

National Park Service
U.S. Department of the Interior

Northeast Region
Philadelphia, Pennsylvania



Richmond National Battlefield Park Avian Inventory

Technical Report NPS/NER/NRTR—2007/074



ON THE COVER

Canada Goose - Dana Bradshaw (top left)

Scarlet Tanager - Dana Bradshaw (bottom left)

Great Egret - Dana Bradshaw (center)

Red-shouldered Hawk - Dana Bradshaw (top right)

Prothonotary Warbler - A.H. Environmental (bottom right)

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December 2007

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Abstract

A comprehensive, year-round inventory of birds was conducted at Richmond National Battlefield Park (RICH) in 2003 and 2004. The inventory yielded 151 species collectively on the eight land units that comprise RICH, documenting over 95% of the species that would have been expected to occur. Only one threatened and endangered species was detected; the bald eagle (*Haliaeetus leucocephalus*), although it does not nest on the park. A total of 26 additional species observed are recognized as state species of special concern, federal species of conservation concern, or priority species under national conservation initiatives.

Major factors contributing to the bird profile of RICH are the small size of the individual land units, resulting in generally small habitat patches and relatively low bird diversity. Likewise, the near absence of fallow fields suitable for grassland species and a paucity of shrubland habitats relegated early successional species to a minority of the total species pool. The most redeeming feature of the park was the presence of forested wetlands in all but one of the units. These habitats harbored a significant portion of the bird diversity and were the single most valuable attribute of the park. Some extenuating circumstances that may influence bird diversity at RICH include the effects of Hurricane Isabel in September 2003—which resulted in extensive loss of mature trees in several of the units. In addition to compromising these important habitats, this may also serve to exacerbate the spread of invasive plants which have established a noticeable presence in most of the units.

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 those 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 Richmond National Battlefield Park (RICH), located in and around the city of Richmond, 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 the presence of new species. 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; Sauer et. al 2005). The list is comprised of 156 species, of which, 98 were species expected to occur during breeding season, 30 were expected as wintering species, and 28 were expected to occur only as transient migrants.

Study Area

Richmond National Battlefield Park is a moderate sized park within the Northeast Region Mid-Atlantic Network of parks. It encompasses some 566 ha (1,400 ac) across eight independent land units (Table 1). The eight park units are roughly segregated into two clusters along a north/south axis (Figure 1). The northern cluster from west to east includes Chickahominy Bluffs, Beaver Dam Creek, Gaines Mill, and Cold Harbor units. The southern cluster, separated by about 15 k (9 mi) from the northern units, runs west to east with Fort Darling, Parker's Battery, Fort Harrison, and Malvern Hill units. The James River separates Fort Darling and Parker's Battery from the latter two units.

All units are east and south of the city of Richmond, Virginia, placing them near the divide between Coastal Plain and Piedmont. As such, the features of the park share characteristics of both physiographic areas, from extensive floodplain wetlands to steep forested slopes. Units vary considerably in their landscape context, however. Chickahominy Bluffs and Beaver Dam Creek are embedded in an urban/suburban landscape. Fort Darling and Parker's Battery are both sandwiched within industrial complexes, themselves surrounded by urbanization. The remaining four units, Gaines Mill, Cold Harbor, Fort Harrison and Malvern Hill, all represent the typical Coastal Plain mosaic of agriculture and forest land interlaced with streams, creeks, and rural, low density housing. Malvern Hill, the largest unit, is also the most rural, surrounded in all directions by forest and farmland for several kilometers.

Habitat Types

Although individual units at RICH are typically small; they collectively comprised a broad diversity of cover types. Nine different habitats were identified for this project based on field observations and discernable aerial photography signatures:

Residential

Residential is the name used to reference all open areas with lawns and buildings present. It was not a common habitat type, since it primarily referred to the building complex at Fort Harrison and the Visitor Center areas at Cold Harbor and Gaines Mill. However, it harbors a unique bird community relative to the other open habitats.

Table 1. Units of Richmond National Battlefield Park and their relative area.

Unit	Hectares	Acres
Chickahominy Bluffs (CB)	16	39
Beaver Dam Creek (BC)	6.5	16
Gaines Mill (GM)	24	60
Cold Harbor (CH)	60	149
Fort Darling (FD)	15	36
Parker's Battery (PB)	4	10
Fort Harrison (FH)	126	312
Malvern Hill (MH)	314	776
Total	565.5	1,398

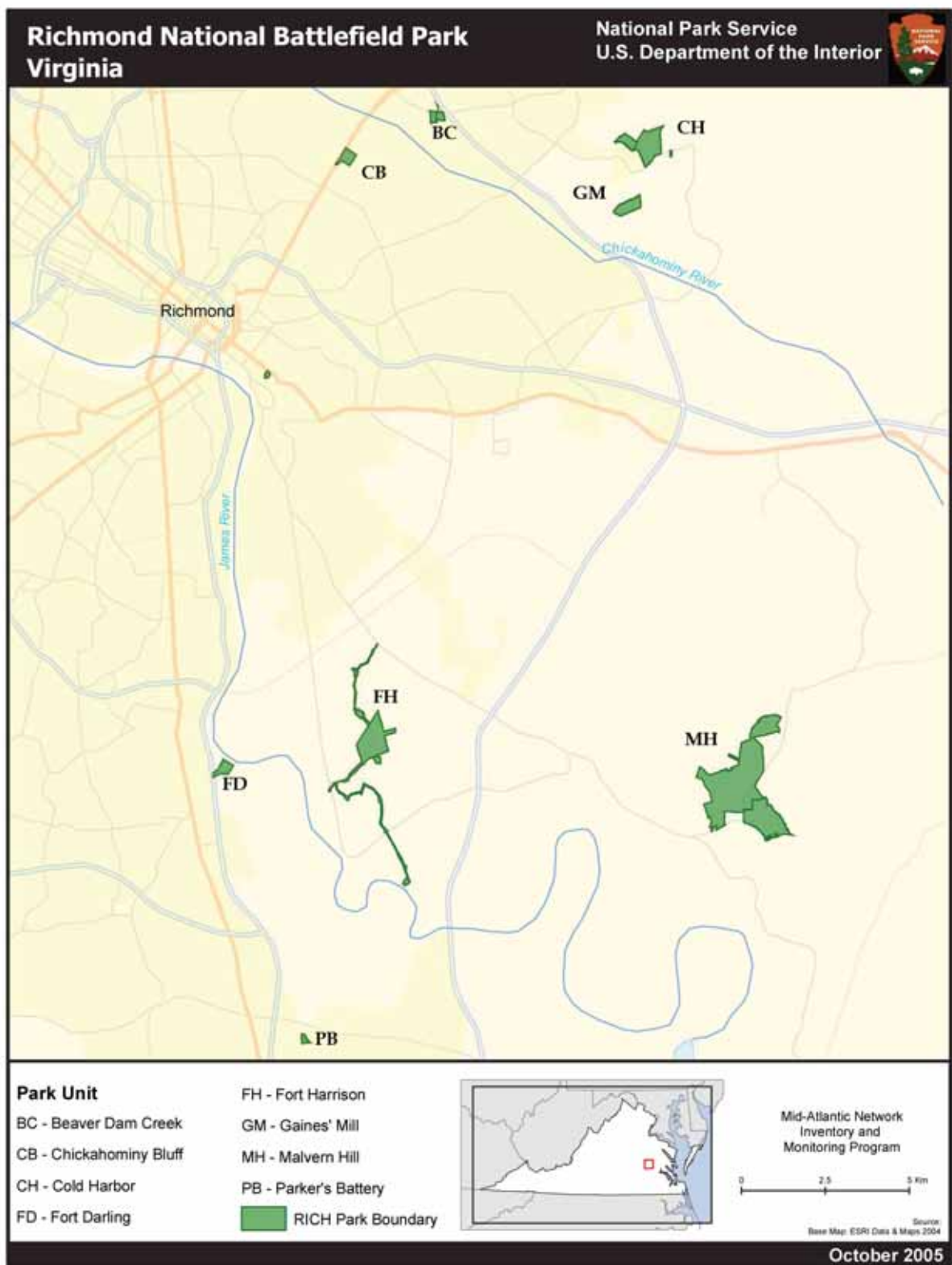


Figure 1. Distribution of Richmond National Battlefield Park units.

Edge

Edge 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 prey but remain associated most closely with the forest edge.

Grassland

Grassland implies any pasture, agriculture, or fallow field at less than shrub stage (having less than 5% woody vegetation), excluding lawns. All but one unit had at least some grassland component; although most of those areas were in active agriculture.

Forested Wetland

Forested wetland cover type includes all age classes of emergent woody or forested wetland. This typically referenced bottomland hardwood sites dominated by bald cypress (*Taxodium distichum*), black gum (*Nyssa sylvatica*), and/or red maple (*Acer rubrum*); however, there was one loblolly pine (*Pinus taeda*) dominated wetland and one scrub/shrub wetland dominated by red maple and sweetgum (*Liquidambar styraciflua*) saplings.

Scrub/Shrub

Scrub/shrub 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. The habitat is primarily shrub habitat, but may include a significant percentage of sapling trees. At RICH, this habitat was typically comprised of shrubs, such as blackberry (*Rubus* sp.), sumac (*Rhus* sp.), and multiflora rose (*Rosa multiflora*), as well as small trees such as cherry (*Prunus* sp.), locust (*Gleditsia triacanthos*), and loblolly pine seedlings.

Pine Plantation (Seedling/Sapling):

Pine plantation (seedling/sapling) implies a regenerating loblolly pine stand in its first few years after seeding. The pine seedlings co-occur with grasses and herbaceous vegetation during the first three to four years after seeding. The pines then mature into a dense shrub stage for the next several years—eventually blocking sunlight to the ground and precluding the continued presence of a grassy or herbaceous understory. This habitat differs from shrub/scrub habitats due to the homogeneity of the stand composition through all growth phases. It is an even-aged seral stage that maintains a predictable succession, lacking the openness of true grasslands and the heterogeneity of shrub/scrub habitats. This habitat only exists at Malvern Hill.

Pine Plantation (Pole Stage)

Pine plantation (pole stage) references monoculture loblolly pine stands in the 10–20 year age class. These are typically dense stands with little or no understory and midstory components and

typically very low in bird diversity. It was a common habitat type at Malvern Hill, but was absent from other units.

Mixed Forest

Mixed forest cover type assumes a relatively evenly mixed stand of loblolly pine and hardwoods (dominated by tulip poplar [*Liriodendron tulipifera*], red maple, sweetgum, hickory [*Carya* sp.], American beech [*Fagus grandifolia*], and several oak species [*Quercus* sp.]). This forest type is usually not mature, but in an advanced second-growth phase, usually still containing a moderate to dense midstory and understory. Midstory vegetation is typically dominated by such species as American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), and sweetbay (*Magnolia virginiana*), with an understory typically of sweet pepperbush (*Clethra alnifolia*), laurel (*Kalmia* sp.), blueberry (*Vaccinium* sp.), and/or saplings of overstory species.

Mature Hardwood Forest

The mature hardwood forest habitat 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 rich in biomass. Typical species include oaks, hickories, American beech, and tulip poplar as the most common, followed by sweetgum and red maple as secondary species.

Methodology

Expected Species List Development

An expected species list for the park was generated from several sources prior to initiating field surveys. An initial breeding species list was assembled from data taken from The Virginia Breeding Bird Atlas Project 1985–1989 (Trollinger and Reay 2001). Data were compiled from a survey area that extended five USGS 7½ minute topo maps wide by five topos high that was centered around the cluster of RICH park units. Additional data were collected using results from over 20 years of data from the six nearest Breeding Bird Survey routes that surround RICH in all directions (no routes actually contain any portions of the RICH units). Finally, field guide range maps (Peterson 1980; Sibley 2000) were consulted along with over 60 years of combined local knowledge of the area avifauna (CCB Staff). These lists then were consolidated and edited to reflect only those species that would be subject to occur within the habitats known to exist at RICH. Likewise, a list of spring and fall migrants expected to utilize habitats at RICH 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). The winter list had the most applicable source data because portions of RICH lie within the boundary of a Christmas Bird Count circle (Hopewell). A total of 156 species was expected to occur at RICH, of which 98 species were expected during the breeding season (Appendix A), 30 species were expected in winter (Appendix B), and 28 species were expected to occur 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 at areas close to RICH. Winter birds included only those birds unique to the winter season; typically temperate migrants that do not also breed at the latitude of RICH. And transient migrants included only those migrants known to not breed or winter in Virginia, but utilize RICH only as a “refueling” (stopover) area en route to points north or south.

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 NPS along with the most current park unit boundary shapefiles. Upon examination of the imagery, all significant habitat types were noted for each park unit along with size and distribution of each. Any trails, roads, or other access points were noted as well, for use in establishing the most efficient survey routes. Potential survey points were laid out on the imagery to give 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 primarily due to the extremely small size of many of the units in conjunction with the rather large minimum distance (250 m [656 ft]) between points that

was required to ensure point independence (Ralph 1993). As a result, some of the units could only accommodate two or three points; therefore, it was important that these points were situated in a way that gave the best representation of habitats available. Habitat descriptions and point distribution for each unit were generated as follows:

Chickahominy Bluffs

This unit is dominated by a mixed forest that is bisected by a county service road running west to east through the mid-point (Figure 2). The northern half of the unit is characterized by a forested wetland dominated by cypress, maple, blackgum, and scattered upper canopy loblolly pines. The southern half is dominated by mixed forest with more tulip poplar and red maple present along with a minority of oaks and hickories. A viewing platform overlooks a small (0.25 ha [0.62 ac]) sloped grassland, with a manicured grassy 1.5 ha (3.7 ac) entranceway and parking area. The southern half reaches an elevation some 20 m (66 ft) higher than the northern component. State Rte. 360, a four-lane highway, runs directly adjacent to the western edge of this unit and a transmission line corridor marks the northern boundary. Residential development dominates the landscape on both sides.

