

The 2008 VSO Foray – Breeding Birds of Riparian Areas

INTRODUCTION

The Virginia Society of Ornithology's (VSO) Forays have traditionally provided data on the distribution and abundance of breeding avian species for particular geographic areas of interest within Virginia. In the past two years the Forays have deviated from this approach by targeting specific species (Northern Saw-whet Owl) or public land systems (Virginia state parks). The 2008 Foray continues this recent trend by focusing on breeding birds of forested riparian areas. Currently there are no surveys in the Commonwealth that adequately capture data on breeding riparian birds. A number of surveys on public lands managed by state and federal agencies are targeted at individual species or at upland bird communities, including grassland and forest birds. These include surveys on National Forests, National Parks, National Refuges, state Wildlife Management Areas and Natural Area Preserves. However, survey effort is not sufficiently focused on riparian areas intersecting or abutting these lands to collect meaningful data. The North American Breeding Bird Survey (BBS) yields data on population trends of landbird species across the United States and Canada, which are used by the avian conservation community at large in assessing the status of breeding bird populations. In Virginia, the BBS currently operates 70 routes distributed across the state. The BBS is effective in monitoring a large number of species associated with upland habitats. However, because it operates as a roadside survey, it does not adequately sample riparian and other wetland areas. As a result, species associated with these habitat types are generally underrepresented in BBS data. The 2008 Foray was designed to begin addressing the data gap that exists for riparian breeding birds by establishing a systematic survey along riparian corridors over a broad geographic area of Virginia. Its primary objective was the collection of data on the distribution and abundance of avian breeders associated with forested riparian areas in the Coastal Plain and Piedmont. The Foray is also unique in having been conducted as a boat-based survey. As such, it is one of the few systematic boat-based surveys of forest landbirds in North America to date. Only one other such survey was conducted in Virginia in the 1980s (Dana Bradshaw, personal communication). The boat-based approach served to maximize access to areas that are mostly in private ownership and that may not be connected to a road or trail system. By avoiding the traditional road-based survey approach, the Foray also sought to capture information on avian communities that may be less impacted by habitat degradation related to roads and their associated disturbance. The survey also marks the first time that the Virginia Department of Game and Inland Fisheries (DGIF) and the VSO have cooperated on design and coordination of a Foray.

The Foray was conducted along 18 broadly distributed riparian routes in the Coastal Plain and Piedmont. These riparian segments ranged in location from extreme southeast Virginia (Northwest and North Landing Rivers) to the northern Piedmont (Rapidan River) (Figure 1), and are contained within two primary watersheds. Twelve segments are located along rivers within the Chesapeake Bay watershed (Rapidan, Rappahannock, Mattaponi, North Anna, South Anna, Rivanna and Appomattox). Six segments are contained within the Roanoke River watershed. They include the Nottoway and Blackwater Rivers, which converge into the Chowan River in North Carolina and drain into Albemarle Sound; and the North Landing (Pocaty) and Northwest Rivers, which are part of the Intracoastal Waterway and drain into Currituck Sound. Survey routes along tributaries to the Chesapeake Bay are well above the tidal influence, whereas waters

along the Northwest and North Landing Rivers are subject to wind-blown tides. All survey routes were predominantly characterized by forested habitat within a landscape of forested, agricultural, residential and commercial land types. River segments were generally narrow (< 100 m) and slow-flowing. The exceptions were 2 routes along the Northwest River, which achieves widths > 200 m, and 4 routes along the Rapidan and Rappahannock Rivers, which at points are wider than 100 m and characterized by riffles and rapids. The latter routes were included in the Foray because of interest in characterizing the bird community along the City of Fredericksburg's Watershed Management Property, which they abut. The Property is a 4,800 parcel in easement for which a management plan is being developed in 2009 and for which avian data had until now not been collected. Through this broad geographic approach, the Foray sought to document avian diversity and abundance occurring in different regions of Virginia along diverse river systems.

METHODS

Survey Routes

Riparian survey routes were selected in the Coastal Plain and Piedmont on the basis of various factors, including: landscape characteristics that encompassed extensive forested habitat; accessibility in the form of viable launch and take-out points; navigability based on average water flow during the survey period and the absence of obstacles such as downed trees and debris; width of the river channel and velocity of flow such that noise impacts on bird detectability be minimal; and length of the route between access points. Surveys were conducted at 18 of 23 viable survey routes identified through this process, over a length of approximately 109 river km. These included 8 routes in the Piedmont along the Rapidan, Rappahannock, Rivanna, and Appomattox Rivers, and 10 Coastal Plain routes along the North Anna, South Anna, Mattaponi, Blackwater, Nottoway, Northwest and North Landing (Pocaty) Rivers (Figure 1). Survey points were generated in GIS using aerial imagery. A flip of the coin was used to randomly determine on which side of a river segment to place the points. Points were placed approximately 150 meters from the boat launch in order to minimize the impact of traffic noise on bird detectability, and were separated from one another by a 300 meter straight-line distance. The number of points varied between 10 and 20 per route (Table 1) and was determined by the length of the route and by the estimated time period available for survey.

