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JOURNAL INFORMATION

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(Editorial policy continued on inside back cover)

Cover Photo: amelanistic *Eurycea wilderae, see p. 129-130.*

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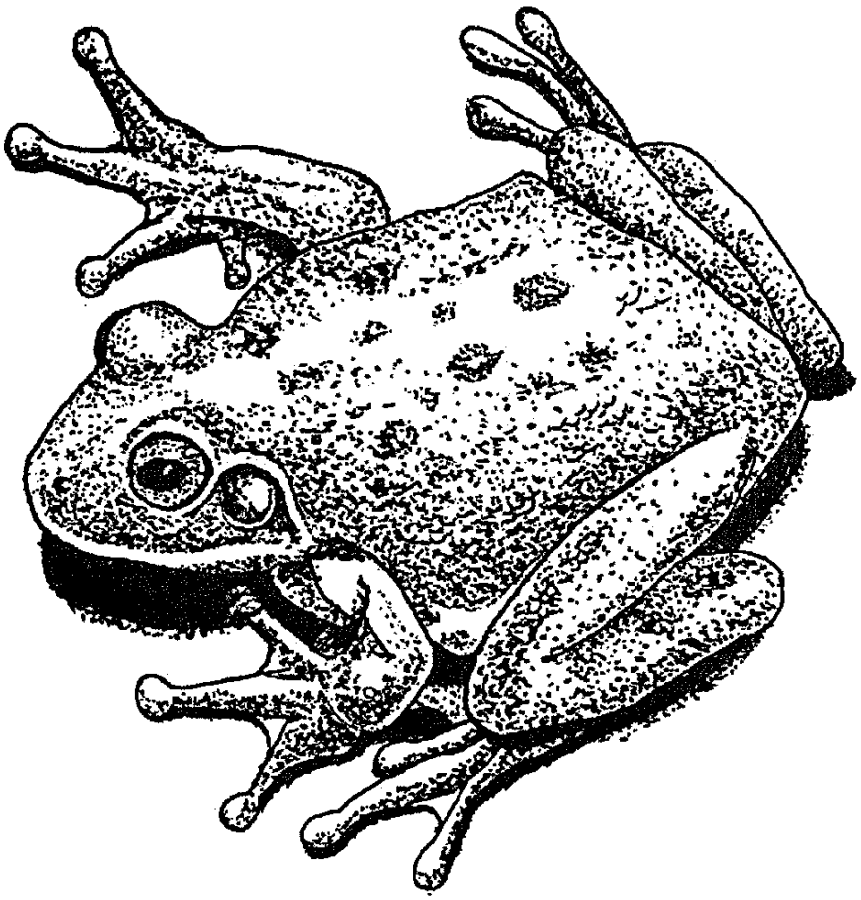

Hyla gratiosa mjp '98

Twenty-Three Years of Phenology and Natural History Observations on Anurans and Salamanders in Anglers Park and Dan Daniel Parks, Danville, Virginia

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Abstract: Since 2000 I have been collecting and recording observations about the amphibians that inhabit Anglers Park and Dan Daniel Park in the City of Danville. During this period fourteen species of anurans and seven species of salamanders were found. This paper covers calling dates, egg laying dates, habitat associations, activity periods, parasites, physical anomalies, and additional natural history information collected on each species.

Keywords: phenology, natural history, anurans, salamanders, parasites, chiggers, road mortality, anomalies

Introduction

Much attention has been given to the distribution of amphibians and reptiles in Virginia. Up to now, two herpetological atlases have been produced; Tobey's "Virginia's Amphibians and Reptiles: A Distributional Survey," published in 1985, and Mitchel and Reay's "Atlas of Amphibians and Reptiles in Virginia," published in 1999 (Tobey, 1985; Mitchel and Reay, 1999). In addition to these publications, the Virginia Herpetological Society publishes distributional field notes and survey papers in the journal Catesbeiana twice a year. Many hundreds of distributional observations are also being posted on iNaturaist. Species' range maps are constantly being updated by the VHS websmaster, John White, on the Virginia Herpetological Society website. These maps are updated based on published accounts in Herpetological Review, Catesbeiana, and species locations reported to the Virginia Department of Wildlife Resources, as a requirement for those holding scientific collecting permits.

As the distribution of amphibians progressively becomes resolved, we should focus more attention on the ecology of each species. Obtaining this information is very time-consuming and will require people from all over the state to observe and report these data. Virginia has tremendous variation in geology, distribution of plants, and climate in the various physiographic provinces. Due to Virginia's unique diversity of habitat and climate, we have a wealth of amphibian diversity, including 58 species of salamanders and 28 species of anurans. We know little about the ecology of most of these species.

Ecological studies are very time consuming and often difficult, making them less attractive for scientists to conduct. The variability in climate from year to year, the secretive nature of some species, the difficulty in finding them, and the sporadic occurrence of breeding add difficulty to studying them. However difficult this work may be, it must be done if we are going to manage and preserve these animals into the future. My effort at recording basic ecological information on fourteen species of amphibians in the city of Danville is based on my love for walking and my interest in amphibians. Dan Daniel Park and Anglers Park within the city of Danville are close to my house, so every chance I could get to go hiking, I did. I did this between 2000 and 2023. During these walks I took notes on everything I saw and heard. Sometimes I would use a net or a stump ripper and dip into ponds or flip over logs and rocks. Other times, I had purposeful intent to study a particular species or to record what I found dead on roads. Anyone reading this article could do the same thing with a habitat around where you live, even in your yard if you don't have a park within a close distance. If year after year, during different seasons you just record what you hear, what you see, what you find dead on the road this information could be very valuable to our understanding of the life history of whatever species you observe. The following paper presents my observations over 23 years.

Materials and Methods

Study Sites

Anglers Park and Dan Daniel Park are located in the Piedmont physiographic province in the city of Danville. These parks are separated by the Danville Expressway (Route 58) and are bordered by the Dan River on the west side. Anglers Park encompasses 121.41 hectares (300 acres). Within this park there are 48.28 kilometers (30 miles) of biking/hiking trails (paved and unpaved), a large mowed grass playing field, parking lots, picnic areas, and a boat ramp. A large portion of this park is deciduous hardwood forests. Within these forests are two perennial streams and many intermittent streams. An important feature of this park is a constructed open marshy wetland with two large shallow seasonal ponds. One main road enters the property from Northside Drive. Bordering this property to the west is a wastewater treatment plant. Dan Daniel Park contains 68.8 hectares (170 acres). River Park Drive, the main road entering the park, leads to picnic shelters, soccer, baseball, and softball fields, a skate park, and parking areas. Surrounding these sites is a deciduous hardwood forest with many hiking trails. Wildlife habitats include hardwood forests, three man-made water retention ponds, one large perennial stream (Barkers Branch), many small intermittent streams, and forested shallow seasonal water pools. Nine wetland habitats important to amphibians are described below (Figures 1 and 2). GPS coordinates were obtained from Google Earth for each site, these coordinates appear in parentheses behind each site below. At the end of each description in parentheses is a standard technical classification of each habit which follows Cowardin et al., 1979.

Site 1. (36°34'44.05"N; 79°22'36.74"W) This site consists of a shallow depression in a

mowed grass field adjacent to the Dan River, probably created by uneven grading of the field. During wet years the depression may fill due to excessive rain events or when the Dan River floods and overflows its banks. During dry years this depression does not fill.

Site 2. (36°34'38.66"N; 79°22'32.66"W) This is a long series of forested seasonally flooded shallow pools which are found between a hard paved/unpaved road and paved walking/biking trails. Because this site is located adjacent to the Dan River, when the river overflows its banks, these pools fill with water. Excessive rains also allow these pools to fill. By the fall, these pools usually dry due to evapotranspiration of the forest trees. (PFO1C - Palustrine, forested, broad-leaved deciduous, seasonally flooded)

Site 3. (36°34'38.44"N; 79°22'6.99"W) This wetland is a man-made water retention pond. This pond was created to help drain water coming from a softball field and a parking lot. The pond has a shallow margin but a deep center. It holds water all year. Surrounding the pond is a mixed pine and deciduous hardwood forest. (PUB3Hh - Palustrine, unconsolidated bottom, mud, permanently flooded, diked/impounded)

Site 4. (36°34'36.62"N; 79°22'11.72"W) This site consists of a small man-made water retention pond. Surrounding this pond is a hardwood forest. This pond is shallow but has never been observed completely dried. (PUB3Hh - Palustrine, unconsolidated bottom, mud, permanently flooded, diked/impounded)

Site 5. (36°34'28.99"N, 79°22'0.17"W) Site 5 is a forested seasonally flooded shallow pool. It was formed when the Danville Expressway was created. An intermittent stream flows into this pool and a drainage pipe allows overflow from the pool to cross under the Danville Expressway. The pipe is higher than the depression which allows water to accumulate and fill the pool. On occasion beavers have been observed damming the outflow pipe. When the pipe was dammed the pool doubled in size and depth. The Danville Parks and Recreation staff in recent years have kept the pipe dam-free and thus have inadvertently maintained a shallower pool. (PFO1Ch - Palustrine, forested, broad-leaved deciduous, seasonally flooded, diked/impounded)

Site 6. (36°34'33.02"N, 79°22'4.84"W) The main water feature at this site is an intermittent stream flowing through a deciduous hardwood forest. The streambed consists of some large rocks but mainly gravel and sand. In summer and fall, small pools will be left in the streambed as the flow diminishes. (R4SB3 - Riverine, intermittent, streambed, cobble-gravel)

Site 7. (36°34'31.31"N, 79°22'14.86"W) A small wet depression created by ditched run-off is the main feature at this site. This wet depression fills with water during the winter and spring and dries up in the summer. The substrate of this depression is decaying leaf matter from the surrounding deciduous hardwood forest. (PFO1C - Palustrine, forested, broad-leaved deciduous, seasonally flooded)

Site 8. (36°33'42.05"N, 79°21'31.78"W) This site is a constructed wetlands encompassing an area of 2.6 hectares and consisting of two shallow ponds (0.14 hectares and 0.18 hectares, size depends on season and availability of water) and marshy wetlands surrounding the ponds. Some bald cypress trees were planted in these wetlands but are still not very mature. Persistent emergent vegetation covers all the marshy area. The wetlands are bordered to the north by 0.29 km of hard paved road and to the south by a 5.48-hectare mowed grass playing field. (PEM1Cx - Palustrine, emergent wetland, persistent, seasonally flooded, excavated)

Site 9. (36°33'31.00"N, 79°21'14.38"W) This wetland is a perennial stream flowing through a deciduous hardwood forest. Some areas of the stream bed are bedrock while most of the stream bed consists of small rocks, gravel, and sand. This stream drains the area of a retired landfill. (R2SB3 - Riverine, lower perennial, streambed, cobble-gravel)

Figure 1. Map of seven important wetland sites at Dan Daniel Park. Stars represent roads where many road-killed amphibians have been observed.

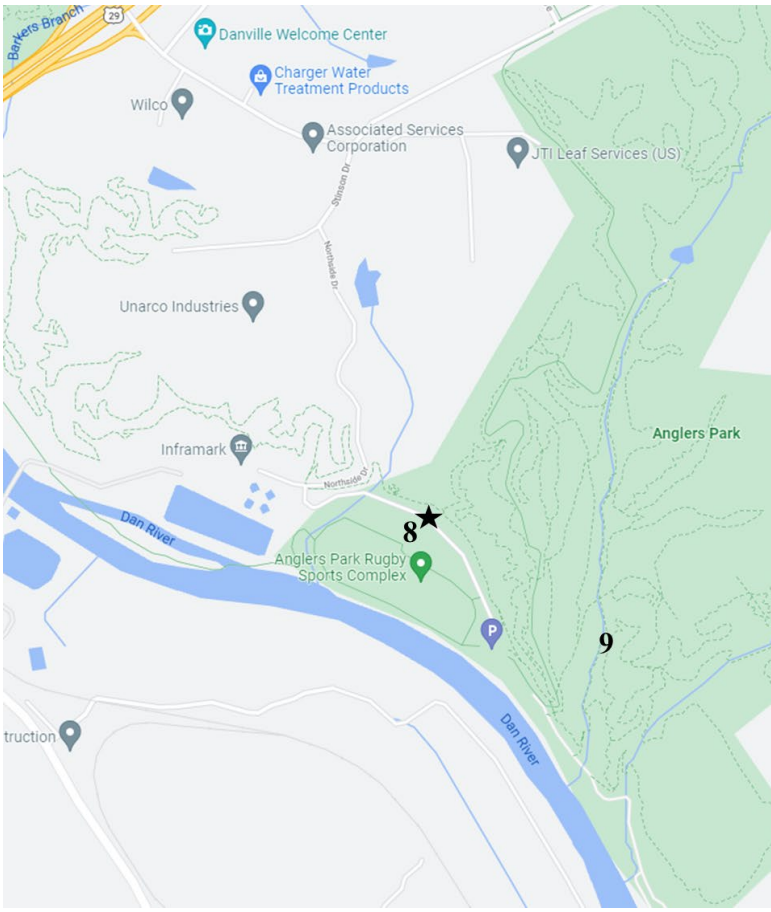

Figure 2. Map of two important wetland sites at Anglers Park. The star represents a road where many road-killed amphibians have been observed.

Field Methods

Observations reported in this manuscript were begun in January 2000 and continue to the present. Six one-day herpetological diversity surveys were conducted as outreach for the parks and recreation department on 5 May 2008 (1), 9 May 2009 (2), 15 May 2010 (3), 28 April 2012 (4), 3 May 2014 (5), and 1 May 2015 (6) (Table 1). Many additional observations were made while taking my high school students on walks through these parks. These parks were walked on numerous occasions over the years and in every month. During the initial outbreak of Covid in 2020, I spent more time than usual surveying and walking the parks. On wet nights during all months I drove the roads in the parks at night looking for animals alive on the road. After many wet nights I walked the roads in the morning looking for road-killed animals. I found this to be one of the best ways to document species occurrence, species activity periods, mass migrations, and a source of animal bodies to look for dietary items and parasites.

Survey methods included hand capture, road cruising, visual observations, walking roads, listening for calling males, dipnetting, and flipping/replacing rocks and logs. All amphibians hand captured were inspected for anomalies, parasites, and general health. Anurans were measured for snout-vent length (SVL) by measuring from the snout to the cloacal opening while the anurans were pressed flat. SVL measurements were recorded in millimeters (mm) and mass measurements in grams (g). Salamanders were measured for snout-vent length (SVL) by measuring from the snout to the posterior angle of the cloaca. Total length (TL) measurements were acquired by measuring from the tip of the snout to the tip of the tail. SVL and TL measurements were in millimeters and mass measurements in grams. Pittsburgh 150 mm digital calipers (accuracy ± 0.025mm) were used to measure SVL and TL. Mass was measured using an Ohaus Model Scout Pro SPE 123 digital scale (capacity 120g, accuracy .001g). Mean and standard deviation were calculated using Excel. Means are followed by ± 1 standard deviation, minimum and maximum value for the sample, and the sample size (*n*). All photographs were taken using a Samsung Galaxy S7 cell phone camera. All work was conducted under scientific collecting permit 070741 and wildlife salvage permit 070831.

Results

Since 2000 twenty-one species of amphibians have been collected. This includes fourteen species of anurans and seven species of salamanders. I thought this species list was complete for anurans however on 12 November 2021 I found a roadkilled *Hyla cinerea*, after not having documented one in over 20 years. Barring finding another introduced species I believe the list for anurans is complete for these parks. I do not feel confident claiming that the salamander species list is complete at this time. With more effort during the right breeding seasons and in the right habitat, more species may be found. An annotated species list follows this section. In each species account I report all of my accumulated observations on habitat preferences, activity dates, calling dates, egg laying dates, mortality events, anomalies, and parasitic infections. Table 1 lists all the

species and numbers of each animal found during six surveys conducted at Dan Daniel and Anglers Parks. Table 2 shows the species utilizing nine wetland habitats at Dan Daniel and Anglers Parks. All common and scientific names follow Crother (2017). All anomalies observed follow the terminology reported in Henle et al. (2017).

Table 1. Total number of amphibians found at each site during six different surveys. (C = calling male, L = larvae, T = tadpoles)

Surveys	1	2	3	4	5	6
Anuarans						
Acris crepitans		1	1	8	107	19
Anaxyrus a. americanus	1		372	1		T
Anaxyrus fowleri	1	6	1			
Gastrophryne carolinensis						
Hyla chrysoscelis/versicolor	1C		1			
Lithobates catesbeianus	T	T				
Lithobates clamitans	1C	8	1			2
Lithobates palustris	1	1				
Lithobates s. utricularis		E	4			
Scaphiopus holbrookii	1					
Salamanders						
Ambystoma maculatum	L	L				
Ambystoma opacum			1	1		
Desmognathus fuscus	16	29	21	1	4	9
Eurycea cirrigera	8	13	2			2
Eurycea guttolineata					1	
Notophthalmus v. viridescens	1					

Plethodon cylindraceus	2		1			
Totals	35	60	406	11	112	33

Table 2. Distribution of amphibians in nine selected wetland sites in Dan Daniel and Anglers Parks.

Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Anurans									
Acris crepitans		**x**	**x**		**x**	**x**		**x**	**x**
Anaxyrus a. americanus		**x**	**x**		**x**			**x**	
Anaxyrus fowleri		**x**						**x**	
Gastrophryne carolinensis		**x**						**x**	
Hyla chrysoscelis/versicolor		**x**			**x**	**x**		**x**	**x**
Hyla cinerea								**x**	
Lithobates catesbeianus		**x**	**x**	**x**	**x**			**x**	
Lithobates clamitans		**x**	**x**	**x**	**x**	**x**		**x**	**x**
Lithobates palustris		**x**	**x**	**x**	**x**	**x**		**x**	**x**
Lithobates s. utricularis		**x**	**x**		**x**			**x**	**x**
Pseudacris crucifer		**x**	**x**	**x**	**x**		**x**	**x**	**x**
Pseudacris feriarum		**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Scaphiopus holbrookii	**x**	**x**						**x**	

Salamanders									
Ambystoma maculatum		**x**	**x**	**x**	**x**		**x**	**x**	
Ambystoma opacum		**x**			**x**			**x**	
Desmognathus fuscus									**x**
Eurycea cirrigera						**x**			**x**
Eurycea guttolineata									
Notophthalmus v. viridescens		**x**	**x**	**x**	**x**			**x**	
Plethodon cylindraceus									
Total	**1**	**15**	**10**	**7**	**12**	**6**	**3**	**16**	**9**

Annotated Species List

1. *Acris crepitans* (Eastern Cricket Frog)
Eastern Cricket Frogs were found in marshy wetlands, seasonally flooded pools, grassy fields, dry stream beds, road rut puddles, edges of perennial and intermittent streams, and along trails, in leaf litter of mature hardwood forests and on roads bordering all of these wetland habitats. The activity period for this species extends from 1 January to 28 December with frogs being found active in every month between those dates. Many frogs were found dead on roads adjacent to wetlands. A breakdown of how many per month follows: (1) February, (2) March, (30) April, (16) May, (6) June, (1) July, (1) September, (8) October, and (2) November. Calling males were heard from 1 April and until 6 August. Breeding habitat includes pools in perennial and intermittent streams, vernal pools, and shallow ponds in marshy wetlands. Two gravid females were observed along the edge of a perennial stream on 7 May. This is a very abundant frog in these parks. The most animals found at one time was 107 adults on 3 May at Anglers Park. These animals were found along the shore of a stream at Anglers Park. On 5 November 2020 twenty cricket frogs were counted to denote the color phenotype. Of the twenty frogs ten were all brown, five had a brown stripe, and five had a green stripe. A sampling of fourteen cricket frogs on 17 December yielded six that were all brown, three had a

brown stripe, and five had a green stripe. On 17 December a mix of mature male and female and juvenile frogs was observed. Males on 17 December had the characteristic dark yellow throat. In a sampling of 12 frogs on 17 December eight did not have a yellow patch of pigment in the groin but five did. Of the five that did have the yellow groin one had an all-brown body, one had a brown stripe, and three had green stripes. Both males and females and mature and juvenile frogs were observed exhibiting the yellow groin. One dissected dead on road (DOR) frog stomach contained two leaf hoppers (family *Cicadellidae*), one aphid (family *Aphididae*), and one ant (*Tapinoma sessile*). One frog found on 30 October 2021 was observed being scavenged by a slug (genus *Deroceras*) (Figure 3) (Timothy Pearce, personal communication).

Figure 3. Slug scavenging a road killed adult male *Acris crepitans*.

