



Breeding Bird Monitoring

Mid-Atlantic Network 2010 Summary Report

Natural Resource Data Series NPS/MIDN/NRDS—2012/279



ON THE COVER

Red-eyed Vireo (*Vireo olivaceus*)

Photograph by: Bill Moses

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List of Terms, Small Glossary, Acronyms, or Contacts

APCO: Appomattox Court House National Historical Park
BCI: Bird Community Index
BCR: Bird Conservation Region
BOWA: Booker T. Washington National Monument
FRSP: Fredericksburg and Spotsylvania National Military Park
GRTS: Generalized Random Tessellation Stratified Design
I&M: Inventory and Monitoring Program
MIDN: Mid-Atlantic Network
NABCI: North American Bird Conservation Initiative
NB: National Battlefield
NBP: National Battlefield Park
NER: NPS Northeast Region
NHP: National Historical Park
NM: National Monument
NMP: National Military Park
NP: National Park
NPS: National Park Service
PIF: Partners in Flight
RICH: Richmond National Battlefield Park
SE: Standard Error
USGS: U.S. Geological Survey
VAFO: Valley Forge National Historical Park

Introduction

As part of the Natural Resource Challenge (NPS 1999), the Mid-Atlantic Network (MIDN) has been tasked with monitoring “vital signs,” a suite of physical, chemical, or biological elements or processes that represent the overall health or condition of the network parks’ natural resources. Breeding birds have been selected as one of the Mid-Atlantic Network’s vital signs because they are highly visible, are a reliable indicator of ecological integrity, and face numerous population threats in the region (Comiskey and Callahan 2008).

The Mid-Atlantic Network began pilot testing a volunteer breeding bird monitoring program in 2009 at three network parks and has expanded the program to five network parks for 2010 (Figure 1). Four parks fall in the Piedmont Bird Conservation Region (BCR) and one falls in the Southeastern Coastal Plain BCR, but is immediately adjacent to the Piedmont BCR. Developed by the North American Bird Conservation Initiative (NABCI), BCRs are ecologically distinct units designed to help focus conservation efforts for specific bird communities. The Mid-Atlantic Network consists of 10 park units across Pennsylvania and Virginia. In the future, the network hopes to expand monitoring efforts to the remaining parks within the network.

The two primary objectives for the monitoring protocol are to:

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of the relationship between breeding birds, habitats, and park management.

This report summarizes monitoring data collected in 2009 and 2010. We provide park and region-wide abundance metrics for all species, and take note of the spatial distribution of species of conservation concern identified on a continental and regional scale (for the Piedmont/Southeastern Coastal Plain region). We also provide a community-wide assessment of species composition (a “Bird Community Index” or BCI) that informs on ecosystem integrity by evaluating the relative composition of different guilds in the overall bird community.

A resource brief that may be used as outreach material is also provided at the beginning of each park’s section of the report. Higher resolution versions of these documents that are suitable for printing may be downloaded from the Mid-Atlantic Network’s bird protocol website (<http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>).

Readers should treat results as provisional, as metrics may be confounded by variability in detection probability. A more comprehensive analysis that accounts for such variability will be included as we acquire more data.

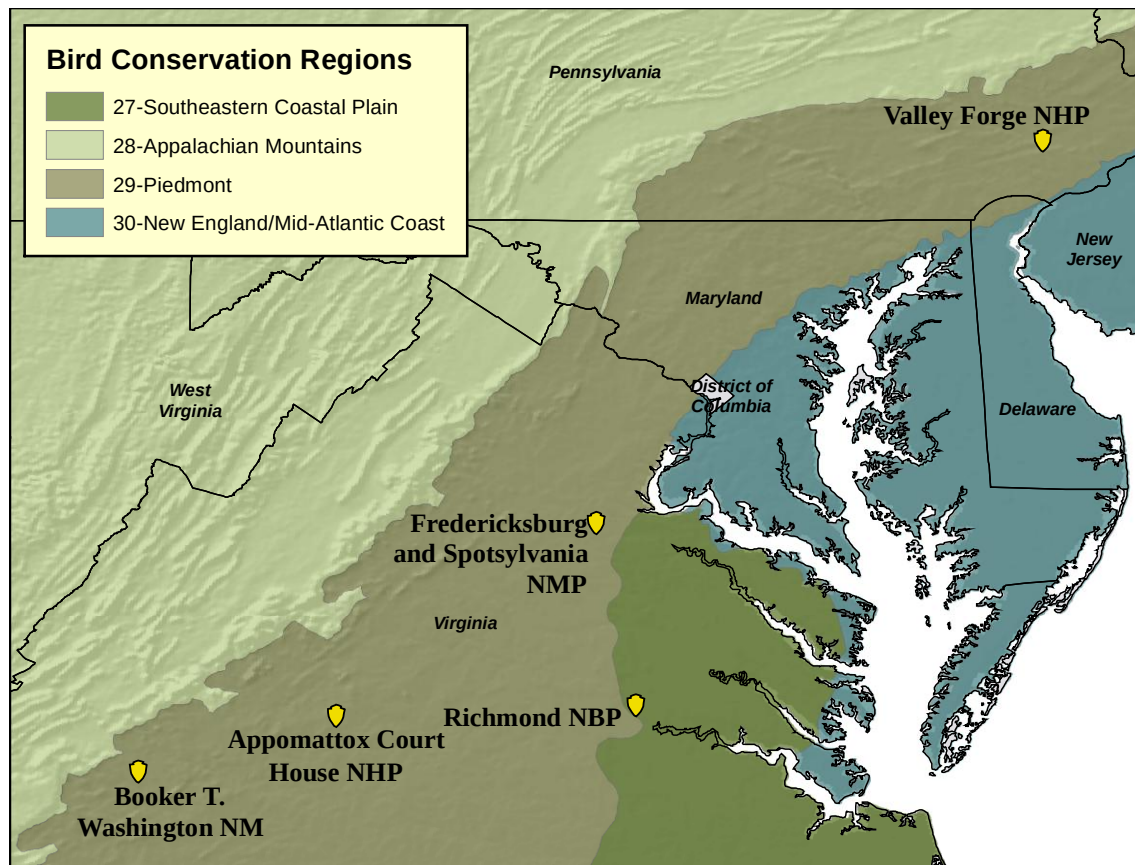


Figure 1. Mid-Atlantic Network parks implementing bird monitoring in 2009 and 2010 and their associated Bird Conservation Region (BCR).

Methods

Study Area

Pilot testing for the bird monitoring program began in 2009 at Booker T. Washington National Monument (BOWA), Fredericksburg and Spotsylvania National Military Park (FRSP), and Valley Forge National Historical Park (VAFO). In 2010, monitoring efforts were expanded to Appomattox Court House National Historical Park (APCO) and Richmond National Battlefield Park (RICH).

Sample Design

Monitoring stations were selected by overlaying a 250 m grid on park maps. The grid is the same used for selecting vegetation monitoring plots (Comiskey et al. 2009), but offset by 125 m. This allows for point count stations to be co-located with vegetation monitoring plots, but reduces trampling or otherwise influencing vegetation monitoring data from repeat visits. Stations that were selected were at least 15 m from hiking trails and secondary and tertiary roads (park roads), and 50 m from primary roads, park boundaries, and buildings which are frequented by visitors and may influence bird behavior.

VAFO is a large contiguous park with more possible sampling locations than available volunteers. Therefore, stations at this park were randomly selected using the Generalized Random Tesselation Stratified (GRTS) algorithm (Stevens and Olsen 2004).

APCO, like VAFO is a large contiguous park, but due to severe limitations in available volunteers and the difficulty of accessing points in dense thickets, a GRTS sample was not possible. Therefore, only stations that were easily accessible were sampled at this park.

FRSP and RICH contain several discrete units separated over large areas. To maximize volunteer time, resource managers at those parks selected a unit most representative of their park or of management concern for monitoring (Table 1).

While the parks within the network are primarily forested, many also contain large areas managed as grasslands to represent historic battlefields. Resource managers were interested in long-term trends for both of these habitat types. Therefore, each point count station was categorized as either grassland or forest based on vegetation maps available for each park (Patterson 2008, Taverna and Patterson 2008, and Podniesinski et al. 2005). Edge buffers between habitat types were not applied because analysis is on the overall characterization of each habitat type rather than a comparison across types (Ralph et al. 1995).

Surveys

Skilled volunteers with approximately 3-5 years of birding experience in the region were recruited by the parks. All volunteers attended a training session or a refresher course prior to the field season. Point counts were conducted at stations between May 25 and July 15 of each year, except at BOWA, where sampling began a week earlier. Volunteers visited each station at least once per season, and some stations were surveyed multiple times. During each survey, volunteers recorded all birds detected, including flyovers, in a ten-minute interval along with the minute the bird was first detected, whether the bird was within or beyond 50 m, the type of detection (visual, auditory, both), and the location of the detection. New species detected outside

the formal count (i.e. walking between stations or detected right after count ended) were recorded as incidentals.

Data were transcribed to paper datasheets, entered into the U.S. Geological Survey (USGS) point-count database (<http://www.pwrc.usgs.gov/point/>), and later verified by the project lead.

Metrics

We present total number of species, total raw detections, relative abundance, and percent occurrence summaries for the region and each park. In the past, we provided density estimates which incorporated variation in detectability relative to distance. These density estimates are not being presented in this report because we believe they will be more accurate and meaningful after additional data has accumulated and a thorough analysis of factors affecting detectability can be conducted. Because 75-100 detections per species are typically required for such analysis (Buckland et al. 2001), data will be fully analyzed and presented every 5-10 years. Hence, until such analyses are completed, results should be treated as preliminary since variation in detectability is not accounted for in the current data summaries.

All detections, including flyovers and incidentals, were included in species counts and total raw detections. Here, the goal is to document the total diversity of species across all three parks, so including incidental encounters is not problematic. However, for calculations of percent occurrence and relative abundance, flyovers and incidentals are not useful and were removed. Additionally, in assessing the relative abundance of a particular species, using the sum of individuals across repeat visits may lead to upward-biased results (e.g. inflating abundance estimates by double-counting the same bird across multiple visits). To avoid this potential bias, we calculated relative abundance using the maximum count across repeat visits (if applicable).

Special note was also taken for species of conservation concern. Partners in Flight (PIF), a cooperative effort to address the conservation of birds, produced a list of species of conservation concern in their North American Landbird Conservation Plan (Rich et al. 2004). They define two sets of species of concern, “Watchlist” species that face immediate threats due to habitat alteration, declining populations, small population size, and limited distributions, and “Stewardship” species that are representative species of avifaunal biomes that may or may not be in immediate danger. These lists have been developed at the continental and regional scale. We identified both continental and regional (e.g. Piedmont and Southeastern Coastal Plain BCRs) Watchlist and Stewardship species detected across the five parks.

Avian Integrity Scorecards

Avian guilds, or groups of species occupying similar ecological niches, are diverse and can be utilized for assessing response to environmental changes and ecosystem stressors. These guilds can be defined based on foraging behavior and substrate, nesting substrate, migratory distance, and various other life history traits. Changes in ecological condition can variably impact avian guilds, resulting in alterations to the bird community as a whole (Severinghaus 1981, Verner 1984). Bird community assessments, or “indices” (BCIs), yield a quantitative metric that can be used to define the ecological integrity of a sampled area based on the avian community present. BCIs assume that changes in habitat quality or extent, upon which a specific guild is dependent, results in corresponding changes in the representation of that guild within the overall bird community. Within the BCI, guilds are ranked based on specialization, with specialist guilds

receiving higher weight over generalist guilds. This ability to use the bird community to reflect ecological condition, particularly in urban areas where impacts can be multi-faceted, provides a valuable and informative indicator for monitoring programs.

BCI scores and ratings are based on ecological criteria. However, due to cultural landscape objectives within the park and surrounding land use conditions, parks may not ever attain “high ecological integrity”. However, shifts in ecological integrity over time may be indicative of stressors. Additionally, a management scorecard could be developed by park and MIDN staff that would reflect progress towards avian and ecological management goals for individual parks.

BCIs are designed to represent major habitat types, as bird communities shift markedly by ecosystem. Two major habitat types dominate the parks in the Mid-Atlantic Network; forest and grassland. O’Connell et al. (2003) developed a combined forest integrity index for the Piedmont and Southeastern Coastal Plain ecoregions that can be applied to the points that fall in forested areas. For grassland bird communities, however, we are still exploring metrics for assessment.

Avian Scorecard Methods

For forest BCI analysis, data from grassland stations, incidentals, flyovers, and unknown species were removed. Only members of the following families were used in BCI analyses: Passeriformes, Columbiformes, Apodiformes, Piciformes, and Cuculiformes. Furthermore, only bird species that were included in the original development of the index were considered (O’Connell et al. 2003, Coppedge et al. 2006). Therefore, there were some detections of birds that were not included in the integrity analyses.

Data were compiled for stations that were visited more than once. Forest integrity estimates based on O’Connell et al. (2003) are built from percent guild representation rather than counts of individuals, so multiple visits provide a more complete picture of the community and not an upward biased BCI score (e.g. from double-counted individuals).

Often, ecological integrity reports aggregate individual integrity metrics to create indices of overall ecosystem scores (Karr 1991, O’Connell et al. 2003). However, some believe that these indices may rely on a subjective understanding of the relative importance of each individual metric in estimating overall ecosystem integrity and that, by aggregating metrics, individual ecosystem components which may need attention are obscured (Faccio et al. 2010). Therefore, we summarized the data in both manners: across each individual guild and as an aggregated score.

Calculating BCI scores

All species detected at forested stations were assigned to appropriate guilds that were defined by O’Connell et al. (2003) and shown to respond most strongly to changing forest structure (Appendix A). Proportional guild representation was then calculated for each station. For example, if 2 of 10 species detected at a station were forest interior species, then that station had 20% forest interior species. That guild percentage was then assigned a rank score of 1, 2, 3, or 4 (Table 1) using thresholds derived by O’Connell et al. (2003) for the Piedmont and Southeastern Coastal Plain. This was done for each guild and a final BCI score for a station is then calculated as follows:

$$V1 = \frac{\sum \text{Structural Guild Ranks}}{4}$$

$$V1 = \frac{\sum \text{Functional Guild Ranks}}{4}$$

$$V1 = \frac{\sum \text{Compositional Guild Ranks}}{4}$$

$$BCI = \frac{V1 + V2 + V3}{9}$$

This final BCI score which ranges from 0.25 – 1.00 can then be then assigned a rank that falls on the Humanistic to Naturalistic scale of 1 to 4 (Table 1). Thus for each station, we derive individual guild rank scores and an aggregate rank score. Station scores are then averaged to provide scores for each park and the region.

Table 1. Rank scores by percent guild representation for forested sites based on O’Connell et al. (2003). See details on these guild assignments in Appendix A.

Guild		Percent Guild Representation			
		Rank = 1 Humanistic	Rank = 2 Moderately Disturbed	Rank = 3 Largely Intact	Rank = 4 Naturalistic
Structural Guilds	Forest Interior	0 -10.0	10.1 - 20.0	20.1 - 28.0	28.1 - 100
	Pine Associated	0	0.1 - 2.0	2.1 - 5.0	5.1 - 100
	Urban/Suburban	60.1 - 100	47.1 - 60.0	20.1 - 47.0	0 - 20.0
Functional Guilds	Bark Prober	0 - 9.0	9.1 - 16.0	16.1 - 20.0	20.1 - 100
	Upper Canopy Forager	0 - 4.0	4.1 - 12.0	12.1 - 18.0	18.1 - 100
	Ground Forager	0	0.1 - 3.0	3.1 - 7.0	7.1 - 100
Compositional Guilds	Single Brooded	0 - 16.0	16.1 - 34.0	34.1 - 46.0	46.1 - 100
	Nest Predator / Brood Parasite	23.1 -100	16.1 - 23.0	0.1 - 16.0	0
	Exotic	11.1-100	1.1 - 11.0	0.1 - 1.0	0
Final BCI Score		0.25 - 0.46	0.46-0.60	0.60 - 0.73	0.73 - 1.0

Results and Discussion

Region-wide

A total of 361 surveys were conducted by 36 volunteers at 210 stations in 2010 (Table 2). Of the stations, 141 were in forested habitat and 69 were in grassland habitat.