Survey Protocol

Routes were surveyed by sixteen teams consisting of an observer and a paddler in canoes and/or kayaks. Two individuals operating alone conducted surveys along 3 routes. Each route was surveyed once between May 30 and June 28 using standard point count methodology. The majority of points were surveyed between official sunrise and 1000, while 4.8% of points were surveyed after 1000. Observers strove to conduct surveys during favorable weather conditions, excluding winds blowing at greater than 12 mph, fog and/or rain above a drizzle. Surveys were conducted from a stationary boat or kayak at each point in proximity to the river bank. Surveys at each point were subdivided into three 2-minute time periods, for a total of 6 minutes. One observer recorded onto a standardized data sheet each bird detected by sight or sound, noting the time period and location in which the bird was first detected. The location of first detection consisted of river right (right side of the river when facing downstream) or river left (left side of

the river when facing downstream). Juvenile or newly fledged birds and birds detected flying above a survey point rather than from within the vegetation (flyovers) were recorded separately.

RESULTS

A total of 335 points were surveyed, yielding detections of 4539 individual birds. 495 of these detections were flyovers. An additional 31 detections could not be identified to species, including 1 unidentified heron, 11 drumming woodpeckers, 2 unidentified swallow species and 3 unidentified warblers. In addition, two detections of Blue-headed Vireo and one of Brown Creeper were classified as 'possible' due to their having been detected outside of their breeding range relatively late in the season. The total number of individuals reported is somewhat lower than the actual number detected, as at least 3 observers did not report birds that they could not positively identify. A total of 95 species were documented during the surveys, ranging from 23 to 55 per route (Table 1). Two additional species were detected between points outside of the formal survey period: one individual of merganser sp. along Appomattox route 1, and one Cooper's Hawk along the Rappahannock route.

Two species (Red-eyed Vireo, Carolina Wren) were detected on all 18 routes, 18.9 % species were detected at 75 % or more of the routes, and 40.0 % of the species at 50 % or more of the routes (Table 2). These results are a product of both geographic distribution and detectability of individual species. Including flyovers, the most frequently-detected species across routes was Red-eyed Vireo (63.6 % of points), followed by Northern Cardinal (59.4 %) and Carolina Wren (49.9 %) (Table 2). Tufted Titmouse, Blue-gray Gnatcatcher, Acadian Flycatcher, American Crow, Northern Parula, Indigo Bunting and Prothonotary Warbler were all detected at approximately one third or more of all the points (Table 2). Twelve species were detected at only one survey point (Table 2); three of these were flyovers. The most frequently-detected species (with the addition of Carolina Chickadee) were also those detected with the greatest abundance (> 100 individuals). Each of the remaining species was represented by detections of fewer than 100 individuals (Table 2). Fifteen species were represented by the detection of one individual (Table 2); three of these were flyovers.

Unusual summer observations for this region of Virginia included detections of Solitary Sandpiper, Mississippi Kite, possible Brown Creeper, possible Blue-headed Vireo, Cerulean Warbler, and Canada Warbler. Each was represented by one individual, with the exception of the vireo (2 individuals). All of these species can reasonably be assumed to be late migrants. The adult Mississippi Kite was detected as a flyover on the Blackwater 1 route dividing Southampton and Isle of Wight counties. Though likely a transient individual, the individual may represent a breeder based on recently documented nesting records for Southampton County (Rottenborn and Brinkley 2007). The Cerulean Warbler is a relatively early migrant, with migration in the mid-Atlantic region generally occurring in the last week of April and with very few individuals found in the South beyond the first week of May (Dunn and Garrett 1997). The Foray detection of this species occurred on May 30 along the Appomattox 1 route, dividing Powhatan and Amelia counties. Piedmont breeders occur primarily near the Blue Ridge and in northwestern Fairfax County (Rottenborn and Brinkley 2007). Although the individual may have been a late migrant, its status as a possible local breeder should also be considered in light of other recent records for this geographic area. These include a July 12, 1996 capture of an

adult female with a full brood patch in the vicinity of Powhatan Wildlife Management Area (WMA); the bird had not yet begun her end-of-season prebasic molt (Bob Reilly, personal communication). In addition, a male was heard singing during point count surveys on Powhatan WMA on June 10, 2003 (DGIF unpublished data). The Foray record for Cerulean Warbler was at a point approximately 5 km from the Powhatan WMA.

