As a result, night surveys were conducted using taped playbacks of conspecific calls for each of the following species of owls: great horned owl, barred owl, barn owl (*Tyto alba*) and eastern screech owl. Owls were surveyed only on calm nights with clear skies and at least some moonlight. Surveys were conducted from roadsides and/or forest interior locations, depending on habitat conditions. Distance between survey points was a minimum of 1 km (0.6 mi). 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 all appropriate species depending upon the surrounding habitat at each stop. The same protocol was followed on a second date but with the species reversed.

Results

Inventory Results

A total of 92 avian species was detected during the 2003 inventory at BOWA (Appendix C). Just over 76% (90 of 118) of the total species that were expected to occur at the park were documented during the 2003 inventory effort. Osprey and common nighthawk were observed but initially were not expected to occur, bringing the total to 92 species. Of these, 58 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 64.4% (58 of 90 species) that could possibly occur at BOWA during the breeding season. Additionally, 64.7% (11 of 17) of expected wintering bird species were detected between 15 November and 15 March. Two other winter residents, swamp sparrow and purple finch were detected but only during migration. Another 81.8% (9 of 11 species) of expected transient species were identified during spring and/or fall migration.

Species Relative Abundance Data

Relative abundance of bird species by habitat type was calculated for the 2003 breeding season (Table 1). 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 four most abundant species across all habitats were chipping sparrow, American robin, northern cardinal and red-eyed vireo; with chipping sparrows dominant within edge and grassland habitats, American robin prevalent in edge and mixed forest habitats, red-eyed vireo dominant in mature deciduous forest habitat, and northern cardinals abundant in all habitats throughout BOWA. Residential habitat including the animal feedlot and paddock were characterized primarily by the presence of European starlings, house sparrows, American crow and house finch.

Species By Habitat Type

Combining point count and area survey data from the 2003 breeding season, we determined which habitats contained the highest number of bird species and birds of conservation concern. Mixed coniferous and deciduous forest contained the greatest species richness ($n = 47$) and the highest number of priority species ($n = 6$) of any of the habitat types, however they also received the most survey effort including three point count and five area search locations (Table 2). Grasslands, second in terms of survey effort including two point count and four area search locations, were relatively high in species richness ($n = 40$) and contained five priority species. Grasslands are comprised of mowed visitor use and developed zone areas or pasture and hay fields dominated by fescue, orchard grass, timothy and goldenrod. Each of these regimes contained a different compliment of birds leading to their relatively high species richness. Mature deciduous forest ($n = 12$ species) and riparian forest ($n=17$ species) yielded the least overall number of species ($n = 12$ and 17 , respectively) and priority species ($n = 2$ each), however, each of these two forested habitats housed only a single point count location.

Table 1. Relative abundance of breeding birds (expressed as a percent) by habitat type for point count surveys conducted in 2003 at Booker T. Washington National Monument, Virginia.

Species	Habitat Type ^a						Total %
	AFP	EDG	GRA	MDF	MXF	RPF	
chipping sparrow	6.8	23.8	36.4	---	8.7	---	12.8
American robin	6.8	21.4	---	---	10.1	11.1	10.0
northern cardinal	9.1	7.1	9.1	12.5	4.3	5.6	7.1
red-eyed vireo	2.3	4.8	---	31.3	8.7	5.6	7.1
Carolina chickadee	---	4.8	---	18.8	10.1	5.6	6.2
house finch	9.1	7.1	9.1	---	4.3	---	5.7
American goldfinch	2.3	4.8	---	6.3	1.4	22.2	4.3
eastern tufted titmouse	---	---	---	6.3	10.1	---	3.8
indigo bunting	4.5	4.8	9.1	---	2.9	---	3.8
American crow	9.1	2.4	---	---	---	11.1	3.3
blue-gray gnatcatcher	---	2.4	---	6.3	2.9	11.1	2.8
brown-headed cowbird	4.5	4.8	---	---	1.4	5.6	2.8
eastern bluebird	4.5	2.4	9.1	---	---	---	2.4
European starling	11.4	---	---	---	---	---	2.4
house sparrow	11.4	---	---	---	---	---	2.4
wood thrush	---	---	---	6.3	5.8	---	2.4
Carolina wren	4.5	---	---	---	2.9	---	1.9
Acadian flycatcher	---	---	---	---	2.9	5.6	1.4
downy woodpecker	---	---	---	---	4.3	---	1.4
eastern phoebe	4.5	---	4.5	---	---	---	1.4
eastern kingbird	---	---	13.6	---	---	---	1.4
grasshopper sparrow	---	2.4	4.5	---	1.4	---	1.4
yellow-throated vireo	---	---	---	---	1.4	11.1	1.4
blue jay	---	---	---	---	2.9	---	0.9
hairy woodpecker	2.3	---	---	---	---	5.6	0.9
Louisiana waterthrush	---	2.4	---	---	1.4	---	0.9
pine warbler	---	4.8	---	---	---	---	0.9
red-bellied woodpecker	4.5	---	---	---	---	---	0.9
white-breasted nuthatch	---	---	---	6.3	1.4	---	0.9
yellow-billed cuckoo	---	---	---	---	2.9	---	0.9
cedar waxwing	---	---	---	---	1.4	---	0.5

Table 1. Relative abundance of breeding birds (expressed as a percent) by habitat type for point count surveys conducted in 2003 at Booker T. Washington National Monument, Virginia (continued).

Species	Habitat Type ^a						Total %
	AFP	EDG	GRA	MDF	MXF	RPF	
eastern wood-pewee	---	---	---	---	1.4	---	0.5
great crested flycatcher	---	---	---	---	1.4	---	0.5
mourning dove	2.3	---	---	---	---	---	0.5
northern parula	---	---	---	---	1.4	---	0.5
ovenbird	---	---	---	6.3	---	---	0.5
purple martin	---	---	4.5	---	---	---	0.5
ruby-throated hummingbird	---	---	---	---	1.4	---	0.5

^a Habitat types include AFP = Animal Feedlot - Paddock, EDG = Forest/Field Edge, GRA = Grassland, MDF = Mature Deciduous Forest, MXF = Mixed Coniferous and Deciduous Forest and RPF = Riparian Forest.