Table 2. Number of monitoring stations at five Mid-Atlantic Network parks in 2010 by habitat type, total number of surveys conducted, and total number of volunteers surveying.

Park	Park Unit	Park Code	Number of Stations			Total Surveys	Average Surveys/Station	Volunteers
			Forest	Grassland	Total			
Appomattox Court House National Historical Park (NHP)		APCO	24	8	32	42	1.31	6
Booker T. Washington National Monument (NM)		BOWA	11	4	15	47	3.13	4
Fredericksburg and Spotsylvania National Military Park (NMP)	Spotsylvania Battlefield	FRSP	48	8	56	103	1.84	8
Richmond National Battlefield Park (NBP)	Malvern Hill	RICH	22	10	32	32	1.00	4
Valley Forge National Historical Park (NHP)		VAFO	36	39	75	137	1.83	14
Total			141	69	210	361	1.72	36

Across the five parks, 4,393 individual birds were detected encompassing 96 species, with an additional two species and 691 individuals detected as flyovers. Within forested habitats 128 species were detected, while 113 species were detected in grassland habitats. Fredericksburg and Spotsylvania NMP and Valley Forge NHP had the greatest number of detections and number of species (Table 3), but they also had the greatest number of surveys conducted (Table 2). Booker T. Washington NM and Fredericksburg NMP had the highest number of species of concern.

Table 3. Number of detections and species detected in 2010 at bird monitoring stations in five Mid-Atlantic Network parks.

Unit	Detections*	Number of Species			Total
		Forest	Grassland	Species of Concern	
APCO	377	39	33	24	50
BOWA	698	51	42	27	60
FRSP	1165	53	44	27	63
RICH	347	53	31	23	59
VAFO	2497	55	64	23	73

*Detections are raw unadjusted counts which include flyovers and may include double-counted individuals.

European Starlings had the highest relative abundance ($\bar{x} = 2.17$ birds/station ± 0.63 SE) and the greatest number of detections ($n = 302$) across the region. Red-eyed Vireos had the second

highest relative abundance ($\bar{x} = 0.78$ birds/station ± 0.06 SE) and detections ($n = 164$) and were the most prevalent species, occurring at 55.2% of stations surveyed (Table 4).

A total of 36 species of concern as identified by Partners in Flight (PIF) were detected across the five parks in 2010, including 20 watchlist species and 16 stewardship species (Table 5). Two species of concern, the Wood Thrush and Red-bellied Woodpecker, were among the 10 most abundant (Table 4).

The average BCI for forested stations across the parks was 0.68 ± 0.01 , giving the region a rating of “largely intact” (Table 6). The nest predator / brood parasite and pine associated guilds had the lowest ratings, ranked “moderately disturbed.” The remaining guilds were either rated “largely intact” or “naturalistic.”

Table 4. Number of detections, mean and standard error of abundance (birds/station) and the number and percentage of stations individual species were detected at during the 2010 breeding bird monitoring season at five Mid-Atlantic Network parks. Detections do not include flyovers or incidentals and uses maximum counts per station if multiple visits were made.

Species	Detections	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)
European Starling	302	2.17 $\pm$ 0.63	10.00
Red-eyed Vireo	164	0.78 $\pm$ 0.06	55.24
Red-winged Blackbird	81	0.76 $\pm$ 0.13	10.95
Tufted Titmouse	158	0.75 $\pm$ 0.07	50.00
American Crow	146	0.70 $\pm$ 0.07	44.29
Blue Jay	141	0.67 $\pm$ 0.06	46.19
Red-bellied Woodpecker†	114	0.54 $\pm$ 0.05	43.81
Wood Thrush*	112	0.53 $\pm$ 0.05	37.62
Canada Goose	84	0.52 $\pm$ 0.25	2.86
American Robin	108	0.51 $\pm$ 0.06	32.38
Northern Cardinal	105	0.50 $\pm$ 0.05	40.00
Indigo Bunting†	96	0.46 $\pm$ 0.06	30.00
Northern Mockingbird	53	0.43 $\pm$ 0.05	16.67
Song Sparrow	56	0.43 $\pm$ 0.05	19.52
Eastern Meadowlark*	52	0.43 $\pm$ 0.07	12.38
Common Yellowthroat	81	0.39 $\pm$ 0.05	25.24
Eastern Wood-Pewee*	80	0.38 $\pm$ 0.04	32.38
Carolina Chickadee†	74	0.35 $\pm$ 0.05	25.71
White-breasted Nuthatch	74	0.35 $\pm$ 0.04	29.52
Mourning Dove	73	0.35 $\pm$ 0.05	26.67
Ovenbird	72	0.34 $\pm$ 0.05	24.76
Acadian Flycatcher†	69	0.33 $\pm$ 0.04	25.71
Scarlet Tanager	59	0.28 $\pm$ 0.04	24.76
Tree Swallow	21	0.28 $\pm$ 0.09	4.29
American Goldfinch	58	0.28 $\pm$ 0.05	18.10
Carolina Wren†	57	0.27 $\pm$ 0.04	21.43
Gray Catbird	44	0.27 $\pm$ 0.04	16.19
Chipping Sparrow	55	0.26 $\pm$ 0.05	18.10
Grasshopper Sparrow*	12	0.26 $\pm$ 0.05	2.86
Baltimore Oriole*	34	0.23 $\pm$ 0.04	10.95
Eastern Towhee*	38	0.21 $\pm$ 0.04	14.29
Downy Woodpecker†	44	0.21 $\pm$ 0.03	19.05
Eastern Bluebird	35	0.20 $\pm$ 0.05	10.48
Yellow-billed Cuckoo*	39	0.19 $\pm$ 0.04	14.29
Blue-gray Gnatcatcher	39	0.19 $\pm$ 0.03	15.71
Eastern Kingbird*	30	0.17 $\pm$ 0.03	10.48
House Wren	12	0.16 $\pm$ 0.03	5.71
Eastern Phoebe	23	0.16 $\pm$ 0.03	9.05
Barn Swallow	27	0.15 $\pm$ 0.05	5.71

Table 4. Number of detections, mean and standard error of abundance (birds/station) and the number and percentage of stations individual species were detected at during the 2010 breeding bird monitoring season at five Mid-Atlantic Network parks (continued).

Species	Detections	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)
Field Sparrow*	30	0.14 $\pm$ 0.03	11.43
Yellow-throated Vireo†	19	0.14 $\pm$ 0.03	8.10
Brown-headed Cowbird	29	0.14 $\pm$ 0.04	10.00
Blue-winged Warbler*	12	0.13 $\pm$ 0.05	1.90
Northern Flicker*	10	0.13 $\pm$ 0.08	0.48
Black Vulture	28	0.13 $\pm$ 0.03	11.90
Orchard Oriole†	21	0.12 $\pm$ 0.03	7.62
Warbling Vireo	8	0.11 $\pm$ 0.02	3.81
Chimney Swift*	14	0.10 $\pm$ 0.03	4.76
Great Crested Flycatcher	21	0.10 $\pm$ 0.02	8.57
Prairie Warbler*	7	0.10 $\pm$ 0.02	2.86
Blue Grosbeak†	10	0.10 $\pm$ 0.03	2.86
Hooded Warbler†	3	0.09 $\pm$ 0.02	1.43
Yellow-throated Warbler	3	0.09 $\pm$ 0.03	0.95
Cedar Waxwing	11	0.09 $\pm$ 0.03	3.33
Turkey Vulture	18	0.09 $\pm$ 0.02	6.67
Pileated Woodpecker†	14	0.08 $\pm$ 0.02	6.19
Northern Bobwhite*	5	0.08 $\pm$ 0.02	2.38
Summer Tanager†	1	0.07 $\pm$ 0.02	0.48
Blackpoll Warbler	1	0.07 $\pm$ 0.02	0.48
Northern Rough-winged Swallow	9	0.07 $\pm$ 0.02	4.29
Osprey	2	0.06 $\pm$ 0.02	0.48
Common Grackle	13	0.06 $\pm$ 0.02	4.76
Yellow-breasted Chat	5	0.06 $\pm$ 0.02	1.90
Mallard	6	0.06 $\pm$ 0.03	0.95
House Finch	4	0.05 $\pm$ 0.03	0.95
American Coot	4	0.05 $\pm$ 0.02	1.90
Red-tailed Hawk	11	0.05 $\pm$ 0.02	4.29
Pine Warbler†	7	0.05 $\pm$ 0.02	3.33
Louisiana Waterthrush	5	0.05 $\pm$ 0.01	2.38
Hairy Woodpecker	8	0.04 $\pm$ 0.02	2.86
Red-shouldered Hawk†	4	0.04 $\pm$ 0.02	0.95
American Redstart	6	0.04 $\pm$ 0.01	2.86
Brown Thrasher*	7	0.04 $\pm$ 0.02	2.86
American Kestrel	3	0.04 $\pm$ 0.01	1.43
Yellow Warbler	3	0.04 $\pm$ 0.01	1.43
Northern Parula†	4	0.04 $\pm$ 0.02	0.95
Kentucky Warbler*	3	0.03 $\pm$ 0.01	1.43
White-eyed Vireo†	6	0.03 $\pm$ 0.02	1.90
Killdeer	3	0.03 $\pm$ 0.02	0.95

Table 4. Number of detections, mean and standard error of abundance (birds/station) and the number and percentage of stations individual species were detected at during the 2010 breeding bird monitoring season at five Mid-Atlantic Network parks (continued).

Species	Detections	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)
Red-headed Woodpecker*	1	0.03 $\pm$ 0.01	0.48
Lesser Yellowlegs	1	0.03 $\pm$ 0.01	0.48
Wild Turkey	1	0.03 $\pm$ 0.01	0.48
Ruby-throated Hummingbird	4	0.03 $\pm$ 0.01	1.90
Great Blue Heron	6	0.03 $\pm$ 0.02	1.90
Worm-eating Warbler*	2	0.03 $\pm$ 0.01	0.95
Wood Duck	2	0.02 $\pm$ 0.01	0.48
Belted Kingfisher	3	0.02 $\pm$ 0.01	1.43
Green Heron	1	0.02 $\pm$ 0.01	0.48
Palm Warbler	1	0.02 $\pm$ 0.01	0.48
Fish Crow	2	0.02 $\pm$ 0.01	0.95
Veery	2	0.02 $\pm$ 0.01	0.95
Willow Flycatcher*	1	0.01 $\pm$ 0.01	0.48
Eastern Screech-Owl	1	0.01 $\pm$ 0.01	0.48
Bank Swallow	1	0.01 $\pm$ 0.01	0.48
Sharp-shinned Hawk	1	0.01 $\pm$ 0.01	0.48

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 5. Bird species detected in the five Mid-Atlantic Network parks during the 2010 breeding bird monitoring season and patterns of occurrence between 2009-2010. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	APCO	BOWA	FRSP	RICH	VAFO	Region	
						2009	2010
Canada Goose			●	●	●	●	●
Wood Duck				●	○		●
Mallard				●	●	●	●
Common Peafowl						○	
Wild Turkey				●		●	●
Northern Bobwhite*	●			●			●
Great Blue Heron	●	●	○	●	●	●	●
Green Heron			●				●
Black Vulture		○			●	●	●
Turkey Vulture	●	●	○	●	●	●	●
Osprey				●			●
Bald Eagle				○			○
Sharp-shinned Hawk			●		○		●
Cooper's Hawk						○	
Red-shouldered Hawk†	●	●	●	●		●	●
Red-tailed Hawk	●	○	●	○	●	●	●
American Kestrel					●	●	●
American Coot					●		●
Killdeer		●			●	●	●
Lesser Yellowlegs				●			●
Rock Pigeon					○		○
Mourning Dove	●	●	●	●	●	●	●
Black-billed Cuckoo*					○		○
Yellow-billed Cuckoo*	●	●	●	●	●	●	●
Eastern Screech-Owl					●		●
Barred Owl						●	
Chimney Swift*	●			●	●	●	●
Ruby-throated Hummingbird	●	●	●	○			●
Belted Kingfisher			●	●	●	●	●
Red-headed Woodpecker*				●			●
Red-bellied Woodpecker†	●	●	●	●	●	●	●
Downy Woodpecker†	●	●	●	●	●	●	●
Hairy Woodpecker		●	●	●	●	●	●
Northern Flicker*	●	●	●	●	●	●	●
Pileated Woodpecker†		●	●	●	●	●	●
Eastern Wood-Pewee*	●	●	●	●	●	●	●

Table 5. Bird species detected in the five Mid-Atlantic Network parks during the 2010 breeding bird monitoring season and patterns of occurrence between 2009-2010 (continued).

Species	APCO	BOWA	FRSP	RICH	VAFO	Region	
						2009	2010
Acadian Flycatcher†	•	•	•	•	•	•	•
Willow Flycatcher*					•	•	•
Eastern Phoebe		•	•		•	•	•
Great Crested Flycatcher	•	○	•	•	•	•	•
Eastern Kingbird*	•	•	•		•	•	•
White-eyed Vireo†		○	•	•	•	•	•
Yellow-throated Vireo†	•	•	•	•		•	•
Warbling Vireo					•	•	•
Red-eyed Vireo	•	•	•	•	•	•	•
Blue Jay	•	•	•	•	•	•	•
American Crow	•	•	•	•	•	•	•
Fish Crow			•		•		•
Purple Martin†						○	
Tree Swallow					•	•	•
Northern Rough-winged Swallow		•				○	•
Bank Swallow					•		•
Barn Swallow	•	•	○		•	•	•
Carolina Chickadee†	•	•	•	•	•	•	•
Tufted Titmouse	•	•	•	•	•	•	•
White-breasted Nuthatch	•	•	•	•	•	•	•
Carolina Wren†	•	•	•	•	•	•	•
House Wren					•	•	•
Blue-gray Gnatcatcher	•	•	•	•	•	•	•
Eastern Bluebird		•	•	•	•	•	•
Veery			•		•	•	•
Wood Thrush*	•	•	•	•	•	•	•
American Robin	•	•	•	•	•	•	•
Gray Catbird			•	•	•	•	•
Northern Mockingbird	•	•			•	•	•
Brown Thrasher*			•	•	•	•	•
European Starling	•			•	•	•	•
Cedar Waxwing	•	•			•	•	•
Blue-winged Warbler*					•	•	•
Northern Parula†	•	○	•			•	•
Yellow Warbler					•	•	•
Yellow-throated Warbler				•		•	•
Pine Warbler†	•	•	•	•		•	•

Table 5. Bird species detected in the five Mid-Atlantic Network parks during the 2010 breeding bird monitoring season and patterns of occurrence between 2009-2010 (continued).

Species	APCO	BOWA	FRSP	RICH	VAFO	Region	
						2009	2010
Prairie Warbler*		●	●			●	●
Palm Warbler			●				●
Blackpoll Warbler		●					●
American Redstart		●			●		●
Worm-eating Warbler*		●	●			●	●
Ovenbird	●	●	●	●	●	●	●
Louisiana Waterthrush		●	●	●		●	●
Kentucky Warbler*			●	●			●
Common Yellowthroat	●	●	●	●	●	●	●
Hooded Warbler†				●		●	●
Canada Warbler						●	
Yellow-breasted Chat	●		●			●	●
Summer Tanager†	●	●	●	●		●	●
Scarlet Tanager	●	●	●	●	●	●	●
Eastern Towhee*	●	●	●		●	●	●
Chipping Sparrow	●	●	●	●	●	●	●
Field Sparrow*	●	●	●	●	●	●	●
Grasshopper Sparrow*	●	●				●	●
Song Sparrow			●		●	●	●
Northern Cardinal	●	●	●	●	●	●	●
Blue Grosbeak†	●	●	●			●	●
Indigo Bunting†	●	●	●	●	●	●	●
Red-winged Blackbird				●	●	●	●
Eastern Meadowlark*	●	●			●	●	●
Common Grackle	●	●	●	○	●	●	●
Brown-headed Cowbird	●	●	●	●	●	●	●
Orchard Oriole†	●	○	●		●	●	●
Baltimore Oriole*		●	●		●	●	●
House Finch					●	●	●
American Goldfinch	●	●	●	○	●	●	●

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 6. Regional avian forest guild summary and Bird Community Index (BCI) rank for 2010. Percents indicate the average percent guild membership at monitoring locations across five parks in the Mid-Atlantic Network. Total BCI scores range from 0-1 with 1 being having the highest integrity. Ranks are derived from O'Connell et al. (2003).

