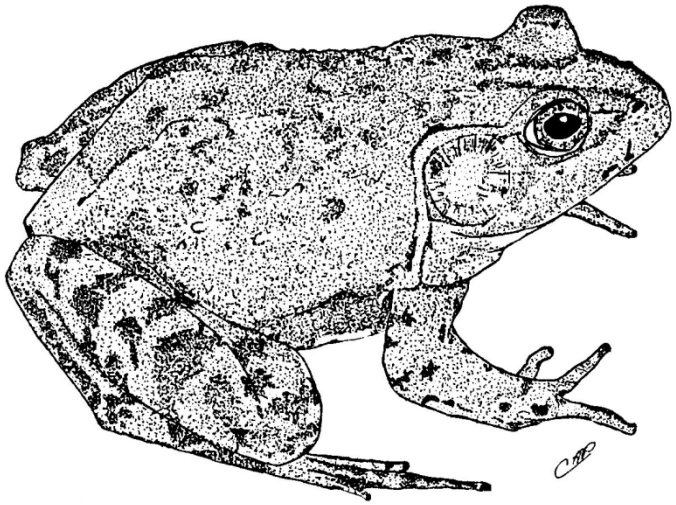
CATESBEIANA



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(Editorial policy continued on inside back cover)

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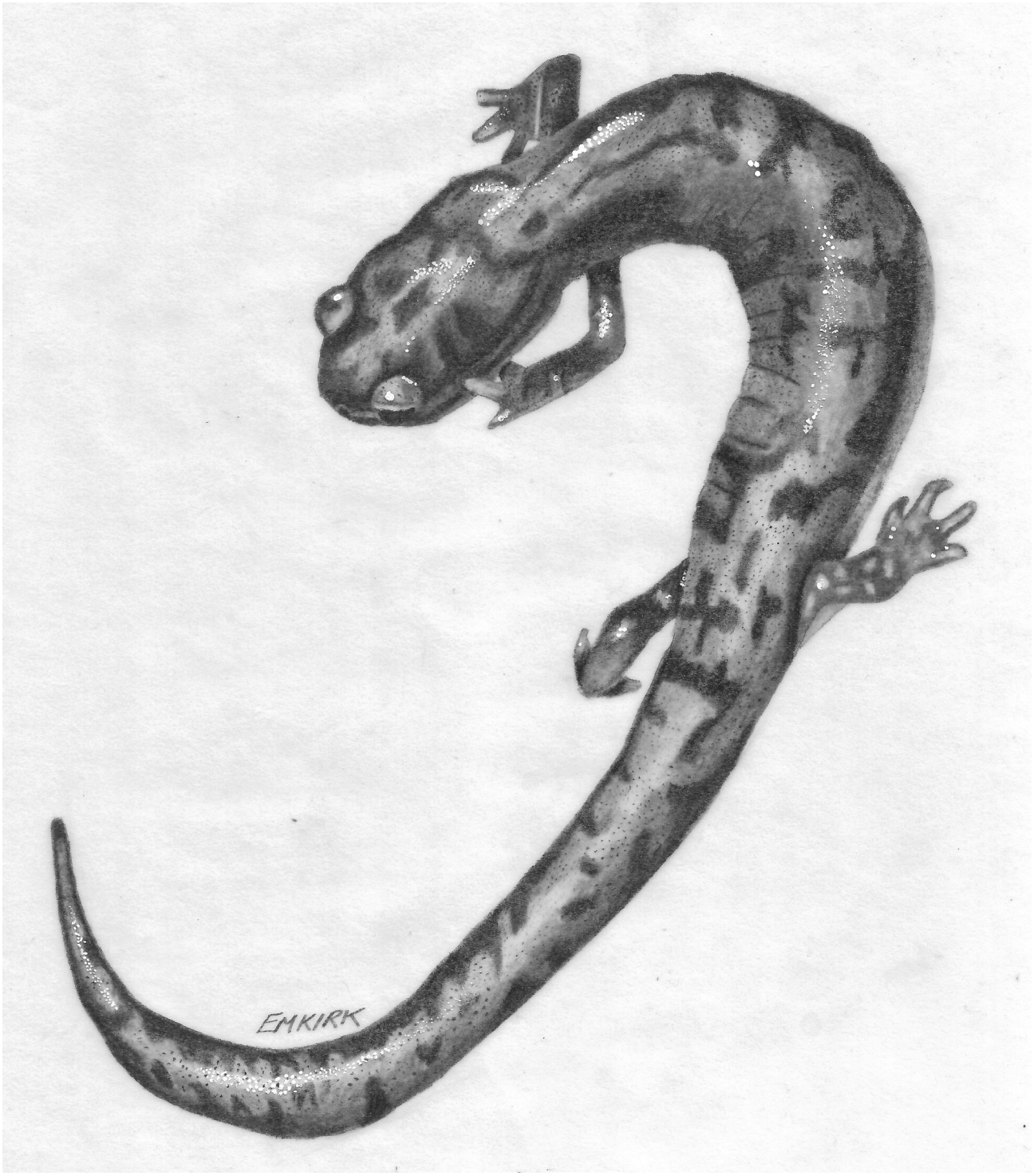

Plethodon welleri by Erin M. Kirk

Survey of Herpetofauna on the Campus of Hampden-Sydney College in Prince Edward County, Virginia

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Introduction

This report summarizes the findings of various formal and informal surveys for herpetofauna that were conducted during 2010 - 2014 on the property of Hampden-Sydney College in Prince Edward County in central Virginia. Hampden-Sydney College (H-SC) is a small, private, all-male liberal arts college that was founded in 1775, making it the tenth oldest institution of higher learning in the United States. Part of the campus has been designated a National Historic Preservation Zone, although none of the original buildings remain today. The campus includes 538 hectares, about 100 of which are actively used for buildings, trails, walkways, roads, parking lots, and lawns. The remainder of the property includes mixed pine and hardwood forests, with a few small, natural ephemeral ponds (not surveyed) and four small, man-made ponds (described below). The H-SC campus lies within the Piedmont physiographic province and the James River Watershed.

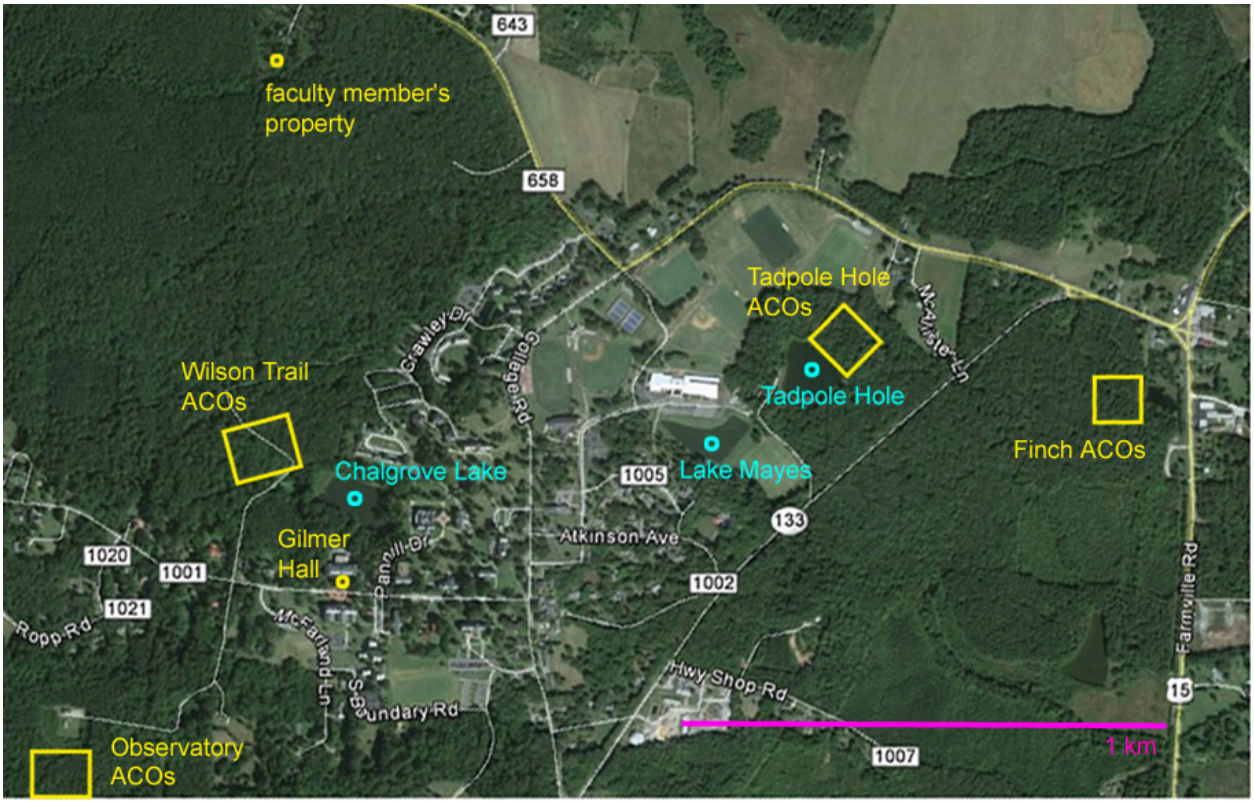
The primary investigator R. M. Goodman led students in H-SC courses and conducted research on local herpetofauna utilizing the campus property during 2010 - 2014. The current study summarizes the numbers and species identity of all reptiles and amphibians captured and sighted by Goodman and her students when species identity was confirmed by her or trained research assistants (including E.D. Carter) during this time period.

Methods

In March - April of 2010 and 2013, students in Goodman's Herpetology course at H-SC conducted sporadic sampling of three ponds (approx. 1 ha each) and the surrounding property on campus (Figure 1; Chalgrove "Lake", hereafter just Chalgrove: N 37° 14.5', W 78° 27.8'; "Lake" Mayes, hereafter just Mayes: N 37° 14.6', W 78° 27.3'; and Tadpole Hole hereafter just Tadpole: N 37° 14.7', W 78° 27.2'). These water bodies are man-made and bordered by manicured lawns, but with mixed pine and deciduous hardwood trees within 30 m. Approximately 10 visits total during afternoons (13:30 - 16:00) and nights (19:00 - 21:00) consisted of students mostly hand-capturing and occasionally dip netting amphibians and pole-noosing lizards. In September of 2011, students in Goodman's Ecology class (13:30-16:00) found individuals from two species in the woods bordering the Wilson Trail (N 37° 14.8'; W 78° 28.1'), and she confirmed the species identity of each. While herpetofaunal surveillance was not intended on that afternoon, these records are included in the current study because one species (*Opheodrys aestivus*) has not been sighted since then. Sex and size measurements of the aforementioned animals were not consistently obtained and recorded, nor were individuals

marked during these outings which were not herpetologically focused.

Figure 1. Survey and study sites visited on the Hampden-Sydney College campus during 2010 - 2014. Networks of artificial cover objects (ACOs) are shown as boxes, whereas all other location are shown as points. The three water bodies from which animals were sampled are labeled in blue. Sites are described, and GPS coordinates are given for each, within the text.



On 12 nights (20:00 - 22:00) during 01 April - 02 July of 2010, anurans were surveyed at Chalgrove and Tadpole as part of a surveillance study for two amphibian pathogens: the fungus *Batrachochytrium dendrobatidis* and viruses in the genus *Ranavirus* (Goodman & Ararso, 2012). Animals were hand captured, measured for mass (g) and snout-urostyle length (SUL, cm), and released at the site of capture within 24 hours. Toe clips were used to obtain tissue samples for disease testing and also to prevent collecting tissue samples from recaptured animals.

During 24 May - 1 July of 2010, turtles were trapped for a ranavirus surveillance study by Goodman et al. (2013). We trapped at each site twice for one week during this period, using four Promar collapsible crab/fish traps with dual-ring entrance, a Sundeck turtle trap with a bait tower (Item #840876, Heinsohn's Country Store), and a floating turtle tunnel (Item#840460, Heinsohn's Country Store). Traps were set 1 - 2 m from shore with chicken livers and checked twice daily for turtles. Upon removal from traps, individuals were weighed (g), measured for maximum carapace width (cm), plastron length (cm), and individually marked using scute notches. Turtles were returned to the point of trapping within 24 hours of capture.

During April - May of 2013 and 2014, a dedicated sampling network of artificial cover objects (ACOs) was constructed to survey herpetofauna in the woods bordering the campus. In 2013, 216 ACOs (0.6 m x 1.2 m) were distributed in four sites on the property of H-SC (Wilson Trail: N 37° 14.6'; W 78° 27.9'; Observatory: N 37° 14.3'; W 78° 28.2'; Tadpole: N 37° 14.7'; W 78° 27.2'; Finch House: N 37° 14.7'; W 78° 26.7'). Alternating plywood and roofing tins (27 each; 54 per site) were spaced 20 m apart in a grid covering 2 hectares per site. Each site bordered a water body, specifically streams at the Wilson Trail and Observatory sites and ponds at the Tadpole and Finch House sites. Leaf litter was removed from underneath the ACOs exposing bare soil, since rotting vegetation may deter some snakes (Parmalee & Fitch 1995). ACOs were left undisturbed for two or more weeks prior to initiation of sampling.

In 2013, herpetofauna were surveyed using ACOs and during travel to and between the four sites. In 2014, the ACOs were removed from the Tadpole and Finch House sites because of theft of tins at the former and lack of animal sightings at the latter. The weathered ACOs from those two sites were used to extend the grid of ACOs at the Wilson Trail and Observatory sites, so that each had 100 ACOs (50 plywood, 50 tin) spread over 3.5 hectares each in the 2014 season.

During 4 June - 17 July 2013 and 19 May - 8 July of 2014, each ACO site was surveyed two times per week, once between 8:00 - 11:00 and once during 16:00 - 19:00, with at least 48 hours between visits to a site. A few opportunistic site visits were conducted in the months between the two summer collections. During each visit, all ACOs were lifted and any reptiles underneath were hand-caught and stored individually until processing in the lab. Anurans were not captured or marked, but species identity was noted. During the summer survey sessions, the Wilson Trail hiking loop and an adjacent private property (N 37° 15.1'; W 78° 27.9') were traversed 1 - 2 times per week to visually scan the habitat for turtles, snakes, and lizards. Common Five-lined Skinks (*Plestiodon fasciatus*) were also collected opportunistically at two areas on campus (Gilmer Hall: N 37° 14.5'; W 78° 27.8'; Blake Dormitories: N 37° 14.4'; W 78° 27.8'). Lizards were pole-noosed and hand captured, and turtles and snakes were hand-captured. Animals were placed individually into sterilized containers for storage and transport. Back in the lab, each animal was identified to species, sexed when possible using external characteristics, and measured for mass (g) and snout-vent and tail lengths (SVL and TL, cm). Animals in target taxa for a separate study (lizards, snakes, and box turtles) were marked permanently for identification upon re-capture and to prevent repeat sampling of individuals for the other study. Eastern box turtles (*Terrapene carolina carolina*) were marked with scute notches, lizards were marked with toes clips, and snakes were marked with cautery of ventral scales with a medical cautery unit (as in Winne et al. 2006). All animals were released within 24 hours at their site of capture. All materials used to capture and transport animals were disinfected with a 1% Nolvasan solution. A Chi-square test was performed to determine whether the most abundant snake species demonstrated a preference between wood and tin ACOs. Other reptile species were found too infrequently under ACOs to yield sample size adequate for statistical analysis.

All sampling and collecting described herein was conducted with approval of the Hampden-Sydney College Animal Care and Use Committee. Animals were collected in 2010 under Virginia Department of Game and Inland Fisheries permit # 038354 and in 2013 - 2014 under permit # 044820.

Results

Formal and informal surveys and research during 2010 - 2014 yielded sightings and captures of four species of salamanders, six species of frogs, five species of turtles, eight species of snakes, and three species of lizards on the H-SC campus (Table 1). No reptiles or amphibians were found under ACOs at the Finch site in 2013; therefore, we did not continue sampling there in 2014.

White-Spotted Slimy Salamanders (*Plethodon cylindraceus*) were only found under ACOs at the Observatory site, with seven and one sightings in 2013 and 2014, respectively (note that individuals were not marked; Table 1). Only one Northern Red Salamander (*Pseudotriton ruber ruber*) was observed under an overturned log in the woods within 10 m of the Wilson Trail, during haphazardly sampling for a class field trips. Southern Two-Lined Salamanders (*Eurycea cirrigera)* were infrequently found under ACOs, once at the Wilson Trail survey site and once at the Observatory site. An eft, terrestrial adults, and aquatic adults of *Notophthalmus viridescens viridescens* (Red-spotted Newt) were found in Chalgrove and in the Wilson Trail ACOs and surrounding area, which is right next to Chalgrove. Only one terrestrial eft was observed at the Observatory site under an ACO. No salamanders were ever observed at Tadpole, either in the pond or at the adjacent ACO survey site.

Dedicated frog sampling at Chalgrove during April, May and June of 2010 resulted in several captures of *Acris crepitans*, *Anaxyrus fowleri*, and *Lithobates palustris* (eight Northern Cricket Frogs, 14 Fowler's Toads, and 19 Pickerel Frogs; body size measurements in Table 2). Frogs of these species were also found there in 2013, although none were marked or measured in this period (therefore we cannot report on numbers of individuals). Only three American Bullfrogs (*Lithobates catesbeianus*) and four Green Frogs (*Lithobates clamitans*) were captured, marked, and measured at Chalgrove in 2010. Both species were also found there in 2013.

Dedicated frog sampling at Tadpole during April, May and June of 2010 resulted in several captures of *A. crepitans*, *L. clamitans*, and *Pseudacris crucifer* (21 Northern Cricket Frogs, seven Green Frogs, and 15 Spring Peepers; body size measurements in Table 2). Frogs of these species were also found (though not marked or measured) in 2013. Only one American Bullfrog and two Pickerel Frogs were found at Tadpole in 2010. However, sightings of both species there and at nearby Mayes (approx. 100 m apart) in 2013 suggest that both species persisted in the area. Fowler's Toads were not detected at Tadpole in 2010, and therefore no body size measurements were made. However, this species was found here and at nearby Mayes in 2013 (Table 1).

Table 1. Amphibians (A) and reptiles (B) found during class visits, research projects, and surveys conducted by Rachel M. Goodman trained research assistants, and additional Hampden-Sydney College students during 2010 - 2014. The number of individuals found per species (N) is only a minimum based on haphazard sampling and observation techniques and does not represent a population estimate.

A. Amphibians

Latin name	Month(s)	Year(s)	Occurrence Site(s)	N
ANURANS				
	Apr - Jul	2010	Chalgrove, Tadpole	32
Acris crepitans	Apr	2013	Chalgrove, Tadpole, Wilson Trail	12
	Jun	2010	Chalgrove	15
Anaxyrus fowleri	May	2013	Chalgrove, Mayes, Tadpole	5
	Apr - Jul	2010	Chalgrove, Tadpole	4
Lithobates catesbeianus	Apr	2013	Chalgrove, Mayes, Tadpole	13
	Apr - Jul	2010	Chalgrove, Tadpole	11
Lithobates clamitans	Apr	2013	Chalgrove, Mayes, Tadpole	10
	Apr - Jul	2010	Chalgrove, Tadpole	21
Lithobates palustris	Apr	2013	Chalgrove, Mayes, Tadpole	22
Pseudacris crucifer	Apr	2010	Tadpole	15
	Apr	2013	Tadpole	4
SALAMANDERS				
Eurycea cirrigera	Jun	2013	Observatory (ACOs), Wilson Trail (ACOs)	2
	Apr	2010	Chalgrove (in pond)	1
Notophthalmus viridescens	Sep	2011	Wilson Trail (on land)	1
viridescens	Apr	2013	Chalgrove (in pond)	1
	Jun - Jul	2013	Wilson (ACOs)	3
	Jun	2014	Wilson (ACOs)	1
Pseudotriton ruber ruber	Apr	2013	Wilson Trail	1
	Jun - Jul	2013	Observatory (ACOs)	7
Plethodon cylindraceus	Jun - Jul	2014	Observatory (ACOs)	1

B. Reptiles

Species	Month(s)	Year(s)	Occurrence Site(s)	N
TURTLES				
Chelydra serpentina	May - Jun	2010	Chalgrove, Tadpole (trapped)	3
Chrysemys picta pica	Apr - Jun	2010	Chalgrove, Tadpole (trapped)	64
	Apr	2013	Chalgrove	5
Pseudemys c. concinna	Jun	2010	Chalgrove (trapped)	1
Sternotherus odoratus	May - Jun	2010	Chalgrove, Tadpole (trapped)	38
	Apr	2013	Chalgrove	1
Terrapene c. carolina	May - Jul	2013-2014	Observatory, Tadpole, Wilson Trail	37
SNAKES				
Agkistrodon contortrix mokasen	Jun - Jul	2013-2014	Observatory, Observatory (ACOs), Wilson Trail	5
Carphophis amoenus amoenus	Jun - Sep	2013	Wilson Trail (ACOs), Observatory (ACOs), Tadpole (ACOs)	9
	Feb - Jul	2014	Wilson Trail (ACOs), Observatory (ACOs)	26
Coluber constrictor constrictor	Jun	2014	Observatory (ACOs)	1
Diadophis punctatus	May - Sep	2013-2014	Wilson Trail (ACOs), Observatory (ACOs)	5
Nerodia sipedon sipedon	Apr - Sep	2013-2014	Chalgrove, Mayes, Wilson Trail	5
Opheodrys aestivus	Sep	2011	Wilson Trail	1
Pantherophis alleghaniensis	Jun - Jul	2013-2014	Wilson Trail, Chalgrove	3
Storeria dekayi dekayi	Jul	2013	Wilson Trail (ACOs)	1
Storeria occipitomaculata occipitomaculata	Jun - Jul	2013	Wilson Trail (ACOs)	2
LIZARDS				
Plestiodon fasciatus	Apr - Oct	2011-13	Gilmer Hall and Blake dormitories, Observatory	10
Sceloporus undulatus	Jun - Jul	2013	Tadpole, Wilson Trail, Observatory	36
Scincella lateralis	Jul	2013	Tadpole (ACOs)	5

Table 2. Numbers (N), mass, and snout-urostyle length (SUL) are shown for frogs captured in 2010 in and around two small ponds, Tadpole and Chalgrove, on the campus of Hampden-Sydney College in central Virginia.

