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SURVEY OF AMPHIBIANS AND REPTILES IN POWHATAN COUNTY, VIRGINIA WITH SELECTED NATURAL HISTORY NOTES

Jason Daniel Gibson
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SURVEY OF AMPHIBIANS AND REPTILES IN POWHATAN COUNTY,
VIRGINIA WITH SELECTED NATURAL HISTORY NOTES.

by

JASON DANIEL GIBSON

A Thesis Submitted to the Faculty of
Longwood College
in partial Fulfillment of the Requirements for the Degree of
Master of Science
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ABSTRACT

A SURVEY OF AMPHIBIANS AND REPTILES IN POWHATAN COUNTY, VIRGINIA WITH SELECTED NATURAL HISTORY NOTES.

JASON DANIEL GIBSON

DIRECTOR: DR. DONALD MERKLE

This thesis establishes baseline data on the herpetofauna that exist in Powhatan county. No systematic study of the amphibians and reptiles in Powhatan county has ever been conducted. The methods used in this survey include hand capture, egg mass observations, road kill collections, and frog call surveys. Documentation of each species collected included measurements, photographs, range maps, and tape recordings.

This survey produced 8 species of salamanders, 11 anurans, 6 turtles, 4 lizards, and 14 snakes. Based on records in the Atlas of Amphibians and Reptiles of Virginia (Mitchell & Reay, 1999), 11 new county records were discovered. This brings county totals to 9 species of salamanders, 12 anurans, 6 turtles, 5 lizards, and 16 snakes.

Road kill surveys found that vehicular traffic kills at least 1 species of frog, 1 species of salamander, 4 species of turtles, and 8 species of snakes. Bufo fowleri (Fowler's toad) was the most commonly killed frog, Notophthalmus viridescens viridescens (red-spotted newt) was the most commonly killed salamander, Terrapene carolina carolina (eastern box turtle) and Kinosternon subrubrum subrubrum (common mud turtle) were tied in being the most commonly killed turtles, and Elaphe obsoleta obsoleta (black rat snake) was the most commonly killed snake.

Many sensitive areas of amphibian reproduction, such as the breeding sites for Gastrophryne carolinensis (eastern narrow-mouthed toad), Ambystoma opacum

(marbled salamander), and Ambystoma maculatum (spotted salamanders), have been found and documented on range maps. Baseline information on the number of eggs per egg mass, and mortality rates have been established. Eighteen sites have been evaluated for relative abundance of frogs through late winter, spring, and summer.

ACKNOWLEDGEMENTS

First and foremost this project could not have been accomplished without the unconditional support of my wife. She spent many nights worrying and, in addition to her full time job, had to maintain the house without help. She never complained about me tracking in mud or filling the cars with boots and equipment.

Secondly, many thanks go to my director Dr. Don Merkle and my two committee members Dana Johnson and Dr. Paul Sattler. Their guidance and interest helped my desire to do the best I could do. Dr. Wells was the best advisor I have ever had.

My students always give me motivation. Special thanks to the following students: Lou Caudle, Ryan Fischer, Tom Hofelich, Brandon Ayers, and Chris Kerns. For the past year the teachers and staff at Pocahontas Middle school have been patient and supportive. Special thanks to Kay Hancock for helping me count egg masses.

Special thanks to my parents for encouraging me to go higher in my education and for my dad getting me interested in nature. Dean Bohon has also pushed and motivated me to learn as much as I can about everything in nature.

The following people have been helpful in allowing me to find animals on their land: Nancy Hakula, Sara Tilley, Ted Bricker, David Ellenhausen (PWMA manager), and Ernie Cundiff. Please forgive me the omission of any person.

Finally, I thank Nature for creating the wonderful and beautiful creatures that I have had the privilege to study.

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INTRODUCTION

Amphibian declines have been documented in the United States and around the World. Declines documented include the Yosemite regional frog fauna (Drost & Fellers, 1996), the golden toad (Crump et al, 1992), the gastric brooding frog (Duellman, 1992), and the Cascades frog (Blaustein & Wake, 1995). Due to these and other declines, the World Conservation Union set up a Declining Amphibian Populations Task Force in 1991, with 90 regional and worldwide working groups to determine the status of amphibians. So far the group has documented some declines, some stabilized populations, and some increases in amphibian populations.

In 1998-1999, the Virginia Department of Game and Inland Fisheries began to train volunteers and initiated a frog and toad calling survey to assess the relative abundance of anurans throughout the state. This effort has thus far produced few volunteers and will take many years to establish a significant data base. The Commonwealth of Virginia has 4 federally endangered, 3 federally threatened, and 5 amphibian and reptile species of special concern. There are also 4 state endangered, 4 state threatened and 10 state amphibian and reptile species of special concern.

There is little documentation of herpetological declines in Virginia (Mitchell, 1996). Many herpetologists are calling for baseline data to document critical habitats, establish distributions, and collect data on reproductive capacity and mortality. Without these data, declines can not be proven, governments can not protect habitats of special concern, and environmental and community groups can not mobilize to protect sensitive habitats. County surveys and inventories are critically needed in light of how fast human population growth and suburbanization in Virginia is increasing (Mitchell, 1996). With this type of information, scientists can begin to see if there are declines, stabilization, or increases in populations. We cannot rely on studies in other areas to inform us about the status of Virginia's herpetofauna.

The thrust of this project was to document the amphibians and reptiles in Powhatan county. Major objectives were to: (1) provide a voucher slide or tape recording for every species of amphibian and reptile residing in Powhatan county, (2) make a distribution map for every species found, (3) make natural history observations on and morphological measurements of each species collected, (4) collect data on rates of road kills, (5) identify sensitive habitats and road crossings, (6) establish dates of reproduction and collect egg data on each species of amphibian producing egg masses, and (7) establish a frog call route and conduct frog call surveys to estimate relative abundances of calling species.

THE REGION

Powhatan county is a rural area approximately 20 miles west of the city of Richmond. The county encompasses 272 square miles and has an elevation ranging from 150 to 400 feet above sea level. The climate supports a southeastern mixed forest (oak, hickory, and pine dominating) with an annual average rainfall of 44.07 inches and an annual average temperature of 14.3 °C (57.7 °F). The eastern region of the county has triassic sedimentary deposits with coal having been mined in the 19th century. West of this region, the underlying rock is metamorphic and igneous (predominantly mica schist and granite).

The total land base for the county is 174,081 acres. Commercial forest land comprises 127,162 acres with 20,000 of these being crop land and 107,162 acres being trees. Five thousand of the forested acres are natural pines (Virginia and Shortleaf pines), and 28,000 acres are planted Loblolly pines. Logging has been conducted since the 1700's so forest land has been clear cut many times over. The Virginia Department of Forestry has been working with landowners since 1960 in developing best practice methods of harvesting timber. Farming has also been

practiced since the 1700's. Today, 195 farms are found in the county with an average of 221 acres. Corn, grains, soybeans, hay, tobacco, cows, and horses are the main agricultural products (Geyer, 1999).

Powhatan's population in 1852 was 8,171 people. In 1990, the population was 15,328 and by 1995 had increased to 18,905, a 23% increase in five years. Census officials project the population will be around 21,700 by the year 2000. Many people are moving from the city of Richmond into the newly formed suburbs of Powhatan. That suburbanization is occurring can be seen in the amount of taxable parcels of land. In 1985, there were 7,579 taxable parcels of land. This increased to 11,042 in 1997 (Blankenship, 1999) The push of suburban sprawl is heading west with many new gas stations, supermarkets, and restaurants going up every day.

METHODS

Before the official start of the thesis, many observations were made and recorded in a field notebook. These informal observations occurred from February 1997 to August 1998. During this time, many of my students brought in specimens, and collected specimens during class activities. I collected after school around the county. I joined the Virginia Herpetological Society in 1997, and tried to learn as much as possible about amphibians and reptiles, the techniques used to capture them, and standard methods of recording information.

In August of 1998, after having been accepted as a thesis student by Dr. Donald Merkle, I began to survey Powhatan County, looking for places where amphibians and reptiles might be located. Between September and October, I read many books on species accounts and conducted a literature search on Virginia's herpetofauna. During this time, I attended lectures on amphibian conservation and was trained by the Department of Game and Inland Fisheries to conduct Frog and Toad Call Surveys. I studied frog call tapes and became competent in frog call identification. I also studied

the identification of amphibian eggs, preparing for the upcoming breeding that would start in February. In October, I began to collect by flipping logs and netting specimens along the edges of ponds.

For each species that was caught, the following information was recorded in a field notebook: species identification, location, weight (grams), injuries, ectoparasites, behavior, date, time, microhabitat, and length (millimeters). A slide voucher photo was taken for each different species. Measurement techniques were conducted according to Conant and Collins (1998). For salamanders, the following measurements were taken: SVL (snout to vent length) was measured from the snout to the posterior angle of the vent, TL (total length) was measured from the snout to the tip of the tail, and tail length was measured from the posterior angle of vent to the tip of the tail. Frogs and toads were measured for SVL, which is measured from the snout to the posterior end of the cloacal opening. Turtles were measured for CL (carapace length), and PL (plastron length) using calipers to determine straight line length measurements. Lizards were measured for SVL (snout to vent length) a measure from the tip of the snout to the cloacal opening, and TL (total length) from the tip of the snout to the tip of the tail, and tail length, from the cloacal opening to the tip of the tail. Finally, snakes were measured for the same lengths as lizards, SVL, TL, and tail length.

Many specimens were found DOR (dead on road). For these specimens, measurements were taken if the specimen was freshly killed and intact. Dissection to determine the sex of the individual was conducted and dissection of the stomach contents was done to determine diet. A voucher photo was taken for each different DOR species as a record of what is being killed on Powhatan roads.

Different species were focused upon during different times of the year. In the winter (January and February), the focus was mainly on Notophthalmus viridescens viridescens (red-spotted Newt). Dip nets were used to capture adult newts. From mid

February to April, the focus shifted to the following species in order of natural temporal sequencing: Ambystoma maculatum (spotted salamander), Ambystoma opacum (marbled salamander), Pseudacris feriarum (upland chorus frog), Rana palustris (pickerel frog), Pseudacris crucifer crucifer (spring peeper), Bufo americanus (american toad), Bufo fowleri (Fowler's toad), and Plethodon cylindraceus (white spotted slimy salamander).

All the above species were hand captured, usually in breeding ponds or under logs near breeding pools. For each egg mass found the following information was collected: location of mass, weight of mass (using hand scale and plastic bag), attachment substrate, color, location within the breeding pool, depth, and number of eggs. Egg masses were flagged and visited periodically for observations and to determine the mortality, number of hatching tadpoles, and time of hatching.

During mid February to April and extending into June, frog and toad call surveys were conducted at night. Frog and toad calling surveys were conducted according to the protocols set by the Virginia Frog and Toad Calling Survey as established by the Virginia Department of Game and Inland Fisheries Wildlife Diversity Division (Madaris & Schwab, 1998). One small deviation from the protocols was that routes were site based rather than random transect based. This was done to assure full coverage of the county. Schwab (personal comm.) indicated that Virginia's survey may eventually go to site based routes as opposed to random transect based. Eighteen sites were established based on the criteria of having water and having a safe pull off (see figure 1 for the location of each site). Many different wetland types were selected and a description of each site with specific location directions appears in Appendix 1. A summary of frog call survey data can be found in Appendix 2.

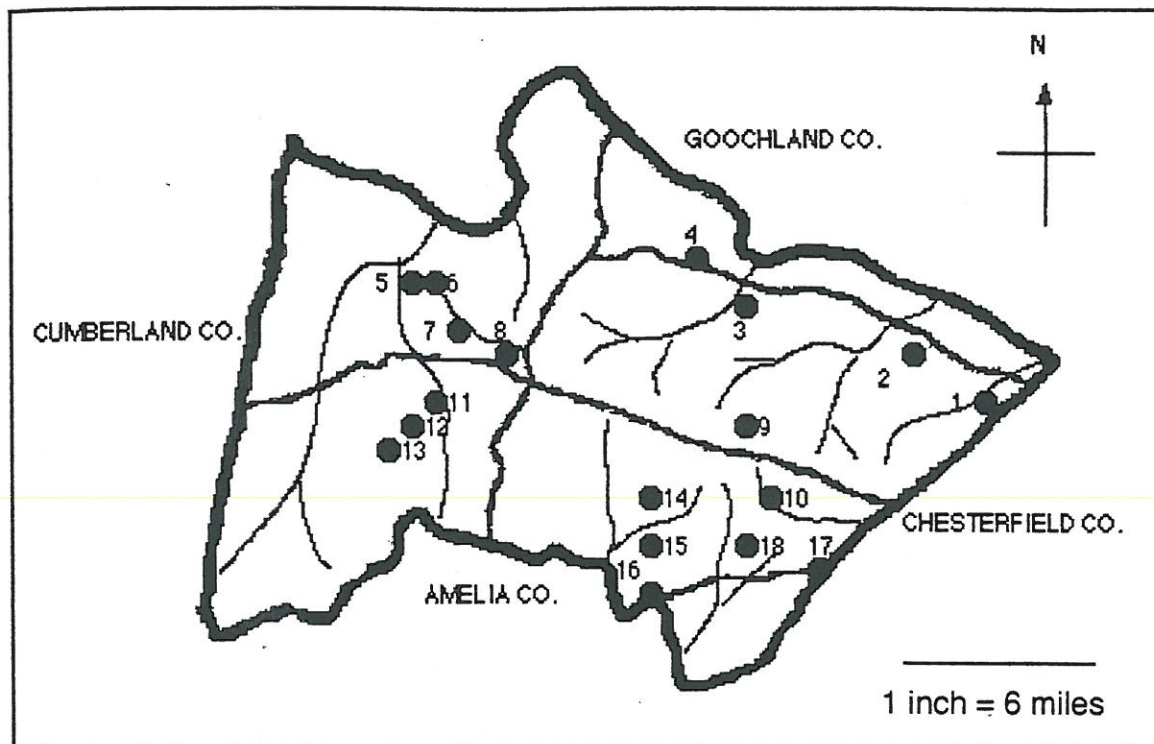


Figure 1. Map of sites used for calling frog and toad survey.

From May to August 1999, collection efforts centered on turtles, lizards, and snakes. In addition, certain explosive breeding anurans, mainly Scaphiopus holbrooki (eastern spadefoot toad) and Gastrophryne carolinensis (eastern narrowmouth toad) were sought after heavy rains. After rainstorms, road cruising and calling surveys helped to find many anurans. Turtles were found with a dip net while walking through swamps and around the margins of ponds. Terrapene carolina carolina (eastern box turtle) was sought in appropriate habitat and while road cruising after rains. All of these turtles were marked with a "permanent marker" to temporarily identify the individual in case of recapture. Egg laying, by turtles, was sought in habitats adjacent to wet areas.

Lizards were caught by hand, by using a noose, or by using a large rubber band. Snakes were actively sought using a stump ripper, in logs, under logs, and under bark. Many brush piles, trash piles, and margins of lakes, ponds, and swamps

were searched.

In mid July, I visited the Virginia Museum of Natural History in Martinsville, Virginia. During this visit, all specimens in their reptile and amphibian collection that were found in Powhatan county were measured and viewed to collect additional data. The Virginia Herpetological Society's slide set was also viewed for potential data or new species not seen in my survey.

During September and October, the main focus for searching efforts was on Autumn breeding salamanders and snakes migrating to habernacula for the winter. Ambystoma opacum egg masses were uncovered by turning over cover objects. Many potential egg-laying sites were identified during the late winter, which led to early spring discovery of adults and tadpoles in breeding ponds.

In addition to all the above techniques, road cruising was carried out during all months, for live and dead amphibians and reptiles.

RESULTS

For each species collected in this survey, an individual account follows. In this account, all observations, locations, and measurements are given. A locality map showing where each individual was found is also given. Dark circles represent living animals caught, open circles represent DOR specimens, dark squares represent frogs heard calling, and open squares represent frogs heard calling and living animals caught. In addition to the map, specific directions are given for each animal found. For each measurement or quantitative observation, the following analysis is given: (mean, standard deviation (\pm), range, and n = sample size.) Species accounts are arranged phylogenetically and in alphabetic order.

Class AMPHIBIA

Order CAUDATA (Salamanders)

Family AMBYSTOMATIDAE (Mole Salamanders)

Ambystoma maculatum (Spotted Salamander)

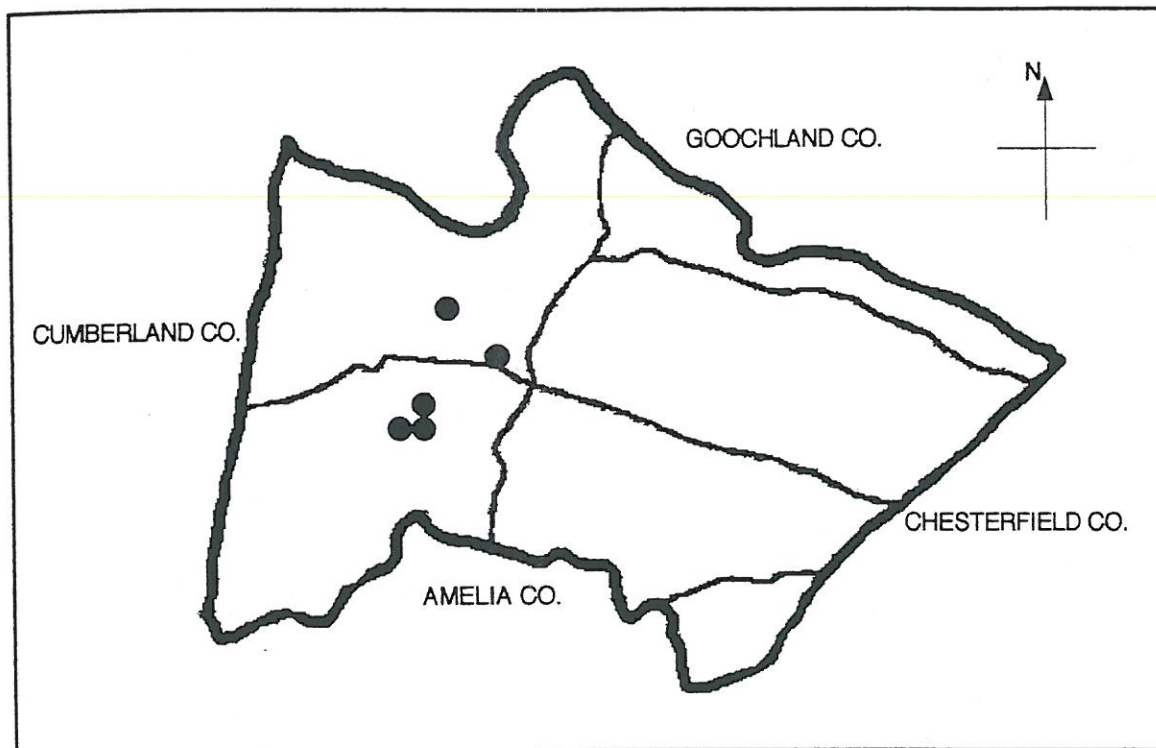


Figure 2. Distribution map of Ambystoma maculatum.

Spotted salamanders were seen in breeding pools beginning on 16 February 1999 and ending on 21 March 1999 (Figure 2). Breeding pools included beaver ponds, road ruts, ephemeral streams, holes created by uprooted trees, and swamps. The majority of the breeding pools were surrounded by mature hardwood forests, only one being surrounded by a young regrowth forest. See Appendix 3 for a drawing of each breeding pool and a location map. All breeding pools were found on PWMA (Powhatan Wildlife Management Area) property.

Sixteen live and two dead adults were found in various breeding pools. Dates of capture include: 16 February 1999 one dead adult, 20 February 1999 two live and

one dead adult, and 21 March 1999 11 live adults. On 28 April 1999 three live adults were found under rotten logs near breeding pools. One adult was found 165 feet away from a breeding pool, which was the furthest distance any adult was found from the pool.

Measurements: SVL ($89.9 \text{ mm} \pm 11.27$, 70-124, $n = 18$), TL ($171 \text{ mm} \pm 13.05$, 145-199, $n = 18$), Tail length ($81.2 \text{ mm} \pm 8.7$, 60-94, $n = 18$), Mass ($20.4 \text{ g} \pm 4$, 11.5-28, $n = 14$), and number of dorsal spots (30.8 ± 7.3 , 15-43, $n = 18$). A summary of individual animal measurements can be seen in Table 1.

Date	Alive/Dead	SVL (mm)	TL (mm)	Tail length (mm)	# of spots	Mass (g)
2/16	dead	81	175	94	29	
2/20	alive	94	176	82	19	
2/20	alive	81	165	84	25	
2/20	dead	89	183	94	25	
3/21	alive	85	165	80	28	21
3/21	alive	85	165	80	29	19.3
3/21	alive	90	179	89	22	28
3/21	alive	85	172	87	35	22
3/21	alive	82	169	87	35	24
3/21	alive	84	147	63	37	20.5
3/21	alive	70	152	82	37	11.5
3/21	alive	89	171	82	15	20.5
3/21	alive	96	177	81	39	20.5
3/21	alive	85	145	60	34	13.2
3/21	alive	102	181	79	38	21
4/28	alive	95	182	87	31	18
4/28	alive	124	199	75	43	23.7
4/28	alive	102	178	76	34	23

Table 1. Ambystoma maculatum measurements.

Seven breeding ponds were thoroughly followed during the 1999 breeding year. A map was drawn for each breeding pond and each egg mass was plotted on the map as to the location of deposition. A flag was attached to each egg mass and each was followed until hatching. For each egg mass the following information was recorded: date of deposition, number of eggs, attachment substrate, depth, mass,

color, date of hatching, percent of eggs hatching, presence of algae, and special natural history notes if applicable. See appendix 3 for breeding pool maps, egg maps, and egg mass data sheets.

Thirty-eight spermatophores were found on 21 February 1999 and they were the first ones found. Egg deposition began on 24 February 1999 and the last to be deposited was on 14 April 1999. The following is a summary of all data taken on egg masses: number of eggs per mass (71.9 ± 35.4 , 8-177, $n = 158$), depth (cm) ($4 \text{ cm} \pm 3.8$, 0-23, $n = 99$), mass ($111 \text{ g} \pm 68$, 10-380, $n = 140$), percent of eggs hatching (89 ± 23.6 , 0-100, $n = 93$), presence of algae (112 egg masses). The rest of the masses either washed away or were eaten and could not be found to observe. Algae was viewed under the microscope and was the green circular unicellular algae (Oophila amblystomatis). All but 1 egg mass were clear when deposited. Most egg masses became the color of the medium they were submerged in.

Egg masses were attached to a wide variety of materials including a metal flag pole, underwater plant stems, grass, woody sticks (one identified branch coming from Carpinus caroliniana (ironwood), Juncus sp. stems, hardwood leaves (Liquidambar styraciflua (sweetgum), Fagus grandifolia (american beech), Acer rubrum (red maple), Salix sp. (willow), Quercus falcata (spanish oak), Quercus palustris (pin oak), Quercus rubra (red oak), and Quercus alba (white oak), Sedge sp. stem, and some masses were unattached. Masses were found attached to various substrates in the following numbers: Grass = 43 masses, Woody substances = 37 masses, Hardwood leaves = 34 masses, Unattached = 34 masses, Underwater plant stem = 5 masses, Juncus sp. = 4 masses, Metal flag pole = 1 mass, and Sedge sp. = 1 mass. For each breeding pool, a summary analysis was done for each of the parameters for egg masses as stated above (see appendix 4).

Ambystoma opacum (Marbled Salamander)

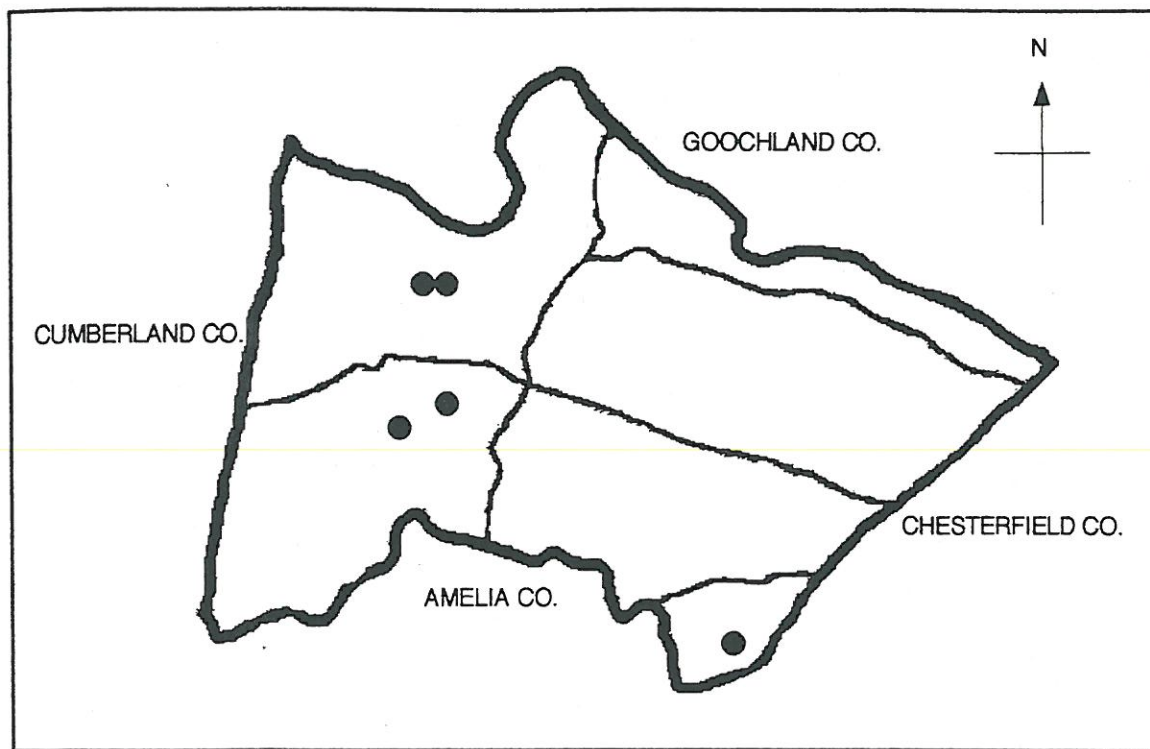


Figure 3. Distribution map of Ambystoma opacum.

This creature was only found where there were logs and vernal pools. All larvae were found in areas where Ambystoma maculatum eggs were found. One egg mass was found under a log along the shore of Bass pond PWMA on 6 December 1998. 102 eggs were counted. All eggs in this mass died due to desiccation.

Larvae were found in the following locations: 14 March 1999 (Sunfish pond swamp area PWMA), 27 March 1999 (larvae with hind legs in Sunfish pond swamp area), road rut along side of road going to Sunfish pond, CCC trail vernal pool PWMA, Lower lake site 1 and 2 PWMA (Figure 3). One juvenile was found under a log on 17 May 1999 in a forest near the intersection of a gas line and Salle creek PWMA. This animal had the following measurements: SVL = 42 mm, TL = 68 mm, Tail length = 26 mm, and Mass 3.2 g. Adults were found on 29 April 1999 (under log near Lower Lake 2 site), 12 May 1999 (student found and brought in a salamander that was discovered

in dog's drinking bowl, 713 Petersburg road), 23 September 1999 (two found under logs in forest at edge of vernal pool, where Salle creek intersects with gas line right of way), 25 September 1999 (in vernal pool near where Salle creek intersects with gas line right of way), and 29 September 1999 (found in dog's drinking bowl by Christy Noechel, Ballsville Road).

The adults had the following measurements: SVL ($60 \text{ mm} \pm 4.5$, 55-69, $n = 6$), TL ($103.3 \text{ mm} \pm 11.26$, 84-121, $n = 6$), Tail length ($43.3 \text{ mm} \pm 7.25$, 29-52, $n = 6$), and Mass ($8.7 \text{ g} \pm 2.9$, 5-13, $n = 6$). See table 2 for individual salamander measurements.

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)	Sex
4/29/99	61	109	48	13.2	?
5/12/99	69	121	52	11.7	?
5/17/99	42	68	26	3.2	?
9/23/99	55	84	29	5	M
9/23/99	60	104	44	6.25	M
9/25/99	59	105	46	9	F
9/28/99	56	97	41	7.2	M

Table 2. Ambystoma opacum measurements.

The salamander caught on 29 April 1999 released a fluid out of its cloaca that at first was very fluid but after a short period of time became sticky.

Family PLETHODONTIDAE (Lungless Salamanders)

Subfamily PLETHODONTINAE

Tribe HEMIDACTYLIINI

Eurycea cirrigera (Southern Two-lined Salamander)

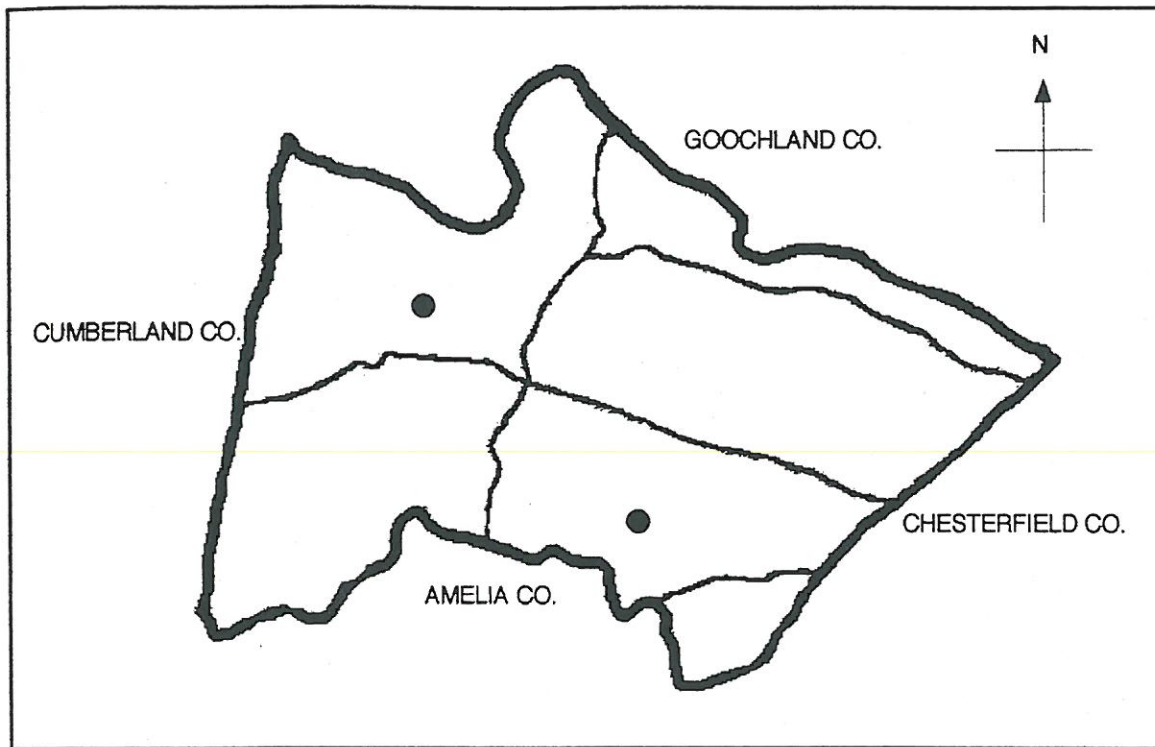


Figure 4. Distribution map of Eurycea cirrigera.

The southern two-lined salamander was found in different locations and in different years (Figure 4). One specimen was found by a student (Kelley Shepperson) on 19 March 1997 where Rt. 603 crosses Rocky Ford Creek. Fourteen coastal grooves were counted on this animal. Six red round growths were observed on the body and tail.

On 25 October 1998, two salamanders were found under logs in a wooded area near a small stream. This wooded area was located near the earthen dam on the west side of the Lower lake in Powhatan Wildlife Management Area. Both individuals continuously rolled while in hand, trying to escape.

One salamander was caught on 15 November 1998 under a log in a forest on the south side of the Lower lake PWMA. This animal also exhibited the rolling escape behavior and measured 99 mm TL (no damage to tail).

Eurycea guttolineata (Three-lined Salamander)

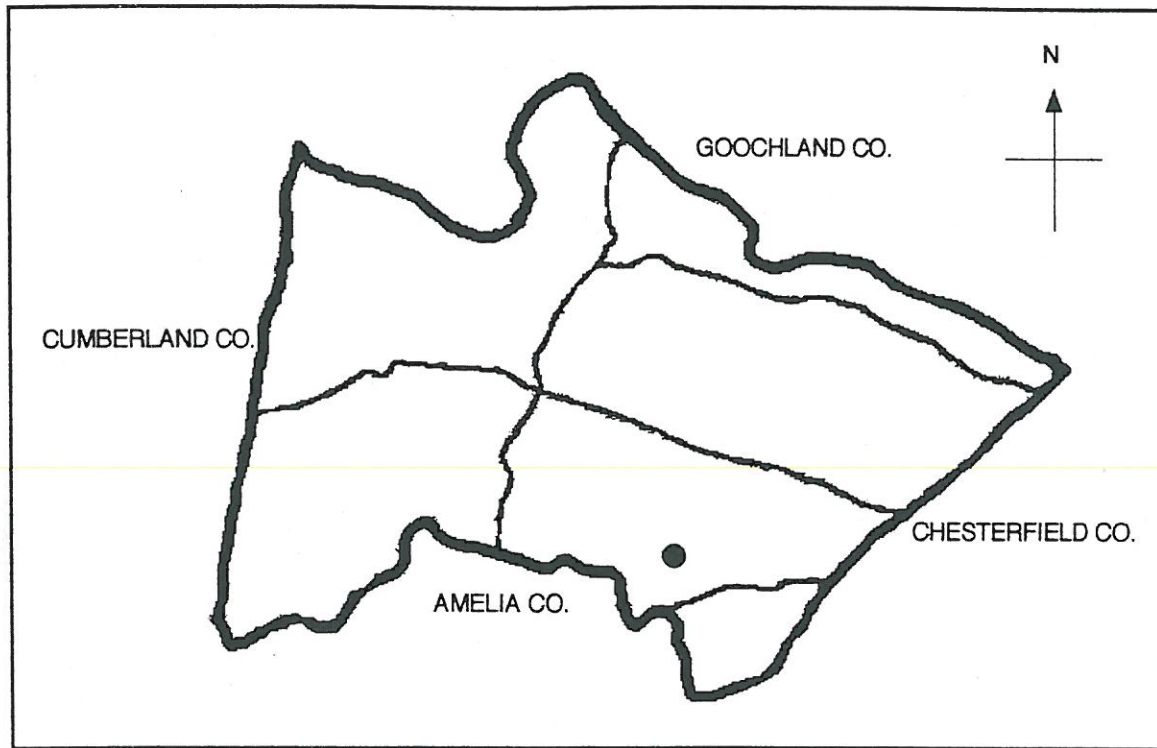


Figure 5. Distribution map of Eurycea guttolineata.