	Guild	Percent	Rank
Structural	Forest Interior	30.23	Naturalistic
	Pine Associated	0.85	Moderately Disturbed
	Urban/Suburban	40.43	Largely Intact
Functional	Bark Prober	20.27	Naturalistic
	Ground Forager	4.06	Largely Intact
	Upper Canopy Forager	20.38	Naturalistic
Compositional	Nest Predator / Brood Parasite	18.46	Moderately Disturbed
	Single Brooded	48.14	Naturalistic
	Exotic	0.82	Largely Intact
Total BCI Score		0.69	Largely Intact

Appomattox Court House National Historical Park

Northeast Region
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Mid-Atlantic Network

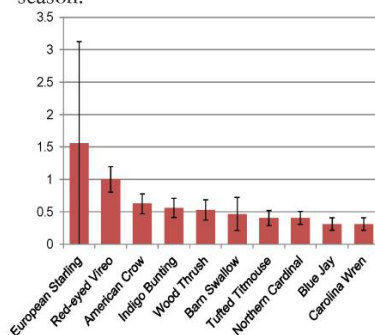
Breeding Bird Resource Brief



Red-eyed Vireo

Appomattox Courthouse National Historical Park 2010 Status & Trends

A total of 32 stations were surveyed at Appomattox Court House NHP during the park's first season of breeding bird monitoring, including 24 stations in forested habitats and 8 stations in grassland habitats. Six volunteer birders from the local birding community conducted an average of 1.31 surveys per station producing a total of 42 surveys for the season.



The 10 most commonly detected bird species at Appomattox Court House NHP in 2010 and their associated relative abundance (average birds/station). Error bars indicate standard error, a measure of variation.

Between June and July, 377 birds of 50 species were detected throughout the park. Species richness was similar across habitat types with 39 species in forested habitats and 33 in grassland habitats.

The 10 most abundant species were the European Starling, Red-eyed Vireo, American Crow, Indigo Bunting, Wood Thrush, Barn Swallow, Northern Cardinal, Tufted Titmouse, Blue Jay, and Carolina Wren. European Starlings had the highest relative abundance averaging 1.56 birds / station, but this is based on a single detection of a large flock. Red-eyed Vireos were the second most abundant species and the most prevalent species, occurring in 59.3% of the stations surveyed.

Species of conservation concern, as defined by Partners in Flight (PIF), were well represented in the park, with volunteers detecting 24 species (see table on back right). PIF further distinguishes

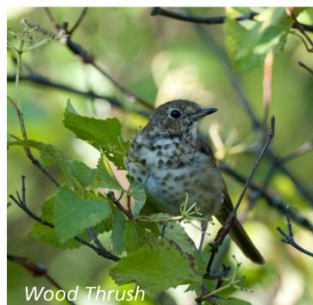
Objectives

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of relationships between breeding birds, habitats and park management.

species of concern as “watchlist” species, which face immediate threats, or “stewardship” species, which are representative of avifaunal biomes that may or may not be in immediate danger.

Within the park, 11 watchlist species and 13 stewardship species were detected. The Wood Thrush, a watchlist species was quite prevalent in the park, occurring at 34.4% of the stations surveyed. Additionally, the Wood Thrush and 2 stewardship species (i.e. Indigo Bunting and Carolina Wren) were among the 10 most abundant species.

Avian guilds, or groups of species occupying similar ecological niches, can



Wood Thrush

Importance

In the densely populated Mid-Atlantic region, birds face numerous threats including urbanization, habitat loss, and fragmentation. National parks provide refuge from such threats with contiguous and protected tracts of habitat suitable for breeding birds. These parks host species of continental concern and other species that are declining throughout their range.

Birds are also excellent barometers of ecosystem health due to their high metabolism and prominent position in the food web. Detecting changes in bird populations may help alert park staff to ecological stressors such as invasive species, overbrowsing, detrimental park management practices, or climate change and help guide future management actions.

Figure 2. 2010 Resource Brief for Appomattox Court House NHP. A high resolution version may be downloaded from <http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>.

Management Applications

- A total of 50 species were detected across the park including 24 species of concern.
- The Wood Thrush, a continental watchlist species, was among the 10 most common species in the park.
- European Starlings, an exotic species, had the highest abundance using unadjusted counts

Long-term Monitoring

Between May and July of each year, volunteer birders conduct point counts at monitoring stations in forest and grassland habitats. Stations in forested areas are located within 125 m of forest vegetation monitoring plots enabling park staff to associate long-term trends in vegetation with avian population trends.

During each 10-minute count, the volunteer records environmental

conditions, how the bird was detected (visually or aurally), and the distance and minute of first detection.

Each site is visited at least once, but volunteers are encouraged to make multiple visits in a season. Multiple visits are especially important for obtaining accurate density estimates as information on variability due to observers, weather, etc. can be accounted for.

Status & Trends Continued...

be utilized for assessing response to environmental changes and ecosystem stressors via bird community assessments, or “indices” (BCIs). Based on a BCI developed for the Piedmont/Coastal Plain region (O’Connell et al.

Avian forest guild summary and Bird Community Index (BCI) score for 2010. Percents indicate the average percent guild membership at monitoring locations across the park. Total BCI scores range from 0-1 with 1 having the highest integrity.

	Guild	Percent	Rank
Structural	Forest Interior	22.77	Largely Intact
	Pine Associated	2.92	Largely Intact
	Urban/Suburban	42.50	Largely Intact
Functional	Bark Prober	16.42	Largely Intact
	Ground Forager	2.49	Moderately Disturbed
	Upper Canopy Forager	28.93	Naturalistic
Compositional	Nest Predator/Brood Parasite	18.52	Moderately Disturbed
	Single Brooded	46.02	Naturalistic
	Exotic	0.00	Naturalistic
Total BCI Score		0.78	Naturalistic

2003), forested stations surveyed this year received the highest ranking of “naturalistic”. Rankings, when broken out by guild, also show medium to high ecological integrity (see table on left). Ground foraging species such as Ken-

tucky Warblers, Louisiana Waterthrush, and Ovenbirds were underrepresented, whereas nest predator/brood parasite guild species such as American Crows and Blue Jays were prevalent explaining the “moderately disturbed” rank for these two guilds.

Species	Detections	% Occupied
Watchlist Species		
Chimney Swift	1	3.13
Eastern Kingbird	2	3.13
Eastern Meadowlark	8	9.38
Eastern Towhee	1	3.13
Eastern Wood-Pewee	2	6.25
Field Sparrow	3	6.25
Grasshopper Sparrow	6	9.38
Northern Bobwhite	1	3.13
Northern Flicker	1	3.13
Wood Thrush	17	34.38
Yellow-billed Cuckoo	9	25.00
Stewardship Species		
Acadian Flycatcher	5	15.63
Blue Grosbeak	2	6.25
Carolina Chickadee	8	15.63
Carolina Wren	10	28.13
Downy Woodpecker	6	18.75
Indigo Bunting	18	43.75
Northern Parula	2	3.13
Orchard Oriole	2	6.25
Pine Warbler	2	6.25
Red-bellied Woodpecker	8	25.00
Red-shouldered Hawk	1	3.13
Summer Tanager	1	3.13
Yellow-throated Vireo	1	3.13

Number of detections of Partners in Flight (PIF) watchlist and stewardship species and percent of stations they were detected at Appomattox Court House NHP in 2010. Number of detections exclude flyovers and incidental encounters.

References:

O’Connell, et al. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS – Patuxent Wildlife Research Center. Report No. 2003-02.

Photographs by:

Bill Thompson

A Final Note

It is important to note that the data presented in this brief is preliminary and results are limited to areas in the park sampled. More information about this protocol can be found in the full annual reports accessible from the protocol website linked below.

We’d like to thank all our volunteers for walking off the beaten path in the summer heat to count birds: Thelma Dalmás, Joseph Freeman, JoAnne Pierce, Gene Sattler, John Styrsky, and Sandra Weigand.



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Protocol Website:

More information and full annual reports may be found at
<http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>

February 2012

Figure 2. 2010 Resource Brief for Appomattox Court House NHP (continued).

Table 7. Summary statistics and detection types for point count surveys conducted in 2010 at Appomattox Court House NHP. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected 2010
European Starling	1.56 $\pm$ 1.56	3.13	●
Red-eyed Vireo	1.00 $\pm$ 0.20	59.38	●
American Crow	0.63 $\pm$ 0.15	40.63	●
Indigo Bunting†	0.56 $\pm$ 0.15	43.75	●
Wood Thrush*	0.53 $\pm$ 0.16	34.38	●
Barn Swallow	0.47 $\pm$ 0.25	12.50	●
Tufted Titmouse	0.41 $\pm$ 0.12	31.25	●
Northern Cardinal	0.41 $\pm$ 0.10	37.50	●
Blue Jay	0.31 $\pm$ 0.09	28.13	●
Carolina Wren†	0.31 $\pm$ 0.09	28.13	●
Common Yellowthroat	0.28 $\pm$ 0.13	15.63	●
Yellow-billed Cuckoo*	0.28 $\pm$ 0.09	25.00	●
Eastern Meadowlark*	0.25 $\pm$ 0.16	9.38	●
Carolina Chickadee†	0.25 $\pm$ 0.12	15.63	●
Red-bellied Woodpecker†	0.25 $\pm$ 0.08	25.00	●
Scarlet Tanager	0.22 $\pm$ 0.09	18.75	●
Grasshopper Sparrow*	0.19 $\pm$ 0.11	9.38	●
Ovenbird	0.19 $\pm$ 0.08	15.63	●
Downy Woodpecker†	0.19 $\pm$ 0.07	18.75	●
American Robin	0.19 $\pm$ 0.07	18.75	●
Mourning Dove	0.16 $\pm$ 0.07	15.63	●
Acadian Flycatcher†	0.16 $\pm$ 0.07	15.63	●
Turkey Vulture	0.13 $\pm$ 0.07	9.38	●
Blue-gray Gnatcatcher	0.13 $\pm$ 0.07	9.38	●
Chipping Sparrow	0.13 $\pm$ 0.07	9.38	●
White-breasted Nuthatch	0.13 $\pm$ 0.06	12.50	●
Field Sparrow*	0.09 $\pm$ 0.07	6.25	●
Brown-headed Cowbird	0.09 $\pm$ 0.05	9.38	●
Eastern Kingbird*	0.06 $\pm$ 0.06	3.13	●
Northern Parula†	0.06 $\pm$ 0.06	3.13	●
Eastern Wood-Pewee*	0.06 $\pm$ 0.04	6.25	●
Pine Warbler†	0.06 $\pm$ 0.04	6.25	●
Yellow-breasted Chat	0.06 $\pm$ 0.04	6.25	●
Blue Grosbeak†	0.06 $\pm$ 0.04	6.25	●
Common Grackle	0.06 $\pm$ 0.04	6.25	●
Orchard Oriole†	0.06 $\pm$ 0.04	6.25	●
Northern Bobwhite*	0.03 $\pm$ 0.03	3.13	●

Table 7. Summary statistics and detection types for point count surveys conducted in 2010 at Appomattox Court House NHP (continued).

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected 2010
Great Blue Heron	0.03 $\pm$ 0.03	3.13	●
Red-shouldered Hawk†	0.03 $\pm$ 0.03	3.13	●
Red-tailed Hawk	0.03 $\pm$ 0.03	3.13	●
Chimney Swift*	0.03 $\pm$ 0.03	3.13	●
Ruby-throated Hummingbird	0.03 $\pm$ 0.03	3.13	●
Northern Flicker*	0.03 $\pm$ 0.03	3.13	●
Great Crested Flycatcher	0.03 $\pm$ 0.03	3.13	●
Yellow-throated Vireo†	0.03 $\pm$ 0.03	3.13	●
Northern Mockingbird	0.03 $\pm$ 0.03	3.13	●
Cedar Waxwing	0.03 $\pm$ 0.03	3.13	●
Summer Tanager†	0.03 $\pm$ 0.03	3.13	●
Eastern Towhee*	0.03 $\pm$ 0.03	3.13	●
American Goldfinch	0.03 $\pm$ 0.03	3.13	●

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 8. Avian forest guild summary and Bird Community Index (BCI) score for 2010 at Appomattox Court House NHP. Percents indicate the average percent guild membership at monitoring locations. Total BCI scores range from 0-1 with 1 having the highest integrity. Ranks are derived from O'Connell et al. (2003).

2010 (n=29)			
Guild		Percent	Rank
Structural	Forest Interior	22.77	Largely Intact
	Pine Associated	2.92	Largely Intact
	Urban/Suburban	42.50	Largely Intact
Functional	Bark Prober	16.42	Largely Intact
	Ground Forager	2.49	Moderately Disturbed
	Upper Canopy	28.93	Naturalistic
Compositional	Nest Predator / Brood Parasite	18.52	Moderately Disturbed
	Single Brooded	46.02	Naturalistic
	Exotic	0.00	Naturalistic
Total BCI Score		0.78	Naturalistic

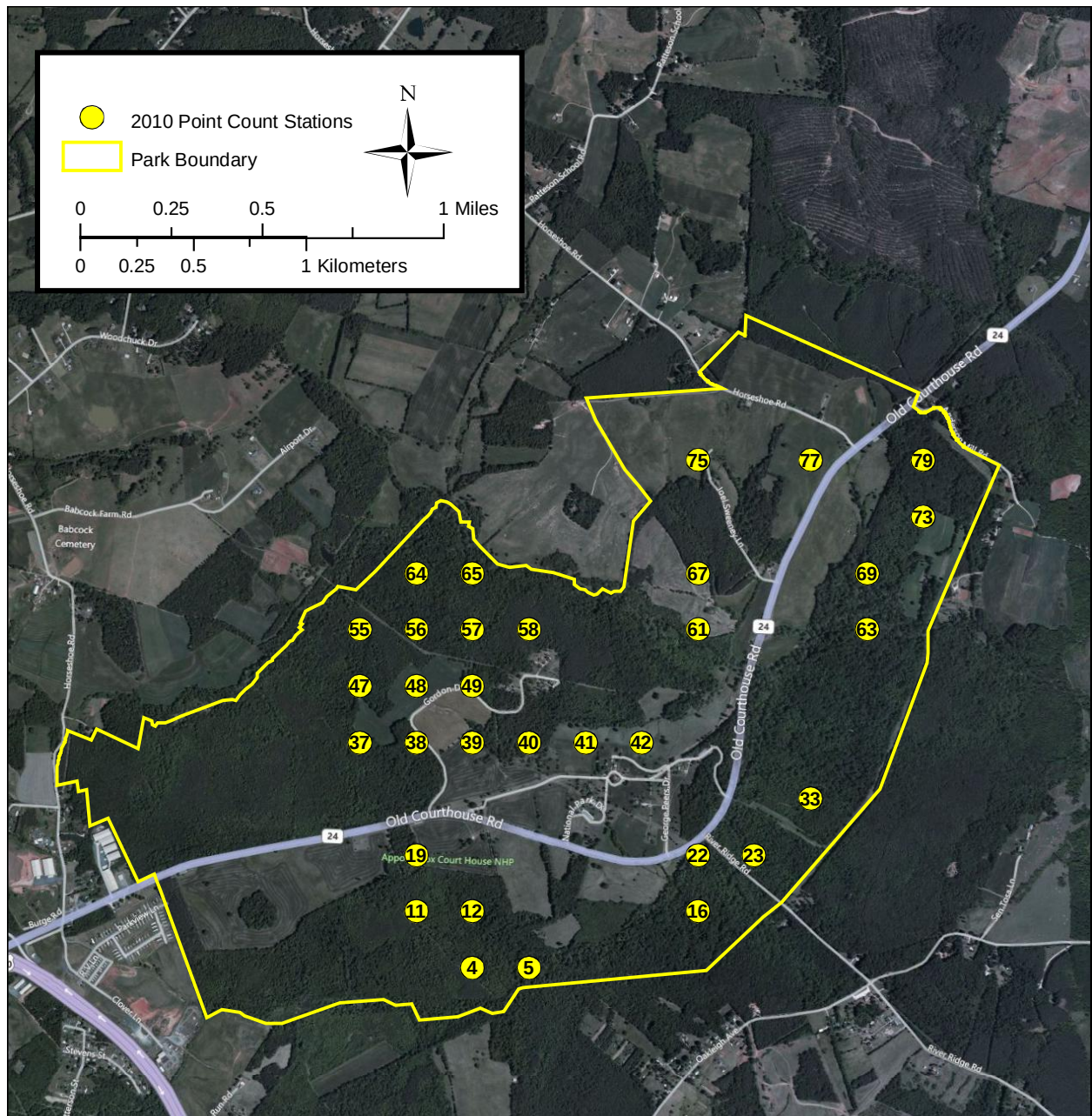


Figure 3. Bird monitoring stations sampled at Appomattox Court House NHP in 2010.

