

HABITAT PREFERENCE AND DISTRIBUTION OF
SALAMANDER SPECIES IN SLAGLE HOLLOW,
STEELE CREEK PARK
(SULLIVAN COUNTY, TENNESSEE)

Special Problems in Biology II
Mrs. Dickerson
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by
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and Derek Slagle

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Table of Contents

I.	Acknowledgements	ii
II.	Abstract	1
III.	Introduction	2
IV.	Methods and Materials	6
V.	Results	8
VI.	Discussion	11
VII.	Tables and Figures	16
VIII.	Appendix A- Data Sheets (1-20)	30
IX.	Appendix B- Howard Hughes Research Grant/ Park Permission	51
X.	Works Cited	54

Tables and Graphs

Table 1. Coordinates of Plot	16
Table 2. Salamander Species in Slagle Hollow	17
Table 3. Ravine Salamanders Compared to Cover Object	18
Table 4. Plot Characteristics	19
Table 5. Comparison of Ravine and N. Dusky Salamanders to Water Presence	20
Figure 1. Map of Plots	21
Figure 2. Plot Diagram	22
Figure 3. Snout-Vent Length	23
Figure 4. Salamander Composition	24
Figure 5. Salamander Species	25
Figure 6. Ravine Cover Object	26
Figure 7. Number of Ravine Salamanders	27
Figure 8. Standard Error of Mean	28
Figure 9. Ravine Mean vs. Average Distance from Water	29

Abstract

Slagle Hollow, located in Steele Creek Park, Sullivan County, Tennessee, comprises 1,200 acres. This hollow is home to several different species of salamanders, yet the factors that affect their distribution are unknown. Through twenty research plots, four identified salamander species were located. They included the Ravine Salamander (*Plethodon richmondi*), Northern Dusky salamander (*Desmognathus f. fuscus*), Blue Ridge Two-Lined salamander (*Eurycea wilderae*), and a new park record, the Blue-Ridge Spring salamander (*Gyrinophilus p. danieli*). Four unidentified salamanders were also located, which are thought to be Blue-Ridge Spring larvae. The Ravine average distance from water was affected by the mean length of the Ravines in each plot. The moisture levels of each plot were also found to be a factor on the Ravine distribution. The distribution of the Northern Dusky and Blue-Ridge Two-Lined salamander was affected by the presence of year-round water.

Introduction

Salamander is the common name for approximately 350 species of tailed amphibians. Their name is derived from an old Arab/Persian word that means "lives in fire", stemming from an old false myth stating that salamanders could walk through fire and remain unharmed (Intro to Salamanders, 2001). They are found in the order Caudata and account for several different families. There are three main types of salamanders. These include: aquatic, which live permanently in water, semi-aquatic, which live in water as larvae and while breeding, and terrestrial, which live their entire life on land.

Salamanders can live up to sixty years. They have a pair of front and hind legs and slender bodies with smooth moist skin. Salamanders are usually described by their length (measured snout to vent) and their number of costal grooves (grooves on the side of their body). They are normally 10-15 cm in length, but can be 70 cm long. Salamanders have good vision, but they are voiceless and deaf to airborne sounds. They hear and feel by sensing vibrations from the ground. Salamanders are carnivorous organisms, usually feeding on insects, worms, snails, and other small prey.

Salamanders are typically nocturnal and only active when moisture and temperature levels are suitable for them. As with other amphibians, salamanders absorb water directly through their skin. Hence, they are constantly trying to avoid desiccation. For this reason, they are found in cool moist environments and restrict their activity to periods of rainfall or high humidity (Grover, 2000). They are usually located under logs, rocks, and leaves near a creek or stream.

Several examples of salamanders located in Eastern Tennessee would include the Northern Dusky, Ravine, Blue Ridge Spring, and Blue Ridge Two-Lined.

The Northern Dusky salamander (*Desmognathus fuscus fuscus*) is normally brown or gray, but with a great variation in patterns. It has a knife-edged tail and usually a pale diagonal line from its eye to the angle of its jaw. They are normally 6-14 cm long. Northern Dusky salamanders are very quick and agile, as well as excellent burrowers and jumpers. They are also difficult to catch due to their slimy bodies. The Ravine salamander (*Plethodon richmondi*) is normally lead colored, with bronze or brassy specks on its back and white blotches and dots on its lower side and belly. The Ravine salamander is frequently called a "worm with legs", due to a long, slender body and short legs (Conant and Collins, 1998). It is usually 7.5-11.5 cm long, with approximately 19-22 costal grooves. Blue Ridge Spring Salamander (*Gyrinophilus porphyriticus danieli*) is a reddish or rich salmon color. It has scattered black spots on its back, as well as a white mottled lower jaw. A distinctive characteristic of this salamander is a white line from its eye to its nostril, bordered below by a conspicuous black or dark brown line. The Blue Ridge Spring salamander is usually 12-19 cm in length. The Blue Ridge Two-Lined Salamander (*Eurycea wilderae*) is normally a brownish yellow color, with two broad black stripes that break up into dots at the middle of its tail. It is usually 7-10.7 cm long, with 14-16 costal grooves. Northern Dusky, Ravine, Blue Ridge Spring, and Blue Ridge Two-lined salamanders are all found under rocks and logs along the creeks and streams of the Southern Appalachian region of Eastern Tennessee.

There is little information on salamander density and distribution. Furthermore, the factors that influence salamander distribution in their environments are not fully understood. Such things as soil and forest characteristics have been thought to affect

their density. Past researchers have studied the relationships between salamanders and forest management, soil moisture and pH, and their prey's density.

Research shows that forest management greatly influences salamander distribution. It reveals that salamanders are more predominant in old growth forests (>120 years), than in second growth forests (70-80 years) or regeneration cut forests (<5 years) because regeneration cutting removes canopy cover and increases light penetration. This leads to an increase in soil temperature, and a decrease in soil moisture and leaf litter. Therefore, mature forests support more salamanders (Herbeck and Larsen, 1999).

Studies also reveal that soil moisture and pH affect salamander distribution. Soil pH has been shown to be a more influential factor than soil moisture, though moisture would be expected to have a larger impact on the distribution. The research also shows that salamanders prefer high soil pH and moisture levels. There is no particular reason why the salamanders are affected by the pH more than the moisture (Sugalski and Claussen, 1997).

Other research shows that salamander distribution is influenced by the density of prey in their environment. Salamanders tend to be found in areas with high densities of snails, insects, worms, and other small prey. The density of these invertebrates may influence the distribution of salamanders more than other factors (Harper and Gynn, 1999).

The relationship between salamanders and their environment is not completely understood. Many different factors seem to influence their distribution. Past research

has not been successful in fully explaining the factors that affect salamanders and their distribution.