			Mass (g)		SUL (cm)	
Species	**Site**	**N**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**
Acris crepitans	Chalgrove	8	1.1 (0.5)	0.4 - 2.2	2.0 (0.4)	1.0 - 2.3
	Tadpole	21	1.3 (0.5)	0.7 - 2.8	2.3 (0.1)	2.1 - 2.6
Anaxyrus fowleri	Chalgrove	14	18.7 (6.1)	5.3 - 25.8	4.9 (1.1)	2.2 - 5.8
Lithobates catesbeiana	Chalgrove	3	4.1 (0.9)	3.5 - 5.2	4.5 (1.2)	3.1 - 5.5
		1	3.1 (--)	--	3.0 (--)	--
Lithobates clamitans	Chalgrove	4	3.7 (2.7)	1.7 - 7.7	4.0 (1.8)	2.6 - 6.4
	Tadpole	7	3.0 (1.4)	1.2 - 5	5.7 (2.3)	2.2 - 7.6
Lithobates palustris	Chalgrove	19	2.2 (0.9)	0.5 - 3.0	1.7 (0.5)	0.7 - 2.6
	Tadpole	2	2.5 (--)	1.6 - 3.5	7.1 (--)	6.4 - 7.7
Pseudacris crucifer	Tadpole	15	1.6 (0.4)	1.2 - 2.5	2.7 (0.1)	2.4 - 3.0

Turtle trapping for two separate weeks at Tadpole in May - June of 2010 yielded 32 Eastern Painted turtles (*Chrysemys picta picta*), nine Eastern Musk Turtles (*Sternotherus odoratus*), and two Eastern Snapping Turtles (*Chelydra serpentina*; body size measurements in Table 3). Trapping for two different weeks in the same months at Chalgrove yielded 18 Eastern Painted turtles, 21 Eastern Musk Turtles, one Eastern Snapping Turtle and one Eastern River Cooter (*Psuedemys concinna*; body size measurements in Table 3).

In 2013, 25 snakes and lizards were found during 3,564 ACO checks (66 visits among the four sites, each containing 54 ACOs), yielding an encounter rate of 0.7% for reptiles. If we added 12 sightings of amphibians, which were non-target but noted, the rate for herpetofaunal detection in our ACO network increased to 1.0%. In 2014, the encounter rate for reptiles was 1.5% and that of reptiles plus amphibians was 1.6% (48 and 52 sightings, respectively, out of 3,300 ACO

Table 3. Numbers (N) and measurements of turtles trapped in 2010 are shown for females (F), males (M), individuals of undetermined sex (Und), and total of these categories combined (Tot). Turtles were trapped at two small ponds, Tadpole Hole and Chalgrove Lake, on the campus of Hampden-Sydney College in central Virginia.

				Mass (g)		Carapace Width (cm)		Carapace Length (cm)		Plastron Length (cm)	
Species	**Site**		**N**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**
Chelydra serpentina	Tadpole Hole		2	2070 (--)	1080.0 - 3060.0	17.4 (--)	14.7 - 20.0	20.9 (--)	17.3 - 24.4	14.9 (--)	12.1 - 17.6
			1	776.0 (--)	--	12.8 (--)	--	14.2 (--)	--	10.5 (--)	--
	Lake										
	Tadpole	F	9	398.0 (152.4)	129.5 - 710.0	10.7 (1.2)	9.9 - 12.0	14.1 (1.8)	9.8 - 16.2	13.0 (1.7)	9.3 - 15.2
Chrysemys	Hole	M	17	210.9 (80.6)	106.5 - 387.0	8.9 (1.0)	7.3 - 10.5	11.9 (1.7)	9.0 - 14.1	11.0 (1.5)	8.3 - 13.4
picta picta		Tot	32	256.7 (153.1)	28.0 - 710.0	9.1 (1.7)	5.2 - 12.0	12.1 (2.7)	5.5 - 16.2	11.2 (2.5)	5.1 - 15.2
		F	2	487.3 (--)	454.5 - 520.0	11.05 (--)	10.4 - 11.7	15.4 (--)	14.6 - 16.2	14.1 (--)	13.6 - 14.6
	Lake	M	4	146.7 (87.2)	67.3 - 244.3	7.8 (1.6)	6.4 - 9.4	10.4 (2.7)	7.8 - 12.8	9.4 (2.5)	7.0 - 11.6
		Tot	18	127.4 (145.8)	15.2 - 520.0	6.9 (2.0)	4.3 - 11.7	8.6 (3.5)	4.4 - 16.2	7.9 (3.2)	3.8 - 14.6
Sternotherus	Tadpole	F	4	132.4 (39.7)	91.6 - 185.0	6.7 (0.8)	5.8 - 7.6	9.3 (1.0)	8.3 -10.6	7.2 (0.9)	6.4 - 8.5
odoratus	Hole	M	5	135.0 (54.6)	72.7 - 196.1	6.42 (0.9)	5.5 - 7.7	9.7 (1.1)	8.2 - 10.7	7.0 (1.1)	5.8 - 8.1
		F	10	136.8 (37.6)	81.5 - 199.0	6.6 (0.5)	5.9 - 7.3	9.3 (1.0)	7.7 - 11.0	7.2 (0.7)	5.9 - 8.1
	Lake	M	11	137.7 (49.0)	65.9 - 238.4	6.7 (0.6)	5.5 - 7.7	9.5 (1.1)	7.9 - 11.2	7.1 (0.9)	5.7 - 8.5
Pseudemys concinna	Lake		1	169.6 (--)	--	8.9 (--)	--	9.7 (--)	--	9.4 (--)	--

checks). In 2014, only two sites were surveyed, Wilson and Observatory, with 100 ACOs in each. For comparison, the 2013 encounter rates for these two sites alone (33 visits, each site contained 54 ACOs) were 0.9% and for reptiles and 1.4% for reptiles plus amphibians (16 and 25 sightings, respectively, out of 1,782 ACO checks).

During the ACO survey conducted during 2013 - 2014, three species of salamanders were observed under ACOs but were not captured or measured (Table 1). Little Brown Skinks, *Scincella lateralis*, were also observed under ACOs (Table 1) but were not captured or marked because we were focused on sampling snakes for a separate study at that time. We observed Common Five-Lined Skinks (*Plestiodon fasciatus*) under a couple ACOs; however, we mostly saw and captured this species on sidewalks and stairs near building on campus during this time (body size measurements in Table 4). We hand-captured and noosed 36 Eastern Fence Lizards (*Sceloporus undulatus*) in 2013 at the Tadpole, Wilson Trail, and Observatory ACO sites (but they did not occur under ACOs), and also in additional wooded areas along the Wilson Trail (body size measurements in Table 4). Surveys of the Wilson Trail and Observatory ACO sites, plus additional areas around the Wilson Trail, resulted in captures of 37 Eastern Box Turtles (*Terrapene carolina carolina*) in 2013 - 2014 (body size measurements in Table 5).

Snakes were the focus of the 2013 - 2014 ACO surveys, which resulted in captures of individuals from eight out of the nine species documented on the H-SC campus (Tables 1 & 4). The most prevalent snake found under ACOs was *Carphophis amoenus amoenus* (Eastern Wormsnake), with 44 sightings including 37 individuals who were captured and marked during 2013 - 2014 at the Wilson, Observatory, and Tadpole sites (Table 4). Wormsnakes were found under tin ACOs in 14 instances and under plywood ACOs in 26 instances, after omitting repeat captures of an individual under the same ACO. We found a trend for more Wormsnakes under wood ACOs than tin; however, this difference was not statistically significant (Chi-square test: $X^2=3.6$, df = 1, p=0.058).

Only one Northern Black Racer (*Coluber constrictor constrictor*) was captured during all surveys, and it was under an ACO at the Observatory site in 2014, although this species was spotted in 2013 at the Wilson Trail site (Tables 1 & 4). Copperheads (*Agkistrodon contortrix mokasen*) were found in the Observatory site in both years (only once under an ACO) and in the Wilson Trail in 2013 (Tables 1 & 4). Only one Ring-necked Snake (*Diadophis punctatus*) was found under an Observatory ACO, and four Ring-necked Snakes were found under ACOs at the Wilson site (Tables 1 & 4). Northern Watersnakes (*Nerodia sipedon sipedon*) were never found under ACOs, but were found alongside water bodies that were associated with each site in both years (except the Finch site; Tables 1 & 4). Only one Northern Rough Greensnake (*Opheodrys aestivus*) was ever found, and it was caught by a student in 2011 from low-hanging vegetation in the woods near the Wilson Trail. Four Eastern Ratsnakes (*Pantherophis alleghaniensis*) were captured in the Wilson Trail area in 2013 and 2014, but were never sighted under ACOs. Two Northern Red-bellied Snakes (*Storeria occipitomaculata occipitomaculata*) and one Northern Brownsnake (*Storeria dekayi dekayi*) were found under ACOs in 2013 at the Wilson site.

Table 4. Lizards and snakes captured during 2013 - 2014 in sites containing artificial cover objects (ACOs) on the campus of Hampden-Sydney College in central Virginia. Mass, snout-vent length (SVL), and tail length (TL) are shown for adult females (F), males (M), individuals of undetermined sex/age (Undetermined) and juveniles, as noted.

			Mass (g)		SVL (cm)		TL (cm)	
Species	**Life stage / Sex**	**N**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**	**Mean (SD)**	**Min - Max**
FOUND UNDER ACOs								
Carphophis amoenus amoenus	Undetermined	36	6.0 (1.9)	2.4 - 10.4	20.3 (2.9)	13.5 - 25.9	4.0 (1.0)	2.6 - 8.0
Coluber constrictor constrictor	Undetermined	1	305.0 (--)	--	100.0 (--)	--	26.5 (--)	--
Diadophis punctatus	Undetermined	5	6.2 (1.9)	3.1 - 7.9	24.9 (5.0)	17.4 - 30.1	6.1 (1.0)	4.7 - 7.5
Storeria dekayi dekayi	Undetermined	1	4.8 (--)	--	20.6 (--)	--	6.0 (--)	--
Storeria occipitomaculata occipitomaculata	Undetermined	2	1.6 (--)	1.3 - 1.8	13.0 (--)	11.9 - 14.1	4.0 (--)	3.4 - 4.6
NOT FOUND UNDER ACOs								
Pantherophis alleghaniensis	Adult M/F	3	372.5 (124.6)	240.5 - 488.0	103.7 (9.0)	95.0 - 113.0	26.3 (4.1)	23.5 - 31.0
	Juvenile	1	26.0 (--)	--	45.6 (n/a)	--	9.8 (n/a)	--
Plestiodon fasciatus	Undetermined	11	5.1 (2.0)	3.1 - 9.0	5.6 (1.2)	2.8 - 7.3	8.5 (1.9)	4.8 - 10.5
Sceloporus undulatus	Adult F	22	13.0 (6.1)	3.1 - 20.4	6.7 (1.1)	4.3 - 8.1	8.4 (1.8)	2.8 - 10.6
	Adult M	14	9.3 (3.0)	4.4 - 12.9	6.3 (0.7)	4.7 - 6.9	7.4 (1.9)	4.0 - 10.1

Table 5. Numbers (N) and measurements of Eastern Box Turtles (*Terrapene carolina carolina*) for females (F) and males (M) captured during 2013 - 2014 on the campus of Hampden-Sydney College in central Virginia.

		Mass (g)		Carapace Width (cm)		Carapace Length (cm)		Plastron Length (cm)	
Sex	**N**	**Ave (SD)**	**Min - Max**	**Ave (SD)**	**Min - Max**	**Ave (SD)**	**Min - Max**	**Ave (SD)**	**Min - Max**
F	12	330.1 (102.2)	135.0 - 477.0	9.3 (0.8)	7.7 - 10.6	11.5 (1.1)	9.3 - 13.0	10.6 (1.2)	8.3 - 12.5
M	25	381.0 (64.2)	249.1 - 499.0	10.2 (0.6)	8.8 - 11.2	12.6 (0.8)	11.0 - 14.2	11.7 (0.8)	10.3 - 13.1

Discussion

This first report on the herpetofauna of Hampden-Sydney College suggests that at least 10 species of amphibians and 16 species of reptiles occur on campus. Salamanders were not the focus of any research project during 2010 - 2014, and therefore were probably the most under-sampled group of herpetofauna in this study. We did not find any salamanders at the Tadpole pond or ACO site; however, this area was only part of the ACO survey in 2013, after which sampling was discontinued.

Among salamanders that have been recorded in Prince Edward County, we did not find *Ambystoma maculatum* (Spotted Salamanders), *Ambystoma opacum* (Marbled Salamanders), *Desmognathus fuscus* (Northern Dusky Salamanders), *Eurycea guttolineata* (Three-lined Salamanders), or *Plethodon cinereus* (Eastern Red-backed Salamanders). *Pseudotriton montanus montanus* (Eastern Mud Salamanders) and *Hemidactylium scutatum* (Four-toed Salamanders) are thought to possibly occur in Prince Edward County based on their range in Virginia; however, we did not detect these species at H-SC. The aforementioned species absences may represent true absences or reflect a lack of dedicated sampling for salamanders. Future herpetofaunal surveys should include dip-netting and turning over rocks in streams and ponds on campus, and turning over rocks and logs in the wooded areas on campus, particularly during wet and warm periods. Also, attempts should be made to find ephemeral water bodies used for breeding by *Ambystoma* species.

Using formal and informal survey data, we found populations of *A. crepitans*, *A. fowleri*, and *L. palustris* at Chalgrove. Despite the capture of few individuals of *L. catesbeianus* and *L. clamitans* in 2010, sightings of both species there again in 2013 suggest that both persisted in the area. At Tadpole, we found populations of *A. crepitans*, *L. clamitans*, and *P. crucifer*. Spring Peepers (*P. crucifer*) were mostly found perched in shrubs and low vegetation in the semi-flooded woodland surrounding and connected to the pond Tadpole. In contrast, Chalgrove is a pond with distinct borders, steeper banks at the edges that abut woodlands, and heavily manicured lawns at the edges with less sloping banks. This difference in habitat probably explains the lack of Spring Peepers at Chalgrove. Few individuals of *L. catesbeianus* and *L. palustris* were found at Tadpole in 2010. However, sightings of both species there and at nearby Mayes (approx. 100 m apart) in 2013 suggest that both species persisted in the area. While no *A. fowleri* (Fowler's Toads) were captured at Tadpole in 2010, this was probably because sampling was outside the mating season. Fowler's toads were sighted in 2013 at both Tadpole and Mayes, suggesting a resident population. Body sizes of all anurans captured in this study were within the normal range reported for each species, and did not approach the maximum thereof, as reported by Powell et al. (2016).

While recorded or thought to occur in Prince Edward County, we did not see or hear any *Anaxyrus americanus americanus* (Eastern American Toads) or *Lithobates sphenocephalus* (Southern Leopard Frogs), which would be active and calling at ponds similar to the ones surveyed. We did not capture any *Hyla* species, *Pseudacris feriarum* (Upland Chorus Frogs), *Lithobates sylvaticus* (Wood Frogs), *Gastrophryne carolinensis* (Eastern Narrow-mouthed Toads), or *Scaphiopus holbrookii* (Eastern Spadefoots), despite their reported or suspected occurrence in the county. These species could be present on campus, but not yet detected due

to a lack of strategic sampling methods or time periods (e.g. earlier in year for Wood Frogs and Upland Chorus Frogs).

We found all five species of turtles that have been previously reported in Prince Edward County on the H-SC campus, although only one Eastern River Cooter (*Pseudemys concinna concinna*) was ever captured or seen. This species is more typically found in larger bodies of water with moving currents, although it can also be found in large ponds and lakes (Ernst & Lovich 2009). We wonder if the one small River Cooter at Chalgrove represented a translocation event or a natural occurrence of *P. c. concinna.* Although not found elsewhere on campus, one individual was captured in an equivalent trapping effort during the same months at nearby Briery Creek Reservoir (approx. 4.5 km from H-SC water bodies; Goodman, pers. obs., Goodman et al. 2013). Trapping efforts during 2010 yielded several captures of *Chrysemys picta picta* and *Sternotherus odoratus* at both Chalgrove and Tadpole, indicating resident populations of both species on campus. Many Eastern Box Turtles (*T. c. carolina*) were found on land in the Wilson Trail and Observatory ACO sites, plus additional areas around the Wilson Trail in 2013 - 2014. Box Turtles have been documented to readily enter and spend time in streams and ponds during the summer (Stickelle 1950; Donaldson & Echternacht 2005). However, we never saw any *T. c. carolina* in the water or in aquatic traps at either site, or at nearby Briery Creek Reservoir (Goodman, pers. obs., Goodman et al. 2013).

The three *C. serpentina* we captured were much smaller than the maximum sizes reported by Mitchell (1994) for this species (0.7 – 3.1 kg vs. max 16.0 kg; CL of 14.2 – 24.4 cm vs. max 41.5 cm). We suspect that our traps and methods were more suited to catching smaller turtles, so we may not have captured larger *C. serpentina* if they occur in our sites. The body sizes of the 50 *C. picta picta* measured in our study were mostly within ranges provided by Mitchell (1994); however, one female at Tadpole was larger in mass (710 g vs. max 600 g) though not in CL (16.2 cm vs. max 17.9 cm). Sizes of 30 *S. odoratus* and the one *P. concinna* found at our sites were within the reported range for these species (Mitchell 1994).

Sceloporus undulatus was the only lizard we focused on during research projects in 2010 – 2014 (captured for a ranavirus surveillance study). This species occurred at several sites across the H-SC campus. Common Five-Lined Skinks (*P. fasciatus*) were mostly concentrated, or are most obvious around, the academic buildings and dorms on campus. Little Brown Skinks (*S. lateralis*) were only detected at the Tadpole ACO site and not at other ACO sites despite comparable sampling efforts. Future surveys could investigate whether they are more widespread on the campus. While we recorded three species of lizard at H-SC, we did not find any Eastern Six-lined Racerunners (*Aspidoscelis sexlineata sexlineata*) or Broad-headed Skinks (*Plestiodon laticeps*), which may possibly occur in Prince Edward County, or Southeastern Five-lined Skinks (*Plestiodon inexpectatus*), for which there is one record in the county. We did check ventral scales on *Plestiodon fasciatus* to confirm the species identity on our campus, since these skinks otherwise appear identical to *P. inexpectatus*. Body sizes of all *P. fasciatus* and *S. undulatus* in our sites were within the normal ranges reported by Mitchell (1994) for these species.

In 2013, our encounter rate was 0.7% reptiles per ACO check and 1.0% for reptiles plus amphibians. In 2014, encounter rates were 1.5% and 1.6%, respectively. We found slightly more snakes and lizards in our second year, which may have been due to animals settling into older ACOs, our removal of ACOs from the Finch site where no animals were captured in 2013, or environmental differences between years. Our encounter rates are hard to compare to other studies, because type of cover objects and habitats as well as species inhabiting study sites differ, and some studies fail to report the number of total encounters or survey effort in number of ACO checks.

Bolen (2003) captured only one snake (*Thamnophis sirtalis*) in 2,440 checks (encounter rate of 0.04%) of 72 cover objects in an old-field grassland habitat in Wisconsin. However, Joppa et al. (2009) had a 14.1% encounter rate with 1,279 snakes (*Thamnophis sirtalis* and *Thamnophis butleri*) captured during 9,058 ACO checks of 753 plywood ACOs in 18 upland habitat sites adjacent to different wetlands in southeastern Wisconsin. Kjoss and Litvaitis (2001) used black plastic sheets (1.5 m x 3 m) staked to the ground and had a high capture rate of 29.5%, with 332 snakes caught from under 187 cover sheets during 1,122 checks (*T. sirtalis, S. dekayi*, *S. occipitomaculata* and *Lampropeltis triangulum*). Habitat in that study consisted of forests and edges of idle agricultural land and industrial sites dominated by grasses and forbs in New Hampshire. Patrick and Gibbs (2009) had an encounter rate of 39% in three old field sites in Cicero Swamp Wildlife Management Area in New York. They sighted snakes 1,400 times (*T. sirtalis*, *S. d. dekayi*, *L. t. triangulum*, and *N. s. sipedon*) during 3,588 checks of 136 metal road signs used as ACOs (0.7 m x 0.7 m). Tietje and Vreeland (1997) had capture rates of 7.9% with 2,658 encounters (11 species of reptiles, mostly *Pituophis melanoleucus* and *Eumeces skiltonianus*) during 33,728 checks of plywood ACOs in a California oak woodland. Reilly and colleagues (2011) used only nine plywood ACOs (2.4 m x 1.2 m) in the dry interior of southwestern Oregon and had an encounter rate of (1.5%). They captured one individual each of *Charina bottae*, *Thamnophis elegans*, and an unnamed species of skink during 261 cover checks. In an extensive survey that covered multiple habitat types within the Savanna River Site in South Carolina and included 444 site visits over three years, Grant and colleagues (1992) had an encounter rate of 5.6%. They found 2,878 reptiles and amphibians of 31 species during 51,006 ACO checks. Hampton (2007) had a 6.9% detection rate for 22 species of reptiles and amphibians using 48 tin and plywood ACOs checked 4,992 times over three years in a bottomland hardwood forest in eastern Texas. Engelstoft and Ovaska (2000) had an encounter rate of 38.4% using 85 ACOs (plywood, black asphalt roofing, and corrugated tin roofing) checked 5,565 times in sites in the Gulf Islands in British Columbia. Sightings included 4 species of snakes (*Thamnophis ordinoides*, *T. elegans*, *T. sirtalis*, and *Contia tenuis*) in forest edges and openings in stands surrounded by residential developments, gardens, and hay fields.

Encounter rates of 0.7 - 1.5% for ACOs in our study site fall within the range of values reported in similar studies, but they indicate that we need a large number of ACOs and site visits to produce a reliable sample of our local herpetofauna. Still, ACOs offer significant advantages over other surveys methods, including high efficacy for detecting many species and minimal rate of injury for target and non-target species (Fitch 1992; Grant et al. 1992).

Nine species of snakes were observed or captured on the H-SC campus, with Eastern Wormsnakes (*C. a. amoenus*) occurring most commonly and at all ACO sites except Finch.

This species was the only one for which a sufficient sample size existed to test ACO preference. *Carphophis a. amoenus* appeared to prefer wood over tin ACOs in this study, but further sampling is needed to confirm this relationship. *Agkistrodon c. mokasen*, *N. s. sipedon*, *P. alleghaniensis* and *D. p. edwardsii* were fairly common on campus, with most individuals found in the Chalgrove and Wilson Trail area. Species that were present but uncommon on campus, or less able to be detected with our survey methods, included: *C. c. constrictor*, *O. aestivus*, *S. o. occipitomaculata* and *S. d. dekayi*. The one sighting of *S. d. dekayi* (Northern Brown Snake) represented a county record for Prince Edward County (Carter & Goodman 2014). All individuals that we captured of *C. amoenus amoenus*, *D. punctatus*, *S. occipitomaculata occipitomaculata*, *P. alleghaniensis*, *C. constrictor constrictor* and *S. dekayi dekayi* were within the size limits that Mitchell (1994) described for each species.

Snakes not found in this study, but previously recorded for Prince Edward County include: Northern Scarletsnakes (*Cemophora coccinea copei*), Eastern hog-nosed Snakes (*Heterodon platirhinos*), Mole Kingsnakes (*Lampropeltis calligaster rhombomaculata*), Eastern Kingsnakes (*Lampropeltis getula*), Queensnakes (*Regina septemvittata*), Common Ribbonsnakes (*Thamnophis sauritus sauritus*), and Eastern Gartersnakes (*T. s. sirtalis*). Snakes not found, but thought to occur in the county based on geographic range include: Eastern Milksnakes (*Lampropeltis triangulum triangulum*), Red Cornsnakes (*Pantherophis guttatus*), and Eastern Smooth Earthsnakes (*Virginia valeriae valeriae*). While some of these species may be absent from the H-SC campus, many are rarely detected in surveys where they do occur and therefore might be detected in our site with sampling of additional habitats and with different survey methods. Future surveys of the H-SC campus for reptiles and amphibians should concentrate on areas less visited by humans, investigation of possible cover objects throughout campus including wood, stones, and discarded or abandoned construction materials, and streams and ephemeral wetlands that were not surveyed in this study.