Booker T. Washington National Monument

Northeast Region
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Mid-Atlantic Network

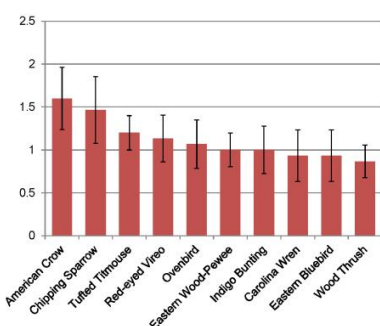
Breeding Bird Resource Brief



Red-eyed Vireo

Booker T. Washington National Monument 2010 Status & Trends

A total of 15 stations were surveyed at Booker T. Washington NM during the 2010 breeding bird monitoring program, including 11 stations in forested habitats and 4 stations in grassland habitats. Four volunteer birders from the local birding community conducted an average of 3.13 surveys per station producing a total of 47 surveys for the season.



The 10 most commonly detected bird species at Booker T. Washington NM in 2010 and their associated relative abundance (average birds/station). Error bars indicate standard error, a measure of variation.

Between May and July, 698 birds of 60 species were detected throughout the park. Several species were detected this year that were not in previous monitoring years including the American Redstart, Blackpoll Warbler, Blue Grosbeak, Orchard Oriole, Worm-eating Warbler, and White-eyed Vireo.

The 10 most abundant species were the American Crow, Chipping Sparrow, Tufted Titmouse, Red-eyed Vireo, Ovenbird, Indigo Bunting, Eastern Wood-Pewee, Carolina Wren, Eastern Bluebird, and Wood Thrush. American Crows were the most numerous species averaging 1.60 birds / station followed by Chipping Sparrows at 1.47 birds / station. The Tufted Titmouse and Eastern Wood-Pewee were the most prevalent species, occurring at 80% of the stations surveyed.

Species of conservation concern, as defined by Partners in Flight (PIF),

Objectives

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of relationships between breeding birds, habitats and park management.

were well represented in the park, with volunteers detecting 27 species (see table on back right). PIF further distinguishes species of concern as “watchlist” species, which face immediate threats, or “stewardship” species, which are representative of avifaunal biomes that may or may not be in immediate danger.

Within the park, 12 watchlist species and 15 stewardship species were detected. Four species of concern, including 2 watchlist species (i.e. Eastern Wood-Pewee and Wood Thrush) and 2 stewardship species (i.e. Indigo Bunting and Carolina Wren), were among the 10 most abundant species.



Wood Thrush

Importance

In the densely populated Mid-Atlantic region, birds face numerous threats including urbanization, habitat loss, and fragmentation. National parks provide refuge from such threats with contiguous and protected tracts of habitat suitable for breeding birds. These parks host species of continental concern and other species that are declining throughout their range.

Birds are also excellent barometers of ecosystem health due to their high metabolism and prominent position in the food web. Detecting changes in bird populations may help alert park staff to ecological stressors such as invasive species, overbrowsing, detrimental park management practices, or climate change and help guide future management actions.

Figure 4. 2010 Resource Brief for Booker T. Washington NM. A high resolution version may be downloaded from <http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>.

Management Applications

- A total of 60 species were detected across the park including 27 species of concern.
- The Eastern Wood-Pewee and Wood Thrush, both watchlist species, were among the 10 most common species in the park.
- The park's forested stations received the highest ecological integrity ranking, "naturalistic", using a Bird Community Index (BCI).

Long-term Monitoring

Between May and July of each year, volunteer birders conduct point counts at monitoring stations in forest and grassland habitats. Stations in forested areas are located within 125 m of forest vegetation monitoring plots enabling park staff to associate long-term trends in vegetation with avian population trends.

During each 10-minute count, the volunteer records environmental

conditions, how the bird was detected (visually or aurally), and the distance and minute of first detection.

Each site is visited at least once, but volunteers are encouraged to make multiple visits in a season. Multiple visits are especially important for obtaining accurate density estimates as information on variability due to observers, weather, etc. can be accounted for.

Status & Trends Continued...

opened for the Piedmont/Coastal Plain region (O'Connell et al. 2003), forested stations surveyed this year received the highest ranking of "naturalistic". This was an increase from the 2009 ranking of "largely intact". Rankings, when broken out by guild, also show medium

to high ecological integrity (see table below). Forest interior, single brooded, upper canopy forager, and exotic guilds showed particularly high ecological integrity, because species like the Eastern Wood-Pewee, Ovenbird, and Wood Thrush were well represented whereas exotic species were uncommon.

	Guild	2009		2010	
		Percent	Rank	Percent	Rank
Structural	Forest Interior	34.93	Naturalistic	43.05	Naturalistic
	Pine Associated	0.00	Humanistic	1.42	Moderately Disturbed
	Urban/Suburban	43.59	Largely Intact	29.08	Largely Intact
Functional	Bark Prober	16.73	Largely Intact	18.91	Largely Intact
	Ground Forager	6.48	Largely Intact	6.80	Largely Intact
	Upper Canopy Forager	17.32	Largely Intact	25.27	Naturalistic
Compositional	Nest Predator/Brood Parasite	18.30	Moderately Disturbed	11.88	Largely Intact
	Single Brooded	45.78	Largely Intact	56.65	Naturalistic
	Exotic	0.00	Naturalistic	0.00	Naturalistic
Total BCI Score		0.72	Largely Intact	0.83	Naturalistic

Avian forest guild summary and Bird Community Index (BCI) score for 2010. Percents indicate the average percent guild membership at monitoring locations across the park. Total BCI scores range from 0-1 with 1 having the highest integrity.

A Final Note

It is important to note that the data presented in this brief is preliminary as variability in the dataset has not yet been accounted for. For more information on this protocol, please see the full annual report accessible from the protocol website linked below.

We'd like to thank all our volunteers for walking off the beaten path in the summer heat to count birds: Alyce Quinn, Tim Quinn, Anne Tucker, and Bill Tucker.



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Photographs by:
Bill Thompson

Species	Detections	% Occupied
Watchlist Species		
Baltimore Oriole	2	13.33
Eastern Kingbird	2	6.67
Eastern Meadowlark	12	33.33
Eastern Towhee	9	33.33
Eastern Wood-Pewee	15	80.00
Field Sparrow	6	26.67
Grasshopper Sparrow	6	20.00
Northern Flicker	4	20.00
Prairie Warbler	4	26.67
Wood Thrush	13	66.67
Worm-eating Warbler	1	6.67
Yellow-billed Cuckoo	4	13.33
Stewardship Species		
Acadian Flycatcher	9	53.33
Blue Grosbeak	2	6.67
Carolina Chickadee	10	53.33
Carolina Wren	14	46.67
Downy Woodpecker	4	20.00
Indigo Bunting	15	60.00
Northern Parula	-	-
Orchard Oriole	-	-
Pileated Woodpecker	4	26.67
Pine Warbler	3	20.00
Red-bellied Woodpecker	11	66.67
Red-shouldered Hawk	2	13.33
Summer Tanager	1	6.67
White-eyed Vireo	-	-
Yellow-throated Vireo	6	40.00

Number of detections of Partners in Flight (PIF) watchlist and stewardship species and percent of stations they were detected at Booker T. Washington NM in 2010. Number of detections exclude flyovers and incidentals.

References:
O'Connell, et al. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS - Patuxent Wildlife Research Center. Report No. 2003-02.

February 2012

Figure 4. 2010 Resource Brief for Booker T. Washington NM (continued).

Table 9. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Booker T. Washington NM. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
American Crow	1.60 $\pm$ 0.36	73.33	●	●
Chipping Sparrow	1.47 $\pm$ 0.39	60.00	●	●
Tufted Titmouse	1.20 $\pm$ 0.20	80.00	●	●
Red-eyed Vireo	1.13 $\pm$ 0.27	66.67	●	●
Ovenbird	1.07 $\pm$ 0.28	66.67	●	●
Indigo Bunting†	1.00 $\pm$ 0.28	60.00	●	●
Eastern Wood-Pewee*	1.00 $\pm$ 0.20	80.00	●	●
Carolina Wren†	0.93 $\pm$ 0.30	46.67	●	●
Eastern Bluebird	0.93 $\pm$ 0.30	53.33	●	●
Wood Thrush*	0.87 $\pm$ 0.19	66.67	●	●
Eastern Meadowlark*	0.80 $\pm$ 0.43	33.33	●	●
Northern Cardinal	0.80 $\pm$ 0.30	46.67	●	●
Blue Jay	0.80 $\pm$ 0.22	53.33	●	●
Scarlet Tanager	0.80 $\pm$ 0.17	66.67	●	●
American Goldfinch	0.73 $\pm$ 0.21	53.33	●	●
Red-bellied Woodpecker†	0.73 $\pm$ 0.15	66.67	●	●
Carolina Chickadee†	0.67 $\pm$ 0.21	53.33	●	●
Eastern Towhee*	0.60 $\pm$ 0.24	33.33	●	●
Acadian Flycatcher†	0.60 $\pm$ 0.16	53.33	●	●
Blue-gray Gnatcatcher	0.60 $\pm$ 0.16	53.33	●	●
Eastern Phoebe	0.53 $\pm$ 0.17	46.67	●	●
White-breasted Nuthatch	0.47 $\pm$ 0.24	26.67	●	●
Mourning Dove	0.47 $\pm$ 0.17	40.00	●	●
Grasshopper Sparrow*	0.40 $\pm$ 0.24	20.00	●	●
Field Sparrow*	0.40 $\pm$ 0.19	26.67	●	●
Yellow-throated Vireo†	0.40 $\pm$ 0.13	40.00	●	●
Yellow-billed Cuckoo*	0.27 $\pm$ 0.18	13.33	●	●
Downy Woodpecker†	0.27 $\pm$ 0.15	20.00	●	●
Northern Flicker*	0.27 $\pm$ 0.15	20.00	●	●
American Robin	0.27 $\pm$ 0.15	20.00	●	●
Common Yellowthroat	0.27 $\pm$ 0.15	20.00	●	●
Pileated Woodpecker†	0.27 $\pm$ 0.12	26.67	●	●
Prairie Warbler*	0.27 $\pm$ 0.12	26.67	○	●
Great Blue Heron	0.20 $\pm$ 0.20	6.67	●	●
Barn Swallow	0.20 $\pm$ 0.14	13.33	○	●
Northern Mockingbird	0.20 $\pm$ 0.11	20.00	●	●
Pine Warbler†	0.20 $\pm$ 0.11	20.00	●	●

Table 9. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Booker T. Washington NM (continued).

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
Brown-headed Cowbird	0.20 $\pm$ 0.11	20.00	●	●
Killdeer	0.13 $\pm$ 0.13	6.67	●	●
Hairy Woodpecker	0.13 $\pm$ 0.13	6.67	○	●
Eastern Kingbird*	0.13 $\pm$ 0.13	6.67		●
American Redstart	0.13 $\pm$ 0.13	6.67		●
Blue Grosbeak†	0.13 $\pm$ 0.13	6.67		●
Red-shouldered Hawk†	0.13 $\pm$ 0.09	13.33	●	●
Baltimore Oriole*	0.13 $\pm$ 0.09	13.33		●
Turkey Vulture	0.07 $\pm$ 0.07	6.67	●	●
Ruby-throated Hummingbird	0.07 $\pm$ 0.07	6.67		●
Northern Rough-winged Swallow	0.07 $\pm$ 0.07	6.67	○	●
Cedar Waxwing	0.07 $\pm$ 0.07	6.67	●	●
Blackpoll Warbler	0.07 $\pm$ 0.07	6.67		●
Worm-eating Warbler*	0.07 $\pm$ 0.07	6.67		●
Louisiana Waterthrush	0.07 $\pm$ 0.07	6.67	●	●
Summer Tanager†	0.07 $\pm$ 0.07	6.67	●	●
Common Grackle	0.07 $\pm$ 0.07	6.67		●
Black Vulture	-	-		○
Red-tailed Hawk	-	-	●	○
Great Crested Flycatcher	-	-	●	○
White-eyed Vireo†	-	-		○
Brown Thrasher*	-	-	●	
European Starling	-	-	○	
Northern Parula†	-	-	●	○
Canada Warbler	-	-	●	
Orchard Oriole†	-	-		○

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 10. Avian forest guild summary and Bird Community Index (BCI) score for 2009 and 2010 at Booker T. Washington NM. Percents indicate the average percent guild membership at monitoring locations. Total BCI scores range from 0-1 with 1 having the highest integrity. Ranks are derived from O'Connell et al. (2003).