Beaver Dam Creek

This unit is dominated by an emergent wetland through which a creek runs that feeds into the Chickahominy River less than 0.5 k (0.3 mi) (Figure 3). The unit is linear, following the run of the creek, and is sandwiched between dense residential development. Its northern boundary is State Rte. 156 which bridges the creek at the park boundary. The only other vegetation is found in two areas of more traditional forested wetland occupying the northwest and southeast corners of the unit with scrubby hardwoods.



Figure 2. Map showing locations of sample points at Chickahominy Bluffs Unit, Richmond National Battlefield Park, VA.



Figure 3. Map showing locations of sample points at Beaver Dam Creek Unit, Richmond National Battlefield Park, VA.

Gaines Mill

Approximately 20 percent of this unit (Figure 4) is taken up by grasslands in agricultural use and a small residential site with a few large shade trees and ornamentals. The remaining 80 percent is comprised of mature mixed forest. A creek runs through the long axis of the forest creating at least two linear hectares of forested wetland. Hollies are a dominant sub-canopy species on the higher slopes of the upland forest with mature oaks, beech, and tulip poplar dominating the deciduous canopy. Mature loblolly pines dominate the higher and drier slopes.

Cold Harbor

This unit is divided into 3 distinct habitat types (Figure 5), with grasslands covering 10 percent, forested wetlands covering 10 percent, and the remainder in mixed forest. The grasslands are primarily pasture type grasses, while the forested wetlands are comprised primarily of mature mast-producing hardwoods that line a small creek. The mixed forest contains an even mix of loblolly pine and various oaks, hickories, and dogwoods. The exception is a 2 hectare area near the center of the unit that is devoid of understory and comprised of only large, over-mature loblolly pines, widely scattered across the area.



Figure 4. Map showing locations of sample points at Gaines Mill Unit, Richmond National Battlefield Park, VA.



Figure 5. Map showing locations of sample points at Cold Harbor Unit, Richmond National Battlefield Park, VA.

Fort Darling

Also known as Drewry's Bluff, this unit sits atop a high bluff along the James River, sandwiched between Interstate 95 on one end and industrial complexes to either side (Figure 6). An entrance road enters the unit by the side of a 3.5 ha (8.6 ac) early successional grassland. The circular parking area then wraps around just ahead, inside the edge of a mature deciduous forest. This forest is one of the best examples of a mature hardwood forest dominated by mast producing oaks, hickories, and beech occurring anywhere on the James River. However, it covers only 10 ha (24.7 ac), including a little over 1 ha (2.5 ac) of forested wetlands.

Parker's Battery

At 4 ha (9.9 ac) this unit (Figure 7) is comprised primarily of a small upland, mixed forest block dominated by mature pines with a subcanopy of hardwood shrubs and young trees. The only other component is a 1 ha (2.5 ac) transitional grassland that occupies a portion of a utility line corridor. The unit is sandwiched within a mosaic of roads and industrial buildings with little other natural habitat nearby.



Figure 6. Map showing locations of sample points at Fort Darling Unit, Richmond National Battlefield Park, VA.



Figure 7. Map showing locations of sample points at Parker's Battery Unit, Richmond National Battlefield Park, VA.

Fort Harrison

This unit is the most linear of the RICH units, as much of its area is comprised of a narrow corridor on either side of the historical road that links a number of Civil War forts. The road winds through low density residential, agricultural, and mixed forest land. In only one significant area does the boundary spread out to encompass some 80 ha (197.6 ac) of land in something of a diamond shape (Fort Harrison and associated operations buildings; Figure 8). This area is dominated by mixed forest. A visitor center, picnic area, and offices break the forest up into small open units of areas with scattered shade trees. At least three distinct areas contain forested wetlands, although they are primarily dominated by pines. The terminal end of this linear unit stops at the bank of the James River where a final fort site (Fort Brady) indicates the presence of a small stand of mature hardwoods and scrub/shrub edge habitat (Figure 9) Only portions of this Park unit that contain survey points are shown in Figures 8 and 9.



Figure 8. Map showing locations of sample points in the central section of Fort Harrison Unit, Richmond National Battlefield Park, VA.



Figure 9. Map showing location of a sample point in Port Bradley section of Fort Harrison Unit, Richmond National Battlefield Park, VA.

Malvern Hill

The largest unit, by a considerable margin, Malvern Hill (Figure10) also has several habitat types unique to RICH. First and foremost is the presence of an open body of water. A dam and dike within the creek known as Crew's Channel holds back some 4 ha (9.9 ac) of open water throughout the year. In addition, there are at least 50 ha (123.5 ac) of forested wetlands throughout the unit. Other unique habitats include a 28 ha (69 ac) pine plantation in the seedling/sapling stage and a 35+ ha (86.5+ ac) pole stage pine stand. The unit also contains some 26 ha (64 ac) of grassland that is actively farmed each year. The remaining area is dominated by mixed forest biased toward hardwoods. There are at least three 30+ ha (74+ ac) stands of mature, mast-producing hardwoods, with only a small proportion of pines. The unit is segregated into three components by two state secondary roads.

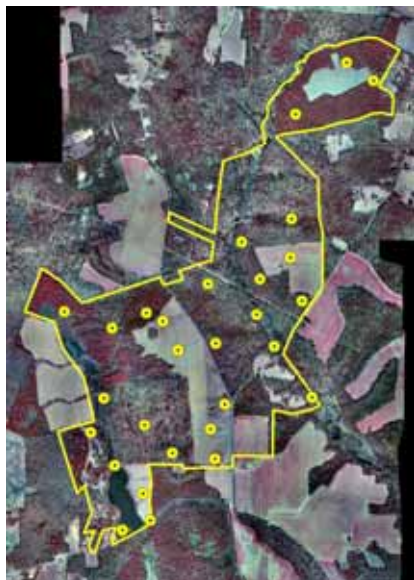


Figure 10. Map showing location of sample points at Malvern Hill Unit, Richmond National Battlefield Park, VA.

Field Surveys

In order to effectively inventory bird communities at RICH, 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 RICH 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 of segregating time segments and stratifying count distances 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 53 points, distributed between different habitat types and park units, were sampled over the course of the survey period (Appendix D). All breeding season surveys were initiated at sunrise and terminated not later than four hours after sunrise. Surveys assumed reasonably fair weather and light winds. No surveys were undertaken in heavy rain or winds exceeding an average of 15 mph. Each point was surveyed twice during a single breeding season, referenced in this project as 1 June to 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 as the total number of individuals of a species detected within the 50m (164 ft) radius of a point divided by the total number of individuals of all species detected within 50 m at that point for all point counts conducted during the breeding season. The data were analyzed using Statistica v6.1 (Statsoft Inc. 1984–2003) and presented in tabular form representing relative abundance, as a percentage, for species detected by unit and for species detected by habitat type for each of the nine primary habitat categories across all units combined.

Migration Surveys

A secondary objective of this project was to assess bird use of respective park units during migration and winter to better develop a year round profile of bird diversity at RICH. 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 units and their habitats for areas of significant importance to migrants as foraging or staging areas during peak times of migration. For this purpose, three 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. And finally, area searches were conducted in many small habitat patches to evaluate migrant diversity and abundance. Migration surveys for passerines were conducted during the first four hours after sunrise. The migration periods were recognized as 15 March to 31 May and 15 August to 15 November; although, the bulk of the migration survey effort was undertaken between 15 April and 15 May, which covers the peak of the spring passerine migration in eastern Virginia.

Winter Surveys

Winter surveys were conducted similar to those during migration. Given the tendencies of birds to form mixed-species foraging flocks during winter and adopt a more nomadic existence, there is tremendous heterogeneity in bird distribution across a given habitat (Morse 1970). As a result, winter survey work made use of all techniques again: point counts, transects, and area searches. Winter data were not collected for analysis, but only for building a winter species profile for each unit. An initial survey was conducted at each permanent survey point as the points were originally established in January 2003. Surveys were conducted throughout the day, with the emphasis on the first five hours 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 and 15 March.

Grassland Surveys

In addition to point counts in some of the agricultural fields and open areas, transect surveys were also conducted in all open fields that exceeded 1 ha (2.47 ac) in size. Transects were used to supplement breeding season point counts 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 (Watts et al. 1997). Transects were used as the primary survey method in grassland habitats for winter and fall migration surveys; primarily to determine presence/absence of birds, rather than density.

Audio-playback Surveys

Several species groups, including nocturnal species and birds of prey, are not readily detected by conventional passerine survey techniques. Among the nocturnal species, nightjars and owls are the two groups of relevance at RICH. As a result, night surveys were conducted using taped playbacks of conspecific calls for each species of interest. Chuck-will's-widows and Whip-poor-wills (bird species' scientific names can be located throughout the various appendixes) were surveyed from roadsides adjacent to habitat interfaces at each unit. 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 (Wilson and Watts 2000). This sequence was followed for both species at each stop. The same protocol was followed on a second date, but with the species reversed. Surveys were conducted only on calm nights with clear skies and at least some moonlight.

Owls were surveyed from roadsides and/or forest interior locations, depending on habitat conditions. Four species were targeted: great horned owl, barred owl, barn owl, and eastern screech owl. The same sequence of playing and listening was done for owls as for nightjars. Distance between survey points for both owls and nightjars was a minimum of 1 km (0.6 mi).

Results

Inventory Results

One hundred fifty-one bird species were detected during the two-year inventory (Table 2). Of these, 75 species were confirmed or suspected of breeding, based on repeated observations within appropriate habitat during the breeding season. An additional 21 species known to breed locally within the region were observed in the park; at least half of these may ultimately breed in the park as habitat conditions change over time. Another 28 species were detected as transients only during spring and/or fall migration. Also, 28 species were detected as wintering birds only (Table 3). These results represent 97% of the species expected to occur during the breeding season, 100% of the migration period species, and 93% of the wintering season species (Table 4).

Species Relative Abundance Data

Relative abundance data were calculated for all breeding season survey points for each unit, and for all units by habitat type. Data were limited to that collected within the 50 m survey radius due to the typically small size of units and habitat patches and subsequent attempt to restrict inclusion of species from extraneous habitats.

Table 5 provides an overview of the avian species composition of RICH units. The two most abundant species across nearly all units were blue-gray gnatcatcher and red-eyed vireo, both neotropical migrants and both indicative of mixed forest habitats. Likewise, the next several species in order of overall abundance were northern cardinal, tufted titmouse, Carolina chickadee, and American robin, all primarily edge species or species prominent in small woodlots. These two sets of species accurately reflect the profile of RICH as a complex of primarily small or fragmented, mixed-forest habitats.

Forested wetlands emerged as the most significant habitat type in terms of number of species detected, number of priority species, and proportion of neotropical migrants (Tables 6 and 7). This was followed by mixed forest and scrub/shrub habitats, two other priority habitats in the region (Watts 1999). The continuing decline in these habitats has placed many of the species they harbor in need of management attention, and therefore places a premium on the conservation of these habitats. The only habitat that did not emerge as expected was the grassland habitat. Although a critical habitat in the region, the majority of grasslands at RICH were dominated by sod-forming grasses which preclude use by most grassland obligate species (Askins 1993). Therefore the grasslands were usually not of adequate quality to support priority grassland species.

Table 2. Species detected by seasonal status at Richmond National Battlefield Park, VA, during inventories conducted in 2003–2004¹.

#	Species	Migration Status	Park Units ²							
			BC	CB	CH	FD	FH	GM	MH	PB
1	pied-billed grebe	temperate migrant							W	
2	double-crested cormorant	temperate migrant				b	b		b	
3	great blue heron	temperate migrant	b			b	b	b	b	
4	great egret	neotropical migrant							b	
5	green heron	neotropical migrant	b						b	
6	Canada goose	temperate migrant							b	
7	wood duck	temperate migrant	B					B	B	
8	mallard	temperate migrant					b		b	
9	American black duck	temperate migrant							W	
10	gadwall	temperate migrant							W	
11	northern pintail	temperate migrant							W	
12	American widgeon	temperate migrant							W	
13	blue-winged teal	temperate migrant							T	
14	green-winged teal	temperate migrant							W	
15	ring-necked duck	temperate migrant							W	
16	bufflehead	temperate migrant							W	
17	hooded merganser	temperate migrant							W	
18	turkey vulture	neotropical migrant	b	b	b	b	b	b	b	
19	black vulture	neotropical migrant	b			b			b	
20	northern harrier	temperate migrant	W						W	
21	sharp-shinned hawk	temperate migrant					T		T	
22	Cooper's hawk	temperate migrant			b				B	
23	red-shouldered hawk	temperate migrant	b	b	B		B	B	B	
24	broad-winged hawk	neotropical migrant							b	
25	red-tailed hawk	temperate migrant	b		B	b	B	b	B	
26	bald eagle	resident		b					b	
27	osprey	neotropical migrant				b			b	
28	American kestrel	temperate migrant							B	
29	northern bobwhite	resident					B		B	
30	wild turkey	resident					B	B	B	
31	killdeer	temperate migrant							b	
32	black-necked stilt	neotropical migrant							T	
33	greater yellowlegs	neotropical migrant							T	
34	lesser yellowlegs	neotropical migrant							T	
35	solitary sandpiper	neotropical migrant							T	
36	spotted sandpiper	neotropical migrant							T	
37	least sandpiper	neotropical migrant							T	
38	American woodcock	temperate migrant					W		W	
39	common snipe	temperate migrant							W	
40	laughing gull	temperate migrant				b	b		b	
41	ring-billed gull	temperate migrant				W	W		W	
42	herring gull	temperate migrant				W				
43	Caspian tern	neotropical migrant				T				
44	mourning dove	temperate migrant	B	B	B	B	B	B	B	B
45	yellow-billed cuckoo	neotropical migrant		B	B	B	B	B	B	
46	great horned owl	resident			B		B	B	B	
47	barred owl	resident			B		b	B	B	
48	eastern screech owl	resident			B		B	B	B	
49	chimney swift	neotropical migrant	b		b		b	b	b	
50	ruby-throated hummingbird	neotropical migrant		B	B	B	B	B	B	
51	belted kingfisher	temperate migrant	W			b			b	
52	red-headed woodpecker	resident			B	B			B	
53	red-bellied woodpecker	resident	B	B	B	B	B	B	B	
54	yellow-bellied sapsucker	temperate migrant		W	W		W	W	W	

Table 2. Total species detected by seasonal status at Richmond National Battlefield Park, VA, during inventories conducted in 2003–2004¹ (continued).