Detections were made of 7 individual Bald Eagles during the survey period, including at least one subadult bird, and of 2 additional individuals between survey points. Individuals were documented on the Rapidan 3, Appomattox 1, South Anna 1, Nottoway 1 and Blackwater 2 routes. These individuals could be resident Virginia birds or summering individuals from the Southeast. Eagle nests have been documented along all 5 of these rivers. However, in addition to supporting resident Virginia birds and their offspring, the Chesapeake Bay area hosts post-breeding and subadult individuals from southeastern states during the summer months (Watts et al. 2008). These birds converge in concentration areas in the tidal freshwater portions of the Potomac, Rappahannock and James Rivers in Virginia. The status of this migrant population in non-tidal segments of Virginia's Coastal Plain and Piedmont rivers has not been examined, however, and it is possible that at least some of the birds detected were non-resident individuals.

The survey methodology was such that the vast majority of detections were made by ear. This limited the opportunity for observers to document direct signs of breeding activity, which is primarily a visual exercise. The resulting 11 reports of direct breeding evidence are skewed toward waterfowl, which had relatively high visibility because they were on the water (Table 3).

DISCUSSION

The mean number of species detected per point per route was highly variable among routes, ranging from 5.1 to 15.9. A number of factors can account for such variation, including the geographic distribution of species, route-level effects related to habitat, and bird detectability. The latter may be in turn be influenced by weather conditions (Robbins 1981a), time of day (Robbins 1981b, Skirvin 1981), habitat and distance to observer (McShea and Rappole 1997), vegetation structure and background noise (Pacifiçi et al. 2008) as well as observer skill and experience (Sauer et al. 1994). Observer effects in particular may have played a role here, as, unlike past Forays that have relied on groups of observers to report observations, results for each route were based on the survey effort of one individual. Although route-level summary data are presented (Tables 1 and 2), direct comparisons among routes are not attempted. Comparisons of species abundance among routes may be possible by correcting for detectability factors and testing for observer effect. Such an analysis is beyond the scope of this report. Nevertheless, the Foray results provide a valuable snapshot of the riparian forest bird community along a broadly distributed sample of Virginia's Coastal Plain and Piedmont rivers.

The surveys documented the full complement of forest generalist species, as well as Neotropical migrants associated with forest interior habitat, common to the Coastal Plain and Piedmont of Virginia. The surveys were also successful in documenting the bird community more specifically associated with forested riparian habitat. These include aquatic species such as waterfowl, herons, Osprey, Spotted Sandpiper and Belted Kingfisher, as well as a variety of passerines such as Acadian Flycatcher, Northern Parula, Yellow-throated Warbler, Prothonotary

Warbler, Louisiana Waterthrush and Kentucky Warbler. Detection frequencies for particular riparian species, including Acadian Flycatcher, Northern Parula and Prothonotary Warbler, were relatively high (Table 2). A comparison to detections rates of these and other riparian species along BBS routes would yield insight into the relative value of each of these surveys in documenting and monitoring the riparian bird community. Such an analysis is currently beyond the scope of this report.

The Foray also highlights the importance of riparian habitats in far southeastern Virginia to Prothonotary Warblers. The species was detected on 8 of 10 Coastal Plain routes and on 4 of 8 Piedmont routes. Within the Coastal Plain, frequency of detection and abundances on the North Landing (Pocaty River) and on both Northwest River routes are especially notable. Prothonotaries here were detected at 90-100% of points per route, with mean abundances of 2.30 to 2.65 individuals per point. Frequency of detection on other Coastal Plain rivers was also relatively high along certain routes (40-80% of points per route). However, mean abundances along these routes were considerably lower (0.55- 1.20 individuals per point). Caution must be exercised in comparing uncorrected abundance across routes, given the potential for observer effects to influence counts. However, these effects are mitigated by the high level of detectability of the species and by the consistency in results between the two observers conducting surveys along the Northwest and North Landing Rivers.

As expected, species associated with early successional (shrubland) habitats were detected with low frequencies ($\leq 20\%$), given the bias of the surveys toward forested lands. These species include Northern Bobwhite, Gray Catbird, Brown Thrasher, Prairie Warbler, Yellow-breasted Chat, Blue Grosbeak, Eastern Towhee, Song and Field Sparrows, and others (Table 2). Another species with a shrubland affinity, Indigo Bunting, was detected at nearly one third of the points, a testament to this species' ability to exploit a wide range of early-successional scenarios, including relatively small openings in the forest canopy.

The systematic nature of the surveys allows for their future replication by controlling for effort and by establishing fixed survey point coordinates. There was a reasonable level of precision in locating survey points in the field. GPS units were used along 11 routes to navigate to survey points via the coordinates provided. Observers reported a high level of confidence in navigating to survey points through the use of maps alone on 3 additional routes. Observers on 4 routes (Northwest 1, North Anna 1 and 2, Nottoway 1) reported a lower degree of confidence in navigating to survey points. The use of GPS units for future surveys is highly recommended in order to improve the level of spatial precision.