		2009 (n=41)		2010 (n=31)	
	Guild	Percent	Rank	Percent	Rank
Structural	Forest Interior	34.93	Naturalistic	43.05	Naturalistic
	Pine Associated	0.00	Humanistic	1.42	Moderately Disturbed
	Urban/Suburban	43.59	Largely Intact	29.08	Largely Intact
Functional	Bark Prober	16.73	Largely Intact	18.91	Largely Intact
	Ground Forager	6.48	Largely Intact	6.80	Largely Intact
	Upper Canopy	17.32	Largely Intact	25.27	Naturalistic
Compositional	Nest Predator / Brood Parasite	18.30	Moderately Disturbed	11.88	Largely Intact
	Single Brooded	45.78	Largely Intact	56.65	Naturalistic
	Exotic	0.00	Naturalistic	0.00	Naturalistic
Total BCI Score		0.72	Largely Intact	0.83	Naturalistic

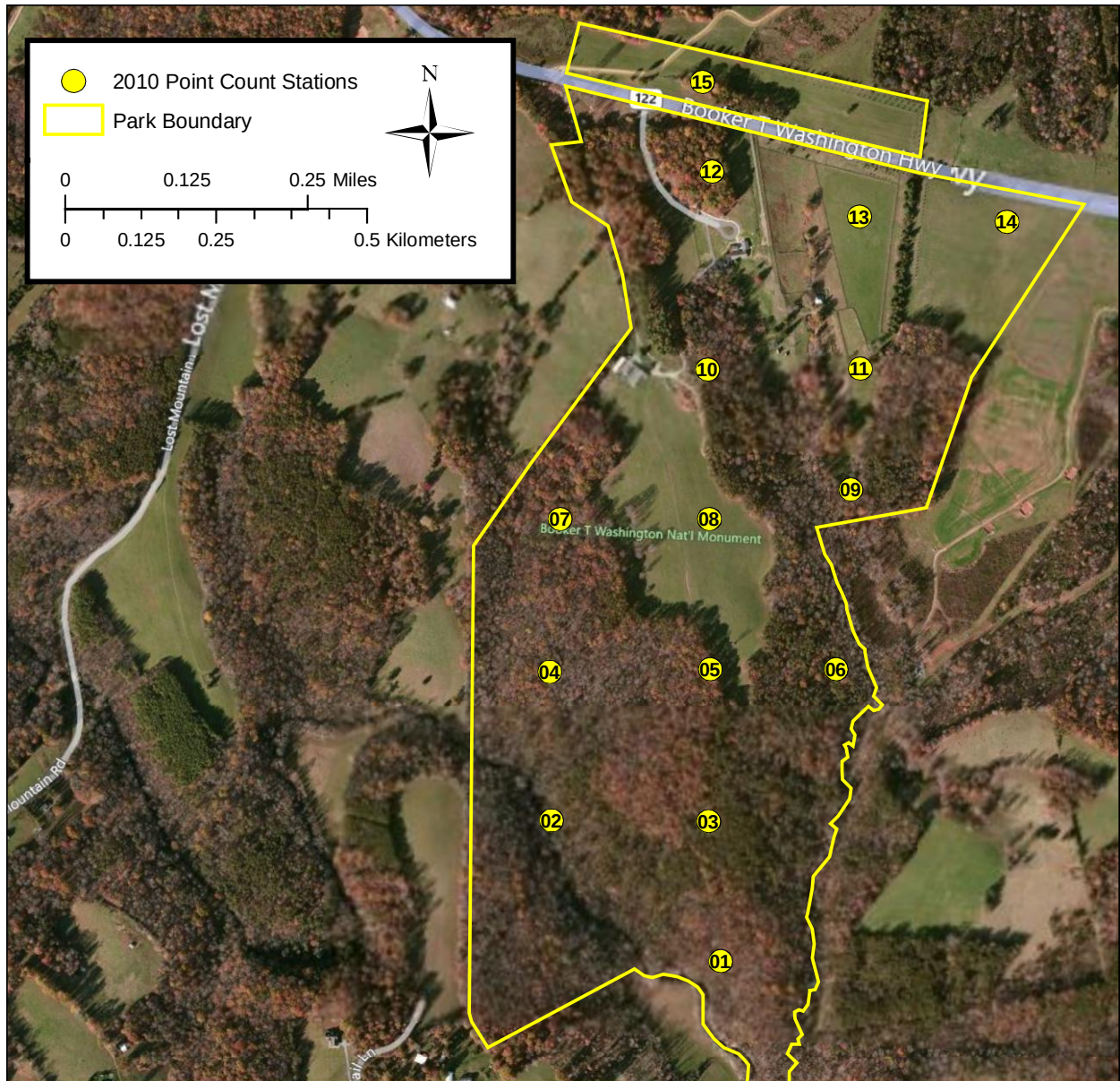


Figure 5. Bird monitoring stations sampled at Booker T. Washington NM in 2010.

Fredericksburg and Spotsylvania National Military Park

Northeast Region
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Mid-Atlantic Network

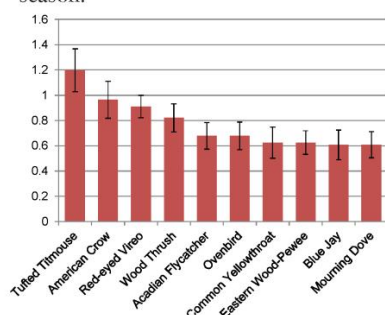
Breeding Bird Resource Brief



Red-eyed Vireo

Fredericksburg and Spotsylvania National Military Park 2010 Status & Trends

A total of 56 stations were surveyed at Fredericksburg and Spotsylvania NMP during the 2010 breeding bird monitoring program, including 48 stations in forested habitats and 8 stations in grassland habitats. Eight volunteer birders from the local birding community conducted an average of 1.84 surveys per station producing a total of 103 surveys for the season.



The 10 most commonly detected bird species at Fredericksburg and Spotsylvania NMP in 2010 and their associated relative abundance (average birds/station). Error bars indicate standard error, a measure of variation.

Between May and July, 1165 birds of 63 species were detected throughout the park. Several species were detected this year that were not in previous monitoring years, including the White-eyed Vireo, Kentucky Warbler, and Baltimore Oriole.

The 10 most abundant species were the Tufted Titmouse, American Crow, Red-eyed Vireo, Wood Thrush, Acadian Flycatcher, Ovenbird, Common Yellowthroat, Eastern Wood-Pewee, Blue Jay, and Mourning Dove. The Tufted Titmouse was the most numerous species averaging 1.20 birds / station followed by the American Crow at 0.96 birds / station, while the Red-eyed Vireo was the most prevalent, occurring at 75% of the stations surveyed.

Species of conservation concern, as defined by Partners in Flight (PIF), were well represented in the park, with volunteers detecting 27 species (see table

Objectives

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of relationships between breeding birds, habitats and park management.

on back right). PIF further distinguishes species of concern as “watchlist” species, which face immediate threats, or “stewardship” species, which are representative of avifaunal biomes that may or may not be in immediate danger.

Within the park, 12 watchlist species and 15 stewardship species were detected. Three species of concern, including 2 watchlist species (i.e. Wood Thrush and Eastern Wood-Pewee) and a stewardship species (i.e. Acadian Flycatcher), were among the 10 most abundant species.

Avian guilds, or groups of species occupying similar ecological niches, can be utilized for assessing response to



Wood Thrush

Importance

In the densely populated Mid-Atlantic region, birds face numerous threats including urbanization, habitat loss, and fragmentation. National parks provide refuge from such threats with contiguous and protected tracts of habitat suitable for breeding birds. These parks host species of continental concern and other species that are declining throughout their range.

Birds are also excellent barometers of ecosystem health due to their high metabolism and prominent position in the food web. Detecting changes in bird populations may help alert park staff to ecological stressors such as invasive species, overbrowsing, detrimental park management practices, or climate change and help guide future management actions.

Figure 6. 2010 Resource Brief for Fredericksburg and Spotsylvania NMP. A high resolution version may be downloaded from <http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>.

Management Applications

- A total of 63 species were detected across the park including 27 species of concern.
- The Wood Thrush and Eastern Wood-Pewee, both watchlist species, were among the 10 most common species in the park.
- The park's forested stations received the highest ecological integrity ranking, "naturalistic", using a Bird Community Index (BCI).

Long-term Monitoring

Between May and July of each year, volunteer birders conduct point counts at monitoring stations in forest and grassland habitats. Stations in forested areas are located within 125 m of forest vegetation monitoring plots enabling park staff to associate long-term trends in vegetation with avian population trends.

During each 10-minute count, the volunteer records environmental

conditions, how the bird was detected (visually or aurally), and the distance and minute of first detection.

Each site is visited at least once, but volunteers are encouraged to make multiple visits in a season. Multiple visits are especially important for obtaining accurate density estimates as information on variability due to observers, weather, etc. can be accounted for.

Status & Trends Continued...

This was consistent with the 2009 ranking for the park. Rankings, when broken out by guild, also show medium to high ecological integrity (see table below). Only the pine associated guilds

was ranked "moderately disturbed" as species such as the Pine Warbler and Red-cockaded Woodpecker were rare to absent.

	Guild	2009		2010	
		Percent	Rank	Percent	Rank
Structural	Forest Interior	40.58	Naturalistic	36.10	Naturalistic
	Pine Associated	0.92	Moderately Disturbed	0.42	Moderately Disturbed
	Urban/Suburban	28.21	Largely Intact	33.57	Largely Intact
Functional	Bark Prober	18.98	Largely Intact	20.98	Naturalistic
	Ground Forager	7.49	Naturalistic	5.88	Largely Intact
	Upper Canopy Forager	23.42	Naturalistic	23.37	Naturalistic
Compositional	Nest Predator/Brood Parasite	9.97	Largely Intact	15.72	Largely Intact
	Single Brooded	59.70	Naturalistic	56.06	Naturalistic
	Exotic	0.00	Naturalistic	0.00	Naturalistic
Total BCI Score		0.86	Naturalistic	0.86	Naturalistic

Avian forest guild summary and Bird Community Index (BCI) score for 2010. Percents indicate the average percent guild membership at monitoring locations across the park. Total BCI scores range from 0-1 with 1 having the highest integrity.

A final Note

It is important to note that the data presented in this brief is preliminary as variability in the dataset has not yet been accounted for. For more information on this protocol, please see the full annual report accessible from the protocol website linked below.

We'd like to thank all our volunteers for walking off the beaten path in the summer heat to count birds: Andrew Dolby, Donna Finnegan, Michael Lott, Paul Nasca, Chris Ochman, Matt Roland, Beverly Smith, and Marty Wright.

Species	Detections	% Occupied
Watchlist Species		
Baltimore Oriole	1	1.79
Brown Thrasher	3	5.36
Eastern Kingbird	-	
Eastern Towhee	3	5.36
Eastern Wood-Pewee	35	51.79
Field Sparrow	11	16.07
Kentucky Warbler	1	1.79
Northern Flicker	1	1.79
Prairie Warbler	3	3.57
Wood Thrush	46	57.14
Worm-eating Warbler	1	1.79
Yellow-billed Cuckoo	23	35.71
Stewardship Species		
Acadian Flycatcher	38	50.00
Blue Grosbeak	6	5.36
Carolina Chickadee	28	30.36
Carolina Wren	7	10.71
Downy Woodpecker	21	32.14
Indigo Bunting	22	23.21
Northern Parula	2	1.79
Orchard Oriole	1	1.79
Pileated Woodpecker	5	7.14
Pine Warbler	1	1.79
Red-bellied Woodpecker	31	50.00
Red-shouldered Hawk	1	1.79
Summer Tanager	5	8.93
White-eyed Vireo	1	1.79
Yellow-throated Vireo	6	8.93

Number of detections of Partners in Flight (PIF) watchlist and stewardship species and percent of stations they were detected at Fredericksburg and Spotsylvania NMP in 2010. Number of detections exclude flyovers incidental encounters.

References:

O'Connell, et al. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS - Patuxent Wildlife Research Center. Report No. 2003-02.

Photographs by:

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February 2012

Figure 6. 2010 Resource Brief for Fredericksburg and Spotsylvania NMP (continued).

Table 11. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Fredericksburg and Spotsylvania NMP. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
Tufted Titmouse	1.20 $\pm$ 0.17	73.21	●	●
American Crow	0.96 $\pm$ 0.15	62.50	●	●
Red-eyed Vireo	0.91 $\pm$ 0.09	75.00	●	●
Wood Thrush*	0.82 $\pm$ 0.11	57.14	●	●
Acadian Flycatcher†	0.68 $\pm$ 0.11	50.00	●	●
Ovenbird	0.68 $\pm$ 0.11	48.21	●	●
Common Yellowthroat	0.63 $\pm$ 0.12	39.29	●	●
Eastern Wood-Pewee*	0.63 $\pm$ 0.09	51.79	●	●
Blue Jay	0.61 $\pm$ 0.12	37.50	●	●
Mourning Dove	0.61 $\pm$ 0.10	46.43	●	●
Northern Cardinal	0.57 $\pm$ 0.10	41.07	●	●
Red-bellied Woodpecker†	0.55 $\pm$ 0.08	50.00	●	●
White-breasted Nuthatch	0.52 $\pm$ 0.07	50.00	●	●
Carolina Chickadee†	0.50 $\pm$ 0.13	30.36	●	●
Scarlet Tanager	0.50 $\pm$ 0.08	42.86	●	●
Blue-gray Gnatcatcher	0.41 $\pm$ 0.10	28.57	●	●
Yellow-billed Cuckoo*	0.41 $\pm$ 0.08	35.71	●	●
Indigo Bunting†	0.39 $\pm$ 0.11	23.21	●	●
Downy Woodpecker†	0.38 $\pm$ 0.08	32.14	●	●
American Goldfinch	0.36 $\pm$ 0.11	21.43	●	●
Brown-headed Cowbird	0.21 $\pm$ 0.09	14.29	●	●
Field Sparrow*	0.20 $\pm$ 0.06	16.07	●	●
Eastern Bluebird	0.14 $\pm$ 0.11	5.36	●	●
Great Crested Flycatcher	0.14 $\pm$ 0.05	12.50	●	●
Eastern Phoebe	0.13 $\pm$ 0.08	7.14	●	●
Carolina Wren†	0.13 $\pm$ 0.05	10.71	●	●
Blue Grosbeak†	0.11 $\pm$ 0.07	5.36	●	●
Yellow-throated Vireo†	0.11 $\pm$ 0.05	8.93	●	●
Pileated Woodpecker†	0.09 $\pm$ 0.05	7.14	●	●
American Robin	0.09 $\pm$ 0.04	8.93	●	●
Summer Tanager†	0.09 $\pm$ 0.04	8.93	●	●
Chipping Sparrow	0.09 $\pm$ 0.04	8.93	●	●
Prairie Warbler*	0.05 $\pm$ 0.04	3.57	●	●
Yellow-breasted Chat	0.05 $\pm$ 0.04	3.57	●	●
Brown Thrasher*	0.05 $\pm$ 0.03	5.36	●	●
Louisiana Waterthrush	0.05 $\pm$ 0.03	5.36		●

Table 11. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Fredericksburg and Spotsylvania NMP (continued).

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
Eastern Towhee*	0.05 $\pm$ 0.03	5.36	●	●
Northern Parula†	0.04 $\pm$ 0.04	1.79	●	●
Ruby-throated Hummingbird	0.04 $\pm$ 0.03	3.57		●
Hairy Woodpecker	0.04 $\pm$ 0.03	3.57	●	●
Gray Catbird	0.04 $\pm$ 0.03	3.57	●	●
Canada Goose	0.02 $\pm$ 0.02	1.79		●
Green Heron	0.02 $\pm$ 0.02	1.79		●
Sharp-shinned Hawk	0.02 $\pm$ 0.02	1.79		●
Red-shouldered Hawk†	0.02 $\pm$ 0.02	1.79	●	●
Red-tailed Hawk	0.02 $\pm$ 0.02	1.79		●
Belted Kingfisher	0.02 $\pm$ 0.02	1.79		●
Northern Flicker*	0.02 $\pm$ 0.02	1.79	●	●
White-eyed Vireo†	0.02 $\pm$ 0.02	1.79		●
Fish Crow	0.02 $\pm$ 0.02	1.79		●
Veery	0.02 $\pm$ 0.02	1.79		●
Pine Warbler†	0.02 $\pm$ 0.02	1.79	●	●
Palm Warbler	0.02 $\pm$ 0.02	1.79		●
Worm-eating Warbler*	0.02 $\pm$ 0.02	1.79	●	●
Kentucky Warbler*	0.02 $\pm$ 0.02	1.79		●
Song Sparrow	0.02 $\pm$ 0.02	1.79	●	●
Common Grackle	0.02 $\pm$ 0.02	1.79	●	●
Orchard Oriole†	0.02 $\pm$ 0.02	1.79	●	●
Baltimore Oriole*	0.02 $\pm$ 0.02	1.79		●
Great Blue Heron	-	-	○	○
Turkey Vulture	-	-	○	○
Eastern Kingbird*	-	-	●	●
Barn Swallow	-	-		○
Common Peafowl	-	-	○	
Wild Turkey	-	-	●	
Barred Owl	-	-	●	
Chimney Swift*	-	-	●	
Purple Martin†	-	-	○	
Tree Swallow	-	-	○	
House Wren	-	-	○	
Hooded Warbler†	-	-	●	
Grasshopper Sparrow*	-	-	●	

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 12. Avian forest guild summary and Bird Community Index (BCI) score for 2009 and 2010 at Fredericksburg and Spotsylvania NMP. Percents indicate the average percent guild membership at monitoring locations. Total BCI scores range from 0-1 with 1 having the highest integrity. Ranks are derived from O'Connell et al. (2003).