One three-lined salamander was found on 19 March 1997 by a student (Kelley Shepperson). This salamander was found where Rt. 603 intersects with Rocky Ford Creek and was found in the creek (Figure 5). No measurements were taken.

Hemidactylium scutatum (Four-toed Salamander)

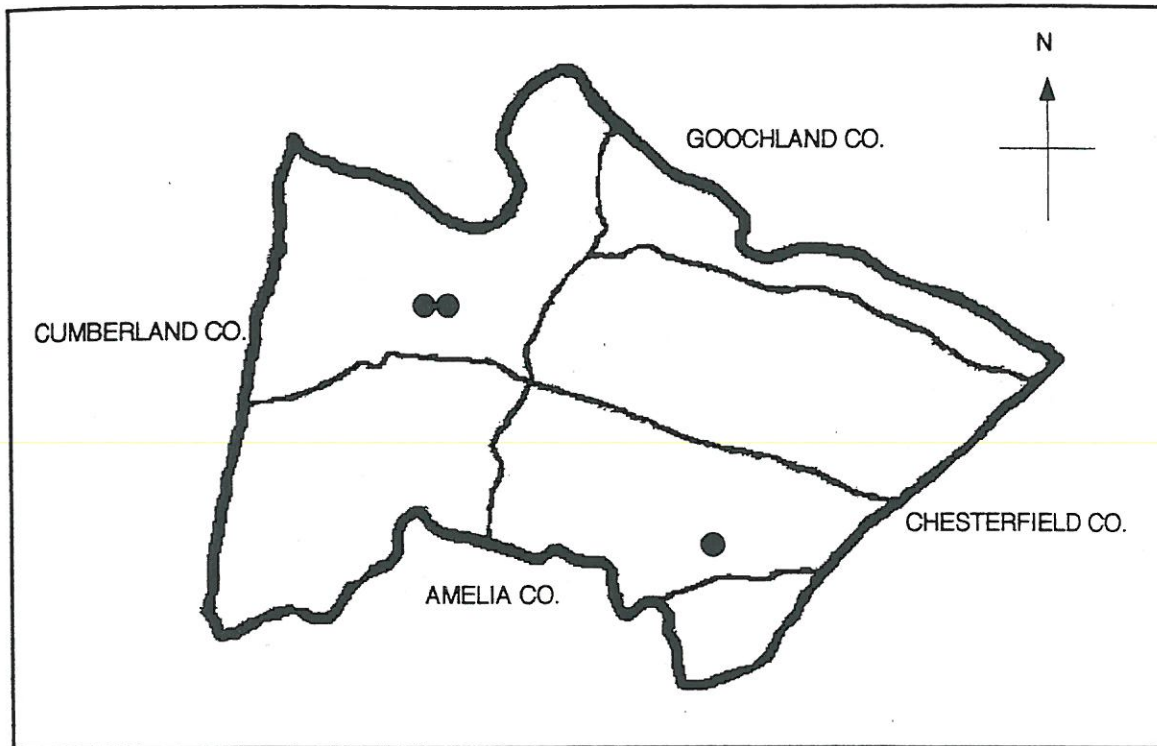


Figure 6. Distribution map of Hemidactylium scutatum.

The four toed salamander is a very secretive animal and was seen only three times. One animal was found on 17 November 1998 at 1301 Avatar Drive. This individual was found under a log adjacent to a damp low area with many moss plants. The temperature was 21°C (70°F) with no precipitation within 24 hours. This salamander had a total length measurement of 58 mm.

The second individual was found on 28 November 1998 in the Powhatan Wildlife Management Area, specifically on the north side of the Upper Lake. This individual was found under a log with a 25.6 °C (78°F) temperature. Again no precipitation occurred within 24 hours of capture. This salamander had a total length measurement of 65 mm (Figure 6).

The third individual was found on 31 October 1999 in woods on the west side of Lower Lake PWMA. This individual was found under a log and had the following

measurements: SVL = 19 mm, TL = 33 mm, and Tail length = 14 mm.

Tribe PLETHODONTINI

Plethodon cinereus (Red-backed Salamander)

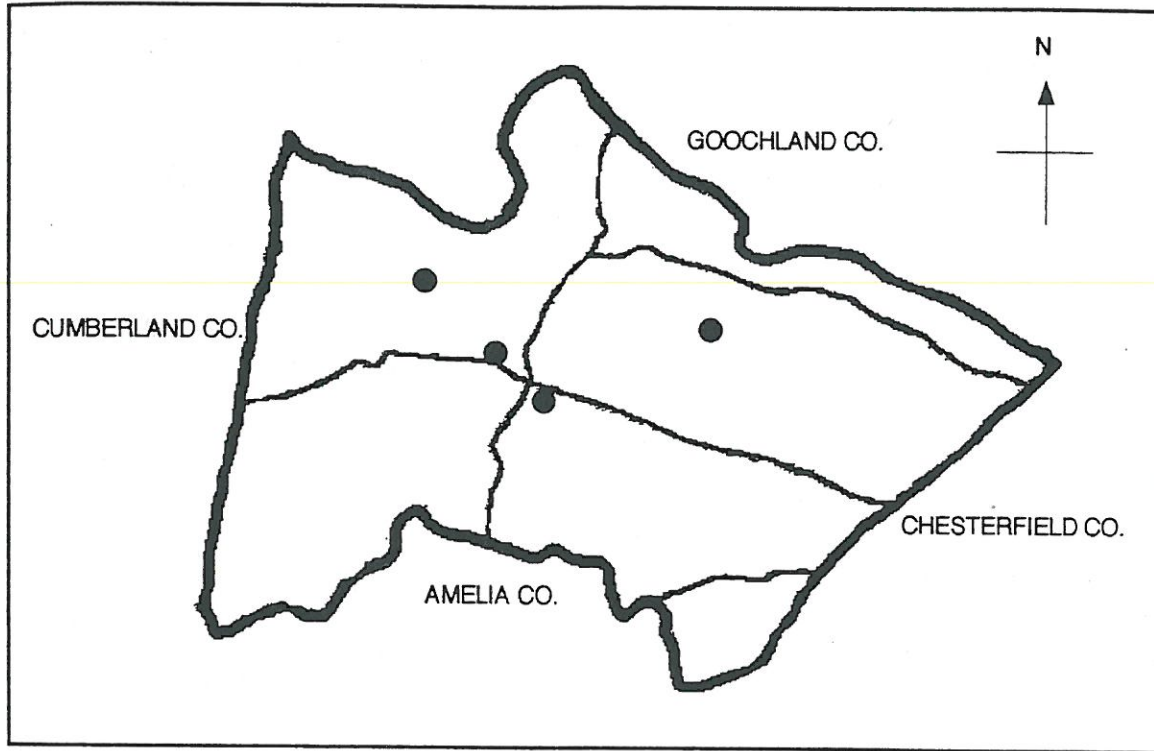


Figure 7. Distribution map of Plethodon cinereus.

The red backed salamander is very abundant throughout Powhatan county. All salamanders were found under logs. Plethodon cinereus was found on the following dates in the following locations: 13 November 1998 (48 salamanders were found in the mature hardwood forest in a residential neighborhood on Lee's Landing road), 18, 19, 20, and 23 November 1998 (61 salamanders found in the mature hardwood forest surrounding Pocahontas Elementary and Pocahontas Middle schools), 24 November (2 salamanders found in the mixed hardwood/pine forest behind Powhatan High School), and 28 November (1 salamander found in the mature hardwood forest on the north side of Upper lake PWMA) (Figure 7).

Out of 110 salamanders collected, 56 exhibited the red stripe phase, 48 exhibited the lead (black) phase, and 6 exhibited a bronze stripe. A measurement of TL was taken for 57 salamanders collected ($59 \text{ mm} \pm 11$, 34-84, $n = 57$). Many of the salamanders collected had various injuries to the tail, some missing complete tails while others only a small portion. One salamander collected had a damaged eye that had healed over.

Plethodon cylindraceus (White Spotted Slimy Salamander)

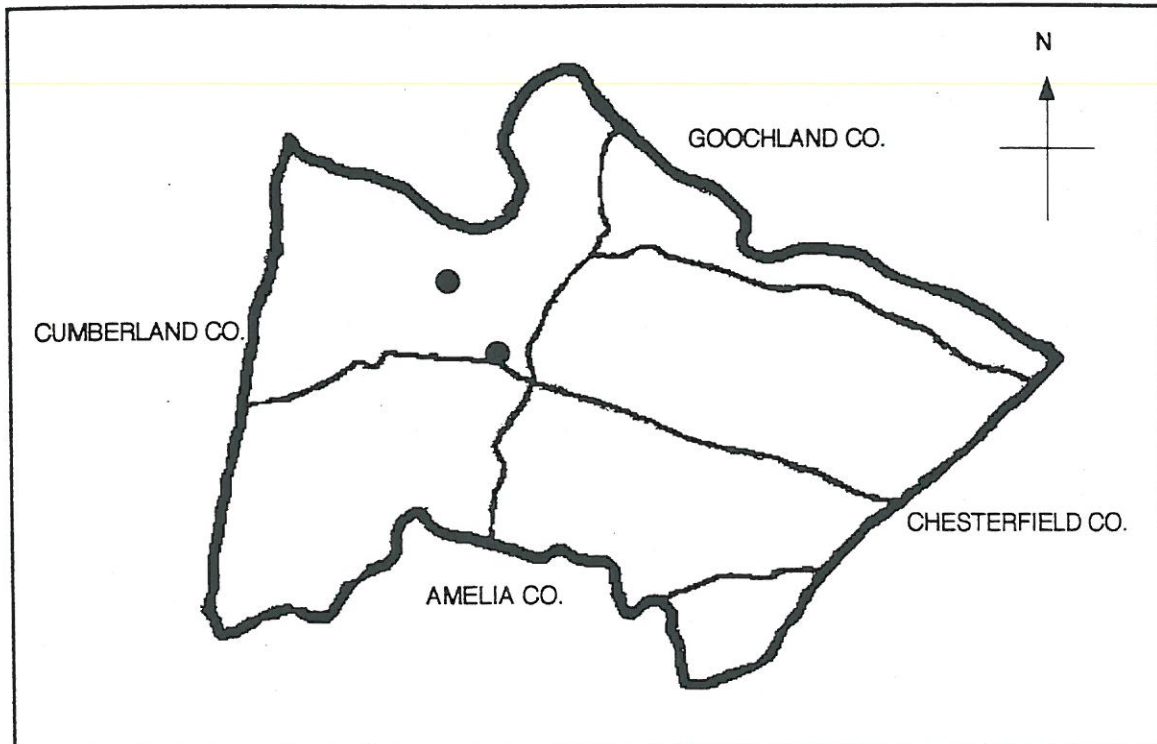


Figure 8. Distribution map of Plethodon cylindraceus.

Plethodon cylindraceus is a member of the Plethodon glutinosus complex. Highton et al. (1989), after conducting genetic tests on the complex, recognizes 13 species of slimy salamander. Petranka (1998) argues that a genetic test alone should not be used as proof that each of the complex members be recognized as separate species. He suggests that studies need to be done to show that each of the 13 species are reproductively isolated and that no gene exchange is occurring. Here I

recognize the slimy salamander in Powhatan county as Plethodon cylindraceus for two reasons.

First, the Atlas work of Mitchell and Reay (1999) limits Plethodon chlorobryonis to the southeast corner of Virginia and Plethodon glutinosus to the western and southwestern parts of Virginia. Plethodon cylindraceus is the most wide spread slimy salamander being found in parts of the coastal plain, piedmont, and mountains. Second, the slimy salamander I have found meets the description of Plethodon cylindraceus in Highton et al. (1989) as having small white spots over dorsum and legs as opposed to brassy spots found on the dorsum of Plethodon chlorobryonis and Plethodon glutinosus.

Two factors influenced where white spotted slimy salamanders were found, these are the presence of water and mature hardwood forests with many rotten logs. Salamanders were found on PWMA property in the woods surrounding the Upper lake, Lower lake, and Salle creek. Salamanders were also found in the woods on the west side of Pocahontas Elementary school. All animals were found under logs (Figure 8).

When captured, most salamanders excreted a watery solution from its skin which would gum up after a period of time. A few salamanders escaped capture by moving very quickly into underground holes. The following measurements were taken from captured animals: SVL ($63 \text{ mm} \pm 11.4$, 34-81, $n = 16$), TL ($114.5 \text{ mm} \pm 33$, 37-160, $n = 19$), Tail length ($56.9 \text{ mm} \pm 21.5$, 24-89, $n = 16$), and Mass ($6.7 \text{ g} \pm 2.3$, 2.2-11, $n = 16$). Data table 3 lists a summary of all adult animal measurements. One juvenile was captured and had the following measurements: SVL = 22 mm, TL = 37 mm, Tail length = 15 mm, and mass .5 g.

Date	SVL (mm)	TL (mm)	Tail length (mm)	Mass (g)
11/19/98		126		
11/28/98		90		
4/24/99	81	160	79	10
4/28/99	64	105	41	7.5
4/28/99	66	115	49	8
4/28/99	65	153	88	8
5/15/99	64	135	71	6.7
5/15/99	72	151	79	8
5/15/99	73	98	25	6.5
5/15/99	67	109	42	5.5
5/15/99	56	89	33	5.5
5/15/99	72	137	65	8.7
5/15/99	63	105	42	5.2
5/15/99	54	103	49	4
5/15/99	34	58	24	2.2
5/17/99	69	158	89	7.2
5/17/99	43	95	52	3
5/23/99	70	152	82	11

Table 3. Plethodon cylindraceus measurements.

Family SALAMANDRIDAE (Newts)

Notophthalmus viridescens viridescens (Eastern Newt)

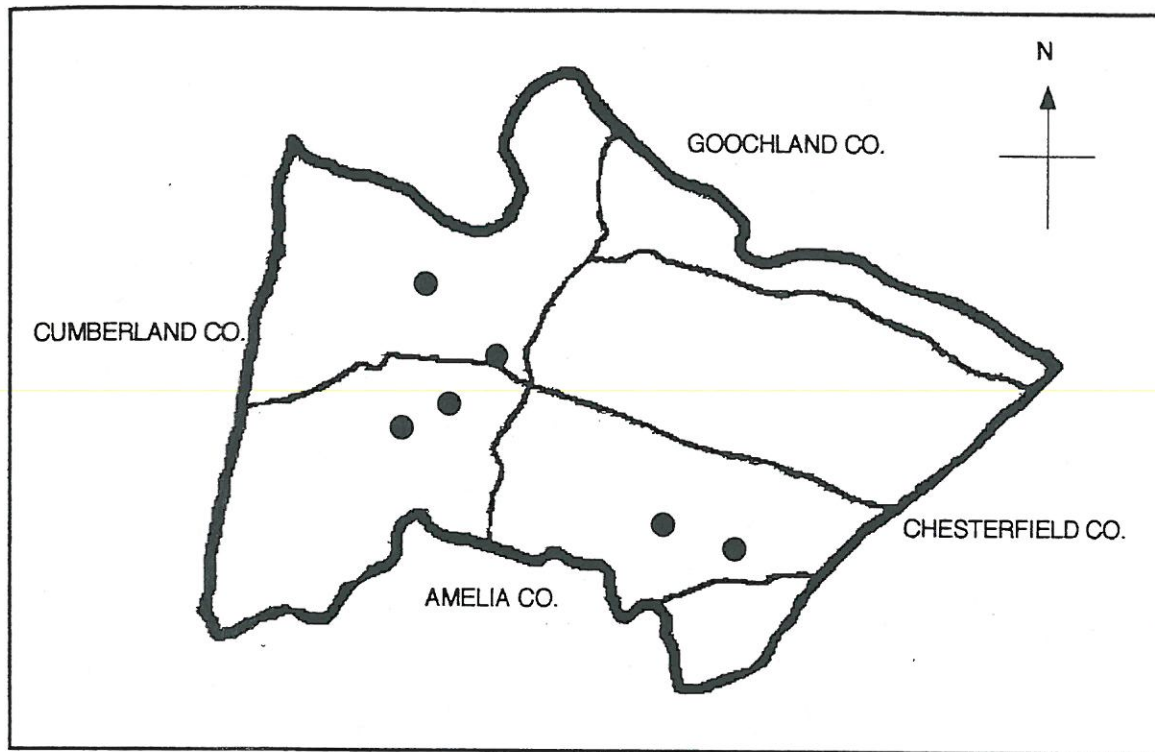


Figure 9. Distribution map of Notophthalmus viridescens viridescens.

This salamander, which can be found all year round, occupied every suitable habitat and in large numbers. Some of the habitats in which this salamander was found include vernal pools, road ruts, swamps, man made ponds, beaver ponds, roads, and mature hardwood forests. Specific locations include Ernie Cundiff pond site (Rocky Ford road), Avatar drive, Pocahontas Elementary School pond, and PWMA (Lower and Upper lakes, Bass pond, Sunfish pond, Bullhead pond, Swamp behind Sunfish pond, Salmon creek area, Salle creek and associated beaver ponds and woods surrounding these wetland areas) (Figure 9).

Dorsal amplexus was observed on 23 January 1999 (2 pairs were found in the water in Lower lake PWMA) and 21 February 1999 (in water in a Beaver pond that flows into Bullhead pond PWMA). No eggs were counted.

Many animals were captured by dipnetting. Males had the following measurements: SVL (41.7 mm \pm 4, 35-52, n = 56), TL (84.4 mm \pm 11, 65-121, n = 56), Tail length (42.6 mm \pm 7.6, 29-69, n = 56), Mass (3.3 g \pm 1, 2-5, n = 8), Number of dorsal spots (14 \pm 6.5, 7-40, n = 42). Females had the following measurements: SVL (42.2 mm \pm 4.5, 36-56, n = 30), TL (82.2 mm \pm 8.2, 67-103, n = 30), Tail length (40 mm \pm 6, 25-52, n = 30), Mass (2.5 g \pm .3, 2-3, n = 5), and number of dorsal spots (11.2 \pm 4, 7-23, n = 13). Transforming stage newts had the following measurements: SVL (37.7 mm \pm 3.3, 34-42, n = 3), TL (69.3 mm \pm 4.8, 61-73, n = 4), Tail length (31 mm \pm 3.7, 27-36, n = 3), Mass (1.5 g n = 1), and number of dorsal spots (12 \pm .8, 11-13, n = 3).

This is a hardy species, being found swimming under ice in January. A few captured animals had small white nodules over the surface of the body. I do not know if this is a parasite. One newt was observed eating the tail of another newt while being held in a small aquarium.

Pseudotriton ruber (Red Salamander)

The red salamander has been recorded for Powhatan county but was not found during this survey (Mitchell and Reay, 1999).

Order ANURA (Frogs and Toads)

Family PELOBATIDAE

Scaphiopus holbrooki (Eastern Spadefoot Toad)

The spadefoot toad was not found during this survey period despite the fact that many road cruises and site surveys were done during the appropriate weather conditions. The spadefoot toad has been recorded from the northeastern end of Powhatan (Mitchell and Reay, 1999).

Family BUFONIDAE

Bufo americanus (American Toad)

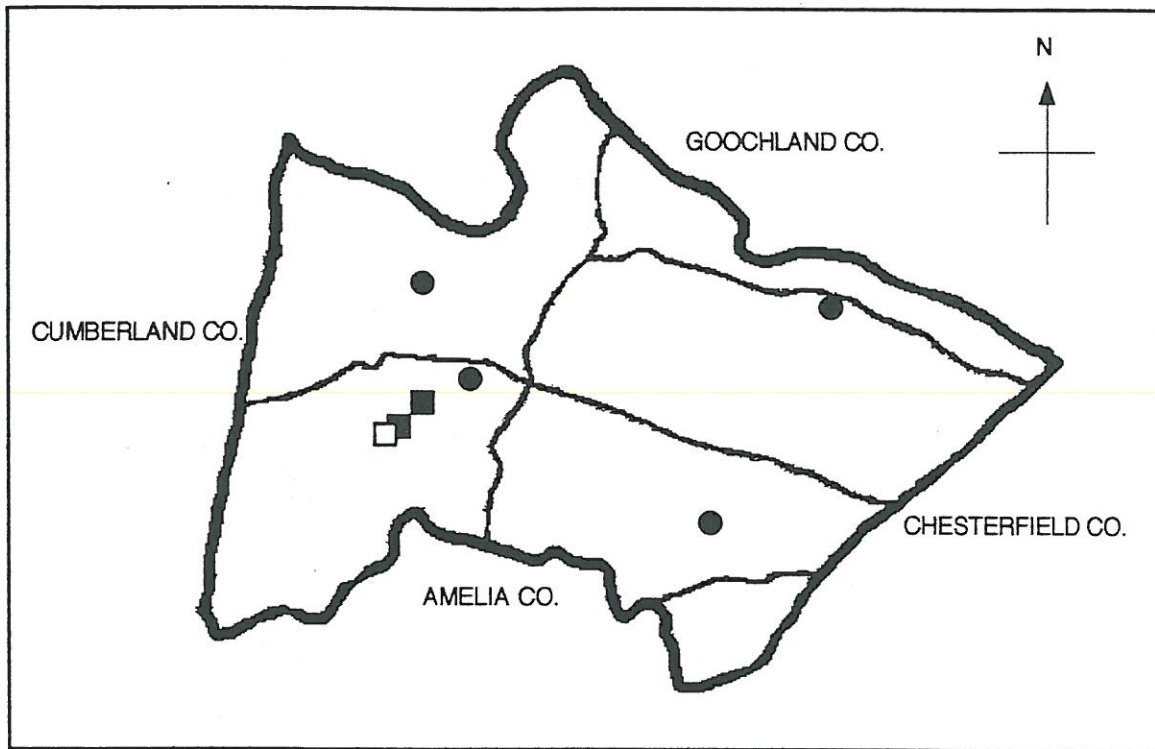


Figure 10. Distribution map of Bufo americanus.

Two years of data have been collected for the american toad. In 1997, toads were first observed on 2 March at 1965 Huguenot Trail (Millwood). Males were heard calling on 29 March and 4 April. Three males were observed calling on 4 April and periodically each male would mount other males eliciting a release call from the male mounted.

Eggs were seen deposited in a vernal ditch on 29 March, 2 April, and 8 April. The strings of eggs were clear when deposited but over a short period of time, they swelled and attracted detritus and algae to their surface. Two egg masses were followed and each took six days to hatch. One egg mass was counted and found to contain 4,693 eggs. Due to the ephemeral nature of this ditch, it dried up before tadpoles could metamorphose.

In 1999, toads were observed on 1 April (in and near a vernal road rut beside the road going to Sunfish pond PWMA and along the margin of Bass pond PWMA), 4 April (on Avatar Drive), 20 April (Bass Pond PWMA), 24 April (Bass Pond), and 22 May (Avatar Drive). Males were observed calling on 1 April, 20 April, 23 April, and 17 May (Figure 10).

Egg deposition corresponded with rain events and was seen on 1 April, 5 April, and 8 April. Eggs were deposited in road ruts and beaver ponds. Many of the eggs deposited in road ruts were crushed by vehicles and desiccated when pools dried up. Eggs deposited on 5 April (beaver pond flowing into Bullhead pond PWMA) hatched on 9 April (Salle creek beaver pond 1 PWMA).

Female american toads had the following measurements: SVL ($67.5 \text{ mm} \pm 7.4$, 50-76, $n = 8$), and Mass ($37.8 \text{ g} \pm 12.3$, 12-52, $n = 8$). See data table 4 for individual measurements.

Date	SVL (mm)	Mass (g)
4/1/99	68	41
4/1/99	68	43
4/1/99	72	41
4/1/99	76	52
4/1/99	71	50
4/4/99	64	26
4/24/99	71	37
5/22/99	50	12

Table 4. Female Bufo americanus Measurements

Males had the following measurements: SVL ($59.3 \text{ mm} \pm 2.9$, 56-63, $n = 4$), and Mass ($21.4 \text{ g} \pm 2.2$, 19.5-25, $n = 4$). See data table 5 for individual male american toad measurements.

Date	SVL (mm)	Mass (g)
4/1/99	56	21
4/1/99	61	20
4/1/99	63	25
4/20/99	57	19.5

Table 5. Male Bufo americanus Measurements

Bufo fowleri (Fowler's Toad)

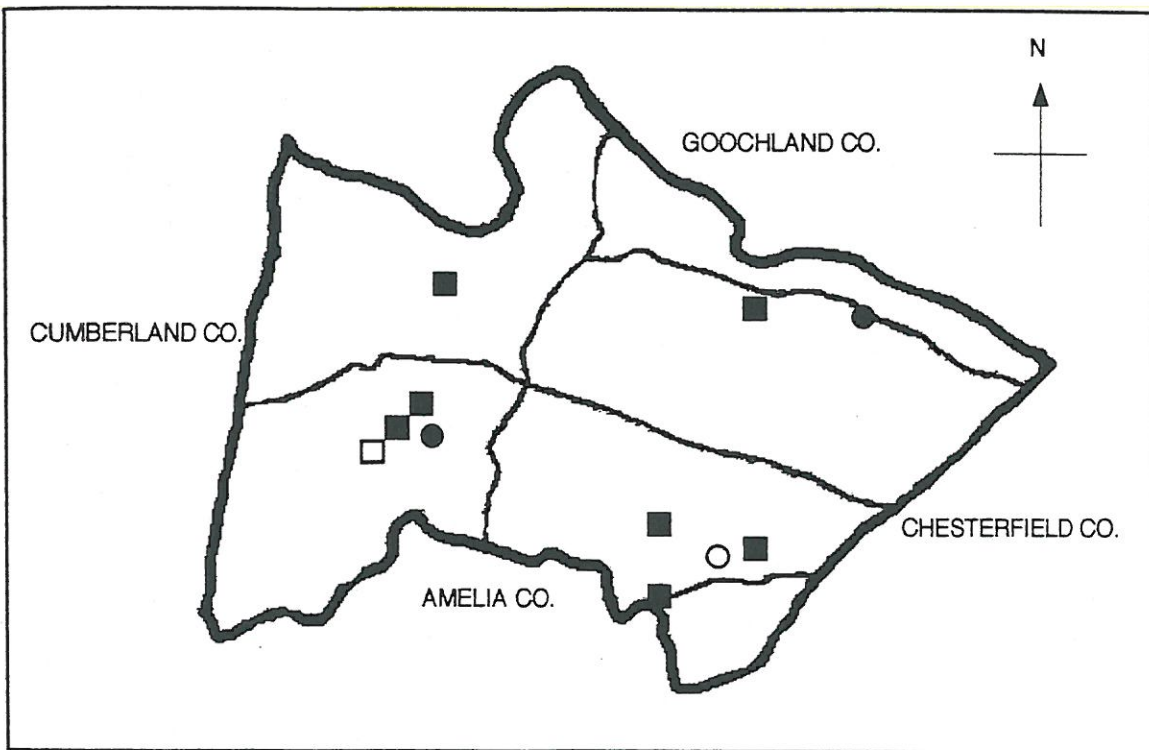


Figure 11. Distribution map of Bufo fowleri.

Fowler's toad was first encountered on 4 April 1999 (1301 Avatar Drive in driveway). Since that time it was seen or heard on 20 April 1999 (Pocahontas Middle school campus and Bass pond PWMA), 23 April 1999 (frog call survey see map above), 17 May 1999 (PWMA, woods near Salle creek and gas line), 18 May 1999 (Sunfish pond PWMA), 22 May 1999 (Avatar drive), 2 June 1999 (Squirrel Ridge trail

PWMA), 12 June 1999 (frog call survey), 28 June 1999 (frog call survey), 3 July 1999 (DOR on Avatar drive .5 km (.3 miles) west of intersection of Avatar and Corso drive), 11 July 1999 (northern shore of Lower lake PWMA), and 10 August 1999 (Squirrel Ridge trail PWMA) (Figure 11).

Male Fowler's toads were heard calling from 23 April 1999 to 28 June 1999. These toads were found calling at 8 of the 18 sites visited during frog call surveys. An average call index of 2 (n = 10) was scored for this frog. (2 = Calls of individuals can be distinguished but there is some overlapping of calls).

One egg mass was found on 24 April 1999 attached to the stems of Juncus sp. This mass was distinguished from american toad eggs by its lack of an inner envelope. There was rain the previous night before deposition. The eggs were carefully collected and counted. The mass contained 4,512 eggs. The eggs were replaced and hatched on 29 April 1999, 5 days later.

Male and female toads could be differentiated. Males had the following measurements: SVL ($55.5 \text{ mm} \pm 4.4$, 50-67, n = 11), and Mass ($19.4 \text{ g} \pm 3$, 15-27, n = 11). See data table 6 for individual male measurements.

Date	SVL (mm)	Mass (g)
4/20/99	67	27
4/20/99	58	20
4/20/99	55	19
4/20/99	54	20.5
4/20/99	53	19.5
4/20/99	57	19.5
4/20/99	50	15.5
4/20/99	57	19.5
5/18/99	50	19.5
5/22/99	55	18
5/2/99	54	15

Table 6. Male Bufo fowleri measurements

Females had the following measurements: SVL ($59.8 \text{ mm} \pm 9$, 52-75, $n = 4$), and Mass ($23.5 \text{ g} \pm 10.9$, 14-42, $n = 4$). See data table 7 for individual female measurements.

Date	SVL (mm)	Mass (g)
4/4/99	75	42
5/17/99	52	14
5/22/99	57	19
5/22/99	55	19

Table 7. Female Bufo fowleri measurements

All toads appeared to be healthy; one was missing a right front foot but it appeared healed and the frog's locomotion did not seem impaired. One circular black dot was seen on the chests of many of these toads.

Family HYLIDAE

Acris crepitans crepitans (Northern Cricket Frog)

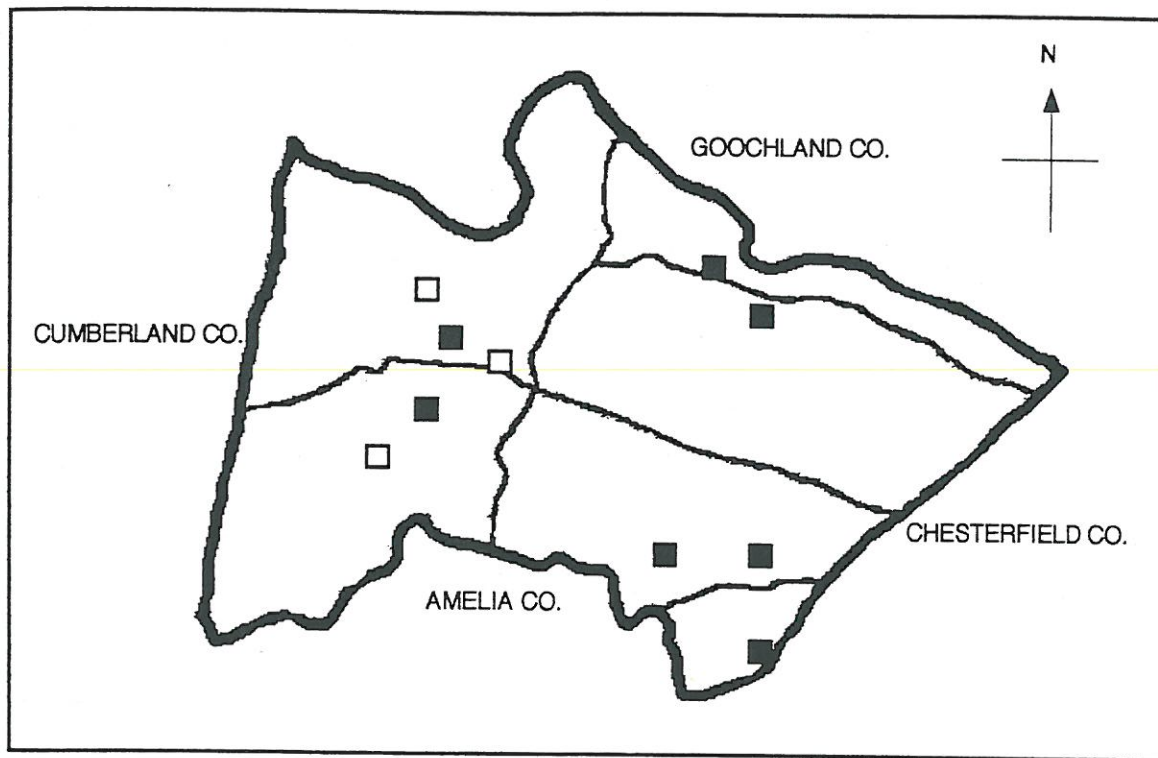


Figure 12. Distribution map of Acris crepitans crepitans.

Only the northern cricket frog was found in Powhatan. Most frogs that were found had the following characteristics: blunt snout, subanal white tubercles, jagged thigh stripe, and legs where the heel did not pass the snout. Some frogs found did have characteristics of Acris gryllus gryllus but overall they were more similar to Acris crepitans crepitans. Cricket frogs are very widely distributed in Powhatan and can be found in every month (Figure 12).

Cricket frogs were observed calling from 8 April 1999 to 12 July 1999. Frog call surveys conducted found that the northern cricket frog was found in 10 of 18 sites and had an average call index of 3. (The highest possible score.) Egg masses were found on 18 May 1999 and consisted of loosely attached eggs in a weak jelly. Number of

eggs per mass had the following average (36.8 ± 9.5 , 23-57, $n = 34$). From a total sample of 34 egg masses, 26 were attached to grass, 5 were attached to Juncus sp., 1 was attached to a unidentified hardwood leaf, 1 was attached to a Quercus alba (white oak) leaf, and 1 mass was not attached.

Cricket frogs were observed to be highly variable phenotypically. Three major color morphs were observed: all brown body, all brown body with dark brown triangle on head, and greenish body with dark green stripe on back with brown triangle on head. Cricket frogs were found to have the following SVL ($18.2 \text{ mm} \pm 2.4$, 8-22, $n = 54$).