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(*surveyed two routes)

Figure 1. Coastal Plain (light gray) and Piedmont (dark gray) riparian routes surveyed (heavy black lines), also showing major rivers (thin black lines).

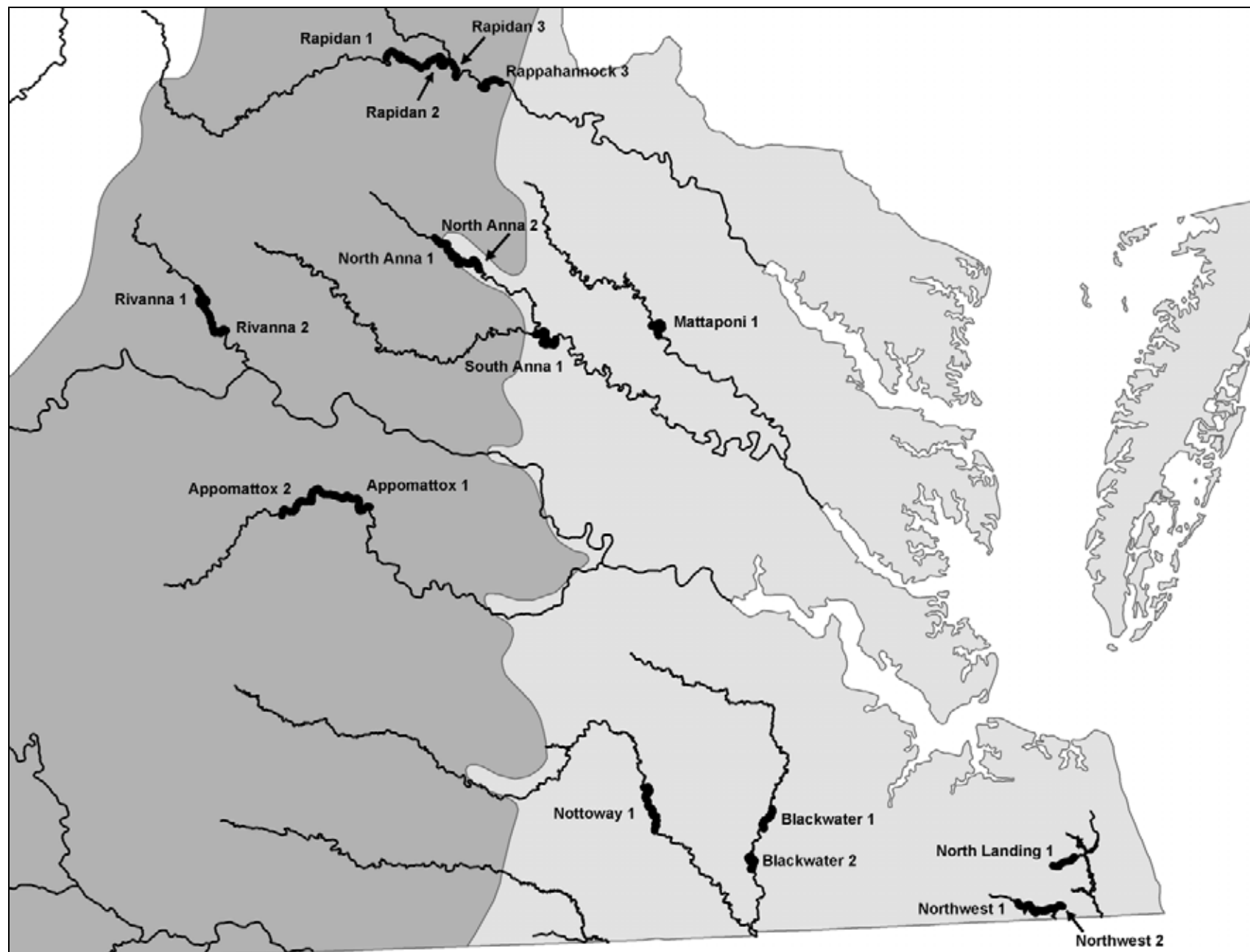


Table 1. Number of points surveyed, total species detected during the survey period of the Foray, and total counts (including flyovers) per species, by survey route.