#	Species	Migration Status	Park Units ²							
			BC	CB	CH	FD	FH	GM	MH	PB
55	downy woodpecker	resident	B	B	B	B	B	B	B	B
56	hairy woodpecker	resident		B	B	B	B	B	B	
57	northern flicker	temperate migrant	b	B	B		B	B	B	
58	pileated woodpecker	resident		B	B		B	B	B	
59	eastern wood-pewee	neotropical migrant		B	B	B	B	B	B	B
60	Acadian flycatcher	neotropical migrant	B	B	B	B	B	B	B	B
61	eastern phoebe	neotropical migrant	B	B			B	B	B	
62	great crested flycatcher	neotropical migrant	B	B	B	B	B	B	B	
63	eastern kingbird	neotropical migrant			B		B	B	B	
64	red-eyed vireo	neotropical migrant	B	B	B	B	B	B	B	
65	white-eyed vireo	neotropical migrant	B	B	B	B	B	B	B	
66	yellow-throated vireo	neotropical migrant		B	B	B	B	B	B	
67	blue-headed vireo	neotropical migrant							T	
68	blue jay	temperate migrant	b	B	B	B	B	B	B	
69	American crow	resident	b	B	B	B	B	B	B	
70	fish crow	resident	b			b	b		b	
71	horned lark	temperate migrant							W	
72	purple martin	neotropical migrant			b		b	b	b	
73	northern rough-winged swallow	neotropical migrant	b						b	b
74	tree swallow	neotropical migrant	b						b	
75	bank swallow	neotropical migrant							T	
76	barn swallow	neotropical migrant				T	b	b	b	
77	tufted titmouse	resident	B	B	B	B	B	B	B	B
78	Carolina chickadee	resident	B	B	B	B	B	B	B	B
79	white-breasted nuthatch	resident	B	B	B	B	B	B	B	B
80	brown creeper	temperate migrant	W	W	W	W	W	W	W	W
81	Carolina wren	resident	B	B	B	B	B	B	B	B
82	house wren	temperate migrant				B			B	
83	winter wren	temperate migrant		W	W	W	W	W	W	
84	golden-crowned kinglet	temperate migrant	W	W	W	W	W	W	W	W
85	ruby-crowned kinglet	temperate migrant	W	W	W	W	W	W	W	
86	blue-gray gnatcatcher	neotropical migrant	B	B	B	B	B	B	B	B
87	eastern bluebird	temperate migrant	B		B		B	B	B	
88	American robin	temperate migrant	B	B	B	B	B	B	B	B
89	wood thrush	neotropical migrant		B	B	B	B	B	B	
90	veery	neotropical migrant				T				
91	Swainson's thrush	neotropical migrant			T		T		T	
92	gray-cheeked thrush	neotropical migrant							T	
93	hermit thrush	temperate migrant	W	W	W	W	W	W	W	W
94	gray catbird	temperate migrant	B			B		B	B	
95	northern mockingbird	resident			B	B	B	B	B	B
96	brown thrasher	temperate migrant	B	B	B	B	B	B	B	B
97	European starling	resident	b		B		B	B	B	
98	cedar waxwing	temperate migrant			B	b	B	B	B	B
99	northern parula	neotropical migrant	B	B	B	B	B	B	B	
100	Tennessee warbler	neotropical migrant					T			
101	blue-winged warbler	neotropical migrant							T	
102	yellow warbler	neotropical migrant	T				B		B	
103	chestnut-sided warbler	neotropical migrant					T	T		
104	magnolia warbler	neotropical migrant					T		T	
105	Cape May warbler	neotropical migrant			T					
106	black-throated blue warbler	neotropical migrant		T	T		T	T	T	
107	yellow-rumped warbler	temperate migrant	W	W	W	W	W	W	W	W
108	black-throated green warbler	neotropical migrant		T	T			T	T	
109	prairie warbler	neotropical migrant					B	B	B	

Table 2. Total species detected by seasonal status at Richmond National Battlefield Park, VA, during inventories conducted in 2003–2004¹ (continued).

#	Species	Migration Status	Park Units ²							
			BC	CB	CH	FD	FH	GM	MH	PB
110	palm warbler	temperate migrant			T				T	
111	pine warbler	temperate migrant	b	B	B		B	B	B	B
112	bay-breasted warbler	neotropical migrant							T	
113	blackpoll warbler	neotropical migrant		T	T	T	T	T	T	T
114	yellow-throated warbler	neotropical migrant	B	B		B	B	B	B	
115	worm-eating warbler	neotropical migrant							B	
116	prothonotary warbler	neotropical migrant	B	b			B	B	B	
117	black-and-white warbler	neotropical migrant	T	b	B	b	B	B	B	T
118	American redstart	neotropical migrant	B	b	B	b	b	b	B	
119	ovenbird	neotropical migrant		B	B	B	B	B	B	
120	northern waterthrush	neotropical migrant	T				T	T	T	
121	Louisiana waterthrush	neotropical migrant				B	B	B	B	
122	Kentucky warbler	neotropical migrant		B				B	B	
123	common yellowthroat	temperate migrant	B	B		B	B	B	B	B
124	Canada warbler	neotropical migrant	T					T	T	
125	hooded warbler	neotropical migrant			B		B	B	B	
126	yellow-breasted chat	neotropical migrant					B	B	B	
127	summer tanager	neotropical migrant	B	B	B	B	B	B	B	B
128	scarlet tanager	neotropical migrant	b	B	B	B	B	B	B	
129	northern cardinal	resident	B	B	B	B	B	B	B	B
130	rose-breasted grosbeak	neotropical migrant							T	
131	blue grosbeak	neotropical migrant			B	B	B	B	B	
132	indigo bunting	neotropical migrant	B	B	B	B	B	B	B	B
133	eastern towhee	temperate migrant	B	B	B	B	B	B	B	B
134	field sparrow	temperate migrant			B	B	B	B	B	B
135	chipping sparrow	temperate migrant	B	B	B	B	B	B	B	B
136	grasshopper sparrow	temperate migrant			B	B			B	
137	savannah sparrow	temperate migrant			W			W	W	
138	white-throated sparrow	temperate migrant	W	W	W	W	W	W	W	W
139	fox sparrow	temperate migrant						W	W	
140	song sparrow	temperate migrant	B		B	B	B		B	
141	swamp sparrow	temperate migrant	W					W	W	
142	dark-eyed junco	temperate migrant	W	W	W	W	W	W	W	W
143	eastern meadowlark	temperate migrant			B			B	B	
144	brown-headed cowbird	temperate migrant	B	B	B	B	B	B	B	B
145	red-winged blackbird	temperate migrant	B			b	b		B	
146	rusty blackbird	temperate migrant					W		W	
147	common grackle	temperate migrant	B	B	B	B	B	B	B	B
148	Baltimore oriole	neotropical migrant							T	
149	orchard oriole	neotropical migrant			B	B	B	B	B	
150	house finch	resident	B				B		B	B
151	American goldfinch	temperate migrant	B	B	B	B	B	B	B	B

¹ Key:

B = Documented breeding, or observed repeatedly in appropriate habitat during breeding season.

b = No evidence that species breeds at unit, but observed at unit and known to breed locally.

T = Observed as a migratory transient only; not present during breeding or wintering season.

W = Occurs during winter only, or observed only during winter (for species that may actually be resident in other nearby areas.)

² Park unit abbreviations: BC (Beaver Dam Creek)
 CB (Chickahominy Bluffs)
 CH (Cold Harbor)
 FD (Fort Darling)
 FH (Fort Harrison)
 GM (Gaines Mill)
 MH (Malvern Hill)
 PB (Parker's Battery)

Table 3. Total bird species detected per unit by seasonal status at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004.

Season	Park Units ¹								Total
	BC	CB	CH	FD	FH	GM	MH	PB	
Breeding	50	46	60	59	74	69	95	26	95
Transients	4	3	6	4	8	6	23	2	28
Wintering	10	9	10	10	12	12	27	6	28

¹ Park unit abbreviations: BC (Beaver Dam Creek), CB (Chickahominy Bluffs), CH (Cold Harbor), FD (Fort Darling), FH (Fort Harrison), GM (Gaines Mill), MH (Malvern Hill), PB (Parker's Battery).

Table 4. Number of expected and observed bird species at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004.

Season	Expected	Observed	Percent of Expected
Breeding season	98	95	97%
Migration	28	28	100%
Wintering season	30	28	93%

Table 5. Breeding season relative abundance (percent) for species detected by unit¹ (n = # survey points) at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004.

Species	Park Unit ¹							
	MH (n=30)	FH (n=9)	CH (n=4)	GM (n=4)	FD (n=3)	CB (n=3)	BC (n=2)	PB (n=2)
red-eyed vireo	8.003	7.724	7.609	15.714	11.594	7.792	5.769	
blue-gray gnatcatcher	6.346	6.098	7.609	11.429	8.696	6.494	11.538	6.667
northern cardinal	5.609	3.252	3.261	4.286	2.899	7.792	5.769	13.333
mourning dove	4.688	0.407		4.286		1.299		
indigo bunting	4.136	0.407		2.857	10.145	3.896	1.923	
American goldfinch	3.952	5.285	2.174	4.286	11.594	2.597		
white-eyed vireo	3.952				2.899		7.692	
Acadian flycatcher	3.583	2.439	5.435	11.429	2.899	5.195	1.923	
common grackle	3.215	16.667		4.286			7.692	
Carolina chickadee	3.031	6.504	3.261	2.857	4.348	5.195	5.769	6.667
tufted titmouse	3.031	9.350	1.087	2.857	2.899	5.195	5.769	11.111
summer tanager	2.947	2.033	2.174	1.429			3.846	2.222
common yellowthroat	2.762					3.896	1.923	
American robin	2.578	0.407	4.348	1.429	7.246	9.091	1.923	6.667
chipping sparrow	2.394	3.659	7.609	5.714				4.444
ovenbird	2.210	2.033	7.609	1.429	1.449	7.792		
eastern towhee	2.026		1.087		2.899	2.597	1.923	6.667
yellow-billed cuckoo	1.842	2.439	2.174	1.429				
eastern wood-pewee	1.658	2.439	2.174	1.429	5.797			4.444
downy woodpecker	1.658	2.439	3.261	1.429		2.597	3.846	
eastern bluebird	1.658	1.626	2.174				1.923	
hooded warbler	1.658	1.220						
field sparrow	1.658							11.111

Table 5. Breeding season relative abundance (percent) for species detected by unit¹ (n = # survey points) at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004 (continued).

Species	Park Unit ¹							
	MH (n=30)	FH (n=9)	CH (n=4)	GM (n=4)	FD (n=3)	CB (n=3)	BC (n=2)	PB (n=2)
gray catbird	1.473				2.899			
white-breasted nuthatch	1.473	2.846	1.087		2.899	1.299		2.222
blue grosbeak	1.105				1.449			
brown-headed cowbird	1.105	2.439	2.174	7.143		1.299		4.444
northern parula	1.105	0.813	1.087	2.857		1.299		
eastern meadowlark	1.105							
prairie warbler	1.105							
red-winged blackbird	1.105						9.615	
Carolina wren	0.921	2.439	4.348		1.449	6.494	7.692	2.222
wood thrush	0.921	2.033		1.429		9.091		
scarlet tanager	0.921	0.813	2.174	1.429	1.449			
red-bellied woodpecker	0.921	2.439	3.261	1.429	2.899			
great crested flycatcher	0.737	2.033	5.435	1.429	2.899		1.923	
grasshopper sparrow	0.737				1.449			
pine warbler	0.737	0.813	3.261			1.299		
yellow-throated warbler	0.737	0.813		1.429			3.846	
Kentucky warbler	0.737			1.429				
yellow-breasted chat	0.737							
northern mockingbird	0.553	0.813	3.261					6.667
orchard oriole	0.553	0.407						
yellow-throated vireo	0.553							
ruby-throated hummingbird	0.553	0.407	1.087	1.429		1.299		
red-headed woodpecker	0.553							
northern bobwhite	0.553							
cedar waxwing	0.553							2.222
brown thrasher	0.368	1.626			1.449	2.597		2.222
hairy woodpecker	0.368	0.813			2.899			
European starling	0.368		4.348					
black-and-white warbler	0.368							
house finch	0.368							6.667
prothonotary warbler	0.184			1.429			1.923	
Louisiana waterthrush	0.184				2.899			
great blue heron	0.184							
blue jay	0.184	0.813	3.261			2.597		
pileated woodpecker	0.184	0.407	1.087			1.299		
eastern kingbird	0.184		1.087					
northern flicker	0.184	0.407						
eastern phoebe	0.184							
American redstart	0.184						1.923	
worm-eating warbler	0.184							
wild turkey	0.184							
yellow warbler		0.407						
song sparrow							1.923	
green heron							1.923	

¹Abbreviations:

MH (Malvern Hill); FH (Fort Harrison); GM (Gaines Mill); CB (Chickahominy Bluffs); FD (Fort Darling); BC (Beaver Dam Creek); CH (Cold Harbor); and PB (Parker's Battery).