This project was initiated because of the lack of information about salamander distribution in Steele Creek Park of Sullivan County, Tennessee. In the spring of 1998, Katrina Williams performed an inventory of the salamander species of the park. Williams' research showed that there were a large number of Ravine salamanders in Slagle Hollow of Steele Creek Park (Williams, 1998). Because the Ravine salamander is only found in the northeastern part of Tennessee (Scott, 1995), further research was needed to study the Ravine salamanders that occur in large numbers in the Park. This study was developed as a follow-up to William's paper research, as well as to add to the Steele Creek Park Natural History records on salamander distribution. It was also performed to add to the current information on salamanders and their relationship to their environment. In this project, factors such as temperature, pH, vegetation, and creek characteristics were studied to attempt to determine the factors that influence salamander density and distribution.

Methods and Materials

This study of salamander distribution was performed at Slagle Hollow in Steele Creek Park of Bristol, Tennessee during the months of March and April of 2001. It covered approximately five weeks, starting on March 21, 2001 and ending on April 22, 2001. Slagle Hollow is a thirty-minute hike through the mountains of Steele Creek Park. It is composed of 1,200 acres and is a self-contained watershed. The creek that was followed in this study was Slagle Creek (Figure 1). The presence of this creek depends on the amount of rain that it receives. By summer, most of the creek is dried out. The only place where the creek remains somewhat permanent is beyond Jackson's Camp, where water is usually present for ten months of the year.

At the beginning of Slagle Hollow, a 15-meter (diameter) circular plot was measured with a 50-meter tape, with the center of the circle being in the middle of the creek (Figure 2). After plotting the area, the salamanders in the plot were located by looking under the rocks and logs in the creek and on the surrounding land. Occasionally salamanders were found in leaf litter or just swimming in the water. When a salamander was located, it was placed in a ziplock bag with either water or leaf litter, depending on where it was found. The salamanders were then identified with the help of a *Peterson's Field Guide to Reptiles and Amphibians of Eastern/Central North America*. They were measured by their head-body length, also known as snout-vent length, using a caliber. The salamanders were measured from the tip of their snout to their anal slit, or vent (Figure 3). The following data was collected on the salamanders: common name, size in millimeters, cover object (rock/log/ leaf litter), location (water/land), and distance from water. In addition to recording the salamanders of the plot, the plot characteristics were

also recorded on the data sheet. The location of the plot was determined by using a GPS (Global Positioning System) unit. GPS is a worldwide radio-navigation system that is formed by 24 satellites and their ground stations (Trimble, 2001). The latitude and longitude of the plot was recorded in degrees, minutes, and seconds (Table 1). The GPS coordinates were off due to the signals bouncing off of the mountains. The coordinates were altered to fit the map of Slagle Hollow. The general weather conditions, air and water temperatures, and characteristics of the creek were also recorded. These included: the presence or absence of water in the plot, and the width and the depth of the creek. The measurements were made using a 50- meter tape. Next, a water sample was taken and tested using a LaMotte® pH kit. A soil sample was also taken from each plot for pH testing. The soil samples were then dried overnight and tested with a LaMotte® soil pH kit at a lab. After recording the creek data, the land characteristics were determined. All of the trees greater than 12.7 cm (dbh), or diameter breast height, were recorded. All of the rocks on land greater than 12.5 cm (length) as well as all of the logs in the creek and on the land were also recorded. The rocks in the creek, or creek bed, were not measured due to their vast numbers. If there was a mass of downed logs, it was also recorded on the data sheet. When a plot was completed, a meter tape was used to measure 50 meters from the center the plot. This new point, 50 meters away from the original, became the center of the next plot (Figure 2). This was done in order to keep the plots random. Any other organisms that were sighted were noted on the data sheets.

Results

In this salamander study of Slagle Hollow, a total of sixty-four salamanders were found in 20 plots. Four species were recorded, including one new park record, the Blue Ridge Spring salamander (*Gyrinophilus porphyriticus danielsi*). Of the sixty-four salamanders found, fifty-eight percent were Ravine salamanders (*Plethodon richmondi*), thirty-one percent were Dusky salamanders (*Desmognathus fuscus fuscus*), three percent were Blue Ridge Two-Lined salamanders (*Eurycea wilderae*), two percent was a Blue Ridge Spring salamander (*Gyrinophilus porphyriticus danielsi*), and six percent were unidentified salamanders (Figure 4, Table 2). *Plethodon richmondi* was found in Plots 1-16, *Desmognathus f. fuscus* was found in Plots 17-20, *Eurycea wilderae* was found in Plot 20, and *Gyrinophilus p. danielsi* was found in Plot 1 (Figure 5). Plot 9 was not studied due to a high number of downed trees.

The *Gyrinophilus p. danielsi* that was found in Plot 1 was a new Steele Creek Park record. It was found during the afternoon of March 21, 2001. The *Gyrinophilus p. danielsi*, or Blue Ridge Spring salamander, was 89 mm in length and was found under a relatively large downed log, located 0.4 meters from the creek. This was a day of consistent rainfall and an air temperature of 8.5°C. The water pH of the site was 6.7 and the soil pH was 5.5. The creek temperature was 7.5°C and the air temperature was 8.5°C. For positive identification of the salamander, it was taken to the park naturalist to be identified by description in Conant and Collins as *Gyrinophilus p. danielsi*. Several pictures of the salamander were taken and it was documented in the park records.

The Ravine salamander (*Plethodon richmondi*) was recorded in Plots 1-16 of Slagle Hollow. It was found on land under rocks, logs, tree bark, and in the leaves.

Fifty-seven percent of the time Ravines were found under rocks, thirty-seven percent of the times they were found under logs, and three percent of the time under bark and leaves, respectively (Figure 6). Although *Plethodon richmondi* was found under rocks more than logs, there were a greater number of rocks than logs in the hollow (Table 3). The water pH of Plots 1-16 remained at 6.7 and the soil pH fluctuated between 5 and 7.3 (Table 4). The water temperature stayed between 7.5° and 11°C and the air temperature changed from 8.5° to 37°C (Table 4). The water was consistently flowing until Plot 13, where the creek became dry. From Plot 13 to Plot 16, the creek was barely running, if present at all. Although soil moisture was not recorded in the data sheets, it was observed that by Plot 13, the ground was becoming much drier and losing moisture. It was also observed that as the plots became drier, the number of *Plethodon richmondi* decreased (Figure 7). From Plot 13 to 20, there was usually a mass of downed trees and logs at each plot.

From Plots 17-20, the creek appeared to have constant moisture, due to historic information, pools of water, and the presence of fish (Jackson 1970). In these plots, the first aquatic salamanders were found, but no *Plethodon richmondi* were located. In Plots 17, 18, and 19, four Northern Dusky salamanders (*Desmognathus f. fuscus*) were found, including one dead one. The water pH was between 6.7 and 6.8, and the soil pH ranged from 5.5 to 7 (Table 4). The water temperature remained at 11°C and the air temperature was between 17° and 24°C (Table 4). At Plot 20, the air temperature reached 29°C and the water temperature reached 16°C (Table 4). The water pH raised slightly to 6.9 and the soil pH became 6.5 (Table 4). At Plot 20, twenty *Desmognathus f. fuscus* were found, along with two Blue-Ridge Two-Lined (*Eurycea wilderae*), and four unidentified

salamanders (Figure 5). The unidentified salamanders were later thought to be Blue-Ridge Spring larvae. Plots 17-20 where the only plots where the "aquatic" salamanders were located.