2. *Anaxyrus a. americanus* (Eastern American Toad)

American toads were found in marshy wetlands, road rut puddles, seasonally flooded pools, small ephemeral puddles beside hiking trails, on trails through mature hardwood forests, along the edge of perennial streams, and on all the roads in both parks. The parks have many light poles which toads can be found under during warmer months. The activity period for this species is 17 February through 13 November, with animals being active every month between these two dates. Many toads were found dead on roads near wetlands. A breakdown of how many per month follows: (3) February, (76) March, (3) April, (2) May, (6) June, (2) July, (1) September, (1) August, (4) September, (4) October, and (1) November. Calling males were heard starting on 17 February and ending on 21 May. On 4 June 2009 American Toads were uncharacteristically calling after a long accumulating rainstorm brought 1.4 cm of rainfall to the parks. Breeding habitat consists of marshy wetlands, seasonally flooded pools, site 3 (large man-made pond), and road rut puddles or trail-side puddles. Egg laying mainly occurs around the second week of March; breeding is usually an explosive event which follows warm weather and rain. The last egg laying was observed on 19 March 2022. Eggs have been observed deposited at the bottom of shallow water attached to leaves and underwater vegetation or just deposited free, some strings of eggs have been observed attached to underwater sticks. Tadpole mass mortality is common in shallow pools which dry up. Tadpoles have been observed scavenging dead tadpoles. Metamorphs emerging from breeding pools have been found as early as 10 May. On 15 May 372 metamorphs were counted along the periphery of Anglers wetlands. On 25 May 2021 16 metamorphs were found emerging from a shallow trail side puddle. For these metamorphs the body length averaged 8.18 ± 0.74 mm SVL (6.86 - 9.4, n = 16) and the mass averaged .055 ± .013 g body mass (.036 - .081, n = 16). This is a very abundant toad,

especially at Anglers Park. The most counted at one time was 107 adults on 13 March at Anglers Park wetlands. This was only a fraction of the total number that were not captured but heard calling at that site on that date. Occasionally American Toads were found parasitized by unidentified chigger larvae (Figure 4). One adult female and one adult male toad found DOR were dissected and the stomachs found to contain one spider, one harvestman, four beetles, three true bugs, and six ants (see Gibson & Ivanov, 2020 for species names).

Figure 4. Black arrows pointing to chigger larvae parasites on the venter and ventral thigh of an American Toad.

3. *Anaxyrus fowleri* (Fowler's Toad)

Fowler's Toads were found in seasonally flooded pools, trail-side puddles, on trails in hardwood forests, and along roads within both parks. The activity period for this species is from 9 May until 14 December (the toad found on 14 December was found DOR, so it could have been last active on 13 December). Fowler's Toads were found active in all months between those dates except for August and November. A breakdown of how many Fowler's Toads were found DOR per month follows: (9) May, (1) July, (2) September, (1) October, and (1) December. The weather on 14 December 2020 when a male toad was found DOR was 70°F and raining. Calling males have been heard on 4 - 6 June. Breeding habitats observed include, shallow trail-side puddles, marshy wetlands, flooded grass fields, and flooded road ruts in a mowed grass median between two roads. A fresh string of eggs was found in a shallow trail-side puddle on 29 May, this particular puddle soon dried up after hatching and all the tadpoles died. Metamorphs have been found emerging from a breeding pool on 15 June. The largest number of this species counted at one time was thirteen (ten males, two females, and one juvenile) collected on roads at Dan Daniel Park on 21 May. Juvenile toads have been found run over by bikes on bike trails at Anglers Park on 7 August and 6 September 2021. This probably represents a significant source of mortality for the species. This species of toad is less common and abundant than the Eastern American Toad.

4. *Gastrophryne carolinensis* (Eastern Narrow-mouthed Toad)

Narrow-mouthed toads were found at both parks in the following habitats: mowed grass fields with flooded tire ruts, a wooded seasonally flooded pool, marshy wetlands, adjacent to and in road-rut puddles, and on the roads beside these habitats. These frogs have an observed activity period from 17 May to 11 October; no frogs were observed

in September. Five adults were found DOR on 20-21 June 2023 after multiple days of heavy rain. Males have been heard calling from 26 May to 7 August. Between these dates, calling is likely after rain but calling can also occur day or night without rain. Breeding habitats include flooded road-ruts, marshy open wetlands, and flooded grass fields. Floating egg masses have been found on 5 June, 8 July, 25 July, and 1 August. Gosner stage 37 and 38 tadpoles were found up to 30 August in flooded road-ruts at Anglers Park (Gosner, 1960). After a large storm on 4 June 2009 at least 24 males were heard calling at two sites. This species is common in the parks in appropriate habitats.

5-6. *Hyla chrysoscelis/versicolor* (Cope's and Common Gray Treefrog)

Hyla chrysoscelis and *Hyla versicolor* were found in the following habitats: calling from hardwood forest beside small perennial and intermittent streams, Anglers wetlands (man-made created wetlands as a wetlands mitigation project), on roads throughout Dan Daniel and Anglers parks, calling from trees in hardwood forests beside small man-made ponds, in the hole of a hollowed out tree, calling from trees in hardwood forests in and surrounding seasonally flooded pools, flooded road ruts, and on a wooden boardwalk crossing the center of Anglers wetlands. These species were found active from 7 March to 14 December and in every month between those dates. A mixture of adult, juvenile, and metamorph frogs have been found DOR on 1 April (5), 9 May (5), 10 May (15), 17 May (1), 24 May (1), 29 May (1), (2) June, 1 August (2), 6 August (2), 18 September (1), 25 September (1), 29 September (1), 9 October (6 juv.), 11 October (1), 25 October (1 juv), 30 October (1 adult), 12 November (5 juveniles and small adults), 13 November (1), and 14 December (1). Calling males have been heard from 28 March until 28 October. Calling in September and October is more sporadic than in the months between May and August. Breeding habitats include open marshy wetlands, wooded and open seasonally flooded pools, flooded grassy pools, and flooded road ruts. Amplexed pairs were observed as early as 21 May. Fresh egg masses were found on 17 July, 29 July and on 1 August. The earliest metamorphs were observed emerging from breeding ponds was on 30 July. Newly emerging metamorphs on 4 September from a vernal pool in Dan Daniel Park averaged 12.74 ± 0.55 mm SVL (12.34 - 13.55, $n = 4$) and 0.18 ± 0.03 g body mass (.155 - .222, $n = 4$). Many metamorphs have been collected on roads by the wetlands at Anglers Park after rainstorms as late as 21 September. These species are very abundant at both Dan Daniel and Anglers Parks.

7. *Hyla cinerea* (Green Treefrog)

One Green Treefrog was found DOR in front of Anglers wetlands on 12 November 2021 (Figure 5). This is the only animal seen or heard at either site in the twenty years of looking at these properties. This animal most likely transported to this site from somewhere else in Virginia or North Carolina.

Figure 5. Road killed *Hyla cinerea* found at Anglers Park.

8. *Lithobates catesbeianus* (American Bullfrog)

American Bullfrogs were found in small man-made ponds, seasonally flooded pools, open marshy wetlands, and on the roads adjacent to these wetlands. Bullfrogs have been observed active from 1 January until 28 December and every month between these two dates. Four frogs were observed basking on branches on 28 December 2021 and two frogs were observed basking on 1 January 2022 in the pond at site 3. Juvenile frogs have been found DOR on 15 April, 27 June, 18 September, and 26 September. Calling has been observed from 27 April until 9 August. Only two breeding habitats have been found; open marshy wetlands at Anglers Park and a small man-made pond at Dan Daniel Park. These two wetlands hold water all year. One floating egg mass was found on 29 May at the small man-made pond in Dan Daniel Park. This frog is common only at one pond; nine have been observed at one time at the man-made pond at Dan Daniel Park. At this pond frogs have been observed basking over the water on the branches of fallen trees.

9. *Lithobates clamitans* (Green Frog)

This species was found in the following habitats: shallow ditches, marshy open wetlands, beside perennial and intermittent streams, man-made ponds, seasonally flooded pools, and roads adjacent to these sites. Green frogs were observed active from 8 April to 28 December and in every month between those dates. One adult male Green Frog was found under a rock in a stream bed at Dan Daniel Park on 14 January 2021 during an unusually warm day. Active adult or juvenile frogs have not been found in February or March. Juvenile frogs have been found DOR on 15 May, 20 and 21 June, 9 July, 30 September, and 13 November. Calling males have been heard from 8 April until 7 September. Breeding habitats include marshy open wetlands, man-made ponds, seasonally flooded pools, and road-side ditches. No egg masses were observed but tadpoles can be found in all months of the year. A freshly crushed gravid female was found on a paved bike path on 6 September 2021 (Figure 6). This animal was run over by a bike. Although mortality from bikes is probably rare for this species it is commonly seen in juvenile toads. This frog was found parasitized by a nematode worm. A mass migration of more than 20 fresh metamorphosed Green Frogs was observed on the paved road adjacent to the marshy wetlands at Anglers Park on a rainy night on 10 September 2022. This frog is common throughout both parks.

Figure 6. Gravid adult female Green Frog run over by a bike on a paved bike path at Anglers Park. White arrow pointing to eggs.

10. *Lithobates palustris* (Pickerel Frog)
Pickerel Frogs have been found in open marshy wetlands, in flowing water and under rocks in perennial and intermittent streams, in man-made ponds, trail-side mud puddles, seasonally flooded pools, and on roads adjacent to these habitats in both Anglers and Dan Daniel Parks. These frogs were observed from 6 February to 16 November and every month in between except for June. Pickerel Frogs have been found DOR in March (3 adults), April (3), September (8 adults, 1 juvenile), and October (4 adults, 1 juvenile). During warm nights in September Pickerel Frogs can be found under street lights at night, presumably catching insects. Calling males were heard on 18 March, 21 March, 26 March, and 28 March. A gravid female migrating to a breeding site was found AOR on 7 March 2022 and a DOR gravid female was found on 1 April 2023 near a breeding pool at Dan Daniel Park. Amplexed pairs were found on 14 March and 18-19 March 2022. On 18 March 2021 numerous adult frogs were observed crossing a road from a hardwood forest and migrating toward the marshy breeding wetlands at Anglers Park. Fresh egg masses have been found on 28 March. Egg masses are submerged in water and often attached to underwater sticks. Breeding habitats include open marshy wetlands, man-made ponds, and wooded seasonally flooded pools. Metamorphosing frogs were found starting on 4 June and until 31 July. It was interesting to find a gravid DOR female frog on 18 September. This frog is common throughout both parks. A DOR pickerel frog found on 2 March at Anglers Park was found to be parasitized by the intradermal mite *Hannemania dunni* (Gibson & Welbourn, 2018). This frog usually has two parallel rows of squarish dark dorsal spots on the dorsum. One adult frog found at Anglers Park had two long parallel dorsal markings with one dorsal spot in between two rows of spots (Figure 7).

Figure 7. An adult Pickerel Frog with one spot between the normal two rows of squarish dorsal spots.

11. *Lithobates sphenocephalus utricularius* (Coastal Plains Leopard Frog)

Adults of this species were rarely observed outside the breeding season. During the breeding season frogs were found in open marshy wetlands, shallow trail-side seasonally flooded pools, shallow mud puddles, along the margin of a perennial stream flowing through a hardwood forest, and along the trails and roads beside these habitats. Observed activity dates were between 17 February and 12 November. I recorded no adult observations in June, July, or August. Adult frogs were found DOR on 17 February, 7 March (6), 24 March, 1 April, 18 September, 21 September (1), and 12 November. On 7 March 2022 2 DOR and 4 AOR females were found on the road adjacent to Anglers wetlands, suggesting a migration to or from the wetlands. Numerous adults were also observed on the road adjacent to Anglers wetlands on 10 September, also suggesting a migration to the wetlands for fall breeding. Males were observed calling between 19 February until 28 March and males were heard calling once once on 22 September. This frog has an early spring and late summer bimodal breeding pattern at this location. Freshly laid egg masses were found on 19 February through 6 April in the spring breeding season and on 23 September in the fall breeding season. A gravid female was found DOR in front of Anglers Wetlands on 21 September 2021. Eggs are sometimes deposited at the bottom of a shallow breeding pool and unattached to surrounding objects, often in communal clusters. In deeper habitats, egg masses have been observed attached to underwater tree branches. Some egg masses were observed exposed to air when the water levels of the breeding pools dropped. Metamorphs were found from 15 May to 4 June. These metamorphs probably were deposited as eggs during the previous late summer breeding season and overwintered in breeding ponds. Breeding habitats include open marshy wetlands, shallow trail-side pools and puddles, and seasonally flooded pools. Four DOR metamorphs emerging from a breeding pool were found on 20-21 June 2023, probably spawned the previous summer. This frog is hard to find but during the breeding season it is common in areas where it lays eggs. A 58 mm SVL adult male frog was found DOR in Anglers Park was found with nematode worms beneath both the ventral and femoral skin (Figure 8). A DOR female found on 21 September 2021 was found parasitized by one chigger larvae on the hind leg. One AOR and one DOR frog found on 7 March 2022 were parasitized by chiggers (Figures 9 and 10). Three DOR adult frog stomachs yielded two annelid worms, three pill bugs (*Armadillidium vulgare*), one harvestman (Family *Phalangiidae*), and one adult *Pseudacris* sp. frog.

Figure 8. Nematode worms (see black arrows) under the ventral and femoral skin of an adult male Coastal Plains Leopard Frog.

Figure 9. White arrow - chigger embedded in webbing between hind foot toes. Black arrows - chiggers embedded in ventral thigh. 7 March 2022.

Figure 10. Magnified view of chigger larva.

12. *Pseudacris crucifer* (Spring Peeper)
This species is widespread in both parks. Habitats where this species has been found include: hardwood forests surrounding seasonally flooded pools, seasonally flooded pools, hardwood forests surrounding intermittent and perennial streams, and open marshy wetlands. This frog has been found active from 1 January until 28 December and all months between these dates except for August. Adult frogs have been found DOR in February (14), March (18), April (44), October (3), and December (1). Many live frogs were noted to be found AOR on 26 February and 18 March. The late winter/ early spring calling season lasts from 1 January until 21 May, most robust calling occurs February through April. Individual male Spring Peepers have also been heard calling from 12 September to 30 December and in all months between those dates. Egg laying habitats include seasonally flooded pools and pools in intermittent streams. Metamorphs have been found on 20 June (5 found on the road immigrating from the breeding pool) and 8 July. Four metamorphs found on 20 June had an average body length of 12.12 ± 1.528 mm SVL (10.34 - 14.56, n = 4) and an average mass of 0.118 ± .0212 g (.096 - .153, n = 4). This frog is very abundant and common throughout both parks. Of nine DOR frogs found on 28 March 2021 one frog dissection yielded 2 flukes in its abdominal cavity. Another DOR frog found on 11 October 2020 was hypomelanistic. Its dorsum was very light tan, the normal X marking was very light and the hind legs appeared yellow (Figure 11). Under microscopic examination melanocytes could be seen but there were very few of them and they were highly scattered.

Figure 11. A hypomelanistic Spring Peeper found DOR at Anglers Park.

13. *Pseudacris feriarum* (Upland Chorus Frog)

This frog, like other chorus frogs, is very secretive and hard to find outside of the breeding season. Adults have been found at both parks in these habitats: seasonally flooded pools, man-made ponds (sites 3,4), roadside ditches, open marshy wetlands, beside intermittent streams, and hardwood forests surrounding these habitats. Early and late activity dates run from 1 January until 31 December. This species was not detected in July and August but was found active in all other months of the year. Frogs were only found DOR on 17 February (1), 16 October (1) and 25 December (4). One AOR female adult frog was found on the road adjacent to Anglers Park on 7 March 2022. Males were noted calling between 13 January (on 13 January 2023 a large chorus of males was heard on this date, a thunderstorm occurred the night before hearing this chorus) and 21 June (on 4 and 5 June 2009, this species was heard calling after a 1.4 cm rain and on 21 June 2023 a chorus consisting of multiple males with overlapping calls was heard from 0713 h to 0727 h after multiple days of rain). Large choruses of many males with overlapping calls were noted to occur between 12 February to 26 March. Outside of the breeding season, single males were also noted calling from 20 September until 31 December and in all months between those dates. Males were observed vocalizing during the day and night. A chorus of 4 males was heard at Dan Daniel Park on 1 January 2022. Freshly deposited eggs were found from 24 February to 18 March. Egg masses are laid in loose clumps and are often attached to blades of grass or small sticks submerged in the water. The average depth of egg masses found deposited below the water surface was 2 ± 1.1 cm (0.5 - 3.5, n = 10). The average number of eggs in each cluster was 30.9 ± 12.24 eggs (15 - 51, n = 10). From eggs deposited on 24 and 28 February metamorphs began to emerge from this breeding pool on 27 April (62 days or about 8.9 weeks). Egg laying habitats include shallow grassy drainage ditches, seasonally flooded pools, man-made constructed marshy wetlands. On 25 May 2021 9 metamorphs were found emerging from a shallow trail side puddle. For these metamorphs the body length averaged 8.18 ± 0.539 mm SVL (7.25 - 8.73, n = 9) and the mass averaged .051 ± .006 g body mass (.044 - .062, n = 9). This frog is common, abundant and widespread in both parks. One stomach dissected from a DOR adult frog was found to be parasitized by nematode worms (Figure 12).

Figure 12. Nematode worm found in the stomach of a dissected Upland Chorus Frog.

14. *Scaphiopus holbrookii* (Eastern Spadefoot)

Adults have been found at Dan Daniel Park in wooded seasonally flooded pools, trail side flooded pools, flooded mowed grassy areas, and on roads adjacent to these habitats. Activity periods include 7 March 2022 (1 adult found on a road in Dan Daniel Park after an 80ºF day and rain at night), 10 May 2008 (1 DOR adult found on Northside Drive adjacent to Anglers Park wetlands), 21 May 2020, 4 June 2009 (the 4 June 2009 event is outlined with more details in Gibson and Sattler, 2010), 21 June 2023 (2 DOR adults, 1 male and 1 gravid female, were found on northside drive near the entrance to a wastewater treatment plant; on that same night 4 adult males were found AOR in Dan Daniel Park), 22 June 2023, and 10 September 2022 (2 adults were found AOR at Dan Daniel Park during a rainstorm) . Males were heard calling on 21 May 2020, 4 June 2009, and 22 June 2023. The 21 May breeding was preceded by over 10 centimeters of rain, the 4 June event was preceded by a more modest 1.4 centimeters of rain, and the 22 June event was preceded by 7 centimeters of rain. Strings of eggs were observed on 5 June 2009 and 23 June 2023. Egg laying habitats include open grassy seasonally flooded pools and seasonally flooded pools found in hardwood forest. This species is very common at Dan Daniel Park as evidenced by the large numbers that have been found during breeding congresses. Spadefoots have been successfully found at both parks from 2008 - 2023, some 15 years and populations have been observed to be high at Dan Daniel Park from 2009 - 2023, some 14 years. The breeding event observed on 21 May 2020 produced 151 animals (30 females (all spent), 114 males, and seven juveniles). Out of 163 animals hand captured and inspected, only three animals had anomalies. One adult male had an eye injury, one adult had unilateral ectromely, and one adult had bilateral ectromely (Figures 13 and 14). The activity period and known locations for this species would most likely be extended by utilizing an eye shine survey as outlined in Devan-Song et al. (2021).

Figure 13. Male Eastern Spadefoot with eye injury.

Figure 14. The Eastern Spadefoot on the left is exhibiting unilateral ectromely of the right forearm. The Eastern Spadefoot on the right had bilateral ectromely of both forelimbs.