Table 6. Relative abundance (percent) of breeding bird species detected by habitat type (n = # survey pts) at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004.

		Habitat types ²								
Species	MS ¹	Res. (n=3)	Edge (n=4)	Grsl (n=9)	FWtl (n=16)	Sc/Sh (n=5)	PnSd (n=2)	PiPl (n=3)	Mx (n=13)	MHd (n=3)
chipping sparrow	T	16.667		16.000					2.632	4.444
mourning dove	T	14.583	3.030	9.000	1.263	0.926		5.128	2.256	1.111
brown-headed cowbird	R	8.333	2.020		1.263	1.852		5.128	2.256	1.111
indigo bunting	N	6.250	5.051	9.000	1.515	11.111	5.000			
northern mockingbird	R	6.250		5.000						
eastern bluebird	T	4.167	1.010	9.000	0.253	1.852			0.376	
brown thrasher	T	4.167	4.404				5.000		0.376	1.111
northern cardinal	R	4.167	6.061	7.000	4.293	6.482	15.000	10.256	3.008	5.556
eastern wood-pewee	N	4.167	6.061				5.000	2.564	3.008	4.444
blue-gray gnatcatcher	N	4.167	7.071		9.849	5.556	5.000	5.128	8.271	5.556
Carolina chickadee	R	4.167	12.121		4.040				6.392	4.444
blue grosbeak	N	4.167		3.000		1.852				
grasshopper sparrow	T	4.167		3.000						
European starling	R	4.167		4.000						
red-eyed vireo	N	2.083	8.081		9.343	4.630		12.821	11.278	11.111
American robin	T	2.083	10.101	2.000	1.515	1.852	2.500		3.759	4.444
summer tanager	N	2.083		1.000	0.758	5.556	5.000	2.564	4.135	2.222
field sparrow	T	2.083		5.000		7.407				
downy woodpecker	R	2.083			2.020		2.500	7.692	3.008	2.222
orchard oriole	N		1.010	1.000		0.926	2.500			
ovenbird	N		1.010		2.778			5.128	5.639	1.111
scarlet tanager	N		1.010		1.515				1.504	
hairy woodpecker	R		1.010		0.758					2.222
eastern towhee	T		2.020	6.000	0.505	6.482	7.500			
great crested flycatcher	N		2.020		1.515	0.926			2.632	2.222
ruby-throated hummingbird	N		2.020		0.505	1.852			0.376	
Louisiana waterthrush	N		2.020		0.253					
common yellowthroat	T		3.030	1.000	1.515	7.407	2.500			
Carolina wren	R		4.040	1.000	2.273		5.000		3.008	2.222
blue jay	T		4.040						1.128	
American goldfinch	T		4.040	6.000	1.768	8.333	7.500		3.383	13.333
tufted titmouse	R		8.081		4.546			2.564	9.399	5.556
white-eyed vireo	N			1.000	2.778	8.333	12.500			2.222
eastern kingbird	N			1.000	0.253					
red-winged blackbird	T			2.000	2.020					
house finch	R			2.000					1.128	
eastern meadowlark	T			6.000						
common grackle	T				15.909				1.128	
Acadian flycatcher	N				7.323			5.128	4.512	3.333
northern parula	N				2.525				0.376	1.111
Wood thrush	N				2.273				2.256	3.333
yellow-billed cuckoo	N				1.768	1.852		2.564	2.632	
yellow-throated warbler	N				1.515				0.376	2.222
Kentucky warbler	N				1.263				0.376	
white-breasted nuthatch	R				1.010				4.512	4.444
red-bellied woodpecker	R				1.010				1.128	5.556
pileated woodpecker	R				1.010					
red-headed woodpecker	R				0.758					
hooded warbler	N				0.505	0.926	7.500	12.821	0.376	
gray catbird	T				0.505	5.556				2.222
yellow-breasted chat	N				0.505	2.778				
yellow-throated vireo	N				0.505					
northern flicker	T				0.505					
prothonotary warbler	N				0.505					

Table 6. Relative abundance (percent) of breeding bird species detected by habitat type (n = # survey pts) at Richmond National Battlefield Park, VA, from inventories conducted in 2003–2004 (continued).

		Habitat types ²								
		Res. (n=3)	Edge (n=4)	Grsl (n=9)	FWtl (n=16)	Sc/Sh (n=5)	PnSd (n=2)	PiPl (n=3)	Mx (n=13)	MHd (n=3)
Species	MS ¹									
American redstart	N				0.505					
black-and-white warbler	N				0.253			2.564		
great blue heron	T				0.253					
song sparrow	T				0.253					
green heron	N				0.253					
pine warbler	T							10.256	2.256	
prairie warbler	N					3.704	5.000			
cedar waxwing	T							7.692	0.376	
northern bobwhite	R					0.926	5.000			
yellow warbler	N									1.111
eastern phoebe	N					0.926				
worm-eating warbler	N								0.376	
wild turkey	R								0.376	

¹ MS=migration status:

T = Temperate migrant, N = Neotropical migrant, R = Resident.

² Habitat abbreviations:

Res. = Residential, Edge = Edge habitat, Grsl = Grassland, FWtl = Forested wetland,
Sc/Sh = Scrub/shrub, PnSd = Pine plantation (seedling), PiPl = Pine (pole), Mx = Mixed forest,
MHd = Mature hardwood forest.

Table 7. Summary statistics for habitat type relative abundance data for avian inventories conducted at Richmond National Battlefield Park, VA, from 2003–2004.

Habitat Type	# Species	Priority Species ¹	Neotropical	Temperate	Resident
Residential	19	3	6	7	6
Edge	24	3	10	8	6
Grassland	24	3	7	12	5
Forested wetland	38	9	19	8	11
Scrub/Shrub	26	6	15	8	3
Pine (seedling)	19	3	10	5	4
Pine (pole)	17	3	10	3	4
Mixed forest	37	11	16	10	11
Mature hardwood	27	10	12	6	9

¹ Priority Species implies 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.

Discussion

Species Inventory

Results of the species inventory conducted at Richmond National Battlefield Park represent 97% of the species that were expected to occur in the park. This represents a high level of success for the inventory and is at least partially due to the size and habitat diversity of the park. The generally small size of each of the units served to diminish the potential biodiversity by affording only small habitat patches; thereby limiting the more area-sensitive species (Askins and Philbrick 1987; Robbins et al. 1989). At the same time, it enabled the survey team to generate almost comprehensive coverage with a minimum of survey points. The margin of error with regard to missing species was small. Likewise, the near absence of open water habitats greatly restricted the overall diversity of species that might have been observed were this a more available resource, and made it easier for the survey team to concentrate on the one site (Crewes Channel at Malvern Hill) that was available.

Species of Special Concern

There were no federally listed species detected in this survey. Bald eagles were observed at two of the units, however this species is in the process of being de-listed from the federal list of Threatened and Endangered Species as of summer 2007 (USFWS 2007). It had previously been listed as “threatened” and still retains that status at the state level in Virginia (VDGIF 2006). Although the species was observed numerous times at Malvern Hill, and occasionally at other units, no confirmed nest has been recorded at RICH as of the latest aerial survey by the state, conducted in March 2006 (Bryan Watts, Center for Conservation Biology, College of William and Mary, pers. comm., 2006). There are documented eagle nest sites within a few kilometers of several of the RICH units (Watts 2005); therefore, observations of the species in the park were not unexpected.

Eight additional species are listed as species of special concern at the state level (Table 8). This designation applies to the breeding population of each species; and, therefore, only potentially applies to two of the species at RICH: great egret and northern harrier. Great egrets breed in several locations near the RICH units, and one of the larger colonies in the interior Coastal Plain region is within a few kilometers of Malvern Hill (Watts and Paxton 2004). Young great egrets (20–50 individuals) have been observed routinely during the fall at Malvern Hill in what may be recognized as a post-dispersal staging area at Crewes Channel (Bradshaw, pers. obs.). Malvern Hill may be a locally significant landscape attribute for this species. 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 RICH 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). Four of the remaining species, brown creeper, winter wren, golden-crowned kinglet, and hermit thrush are all temperate migrants and occur in the Coastal Plain only as wintering species. Each of these species also nest in small numbers in the higher elevation spruce forests of Virginia (Kain 1987). The last two species of special concern, Caspian tern and magnolia warbler are both transient species in the interior Coastal Plain. Caspian terns nest on the barrier

Table 8. Species of conservation concern and their status at Richmond National Battlefield Park,

Species	Status	Distribution at RICH ¹	Abundance at RICH	Status ²
great egret	breeds locally	MH	rare	SC - State
northern harrier	winters	BC, MH	rare	SC -State
bald eagle	breeds locally	CB, MH	uncommon	Thr. – State
Caspian tern	transient	FD	rare	SC - State
red-headed woodpecker	breeds	CH, FD, MH	uncommon	BCC – USFWS R5
brown creeper	winters	All units	uncommon	SC – State
winter wren	winters	All except BC, PB	uncommon	SC – State
golden-crowned kinglet	winters	All units	common	SC - State
wood thrush	breeds	All except BC, PB	common	BCC – BCR 27 & USFWS R5
hermit thrush	winters	All units	common	SC – State
northern parula	breeds	All except PB	common	BCC – BCR 27
magnolia warbler	transient	FH, MH	rare	SC – State
black-throated green warbler	transient	CB, CH, GM, MH	uncommon	BCC – BCR 27
prairie warbler	breeds	FH, GM, MH	uncommon	BCC – BCR 27 & USFWS R5
bay-breasted warbler	transient	MH	rare	BCC – USFWS R5
worm-eating warbler	breeds	MH	rare	BCC – USFWS R5
Kentucky warbler	breeds	CB, GM, MH	uncommon	BCC – USFWS R5
Canada warbler	transient	BC, GM, MH	rare	BCC – USFWS R5

¹ Park unit abbreviations:

BC (Beaver Dam Creek)
 CB (Chickahominy Bluffs)
 CH (Cold Harbor)
 FD (Fort Darling)
 FH (Fort Harrison)
 GM (Gaines Mill)
 MH (Malvern Hill)
 PB (Parker's Battery).

² Status abbreviations:

SC – Special Concern
 Thr – Threatened
 BCC – Birds of Conservation Concern
 BCR 27 – Southeastern Coastal Plain
 USFWS R5 – Region 5 (VA, WV, MD, PA, NJ, NY, CT, RI, MA, NH, VT, ME)

Table 9. Partners in Flight Tier 1 priority species detected at Richmond National Battlefield Park, VA, during inventories in 2003–2004.

Species	PIF Score	Status	Distribution at RICH ¹	Abundance at RICH
American black duck	24	winters	MH	rare
eastern wood-pewee	22	breeds	All units except BC	common
Acadian flycatcher	23	breeds	All units	common
white-eyed vireo	22	breeds	All units except PB	common
yellow-throated vireo	23	breeds	All units except BC, PB	uncommon
wood thrush	25	breeds	All units except BC, PB	common
blue-winged warbler	24	transient	MH	rare
prairie warbler	25	breeds	FH, GM, MH	common
worm-eating warbler	23	breeds	MH	rare
prothonotary warbler	22	breeds	BC, FH, GM, MH	uncommon
Louisiana waterthrush	22	breeds	FD, FH, GM, MH	common
Kentucky warbler	24	breeds	CB, GM, MH	uncommon

¹ Park unit abbreviations:

BC (Beaver Dam Creek)
 CB (Chickahominy Bluffs)
 CH (Cold Harbor)

FD (Fort Darling)
 FH (Fort Harrison)
 GM (Gaines Mill)

MH (Malvern Hill)
 PB (Parker's Battery).

islands of Virginia, the Great Lakes, the Pacific Northwest and interior and maritime Canada (Cuthbert and Wires 1999), but transient birds in migration are occasionally observed along inland rivers in Virginia. Magnolia warblers nest in higher elevation spruce/fir forests from Virginia into Canada and are uncommon spring migrants through the Coastal Plain of Virginia (Kain 1987).

Another nine species were recognized by the U.S. Fish and Wildlife Service as Birds of Conservation Concern within the region (USFWS 2002; see Appendix E and Table 8). These species were compiled from two different source lists within this 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). RICH lies within the Southeastern Coastal Plain BCR (BCR 27). The second source list was the USFWS Regional list, of which RICH 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 specific to the BCR list only: northern parula and black-throated green warbler. Northern parula was a common nesting species within appropriate habitat at RICH. Reasons for decline are thought to be at least partially tied to the effects of air pollution on the loss of epiphytes that this species uses for nesting (Moldenhauer and Regelski 1996). Black-throated green warblers are a common spring migrant through the Coastal Plain and were observed at several of the RICH units. That species is declining throughout much of the northeast, mostly due to habitat loss/fragmentation and potentially from effects of spruce budworm insecticide treatments (Morse 1993).