Hyla chrysoscelis (Cope's Gray Treefrog)

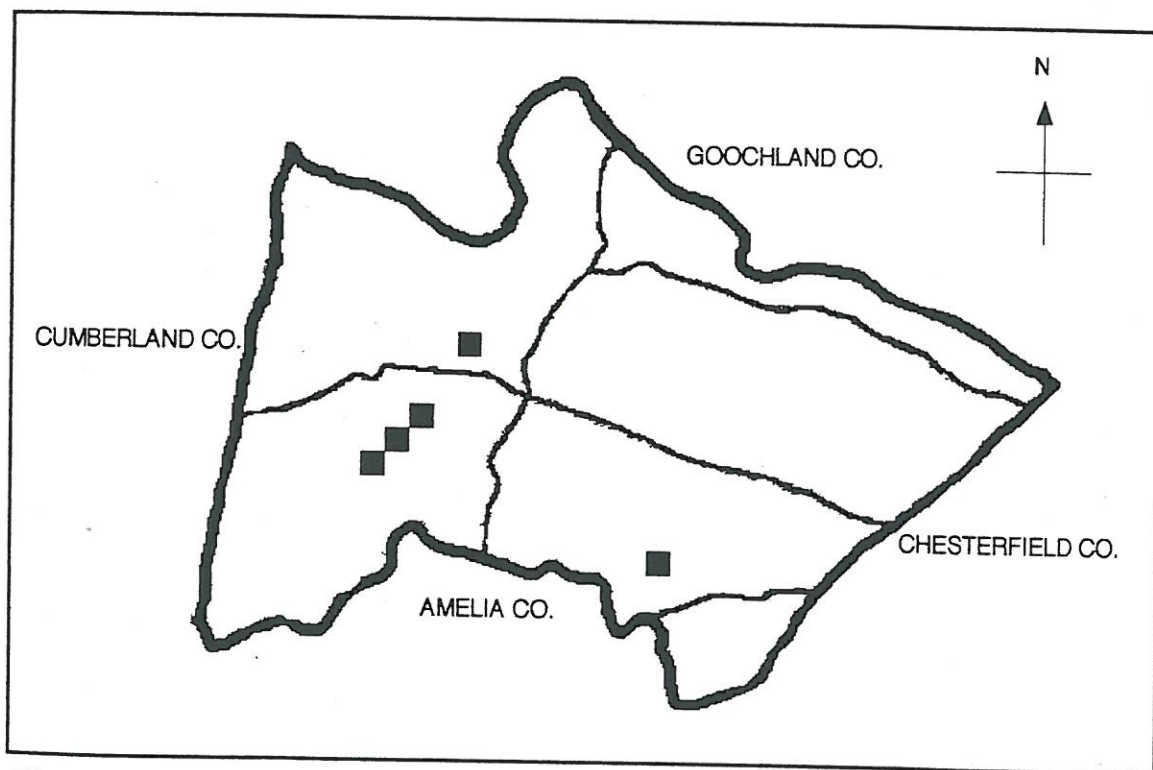


Figure 13. Distribution map of Hyla chrysoscelis.

Cope's gray treefrog was distinguished from the common gray treefrog by sound. Frog call tapes were studied and used for identification. At most sites, the two species were both calling which aided identification. Hyla chrysoscelis was observed

calling on 12 June 1999 and 28 June 1999. (See Appendix 2 for frog and toad calling survey sheets) The above map shows the distribution of this species (Figure 13). Measurements and other observations were not taken due to the difficulty in phenotypic identification.

Hyla versicolor (Common Gray Treefrog)

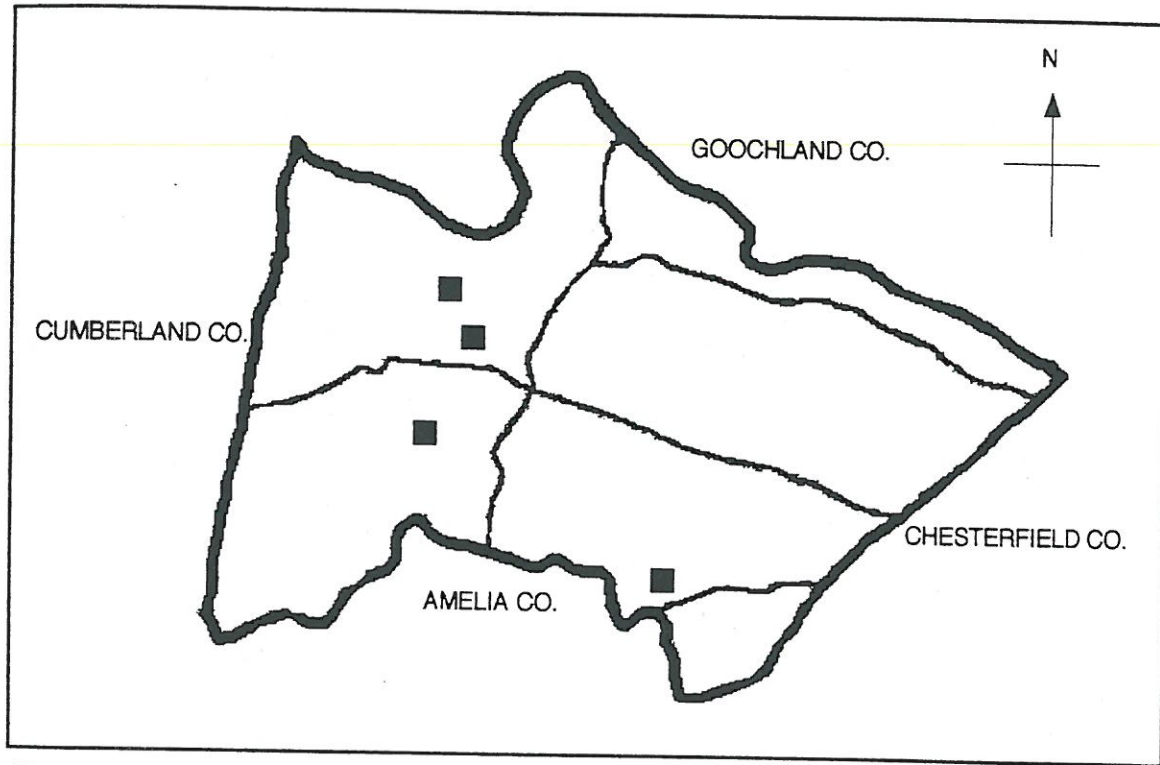


Figure 14. Distribution map of Hyla versicolor.

The above map shows the distribution of this species (Figure 14). Hyla versicolor was observed calling on 12 June 1999 and 28 June 1999. As for reasons stated above, other observations were not made.

Pseudacris crucifer crucifer (Spring Peeper)

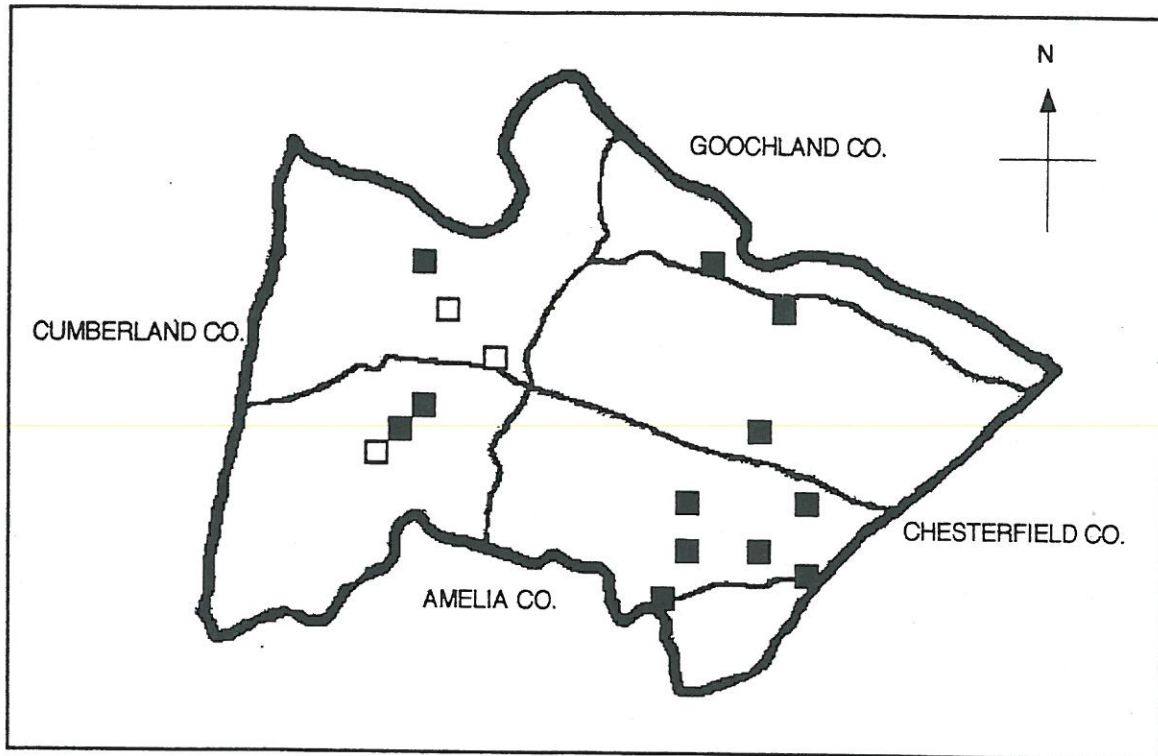


Figure 15. Distribution map of Pseudacris crucifer crucifer.

Three years of calling data have been collected. In 1997, spring peepers were heard from 20 February (21°C (70°F) air temp.) to 4 April. In 1998, spring peepers were heard from 25 February to 15 April. In 1999, spring peepers were heard from 21 January (14°C (58°F) air temp.) to 23 April.

This is a very widely distributed and abundant frog (Figure 15). It was heard at 16 of 18 frog call survey locations and rated a call index of 3 at 14 of the 16 sites. (A call index of 3 is the highest index value and means that a full chorus where calls are constant, continuous and overlapping was heard.)

Many different sites were chosen for laying eggs including man made ponds, beaver ponds, vernal pools, and swamps. No measurements of egg masses could be gathered because this frog lays eggs individually. One male frog was captured and had the following measurements: SVL = 28 mm and Mass = 2.5 g.

Pseudacris feriarum (Upland Chorus Frog)

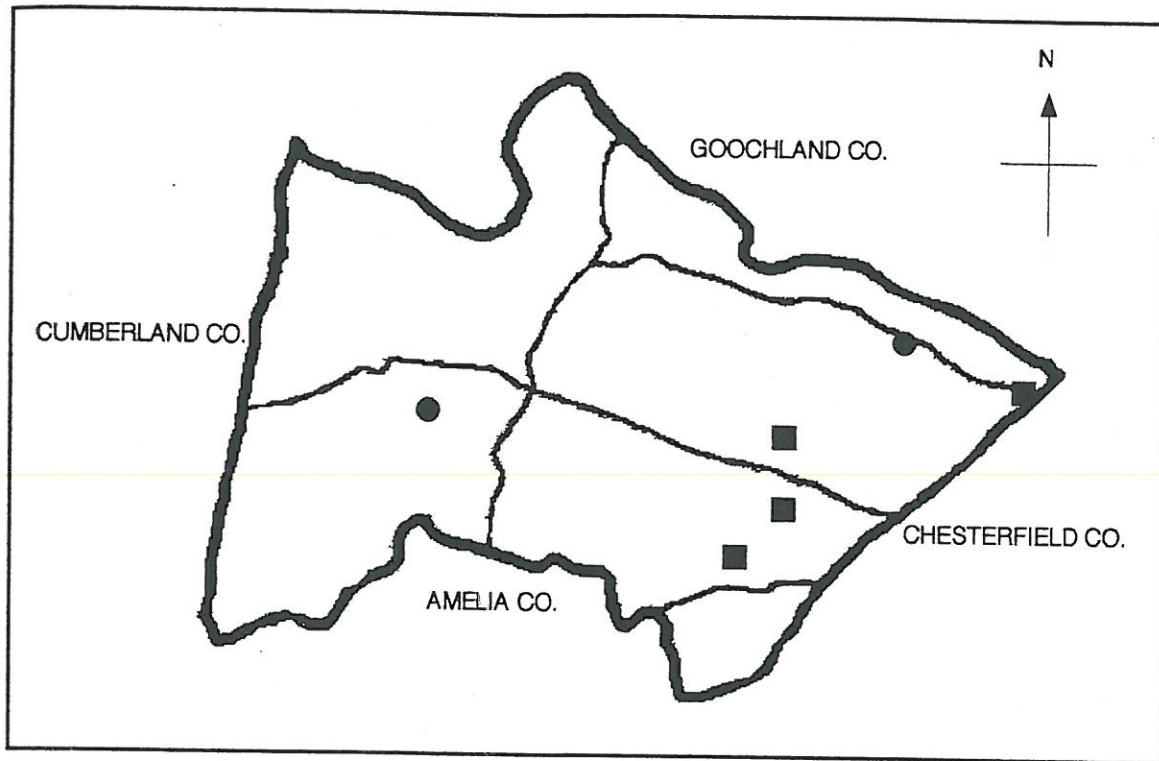


Figure 16. Distribution map of Pseudacris feriarum.

Upland chorus frogs have been observed in three different years. In 1997, frogs were heard calling from 27 February 1997 to 5 April 1997. In 1998, frogs were heard calling starting on 17 February 1998. End calling time was not recorded. In 1999, frogs were observed calling from 18 January 1999 (20°C (68°F) air temperature) to 12 April 1999. Frog call surveys were not very productive in documenting where these frogs are distributed (Figure 16). Spring peepers seem to overpower the upland chorus frog and therefore I hypothesize that the upland chorus frog temporally sequences its calling to come before the spring peepers.

Amplexus was observed on 4 March 1999. Eggs were seen deposited on 4 March 1999, 6 March 1999, 11 March 1999, 17 March 1999, and 19 March 1999. Egg laying sites included very ephemeral areas such as vernal pools and road ruts. For each egg mass, the following data was collected: number of eggs, attachment

substrate and associations with algae. The following is a summary of the data: number of eggs per mass (30.3 ± 11.6 , 11-62, $n = 65$), attachment substrate (grass = 50, Quercus alba (white oak) leaf = 2, Quercus falcata (spanish oak) leaf = 5, not attached = 1, detritus = 1, Juncus sp. = 1), and number of masses which had stringy algae on outer surface (49 masses)

Family RANIDAE

Rana catesbeiana (Bullfrog)

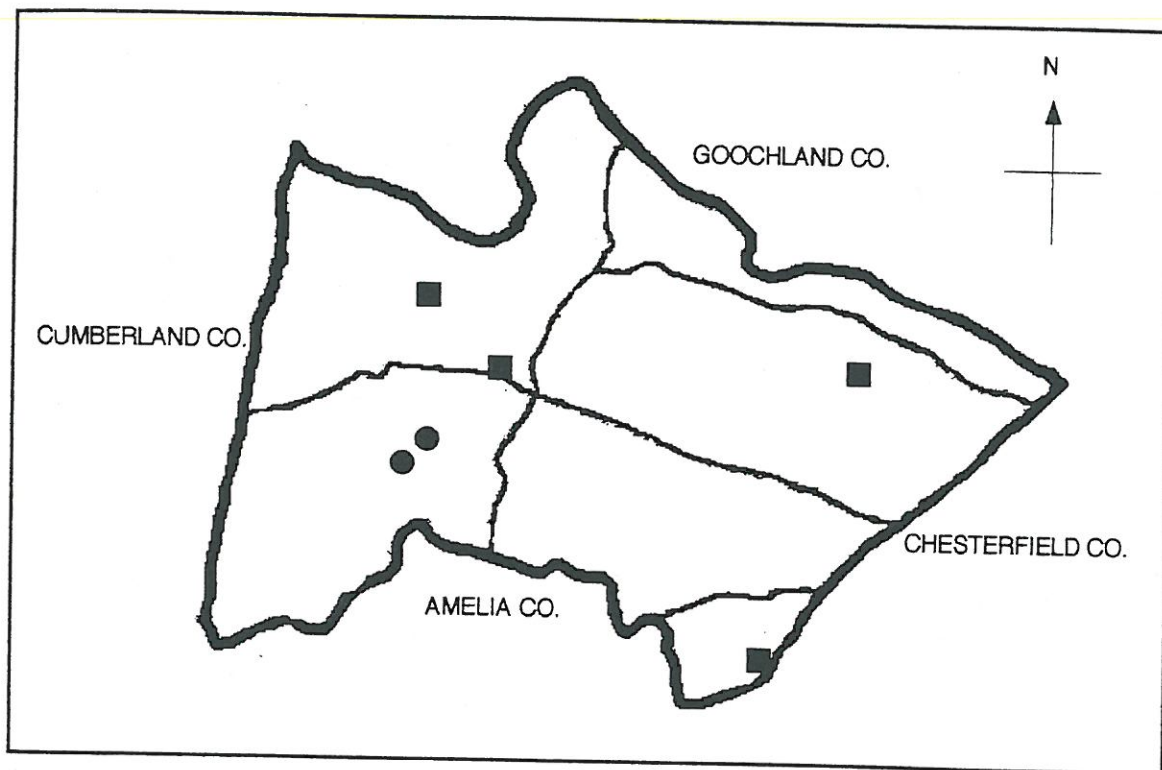


Figure 17. Distribution map of Rana catesbeiana.

Bullfrogs were observed calling from 28 March 1999 until 12 July 1999. All but two captured animals were dredged up using a dip net. Two large adult animals were caught with nets. Bullfrogs are widely distributed in the county as evidenced by the animals collected and call surveys (Figure 17). Most frogs caught were found in Bass pond and the beaver pond that flows into Bullhead pond on PWMA. The following

measurements are biased due to large animals not being caught. SVL ($54.9 \text{ mm} \pm 33.4$, 31-142, $n = 9$) and Mass ($74.8 \text{ g} \pm 127.7$, 4.1-330, $n = 5$). See table 8 for a summary of bullfrog measurements.

Date Found	SVL (mm)	Mass (g)
1/9/99	31	
1/13/99	37	
1/18/99	32	
2/12/99	75	
3/7/99	32	4.1
3/21/99	51	16
4/6/99	49	14.25
4/6/99	142	330
4/20/99	45	9.5

Table 8. Rana catesbeiana measurements.

Egg masses were found only in one pond on 9 May 1999. This pond is a man made pond behind Pocahontas Elementary school. Fifteen surface film type egg masses were found distributed around the pond. Most egg masses were located on the southwestern side of the pond. Egg masses were found with the following species of plants: Juncus sp. 5 masses, Typha sp. 6 masses, Salix sp. 2 masses, and grass 2 masses. Two egg masses were collected and found to contain 4,498 eggs and 6,875 eggs. Some egg mortality was observed due to the eggs being deposited on vegetation. When water levels fell this led to desiccation. All egg masses hatched within 5 days.

A small bullfrog tadpole survey was done on 21 January 1999. Bullfrog tadpoles were distinguished from green frog tadpoles in having round, well defined black dots on body and upper half of tail fin. Tadpoles were weighed for mass and measured for total length. (Water temp. 5°C .) TL ($83.4 \text{ mm} \pm 9.8$, 52-106, $n = 72$) and Mass ($7.4 \text{ g} \pm 2$, 2.2-12.3, $n = 72$). Fifteen of seventy-two tadpoles had hindlegs.

Rana clamitans melanota (Green Frog)

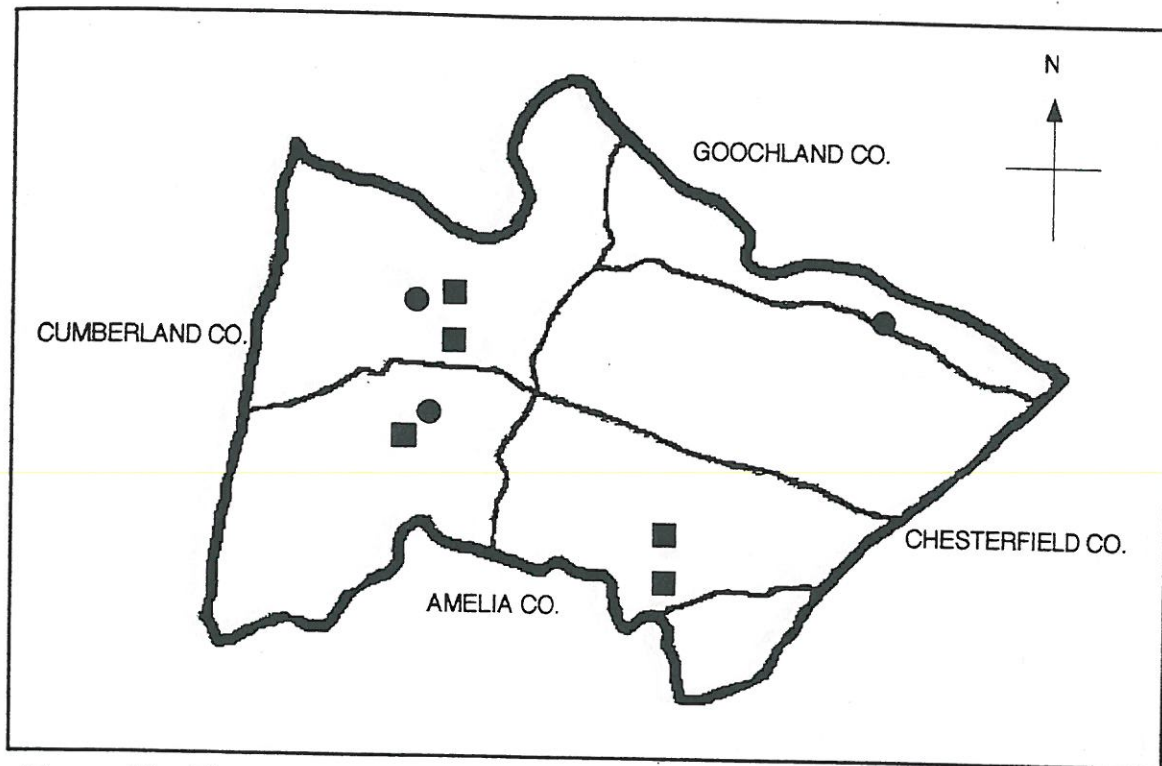


Figure 18. Distribution map of Rana clamitans melanota.

Green frogs were heard calling from 18 April 1999 until 28 June 1999 (Figure 18). Only one adult frog was caught for observation along the shore of the Lower lake PWMA. This male had the following measurements SVL = 74 mm and Mass = 28.2 g. On 4 February a green frog tadpole survey was conducted using a man made pond behind Pocahontas Elementary school. Tadpoles had the following measurements in TL ($66 \text{ mm} \pm 10.9$, 46-81, $n = 23$). Thirteen of 24 tadpoles had hindlimbs. Four tadpoles had pieces of the tail removed, possibly evidence of predation. One tadpole had a circular wound on the side of its body.

Rana palustris (Pickerel Frog)

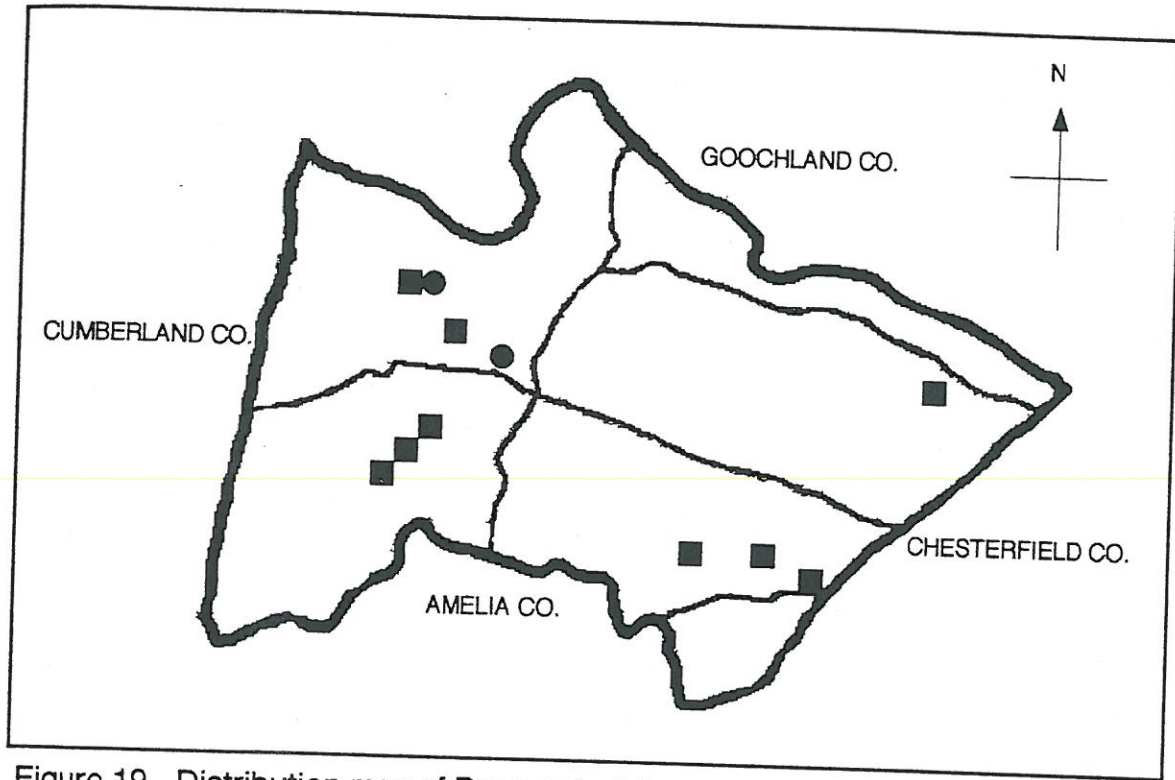


Figure 19. Distribution map of *Rana palustris*.

The first observation of a pickerel frog was on 9 February 1999, in a small pond on the west side of the Lower lake in PWMA. Other adult frogs were caught on 1 March 1999, on edge of beaver pond adjacent to Salle Creek and Lower lake PWMA, 4 March 1999, on a dam forming on the west side of the Lower lake on PWMA, 22 March 1999, on the edge of a beaver pond adjacent to Salle Creek and the Lower lake on PWMA, 1 April 1999, crossing a road which goes to Sunfish Pond, PWMA, and 27 September 1999, in a grass field near the pond behind Pocahontas Middle school (Figure 19).

Measurements: SVL average ($48 \text{ mm} \pm 6.1$, 42-61, $n=6$) Mass average ($12.7 \text{ g} \pm 8.3$, 6-29, $n=5$) average number of spots (10.5 ± 2 , 10-16, $n=4$). See table 9 for individual frog measurements.

Date Found	SVL (mm)	Mass (g)	# of Dorsal Spots
2/9/99	48		
3/1/99	46	10	13
3/4/99	42	6	13
3/22/99	44	10.2	10
4/1/99	61	29	16
9/22/99	47	8.5	

Table 9. Rana palustris measurements.

Egg masses were found on 30 March 1999 in a swamp on the west side of an earthen dam forming the west side of the Lower lake, PWMA, in the water on the west side of the Lower lake, and in a swamp formed by Salle creek PWMA, 31 March 1999 in a beaver pond that feeds into Bullhead pond PWMA, 9 April 1999 a hatched egg mass was found in Bass pond on PWMA, and 19 April 1999 in a man-made pond behind Pocahontas Elementary school. Only two breeding events were observed during this spring collection.

Measurements: depth of egg mass (8.94 cm \pm , 0-26, n=10) number of eggs (1877 eggs with a mass of 105 g, 1331 eggs with a mass of 57 g, and 2041 eggs with a mass of 79 g.) substrate attachment (underwater plant stems 3 masses, Nuphar luteum (spadderdock) 2 masses, submerged sticks 3 masses) average length of time for the egg mass hatching (10 days n=3) percent hatching(2 egg masses had a 100% hatching and 2 egg masses had 9 undeveloped eggs; the rest of the egg masses could not be found)

Family MICROHYLIDAE

Gastrophryne carolinensis (Eastern Narrowmouth Toad)

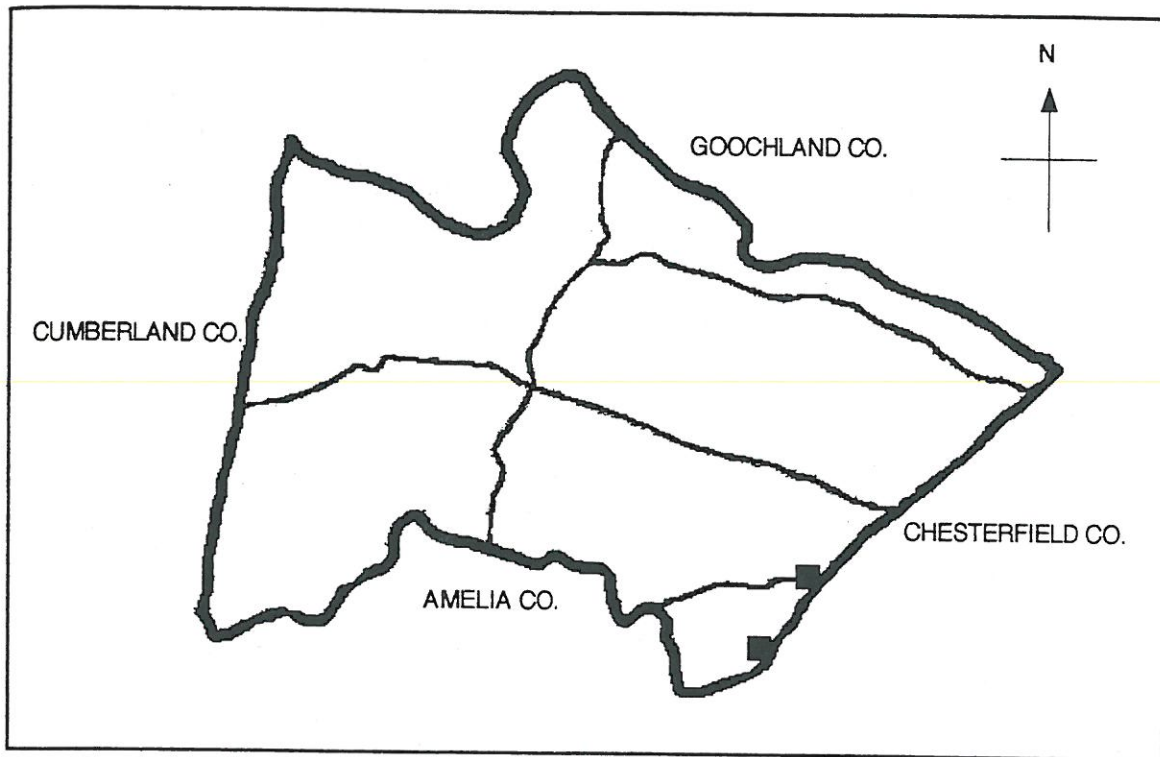


Figure 20. Distribution map of Gastrophryne carolinensis.

Two small breeding choruses of this frog were found on 7 July 1999 after a large thunderstorm came through the area with downpours and 60 MPH winds (Figure 20). After the storm, road cruising led to the discovery of the choruses. One chorus, found in a swamp at the end of Clayville Road near Skinquarter Creek, was composed of about 9 frogs. A voucher recording was made due to the fact that this may be a county record. The time was 1915 hours and the temperature was 26.7°C (80°F). Another chorus was found at 2030 hours on Genito Road, 1.3 km (.8 miles) east of the intersection of Dorsett Road and Genito Road. Only one individual was calling and again a recording was made.

The Clayville site was visited again on 12 July 1999 after another rain storm. At

1900 hours, the air temperature was 20°C (68°F) and water temperature was 21°C (70°F). Eight males were heard calling and capture of an animal was unsuccessful. The Clayville site was again visited on another rainy day. At 1845 hours, a large chorus of frogs was calling but again capture of one was unsuccessful.

Class REPTILIA

Order TESTUDINES

Family CHELYDRIDAE

Chelydra serpentina serpentina (Snapping Turtle)

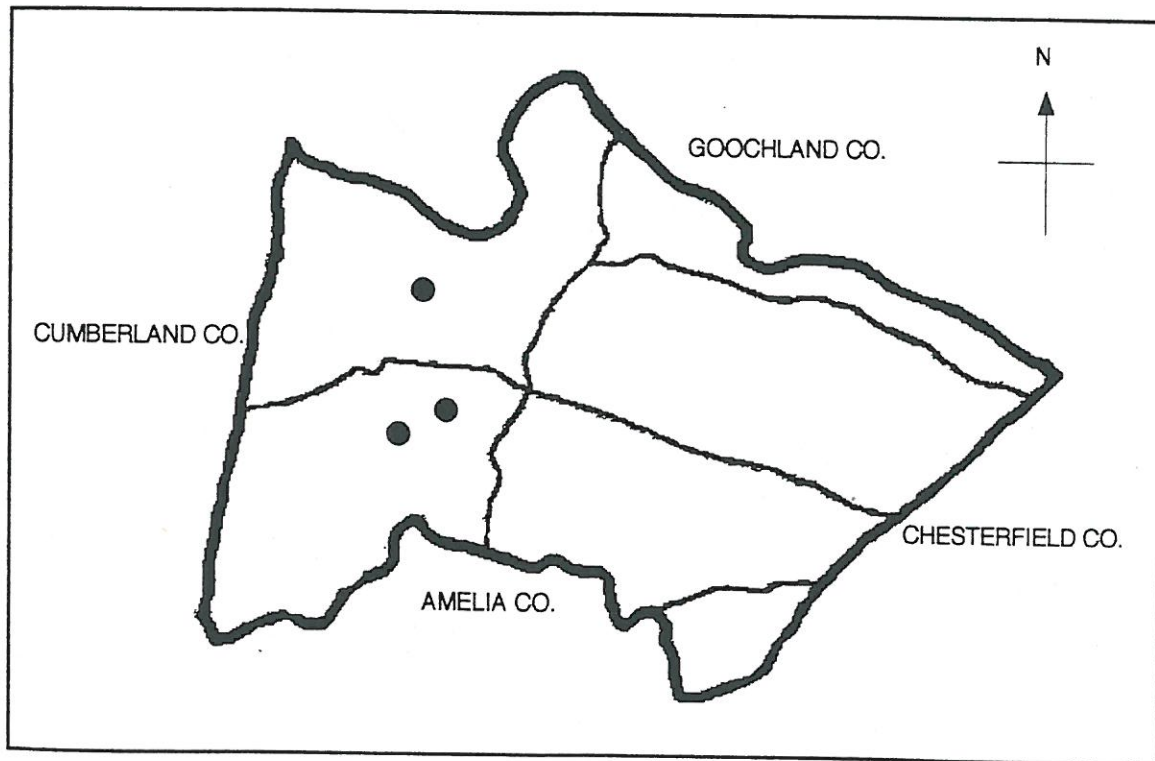


Figure 21. Distribution map of Chelydra serpentina serpentina.

Snapping turtles were found on 12 May 1999, 15 May 1999, and 13 June 1999. Two large shells were found in wetland areas and no DOR specimens were seen. On 12 May 1999, a turtle was found in a swamp on the west side of the earthen dam that forms the west side of the Lower Lake on PWMA. This turtle had a carapace length of

234 mm and a plastron length of 177 mm. The turtle found on 15 May 1999 was captured with a dip net in a beaver pond created by Salmon creek on PWMA land. This turtle had a carapace length of 366 mm. The plastron length was not obtained due to the disposition of the animal. A large leech was seen crawling on the carapace. On 13 June 1999 a dead snapping turtle was found on the south shore of Bass pond PWMA (Figure 21). The plastron was damaged but the carapace was 312 mm in length.