15. *Ambystoma maculatum* (Spotted Salamander)

Spotted Salamanders were found at both Angler and Dan Daniel Parks. Adults were very infrequently observed outside of the spring migrations but larvae and egg masses were readily found in breeding pools. This species was found in seasonally flooded pools, man-made water retention ponds, open marshy wetlands and in the hardwood forests and roads surrounding these habitats. Subadults and adults are usually found under logs, in between sections of rotten logs, in water of breeding habitats, and on roads migrating to breeding habitats. Early and late activity dates are 14 January and 6 November. The earliest egg mass was found on 14 January 2021 (this egg mass had been in the pool some time as it was not completely fresh, rain occurred on Jan 2-3 and Jan 9, so this mass may have been deposited at those times), with new egg masses found up to 28 March. Most egg masses are deposited in March. Deposited spermatophores have been observed as early as 18 February and a mass migration of males and one gravid female crossing the road into the marshy wetlands at Anglers Park and a road leading to the softball fields at Dan Daniel Park was observed during a rainstorm on 27 February 2021. I only noted finding DOR salamanders on 17 February (3) and 26 March (1), all of these observations were on roads adjacent to wetlands. Breeding pools consist of small vernal pools, large vernal pools, open marshy wetlands, man-made water retention ponds (some are small and dry in the summer, while others are larger and deep and retain water all year round). Having hardwood forest adjacent to these breeding pools seems to be required. Free swimming larvae have been observed as early as 13 April with larvae being observed up until early October. Discoveries of metamorphs were noted on 29 July with the last transforming larva being dipnetted on 2 October (this larva was found in a man-made water retention pond that retained water all year). A sample of 30 larvae was collected and measured on 31 July from a man-made retention pond in Dan Daniel Park. These larvae averaged 45.66 ± 3.43 mm TL (39.15 - 52.91, n =30) and 0.65 ± 0.12 g body mass (0.39 - 0.88, n = 30), relationship between length and body mass is shown in Figure 15. Two metamorphs dipnetted at the same pool measured 47.47 mm TL, mass 0.688 g and 43.71 mm TL, mass 0.580 g. The sample of larvae measured most likely represents

individuals from egg masses which were deposited at different intervals during the breeding season. Between 31 July and 2 October transforming salamanders probably emerge from the breeding pool during rainstorms. Several anomalies were observed in the small sample size of salamanders collected. Two adults, one female and one male, collected under logs on 27 February 2022 at Dan Daniel Park each had on hind foot exhibiting polydactyly (Figure 16). Another adult female salamander was found at Anglers Park on 7 March 2022 and exhibited polydactyly on one hind foot. One male found under a log on 28 February 2021 had a lower mandible which did not align with the upper maxilla (Figure 17).

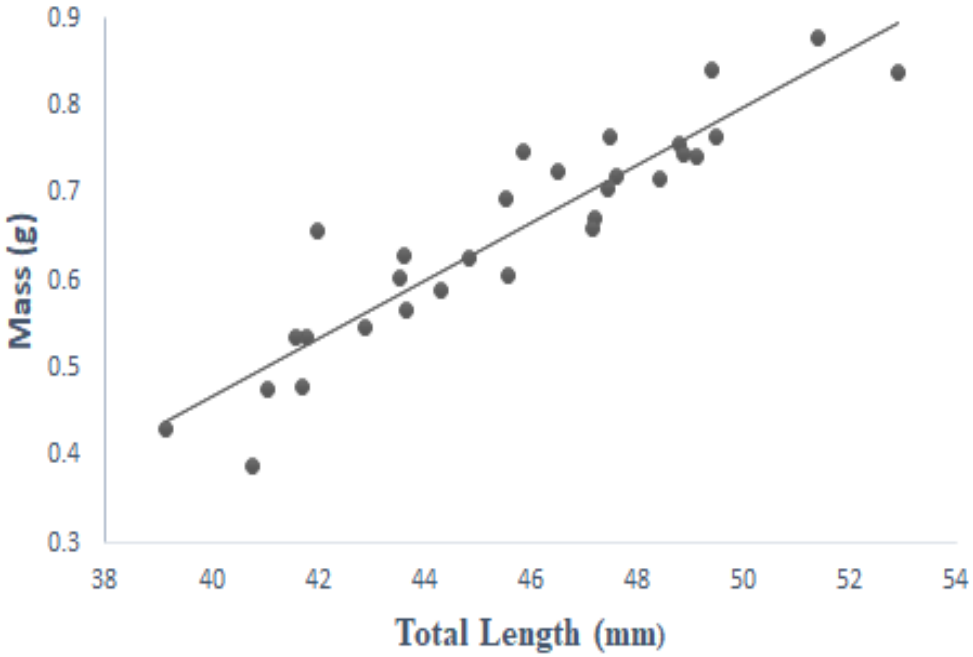

Figure 15. Relationship between total length (mm) and mass (g) for a sample of Spotted Salamander larvae dipnetted on 31 July at Dan Daniel Park.

Figure 16. Left, adult male spotted salamander hind foot with polydactyly. Middle, adult female spotted salamander hind foot with polydactyly. Right, female with hind foot with polydactyly.

Figure 16. Spotted Salamander with a jaw anomaly. The white arrow is pointing to the lower jaw not matching with the upper jaw. The black arrow points to a normal jaw alignment.

16. *Ambystoma opacum* (Marbled Salamander)

Marbled Salamanders were found at both Angler and Dan Daniel Parks in various habitats including: seasonally flooded pools (both dry and full), open marshy wetlands and the roads and hardwood forests adjacent to these habitats. This species has some life stage active every month of the year. Early and late activity dates for adults are 15 April and 30 December. Adults were not observed in June, July, or August. Adults were commonly observed in September through December with the most observations occurring in late September and October. The frequency of observed road killed animals gives a sense of relative activity in this species. DOR salamanders were found on the roads near breeding pools the morning after rains. This is a breakdown of DOR adult salamanders by month: May (1), September (34, on one night 80 were found AOR, see below), October (40), November (13) December (6). Breeding habitats consist of vernal pools, marshy open wetlands which

flood and dry seasonally, and a small man-made water retention pond (this pond holds water all year but does not contain fish). All of these habitats are surrounded by hardwood forests or have a forest nearby. The first observations of salamanders moving to fall breeding areas was on 18 September. This consisted of finding 5 DOR adults. This migration event corresponded to remnants of a hurricane moving through the area. Rains in late September seem to be a stimulus for the movement of salamanders to the breeding ponds. On 21 September 2021 I witnessed a mass migration of Marbled Salamanders crossing a road to the marshy breeding ponds at Anglers Park. During this migration I counted 79 males and 1 female heading to the breeding area. This was only a small sample taken over a period of just half an hour. By 22 September gravid females were found under cover objects in dry vernal pools. A sample of females found in dry breeding pools on 4 and 9 October 2020 averaged 66.17 ± 5.04 mm SVL (50.46 - 72.78, $n = 31$), 112.88 ± 7.94 mm TL (98.79 - 124.66, $n = 31$), and 9.56 ± 1.28 g body mass (7.26 - 12.78, $n = 31$) (Figure 17). The first nests of eggs were found on 1 October. On October 2 a communal nest was observed with five females and one male under the same log. On 4 October seven nests were found with one female actively laying eggs. An egg freshly laid on my hand as I was measuring the female had a diameter of 4.12 mm, vitellus diameter - 3.34 mm, and a mass of 0.038g). A sample of 30 eggs from one nest averaged 5.41 ± 0.45 mm diameter (4.61 - 6.23) and 0.08 ± 0.02 g mass (0.042 - 0.12). The number of eggs per nest (all nests observed were attended by females) is 128 ± 39 (82 - 181, $n = 8$). Nests were found under bark, under small and large logs, under rocks (large granite rocks used to control erosion), and in between rotted wood of a log. Generally, nests were excavated in the sandy deposits under cover objects. These are merely shallow depressions made by the female. One nest observed on 21 October, unattended by a female, had larvae in Harrison stage 37. The last female attending nests was on 5 November. By this time rains usually have inundated the nests. When rains come in November, the females leave the nests and return to surrounding hardwood forests. This is a time when an increase in road mortality is seen, and usually females are most susceptible to being killed. Hatching occurs as early as 12 November but corresponds to the vernal pool being flooded. Cold fronts coming through in November provide rains to flood the pools. In the extreme drought of late 2021 viable eggs were found up to 28 December in the dry basin of the breeding pool at site 5. Measurements of larvae 9 days after hatching were TL = 21.53 mm, sd ± 2.4 (range 17.63 - 25.49) $n = 40$. I measured a sample of larvae in one vernal pool from 21 November to 9 May at roughly one month intervals in order to determine the average growth rate per day (Table 3.). Metamorphs begin to emerge from breeding pools as early as 15 April and continue until at least 4 June. Metamorphs were found DOR on the roads adjacent to breeding pools at Anglers and Dan Daniels parks from 15 April until 29 May. It appears that larvae may undergo metamorphosis and stay near the breeding pool for some time and then emigrate to surrounding forests during rainy nights. A very young juvenile with white cross bars

beginning to form was found emigrating from a breeding pool on 20 June at 0700 h during a light rainstorm. A sample of metamorphs found on 7 and 8 May 2021 averaged 34.41 ± 2.29 mm SVL (30.79 - 38.27, *n* = 9); 58.38 ± 4.47 mm TL (48.35 - 62.52, *n* = 9); and 1.33 ± 0.32 g mass (0.967 - 1.527, *n* = 9). Several anomalies were observed including a bifurcated tail and a deep tail laceration. The female with the bifurcated tail measured SVL 64.01 mm and had a mass of 8.798 g (Figure 17). Bifurcated tails have been seen in *Ambystoma maculatum*, *Ambystoma talpoideum*, and *Ambystoma tigrinum* and in 2022 was reported for the first time in *Ambystoma opacum* (Henle et al., 2012; Wang, 2022). The great majority of animals exhibited the perpendicular white/grey crossbar pattern, but a few animals were observed to have longitudinal stripes (Figure 18). Several adult salamanders were found dead at the edge of curbs or in parking areas with curbs on three sides (Figure 19). The animals did not appear to have been run over by cars but may have been trapped by the curbs and desiccated.

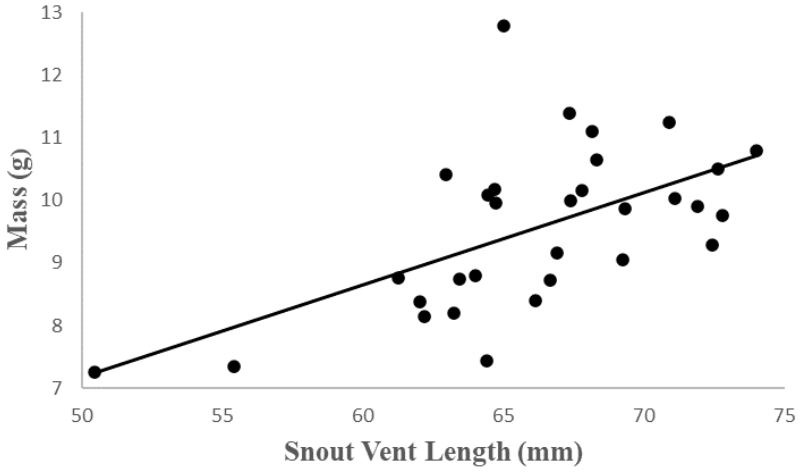

Figure 17. Relationship between snout-vent length (mm) and mass (g) for 31 adult female Marbled Salamanders collected at Dan Daniel Park.

Table 3. Chart showing growth intervals during different sampling time periods.

Date of measurement	Average TL (mm)	Sample Size	Growth (mm) / day during interval
21 November 2020	21.53	n = 40	
12 December 2020	29.52	n = 91	0.38 mm / day
2 January 2021	32.8	n = 82	0.156 mm / day
6 February 2021	36.29	n = 80	0.0997 mm / day
9 May 2021	59.44	n = 27	.254 mm / day

Figure 17. Adult female Marbled Salamander with bifurcated tail.

Figure 18. Marbled Salamander with longitudinal stripes on back.

Figure 19. Dead Marbled Salamander at edge of curb.

17. *Desmognathus fuscus* (Northern Dusky Salamander)

Northern Dusky Salamanders were found at both parks. Juveniles and adults were found under rocks and leaf litter within and along the perennial and intermittent streams flowing through hardwood forests in both parks. A few adults were found on the roads and parking lots adjacent to these habitats on wet nights. Early and late activity dates are 2 January and 31 December. This salamander was collected in all months except for June, July, and August. Road mortality was documented on 29 May (1), 11 October (1), 13 November (1), and 14 December (1). No egg masses were found but a gravid female was found DOR on 11 October. Chigger parasites were commonly found on the legs and feet of infected animals. This species is abundant along the streams at both parks.

18. *Eurycea cirrigera* (Southern Two-lined Salamander)

Two-lined Salamanders were found at both parks under bark and rocks beside perennial and intermittent streams running through hardwood forests. One salamander was found .61 meters (2 feet) off the ground under bark. Animals were found active between 6 February and 15 May and between 16 September and 31 December. No animals were observed in June through August. Eggs were found under rocks in streams on 9 May. One female was found guarding 26 eggs. Two other nests without females in attendance had 24 eggs each. A gravid female was found under a rock at Dan Daniel Park on 12 December. Animals parasitized by chigger larvae were found on 9 and 10 May. Chiggers were only found on the legs and feet of parasitized animals. One DOR animal was found near a marshy wetland area at Anglers Park on 25 October another was

found DOR on 30 December at Dan Daniel Park. It was a considerable distance away from a stream but this site was adjacent to a large marshy area at Anglers Park. An AOR animal was found after a light rainstorm on the road crossing a small stream at Anglers Park on 26 November. This species is abundant along the streams in both parks.

19. *Eurycea guttolineata* (Three-lined Salamander)

This species was only observed on three occasions: 3 May, 10 May and 21 May. Only adults were found under logs by an intermittent stream at Anglers Park and several adults were found on the road near a small stream and vernal pool at Dan Daniel Park. The animals found on the road were probably pushed there when the Dan River flowed out of its banks due to flooding.

20. *Notophthalmus v. viridescens* (Red-spotted Newt)

Red-spotted Newts were found in both Anglers and Dan Daniel Parks. They were observed in man-made retention ponds, seasonally flooded pools, bike and hiking trails, open shallow marshy wetlands, flooded road ruts, and on the roads and in the hardwood forests surrounding these habitats. Newts are active all year round at this location. Early and late dates are 2 January and 30 December. The following is a breakdown of AOR and DOR observations of this species on roads by month: April (1 AOR), May (26 AOR, 21 DOR), June (1 AOR, 5 DOR), July (42 AOR), August (1 DOR), September (49 AOR, 43 DOR), October (17 AOR, 36 DOR), November (1 AOR, 2 DOR), and December (4 DOR, 3 AOR). The large numbers of newts found on roads in certain months is due to mass migrations into or out of the breeding wetlands. On 29 May 2021, 24 AOR and 19 DOR newts were found on the road in front of the marshy wetlands at Anglers Park. Of the AOR newts, three were immigrating to the wetlands and 21 were emigrating out of the wetlands heading toward the surrounding hardwood forest. On 9 July 2020, 39 freshly metamorphosed newts were collected on the road, emigrating out of the marshy wetlands at Anglers Park and heading toward the surrounding hardwood forest. This sample of metamorphs measured 31.85 ± 2.89 mm TL (24.92 - 37.58, n = 39); and 0.16 ± 0.04 g mass (0..094 - 0.246, n = 39) Numerous small newts were crushed on the road but not counted. On 25 September 2020, eight DOR newts and 26 AOR newts were observed immigrating to the marshy wetlands from the surrounding hardwood forest at Anglers Park. These newts included a mixture of adults and efts that were beginning to transform into adults. On 30 September 2020, a second migration wave was seen at the same location. Fifteen AOR and seven DOR newts were observed heading toward the marshy wetlands. These observations included a mix of adults and transforming efts. The most frequented habitats for successful breeding observed during this survey are vernal pools and open marshy wetlands. This is a very abundant species found in both Anglers and Dan Daniel Parks. One adult found on 26 September 2020 was found to have unilateral anophthalmia, this was the only anomaly observed in animals that were examined (Figure 20). On 30 September 2020 one DOR newt was

observed being scavenged by a harvestman (Figure 21).

Figure 20. Adult Red-spotted Newt found at Anglers Park with anophthalmia.

Figure 21. DOR Red-spotted Newt being scavenged by harvestman.

21. *Plethodon cylindraceus* (White-spotted Slimy Salamander)

This species was observed on 10 May, 15 May, and 31 October. On 10 May two adults were found under logs in a hardwood forest at Doe Run Trail, Dan Daniel Park. One of these adult animals had chiggers on its front legs. On 15 May an adult was found in a hardwood forest at Anglers Park. On 31 October one male was found in a hardwood forest adjacent to the soccer fields at Dan Daniel Park.

Discussion

Over the course of 23 years, 14 species of anurans and seven species of salamanders have been found at these parks. Compared to the species list of a study conducted 24 km to the north at White Oak Mountain Wildlife

Management Area in Pittsylvania County, the amphibian diversity seen at Anglers and Dan Daniels Parks is greater for anurans but less for salamanders (Gibson and Sattler, 2020). This study found one introduced species, *Hyla cinerea*, at Anglers Park. Other than that species, the anuran diversity between the Pittsylvania County and the city of Danville sites is the same. However, the salamander species count at White Oak Mountain stands at 11 species, whereas this survey only found seven species of salamanders (Gibson and Sattler, 2021). *Ambystoma talpoideum*, *Gryinophilus porphyriticus*, *Plethodon cinereus*, and *Pseudotriton r. ruber* were found at White Oak Mountain WMA but not in the city of Danville. The larger diversity of salamanders at White Oak Mountain WMA could be explained by the larger land area (1,100-hectares) and more varied habitats that exist at the WMA site. *Plethodon cinereus* has been reported for the city of Danville (USNM 409998) but none of the others found at White Oak Mountain have been reported being found in the city.

The reproductive and behavioral flexibility of amphibians is in full view when studying these parks. Most of the wetland habitats, with the exception of the intermittent and perennial streams, cannot be considered natural. The landscapes at both parks have been extensively modified, with most of the seasonally flooded pools and breeding grounds inadvertently created by the placement of sidewalks, poor grading of land, the building of an expressway, flooded tire ruts, and stormwater retention ponds. The construction of the mitigation wetlands at site 8 is an exception, as it was built for the purpose of providing wildlife habitat. Many species have rebounded from the construction of these sites, with some even benefiting from the habits that were created, especially the anurans, *Ambystomatid* salamanders, and *Notophthalmus v. viridescens*. However, other amphibians, such as woodland salamanders, have not fared as well and have either been extirpated (ie. *Plethodon cinereus*) or have not made significant population increases since the land was significantly modified (ie. *Plethodon cylindraceus*). The completely random creation of many of these habitats, successfully used by many species, should suggest to managers of these properties to allow a little bit of randomness to exist by not always “fixing” an area that floods or kicking out a beaver trying to build a home. A threat to these species would be draining and beautifying everything and getting rid of randomly created wetland habitats.

The primary threat to amphibians at both parks is vehicular traffic, especially true on wet nights and during seasonal breeding migrations. Street lighting attracts anurans to utilize the ground beneath as a feeding area, making them susceptible to being crushed by moving vehicles on roads. Concrete curbs seem to offer resistance to Marbled and Spotted Salamanders migrating to and from the breeding ponds in Dan Daniel Park. The roads and curbs lie between and parallel to the breeding ponds and the forest the salamanders utilize before and after breeding. Many road-killed specimens have been found on the roads with curbs as barriers on both sides. Additionally, some fully intact

salamanders have been found dead beside curbs with no apparent signs of predation or other injuries (not run over by cars). Although the cause of death is unknown for these salamanders, it is very likely that they were unable to cross the curbs and simply desiccated. To reduce overall mortality of this species, a concerted effort to document the most used paths of migration and then implementing salamander ramps would be beneficial. Furthermore, closing roads on wet nights at the height of the breeding season or having volunteers "shepherd" cars through the migration area could significantly reduce mortality. Marbled Salamanders are much more likely to be killed on roads in these parks than Spotted Salamanders due to their migration occurring during warmer periods of time when people are more likely to utilize the parks at night. Conversely, during the cold, rainy, and dark periods in February, fewer people travel the roads during the Spotted Salamander migration. Rain is the most important factor in finding amphibians and seeing mass migrations of salamanders on roads. During key times of the year, roads going through wetlands could be blocked off for only a few nights, which could save massive numbers of amphibians. An unknown source of potential harm to the amphibians at Anglers Park is a wastewater treatment plant 0.22 km to the east. When the Dan River overflows its banks, raw untreated sewage can be carried downstream to wetlands sites in Anglers Park that are on the floodplain. This raises concerns about the potential threat of various chemicals found at wastewater treatment plants, such as pharmaceuticals, organic pollutants, and heavy metals, which may pose risks to wildlife (Kasonga et al., 2021). Wetland site 8 has been observed on numerous occasions to be flooded by wastewater flowing from the treatment plant during flood events. An ecotoxicology study of the amphibians at site 8 would be an interesting test case to see if heavy metals or other pollutants are bioaccumulating in their tissues, as compared to more pristine sites nearby at Dan Daniel Park. Another potential threat to amphibians is technogenic man-made traps, such as storm drains. There are many of these drains at both Anglers and Dan Daniel Parks. The curbing at Dan Daniel Park serves as a migration barrier and often leads to storm drains. A study of the effects of both curbs and storm drains would help our understanding of the impact on these species. Additionally, both parks also have many miles of biking and hiking trails, where dead amphibians and reptiles have been found on many occasions. High trafficked trails, especially bike traffic, may be negatively impacting some species. Furthermore, another unknown potential threat to wildlife in Anglers Park is the retired Danville Landfill (EPA superfund site VAD988227765) located on the northern and eastern boundary of this park. This landfill site is drained by the two perennial streams flowing through Anglers. A study to assess the effects of this landfill on the local wildlife would be valuable.