Common Name	Appomattox 1	Appomattox 2	Blackwater 1	Blackwater 2	Mattaponi 1	North Anna 1	North Anna 2	North Landing 1	Northwest 1	Northwest 2	Nottoway 1	Rapidan 1	Rapidan 2	Rapidan 3	Rappahannock 3	Rivanna 1	Rivanna 2	South Anna 1
Number of Points Surveyed	20	20	20	20	20	16	14	10	20	20	20	20	19	20	16	20	20	20
Total Species Detected	49	42	55	46	55	24	27	22	41	35	46	55	43	38	23	32	50	41
Canada Goose					1			2				31	20		2	35	2	7
Wood Duck	1	1		1	3		2	1	3	2		1		2	1	4	6	1
Mallard	6											3	2	5	11	4		
Wild Turkey		1				1											3	
Northern Bobwhite	4	3	7	1		1											1	
Great Blue Heron	2	4	2	3	3				6	1		1	5	5	6		3	2
Great Egret				3							1							
Green Heron	1	1				1			6	8	2		1				5	1
Black Vulture												1					6	
Turkey Vulture			1	2	1				3	2			1	1	1		5	
Osprey			2			1			3	2			1	1	1	1		
Mississippi Kite			1															
Bald Eagle	1										4			2				
Red-shouldered Hawk		1	2		10							3						1
Broad-winged Hawk																	1	1
Red-tailed Hawk									3								1	
American Kestrel	1																	
Killdeer			2								1			1				
Solitary Sandpiper	1																	
Spotted Sandpiper						1												
Rock Pigeon				16					3									
Mourning Dove	2		9	3	12	2	1		5	8	10		4			1	6	3
Yellow-billed Cuckoo	1	5		1			1				6	6				3	6	

Table 1. (continued)

Common Name	Appomattox 1	Appomattox 2	Blackwater 1	Blackwater 2	Mattaponi 1	North Anna 1	North Anna 2	North Landing 1	Northwest 1	Northwest 2	Nottoway 1	Rapidan 1	Rapidan 2	Rapidan 3	Rappahannock 3	Rivanna 1	Rivanna 2	South Anna 1
Barred Owl								3										
Chimney Swift			2	36		1		3			1			3			1	
Ruby-throated Hummingbird	3		1		1	2		2			2	7					1	
Belted Kingfisher	3		1	2	2	6			5		1	1	2	1		1	1	
Red-headed Woodpecker			1															
Red-bellied Woodpecker	4	8	7	5	9		2	5	10	9	2	4		1	1	5	10	7
Downy Woodpecker	6	2	4	1	6		1	5	5	7	3	5	4	2	5	2	5	4
Hairy Woodpecker			2	1	4				1		1							
Northern Flicker		2	2		1						3	1						
Pileated Woodpecker	3	7	8	2	5	1		5	2	5	2	3	3	1		3	7	7
Eastern Wood-Pewee	7	7	6	5	9	2			1	2	1	2	1	5		1		13
Acadian Flycatcher	12	9	10	4	30		11	2	10		11	6	10	12	4	5	6	15
Eastern Phoebe						2	2		3	1			2					1
Great Crested Flycatcher	2	3	6	13	3		2	9	5	11	7	1	1	1			1	3
Eastern Kingbird					1							1		4	4			
Purple Martin					3				3	4		1						
Tree Swallow					1				27			3		7				
Northern Rough-winged Swallow			2		3				5			1				3	2	
Barn Swallow			2		4		10		7	2	1	1	8				1	
Blue Jay	2		5	2	4	1	3	7	3	19	3	1	3	3	1		1	1
American Crow	15	20	9	13	25	9	9	5	8	5	15	17			5	4	21	5
Fish Crow				3						8		1					1	
Carolina Chickadee	11	6	14	13	10			4	18	16	7	15	13	3	3	14	12	5
Tufted Titmouse	13	13	24	4	41		13	4	22	10	20	9	26	3	3	5	10	9
White-breasted Nuthatch	3	2	10	14	7		3	9	13	11	5	1	2			1	2	2
Brown-headed Nuthatch										6	1							

Table 1. (continued)

Common Name	Appomattox 1	Appomattox 2	Blackwater 1	Blackwater 2	Mattaponi 1	North Anna 1	North Anna 2	North Landing 1	Northwest 1	Northwest 2	Nottoway 1	Rapidan 1	Rapidan 2	Rapidan 3	Rappahannock 3	Rivanna 1	Rivanna 2	South Anna 1
Carolina Wren	19	8	14	14	27	3	1	9	9	20	23	13	13	6	13	9	13	12
House Wren																	1	
Blue-gray Gnatcatcher	10	16	28	15	23			1	16	1	7	15	23	11		1	38	10
Eastern Bluebird			2	5	1	6				2	1		1				1	
Wood Thrush	6	3	2	1	2	3	3		3	3		1	6	4	7	1	5	4
American Robin										1		1			2	4		2
Gray Catbird							1		4									4
Northern Mockingbird			1														1	
Brown Thrasher	2		1		1				1	2		1				1		
Cedar Waxwing					3							6						
European Starling				1														
White-eyed Vireo	15	11	1	1	11		6				6	4	4	3				2
Yellow-throated Vireo	10	8	4	2	8		3		5		1							4
Red-eyed Vireo	29	30	10	4	70	11	10	6	3	3	25	21	15	26	10	18	23	22
Northern Parula	29	5	4	4	19						6	26	18	22	13	3	12	7
Yellow Warbler												2	3	6			1	
Yellow-throated Warbler	5	5	5	4	5			1			1	2	1					1
Pine Warbler	1		9						1	2			2					
Prairie Warbler	3	9	3	1	5							1					2	
Cerulean Warbler	1																	
Black-and-white Warbler		1			1							2						1
American Redstart	10	1														9		
Prothonotary Warbler	2	7	15	24	16		1	23	50	53	11		1				2	
Worm-eating Warbler	1											1		2				
Ovenbird	6		5	1	8	2	2				2	1	3	5			3	
Louisiana Waterthrush	7	6		1	10		1				2	5	7	9	1	2	4	