Five additional species were specific to the USFWS list from Region 5 only: red-headed woodpecker, bay-breasted warbler, worm-eating warbler, Kentucky warbler, and Canada warbler. Red-headed woodpeckers were located at three of the RICH units. This species tends to have an affinity for more open habitats and areas free from disturbance (Smith et al 2000). Within the Coastal Plain of Virginia, they are commonly found in association with beaver-impounded wetlands where trees are dying from root inundation, and large daylighted areas created from localized tree die-offs and storm damage. Bay-breasted warblers nest only in the northern tip of USFWS Region 5, and are a rare spring migrant through the Coastal Plain of Virginia, so this species status has no relevance to RICH. The same is true for Canada warblers which are a rare spring migrant around RICH as well, but they nest from the higher elevations of Virginia north into Canada (Sibley 2000). The Worm-eating warbler is a very local species across the Coastal Plain in appropriate habitat (Trollinger and Reay 2001). It is rare in central Virginia as a nesting species and only one singing male was detected at Malvern Hill. It was not confirmed whether a nesting pair existed there or not. Kentucky warbler is another declining species within the region. It was uncommon at RICH, found in moist or wetland forests with a healthy understory. This species may be declining at least locally from the spread of invasive species that impact its nesting habitat (see Summary and Management Recommendations section).

Two additional species were recognized as a species of conservation concern within both the BCR 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), and its density was lower than anticipated within most appropriate habitat types at RICH. Prairie warblers were uncommon in appropriate habitat at RICH. They are a scrub/shrub nesting species found in regenerating clearcuts and young second-growth habitats lacking closed canopies (Nolan et al 1999).

A final 12 species are ranked among Partners in Flight's (PIF) top tier of species within the mid-Atlantic Coastal Plain (Watts 1999) (Table 9). This is the smallest ecological unit under which an assessment of bird species has been undertaken, and has the greatest relevance to RICH. Species scoring 22 or higher (out of 30) in the PIF prioritization scheme indicate high vulnerability of populations, not only locally, but throughout the species range. Four of these species were already referenced in the USFWS Birds of Conservation Concern list: wood thrush, prairie warbler, worm-eating warbler, and Kentucky warbler.

Aside from the black duck, these species are representative of three major habitat types: upland mixed forest (eastern wood-pewee, wood thrush); forested wetland (Acadian flycatcher, prothonotary warbler, Louisiana waterthrush, Kentucky warbler); and scrub/shrub habitats (white-eyed vireo, blue-winged warbler, and prairie warbler). Worm-eating warbler and yellow-throated vireo are associated with both the first two habitats, found most often in the more mature of both upland mixed forest and forest wetlands, depending on specific habitat variables (Rodewald and James 1996; Hanners and Patton 1998). Blue-winged warblers do not nest at RICH, and only occur as rare migrants in the interior Coastal Plain (Kain 1987).

Although the PIF priority species detected were usually common within the appropriate habitat type, none was particularly numerous. This was largely due to the small size of the respective habitat patches that these species occupied. None of the RICH units, with the exception of Malvern Hill and Fort Harrison, exceeded 100 ha (247 ac) in size; most were less than half that. This resulted in most habitat patches falling below 10–15 ha (24.7–37 ac) in size; likely at, or below, the margins of what is acceptable as a minimum size threshold required by most of these species (Robbins et al 1989; Freemark and Collins 1992). Of most concern are the transitional habitat species that depend on ephemeral habitat types and therefore prefer landscapes that undergo frequent disturbance events. These events at RICH are primarily limited to timber harvests, and, therefore, are unlikely to occur at a high enough frequency to sustain these species at RICH.

Habitat Associations

The forested wetlands were the most species rich habitat, with the highest number of neotropical migrants, and the highest number of priority species. This result has been linked to the foliage diversity, presence of water, insect availability, and overall heterogeneity of the habitat affording opportunities for more species to occupy and exploit the available resources (Wharton et al. 1981; Pashley and Barrow 1993). Both mature mixed and hardwood forest habitats were the most significant habitats surveyed at RICH with regard to priority species. This stems largely from the number of forest interior species common to both types of mature forest that are

declining due to forest fragmentation, nest parasitism, and other factors. Scrub/shrub habitats also had relatively high numbers of priority species per total species richness, representative of the suite of species that are declining due to loss of these transitional habitats region-wide (Watts 1999). In contrast, the grassland habitat, another critical habitat in the region, had generally fewer species than expected; likely due to the size and condition of the existing grasslands in the park. The majority of the open, pasture-type battlefields are comprised of dense stands of fescue, a sod-forming grass that excludes access to the bare soil beneath and typically results in a monoculture stand of virtually no value to birds (KDFWR 2004). In winter, rain and snow tend to flatten it in waves, leaving little room for cover beneath. This precludes use of these fields by the two prominent grassland obligate species, grasshopper sparrows (breeding) and savannah sparrows (wintering), and minimizes foraging opportunities for a number of other grassland users such as meadowlarks, finches, and blackbirds. The typically small size of most grassland patches also worked against their capabilities to support grassland obligate species, since many of these species tend to be area sensitive (Herckert 1994; Watts et al 1997).

The link between habitat diversity within the park and the surrounding landscape is essential to understanding long-term trends in most of the bird species at RICH. Five units at RICH are smaller than 25 ha (62 ac), and all are subdivided into smaller habitat components that are below the minimum size threshold for many species (Robbins et al. 1989; Freemark and Collins 1992). A change in habitat size or condition that displaces a species, either locally or at a landscape level, may result in the decline or loss of that species within the park; therefore, habitats must be evaluated in terms of their surrounding landscape. This is especially important at RICH because the individual habitat components are often small, harboring only a single pair or individual bird of many species. Many of these species are ones in particular need of management attention, including wood thrush, prairie warbler, worm-eating warbler, and Kentucky warbler.

Seasonal Variation

Breeding season results were especially productive due to overall small size of units and essentially comprehensive coverage of survey points. Although the same situation existed for the migration periods, the nature of migration is more dynamic. Unless observers are present several times a week many species will go unnoticed. In addition, the spring migration is such a broad front migration that uncommon species often remain undetected due to extremely low numbers and broad distribution. In the fall the migration often has such a coastal bias that many species once again go undetected in interior areas (Degraaf and Rappole 1995).

Breeding Season

Breeding species expected to occur that were not detected included whip-poor-will, chuck-will's-widow, rock dove, and house sparrow. The first two species are of concern due to local declines in the Virginia Coastal Plain (Wilson and Watts 2000). The reason for this is not clear, but both species were historically common as recently as 10–15 years ago. Both species still occur in the Coastal Plain and were detected within a few miles of several RICH units, but were not detected within the park boundaries. In contrast, rock doves and house sparrows are extremely common generalist species but were not detected at any of the units surveyed. The units, for the most part, are apparently too forested and too rural to attract these species.

Only one species was detected that was not expected during the breeding season, the worm-eating warbler. This species has not been reported from any of the local BBS routes and it is not known as a breeding species from any regularly visited sites close to RICH. However, Malvern Hill is within the quadrant of the USGS topographic map where worm-eating warbler was detected during the Breeding Bird Atlas project of the late 1980s (Trollinger and Reay 2001). One singing male was confirmed in late-June, on the second of two breeding season surveys, suggesting a bird on a breeding territory. The habitat where it was found was suitable, and the species is known to breed across Virginia, albeit in mostly disjunct locations within larger blocks of mature habitat. So its status as a breeder will remain unconfirmed. The warbler may have been a late migrant, or may have been a lone male on a territory.

Migration

The expected species list for migrants was generated from a combination of migration maps, field guides, and a local colleague with experience of migration through Virginia's Coastal Plain. Use of additional data on distribution of migration routes between those that winter in the Caribbean Islands and those that winter in Central and South America was useful in segregating expected species from all neotropical and temperate migrants (Faaborg and Terborgh 1980; Degraaf and Rappole 1995). The Caribbean migration route through Virginia is heavily weighted toward the Coastal Plain, whereas birds from the southern mainland (Central and South America) tend to follow the mountains north. Although the spring migration is a broader front migration, very few of the mountain migrants are likely to be observed in the Coastal Plain. Likewise, not all Caribbean migrants were listed as expected, because some species' numbers are so low and their migration so broad that the likelihood of detecting the species in migration is small.

Nevertheless, the expected species list included 28 species, and 28 transient migratory species were observed, though some species differed between the two lists. Missing from the expected list were common tern, willow flycatcher, orange-crowned warbler, and bobolink. Common tern is usually easily seen in migration along the James River and was likely missed due to lack of sufficient survey effort along the river. The same is probably true for bobolinks; although not nearly as common, that species is often seen during the fall migration in large agricultural areas such as those found in the Malvern Hill area. Willow flycatcher was not detected at two potential locations, Malvern Hill and Beaver Dam Creek, although the species can normally be found each spring at a similar site just a few miles away (College of William and Mary, Fenton Day, Field Technician, pers. comm., 2004). The species is, however, an uncommon migrant in the Coastal Plain (Kain 1987). The orange-crowned warbler is simply a difficult species to detect in large mixed flocks with yellow-rumped warblers and other species. It is only rarely reported in this part of the state, probably due to its cryptic nature, although the species clearly transits the area in migration.

Of the four species, the orange-crowned warbler and bobolink should be considered as likely to occur, having simply been missed in this effort. Common tern also can be expected to be observed from the river units, although not actually making use of the units proper. Willow flycatcher is less likely to occur at RICH due to the relatively small size of suitable habitat at each of the two referenced parks; less than 1 ha (2.5 ac) each.

Four species observed that were not expected were the black-necked stilt, Caspian tern, Tennessee warbler, and bay-breasted warbler. All these species were represented by single individuals. The stilt was observed at Malvern Hill with a mixed species flock of shorebirds at the west end of Crewes Channel. It was only present for one day, and represented a new county record. The species is normally only observed very near the coast, and then only rarely, since it is a southern and Gulf Coast nesting species in the east. The Caspian tern was observed foraging over the James River adjacent to Fort Darling. This species nests in disjunct locations from coastal California across northern Canada and down to the lower Delmarva Peninsula. Migrant breeders, as well as non-breeding adults, may be seen wandering along coastal rivers during migration (Cuthbert and Wires 1999). Tennessee and bay-breasted warblers are not Caribbean migrants and so normally follow a more mountainous route through Virginia, but are occasionally observed in the Coastal Plain. (Williams 1996; Rimmer and McFarland 1998) The two birds were observed at Fort Harrison and Malvern Hill, respectively.

Winter

No species were observed that were not expected for the winter season, while three expected species, northern shoveler, American coot, and American pipit, were not encountered. Shovelers and coots can both be found in low numbers at several of the larger pond complexes on nearby farms. Given the constant shifting of waterfowl during hunting season, Crewes Channel at Malvern Hill would have provided a suitable alternative habitat. It is likely that both of these species make use of Crewes Channel at some point during most winters, but were missed during the course of this project. Likewise, the American pipit is a common wintering species across the Coastal Plain, especially where there are large acreages of freshly exposed soil or recently harvested crops. The only fields that would have potentially accommodated this species are at Malvern Hill, and only one of those was in a suitable condition for pipits. American pipits often forage in mixed flocks with horned larks during the winter, and horned larks were detected, but not with pipits. Again, this is a species that probably occurs during most winters for brief periods at Malvern Hill but went undetected during this project.

Natural Disturbance and Hurricane Isabel

Hurricane Isabel caused extensive damage to habitat communities at Richmond National Battlefield Park in September 2003; that may impact long-term bird diversity in the park. The effects of this storm had landscape-level impacts, especially as regards stands of mature timber. Hardest hit were mature, large diameter pines and mast producing oak and beech trees. Several of the RICH units were heavily damaged, especially Gaines Mill which lost scores of old growth hardwoods that were a significant component of the mature forest. Both upland and wetland habitats alike were affected.

The initial response to these canopy gaps will be a flush of vegetation, adding to the understory and midstory structural complexity, and subsequent fruit, seed, and arthropod prey base. This will generate much more appealing habitats for birds in migration. Edge species will prosper in these micro-habitats, as this eventual shrub/scrub habitat lies in juxtaposition to interior woods and exterior fields. Given the small overall patch size of the forest habitats in most of these units, and Gaines Mill in particular, forest interior species could be adversely affected by this change.

A spread of invasive species has also been observed in response to the damage from Isabel. An exotic grass, *Microstegium* sp., is a rapidly spreading, prolific species that is showing signs of altering the natural understory of eastern forests; it creates a dense mat of tall, sinewy grass that appears to overtake and displace many native species (Barden 1987; LaFleur 1996). Anecdotal evidence suggests that the spread of this grass may be affecting ground foraging and/or nesting bird species (Bradshaw, pers. obs.). The decline in ovenbirds, wood thrushes, and Kentucky warblers has been noticed on nearby properties to RICH after *Microstegium* had completely overtaken the ground cover. This cause and effect has not been proven, but given the habitat preferences of most ground dwelling birds it is reasonable to assume that *Microstegium* is adversely affecting their preferred habitat.

Overview of Unit Status and Species Priorities

Following are summaries of survey highlights and target species and habitats for long-term monitoring. They are presented relative to unit size, from smallest to largest. Beside each unit name is the number of species detected as breeders, transients, and wintering species, respectively.

Parkers Battery (26, 2, 6)

At 4 ha (9.8 ac), Parkers Battery is already too small to be considered for bird management purposes, and when viewed in its mosaic of industrial complexes and woodlots, its utility as a viable habitat for birds is extremely limited. It has no standing water, little useful understory, and few mast- or berry-producing trees and shrubs. Most of the species detected there were visitors from other areas capitalizing on ephemeral resources available along the transmission line corridor. The exception to this was the standard profile of edge and small woodlot species dominated by resident birds. The transitional grassland/shrubland habitat that occupies the utility corridor and the associated forest edge is of most value and will benefit only the edge species.

Beaver Dam Creek (50, 4, 10)

With only an additional 2.5 ha (6 ac) in size over Parkers Battery, Beaver Dam Creek hosted almost twice as many species. The difference was water. Beaver Dam Creek harbors an excellent nontidal wetland, with both emergent and forested components. Although extremely small, this habitat is critical to many species, making diversity higher per unit area than in most other habitats.