Discussion

This study of the habitat preference/distribution of the salamanders of Slagle Hollow, Steele Creek Park yielded four identified species. The Ravine salamander (*Plethodon richmondi*) was the most common, followed by the Northern Dusky (*Desmognathus f. fuscus*), the Blue-Ridge Two-Lined (*Eurycea Wilderae*), and the Blue Ridge Spring (*Gyrinophilus p. danieli*).

The Blue Ridge Spring salamander that was located in Plot 1 was a park record found on March 21, 2001, the only day of rain on which the research was conducted. The Blue Ridge Spring was found under a large log beside the creek, a typical place for this species (Conant and Collins, 1998). This salamander is nocturnal as an adult, and its activity is usually restricted to periods of rainfall (Salamanders of VA). Although this was the first time that the Blue Ridge Spring salamander was found in Steele Creek Park, its status in the park is questionable. According to Mr. Hamed, the Steele Creek Park naturalist, very little or no research on the salamanders of Slagle Hollow has been performed on rainy days (Hamed, 2001). Therefore, the status of the Blue Ridge Spring salamander is unknown. Future research is recommended to determine the status of this salamander in Slagle Hollow.

The Ravine salamander (*Plethodon richmondi*) was the most common species found in Slagle Hollow. Thirty-seven Ravines were located in Plots 1-16, making up fifty-eight percent of the total number of salamanders found in this study. The total number of Ravines, as well as the average size of the Ravines, was compared to several different factors. These factors included: the presence of water, air and water temperature, water and soil pH, width and depth of stream, and the number of rocks, logs,

and trees. Very few of the factors that were studied affected to distribution of the Ravine salamander.

The distribution of the Ravine salamander was studied by comparing their total numbers and mean length to several different habitat factors. When the total number of Ravine salamanders was compared to the water pH, soil pH, water temperature, and air temperature of each plot, no significant correlation was seen. When the Ravine mean length of each plot was compared to the same factors, there was, once again, no correlation seen.

The cover objects used by the Ravine salamander was also studied. The Ravines were located under rocks, logs, tree bark, and leaf litter. In the analysis of the Ravine's cover object preference, several different things were studied. The number of Ravines from Plots 1-16 was compared to the cover object under which they were found. Of the thirty-seven Ravines found, twenty-two were found under rocks (57%), sixteen under logs (37%), one under tree bark (3%), and one under leaf litter (3%) (Figure 6). After this comparison, the number of available cover objects (rocks and logs) in Plots 1-16 was then analyzed. Only Plots 1-16 were studied because Plot 16 was the last plot that a Ravine was located. A total of 460 rocks and 299 logs were found in the first sixteen plots (Table 3). Although there were a greater number of Ravines found under rocks than logs, a cover object preference could not be determined simply because there were more rocks than logs in the hollow. Therefore, more Ravines were found under rocks than logs because more rocks were available.

The size of the Ravine salamanders was also compared to their cover objects to determine a preference. The Ravines were broken down into four categories: 0-25mm,

25-35 mm, 35-45mm, and 45+. The Ravine data was then placed in the proper class and compared to the cover object under which they were located. This analysis also showed no significant correlation.

The Standard Deviation (SD) and Standard Error of Mean (SEM) of the Ravine snout-vent length were also calculated. The SEM showed that there was a significant difference in the mean snout-vent length of Ravine salamanders between Plots 2, 4, and 6 (Figure 8). When the habitat factors and characteristics of these plots were compared, no correlation was seen. Therefore, some factor that was not studied, affected the mean snout-vent length of the Ravine salamander in Plots 2, 4 and 6.

Another analysis of the Ravine data was the comparison of the number of Ravines in each plot to their average distance from water. A correlation was finally seen in this comparison. The average distance from water of the Ravines followed the number of Ravines in each plot (Figure 9). This meant that, as the number of Ravines increased, they were found further away from the creek. As the number of Ravines decreased, they were found closer to the creek. This shows that a large population of Ravine salamanders is found further away from the water, and a small population is found closer to water. This correlation also shows that Ravine salamanders are found near water, which follows the idea that salamanders need to be in a moist environment, usually near a creek or stream (Conant and Collins, 1998). Therefore, the Ravine salamander's distance from water is affected by

The only other correlation seen between the Ravines and their habitat was moisture levels of the soil as compared to the number of Ravines found in a plot. Although the soil moisture was not studied, the authors observed that from Plot 13 to 20,

the ground gradually lost moisture. From Plots 1-12, the soil under rocks and logs was usually cool and moist. From Plots 13-20, the soil became warmer and drier. With this change in soil moisture, an observation was made with the Ravines of each plot. As the soil lost moisture, the number of Ravines in each plot decreased (Figure 7). This was due to the fact that salamanders need a cool moist environment to survive. Hence, the Ravines burrowed deeper into the ground to where the soil was cooler and had more moisture (Hamed, 2001). Therefore, the number of salamanders is affected by the moisture levels of the soil.

The Northern Dusky salamander (*Desmognathus f. fuscus*) was the second most common species found in Slagle Hollow. The N. Dusky was not located until Plot 17. After it was first located, it was seen from Plots 17 to 20. The same habitat factors (pH and temperature) were studied with the N. Dusky, but no correlation was found. Along with the N. Dusky salamanders of Plot 20, two Blue Ridge Two-Lined salamanders (*Eurycea Wilderae*) and four unidentified salamanders were also found. The unidentified salamanders were later thought to be Blue-Ridge Spring larvae, due to two main factors. The Blue-Ridge Spring salamander lays its eggs in July or August (Salamanders of VA). If a Blue-Ridge Spring salamander laid its eggs during July or August of 2000, the salamanders would be the same size (age) as the unidentified salamanders that were recorded in April 2001 (Data Sheet 20). After comparing pictures of Blue-Ridge Spring larvae to pictures taken during the research, the authors felt that the unidentified salamanders could possibly be Blue-Ridge Spring larvae. The reason of the appearance of "aquatic" salamanders was due to a year-round presence of water, as seen by pools of water and the presence of fish (Jackson, 1971) (Table 5). The N. Dusky and Blue Ridge

Two-Lined were not found in the previous plots because they lay their eggs in or near water, and live in the water as larvae (Behler and King, 1998).

The research project Habitat Preference and Distribution of Salamander Species in Slagle Hollow, Steele Creek Park (Sullivan County, TN) revealed several different things. The Blue-Ridge Spring salamander (*Gyrinophilus p. danielsi*), a new Steele Creek park record, was found during the research. The project also showed that soil moisture levels affect the Ravine salamanders (*Plethodon richmondi*), and that Ravine population size in a given area follows the Ravine average distance from water. The research showed that "aquatic" salamanders stay in areas of permanent water because they lay their eggs in or near water, and live their larvae stage in the water. Future research is recommended to study any other factors than the ones included in this study. They may include salamander prey, soil moisture, canopy cover, and other areas in Slagle Hollow. It is also recommended that more research is conducted on the Ravine salamanders, as well as the Blue-Ridge Spring salamanders, of Slagle Hollow, Steele Creek Park.