In addition to serving the recreation needs of the public, these parks could function as a living laboratory for college students at Danville Community College and Averett University, as well as for Master Naturalist projects. Numerous studies could be conducted to document various aspects of the

natural history of these species in the parks. Additionally, other projects could focus on finding ways to better protect these species from human impact.

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HerpBlitz Survey of Powhatan State Park

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Abstract: The Virginia Herpetological Society conducted a one-day herp survey at the future site of Powhatan State Park on 8 May 2010. During that survey, 15 species of amphibians and nine species of reptiles were documented. On 20 May 2023, thirteen years after the first survey, the park was revisited. During this survey, 25 species of amphibians and reptiles were documented including 15 species of amphibians and 10 species of reptiles. The most frequently found species was the Northern Cricket Frog with 63 being observed. In all 204 animals were observed during the survey period. Forty people contributed 218 person-hours of effort surveying the park during the one-day survey.

Keywords: Herpetological survey, State Park, Powhatan County, Citizen Science

INTRODUCTION

A herpetological survey or "HerpBlitz" was conducted on 20 May 2023 from 0900 h to 1530 h at Powhatan State Park (PWSP) in the northwest corner of Powhatan County, Virginia by members of the Virginia Herpetological Society, the James River Master Naturalist Chapter, two state agency staff from the Virginia Department of Conservation and Recreation (DCR), and other participants from the general public.

Land for the Park was originally designated in 2003, when 633.3 hectares (1,565 acres) (including two miles (3.22 km) of frontage along the James River) were transferred from the neighboring Beaumont Juvenile Correctional Center of the Virginia Department of Juvenile Justice (DJJ) to Virginia DCR. A Powhatan State Park Master Plan was developed by an Advisory Committee and adopted in 2007, which states that the purpose of the park is "to provide premiere water and land based outdoor recreational and educational opportunities while protecting and interpreting the unique natural, historical, and cultural resources of the storied James River and the eastern Piedmont region of Virginia" (Department of Conservation and Recreation, 2012). The Park officially opened to the public on July 6, 2013. After the land was acquired in 2003, various field surveys were conducted on the property by state agency personnel to ascertain the ecological, archaeological and historical assets present. Of particular note were the wetlands identified on Park property, which in its earliest days was sometimes referred to as Beaumont State Park. An unpublished report about the plant communities describes the habitats and hydrology as follows:

> "On June 7, 2005, Virginia Natural Heritage Program (VANHP) chief biologist Chris Ludwig and ecologist Gary Fleming visited the site of the future Beaumont State Park and conducted a reconnaissance inventory. One of the most interesting discoveries of this visit was an eight-acre isolated basin wetland in the Big Woods section of the site. This wetland is a high-quality example of a forested, seasonally flooded Coastal Plain Depression Wetland (red maple - sweetgum - willow oak type) a very localized community most typical of the Coastal Plain but occasionally extending into the eastern Piedmont…On August 23, 2006, VANHP ecologists Gary Fleming and Karen Patterson returned to the site with State Parks District IV Resource Specialist Irene Frentz to revisit this significant wetland and explore other potential sites for the community based on aerial photo signatures and National Wetlands Inventory maps… In a stream-head depression across the road from the Big Woods and the old picnic pavilion, we also located a five-acre swamp forest of very different composition and character. This forest is classified as a Coastal Plain / Piedmont Acidic Seepage Swamp. Whereas the Coastal Plain Depression Wetland community is characterized by prolonged seasonal flooding and standing water, the

> Coastal Plain / Piedmont Acidic Seepage Swamp is associated with flow-through groundwater seepage (usually emanating from an adjacent slope) and a saturated hydrologic regime" (Ludwig, 2006).

The Park's proximity to the river and its associated low-lying wetland areas and forested plant communities together contribute to the unique habitat associations that support a diversity of herpetological species. For example, the high value of these habitats is noted as follows: "Prior to the Park's opening, the presence of wood frogs was first documented in Powhatan County in 2010 [Whitehurst & Wright, Field Notes *Catesbeiana*, Fall 2010] in an interior PWSP vernal pool. Normally found throughout western and northern Virginia, this record now defines the southeastern limit of the wood frog range in Virginia. In 2014, breeding wood frog adults and eggs were found in two additional floodplain pools in the northern section of the park. This could represent an expansion of the population or simply a lack of sufficient sampling effort, but it is a point of scientific interest as amphibian ranges expand and contract in response to changing environmental conditions. The wood frog findings, coupled with the identified high-value pool and other potential significant pools in the northern floodplain area prove that, at the least, this northern floodplain area supports high numbers of obligate vernal pool species. There is the potential that the amphibian populations in the floodplain may be connected with populations in the interior pool complexes in the park. This would have significant ramifications for gene flow and exchange at the landscape level and for forest health and biodiversity within the park" (Wright, 2017).

Between 2014 and 2017, more than 30 vernal pools were mapped in the park by DCR Resource Specialist Irene Frentz and other resource professionals. Important obligate herpetological species are supported by these seasonal wetlands, including marbled salamanders (*Ambystoma opacum*), spotted salamanders (*Ambystoma maculatum*) and wood frogs (*Lithobates sylvaticus*). From 2016 until the present, several of these pools have been monitored every winter (February through April) by Virginia Master Naturalist volunteers, through the Vernal Pool Cooperative of Virginia (http://www.virginiamasternaturalist.org/vernal-pools-cooperative.html). Field tallies are typically recorded weekly and include counts of the number of spotted salamander egg masses and the number of marbled salamander larvae observed, as well as the presence or absence of other indicator species such as wood frogs or fairy shrimp. Each pool's data is then entered into and maintained in the online platform CitSci.

Study Sites

On the day of the HerpBlitz, Powhatan State Park was divided into four survey areas. A map showing these areas can be found below (Figure 1). The following is a general description of each site with Google Earth GPS coordinates taken at the middle of the site.

Site 1: GPS coordinates (37°40'55.02"N, 77°56'9.12"W)
The starting point for this site was the parking area at Canoe Launch A, located at the end of

River Launch Road. Three major hiking trails, River Trail, Turkey Trail, and Gold Dust Trail, were used to gain access to this site. The River Trail followed through hardwood forest along the James River Edge. Along this trail was a dense herbaceous layer of grasses. Both Turkey Trail and Gold Dust Trail were high-elevation trails that paralleled small perennial streams. Observations were made both on the trail and off trail in the streams.

Site 2: GPS coordinates (37°41'21.15"N, 77°54'58.67"W)
The starting point for this site was the parking area at Canoe Launch C, located at the end of Powhatan State Park Road in the northeast corner. This site consisted of dense hardwood forest, edges of fields, and lowland marsh. There were several old gravel pits surrounded by dense vegetation.

Site 3: GPS coordinates (37°40'43.17"N, 77°55'27.58"W)
The starting point for this site was the parking area at picnic shelters 1 and 2. This site was accessed using Big Woods Trail and Pine Trail. The forest surrounding these trails was oak hardwood and mixed pine-hardwood. One lowland perennial stream was found at this site.

Site 4: GPS coordinates (37°40'11.58"N, 77°55'10.32"W)
The starting point for this site was the parking area at picnic shelters 1 and 2. A major feature of this site was Cabin Trail. Survey members followed this trail, fanning out into a hardwood forest. Throughout the hardwood forest were tree falls from a previous windstorm and many temporary seasonal pools. One small perennial stream was accessed at the eastern edge of the trail. On the west side of this site there was a mixed pine/hardwood forest with a large series of seasonal temporary pools scattered within.

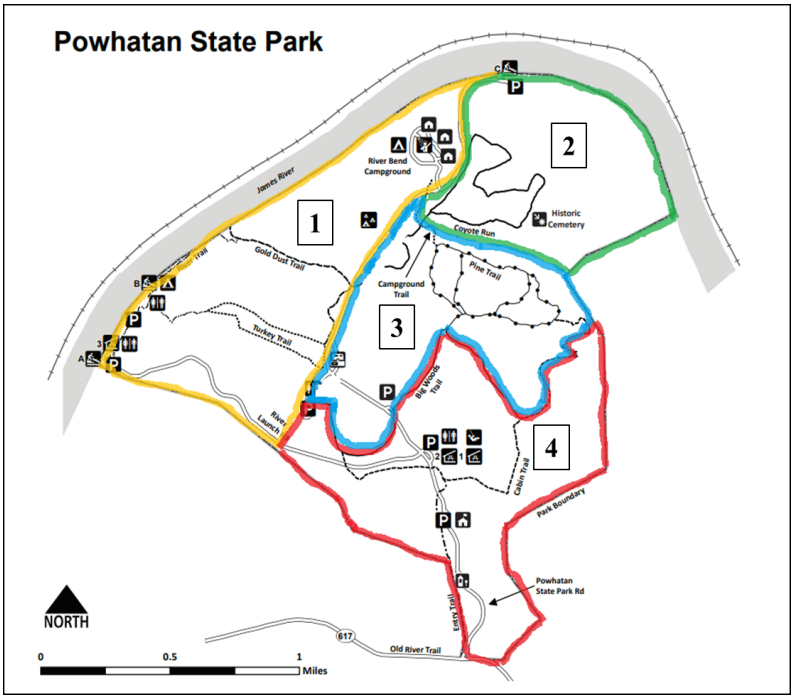

Figure 1. Map of survey areas in Powhatan State Park

MATERIALS AND METHODS

Four teams of 8 - 12 people surveyed four different sections of the Powhatan State Park from 9:00 a.m. until 3:30 p.m. on 20 May 2023. Weather conditions were sunny with a high temperature of 27.8 ºC (82 ºF). Survey participant collecting methods included: visual observations, looking for turtles on logs using binoculars, flipping and replacing logs, rocks, trash, and other cover objects, looking on park roads for alive and dead animals, dipnetting for aquatic amphibians, and listening for calling anurans. No turtle traps were used during this survey. Each animal captured was inspected for disease or other anomalies and then released at the capture site. Digital photos were taken of each species and all data were recorded on VHS survey forms. The VHS survey forms have been deposited in the VHS physical archive. A summary of the survey effort at each site appears in Table 1.

Table 1. Summary of survey effort at four sites in Powhatan State Park.

Survey Site	Number of Surveyors	Hours	Estimated Person Hours
1	10	6	60
2	8	6	48
3	12	5	60
4	10	5	50
Total	40		218

RESULTS

A total of 25 species (8 anurans, 7 salamanders, 2 turtles, 2 lizards, and 6 snakes) were found during this survey of Powhatan State Park (Table 2). Two additional species, *Chelydra serpentina* and *Pantherophis guttatus*, were recently observed in the park and reported to us by Chief Ranger Dan Gugliocciello and are included in this report since they had not been previously documented for Powhatan State Park. Carol Heiser found four species, *Clemmys gutatta*, *Kinosternon s. subrubrum*, *Nerodia s. sipedon*, and *Thamnophis s. sirtalis*, hiking through the park. These species are also reported in this paper. A total of 204 animals were seen or hand captured. Table 2 gives a summary of each species, total number of animals, and totals for each site. Scientific and English common names follow Crother (2017).

Table 2. Summary of animals observed per site at Powhatan State Park.

Species/Site	Site 1	Site 2	Site 3	Site 4	Total
Amphibians					
Acris creptians	12	11	32	8	63
Anaxyrus a. americanus		1	3		4
Anaxyrus fowleri	1		2	2	5
Gastrophryne carolinensis		1	3	2	6
Hyla versicolor	2		3	2	7
Lithobates catesbeianus	2				2
Lithobates clamitans		1	4		5
Lithobates palustris	3		1		4
Ambystoma maculatum		1	1	3	5
Ambystoma opacum		2	1	9	12
Desmognathus fuscus	6	1		1	8
Eurycea cirrigera	1	3	1		5
Notophthalmus v. viridescens	1	4	13	5	23
Plethodon cinereus	1		1		2
Plethodon cylindraceus	1	1	6	8	16
Reptiles					
Pseudemys c. concinna	3				3
Terrapene c. carolina			1		1
Plestiodon fasciatus		1		1	2
Plestiodon sp.	2		2		4
Scleoporus undulatus				1	1
Carphophis a. amoenus	2	1	5	4	12
Coluber c. constrictor		1	2	2	5
Diadophis punctatus edwardsi				1	1
Opheodrys a. aestivus			1		1
Pantherophis alleghaniensis	1	2	3		6
Storeria dekayi			1		1
Total	38	31	86	49	204

Annotated Checklist

Amphibians

1. *Acris creptians* (Eastern Cricket Frog)
The Eastern Cricket Frog was the most numerous species reported during the survey, with 63 being caught or observed. Twelve were found in leaf litter in a hardwood forest at site one. Eleven cricket frogs were found in leaf litter in a hardwood forest adjacent to the James River at site two. Thirty-two adult cricket frogs were found in leaf litter in upland forests and along the stream at site three. Eight cricket frogs were found in leaf litter at site four.

2. *Anaxyrus a. americanus* (Eastern American Toad)
One adult was found in leaf litter at site two. Three adult toads were found at site three. At this site, two were in leaf litter and one was found under a log.

3. *Anaxyrus fowleri* (Fowler's Toad)
One large adult female was found in grass beside the trail at site one. Two adult Fowler's Toads were found in leaf litter at site three. One adult and one juvenile were found in leaf litter and in a log, respectfully, at site four.

4. *Gastrophryne carolinensis* (Eastern Narrow-mouthed Toad)
One Eastern Narrow-mouthed Toad was found under a log at site two. Three adults were found under logs in the forest at site three. Two adults were found under logs in a hardwood forest at site four.

5. *Hyla versicolor* (Gray Treefrog)
One male was observed calling from the hardwood forest near the stream paralleling Gold Dust Trail at site one. Another male was heard calling in the woods surrounding the trail near the parking lot at site one. Male Gray Treefrogs were observed calling at 1015 h and 1300 h from the hardwood forests at site three. Two males were heard calling from trees in hardwood forests at site four.

6. *Lithobates catesbeianus* (American Bullfrog)
Two American Bullfrogs were found in a stream at site one.

7. *Lithobates clamitans* (Green Frog)
One adult male Green Frog was heard calling at 1100 h at the gravel pit pond at site two. A total of three adult Green Frogs were observed near a stream at site three.

8. Lithobates *palustris* (Pickerel Frog)
Two Pickerel Frogs were found in leaves near streams and one in the stream at site one. One adult Pickerel Frog was observed near a stream at site three.

9. *Ambystoma maculatum* (Spotted Salamander)
One adult Spotted Salamander was found under the same log as one of the Marbled Salamanders found at site two. One adult Spotted Salamander was found under a log in an upland forest at site three. Three adult Spotted Salamanders were found under logs in the hardwood forest at site four.

10. *Ambystoma opacum* (Marbled Salamander)
Two adults were found under logs in the hardwood forest at site two. One juvenile was found under a log in the upland forest at site three. At site four a total of nine Marbled Salamanders were found. Salamanders at this site were found under logs in the hardwood forest and one larva was dipnetted from a temporary seasonal pool. All age classes, including larvae, metamorphs, juveniles, and adults were observed at site four.

11. *Desmognathus fuscus* (Northern Dusky Salamander)
Three dusky salamanders were found in the stream, which parallels Turkey Trail and three were found in the stream which parallels Gold Dust Trail at site one. One adult was found under a log at site two. One juvenile was found under a rock in a muddy temporary season pool at site four.

12. *Eurycea cirrigera* (Southern Two-lined Salamander)
One two-lined salamander was found in a stream at site one. Three adult two-lined salamanders were found under logs at site two. One adult was found in a stream at site three.

13. *Notophthalmus v. viridescens* (Red-spotted Newt)
A total of 23 eft stage Red-spotted Newts were found, making this salamander species the second most frequently observed animal during the survey. Only eft stage newts were collected, no adults were observed. One eft was found under a log along a stream at site one. Four eft stage Red-spotted Newts were found under logs at site two. Thirteen eft stage newts were found under logs in the hardwood forest at site three. Four eft stage newts were found under logs and one eft stage newt was found on top of a log at site four.

14. *Plethodon cinereus* (Eastern Red-backed Salamander)
One Eastern Red-backed Salamander was found under a log near a stream at site one. One juvenile red-backed salamander was found under a log in the upland forest at site three.

15. *Plethodon cylindraceus* (White Spotted Slimy Salamander)
One slimy salamander was found under a log in the hardwood forest at site one. One adult slimy salamander was found under a log at site two. A total of six slimy salamanders were found under logs in hardwood forests at site three. Eight slimy salamanders were found under logs in hardwood forests at site four. Of the eight observed, one was a juvenile, and seven were adults.

Reptiles

16. *Chelydra serpentina* (Snapping Turtle)
One Snapping Turtle was found alive on the road by Chief Ranger Dan Gugliocciello on 24 March 2023.

17. *Clemmys gutatta* (Spotted Turtle)
Spotted turtles were not found during any survey of the park. Carol Heiser found one adult on 11 March 2022.

18. *Kinosternon s. subrubrum* (Southeastern Mud Turtle)
Southeastern Mud Turtles were not found during the survey, but on 25 March 2022 Carol Heiser found one in a temporary seasonal pool.

19. *Pseudemys c. concinna* (Eastern River Cooter)
Three Eastern River Cooters were observed on logs on the opposite side of the James River at site one. On Friday, during a pre-survey hike, one adult male River Cooter was photographed basking on a log along the bank of the James River at site one. Amelia Hulth found a hatchling turtle at the edge of an abandoned gravel pond at site two on 11 May 2023.

20. *Terrapene c. carolina* (Woodland Box Turtle)
One adult box turtle was found in leaf litter in an upland forest at site three.

21. *Eumeces fasciatus* (Common Five-lined Skink)
Numerous skinks were observed throughout the survey. Only a few were hand captured, and these were identified as Common Five-lined Skinks. At site one, several skinks were found under bark but were not hand captured for full identification. One adult female was found under bark at site two. Two adult skinks were observed but not captured at site three. One juvenile five-lined skink was found under a log in a hardwood forest at site four. Upon visual inspection, this animal was found to be parasitized by a tick. The tick was attached at the intersection of the front leg and the body.

22. *Sceloporus undulatus* (Eastern Fence Lizard)
One large female adult fence lizard was found basking on a fallen log in a hardwood forest at site four.

23. *Carphophis a. amoenus* (Eastern Wormsnake)
One adult Eastern Wormsnake was found DOR on the asphalt road, and one adult wormsnake was found under a log at site one. One adult wormsnake was found under a log at site two. Five adult wormsnakes were found under logs in hardwood forests at site three. Three adult wormsnakes were found under logs, and one wormsnake was found inside a rotten log at site four.

24. *Coluber c. constrictor* (Northern Black Racer)

One adult was observed basking on a thorn bush at 1030 h at site two. One adult was found in a rocky culvert beside a road at site three. Another adult was found in an upland forest at site three. One adult and one juvenile black racer were found in leaf litter in the hardwood forest at site four.

25. *Diadophis punctatus edwardsii* (Northern Ring-necked Snake)
One adult ring-necked state was found under a decomposed tree stump at site four. The animal had a complete neck band.

26. *Nerodia s. sipedon* (Northern Watersnake)
After the survey, on 31 May 2023, Carol Heiser found a Northern Watersnake basking on a fallen tree in the stream near Pine Trail.

27. *Opheodrys a. aestivus* (Northern Rough Greensnake)
One adult Northern Rough Greensnake was found at the edge of the woods at site three.

28. *Pantherophis alleghaniensis* (Eastern Ratsnake)
One Eastern Ratsnake was observed in rip rap near a road at site one. One adult was observed basking on a log at 1000 h, and another adult was found at 1400 h basking on a log adjacent to a temporary seasonal pool at site two. Three adult ratsnakes were found at site three. One was in an upland forest, one was in a bottomland forest, and one was beside the road adjacent to the forest.

