

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.

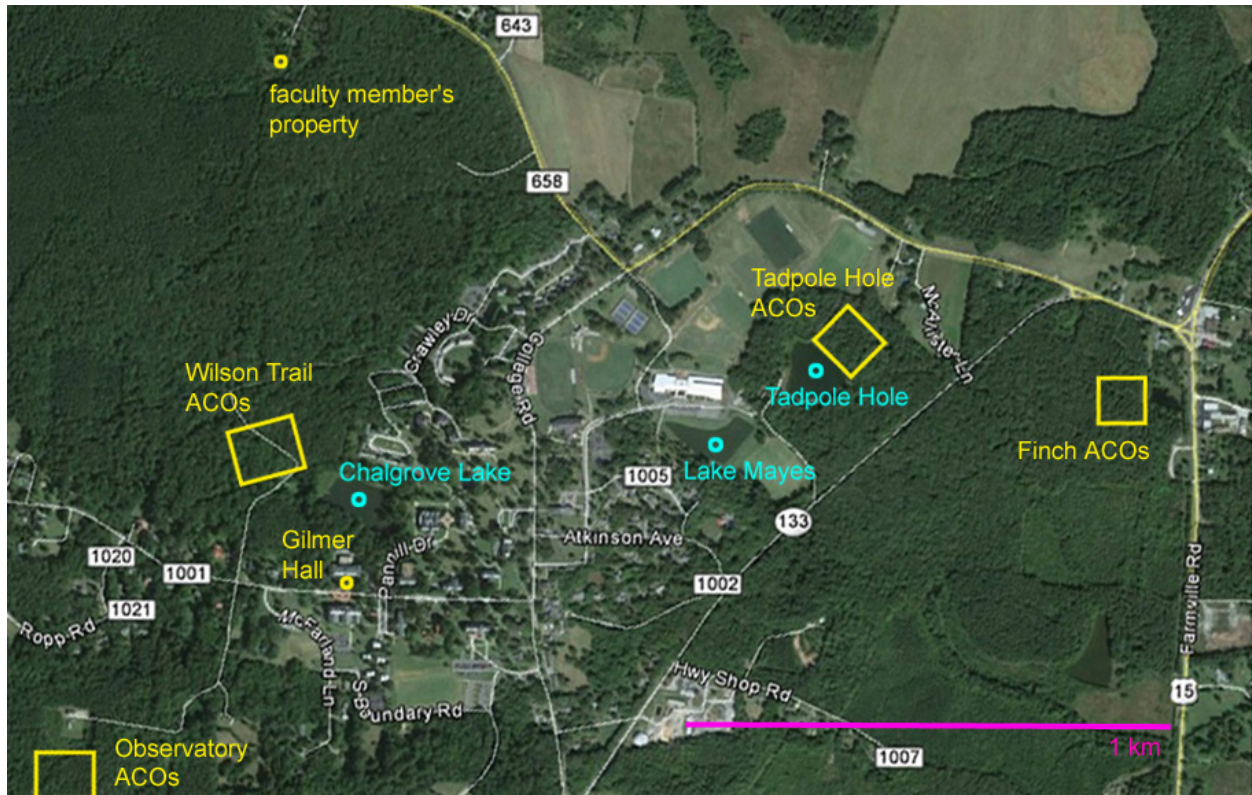
Methods

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

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

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B. Reptiles

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

Species	Site	N	Mass (g)		SUL (cm)	
			Mean (SD)	Min - Max	Mean (SD)	Min - Max
<i>Acris crepitans</i>	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
<i>Anaxyrus fowleri</i>	Chalgrove	14	18.7 (6.1)	5.3 - 25.8	4.9 (1.1)	2.2 - 5.8
<i>Lithobates catesbeiana</i>	Chalgrove	3	4.1 (0.9)	3.5 - 5.2	4.5 (1.2)	3.1 - 5.5
		1	3.1 (--)	--	3.0 (--)	--
<i>Lithobates clamitans</i>	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
<i>Lithobates palustris</i>	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
<i>Pseudacris crucifer</i>	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 (*Pseudemys 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.

Species	Site	N	Mass (g)		Carapace Width (cm)		Carapace Length (cm)		Plastron Length (cm)		
			Mean (SD)	Min - Max	Mean (SD)	Min - Max	Mean (SD)	Min - Max	Mean (SD)	Min - Max	
<i>Chelydra serpentina</i>	Tadpole	2	2070 (--)	1080.0 - 3060.0	17.4 (--)	14.7 - 20.0	20.9 (--)	17.3 - 24.4	14.9 (--)	12.1 - 17.6	
	Hole	1	776.0 (--)	--	12.8 (--)	--	14.2 (--)	--	10.5 (--)	--	
<i>Chrysemys picta picta</i>	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
	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
	Lake	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
		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
<i>Sternotherus odoratus</i>	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
	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
	Lake	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
		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
<i>Pseudemys concinna</i>	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.

Species	Life stage / Sex	N	Mass (g)			SVL (cm)			TL (cm)		
			Mean (SD)	Min - Max	Mean (SD)	Min - Max	Mean (SD)	Min - Max			
FOUND UNDER ACOs											
<i>Carphophis amoenus</i>	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			
<i>Coluber constrictor</i>	Undetermined	1	305.0 (--)	--	100.0 (--)	--	26.5 (--)	--			
<i>Diadophis punctatus</i>	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			
<i>Storeria dekayi dekayi</i>	Undetermined	1	4.8 (--)	--	20.6 (--)	--	6.0 (--)	--			
<i>Storeria occipitomaculata</i>	Undetermined	2	1.6 (--)	1.3 - 1.8	13.0 (--)	11.9 - 14.1	4.0 (--)	3.4 - 4.6			
NOT FOUND UNDER ACOs											
<i>Pantherophis alleghaniensis</i>	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			
<i>Plestiodon fasciatus</i>	Juvenile	1	26.0 (--)	--	45.6 (n/a)	--	9.8 (n/a)	--			
<i>Plestiodon fasciatus</i>	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			
<i>Sceloporus undulatus</i>	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			
<i>Sceloporus undulatus</i>	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.

Sex	N	<u>Mass (g)</u>			<u>Carapace Width (cm)</u>			<u>Carapace Length (cm)</u>			<u>Plastron Length (cm)</u>		
		Ave (SD)	Min - Max	Ave (SD)	Min - Max	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 sphenoccephalus* (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.

Hampden-Sydney College Survey

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. occipitamaculata* 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. occipitamaculata* 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. occipitamaculata occipitamaculata*, *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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