Table 2. Number of bird species by migratory guild and habitat type for avian inventories conducted during the breeding season of 2003 at Booker T. Washington National Monument, Virginia.

Habitat Type	No. Species	Neotropical Migrants	Temperate Migrants	Permanent Residents	Priority Species ^a
Animal Feedlot - Paddock	24	7	7	10	1 - wood thrush (woth)
Forest/Field Edge	26	7	11	8	2 - Louisiana waterthrush (lowa) & scarlet tanager (scta)
Grassland	40	17	14	9	5 - northern bobwhite, chimney swift (chsw), woth, scta & field sparrow
Mature Deciduous Forest	12	5	1	6	2 - woth & scta
Mixed Coniferous and Deciduous Forest	47	19	14	14	6 - chsw, Acadian flycatcher (acfl), woth, lowa, scta & eastern towhee
Riparian Forest	17	7	3	7	2 - acfl & scta

^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 92 species detected at BOWA during 2003, none are federally listed as Threatened or Endangered Species (United States Fish and Wildlife Service 2009). However, 15 species were identified as special concern or priority species by the United States Fish and Wildlife Service, the State of Virginia or Partners in Flight (United States Fish and Wildlife Service 2002; Kearney 2003; Virginia Department of Game and Inland Fisheries 2008; Table 3). Six of the species detected at BOWA are recognized as a Species of Special Concern in Virginia: brown creeper, winter wren, golden-crowned kinglet, hermit thrush, magnolia warbler and purple finch. The Special Concern designation applies only to breeding populations of these species; therefore, it does not apply to these species detected at BOWA. Brown creepers breed in the conifer forests of northern and western Virginia and winter wrens, golden-crowned kinglets, hermit thrushes, and purple finch breed in Virginia in only the high elevation conifer forests of the mountain region (Sibley 2000; Trollinger and Reay 2001). All five 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 BOWA as a stopover location during migration.

Two additional species, whip-poor-will and wood thrush were recognized by the United States Fish and Wildlife Service (USFWS) as Birds of Conservation Concern (BCC) for Bird Conservation Region 29 (BCR 29) and USFWS Region 5 (R5) and by Partners in Flight (PIF) (United States Fish and Wildlife Service 2002; Kearney 2003; Table 3). 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). BOWA lies within the Piedmont BCR (BCR 29). The second conservation area designation is the USFWS Regional list. BOWA 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”] (United States Fish and Wildlife Service 2002). Whip-poor-will and wood thrush are also ranked among 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. Whip-poor-will was only detected during the migratory season at BOWA, but could possibly breed within the open mature hardwood forests within the park. 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). Wood thrush was fairly common during the 2003 breeding season within appropriate forested habitat at BOWA.

Seven species are also ranked among PIF top tier of species (scoring higher than 19) within the mid-Atlantic Piedmont (Kearney 2003). A complete list of PIF priority species for this physiographic area that were detected at BOWA is shown in Table 3. Field sparrows are a generally common species of idle grasslands and shrubby habitats, while eastern towhee are found in early successional, brushy areas. Concern for these species stems from loss of habitat due to natural succession or conversion to other uses (Carey et al 1994; Trollinger and Reay 2001). Only two field sparrows and a single towhee were identified in grassland and mixed

forest habitat, respectively at BOWA during the 2003 breeding season. Three of the species, scarlet tanager (n = 10), Acadian flycatcher (n = 13) and Louisiana waterthrush (n = 4) are forest obligate birds with the latter two associated with forested stream habitats (Sibley 2000; Trollinger and Reay 2001). Although not a large park (97 ha), BOWA does provide important breeding habitat for these three species as evidenced by their relative abundance at the park.

Table 3. Bird species of conservation concern detected during 2003 at Booker T. Washington National Monument, Virginia.

Species	Residency Status	Abundance	Conservation Status ^a
northern bobwhite	breeds	uncommon	PIF - 20
whip-poor-will	migratory	uncommon	BCC - BCR 29 & USFWS R5; PIF - 20
chimney swift	breeds	uncommon	PIF - 20
Acadian flycatcher	breeds	common	PIF - 22
brown creeper	winters	uncommon	SSC
winter wren	winters	uncommon	SSC
golden-crowned kinglet	winters	common	SSC
wood thrush	breeds	common	BCC - BCR 29 & USFWS R5; PIF - 23
hermit thrush	winters	common	SSC
magnolia warbler	migratory	uncommon	SSC
Louisiana waterthrush	breeds	uncommon	PIF - 21
scarlet tanager	breeds	common	PIF - 22
eastern towhee	breeds	common	PIF - 19
field sparrow	breeds	uncommon	PIF - 20
purple finch	migratory	uncommon	SSC

^a Conservation status includes United States Fish and Wildlife Service Birds of Conservation Concern (BCC) for Bird Conservation Region 29 (BCR 29) and USFWS Region 5 (R5), Species of Special Concern for Virginia (SSC), and Partners in Flight (PIF) priority species with numeric score. PIF priority species taken from Kearny (2003).

Discussion

Species Inventory

The 2003 bird inventory documented over 76% (90 of 118) of the total species projected to occur at the park. By season, 64.4% (58 of 90 species) of expected breeding species were detected, with 64.7% (11 of 17) of expected wintering bird species observed. The results were more complete for migratory species with 81.8% (9 of 11 species) of expected species documented. These shortfalls may reflect either inadequate survey effort (single season of surveys) or an unrealistic expected species list for a small park (97 ha). To get a more accurate and extensive account of bird species present at the park, we combined the 2003 inventory results with species accounts made by Anne and Bill Tucker over the past 20 years at BOWA (complete list for BOWA in Appendix F). Based on these combined data sets, nearly 92.4% (109 of 118) of the total species projected to occur at the park have been recorded. The percentages for species accounts by season also increased, including 74.4% (67 of 90) of breeding species, 76.5% (13 of 17) of winter residents, and all 11 migratory species identified at BOWA during the appropriate season.