Table 1. Coordinates of Plots

Plot #	Latitude	Longitude
1	36°33'40.3"	82°14'54.1"
2	36°33'39.3"	82°14'55.4"
3	36°33'37.0"	82°14'59.7"
4	36°33'36.5"	82°14'57.4"
5	36°33'35.8"	82°14'58.4"
6	36°33'34.2"	82°14'59.5"
7	36°33'34.8"	82°15'3.8"
8	36°33'33.8"	82°15'5.7"
9	36°33'33.7"	82°15'8.1"
10	36°33'31.9"	82°15'9.5"
11	36°33'30.6"	82°15'10.5"
12	36°33'29.9"	82°15'10.5"
13	36°33'29.5"	82°15'12.0"
14	36°33'28.1"	82°15'13.9"
15	36°33'26.9"	82°15'15.9"
16	36°33'25.9"	82°15'16.6"
17	36°33'24.3"	82°15'16.9"
18	36°33'23.4"	82°15'16.9"
19	36°33'24.4"	82°15'14"
20	36°33'20.0"	82°15'19.9"

Table 2. Salamander species in Slagle Hollow

Species	Number Found	Mean S-V Length	Longest Found	Smallest Found
<i>Plethodon richmondi</i>	37	40.67 mm	55.8 mm	10.5 mm
<i>Desmognathus f. fuscus</i>	24	25.92 mm	57.7 mm	15.6 mm
<i>Eurycea wilderae</i>	2	48.8 mm	49.1 mm	48.5 mm
<i>Gyrinophilus p. danielsi</i>	1	89 mm		

Table 3. Ravine Salamanders Compared to Cover Object

Cover Object	Number of Salamanders under cover object	Total number of cover objects
Log	13	299
Rock	22	460

Table 4. Plot Characteristics

Plot	Water pH	Soil pH	Water Temperature	Air Temperature	# of Ravine	# of Dusky
1	6.7	5.5	7.5 °C	8.5 °C	6	0
2	6.7	7	11 °C	23 °C	4	0
3	6.7	7	8 °C	9 °C	1	0
4	6.7	6.5	9.5 °C	22.5 °C	3	0
5	6.7	7.3	N/A	N/A	8	0
6	6.7	5	N/A	N/A	4	0
7	6.7	6.8	N/A	N/A	7	0
8	6.7	7	N/A	N/A	0	0
9	N/A	N/A	N/A	N/A	0	0
10	6.7	6	N/A	N/A	2	0
11	6.7	7	N/A	N/A	1	0
12	6.7	7	N/A	N/A	0	0
13	6.7	5.8	11 °C	29 °C	0	0
14	6.7	6.8	11 °C	37 °C	1	0
15	6.7	5.7	11 °C	28 °C	0	0
16	6.7	7	11 °C	24 °C	1	0
17	6.8	5.5	11 °C	22 °C	0	1
18	6.7	6.7	11 °C	17 °C	0	1
19	6.8	7	11 °C	17 °C	0	2
20	6.9	6.5	16 °C	29 °C	0	16

Table 5. Comparison of Ravine and Dusky to Water Presence

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# of Ravine	5	4	1	3	8	4	7	0	0	2	1	0	0	1	0	1	0	0	0	0
# of Dusky	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	20
Year-round water	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y

N= no Y= yes

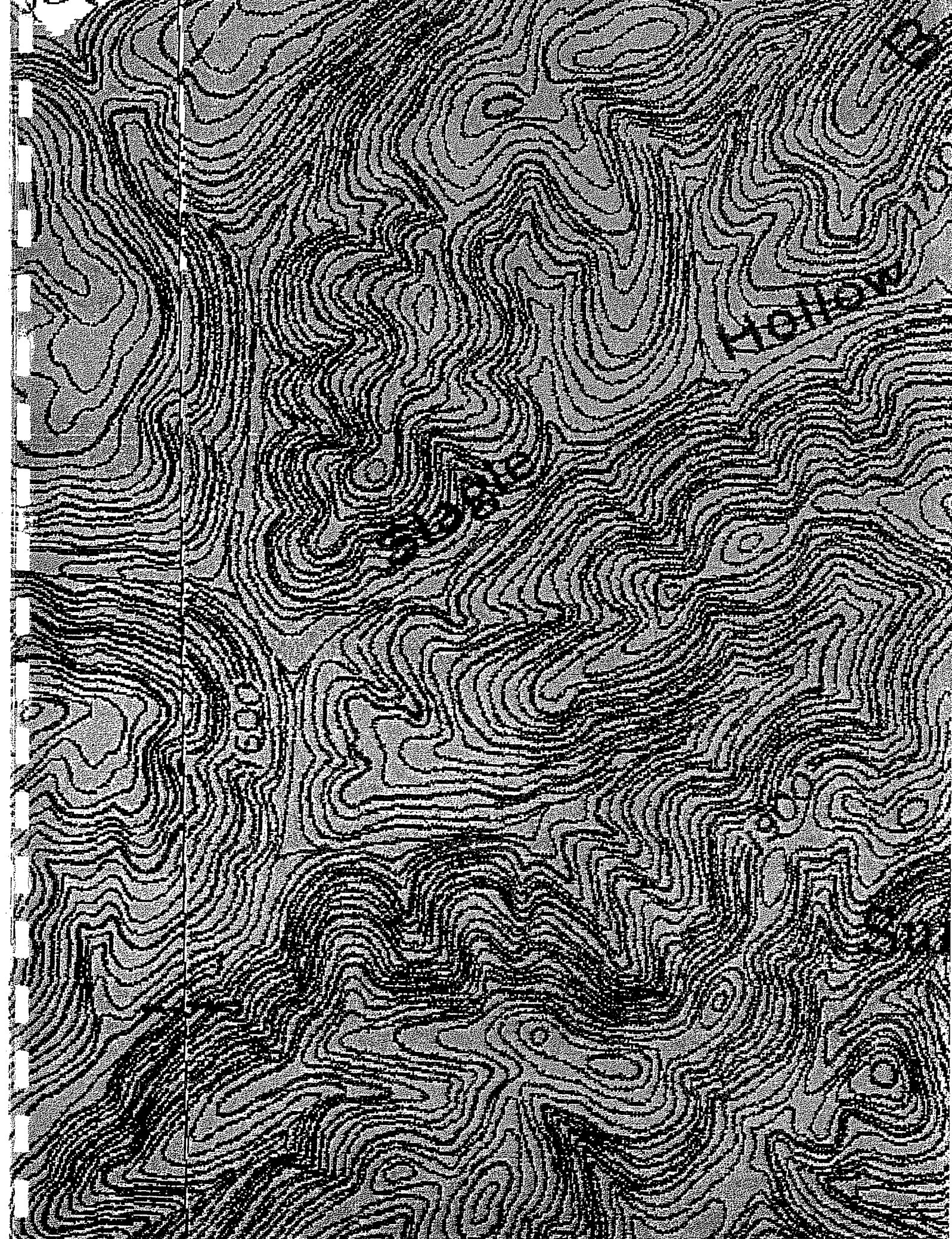
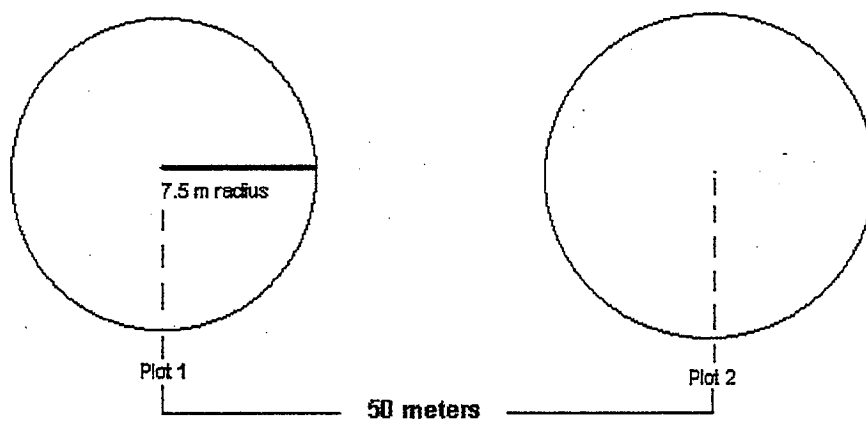