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Eleventh Annual HerpBlitz: Survey of Reptiles and Amphibians at Stewarts Creek Wildlife Managment Area, Carroll County, Virginia

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Introduction

Stewarts Creek Wildlife Management Area (SCWMA) is located just off the Blue Ridge Parkway in Carroll County, Virginia, about 11 km (7 mi) southeast of Galax. Carroll County lies within the southern end of the Blue Ridge Physiographic Province. It consists of steep sided valleys with mountain streams at the bottom, the hillsides often covered by Rhododendron thickets. Most of the WMA (99%) is forested, with Tulip Poplar (*Liriodendron tulipifera*) and Yellow Birch (*Betula alleghaniensis*) at the lower elevations and Oak (*Quercus rubra* and *Q. alba*) and various species of Hickory (*Carya*) at higher elevations. The elevation ranges from 480m (1580 ft) at the lower parking lot to 910m (2995 ft) near the upper lot close to the Blue Ridge Parkway.

The WMA was purchased in 1988 and is named for the North and South Forks of Stewarts Creek which traverse and merge within it. There are 7.7 km (4.8 mi) of streams which provide one of the main attractions, native Brook Trout fishing. The streams begin in the higher elevations in the mountains and flow through the WMA carving deep pools and numerous cascades containing large populations of "Brookies". This species, and the more recently documented Federally threatened Northern Long-eared Bat are the current focus of management efforts.

Stewarts Creek Wildlife Management Area consists of 440 ha (1087 acres) in the mountains of southwestern Virginia where many rare and endemic salamanders occur. The management plan for SCWMA states that little is known of the game or nongame fauna, surveys not having been performed; and called for volunteer groups to be recruited for the first basic surveys (Bassinger et al., 2016). The plan listed 13 tiered species likely to occur in Carroll County, which included three herps (the Hellbender, Bog Turtle and Timber Rattlesnake) with only the Timber Rattlesnake actually documented. None of the high-elevation endemic salamanders are included in that list. Since the WMA has not previously had a survey of amphibians and reptiles, the information gained could prove useful to the management of the WMA for these tiered species if they can be documented.

Stewarts Creek Wildlife Management Area was also selected for its special location in Virginia. Biogeographapically, the site is interesting because it is part of the Yadkin - Pee Dee River watershed. The Stewarts Creek watershed carries water all the way to South Carolina. Over the eons of time, this watershed basin could have been used as a corridor for the contraction and expansion of species' ranges as the temperature of this region cooled and warmed. The HerpBlitz

committee thought this area might contain relict communities or perhaps some faunal surprises, being this is the only location in Virginia included within this drainage system. This report documents the eleventh annual HerpBlitz survey held on 28-29 May 2016 at Stewarts Creek Wildlife Management Area.

Study Sites

Upper Access:

This area consisted of upland hardwood forest with rolling hills and sometimes steep ravines. Dominant trees included White Oak, Rhododendron, White Pine, Cucumber Magnolia, Tulip Poplar, Black Locust, Chestnut Oak, Eastern Hemlock and Red Maple. The understory included Ferns, Greenbrier, May Apple and Wild Rose.

Site 1. (N 36˚35' 43.6"; W 80˚48' 11.4") In a tributary to the South Fork of Stewarts Creek, and the floodplain on either side of the creek. There was hardwood forest throughout the area, including some Rhododendron thickets.

Site 2. (N 36˚35' 31.2", W 80˚48' 14.5") In the South Fork of Stewarts Creek and the shore on both sides. Rhododendron lined both banks, with some Ferns.

Site 3. (N 36˚35' 49.8", W 80˚47' 46.9") Upland mixed hardwood and pine forest to the east of the upper access parking lot. Extensive tracts of White Pine with patches of Rhododendron interspersed. Some tracks of hardwoods were included.

Site 4. (N 36˚30' 0.07", W 80˚48' 24.81") A ravine to the north of the upper access parking area. Hardwood forest with a Fern and Greenbrier understory. A Rhododendron thicket lined the east slope. There was a small tributary to the North Fork of Stewarts Creek at the bottom end of the ravine.

Lower Access:

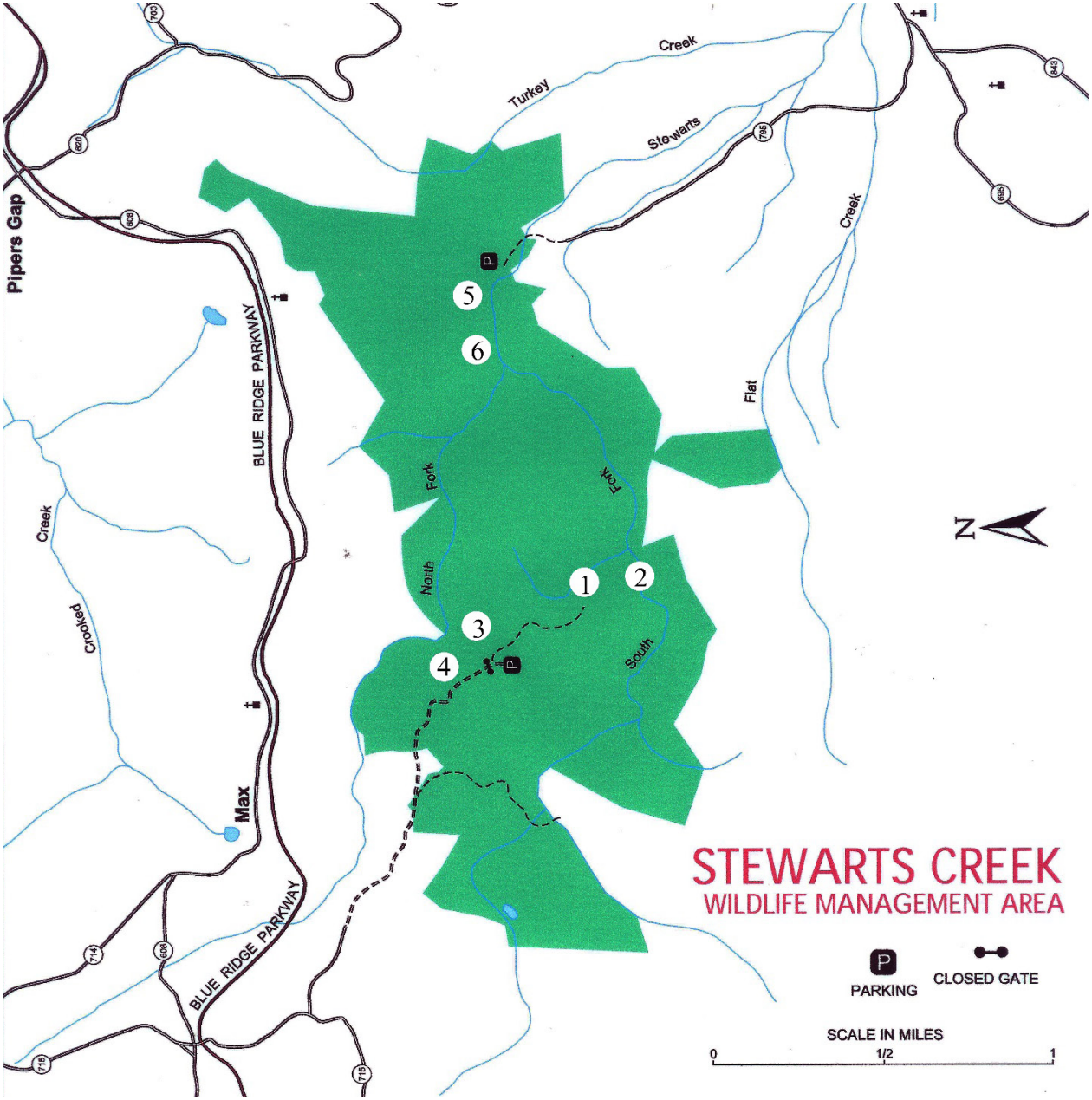
This area included the floodplain of Stewarts Creek. The dominant tree is mostly Tulip Poplar with some Red Oak, Hickory, American Sycamore, White Pine, and several dead Eastern Hemlocks. A small Rhododendron thicket occurred on one slope. The understory consisted of extensive patches of Stinging Nettle, some Eastern Redbud, Raspberry, Wild Rose, Virginia Creeper, and Spicebush.

Site 5. (36˚35' 50.4", W 80˚46 53.11) A small unnamed tributary to Stewarts Creek, including some terrestrial areas in the floodplain of the stream. The stream bed consisted of rock and some gravel.

Site 6. (36˚35' 53.4", 80˚47' 04.96") A smaller unnamed tributary to Stewarts creek, including the floodplain of the stream. The stream bed again consisted of mostly rock with some sand and gravel.

Site 7. Road running in Carroll County, south of US 58 and north of the Blue Ridge Parkway; primarily along Co. Rt. 712 west of Co. Rt. 620 and east of Co. Rt. 713.

Figure 1. Map showing survey sites



Materials and Methods

Upon arriving in the morning, all participants were put through the VHS disinfection protocol. All boots and equipment were dipped in a bleach solution. After disinfection, participants were briefed on safety precautions and on proper methods of rolling logs and rocks and replacing them. Volunteers for this survey utilized a wide variety of collecting methods including flipping logs and rocks, hand capture, visual observation, dipnetting, and listening for calling anurans. For two nights some survey members cruised roads in the county looking for live and road killed animals and listening for calling anurans. Each animal collected was inspected for abnormalities such as parasites, disease, injuries, or malformations. All animals were immediately released at the site of capture. Digital photos and digital audio recordings were collected to voucher any county records or any abnormalities. The group leader recorded all observations on standard VHS data collecting forms. These forms and relevant digital photos have been placed in the VHS physical and digital archives. See Table 1 for the amount of survey effort given to each collecting site.

Table 1. Collecting effort per site at the VHS Stewart's Creek Wildlife Management Area Survey, 28-29 May 2016

Site	1	2	3	4	5	6	7
Number of surveyors	9	9	9	9	4	4	3
Hours surveyed	1.0	0.75	1.25	0.5	1.75	0.75	2
Person hours of survey effort	9.0	6.75	11.25	4.5	3.0	1.5	6

Results

A total of 16 species were found during the weekend survey. Of these there were 13 amphibian species (four anurans and nine salamanders) and three reptile species (one turtle and two snakes). All combined 114 animals were collected from the seven sites investigated. Two county records, *Anaxyrus a. americanus* and *Pseudacris crucifer* were found during the survey. Voucher digital photos and audio recordings have been submitted to the VHS digital archives (#417, 418). Table 2 summarizes the species, number of animals observed, and totals found at each survey site.

Table 2. List of individuals found at each site, with totals, from Stewarts Creek Wildlife Management Area 28-29 May 2016. C=Calling Males.

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Total
Reptiles								
Snakes								
Diadophis punctatus edwardsii	3		1				2	6
Thamnophis s. sirtalis	2		1					3
Turtles								
Terrapene c. carolina							1	1

Anurans								
Anaxyrus a. americanus	1						1	2
Anaxyrus fowleri							1	1
Lithobates palustris	1				1			2
Pseudacris crucifer							2C	2
Salamanders								
Desmognathus fuscus	2	2						4
Desmognathus orestes	2							2
Desmognathus monticola	6	4		6	12	7		35
Desmognathus quadramaculatus		7			4	1		12
Eurycea wilderae	3	1						4
Gyrinophilus porphyriticus		2						2
Notophthalmus v. viridescens	1			1	2			4
Plethodon cylindraceous	11		3	10		1		25
Plethodon yonahlossee	7		2					9
Totals	39	16	7	17	19	9	4	114

Annotated Checklist

Amphibians:

1. *Anaxyrus a. americanus* (American Toad): Found in sites 1 and 7.
One American Toad was found road cruising on the evening of 27 May. It was on Co. Rt. 620 east of Co. Rt. 712 and west of Co. Rt. 915. Another was found under a rock beside the trail at the Upper Access parking area on 28 May (VHS Archive #418).

2. *Anaxyrus fowleri* (Fowler's Toad): Found in site 7.
One Fowler's Toad was found road cruising on the evening of 27 May, north of the WMA.

3. *Lithobates palustris* (Pickerel Frog): Found in sites 1 and 5.
One Pickerel Frog was found in tall grass by the Upper Access parking area. A juvenile was found under a rock in a small tributary of Stewarts Creek.

4. *Pseudacris crucifer* (Spring Peeper): Found at site 7.
Spring Peepers were heard calling at a variety of sites when road cruising on the evenings of 28 and 29 May. Choruses ranged from a single individual to up to a half dozen males calling. Since there were no previous vouchers in Carroll County for this species (Mitchell and Reay, 1999; FWIS Database), a digital sound recording was made and deposited in the VHS Archive (#417) to verify the occurrence in the county. GPS coordinates for the site at which calls were recorded is N 36˚40' 27.0", W 80˚49' 25.1", on Co. Rt. 712 0.8 km SE of the intersection with Co. Rt. 713.

5. *Desmognathus fuscus* (Northern Dusky Salamander): Found at sites 1 and 2.
Northern Dusky Salamanders were found under rocks in the small streams at sites 1 and 2, and under a log about 1m from the stream at site 1. On 12 March 2016 during a planning trip to the property we observed two dusky salamanders fighting. One salamander was biting the head of a second salamander. We filmed this fighting bout for over a minute until the dominant salamander released the subordinate.

6. *Desmognathus monticola* (Seal Salamander): Found at sites 1, 2, 4, 5, and 6.
Most Seal Salamanders were found under rocks at the margin of streams at these sites. One was found under the bark of a dead tree in the trail 10 m from the stream at site 1, and another at site 1 was found under a log about 20 m from the stream. One at site 6 was found under leaf litter at the mouth of a small stream.

7. *Desmognathus orestes* (Blue Ridge Dusky Salamander): Found at site 1.
Both of the Blue Ridge Dusky Salamanders at site 1 were found under logs, one about a meter from a very small stream, and the other about 20 m from a larger stream.

8. *Desmognathus quadramaculatus* (Black-bellied Salamander): Found at sites 2, 5, and 6.
Black-bellied Salamanders were found under rocks along the larger streams at these sites.

9. *Eurycea wilderae* (Blue Ridge Two-lined Salamander): Found at sites 1 and 2.
Blue Ridge Two-lined Salamanders were found under logs in the floodplains at sites 1 and 2. They were all small adults, less than a year old.

10. *Gyronophilus porphyriticus* (Northern Spring Salamander): Found at site 2.
The one Northern Spring Salamander found in the WMA was under a rock in a relatively dry undercut protected above by a large rock protruding over the undercut area.

11. *Notophthalamus v. viridescens* (Red-spotted Newt): Found at sites 1, 4, and 5.
All of the Red-spotted Newts found were in the red eft stage. These newts were found mostly under logs in the floodplains at these sites. One from site 5 was out walking on the forest floor on 29 May, a relatively overcast and rainy morning.

12. *Plethodon cylindraceous* (White-spotted Slimy Salamander): Found at sites 1, 3, 4, and 6.
All of the White-spotted Slimy Salamanders were found under logs in the forests at these sites. At least one at site 6 was found under a log where the forest floor litter was composed of pine needles.

13. *Plethodon yonahlossee* (Yonahlossee Salamander): Found at sites 1 and 3.
All of the Yonahlossee Salamanders were found under logs, close to *Rhododendron maximum* thickets. The elevation at site 1 was 2630' and for site 3 was 2835'. At site 1 there were 3 adults and 4 juveniles, indicated this was a good, reproducing population.

Reptiles

14. *Terrapene c. carolina* (Woodland Box Turtle): Found at site 7
A road killed Woodland Box Turtle was observed on County Route 696 on the bridge over Stewarts Creek just west of Lambsburg on 27 May while visiting the Lower Access to the WMA prior to the survey.

15. *Diadophis punctatus edwardsii* (Northern Ring-necked Snake): Found at sites 1, 3, and 7. The Northern Ring-necked Snakes found were usually under bark of dead trees. However, the one at site 3 was a juvenile crossing the trail. The two found road cruising at night were both lying still on the side of the road. One of these vibrated its body when handled, much like a larger snake will sometimes vibrate its tail when cornered or handled. All but one had a full neck band and plain yellow venter, typical of the northern subspecies.. One had small dots down the middle of the belly, more typical of the intergrades between the two subspecies.

16. *Thamnophis s. sirtalis* (Eastern Gartersnake): Found at sites 1 and 3.
The two Eastern Gartersnakes found at site 1 were found under rocks. The one at site 3 was coiled up and basking by the side of the trail.

Discussion

The Stewarts Creek Herpblitz documented 16 species of reptiles and amphibians with a total of 114 animals hand captured or observed. This is over half the number of species (31) reported by the VHS Herp Database for Carroll County. Of these species *Anaxyrus a. americanus* and *Pseudacris crucifer* were new county records and three salamander species had Wildlife Action Plan ratings. The species with Wildlife Action Plan ratings include *Desmognathus orestes* (tier IV), *Eurycea wilderae* (tier III), and *Plethodon yonahlossee* (tier IV). Finding *Plethodon yonahlossee* represents a new site not reported by Hoffman (1992) or Ogle (1977). Nine of the 16 species (56%) were salamanders which is not unexpected for a mountainous area in this region. Not one lizard species was collected during the survey and reptiles in general were poorly represented on this property. Anurans were also underrepresented in our survey, but proper habitat for this group is not in abundance at the sites we surveyed.

Our one and a half day survey only sampled a few locations at Stewarts Creek WMA. Future surveys should cover more area and habitat types. As the WMA is developed more fully in the future, greater access to the waterways is one goal of the management plan. This will facilitate future wildlife surveys. Surveying at other times of the year may also yield more species and animals. One location which future survey parties may explore is a pond on the western edge of the property. This site might increase the number of known turtles and anurans. There are many species that may still be found on this property. *Chelydra serpentina* and *Glyptemys muhlenbergii* are turtles already reported for the county. *Chrysemys p. picta*, *Kinosternon s. subrubrum*, and *Sternotherus odoratus* are turtles found in surrounding counties. With more surveying and use of turtle traps in the pond on the western edge of the property, some of these turtles may be found. Anurans which might be added to this site's list include *Hyla chrysoscelis*, *Hyla versicolor*, *Lithobates catesbeianus*, *Lithobates clamitans*, *Lithobates palustris*, *Lithobates sylvaticus*, *Pseudacris brachyphona*, and *Pseudacris feriarum*. With no lizard species being found, this taxon's species list has the greatest potential for being increased. *Plestiodon a. anthracinus*' distribution is still being elucidated, but this species is associated with the Blue Ridge and therefore may be found on this property. Additionally, *Plestiodon fasciatus* and *Scleoporus undulatus* have statewide distributions and *Plestidon laticeps* is found in the adjoining county to the east. *Scincella lateralis* has an austral distribution, so one would think it might be associated with the Yadkin-Pee Dee drainage and likely to be found at this site. Snakes having statewide distributions including *Agkistrodon c. mokasen*, *Carphophis a. amoenus*, *Coluber c. constrictor*, *Heterodon platirhinos*, *Lampropeltis t. triangulum*, *Nerodia s. sipedon*, *Opheodrys aestivus*, and *Pantherophis alleghaniensis* would be highly likely to be found on this site. *Regina septemvittata* having a western distribution and *Crotalus horridus* being found

in the mountains are also possible future finds. It would not be surprising to also find *Storeria sp*. We did not find the proper habitat for *Ambystoma sp*. salamanders or *Hemidactylium scutatum* but these would be possible for the area if the proper habitat was found on the property. *Plethodon cinereus*, *Plethodon wehrlei*, and *Pseudotriton r. nitidus* are salamanders which should also be sought on the property. The large, clean streams on the property would provide excellent habitat for *Cryptobranchus a. alleganiensis*. It is unlikely that this species resides on the property since the drainage travels south and away from the watershed where Hellbenders are currently found. eDNA sampling is warranted to at least rule out the possibility.

The importance of proper management of this property cannot be overstated by the authors. Finding three tiered species with others that may be found should give property managers pause in logging or other land management practices. One of the goals in the management plans for Stewarts Creek is to ensure that streams stay unsilted so that Brook Trout can flourish (Bassinger et. al, 2016). This management practice goes hand in hand with protecting the Blue Ridge endemic salamanders. They too need clean water and mature forestland in order to thrive. *Plethodon yonahlossee* needs a little more care though. It thrives in mature forests that are not just by streams but that are also found away from streams. We strongly encourage the VDGIF to extensively survey for this species and protect all the habitat in which it is found. In continuing to update management plans for this site it should also be stated that poaching of this species could possibly be a threat. With limited manpower, perhaps strategic placement of trail cameras could be a deterrent. This has already been proposed as a means to monitor the level of trout fishing.

There is a lot left to be discovered at Stewarts Creek Wildlife Management Area but also Carroll County as a whole. The VHS Herp Database reports 31 species of reptiles and amphibians (15 salamanders, five anurans, three turtles, one lizard, and seven snake species) for the entire county. The high elevation sites have been surveyed but low elevation sites have not been given proper attention. There are many county records waiting to be found at low elevations sites around the county.

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Aspects of Eastern Wormsnake (*Carphophis amoenus*) Microhabitats at Two Natural Areas in Fairfax County, Virginia, and Anne Arundel County, Maryland

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Introduction

Carphophis amoenus (Say) (Eastern wormsnake; hereafter wormsnake) is a small, fossorial snake whose range encompasses most of the eastern United States, from southern Massachusetts to Georgia, and east to the Mississippi River (Powell et al., 2016). Ernst and Ernst (2003) estimate that wormsnakes are one of the most common vertebrates in eastern deciduous forests and thus may play an underappreciated role in forest food webs, particularly as a source of prey for other snakes (e.g. *Lampropeltis getula*, and *Coluber constrictor*; Clark 1970), and birds during the nesting season (e.g. *Siala sialis*; Stankback and Mercadante 2009). Despite their potential importance in eastern forest ecosystems, few studies have focused exclusively on this species and many questions remained unanswered about their ecology (Barbour et al. 1969, Russell and Hanlin 1999, Orr 2006).

One aspect of wormsnake ecology that remains poorly understood is their microhabitat requirements. The microhabitat encompasses the area needed for an individual to fulfill its immediate physiological needs, such as osmoregulation and thermoregulation (Huey 1991). Small snakes are especially sensitive to temperature changes and subcutaneous water loss, which render them more vulnerable than larger snakes to variable microclimates (Shoemaker and Nagy 1977, Stevenson 1985). Furthermore, optimal body temperatures for fossorial snakes may be shifted towards lower temperatures compared to other reptiles, requiring them to seek cool microclimates during hot weather (Kamel and Gatten 1983). Therefore a small, fossorial snake such as the wormsnake may require a microclimate that is both humid and cool for survival.

While wormsnakes spend approximately 60% of their time underground (Clark 1967), most of their time above ground is spent in an immobile resting state within refuges (Barbour et al. 1969, Ernst and Ernst 2003). Their most commonly used refuges are the interstitial spaces within coarse woody debris (CWD)—defined as fallen logs and branches with a diameter greater than 7.5 cm (Harmon et al. 1986). Some snakes use the microclimate found within CWD refuges to thermoregulate while simultaneously avoiding desiccation and predation (Elick and Sealander 1972, Huey et al. 1989, Winne et al. 2001). Hence, migration between the soil and CWD refuges may provide benefits for wormsnakes that have yet to be explored.