Table 1. (continued)

Common Name	Appomattox 1	Appomattox 2	Blackwater 1	Blackwater 2	Mattaponi 1	North Anna 1	North Anna 2	North Landing 1	Northwest 1	Northwest 2	Nottoway 1	Rapidan 1	Rapidan 2	Rapidan 3	Rappahannock 3	Rivanna 1	Rivanna 2	South Anna 1
Kentucky Warbler	4	9					2				1		2					3
Common Yellowthroat	3	8	3	4	3				2	7	2	2		2			4	
Hooded Warbler	2	3			9	15	6				6		2					1
Canada Warbler		1																
Yellow-breasted Chat	3	9	2	1	2		3				4	4	2				7	
Summer Tanager	1		9	3	5				5		5		1	2				2
Scarlet Tanager	3	2			6	6	5						2	1			1	3
Northern Cardinal	26	12	33	15	43	11	16		17	23	29	14	24	14	6	11	20	27
Blue Grosbeak		1	1		4				4		1							
Indigo Bunting	11	11	9	2	16						13	17	7	9		18	23	6
Eastern Towhee		3	4			1						1	1					
Chipping Sparrow			4	1	1											1		2
Field Sparrow			5		1							1						
Song Sparrow												1		1				1
Red-winged Blackbird									3								4	
Common Grackle			9	15	2			24	19	35	6	1				1		1
Brown-headed Cowbird			8	1	4					2	4	6	9	1	1		2	1
Orchard Oriole			1									2	2			1	2	2
Baltimore Oriole												1						
American Goldfinch	7	2	5	12	7	7		4		8	4	9	10	11	1	7	4	

Table 2. Species detected during the survey period of the Foray, including: number and percentage of routes (n = 18) where detected, number and percentage of points (n = 335) where detected, number of individuals detected, number of flyovers detected, total count (sum of number of individuals detected and flyovers), and mean of individuals detected per point (excluding flyovers).

Common Name	Scientific Name	# of routes where detected	% of routes where detected	# of points where detected	% of points where detected	# of individuals detected	Fly-overs	Total Count	Mean per Point
Canada Goose	<i>Branta canadensis</i>	8	44.4	17	5.1	54	46	100	0.16
Wood Duck	<i>Aix sponsa</i>	14	77.8	17	5.1	22	7	29	0.07
Mallard	<i>Anas platyrhynchos</i>	6	33.3	18	5.4	13	18	31	0.04
Wild Turkey	<i>Meleagris gallopavo</i>	3	16.7	3	0.9	5	0	5	0.01
Northern Bobwhite	<i>Colinus virginianus</i>	6	33.3	14	4.2	17	0	17	0.05
Great Blue Heron	<i>Ardea herodias</i>	13	72.2	40	11.9	26	17	43	0.08
Great Egret	<i>Ardea alba</i>	2	11.1	2	0.6	0	4	4	0.00
Green Heron	<i>Butorides virescens</i>	9	50.0	21	6.3	19	7	26	0.06
Black Vulture	<i>Coragyps atratus</i>	2	11.1	2	0.6	6	1	7	0.02
Turkey Vulture	<i>Cathartes aura</i>	9	50.0	14	4.2	4	13	17	0.01
Osprey	<i>Pandion haliaetus</i>	8	44.4	11	3.3	5	7	12	0.01
Mississippi Kite	<i>Ictinia mississippiensis</i>	1	5.6	1	0.3	0	1	1	0.00
Bald Eagle	<i>Haliaeetus leucocephalus</i>	3	16.7	6	1.8	4	3	7	0.01
Red-shouldered Hawk	<i>Buteo lineatus</i>	5	27.8	15	4.5	14	3	17	0.04
Broad-winged Hawk	<i>Buteo platypterus</i>	2	11.1	2	0.6	2	0	2	0.01
Red-tailed Hawk	<i>Buteo jamaicensis</i>	2	11.1	3	0.9	1	3	4	0.00
American Kestrel	<i>Falco sparverius</i>	1	5.6	1	0.3	1	0	1	0.00
Killdeer	<i>Charadrius vociferus</i>	3	16.7	4	1.2	2	2	4	0.01
Solitary Sandpiper	<i>Tringa solitaria</i>	1	5.6	1	0.3	1	0	1	0.00
Spotted Sandpiper	<i>Actitis macularius</i>	1	5.6	1	0.3	1	0	1	0.00
Rock Pigeon	<i>Columba livia</i>	2	11.1	3	0.9	0	19	19	0.00
Mourning Dove	<i>Zenaida macroura</i>	13	72.2	56	16.7	59	7	66	0.18
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	8	44.4	26	7.8	28	1	29	0.08
Barred Owl	<i>Strix varia</i>	1	5.6	1	0.3	3	0	3	0.01
Chimney Swift	<i>Chaetura pelagica</i>	7	38.9	23	6.9	1	46	47	0.00
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	8	44.4	18	5.4	17	2	19	0.05
Belted Kingfisher	<i>Ceryle alcyon</i>	12	66.7	26	7.8	17	9	26	0.05