		2009 (n=95)		2010 (n=86)	
	Guild	Percent	Rank	Percent	Rank
Structural	Forest Interior	40.58	Naturalistic	36.10	Naturalistic
	Pine Associated	0.92	Moderately Disturbed	0.42	Moderately Disturbed
	Urban/Suburban	28.21	Largely Intact	33.57	Largely Intact
Functional	Bark Prober	18.98	Largely Intact	20.98	Naturalistic
	Ground Forager	7.49	Naturalistic	5.88	Largely Intact
	Upper Canopy	23.42	Naturalistic	23.37	Naturalistic
Compositional	Nest Predator / Brood Parasite	9.97	Largely Intact	15.72	Largely Intact
	Single Brooded	59.70	Naturalistic	56.06	Naturalistic
	Exotic	0.00	Naturalistic	0.00	Naturalistic
Total BCI Score		0.86	Naturalistic	0.86	Naturalistic

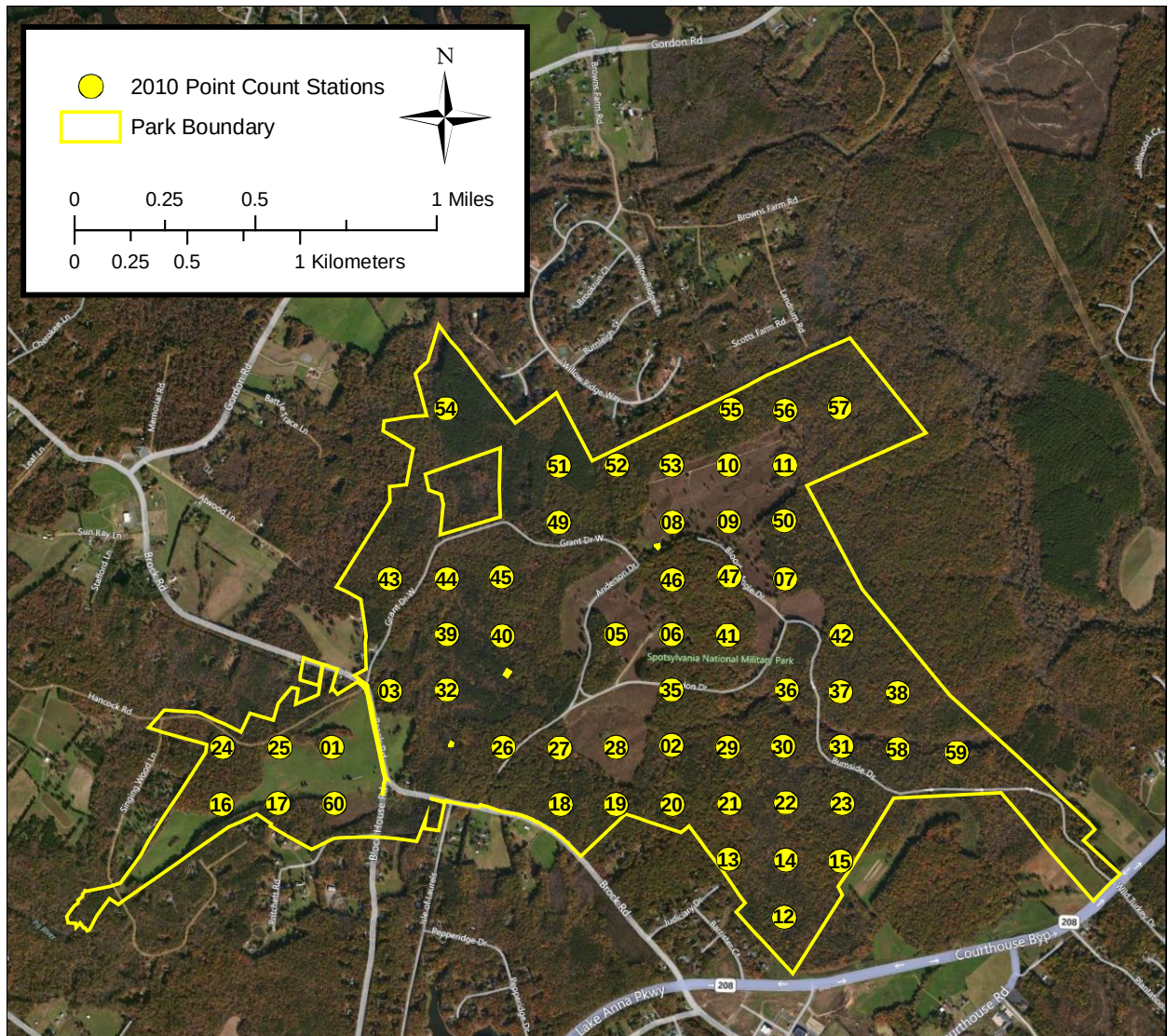


Figure 7. Bird monitoring stations surveyed at Spotsylvania Battlefield, Fredericksburg and Spotsylvania NMP in 2010.

Richmond National Battlefield Park

Northeast Region
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Mid-Atlantic Network

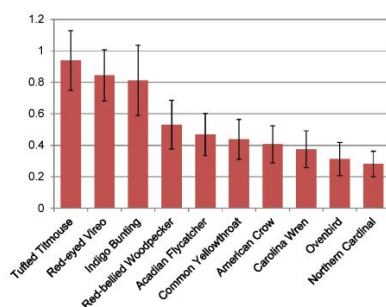
Breeding Bird Resource Brief



Red-eyed Vireo

Richmond National Battlefield Park 2010 Status & Trends

A total of 32 stations were surveyed at Richmond NBP during the park's first season of breeding bird monitoring, including 22 stations in forested habitats and 10 stations in grassland habitats. Four volunteer birders from the local birding community conducted an average of 1 survey per station producing a total of 32 surveys for the season.



The 10 most commonly detected bird species at Richmond NBP in 2010 and their associated relative abundance (average birds/station). Error bars indicate standard error, a measure of variation.

Between May and July, 347 birds of 59 species were detected throughout the park. Species richness was higher at forested stations, with 53 different species detected, versus 31 species detected at grassland stations.

The 10 most abundant species were the Tufted Titmouse, Red-eyed Vireo, Indigo Bunting, Red-bellied Woodpecker, Acadian Flycatcher, Common Yellowthroat, American Crow, Carolina Wren, Ovenbird, and Northern Cardinal. The Tufted Titmouse had the highest relative abundance averaging 0.93 birds / station and was the most prevalent species occurring at 59.3% of stations surveyed.

Species of conservation concern, as defined by Partners in Flight (PIF), were well represented in the park, with volunteers detecting 23 species (see table on back right). PIF further distinguishes species of concern as “watchlist” species, which face immediate threats, or

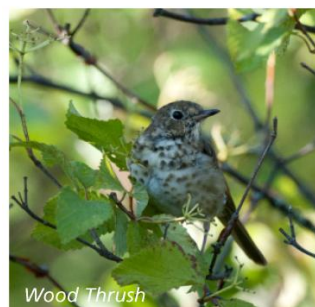
Objectives

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of relationships between breeding birds, habitats and park management.

“stewardship” species, which are representative of avifaunal biomes that may or may not be in immediate danger.

Within the park, 10 watchlist species and 13 stewardship species were detected. Four species of concern (i.e. Indigo Bunting, Red-bellied Woodpecker, Acadian Flycatcher, and Carolina Wren) were among the 10 most abundant species.

Avian guilds, or groups of species occupying similar ecological niches, can be utilized for assessing response to environmental changes and ecosystem stressors via bird community assessments, or “indices” (BCIs). Based on a BCI developed for the Piedmont/Coastal



Wood Thrush

Importance

In the densely populated Mid-Atlantic region, birds face numerous threats including urbanization, habitat loss, and fragmentation. National parks provide refuge from such threats with contiguous and protected tracts of habitat suitable for breeding birds. These parks host species of continental concern and other species that are declining throughout their range.

Birds are also excellent barometers of ecosystem health due to their high metabolism and prominent position in the food web. Detecting changes in bird populations may help alert park staff to ecological stressors such as invasive species, overbrowsing, detrimental park management practices, or climate change and help guide future management actions.

Figure 8. 2010 Resource Brief for Richmond NBP. A high resolution version may be downloaded from <http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>.

Management Applications

- A total of 59 species were detected across the park including 23 species of concern.
- Four Partners in Flight (PIF) stewardship species were among the 10 most common species in the park.
- The park's forested stations received the second highest ecological integrity ranking, "largely intact", using a Bird Community Index (BCI).

Long-term Monitoring

Between May and July of each year, volunteer birders conduct point counts at monitoring stations in forest and grassland habitats. Stations in forested areas are located within 125 m of forest vegetation monitoring plots enabling park staff to associate long-term trends in vegetation with avian population trends.

During each 10-minute count, the volunteer records environmental

conditions, how the bird was detected (visually or aurally), and the distance and minute of first detection.

Each site is visited at least once, but volunteers are encouraged to make multiple visits in a season. Multiple visits are especially important for obtaining accurate density estimates as information on variability due to observers, weather, etc. can be accounted for.

Status & Trends Continued...

Plain region (O'Connell et al. 2003), forested stations surveyed this year received the second highest ranking of "largely intact".

Rankings, when broken out by guild, ranged from low to high ecological

Avian forest guild summary and Bird Community Index (BCI) score for 2010. Percents indicate the average percent guild membership at monitoring locations across the park. Total BCI scores range from 0-1 with 1 having the highest integrity.

	Guild	Percent	Rank
Structural	Forest Interior	30.73	Naturalistic
	Pine Associated	0.58	Moderately Disturbed
	Urban/Suburban	40.61	Largely Intact
Functional	Bark Prober	23.58	Naturalistic
	Ground Forager	6.70	Largely Intact
	Upper Canopy Forager	15.99	Largely Intact
Compositional	Nest Predator/Brood Parasite	24.89	Humanistic
	Single Brooded	44.28	Largely Intact
	Exotic	5.26	Moderately Disturbed
Total BCI Score		0.69	Largely Intact

integrity (see table above). The nest disrupter guild received the lowest ranking of "humanistic" likely due to the high number of American Crows and Red-bellied Woodpeckers detected in the park. On the other hand, species such as the Tufted Titmouse, Red-eyed

Vireo, and White-breasted Nuthatch were quite prevalent leading to the high ranking of the bark prober and forest interior guilds.

Species	Detections	% Occupied
Watchlist Species		
Brown Thrasher	1	3.13
Chimney Swift	3	9.38
Eastern Wood-Pewee	4	12.50
Field Sparrow	4	12.50
Kentucky Warbler	2	6.25
Northern Bobwhite	4	12.50
Northern Flicker	2	6.25
Red-headed Woodpecker	1	3.13
Wood Thrush	5	15.63
Yellow-billed Cuckoo	2	6.25
Stewardship Species		
Acadian Flycatcher	15	34.38
Carolina Chickadee	1	3.13
Carolina Wren	12	28.13
Downy Woodpecker	3	9.38
Hooded Warbler	3	9.38
Indigo Bunting	26	40.63
Pileated Woodpecker	4	12.50
Pine Warbler	1	3.13
Red-bellied Woodpecker	17	37.50
Red-shouldered Hawk	2	6.25
Summer Tanager	2	6.25
White-eyed Vireo	4	6.25
Yellow-throated Vireo	6	15.63

Number of detections of Partners in Flight (PIF) watchlist and stewardship species and percent of stations they were detected at Richmond NBP in 2010. Number of detections exclude flyovers and incidental encounters.

A Final Note

It is important to note that the data presented in this brief is preliminary as variability in the dataset has not yet been accounted for. For more information on this protocol, please see the full annual report accessible from the protocol website linked below.

We'd like to thank all our volunteers for walking off the beaten path in the summer heat to count birds: David Bryan, Ethan Bullard, Clyde Coats, and Kelly Kerney.

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References:
 O'Connell, et al. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS - Patuxent Wildlife Research Center. Report No. 2003-02.

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February 2012

Figure 8. 2010 Resource Brief for Richmond NBP (continued).

Table 13. Summary statistics and detection types for point count surveys conducted in 2010 at Richmond NBP. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected 2009
Tufted Titmouse	0.94 $\pm$ 0.19	59.38	●
Red-eyed Vireo	0.84 $\pm$ 0.16	50.00	●
Indigo Bunting†	0.81 $\pm$ 0.22	40.63	●
Red-bellied Woodpecker†	0.53 $\pm$ 0.16	37.50	●
Acadian Flycatcher†	0.47 $\pm$ 0.13	34.38	●
Common Yellowthroat	0.44 $\pm$ 0.13	31.25	●
American Crow	0.41 $\pm$ 0.12	31.25	●
Carolina Wren†	0.38 $\pm$ 0.12	28.13	●
Ovenbird	0.31 $\pm$ 0.1	25.00	●
Northern Cardinal	0.28 $\pm$ 0.08	28.13	●
Yellow-throated Vireo†	0.19 $\pm$ 0.08	15.63	●
Mourning Dove	0.19 $\pm$ 0.07	18.75	●
Scarlet Tanager	0.19 $\pm$ 0.07	18.75	●
Chipping Sparrow	0.16 $\pm$ 0.08	12.50	●
White-breasted Nuthatch	0.16 $\pm$ 0.07	15.63	●
Wood Thrush*	0.16 $\pm$ 0.07	15.63	●
Mallard	0.13 $\pm$ 0.13	3.13	●
White-eyed Vireo†	0.13 $\pm$ 0.1	6.25	●
Northern Bobwhite*	0.13 $\pm$ 0.06	12.50	●
Turkey Vulture	0.13 $\pm$ 0.06	12.50	●
Pileated Woodpecker†	0.13 $\pm$ 0.06	12.50	●
Eastern Wood-Pewee*	0.13 $\pm$ 0.06	12.50	●
Blue Jay	0.13 $\pm$ 0.06	12.50	●
Field Sparrow*	0.13 $\pm$ 0.06	12.50	●
Eastern Bluebird	0.09 $\pm$ 0.07	6.25	●
Yellow-throated Warbler	0.09 $\pm$ 0.07	6.25	●
Chimney Swift*	0.09 $\pm$ 0.05	9.38	●
Downy Woodpecker†	0.09 $\pm$ 0.05	9.38	●
Hooded Warbler†	0.09 $\pm$ 0.05	9.38	●
Wood Duck	0.06 $\pm$ 0.06	3.13	●
Osprey	0.06 $\pm$ 0.06	3.13	●
Red-winged Blackbird	0.06 $\pm$ 0.06	3.13	●
Great Blue Heron	0.06 $\pm$ 0.04	6.25	●
Red-shouldered Hawk†	0.06 $\pm$ 0.04	6.25	●
Yellow-billed Cuckoo*	0.06 $\pm$ 0.04	6.25	●
Northern Flicker*	0.06 $\pm$ 0.04	6.25	●
Kentucky Warbler*	0.06 $\pm$ 0.04	6.25	●

Table 13. Summary statistics and detection types for point count surveys conducted in 2010 at Richmond NBP (continued).

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected 2009
Summer Tanager†	0.06 $\pm$ 0.04	6.25	●
Canada Goose	0.03 $\pm$ 0.03	3.13	●
Wild Turkey	0.03 $\pm$ 0.03	3.13	●
Lesser Yellowlegs	0.03 $\pm$ 0.03	3.13	●
Belted Kingfisher	0.03 $\pm$ 0.03	3.13	●
Red-headed Woodpecker*	0.03 $\pm$ 0.03	3.13	●
Hairy Woodpecker	0.03 $\pm$ 0.03	3.13	●
Great Crested Flycatcher	0.03 $\pm$ 0.03	3.13	●
Carolina Chickadee†	0.03 $\pm$ 0.03	3.13	●
Blue-gray Gnatcatcher	0.03 $\pm$ 0.03	3.13	●
American Robin	0.03 $\pm$ 0.03	3.13	●
Gray Catbird	0.03 $\pm$ 0.03	3.13	●
Brown Thrasher*	0.03 $\pm$ 0.03	3.13	●
Scarlet Tanager	0.19 $\pm$ 0.07	18.75	●
Chipping Sparrow	0.16 $\pm$ 0.08	12.50	●
Field Sparrow*	0.13 $\pm$ 0.06	12.50	●
Northern Cardinal	0.28 $\pm$ 0.08	28.13	●
Indigo Bunting†	0.81 $\pm$ 0.22	40.63	●
Red-winged Blackbird	0.06 $\pm$ 0.06	3.13	●
Common Grackle	-	-	○
Brown-headed Cowbird	0.03 $\pm$ 0.03	3.13	●
American Goldfinch	-	-	○

*Partners in Flight Watchlist species

†Partners in Flight Stewardship species

Table 14. Avian forest guild summary and Bird Community Index (BCI) score for 2010 at Richmond NBP. Percents indicate the average percent guild membership at monitoring locations. Total BCI scores range from 0-1 with 1 having the highest integrity. Ranks are derived from O'Connell et al. (2003).