Previous investigations into the microhabitat preferences of wormsnakes used artificial refuges (e.g., plywood coverboards and concrete slabs) to attract snakes rather than relying solely

on CWD (Russell and Hanlin 1999, Creque 2001, Orr 2006). Artificial refuges can have significantly greater thermal variation than CWD refuges and thus may alter the behavior of wormsnakes during the microhabitat selection process (Houze and Chandler 2002). Thus, previous studies using artificial refuges may not accurately reflect the microhabitat preferences of this species under natural conditions. Additionally, they have not examined why CWD appears to be a preferred refuge for this species in its native habitat. Furthermore, it is unknown whether other components of the habitat also play a role in microhabitat selection. For example, leaf litter and understory vegetation may provide wormsnakes cover from predators while moving above ground. Abiotic factors, such as soil moisture, may affect the ability of snakes to burrow or find earthworms, their primary prey (Barbour 1960). Hence habitat variables adjacent to refuges that could be important in the selection process may have been overlooked by previous studies.

The purpose of this study was to determine the microhabitat preferences of wormsnakes under natural conditions. Specifically, we attempted to determine (1) whether CWD that wormsnakes select as refuges have significantly different microclimates than CWD available within the habitat as a whole; (2) if components of the habitat immediately surrounding CWD refuges impact microhabitat selection; and (3) whether temperatures within CWD refuges fall within the species' thermal optima for a greater portion of the year than soil temperatures.

Methods

Study Sites: We sampled at Huntley Meadows Park (hereafter Huntley Meadows; 38°45'12.49" N, 77°06'25.64" W; Figure 1.) in Alexandria, Fairfax County, Virginia, and Jug Bay Wetlands

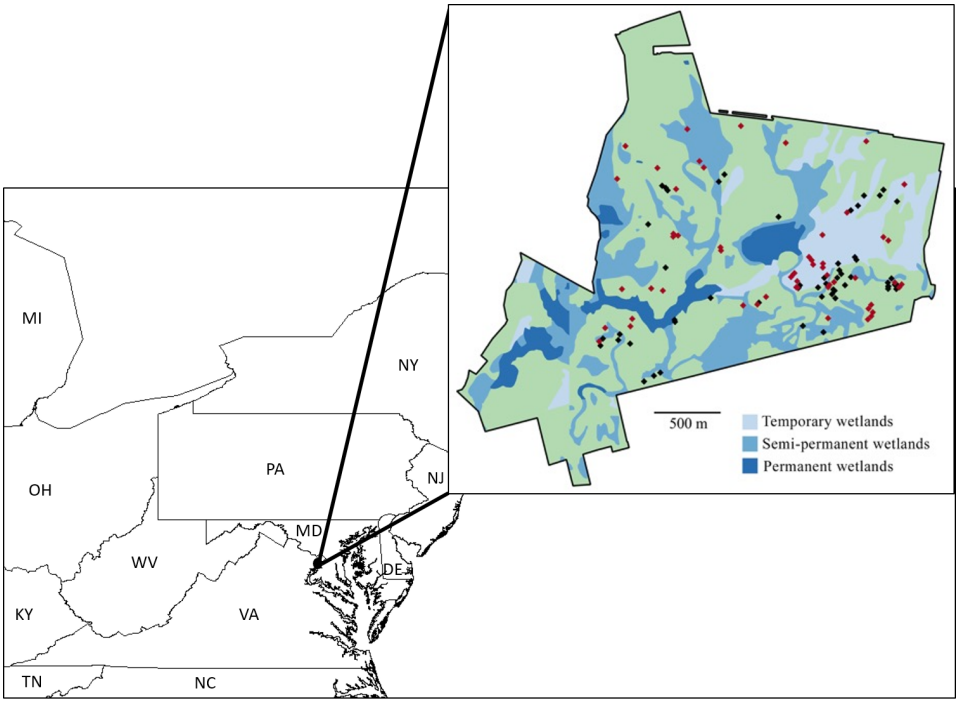

Figure 1. Map of Huntley Meadows Park. Snakes found in 2012 represented by red diamonds and in 2013 by black diamonds. Wetland classification based on US Fish and Wildlife Service's National Wetlands Inventory classification scheme.

Sanctuary (38°47’04.11’, 76°42’01.84” W; hereafter Jug Bay, Figure 2) in Lothian, Anne Arundel County, Maryland. Huntley Meadows is a 630 ha park containing a variety of habitats,

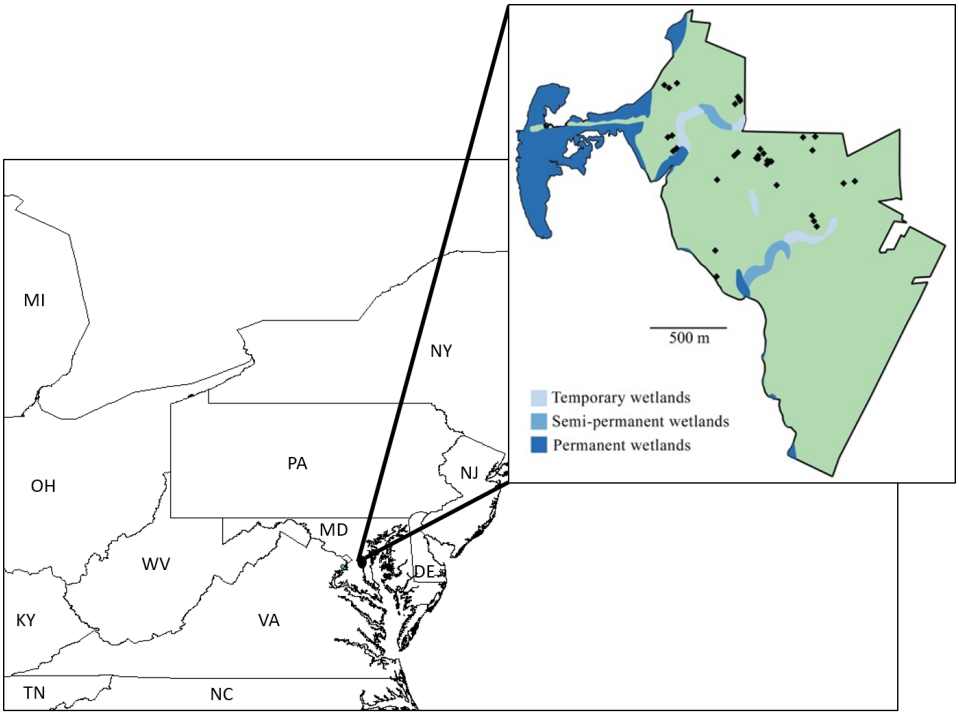

Figure 2. Map of Jug Bay Wetlands Sanctuary. Black diamonds represent snakes found in 2013. The southern portion of the park is mostly private farmland and was not included in searches.

including a 9 ha central wetland, meadows, vernal pools, and oak-maple forest. Huntley Meadows is surrounded by a highly developed landscape and has little connectivity with other non-urbanized habitats. At 650 ha, Jug Bay is similar in size to Huntley Meadows, but approximately half of that area is comprised of wetlands, leaving less terrestrial habitat appropriate for wormsnakes. Terrestrial habitats at Jug Bay consist of meadows, deciduous forest and mixed forest, bordered by agricultural fields and a river.

Sampling Scheme: We used a stratified-random sampling procedure to ensure sampling was evenly distributed throughout available habitats. Using QGIS 2.0.1, we overlaid a vector grid (divided into 300 m x 300 m squares) on a shapefile of wetland coverage for each field-site (FWS 2014). If a grid square was dominated by unsuitable habitats (e.g. areas with saturated soils), it was discarded. We then used a random point function to choose an equal number of search points for each remaining square based on the proportion of existing available suitable habitat. Search points were a minimum of 100 m apart (see Barbour et al. 1969 for home range data) to avoid spatial autocorrelation and maintain observation independence by decreasing the likelihood of recapture (Koenig and Knops 1998).

Time Constrained Searches and Demographics: We conducted one-person-hour time-constrained searches at each preselected sampling point in 2013 and 2014 during May, June and July, when wormsnake detectability is highest (Orr 2006). We located sampling points in the field with a Garmin eTrex 20 GPS unit. Time-constrained searches consisted of meticulously looking beneath and within all available CWD within an 80 m radius of each randomly selected point. Once captured, we weighed snakes to the nearest 0.2 g using a Pesola® spring scale, and measured snout-vent and tail length with a Fisher® scientific measuring ruler. We sexed snakes using visual characteristics, tail length and

thickness (*see* Fitch 1956). Individuals less than 170 mm in total length were considered juveniles (Willson and Dorcas 2004). We released snakes at the point of capture after measuring, weighing, and assessing body condition.

Microhabitat Measurements: We recorded a suite of microhabitat features, both at the capture point and within a 1 m^2 quadrat centered on that point. We measured refuge temperature and humidity with an Extech® EasyView 20 digital thermo-hygrometer and CWD moisture using an Extech MO220 Wood Moisture Detector. For snakes found within a piece of CWD, all effort was made to place the probe within the crevice exactly where the snake was found and return any displaced portions of the CWD to their original configuration before taking measurements. Furthermore, we kept thermo-hygrometers in place for at least five minutes and allowed microclimate readings to stabilize before we recorded measurements. We measured external ambient temperature and humidity by placing the thermo-hygrometer probes on the ground next to capture locations. We used a tape measure to quantify course woody debris dimensions (i.e. length, height and width) and visually assessed CWD for level of decay. Level of decay is based on a ranked ordinal scale from 1-5, with 1 = freshly fallen and 5 = extensive decay (Table 1).

Table 1. Decay classification scheme for coarse woody debris (CWD). CWD is classified from freshly fallen (1) to almost completely decayed (5). Decay classes adapted from Mohrmann et al. (2010).

	1	2	3	4	5
Age	Freshly fallen	Slight decay	Advanced decay	Extensive decay	Extensive decay
Bark	Firmly attached	Loosely attached	Mostly absent	Absent	Absent
Branches	Branches and twigs present	Branches broken, no twigs	Absent	Absent	Absent
Wood texture	Hard, thumbnail cannot penetrate	Hard, thumbnail penetrates	Spongy	Mushy	Disintegrated
Portion on ground	Elevated if branches are present	Part of width touching ground	Entire width of log flat on ground	Sunken partially into ground	Sunken extensively into ground
Percent permeable by *C. amoenus*	0%	0%	25-50%	>50%	100%

We measured biotic variables, such as vegetation and leaf litter cover, within a 1 m^2 quadrat centered over the CWD refuge where the snake was found. We used ground-based digital cover photography to calculate percent canopy cover over refuges and percent cover of ground vegetation surrounding refuges (Reinert 1984, Pekin and Macfarlane 2009). We analyzed digital images with a bespoke Photoshop CS5 algorithm that adjusts the luminance threshold to differentiate between vegetation and background images. This renders a high-contrast image where black pixels represent vegetation, allowing the percentage of vegetation to be accurately calculated from the

program's built-in luminance histogram. We also measured soil moisture with an Extech® MO750 soil moisture meter probe inserted to a 10 cm depth at four random points within the quadrat, which were then averaged. Similarly, leaf litter depth was averaged from four random measurements within the quadrat.

For each piece of CWD where a snake was detected ("used sites") we also took the same measurements at a randomly selected piece of CWD ("available sites"). Available sites were defined as the closest piece of CWD found after walking 30 m away from the capture site in a randomly pre-determined direction. We took measurements at both used and available sites within thirty minutes of each other to minimize thermal variation. Biotic attributes can significantly change over time; thus used and available sites were paired—rather than pooled—for data analysis to provide a more accurate comparison of differences between used and available sites across the sampling season.

Statistical Analyses: We used descriptive statistics and one-way analysis of variance (ANOVA) to examine the demographics of captured wormsnakes. We used paired *t*-tests to determine whether microclimate variables within refuges differed between used and available sites, and whether the microclimate within refuges differed from the microclimate immediately outside of the refuges. We also used paired *t*-tests to compare microhabitat variables surrounding CWD at used and available sites. Normality and equality of variance were assessed with normal probability plots, Kolmogorov-Smirnov tests, and Levene's test for equality of variances.

We also compared average daily soil temperatures at a depth of 50 cm to refuge temperatures to determine if they differed throughout the year. Air and soil temperatures were obtained from the USDA Natural Resources Conservation Service's Powder Mill site in Prince George's County, Maryland. A paired *t*-test was used to determine whether temperatures were comparable between Powder Mill and the two field sites. Refuge temperatures were extrapolated for all dates using the equation from a linear regression analysis of measured air and refuge temperatures taken on random dates at the field-sites from March through September. Normality and heteroscedasticity were assessed in residual plots. We then used a Fisher's exact test to compare the number of days soil and extrapolated refuge temperatures were within the snakes' preferred range (16–30°C, *see* Clark 1967, Orr 2006). We completed all statistical analyses in R (version 3.0.2) at $\alpha = 0.05$. Means are reported ± standard error. We used Zar (2009) as a reference for analyses.

Results

Demographics: We found a total of 125 wormsnakes: 88 at Huntley Meadows and 37 at Jug Bay. Of the 118 snakes successfully captured, 58 (49%) were male, 46 (39%) female, and 14 (12%) juvenile. Females had significantly greater mass ($F = 34.1$, $P < 0.001$), longer snout-vent lengths ($F = 65.9$, $P < 0.001$), longer total lengths ($F = 70.1$, $P < 0.001$), and a smaller total length to tail length ratio ($F = 56.6$, $P < 0.001$; Table 2). Eighty percent of measured wormsnakes were probably in their second year, as indicated by snout vent length (between 170 and 230 mm; Willson and Dorcas 2004). Eight percent of captures had visible injuries, such as lacerations or broken ribs, and nine percent of captures were found with a conspecific.

Table 2. Morphometrics of Eastern wormsnakes captured in this study.

Sex/Age	Mean	SE	Min	Max
		Snout Vent Length (cm)		
Female	20.6	0.42	14.7	28.1
Juvenile	11.8	0.42	9.9	14.1
Male	18.8	0.31	13.8	25.2
		Total Length to Tail Length Ratio		
Female	0.14	0	0.11	0.2
Juvenile	0.17	0.01	0.12	0.21
Male	0.18	0	0.15	0.21
		Mass (g)		
Female	7.7	0.44	2	17
Juvenile	2.07	0.2	1	3
Male	6.49	0.27	3	11

Microhabitats: There was no significant difference between used and available sites for refuge temperature ($t = 1.41$, $P > 0.10$) or relative humidity ($t = 0.19$, $P > 0.10$; Table 3). Refuge temperatures were significantly lower than ambient air temperatures ($t = -13.4$, $P < 0.001$), and relative humidity within refuges was significantly higher than outside the refuge ($t = 6.15$, $P < 0.001$).

Table 3. Microclimate characteristics of used and available CWD refugia. There were no significant differences between used and available refugia for any microclimate characteristics.

	Used		Available	
	mean	*range*	*mean*	*range*
Temperature (°C)	22.9 ± 2.9	11.8−29.4	22.6 ± 3.0	12.0−28.1
Relative humidity (%)	98.3 ± 4.3	78.2−99.9	98.1 ± 4.5	75.7−99.9
CWD moisture (%)	76.8 ± 28.2	11.5−100	82.2 ± 25.6	13.6−100
CWD temp. (%)	21.3 ± 3.6	7.1−28.0	21.8 ± 3.4	12.1−31.5
Soil moisture (%)	4.1 ± 3.8	0.0−14.3	4.3 ± 3.7	0.0−14.7

There was no significant difference between used and available sites for CWD moisture ($t = -6.21$, $P = 0.090$) or volume ($t = 1.40$, $P = 0.166$). Higher decay classes were used significantly more than expected ($\chi^2 = 66.70$, $P < 0.001$; mean used decay class = 3.92 ± 0.08). There were no significant differences between used and available sites for leaf litter depth ($t = -0.094$, $P = 0.925$), leaf litter cover ($t = -1.22$, $P = 0.224$), vegetation cover ($t = 0.842$, $P = 0.402$) and canopy cover ($t = -1.91$, $P = 0.059$; Table 4).

Table 4. Structural microhabitat characteristics surrounding used and available CWD refugia. There were no significant differences between used and available refugia for any microhabitat characteristics.

	Used		Available	
	mean	*range*	*mean*	*range*
Leaf litter depth (cm)	2.2 ± 0.8	0.5−5.3	2.2 ± 0.9	0.0−4.4
Leaf litter cover (%)	99.1 ± 3.8	70.0−100	99.7 ± 2.3	80.0−100
Vegetation cover (%)	14.9 ± 21.9	0.0−93.2	12.7 ± 21.6	0.0−84.3
Canopy cover (%)	75.8 ± 5.9	58.3−95.7	77.1 ± 5.4	53.0−87.4

There was no significant difference in air temperatures between the Powder Mill site where soil measurements were recorded and the field sites ($t = 0.38$, $P = 0.707$). Linear regression showed that refuge temperature increased proportionally as ambient air temperature increased ($R^2 = 0.779$, $F = 160.9$, $P < 0.001$). Refuge temperatures were extrapolated across all dates using Equation 1: Refuge temperature = (0.6306**A*) + 7.0397, where *A* equals air temperature at ground level. There were significantly more days at which refuge temperatures fell within the preferred temperature range of wormsnakes compared to soil temperatures ($\chi^2 = 30.36$, $P < 0.001$). Most of the divergence between soil and refuge temperatures occurred during the months of April and May (Figure 3).

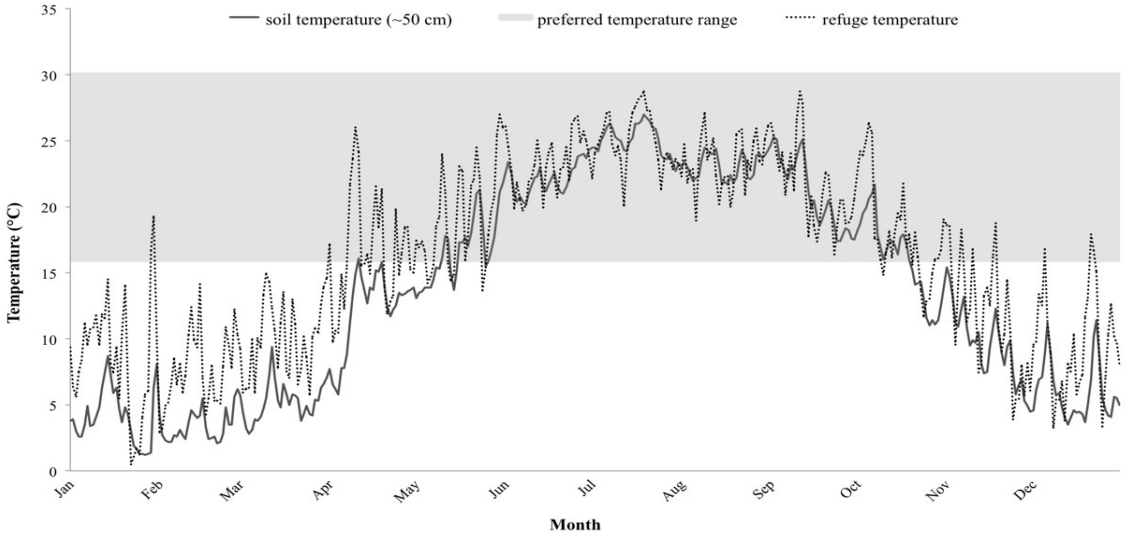

Figure 3. Refuge and soil temperature (~50 cm depth) compared to preferred temperature range for Wormsnakes in this study.

Discussion

CWD, Temperature and Humidity: CWD refuges had uniform microclimates at both used and available sites, making it unlikely that wormsnakes select among available CWD refuges based on temperature or humidity. There was also no indication that microhabitat characteristics outside of the refuge differed between used and available sites. However, our results do suggest that wormsnakes select CWD refuges that provide cooler temperatures and higher humidity than ambient external conditions during spring and early summer (i.e. May, June and July), and provide warmer temperatures than the soil during the early spring, when ground temperatures remain below 10°C.

Many snakes in temperate climates thermoregulate behaviorally, using basking to achieve temperatures high enough for activity, and to facilitate gestation, digestion and recovery from illness (Huey et al. 1989, Reinert 1993). Although we encountered two wormsnakes exhibiting what could be considered basking behavior during the course of this study, this species has not been previously reported to bask in direct sunlight, nor does it appear that they use refuges warmer than surrounding air. Thus, our observations conform to the idea that adaptation to a fossorial lifestyle may have shifted thermal optima in wormsnakes toward lower temperatures, as has been shown in other fossorial reptiles (Kamel and Gatten 1983).

While desiccation tolerance in Eastern wormsnakes has not been studied, its congener *C. vermis* (Western wormsnake) showed low resistance to subcutaenous and cloacal water loss when compared to four other small, fossorial snakes (Elick and Sealander 1972). Nearly all used and available refuges had high levels of relative humidity (mean 98.2 ± 0.29), suggesting that Eastern wormsnakes may seek humid refuges within CWD as part of desiccation avoidance behavior. However, the lack of a humidity gradient between different CWD pieces make it impossible to draw definitive conclusions as to whether Eastern wormsnakes occupy CWD refuges because they provide a humid microclimate, or if the humid microclimate is coincidental to other factors guiding selection.

Wormsnakes spend the majority of their time underground, especially during the winter months, which they spend in underground hibernacula (Barbour 1960, Ernst and Ernst 2003). Soils are slower to warm than air (Parton and Logan 1981); thus in early spring soil temperatures may remain below thermal optima for wormsnakes longer than above ground temperatures. Indeed, we found that refuge temperatures rose to within the species' preferred temperature range earlier in the spring than soil temperatures. The discrepancy between soil and refuge temperatures begins in April, which is also the same month that the majority of wormsnakes move from underground hibernacula into CWD refuges in the mid-Atlantic (Creque 2001, Orr 2006). Wormsnakes within refuges can achieve higher mean body temperatures in refuges within CWD than using other substrates (Orr 2006). Thus, we hypothesize that migrating from the soil into CWD refuges during spring may help wormsnakes remain within thermal optima for a greater proportion of the year. Further study is needed to confirm whether thermoregulation is the sole driver for migration between soil and CWD refuges, or if other factors, such as osmoregulation, also play a role.

Conclusions: The only significant difference between used and available CWD refuges was that used refuges were more likely to be found in highly decayed wood, probably due to the increase permeability at high decay classes, enabling a greater proportion of the wood to be used as refuges. Temperatures were significantly lower within refuges than ambient air temperatures. Coarse woody debris refuges were within the optimal temperature range of Eastern wormsnakes for significantly more days per year than refuges underground, indicating that thermoregulation may be the driving factor influencing CWD refuge selection.

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Detection of the Pathogenic Fungus, *Batrachochytrium dendrobatidis,* in Anurans of Huntley Meadows Park, Fairfax County, Virginia

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Introduction

The chytrid fungus, *Batrachochytrium dendrobatidis* (hereafter *Bd*), has been identified as a proximate driver of amphibian population declines and extinctions worldwide (Lambertini et al., 2016; Lips et al., 2006; Olson et al., 2013). The pathogen is now widespread across much of North America, demonstrating a highly heterogeneous spatial distribution (Lannoo et al., 2011). *Bd*-related declines have been documented in several western states (Arizona, California and Colorado; Bradley et al., 2002; Briggs et al., 2005; Muths et al., 2003). Portions of the southwest and the eastern United States have reported high prevalence of the pathogen, but without concomitant declines (Lannoo et al., 2011; Petersen et al., 2016).