Table 2. (continued)

Common Name	Scientific Name	# of routes where detected	% of routes where detected	# of points where detected	% of points where detected	# of individuals detected	Fly-overs	Total Count	Mean per Point
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	1	5.6	1	0.3	0	1	1	0.00
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	16	88.9	85	25.4	88	1	89	0.26
Downy Woodpecker	<i>Picoides pubescens</i>	17	94.4	63	18.8	63	4	67	0.19
Hairy Woodpecker	<i>Picoides villosus</i>	5	27.8	8	2.4	8	1	9	0.02
Northern Flicker	<i>Colaptes auratus</i>	5	27.8	8	2.4	9	0	9	0.03
Pileated Woodpecker	<i>Dryocopus pileatus</i>	16	88.9	62	18.5	62	2	64	0.19
Eastern Wood-Pewee	<i>Contopus virens</i>	14	77.8	57	17.0	62	0	62	0.19
Acadian Flycatcher	<i>Empidonax virens</i>	16	88.9	123	36.7	157	0	157	0.47
Eastern Phoebe	<i>Sayornis phoebe</i>	6	33.3	10	3.0	10	1	11	0.03
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	15	83.3	56	16.7	68	0	68	0.20
Eastern Kingbird	<i>Tyrannus tyrannus</i>	4	22.2	10	3.0	9	1	10	0.03
Purple Martin	<i>Progne subis</i>	4	22.2	7	2.1	4	7	11	0.01
Tree Swallow	<i>Tachycineta bicolor</i>	4	22.2	9	2.7	1	37	38	0.00
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	6	33.3	8	2.4	4	12	16	0.01
Barn Swallow	<i>Hirundo rustica</i>	9	50.0	11	3.3	13	23	36	0.04
Blue Jay	<i>Cyanocitta cristata</i>	16	88.9	43	12.8	52	7	59	0.16
American Crow	<i>Corvus brachyrhynchos</i>	16	88.9	122	36.4	165	20	185	0.49
Fish Crow	<i>Corvus ossifragus</i>	4	22.2	11	3.3	10	3	13	0.03
Carolina Chickadee	<i>Poecile carolinensis</i>	16	88.9	102	30.4	164	0	164	0.49
Tufted Titmouse	<i>Baeolophus bicolor</i>	17	94.4	150	44.8	228	1	229	0.68
White-breasted Nuthatch	<i>Sitta carolinensis</i>	15	83.3	66	19.7	84	1	85	0.25
Brown-headed Nuthatch	<i>Sitta pusilla</i>	2	11.1	3	0.9	7	0	7	0.02
Carolina Wren	<i>Thryothorus ludovicianus</i>	18	100.0	167	49.9	225	1	226	0.67
House Wren	<i>Troglodytes aedon</i>	1	5.6	1	0.3	1	0	1	0.00
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	15	83.3	146	43.6	215	0	215	0.64
Eastern Bluebird	<i>Sialia sialis</i>	8	44.4	17	5.1	19	0	19	0.06
Wood Thrush	<i>Hylocichla mustelina</i>	16	88.9	45	13.4	54	0	54	0.16
American Robin	<i>Turdus migratorius</i>	5	27.8	9	2.7	10	0	10	0.03

Table 2. (continued)