29. *Pantherophis guttatus* (Red Cornsnake)
One Red Cornsnake was found alive on the road by Chief Ranger Dan Gugliocciello on 11 May 2023.

30. *Storeria dekayi* (Dekay's Brownsnake)
One adult was found DOR at site three.

31. *Thamnophis s. sirtalis* (Eastern Gartersnake)
The Eastern Gartersnake was not found during either VHS surveys of the park, but Carol Heiser found one on 25 March 2022, basking in leaf litter on the slope above the vernal pool located near Canoe Launch C.

DISCUSSION

During the survey day of 20 May 2023, 40 volunteers were able to document 25 species of reptiles and amphibians. The Virginia Herpetological Society conducted a survey of this area in 2010 before Powhatan State Park officially opened. During that survey, 26 species were found, with the species lists being very similar to the 2023 survey. A survey of Belmead, just to the west of Powhatan State Park in Powhatan County, yielded 33 species. This difference is likely due to the Belmead survey being both in May and in June, and the surveyors utilized turtle trapping. Turtle trapping increased the total number of species compared to the Powhatan State Park surveys.

As Powhatan State Park moves forward in further cataloging amphibian and reptile species, we suggest a few species for each taxonomic group to look for and suggest some techniques to find them. Anurans found in Powhatan County and likely to be found at Powhatan State Park include *Hyla chrysoscelis*, *Pseudacris feriarum*, and *Scaphiopus holbrookii*. *Pseudacris feriarum* vocalizing males should be sought during February and early March as this is their breeding season. *Hyla chrysoscelis* may be added to the state park list by listening for calling males from April until September. With more than 30 temporary seasonal pools spread throughout the park the likelihood of finding *Scaphiopus holbrookii* is high. Listening for calling males after long stretches of rain or during tropical storms or hurricanes might allow an observer to document this species for the park. Additionally, looking for eye shine at night around the seasonal wetlands might also turn up a spadefoot.

Eurycea guttolineata and *Pseudotriton ruber* are salamander species that are documented for Powhatan County and thus may be found in the park. The secretive Eastern Mud Salamander (*Pseudotrition m. montanus*) has a spotty statewide distribution but is documented for Goochland and Amelia Counties to the north and south. This may be found in the park if the right microhabitat is surveyed during its breeding season.

To date, five species of turtles have been reported in the park. The Belmead Survey nearby to the west, documented *Chrysemys p. picta*, *Sternotherus odoratus*, and the naturalized *Trachemys scripta elegans*, which have not been documented in the park. These species may be found with the use of baited hoop turtle traps. Traps set in more temporary seasonal wetlands on park property in March and April may add this species to the park's list.

The large open areas within Powhatan State Park would potentially serve as good habitat for the lizard *Aspidoscelis s. Sexlineata*. Searching the edge of these open fields during hot weather may produce an observation of this lizard. Other lizard species including *Ophisaurus attenuatus longicaudus*, *Plestiodon inexpectatus*, and *Scincella lateralis* are reported for Powhatan County and may potentially be found within park boundaries.

Snakes already documented for Powhatan County but not for PWSP include *Cemophora coccinea copei*, *Haldea striatula*, *Regina septemvittata*, *Storeria occipitomaculata*, *Thamnophis s. saurita*, and *Virginia v. valeriae*. With some effort these could be added to the state park master list of species. *Lampropeltis elapsoides* has a spotty distribution in Virginia but could possibly be another snake species that could be found in the park boundaries.

Table 3. Comparison of Powhatan State Park reptile and amphibian records, 2010 VHS survey results, and 2023 VHS survey results. Last column is master list of species for the park.

Survey Reference	Pow	2010	2023	Mast
Amphibians				
Acris creptians	*	*	*	*
Anaxyrus a. americanus	*	*	*	*
Anaxyrus fowleri	*	*	*	*
Gastrophryne carolinensis		*	*	*
Hyla cinerea	*	*		*
Hyla versicolor	*		*	*
Lithobates catesbeianus	*	*	*	*
Lithobates clamitans	*	*	*	*
Lithobates palustris	*		*	*
Lithobates sphenocephalus		*		*
Lithobates sylvaticus	*	*		*
Pseudacris crucifer	*	*		*
Ambystoma maculatum	*	*	*	*
Ambystoma opacum	*	*	*	*
Desmognathus fuscus	*		*	*
Eurycea cirrigera		*	*	*
Hemidactylium scutatum		*		*
Notophthalmus v. viridescens	*	*	*	*
Plethodon cinereus	*	*	*	*
Plethodon cylindraceus	*		*	*
Reptiles				
Chelydra serpentina			*	*
Clemmys gutatta			*	*
Kinosternon s. subrubrum			*	*
Pseudemys c. concinna			*	*
Terrapene c. carolina	*	*	*	*
Plestiodon fasciatus	*	*	*	*
Plestiodon laticeps		*		*
Scleoporus undulatus	*	*	*	*
Agkistrodon contortrix	*			*
Carphophis a. amoenus	*	*	*	*
Coluber c. constrictor		*	*	*
Diadophis punctatus edwardsi		*	*	*
Heterodon platirhinos		*		*
Lampropeltis calligaster rhombomaculata	*			*
Nerodia sipedon	*		*	*
Opheodrys a. aestivus		*	*	*
Pantherophis alleghaniensis	*	*	*	*
Pantherophis guttatus			*	*
Storeria dekayi			*	*
Thamnophis s. sirtalis			*	*
Total	24	26	31	40

Pow = Powhatan State Park database updated 19 May 2023, 2010 = VHS survey on 8 May 2010, 2023 = VHS survey on 20 May 2023, Mast = Master list of amphibians and reptiles for Powhatan State Park

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Comparisons of amphibian diversity at two high-elevation bogs in southwest Virginia's Balsam Mountains

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Abstract: Detailed information on amphibian assemblages associated with high-elevation (>1000 m above sea level) bogs in southwest Virginia's Balsam Mountains is lacking in the literature, with few historic surveys focused on these habitats. We compared amphibian diversity at two such bogs in Grayson Highlands State Park during 2021 and 2022, finding 11 total amphibian species and 172 total individuals. Amphibians at both sites were restricted to salamanders typically associated with headwater stream and seep communities and adjacent forests, with no anurans or pool-breeding salamanders observed. Assemblages also varied between sites, which were similar in wetland character but located within differing upland contexts. Desmognathine salamanders dominated encounters at a bog nested within heavily-disturbed, cleared bald habitat, with a more diverse assemblage containing several species adapted to high-elevation forests found at a nearby site nested within northern hardwood and spruce-fir forests. We additionally uncovered several Weller's Salamanders (*P. welleri*) at the latter site, confirming the species' presence in Grayson Highlands State Park and expanding its habitat associations to sphagnum substrate within high-elevation bogs. Our dataset provides a preliminary inventory of amphibians from this understudied habitat type and a foundation for more detailed investigation into habitat associations of individual species of concern.

Keywords: wetland; Blue Ridge, Appalachia, salamander, survey

INTRODUCTION

Wetlands are critical habitats for herpetofauna, particularly for aquatic and pool-breeding amphibians that require wetlands for all or part of their life cycles (Semlitsch & Bodie, 2003; Baldwin et al., 2006; Gibbons et al., 2006). In Virginia, past studies have identified various wetland types as harboring diverse and speciose amphibian assemblages, including forested lowland wetlands (Mitchell et al., 1993), isolated vernal pools (Rice & Jung, 2004), seasonal sinkhole ponds (Mitchell & Buhlmann, 1999), and artificially-constructed wetland habitat (Atkinson et al., 1997).

Intensive surveys of naturally-occurring wetland habitats in the mountains of far southwestern Virginia have historically been less common, although recent surveys of ridgetop wetlands in southwest Virginia's Cumberland Mountains have uncovered similarly diverse amphibian assemblages, including extensions in the elevational ranges of some taxa typically predisposed to lowland environments (Romans & Smith, 2022).

High-elevation (>1000 m above sea level) wetlands represent a rare habitat type among Virginia's wetland ecosystems, particularly in the southwestern corner of the state. Such

high-elevation wetlands occur primarily across upland areas of the Balsam Mountains of far southwest Virginia, as well as the upper elevations of the Allegheny Highlands (Fleming et al., 2021). Wetlands in the Balsam Mountains are among the highest-elevation wetland ecosystems in Virginia, occurring across the upper reaches of headwater streams in the Mount Rogers and Wilburn Ridge areas of Grayson County. These wetlands also represent high-elevation bog complexes that are characteristic of wetland types found more broadly across the upper elevations of nearby western North Carolina (Shafer, 1986; Pittillo, 1994).

Unlike information on floral assemblages in high-elevation bogs, which have been intensively studied (Weakley & Schafale, 1994; Francl et al., 2004), little information exists in the literature regarding the amphibian communities of high-elevation bog complexes in southwest Virginia and surrounding portions of the Blue Ridge Physiographic Province. While some work has occurred to the north of the region to characterize amphibian communities in high-elevation wetlands in the Alleghany Mountains (Byers et al., 2007), work on amphibian communities in high-elevation bogs in the southern Blue Ridge has been primarily centered around surveys of individual species at bogs in North Carolina (Freeman & Bruce, 2001). In southwest Virginia, no historic amphibian surveys have targeted high-elevation bogs in the Balsam Mountains, with the nearest amphibian survey efforts occurring in the 1980s and early 2000s in nearby upland terrestrial habitats in the general vicinity of wetlands in the Mount Rogers area and Grayson Highlands State Park (Pague, 1984; Gibson, 2009). Those surveys concluded that some high-elevation amphibian species were likely absent from this area due to historic habitat disturbance related to the development and maintenance of grassy balds, although neither study directly surveyed bog habitat. No results of intensive amphibian surveys have been published from Grayson Highlands State Park and immediately adjacent areas since this time.

The goals of this study were to compare amphibian diversity at two high-elevation bogs in Grayson Highlands State Park. In particular, we sought to characterize the amphibian assemblages at each site and determine if amphibian communities in high-elevation wetlands in the Balsam Mountains match anuran-rich communities found in low-elevation wetlands in southwest Virginia or exist as extensions of diverse salamander assemblages found in headwater seepages that are common across upland areas of the Blue Ridge Physiographic Province. We also sought to determine if any high-elevation endemics, such as *Plethodon welleri* and *Desmognathus organi*, were present in and around upland bog habitats within the park.

SURVEY SITES

We established amphibian surveys at two high-elevation bogs in Grayson Highlands State Park in August 2021 at the request of Virginia Department of Conservation and Recreation (DCR) staff. Both bogs were located along the northern edge of the park near the Little Wilson Creek Wilderness Area boundary and were formed across the uppermost headwater reaches of first-order streams near the head of the Wilson Creek drainage (Figure 1). Geographic coordinates for each site below have been obscured to two decimal places at the request of Virginia DCR staff and to adhere to sampling permit conditions, given conservation concerns surrounding the focal habitats of this study and the presence of globally-rare floral assemblages at each site that are susceptible to physical disturbance. Table 1 lists detailed

habitat characteristics for each site, with representative habitat at each site shown in Figure 2.

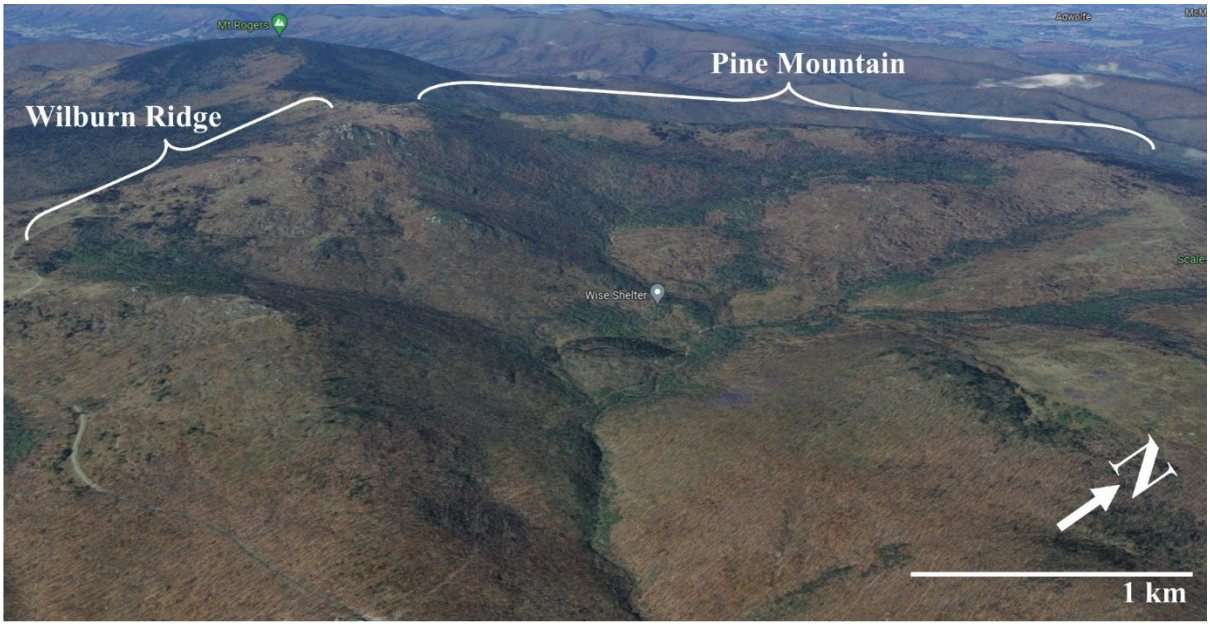

Figure 1: Map of the study area showing the headwaters of the Wilson Creek drainage across Grayson Highlands State Park and adjoining portions of the Mount Rogers National Recreation Area. Light-colored land areas on the map are cleared grassy bald habitats. High-elevation bogs surveyed through this study were located across the upper reaches of first-order headwater streams adjacent to bald habitat in western portions of the drainage. Nearby upland habitat on Wilburn Ridge and Pine Mountain previously surveyed by Pague (1984) is also shown.

Table 1: Habitat characteristics of two high-elevation wetlands surveyed for amphibians in Grayson Highlands State Park in 2021-2022.

Site	Wetland Area (ha)	Elevation (m above sea level)	% Wetland Forested	Predominant Wetland Vegetation	% Forested Uplands	% Bald Uplands
Wilson Bog 1	2.4	1500	23	Emergent	40	60
Wilson Bog 2	2.3	1310	25	Emergent	70	30

Figure 2: Representative examples of typical habitat conditions within two high-elevation bog ecosystems surveyed for amphibians in Grayson Highlands State Park in 2021-2022: (A) a 1500 m above sea level bog surrounded primarily by cleared bald habitat (Wilson Bog 1), and (B) a 1310 m above sea level bog surrounded primarily by spruce-fir and northern hardwood forest cover (Wilson Bog 2).

Site 1 – Wilson Bog 1 (36.64, -81.51). This site was an emergent wetland located at 1500 m above sea level along an unnamed first-order stream within the context of cleared bald habitat below the crest of Wilburn Ridge, with scattered shrub and tree cover (spruce-fir and northern hardwoods) within the wetland proper.

Site 2 – Wilson Bog 2 (36.65, -82.49). This site was an emergent wetland located at 1310 m above sea level at the confluence of two unnamed first-order headwater tributaries of Wilson Creek. This site was surrounded by cleared balds only on its eastern and northern edges, with a mixture of northern hardwood and spruce-fir forests on its western and southern edges.

MATERIALS AND METHODS

We sought to compare amphibian diversity at each of the aforementioned study sites over a comprehensive, year-long sampling effort. Drift-fence surveys are commonly employed as the preferred method for these types of wetland inventories (Mitchell et al., 1993; Jenkins et al., 2003). However, drift-fence surveys were not appropriate at our study sites due to the remote locations of each wetland and conservation concerns related to globally-rare plant species that were present at each site. Instead, we used a combination of monthly visual encounter surveys (VES) and automated anuran call recorders (Frogloggers; Penman et al., 2005) to characterize amphibian assemblages at each site. VES were performed monthly from August 2021 to August 2022.

VES were performed as time- and area-constrained surveys of all accessible habitat within the wetland and a 20m buffer of each wetland. This buffer size was selected to represent terrestrial habitat immediately adjacent to each wetland and below the transition to more xeric, hardwood-dominated uplands above each site. Such adjacent terrestrial habitat has been shown in past work to be important for wetland amphibians generally (Rittenhouse & Semlitsch, 2007) and for regional amphibian assemblages associated with wetlands in mountainous portions of southwest Virginia (Romans & Smith, 2022). We specifically searched all available substrate and cover objects within the aforementioned study sites for a minimum of one hour or until all available habitat had been searched, with surveys during each site visit performed by four observers. All encountered amphibians were identified to species and released at the point of capture. We also visually searched each wetland for the presence of amphibian egg masses during each survey but did not perform dipnet sweeps for larvae due to (i) the aforementioned conservation concerns about physical disturbance to globally-rare plant assemblages at each site, and (ii) shallow surface water levels within each wetland during the majority of survey visits that precluded standing pools of surface water and access for dipnet sweeps.

The lack of dipnet sweeps in our survey methodology presented the risk of overlooking breeding amphibians at both sites, particularly anurans. While this risk seemed minimal due to a lack of standing surface water and with most water instead presenting just below the surface or as saturated soils at both sites, we used Frogloggers as an alternative method to detect calling anurans and associated breeding activity. We installed Frogloggers at both sites on two occasions (28 April and 30 May 2022) throughout the survey period, specifically warm evenings associated with light rainfall events to maximize anuran detection. Frogloggers operated continuously from 1600-0800 h on each date, with resulting recordings surveyed for anuran

calls (species, time of each call) after Frogloggers were retrieved from the field.

Following the completion of surveys, we assembled inventories of species encountered at each site and recorded the relative abundance (total individuals encountered and captures per unit effort, or CPUE) for each species. We used individual-based rarefaction curves (Gotelli & Caldwell, 2001) to assess species richness relative to sampling effort at each site. Lastly, we summarized amphibian diversity at each site using Shannon Diversity (H') and Shannon Evenness (E). Rarefaction analysis and biodiversity metric calculations were performed using R v.4.2.1, with rarefaction curves constructed using the iNEXT package (Hsieh et al., 2016).

RESULTS

We encountered 11 total amphibian species and 172 total individuals across both study sites and 80 total person-hours of visual encounter survey effort (Table 2). All encountered species were salamanders, with no adult or larval anurans encountered and no anuran calling activity detected across all of our in-person surveys and 56 total hours of automated auditory recordings. Thirty-six individuals were larval or recently-transformed desmognathine salamanders that could not be reliably identified to species. Rarefaction curves for both sites began to approach an asymptote (Figure 3), suggesting thorough sampling of amphibian assemblages at each site. The rarefaction curve for Wilson Bog 2, however, suggested the possibility of several additional species at this site that went undetected during surveys.

Table 2: Eleven amphibian species and catch per unit effort (individuals per person-hour) per species encountered during high-elevation bog surveys at two sites within Grayson Highlands State Park in 2021 and 2022. Numbers in parentheses represent total encountered individuals of each species throughout the survey period. "Larval *Desmognathus*" refers to larval individuals that could not be reliably assigned to a species.

Species	**Wilson Bog 1**	**Wilson Bog 2**
Desmognathus fuscus	0.33 (4)	0.08 (1)
Desmognathus marmoratus		0.08 (1)
Desmognathus monticola	0.08 (1)	0.15 (2)
Desmognathus orestes	4.08 (49)	1.44 (19)
Desmognathus quadramaculatus	0.25 (3)	
Larval *Desmognathus*	2.83 (34)	0.15 (2)
Eurycea wilderae	0.75 (9)	0.08 (1)
Gyrinophilus porphyriticus	0.08 (1)	0.08 (1)
Notophthalmus viridescens	0.17 (2)	
Plethodon cinereus	0.92 (11)	1.06 (14)
Plethodon montanus	0.08 (1)	0.83 (11)
Plethodon welleri		0.38 (5)

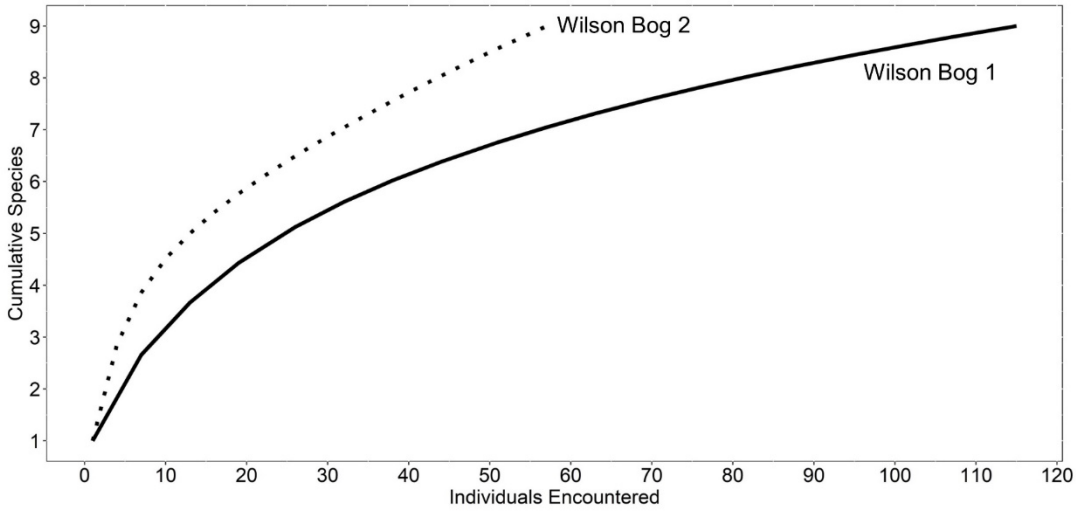

Figure 3: Individual-based rarefaction curves for amphibian sampling at two high-elevation bogs in Grayson Highlands State Park in 2021-2022.