Figure 2. Plot Diagram



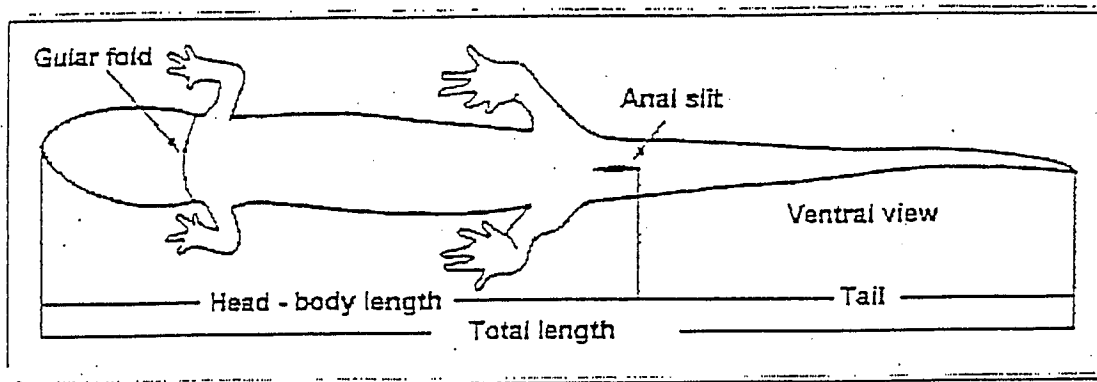


Figure 3. Measuring snout-vent length in salamanders. Tail measurements are not used because the tails are frequently damaged or missing.

Figure 4. Salamander Composition

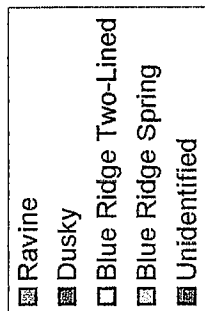
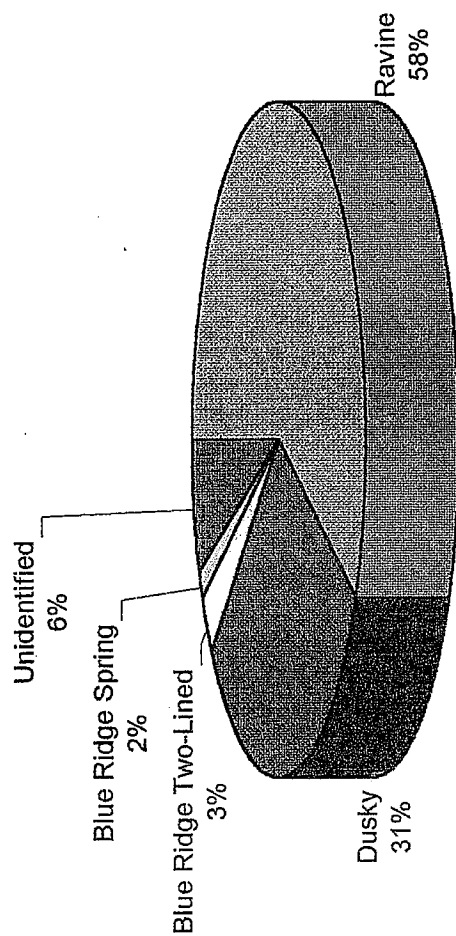