Nocturnal Surveys

Nocturnal surveys were conducted only for owls at BOWA, since common nighthawk and whip-poor-will were detected during diurnal surveys. No owls were detected using playback surveys, although all four owl species probably occur within or near the park in Franklin County, Virginia. Great-horned and eastern screech owl previously have been documented at BOWA (Appendix F), whereas appropriate habitat including moist, coniferous forestland for barred owl and agricultural fields or grassland habitat for barn owl exist within or in close proximity to the park.

Habitat Associations

Forested habitats, in general, stood out in the evaluation of species richness and number of species per migratory guild. There was appreciable difference in the number of species and number of different Neotropical migrants, temperate migrants and winter residents in the mixed forest habitats. However, this was not surprising as sampling effort was greater in both this and the grassland land-use habitats at BOWA. Additionally, forest habitats harbor greater species diversity than other habitats 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 BOWA, probably because the forested wetlands were limited to rather narrow corridors along stream banks, rather than a bottomland hardwood environment. As such, the species community had a greater affinity to an edge community than to a true floodplain forest community.

Grasslands at BOWA yielded higher than expected species richness totals, high proportions of migrant species, and relatively high numbers of priority species. Next to the forested habitats,

grassland habitats yielded the second highest species richness totals. Because of the openness of the historic farming area, the large grassland areas, the proximity to additional grasslands in areas surrounding the park, and proportion of survey locations, BOWA harbored a large number of Neotropical migrants, temperate migrants and winter residents, inflating the diversity numbers for those migratory guilds at the park. Overall abundance of grassland obligate birds tend to be higher in restored native grass fields as compared to homogeneous, fescue (*Festuca* sp.) 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 (i.e., eastern meadowlark, grasshopper sparrow and field sparrow). 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 starlings, house finches, and blackbirds tend to occur (Watts 1996).

Seasonal Variation

The survey results for BOWA 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 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 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 BOWA 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 BOWA was mostly as expected. The diversity was typical of the mosaic of agricultural and mixed forest land that dominates most of Virginia. A number of species were not detected that had been anticipated, highlighted by a number of early successional habitat associates such as white-eyed vireo, prairie warbler, and vesper sparrow. However, due to a limited amount of this habitat type (1.3 ha dense hardwood regeneration), it is not surprising that these as well as gray catbird, yellow warbler, yellow-breasted chat, and common yellowthroat were not detected during the breeding season at BOWA.

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, all but two of the expected migratory species were detected in 2003 and chestnut-sided warbler and rose-breasted grosbeak were documented within the park during the 2005 migratory season.

Winter

For the winter season, four species that had been expected were not detected (northern harrier, swamp sparrow, Savannah sparrow and purple finch). Swamp sparrow winters throughout Virginia, but has an affinity for swampy or marshy habitats (Mowbray 1997); lack of such habitats at BOWA probably accounted for its absence during winter surveys. The winter distributions in Virginia of savannah sparrow and another open grassland associate, northern harrier are a gradient from more common along the coast to nearly absent in the mountains. These species likely do not occur in the southern Piedmont of Virginia during most winters. Like swamp sparrow, purple finch winter throughout Virginia and although they prefer coniferous or mixed woodlands will expand their habitats to include shrubby fields and semi-open areas (www.nenature.com/PurpleFinch; Sibley 2000). Further inventories of winter bird populations at BOWA likely will document purple finch within the park during the winter season.

Summary and Management Considerations

In summary, BOWA 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, BOWA's presence in the Lynchburg Belt subsection of the southern 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 or habitat management concerns.

Encroachment and Visitor Access Issues

BOWA lies in the southern Piedmont region of Virginia, in a relatively quiet part of the state. Although the park is outside the rapid-growth region of the Coastal Plain and away from the more highly visited hiking areas of the mountains, it preserves and exemplifies the region's rural, historical character in the midst of increasing modern development along the Route 122 corridor. However, due to the proximity of BOWA to Smith Mountain Lake and the accompanying rapid development, habitat loss on all sides of the park could very well impact avifauna at the park in the near future.

Grassland Management

Grasslands at BOWA are quite extensive (26.5 ha) for a small park (97 ha). 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.

Conversion of 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, 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 greater than 6 ha (15 ac). Fields below that 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 than most other avian species suites, especially at BOWA as a number of early successional species were not detected 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. Vegetation-map classes, corresponding area for each class, and class descriptions based on United States National Vegetation Classification (NatureServe 2007), Anderson Level II (Anderson et al. 1976), Virginia Department of Conservation and Recreation (Flemming et al. 2006), and park-specific vegetation classes (Patterson 2008) for Booker T. Washington National Monument, Virginia. Additional park-specific floristic information for each vegetation-map class is available in Appendix H of *Vegetation Classification and Mapping at Booker T. Washington National Monument, Virginia* (Patterson 2008).

Vegetation-map Class ^a	Area (ha)	Class Description
Mature Forest Classes	31.4	Land covered by vegetation with no buildings or paved roads. Vegetation dominated by trees (single stemmed woody plants > 6 m tall) with $\geq 25\%$ canopy coverage.
Acidic Oak - Hickory Forest	20.7	Upland forests; lacking wetland plants and soils. Canopy coverage $\geq 75\%$ deciduous species. Forests dominated by oaks; white oak (<i>Quercus alba</i>), southern red oak (<i>Q. falcata</i>), scarlet oak (<i>Q. coccinea</i>), or chestnut oak (<i>Q. prinus</i>), and hickories (<i>Carya alba</i> , <i>C. glabra</i> , and <i>C. ovalis</i>); understory associates include sourwood (<i>Oxydendrum arboreum</i>) or redbud (<i>Cercis canadensis</i>); may have patchy understory of heath shrubs; blueberries (<i>Vaccinium</i> spp.), and huckleberries (<i>Gaylussacia</i> spp.); herbaceous cover sparse.
Piedmont / Mountain Alluvial Forest	6.7	Forests associated with floodplains and stream terraces; vegetation often dense and exotic species may form high cover; trees include black walnut (<i>Juglans nigra</i>), tuliptree (<i>Liriodendron tulipifera</i>), American hornbeam (<i>Carpinus caroliniana</i>), and American sycamore (<i>Platanus occidentalis</i>).
Inner Piedmont / Lower Blue Ridge Basic Mesic Forest	3.4	Upland forests; lacking wetland plants and soils. Mixed hardwood forest of steep slopes; canopy dominated by tuliptree, but also present are red oak (<i>Q. rubra</i>), cucumbertree (<i>Magnolia acuminata</i>), and white ash (<i>Fraxinus americana</i>). Canopy coverage $\geq 75\%$ deciduous species. Herbaceous layer containing species indicating high base status, such as northern maidenhair (<i>Adiantum pedatum</i>) and silver false spleenwort (<i>Deparia acrostichoides</i>).
White Pine Plantation	0.6	Upland forests; lacking wetland plants and soils. Canopy dominated ($\geq 25\%$) by eastern white pine (<i>Pinus strobus</i>), may have minor coverage by Virginia pine (<i>Pinus virginiana</i>).