Bd is a pathogenic mycotic species, which produces flagellated, motile spores that colonize keratinized epithelial cells in the skin of adult amphibians, and keratinized mouthparts of larval amphibians (Brutyn et al., 2012). Clinical manifestations of *Bd* infection reflect the diseased state known as chytridiomycosis. Hyperplasia and keratosis in the diseased state interfere with cutaneous respiration and osmoregulation, and can be lethal (Berger et al., 1998; Kilpatrick et al., 2010; Rachowicz et al., 2006; Voyles et al., 2009). Susceptibility to the pathogen, and effects of the infection vary both within and among species, with cases ranging from asymptomatic to fatal (Beebee and Griffiths, 2005; Briggs et al, 2010; Savage et al., 2011). This variation has been attributed to differences in innate defenses and host life-history traits (Harris et al., 2006; Lips et al., 2003; Woodhams et al., 2007). Habitat and climatic conditions have been shown to significantly influence the virulence of *Bd* infection, with lethal outbreaks of chytridiomycosis most commonly associated with cooler, wetter, and thermally consistent environmental conditions (Berger et al., 2004; Bielby et al., 2008; Kriger and Hero, 2007; Murray et al., 2011; Rowly and Alford, 2007; Savage et al., 2011).

It is thought that *Bd* may be endemic to many regions of North America, including the eastern United States, where the pathogen has been present since the 1960's, and known to infect at least 48 amphibian species (Hughey et al., 2014; Lannoo et al., 2011; Longcore et al., 2007; Ouellet et al., 2005). In the Mid-Atlantic region, *Bd* has been shown to exist without associated declines (Goodman and Ararso, 2012; Grant et al., 2008; Hughey et al., 2014; Lannoo et al., 2011; Petersen et al., 2016; Pullen et al., 2010). Propagation of the fungus and/or virulence has been seemingly discouraged by local climatic conditions. However, synergistic interactions between a changing climate and a suite of anthropogenic stressors may function to alter infection dynamics, potentially inducing disease outbreaks and subsequent declines of local amphibian populations (Davidson et al., 2003; Longcore et al., 2007; Pounds et al., 2006). This latent threat highlights the need for long-term monitoring. Monitoring data are critical to identifying emerging patterns of *Bd* infectivity, understanding its effect on local amphibian populations, and are integral to management of natural areas containing amphibifauna (Olson et al., 2013).

Information on the prevalence of *Bd* in anuran species throughout Virginia is relatively limited. Although prior studies suggest that *Bd* is widespread in the state (Hughey et al., 2014), there appear to be inconsistent trends in rates of infection, with overall prevalence (across anuran species) ranging from as low as 8% (central Virginia; Goodman and Ararso, 2012) to as high as 35% (Hughey et al., 2014). Systematic *Bd* surveys have also been conducted in areas of western, southern and central Virginia (Goodman and Ararson, 2012; Gratwicke et al., 2011; Hughey et al., 2014; Pullen et al., 2010). To the best of our knowledge, only one other study has surveyed for *Bd* in Northern Virginia (Augustine and Neff, 2016). However, because of the low sample size (N = 25), and minimal representation of anuran species (three species; N = 11), supplemental data is necessary to more accurately assess *Bd* prevalence in this region of Virginia. Our primary objective was to determine whether *Bd* is present in this portion of the state, and if so, how its prevalence compares to other regions within Virginia and throughout the Mid-Atlantic region. Data from our study will aid in the development and implementation of disease management protocols on local and regional scales.

Methods

We collected samples at Huntley Meadows Park in Fairfax County, Virginia (Figure 1; 38°45'36.57" N -77°05'44.13" W). Huntley Meadows Park is approximately 577 ha and, other than a green corridor on its southeast side, is predominately surrounded by suburban developments (Figure. 1). Huntley Meadows Park is comprised of a large central wetland that is hydrologically connected to the majority of the park's other smaller wetlands, which range from early-successional, herbaceous open-canopy wetlands to later-successional hardwood swamps. Between 26 March and 5 June 2016, we opportunistically sampled anurans throughout Huntley Meadows Park. Adhering to biosecurity standards outlined by the Virginia Herpetological Society (VHS, 2016), we hand-captured anurans, and swabbed the skin surface with sterile dry swabs (no. MW113, Medical Wire and Equipment Company, Durham, NC). We stored the swabs in 1.5 mL microcentrifuge tubes and kept them frozen until molecular analyses. We followed the Purification of Total DNA from Animal Tissues protocol (Qiagen®, Valencia, CA) to elute DNA from each swab. We prepared a PCR master mix containing 10 µL Sso Advanced™ universal probes supermix (Bio-Rad, Hercules, CA), 200 nM of each primer (ITS1-3Chytr and 5.8sChytr; Boyle et al. 2004), 250 nM MGB probe, and sterile water. We combined 18 µL of the master mix and 2 µL of eluted DNA in a 96-well PCR plate. Positive and negative controls were included for both the DNA elusion and amplification. The positive control required a single, standard concentration as we were testing for presence of the *Bd* pathogen,

Figure 1. Huntley Meadows Park. Blue icons represent sampling locations. We swabbed multiple individuals at each sampling location. We presented the location without a +/- symbol because we found both *Bd* positive and negative individuals at most sampling locations.

and not zoospore load. To detect *Bd*, we used a CFX96 Touch™ Real-Time PCR Detection System (Bio-Rad, Hercules, CA). Samples were exposed to 95°C for three minutes, then run through 45 cycles of 95°C for 30-sec and 55°C for 45-sec. We performed three rounds of PCR per sample. Samples were considered positive if they fluoresced prior to the 40th cycle of the PCR reaction on at least two occasions.

We used multiple logistic regression to determine which variables were significant predictors of *Bd* infection. The predictors were day of year, sex, ecological guild, species and site. The sex variable was an ordinal variable consisting of three categories: male, female, juvenile. Therefore, it also was a proxy for age (adult/subadult). The ecological guild variable was also ordinal and consisted of two categories, terrestrial/arboreal (Eastern American Toad, Cope's Gray Treefrog Green Treefrog, Spring Peeper) and aquatic (American Bullfrog, Green Frog, Southern Leopard Frog). We assessed goodness-of-fit and predictive ability of the logistic regression model with Hosmer-Lemeshow and Somers' D statistics, respectively. We then used descriptive statistics, chi-square tests, and independent sample t-tests to further examine variables identified as significant by multiple logistic regression analysis. Zar (2009) was used to guide statistical analyses. Minitab version 17 was used for all statistical analyses (www.minitab.com), and

ArcGIS version 10.3 (www.ersi.com) and DivaGIS version 7.5.0 (www.diva-gis.org) were used to create maps. Nomenclature follows Crother (2012).

Results

We collected 100 samples between 26 March and 5 June 2016. While we were unable to sample equally among species, we sampled approximately evenly between ecological guilds. We collected the majority of samples in April and May (Tables 1 and 2). Multiple logistic regression

Table 1. Species sampled for *Bd* at Huntley Meadows Park. [1]= terrestrial/arboreal ecological guild. [2] = aquatic ecological guild.

Common Name	Scientific Name	N	# Positive	% Positive
Eastern American Toad[1]	*Anaxyrus americanus*	13	3	23
American Bullfrog[2]	*Lithobates catebeianus*	11	3	27
Cope's Gray Treefrog[1]	*Hyla chrysoscelis*	9	1	11
Green Frog[2]	*Lithobates clamitans*	19	7	37
Green Treefrog[1]	*Hyla cinerea*	11	1	9
Southern Leopard Frog[2]	*Lithobates sphenocephalus*	23	18	78
Spring Peeper[1]	*Pseudacris crucifer*	13	1	8

Table 2. Sampling distribution and number and proportion of *Bd* detections per month.

Month	N	# Positive	% Positive
March	9	8	88.9
April	22	13	59.1
May	52	11	21.2

indicated that sex (age); ($Z = 3.11$; $P < 0.05$), ecological guild ($Z = 3.02$; $P < 0.05$) and day of year ($Z = -2.42$; $P < 0.05$) were strong predictors of infection when considered together with each other and species, and site ($G = 48.1$; $df = 5$; $P < 0.001$; Hosmer-Lemeshow $P = 0.91$; Somers' $D = 0.78$; Table 3). Species and site were not indicated as significant. We identified

Table 3. Multiple logistic regression output. Coef = coefficient, SE = standard error.

Predictor	Coef	SE Coef	*Z*	*P*
Constant	-3.940	3.529	-1.12	
Day of Year	-0.042	0.018	-2.42	
Sex (age)	1.359	0.437	3.11	
Guild	2.629	0.869	3.02	
Species	0.230	0.199	1.16	
Site	0.133	0.097	1.38	

significantly higher infection rates in adult male and female anurans ($\chi^2 = 7.6$; df = 2; $P < 0.05$; Table 4) of the aquatic ecological guild ($\chi^2 = 17.9$; df = 1; $P < 0.001$ *see* Table 1) earlier in the season ($\chi^2 = 25.0$; df = 3; $P < 0.001$; *see* Table 2). Of the 99 testable samples, 34 were positive, yielding an overall infection rate of 34.3%.

Table 4. Number and proportion of *Bd* detections across sexes, and correspondingly, by age class.

Sex	N	# Positive	% Positive
Female	41	13	31.7
	15	1	6.7
Male	39	18	46.2

Discussion

To the best of our knowledge, our work is only the second study to document *Bd* in anurans of Northern Virginia. Because information on *Bd* in this region (in anurans) are so limited, our data are particularly valuable—especially considering that we were able to increase the sample size and expand upon the number of species sampled. Our findings, coupled with results from other Virginia studies, confirm that *Bd* is prevalent throughout the state (Davison and Chambers, 2011; Goodman and Ararson, 2012; Gratwicke et al., 2011; Hughey et al., 2014; Lannoo et al., 2011; Petersen et al., 2016; Pullen et al., 2010). With the exception of Hughey et al. (2014), the overall infection rate in anurans from our study (34.3%; Table 5) was higher than all other studies

Table 5. *Bd* prevalence rates (% *Bd* positive) for studies conducted throughout Virginia and Maryland.

Study	Location	N	% *Bd* Positive
Fuchs et al., 2017	Anne Arundel County MD	116	10
Davidson and Chambers, 2011	Wise County VA	41	14.6
Goodman and Ararso, 2012	Central VA	103	7.8
Grant et al., 2008	C&O National Park, MD	53	17
Hughey et al., 2014	Western VA	292	35
Pullen et al., 2011	Central VA	740	14.1
Tupper et al., 2017	Fairfax County VA	99	34.3

conducted in Virginia (Davison and Chambers, 2011; Goodman and Ararson, 2012; Gratwicke et al., 2011; Lannoo et al., 2011; Petersen et al., 2016; Pullen et al., 2010) and neighboring Maryland (Fuchs et al., 2017; Grant et al., 2008).

Interestingly, the overall infection rate reported in our study also falls among the highest relative to all studies conducted throughout the entire eastern United States (*see* Petersen et al., 2016 and Rothermel et al., 2008 for exceptions). Huntley Meadows Park, a natural depression surrounded by densely populated suburban development (dgif.virginia.gov), is the principle education park for Prince William, Fairfax, and Arlington Counties, and it is host to over 200,000 visitors annually (Kathleen O'Shea, pers. comm). These factors may expose the park's wildlife to a range of anthropogenic stressors, such as pollution (herbicides pesticides, fossil fuel runoff,

siltation), introduced predators (Northern Snakehead *Channa argus*; FOHMP, 2017), human interaction, and noise (Beebee and Griffiths, 2005; Blaustein et al., 2012; Pullen et al., 2008). Exposure to anthropogenic stressors can reduce immune function in hosts and consequently increase disease prevalence (Bruno et al., 2003; Carey et al., 1999; Daszak et al. 1999, 2001; Hoverman et al., 2011; Rohr et al., 2008). It is possible that anthropogenic stressors could have contributed to the relatively high rate of infection found in our study. However, further inquiry would be necessary to assess that statement.

Multiple logistic regression analysis indicated that three variables contributed significantly to infection: day of year, sex (age class), and ecological guild. We found *Bd* to be more prevalent in earlier months of sampling. This finding parallels various temperate regions in situ studies that show infection rates declining as the season progresses and warms (Hughey et al., 2014; Kinney et al., 2011; Longcore et al., 2007; Muths et al., 2008; Petersen et al., 2016). This trend is likely because *Bd* produces zoospores (in vitro) between 4 and 25°C and its pathogenicity declines when temperatures are above 23°C (Berger et al., 2004; Lamirande and Nichols, 2002; Piotrowski et al., 2004; Woodhams et al., 2003).

Timing of sampling may have influenced our finding of lower infection rates among juveniles and metamorphs, in comparison to both male and female adult anurans. Sampling for subadults was greater during periods when metamorphosis and dispersal occurred (*see* Wright and Wright, 1949 and http://www.virginiaherpetologicalsociety.com/). Thus, 87% of our juvenile samples were from June (a warmer month that would likely yield fewer *Bd* positive samples) and predominantly from Spring Peeper (85%), a species that has often demonstrated lower *Bd* infection rates than other anurans (Fuchs et al., 2017; Longcore et al., 2007; Rothermel et al., 2008; Tupper et al., 2011).

We found *Bd* to be more prevalent in aquatic species (53.8% overall, with the highest infection rate in Southern Leopard Frog) than in terrestrial/arboreal species (13%). Similar patterns in infectivity rates across ecological guilds have previously been reported (Kriger and Hero, 2007; Longcore et al., 2007; Tupper et al., 2011). Water is an effective medium for transmission of *Bd* zoospores (Kolby et al., 2015), and it is thought that the lower degree of thermal variability in aquatic environments, relative to terrestrial environments, may be critical to the pathogen's ability to more readily infect aquatic or semi-aquatic amphibians (Chatfield et al., 2012; Kriger and Hero, 2007; Moffitt et al., 2015; Weldon et al., 2004). Although *Bd* is more prevalent in aquatic species, it is not confined to aquatic guilds, as we detected it in the American Toad, Cope's Gray Treefrog, Green Treefrog and Spring Peeper. Additionally, numerous studies have found it in terrestrial/arboreal species (Berger et al., 2005; Daszak et al., 2003; Lannoo et al., 2011; Longcore et al., 2007; Oullett et al., 2005; Rothermel et al., 2008).

Previous studies conducted throughout the Mid-Atlantic region indicate a widespread occurrence of *Bd* in multiple anuran species without associated signs of chytridiomycosis (Fuchs et al., 2017; Grant et al., 2008; Pullen et al., 2010) and without related population declines (Petersen et al. 2016; Longcore et al. 2007; Lannoo et al. 2011; Rothermel et al. 2008). While we also did not observe symptoms of chytridiomycosis, it is thought that cases of the disease may be increasing locally or invading previously uninhabited regions (Daszak et al., 2003). Climate change may shift environmental conditions in favor of the pathogen. Consequently, the potential for interactions between the host and pathogen, coupled with a suite of anthropogenic factors, may influence outcomes of infection in unexpected ways (Davidson et al., 2003; Longcore et al., 2007; Pounds et al., 2006). We therefore recommend continued disease monitoring in the region,

especially where the pathogen is known to exist, and in locations where host immunity may be compromised by anthropogenic stressors. Huntley Meadows Park is one such location, and serves as a critical refuge for wildlife inhabiting increasingly urbanized Northern Virginia. We encourage VHS members to follow Huntley Meadows Park biosecurity protocols to decrease the potential for disease transmission. If visiting the park, please inquire about sanitation stations at the at the visitor center before walking trails

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Eurycea bislineata **(Northern Two-lined Salamander)** VA: Orange Co., Stone Woods, Unionville, VA (38° 13'36.95"N, -77°52'14.03"W). 14 June 2017. Matthew Neff, Roger Neff, and Michael Neff.

County Record: On 14 June 2017 a larval *E. bislineata* was observed, under a rock on the edge of a stream; as noted by the red, feathery gills behind the head. The observation of this Northern Two-lined Salamander is a new county record and has not been previously documented in Orange County (Mitchell J.C. and Reay K.K. 1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.). *Eurycea bislineata* was found previously in the following counties surrounding Orange County: Albemarle, Greene, Madison, Culpeper, and Spotsylvania (VAFWIS). *Eurycea bislienata* is differentiated from the similar looking E. *cirrigera* (Southern Two-lined Salamander) by the number of costal grooves: *E. bislienata* has 15-16 while *E. cirrigera* has 13-14 (Mitchell J. and Gibbons W. 2010. Salamanders of the Southeast. University of Georgia Press, Athens, GA 324pp.). The Southern Two-lined Salamander is found in the following counties surrounding Orange County: Greene, Albemarle, Louisa, and Spotsylvania and is most likely found in Orange County as well (VAFWIS). A digital photograph of the specimen was submitted to the VHS archives (# 449).

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Hyla chrysoscelis (Cope's Gray Treefrog) VA: Loudoun Co., near Neersville, on Purcells Knob (39º 15' 19.29" N, 77º 44' 53.31" W). 7 July 2017. Dee Dunn.

County Record: The diploid Cope's Gray Treefrog (*Hyla chrysoscelis*) has a wide distribution in eastern and southern Virginia. The Tetraploid Gray Treefrog (*Hyla versicolor*) has a distribution more in central Virginia (FWIS Database). In the northern portion of the state, Cope's Gray Treefrog has been reported as far north as Fairfax and Prince William Counties. This report extends the distribution northwards, into Loudoun County. For several years, Cope's

Gray Treefrogs have been calling and mating in artificial pools on my property. On the evening of 7 July 2017, I recorded a short video of a male calling. The morphology of the two species is identical and the best way to identify them is by the mating call. A copy of the video was sent to the VHS for positive identification and posted to youtube (https://www.youtube.com/watch?v=7lIZu5aGIV8) as a voucher for the presence of Cope's Gray Treefrog in Loudoun County.

Dee Dunn

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***Hyla chrysoscelis* (Cope's Gray Treefrog)** VA: Russell County, 206 Creech Drive, Castlewood. 19 June 2017. David and Jacob Young.

County Record: Cope's Gray Treefrog (*Hyla chrysoscelis*) has a significant presence in far southwestern Virginia. It has been reported from Buchanan, Dickenson, Wise, Scott, Smyth and Washington Counties. This report fills a gap in these records by providing a record for Russell County, in the center of these previously listed counties. On the evening of 19 June 2017 a small chorus of Cope's Gray Treefrogs was recorded. The evening was wet and foggy so that a breeding chorus was active. A digital photograph of one animal was submitted to the VHS Archive (#435a) as well as a digital recording of the chorus (#435b), as vouchers. This leaves a significant gap in the distribution to the east where there are no records for Tazewell, Bland, Wythe, Giles, Pulaski and Carroll Counties. These should be examined to determine if the gap in distribution is real, or just underreported.

David A. and Jacob Young
206 Creech Drive
Castlewood, VA

***Hyla versicolor* (Gray Treefrog)** VA: King William County. Rt 600 approximately 1 km east of the county line (37, 52.606 N; 77, 14.227 W) 18 August 2010. Brian Munford.

County Record: On 18 August 2010 I was doing opportunistic frog call surveys and recorded a Gray Treefrog chorus on Co. Rt. 600 just east of the border with Caroline County. Gray Treefrogs have a wide distribution in central Virginia (FWIS Database) although there are few records in eastern counties. This is a new record for King William County. Gray Treefrogs have not been previously reported from any of the counties surrounding King William, although they have been from Charles City, Sussex and Henrico Counties to the south. A digital recording of the chorus was submitted to the VHS Archive (#460) as a voucher for this record.

Brian Munford

***Hyla cinerea* (Green Treefrog):** VA. Lunenburg County, Cattle Pond on Private Property 6 km northwest of Victoria (N 37° 02.922'; W 078°15.609') 25 June 2017. Tyler Smith and Flint Lewis.

County Record: The Green Treefrog has a distribution in eastern Virginia. Other than two isolated populations in Craig and Pulaski Counties, all other records are east of Mecklenburg and Prince Edward Counties. This is a new record for Lunenburg County, located between Prince Edward County to the northwest and Mecklenburg County to the south. This record thus fills the gap between these two previous records.

On the evening of 25 June 2017, I was out looking for herps and heard a frog call I was unfamiliar with. I traced the call to a Green Treefrog calling from about two meters up a tree. The tree was about 2-3 meters from a marshy area on the edge of a cattle pond. The pond is about 6 km northwest of Victoria and about .1 km southeast of Kings Rd, (Route 626). The digital photograph was submitted to the VHS Archive (#447) as a voucher.

Flint Lewis
Nutbush, VA

***Hyla gratiosa* (Barking Treefrog):** VA. Gloucester County, location withheld due to VADGIF status Tier IIa. 28 May 2017. Ned Rose.

County Record: The Barking Treefrog is a tiered species in Virginia, status IIa, indicating a very high conservation need. Their distribution in Virginia is in the southeastern portion of the Commonwealth, but not the counties along the eastern shore, except for the County of Matthews and the City of Virginia Beach. This report gives the newest record for Barking Treefrogs, from Gloucester County, immediately to the west of Matthews.

One the evening of 28 May 2017 I was driving, when I got out to help a Leopard Frog not get squished and happened to see a large and beautiful Barking Treefrog (Hyla gratiosa) sitting in the road. I photographed this specimen since they had not yet been documented in this county. As we drove further down the road, I put my window down and heard large numbers of these frogs calling, mixed in with other more common species, such as Cope's Gray Treefrog. Further down the road, I saw another frog and stopped to see a textbook specimen Barking Treefrog in the road. I photographed this one as well, and while I was doing so, I heard many calling from a vernal pool along what appeared to be a cut of some sort. These frogs seem to be rather prevalent here. Since then I have found five more Hyla gratiosa on that road. All Barking Ttreefrogs were roadcruised, and I've heard several more calling from the forest. A photograph on one of the Hyla gratiosa was submitted to the VHS Archive (#443) as a voucher for this record.

Ned Rose

***Plethodon glutinosus* (Northern Slimy Salamander)** VA: Orange Co., Stone Woods, Unionville, VA (38°13'44.1"N 77°52'12.7"W). 13 May 2017. Matthew Neff, Roger Neff, and Michael Neff.

County Record: On 13 May 2017 a subadult *P. glutinosus* was observed under a log adjacent to a vernal stream. An individual *Carphophis amoenus amoenus* (Eastern Wormsnake) was found under the same log as the salamander. The observation of this Northern Slimy Salamander is a new county record and has not been previously documented in Orange County (Mitchell J.C.

and Reay K.K. 1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.). *Plethodon glutinosus* is known in Madison County to the northwest of Orange County (VAFWIS database). *Plethodon glutinosus* is differentiated from the similar looking *P. cylindraceus* (White-spotted Slimy Salamander) by their dark gray to black chin; *P. cylindraceus* has a light gray to white chin (Mitchell J. and Gibbons W. 2010. Salamanders of the Southeast. University of Georgia Press, Athens, GA 324pp.). A digital photograph of the specimen was submitted to the VHS archives (# 448).