Family EMYDIDAE

Chrysemys picta picta (Painted Turtle)

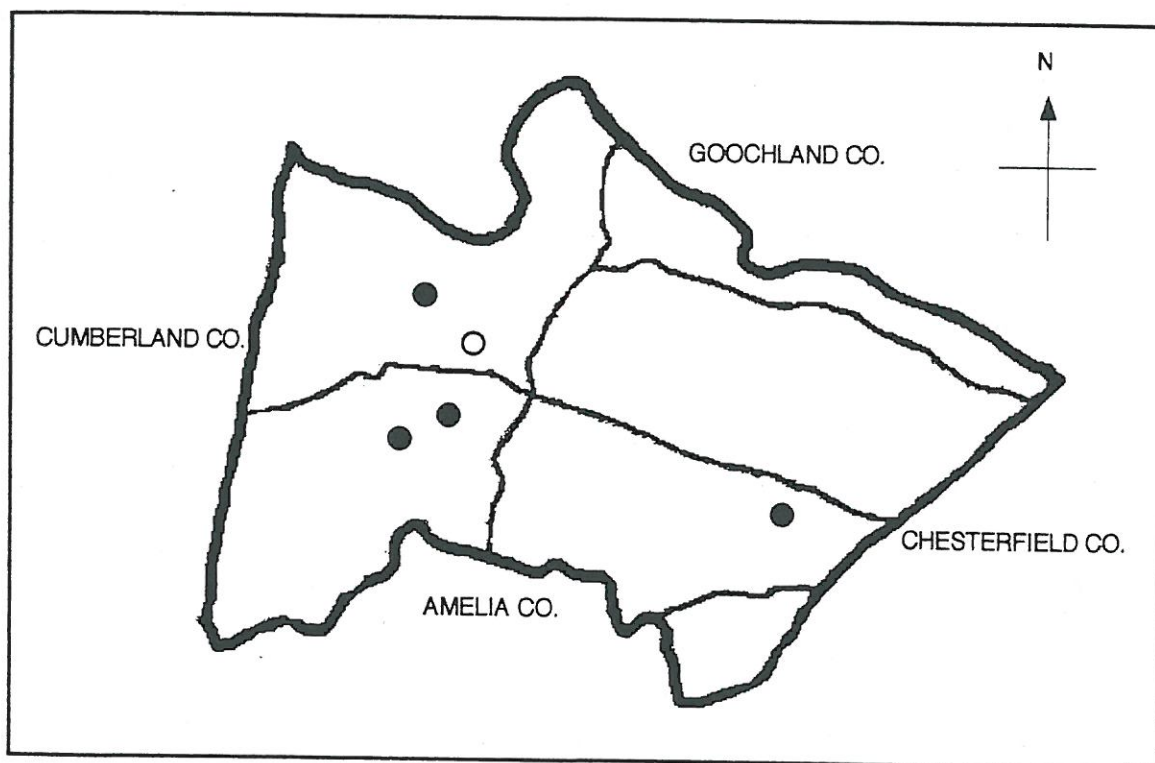


Figure 22. Distribution map of Chrysemys picta picta.

A painted turtle was first seen in the water digging in mud on 16 February 1999. (Water temp. 4°C) This turtle was found in a pool created by a beaver dam blocking Salle creek near the Lower lake PWMA. Other turtles were found on 31 March 1999

(shore of Bass pond PWMA, 9 April 1999 (swimming in Bass pond), 10 April 1999 (crossing New Dorsett Road where this road crosses Swift creek), 11 May 1999 (Bass pond), 15 May 1999 (2 turtles found in a beaver pond created in Salmon creek PWMA), 23 May 1999 (on a road on the east side of Bullhead pond PWMA), and 24 May 1999 (DOR on Bell road where it crosses Steggers creek) (Figure 22).

Both male and female turtles were found. Three females were found to have the following measurements: Carapace length (117 mm \pm 27.7, 78-139, n = 3), Plastron length (69-124, average = 96.5 mm, n = 2), Mass (73-350 g, average = 211.5 g, n = 2), and foreclaw length (5-5, average 5 mm, n = 2). Three males were found to have the following measurements: Carapace length (117 mm \pm 24.1, 93-150, n = 3), Plastron length (109.7 mm \pm 23.6, 84-141, n = 3), Mass (290 g \pm 119.5, 171-410 n = 2), and foreclaw length (10.3 mm \pm .9, 9-11, n = 3). See table 10 for individual measurements.

Date Found	Sex	Carapace Length (mm)	Plastron Length (mm)	Mass (g)	Nail Length (mm)
2/16/99	M	93	84		11
4/9/99	F	78	69	73	5
5/11/99	F	134	124	350	5
5/15/99	M	108	104	171	11
5/15/99	M	150	141	410	9
5/23/99	F	139	Laying eggs		

Table 10. *Chrysemys picta picta* measurements.

Nest digging was observed on 23 May 1999. A road median was chosen as a nest site. Upon return to the nest site, the female was gone and no eggs were deposited.

One leech was found attached to one animal.

Clemmys guttata (Spotted Turtle)

The spotted turtle has been recorded for Powhatan county (Don Merkle personal comm.) but was not found during this survey.

Pseudemys concinna (River Cooter)

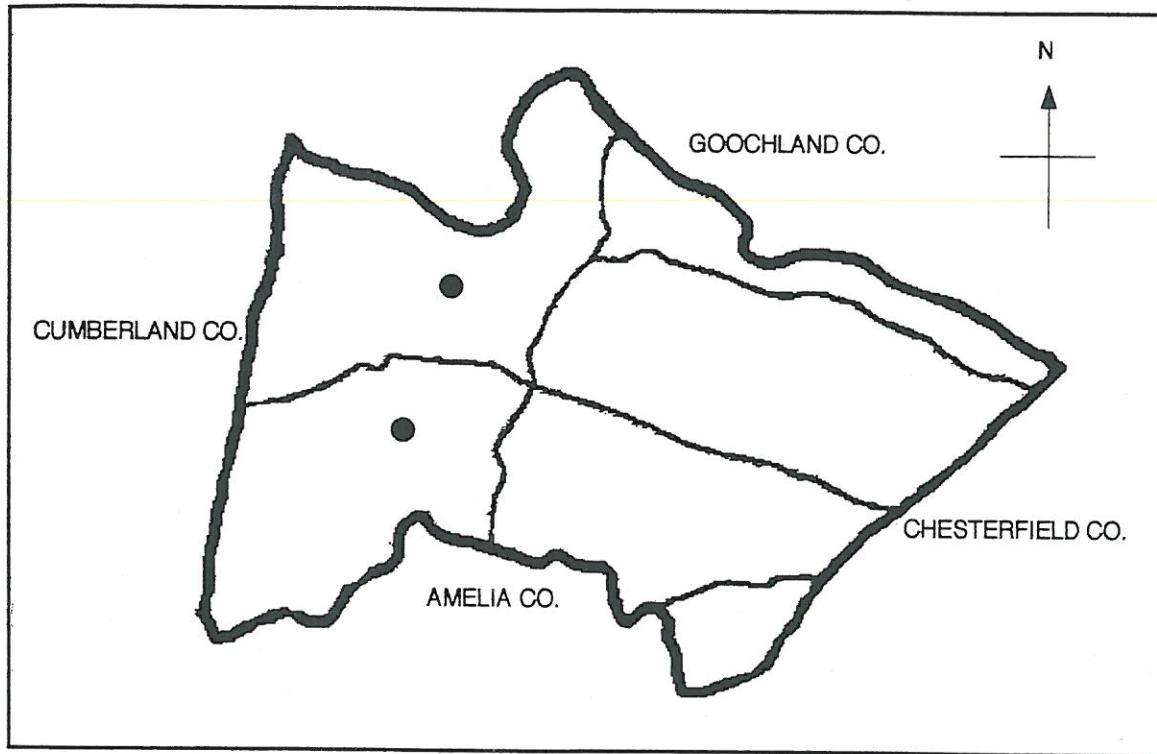


Figure 23. Distribution map of Pseudemys concinna.

River cooters were found only in man made ponds and beaver ponds. One river cooter was found on 13 January 1999 (Bass pond PWMA) near the shore. Ice was still covering the many parts of the pond. This animal was sick; it had a large swelling coming out of the cloacal area. This same animal was tracked in the pond until its death. On 22 January 1999, a leech was found attached to its skin. On 23 January 1999, seven river cooter shells were found on the north shore of Lower lake PWMA. Six of these shells were found in a 10' x 10' area. Two males and one female were found together at the edge of a beaver pond created in Salle creek PWMA on 1

April 1999. A juvenile was dipnetted in Bass pond PWMA on 11 May 1999. Another shell was found on the north shore of the Lower lake PWMA on 26 May 1999 (Figure 23).

Three males were differentiated from females by having longer foreclaws. The males had the following measurements: Carapace length ($257 \text{ mm} \pm 31.6$, 214-289, $n = 3$), and Plastron length ($208 \text{ mm} \pm 10.1$, 194-216, $n = 3$). The one female collected had a carapace length of 313 mm and a plastron length of 287 mm. The five shells collected on shore had the following measurements: Carapace length ($258 \text{ mm} \pm 24$, 215-284, $n = 5$), and Plastron length ($219.8 \text{ mm} \pm 23.4$, 180-254, $n = 5$). The juvenile had a carapace length of 47 mm, plastron length 42 mm, and a mass of 18.5 g. See data table 11 for summary of individual measurements.

Date Found	Carapace Length (mm)	Plastron Length (mm)	Sex	Capture Status
1/13/99	268	216	M	Alive
1/23/99	270	225		Shell
1/23/99	215	180		Shell
1/23/99	251	219		Shell
1/23/99	271	221		Shell
4/1/99	289	225	M	Alive
4/1/99	214	194	M	Alive
4/1/99	313	287	F	Alive
5/26/99	284	254		Shell

Table 11. Pseudemys concinna measurements.

Terrapene carolina carolina (Eastern Box Turtle)

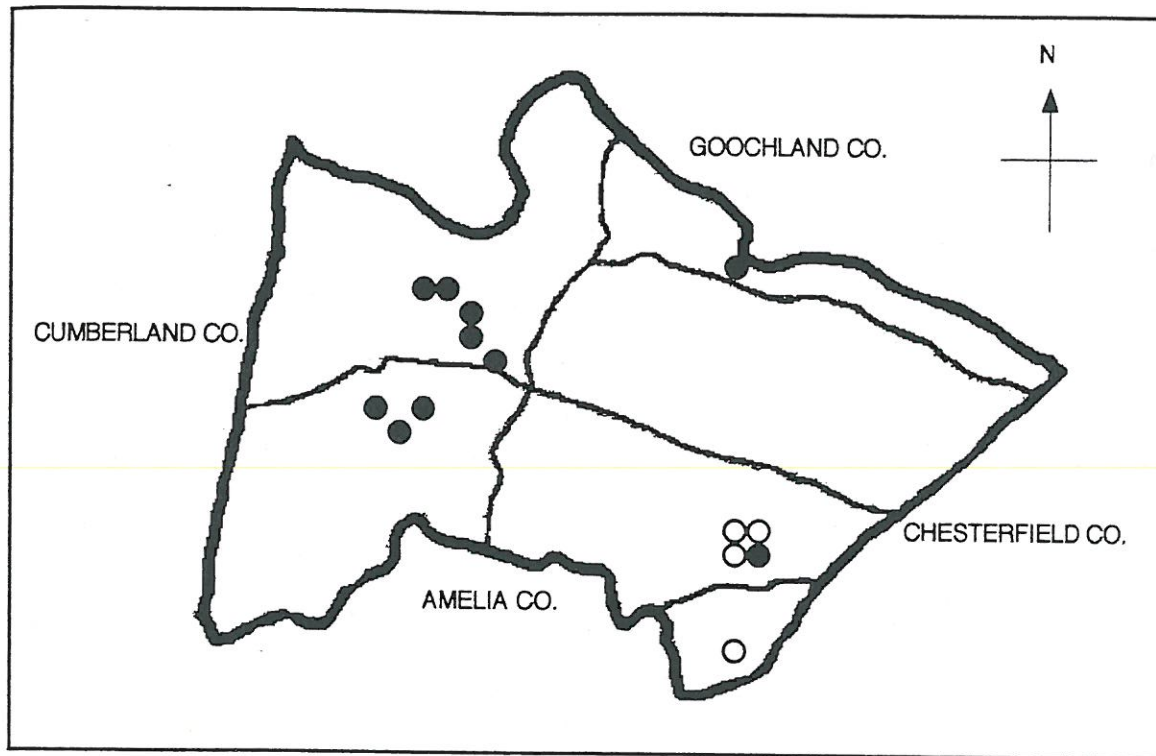


Figure 24. Distribution map of Terrapene carolina carolina.

The box turtle is widely distributed throughout Powhatan. Turtles were found on the following dates and in the following locations: 22 May 1999 (DOR on Avatar drive .1km (.1 miles) from the intersection of Corso drive and Avatar drive), 23 May 1999 (in a field beside Bullhead pond PWMA), 23 May 1999 (crossing road on Bell Road at the intersection of Bell Road and Steggers Creek), 23 May 1999 (on Bell Road .3 Km (.2 miles) north of Steggers creek bridge), 23 May 1999 (wooded forest on South side of Lower lake PWMA), 10 June 1999 (bus lane of Pocahontas Middle school), 27 June 1999 (on Bell road .65 km (.4 miles) west of intersection of Bell road and Powhatan Lakes Road), 28 June 1999 (on road leading to Sunfish pond PWMA), 29 June 1999 (on Ridge road .1 km (.1 miles) south of the intersection of Route 60 and Ridge road), 3 July 1999 (DOR at the intersection of Moyer road and Schroeder road), 29 August 1999 (DOR on Pilkington Road .1 km (.1 miles) west of interesection of Petersburg

Road and Pilkington Road), 20 September 1999 (DOR on Schroeder Road .1 Km (.1 mile) west of intersection of Loche Gate Lane and Schroeder Road), 21 September 1999 (in neighbors yard, on Avatar Drive .1 Km (.1 miles) east of intersection of Avatar Drive and Skipper Creek, collector Chris Chewning).

Three shells were found at the following locations: hardwood forest beside Pocahontas Elementary school, edge of north shore of the Lower lake PWMA, and a grassy lot on the right side of Caesarton Road and Route 711 (Figure 24).

Males had the following measurements: Carapace length (119 mm \pm 7, 110-129, n = 6), plastron length (103 mm \pm 4, 98-109, n = 6), and Mass (325 g \pm 23.2, 300-355, n = 4). Females had the following measurements: Carapace length (110 mm \pm 21, 70-131, n = 6), Plastron length (98.8 mm \pm 21, 67-122, n = 5), and Mass (282 g \pm 148, 55-440, n = 5). See table 12 for individual measurements.

Date Found	Carapace Length (mm)	Plastron Length (mm)	Mass (g)	Sex	Capture Status
5/23/99	121	107	340	M	Alive
5/23/99	120	103	300	M	Alive
5/23/99	70	67	55	F	Alive
5/23/99	129	101	355	M	Alive
5/23/99	110	98	305	M	Alive
5/26/99	126	109		M	Dead
6/10/99	131	121	440	F	Alive
6/16/99	111	99		M	Dead
6/27/99	98	84	170	F	Alive
6/28/99	127			F	Laying eggs
6/29/99	115	100	325	F	Alive
9/21/99	121	122	420	F	Alive

Table 12. Terrapene carolina carolina measurements.

Two shells were found that could not be sexed and had carapace length measurements of 114 mm and 120 mm. All live males had red irises, and all females had brown irises.

On 28 June 1999, one female was observed digging a nest in the middle of a dirt road. This event occurred at 2100 hours with a 26.7°C (80°F) air temperature and precipitation within the past 24 hours. The following day the nest was checked but no eggs were there. The nest was 4.5 cm deep and 7 cm wide.

Four turtles were found DOR. Vehicles probably have a significant impact on population numbers. One turtle was found killed by a bushhogging tractor. Many fields in Powhatan are maintained in this way suggesting that this may significantly impact turtle populations.

Family KINOSTERNIDAE

Kinosternon subrubrum subrubrum (Common Mud Turtle)

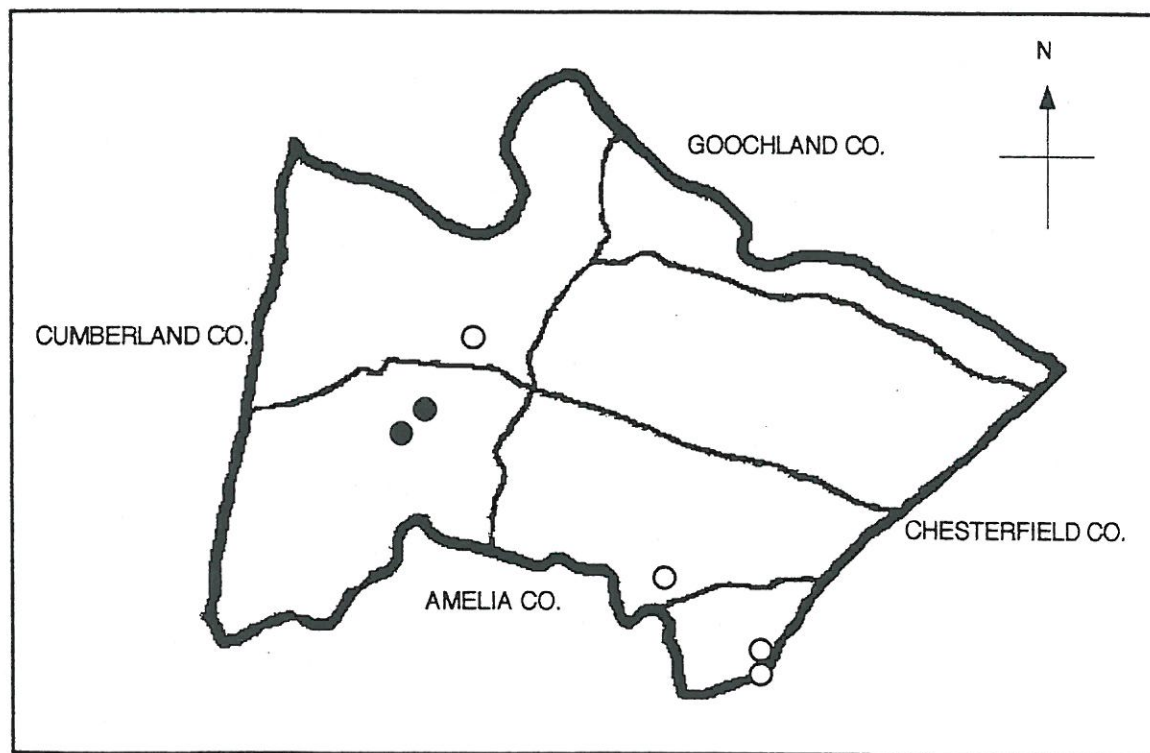


Figure 25. Distribution map of Kinosternon subrubrum subrubrum.

The common mud turtle was distinguished from the common musk turtle by having two plastral hinges and triangular pectoral scutes. This turtle species was

found in man-made ponds and beaver ponds. Four turtles were found DOR. Turtles were found on 9 April 1999 (Two animals found in Bullhead pond PWMA), 18 April 1999 (one animal found in the beaver pond which flows into Bullhead pond PWMA), 13 June 1999 (DOR found on Bell Road on the north side of the bridge that crosses Steggers creek), 9 July 1999 (DOR found on Clayville Road .3 km (.2 miles) north of the bridge that crosses Skinquarter creek), 6 August 1999 (DOR found on Rocky Ford Road on north side of bridge that crosses Rocky Ford creek), and 29 August 1999 (DOR found on Clayville Road at the intersection of Clayville Road and Skinquarter Creek) (Figure 25).

The DOR animals were so badly damaged that measurements could not be taken. The live animals had the following measurements: Carapace length ($99.7 \text{ mm} \pm 2.6$, 96-102, $n = 3$), Plastron length (all animals had 83 mm plastron, $n = 3$), and Mass ($174 \text{ g} \pm 6.7$, 165-180, $n = 3$). See data table 13 for individual animal measurements.

Date Found	Carapace Length (mm)	Plastron Length (mm)	Mass (g)
4/9/99	102	83	180
4/9/99	96	83	178
4/18/99	101	83	165

Table 13. Kinosternon subrubrum subrubrum measurements.

One mud turtle found on 18 April 1999 had a leech attached to its plastral skin. This same animal's carapace seemed to be indented on one side. This injury appeared to have healed and the animal seemed healthy. The carapaces of all the mud turtles collected had a coat of detritus, algae, and mud.

Sternotherus odoratus (Common Musk Turtle)

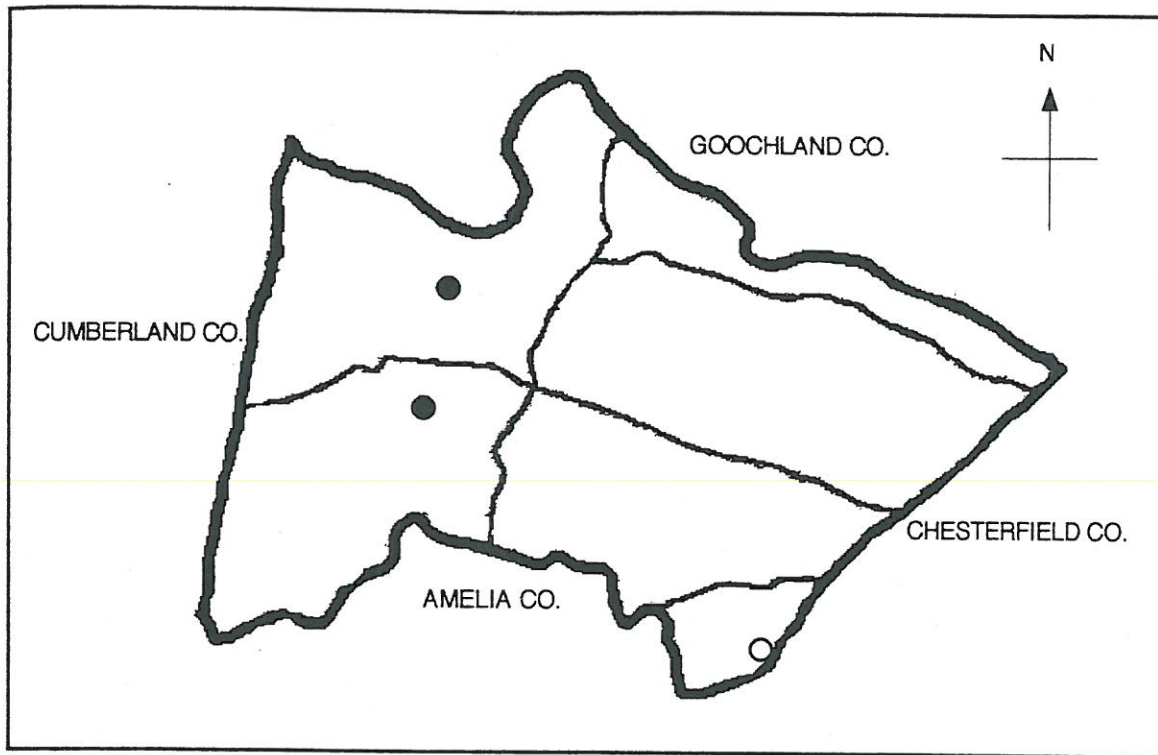


Figure 26. Distribution map of Sternotherus odoratus.

The common musk turtle was distinguished from the common mud turtle by having one plastral hinge and a squarish pectoral scute. Only one DOR turtle was found. Animals were found in the following locations and on the following dates: 25 January 1999 (this animal was dipnetted in thick detritus along the southern shore of the Lower lake PWMA), 11 February 1999 (this was an active turtle found in a small pond on the western side of the Lower lake PWMA), 9 April 1999 (Bullhead pond PWMA), 12 May 1999 (two animals found, one in a beaver pond beside Salle creek and one in a swamp beside Salle creek PWMA), 24 May 1999 (dipnetted along southern shore of the Lower lake PWMA), 26 May 1999 (a shell was found on top of a beaver lodge on the northern shore of the Lower lake PWMA), 11 July 1999 (shell found on top of beaver lodge on the northern shore of Lower lake PWMA), and 17 July 1999 (DOR on Clayville Road, .5 km (.3 miles) north of the bridge that crosses

Skinquarter Creek). See Figure 26.

The following measurements were collected from these animals: Carapace length ($84.8 \text{ mm} \pm 12.4$, 62-97, $n = 8$), Plastron length ($61.8 \text{ mm} \pm 11$, 46-83, $n = 9$), and Mass ($108 \text{ g} \pm 43.2$, 43-160, $n = 4$). See data table 14 for individual measurements.

Date Found	Carapace Length (mm)	Plastron Length (mm)	Mass (g)	Status
1/25/99	62	46		alive
2/11/99	94	71		alive
4/9/99	96	83	160	alive
5/12/99	97	67	130	alive
5/12/99	90	64	100	alive
5/24/99	67	50	43	alive
5/26/99	85	58		shell
7/11/99	87	61		shell
7/17/99		56		DOR

Table 14. Sternotherus odoratus measurements.

Order SQUAMATA

Suborder LACERTILIA

Family ANGUIDAE

Ophisaurus attenuatus (Slender Glass Lizard)

No slender glass lizards were found during this study. This is a species that has been recorded for the county (Wright, 1996).

Family IGUANIDAE

Sceloporus undulatus hyacinthinus (Fence Lizard)

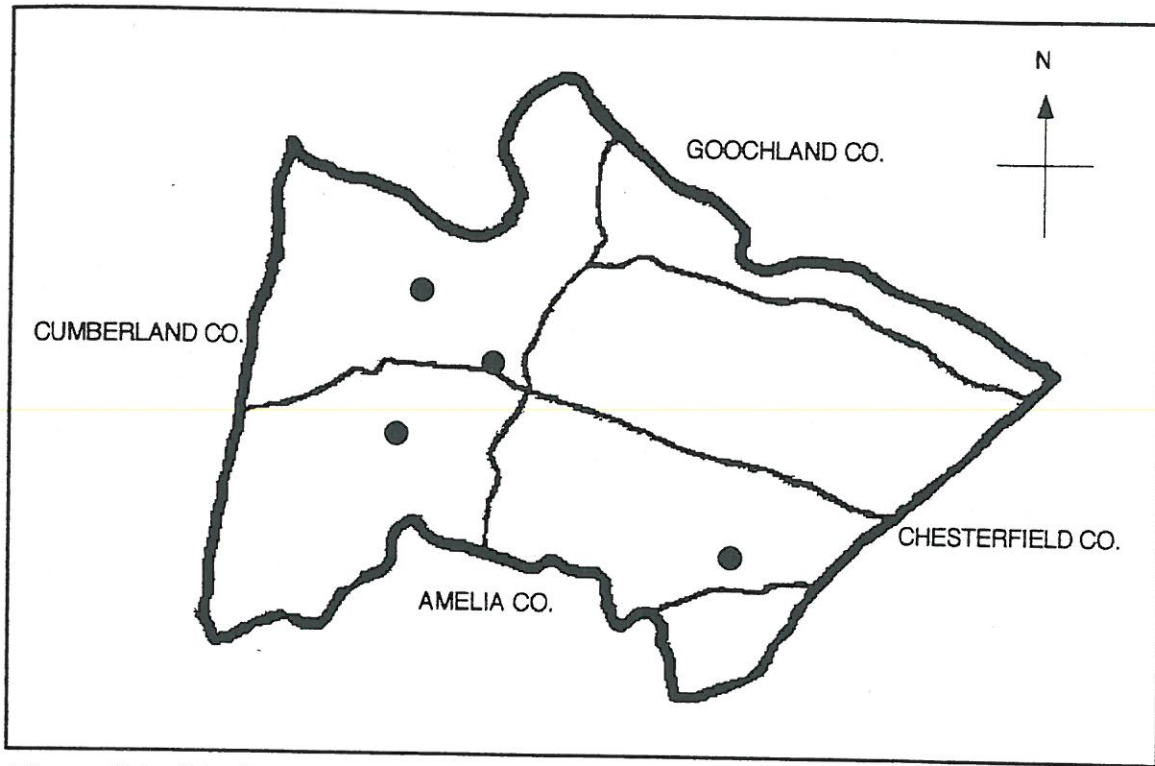


Figure 27. Distribution map of Sceloporus undulatus hyacinthinus.

Fence lizards were found on the following dates in the following locations: 15 May 1998 (on a rotten log eating ants at 1301 Avatar Drive), 5 May 1999 (on a short leaf pine tree behind Pocahontas Elementary School), 28 May 1999 (behind Pocahontas Middle School), and 27 September 1999 (behind Pocahontas Middle School.) See Figure 27. Measurements of captured animals can be seen in data table 15 .

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)	Sex
5/5/99	74	154	80	11	M
5/28/99	69	163	94	11	F
9/27/99	51	153	102	9	M

Data Table 15. Sceloporus undulatus hyacinthinus measurements.

Family SCINCIDAE

Eumeces inexpectatus (Southeastern Five-lined Skink)

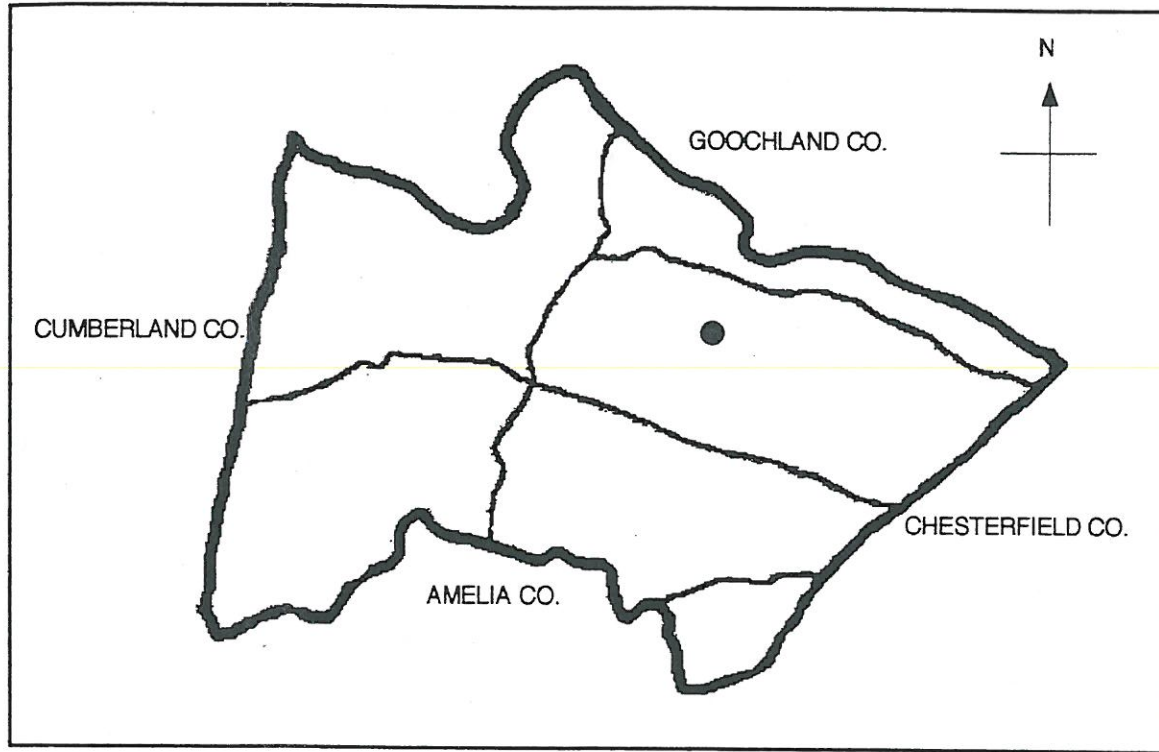


Figure 28. Distribution map of Eumeces inexpectatus.

Eumeces inexpectatus was distinguished from Eumeces fasciatus by inspecting the ventral side of the tail to see if the scales were equal in size or if a row of enlarged scales was present. One animal was found in a residential setting on Lee's Landing road on 10 May 1999 (Figure 28). This animal had 5 yellow dorsal stripes, a blue tail and had the following measurements: SVL = 38 mm, TL = 98 mm, Tail length = 60 mm, and mass 2 g.

Eumeces fasciatus (Five-lined Skink)

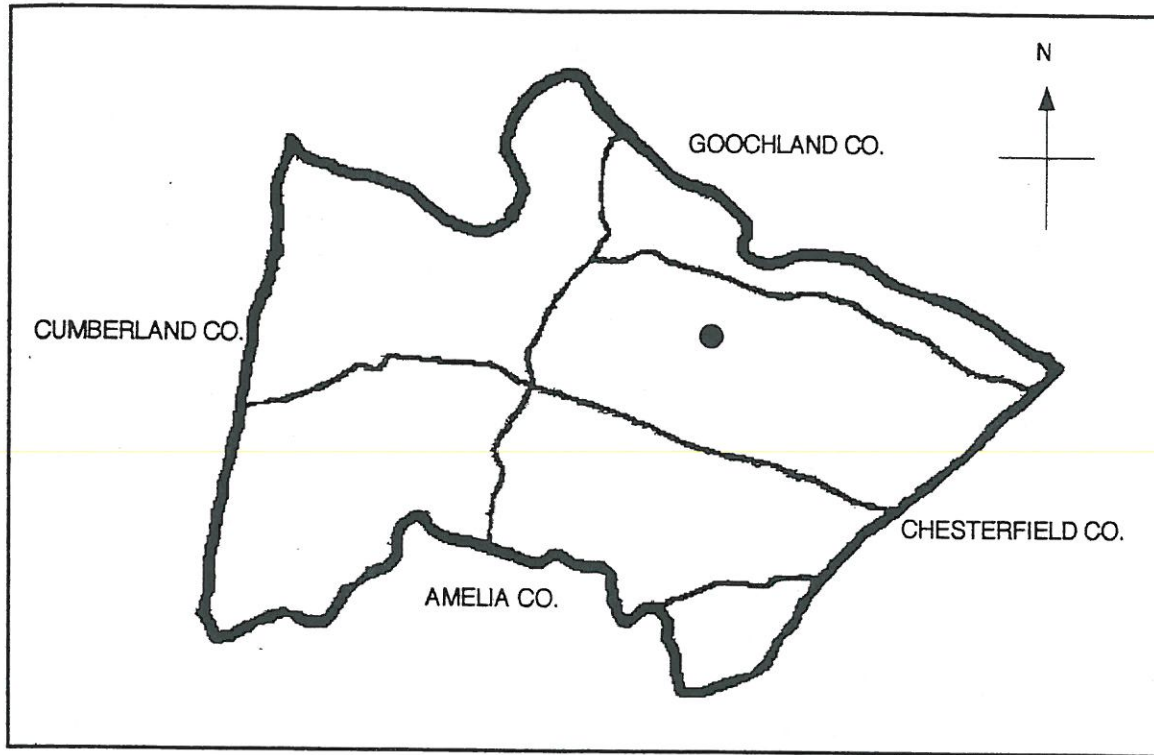


Figure 29. Distribution map of Eumeces fasciatus.