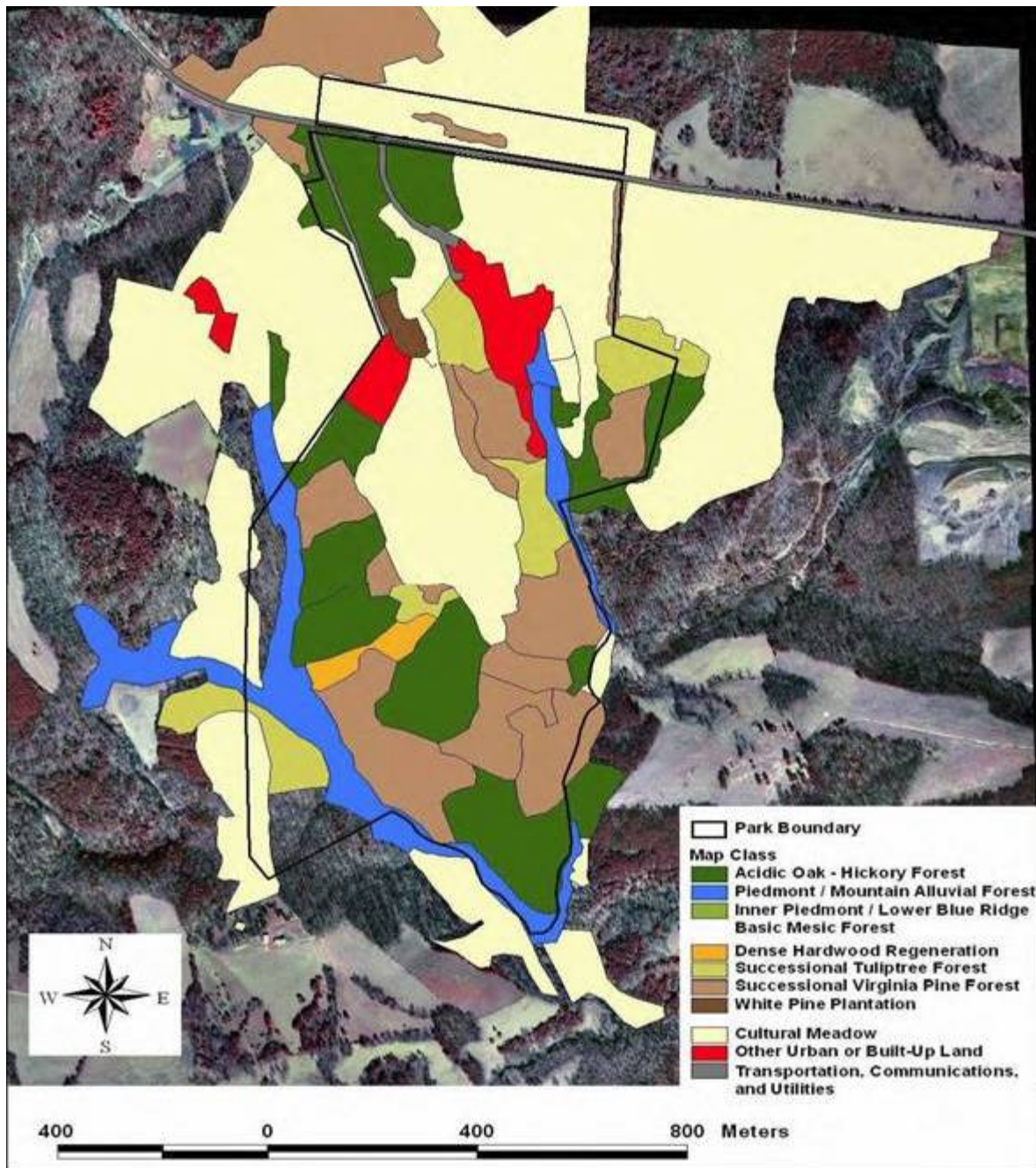
^a General land-use types are right aligned and in bold text. Specific vegetation-map classes are not in bold.

Appendix A. Vegetation-map classes, corresponding area for each class, and class descriptions based on United States National Vegetation Classification (NatureServe 2007), Anderson Level II (Anderson et al. 1976), Virginia Department of Conservation and Recreation (Flemming et al. 2006), and park-specific vegetation classes (Patterson 2008) for Booker T. Washington National Monument, Virginia. Additional park-specific floristic information for each vegetation-map class is available in Appendix H of *Vegetation Classification and Mapping at Booker T. Washington National Monument, Virginia* (Patterson 2008) (continued).

Vegetation-map Class ^a	Area (ha)	Class Description
Successional Forest Classes	28.6	Land covered by vegetation with no buildings or paved roads. Vegetation dominated by trees, small trees or shrubs.
Successional Virginia Pine Forest	21.0	Range of conditions from canopy dominated by Virginia pine or Virginia pine ($\geq 25\%$) with young deciduous trees such as tuliptree, red maple (<i>Acer rubrum</i>), black cherry (<i>Prunus serotina</i>), sourwood, or flowering dogwood (<i>Cornus florida</i>) to a canopy dominated by young, mostly deciduous trees ($\geq 75\%$) of successional hardwood species with a sparse, emergent canopy of dead and dying Virginia Pine.
Successional Tuliptree Forest	6.3	Tuliptree strongly dominant and usually even-aged; nonnative weeds and vines often prevalent in the herb and shrub layers. Canopy coverage $\geq 75\%$ deciduous species.
Dense Hardwood Regeneration	1.3	Very dense, sub-canopy vegetation dominated by shrubs and small trees.
Unclassified Forest	5.5	Land covered by vegetation with no buildings or paved roads. Vegetation dominated by trees or small trees.
Cultural Meadow	26.5	Open area dominated by herbaceous vegetation, consisting of grasses and forbs; may have scattered shrubs or trees.
Developed Land	5.0	Land use includes buildings and paved areas.
Urban or Built-Up Land	4.1	Land use dominated by buildings, maintained lawns and plantings.
Transportation, Communications and Utilities	0.9	Land use is primarily a transportation corridor with paved roadway and mowed roadsides.
Total Land Area for Booker T. Washington National Monument	97.0	Mosaic of forest, herbaceous vegetation and developed land.