Figure 5. Salamander Species

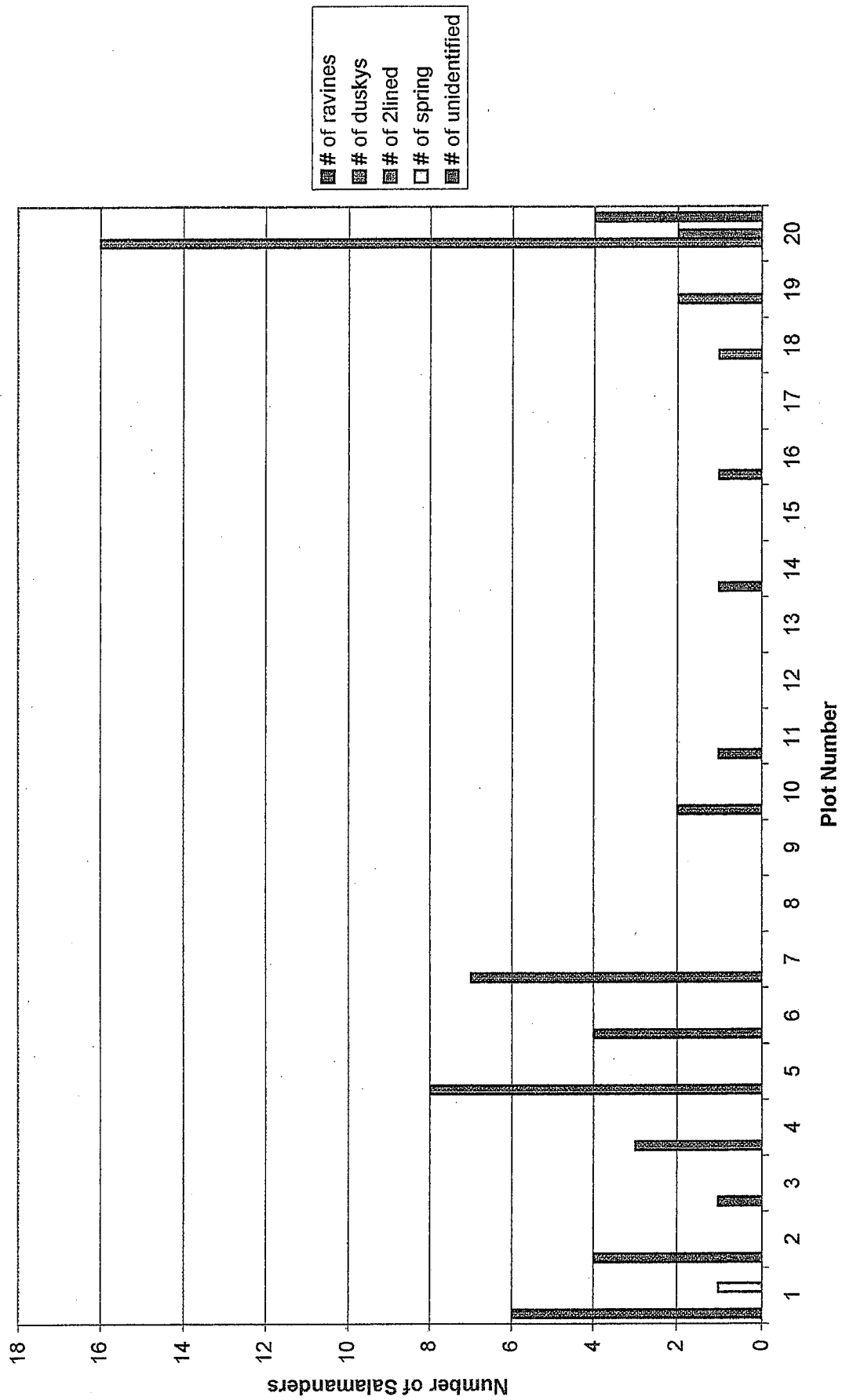


Figure 6. Ravine Cover Objects

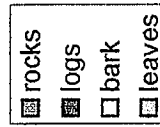
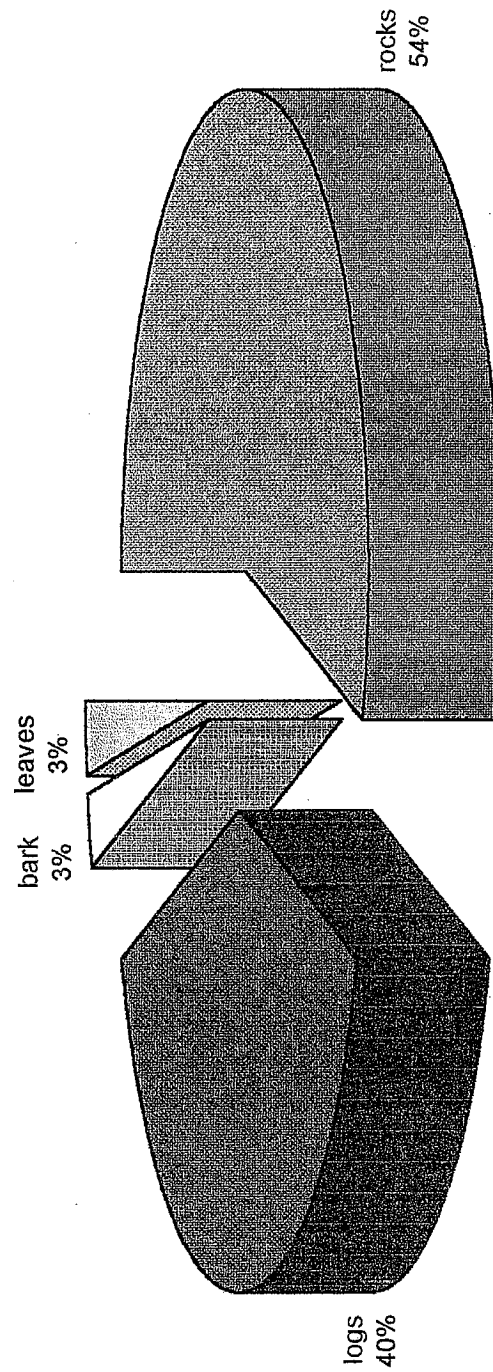