Assemblage composition was relatively disparate between the two study sites, despite both sites having identical species richness. Shannon Diversity and Shannon Evenness were both higher at Wilson Bog 2 (Table 3), a consequence of Wilson Bog 1 being unevenly dominated by desmognathine salamanders, particularly *Desmognathus orestes*. Redback Salamanders (*Plethodon cinereus*) were also abundant at Wilson Bog 1 under cover along the wetland margin, with remaining species restricted to a small number ($n < 5$) of individuals encountered at the site.

Table 3: Species richness (S), Shannon Diversity (H'), and Shannon Evenness (E) for amphibian assemblages surveyed in two high-elevation bogs in Grayson Highlands State Park in 2021-2022.

Site	**S**	**H'**	**E**
Wilson Bog 1	9	1.344	0.612
Wilson Bog 2	9	1.667	0.759

By contrast, encounters at Wilson Bog 2 were more evenly spread across three abundant species: *D. orestes*, *P. cinereus*, and *P. montanus*. The latter two species were found under cover along the wetland margin or within the wetland proper during dry conditions. Two species – *D. marmoratus* and *P. welleri* – were only encountered at Wilson Bog 2, with two other species – *D. quadramaculatus* and *Notophthalmus viridescens* – only encountered at Wilson Bog 1. All of the species encountered during surveys were salamander taxa known from headwater seepage areas and immediately adjacent forested uplands in the Blue Ridge Physiographic Province, with no pool-breeding taxa observed.

All of the species encountered during surveys were also common and widespread taxa across the broader southern Appalachian ecoregion, with the exception of *Plethodon welleri*. We encountered this species on four occasions, with all individuals observed beneath coarse woody debris near the center of a saturated sphagnum mat at Wilson Bog 2 (Figure 4). Comparisons of dorsal patterning showed that we encountered the same individual on two occasions (20 March and 28 April 2022), with at least two unique individuals present at the site.

Figure 4: Two individuals of *Plethodon welleri* (Weller's Salamander) found within a sphagnum mat in a high-elevation bog in Grayson Highlands State Park.

ANNOTATED CHECKLIST

1. *Desmognathus fuscus* (Northern Dusky Salamander) – Four *D. fuscus* were found at Wilson Bog 1, with one individual found at Wilson Bog 2. All individuals were found beneath cover objects.

2.) *Desmognathus marmoratus* (Shovel-nosed Salamander) – *D. marmoratus* was found only at Wilson Bog 2, with a single individual found under rock cover in the channel of one of the first-order feeder streams at the center of the wetland.

3.) *Desmognathus monticola* (Seal Salamander) – *D. monticola* was found at both study sites, with a single individual at Wilson Bog 1 and two individuals at Wilson Bog 2. All individuals were found beneath cover objects.

4.) *Desmognathus orestes* (Blue Ridge Dusky Salamander) – *D. orestes* was the most abundant salamander encountered during surveys at both sites. Individuals at both sites were found beneath cover objects both within the wetland proper and along the wetland margin, as well as actively moving through sphagnum mats at each site.

5.) *Desmognathus quadramaculatus* (Black-bellied Salamander) – *D. quadramaculatus* was only observed at Wilson Bog 1, with individuals observed on three occasions beneath rock cover in the first-order stream at the center of the bog.

6.) *Eurycea wilderae* (Blue Ridge Two-lined Salamander) – *E. wilderae* was present at both sites but was substantially more abundant at Wilson Bog 1. Individuals were routinely found beneath cover along the wetland margin and within the wetland proper. One female attending a nest was also

observed under a rock at the head of the wetland at Wilson Bog 1.

7.) *Gyrinophilus porphyriticus* (Spring Salamander) – A single individual of this species was observed at both sites, with both individuals under cover in first-order streams within the center of each bog.

8.) *Notophthalmus viridescens* (Red-spotted Newt) – Newts were only encountered at Wilson Bog 1. We specifically encountered two efts actively moving through shaded areas of the bog on the ground surface.

9*.) Plethodon cinereus* (Eastern Red-backed Salamander) – *P. cinereus* was the most frequently encountered terrestrial salamander at each site. All individuals were found beneath cover either in terrestrial habitat along the wetland margin or within the wetland proper, particularly during dry periods.

10.) *Plethodon montanus* (Northern Gray-cheeked Salamander) – *P. montanus* was abundant at Wilson Bog 2 but with only a single individual encountered at Wilson Bog 1. Individuals were frequently found under cover in wet but not saturated soils at the margin of each bog.

11.) *Plethodon welleri* (Weller's Salamander) – *P. welleri* was found only at Wilson Bog 2, with all individuals found beneath cover and within a sphagnum mat in a slightly elevated location near the center of the bog.

DISCUSSION

High-elevation bogs in Virginia's Balsam Mountains represent an understudied habitat type for amphibians in the Blue Ridge Physiographic Province. Our surveys found evidence that these wetlands harbor diverse salamander assemblages similar to those known from high-elevation seepage and headwater stream habitats in the broader region (Beane et al., 2010) and from previous surveys of those same habitats within Grayson Highlands State Park (Gibson, 2009). The much larger spatial extent of bog habitats relative to smaller seepages and headwater streams presents the possibility that high-elevation bogs in the Balsam Mountains possess substantial amounts of amphibian abundance and biomass.

We did not encounter evidence of any anurans or pool-breeding salamanders at either site surveyed through this study, suggesting that amphibian assemblages in high-elevation bogs within the study region likely lack these taxa. This phenomenon is likely the consequence of the hydrological nature of bogs within the study area, which typically present with saturated wetland soils that are driven by groundwater seepage in gently-sloped areas and without persistent, large pools of standing water (Figure 2; Weakley & Schafale, 1994). Indeed, we observed large pools of standing surface water present at either site on only three survey occasions (<30% of all survey visits) immediately after high-precipitation periods, during a year that fell within climatological norms for precipitation amounts. It is therefore plausible that the hydrologic characteristics of the study sites likely serve as a limiting factor for pool-breeding and other wetland taxa that require the long-term presence of lentic surface habitat for reproduction and recruitment.

Similarly, the disparity in amphibian assemblages observed between both bogs is likely the result of differences in habitat between each site. Wilson Bog 1, for example, occurred in a much more disturbed upland context than Wilson Bog 2, being located near the center of an area artificially converted into a grassy bald for the purposes

of livestock grazing and presently maintained in this condition for recreational activities within the park. By contrast, Wilson Bog 2 was located within an upland context much more heavily characterized by hardwood forests mixed with sporadic Red Spruce (*Picea rubens*) and Fraser Fir (*Abies fraseri*), with cleared bald habitat restricted to the eastern border of the bog. Total amphibian encounters at both sites were relatively low given the temporal extent of the survey period; however, this is also likely an artifact of the location of each bog within a heavily-disturbed landscape context.

Our study design did not allow us to perform a robust assessment of how individual habitat attributes contribute to the occupancy or abundance of individual salamander taxa at either site. However, past surveys in upland habitats in close proximity to our study site concluded that historic activities replacing forest cover with grassy bald habitat likely reduced habitat availability for a number of taxa within the Grayson Highlands region (Pague, 1984; Gibson, 2009). Pague (1984)'s surveys, for example, found evidence of only *D. orestes* and *P. montanus* occurring in and adjacent to cleared balds on Wilburn Ridge in non-wetland habitat directly above and within 1 km of both wetlands surveyed through this study. Our surveys mirrored these results, finding assemblages characterized by these two taxa and largely lacking high-elevation habitat specialists associated with spruce-fir ecosystems, particularly at the more heavily-disturbed Wilson Bog 1. *D. organi*, for instance, was not encountered at either site. In addition, we encountered numerous instances of *P. cinereus* beneath cover well within the wetland margin at both sites. While unusual for this species, other researchers have previously documented *P. cinereus* using wetland habitat in the same manner during surveys in Maine (Chalmers & Loftin, 2010). Our dataset reinforces these earlier findings and shows that *P. cinereus* may use wetland substrate more frequently than has previously been thought.

Semiaquatic salamander taxa that are generally uncommon in the habitats sampled by Pague (1984) but detected by Gibson (2009) at streamside habitats elsewhere within the park were also encountered in our wetland surveys, albeit less frequently than *D. orestes* and *P. montanus*. The similarity between our species inventory and Gibson's (2009) inventory of streamside habitats within the park also reinforces our conclusion that amphibian assemblages at high-elevation bogs within the Balsam Mountains are effectively extensions of assemblages found in stream and seep habitats. Future, more intensive surveys of individual species of interest may be able to further disentangle if and how legacies of past disturbances within the park interact with local-scale wetland attributes to shape the amphibian diversity patterns uncovered in this study.

One key difference between this study and earlier work by both Pague (1984) and Gibson (2009), however, was the repeated detection of *P. welleri* at Wilson Bog 2. This finding is significant for two reasons. First, past work, including Pague (1984)'s surveys of Grayson Highlands State Park and adjacent areas, did not locate *P. welleri* within the park boundary, concluding that historic clearing of bald habitats within and adjacent to the park had restricted the species' range in Virginia to areas immediately surrounding Mount Rogers, Whitetop, and forested portions of Pine Mountain. During their later surveys, Gibson (2009) also did not locate *P. welleri* at several locations within the state park boundary south of the park's most extensive cleared balds. By contrast, our surveys uncovered that the species does indeed occur south and east of cleared balds

in the Mount Rogers area, with *P. welleri* potentially possessing a broader distribution across the higher elevations of the Balsam Mountains than has previously been assumed.

Second, our discovery of *P. welleri* within high-elevation wetlands represents a novel habitat association for this species, which is typically found in spruce-fir forests exceeding 1500 m above sea level and not associated with aquatic habitat features (Petranka, 1998). While our surveys did encompass a narrow 20 m buffer of terrestrial habitat directly adjacent to each bog, each of our *P. welleri* encounters occurred well within the bog itself, specifically within extensive sphagnum mats emerging from saturated soils within the bog (Figure 4). Our encounters of this species were limited, although we did note the species only being present within the bog during cool and dry conditions, with recaptures of the same individual at the site over multiple monthly visits. This presents the possibility that mesic bog habitats may represent "islands" of suitable substrate within relatively xeric grassy balds, providing *P. welleri* with the potential to disperse across and/or persist in an otherwise unsuitable landscape. Future surveys targeted on this species, particularly those within the state park and surrounding areas lacking historic localities of *P. welleri*, may help shed further light on this species' distribution in Virginia and its associations with various habitat types present across upper elevations of the region.

Overall, our results indicate that high-elevation bogs within Virginia's Balsam Mountains are critical habitats for amphibians, particularly salamanders, and that amphibian diversity adds to these bogs' already high conservation priority (Weakley & Schafale, 1994). Activities that encourage the reestablishment of native forest cover, including spruce-fir and northern hardwood forests, in uplands immediately adjacent to these bogs may also be beneficial to assist in managing resident amphibian assemblages. While these concerns must be balanced with other management goals within the park such as those related to recreation and aesthetic assets, the reestablishment of closed-canopy, high-elevation forests surrounding each bog would help restore suitable habitat conditions for native salamanders. These activities would also likely help restore connectivity between each bog and nearby upland habitats that are currently characterized by xeric, artificially-maintained grassy balds.

More broadly, our results underscore the relevance of high-elevation bogs to ecosystem function at the landscape scale. We recorded both those amphibian taxa typically associated with semiaquatic habitats and more terrestrial taxa that appeared to be using bogs and their margins as potential refugia within otherwise heavily-disturbed landscape contexts. Given the large size of these wetland habitats relative to much more common but smaller spring and seep habitat, bogs within the Balsam Mountains may possess abundant amphibian populations representing substantial vertebrate biomass. Investigating how these habitats contribute to ecological function in the region's high-elevation ecosystems, as well as further examining individual species' use of high-elevation bogs, will be essential to understanding the roles that Virginia's herpetofauna play in these unique, patchily-distributed ecosystems.

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***Acris crepitans* (Eastern Cricket Frog)** VA: Craig County. Fenwick Mines Day Use Area of Jefferson National Forest (37.571803 -80.053985). 22 October 2017. Don Mackler and Bruce Grimes

County Record: The Eastern Cricket Frog, *Acris crepitans* is a small and common anuran found along streams and ponds. It has a wide distribution in eastern Virginia, extending out to Montgomery and Patrick Counties (https://www.virginiaherpetologicalsociety.com/amphibians/frogsandtoads/eastern-cricket-frog/index.php). The Montgomery County record is an older unvouchered call observation, but has no recent confirmations (Jason Gibson, pers. comm). Thus, this record is suspect. Other Virginia counties south and west in the New River drainage and further do not have records of this species.

Here I report the first record of the eastern Cricket Frog from Craig County. The habitat is a constructed wetland, abutting a naturally occurring stream (Mill Creek) and using it to keep shallow pools filled. The species had been previously caught and identified at the site by Don Mackler (with Bruce Grimes) on February 18, 2017, but no confirming photos were taken. A digital photograph from 22 October 2017 was submitted as a voucher for this observation (VHS Archive #758). It has been recorded from adjoining counties in the James River drainage (Alleghany and Botetourt), so this record fills a gap in the western distribution for this species. The Weather conditions were partly cloudy with a temperature of 22°C.

Bruce Grimes
Christiansburg, VA

***Gastrophryne carolinensis* (Eastern Narrow-mouthed Toad)**: VA, Scott County, Gate City 6756 Upper Possum Creek Road. 23 June 2023. Aaron Mazuelos.

County Record. On 23 June and again on 24 June a single Narrow-Mouthed Toad was heard calling. The temperature was 22.8°C the first day and 23.9°C the second day, both days with rain showers in the vicinity. The weather had been similar, in the 20-24°C range with spotty rain showers daily, for the preceding four days.

The call frequency of the eastern narrow-mouthed toad is a higher pitch than the Fowler's toad with a unique bleating-like noise. According to the Virginia Herpetological Society website, this species was previously only known to exist in Lee County in far southwestern Virginia with a wide gap across central Virginia before a larger known range along the eastern portion of Virginia. This observance would extend the toad's range eastward by one county in southwestern Virginia. Due to habitat conservation, sound recordings are being submitted in lieu of photos (VHS Archive #801).

Aaron Mazuelos
6756 Upper Possum Creek Road
Gate City, Virginia

***Lithobates catesbeianus* (American Bullfrog)** VA: Craig County. Fenwick Mines Day Use Area of Jefferson National Forest (37.571803 -80.053985). 22 October 2017. Don Mackler and Bruce Grimes

County Record: The American Bullfrog, *Lithobates catesbeianus* is the largest anuran in Virginia. It inhabits large permanent bodies of water (https://www.virginia herpetologicalsociety.com/amphibians/frogs andtoads/american-bullfrog/index.php) and consumes about anything smaller than it. The Bullfrog has been recorded from most Virginia counties including all of those bordering Craig County. This new record for Craig County is therefore more likely to reflect the lack of previous effort at cataloging species within the county than a range extension. The habitat at the specific site is constructed wetlands, abutting a naturally occurring stream (Mill Creek) and using it to keep shallow pools filled. The species has been heard calling at the site, and tadpoles are present in the large pools. A photograph of a newly metamorphosed Bullfrog was submitted to the VHS Archive (#780) as a voucher for this observation. The weather conditions were partly cloudy, and 22°C.

Bruce Grimes
Christiansburg, VA
Bruce Grimes <bugpix@verizon.net>

Atlantic Coast Leopard Frog (Lithobates kauffeldi) VA: Hanover County, off State Route 613, Fox Hunter Lane, (N 37º 32' 54.44", W 77º 14' 18.33"); and, in the Chickahominy River, just upstream from State Route 156, Cold Harbor Rd., at the Grapevine Bridge (N 37º 33' 12.36", W 77º 16' 17.04"). 09 March 2016. Brian Munford

County Record: On 07 March 2016, at approximately 13.15h, while enjoying a canoe float on the Upper Chickahominy River, two choruses of Atlantic Coast Leopard Frogs were noted. One, in a small bay on the north side of the river just upstream from the bridge, was recorded from the canoe. The second, in a swamp along the south bank, was calling at the parking lot for the boat ramp, and was recorded there.

These observations are a new county record and expand the distribution map of this species westward in Virginia. A digital recording has been deposited in the VHS archives (Digital voucher # 793)

Owen Munford and Brian Munford
Richmond, VA 23225

Atlantic Coast Leopard Frog (Lithobates kauffeldi) VA: Hanover County, off State Route 613, Fox Hunter Lane, (N 37º 32' 54.44", W 77º 14' 18.33"); and, in the Chickahominy River, just upstream from State Route 156, Cold Harbor Rd., at the Grapevine Bridge (N 37º 33' 12.36", W 77º 16' 17.04"). 09 March 2016. Brian Munford

County Record: On 09 March 2016, at approximately 21.30h, while conducting opportunistic field survey work, a chorus of Atlantic Coast Leopard Frogs was noted and recorded. A second population was

also noted and recorded while canoeing in the Chickahominy, at approximately 13.15h on 07 March 2016.

These observations are a new county record and expand the distribution map of this species northwestward in Virginia. Digital recordings have been deposited in the VHS archives (Digital vouchers # 794)

Brian Munford
Richmond, VA 23225

Atlantic Coast Leopard Frog (Lithobates kauffeldi) VA: Prince George County, along State Route 625, Hines Road, at the Blackwater River (N 37º 08'07.31,"W 77º 12' 21.33") 08 March 2016. Brian Munford

County Record: On 08 March 2016, at approximately 23.00h, while conducting opportunistic field survey work, a chorus of Atlantic Coast Leopard Frogs was noted and recorded. These observations are a new county record and expand the distribution map of this species westwards in the central part of its range in Virginia. A digital recording has been deposited in the VHS archives (Digital voucher # 795)

Brian Munford
Richmond, VA 23225

***Scaphiopus holbrookii* (Eastern Spadefoot)**. VA: James City County, (37º 14'06"N; 76º 45'00"W).. John (J.D.) Kleopfer.

Dispersal: The effective management and conservation of wetland-breeding amphibians is contingent on an understanding of their use of upland habitats, especially aspects of their movement patterns. Unfortunately, very little information is available on dispersal distances from breeding sites for the Eastern Spadefoot. Timm et al. (2014. Upland movement patterns and habitat selection of adult eastern spadefoots (*Scaphiopus holbrookii*) at Cape Cod National Seashore. J Herpetol. 2014;48: 84–97.) documented a maximum dispersal distance of 449 meters at Cape Cod National Park. Dodd (C.K. Jr. 1996. Use of terrestrial habitats by amphibians in the sandhill uplands of north-central Florida. Alytes 14: 42-52.) found a maximum distance of 914 m and an average of 539 m from the nearest body of water in north central Florida.

At my personal residency, I have on multiple occasions throughout the spring and summer months encountered adult and juvenile (~3-4 cm. SVL) Eastern Spadefoots. The only known breeding site in the vicinity is ~330 meters away. These observations compile the first reported dispersal distance for this species in Virginia and may also represent the first recorded dispersal distance for juveniles from anywhere in the range.