^a General land-use types are right aligned and in bold text. Specific vegetation-map classes are not in bold.

Appendix B. Location of vegetation-map classes within Booker T. Washington National Monument, Virginia. Information corresponds to Figure 7 in *Vegetation Classification and Mapping at Booker T. Washington National Monument, Virginia* (Patterson 2008).



Appendix C. List of species expected and detected during 2003 at Booker T. Washington National Monument, Virginia.

Common Name	Scientific Name	Migratory Status	Expected	Detected ^a
turkey vulture	<i>Cathartes aura</i>	neotropical migrant	expected	B,W,M
black vulture	<i>Coragyps atratus</i>	neotropical migrant	expected	W,M
osprey	<i>Pandion haliaetus</i>	temperate migrant	not expected	M
northern harrier ^b	<i>Circus cyaneus</i>	temperate migrant	expected	
sharp-shinned hawk ^b	<i>Accipiter striatus</i>	temperate migrant	expected	
Cooper's hawk	<i>Accipiter cooperii</i>	temperate migrant	expected	
red-shouldered hawk	<i>Buteo lineatus</i>	temperate migrant	expected	
broad-winged hawk	<i>Buteo platypterus</i>	neotropical migrant	expected	B,M
red-tailed hawk	<i>Buteo jamaicensis</i>	temperate migrant	expected	B,W,M
American kestrel	<i>Falco sparverius</i>	temperate migrant	expected	
northern bobwhite	<i>Colinus virginianus</i>	resident	expected	B
wild turkey	<i>Meleagris gallopavo</i>	resident	expected	B,M
killdeer	<i>Charadrius vociferus</i>	temperate migrant	expected	M
American woodcock	<i>Scolopax minor</i>	temperate migrant	expected	
mourning dove	<i>Zenaida macroura</i>	temperate migrant	expected	B,W,M
yellow-billed cuckoo	<i>Coccyzus americanus</i>	neotropical migrant	expected	B,M
great horned owl	<i>Bubo virginianus</i>	resident	expected	
barred owl	<i>Strix varia</i>	resident	expected	
eastern screech owl	<i>Otus asio</i>	resident	expected	
common nighthawk	<i>Chordeiles minor</i>	neotropical migrant	not expected	M
whip-poor-will	<i>Caprimulgus vociferus</i>	temperate migrant	expected	M
chimney swift	<i>Chaetura pelagica</i>	neotropical migrant	expected	B,M
ruby-throated hummingbird	<i>Archilochus colubris</i>	neotropical migrant	expected	B,M
belted kingfisher	<i>Ceryle alcyon</i>	temperate migrant	expected	W,M
red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	resident	expected	
red-bellied woodpecker	<i>Melanerpes carolinus</i>	resident	expected	B,W,M
yellow-bellied sapsucker ^b	<i>Sphyrapicus varius</i>	temperate migrant	expected	W,M
downy woodpecker	<i>Picoides pubescens</i>	resident	expected	B,W,M
hairy woodpecker	<i>Picoides villosus</i>	resident	expected	B,W,M
northern flicker	<i>Colaptes auratus</i>	temperate migrant	expected	B,W,M
pileated woodpecker	<i>Dryocopus pileatus</i>	resident	expected	B,W,M
eastern wood-pewee	<i>Contopus virens</i>	neotropical migrant	expected	B,M

Appendix C. List of species expected and detected during 2003 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected ^a
Acadian flycatcher	<i>Empidonax virescens</i>	neotropical migrant	expected	B,M
eastern phoebe	<i>Sayornis phoebe</i>	neotropical migrant	expected	B,W,M
great crested flycatcher	<i>Myiarchus crinitus</i>	neotropical migrant	expected	B,M
eastern kingbird	<i>Tyrannus tyrannus</i>	neotropical migrant	expected	B,M
red-eyed vireo	<i>Vireo olivaceus</i>	neotropical migrant	expected	B,M
white-eyed vireo	<i>Vireo griseus</i>	neotropical migrant	expected	
yellow-throated vireo	<i>Vireo flavifrons</i>	neotropical migrant	expected	B,M
blue-headed vireo	<i>Vireo solitarius</i>	temperate migrant	expected	B,M
warbling vireo	<i>Vireo gilvus</i>	neotropical migrant	expected	M
blue jay	<i>Cyanocitta cristata</i>	temperate migrant	expected	B,W,M
American crow	<i>Corvus brachyrhynchos</i>	resident	expected	B,W,M
purple martin	<i>Progne subis</i>	neotropical migrant	expected	B,M
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	neotropical migrant	expected	B
barn swallow	<i>Hirundo rustica</i>	neotropical migrant	expected	B,M
eastern tufted titmouse	<i>Baeolophus bicolor</i>	resident	expected	B,W,M
Carolina chickadee	<i>Poecile carolinensis</i>	resident	expected	B,W,M
white-breasted nuthatch	<i>Sitta carolinensis</i>	resident	expected	B,W,M
red-breasted nuthatch ^b	<i>Sitta canadensis</i>	temperate migrant	expected	
brown creeper ^b	<i>Certhia americana</i>	temperate migrant	expected	W
Carolina wren	<i>Thryothorus ludovicianus</i>	resident	expected	B,W,M
house wren	<i>Troglodytes aedon</i>	temperate migrant	expected	
winter wren ^b	<i>Troglodytes troglodytes</i>	temperate migrant	expected	W
golden-crowned kinglet ^b	<i>Regulus satrapa</i>	temperate migrant	expected	W,M
ruby-crowned kinglet ^b	<i>Regulus calendula</i>	temperate migrant	expected	W,M
blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	neotropical migrant	expected	B,M
eastern bluebird	<i>Sialia sialis</i>	temperate migrant	expected	B,W,M
American robin	<i>Turdus migratorius</i>	temperate migrant	expected	B,W,M
wood thrush	<i>Hylocichla mustelina</i>	neotropical migrant	expected	B,M
Swainson's thrush ^c	<i>Catharus ustulatus</i>	neotropical migrant	expected	M
hermit thrush ^b	<i>Catharus guttatus</i>	temperate migrant	expected	W,M
gray catbird	<i>Dumetella carolinensis</i>	temperate migrant	expected	
northern mockingbird	<i>Mimus polyglottos</i>	resident	expected	B,W,M