Eumeces fasciatus is distinguished from Eumeces laticeps by having 4 labial scales and 2 post labial scales. One animal was found by Tom Hofelich on 10 May 1999 on a house on Lee's Landing road (Figure 29). This animal had the following measurements: SVL = 69 mm, TL = 165 mm, Tail length = 96 mm, and Mass = 9 g. A second animal was found in the same location as the above lizard on 12 August 1999. This animal had the following measurements: SVL = 60 mm, TL = 157 mm, Tail length = 97 mm, and Mass = 6 g. Many other Eumeces sp. were seen but I was unable to capture them.

Scincella lateralis (Ground Skink)

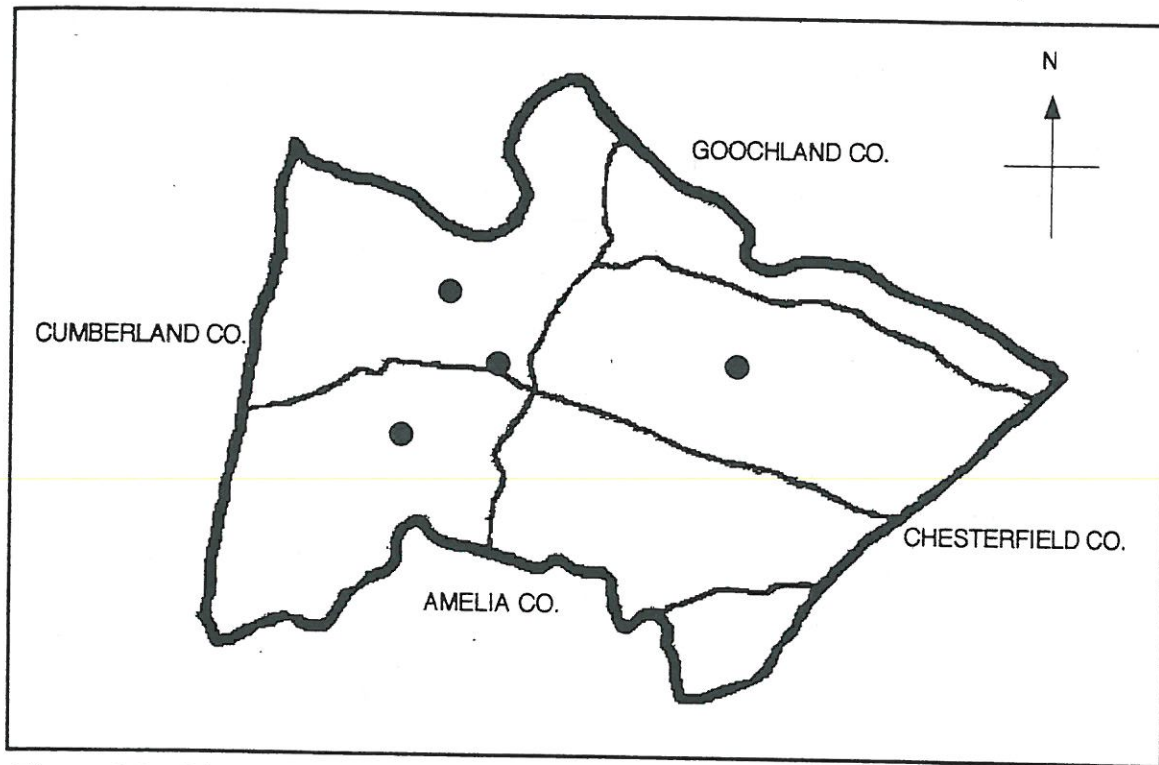


Figure 30. Distribution map of Scincella lateralis.

The ground skink is easy to hear but very hard to capture. This animal was found on the following dates and in the following locations: 20 April 1999 (hardwood forest behind Pocahontas Middle school), 10 May 1999 (hardwood forest on Lee's Landing Road), 16 May 1999 (hardwood forest on north side of the Upper lake PWMA), 23 May (woods surrounding Bullhead pond PWMA), and 12 August 1999 (hardwood forest on Lee's Landing Road) (Figure 30).

The animals captured had the following measurements: SVL ($43.3 \text{ mm} \pm 2.4$, 39-46, $n = 6$), TL ($76 \text{ mm} \pm 7$, 68-85, $n = 6$), Tail length ($32 \text{ mm} \pm 7.9$, 24-43, $n = 6$), and Mass ($1.7 \text{ g} \pm .7$, .75-2.5, $n = 6$). See table 16 for individual measurements.

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)
4/20/99	39	68	24	.75
5/10/99	43	81	38	1.5
5/16/99	45	83	38	2.5
5/16/99	46	71	25	2.5
5/23/99	42	85	43	2
8/12/99	45	69	24	1

Table 16. Scincella lateralis measurements.

Suborder SERPENTES

Family COLUBRIDAE

Carphophis amoenus amoenus (Worm Snake)

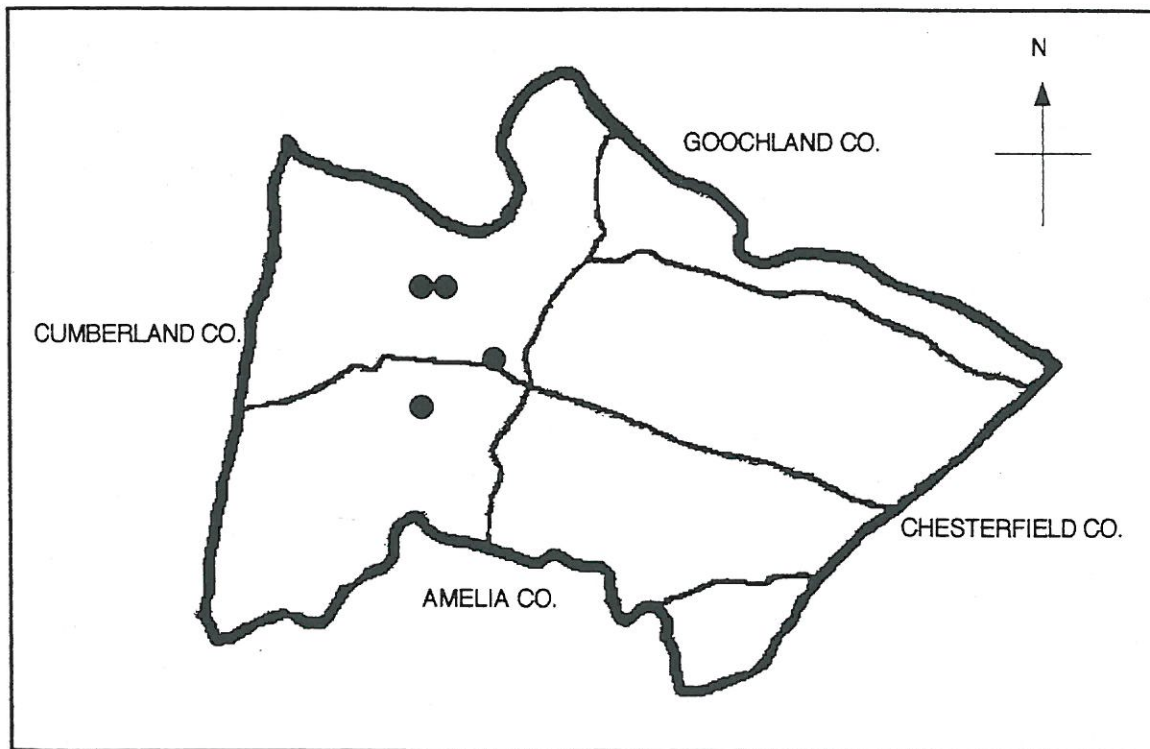


Figure 31. Distribution map of Carphophis amoenus amoenus.

Worm snakes were collected in logs, under rotten logs, and under large sheets of styrofoam. Most of the snakes collected wiggled constantly to escape, but one

animal wiggled, musked, and used the spike on its tail to try to escape. The first snake found this year was on 20 April 1999 and the last was on 21 September 1999. No DOR specimens were collected. One worm snake was collected from a dog, which may have caused the snake's death.

Individuals were found in the woods surrounding the Upper and Lower lakes on PWMA, in the woods near the Pocahontas Middle School campus, and in the woods surrounding a vernal pool on the right side of the CCC trail on PWMA land (Figure 31). Measurements: SVL ($194.8 \text{ mm} \pm 39$, 145-269, $n = 6$), TL ($238.7 \text{ mm} \pm 40.2$, 175-310, $n = 6$), Tail length ($43.8 \text{ mm} \pm 8$, 30-52, $n = 6$), and Mass ($6.1 \text{ g} \pm 2.1$, 2.25-8.5, $n = 5$). See table 17 for individual measurements.

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)
4/20/99	145	175	30	2.25
4/28/99	174	226	52	8.5
4/29/99	196	246	50	7
5/17/99	211	250	39	6.5
5/16/99	174	225	51	6.2
9/21/99	269	310	41	

Table 17. Carphophis amoenus amoenus measurements

Cemophora coccinea copei (Northern Scarletsnake)

The northern scarletsnake has been recorded for Powhatan county but was not found during this survey (Mitchell and Reay, 1999).

Coluber constrictor constrictor (Black Racer)

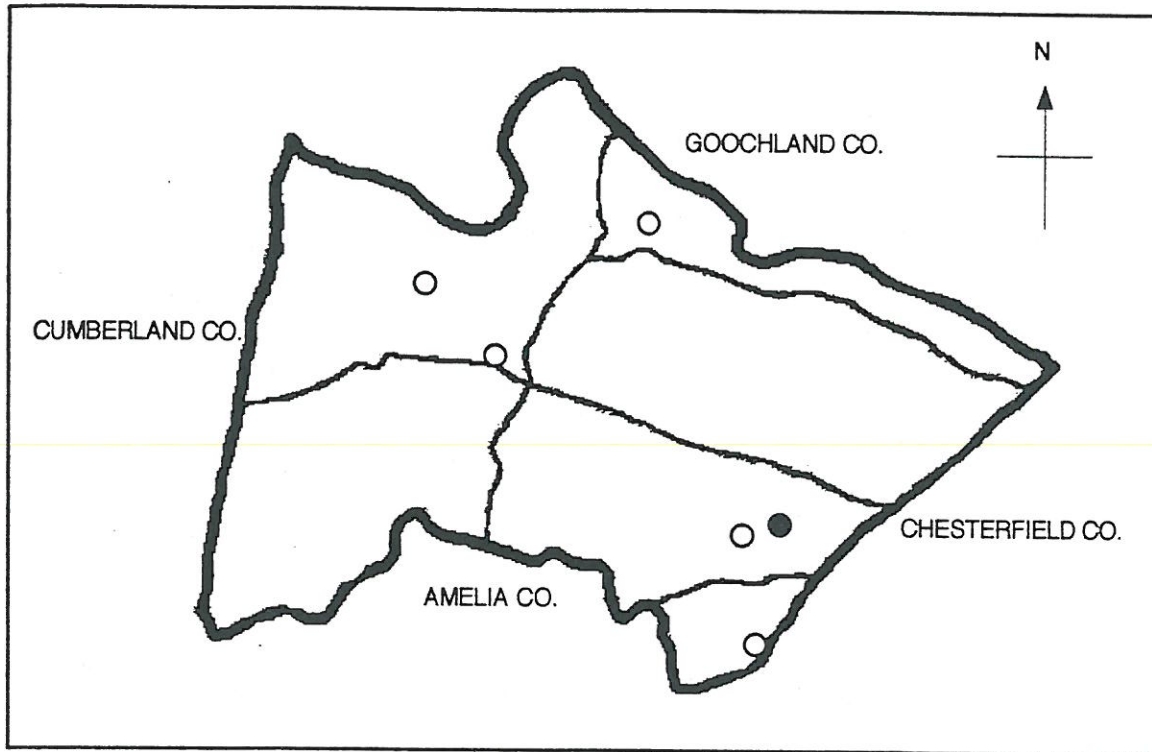


Figure 32. Distribution map of Coluber constrictor constrictor.

Only DOR black racers were found to measure. Live black racers eluded capture by hand. The first black racer found was on 27 June 1999. This animal was DOR on Route 60 in front of Pocahontas Middle School. The surrounding habitat is open field with a small patch of mature forest land. It had the following measurements: SVL = 966 mm, TL = 1271 mm and Tail length = 305 mm. Sex was not determined. Another black racer was found on this same day. This animal was found on Old River Trail, .5 km (.3 miles) east of the intersection of Old River Trail and Route 522.

The third DOR animal was found on 12 July 1999 on Clayville Road right at the end of Clayville road before crossing the bridge into Chesterfield county (Map 31). The surrounding habitat is swamp land with a nearby stagnant stream. This animal had the following measurements: SVL = 1065 mm, TL = 1409 mm, and Tail length = 344 mm. Upon dissection, it was found to be a male.

A fourth DOR snake was found on 12 September at the intersection of Walkers Ridge Road and Schroeder Road. It had the following measurements: SVL = 747 mm, TL = 992 mm, and Tail length = 251 mm.

Two juvenile snakes were found. One juvenile snake was found on 28 September 1999 in Jim Milcarek's yard at the end of Lock Gate Lane. This animal was killed by a weed eater. It had the following measurements: SVL = 270 mm, TL = 359 mm, and Tail length = 89 mm. Dissection discovered a lizard (Eumeces sp.) in the stomach of the snake. The second juvenile snake was found DOR on Howell Road by Steven Dingus. This snake had the following measurements: SVL = 213 mm, TL = 325 mm, and Tail length = 112 mm.

Diadophis punctatus (Ringneck Snake)

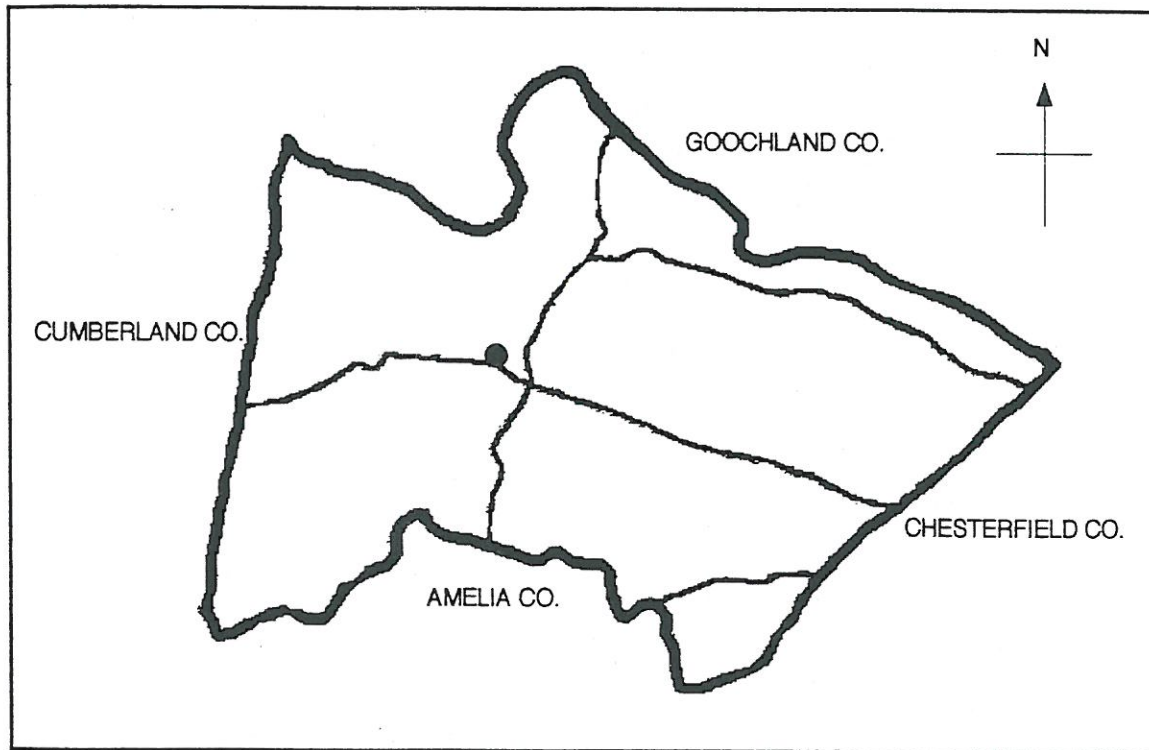


Figure 33. Distribution map of Diadophis punctatus.

Powhatan lies in a zone where Diadophis punctatus edwardsii and Diadophis

punctatus punctatus intergrade. In this intergrade zone, snakes can contain characteristics of both subspecies. Two ringneck snakes were found on 19 May, 1997 in a mature hardwood forest behind Pocahontas Middle school (Figure 33).

One snake had a complete yellow band on its neck and a plain orange/yellow belly. This snake had a SVL of 200 mm and a TL of 260 mm. The second snake had a complete yellow band on its neck but a orange/yellow belly with half moon patterns running along the center of the belly. This snake had a SVL of 220 mm and a TL of 260 mm. The snakes were found under cover objects, one under plyboard and the other under a log.

Another snake was found in the same location as above on 20 May, 1997. This snake had a complete yellow band on its neck with a plain orange/yellow belly. No ringneck snakes were found in 1999 despite searches in appropriate habitat.

Elaphe guttata (Corn Snake)

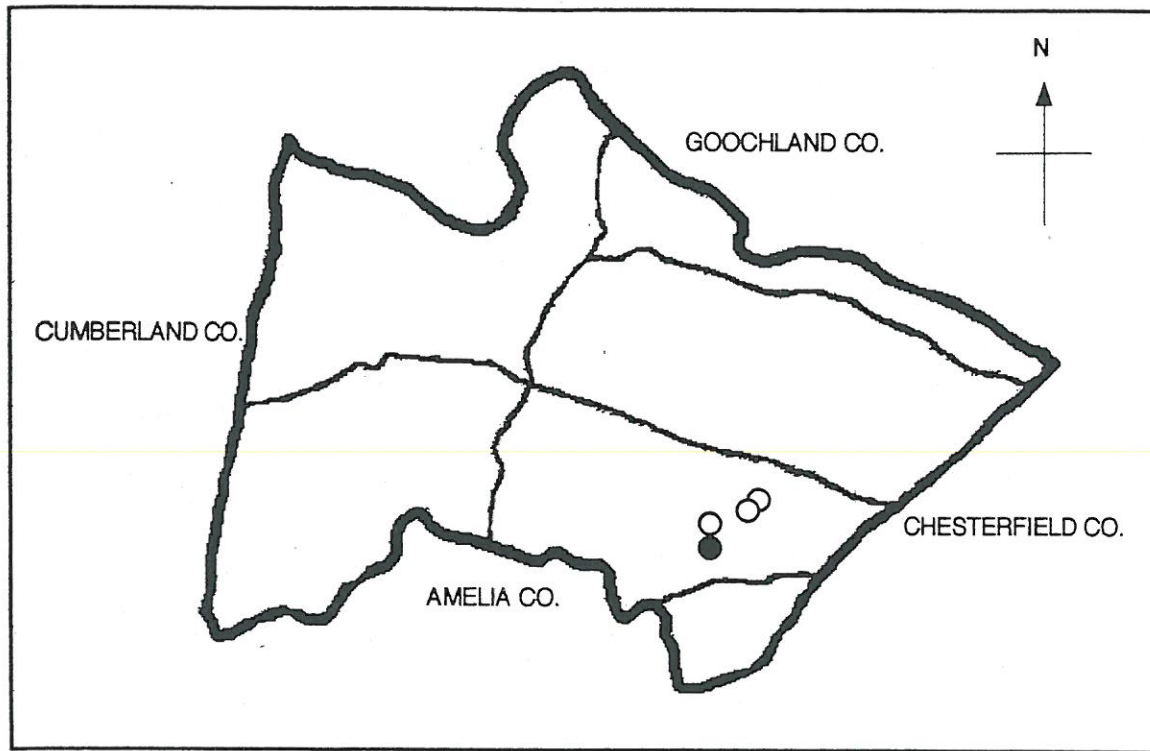


Figure 34. Distribution map of Elaphe guttata.

Corn snakes seem to be isolated to the eastern part of Powhatan County. The only animals I collected were in the southeast corner. Mike Clifford (personal comm.) indicates that in Amelia County, corn snakes are isolated to the northern part of that county. One live snake was brought in by a student (Lou Caudle) on 19 May 1998 from a grassy field off Schroeder Road (Rt. 610).

Three DOR snakes have been found for this study. The first DOR snake was found on 18 May 1999 on Avatar Drive also near an old field cutover with some surrounding wooded lots. The DOR specimen had the following measurements: SVL = 975 mm, TL = 1122 mm, Tail length = 147 mm, and mass = 340 g. Its sex was not determined (Figure 34).

The second DOR snake was found on 8 August 1999 on Dorsett Road, .3 km (.2 miles) north of the intersection of Dorsett Road and Schroeder Road. This specimen

had the following measurements: SVL = 470 mm, TL = 616 mm, and Tail length = 146 mm.

The third DOR snake was found on 25 August 1999 on Dorsett Road at the intersection of Dorsett Road and Schroeder Road. Measurements could not be taken.

Elaphe obsoleta obsoleta (Rat Snake)

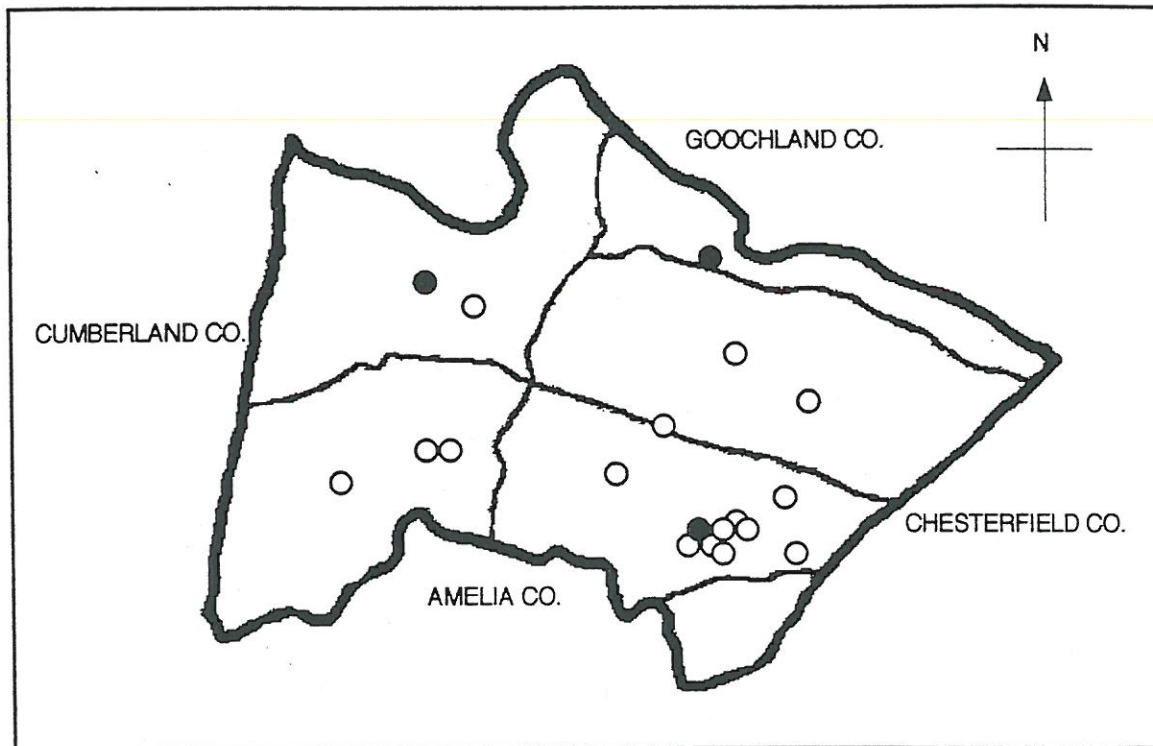


Figure 35. Distribution map of Elaphe obsoleta obsoleta.

The black rat snake was found in many locations throughout the county. The following is a listing of dates and locations: 10 April 1999 (DOR at the intersection of New Dorsett road and swift creek), 5 May 1999 (DOR on Red Lane road, .4 km (.25 miles) south of the intersection of Red Lane road and Three Bridge road), 15 May 1999 (hardwood forest at the north edge of Upper lake PWMA), 24 May 1999 (DOR on Route 60, 2.4 Km (1.5 miles) west of the intersection of Lower Hill road and Route 60), 25 May 1999 (DOR on Bell road, .5 km (.3 miles) north of the bridge that crosses

Steggers creek), 11 June 1999 (DOR on Corso Drive, .1 km (.1 miles) south of intersection of Corso drive and Schroeder road), 27 June 1999 (DOR on Judes Ferry road, .5 km (.3 miles) north of the intersection of Flint Hill road and Judes Ferry road), 28 June 1999 (DOR on Route 13, 2 km (1.3 miles) west of intersection of Jeter road and Route 13), 28 June 1999 (DOR on Route 13, 1 km (.1 miles) west of intersection of Route 13 and Jeter Road), 29 June 1999 (DOR on Avatar drive, .5 km (.3 miles) west of the intersection of Avatar drive and Corso drive), 19 July 1999 (DOR at the intersection of Dorsett road and Schroeder road), 8 August 1999 (DOR on Route 13, .1 km (.1 miles) west of the intersection of Route 13 and Fighting Creek road), 23 August 1999 (DOR at the intersection of Dorsett Road and Schroeder Road), 29 August 1999 (DOR on Dorsett Road, 1 km (.6 miles) south of the intersection of Mosley Road and Dorsett Road), 21 September 1999 (DOR on Red Lane Road, 1.4 km (.9 miles) southeast of intersection of Three Bridge Road and Red Lane Road), 25 September 1999 (1301 Avatar Drive), 28 September 1999 (DOR Lone Draw Road, James Goodman collector), 16 October 1999 (DOR on Corso Drive, .1km (.1 miles) west of the intersection of Corso Drive and Avatar Drive) (Figure 35).

Two sets of measurements are listed below. One set of measurements is for males that were positively identified. The second set of measurements is for other snakes that could not be positively sexed. Male measurements: SVL ($962.8 \text{ mm} \pm 290$, 560-1284, $n = 5$), TL ($1180.6 \text{ mm} \pm 331.7$, 753-1564, $n = 5$), Tail length ($218 \text{ mm} \pm 46$, 150-280, $n = 4$), Mass (800 g, $n = 1$). Other snake measurements: SVL ($986.7 \text{ mm} \pm 161$, 690-1280, $n = 9$), TL ($1194.6 \text{ mm} \pm 144$, 945-1419, $n = 9$), Tail length ($207.9 \text{ mm} \pm 45$, 139-303, $n = 9$), and mass ($237.3 \text{ g} \pm 81$, 122-300, $n = 3$). See table 18 for individual snake measurements.

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)	Status	Sex
4/10/99	929	1232	303	290	DOR	
5/5/99	690	945	255	122	DOR	
5/15/99	1280	1419	139		ALIVE	
5/24/99					DOR	
5/25/99	1270	1527	257	800	DOR	MALE
6/11/99	949	1141	192		DOR	
6/16/99	910	1090	180	300	ALIVE	
6/27/99	1138	1363	225		DOR	
6/28/99	986	1195	209		DOR	MALE
6/28/99					DOR	
6/29/99	714	864	150		DOR	MALE
7/19/99	863	1045	182		DOR	
8/8/99	1043	1245	202		DOR	
8/23/99					DOR	
8/29/99					DOR	
9/21/99	560	753	195		DOR	MALE
9/28/99	1078	1271	193		DOR	
10/16/99	1284	1564	280		DOR	MALE

Table 18. Elaphe obsoleta obsoleta measurements.

Heterodon platirhinos (Eastern Hognose Snake)

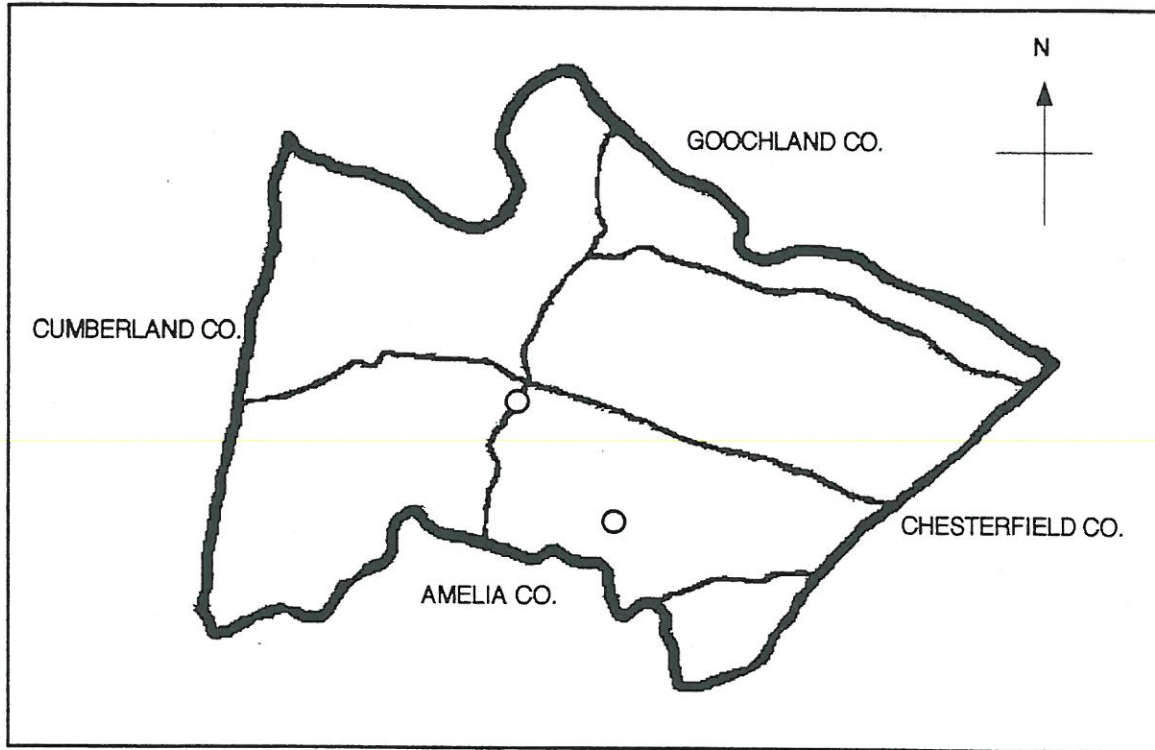


Figure 36. Distribution map of Heterodon platirhinos.

Both eastern hognose snakes found were DOR despite looking in areas with many toads. Of the two snakes found, both the patterned phase and the melanistic phase color schemes were found. The melanistic phased snake was found on 10 May 1999, .5 km (.3 miles) south of the intersection of Rt. 13 and Rt. 522. This snake had the typical upturned rostral snout, black colored dorsum, light grey venter, and a cream tail. The patterned phase snake was found on 3 June 1999 in a driveway at 1392 Millquater Rd. (Figure 36).

Measurements: The melanistic snake was not sexed. SVL = 550 mm, TL = 705 mm, Tail length = 155 mm. Mass was not determined due to desiccation. The patterned snake was dissected to determine it was a male. SVL = 308 mm, TL = 367 mm, Tail length = 59 mm. Mass not determined again due to desiccation.

Lampropeltis calligaster rhombomaculata (Mole Kingsnake)

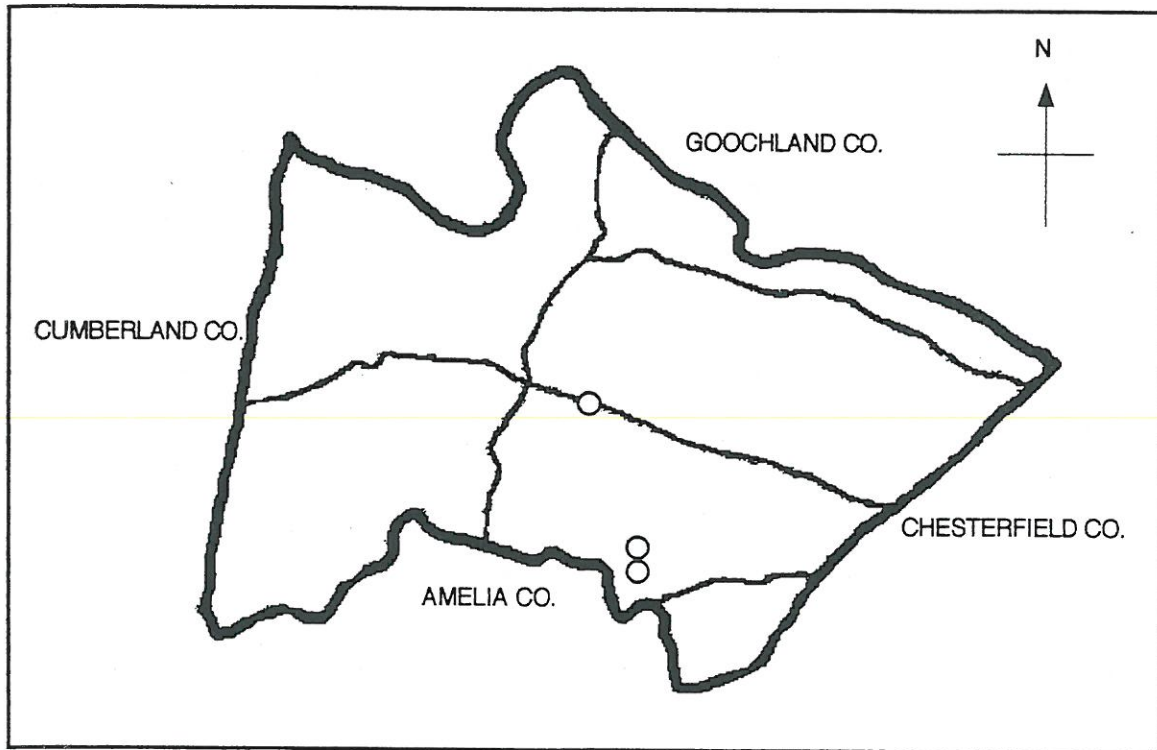


Figure 37. Distribution map of Lampropeltis calligaster rhombomaculata.

Mole kingsnakes were only found DOR. One snake found 2 June 1999 was found on Rt. 60 1.3 km (.8 miles) east of the intersection of Rt. 60 and Academy Road. The surrounding habitat was open field. A second snake found on 13 June 1999 was on Rocky Ford Road 1.3 km (.8 miles) north of the Pineview Drive and Rocky Ford Road intersection. A third snake was found on 8 August 1999 on Rocky Ford Road .3 km (.2 miles) north of the intersection of Rocky Ford Road and Pineview Drive. This snake was male (hemipenes seen) and had the following measurements: SVL = 529 mm, TL = 622 mm and Tail length = 93 mm. Forty eight dorsal blotches were counted (Figure 37).