Figure 7. Number of Ravines

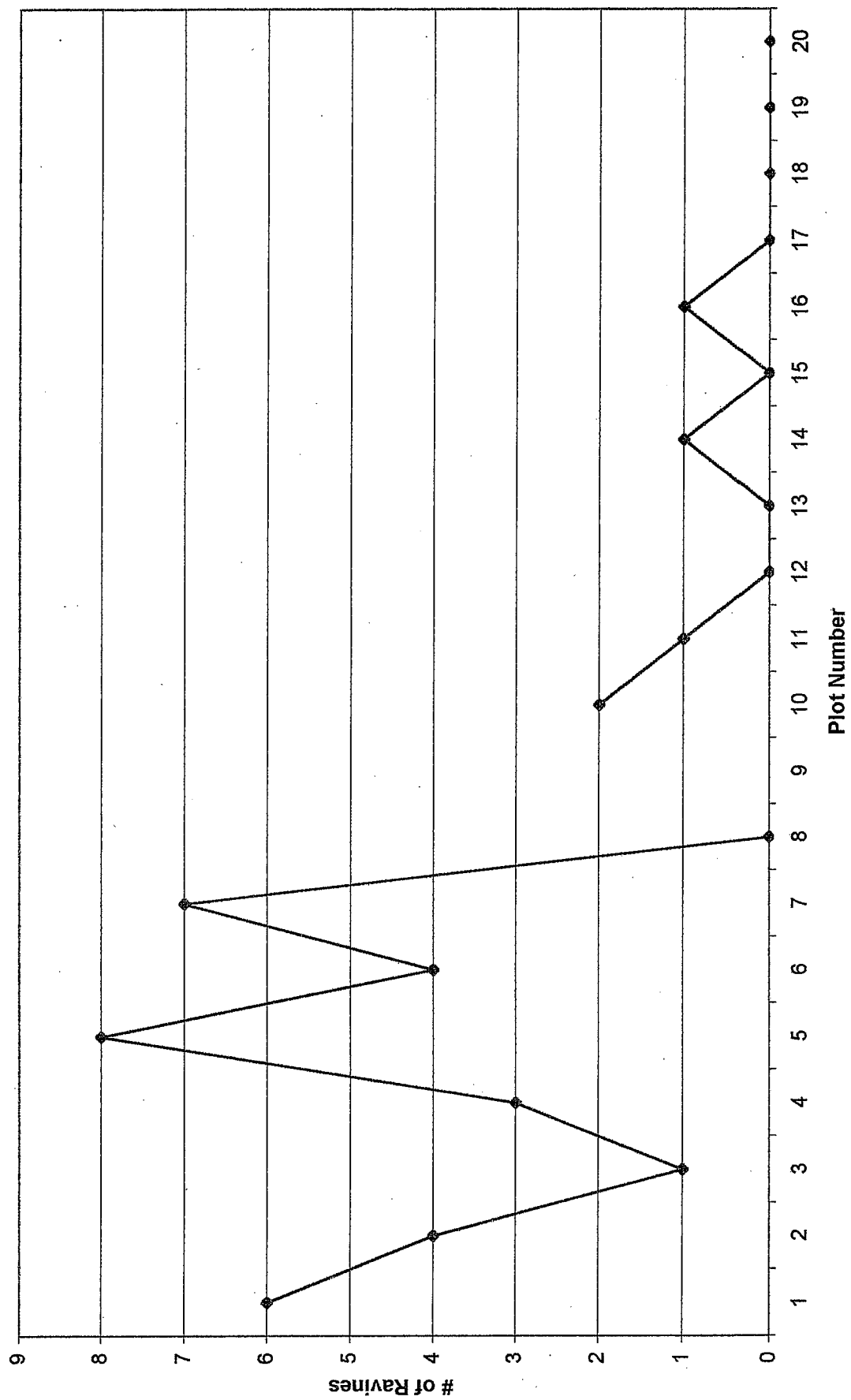
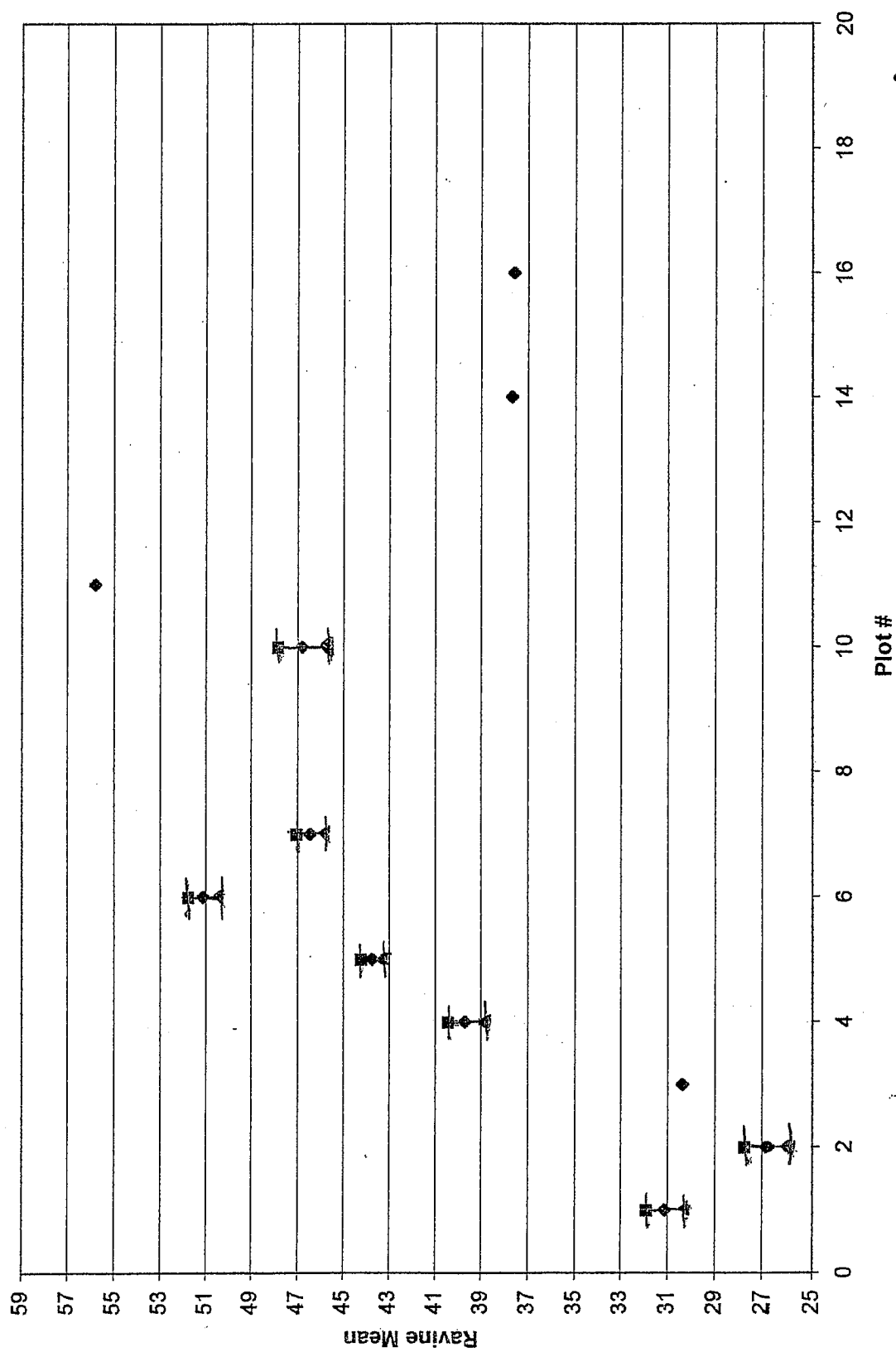
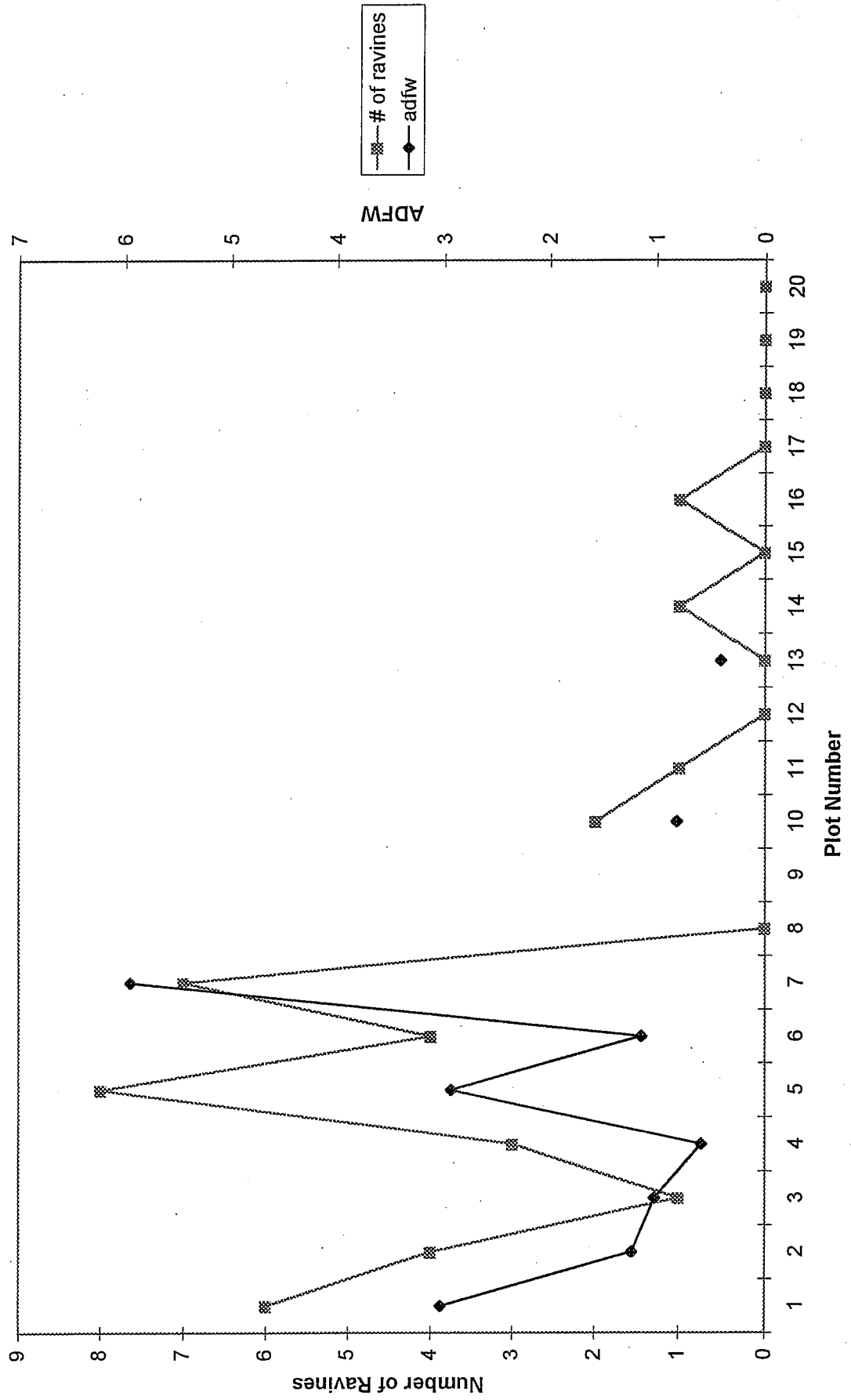