Appendix C. List of species expected and detected during 2003 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected ^a
brown thrasher	<i>Toxostoma rufum</i>	temperate migrant	expected	B,M
European starling	<i>Sturnus vulgaris</i>	resident	expected	B,M
cedar waxwing	<i>Bombycilla cedrorum</i>	temperate migrant	expected	B,W,M
prothonotary warbler	<i>Prothonotaria citrea</i>	neotropical migrant	expected	
northern parula	<i>Parula americana</i>	neotropical migrant	expected	B,M
yellow warbler	<i>Dendroica petechia</i>	neotropical migrant	expected	
chestnut-sided warbler ^c	<i>Dendroica pensylvanica</i>	neotropical migrant	expected	
Cape May warbler ^c	<i>Dendroica tigrina</i>	neotropical migrant	expected	M
magnolia warbler ^c	<i>Dendroica magnolia</i>	neotropical migrant	expected	M
black-throated blue warbler ^c	<i>Dendroica caerulescens</i>	neotropical migrant	expected	M
yellow-rumped warbler ^b	<i>Dendroica coronata</i>	temperate migrant	expected	W,M
black-throated green warbler ^c	<i>Dendroica virens</i>	neotropical migrant	expected	M
prairie warbler	<i>Dendroica discolor</i>	neotropical migrant	expected	
bay-breasted warbler ^c	<i>Dendroica castanea</i>	neotropical migrant	expected	M
blackpoll warbler ^c	<i>Dendroica striata</i>	neotropical migrant	expected	M
pine warbler	<i>Dendroica pinus</i>	temperate migrant	expected	B,M
palm warbler ^c	<i>Dendroica palmarum</i>	temperate migrant	expected	M
yellow-throated warbler	<i>Dendroica dominica</i>	neotropical migrant	expected	
worm-eating warbler	<i>Helmitheros vermivorus</i>	neotropical migrant	expected	
black-and-white warbler	<i>Mniotilta varia</i>	neotropical migrant	expected	M
American redstart	<i>Setophaga ruticilla</i>	neotropical migrant	expected	M
ovenbird	<i>Seiurus aurocapillus</i>	neotropical migrant	expected	B,M
Louisiana waterthrush	<i>Seiurus motacilla</i>	neotropical migrant	expected	B,M
northern waterthrush ^c	<i>Seiurus noveboracensis</i>	neotropical migrant	expected	M
Kentucky warbler	<i>Oporornis formosus</i>	neotropical migrant	expected	
common yellowthroat	<i>Geothlypis trichas</i>	temperate migrant	expected	
hooded warbler	<i>Wilsonia citrina</i>	neotropical migrant	expected	
yellow-breasted chat	<i>Icteria virens</i>	neotropical migrant	expected	M
summer tanager	<i>Piranga rubra</i>	neotropical migrant	expected	
scarlet tanager	<i>Piranga olivacea</i>	neotropical migrant	expected	B,M
northern cardinal	<i>Cardinalis cardinalis</i>	resident	expected	B,W,M
rose-breasted grosbeak ^c	<i>Pheucticus ludovicianus</i>	neotropical migrant	expected	

Appendix C. List of species expected and detected during 2003 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Expected	Detected ^a
blue grosbeak	<i>Guiraca caerulea</i>	neotropical migrant	expected	B,M
indigo bunting	<i>Passerina cyanea</i>	neotropical migrant	expected	B,M
eastern towhee	<i>Pipilo erythrophthalmus</i>	temperate migrant	expected	B,M
field sparrow	<i>Spizella pusilla</i>	temperate migrant	expected	B
chipping sparrow	<i>Spizella passerina</i>	temperate migrant	expected	B,M
grasshopper sparrow	<i>Ammodramus savannarum</i>	temperate migrant	expected	B,M
savannah sparrow ^b	<i>Passerculus sandwichensis</i>	temperate migrant	expected	
white-throated sparrow ^b	<i>Zonotrichia albicollis</i>	temperate migrant	expected	W,M
white-crowned sparrow ^b	<i>Zonotrichia leucophrys</i>	temperate migrant	expected	W
fox sparrow ^b	<i>Passerella iliaca</i>	temperate migrant	expected	W
song sparrow	<i>Melospiza melodia</i>	temperate migrant	expected	M
swamp sparrow ^b	<i>Melospiza georgiana</i>	temperate migrant	expected	M
vesper sparrow	<i>Pooecetes gramineus</i>	temperate migrant	expected	
dark-eyed junco ^b	<i>Junco hyemalis</i>	temperate migrant	expected	W
eastern meadowlark	<i>Sturnella magna</i>	temperate migrant	expected	B,W,M
brown-headed cowbird	<i>Molothrus ater</i>	temperate migrant	expected	B,M
red-winged blackbird	<i>Agelaius phoeniceus</i>	temperate migrant	expected	M
common grackle	<i>Quiscalus quiscula</i>	temperate migrant	expected	B,M
Baltimore oriole	<i>Icterus galbula</i>	neotropical migrant	expected	
orchard oriole	<i>Icterus spurius</i>	neotropical migrant	expected	B,M
purple finch ^b	<i>Carpodacus purpureus</i>	temperate migrant	expected	M
house finch	<i>Carpodacus mexicanus</i>	resident	expected	B,W,M
American goldfinch	<i>Carduelis tristis</i>	temperate migrant	expected	B,W,M
house sparrow	<i>Passer domesticus</i>	resident	expected	B,W,M

^a Birds detected during 2003 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.