Lampropeltis getula (Eastern Kingsnake)

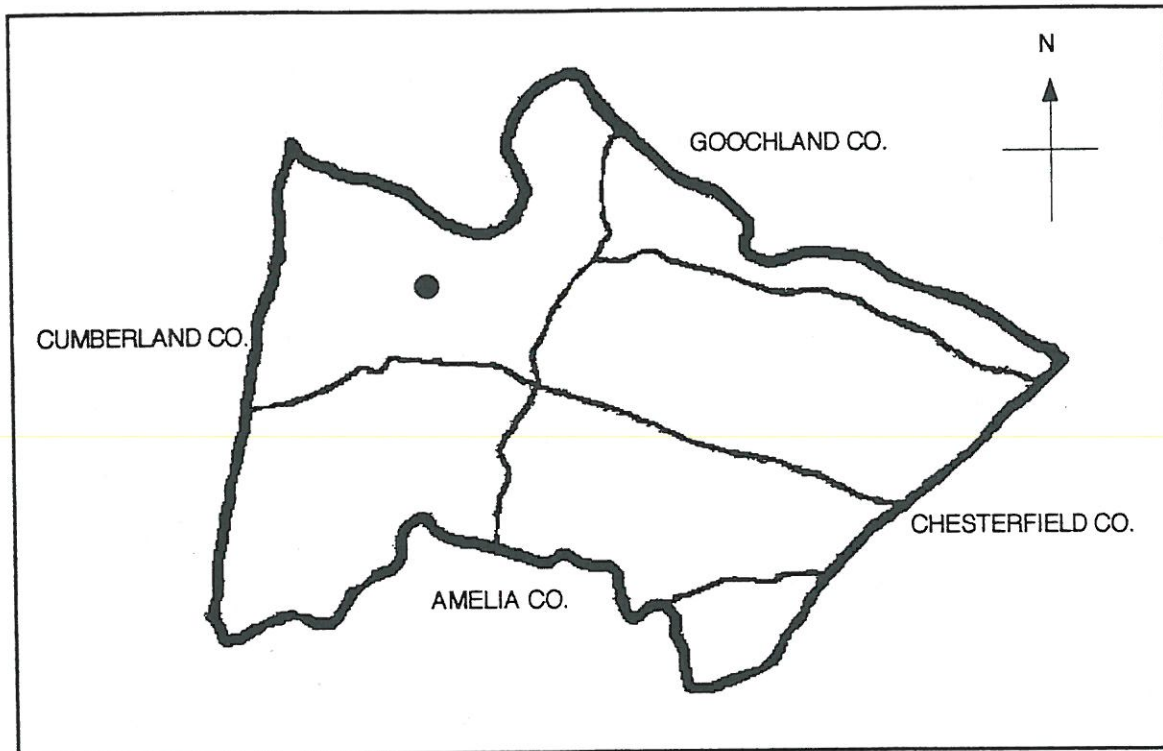


Figure 38. Distribution map of Lampropeltis getula.

Only one eastern kingsnake was found in this survey. The animal was found on 26 May 1999 in the woods at the edge of the north side of the Lower lake in PWMA (Figure 38). The kingsnake was observed moving on top of leaf litter during a partly sunny day with a temperature of 24°C (75°F) at 1530 hours. When approached, the snake rattled its tail in the leaf litter and released musk. When captured, it did not bite.

Measurements: SVL = 110 cm, TL (Total length) = 128 cm, Tail length = 18 cm, Mass = 775 g.

Nerodia sipedon sipedon (Northern Water Snake)

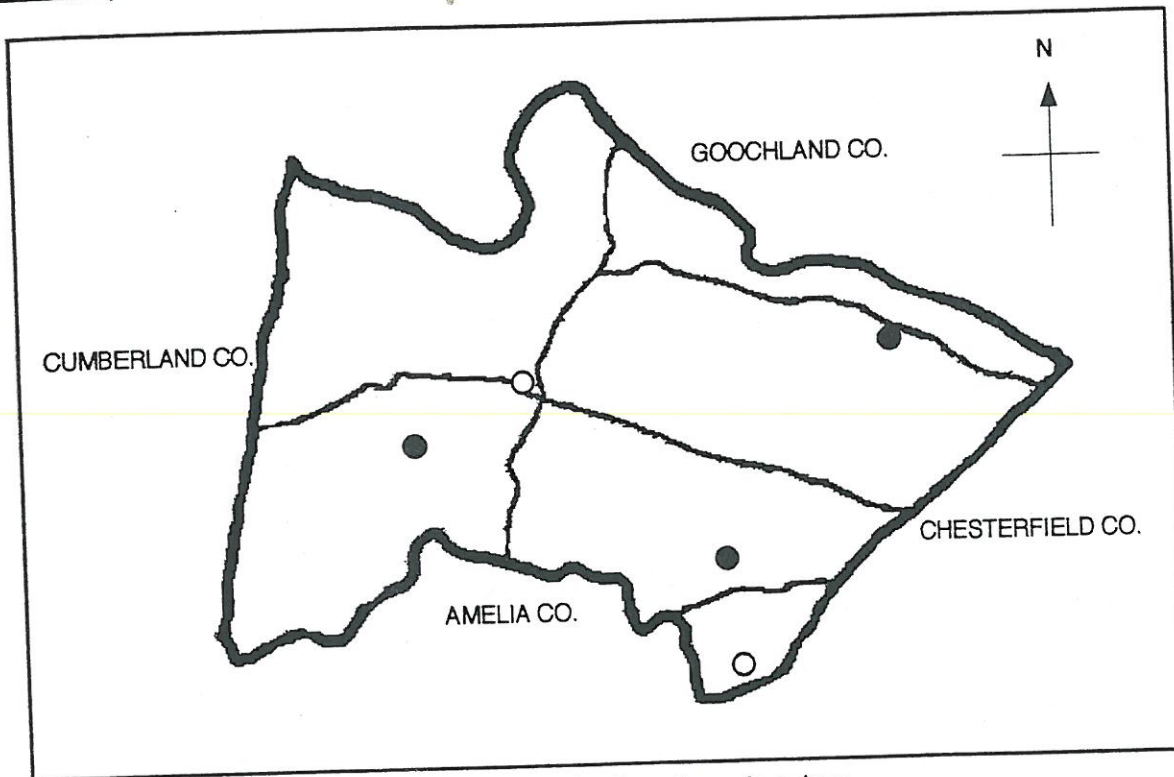


Figure 39. Distribution map of Nerodia sipedon sipedon.

The northern water snake was seen in several locations but was not easily captured. Snakes were seen 3 May 1997 at Millwood (1965 Huguenot Trail in a ditch), and 20 April 1999 (at the edge of Bass pond at 2030 hours). A snake found by a student in a pond on Schroeder road, regurgitated a small fish. Two northern water snakes were found DOR. The first DOR snake was found on 7 August 1999 at the intersection of Petersburg Road and Pilkington Road. The second DOR snake was found on 7 September 1999 on route 60 .08 km (.05 miles) west of intersection of route 60 and route 522. Both of these snakes could not be measured (Figure 39).

Opheodrys aestivus (Rough Green Snake)

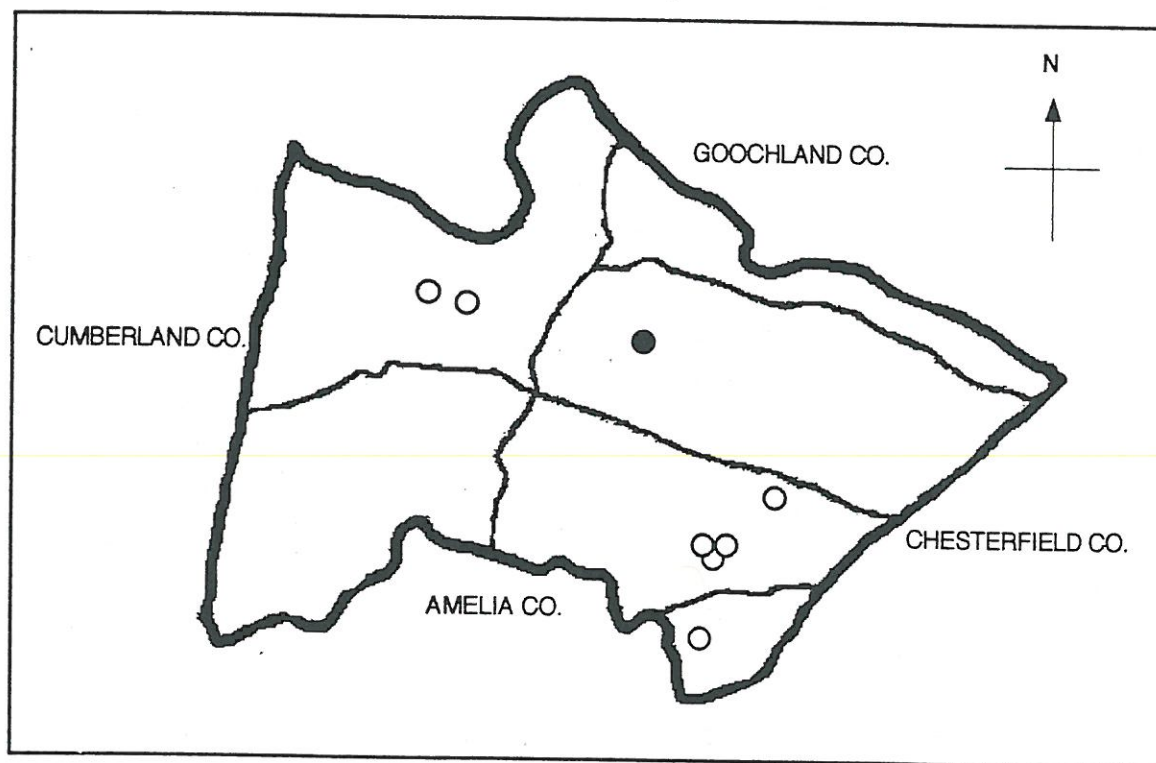


Figure 40. Distribution map of Opheodrys aestivus.

Six DOR specimens were found through collection and museum research. One DOR snake was located in the Virginia Museum of Natural History's reptile collection. This snake was collected on 22 October 1988 by Christopher A Clampitt and Linda Heddrick on a PWMA road. Six DOR snakes were found in the following locations on the following dates: 3 July 1999 (on Avatar Drive .5 km (.3 miles) west of the intersection of Corso Drive and Avatar Drive), 31 August 1999 (on Avatar Drive .3 km (.2 miles) west of the intersection of Corso Drive and Avatar drive), 21 September 1999 (on Powhatan Lakes Road 2.4 km (1.5 miles) west of intersection of Powhatan Lakes Road and Bell Road), 21 September (1301 Avatar Drive), 2 October 1999 (at the intersection of New Dorsett Road and New Dorsett Court), and 12 October 1999 (on River Road .1 km (.1 miles) south of intersection of Rocky Ford Road and River Estate Road.) See table 19 for measurements of all DOR Rough Green snakes. A live

snake was captured in a wooded lot on Three Bridge Road by Tom Hofelich (Figure 40).

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Sex
10/22/88	270	420	150	M
7/3/99	391	532	202	
9/21/99	371	603	212	
9/21/99	290	596	225	
10/2/99	270	462	172	M
10/12/99	423	688	265	F

Table 19. Opheodrys aestivus measurements.

Storeria dekayi dekayi (Northern Brown Snake)

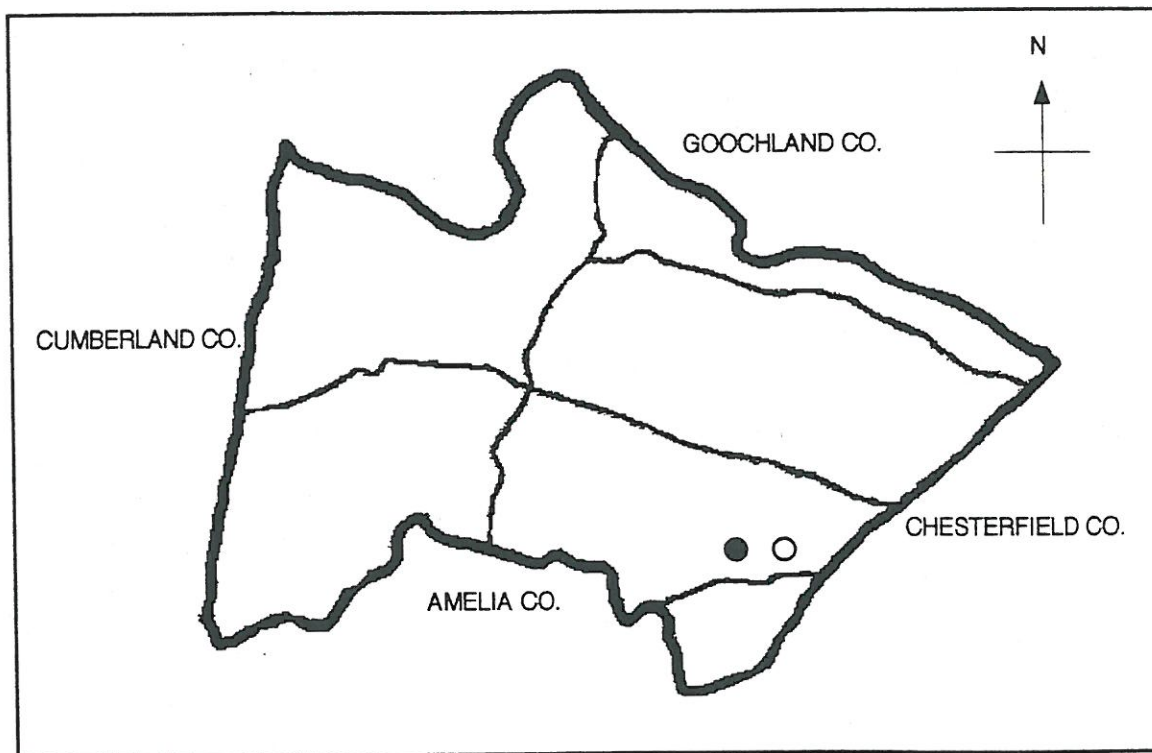


Figure 41. Distribution of Storeria dekayi dekayi.

Only two northern brown snakes were found in this study. One animal was found on 10 October 1999 under a piece of slate at 1301 Avatar Drive (Figure 41). This animal had the following measurements: SVL = 74 mm, TL = 181 mm, and Tail

This animal had the following measurements: SVL = 74 mm, TL = 181 mm, and Tail length = 47 mm.

The second animal was found on 3 November 1999 by Rich Chadbourne. This animal was found DOR on Bradbury Road. This animal had the following measurements: SVL = 193 mm, TL = 254 mm and Tail length = 61 mm.

Storeria occipitomaculata (Red-bellied Snake)

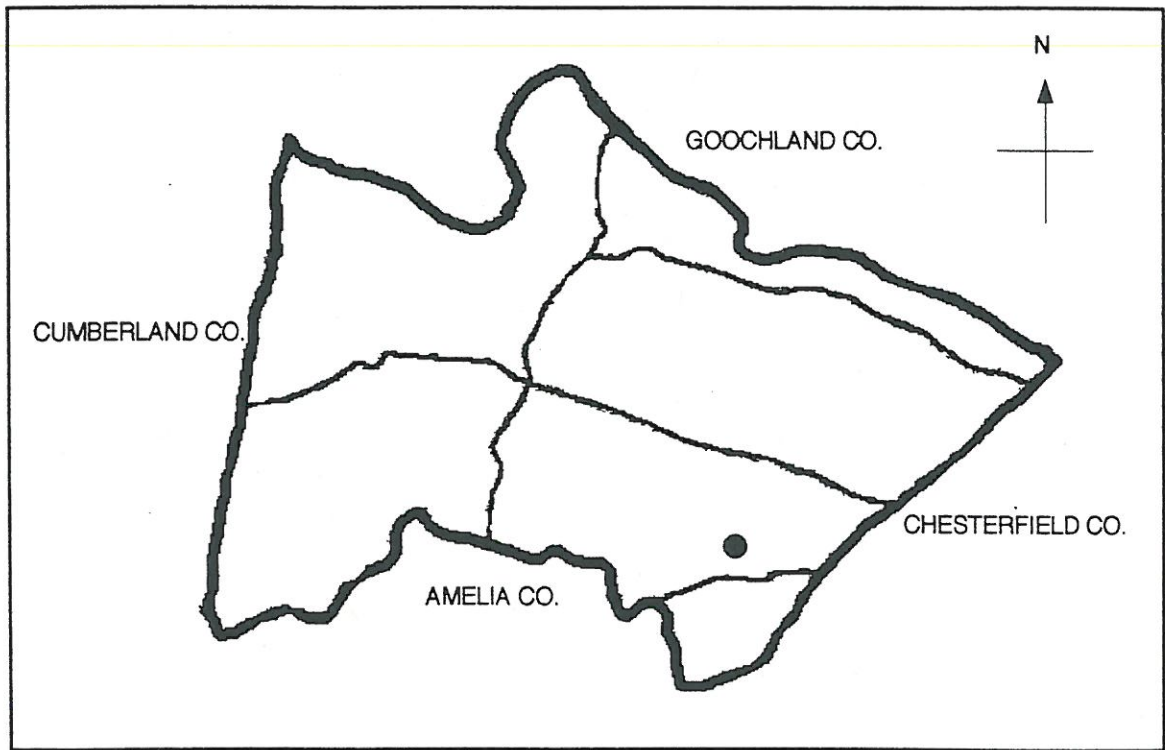


Figure 42. Distribution map of Storeria occipitomaculata.

Only one red-bellied snake was found on 11 May 1998. This specimen was collected by Don Kaizer. See Figure 42 for distribution.

Thamnophis sirtalis sirtalis (Eastern Gartersnake)

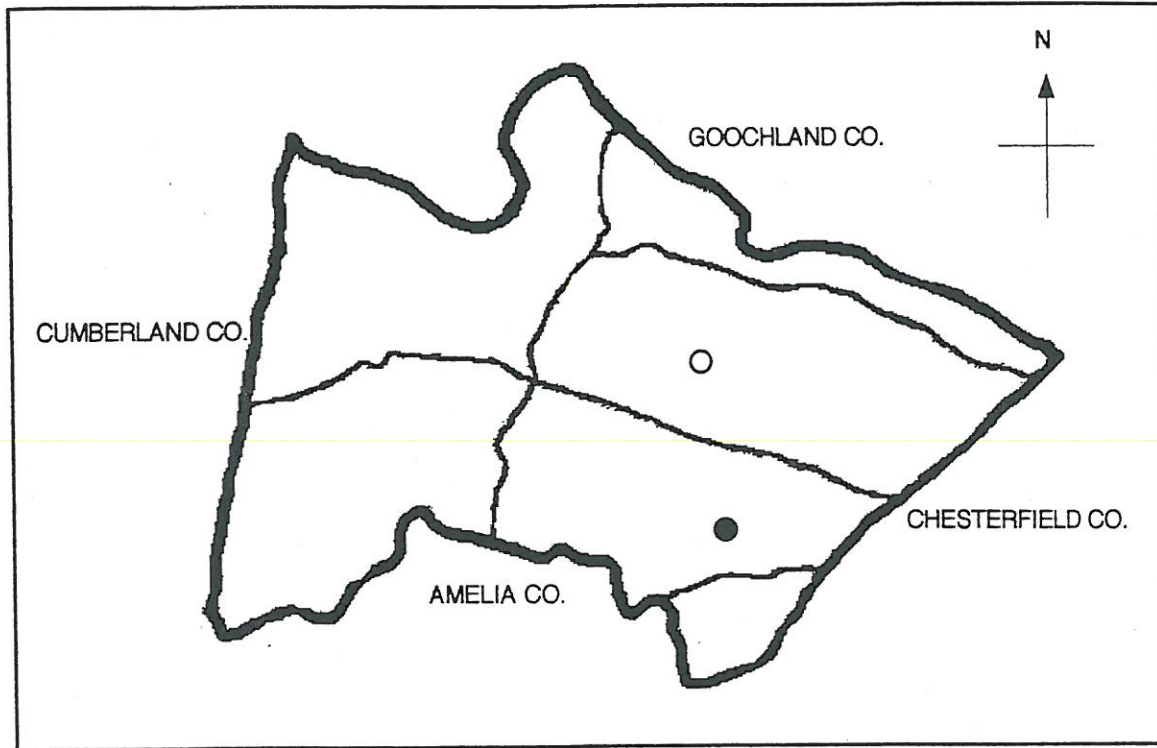


Figure 43. Distribution map of Thamnophis sirtalis sirtalis.

Two gartersnakes were found. One live snake was captured on 12 September 1999 at 1301 Avatar Drive. This animal was seen in grass while I was mowing the lawn. It was found to have the following measurements: SVL = 253 mm, TL = 321 mm, Tail length = 68 mm, and Mass = 21 g.

The second gartersnake was found on 30 September 1999, DOR on Mountain View Road. The collector was Bubba Sing. This animal was found to be a male upon dissection and had the following measurements: SVL = 388 mm, TL = 518 mm, and Tail length = 130 mm. Mass was not determined due to desiccation and injury (Figure 43).

Virginia valeriae (Smooth Earthsnake)

The smooth earthsnake has been recorded for Powhatan county but was not found during this survey (Mitchell and Reay, 1999)

Family VIPERIDAE

Agkistrodon contortrix mokasen (Copperhead)

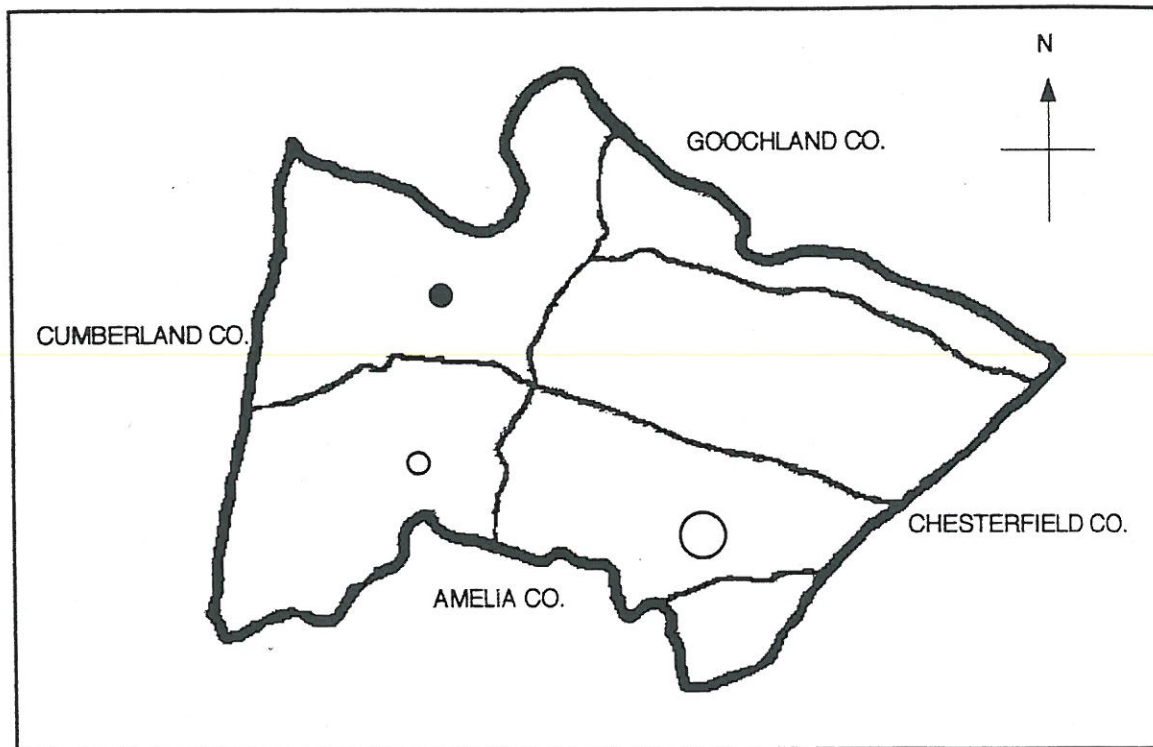


Figure 44. Distribution map of Agkistrodon contortrix mokasen.

A mixture of live, DOR, and killed copperheads were observed for this study. Copperheads were observed at the following sites and dates: 18 May 1999 (DOR on Avatar Drive .5 km (.3 miles) west of the intersection of Corso Drive and Avatar Drive, collector Chris Dodd), 12 June 1999 (killed in yard, 2123 Maple Cottage Road, collector Brandon Ayers), 3 July 1999 (DOR on Avatar Drive .3 km (.2 miles) west of the intersection of Avatar Drive and Corso Drive), 25 September 1999 (alive in woods near a dried vernal pool and Salle Creek on PWMA land, southwest of Lower lake, measurements not taken), and 7 October 1999 (DOR on Jeter Road, collector Amanda Seay) (Figure 44). See table 20 for individual snake measurements.

Date Found	SVL (mm)	TL (mm)	Tail Length (mm)	Mass (g)	Capture Status
5/18/99	232	273	41	9.1	DOR
6/11/99	645	741	96	250	Killed
7/3/99	266	314	48	NT	DOR
10/7/99	205	245	40	NT	DOR

Table 20. Agkistrodon contortrix mokasen measurements.

The copperhead killed by the father of a student (Brandon Ayers) and brought to me on 11 June 1999 was dissected. Upon dissection, a bullfrog (Rana catesbeiana) was found in its stomach. The head of the bullfrog was severely decomposed, maybe indicating that the snake injected venom at that point. Red insects were seen coming out of the bullfrog's stomach. All DOR specimens were juveniles and exhibited green tails.

DISCUSSION

My thesis begins to document the state of amphibians and reptiles in Powhatan County. At the summation of this study, 43 species of amphibians and reptiles were found and documented by voucher slides or tape recordings. This number includes 8 species of salamanders, 11 species of anurans, 6 species of turtles, 4 species of lizards, and 14 species of snakes. Combining the records found in the Atlas of Amphibians and Reptiles of Virginia and these records, the county has a total of 9 species of salamanders, 12 anurans, 6 turtles, 5 lizards, and 16 snakes. This total number of species will probably increase with future study of the amphibians and reptiles of Powhatan county.

Based on the newly published Atlas of Amphibians and Reptiles of Virginia, 11 new county records were discovered by this study. These county records include: Eurycea cirrigera (southern two-lined salamander), Hemidactylium scutatum (four-toed salamander), Gastrophryne carolinensis (eastern narrow-mouthed toad), Rana palustris (pickerel frog), Chelydra serpentina serpentina (eastern snapping turtle), Kinosternon subrubrum subrubrum (eastern mud turtle), Scincella lateralis (ground skink), Agkistrodon contortrix mokasen (northern Copperhead), Lampropeltis getula (common kingsnake), Storeria dekayi dekayi (northern brown snake), and Storeria occipitomaculata (red-bellied snake).

Road kill surveys indicate that many amphibians and reptiles are killed by vehicular traffic. At least 1 species of frog was documented to be killed by cars. Other species of frogs were seen on the road but were captured and placed off the road. Bufo fowleri (Fowler's toad) is very sensitive to being killed on wet rainy warm nights. Many of these toads can be collected and seen at night during spring and summer nights. Because many of these toads are being killed, this can significantly affect the population of toad specialists (eastern hognose snake) near or around roads. Many

Notophthalmus viridescens viridescens (red-spotted newt) were found DOR during the survey period. The red eft terrestrial life stage was the only form collected.

It was surprising to find that the same numbers of Kinosternon subrubrum subrubrum (common mud turtle) and Terrapene carolina carolina (eastern box turtle) were found DOR and tied at being the most commonly found DOR turtles. Mitchell (1994) did not recognize the common mud turtle as being sensitive to vehicular traffic. Chrysemys picta picta (eastern painted turtle) and Sternotherus odoratus (eastern musk turtle) were also found DOR. See table 21 for summary of DOR turtles.

ROAD KILLED TURTLE DATA SUMMARY	
Box turtle	4
Common mud turtle	4
Painted turtle	1
Musk turtle	1

Table 21. DOR turtle summary.

Although the numbers of DOR turtles is not large, it does not diminish the fact that they are being killed by vehicular traffic. Many more deaths occur than those documented here. For the three aquatic species found DOR, (common mud turtle, painted turtle, and musk turtle), a total of 6 turtles were all found where one creek crosses a road. Many of the live box turtles were seen in the same locations of mortality but were collected before becoming DOR.

A total of 42 snakes were collected DOR. Sixteen Elaphe obsoleta obsoleta (black rat snakes) were collected making it the mostly commonly found DOR snake. Other species found DOR include: Agkistrodon contortrix mokasen (northern copperhead), Coluber constrictor constrictor (black racer), Elaphe guttata (corn snake), Heterodon platirhinos (Eastern hog-nosed snake), Lampropeltis calligaster rhombomaculata (mole kingsnake), Nerodia sipedon sipedon (northern watersnake), Opheodrys aestivus (rough greensnake), Storeria dekayi dekayi (northern brown

snake), and Thamnophis sirtalis sirtalis (eastern gartersnake). See table 22 for a summary of the total number of DOR specimens collected for each species.

ROAD KILLED SNAKE DATA SUMMARY	
Black rat snake	16
Green snake	6
Black racer	5
Corn snake	3
Copperhead	3
Mole kingsnake	3
Eastern hognose	2
Northern water snake	2
Garter snake	1
Northern brown snake	1

Table 22. DOR snake summary.

Looking at all the species distributions from my thesis, I have determined that there are six critical areas because of their high diversity, are the only known breeding colonies of rare species, and/or are areas sensitive to vehicular traffic. Refer to figure 45 below.

The outlined area in figure 45 represents Powhatan Wildlife Management Area (PWMA). This 4,462 acre management area has a very high species diversity due to the many varied habitats found within its borders. The forest area is logged periodically and much of the area is disked and left as open fields. The vernal pools and species that live in forests and use the pools are sensitive to the practice of logging. Many of these pools have been identified and this information will be shared with the wildlife manager. The most sensitive pools are where Ambystoma opacum (marbled salamander) breeds.

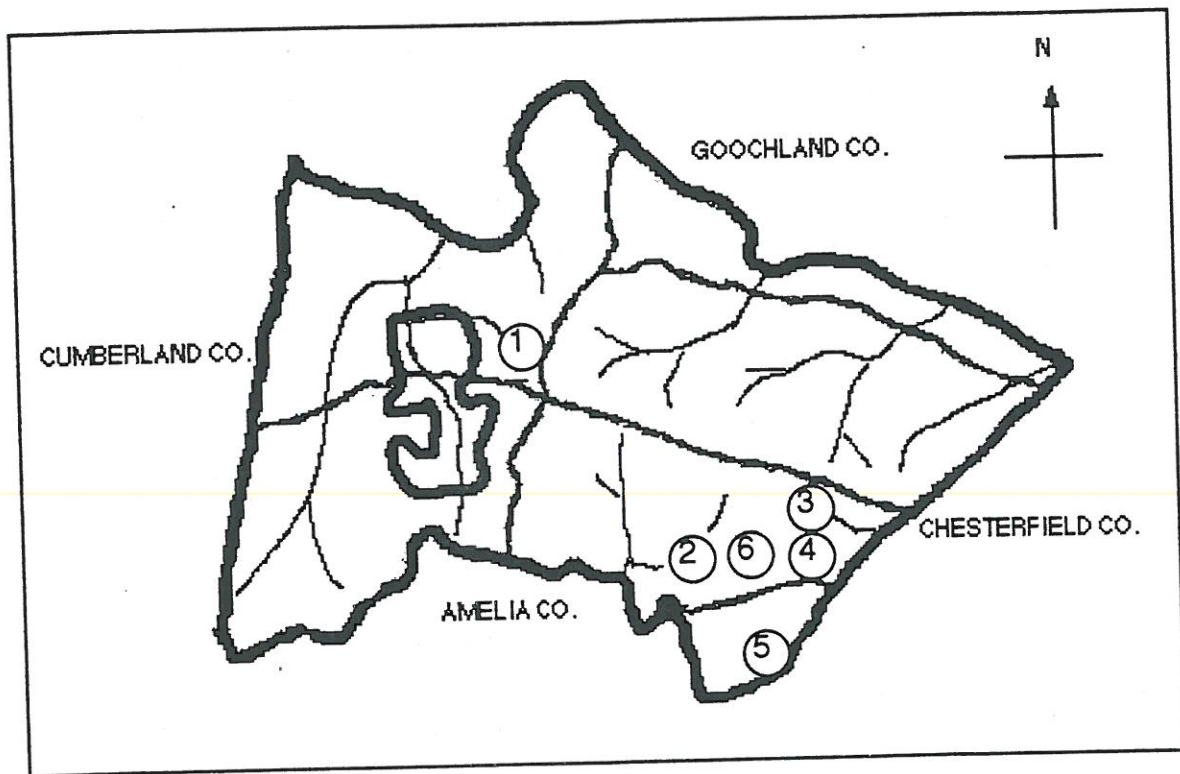


Figure 45. Map of sensitive habitat.

The area represented by circle 1 in figure 45 is the bridge and surrounding road crossing Steggers creek. Many DOR turtles and snakes were seen here. Large choruses of frogs were heard from this bridge (see frog call survey sheets). The speed limit on this road is 55 mph. When one approaches the bridge from the south, there is a curve about a mile before the bridge so a motorist can not see animals on the road and leaving no time to react or stop. Approaching from the north, there is a hill and then a dip. Again there is not time to react or stop. As a way to protect this area, the speed limit could be reduced or maybe even post animal crossing signs.

The area represented by circle 2 in figure 45 is the bridge and surrounding road crossing Rocky Ford creek. This is a site where turtles often cross the road. This is another curving road which leaves little time to react.

The area represented by circle 3 in figure 45 is the point where New Dorsett road crosses Swift creek. Swift creek flows southeast and is an area that allows the

migration from the south to the north. Two species of turtle have been seen crossing the road at this point and many DOR snakes have been found in this location. Housing development and industry in this area will soon destroy all surrounding habitat. A green corridor around Swift creek could help to provide critical habitat to the area.

The area represented by circle 4 in figure 45 is located on Genito road at the Powhatan county / Chesterfield county border. Gastrophryne carolinensis (eastern narrow-mouthed toad) was heard calling in a swamp at this location. This is one of only two known locations for this species in Powhatan county.

The area represented by circle 5 in figure 45 is located at the intersection of Clayville road and Skinquarter creek. A breeding chorus of narrow-mouthed toads was heard at this location. This is the only known area that a full chorus of this species has been heard. DOR turtles and snakes have also been collected at this location.

The area represented by circle 6 in figure 45 is the neighborhood found on Avatar Drive and Corso Drive. Turtles, anurans, salamanders, and snakes have been found DOR on the roads of this neighborhood. The large volume of vehicular traffic in this area causes significant mortality.