2010 (n=22)			
	Guild	Percent	Rank
Structural	Forest Interior	30.73	Naturalistic
	Pine Associated	0.58	Moderately Disturbed
	Urban/Suburban	40.61	Largely Intact
Functional	Bark Prober	23.58	Naturalistic
	Ground Forager	6.70	Largely Intact
	Upper Canopy	15.99	Largely Intact
Compositional	Nest Predator / Brood Parasite	24.89	Humanistic
	Single Brooded	44.28	Largely Intact
	Exotic	5.26	Moderately Disturbed
Total BCI Score		0.69	Largely Intact

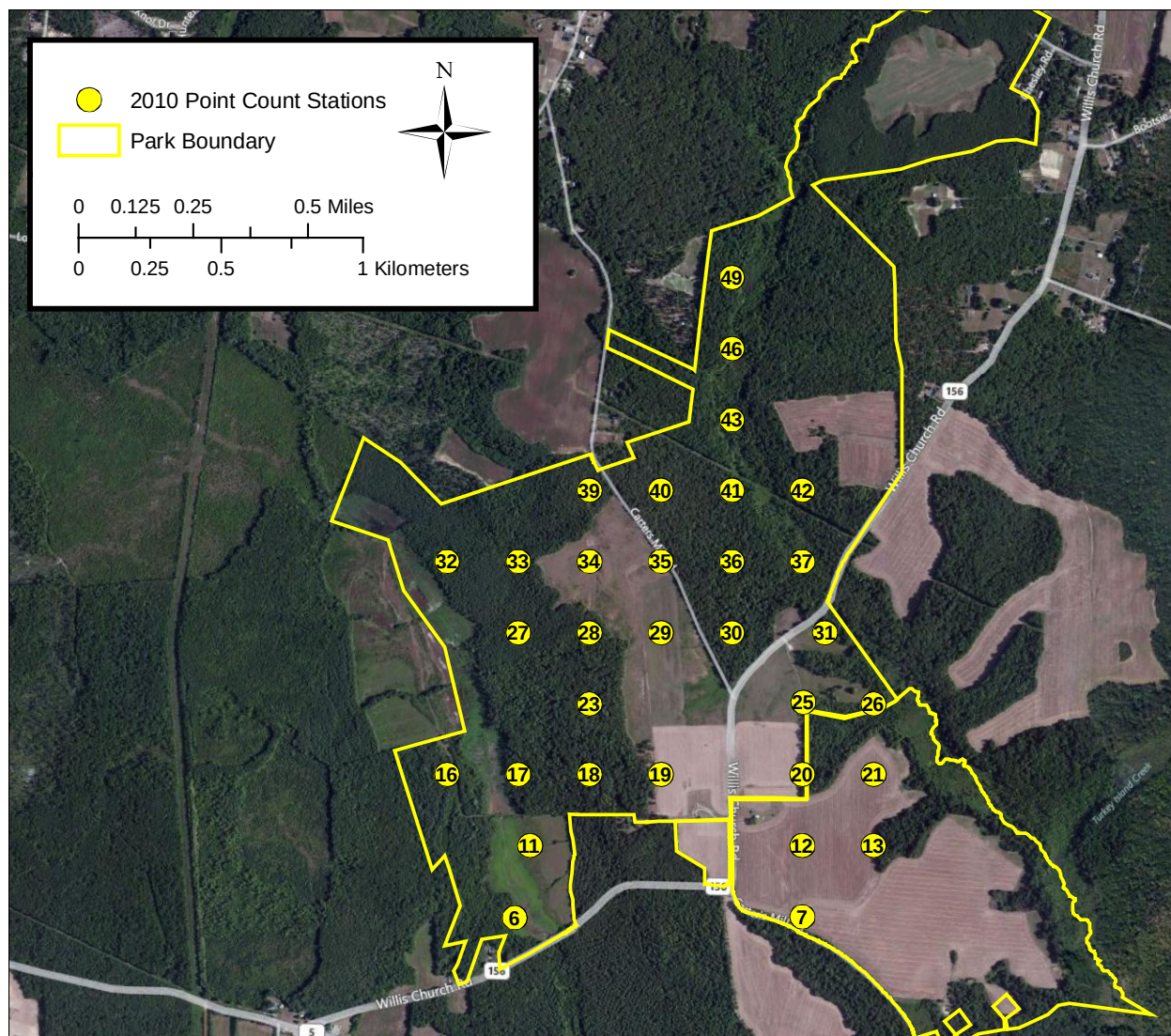


Figure 9. Bird monitoring stations surveyed at Malvern Hill, Richmond NBP in 2010.

Valley Forge National Historical Park

Northeast Region
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior



Mid-Atlantic Network

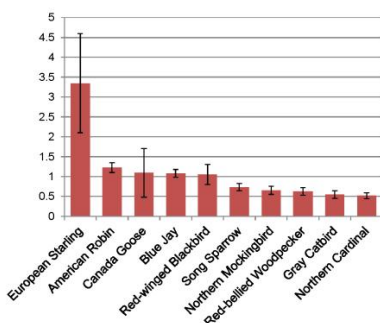
Breeding Bird Resource Brief



Red-eyed Vireo

Valley Forge National Historical Park 2010 Status & Trends

A total of 75 stations were surveyed at Valley Forge NHP during the 2010 breeding bird monitoring program, including 36 stations in forested habitats and 39 stations in grassland habitats. Eight volunteer birders from the local birding community conducted an average of 1.83 surveys per station producing a total of 137 surveys for the season.



The 10 most commonly detected bird species at Valley Forge NHP in 2010 and their associated relative abundance (average birds/station). Error bars indicate standard error, a measure of variation.

Between May and July, 2497 birds of 73 species were detected throughout the park. Several species were detected this year that were not in previous monitoring years including the Acadian Flycatcher, Yellow-billed Cuckoo, Black-billed Cuckoo, and American Redstart.

The 10 most abundant species were the European Starling, American Robin, Canada Goose, Blue Jay, Red-winged Blackbird, Song Sparrow, Northern Mockingbird, Red-bellied Woodpecker, Gray Catbird, and Northern Cardinal. The European Starling was the most abundant species, averaging 3.35 birds / station, while the Blue Jay was the most prevalent species, occurring at 73.3% of stations surveyed.

Species of conservation concern, as defined by Partners in Flight (PIF), were well represented in the park, with volunteers detecting 23 species (see table on back right). PIF further distinguishes

Objectives

1. Determine annual changes and long-term trends in species composition and relative abundance.
2. Improve our understanding of relationships between breeding birds, habitats and park management.

species of concern as “watchlist” species, which face immediate threats, or “stewardship” species, which are representative of avifaunal biomes that may or may not be in immediate danger.

Within the park, 14 watchlist species and 9 stewardship species were detected. One species of concern, the Red-bellied Woodpecker, was among the 10 most abundant species.

Avian guilds, or groups of species occupying similar ecological niches, can be utilized for assessing response to environmental changes and ecosystem stressors via bird community assessments, or “indices” (BCIs). Based on



Wood Thrush

Importance

In the densely populated Mid-Atlantic region, birds face numerous threats including urbanization, habitat loss, and fragmentation. National parks provide refuge from such threats with contiguous and protected tracts of habitat suitable for breeding birds. These parks host species of continental concern and other species that are declining throughout their range.

Birds are also excellent barometers of ecosystem health due to their high metabolism and prominent position in the food web. Detecting changes in bird populations may help alert park staff to ecological stressors such as invasive species, overbrowsing, detrimental park management practices, or climate change and help guide future management actions.

Figure 10. 2010 Resource Brief for Valley Forge NHP. A high resolution version may be downloaded from <http://science.nature.nps.gov/im/units/midn/ProtocolBirds.cfm>.

Management Applications

- A total of 73 species were detected across the park including 23 species of concern.
- The Red-bellied Woodpecker, a species of concern, was among the 10 most common species in the park.
- The park's forested stations received the second highest ecological integrity ranking, "largely intact", using a Bird Community Index (BCI).

Long-term Monitoring

Between May and July of each year, volunteer birders conduct point counts at monitoring stations in forest and grassland habitats. Stations in forested areas are located within 125 m of forest vegetation monitoring plots enabling park staff to associate long-term trends in vegetation with avian population trends.

During each 10-minute count, the volunteer records environmental

conditions, how the bird was detected (visually or aurally), and the distance and minute of first detection.

Each site is visited at least once, but volunteers are encouraged to make multiple visits in a season. Multiple visits are especially important for obtaining accurate density estimates as information on variability due to observers, weather, etc. can be accounted for.

Status & Trends Continued...

a BCI developed for the Piedmont/Coastal Plain region (O'Connell et al. 2003), forested stations surveyed this year received the second highest ranking of "largely intact". This was consistent with the 2009 ranking for the park, but rankings by guild shifted (see table

below). Specifically, rankings for the bark prober and nest predator/brood parasite guilds improved, while those of the upper canopy forager and exotic guilds deteriorated. Results, however, are preliminary and until more data is collected should not be treated as final.

	Guild	2009		2010	
		Percent	Rank	Percent	Rank
Structural	Forest Interior	23.00	Largely Intact	23.21	Largely Intact
	Pine Associated	0.00	Humanistic	0.00	Humanistic
	Urban/Suburban	50.27	Moderately Disturbed	51.55	Moderately Disturbed
Functional	Bark Prober	17.12	Largely Intact	20.57	Naturalistic
	Ground Forager	0.36	Moderately Disturbed	0.47	Moderately Disturbed
	Upper Canopy Forager	15.99	Largely Intact	11.52	Moderately Disturbed
Compositional	Nest Predator/Brood Parasite	23.24	Humanistic	20.70	Moderately Disturbed
	Single Brooded	39.46	Largely Intact	38.44	Largely Intact
	Exotic	0.00	Naturalistic	0.35	Largely Intact
Total BCI Score		0.61	Largely Intact	0.61	Largely Intact

Avian forest guild summary and Bird Community Index (BCI) score for 2010. Percents indicate the average percent guild membership at monitoring locations across the park. Total BCI scores range from 0-1 with 1 having the highest integrity.

A Final Note

It is important to note that the data presented in this brief is preliminary as variability in the dataset has not yet been accounted for. For more information on this protocol, please see the full annual report accessible from the protocol website linked below.

Last but not least, we'd like to thank all our volunteers for walking off the beaten path in the summer heat to count birds.



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February 2012

Species	Detections	% Occupied
Watchlist Species		
Baltimore Oriole	31	26.67
Black-billed Cuckoo	-	-
Blue-winged Warbler	10	1.33
Brown Thrasher	3	2.67
Chimney Swift	10	8.00
Eastern Kingbird	26	26.67
Eastern Meadowlark	32	24.00
Eastern Towhee	25	28.00
Eastern Wood-Pewee	24	28.00
Field Sparrow	6	6.67
Northern Flicker	20	24.00
Willow Flycatcher	1	1.33
Wood Thrush	31	28.00
Yellow-billed Cuckoo	1	1.33
Partners in Flight (PIF) Watchlist Species		
Acadian Flycatcher	2	2.67
Carolina Chickadee	27	30.67
Carolina Wren	14	18.67
Downy Woodpecker	10	13.33
Indigo Bunting	15	18.67
Orchard Oriole	18	17.33
Pileated Woodpecker	1	1.33
Red-bellied Woodpecker	47	45.33
White-eyed Vireo	1	1.33

Number of detections of Partners in Flight (PIF) watchlist and stewardship species and percent of stations they were detected at Valley Forge NHP in 2010. Number of detections exclude flyovers and incidental encounters.

References:

O'Connell, et al. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS – Patuxent Wildlife Research Center. Report No. 2003-02.

Photographs by:
Bill Thompson

Figure 10. 2010 Resource Brief for Valley Forge NHP (continued).

Table 15. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Valley Forge NHP. Closed circles indicate species that were detected in the station while open circles indicate species that were only detected as flyovers or incidentals.

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
European Starling	3.35 $\pm$ 1.25	25.33	●	●
American Robin	1.23 $\pm$ 0.13	70.67	●	●
Canada Goose	1.09 $\pm$ 0.62	5.33	●	●
Blue Jay	1.08 $\pm$ 0.10	73.33	●	●
Red-winged Blackbird	1.05 $\pm$ 0.25	29.33	●	●
Song Sparrow	0.73 $\pm$ 0.09	53.33	●	●
Northern Mockingbird	0.65 $\pm$ 0.10	41.33	●	●
Red-bellied Woodpecker†	0.63 $\pm$ 0.09	45.33	●	●
Gray Catbird	0.55 $\pm$ 0.10	41.33	●	●
Northern Cardinal	0.52 $\pm$ 0.07	44.00	●	●
Red-eyed Vireo	0.49 $\pm$ 0.08	38.67	●	●
American Crow	0.47 $\pm$ 0.10	32.00	●	●
Eastern Meadowlark*	0.43 $\pm$ 0.10	24.00	●	●
Wood Thrush*	0.41 $\pm$ 0.09	28.00	●	●
Baltimore Oriole*	0.41 $\pm$ 0.09	26.67	●	●
Tufted Titmouse	0.40 $\pm$ 0.08	30.67	●	●
White-breasted Nuthatch	0.39 $\pm$ 0.08	28.00	●	●
Carolina Chickadee†	0.36 $\pm$ 0.07	30.67	●	●
American Goldfinch	0.35 $\pm$ 0.09	22.67	●	●
Eastern Kingbird*	0.35 $\pm$ 0.08	26.67	●	●
Eastern Towhee*	0.33 $\pm$ 0.07	28.00	●	●
Eastern Wood-Pewee*	0.32 $\pm$ 0.06	28.00	●	●
Tree Swallow	0.28 $\pm$ 0.15	12.00	●	●
Mourning Dove	0.28 $\pm$ 0.08	17.33	●	●
Northern Flicker*	0.27 $\pm$ 0.06	24.00	●	●
Common Yellowthroat	0.25 $\pm$ 0.07	17.33	●	●
Chipping Sparrow	0.25 $\pm$ 0.06	22.67	●	●
Orchard Oriole†	0.24 $\pm$ 0.07	17.33	●	●
Indigo Bunting†	0.20 $\pm$ 0.05	18.67	●	●
Carolina Wren†	0.19 $\pm$ 0.05	18.67	●	●
Black Vulture	0.16 $\pm$ 0.09	5.33	●	●
House Wren	0.16 $\pm$ 0.04	16.00	●	●
Great Crested Flycatcher	0.15 $\pm$ 0.05	12.00	●	●
Blue-winged Warbler*	0.13 $\pm$ 0.13	1.33	●	●
Brown-headed Cowbird	0.13 $\pm$ 0.07	8.00	●	●
Chimney Swift*	0.13 $\pm$ 0.06	8.00	●	●
Downy Woodpecker†	0.13 $\pm$ 0.04	13.33	●	●

Table 15. Summary statistics for point count surveys conducted in 2010 and patterns of occurrence between 2009 and 2010 at Valley Forge NHP (continued).