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

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

Appendix D. North American Datum 1983 (NAD83) Universal Transverse Mercator (UTM) coordinates and habitat descriptions for bird point count survey locations visited in 2003 at Booker T. Washington National Monument, Virginia.

Point #	UTM-East	UTM-North	Habitat Description
1	612678	4109067	Grassland
2	612751	4108780	Animal Feedlot – Paddock
3	612801	4108517	Mixed Forest
4	612913	4108021	Mixed Forest
5	612580	4107728	Riparian Forest
6	612622	4108013	Mature Deciduous Forest
7	612370	4108313	Mixed Forest
8	612623	4108350	Grassland
9	612467	4108883	Edge (Forest/Field)
10	612382	4109122	Edge (Forest/Field)

Appendix E. Habitat descriptions and total area for locations surveyed using the area search technique during 2003 at Booker T. Washington National Monument, Virginia.

Area Location	Habitat Description	Total Area (ha)
1	Grassland	0.52
2	Grassland	0.72
3	Grassland	0.16
4	Grassland	0.80
A	Mixed Mature Forest	0.55
B	Mixed Mature Forest	0.67
C	Mixed Mature Forest	0.46
D	Mixed Mature Forest	1.62
E	Mixed Mature Forest	2.05
X	Animal Feed Lot	0.27

Appendix F. Avian species detected between October 1993 and April 2009 at Booker T. Washington National Monument, Virginia.

Common Name	Scientific Name	Migratory Status	Detected ^a
great blue heron	<i>Ardea herodias</i>	temperate migrant	M
Canada Goose	<i>Branta canadensis</i>	temperate migrant	B,W,M
wood duck	<i>Aix sponsa</i>	temperate migrant	B,W,M
mallard	<i>Anas platyrhynchos</i>	temperate migrant	B,W,M
turkey vulture	<i>Cathartes aura</i>	neotropical migrant	B,W,M
black vulture	<i>Coragyps atratus</i>	neotropical migrant	W,M
osprey	<i>Pandion haliaetus</i>	temperate migrant	M
sharp-shinned hawk	<i>Accipiter striatus</i>	temperate migrant	W,M
Cooper's hawk	<i>Accipiter cooperii</i>	temperate migrant	W,M
red-shouldered hawk	<i>Buteo lineatus</i>	temperate migrant	W
broad-winged hawk	<i>Buteo platypterus</i>	neotropical migrant	B,M
red-tailed hawk	<i>Buteo jamaicensis</i>	temperate migrant	B,W,M
ruffed grouse	<i>Bonasa umbellus</i>	resident	M
northern bobwhite	<i>Colinus virginianus</i>	resident	B
wild turkey	<i>Meleagris gallopavo</i>	resident	B,W,M
killdeer	<i>Charadrius vociferus</i>	temperate migrant	M
Wilson's snipe	<i>Gallinago delicata</i>	temperate migrant	M
American woodcock	<i>Scolopax minor</i>	temperate migrant	M
mourning dove	<i>Zenaida macroura</i>	temperate migrant	B,W,M
yellow-billed cuckoo	<i>Coccyzus americanus</i>	neotropical migrant	B,M
great horned owl	<i>Bubo virginianus</i>	resident	B,W,M
eastern screech owl	<i>Otus asio</i>	resident	B,W,M
common nighthawk	<i>Chordeiles minor</i>	neotropical migrant	M
whip-poor-will	<i>Caprimulgus vociferus</i>	temperate migrant	M
chimney swift	<i>Chaetura pelagica</i>	neotropical migrant	B,M
ruby-throated hummingbird	<i>Archilochus colubris</i>	neotropical migrant	B,M
belted kingfisher	<i>Ceryle alcyon</i>	temperate migrant	B,W,M
red-bellied woodpecker	<i>Melanerpes carolinus</i>	resident	B,W,M
yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	temperate migrant	W,M
downy woodpecker	<i>Picoides pubescens</i>	resident	B,W,M
hairy woodpecker	<i>Picoides villosus</i>	resident	B,W,M
northern flicker	<i>Colaptes auratus</i>	temperate migrant	B,W,M

Appendix F. Avian species detected between October 1993 and April 2009 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Detected ^a
pileated woodpecker	<i>Dryocopus pileatus</i>	resident	B,W,M
eastern wood-pewee	<i>Contopus virens</i>	neotropical migrant	B,M
Acadian flycatcher	<i>Empidonax virescens</i>	neotropical migrant	B,M
eastern phoebe	<i>Sayornis phoebe</i>	neotropical migrant	B,W,M
great crested flycatcher	<i>Myiarchus crinitus</i>	neotropical migrant	B,M
eastern kingbird	<i>Tyrannus tyrannus</i>	neotropical migrant	B,M
red-eyed vireo	<i>Vireo olivaceus</i>	neotropical migrant	B,M
yellow-throated vireo	<i>Vireo flavifrons</i>	neotropical migrant	B,M
blue-headed vireo	<i>Vireo solitarius</i>	temperate migrant	B,M
warbling vireo	<i>Vireo gilvus</i>	neotropical migrant	M
blue jay	<i>Cyanocitta cristata</i>	temperate migrant	B,W,M
American crow	<i>Corvus brachyrhynchos</i>	resident	B,W,M
common raven	<i>Corvus corax</i>	resident	B,W,M
purple martin	<i>Progne subis</i>	neotropical migrant	B,M
tree swallow	<i>Tachycineta bicolor</i>	neotropical migrant	B,M
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	neotropical migrant	B,M
barn swallow	<i>Hirundo rustica</i>	neotropical migrant	B,M
eastern tufted titmouse	<i>Baeolophus bicolor</i>	resident	B,W,M
black-capped chickadee	<i>Poecile atricapilla</i>	temperate migrant	W,M
Carolina chickadee	<i>Poecile carolinensis</i>	resident	B,W,M
white-breasted nuthatch	<i>Sitta carolinensis</i>	resident	B,W,M
red-breasted nuthatch	<i>Sitta canadensis</i>	temperate migrant	W,M
brown creeper	<i>Certhia americana</i>	temperate migrant	W,M
Carolina wren	<i>Thryothorus ludovicianus</i>	resident	B,W,M
winter wren	<i>Troglodytes troglodytes</i>	temperate migrant	W,M
golden-crowned kinglet	<i>Regulus satrapa</i>	temperate migrant	W,M
ruby-crowned kinglet	<i>Regulus calendula</i>	temperate migrant	W,M
blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	neotropical migrant	B,M
eastern bluebird	<i>Sialia sialis</i>	temperate migrant	B,W,M
American robin	<i>Turdus migratorius</i>	temperate migrant	B,W,M
wood thrush	<i>Hylocichla mustelina</i>	neotropical migrant	B,M
veery	<i>Catharus fuscescens</i>	neotropical migrant	M