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***Pseudacris crucifer* (Spring Peeper)** VA: Dickenson Co., Breaks Interstate Park, Rhododendron Lodge & Conference Center (37° 17’ 09.2”N; 82° 17’ 42.5”W). 27 May 2017. Erin Chapman and Matthew Anthony.

County Record: Spring Peepers are a very common and widespread species in Virginia, and their presence is assumed state wide but not yet verified in a few counties, including Dickenson County. Before a thunderstorm let loose a torrential downpour on 27 May 2017, a chorus of Spring Peepers could be heard outside the Rhododendron Lodge & Conference Center at Breaks Interstate Park. I took a recording with my phone. Later that night, after the storm had passed, spring peepers could be heard all over the park, so breeding populations obviously exist within Dickinson County. A digital recording was submitted to the VHS Archive (#439) as a voucher.

Erin Chapman
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***Lithobates sphenocephalus* (Southern Leopard Frog) and *Lithobates clamitans* (Green Frog).** VA: King William County, Zoar State Forest. 11 March 2016. John (J.D.) Kleopfer and Ben Lewis.

Interspecific Amplexus: Interspecific amplexus is not an uncommon occurrence in explosive-breeding anurans (Wells 1977. Anim. Behav. 25:666-693). This is primarily due to the limited time frame in which breeding conditions occur and the pressure in which individuals are under to breed (Beranek. C. 2017. Natural History Note Herpetological Review. Vol. 48. No. 2, Pg. 411). While explosive-breeding species often find mates through active searching and aggressive competition, prolonged breeders usually are territorial. *Lithobates sphenocephalus* (Southern Leopard Frog) is an explosive-breeder typically gathering into large aggregations for short periods of time in late winter with intermittent calling occurring in late spring and in the fall. However, *L. clamitans* (Green Frog) is not considered an explosive-breeder and typically calls as a solitary individual beginning in mid to late spring and continuing into late summer. Both species are similar in size and are often sympatric throughout their range in Virginia (Kleopfer J.D. and C.S. Hobson. 2011. *A Guide to the Frogs and Toads of Virginia*. Bureau of Wildlife Resources Special Publication Number 3, Virginia Department of Game and Inland Fisheries, Richmond, VA. 44 pp.).

On 11 March 2016, a male *L. sphenocephalus* was found amplexing a female *L. clamitans* at Zoar State Forest in King William County. Sex was determined by the presence of nuchal pads, a characteristic exclusive to male frogs. Although the female made efforts to escape capture, the amplecting male made no effort to release its grasp. No breeding attempts were observed. To the best of the author's knowledge, this is the first observation of interspecific amplexus in these species.

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***Agkistrodon contortrix mokasen* (Copperhead)** VA: Lancaster County, 2172 Iberis Road, Lancaster. 24 June 2017: Warner Ferguson

County Record: The Copperhead has a state-wide distribution in Virginia, being absent from only a few small pockets. One of these is on the northern and middle peninsula on either shore of the Rappahannock River and includes Northumberland, Lancaster and Middlesex Counties. This report is for the middle of these counties, the first report of a Copperhead for Lancaster County.

On 17 June 2015 an approximately one-meter-long Copperhead was found dead at the junction of Iberis and Merry Point Roads. The animal appeared to have been hit and killed by a vehicle. There appears to be a breading population because of unofficial reports from this area. There have been numerous sightings by local residents along Iberis Road from 2015 through 2017, of snakes ranging from 75-105 cm in length. A dog, living on Iberis Rd. was bitten twice, on different occasions, by Copperheads and survived. Another Copperhead was photographed which had fallen into a planter on 10 June 2017. A digital photo was taken on 24 June 2017 of a Copperhead found at 2172 Iberis Rd, Lancaster, and submitted as a voucher (VHS Archive #442) for this new county record.

Warner Ferguson
1974 Iberis Rd
Lancaster, VA

Agkistrodon piscivorus piscivorus (Cottonmouth) VA: Southampton Co., Signpost Road (Co. Rt. 658) between the town of Newsoms and the intersection with Greenhead Signpost Road (Co. Rt. 675), 31 August 2016 Wendell Cooper.

County Record. While Southampton County was recently added to the list of counties in which the Cottonmouth (*Agkistrodon piscivorus piscivorus*) is probably present (FWIS Database), no documented sightings have existed. Locals around Newsoms Virginia, consider all the swamps in the county as good spots to find cottonmouths. Cottonmouths have been reported from Sussex and Surry Counties to the north, but not the City of Suffolk to the east or Greensville County to the west (FWIS Database). On 31 August 2016, Randy Nurney killed and photographed a Cottonmouth on Blackhead Signpost Road (Co. Rt. 658) between the town of Newsoms and the intersection with Greenhead Signpost Road (Co. Rt. 675). It was about 38 inches long. A digital photograph was submitted to the VHS Archive (#437) as a voucher.

Wendell Cooper

Snake Fungal Disease, *Crotalus horridus*: MD. Allegany Co. Latitude and longitude excluded. Todd A. Tupper, Lauren D. Fuchs, Deborah L. Shaffer, Robert Aguilar.

Disease: Snake fungal disease (SFD) is an emerging infectious disease that has been increasingly observed over the past decade in various snake species throughout the eastern and midwestern United States (Guthrie et al. 2016. Detection of snake fungal disease due to *Ophidiomyces ophiodiicola* in Virginia, USA. Journal of Wildlife Diseases 52:143-149). SFD is caused by *Ophidiomyces ophidiicola* (*Oo*), a fungal pathogen peculiar to snakes (Allender et al. 2015. The natural history, ecology, and epidemiology of *Ophidiomyces ophiodiicola* and its potential impact on free-ranging snake populations. Fungal Ecology 17:187-196). The effects of *Oo* are variable; however, mortality is frequently reported in severe cases of the disease. The precise mechanisms that influence mortality are not thoroughly understood, but appear to be multifaceted (Lorch et al. 2015. Experimental infection of snakes with *Ophidiomyces ophiodiicola* causes pathological changes that typify snake fungal disease U.S.

Geological Survey, National Wildlife Health Center, Wisconsin, USA. 6:e01534-15; Guthrie et al. 2016. Detection of snake fungal disease due to *Ophidiomyces ophiodiicola* in Virginia, USA. Journal of Wildlife Diseases. 52:143-149). In Timber Rattlesnake (*Crotalus horridus*), disease outbreaks have been associated with population declines (Clark et al. 2011. Decline of an isolated timber rattlesnake [*Crotalus horridus*] population: Interactions between climate change, disease, and loss of genetic diversity. Biological Conservation. 144:886-891). The vulnerability of *C. horridus* to SFD disease is concerning, as populations are declining in many states (*see* Hammerson. 2007. *Crotalus horridus*. The IUCN Red List of Threatened Species 2007: e.T64318A12765920), and are a conservation concern in Maryland and Virginia (*see* Maryland DNR. 2016. Rare Threatened and Endangered animals of Maryland. Wildlife and Heritage Service Natural Heritage Program, Annapolis MD; Mitchell and Reay. 1999. Atlas of amphibians and reptiles in Virginia. Special Publication No. 1. Virginia Department of Game and Inland Fisheries, Richmond, VA). Habitat loss and intentional killing have led to extirpations throughout much of the species' historical range. Many remaining *C. horridus* populations are patchily distributed and highly isolated (Bushar et al. 2014. Genetic structure of timber rattlesnake [*Crotalus horridus*] populations: Physiographic influences and conservation implications. Copeia. 4:694-706; Olson et al. 2015. Survival of timber rattlesnakes [*Crotalus horridus*]: Investigating individual, environmental, and ecological effects. Herpetologica. 71:274-279). In small and isolated populations, where gene flow may have been reduced, snakes may experience effects of inbreeding depression (Burbrink. 2010. Historical versus contemporary migration in fragmented populations. Molecular Ecology 19:5321-5323; Frankham et al., 2002. Introduction to conservation genetics. Cambridge University Press, Cambridge, United Kingdom), which could ultimately influence a population's capacity to resist disease (Keller and Waller. 2002. Inbreeding effects in wild populations. Trends in Ecological Evolution 17:230–241; Smallbone et al. 2016. The effects of inbreeding on disease susceptibility: *Gyrodactylus turnbulli* infection of guppies, *Poecilia reticulata*. Experimental Parasitology 167:32-37). Additionally, the long lifespan, low fecundity and infrequent reproduction make it more difficult for *C. horridus* populations to recover from disturbances (Reinert and Zappalorti. 1988. Timber rattlesnakes [*Crotalus horridus*] of the Pine Barrens: Their movement patterns and habitat preferences. Copeia. 1988:964-978; Brown. 1992. Emergence, ingress, and seasonal captures at dens of northern Timber Rattlesnakes, *Crotalus horridus*. In: Campbell and Brodie. [Eds]. Biology of Pitvipers. Selva, USA. 251-258 pp) including disease outbreaks that result in high mortality (*see* Clark et al. 2011 op. cit.). Consequently, observations of SFD in *C. horridus* are especially noteworthy considering the disease's potential to impact the species.

On 17 May 2017 at approximately 17:00 in Allegany County, Maryland (~ 32°C) we observed an individual *C. horridus* that displayed symptoms consistent with severe SFD infection. We found the approximately 1 m (TL) darker phase, south-facing specimen coiled underneath overhanging sedimentary rock with approximately half of its body exposed to sun. Lesions on the anterior portion of its body were extensive and included ulceration and recently scabbed over gulars, supralabials and infralabials, and hyperkeratosis of preoculuars, postoculars and rostral. Hyperkeratosis of the rostral was so severe that it was split unilaterally on the snake's left side. We also observed abnormalities and crusting of the right supraocular, intersupraoculars, canthals, and intercanthals. Perhaps the most severely affected region occurred on the

snake's right suboculars, across the loreal, to the rostral. The scales in this region were so severely degraded that only a shallow elongated hole remained, exposing the right loreal pit. Additionally, infection of the pre and postnasals was so severe that lung ventilation appeared to be impaired. We observed a repeated and seemingly forced lowering of the throat (region of the gulars and anteriormost ventrals). We hypothesize that this forced-lowering decreased buccal cavity pressure, enabling air to be pulled in through partially blocked nostrils. Because the nostril function was impaired, raising the throat would then force air into the glottis through a positive pressure mechanism (similar to that of amphibians), rather than back out through the nostrils (for video *see* https://www.facebook.com/nvcczoology/). Although this observation was not from Virginia, it is only approximately 17 km from the Virginia state line. Therefore, to reduce transmission of SFD, we recommend that VHS members photo document symptomatic snakes, and implement biosecurity measures when handling snakes and traveling between and within sites in Virginia and Maryland (*see* http://www.virginiaherpetologicalsociety.com/research /disease/index.htm). This is not our first observation of symptoms consistent with SFD in *C. horridus* in both Virginia and Maryland. However, it is the most severe case that we have observed this late in the season. While our observations are anecdotal, they underscore the necessity for continued monitoring for SFD throughout the region.

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***Diadophis punctatus edwardsii* (Northern Ring-Necked Snake) Ectoparasitism.** VA. York CO (37.202893°N, -76.531511°W, WGS 84). 3 July 2017. Emma L. Wilkinson, Todd A. Tupper.

Parasitism: Chiggers (Trombiculidae) are ectoparasitic mites that are infective during their larval stage (Shatrov and Kudryashova, 2006. *In* Morand et al [eds.], Micromammals and Macroparasites, pp 119–140. Springer, Tokyo, Japan). Various ticks and mites can affect reptiles and many chigger species are habitat rather than host-specific. They have been found on numerous species of snakes including Cottonmouth (*Agkistrodon piscivorous*), Eastern Kingsnake (*Lampropeltis getula*) and Northern Rough Greensnake (*Opheodrys a. aestivus*), whether they are the natural host or not (Powder and Loomis 1962. J. Parisitol. 48:204–208; Walters et al. 2011. Host and Distribution Lists of Chiggers (Trombiculidae and

Leeuwenhoekiidae), of North American Wild Vertebrates North of Mexico. DigitalCommons@ University of Nebraska-Lincoln. 5-2011:183 p.). Chiggers are known to affect reptilian hosts negatively during and after feeding. The mites attach to epithelial tissue (as they do in other vertebrates), release cytolytic enzymes and create a stylosome that enables ingestion of liquefied epithelium. This process results in trombiculosis; a series of external granulomas surrounding the stylosome, and various internal histologic changes that result from the host's resulting immune response to the chiggers cytolytic enzymes (Goldberg and Holshuh. 1993. Ectoparasite-induced lesions in the mite pocket of the Yarrow's spiny lizard *Sceloporus jarrovii* [phrynosomatidae]. J. Wildlife Dis. 28:537–541; Shatrov, 2009. Stylosome formation in trombiculid mites (Acariformes: Trombiculidae). Expl Appl Acarol. 49:261–280).

On 3 July 2017 at 1400h we found a single Northern Ring-Necked Snake (*Diadophis punctatus edwardsii*; ca. 18 cm) with approximately 300 larval chiggers sporadically aggregated and embedded between various ventral scales, and approximately 65 larval chiggers embedded between dorsal scales (Fig. 1). We noted severe dysecdysis, subcutaneous nodules, abnormal crusting, and epidermal and dermal degradation on dorsal caudal scales, and on the dorsal scales just anterior to the cloaca. The dysecdysis and nodules persisted anteriorly, but lessened in severity and became more patchily distributed on the anterior end of the snake (Fig. 2). We also documented two larval ticks crawling on the snake's mid ventrum. We found the snake on fallen deadwood next to a small stream in tuliptree (*Liriodendron tulipifera*)-loblolly pine (*Pinus taeda*) forest. The snake was moribund, had no righting reflex and did not respond when handled. Although it is widely known that squamates can host chiggers, published accounts of such a proportionally widespread infestation on one individual are scant. We hypothesize that this ectoparasitic infestation caused a systemic immune response that eventually, either directly or indirectly, lead to the death of the snake.

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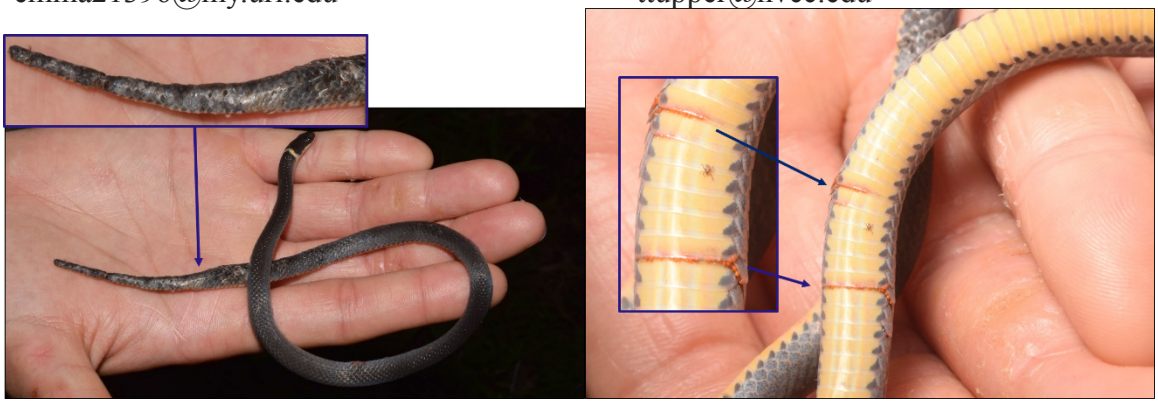
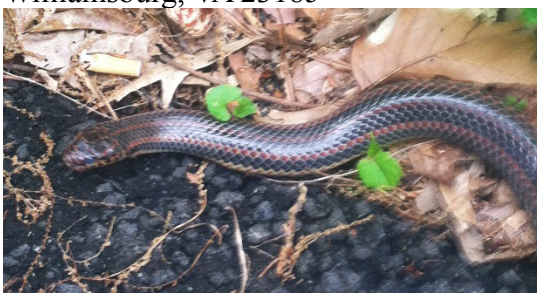


Photographs by R. Aguilar.

***Farancia erytrogramma* (Common Rainbow Snake)** VA: Williamsburg City, Yates Hall (37.271481 N, -076.716360 W) of The College of William and Mary. 13 April 2014. Dakota Hunter

County Record: The Common Rainbow Snake has a southeastern distribution in Virginia. It has been reported on the Lower Peninsula from the more northern Counties of James City and New Kent, but not the more southern York County or Newport News City. This report is for the City of Williamsburg, located between James City and York Counties. Shortly after a rain storm on 13 April 2014, a single meter-long specimen was observed crossing the asphalt path behind Yates Hall at the College of William and Mary. A fellow herpetology-lover, Erin Chapman, recently informed me that Rainbow Snakes had not yet been recorded in Williamsburg City, and encouraged me to submit the photograph I had taken of the snake to the VHS. This photograph was submitted to the VHS Archive (#445) and provides evidence of the snake's presence within the Williamsburg City limits.

Dakota Hunter
606 Conway Drive
Apartment 101
Williamsburg, VA 23185



Grapteymys pseudogeographica (**False Map Turlte**). VA: Fairfax County, Jackson Abbott Wetlands Refuge (38.727537, -77.133201). 5 August 2017. Matthew Ratcliffe.

Introduced Species: There is a large pond at Jackson Abbott Wetlands Refuge that is home to at least two turtle species - *Chrysemys picta picta* and *Trachemys scripta elegans*. I was there on 5 August 2017 with my son and saw two Painted Turtles basking on a log. They were scared off when I approached, so I decided to keep walking and wait to see if they came back up on the log after a little while, as I wanted to photograph them. After I had circled the pond, the Painted Turtles were back with a Red-eared Slider also on the log. After a few minutes, the Slider departed the log, and that's when the False Map Turtle took its spot as pictured. I'm not familiar with this species, but I noticed that this turtle had a carapace with an unfamiliar color and shape, and after getting a look at it with my camera, I knew it was one of the Map Turtle species due to the small ridges down the carapace.

This turtle is obviously a released specimen, since they are not native to Virginia but to the central United States (Ernst, C.A. and J.E. Lovich 2009. Turtles of the United States and Canada, Second Edition. The Johns Hopkins University Press, Baltimore, MD.827pp.). Pet trade introductions are known to occur well outside its natural range, including Europe (Ibid.). A photograph was submitted to the VHS Archive (#461) as a voucher of this observation.

Matt Ratcliffe

7782 Newington Woods Drive
Springfield, Virginia

***Lampropeltis elapsoides* (Scarlet Kingsnake)** New Kent County, Virginia. 17 & 18 May 2017. Exact location intentionally withheld due to risk of collecting pressures. Dane Conley and Jessica Johnston.

County Record: In Virginia, the Scarlet Kingsnake (*Lampropeltis elapsoides*) has only occurred in Bedford, Chesterfield, Nelson, Sussex, Virginia Beach, South Hampton and Pittsylvania Counties (Virginia Fish and Wildlife Information System database).

On 17 May 2017, while road cruising in New Kent County, a live snake was encountered on a country road around 9:30 PM. Based on the black banding fully encircling the ventral scales, 19 mid-dorsal scale count, coloration, and morphological appearance of the animal, it was identified as a Scarlet Kingsnake (*Lampropeltis elapsoides*). The snake's tail was examined and displayed characteristics that were indicative of a female: the tail was short and tapered quickly from the vent. The lower half of the body was robust and considering the time of year, the snake was likely gravid. The animal was temporarily held for photographs and then returned to the original capture location. On 18 May 2017, another Scarlet Kingsnake was encountered around 8:20 PM using the same method (road cruising), at the same location as the snake found on the previous night. This individual was identified as a male and held for approximately 24 hours for photos and species verification by Virginia State Herpetologist John Kleopfer of Virginia Department Game and Inland Fisheries. The habitat surrounding where the snakes were found is predominantly mixed pinewoods. Digital photographs were submitted as vouchers for this record (VHS Archive # 468 & 469)

May 17, 2017 Individual

May 18, 2017 Individual

Dane Conley and Jessica Johnston
Virginia Department of Game and Inland Fisheries
3801 John Tyler Highway
Charles City, Va. 23030

Lampropeltis triangulum triangulum (Eastern Milksnake) VA: Roanoke Co., Havens Wildlife Management Area (37° 20’ 19.33”N 80° 03’ 28.04”W). 25 May 2012. Alex Bentley.

County Record: A single *Lampropeltis triangulum triangulum* was observed during herpetofaunal surveying of the Havens Wildlife Management Area (WMA) in the active seasons of 2010, 2011, and early 2012. The snake, which was approximately 45cm in total length, was encountered under a cover board in an exposed area of the mountain at an elevation of 700 meters. This specific area is characterized by a deteriorated trailer home. Its immediate surroundings mostly lack vegetation and receive significantly more sun exposure than the densely forested areas that extends beyond this location. The surrounding forest is characterized by mostly young *Pinus, Acer,* and *Quercus*. A number of cover boards were present at this location prior to my activity in the area. During my surveying, *Agkistrodon contortrix mokasen* and *Crotalus horridus* were regularly encountered at this same site under cover boards and nearby rocks. A digital photograph was taken of this specimen and was deposited in the VHS archive (# 463). *Lampropeltis. t. triangulum* are secretive creatures and are therefore not often encountered even when they are common in a given area. Given the presence of large tracts of undisturbed habitat in this area and nearby regions to the north and west, it is possible that *L. t. triangulum* is more common in Roanoke County than previously thought.

Alex Bentley
Salem VA

Lampropeltis triangulum (Eastern Milksnake). VA: Roanoke Co., eastern slope of Mason's Knob (37°10'55.5"N 80°00'31.5"W. elev. 1300') 01 May 2017. Dennis Woodson.

County Record: The Eastern Milksnake (*Lampropeltis triangulum*) has a spotty distribution in Virginia, being most common in the western mountainous counties (Mitchell, The Reptiles of Virginia 1994. Smithsonian Institution Press, Washington DC. 352pp.) On the afternoon of 01 May, 2017, I found an adult (approx. 30" long) Eastern Milksnake DOR on Co. Rt. 688 (Cotton Hill Road) while driving to my house. The surrounding area is mixed hardwood with some shortleaf and white pine. I have lived in this location ten years, and this is the only Eastern milksnake I have found in the state of VA. Subsequent to the DOR find, a live Eastern Milksnake turned up in the kitchen of our home (6770 Musical Ln. Roanoke 24018) on 20 May 2017. I photographed then released the live snake on Blue Ridge Parkway property about a mile from our home a few days after I caught it. This is the first report of an Eastern Milksnake from Roanoke County (FWIS Database). They have been previously reported from Montgomery County to the west, Floyd to the southwest and Bedford to the east, but not Craig to the north or Franklin to the south. The photograph was submitted to the VHS Archive (#456) as a voucher.

Dennis Woodson
6770 Musical Lane
Roanoke, VA

Lampropeltis triangulum (Eastern milksnake). VA: Franklin Co., southern slope of Cahas Mountain 37°06’38.7”N 79°59’23.7”W. elev. 2200’) 14 May 2017. Dennis Woodson.