Common Name	Scientific Name	# of routes where detected	% of routes where detected	# of points where detected	% of points where detected	# of individuals detected	Fly-overs	Total Count	Mean per Point
Gray Catbird	<i>Dumetella carolinensis</i>	3	16.7	8	2.4	9	0	9	0.03
Northern Mockingbird	<i>Mimus polyglottos</i>	2	11.1	2	0.6	1	1	2	0.00
Brown Thrasher	<i>Toxostoma rufum</i>	7	38.9	9	2.7	9	0	9	0.03
Cedar Waxwing	<i>Bombycilla cedrorum</i>	2	11.1	4	1.2	1	8	9	0.00
European Starling	<i>Sturnus vulgaris</i>	1	5.6	1	0.3	0	1	1	0.00
White-eyed Vireo	<i>Vireo griseus</i>	11	61.1	57	17.0	64	0	64	0.19
Yellow-throated Vireo	<i>Vireo flavifrons</i>	9	50.0	39	11.6	45	0	45	0.13
Red-eyed Vireo	<i>Vireo olivaceus</i>	18	100.0	213	63.6	336	0	336	1.00
Northern Parula	<i>Parula americana</i>	13	72.2	120	35.8	168	0	168	0.50
Yellow Warbler	<i>Dendroica petechia</i>	4	22.2	12	3.6	12	0	12	0.04
Yellow-throated Warbler	<i>Dendroica dominica</i>	10	55.6	28	8.4	30	0	30	0.09
Pine Warbler	<i>Dendroica pinus</i>	5	27.8	15	4.5	15	0	15	0.04
Prairie Warbler	<i>Dendroica discolor</i>	7	38.9	21	6.3	24	0	24	0.07
Cerulean Warbler	<i>Dendroica cerulea</i>	1	5.6	1	0.3	1	0	1	0.00
Black-and-white Warbler	<i>Mniotilta varia</i>	4	22.2	5	1.5	5	0	5	0.01
American Redstart	<i>Setophaga ruticilla</i>	3	16.7	17	5.1	20	0	20	0.06
Prothonotary Warbler	<i>Protonotaria citrea</i>	12	66.7	109	32.5	204	1	205	0.61
Worm-eating Warbler	<i>Helmitheros vermivorum</i>	3	16.7	4	1.2	4	0	4	0.01
Ovenbird	<i>Seiurus aurocapilla</i>	11	61.1	32	9.6	38	0	38	0.11
Louisiana Waterthrush	<i>Seiurus motacilla</i>	12	66.7	49	14.6	55	0	55	0.16
Kentucky Warbler	<i>Oporornis formosus</i>	6	33.3	17	5.1	21	0	21	0.06
Common Yellowthroat	<i>Geothlypis trichas</i>	11	61.1	34	10.1	40	0	40	0.12
Hooded Warbler	<i>Wilsonia citrina</i>	8	44.4	33	9.9	44	0	44	0.13
Canada Warbler	<i>Wilsonia canadensis</i>	1	5.6	1	0.3	1	0	1	0.00
Yellow-breasted Chat	<i>Icteria virens</i>	10	55.6	32	9.6	37	0	37	0.11
Summer Tanager	<i>Piranga rubra</i>	9	50.0	30	9.0	31	2	33	0.09
Scarlet Tanager	<i>Piranga olivacea</i>	9	50.0	27	8.1	29	0	29	0.09
Northern Cardinal	<i>Cardinalis cardinalis</i>	17	94.4	199	59.4	334	7	341	1.00

Table 2. (continued)

Common Name	Scientific Name	# of routes where detected	% of routes where detected	# of points where detected	% of points where detected	# of individuals detected	Fly-overs	Total Count	Mean per Point
Blue Grosbeak	<i>Passerina caerulea</i>	5	27.8	9	2.7	11	0	11	0.03
Indigo Bunting	<i>Passerina cyanea</i>	12	66.7	110	32.8	136	6	142	0.41
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	5	27.8	9	2.7	10	0	10	0.03
Chipping Sparrow	<i>Spizella passerina</i>	5	27.8	9	2.7	9	0	9	0.03
Field Sparrow	<i>Spizella pusilla</i>	3	16.7	7	2.1	7	0	7	0.02
Song Sparrow	<i>Melospiza melodia</i>	3	16.7	3	0.9	3	0	3	0.01
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	2	11.1	5	1.5	4	3	7	0.01
Common Grackle	<i>Quiscalus quiscula</i>	10	55.6	49	14.6	37	76	113	0.11
Brown-headed Cowbird	<i>Molothrus ater</i>	11	61.1	34	10.1	33	6	39	0.10
Orchard Oriole	<i>Icterus spurius</i>	6	33.3	9	2.7	10	0	10	0.03
Baltimore Oriole	<i>Icterus galbula</i>	1	5.6	1	0.3	1	0	1	0.00
American Goldfinch	<i>Carduelis tristis</i>	15	83.3	67	20.0	56	42	98	0.17

Table 3. Confirmed breeding activity documented during the Foray.

Route	Species	Breeding Evidence
Blackwater 2	Wood Duck	juvenile (4)
Mattaponi 1	Northern Cardinal	nest with eggs
North Anna 2	American Crow	adult feeding fledged young
North Anna 2	Wood Duck	pair
Northwest 2	Blue Jay	juvenile (2)
Northwest 2	Carolina Chickadee	juvenile (6)
Rapidan 2	Mallard	juvenile (3)
Rappahannock 3	Wood Duck	juvenile (2)
Rappahannock 3	Cooper's Hawk	immature (1)
Rivanna 1	Canada Goose	juvenile (5)
Rivanna 1	Wood Duck	juvenile (>9)