Key species at Beaver Dam Creek were prothonotary warbler and American redstart; both represented by a single breeding pair, but probably able to persist in this unit as long as the habitat remains intact. Prothonotaries depend on tree cavities, usually over, or close to, water. Redstarts are more second-growth, brushy habitat species, but usually found in proximity to wetland areas. More common forested and scrub wetland species were northern parula and red-winged blackbird, respectively. This was one of only a couple of locations at RICH that supported the blackbirds. At least two or three pairs of northern parulas nested in the second-growth forest at the north end, as well as the overstory trees at the south end. Several pairs of red-winged blackbirds nested in the scrub/shrub areas of the wetland. These two species are

good habitat indicators for this type of emergent and forested wetland. Another good indicator species for the marshy scrub and edge habitat was the swamp sparrow, present in winter in high numbers all around the brushy areas of the site.

Fort Darling (59, 4, 10)

This 15 ha (37 ac) site is unique within the surrounding landscape. It constitutes the only stand of mature hardwood within a substantial distance in any direction and affords a microcosm of good habitat diversity. Fort Darling, with a perennial stream, early successional grassland, scrub habitat, and mature forest, provides an ideal complex of habitat diversity. The high bluff on which the site is located raises the significance of the site by providing high, protected perch sites, away from disturbance, suitable for raptors along the river.

However, each of the respective habitats at Fort Darling is too small to express a full compliment of species. Although most mature forest species occupy the site during some part of the year, only a small number are able to effectively breed there. As a result, the site is more significant as a complex of migration habitats, and a protected area for resident species. Of the 151 species recorded on Richmond National Battlefield Park, only 73 species were documented here. Most common among them was American goldfinch, often found to be more abundant in riparian habitats. Species of concern to this unit include red-headed woodpecker and Louisiana waterthrush in the interior forest. Only one pair of each was observed at the site. The grassland habitat however, was the most diverse and best quality grassland site of all the RICH units. It is unfortunate that it was too small to express the full compliment of grassland species (Watts et al 1997). Key species to note, however, include blue grosbeaks and at least a few grasshopper sparrows. In addition, the shrubby edge habitat harbored gray catbirds, another uncommon nesting species.

Chickahominy Bluffs (46, 3, 9)

Also under 20 ha (49 ac), Chickahominy Bluffs benefited from its close proximity to the Chickahominy River and the associated extensive bottomland hardwoods. Chickahominy Bluffs had some of the highest densities of wood thrush and ovenbirds of any RICH unit in the upland hardwood forest habitat. The same was true of Acadian flycatchers in the floodplain forest section, as well as a small breeding population of Kentucky warblers. All of this was made possible by its position in the landscape adjacent to the extensive forest tracts of the Chickahominy River. Encroaching development will be the biggest limiting factor to the persistence of the existing biodiversity at this site. Monitoring the spread of *Microstegium* sp., which is already present, is also critical—since it is likely to affect three of the four indicator species listed above.

Gaines Mill (69, 6, 12)

At 24 ha (59 ac), Gaines Mill is still a small unit, but harbors the most significant bird community for its size of any RICH unit. The extensive forested wetland that runs along the northern boundary of the property provides a critical habitat component for this unit, complemented by the mature hardwood forest that covers much of the associated upland. Prothonotary warbler, Louisiana waterthrush, Kentucky warbler, and Acadian flycatcher were all

prominent species in the lowland forest. Wood ducks were a common nesting species in streamside tree cavities. Grassy fields were also a dominant feature of Gaines Mill, and although the quality of the grassland was not sufficient to harbor the full range of grassland species, there were both grasshopper sparrows and eastern meadowlarks present there. Missing were savannah sparrows in winter, due to the heavy fescue content of the grassland. Of equal importance were the scrub habitat borders around much of the field. Prairie warblers, yellow-breasted chats, and blue grosbeaks all nested there, albeit in very low numbers due to the size of the habitat patch. Fox sparrows were present in the same habitats in winter. This site is generally at the threshold of size requirements for many species (Watts et al 1997), and so should be closely monitored as increasing encroachment from development alters the surrounding landscape. On the site proper, *Microstegium* will be important to monitor in the wake of Hurricane Isabel's impacts; this could pose the most immediate threat to ground-nesting species.

Cold Harbor (60, 6, 10)

Cold Harbor is dominated by dry, upland mixed forest with additional smaller components of field, forested wetland, and open, mature pine stand. The forested wetland corridor that bisects the unit is the biodiversity magnet, both for migrants and breeding birds. American redstarts and black-and-white warblers were the two most uncommon species here in breeding season, and may not be detected during most years outside of migration. Both were detected only from a single singing male during the breeding season. Great crested flycatchers, however, were one of the most abundant forest species, followed by ovenbirds. This was made somewhat perplexing by the relative lack of wood thrushes at the site. This declining species should be a target for long-term monitoring.

The field at Cold Harbor, dominated by fescue, was in relatively poor condition for grassland obligate species. However, there was enough heterogeneity in it to appeal to many of the expected breeding species. Grasshopper sparrows, although not common, were found there, as well as good numbers of eastern meadowlarks. Blue grosbeaks also used the area. Probably one of the most common species at Cold Harbor were chipping sparrows. This species was abundant in the mature, open pines around the Visitor Center, as well as the open pine battlefield site in the unit's interior.

Fort Harrison (74, 8, 12)

At twice the size of Cold Harbor, Fort Harrison was only marginally more diverse in bird species. It was hampered by the fact that it is such a linear unit, with most of the unit forming a narrow corridor interspersed with residential housing. In only one area of the unit does the boundary spread out to encompass some 80 ha (197 ac) of mixed forest. This area was generally enhanced by the presence of extensive forested wetlands, although this benefit was muted somewhat by the fact that much of the wetland habitat was dominated by pine forest. There were no significant grasslands associated with this unit, so the bird diversity here was all forest oriented. Prominent species, generally uncommon at other RICH units, were yellow-billed cuckoo, eastern wood-pewee, and hooded warbler. Rarer species that should be watched include prothonotary warblers, which were found within the wetlands along the park tour road, and Louisiana waterthrush, observed at only a couple of sites. The single site with highest bird diversity per unit area was Fort Brady. This tiny area of old-growth hardwood forest, perched at

the top of the river bank, was a magnet for migrants and edge breeding species alike. The unique species here was yellow warbler, only one of two sites this species was found to breed at RICH. Red-shouldered hawks also nested here.

Malvern Hill (95, 23, 27)

At greater than a square mile of area (51,200 ac), Malvern Hill was the only RICH unit large enough to express a full compliment of species in each of the primary habitat categories. This was aided by the presence of an extensive area of forested wetland that shares a boundary with Malvern Hill. But most important to this site is the presence of a significant body of open water habitat in the form of Crewes Channel; a diked impoundment of about 4 ha (9.8 ac) that lies at the foot of a forested wetland. This area alone yielded some 20 waterfowl and shorebird species not detected on any other unit. It was not uncommon to find 60–80 ducks of several species on Crewes Channel on any winter day. Swamp sparrows dominated the grassy margins and adjacent field in winter, while fox sparrows were found along the forest margins. In migration, Crewes Channel was observed to harbor dozens of juvenile great egrets in what appeared to be a post-dispersal staging area. The birds were present there in varying numbers from 20 to over 50 individuals for several days prior to fall migration. Bald eagles are routinely observed around Crewes Channel and park rangers reported large numbers of eagles opportunistically taking advantage of available prey during a period several years ago when the impoundment was drained.

The adjacent forested wetland harbors several pairs of prothonotary warblers, wood ducks, and red-headed woodpeckers, with winter bringing in rusty blackbirds. Surrounding the wetland, however, is one of the most critical habitats in the east, the shrub/scrub habitat that precedes a young forest. Relatively small in size, these habitats still harbored the full range of species: yellow-breasted chat, prairie warbler, and gray catbird. Likewise, these species were also found in the regenerating clearcut at the north end of the unit, along with good numbers of hooded warblers. These are all ephemeral species given the temporal nature of these two habitats. The park would have to implement some type of brush-cutting or burning program to perpetuate these species. Given the age of the transitional habitats involved, this species complex will be declining over the next few years.

The forest blocks at Malvern Hill are also large enough to attract many species that are normally considered “area sensitive.” A worm-eating warbler was detected during the breeding season, along with American redstarts, and several black-and-white warblers and Kentucky warblers. These species are considered tenuous at Malvern Hill, and their persistence may be influenced by subtle changes in the landscape. The spread of *Microstegium* at this unit could have serious implications for the quality of habitat of many of these species, as well as more common ones like wood thrush and ovenbirds.

Malvern Hill harbored the full range of woodpeckers and birds of prey. All three local owl species (great horned, barred, and eastern screech) reside there, as well as red-shouldered and red-tailed hawks, and Cooper’s hawk. An American kestrel nested in or around the abandoned farmhouse across from Malvern Hill, and wintering kestrels are present all along that road. Sharp-shinned and broad-winged hawks were observed in migration at Malvern Hill, and the latter may ultimately nest there. A merlin was also documented foraging at Malvern Hill a few

years ago in migration (College of William and Mary,, Fenton Day, Field Technician, pers. comm., 2004).

This unit was the only RICH unit that contained grassland patches of sufficient size to harbor a year-round grassland bird profile. Unfortunately, most of the patches were in various stages of active agriculture. The exception was the grassland portions of the central field area that contained the cannon batteries north of the visitor parking area. Although still heavy with fescue, there were patches of heterogeneity throughout, allowing grassland birds to find food. This was the only place with any reasonable density of grasshopper sparrows (~ two singing males/ha). Eastern meadowlarks were only slightly more common. In winter, savannah sparrows made very little use of this site, but were found in small numbers in most of the agricultural fields, particularly harvested soybean fields. Likewise, horned larks were observed in these fields in winter, and may possibly breed there in future years. This species breeds locally, and may be losing breeding sites locally as no-till agriculture continues to grow in popularity. Associated species to these grassland sites included blue grosbeaks, and, unfortunately, house finches.

Northern bobwhite and wild turkey were both present in good numbers at Malvern Hill. Likewise American woodcock was a common wintering species in the forest interior, while common snipe was found only occasionally using wet areas in the agricultural fields.

Summary and Management Recommendations

In summary, RICH harbors a fairly typical bird profile for central Virginia. It benefits in some respects from the scattered distribution of the individual units; by virtue of their disparate localities, they collectively represent the majority of Coastal Plain habitats. However, the disjunct nature of the units has ultimately resulted in generally small units where individual habitats are often too small to harbor the full suite of potential species. The presence of forested wetlands in almost every unit has been the one attribute to compensate for small parcel size in terms of achieving maximum avian diversity. Conversely, the pasture-type management of grasslands continues to undermine the full potential for early successional habitats at RICH. And finally, the generally small size also puts the units at a disadvantage against the invasion of exotic or invasive species. These three issues should be at the forefront of long-term management and conservation of biodiversity at RICH.

Grassland Management

Most of the grasslands at Richmond National Battlefield Park are managed as pasture-type grasslands, with a mowing regime that maintains grass height at some moderate height not to exceed about 12–15 inches. Unfortunately, the grass cover is typically composed of fescue species, a dense sod-type grass with little interstitial space and no areas of bare earth. This precludes adequate foraging opportunities for most grassland birds, further complicated by the fact that fescue affords little in seed value to birds or to the insects that would support insectivorous birds. Subtle changes in grassland management could yield significant benefits to grassland biodiversity. The Center for Conservation Biology produced a grassland management publication for Colonial National Historical Park in 2000 (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.

Forested Wetlands Conservation and Management

Forested wetlands at RICH run the gamut from discreet riparian habitats along the James River and numerous nontidal creeks to more diffuse, but extensive, bottomland hardwood habitats in interior forests. Their occurrence at the interface between aquatic and upland habitats, in essence, makes them an “edge” habitat (Mitsch and Gosselink 1986), and thus likely to have a greater diversity and abundance of species than either of the distinct ecosystems on each side (Odum 1979). Blem and Blem (1975) had earlier documented this in the Midwest, and this finding is consistently validated across the country.

The birdlife of forested wetlands follows a predictable distribution based on foliage structure and diversity, hydrology, wetland size and shape, and characteristics of adjacent upland (Frederickson 1979; Pashley and Barrow 1993;). As these attributes change, so too does the faunal community. And this is where management should be vigilant in the future. Timber harvesting is probably one of the single most detrimental events to the diversity of forested wetlands. Despite the lack of timbering in the wetlands proper, the loss of adjacent upland

habitat destroys the integrity of the system and may radically alter the bird community. Even with the implementation of today's "Best Management Practices," there is seldom an adequate buffer left along wetlands to accommodate the range of species that represent that system. This is especially true of riparian forests; although, some of the same impacts can be realized in association with timber harvests around more diffuse bottomland systems. Forested wetlands also exhibit the effects of fragmentation. It may happen as a result of timbering, hydrologic changes, diseases, natural disaster, or other means, but the results can mirror those of upland fragmentation. A net change in the overall community profile is common, usually with a bias toward edge-oriented species (Lynch and Whigham 1984). Any future habitat management initiatives should place priorities on maintaining substantial protected buffers around all wetlands, forested or otherwise, where feasible.