County Record: On the late evening of 14 May, 2017, I saw and photographed a portion of a young Eastern milksnake inside a rock crevice atop a massive rock outcrop in a rocky area of this south-facing slope of the eastern part of Cahas Moutain. The surrounding area is mixed hardwood with some shortleaf pine and lots of rhododendron and mountain laurel. This is the first report of the Eastern Milksnake from Franklin County (Mitchell, J.C. 1994. The Reptiles of Virginia. Smithsonian Institution Press. Washington DC. 352pp., FWIS Database) although records exist for Montgomery, Floyd and Patrick Counties to the west. This report thus helps fills a gap between these western counties and those farther east. A photograph was deposited in the VHS Archive (#464) as a voucher.

Dennis Woodson
6770 Musical Lane
Roanoke, VA 24018

***Pantherophis alleghaniensis* (Eastern Ratsnake)** VA: Buchanan Co., County Route 664 (37° 16’ 56.0”N 82° 12’ 57.9”W). 27 May 2017. Erin Chapman and Matthew Anthony.

County Record: Eastern Ratsnakes are one of the most widespread and common snake species in Virginia. Their presence is assumed in every county and city in the state, but in some localities remains unverified due to lack of surveying or recorded observations. One such pocket occurs in southwestern Virginia and includes the counties of Russell, Buchanan and Dickenson.

During a Memorial Day weekend trip, the authors passed a roadkill snake while driving through Buchanan County and, upon turning around to determine the species, discovered it was an Eastern Ratsnake. This represents a record for the county according to the Virginia Herpetological Society’s website and DGIF’s Fish and Wildlife Information Service Database. The authors photographed the road kill from the driver side window and continued on their way. The photograph was submitted to the VHS Archive (#440) as a voucher.

Erin Chapman

College of William and Mary

Center for Conservation Biology

Williamsburg VA 23185

***Pantherophis guttatus* (Red Cornsnake):** VA. Virginia Beach, 532 Holbrook Road. 14 April 2017. Rob Stanton and Julie Vaughn. *NOTE: Released pet. Record removed 07/31/2019

County Record: The Red Cornsnake has a central distribution in Virginia. While common in central Virginia, there is only one record in the southwest, in Scott County, and previously, no records in southeastern Virginia. The closest records to the southeast are from Gloucester, James City and Dinwiddie Counties. This report is for a new City record from Virginia Beach. On 14 April 2017 I found and photographed a Red Cornsnake in my yard at 532 Holbrook Road. After photographing the snake, it was released in an adjacent wooded area. The photograph was submitted to the VHS Archive (#443) as a voucher for Virginia Beach. This location would be an approximately 80 km extension to the southeast of the previously documented range for the Red Cornsnake. The bright colors and docile nature of the snake could indicate it is a released or escaped pet, and thus an introduction to the area.

Rob Stanton
532 Holbrook Road
Virginia Beach, VA

***Plestiodon laticeps* (Broad-headed Skink)** VA: Northumberland County, 1269 Pumpkin Hill Road, Burgess VA 22473 (N37,52,354 W76,22,065), 9 May 2017. Temple Moore.

County Record: The Broad-headed Skink (*Plestiodon* laticeps) has a wide but spotty distribution in Virginia. There are verified records from throughout the state, except for far southwestern counties (FWIS Database). This report is the first record of Broad-headed Skinks for Northumberland County. On 9 May 2017 at approximately 0900h, I found a recently deceased Broadhead skink which apparently had been run over, on our farm road in Northumberland County. The species has not been reported in Northumberland County in Mitchell and Reay (1999, Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries, Richmond ,VA) or Mitchell (1994, The Reptiles of Virginia, Smithsonian Institution Press, Washington DC . 352 pp). I have reported this species previously to VADGIF for the Wildlife Mapping program but without a photograph. There are previous reports of Broad-headed Skinks from Westmoreland County to the north, but not Lancaster or Richmond Counties to the south and west (FWIS Database). A digital photo of the specimen was submitted to the VHS archives (#457) as a voucher.

Temple Moore
Certified Virginia Master Naturalist
207 N Fairfax Street
Alexandria VA 22314

***Pseudemys ribriventris* (Northern Red-bellied Cooter)** VA: Fauquier County, Germantown Lake 10 km southeast of Warrenton at the end of Rouges Road, Co. Rt. 602 (38° 37' 18" N; 77° 43' 40"W) 11 June 2017. Cameron Jones

County Record: The distribution of the Northern Red-bellied Cooter in Virginia is the eastern third of the Commonwealth. It has been reported from most of the counties in northern Virginia including Prince William, Loudoun, Clarke, Warren and Fairfax. It has not, however, been previously reported from Fauquier County. This report fills a gap between these above mentioned counties to the north of Fauquier County.

On the morning of 11 June 2017 I was fishing in Germantown Lake when I noticed a large turtle basking in the branches of a tree limb laying in the Lake near the shore. I had frequently seen these large turtles previously, but this was the first time I was able to get close to one without its diving into the water. I got a series of photographs of the specimen and sent them to the VHS Identification Page to verify it was a Northern Red-bellied Cooter. The identity of the Cooter was verified and I was informed there was no previous record of the turtle for Fauquier County. A digital photograph was submitted to the VHS Archive (#454) as a voucher for this new county record.

Cameron Jones
10552 Shenandoah Path,
Catlett, VA

Scincella lateralis (**Little Brown Skink**) VA: Buckingham Co., State Road 655, approximately 0.5 km west of State Route 20 (37°, 41', 01" N, 78°, 31' 08"W). 09 June, 2016. Luke Canipe.

County Record: On 09 June, 2016 at approximately 11:00h, my nephew, Luke Canipe (age 4) captured a Little Brown Skink at the edge of a wooded area behind his house. The skink was photographed and then released back to the point of capture. The photograph was sent to me and I identified it as a Little Brown Skink. I sent the photograph to Paul Sattler at Liberty University and VDGIF Herptologist J.D. Kleopfer, both of whom verified this identification. This observation of the Little Brown Skink is a new county record and has not been previously documented for Buckingham County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.) or the Virginia Herpetological Society Webpage. A digital photograph of the specimen was submitted to the VHS archives (#452) as a voucher.

William Flint
Department of Biology
James Madison University
Harrisonburg, VA 22807

Storeria dekayi **(Northern Brownsnake)** VA, City of Roanoke, Roanoke River Wasena Greenway in Wasena Park, 1119 Wiley Dr SW, Roanoke, VA July 8, 2016. Jennifer Carnes and Kristina Hollowell

County Record: While walking Northwest on the Roanoke River Wasena Greenway at 6:28 am at approximately mile marker 22.1, we observed a small brown snake on the asphalt of the greenway. Having a curiosity for snakes native to this area, I photographed the snake for future identification. The Virginia Herpetological Society confirmed that the snake is a Northern Brownsnake, which until this time has been unverified in the City of Roanoke. The Northern Brownsnake has a wide distribution primarily in eastern and central Virginia. The nearest verified records to the City of Roanoke occur in Botetourt County to the northeast and Patrick, Henry and Pittsylvania Counties to the south. A digital photograph was submitted to the VHS Archive (#453) as a voucher for this record.

Jennifer Carnes
4888 Frontage Rd.
Roanoke, VA 24019

***Storeria occipitomaculata occipitomaculata* (Northern Red-bellied Snake)**: VA, Montgomery County, (Preston Forest Subdiv.), Blacksburg (37.291664, -80.405450) 24 June 2017. Mary and Wayne Moore.

County Record: The Northern Red-bellied Snake has a wide distribution in Virginia, with most records occurring in eastern and central Virginia. On June 24, 2017, Mary found a small snake on our property just north of Blacksburg in Montgomery County. We live in a predominantly wooded development with hilly and rocky terrain. Our house is surrounded by grass lawns with deciduous and evergreen trees along with several sections of ground cover, and we have a large open meadow with tall grass and other vegetation. Since we have been seeing more than the usual number of snakes around our house lately, we decided to try to identify this visitor as with previous ones. We photographed the snake and sent the photos to the VHS to confirm the identification as a Northern Red-bellied Snake. The snake was then released on the property. There are records of Northern Red-bellied Snakes from Giles and Pulaski Counties to our west and Franklin County to the east, but no previous reports for Montgomery County. Photographs were submitted to the VHS Archive (#453) as a voucher to verify their presence in Montgomery County.

Wayne D. and Mary I. Moore
1712 Smithfield Drive
Blacksburg, VA

Storeria occipitomaculata occipitomaculata **(Northern Red-bellied Snake)** VA: Orange Co., Stone Woods, Unionville, VA (38° 13’ 40” N, 77° 52’ 24” W). 6 June 2017. Daniel Neff, Roger Neff, and Matthew Neff.

County Record: On 6 June 2017 an individual *Storeria o. occipitomaculata* was observed deceased and ventral-side up on the front porch; most likely killed by a cat or other predator. The observation of the Northern Red-bellied Snake is a new county record and has not been previously documented for Orange County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.). *Storeria o. occipitomaculata* was previously known in five counties surrounding Orange County: Madison, Culpepper, Spotsylvania, Louisa, and Albemarle (VAFWIS database). A digital photograph of the specimen was submitted to the VHS archives(# 451).

Daniel Neff
13095 Saint Just Road
Unionville, VA 22567

Storeria occipitomaculata occipitomaculata (Northern Red-bellied Snake) VA: Hanover Co., 13450 Cross Rd. (37.784329, -77.493521), and at 20280 Ben Gayle Rd. (37.963806, -77.662777) 15 May 2015 and 17 August 2015. Ralph Mills.

County Record: On May 15, 2015 I was checking under artificial cover hoping to find and photograph mole kingsnakes that I had previously located there, when I came across a single adult Red-bellied snake under a piece of tin about five feet inside of the woodline from the edge of a field. Digital photographs were taken. On August 17, 2017 I was checking under artificial cover on Ben Gayle Rd. for ground skinks when I found an apparent neonate Red-bellied snake under a small piece of tin about eight feet inside the woodline from the edge of a horse pasture. Digital photographs were taken of both snakes and submitted to the VHS Archives (#466 and 467) as vouchers. Northern Red-bellied Snakes have been found in virtually all the counties surrounding Hanover, so this records helps fill a gap in the distribution.

Ralph Mills

20280 Ben Gayle Rd

Beaverdam, VA 23015

Cross Rd. May 15, 2015

Ben Gayle Rd. August 17, 2017

Terrapene carolina carolina (Woodland Box Turtle) VA: Madison Co., Aroda (38° 20’ 20.3893”N 78° 11’ 20.6957”W). 28 July 2017. Matthew Eberhardt

County Record: The Woodland Box Turtle (*Terrapene carolina*) has a ubiquitous distribution in Virginia, being reported from all counties except Madison, Greene, King and Queen, Middlesex and Highland (FWIS Database). This report gives the first record for Madison County. A Box Turtle was spotted in our yard the summer of 2016 and not seen again until July 28, 2017. My daughter and I observed it leaving a bush and traversing approximately 50 meters across the lawn to arrive at a culvert on an adjoining property. We examined its underside and took two digital photographs. The turtle was a male, approximately 5” with red eyes and a concave plastron. This is the first verified sighting in Madison County and fills a gap in the known distribution in Virginia. This leaves only Greene County, adjacent and to the southwest of Madison, King and Queen, Middlesex, and Highland Counties without a verified record for the Woodland Box Turtle. A digital photograph was submitted to the VHS Archive (#459) as a voucher.

Matthew Eberhardt
Madison County Public Schools
Madison, Virginia

Terrapene carolina carolina **(Woodland Box Turtle)** VA: King and Queen Co., Elsom Mascot Rd, Mattaponi. 14 October 2017. Judith Old

County Record: I am reporting the first verified sighting of a Woodland Box Turtle in King and Queen County, VA . I came across a Woodland Box Turtle around 0200 h. I was walking my dogs and the turtle was on the other side of the fence from my dogs. I live on 15 acres made up of cleared and wooded land in King and Queen County. I left the turtle alone and it was gone the next day. Woodland Box Turtles have been reported from every county surrounding King and Queen except Middlesex to the east (FWIS database). I am submitting a digital photograph, taken that night as a voucher (VHS Archive #465).

Judith Old
1304 Elsom Mascot Rd.
Mattaponi, VA 23110

Trachemys scripta elegans (Red-eared Slider) VA: Montgomery Co., Duck Pond (37° 13’ 30.65”N 80° 25’ 44.35”W). 1 October 2016. Rick and Deb Barrow.

County Record: While feeding bread to ducks in the water from the gazebo at the Duck Pond, on Virginia Tech’s campus, we first observed large fish also competing for the crumbs, were joined by a single, large turtle. The turtle was also attracted to the breadcrumbs, and I fully zoomed in and photographed it while Deb threw crumbs.

I submitted the photograph to The Virginia Herpetological Society (VHS) to confirm our identification. The Red-eared Slider is not native to Virginia, but has been widely introduced from released animals sold through the pet trade. According to VHS documentation, the Red-eared Slider is verified in 24 Virginia cities and counties, but not Montgomery County where we observed it. The nearest verified locations are Tazwell, Smyth and Washington Counties to the west, and Amherst County and the City of Lynchburg to the east. Because of the large Virginia Tech student population and high public use of the Duck Pond, it is likely this animal is the result of releasing a pet store turtle. The digital photograph was submitted to the VHS Archive (#450) as a voucher for this record.

Rick and Deb Barrow
2035 Childress Rd
Christiansburg VA 24073

***Trachemys scripta elegans* (Red-eared Slider)** VA: City of Virginia Beach, Pleasure House Point Natural Area. 22 April 2017. Elizabeth and Sean King.

County Record: *Trachemys scripta elegans*, the Red-eared Slider is not native to Virginia, but due to large numbers of releases from the pet trade is now naturalized with breeding populations in many areas, often large population centers where the pet trade is more prevalent. On 22 April 2017 an adult Red-eared Slider was observed at 10:26 a.m. crawling from the Soft Beach Trail towards and into the Beach Trail Canal within Pleasure House Point Natural Area in the City of Virginia Beach. The area is located approximately 8.85 kilometers from Cape Henry and the mouth of the Chesapeake Bay. Digital photographs and a video recording were submitted to the VHS for verification. This is the first report of Red-eared Sliders for the City of Virginia Beach (FWIS Database). They have been reported previously from the City of Norfolk to the north, but no other cities surrounding Virginia Beach. A digital photograph of the specimen was submitted to the VHS Archive (#458) as a voucher.

Elizabeth King
3965 Shady Oaks Drive
Virginia Beach, VA

***Virginia valeriae* (Smooth Earthsnake):** VA. Pittsylvania County, Smith Mountain Lake Cooperative Wildlife Management Area (N 37° 03' 34.8"; W 79° 30' 59.8") 6 May 2017. Paul Sattler

County Record: The Smooth Earthsnake has a spotty distribution in the Piedmont of south-central Virginia. Mitchell (1994. The Reptiles of Virginia. Smithsonian Institution Press, Washington D.C. 122 pp.) lists records only in Danville City and Mecklenburg County. Since its publication, additional records for Bedford, Campbell, Franklin, Henry, and Amherst Counties have been found (FWIS Database). It is a small secretive snake and not likely to be found if deliberate searches are not made. I report here finding two Smooth Earthsnakes at Smith Mountain Cooperative Wildlife Management Area on 6 May 2017. The day was unusually cool and rainy for May, with an air temperature of 11°C at 10:30 hr which dropped to 9°C by 12:00. Since the day was cool it seemed likely most reptiles would be under cover, so I undertook a search in an area with numerous flat rocks. Both Smooth Earthsnakes were found under rocks and both appeared to be gravid females. This find in Pittsylvania County leaves only Halifax without a record in south-central Virginia. In North Carolina to the south of Pittsylvania County, Palmer and Braswell (1995. Reptiles of North Carolina. The University of North Carolina Press, Chapel Hill, NC. 412pp.) do not have records for Rockingham, Caswell or Person Counties, but below those there are records in Guilford, Alamance, Orange and Durham Counties. The Smooth Earthsnake thus appears to be a normal, but rare inhabitant of the Piedmont. A digital Photograph of one of the snakes was deposited in the VHS Archive (#433) as a voucher.

Paul Sattler
Liberty University
Department of Biology
Lynchburg, VA

Virginia valeriae **(Eastern Smooth Earthsnake)** VA: Rockingham County, 10375 Genoa Road Fulks Run (38 37 11 N 78 56 23 W) 1 June 2016. Ralph Bolgiano.

County Record: The Smooth Earthsnake has a wide distribution in eastern and central Virginia. This report is for a new record for Rockingham County. On the first of June 2016 I found a Smooth Earthsnake in my garden in Fulks Run. I photographed the snake and sent the photo to the Virginia Herpetological Society to confirm the identification and provide a new record for Rockingham County. Previous records exist for Shanandoah and Page Counties to the north, and Albemarle and Augusta Counties to the south, so this record for Rockingham County fills a gap in the known distribution. The photo was deposited in the VHS Archive (#446) as a voucher.

Ralph Bolgiano
10375 Genoa Road
Fulks Run, VA.

Erratum:

In Powers, K. 2017. Field Note, New County Record for *Plestiodon laticeps*. Catesbeiana 37(1): 54, it has been determined the lizard was misidentified and is actually *Plestiodon fasciatus*. A record for the Broad-headed skink for Roanoke County is thus invalid and still waiting to be found.

President's Corner

Greetings fellow herp enthusiasts,

The executive committee of the Virginia Herpetological Society (VHS) has deliberated and we have chose to stagger the release dates of the newsletter and Catesbeiana to be opposite each other. The point of this is to not take away the significance of either publication. That being said, we have a lot to cover from the surveys conducted earlier this year to the results our fall meeting.

First off, it is important to mention that the VHS is going into our 60th year as an organization. The VHS started in 1958 and we have come a long way since then. A great example would be our peer-reviewed journal Catesbeiana, which is in press as we speak and it will be the longest volume yet at 80 pages! Just this past year the VHS has joined with EBSCO host and now our journals will be open access which will enable Catesbeiana to reach a wider audience. This is a stark difference to the humble beginning when the VHS sent out Bulletins to our membership from 1958-1979. The Bulletin then metamorphosed into our journal Catesbeiana from 1981-present. Catesbeiana's inaugural issue had 19 pages and contained a larval salamander key, an article on captive management of Virginia's watersnakes, and herpetology notes of male combat in copperheads and ratsnakes and the occurrence of the mountain chorus frog in Virginia (which can be viewed here). A big part of the current issues are new herpetological county records, results from VHS grant funded projects, and results from the surveys held the previous year. Keeping that in mind, I would like to extend a big thanks to Kory Steele, Dave Perry, and Jason Gibson for hosting surveys this past year.

Dave Perry organized the Big Woods Wildlife Management Area/State Forest Surveys in Sussex County, Virginia. These surveys were conducted on Sunday, April 23 and Sunday, May 7 which had 10 and 14 participants respectively. The results of both surveys documented 33 species of herps (18 amphibians and 15 reptiles). These two survey days resulted in two new county records: the White-spotted Slimy Salamander (Plethodon cylindraceus) and Eastern Mud Salamander (Pseudotriton montanus).

I organized the Mole Hill Survey in Rockingham County, Virginia on Sunday, May 14. I was hoping the unique basalt rock formations would lead to some interesting salamander finds, but unfortunately only 3 species of herpetofauna were found: 1 Northern Ring-necked Snake (*Diadophis p. punctatus*), 2 Eastern Gartersnakes (*Thamnophis s. sirtalis*), and 136 Red-backed Salamanders (*Plethodon cinereus*).

Kory Steele organized the Spring Survey - BioBlitz 2017 on May 19-21 at Newport News Park in the city of Newport News, Virginia. There were 41 people in attendance that found 393 individuals of 36 species. Some highlights were a Two-toed Amphiuma (*Amphiuma means*) and 2 individuals of the state threatened Mabee's Salamander (*Ambystoma mabeei*). An albino Eastern Wormsnake (*Carphophis a. amoenus*) was found as well.

Jason Gibson organized the 12th Annual HerpBlitz June 10-11 at Hidden Valley Wildlife Management Area in Washington County, Virginia. Seven participants found over 400 individual herps of 20 different species. The highlight of this excursion was finding a new population of Green Salamanders (*Aneides aeneus*) which was discovered during a night hike on a rocky outcrop.

We sure had a productive year as we went into our fall meeting where we had 9 presentations and two poster presenters. After the conclusion of this fall's meeting we had elections and I would like to introduce you to our newly elected officers.

After serving a two-year term for President, Michael Salotti will now play the role of the VHS's Past President. Michael is also heading a newly formed Membership Outreach Committee. This committee will be responsible for reaching out to new potential members as well as keeping current members active and engaged. Michael – thank you for your service.

Travis Anthony was elected as our new Vice President. Travis became interested in herpetology during graduate school at Missouri State University, where he earned his M.Sc. in biology studying the reintroduction success of alligator snapping turtles and freshwater turtle ecology. He earned his bachelor's at the University of Maryland with a B.S. in Environmental Science and Policy. Travis currently works for the Henrico County Police Animal Protection and serves as an adjunct instructor of biology at Reynolds Community College.

Matt Close was re-elected as Treasurer. He is currently an Assistant Professor at Radford University whose research expertise ranges from functional morphology to the ecology of reptiles and amphibians in the Appalachian bioregion.

Dave Perry was re-elected as Secretary. Dave has been involved with the VHS since 2009 and has served in many positions such as: Vice President (2011-2013), Treasurer/Secretary (2013-2015), Secretary (2015-current) and heads the Conservation Committee. Dave also conducts the Conservation Committee Surveys twice a year.

Bonnie Keller has been appointed to the position of Newsletter Editor. Bonnie has been involved with the VHS since 2002 and has served on the Advisory Committee (2015-present).
Susan Watson is heading the newly formed Permits Committee after serving as Newsletter Editor for 8 years (2009-2017). Under this new position she will take care of the permits required by the Virginia Department of Game and Inland Fisheries (VDGIF) to conduct herpetological surveys as well as entering newly found county records into the VDGIF database.

Larry Mendoza is heading the Regulatory Affairs Committee formed earlier this year. Two things Larry has tackled already: giving guidance to officials in Arlington County on the ban of non-venomous snakes over 4 feet long and Richmond's attempt to ban many types of exotics including venomous snakes.

For those of you whom I have not had the pleasure to meet, let me introduce myself. I served as the Vice President of the VHS from 2015-2017. I currently work in the Department of Herpetology at Smithsonian's National Zoo, where I have been since 2011. You may have seen me at a few of the surveys I led: 2016's Quarry Gardens Survey and Dixie Caverns Survey as well as this past year's Mole Hill Survey. I have been interested in herpetology for as long as I can remember. Late one winter evening when I was just five years old I went out with my dad and hiked by flashlight to check out wood frogs and spring peepers calling. Something resonated with me that night and I was hooked ever since. I am honored to serve as president of this great organization as we are going into our 60th year.

I have a few goals that I would like to accomplish over the next two years.
1. Members-only surveys. I would like to continue the tradition of the Vice President coordinating and running members only surveys at least once a year. This will not only be a benefit for our wonderful VHS members, but also give the Vice President the experience of planning surveys (which is no easy task) which will be invaluable when running for president or another committee position in the future.

2. Fall surveys. Our surveys throughout the year are usually focused towards the beginning of the year from late April to early June. Offering a survey in the fall gives our members another season to participate in fieldwork after the absence of VHS activities during the summer months.

3. Expanding membership. This is a topic that always comes up and we have been great at retaining members, but it would be great to reach out to new groups that have never heard of the VHS before. There are many groups out there such as Virginia Master Naturalists as well as other environmental groups in local universities and colleges that would be a great addition to the VHS. Thankfully Mike Salotti's outreach committee will be a great fit for this task.