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APPENDIX 1

SITE DESCRIPTION FORMS

SITE DESCRIPTION FORM

Site name and location: BASS POND (POWATAN WILDLIFE MANAGEMENT AREA)

Condition:	Natural <input type="checkbox"/> <input checked="" type="checkbox"/> Disturbed
Describe disturbance:	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>
Habitat description:	Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp <input type="checkbox"/>
Substrate:	Silt <input type="checkbox"/> <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> <input checked="" type="checkbox"/> Clay <input type="checkbox"/>
Water flow:	Still/slow <input type="checkbox"/> Moving (audible) <input type="checkbox"/> <input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal <input type="checkbox"/>
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial <input type="checkbox"/> flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix) <input type="checkbox"/>

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: CUNOFF POND (ROCKY FORD ROAD)

Condition:	Natural <input type="checkbox"/> <input checked="" type="checkbox"/> Disturbed
Describe disturbance:	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>
Habitat description:	<input checked="" type="checkbox"/> Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp <input type="checkbox"/>
Substrate:	Silt <input type="checkbox"/> <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> <input checked="" type="checkbox"/> Clay <input type="checkbox"/>
Water flow:	Still/slow <input type="checkbox"/> Moving (audible) <input type="checkbox"/> <input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal <input type="checkbox"/>
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial <input type="checkbox"/> flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix) <input type="checkbox"/>

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: *ROCKY FORD ROAD BRIDGE*

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
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Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland Swamp <input checked="" type="checkbox"/> CREEK	
Substrate:	<input checked="" type="checkbox"/> Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	<input type="checkbox"/> Still/slow <input checked="" type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: *APPOMATTOX BRIDGE*

Condition:	Natural	<input checked="" type="checkbox"/> Disturbed
Describe disturbance:	<i>CUT OVER</i>	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland <input checked="" type="checkbox"/> Swamp	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	<input type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible)	<input type="checkbox"/> Permanent <input checked="" type="checkbox"/> Seasonal
Dominant vegetation:	Oak Hickory Beech Maple Pine Grass Annual/Perennial flowers Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: GENITO POWHATAN BORDER. LOCATED AT THE POWHATAN CHESTERFIELD BORDER ON GENITO ROAD

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	<input checked="" type="checkbox"/> Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland <input checked="" type="checkbox"/> Swamp	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	<input checked="" type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:
BREEDING SITE FOR EASTERN NARROW MOUTH TOAD.

SITE DESCRIPTION FORM

Site name and location: LOCH GATE LAKE (FOUND AT THE END OF LOCH GATE LANE.)

Condition:	<input type="checkbox"/> Natural	<input checked="" type="checkbox"/> Disturbed
Describe disturbance:	MAN MADE LAKE	
Land use:	<input type="checkbox"/> Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	<input checked="" type="checkbox"/> Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp	
Substrate:	Silt <input type="checkbox"/> Leaf litter <input checked="" type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input checked="" type="checkbox"/> Clay	
Water flow:	<input checked="" type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: SUNFISH POND (POWHATAN WILDLIFE MANAGEMENT AREA)

Condition:	Natural <input type="checkbox"/> <input checked="" type="checkbox"/> Disturbed
Describe disturbance:	MAN MADE LAKE
Land use:	<input checked="" type="checkbox"/> Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:
Habitat description:	<input checked="" type="checkbox"/> Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input checked="" type="checkbox"/> Clay
Water flow:	<input checked="" type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible) <input type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: BULLHEAD POND (POWHATAN WILDLIFE MANAGEMENT AREA)

Condition:	Natural <input type="checkbox"/> <input checked="" type="checkbox"/> Disturbed
Describe disturbance:	MAN MADE LAKE
Land use:	<input type="checkbox"/> Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:
Habitat description:	<input checked="" type="checkbox"/> Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp
Substrate:	Silt <input type="checkbox"/> Leaf litter <input checked="" type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input checked="" type="checkbox"/> Clay
Water flow:	<input checked="" type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible) <input type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: ST. JOHN NEUMANS CATHOLIC CHURCH .2 MILES EAST OF INTERSECTON OF ROUTE 60 AND BATTERSON ROAD ON BATTERSON ROAD.

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	<input checked="" type="checkbox"/> Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland Swamp VERNAL POOL	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	<input type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible)	<input type="checkbox"/> Permanent <input checked="" type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: NEW DORSET ROAD LOCATED AT THE INTERSECTON OF SWIFT CREEK AND NEW DORSETT ROAD

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland Swamp <input checked="" type="checkbox"/> STREAM	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input checked="" type="checkbox"/> Clay	
Water flow:	<input type="checkbox"/> Still/slow <input checked="" type="checkbox"/> Moving (audible)	<input type="checkbox"/> Permanent <input checked="" type="checkbox"/> Seasonal
Dominant vegetation:	<input checked="" type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: STEGGENS CREEK INTERSECTION OF BELL ROAD AND STEGGENS CREEK

Condition:	<input checked="" type="radio"/> Natural	<input type="radio"/> Disturbed
Describe disturbance:		
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>	
Habitat description:	Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input checked="" type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp <input type="checkbox"/>	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay <input type="checkbox"/>	
Water flow:	Still/slow <input type="checkbox"/> Moving (audible) <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	Oak <input type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial <input type="checkbox"/> flowers <input type="checkbox"/> Herbaceous <input type="checkbox"/> Emerg. <input checked="" type="checkbox"/> Submerg. <input checked="" type="checkbox"/> Mix <input checked="" type="checkbox"/>	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: POCAHONTAS ELEMENTARY SCHOOL POND

Condition:	Natural <input type="radio"/>	<input checked="" type="radio"/> Disturbed
Describe disturbance:	MAN MADE POND	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>	
Habitat description:	Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input checked="" type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond <input checked="" type="checkbox"/> Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp <input type="checkbox"/> CREEK <input type="checkbox"/>	
Substrate:	Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay <input type="checkbox"/>	
Water flow:	Still/slow <input type="checkbox"/> Moving (audible) <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	Oak <input checked="" type="checkbox"/> Hickory <input checked="" type="checkbox"/> Beech <input checked="" type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial <input type="checkbox"/> flowers <input type="checkbox"/> Herbaceous <input type="checkbox"/> Emerg. <input checked="" type="checkbox"/> Submerg. <input type="checkbox"/> Mix <input type="checkbox"/>	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: SALLE CREEK LOCATED AT THE END OF POWHATAN LAKES ROAD.

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other:	
Habitat description:	Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input checked="" type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input checked="" type="checkbox"/> Swamp	
Substrate:	Silt <input type="checkbox"/> <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	Still/slow <input type="checkbox"/> <input checked="" type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	Oak <input type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. <input checked="" type="checkbox"/> Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: LOWER LAKE (POWHATAN WILDLIFE MANAGEMENT AREA)

Condition:	<input type="checkbox"/> Natural	<input checked="" type="checkbox"/> Disturbed
Describe disturbance:	MAN MADE LAKE	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: RECREATION	
Habitat description:	<input checked="" type="checkbox"/> Lake <input type="checkbox"/> River <input type="checkbox"/> Woodland <input type="checkbox"/> Wet-meadow <input type="checkbox"/> Ditch <input type="checkbox"/> Pond Puddle <input type="checkbox"/> Grassland <input type="checkbox"/> Spring <input type="checkbox"/> Bottomland <input type="checkbox"/> Swamp	
Substrate:	Silt <input type="checkbox"/> <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	Still/slow <input type="checkbox"/> <input checked="" type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	Oak <input type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass <input type="checkbox"/> Annual/Perennial flowers <input type="checkbox"/> Herbaceous (Emerg. Submerg. <input checked="" type="checkbox"/> Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: BERNARDS CREEK INTERSECTION OF WINTER FIELD ROAD AND ROUTE 711

Condition:	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	Natural Grazed Mowed Agricultural Logged Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland Swamp CREEK	
Substrate:	<input checked="" type="checkbox"/> Silt <input checked="" type="checkbox"/> Leaf litter <input type="checkbox"/> Bedrock <input type="checkbox"/> Rock <input type="checkbox"/> Clay	
Water flow:	<input type="checkbox"/> Still/slow <input checked="" type="checkbox"/> Moving (audible)	<input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Seasonal
Dominant vegetation:	<input type="checkbox"/> Oak <input checked="" type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input checked="" type="checkbox"/> Pine <input type="checkbox"/> Grass Annual/Perennial flowers Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:
GOLF COURSE WILL DESTROY HABITAT

SITE DESCRIPTION FORM

Site name and location: MILLWOOD PLANTATION 1965 HUGUENOT TRAIL

Condition:	<input type="checkbox"/> Natural	<input checked="" type="checkbox"/> Disturbed
Describe disturbance:		
Land use:	Natural Grazed Mowed <input checked="" type="checkbox"/> Agricultural Logged Other:	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond <input checked="" type="checkbox"/> Puddle Grassland Spring Bottomland Swamp	
Substrate:	Silt Leaf litter Bedrock Rock Clay	
Water flow:	<input type="checkbox"/> Still/slow <input type="checkbox"/> Moving (audible)	<input type="checkbox"/> Permanent <input checked="" type="checkbox"/> Seasonal
Dominant vegetation:	<input type="checkbox"/> Oak <input type="checkbox"/> Hickory <input type="checkbox"/> Beech <input type="checkbox"/> Maple <input type="checkbox"/> Pine <input type="checkbox"/> Grass Annual/Perennial flowers Herbaceous <input checked="" type="checkbox"/> Emerg. <input type="checkbox"/> Submerg. Mix	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: FINE CREEK MILLS INTERSECTION OF LEE'S LANDING ROAD AND ROUTE 711

Condition:	Natural	<u>Disturbed</u>
Describe disturbance:	GOLF COURSE	
Land use:	Natural <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland Swamp <u>CREEK</u>	
Substrate:	<u>Silt</u> Leaf litter Bedrock Rock Clay	
Water flow:	Still/slow <u>Moving</u> (audible)	<u>Permanent</u> Seasonal
Dominant vegetation:	<u>Oak</u> <u>Hickory</u> Beech Maple <u>Pine</u> Grass Annual/Perennial flowers Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

SITE DESCRIPTION FORM

Site name and location: SHERWOOD 3.8 MILES EAST OF THE INTERSECTION OF 599 AND 711 ON 711.

Condition:	<u>Natural</u>	Disturbed
Describe disturbance:		
Land use:	<u>Natural</u> <input type="checkbox"/> Grazed <input type="checkbox"/> Mowed <input type="checkbox"/> Agricultural <input type="checkbox"/> Logged <input type="checkbox"/> Other: <input type="checkbox"/>	
Habitat description:	Lake River Woodland Wet-meadow Ditch Pond Puddle Grassland Spring Bottomland <u>Swamp</u>	
Substrate:	Silt <u>Leaf litter</u> Bedrock Rock Clay	
Water flow:	Still/slow Moving (audible)	Permanent Seasonal
Dominant vegetation:	<u>Oak</u> <u>Hickory</u> Beech Maple <u>Pine</u> Grass Annual/Perennial flowers Herbaceous (Emerg. Submerg. Mix)	

Notes/comments:

APPENDIX 2

FROG CALL SURVEY DATA SHEETS

Date 3/23/94		Time 9:44 P.M.	
Begin Time 6:50 P.M.		End Time 1	
Wind 1		Wind 1	
Air temp (c) 21°C		Air temp (c) 15°C	
Sky 1		Sky 0	

CALL INDEX

Site name	Site number	Water temp (c)	Spring Peeper	Upland Chorus Frog	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickereel frog	American toad	Fowlers Toad	S.Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree Frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	Comments
BERNARD'S CREEK	1																			4 CANS
MILLWOOD PLANTATION	2	11°C																		7 CANS
SHUTE CREEK	3																			3 CANS
SHUTE CREEK	4																			NO SIGNIFICANT RAINING SYSTEM... HEARD TO HEAR
SHUTE CREEK	5	11°C																		1 TRUCK
LOWER LAKE	6	11°C																		5 CANS PASSED
STEIGENS CREEK	7	17°C					3													
PES POND	8	13°C																		
MT. JOHN NEUMAN CATHOLIC CHURCH	9																			
NEW BOSTON AGL.	10																			KILL DEER HEARD
MEAN																				
MODE																				

Upland chorus frog heard
heard my house (2)

Sky code	Wind code	Wind speed (miles/hr)
0 Clear or few clouds	0 less than 1	(Smoke rises vertically)
1 Partly cloudy or variable	1 1-3	(Smoke drift)
2 Cloudy or overcast	2 4-7	(Wind felt on face; leaves rustle)
3 Fog	3 8-12	(Leaves and small twigs constantly move)
4 Drizzle	4 13-18	(Raises dust; small branches move)

Precipitation Code
0 No rain
1 Rain in past 24 hrs
2 Rain in past 48 hrs
3 Rain in past 72 hrs
4 Raining currently

Begin		End	
Date 4/19/15	Time 8:04 P.M.	Time 4:34 P.M.	
Wind 0	Air temp (c) 56°F	Wind 0	Air temp (c) 56°F
Sky 0	by wind in past 24 hrs.	Sky 0	

CALL INDEX

Site name	Site number	Water temp (c)	Spring Peeper	Upland Chorus Frog	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickereel frog	American toad	Fowlers Toad	S.Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree Frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	Comments
Wuester Road	11	18°C	3				3													CANON GEESE HEARD, WHITE-BELL
Buckner Road	12	17°C	3				3													
Bass Road	13	17°C	3				3													
Conover Road	14	17°C	3				3													
Pickens Road	15		3																	0.6 MILES NORTH OF TURNPIKE w/
Wardle	16		3																	FINCHES
APD-Orange Grove	16		3																	
Geist's Mountain	17	17°C	3				1													REHMAN / CHESTERFIELD BOWEN
Clark Gate Lane	18		3				3													
	9																			
	10																			
MEAN																				
MODE																				

Sky code	Wind code	Wind speed (miles/hr)
0 Clear or few clouds	0 less than 1	(Smoke rises vertically)
1 Partly cloudy or variable	1 - 3	(Smoke drift)
2 Cloudy or overcast	4 - 7	(Wind felt on face; leaves rustle)
3 Fog	8 - 12	(Leaves and small twigs constantly move)
4 Drizzle	13 - 18	(Raises dust; small branches move)

Precipitation Code
0 No rain
1 Rain in past 24 hrs
2 Rain in past 48 hrs
3 Rain in past 72 hrs
4 Raining currently

Date 4/15/99		Time 8:04 P.M.	
Begin		End	
Wind 0	Air temp (c) 50°F	Wind 3	Air temp (c) 53°F
Sky 4		Sky 3	
CALL INDEX			
usually raining			

Site name	Site number	Water temp (c)	Spring Peeper	Upland Chorus Frog	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickrel frog	American toad	Fowlers Toad	S.Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	Comments
BIGHANOS CREEK	1																			18 CANS
MILL WOOD PLANTATION	2	13°C																		5 CANS
FINE CREEK WELLS	3																			3 CANS
SHERWOOD	4																			1 CAR BEERED TWICE
SALLE CREEK	5																			COULD NOT SAMPLE DUE TO SMELLY REAROUS
LOWER LAKE	6	13°C																		
STEGGENS CREEK	7	13°C					0.3													WASP-POND-WITH HENNO BEHAVEN SEEN (SUSPENSE)
PES POND	8	15°C																		KILLDEER HEARD
ST. JOHN NEUMANN CATHOLIC CHURCH NEW DORSET ROAD	9																			
MEAN MODE	10																			

* UPLAND CHORUS FROGS HEARD FROM MILL WOOD PLANTATION

Sky code	Wind code	Wind speed (miles/hr)
0 Clear or few clouds	0 less than 1	(Smoke rises vertically)
1 Partly cloudy or variable	1 - 3	(Smoke drift)
2 Cloudy or overcast	4 - 7	(Wind felt on face; leaves rustle)
3 Fog	8 - 12	(Leaves and small twigs constantly move)
4 Drizzle	13 - 18	(Raises dust; small branches move)

Precipitation Code
0 No rain
1 Rain in past 24 hrs
2 Rain in past 48 hrs
3 Rain in past 72 hrs
4 Raining currently

Continuum County Frog and Toad Calling Survey

Date 4/23/91		Time 8:15 P.M.	
Begin		End	
Wind 1	Air temp (c) 70°F	Wind 3	Air temp (c) 70°F
Sky 3	prec 1	Sky 4	prec 4

Site name	Site number	Water temp (c)	CALL INDEX																Comments
			Upland Peeper	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickrel frog	American toad	Fowlers Toad	S.Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	
SWIFSH ROAD	11	19°c																	WHIP-POOP-WALL HEARD
BULL HORN ROAD	12	19°c																	
FRYS ROAD	13	20°c																	
CUNDELL ROAD	14																		
REXLEY ROAD rd	15	20°c																	
ADDERBROOK 5150005	16																		could not sample for SAFETY REASONS
GENETRO PO-HHMMU 120/1000N	17	22°c																	
LOCK BARE LAKE	18																		
	9																		
	10																		
MEAN																			
MODE																			

0	Clear or few clouds	0	less than 1	(Smoke rises vertically)	0	No rain
1	Partly cloudy or variable	1	1-3	(Smoke drift)	1	Rain in past 24 hrs
2	Cloudy or overcast	2	4-7	(Wind felt on face; leaves rustle)	2	Rain in past 48 hrs
3	Fog	3	8-12	(Leaves and small twigs constantly move)	3	Rain in past 72 hrs
4	Drizzle	4	13-18	(Raises dust; small branches move)	4	Raining currently

0	No rain
1	Rain in past 24 hrs
2	Rain in past 48 hrs
3	Rain in past 72 hrs
4	Raining currently

Powhatan County Frog and Toad Calling Survey

Begin		End																			
Date 5/2/11	Time 9:00 a.m.	Time 11:00 p.m.																			
Wind 1	Air temp (c) 72°F	Wind 3	Air temp (c) 68°F																		
Sky 3	Prec: 1	Sky 4	Prec: 4																		
CALL INDEX																					
Site name	Site number	Water number	Water temp (c)	Spring Peeper	Upland Chorus Frog	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickrel frog	American toad	Fowlers Toad	S. Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree Frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	Comments
BEGAN 05 CREEK	1																				6 CANS
MILL WOOD PLANTATION	2																				7 CANS
FINE CREEK MILLS	3						2														3 CANS
SILVERWOOD	4																				3 CANS / TRASH IN PEOPLE VEHICLE
SALT CREEK	5		78°F					1													Finding toad gun on road
LOWER LAKE	6		79°F																		
STEGGERS CREEK	7																				
PE'S POND	8		68°F																		
ST. JOHN NEUMAN CATHOLIC CHURCH	9																				
NEW DORSET ROAD	10																				
MEAN MODE																					

Sky code	Wind code	Wind speed (miles/hr)
0 Clear or few clouds	0	less than 1 (Smoke rises vertically)
1 Partly cloudy or variable	1	1 - 3 (Smoke drift)
2 Cloudy or overcast	2	4 - 7 (Wind felt on face; leaves rustle)
3 Fog	3	8 - 12 (Leaves and small twigs constantly move)
4 Drizzle	4	13 - 18 (Raises dust; small branches move)

Precipitation Code
0 No rain
1 Rain in past 24 hrs
2 Rain in past 48 hrs
3 Rain in past 72 hrs
4 Raining currently

Powhatan County Frog and Toad Calling Survey

Begin		Date	6/28/84	End	
		Time	9:10 P.M.		
Wind		Air temp (c)	82°F	Wind	
		Sky	0		
Wind		Air temp (c)	80°F	Wind	
		Sky	1		

CALL INDEX

Site name	Site number	Water temp	Spring temp (c)	Upland Peeper	Brimley's Chorus Frog	Wood Frog	Barking Treefrog	Pickerel frog	American toad	Fowlers Toad	S. Leopard Frog	Southern cricket frog	Northern cricket frog	E. Gray Tree frog	C. Gray Tree Frog	Green frog	Bullfrog	Spadefoot Toad	Narrowmouth Toad	Comments	
WATER POND	11	82°F																			
BULL POND	12																				
GRASS POND	13	82°F																			
CUMMERS POND	14																				
ROCKY POND N.H.	15																				
APPROXIMATE BRIDGE	16																				
GEORGE POWHATAN TOWER	17	80°F																			
LOCK GATE CREEK	18																				
	9																				
	10																				
MEAN																					
MODE																					

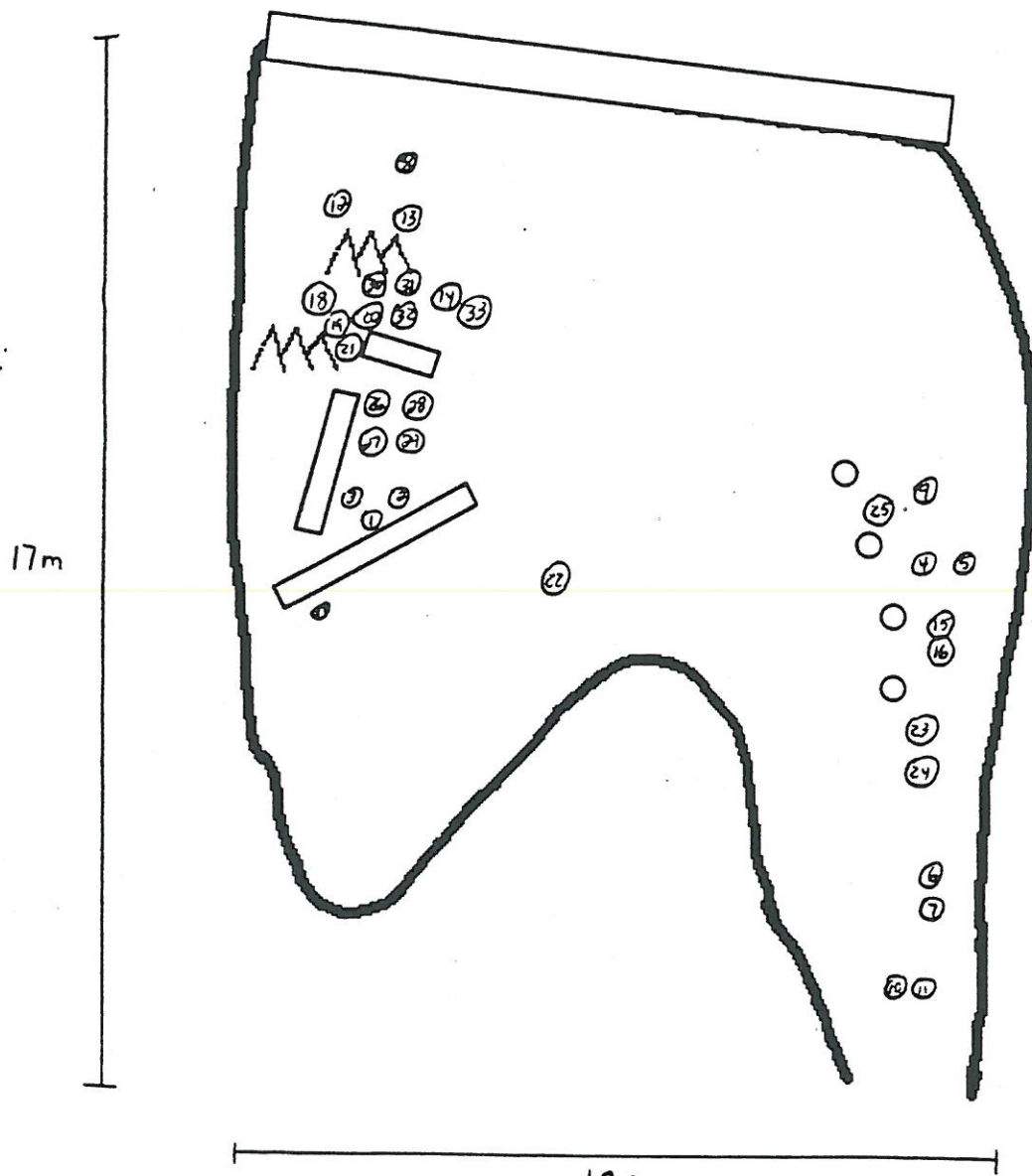
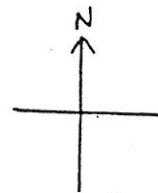
Sky code	Wind code	Wind speed (miles/hr)
0 Clear or few clouds	0	less than 1 (Smoke rises vertically)
1 Partly cloudy or variable	1	1 - 3 (Smoke drift)
2 Cloudy or overcast	2	4 - 7 (Wind felt on face; leaves rustle)
3 Fog	3	8 - 12 (Leaves and small twigs constantly move)
4 Drizzle	4	13 - 18 (Raises dust; small branches move)

Precipitation Code
0 No rain
1 Rain in past 24 hrs
2 Rain in past 48 hrs
3 Rain in past 72 hrs
4 Raining currently

APPENDIX 3

BREEDING POOLS FOR AMBYSTOMA MACULATUM.

POND 1 SALLE CREEK



 Grassy vegetation

 Log

 Stump or tree

SPOTTED SALAMANDER EGG MASS DATA SHEET

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	2/24/99	40	WOODY STICK		
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	2/24/99	43	ATTACHED TO SAME STICK AS MASS 1		
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/13/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	2/24/99	8	IRONWOOD BRANCH		
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE.	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	2/24/99	33	WOODY STICK		
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	2/24/99	29	BLADE OF GRASS		
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/13/99	3 DEAD EGGS 90% HATCHED	YES	EARLY ON ICE DID DAMAGE OUTER LAYER OF JELLY	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	2/24/99	50	BLADE OF GRASS		41g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	

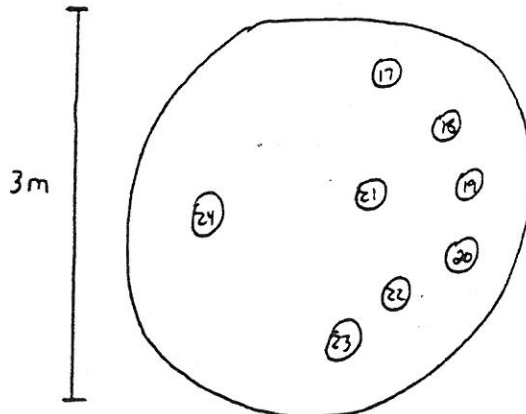
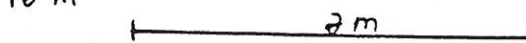
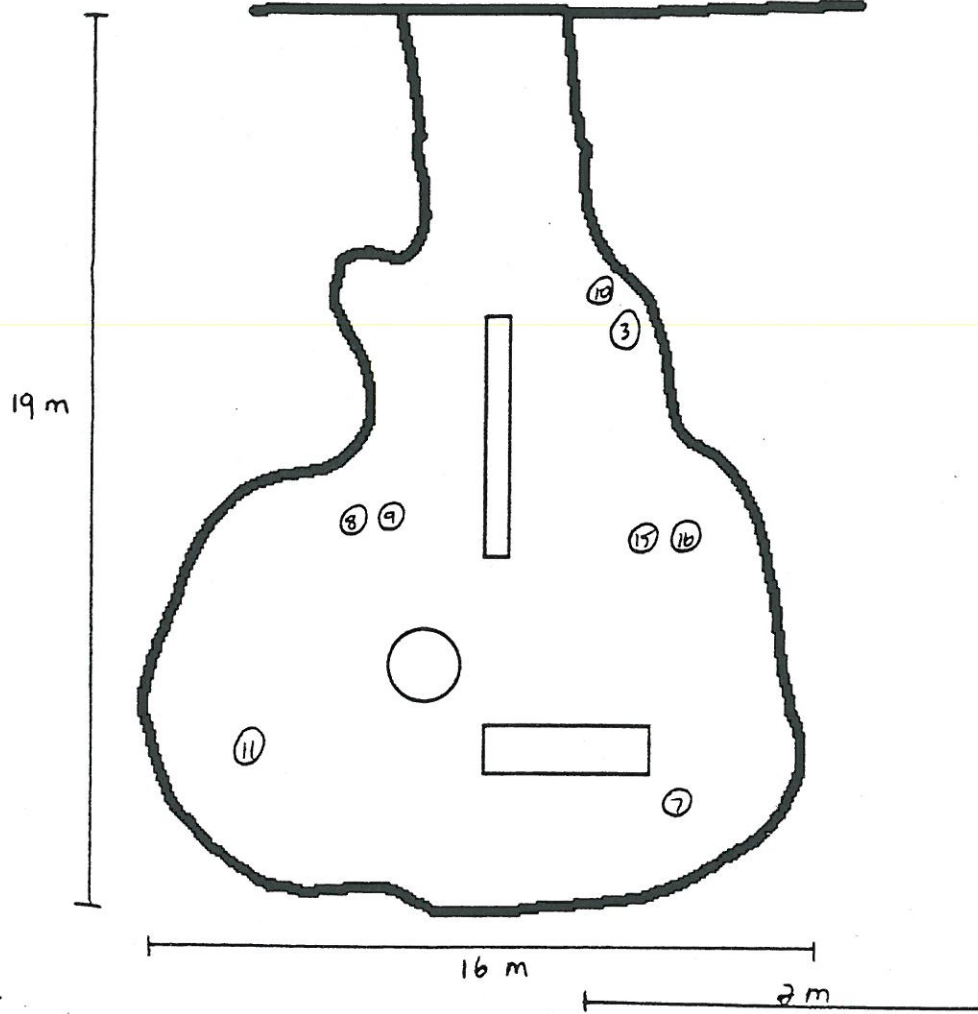
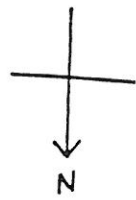
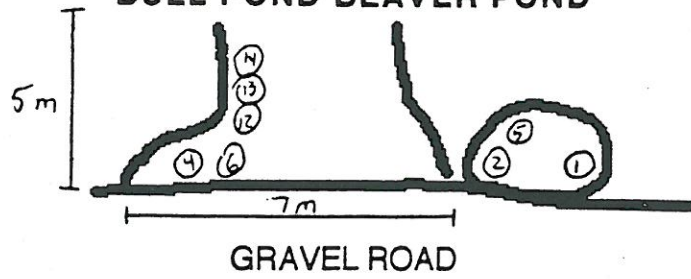
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	2/24/99	41	RESTING ON GRASSY VEGETATION		36g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	2/26/99	99	ATTACHED TO STICK		64g
Color	Date of Hatching	% Hatching	Algae	Notes	
				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	2/26/99	19	ATTACHED TO STICK		37g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/13/99	4 DEAD EGGS 80% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	2/26/99	89	ATTACHED TO GRASS		24g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	2/26/99	20	ATTACHED TO DECAYING GRASS MATERIAL		10g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
12	3/1/99	61	GRASSY VEGETATION		88g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
13	3/1/99	35	NOT ATTACHED		56g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	2 DEAD EGGS 94% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
14	3/1/99	108	PIN OAK LEAF		100.9
Color	Date of Hatching	% Hatching	Algae	Notes	
BROWN / CLEAR	4/13/99	1 DEAD EGG	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
15	3/1/99	22	WOODY STICK		23.9
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
16	3/1/99	50	SAME WOODY STICK AS MASS 15		43.9
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
17	3/3/99	82	WOODY STICK		80.9
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	8 DEAD 90% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
18	3/8/99	32	NOT ATTACHED	.5 cm	3.9
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN				COULD NOT BE FOUND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
19	3/8/99	66	NOT ATTACHED	1 cm	8.7
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	2 DEAD EGGS 47% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
20	3/8/99	83	UNKNOWN VEGETATION	1 cm	71.9 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	100% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
21	3/8/99	86	GRASSY VEGETATION	1 cm	116.3 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/13/99	100%	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
22	3/8/99	10	IRONWOOD BRANCH	2.9 cm	
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
23	3/8/99	73	NOT ATTACHED	10 cm	128.4 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
24	3/8/99	38	NOT ATTACHED	10.5 cm	56.9 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
25	3/8/99	122	WOODY STICK	13 cm	158.5 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN			YES	COULD NOT BE FOUND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
26	3/16/99	68	LEAF MATTER	3 cm	100 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/13/99	4 DEAD EGGS 94% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
27	3/16/99	57	NOT ATTACHED	8 cm	100 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BLACK	4/26/99	10 DEAD 87% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
28	3/16/99	76	GRASS	6.1 cm	180g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN			YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
29	3/16/99	83	WHITE OAK LEAF	6.5 cm	120g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	100%	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
30	3/22/99	80	PIN OAK LEAF	6.2 cm	120g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	100%	YES	FOUND EGGS IN STAGE 27	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
31	3/22/99	66	NOT ATTACHED	6.2 cm	110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	100%	YES	FOUND EGGS IN STAGE 27	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
32	4/13/99	83			
Color	Date of Hatching	% Hatching	Algae	Notes	
				COULD NOT BE FOUND TO CHECK ON ALGAE ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
33	4/13/99	?	METAL FLAG STEM	?	?
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/18/99	?	YES	* FOUND WHILE TAKING FLAGS UP	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
34					
Color	Date of Hatching	% Hatching	Algae	Notes	

BULL POND BEAVER POND



ENLARGED VIEW OF UPPER SMALL POOL

SPOTTED SALAMANDER EGG MASS DATA SHEET

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	2/21/99	125	JUNCUS SP.		172 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/9/99	11 DEAD EGGS 91% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	2/22/99	75	GRASS		52 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	9 DEAD EGGS 80% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	2/22/99	124	NOT ATTACHED		12.5 cm x 7.4 cm
Color	Date of Hatching	% Hatching	Algae	Notes	
GLASS/ BROWN		* WHEN FOUND, 16 EGGS WERE DEAD 97%		COULD NOT FIND TO CHECK ALTHOUGH OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	2/23/99	145	NOT ATTACHED		10.4 cm x 10.2 cm x 3.6 cm
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	3/31/99	100% HATCHED	YES	SMALL MOSQUITO FISH TRAPPED IN JELLY DIED.	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	2/26/99	68	SOUTHERN RED OAK LEAF		18 g
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/9/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	2/26/99	38	RED OAK LEAF		41 g
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/9/99	4 DEAD EGGS 89% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	2/26/99	107	WOODY STICK		
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	2/26/99	177	NOT ATTACHED		1459
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	2/26/99	160	WOODY STICK		1689
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	2/25/99	75	NOT ATTACHED		619
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	3/4/99	94	NOT ATTACHED		1289
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
12	3/18/99	61	LEAF (UNIDENTIFIED)	SURFACE	1209
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
13	3/18/99	98	TULIP POPULAR LEAF	1 cm	1289
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	100% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
14	3/18/99	68	GRASS STEM	1 cm	138g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
15	3/31/99	115	WHITE OAK LEAF	4.5 cm	350g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
16	3/31/99	97	UNIDENTIFIED LEAF	1.7 cm	170g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
17	FOUND 4/19/99	102	WOODY STICK		110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN			YES	COULD NOT BE FOUND TO CHECK FOR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
18	FOUND 4/19/99	45	OAK LEAF QUERCUS SP.		120g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
19	FOUND 4/19/99	44	WOODY STICK		100g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	2 DEAD EGGS 95% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
20	FOUND 4/19/99	40	WOODY STICK		80g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	100% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
21	FOUND 4/19/99	64	WOODY STICK		90g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
22	FOUND 4/19/99	37	WOODY STICK		70g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
23	FOUND 4/18/99 4/19/99	29	SOUTHERN RED OAK LEAF		61g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)			YES	COULD NOT FIND TO CHECK FOR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
24	4/18/99 (FOUND)	45	LEAF (CANNOT IDENTIFY)		
Color	Date of Hatching	% Hatching	Algae	Notes	
			YES	COULD NOT FIND TO CHECK FOR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