Slow degradation of remaining forested wetlands is probably the most common issue facing these habitats on NPS lands. Invasive species, water pollution, air pollution, and subtle changes in hydrology all take their toll on the quality and viability of forested wetlands (Mitsch and Gosselink 1986). Chickahominy Bluffs and Beaver Dam Creek harbor the forested areas of most concern at RICH. Proximity to major roads with ensuing run-off and airborne toxins will surely impact these habitats over time. The other units have relatively stable and healthy forested wetlands, although Crewes Channel may ultimately present problems at Malvern Hill. This impoundment is slowly silting in, and will eventually revert to an emergent wetland. This lack of open water will change the bird profile of this area substantially and, no doubt, indirectly affect the associated forested wetlands community. These areas should be monitoring priorities for the future. As these habitats are compromised efforts should be made to monitor for the spread of exotic or invasive plants. It will be important to control the spread of these species in and around wetlands because of the difficulty in removing problematic species in a wetland environment; there are fewer mechanical and chemical options available for use in wetlands.

Invasive Species Monitoring and Control

Although many species occurring in central Virginia now are alien, or exotic, species, not all of them are invasive. Invasives typically exhibit the following characteristics: rapid growth and maturity; prolific seed production; highly successful colonizers; rampant spread; ability to out-compete native species; and a high cost of control or removal (DCR 2003). The Virginia Department of Conservation and Recreation's Division of Natural Heritage lists 32 species in a 2003 report as "highly invasive." Of these, only a few were obvious at RICH: Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and Johnson grass (*Sorghum halepense*). Although not particularly common anywhere at RICH, they are permanent fixtures in our environment and, even though they are aggressive, exotic species, they all provide usable habitat for one or more bird species. As such, control and/or eradication is often a low priority. Many are already limited by one or more geophysical characteristics: soils, hydrology, or sun exposure.

One of the latest additions to the DCR list of "invasive species" however is *Microstegium vimineum*, commonly referred to as Nepalese browntop, or Japanese stiltgrass. *Microstegium* is a prolific seed disperser, capable of exploiting disturbed areas more quickly than most native plants (LaFleur 1996). 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, events such as Hurricane Isabel provide an ideal venue for the spread of *Microstegium* via stump holes and day-lighted areas from downed trees. 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 five to seven years, making it virtually impossible to eradicate once established (Tu 2000).

Of particular concern with this pest species is its effects on biodiversity. It has been shown to displace communities of native species (LaFleur 1996), but very little information exists on its impacts to wildlife. Anecdotal evidence suggests that its growth form and tendency to overtake native species may create problems for ground nesting and foraging birds. A plan to monitor the spread of this species will go far toward understanding the trends in a number of bird species.

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Appendix A. Expected list of breeding season bird species at Richmond National Battlefield Park, VA.

#	Breeding species	Taxonomic name
1	double-crested cormorant	<i>Phalacrocorax auritus</i>
2	great blue heron	<i>Ardea herodias</i>
3	great egret	<i>Ardea alba</i>
4	green heron	<i>Butorides virescens</i>
5	Canada goose	<i>Branta canadensis</i>
6	wood duck	<i>Aix sponsa</i>
7	mallard	<i>Anas platyrhynchos</i>
8	turkey vulture	<i>Cathartes aura</i>
9	black vulture	<i>Coragyps atratus</i>
10	Cooper's hawk	<i>Accipiter cooperii</i>
11	red-shouldered hawk	<i>Buteo lineatus</i>
12	broad-winged hawk	<i>Buteo platypterus</i>
13	red-tailed hawk	<i>Buteo jamaicensis</i>
14	bald eagle	<i>Haliaeetus leucocephalus</i>
15	osprey	<i>Pandion haliaetus</i>
16	American kestrel	<i>Falco sparverius</i>
17	northern bobwhite	<i>Colinus virginianus</i>
18	wild turkey	<i>Meleagris gallopavo</i>
19	killdeer	<i>Charadrius vociferus</i>
20	laughing gull	<i>Larus atricilla</i>
21	mourning dove	<i>Zenaida macroura</i>
22	rock dove	<i>Columba livia</i>
23	yellow-billed cuckoo	<i>Coccyzus americanus</i>
24	great horned owl	<i>Bubo virginianus</i>
25	barred owl	<i>Strix varia</i>
26	eastern screech owl	<i>Otus asio</i>
27	chuck-will's-widow	<i>Caprimulgus carolinensis</i>
28	whip-poor-will	<i>Caprimulgus vociferus</i>
29	chimney swift	<i>Chaetura pelagica</i>
30	ruby-throated hummingbird	<i>Archilochus colubris</i>
31	belted kingfisher	<i>Ceryle alcyon</i>
32	red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
33	red-bellied woodpecker	<i>Melanerpes carolinus</i>
34	downy woodpecker	<i>Picoides pubescens</i>
35	hairy woodpecker	<i>Picoides villosus</i>
36	northern flicker	<i>Colaptes auratus</i>
37	pileated woodpecker	<i>Dryocopus pileatus</i>
38	eastern wood-pewee	<i>Contopus virens</i>
39	Acadian flycatcher	<i>Empidonax virescens</i>
40	eastern phoebe	<i>Sayornis phoebe</i>
41	great crested flycatcher	<i>Myiarchus crinitus</i>
42	eastern kingbird	<i>Tyrannus tyrannus</i>
43	red-eyed vireo	<i>Vireo olivaceus</i>
44	white-eyed vireo	<i>Vireo griseus</i>
45	yellow-throated vireo	<i>Vireo flavifrons</i>
46	blue jay	<i>Cyanocitta cristata</i>
47	American crow	<i>Corvus brachyrhynchos</i>
48	fish crow	<i>Corvus ossifragus</i>
49	purple martin	<i>Progne subis</i>
50	northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
51	tree swallow	<i>Tachycineta bicolor</i>
52	barn swallow	<i>Hirundo rustica</i>
53	tufted titmouse	<i>Baeolophus bicolor</i>
54	Carolina chickadee	<i>Poecile carolinensis</i>
55	white-breasted nuthatch	<i>Sitta carolinensis</i>
56	Carolina wren	<i>Thryothorus ludovicianus</i>
57	house wren	<i>Troglodytes aedon</i>

Appendix A. Expected list of breeding season bird species at Richmond National Battlefield Park, VA (continued).

#	Breeding species	Taxonomic name
58	blue-gray gnatcatcher	<i>Poliophtila caerulea</i>
59	eastern bluebird	<i>Sialia sialis</i>
60	American robin	<i>Turdus migratorius</i>
61	wood thrush	<i>Hylocichla mustelina</i>
62	gray catbird	<i>Dumetella carolinensis</i>
63	northern mockingbird	<i>Mimus polyglottos</i>
64	brown thrasher	<i>Toxostoma rufum</i>
65	European starling	<i>Sturnus vulgaris</i>
66	cedar waxwing	<i>Bombycilla cedrorum</i>
67	northern parula	<i>Parula americana</i>
68	yellow warbler	<i>Dendroica petechia</i>
69	prairie warbler	<i>Dendroica discolor</i>
70	pine warbler	<i>Dendroica pinus</i>
71	yellow-throated warbler	<i>Dendroica dominica</i>
72	prothonotary warbler	<i>Protonotaria citrea</i>
73	black-and-white warbler	<i>Mniotilta varia</i>
74	American redstart	<i>Setophaga ruticilla</i>
75	ovenbird	<i>Seiurus aurocapillus</i>
76	Louisiana waterthrush	<i>Seiurus motacilla</i>
77	Kentucky warbler	<i>Oporornis formosus</i>
78	common yellowthroat	<i>Geothlypis trichas</i>
79	hooded warbler	<i>Wilsonia citrina</i>
80	yellow-breasted chat	<i>Icteria virens</i>
81	summer tanager	<i>Piranga rubra</i>
82	scarlet tanager	<i>Piranga olivacea</i>
83	northern cardinal	<i>Cardinalis cardinalis</i>
84	blue grosbeak	<i>Guiraca caerulea</i>
85	indigo bunting	<i>Passerina cyanea</i>
86	eastern towhee	<i>Pipilo erythrophthalmus</i>
87	field sparrow	<i>Spizella pusilla</i>
88	chipping sparrow	<i>Spizella passerina</i>
89	grasshopper sparrow	<i>Ammodramus savannarum</i>
90	song sparrow	<i>Melospiza melodia</i>
91	eastern meadowlark	<i>Sturnella magna</i>
92	brown-headed cowbird	<i>Molothrus ater</i>
93	red-winged blackbird	<i>Agelaius phoeniceus</i>
94	common grackle	<i>Quiscalus quiscula</i>
95	orchard oriole	<i>Icterus spurius</i>
96	house finch	<i>Carpodacus mexicanus</i>
97	American goldfinch	<i>Carduelis tristis</i>
98	house sparrow	<i>Passer domesticus</i>

Appendix B. Expected list of winter bird species at Richmond National Battlefield Park, VA.

#	Wintering species ¹	Taxonomic name
1	pied-billed grebe	<i>Podilymbus podiceps</i>
2	American black duck	<i>Anas rubripes</i>
3	gadwall	<i>Anas strepera</i>
4	northern pintail	<i>Anas acuta</i>
5	American widgeon	<i>Anas americana</i>
6	northern shoveler	<i>Anas clypeata</i>
7	green-winged teal	<i>Anas crecca</i>
8	ring-necked duck	<i>Aythya collaris</i>
9	bufflehead	<i>Bucephala albeola</i>
10	hooded merganser	<i>Lophodytes cucullatus</i>
11	northern harrier	<i>Circus cyaneus</i>
12	American coot	<i>Fulica americana</i>
13	American woodcock	<i>Scolopax minor</i>
14	common snipe	<i>Gallinago gallinago</i>
15	ring-billed gull	<i>Larus delawarensis</i>
16	herring gull	<i>Larus argentatus</i>
17	yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
18	horned lark	<i>Eremophila alpestris</i>
19	brown creeper	<i>Certhia americana</i>
20	winter wren	<i>Troglodytes troglodytes</i>
21	golden-crowned kinglet	<i>Regulus satrapa</i>
22	ruby-crowned kinglet	<i>Regulus calendula</i>
23	hermit thrush	<i>Catharus guttatus</i>
24	American pipit	<i>Anthus rubescens</i>
25	savannah sparrow	<i>Passerculus sandwichensis</i>
26	white-throated sparrow	<i>Zonotrichia albicollis</i>
27	fox sparrow	<i>Passerella iliaca</i>
28	swamp sparrow	<i>Melospiza georgiana</i>
29	dark-eyed junco	<i>Junco hyemalis</i>
30	rusty blackbird	<i>Euphagus carolinus</i>

¹ This list includes those species one would expect to find in the vicinity of RICH during the non-breeding seasons, or winter, only; therefore it does not include resident species, even though those occur during winter as well.

Appendix C. Expected list of transient migratory bird species at Richmond National Battlefield Park, VA.

#	Transient migratory species	Taxonomic name
1	blue-winged teal	<i>Anas discors</i>
2	sharp-shinned hawk	<i>Accipiter striatus</i>
3	greater yellowlegs	<i>Tringa melanoleuca</i>
4	lesser yellowlegs	<i>Tringa flavipes</i>
5	solitary sandpiper	<i>Tringa solitaria</i>
6	spotted sandpiper	<i>Actitis macularia</i>
7	least sandpiper	<i>Calidris minutilla</i>
8	common tern	<i>Sterna hirundo</i>
9	willow flycatcher	<i>Empidonax traillii</i>
10	blue-headed vireo	<i>Vireo solitarius</i>
11	bank swallow	<i>Riparia riparia</i>
12	veery	<i>Catharus fuscescens</i>
13	Swainson's thrush	<i>Catharus ustulatus</i>
14	gray-cheeked thrush	<i>Catharus minimus</i>
15	orange-crowned warbler	<i>Vermivora celata</i>
16	blue-winged warbler	<i>Vermivora pinus</i>
17	chestnut-sided warbler	<i>Dendroica pensylvanica</i>
18	magnolia warbler	<i>Dendroica magnolia</i>
19	Cape May warbler	<i>Dendroica tigrina</i>
20	black-throated blue warbler	<i>Dendroica caerulescens</i>
21	black-throated green warbler	<i>Dendroica virens</i>
22	palm warbler	<i>Dendroica palmarum</i>
23	blackpoll warbler	<i>Dendroica striata</i>
24	northern waterthrush	<i>Seiurus noveboracensis</i>
25	Canada warbler	<i>Wilsonia canadensis</i>
26	rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>
27	bobolink	<i>Dolichonyx oryzivorus</i>
28	Baltimore oriole	<i>Icterus galbula</i>

Appendix D. UTM Coordinates (NAD83) and description of habitat context of avian survey point locations at Richmond National Battlefield Park, VA, 2003–2004.