Appendix F. Avian species detected between October 1993 and April 2009 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Detected ^a
Swainson's thrush	<i>Catharus ustulatus</i>	neotropical migrant	M
hermit thrush	<i>Catharus guttatus</i>	temperate migrant	W,M
gray catbird	<i>Dumetella carolinensis</i>	temperate migrant	M
northern mockingbird	<i>Mimus polyglottos</i>	resident	B,W,M
brown thrasher	<i>Toxostoma rufum</i>	temperate migrant	B,M
American pipit	<i>Anthus rubescens</i>	temperate migrant	W
European starling	<i>Sturnus vulgaris</i>	resident	B,W,M
cedar waxwing	<i>Bombycilla cedrorum</i>	temperate migrant	B,W,M
Nashville warbler	<i>Vermivora ruficapilla</i>	neotropical migrant	M
northern parula	<i>Parula americana</i>	neotropical migrant	B,M
yellow warbler	<i>Dendroica petechia</i>	neotropical migrant	M
chestnut-sided warbler	<i>Dendroica pensylvanica</i>	neotropical migrant	M
Cape May warbler	<i>Dendroica tigrina</i>	neotropical migrant	M
magnolia warbler	<i>Dendroica magnolia</i>	neotropical migrant	M
black-throated blue warbler	<i>Dendroica caerulescens</i>	neotropical migrant	M
cerulean warbler	<i>Dendroica cerulea</i>	neotropical migrant	M
blackburnian warbler	<i>Dendroica fusca</i>	neotropical migrant	M
yellow-rumped warbler	<i>Dendroica coronata</i>	temperate migrant	W,M
black-throated green warbler	<i>Dendroica virens</i>	neotropical migrant	M
bay-breasted warbler	<i>Dendroica castanea</i>	neotropical migrant	M
blackpoll warbler	<i>Dendroica striata</i>	neotropical migrant	M
pine warbler	<i>Dendroica pinus</i>	temperate migrant	B,W,M
palm warbler	<i>Dendroica palmarum</i>	temperate migrant	M
yellow-throated warbler	<i>Dendroica dominica</i>	neotropical migrant	M
worm-eating warbler	<i>Helmitheros vermivorus</i>	neotropical migrant	M
black-and-white warbler	<i>Mniotilta varia</i>	neotropical migrant	M
American redstart	<i>Setophaga ruticilla</i>	neotropical migrant	M
ovenbird	<i>Seiurus aurocapillus</i>	neotropical migrant	B,M
Louisiana waterthrush	<i>Seiurus motacilla</i>	neotropical migrant	B,M
northern waterthrush	<i>Seiurus noveboracensis</i>	neotropical migrant	M
common yellowthroat	<i>Geothlypis trichas</i>	temperate migrant	M
hooded warbler	<i>Wilsonia citrina</i>	neotropical migrant	M

Appendix F. Avian species detected between October 1993 and April 2009 at Booker T. Washington National Monument, Virginia (continued).

Common Name	Scientific Name	Migratory Status	Detected ^a
yellow-breasted chat	<i>Icteria virens</i>	neotropical migrant	M
summer tanager	<i>Piranga rubra</i>	neotropical migrant	B,M
scarlet tanager	<i>Piranga olivacea</i>	neotropical migrant	B,M
northern cardinal	<i>Cardinalis cardinalis</i>	resident	B,W,M
rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	neotropical migrant	M
blue grosbeak	<i>Guiraca caerulea</i>	neotropical migrant	B,M
indigo bunting	<i>Passerina cyanea</i>	neotropical migrant	B,M
eastern towhee	<i>Pipilo erythrophthalmus</i>	temperate migrant	B,M
field sparrow	<i>Spizella pusilla</i>	temperate migrant	B,W,M
chipping sparrow	<i>Spizella passerina</i>	temperate migrant	B,M
grasshopper sparrow	<i>Ammodramus savannarum</i>	temperate migrant	B,M
white-throated sparrow	<i>Zonotrichia albicollis</i>	temperate migrant	W,M
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	temperate migrant	W
fox sparrow	<i>Passerella iliaca</i>	temperate migrant	W
song sparrow	<i>Melospiza melodia</i>	temperate migrant	B,W,M
swamp sparrow	<i>Melospiza georgiana</i>	temperate migrant	M
dark-eyed junco	<i>Junco hyemalis</i>	temperate migrant	W,M
eastern meadowlark	<i>Sturnella magna</i>	temperate migrant	B,W,M
brown-headed cowbird	<i>Molothrus ater</i>	temperate migrant	B,M
red-winged blackbird	<i>Agelaius phoeniceus</i>	temperate migrant	M
common grackle	<i>Quiscalus quiscula</i>	temperate migrant	B,M
Baltimore oriole	<i>Icterus galbula</i>	neotropical migrant	M
orchard oriole	<i>Icterus spurius</i>	neotropical migrant	B,M
purple finch	<i>Carpodacus purpureus</i>	temperate migrant	M
house finch	<i>Carpodacus mexicanus</i>	resident	B,W,M
American goldfinch	<i>Carduelis tristis</i>	temperate migrant	B,W,M
house sparrow	<i>Passer domesticus</i>	resident	B,W,M

^a Birds detected between 1993 and 2009 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.

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.

National Park Service
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