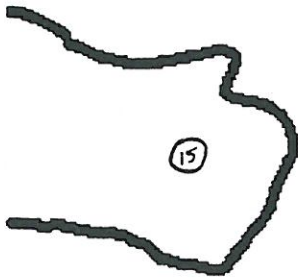
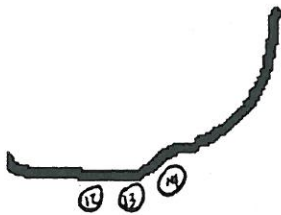
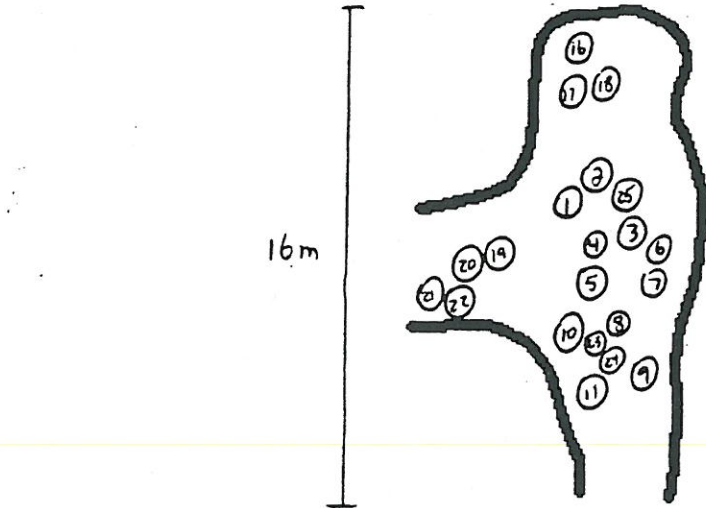
POWHATAN LAKES - LOWER LAKE SITE

ROAD



16m

9m



SPOTTED SALAMANDER EGG MASS DATA SHEET

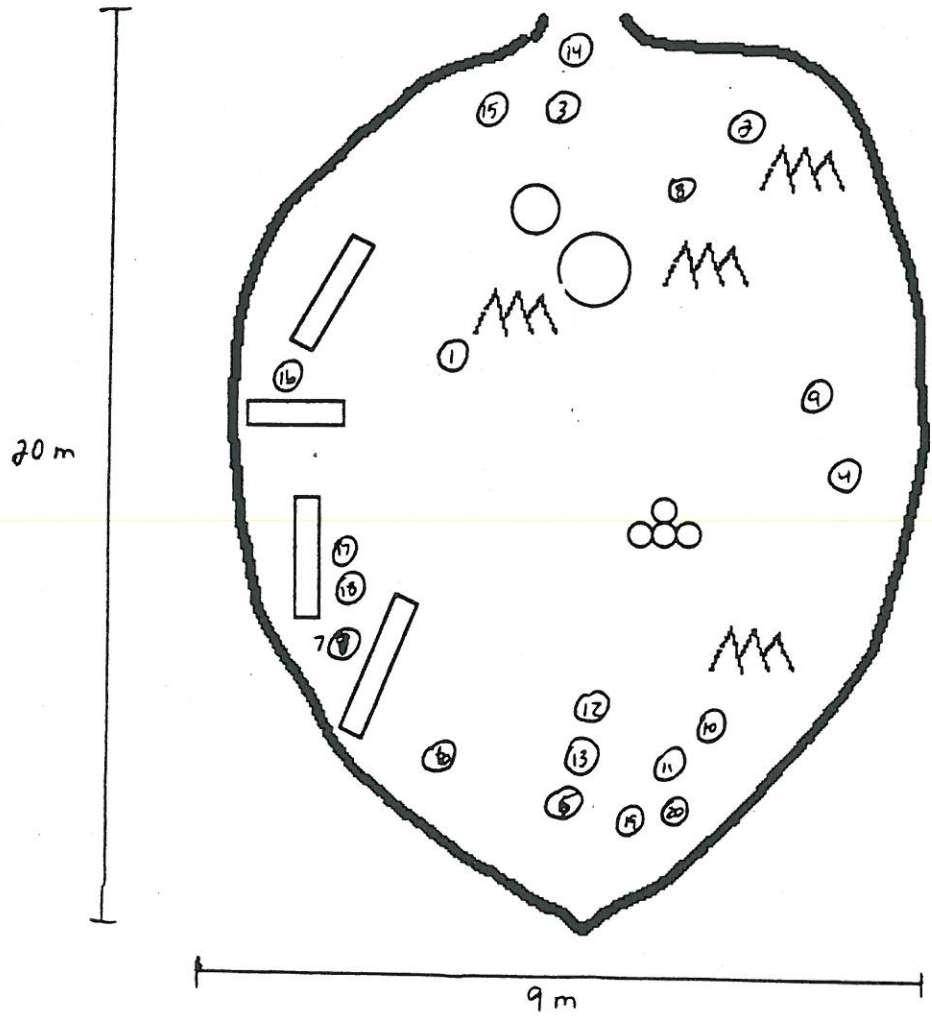
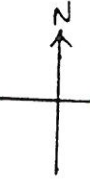
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	3/8/99	145	WATER PLANT STEM	2 cm	240g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	9 DEAD 99% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	3/8/99	126	AMERICAN BEECH LEAF	2 cm	160g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	5 DEAD 96% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	3/8/99	76	NOT ATTACHED	2 cm	138g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	3/8/99	43	WATER PLANT STEM	2 cm	75g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/26/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	3/8/99	150	SWEETGUM LEAF	6 cm	202g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	4 DEAD 97% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	3/8/99	91	WATER PLANT STEM	3 cm	130g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	


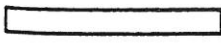
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	3/8/99	73	RED MAPLE LEAF / WATER PLANT STEM	3 cm	72g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/20/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	3/8/99	98	PIN OAK LEAF	1.5 cm	140g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/20/99	40 DEAD 59% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	3/8/99	TO CLOUDY TO COUNT	WOODY STICK	3.5 cm	110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / DARK BROWN				COULD NOT FIND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	3/8/99	112	AMERICAN BEECH LEAF	2 cm	145g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/20/99	7 DEAD 94% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	3/8/99	95	NOT ATTACHED	1.7 cm	122g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/14/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
12	3/8/99	51	GRASS	8 cm	100g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/20/99	3 DEAD 94% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
13	3/8/99	20	WOODY STICK	14 cm	25g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / DARK BROWN				COULD NOT FIND TO CHECK FOR ALGAE OR HATCHING	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
14	3/8/99	29	WATER PLANT STEM	8 cm	70g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN				COULD NOT FIND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
15	3/8/99	134	NOT ATTACHED	11 cm	240g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/20/99	1 DEAD 99% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
16	3/20/99	51	NOT ATTACHED	AT SURFACE	110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				STAGE 26 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
17	3/20/99	109	AMERICAN BEECH LEAF	3 cm	180g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	100% HATCHED	YES	STAGE 26 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
18	3/20/99	26	GRASS	2.5 cm	23g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR			YES	STAGE 7 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
19	3/20/99	93	AMERICAN BEECH LEAF	1 cm	200g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/18/99	100% HATCHED	YES	STAGE 22 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
20	3/26/99	58			21g
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/14/99	100% HATCHED	YES		


Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
21	3/20/99 ^{STAGE 2 EMBRYO}	109	GRASS	3.7 cm	52g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
22	3/20/99	121	NOT ATTACHED	3.5 cm	202g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/18/99	100% HATCHED	YES	STAGE 27 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
23	3/20/99	45	WOODY STICK	2 cm	21g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/26/99	2 DEAD 79% HATCHED	YES	STAGE 12 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
24	3/20/99	85	DEAD PLANT STEM	AT SURFACE	60g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/26/99	17 DEAD 84% HATCHED	YES	STAGE 6 EMBRYO	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
25	4/14/99	58			
Color	Date of Hatching	% Hatching	Algae	Notes	
			YES	FOUND 4/14/99	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

POND 2 SALLE CREEK



 Grassy vegetation
 Log

SPOTTED SALAMANDER EGG MASS DATA SHEET

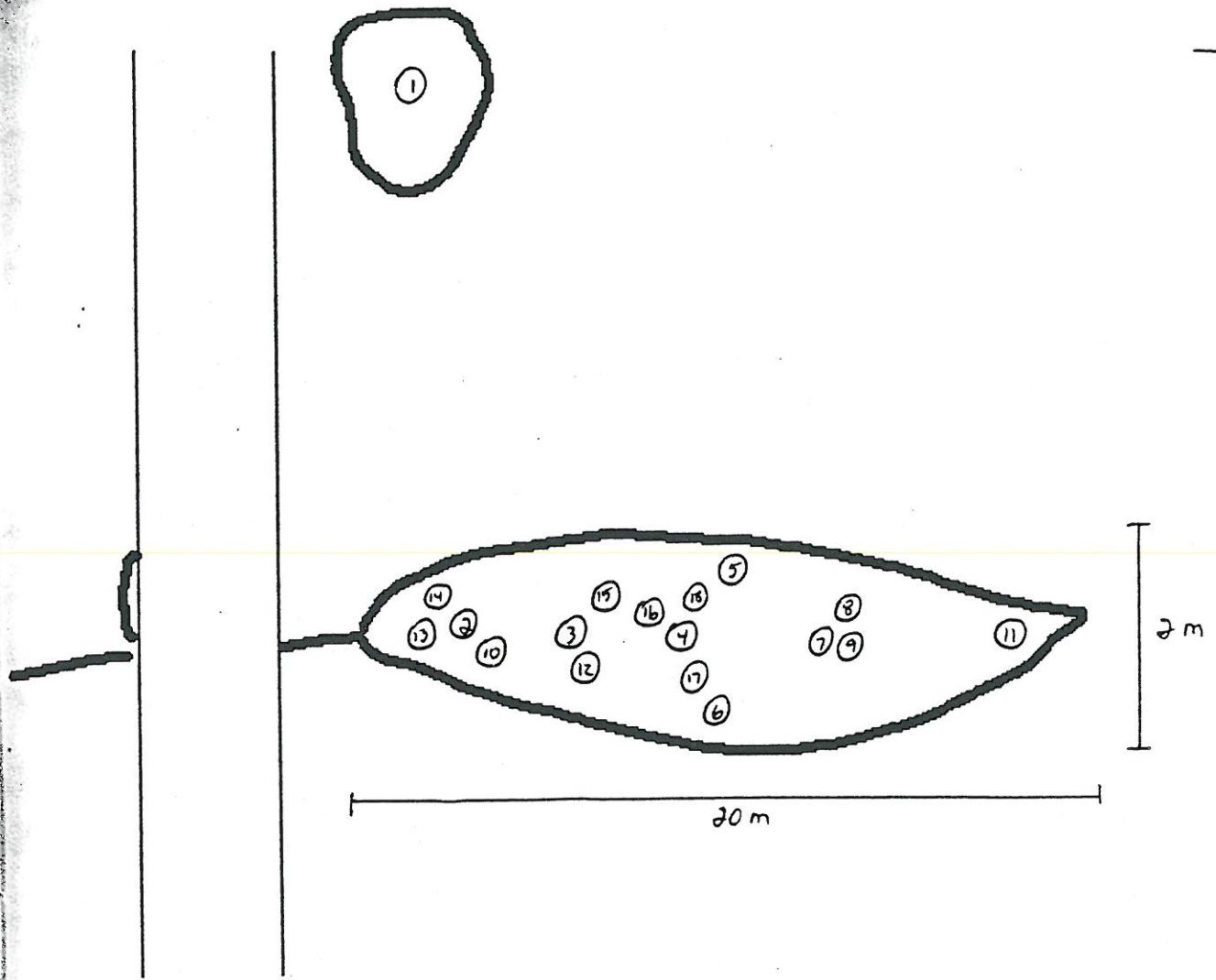
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	2/24/99	78			
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
2	2/24/99	71	DECAYING GRASSY MATERIAL		97 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
3	2/26/99	54	GRASSY MATERIAL		25 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/13/99	11 DEAD 80% HATCHED	YES		
4	2/26/99	107	DECAYING VEGETATION		89 g
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/8/99	100% HATCHED	YES		
5	2/26/99				97 g
Color	Date of Hatching	% Hatching	Algae	Notes	
				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
65	2/26/99	62	GRASSY MATERIAL		70 g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
06	2/26/99	95	GRASSY MATERIAL		22g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR			YES	COULD NOT BE FOUND TO CHECK FOR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
07	2/26/99	57	GRASSY MATERIAL		DID NOT RECORD ?
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/13/99	1 DEAD 98% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
08	3/1/99	114	GRASSY MATERIAL		55g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
09	3/1/99	114	SEEDGE (3 EDGES)		94g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/12/99	1 DEAD 99% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
110	3/1/99	62	GRASSY MATERIAL		46g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/8/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1211	3/1/99	90	GRASSY MATERIAL		50g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/18/99	1 DEAD 99% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
012	3/3/99	67	WOODY BRANCH		67g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN				COULD NOT BE FOUND TO CHECK FOR ALGAE OR HATCHING	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1413	3/8/99	62	NOT ATTACHED		80g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/12/99	3 DEAD 95% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1414	3/16/99	21	GRASS	11.5 cm	40g
Color	Date of Hatching	% Hatching	Algae	Notes	
				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1415	3/16/99	39	GRASS	3 cm	105g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1416	3/16/99	81	WHITE OAK LEAF	7.5 cm	150g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/12/99	4 DEAD 95% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1417	3/16/99	52	WOODY BRANCH	23 cm	DID NOT MEASURE
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1418	3/16/99	26	GRASS	6 cm	90g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN				COULD NOT FIND TO CHECK ON ALGAE OR HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1419	3/16/99	COULD NOT COUNT DUE TO COLOR	GRASS	7 cm	140g
Color	Date of Hatching	% Hatching	Algae	Notes	
DARK BROWN	4/13/99	100% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
20		24	GRASS	9 cm	50g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWN	4/13/99	3 DEAD 88% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

CCC TRAIL ROAD



SPOTTED SALAMANDER EGG MASS DATA SHEET

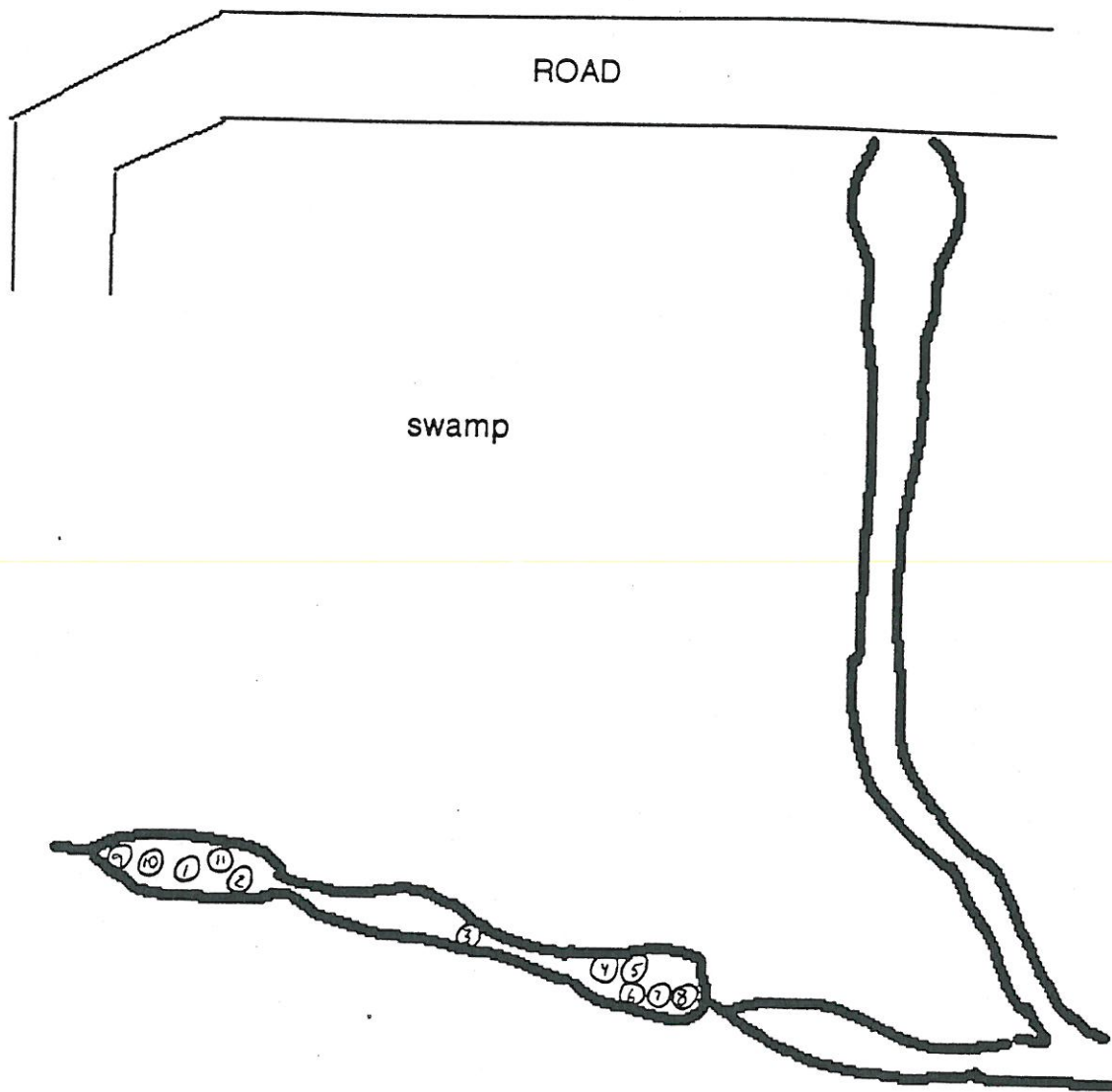
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	3/6/99	90	SOUTHERN RED OAK LEAF	3 cm	143g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/12/99 <small>CHECKED/ NOTHING USABLE</small>	100% MORTALITY	YES	POOL DRIED OUT	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	3/6/99	62			108.7g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	3/6/99	113	GRASS	3.9 cm	156.8g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	3/6/99	97	GRASS	5.6 cm	152.9g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/12/99	5 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	3/6/99	164	GRASS	6.2 cm	380g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/12/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	3/6/99	84	GRASS	6.1 cm	128.2g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	100% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	3/6/99	116	NOT ATTACHED	5.4 cm	156.9g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	3/6/99	89	NOT ATTACHED	5.5 cm	113.7g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	2 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	3/6/99	97	GRASS	5.5 cm	163.6g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/18/99	2 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	3/17/99	60		4.4 cm	170g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	1 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	3/17/99	166	NOT ATTACHED	AT SURFACE	285g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/12/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
12	4/5/99	COULD NOT COUNT	NOT ATTACHED	AT SURFACE	120g
Color	Date of Hatching	% Hatching	Algae	Notes	
OPAQUE *			YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
13	4/12/99	53	JUNCUS SP.	AT SURFACE	240g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/12/99	100% HATCHED	YES	JUST DISCOVERED	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
14	4/12/99	59	JUNCUS SP.	AT SURFACE	110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
15	4/12/99	57	NOT ATTACHED	AT SURFACE	300g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	6 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
16	4/12/99	45	NOT ATTACHED	AT SURFACE	240g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
17	4/12/99	27	GRASS		110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR			YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
18	4/12/99	47	JUNCUS SP.	AT SURFACE	135g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/22/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

SUNFISH POND ASSOC. SWAMP SITE

Sunfish pond

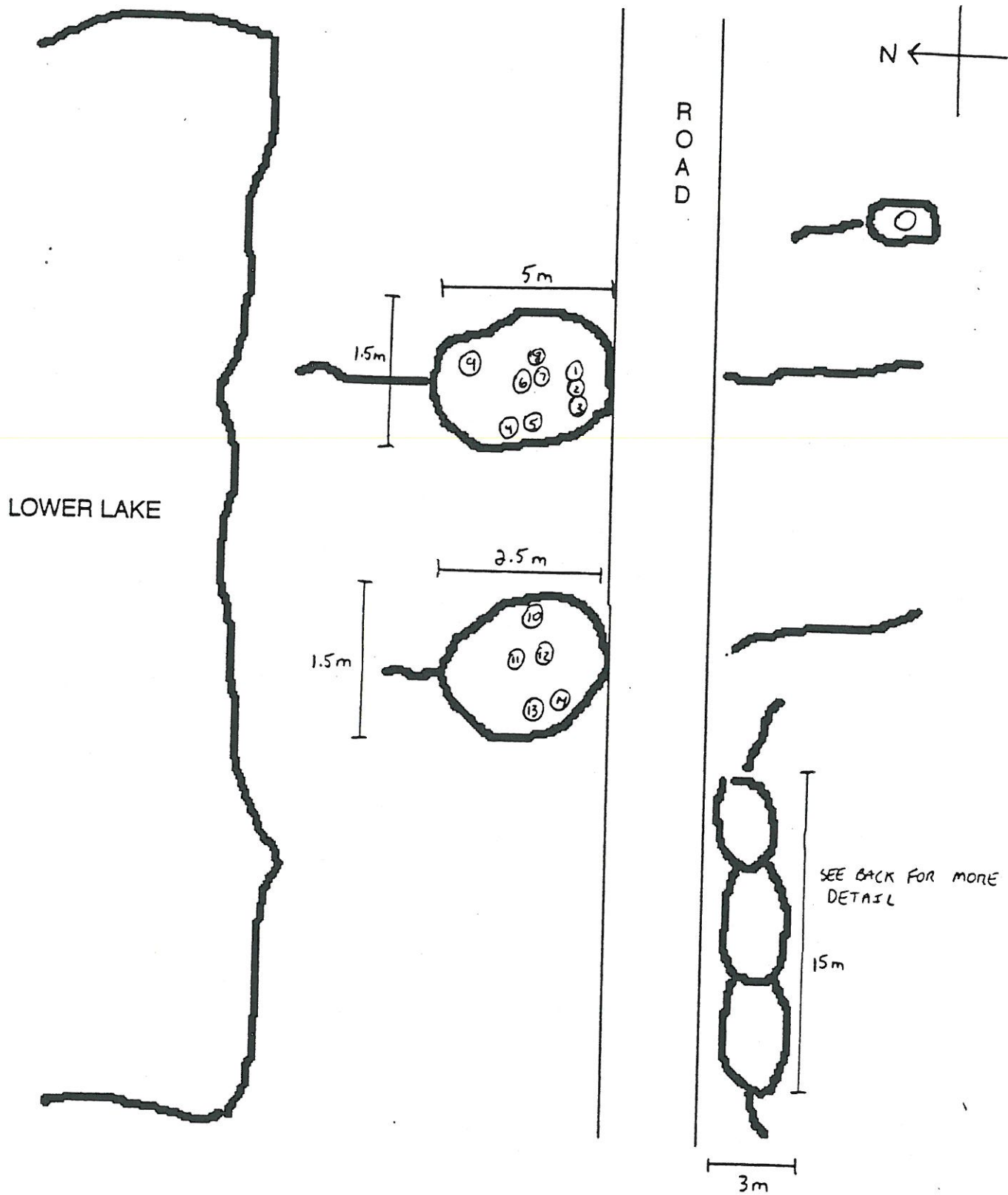


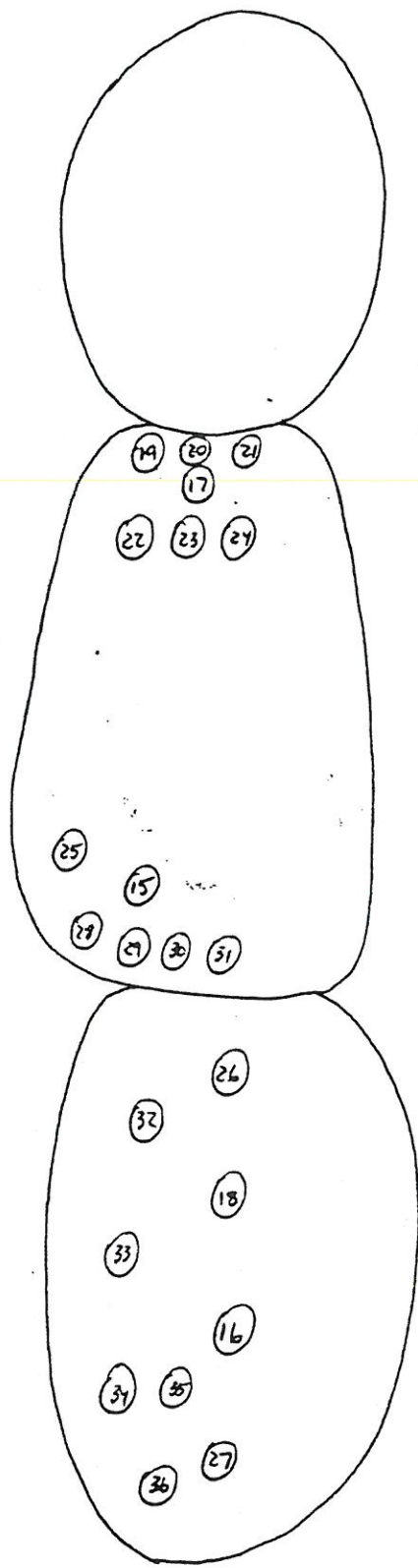
SPOTTED SALAMANDER EGG MASS DATA SHEET

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	3/14/99	26	WOODY STICK	2 cm	50g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR			YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	3/14/99	80	NOT ATTACHED	1.8 cm	118g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/25/99	100% HATCHED	YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	3/14/99	CAN NOT COUNT	LEAF MATTER	2 cm	160g
Color	Date of Hatching	% Hatching	Algae	Notes	
GREENISH OPAQUE			YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	3/14/99	75	WOODY STICK	2 cm	220g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / GREEN			YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	3/14/99	TO CLOUDY TO COUNT	SALIX SP. LEAF	1.5 cm	270g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / GREEN			YES	FOUND AT STAGE 29-35 COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	3/14/99	94	LEAF	AT SURFACE	245g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / GREEN			YES	COULD NOT FIND TO CHECK ON HATCHING	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	3/14/99	29	SALT SP. UCAF	AT SURFACE	72g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / GREEN			YES	FOUND AT STAGE 30 35 COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	3/14/99	71	NOT ATTACHED	1 cm	50g
Color	Date of Hatching	% Hatching	Algae	Notes	
DEAR / GREEN			YES	COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	3/27/99	55	WOODEN STICK	2.6 cm	68g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / BROWNISH			YES	FOUND AT STAGE 12 COULD NOT FIND TO CHECK ON HATCHING	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	3/27/99	53	NOT ATTACHED	3.3 cm	82g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR / GREENISH	4/25/99	100% HATCHED	YES	FOUND AT STAGE 14	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	3/27/99	93	WOODEN STICK	4 cm	140g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/25/99	100% HATCHED	YES	FOUND AT STAGE 12	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

POWHATAN LAKES LOWER LAKE SITE 2





SPOTTED SALAMANDER EGG MASS DATA SHEET

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
1	3/8/99	11	STICK	8 cm	DID NOT PULL OFF STICK
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/26/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
2	3/8/99	61	WOODY STICK	8 cm	100g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
3	3/8/99	67	WOODY STICK	8 cm	105g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
4	3/8/99	116	GRASS / STICK	2.2 cm	160g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
5	3/8/99	98	SWEET GUM LEAF	2.1 cm	140g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/26/99	100% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
6	3/8/99	119	WOODY STICK	7.5 cm	160g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
7	3/8/99	109	WOODY STICK	7.5cm	170g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR			YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
8	3/8/99	103	GRASS	7.5cm	150g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
9	3/8/99	117	WOODY STICK	1.3cm	110g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
10	3/8/99	65	GRASS BLADE		85g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
11	3/8/99		GRASS BLADE		180g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
12	3/8/99		GRASS BLADE		87g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
13	3/8/99	37	GRASS BLADE		69g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/26/99	11 DEAD 70% HATCHED	YES		

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
14	3/18/99	81	GRASS BLADE		200g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR	4/20/99	9 DEAD 81% HATCHED	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
15	3/18/99	86	RED MAPLE LEAF / STICK	.8 cm	150g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ AMBER					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
16	3/18/99	88	RED MAPLE LEAF	.5 cm	120g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	81 DEAD	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
17	3/11/99	85	WOODY STICK	2.8 cm	83g
Color	Date of Hatching	% Hatching	Algae	Notes	
AMBER/ CLEAR					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
18	3/11/99	22	RED MAPLE LEAF	3 cm	12g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN	4/20/99	100% MORTALITY	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
19	3/20/99	57	WOODY STICK	3.3 cm	42g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN			YES	STAGE 1 EMBRYO (EGG)	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
20	3/20/99	34	RED MAPLE LEAF	3 cm	36g
Color	Date of Hatching	% Hatching	Algae	Notes	
CLEAR/ BROWN		21 DEAD	YES	STAGE 2 EGGS	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
21	3/20/99	87	NOT ATTACHED	3.3 cm	54g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)			YES	STAGE 1 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
22	3/20/99	30	AMERICAN BEECH LEAF	3.9 cm	20g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)				STAGE 4 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
23	3/20/99	139	AMERICAN BEECH LEAF	3.2 cm	100g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)				STAGE 4 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
24	3/20/99	50	NOT ATTACHED	AT SURFACE	47g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)				STAGE 5 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
25	3/20/99	90	AMERICAN BEECH LEAF	2.9 cm	70g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)				STAGE 4 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
26	3/20/99	19	RED MAPLE LEAF	3 cm	17g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR)				STAGE 4 EGGS	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
27	3/20/99	46	WOODY STICK	3.5 cm	39 29 g
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR)				STAGE 3 EGGS	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
28	4/14/99	46	BEECH LEAF	AT SURFACE	
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)					
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
29	4/14/99	CAN'T COUNT	MARPLE LEAF (LINED) / OAK LEAF	AT SURFACE	
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)			YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
30	4/14/99	20	WOODY STICK		
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
31	4/14/99	75	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
		100% MORTALITY			
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
32	4/14/99	33	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
				STAGE 29	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
33	4/14/99	39	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
(CLEAR/ BROWN)	4/26/99	30 OCTO 49% HATCHED		STAGE 29	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
34	4/14/99	46	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
			YES	STAGE 29	

Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
35	4/14/99	60	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
		100% MORTALITY	YES		
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
36	4/14/99	64	NOT ATTACHED		
Color	Date of Hatching	% Hatching	Algae	Notes	
	4/26/99	21 DEAD 67% HATCHED		STAGE 29	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
37					
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	
Mass #	Date of Deposition	# of Eggs	Attachment Substrate	Depth (cm)	Mass (g)
Color	Date of Hatching	% Hatching	Algae	Notes	

APPENDIX 4

SUMMARY OF EGG MASS DATA FOR AMBYSTOMA MACULATUM BREEDING POOLS.

Location	Number of eggs	Attachment substrate	Depth (cm)
Pond 1	(57 ± 29, 8-122, n = 32)	Wood 11 Grass 9 Hardwood leaf 3 Not attached 7 Metal flag pole 1	(5.4 ± 4, .5-13, n = 14)
	Mass (g)	% Hatching	Algae
	(79.6 ± 43, 10-180, n = 25)	(95 ± 6.4, 80-100, n = 16)	Algae present 19, n = 19 The rest of masses could not be found to observe.
Location	Number of eggs	Attachment substrate	Depth (cm)
Bull Beaver Pond	(84 ± 40.4, 29-177, n = 24)	Wood 7 Grass 2 Hardwood leaf 9 Not attached 4 Juncus sp. 1	(1.6 ± 1.5, 0-4.5, n = 5)
	Mass (g)	% Hatching	Algae
	(119 ± 69.5, 18-350, n = 19)	(97 ± 5.6, 80-100, n = 20)	Algae present 22, n = 22 The rest of masses could not be found to observe.
Location	Number of eggs	Attachment substrate	Depth (cm)
Lower lake site	(83 ± 37.4, 20-150, n = 24)	Wood 3 Grass 3 Hardwood leaf 7 Not attached 5 Water plant stem 5	(3.7 ± 3.4, 0-14, n = 23)
	Mass (g)	% Hatching	Algae
	(118.3 ± 67.4, 21-240, n = 24)	(89 ± 22.9, 7-100, n = 17)	Algae present 19, n = 19 The rest of masses could not be found to observe.
Location	Number of eggs	Attachment substrate	Depth (cm)
Pond 2	(67 ± 27.8, 21-114, n = 19)	Wood 2 Grass 15 Hardwood leaf 1 Not attached 1 Sedge sp. 1	(9.6 ± 6, 3-23, n = 7)
	Mass (g)	% Hatching	Algae
	(75.9 ± 34.7, 22-150, n = 18)	(95 ± 6.2, 80-100, n = 10)	Algae present 11, n = 11 The rest of masses could not be found to observe.

Location	Number of eggs	Attachment substrate	Depth (cm)
CCC Trail Road	(83 ± 39.4, 27-166, n = 16)	<u>Juncus sp.</u> 3 Grass 6 Not attached 6	(2.8 ± 2.7, 0-6.2, n = 15)
	Mass (g)	% Hatching	Algae
	(181 ± 78, 108.7-380 n = 17)	(98 ± 2.9, 89-100, n = 15)	All egg masses had algae present.
Location	Number of eggs	Attachment substrate	Depth (cm)
Sunfish pond assoc. swamp	(64 ± 23.7, 26-94, n = 9)	Grass 1 Wood 4 Not attached 3 Hardwood leaf 3	(1.8 ± 1.2, 0-4, n = 11)
	Mass (g)	% Hatching	Algae
	(134 ± 76.4, 50-270, n = 11)	(100 ± 0, n = 3) This area was a stream and many egg masses were washed away.	All egg masses had algae present.
Location	Number of eggs	Attachment substrate	Depth (cm)
Lower lake site 2	(67 ± 33, 11-139, n = 33)	Grass 7 Hardwood leaf 11 Wood 10 Not attached 8	(4 ± 3.2, 0-13, n = 24)
	Mass (g)	% Hatching	Algae
	(96 ± 54, 12-200, n = 26)	(46 ± 38, 0-100, n = 11)	Algae present 13, n = 13 The rest of masses could not be found to observe.
Average	Number of eggs	Attachment substrate	Depth (cm)
Final data summary	(71.9 ± 35.4, 8-177, n = 158)	Grass 43 Not attached 34 Wood 37 Hardwood leaf 34 <u>Juncus sp.</u> 4 Water plant stem 5 Metal flag pole 1 Sedge sp. 1	(4 ± 3.8, 0-23, n = 99)
	Mass (g)	% Hatching	Algae
	(111 ± 68, 10-380, n = 140)	(89 ± 23.6, 0-100, n = 93)	Algae present 112, n = 112. The rest of masses could not be found to observe.