John D. Kleopfer
Virginia Department of Wildlife Resources
3801 John Tyler Highway
Charles City, Va. 23030

***Ambystoma maculatum* Spotted Salamander.** VA: Craig. Fenwick Mines Day Use Area of Jefferson National Forest (37.571803 -80.054621). 3 May 2017. Mac McCord, Judy McCord, Christine Sokol and Bruce Grimes

County Record: The Spotted Salamander, *Ambystoma maculatum*, is a large salamander. They are black with striking large yellow spots. They have an almost state-wide distribution, being found in all areas save the southeastern corner of Virginia. Here we report the first record of the Spotted Salamander from Craig County.

The habitat at the site is constructed wetland, in this case an excavated borrow pit adjoining an elevated trail and with a constructed stream-fed fish pond on the other side of the trail. The borrow pit is at the bottom of a hillside and collects the drainage with no outlet. While fishless and considered ephemeral, we have not observed the pool to be completely dry during our many visits over the years, though the size and depth have varied widely. We had observed *A.maculatum* spermatophores and egg masses in the pool previous to this sighting, but were able on 3 May 2017 to confirm the presence of adults, with a minimum of 6 present, and one of them egg-laying. There were other egg masses present and many spermatophores. They have been recorded from all Virginia counties bordering Craig County. We have subsequently located the species at other sites within the county. The new record is therefore more likely to reflect the lack of previous effort at cataloging species within the county than a range extension. A digital photograph of breeding adults was submitted to the VHS Archive (#759) as a voucher for this observation. The weather was sunny and 9°C.

Bruce Grimes
Christiansburg, VA

***Ambystoma tigrinum* (Eastern Tiger Salamander).** VA: Westmoreland County, location withheld 16 March 2015. John (J.D.) Kleopfer.

Dispersal: Movement and dispersal of Eastern Tiger Salamanders can vary depending on location and environmental factors. In Long Island, New York, Madison and Farrand (1998. Habitat use during breeding and emigration in radio-implanted tiger salamanders, *Ambystoma tigrinum*. Copeia 1998:402-410.) found most resident salamanders moved no more than 150 meters from the breeding pond and used an area of approximately 300 meters around the pond. At the Joseph W. Jones Ecological Research Center at Ichauway in Georgia, Steen et. al (2006. Post-breeding terrestrial movements of *Ambystoma tigrinum* (eastern tiger salamander). Southeast. Nat. 5: 285–288) found salamanders moved up to 255 meters from the wetland of origin and found refugia both within forested land and wildlife food plots. One of the most extensive investigations into the movement of tiger salamanders was also conducted in Long Island, New York (Titus et al. 2014. The

Importance of Maintaining Upland Forest Habitat Surrounding Salamander Breeding Ponds: Case Study of the Eastern Tiger Salamander in New York, USA. Forests 5: 3070-3086.) juveniles were found to move further than adult males and females with maximum dispersal range of 282 meters. North Carolina Wildlife Profiles states a maximum movement of 0.5 mile (~800 meters), but it is unknown where this information was obtained.

Dispersal distances of Eastern Tiger Salamanders in Virginia have not been recorded until now. On 16 March 2015, a landowner in Westmoreland County overturned a horse trough and found what she believed was a "lizard". A photograph was submitted to the Virginia Herpetological Society, and it was identified as an adult female Eastern Tiger Salamander. Upon further investigation, a breeding site was discovered ~265 meters away. This observation represents the first recorded dispersal distance of this species in Virginia.

John D. Kleopfer
Virginia Department of Wildlife Resources
3801 John Tyler Highway
Charles City, Va. 23030

***Eurycea longicauda* (Eastern Long-tailed Salamander)** VA: Radford City, Wildwood Park in rock cervices near parking lot. 15 July 2023. Kalee Shahayda.

City Record: The Long-tailed Salamander has a distribution along the western mountain counties in Virginia, primarily west of Interstate 81. It is a striking-looking animal with a yellow to orange coloration with black spotting on the back which tend to merge into horizontal stripes on the sides of the tail. While it has been found in most counties along the western portion of the state, it has not yet been reported in any cities (https://www.virginiaherpetological society.com/amphibians/salamanders/long-tailed-salamander/index.php). On 15 July I was looking for salamanders in the rock crevices near the parking lot of Wildwood Park in the city of Radford as it seemed to be a good habitat for dusky salamanders. In one of the larger cracks in a dryer section two individuals were observed. Since the initial sighting up to 6 have been observed in a single day. A digital photograph (Archive #574) was submitted as a voucher for this observation. It represents the first record for a Virginia city, although it is found in all the surrounding counties.

Kalee Shahayda
Radford, VA

Eurycea wilderae **(Blue Ridge two-lined salamander)** VA: Pulaski Co. (37° 2' 34.1" N, 80° 51' 36.2" W). 30 March 2022. Ruger L. Groseclose, Matthew T. Close, Karen E. Powers, Robert R. Sheehy, and Frank W. Taylor.

County Record and Unusual Coloration: Co-author Groseclose was hiking a grassy hiking trail within a secondary-growth mature forest matrix. This area abutted a slope with scattered, exposed limestone, and was positioned uphill of the southeastern branch of the Gatewood Reservoir, Pulaski Co., Virginia. He flipped over a piece of wet cardboard and discovered an amelanistic plethodontid salamander of initially unconfirmed identity. Measurements for this salamander were: snout-vent length = 26.6 mm; total length = 32.9 mm, mass = 0.35g. Because this was an opportunistic find, the salamander was briefly taken into captivity by Close and Powers to photograph, measure and retrieve and properly preserve a ca. 5-mm tail sample for genetic analyses (via Powers' Virginia scientific collecting permit [no number assigned] and approved IACUC protocol FY21-008). The salamander was returned to its original location unharmed.

Sheehy extracted DNA from the tail and sequenced the Folmer region (Folmer et al. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. Molecular Marine Biology and Biotechnology. 3:294–299) of the COI gene. This specimen showed a sequence similarity of 99.85% with GenBank Accession number MK037337 *Eurycea wilderae* (Blue Ridge two-lined salamander) specimens in the database; this is consistent with this specimen being *Eurycea wilderae*. This DNA sequence has been submitted to GenBank at NCBI (GenBank Accession number OR820945).

This find was a new county record in Pulaski County, as confirmed by Susan Watson, Virginia Department of Wildlife Resources (personal communication). This species has been confirmed in Carroll County, directly to the south of Pulaski. It represents the northernmost documentation of Blue Ridge two-lined salamanders to date.

Amelanistic plethodontids in the genera *Aneides* (*A. aeneus* [Green Salamander]; Williams et al. 2013. *Aneides aeneus* (Green Salamander) Color Variation. Herpetological Review. 44(1):114-115) and *Plethodon* (*P. cinereus* [eastern red-backed salamander]; Moore and Gilhen. 2011. Two amelanistic eastern red-backed salamanders (*Plethodon cinereus*) from eastern Canada. Canadian Field-Naturalist. 125(1):58-60; Mitchell and Mazur. 1998. Leucistic red-backed salamanders [*Plethodon cinereus*] from Maryland. Northeastern Naturalist. 5(4):367–369) have been reported. Partially amelanistic larval (e.g., *Eurycea cirriguera* [southern two-lined salamander]; Lamb and Qualls. 2013. *Eurycea cirriguera* [southern two-lined salamander]. Partial albino larva. Herpetological Review. 44(3):490), fully amelanistic larval (*Eurycea bislineata*, then *Spelerpes bilineatus;* Banta and Gortner. 1915. An albino salamander, *Spelerpes bilineatus*. Proceedings of the United States National Museum. 49(2112):377–379; Bartley. 1959. Two records of albinism in *Eurycea b. bislineata* Green. Herpetologica. 15(4):192), partially amelanistic adult (e.g., *Eurycea lucifuga* [cave salamander]; Fenolio. 2006. Partially amelanistic *Eurycea lucifuga*. Available on-line at https://calphotos.berkeley.edu/cgi/img_query?seq_num=211535&one=T; *Eurycea bislineata* [two-lined salamander]; Lotter. 1977. An unusual two-lined salamander, *Eurycea bislineata* [Amphibia, Urodela, Plethodontidae] and its implications regarding the developmental mechanism of

the striped pattern in the Plethodontidae. Journal of Herpetology. 11(1):100-102), and fully amelanistic adult (*Eurycea b. bislineata;* Rubin. 1963. An albino two-lined salamander. Herpetologica. 19(1):72) individuals of *Eurycea* have been reported previously but records in over 100 years are isolated and uncommon. To our knowledge, this record is the first report of a fully amelanistic (albino) adult *Eurycea wilderae*.

Upon return of the amelanistic salamander to its original location, a search for other salamanders found that all individuals displayed typical coloration. We assume that this is an isolated instance of amelanism in the population. However, because this was an opportunistic find, and not part of a long-term monitoring project, we cannot assume that amelanistic individuals beyond this one were entirely lacking. We can only speculate as to the ultimate fate of this individual, though we acknowledge that its coloration likely made it more visible to potential predators.

Karen E. Powers
Radford, VA

***Hemidactylum scutatum* (Four-toed Salamander)** VA: Campbell County, Camp Hydaway (N37º 20’ 19.0”; W 79º 09’ 05.4”). 7 September 2023. Abigail Rice.

Confirmation of County Record. The Four-toed Salamander is a secretive species, rarely encountered, and except for females guarding nests of eggs, rarely in large numbers. Its name derives from the fact they only possess four rather than five digits on the hind feet. They have a state-wide distribution but have been reported from only 61 of the 95 counties, reflecting the scarcity of observations for this species (https://www.virginiaherpetologicalsociety.com/amphibians/salamanders/four-toed-salamander/index.php). Here I report the second observation of a Four-toed Salamander from Campbell County. On 7 September 2023 I was on a survey at Camp Hydaway, the education and recreational facility of Liberty University on the south side of Candler’s Mountain, with a field class when I uncovered a juvenile Four-toed Salamander from under a log. The only previous observation for the species was from 1996, more than a quarter of a century ago. This report of a juvenile indicates there is a breeding population at this facility and confirms their continued presence in the county. A digital photograph was submitted to the VHS Archive (Archive #800) as a voucher for the observation.

Abigail Rice
Woodbridge, VA

Plethodon yonhalossee **(Yonhalossee Salamander)** VA: Patrick County, Primland Resort, Busted Rock Road, Meadows of Dan, (36.661675,-80.397753). 13 August 2023. Lauren A. Peery.

County Record: The Yonhalossee Salamander is a striking salamander, with its orange-brown wide stripe down the back. They are a high elevation species, typically found in forested habitats. On 13 August 2023 I was driving home at almost 1am from a meteor shower watch event at Primland Resort where I work as an astronomer. It was a clear dark night after an evening of thunderstorms, and I caught a glimpse of a reflection with my headlights and carefully reversed like I always do to see if it was in fact a salamander. Indeed it was a large P. yonahlossee in almost the middle of the wet road with a large dark discoloration on its back. I took some photos and encouraged it to wriggle its way back to the side of the road before leaving.

The Yonhalossee Salamander was currently known from seven western counties, including Floyd and Carroll, just to the west of Patrick County where this observation was made (https://www.virginiaherpetological society.com/amphibians/salamanders/yonahlossee-salamander/index.php). This represents the first record from Patrick County, although it is not an eastern range extension. Two records in Floyd County are farther east. Photos were submitted to the VHS Archive (#785) as a voucher.

Lauren A. Perry
Laurel Fork, VA

Agkistrodon contortrix **(Eastern Copperhead)** VA: Northumberland County, Knight's Run Rd. Northeast of Brown's Store (37.848177 -76.423047). 12 October 2022. Christian "Alec" Jarboe.

County Record: The Eastern Copperhead is one of three venomous species of snakes in Virginia. This is the most widespread with a state-wide distribution (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/copperhead/index.php). They occupy a wide variety of habitats, being active during the warmer months of the year, primarily May through September. They utilize a wide variety of prey. Juveniles consume more invertebrates than adults, which prey more on small mammals. Much depends on what prey is available. Juveniles have the interesting habit of slowly moving the yellow-green tip of their tail as a caterpillar-like lure to draw in amphibians and lizards which can then be consumed.

Here I report the first instance of a Copperhead from Northumberland County. I am a snake biologist currently living in Florida. On 12 October 2022 I was visiting family and came across a road-killed Copperhead on Knight’s Run Road. I took a digital photo as I normally do with any snakes encountered and removed it from the road. Only recently did I notice there was not a verified record for Northumberland County,

so I submitted the photo as a voucher (VHS Archive #791). There are records for the surrounding counties of Gloucester, Westmoreland and Lancaster in Virginia, and across the River in St. Mary's County in Maryland, so this observation helps fill a gap in the distribution.

Christian "Alec" Jarboe
Jacksonville Beach, FL

***Carphophis amoenus* (Eastern Wormsnake):** VA, City of Charlottesville 1129 Locust Avenue. 25 October 2023. Brendan Ferreri-Hanberry

City Record: The Eastern Wormsnake is one of the most common snakes in Virginia, being found in 86 of the 95 counties and 24 cities (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/eastern-wormsnake/index.php). They are also one of the most abundant snakes found on VHS surveys (P. Sattler, Pers. Comm.). On a warm sunny day, 25 October 2023, at 1pm and my mother was trying to clean the floor of the garage with a leaf blower. She saw a snake moving on the floor near the wall of the garage and called me. I recognized the snake as an Eastern Wormsnake. In looking at the VHS website I saw there was no record of Wormsnakes for the City of Charlottesville, so I sent a digital photo to the VHS as a voucher for this observation (VHS Archive # 796). The habitat around our garage is grassy lawns and gardens on either side and a narrow band of trees behind it. This report helps fill a gap in the distribution in central Virginia.

Brendan Ferreri-Hanberry
Charlottesville, VA

***Carphophis amoenus* (Eastern Wormsnake)** VA: Middlesex County, 98 Poplar Drive, Hartfield (N 37°32'44.6712" W 76°29'43.9836"). 3 September 2023. L.J. Blackwell.

County Record: The Eastern Wormsnake is one of the most common snakes in Virginia, with a statewide distribution (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/eastern-wormsnake/index.php) having been reported in 86 of the 95 counties. On 3 September 2023 while doing some yardwork I came across an Eastern Wormsnake underneath a brick next to my porch steps. I noticed the VHS website did not list the Wormsnake as being confirmed from Middlesex County, so I sent a photo of the snake as a voucher (VHS Archive # 786). The area is wooded with mature pines and is

near the Piankatank River. The Eastern Wormsnake has been reported from all surrounding Counties, so this report helps fill a gap in its distribution in eastern Virginia.

L.J. Blackwell
Hartfield, VA

***Carphophis amoenus* (Eastern Wormsnake).** VA: Giles Co., Pocahontas Rd. 37.365349 N, -80.749076 W. 20 May 2018. Kari L. Spivey, Trevor L. Chapman, Brian G. Gall.

County Record: At approximately 13:30 hrs on 20 May 2018, an Eastern Wormsnake was discovered under a rock in a small boulder pile approximately 50 m from a gravel road. A second juvenile Eastern Wormsnake was discovered under a rock approximately 100 meters NW shortly thereafter. Since this time, 3 additional worms snakes have been found at various sites in Jefferson National Forest along Pocahontas Rd. Worm snakes have been recorded in all bordering VA counties as well as Monroe and Mercer Counties in West Virginia (Green, N.B. and T.K. Puley. 1987. Amphibians and Reptiles in West Virginia, University of Pittsburg Press. Pittsburg, PA 241pp). This is the first vouchered record for this species from Giles County (Mitchell, J.C. and K.K. Reay. 1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.). This species has not been previously reported to the VA Department of Game and Inland Fisheries FWIS Database. A digital photograph was deposited in the VHS Archive (Archive # 798) as a voucher.

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Cemophora coccinea copei **(Northern Scarletsnake)** VA: Caroline County, 31050 Sparta Road, Tignor. (N 37º 58' 39.24"; W 77º 06' 38.08") 10 June 2023. Nick Daniels.

County Record: The Northern Scarletsnake is rarely seen as it spends most of its time underground, burrowing in soft sandy soils (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/northern-scarletsnake/index.php). It is a beautiful animal with red, black and yellow crossbands. Because of the rarity of observations, its conservation status is questioned. It has been reported in 23 counties, mostly in southeastern Virginia. Here I report the first observation in Caroline County.

On 10 June 2023 I found a dead Northern Scarletsnake in my back yard. It had apparently taken refuge under a tire on my truck and was run over when I moved the vehicle. It was located next to a heavily planted flower bed. The area is a very old English garden with large trees that accumulate dense leaf litter. A digital photograph was submitted to the VHS (Archive #783) as a voucher for this observation, the first for Caroline County. The Scarletsnake has been previously recorded (Op. Cit.) in Hanover and King William Counties, just to the south of Caroline. This observation also represents a range extension of 31 km. north of the previous record in King William County (USNM 144530).

Nick Daniels
31050 Sparta Rd.
Tignor, VA

Heterodon platyrhinos **(Eastern Hog-nosed Snake)** VA: Appomattox County, Spout Spring, 759 Hummingbird Lane. 14 May 2023. Stephen Bradish.

County Record: The Eastern Hog-nosed Snake is named for its upturned snout, the most reliable method of identifying this species. There are two main color phases, an all black or melanistic phase, and the more common light brown to tan background color with darker irregular shaped blotches. Recently, some specimens with an orangish background color have been reported (https://www.virginiaHerpetologicalsociety.com/reptiles/snakes/eastern-hog-nosed-snake/index.php). They are mostly known for their threat displays, where they spread their neck like a cobra, hiss, and strike at an intruder. Although they strike, they never open their mouth, bite, or cause any damage. If the threat display does not work the snake goes into a "play dead" routine where it flips onto its back and defecates. Their primary prey are toads (Op. Cit.). They have a state-wide distribution being documented in 82 of the 95 counties and 11 cities. Here I report the first observation of the Hog-nosed Snake in Appomattox County. On 14 May 2023 I observed a snake crossing my driveway near a barn. I took a digital photograph and

submitted it to the Virginia Herpetological Society as a voucher (Archive #788). It has previously been documented from all surrounding counties, so its presence is not unexpected, but does help fill a gap in the distribution in central Virginia.

Stephen Bradish
Spout Spring, VA

***Indotyphlops (*formerly *Ramphotyphlops) braminus* (Brahminy Blindsnake)**. VA: Albemarle County, Virginia 22932 (38º 3'47" N, 78º 41'11" W). 4 August 2023. John (J.D.) Kleopfer, Mike McGarry, and Ajay Sharma.

County Record: On 4 August 2023, co-authors Mike McGarry and Ajay Sharma encountered a Brahminy Blindsnake near a storm water retention pond in the Crozet area of Albemarle County. They initially reported the observation to Clemson Extension's Home and Garden Information Center (HGIC), where Ajay Sharma was directed to Dr. Carola Haas at Virginia Tech. Dr. Haas then redirected him to co-author and State Herpetologist John (J.D.) Kleopfer, who positively identified the snake as a Brahminy Blindsnake. Additional observations were made during the week of 20 August 2023 near Lickinghole Creek (38º 3'37" N 78º 40'0" W).

The Brahminy Blindsnake is the most widely distributed species in the world and the most successful invasive herpetological species (Wallach, V. 2020. First Appearance of the Brahminy Blindsnake, Virgotyphlops braminus (Daudin 1803) (Squamata: Typhlopidae), in North America, with Reference to the States of Mexico and the USA). Populations consist entirely of females and is the only known obligate parthenogenic snake (Nussbaum, R. A. 1980. The Brahminy blind snake (Ramphotyphlops braminus) in the Seychelles Archipelago: distribution, variation, and further evidence for parthenogenesis. Herpetologica 36, 215–221). The geographic origin of this species is believed to be in South Asia. However, they have been transported around the world in rotting wood and soils of ornamental plants. Due to their ease of transport and reproductive ecology, they have become established in numerous countries, including the United States. In Virginia, documented occurrences of this species are in the cities of Newport News and Norfolk (Savitzky, B.A., A.H. Savitzky, R.T. Belcher, and S. Ewers. 2002. Geographic distribution. *Ramphotyphlops braminus* (Brahminy Blindsnake). Herpetological Review 33: 150–151). This is the third city or county observation of this species in Virginia (VHS Archive #782). Photo credit: Ajay Sharma.

John D. Kleopfer
Virginia Department of Wildlife Resources
3801 John Tyler Highway
Charles City, Va. 23030

***Lampropeltis getula* (Eastern Kingsnake)** VA, Northumberland County, Lottsburg, intersection of Bon Harbor and Fort Point Roads. 5 September 2023. Bruce Pardoe.