Pt #	Unit	XCoord.	Y Coord.	Location/Habitat
1	CB	289046	4162450	Observation platform overlooking grassy slope
2	CB	289191	4162661	Floodplain mixed forest (oak, cypress, pine)
3	CB	289297	4162411	Along upper slope of mature mixed forest
4	BC	291740	4163825	Transitional forested wetland: mixed mature to scrub/shrub
5	BC	291741	4163569	Edge of emergent wetland bounded by scrub/shrub habitat
6	CH	298138	4162355	Fescue dominated pasture
7	CH	297932	4162847	Dry, upland pine-dominated mixed mature forest
8	CH	298284	4163141	Dry, upland mixed pine-hardwood mature forest
9	CH	298187	6162711	Mature, mixed, forested stream corridor bisecting upland mixed forest
10	GM	297765	4161233	Lowland, pine dominated mixed mature forest
11	GM	297746	4160975	Developed grassland with scattered trees/buildings
12	GM	297448	4160971	Mature, mixed forest mid-slope between dry upland & forested wetland
13	GM	297240	4160909	Mature, mixed forest adjacent to forested wetland corridor
14	FD	285383	4144193	Fallow field in early succession toward shrub/scrub
15	FD	285496	4144364	Edge point between mature deciduous forest and open habitat
16	FD	285598	4144381	Mature, deciduous, high-bluff riparian forest
17	PB	287867	4136329	Transmission line corridor of grassland/scrub-shrub mixture
18	PB	287986	4136210	Upland, mature, pine-dominated mixed forest
19	FH	289595	4145966	Mature, upland mixed forest, along road edge
20	FH	290125	4145426	Mixed, transitional forest
21	FH	289831	4145330	Upland, mixed mature forest
22	FH	289695	4145090	Open area; buildings /shade trees surrounded by mature forest
23	FH	290222	4145059	Mixed, transitional forested wetland.
24	FH	290033	4144848	Open, earthworks area; grassy with random shade trees.
25	FH	289687	4144796	Interior, mixed mature, forested wetland
26	FH	289767	4144569	Mixed, transitional wetland forest, along roadside
27	FH	290963	4140941	Mature, deciduous woodland; adjacent to riparian scrub-shrub.
28	MH	300238	4142610	Scrub-shrub habitat along wetland border
29	MH	300416	4142657	Field/forest edge along roadside
30	MH	300367	4142839	Agricultural (soybean) field
31	MH	300176	4143030	Unpaved road at dike crossing between forested and open wetland.
32	MH	300016	4143252	Scrub-shrub habitat between forest and forested wetland
33	MH	300854	4143074	Edge of soybean field and information kiosk by parking area.
34	MH	300565	4143114	On trail at entrance to mature deciduous forest
35	MH	300377	4143301	Interior of mature, deciduous dominate forest
36	MH	300032	4143529	Mature, mixed forested wetland.edge habita.
37	MH	299880	4143752	Juncture of grassland, forested wetland, and settling pond
38	MH	300897	4143457	Scrub-shrub habitat surrounding wetland within grassland
39	MH	300496	4144004	Scrub-shrub island within grassland adjacent to pine forest
40	MH	300161	4143957	Interior pine plantation adjacent to stream corridor
41	MH	299837	4144069	Interior pine plantation adjacent to forested wetland
42	MH	300838	4143881	Mature, deciduous forest adjacent to road
43	MH	300805	4144273	Mature, deciduous interior forest
44	MH	301500	4143500	Transitional forest between grassland and forested wetland
45	MH	301241	4143916	Mature, deciduous forested wetland, adjacent to road
46	MH	301133	4144049	Mature, deciduous, interior forested wetland
47	MH	301441	4144141	Mature, deciduous forest adjacent to agricultural field
48	MH	301169	4144180	Mixed, mature forest between agricultural field and forested wetland\
49	MH	300981	4144456	Edge of mature deciduous forest and scrub-shrub wetland
50	MH	301332	4144785	Interior, mixed forested wetland
51	MH	301918	4145635	Scrub-shrub wetland corridor between agricultural field and residential
52	MH	301064	4144919	Scrub-shrub, regenerating pine plantation edge
53	MH	301977	4145797	Scrub-shrub, regenerating pine plantation interior, adjacent to remnant mature hardwoods

Appendix E. Species list and conservation status of birds detected at Richmond National Battlefield Park, VA, during inventories in 2003–2004.

#	Species	Taxonomic name	Fed.	State	PIF score
1	pied-billed grebe	<i>Podilymbus podiceps</i>			14
2	double-crested cormorant	<i>Phalacrocorax auritus</i>			
3	great blue heron	<i>Ardea herodias</i>			13
4	great egret	<i>Ardea alba</i>		SC	11
5	green heron	<i>Butorides virescens</i>			
6	Canada goose	<i>Branta canadensis</i>			
7	wood duck	<i>Aix sponsa</i>			
8	mallard	<i>Anas platyrhynchos</i>			
9	American black duck	<i>Anas rubripes</i>			24
10	gadwall	<i>Anas strepera</i>			
11	northern pintail	<i>Anas acuta</i>			
12	American widgeon	<i>Anas americana</i>			
13	blue-winged teal	<i>Anas discors</i>			
14	green-winged teal	<i>Anas crecca</i>			
15	ring-necked duck	<i>Aythya collaris</i>			
16	bufflehead	<i>Bucephala albeola</i>			
17	hooded merganser	<i>Lophodytes cucullatus</i>			
18	turkey vulture	<i>Cathartes aura</i>			
19	black vulture	<i>Coragyps atratus</i>			
20	northern harrier	<i>Circus cyaneus</i>		SC	16
21	sharp-shinned hawk	<i>Accipiter striatus</i>			
22	Cooper's hawk	<i>Accipiter cooperii</i>			15
23	red-shouldered hawk	<i>Buteo lineatus</i>			15
24	broad-winged hawk	<i>Buteo platypterus</i>			
25	red-tailed hawk	<i>Buteo jamaicensis</i>			
26	bald eagle	<i>Haliaeetus leucocephalus</i>		LT	17
27	osprey	<i>Pandion haliaetus</i>			15
28	American kestrel	<i>Falco sparverius</i>			19
29	northern bobwhite	<i>Colinus virginianus</i>			21
30	wild turkey	<i>Meleagris gallopavo</i>			
31	killdeer	<i>Charadrius vociferus</i>			
32	black-necked stilt	<i>Himantopus mexicanus</i>			
33	greater yellowlegs	<i>Tringa melanoleuca</i>			
34	lesser yellowlegs	<i>Tringa flavipes</i>			
35	solitary sandpiper	<i>Tringa solitaria</i>			
36	spotted sandpiper	<i>Actitis macularia</i>			
37	least sandpiper	<i>Calidris minutilla</i>			
38	American woodcock	<i>Scolopax minor</i>			
39	common snipe	<i>Gallinago gallinago</i>			
40	laughing gull	<i>Larus atricilla</i>			
41	ring-billed gull	<i>Larus delawarensis</i>			
42	herring gull	<i>Larus argentatus</i>			
43	Caspian tern	<i>Sterna caspia</i>		SC	
44	mourning dove	<i>Zenaidura macroura</i>			
45	yellow-billed cuckoo	<i>Coccyzus americanus</i>			
46	great horned owl	<i>Bubo virginianus</i>			
47	barred owl	<i>Strix varia</i>			13
48	eastern screech owl	<i>Otus asio</i>			
49	chimney swift	<i>Chaetura pelagica</i>			20
50	ruby-throated hummingbird	<i>Archilochus colubris</i>			
51	belted kingfisher	<i>Ceryle alcyon</i>			
52	red-headed woodpecker	<i>Melanerpes erythrocephalus</i>		BCC	21
53	red-bellied woodpecker	<i>Melanerpes carolinus</i>			
54	yellow-bellied sapsucker	<i>Sphyrapicus varius</i>			
55	downy woodpecker	<i>Picoides pubescens</i>			
56	hairy woodpecker	<i>Picoides villosus</i>			
57	northern flicker	<i>Colaptes auratus</i>			

Appendix E. Species list and conservation status of birds detected at Richmond National Battlefield Park, VA, during inventories in 2003–2004 (continued).

#	Species	Taxonomic name	Fed.	State	PIF score
58	pileated woodpecker	<i>Dryocopus pileatus</i>			
59	eastern wood-pewee	<i>Contopus virens</i>			22
60	Acadian flycatcher	<i>Empidonax vireescens</i>			23
61	eastern phoebe	<i>Sayornis phoebe</i>			
62	great crested flycatcher	<i>Myiarchus crinitus</i>			
63	eastern kingbird	<i>Tyrannus tyrannus</i>			
64	red-eyed vireo	<i>Vireo olivaceus</i>			
65	white-eyed vireo	<i>Vireo griseus</i>			22
66	yellow-throated vireo	<i>Vireo flavifrons</i>			23
67	blue-headed vireo	<i>Vireo solitarius</i>			
68	blue jay	<i>Cyanocitta cristata</i>			
69	American crow	<i>Corvus brachyrhynchos</i>			
70	fish crow	<i>Corvus ossifragus</i>			
71	horned lark	<i>Eremophila alpestris</i>			
72	purple martin	<i>Progne subis</i>			
73	northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>			
74	tree swallow	<i>Tachycineta bicolor</i>			
75	bank swallow	<i>Riparia riparia</i>			13
76	barn swallow	<i>Hirundo rustica</i>			
77	tufted titmouse	<i>Baeolophus bicolor</i>			
78	Carolina chickadee	<i>Poecile carolinensis</i>			21
79	white-breasted nuthatch	<i>Sitta carolinensis</i>			
80	brown creeper	<i>Certhia americana</i>		SC	
81	Carolina wren	<i>Thryothorus ludovicianus</i>			
82	house wren	<i>Troglodytes aedon</i>			
83	winter wren	<i>Troglodytes troglodytes</i>		SC	
84	golden-crowned kinglet	<i>Regulus satrapa</i>		SC	
85	ruby-crowned kinglet	<i>Regulus calendula</i>			
86	blue-gray gnatcatcher	<i>Poliophtila caerulea</i>			
87	eastern bluebird	<i>Sialia sialis</i>			
88	American robin	<i>Turdus migratorius</i>			
89	wood thrush	<i>Hylocichla mustelina</i>	BCC		25
90	veery	<i>Catharus fuscescens</i>			
91	Swainson's thrush	<i>Catharus ustulatus</i>			
92	gray-cheeked thrush	<i>Catharus minimus</i>			
93	hermit thrush	<i>Catharus guttatus</i>		SC	
94	gray catbird	<i>Dumetella carolinensis</i>			19
95	northern mockingbird	<i>Mimus polyglottos</i>			
96	brown thrasher	<i>Toxostoma rufum</i>			21
97	European starling	<i>Sturnus vulgaris</i>			
98	cedar waxwing	<i>Bombycilla cedrorum</i>			
99	northern parula	<i>Parula americana</i>	BCC		
100	Tennessee warbler	<i>Vermivora peregrina</i>			
101	blue-winged warbler	<i>Vermivora pinus</i>			24
102	yellow warbler	<i>Dendroica petechia</i>			
103	chestnut-sided warbler	<i>Dendroica pensylvanica</i>			
104	magnolia warbler	<i>Dendroica magnolia</i>		SC	
105	Cape May warbler	<i>Dendroica tigrina</i>			
106	black-throated blue warbler	<i>Dendroica caerulescens</i>			
107	yellow-rumped warbler	<i>Dendroica coronata</i>			
108	black-throated green warbler	<i>Dendroica virens</i>	BCC		
109	prairie warbler	<i>Dendroica discolor</i>	BCC		25
110	palm warbler	<i>Dendroica palmarum</i>			
111	pine warbler	<i>Dendroica pinus</i>			
112	bay-breasted warbler	<i>Dendroica castanea</i>	BCC		
113	blackpoll warbler	<i>Dendroica striata</i>			
114	yellow-throated warbler	<i>Dendroica dominica</i>			

Appendix E. Species list and conservation status of birds detected at Richmond National Battlefield Park, VA, during inventories in 2003–2004 (continued).

#	Species	Taxonomic name	Fed.	State	PIF score
115	worm-eating warbler	<i>Helmitheros vermivorus</i>	BCC		23
116	prothonotary warbler	<i>Protonotaria citrea</i>	BCC		22
117	black-and-white warbler	<i>Mniotilta varia</i>			
118	American redstart	<i>Setophaga ruticilla</i>			
119	ovenbird	<i>Seiurus aurocapillus</i>			
120	northern waterthrush	<i>Seiurus noveboracensis</i>			
121	Louisiana waterthrush	<i>Seiurus motacilla</i>			22
122	Kentucky warbler	<i>Oporornis formosus</i>	BCC		24
123	common yellowthroat	<i>Geothlypis trichas</i>			
124	Canada warbler	<i>Wilsonia canadensis</i>	BCC		
125	hooded warbler	<i>Wilsonia citrina</i>			
126	yellow-breasted chat	<i>Icteria virens</i>			19
127	summer tanager	<i>Piranga rubra</i>			
128	scarlet tanager	<i>Piranga olivacea</i>			21
129	northern cardinal	<i>Cardinalis cardinalis</i>			
130	rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>			
131	blue grosbeak	<i>Guiraca caerulea</i>			
132	indigo bunting	<i>Passerina cyanea</i>			
133	eastern towhee	<i>Pipilo erythrophthalmus</i>			21
134	field sparrow	<i>Spizella pusilla</i>			21
135	chipping sparrow	<i>Spizella passerina</i>			
136	grasshopper sparrow	<i>Ammodramus savannarum</i>			20
137	savannah sparrow	<i>Passerculus sandwichensis</i>			13
138	white-throated sparrow	<i>Zonotrichia albicollis</i>			
139	fox sparrow	<i>Passerella iliaca</i>			
140	song sparrow	<i>Melospiza melodia</i>			
141	swamp sparrow	<i>Melospiza georgiana</i>			
142	dark-eyed junco	<i>Junco hyemalis</i>			
143	eastern meadowlark	<i>Sturnella magna</i>			
144	brown-headed cowbird	<i>Molothrus ater</i>			
145	red-winged blackbird	<i>Agelaius phoeniceus</i>			
146	rusty blackbird	<i>Euphagus carolinus</i>			
147	common grackle	<i>Quiscalus quiscula</i>			
148	Baltimore oriole	<i>Icterus galbula</i>			
149	orchard oriole	<i>Icterus spurius</i>			
150	house finch	<i>Carpodacus mexicanus</i>			
151	American goldfinch	<i>Carduelis tristis</i>			

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

SMC = Species of Management Concern

LT = Listed Threatened

State = State list of threatened and endangered species

SC-b = Special Concern as a breeding species

PIF score = Partners in Flight conservation score;

Species with scores higher than 20 are listed in the table and considered to be most threatened

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
U.S. Department of the Interior



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