Species	Abundance ($\bar{x} \pm SE$)	Occurrence (% stations)	Detected	
			2009	2010
Eastern Bluebird	0.13 $\pm$ 0.04	12.00	●	●
Cedar Waxwing	0.12 $\pm$ 0.06	6.67		●
Turkey Vulture	0.12 $\pm$ 0.05	8.00	●	●
Red-tailed Hawk	0.12 $\pm$ 0.05	9.33	●	●
Barn Swallow	0.12 $\pm$ 0.05	8.00	●	●
Common Grackle	0.12 $\pm$ 0.05	8.00	●	●
Eastern Phoebe	0.11 $\pm$ 0.04	10.67	●	●
Warbling Vireo	0.11 $\pm$ 0.04	10.67	●	●
Field Sparrow*	0.08 $\pm$ 0.04	6.67	●	●
Scarlet Tanager	0.08 $\pm$ 0.03	8.00	●	●
American Coot	0.05 $\pm$ 0.04	2.67		●
House Finch	0.05 $\pm$ 0.03	5.33	●	●
Hairy Woodpecker	0.04 $\pm$ 0.03	2.67	●	●
Brown Thrasher*	0.04 $\pm$ 0.03	2.67	●	●
American Kestrel	0.04 $\pm$ 0.02	4.00	●	●
Yellow Warbler	0.04 $\pm$ 0.02	4.00	●	●
Mallard	0.03 $\pm$ 0.03	1.33	●	●
American Redstart	0.03 $\pm$ 0.03	1.33		●
Acadian Flycatcher†	0.03 $\pm$ 0.02	2.67		●
Blue-gray Gnatcatcher	0.03 $\pm$ 0.02	2.67	●	●
Ovenbird	0.03 $\pm$ 0.02	2.67	●	●
Killdeer	0.01 $\pm$ 0.01	1.33		●
Yellow-billed Cuckoo*	0.01 $\pm$ 0.01	1.33		●
Eastern Screech-Owl	0.01 $\pm$ 0.01	1.33		●
Belted Kingfisher	0.01 $\pm$ 0.01	1.33	●	●
Pileated Woodpecker†	0.01 $\pm$ 0.01	1.33		●
Willow Flycatcher*	0.01 $\pm$ 0.01	1.33	●	●
White-eyed Vireo†	0.01 $\pm$ 0.01	1.33	●	●
Fish Crow	0.01 $\pm$ 0.01	1.33		●
Bank Swallow	0.01 $\pm$ 0.01	1.33		●
Veery	0.01 $\pm$ 0.01	1.33	●	●
Cooper's Hawk	-	-	○	
Wood Duck	-	-		○
Great Blue Heron	-	-	●	●
Sharp-shinned Hawk	-	-		○
Rock Pigeon	-	-		○
Black-billed Cuckoo*	-	-		○
Yellow-throated Warbler	-	-	●	

*Partners in Flight Watchlist species
†Partners in Flight Stewardship species

Table 16. Avian forest guild summary and Bird Community Index (BCI) score for 2009 and 2010 at Valley Forge NHP. Percents indicate the average percent guild membership at monitoring locations. Total BCI scores range from 0-1 with 1 having the highest integrity. Ranks are derived from O'Connell et al. (2003).

		2009 (n=38)		2010 (n=47)	
	Guild	Percent	Rank	Percent	Rank
Structural	Forest Interior	23.00	Largely Intact	23.21	Largely Intact
	Pine Associated	0.00	Humanistic	0.00	Humanistic
	Urban/Suburban	50.27	Moderately Disturbed	51.55	Moderately Disturbed
Functional	Bark Prober	17.12	Largely Intact	20.57	Naturalistic
	Ground Forager	0.36	Moderately Disturbed	0.47	Moderately Disturbed
	Upper Canopy	15.99	Largely Intact	11.52	Moderately Disturbed
Compositional	Nest Predator / Brood Parasite	23.24	Humanistic	20.70	Moderately Disturbed
	Single Brooded	39.46	Largely Intact	38.44	Largely Intact
	Exotic	0.00	Naturalistic	0.35	Largely Intact
Total BCI Score		0.61	Largely Intact	0.61	Largely Intact

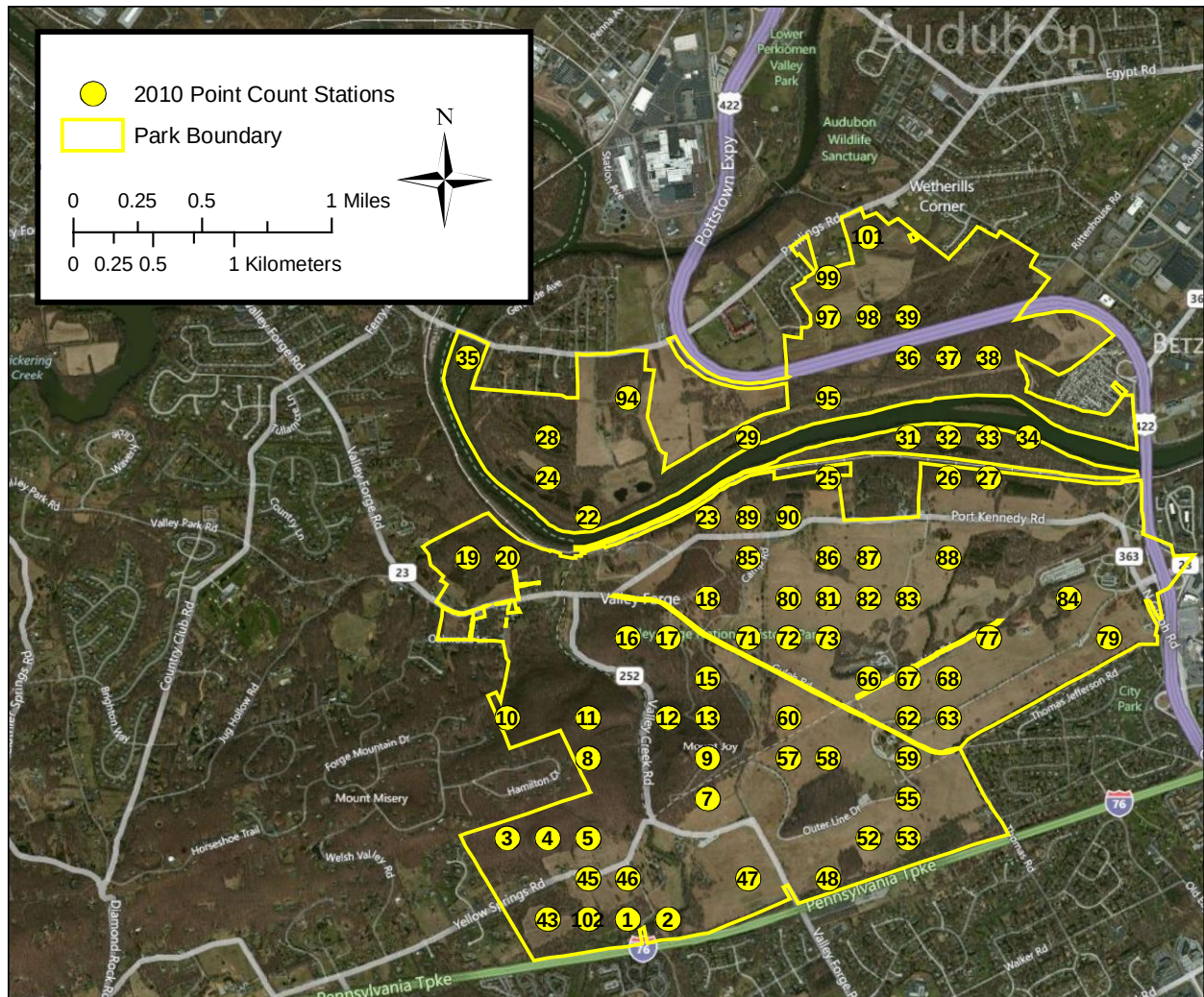


Figure 11. Bird monitoring stations surveyed at Valley Forge NHP in 2010.

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Appendix A. Forested guild assignments

Species Guild Assignments

Several guild categories were considered in the development of the forested guild BCI and ultimately, only a subset of these guilds was found to be responsive to forest structure change (O’Connell et al. 2003). For that reason, some of the guild categories below do not cover the guild a species belongs to. For example, Acadian Flycatchers are aerial salliers under the functional guild category. As this guild is not part of the final structure of the BCI, this space is left blank. Furthermore, because guilds were selected to reflect different aspects of each species’ life history traits, a species may belong to several guilds simultaneously.

Species	Guild		
	Structural	Functional	Compositional
Acadian Flycatcher	forest interior		single brood
American Crow	urban/suburban		nest predator/brood parasite
American Goldfinch	urban/suburban		
American Redstart	forest interior		single brood
American Robin	urban/suburban		
Bachmans Sparrow	pine associated		
Baltimore Oriole		upper canopy forager	single brood
Black-and-White Warbler	forest interior	bark prober	single brood
Black-billed Cuckoo			single brood
Black-capped Chickadee		bark prober	single brood
Black-throated Green Warbler		upper canopy forager	single brood
Blue Jay	urban/suburban		nest predator/brood parasite
Blue-gray Gnatcatcher		upper canopy forager	
Boat-tailed Grackle			nest predator/brood parasite
Bobolink			single brood
Brown Thrasher			single brood
Brown-headed Nuthatch	pine associated		single brood
Carolina Chickadee		bark prober	single brood
Carolina Wren	urban/suburban		
Cedar Waxwing	urban/suburban		
Cerulean Warbler	forest interior	upper canopy forager	single brood
Chimney Swift	urban/suburban		single brood
Chipping Sparrow	urban/suburban		
Common Grackle	urban/suburban		nest predator/brood parasite; single brood
Downy Woodpecker	urban/suburban	bark prober	
Eastern Kingbird			single brood
Eastern Towhee	forest interior		
Eastern Wood-Pewee	forest interior		single brood
Eurasian Collared Dove	urban/suburban		exotic
European Starling	urban/suburban		nest predator/brood parasite; exotic
Fish Crow			nest predator/brood parasite; single brood
Gray Catbird	urban/suburban		
Great Crested Flycatcher			single brood

Species	Guild		
	Structural	Functional	Compositional
Hairy Woodpecker	forest interior	bark prober	single brood
Hooded Warbler	forest interior		
House Finch	urban/suburban		exotic
House Sparrow	urban/suburban		nest predator/brood parasite; exotic
Kentucky Warbler	forest interior	ground forager	single brood
Loggerhead Shrike			nest predator/brood parasite
Louisiana Waterthrush	forest interior	ground forager	single brood
Mourning Dove	urban/suburban		
Northern Cardinal	urban/suburban		
Northern Flicker		ground forager	single brood
Northern Mockingbird	urban/suburban		
Northern Parula	forest interior	upper canopy forager	single brood
Northern Rough-winged Swallow			single brood
Orchard Oriole			single brood
Ovenbird	forest interior	ground forager	single brood
Pileated Woodpecker	forest interior	bark prober	single brood
Pine Warbler	pine associated	bark prober	
Prairie Warbler			single brood
Purple Martin	urban/suburban		single brood
Red-bellied Woodpecker	urban/suburban		nest predator/brood parasite
Red-cockaded Woodpecker	pine associated	bark prober	single brood
Red-eyed Vireo		upper canopy forager	single brood
Red-headed Woodpecker			nest predator/brood parasite
Rock Dove/Pigeon	urban/suburban		exotic
Rose-Breasted Grosbeak	forest interior	upper canopy forager	
Ruby-throated Hummingbird	urban/suburban		
Scarlet Tanager	forest interior	upper canopy forager	single brood
Song Sparrow	urban/suburban		
Summer Tanager		upper canopy forager	single brood
Swainsons Warbler	forest interior	ground forager	single brood
Tree Swallow			single brood
Tufted Titmouse		bark prober	
Veery	forest interior		single brood
Warbling Vireo		upper canopy forager	
White-breasted Nuthatch	forest interior	bark prober	single brood
Willow Flycatcher			single brood
Wood Thrush	forest interior		single brood
Worm-eating Warbler	forest interior		single brood
Yellow Warbler			single brood
Yellow-billed Cuckoo		upper canopy forager	single brood
Yellow-throated Vireo	forest interior	upper canopy forager	single brood
Yellow-throated Warbler			single brood

Guild Descriptions

Individual guilds are broadly categorized as “specialist” or “generalist” based on their relationship to specific elements of ecosystem structure, function, and composition (O’Connell 2003). A specialist can be a species with a narrow range of habitat tolerances, while a generalist can be a species with a wide range of habitat tolerances. For our purposes, specialist guilds may be thought of as “guilds indicative of a high-integrity condition” while generalist guilds are “guilds indicative of a low-integrity condition.”

Structural Guilds

Species guilds based on nesting and/or foraging habitat requirements

Forest Interior (Specialist)

This guild includes species that require large blocks of interior forest. Few to none of the species in this guild are typically supported in small forest fragments (<10ha; Robbins et al. 1989, Freemark and Collins 1992) and numbers typically decline with increasing human disturbance (O’Connell 2003, Glennon and Porter 2005).

Examples include the Ovenbird, Louisiana Waterthrush, Yellow-throated Warbler, and Eastern Wood Peewee.

Pine Associated (Specialist)

This guild is comprised of species that require pine forest or plantations for foraging and nesting. The proportion of pine associated guild species is typically low compared to other species, but is positively correlated with habitat quality.

Examples include the Pine Warbler, Brown-headed Nuthatch, and Red-Cockaded Woodpecker.

Urban/Suburban (Generalist)

These are species that typically occur in human dominated environments. They nest and forage in a wide range of habitats and many prefer edges. Exotic species fall in this guild and hence large proportions of these species are indicative of poor-quality habitat.

Northern Mockingbird, House Finch, Gray Catbird, and Song Sparrow are all examples of Urban/Suburban guild species.

Functional Guilds

Species guilds based on foraging habit

Bark Prober (Specialist)

Insectivorous species that primarily forage via bark probing fall in this guild. They require standing snags, large diameter coarse woody debris (CWD), and/or mature trees with deeply furrowed or flaking bark which provide substrates that support abundant insect populations. Increasing proportions of these guilds indicate higher forest integrity.

Examples include the woodpeckers, nuthatches, and chickadees.

Upper Canopy Forager (Specialist)

This guild includes species that forage high in the forest canopy. These species are typically restricted to mature forests and many are considered forest interior obligates. The majority of the species in this guild are insectivorous warblers. Like the Forest Interior guild the proportion of species in this guild increases with forest integrity.

Examples of species in this guild are the Baltimore Oriole, Black-throated Green Warbler, Blue-gray Gnatcatcher, and Cerulean Warbler.

Ground Forager (Specialist)

Species that primarily forage by gleaning insects from the ground fall into this guild. They include specialized insectivores that pick insects from the leaf litter or directly from the ground. Like species in the Pine Associated guild, numbers of these species are low and hence detections are difficult to rare, but higher proportions of these species are indicative of good forest integrity.

The Kentucky Warbler, Louisiana Waterthrush, Northern Flicker, and Swainsons Warbler are examples of species form this guild.

Compositional Guilds

Species guilds based on factors that are not functional or structural (e.g. interspecific dynamics, breeding phenology)

Single-brooded (Specialist)

This guild is comprised of species that typically raise only one brood per breeding season. Many single-brooded species are restricted to interior forest habitat, and are absent from smaller forest fragments due to increased competition and higher rates of predation and nest parasitism associated with edge habitats (Freemark and Collins 1992). Hence, proportional species richness for this guild increases with forest integrity.

Species in this guild include Red-eyed Vireos, Tree Swallows, Yellow-billed Cuckoos, and Wood Thrush.

Nest Predator / Brood Parasite (Generalist)

This guild includes species that are nest predators or brood parasites. Nest predators and brood parasites have been shown to negatively affect the distribution, abundance, and nest success of other bird species, particularly neotropical migrants (Wilcove 1985, Robinson et al. 1993), and these effects increase significantly in fragmented and edge habitats (Robinson et al. 1995). Hence high proportions of species in this guild are indicative of poor forest integrity.

Many of the Corvids fall into this guild along with European Starlings, Red-bellied Woodpeckers, and Red-headed Woodpeckers.

Exotic (Generalist)

This guild is comprised of species that are not native to the study region. Typically edge-loving, generalists, species in this guild are indicative of poor forest integrity. Additionally, species in this guild often disrupt natural communities and compete with native species for nesting sites.

Species such as the House Finch, Rock Dove, and European Starling fall in this guild.

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