County Record: The Eastern Kingsnake is a large snake which can reach a total length of a meter and a half (https://www.virginia herpetologicalsociety.com/reptiles/snakes/eastern-kingsnake/index.php). The Kingsnakes get their name from their wide diet, including other, even venomous, snakes. They have a wide distribution in Virginia, having been documented in 56 counties in the eastern portion of the state. Here I report the first instance of an Eastern Kingsnake from Northumberland County. On 5 September 2023 I found a snake sunning itself in the road, at the intersection of Bon Harbor and Fort Point Roads in Lottsburg next to the Yeocomico River. I took a digital photograph and sent it to the Virginia Herpetological Society for an identification of what kind of snake it was. I was informed the snake was an Eastern Kingsnake and the species had not been previously reported from Northumberland County although it has from all surrounding counties. The digital photo was submitted as a voucher for this observation (VHS Archive #789).

Bruce Pardoe
Lottsburg, VA

***Storeria dekayi* (Dekay's Brownsnake)** VA: Charlotte County, 1166 Morton Road, Keysville. 7 September 2023. Juanita Giles.

County Record: Dekay's Brownsnake is a small, secretive snake rarely encountered out in the open (https://www.virginia herpetologicalsociety.com/reptiles/snakes/dekays_brownsnake/index.php). They are nocturnal and if found during the day, usually under some type of cover object. Earthworms and slugs are their main prey items (Op. Cit.). Most of the occurrences in Virginia are from eastern and central counties. Here I report the first instance of Dekay's Brownsnake from Charlotte County. On 7 September 2023 we found a dead snake on our sidewalk and took a digital photograph which was sent to the Virginia Herpetological Society for identification. We were informed it was a Dekay's Brownsnake, and it had not been reported previously from Charlotte County. We had found another specimen, also dead in our

yard, about a week previously, so they must not be uncommon in our area. There are sheds, a brush pile and fields around the house, which sits about a half km from the country road on which we live. The weather prior to finding the snake was hot and dry. The digital photograph was submitted to the VHS Archive (#790) as a voucher for this observation. The species has been reported from all counties surrounding Charlotte except Halifax.

Juanita Giles
Keysville, VA

Storeria occipitomaculata **(Red-bellied Snake)** VA: City of Manassas, 6018 High Bluff Trail. 30 September 2023. Sisc Johnson.

City Record: The Red-bellied Snake has a state-wide distribution, although there are few records in southwestern Virginia (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/northern-red-bellied-snake/index.php). This is a small terrestrial snake whose diet consists primarily of slugs (op. cit.). They are nocturnal and rarely seen out during the day, but can be found under all manner of cover objects. Here, I report the first record of the Red-bellied Snake in the City of Manassas, although it has been reported in Prince William and Fairfax Counties which surround the city. On 30 September 2023 I was leaf blowing on my driveway when I noted a small snake where it had apparently taken refuge at night in a leaf pile. I sent a digital photograph to the VHS as a voucher (Digital Archive # 797). This observation helps fill a gap in the distribution of this species in northern Virginia.

Sisc Johnson
Manassas, VA

Storeria occipitomaculata **(Red-bellied Snake)** VA: Fauquier County, Sumerduck, Quail Hollow Lane, 200 meters from the C.F. Phelps Wildlife Management Area. 14 May 2023. Abu Uddin.

County record: The Red-bellied Snake is a small secretive snake, which is primarily nocturnal. When found during the day, it is usually under some type of cover object. Its distribution in Virgina is mostly statewide, although only reported from one county in the far southwestern portion of the state. Its diet consists of slugs (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/northern-red-bellied-snake/index

.php). Here I report the first observation of the Red-bellied Snake in Fauquier County. I live in a newly built home. On 14 May 2023 I was going down my walk-up basement and saw a small snake on the pavement near the storm drain. At first I thought it was a long worm, but as I got closer I realized it was a snake. Copperheads are known to be in the county so I googled what a baby copperhead looks like. When it didn't match that, I assumed it would be a garter snake or water snake. I took a picture for identification purposes, and then the snake slithered off into my storm drain before I could relocate it. I found the snake was a Red-bellied Snake, and it had not been previously reported from Fauquier County. I submitted the photograph as a voucher for this observation (VHS Archive #787). It has been reported from all the surrounding counties to the east, west and south of Fauquier, so this find helps fill a gap in its distribution in northern Virginia.

Abu Uddin
Sumerduck, VA

***Storeria occipitomaculata* (Red-bellied Snake)** VA, Prince William County, private residence (38°38'53"N 077°27'41"W) 11 July 2023. William Lightner.

Unusual Coloration: The Red-bellied Snake has virtually a state-wide distribution. There are fewer records for the far southwestern counties, but there is an observation for Scott County (https://www.virginiaherpetological society.com/reptiles/snakes/northern-red-bellied-snake/index.php). There are three normal color variants for this species, a gray, brown and a reddish background (see Figure 1 below for two of these). On 11 July 2023 I was doing yard work and moved a plastic jug from a brick garden wall when I saw a small snake on the wall under the jug. I took a digital photo of the snake and sent it to the VHS Herp Identification website. The snake was identified as a Red-bellied Snake, but I was informed it was an unusual color variant, with a gray body and a red stripe down the middle of the back (Figure 2). This color variant has only been seen once previously (Paul Sattler, Pers. Comm.) from Highland County in a juvenile, and this observation is the first vouchered example. A digital voucher was submitted to the VHS Archive (#755).

William Lightner
Prince William, VA

Figure 1. Two color variants of *Storeria occipitomaculata* (from Highland County)

Figure 2. Unusual *S. occipitomaculata* with reddish stripe from Prince William County.

Thamnophis s. sirtalis **(Eastern Gartersnke)** VA: Lunenburg County, 24 km south of Kenbridge, north side of the Meherrin River (36.8117255, -78.2273038). 1 May 2023. Alex Przybylek.

County Record: The Eastern Gartersnake is one of the most common snakes in Virgina (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/eastern-gartersnake/index.php) found in all but ten counties. They are found in a wide variety of habitats, contributing to their frequent observations by people. Partially for this reason they were adopted as the state snake of Virginia. Here I report the first record of the Eastern Gartersnake in Lunenburg County. On the first of May 2023 I found this snake on my property while walking on a trail. The snake was lying in a sunny spot on the trail and I was able to take a digital photograph of it. I sent the photo to the VHS as a voucher for this first record in Lunenburg County (VHS Archive #784). This observation helps fill a gap in the Virginia distribution for the Eastern Gartersnake.

Alex Przybylek
Kenbridge, VA

Thamnophis s. sirtalis **(Eastern Gartersnake)** VA: Orange County, private residence (38.1377562, -77.9622560). 17 July 2023. Christy Rogers.

County Record: The Eastern Gartersnake, the official Virginia state snake, has a state-wide distribution, being verified in all but 10 counties (https://www.virginiaherpetologicalsociety.com/reptiles/snakes/eastern-gartersnake/index.php). They occupy a wide variety of habitats and consume a wide variety of prey, which is one reason for their distribution. On the evening of 17 July 2023 I was walking towards my home from the mailbox with a flashlight, and noticed an Eastern Gartersnake crossing my driveway. I was able to obtain several photographs of the snake and sent them to the Virginia Herpetological Society as a voucher for this observation (Archive #757). The weather on this evening was hot and humid. There are woods on both sides of the driveway on

which the snake was found. This is the first report of the Gartersnake from Orange County although they have been reported from all surrounding counties except Culpeper. This report thus fills one of the few remaining gaps in their distribution in Virginia.

Christy Rogers
Thornhill, VA

***Plestiodon fasciatus* (Common Five-Lined Skink).** VA: Giles Co., Goodwins Ferry Rd., 37.264227 N, -80.602467 W. 22 May 2018. Kari L. Spivey, Trevor L. Chapman, Brian G. Gall.

County Record: At 10:55 hrs on 22 May 2018, a Common Five-Lined Skink was caught on an exposed cliff face along railroad tracks near Goodwins Ferry Rd. Species identification was confirmed by examination of supralabials (7) and postlabials (2 equal sized). This species has been reported in the surrounding counties in Virginia and Monroe and Mercer Counties in West Virginia (Green, N.B. and T.K. Puley. 1987. Amphibians and Reptiles in West Virginia, University of Pittsburg Press. Pittsburg, PA241pp), and is the first vouchered record for this species from Giles County (Mitchell, J.C. and K.K. Reay. 1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.). This species has not been previously reported to the VA Department of Game and Inland Fisheries FWIS Database. A digital photograph was deposited in the VHS Archive (Archive # 799) as a voucher.

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Sceloporus undulatus **(Eastern Fence Lizard)**: VA, Orange County, 3141 Reci Ln. Locust Grove. 21 September 2023. Jonathon A. Smallwood.

County Record: The Eastern Fence Lizard has a statewide distribution in Virginia, being found in 87 of the 95 counties (https://www.virginiaherpetologicalsociety.com/reptiles/lizards/eastern-fence-lizard/index.php). They prefer open forests with sufficient sunlight for basking. In those counties still lacking records, it appears due to a lack of survey effort rather than a scarcity of the animals. In recent years, however, there has been renewed interest in herpetological surveys in Orange County (Kovach M. *2022. Heterodon platyrhinos* Catesbeiana 42(2):62 ; Colby, L. 2022. *Lampropeltis rhombomaculata* Catesbeiana 42(2): 64 ; Robbins-Johnson, J. 2022. *Nerodia sipedon* Catesbeiana 42(2): 66 ; Robbins-Johnson,J. 2022. *Pseudemys rubriventris* Catesbeiana 42(2): 76-77 ; Fast, M. 2022. *Scincella lateralis* Catesbeiana 42(2): 79 ; Robbins-Johnson *, J. Sternotherus odoratus* Catesbeiana 42(2): 77-78*;* Robbins-Johnson, J. 2022. *Trachemys scripta elegans* Catesbeiana 42(2): 77.). Here I report the first vouchered record of an Eastern Fence Lizard in Orange County.

We have Eastern Fence Lizards around our home in Locust Grove. This is a wooded 1.2 hectare lot with a stream in the back of the property draining into the Rapidan River. We see them on the trees around the house, in a woodpile, and on our patio. On 21 September 2023, I was able to photograph one on an oak tree in our yard. I sent the digital photo (Archive # 792) to the VHS for a positive identification and was informed there was not a verified record for Orange County. They have been reported in all surrounding counties except Madison and Page to the northwest, so this record helps fill a gap in the northern Virginia distribution.

Jonathon Smallwood
Locust Grove, VA

President's Corner

The Virginia Herpetological Society recently held elections at our Fall Meeting. I am your new president. Dr. Arianna Kuhn, herpetologist at the Virginia Museum of Natural History, is our new Vice President. Thankfully, Dr. Matt Close will continue in his long-standing role as Treasurer. Yohn Sutton will continue to serve as our Secretary.

I want to thank our outgoing president, Erin Anthony. She brought a lot of fresh energy and new ideas to the society. We've had new activities and unique fundraising ideas. She also brought a Spring Survey and Fall Meeting to the oft-neglected SW corner of Virginia. Additionally, she has helped to update the VHS Bylaws, a project that she has committed to continue.

If you've made it this far through the issue of *Catesbeiana* then you've likely noticed the work of our editor, Dr. Paul Sattler. Paul was honored as VHS "Member of the Year" at our annual meeting largely (I believe) due to his excellent work on the journal. Some members with fully-ringed scutes may remember when a bright yellow *Catesbeiana* used to arrive by snail mail. Maybe you've also noticed that *Catesbeiana* is getting thicker. This is due to a collaborative effort between Paul, John White on the website, the herp ID team, and hundreds of curious Virginians armed with cell phone cameras. The range maps are filling in! It's an amazing collaborative effort that Franklin Tobey could have never imagined while painstakingly working on the original herp atlas, "Virginia's Amphibians and Reptiles: A Distributional Survey" in the 1980s. Thank you to John, Paul, and the Herp ID Team!

This work is an example of the strengths of our society that I'd like to continue to leverage through my presidency. We have a committed group of knowledgeable volunteers, a strong web presence, and dedicated professional biologists. I want to explore new ways to use our strengths to increase public herp knowledge and appreciation throughout the state. Additionally, we will continue the project to update our Bylaws. Lastly, I've had the pleasure of helping to recruit and organize speakers for the last two Fall meetings. I want to continue to elevate the quality of our meetings.

Thank you and hope to see you at a survey soon!

Dr. John Orr
VHS President

Minutes of the Fall Meeting of the VHS
November 4, 2023
Virginia Museum of Natural History

The annual Virginia Herpetological Society fall meeting was held at the Virginia Museum of Natural History in Martinsville, Virginia on the 4th of November 2023. The committee members in attendance were Vice President John Orr, Treasurer Matt Close, Secretary Yohn Sutton, Catesbeiana Journal Editor Paul Sattler, Education Committee Caroline Seitz, Permits Committee Susan Watson, Herpblitz and Survey Chair Jason Gibson, Website John White, Outreach Committee Kelly Geer, Grants Chair Kory Steele, and President, the honorable Erin Anthony.

The meeting started off with a conservation report from the committee chair, Yohn Sutton, who had no updates to report.

Paul Sattler reported there were three major papers and numerous Field Notes ready to be included in the Fall issue of Catesbeiana.

Caroline Seitz completed an education report submitted to the committee for review. In summary, nineteen members are actively involved with the education committee and forty-five programs were accomplished this year with approximately 6,500 individuals in attendance. With the successful interest in VHS educational programs throughout Virginia, there is need for creating an efficient process to register for future programs and training. An online application form was created for such purposes, and an online training guide is needed to standardize educational programs for all education members in the committee conducting public outreach programs. A suggestion was made to incorporate how membership fees contribute to the education committee's thriving activities, to encourage additional memberships for the society. Overall, the education committee wants to enlist more assistance and increase table signage. Slide presentations are in the works with the collaboration of a local girl scouts, for the VHS.

The new exhibitors' permit has been completed with many thanks to Susan Watson. The Scientific Collecting permit will need to be renewed by spring 2024.

Jason Gibson has suggested the Powhatan Wildlife Management Area as a future spring survey. There is the potential to do a small survey at Norfolk Botanical Gardens as well. This will most likely be a limited participant survey due to the size of the area at the botanical gardens. There is the prospect of a survey at Prince George County in March.

John White reports that content is being continuously added to the VHS website. The front page will undergo a new design, and there were 713 identifications submitted this year.

For the outreach committee, Kelly Geer reports that there is currently ninety-three lifetime members in the society. Thirty-five students have joined and there are 375 individuals as members of the Virginia Herpetological Society. Notifications are sent out a month in advance for expiring memberships. It is noted that most members are opting to pay the three percent fee in addition to the membership fee to cover the cost of the software used, Little Green Light. Also, there is an inquiry of a more detailed description of the responsibilities of the outreach committee chair member, by Kelly.

Larry Mendoza was not present to give a regulatory committee report; there are no updates to include.

For the grants committee, Kory Steele informed us there might be individuals conducting educational research that need more than the allotted five hundred dollars that the society will award for an individual grant. An earlier email to the professor's list for a call for grants may be in consideration to determine if the society will offer additional funds for research within the state. At hand is a request for a new revised document for awarded grant participants. An inquiry for including K-12 educators for grant money was initially proposed given the theory there may be a strong interest in this category of outreach for the VHS. The issue is whether the demand may be higher than the Society can withstand financially. To alleviate this, it was recommended participants seeking grants might need to attend a workshop, created by the VHS. The guidelines of the workshop would include not being conducted at the fall meeting to limit attendance, and workshops would be based on regions within the state using a template lesson plan for grant workshops. A budget for these grant workshops should be established by the committee.

There has been little communication with the newsletter chair to discuss current updates. Questions on content for the newsletter arose in the meeting. There needs to be herpetological society information posted for public inquiry to reach an interested audience. One suggestion was to publish bioblitz and survey information more frequently in the newsletter. This would strategically not jeopardize the upkeep and longevity of the publication, Catesbeiana, in which a collection of the survey reports is included. A proposal for the committees to share the responsibilities of the newsletter as editors was recommended and approved.

The Merchandise Committee has been officially eliminated and will be monitored by the outreach committee.

A vote by participating committee members approved the elimination of the advisory committee.

Treasure of the VHS, Matt Close, delivered an updated treasurer's report. Dues and Fees are to be determined. Paypal and Stripe are still being incorporated for dues receipts. The copperhead informational business cards are ready and available to members. Matt would like to give a big thank you to Erin for assisting with the donation that National Geographic gave to the society. Amazon smile is not available anymore for society donations. Matt suggested obtaining a seven-month CD at a rate of 4% to gain interest rates and add additional income to the society funds. A vote was taken on this proposal, and the majority of the committee approved with one member opposed. A large saving has come from the digital version of Catesbeiana, which saves on print charges, which was the largest expenditure in the past. Moving forward, the treasurer would recommend a definition to the yearly budget to better plan for future expenditures. Lastly, an additional person to assist with monitoring the treasury was proposed. This was approved unanimously, and Kory opted to assist.

John Orr offered locations for the 2024 survey in the fall meeting. The locations considered were the Clifton institute in Warrenton, Virginia, and Natural tunnel. A suggestion to survey a new Virginia state park, Sweet Run State Park in Loudon County was also mentioned.

A portion of the bylaws within the Articles of Incorporation, formerly known as the VHS constitution, were amended and voted upon during the 2023 fall meeting. The first modification was changing the term "council" to "committee." A vote of approval passed. A change to Article V section 2 proposed a 2/3rd majority vote from attending members on future amendments was approved. The proposal on how bylaw amendments will be processed, Article VIII sections 1-5, within the society were all voted on and received approval. Amendments to the articles may be suggested by any VHS member and submitted in writing to the secretary. The secretary will read the proposals to the committee and there will need to be a 50% approval from the committee before addressing them at the next business meeting. Amendments are published one month prior to the general members before voting takes place. As stated in Article V section 2, a 2/3rd majority vote by the attending committee will be needed for approval or dismissal. Article VII sections 2-6 on the fiscal budget were added and voted upon. A 2/3rd approval was granted for a budget proposal prior to the 31st of December of a fiscal year and the president will have the authority to approve expenditures up to 500.00 dollars at their discretion. Any larger amounts need to be discussed and authorized by the executive committee. Any purchases for the society will need written authorization from the president to receive reimbursement from the treasurer.

A vote for the fall 2024 meeting location was held. It will be in Richmond, Virginia and the spring meeting will be determined based on the location of the spring 2024 survey.

Finally, officer nominations were in order at the 2023 VHS fall meeting. Congratulations to John Orr for becoming the next VHS president. There were three candidates nominated for Vice President and congratulations to Arianna Kuhn for being elected as the next Vice President. Matt Close was uncontested as the Treasurer. There were two candidates nominated for Secretary of the society. Yohn Sutton has retained the role as the Secretary.

Yohn Sutton
VHS Secretary

Virginia Herpetological Society
Treasurer's Report
December 4, 2023

Previous Balance- June 16, 2023	$	19,256.32
Receipts		
Dues	$	3501.66
Donations (One-time and recurring)	$	1765.65
Fundraiser-Funtastic Meads	$	200.00
JMIH (Donations, VHS Merchandise)	$	105.00
VHS Fall Meeting (Donations, Auction, VHS Merchandise)	$	915.17
Expenses (06/15/2023-12/04/2023)		
Operational Expenses-Little Green Light	$	486.00
Educational Materials	$	170.83
Promotional and Outreach Materials, VHS Merchandise	$	606.00
Awards- Member of Year, Photo Contest	$	220.51
2023 VHS Fall Meeting	$	910.15
Travel	$	517.00
Supplies	$	49.31
Postage	$	44.32
Service Fees and Refunds (Paypal, etc.)	$	250.22
Current Gross Balance (12/04/2023)	$	22,489.46
Certificate of Deposit-Truist Bank (matures 06/10/24)	$	10,000.00
Current Available Balance	$	12,489.46

VHS Memberships (dues current)

Regular:	370
Student:	33
Lifetime:	99
Total	**502**

Matthew Close
VHS Treasurer

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 Notecontains 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** (cassette tape or 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 Mitchell and Reay (1999. *Atlas of Amphibians and Reptiles in Virginia*), Mitchell (1994. *The Reptiles of Virginia*), and Tobey (1985. *Virginia's Amphibians and Reptiles: A Distributional Survey*) [**both atlases are available on-line on the VHS website**] as well as other recent literature 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 (prints, slides, or 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. Digital images are preferred. Prints should be on glossy paper and no larger than 5 x 7 inches. Published photographs will be deposited in the Virginia Herpetological Society archives.

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