4. Un-surveyed counties. In the 60 years that VHS has been an organization there are still many counties that have gone un-surveyed. Virginia has 95 counties and the VHS has surveyed just under 70. It should be noted that a fair number of the counties, such as Orange, Clarke, and Goochland, have very little to no public land. Records from these counties are based on what private landowners submit. It will be a goal to start holding surveys in un-surveyed counties with public land such as wildlife management areas and state parks. Eventually when those are exhausted we could reach out to interested land owners to survey their property to fill in Virginia's gaps of species accounts.

5. Continue large scale projects. During the past term the VHS was able to fund a substantial, searchable bibliography by renowned Virginia herpetologist, Joe Mitchell entitled "Bibliography of Virginia Herpetology". This bibliography totals more than 300 pages. There are a few options in the works which will contribute and expand the knowledge of Virginia's herps. One potential is publishing the Amphibians of Virginia which will complement Mitchell's 1994 book "The Reptiles of Virginia". Whether the Amphibians of Virginia project would be in book form or released online is to be seen, but an exciting prospect nonetheless.

6. Growing the executive committee. The VHS has a lot of past leadership in committee roles which shows how great the organization is if people stick around. However, adding new people to advisory roles would be a great way to give interested members a taste of the inner workings of the VHS. This experience may one day lead an individual to serving in a leadership role or an elected position down the line.

7. Research grants. Virginia has a lot of stellar colleges and universities and I would like to reach out to more schools and fund more research projects that focus on Virginia's herpetofauna.

I would also like to mention that although Autumn is still in full swing, we already have our 2018 Spring Survey on the books. The survey will be held on Saturday and Sunday, May 19 and 20 at Lake Anna State Park in Spotsylvania County, Virginia. The business meeting will be held the evening before on Friday, May 18. This park is over 3,000 acres with a variety of habitats to

target different herp species. Spotsylvania County has not yet been surveyed by the VHS and there is a potential to get several new county records. It should be noted that this is the weekend before Memorial Day which will be very busy, so book your accommodations ahead of time! There are also a few hotels and other campsites within 20 minutes of the state park.

I am very excited to serve as president of this great organization and am not only excited for the next two years, but the next 60 as well!

Sincerely,
Matt Neff
president@vaherpsociety.com

Oral Presentations at the Fall 2017 VHS Meeting:

Novel Hylid survey technique: A clear alternative to traditional Polyvinyl Chloride pipe refugia - Sarah McGrath, James Madison University

A shell geometry ratio model for inferring habitats in extant and extinct Testudines - Dr. George Argyros and Benjamin Sexton, Emory and Henry College.

Applications of non-invasive epithelial body swabbing in Amphibians - Drl George Argyros, Brandon Gearhart and Erin M. Kirk, Emory and Henry College.

Rehabilitation of Eastern Box Turtles - Kelli Hughart, AWARE

Identification of Italian Wall Lizards (*Podarcis sicula*) in Loudoun County, VA - Brad Haak

Anuran call survey of Mason Neck State Park - Kwanhyo Kim, George Mason University.

Dixie Caverns survey and the Wehrle's Salamander - Matt Neff, Smithsonian National Zoo.

Revolutionary methods of telemetry for the ecological study of Box Turtles - Dr. Bryan A Cage, James Madison University.

Reptiles in the classroom - Bonnie Keller, VHS.

Virginia Herpetological Society
Annual Spring Meeting, May 19, 2017
Newport News Park, Newport News, VA
Minutes of Meeting

The meeting was called to order by Mike Salotti, VHS President, at 6:11pm with 21 members in attendance. Mike provided an update on the "Bibliography of Virginia Herpetology" completed by Joseph Mitchell. This was placed on our website in January, and is available in a searchable PDF format. Public sharing of this document was discussed and it was agreed that use is acceptable as long as permission is asked beforehand and no commercial profit is obtained by the individual. The VHS will work on adding new citations from this point forward and determine during the Fall Meeting if a committee is necessary to handle this task.

The newest publication of "A Guide to the Snakes and Lizards of Virginia" is now available. VaDGIF has made copies available for the VHS to sell during the Bioblitz this weekend.

Committee Reports:

Newsletter: Susan Watson-Joellen Welch recently resigned from her position. Recommendations for a replacement are welcomed. A draft of the current newsletter is available and should be ready for publication by the end of the summer.

Catesbeiana: Paul Sattler-Recently sent out our current journal, roughly 70 pages in length. He has about 6-10 field notes submissions for the next journal, as well as 3 articles. Paul requests that when submitting your articles or notes, please avoid using automatic formatting such as numbering, bullets, and paragraph indents. This causes problems when he formats the file to fit the journal template. He also has decided to start publishing the permit number at the end of the article to show that necessary protocols were followed.

Education: Mike Clifford-Not in attendance.

Cafe Press: Kelly Geer-Not in attendance.

Treasurer: Matt Close-Not in attendance, but an up-to-date report is available in our current Catesbeiana. As of April, our member count is at 163.

Secretary: David Perry-Not in attendance, but the minutes from the Fall Meeting have been published in our current Catesbeiana.

Website: John White-Recently redesigned the website. He will need to step away from Facebook and animal identification requests to spend more time on the website. Our Facebook page currently has 5,344 followers.

Grants: Kory Steele-Funds for three grants were provided this year . The grant recipients were Becker, McGrath, and Salter. They are working on revisions of the guidelines and should be up and running for the next round of grant submissions.

Conservation: David Perry-Not in attendance, but report provided. Survey at the Big Woods Forest WMA was completed on April 23 and May 7, 2017. A total of 33 species were documented, including the newly identified Atlantic Coast Leopard Frog. David reports that three Sussex County records have been documented: the eastern mud salamander, four-toed salamander, and a white-spotted slimy salamander.

HerpBlitz: Jason Gibson-The next HerpBlitz is scheduled for June 10-11, 2017 at the Hidden Valley WMA in southwestern Virginia. This will be a small survey group and expected species include turtles, hellbenders, and green salamanders. Primitive camping is available on-site and there is a nearby campground and hotels for alternative accommodations. This will be the 12th scheduled HerpBlitz.

New business up for discussion:

EBSCO: The VHS has been approached by EBSCO to include Catesbeiana in their list of journals. They are an indexing service that provides searchable and printable PDF versions of scientific journals to its members. The society would make 20% profit from the fee charged to the members of EBSCO for each download. Paul will have a lawyer review the contract to determine if this is a feasible partnership. It was agreed during the meeting that the VHS should retain full copyright over all journals and continue posting on our website. Will also determine if EBSCO can accept PDF files of scanned images and not just files of text.

Regulatory Affairs Committee: It was discussed if we have the need for a new committee to attend any meetings regarding state, federal, and local regulations. This new committee would represent the VHS and keep the society up-to-date on current laws. Larry Mendoza has attended meetings in the past and it was agreed he should run the new Regulatory Affairs Committee.

Bans: Discussion was held on whether the VHS should involve themselves in proposed herpetofauna bans. An example is Arlington County, where the VHS responded to the regulation banning pet snakes over four feet. It was determined that the VHS should review the bans as they come up and determine involvement on a case by case basis, definitely if native species are involved.

Social media: Should our journals and newsletters go on social media for the public to obtain or should we continue to send to the members first? Although listed as a member benefit, it was determined posting on social media helps the VHS accomplish our goal of educating the public. There are member benefits such as specialized surveys and all membership payments help fund grants and other goals of the society.

Open discussion: Consider paying for Facebook ads to help gain awareness for special events. Will determine this need at our next meeting. Future survey sites to consider are counties not yet visited, the 3 or 4 WMA not yet visited, and still consider Lake Anna and the George Washington National Forest. Will discuss in further detail at the Fall Meeting. Nominations for elected positions are due in the Fall. President, vice president, secretary, and the treasurer positions are open for election. Jason will head the nominating committee and present the nominations for vote at the Fall Meeting.

The meeting concluded at 6:50pm and a presentation by Jason Gibson was given to discuss what species to expect in the 7,000acres of Newport News Park. Jason encouraged obtaining photo documentation of any diseases or malformations, and bring back any significant species for public exhibit during the afternoon on Saturday.

Minutes taken by: Emily Steele

Virginia Herpetological Society
Annual Business Meeting, 04 November 2017
VDGIF Headquarters, Henrico, VA
Minutes of Meeting

Mike Salotti, President of the Virginia Herpetological Society (VHS), opened the meeting at approximately 17:22 hr. EDT and provided the agenda for the meeting.

News

1) New Committee Formed-Regulatory Affairs Committee

Mike Salotti indicated that at the Spring Business Meeting, a decision was made to form a new committee focused on regulatory affairs and Larry Mendoza was appointed Regulatory Affairs Chair. The Regulatory Affairs Committee would focus on local ordinances that might impact any aspect of herpetology.

2) Catesbeiana Schedule Change

The new schedule for publication of Catesbeiana will be after the Spring Survey and after the Annual Fall Business Meeting. Paul Sattler, Editor of Catesbeiana, will target November and June for publication.

3) New Amphibian Egg Identification Keys page on our website

John White, VHS Webmaster, has developed identification guidelines for amphibian eggs which will be maintained on the VHS website.

4) VHS Webmaster Opening

After approximately 20 years of outstanding service to VHS as Webmaster, John White has indicated a desire to resign. It will be very difficult to replace John and there is no obvious candidate who can assume the Webmaster position. In the short term, Mike Salotti could help with event announcement postings etc. Bonnie Keller is also willing to assist on an interim basis. John White is also willing to assist in the transition. Some action items include:

-Obtain John's log-in information and guide sheet for the timing of major website upgrades.
-Poll VHS membership to identify potential IT experts who might have an interest in the VHS Webmaster position.
-Explore the future need for a second domain and whether one can be eliminated.

Committee Reports

Newsletter Report

Bonnie Keller has been appointed Editor of the VHS Newsletter. Many thanks are due to Susan Watson for her dedicated commitment to the VHS Newsletter over the last several years. Some VHS Executive Committee members had in the past expressed a desire to increase the frequency of publication from two to three issues per year to maintain membership interest. Bonnie will determine the future frequency of publication in part based on content. Some sources of content would include VHS membership, new herpetological publications and feeds from professional

journals. A decision will be made at a future date about the possibility of adding a person to assist Bonnie

Catesbeiana
Paul Sattler, Editor of Catesbeiana, reported Volume 37, No.2 will soon be sent out. It will contain 80 pages, which is a volumetric record. There will be 34 field notes included. Paul believes the VHS identification page is the most likely source of the substantial increase in county record observations. He remains committed to a policy of the observer being the sole author but there is a lot of personal work involved in clarifying field observations submitted by non-scientists. Matt Close, VHS Treasurer, volunteered to help with southwest Virginia field notes. One suggestion for reducing the workload was the possibility of adding Paul to the identification page email listing. Two survey drafts have already submitted for Vol. 38 No. 1

Education
Mike Clifford, Education Committee Chair, provided a written copy of the annual Education Committee Report in advance of the meeting. New master naturalist candidates in the 28 Virginia Master Naturalist (VMN) Chapters participate in a lengthy series of training sessions, typically including about three hours of herpetology instruction. In the time period of October 2016 to October 2017, VHS members Mike Clifford, Tim Christensen, Paul Sattler and Susan Watson conducted a combined total of 11 VMN herpetology training sessions. Also during this time period, VHS members Mike Clifford, Jason Gibson, Larry Mendoza, Paul Sattler and Susan Watson made a combined total of 11 educational presentations to a variety of other groups and organizations. Nine of these included an exhibition of live snakes and/or salamanders.

Café Press
Kelly Geer, Café Press Coordinator, did not attend the meeting and did not provide a committee report prior to the meeting. The status of Cafe´ Press will be evaluated by the next administration.

Treasurer
Matt Close, VHS Treasurer, provided a written copy of the Treasurer's Report dated October31, 2017. The current cash balance is $11,910.26. The balance does not include one grant check for $500, which was not cashed prior to the meeting. Current VHS Membership (dues current) is 183. This does not include lifetime members. For future Treasurer's reports Matt will include current dues, lifetime and total membership tallies. Revenue from the sale of BioBlitz T-Shirts totaled $972 and VHS netted approximately $300 on these sales. Several executive committee members noted that the VHS cash balance is impressive, given the past spending for large projects such as Joe Mitchell's bibliography, herp display cases and VHS research grants. Continuation of VHS Membership Cards was discussed and it was left for the next administration to decide how to proceed.

Secretary
David Perry, VHS Secretary, thanked Emily Steele for recording the minutes from Spring Survey Business Meeting, which he could not attend.

VHS Grants
Kory Steele, VHS Grants Chair, reported that there would be no advertising for 2018 grant awards as he would prefer to get fewer research grant requests and fund them all. One grant request was turned down in 2017. He will continue to email the grant approval form to the executive committee, even though some members may choose not to comment or vote. A grant tracking system will be developed as time permits.

Conservation Committee
David Perry, VHS Conservation Chair, reported the first draft report on the April 23 and May 7 surveys of Big Woods Wildlife Management Area and State Forest had been sent out for editorial review. VHS volunteers documented 33 species including 5 with conservation tier status and 3 new county records.

Survey Committee
Jason Gibson, VHS Survey Committee Chair, did not attend the meeting but Paul Sattler indicated that the HerpBlitz would probably target southeast Virginia for 2018.

Regulatory Affairs Committee
Larry Mendoza, Regulatory Affairs Chair could not attend the meeting but filed a written report with Mike Salotti prior to the meeting.
A) Arlington-Arlington tried passing a ban on certain non-venomous snakes (venomous snakes are already banned) over 4 feet long. The VHS, through the Regulatory Affairs Committee in conjunction with other stakeholders, developed guidelines for the keeping of large boids which included primarily caging requirements. It was a very long and concerted effort, but eventually the board of supervisors in Arlington agreed with many of the suggestions and amended the ordinance to include our recommendations. It was a good compromise that appeased the fear factor of large boids and educated the board members on the benefits of keeping snakes as pets to promote an interest in both conservation and STEM education in the general public.
B) Richmond-Richmond City Council, upon the recommendation of the Director of Animal Control, is trying to pass a ban on many types of exotics, including the keeping of venomous snakes. The VHS, through the committee has contacted the City Council as well as the Director of Animal Control to express concerns about the ordinance that is also in conflict with state regulations. I'm trying to help Animal Control draft an ordinance that will require caging requirements for the keeping of venomous snakes and to educate them on empirical and statistical evidence of both "perceived risk" and "actual risk" of keeping venomous snakes and how it affects public safety. The Director of Animal Control has decided to pull the ordinance and will be redrafting it. I'm in the process of trying to get a meeting with the Director to see if we can be part of the ordinance writing efforts to develop a well-rounded but fair and empirically satisfactory ordinance. For now, the ordinance has been pulled and we're waiting to see what happens next. The Director will certainly resubmit a new ordinance and hopefully it will have VHS' input. If it doesn't, then I will suggest to the City Council to vote the ordinance down as it will impact the VHS in its educational efforts.

New Items

Mike Salotti introduced some new business topics.

VHS Archive

Paul Sattler made a slide presentation on the VHS Archive located at Liberty University. Included in the Archive are hard copies of all past issues of Catesbeiana, some VHS Newsletters, records of the Central VA Herpetological Society (previously part of VHS with an emphasis on non-native species), photo archives including prints, 2"x 2" slides, digital archives, correspondence of the VHS founding fathers and a 1958 VHS patch. These items are available for inspection or use in the event of a future need by VHS membership. Kory Steele suggested that either a physical (hard disk or USB drive) or digital (Cloud or Google) backup be maintained in a separate location. This could be a future project for the next VHS Webmaster.

Frogs of Virginia and Salamanders of Virginia by Joe Mitchell

"The Reptiles of Virginia" by Joe Mitchell is considered to be the most comprehensive analysis of Virginia reptiles published to date. Around the time of publication, Chris Paige was supposed to publish a similarly comprehensive analysis of the amphibians of Virginia. Significant species data was collected and is maintained in file cabinets by Joe Mitchell. Paul and Jason Gibson are advocating for VHS funding for Joe to complete the project that would result in the eventual publication of "The Amphibians of Virginia". The project could be done in stages, beginning with anurans. Individual species accounts could be funded if there are VHS financial constraints. There was some discussion and different opinions about the potential value of individual species accounts in the event the entire project was not completed. It was agreed that the next VHS Administration should obtain a projected hours and dollar estimate for an individual species account and decide how to proceed. The pursuit of a VDGIF grant was also raised as a possibility.

Exotic Herps

Bonnie Keller expressed that viewpoint that VHS was somewhat unique among Herpetological Societies in its focus on native species. While this native herp focus is admirable, Bonnie knows some exotic (non-native) herpetologists who feel they are not welcome within the VHS. Kory Steele countered that this is not the case and added that the newly formed Regulatory Affairs Committee would most likely be primarily involved in combating ordinances that primarily affect exotic species. David Perry pointed out that VHS was assertive in objecting to the Commonwealth's efforts to develop restrictions for exotic pets after the Ohio escape incident. Kory suggested that a part of the VHS Newsletter or the the VHS website, Bonnie could publish guidelines on safe animal husbandry as way to increase VHS appeal to exotic herpetologists.

New Committee: Community Outreach Committee

Mike Salotti announced the formation of a new committee, the Community Outreach Committee. This committee would have two primary objectives:

1) Membership Affairs (membership cards, membership benefits, renewal reminders)
2) Facebook® Page

Mike Salotti was appointed Community Outreach Committee Chair. Mike proposed that we

change membership from a calendar year to a full year anniversary date system. Monthly membership renewal reminders would be sent out each month for those with expiring memberships. This system would insure each member would enjoy a full year of membership benefits. It was unclear if the VHS Constitution would need to be amended. A majority voted to amend the VHS Constitution, if necessary, and adopt the full year anniversary date system. Mike indicated the Community Outreach Committee would advertise on the VHS Facebook® page to recruit new membership.

2018 Surveys

Matt Neff confirmed that the 2018 Spring Survey will be held at Lake Anna State Park on May 18, 19 & 20. Camp sites are available but should be reserved now. There are no cabins but Lake Anna will also make available at no charge a three bed, two bath bunk house which can also accommodate additional sleeping bag cots. Species documentation for Spotsylvania County is weak and there should be a good opportunity to document new county records. The business meeting room will have internet access and will accommodate a projector.

New Advisory Committee-Member Suggestions

This committee will be designed to prepare VHS members for future officer positions. The next administration will be tasked with developing membership for this committee.

Elections

Officers were elected for the next two year period as follows:
1) President-Matt Neff
2) Vice President-Travis Anthony
3) Treasurer-Matt Close
4) Secretary-Dave Perry

Presidential Priorities

Matt Neff, VHS President, outlined some of his administrative priorities: 1) Members-only surveys,2) Autumn surveys, 3) Expanding membership, 4) Outreach to other groups (Master Naturalists etc.), 5) Large scale projects (The Amphibians of Virginia etc.) 6) Un-surveyed counties and 6) Research grants

There being no other business to discuss, the meeting was adjourned by Matt Neff at approximately 19:00 hr. EDT.

David A. Perry
VHS Secretary

Virginia Herpetological Society
Treasurer's Report
Oct 31, 2017

Previous Report Balance – April 27, 2017	$ 10,491.38
Net Receipts (excludes PayPal fees):	
April Dues (from Apr. 27)	$ 61.00
May Dues	$ 384.00
June Dues	$ 159.00
July Dues	$ 83.00
August Dues	$ 150.00
Sept Dues	$ 68.00
Oct Dues	$ 249.00
Donations	$ 25.00
CafePress Commission	$ 28.51
Amazon Smile Credits	$ 72.65
BioBlitz T-Shirt Sales	$ 972.00
Total Net Receipts	$ 2252.16
Disbursements:	
2017 BioBlitz T-shirt Order	$ 675.40
2017 Survey Supplies-misc.	$ 81.51
Facebook Advertisements	$ 10.05
Postage Stamps	$ 6.65
PayPal Fees (Apr 28-Oct 31)	$ 62.24
Total Net Disbursements	$ 875.39
Current BB&T Balance	$ 11,710.26
Current PayPal Balance	$ 200.00
Current Total Balance	$ 11,910.26
Pending:	
VA Exhibitors Special Permit	$ 10.00
Spring Catesbiana Postage	$ 28.66
2017 Survey Supplies-traps	$ 15.38
2017 VHS Grant-in-Aid	$ 500.00

VHS Regular Members (2017 dues current): 147
VHS Student Members (2017 dues current): 36
VHS Life Members: 49

Matthew Close
VHS Treasurer

Literature of interest to Virginia Herpetology:

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Richardson, C., T. Messa, and M.S. Mills. 2017. Testing the effectiveness of bait types on trapping freshwater turtles in Missouri. Herp. Review 48(2): 331-333.

Gray, M.J. et al. 2017. Pathogen surveillance in Herpetofaunal populations: Guidance on study design, sample collection, biosecurity, and intervention strategies. Herp. Review 48(2): 334-351.

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Duffus, A.L.J., H.M.A. Fenton, M.J. Gray and D.L. Miller. 2017. Investigating amphibian and reptile mortalities: A practical guide for wildlife professionals. Herp. Review 48(3): 550-557.

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Field Notes

The field notes section of *Catesbeiana* provides a means for publishing natural history information on Virginia's amphibians and reptiles that does not lend itself to full-length articles. Observations on geographic distribution, ecology, reproduction, phenology, behavior, and other topics are welcomed. Field Notes will usually concern a single species. The format of the reports is: scientific name (followed by common name in parentheses), state abbreviation (VA), county and location, date(s) of observation, observer(s), data and observations. The name(s) and address(es) of the author(s) should appear one line below the report. Consult the editor if your information does not readily fit this format. All field notes must include a brief statement explaining the significance of the record (e.g., new county record) or observation (e.g., unusual or rarely observed behavior, extremely early or late seasonal record, abnormal coloration, etc.). Submissions that fail to include this information are subject to rejection. Relevant literature should be cited in the body of the text (see Field Notes in this issue for proper format). All submissions will be reviewed by the editor (and one other person if deemed necessary) and revised as needed pending consultation with the author(s).

If the field note contains information on a new county (or state) record, verification is required in the form of a voucher specimen deposited in a permanent museum (e.g., Virginia Museum of Natural History) or a photograph (print, slide, or digital image) or recording (digital recording of anuran calls) deposited in the archives of the Virginia Herpetological Society. Photographs and recordings should be sent to the editor for verification and archiving purposes; the identity of voucher specimens must be confirmed by a museum curator or other qualified person. Include the specimen number if it has been catalogued. Prospective authors of distribution reports should consult the VHS website (County/City Herp Lists) to determine if they may have a new county record. New distribution records from large cities that formerly constituted counties (Chesapeake, Hampton, Newport News, Suffolk, and Virginia Beach) are acceptable, but records from smaller cities located within the boundaries of an adjoining county will only be published if the species has not been recorded from that county. Species identification for observational records (e.g., behavior) should be verified by a second person whenever possible.

PHOTOGRAPHS

High contrast photographs (digital images) of amphibians and reptiles will be considered for publication if they are of good quality and are relevant to an accompanying article or field note. Published photographs will be deposited in the Virginia Herpetological Society archives.

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