Figure 8. Ravine Standard Error of Mean



Number of Ravines vs. Average Distance From Water



APPENDIX A- Data Sheets (1-20)

Salamander Distribution/Density in Steele Creek Park Data Sheet

31

Date	3/21/01
Day #	1
Plot #	1

Plot Characteristics

Location	36°33'40.3"/ 82°14'54.1"
Weather conditions	Raining
Presence of water	Yes/No
Stream condition	running /standing water
Air temperature	8.5 °C
Water Temperature	7.5 °C
Water pH	6.7
Soil pH	5.5
Width and depth of stream	.9 m / .12m
# of trees > 12.7 cm (dbh)	11
# of rocks > 7.5 cm (stream)	24
# of downed logs (stream & land)	16
# of salamanders present	6

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	41.1	rock/log/root mass	stream/land	4.5 m
<i>Plethodon richmondi</i>	29.7	rock/log/root mass	stream/land	3.4 m
<i>Plethodon richmondi</i>	34	rock/log/root mass	stream/land	1.5 m
<i>Plethodon richmondi</i>	32.7	rock/log/root mass	stream/land	6.9 m
<i>Plethodon richmondi</i>	18.2	rock/log/root mass	stream/land	1.4 m
<i>Gyrinophilus porphyriticus danieli</i>	89	rock/log/root mass	stream/land	.4 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	3/23/01
Day #	2
Plot #	2

Plot Characteristics

Location	36°33'39.3" / 82°14'55.4"
Weather conditions	Sunny / normal creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	23°C
Water Temperature	11°C
Water pH	6.7
Soil pH	7
Width and depth of stream	.09 m / .67 m
# of trees > 12.7 cm (dbh)	3
# of rocks > 7.5 cm (stream)	42
# of downed logs (stream & land)	19
# of salamanders present	4

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	33.4	rock/log/root mass	stream/land	.9 m
<i>Plethodon richmondi</i>	10.5	rock/log/root mass	stream/land	.92 m
<i>Plethodon richmondi</i>	23.7	rock/log/root mass	stream/land	1.55 m
<i>Plethodon richmondi</i>	39.8	rock/log/root mass	stream/land	1.5 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	5/26
Day #	3
Plot #	3

Plot Characteristics

Location	36°33'37" / 82°14'59.7"
Weather conditions	Sunny
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	9°C
Water Temperature	8°C
Water pH	6.7
Soil pH	7
Width and depth of stream	.85 m / .13 m
# of trees > 12.7 cm (dbh)	8
# of rocks > 7.5 cm (stream)	29
# of downed logs (stream & land)	14
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	50.4	rock/log/root mass	stream/land	1 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	3/29/01
Day #	4
Plot #	4

Plot Characteristics

Location	36°33'36.5" / 82°14'57.4"
Weather conditions	Sunny/ little breezy/ creek running a little
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	22.5°C
Water Temperature	9.5°C
Water pH	6.7
Soil pH	6.5
Width and depth of stream	.95 m / .15 m
# of trees > 12.7 cm (dbh)	5
# of rocks > 7.5 cm (stream)	26
# of downed logs (stream & land)	7
# of salamanders present	3

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	33.2	rock/log/root mass	stream/land	.6 m
<i>Plethodon richmondi</i>	40.8	rock/log/root mass	stream/land	.75 m
<i>Plethodon richmondi</i>	45.1	rock/log/root mass	stream/land	.35 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/1/01
Day #	5
Plot #	5

Plot Characteristics

Location	36°33'35.8" / 82°14'58.4"
Weather conditions	Sunny/ little wind/ deep creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	10°C
Water Temperature	°C
Water pH	6.7
Soil pH	7.3
Width and depth of stream	2.4 m / 1.3 m
# of trees > 12.7 cm (dbh)	8
# of rocks > 7.5 cm (stream)	50+
# of downed logs (stream & land)	18
# of salamanders present	8

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	42	rock/log/root mass	stream/land	5 m
<i>Plethodon richmondi</i>	50.6	rock/log/root mass	stream/land	6.5 m
<i>Plethodon richmondi</i>	53	rock/log/root mass	stream/land	.3 m
<i>Plethodon richmondi</i>	46.7	rock/log/root mass	stream/land	7.5 m
<i>Plethodon richmondi</i>	34.8	rock/log/root mass	stream/land	1.4 m
<i>Plethodon richmondi</i>	35.1	rock/log/root mass	stream/land	1.75 m
<i>Plethodon richmondi</i>	45.1	rock/log/root mass	stream/land	.95 m
<i>Plethodon richmondi</i>	42.8	rock/log/root mass	stream/land	Not actually in water but above it
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes: Thermometer broke

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/1/01
Day #	5
Plot #	6

Plot Characteristics

Location	36°33'34.2"/ 82°14'59.5"
Weather conditions	Sunny/ little wind/ deep creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	-°C
Water Temperature	-°C
Water pH	6.7
Soil pH	5
Width and depth of stream	1.55 m / 1.12 m
# of trees > 12.7 cm (dbh)	5
# of rocks > 7.5 cm (stream)	32
# of downed logs (stream & land)	37
# of salamanders present	4

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	50.3	rock/log/root mass	stream/land	.8 m
<i>Plethodon richmondi</i>	43.1	rock/log/root mass	stream/land	.8 m
<i>Plethodon richmondi</i>	55.7	rock/log/root mass	stream/land	1.3 m
<i>Plethodon richmondi</i>	55.5	rock/log/root mass	stream/land	1.6 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/1/01
Day #	5
Plot #	7

Plot Characteristics

Location	36°33'34.8" / 82°15'3.8"
Weather conditions	Sunny/ little wind/ deep creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	-°C
Water Temperature	-°C
Water pH	6.7
Soil pH	6.8
Width and depth of stream	2.1 m / .15 m
# of trees > 12.7 cm (dbh)	7
# of rocks > 7.5 cm (stream)	50+
# of downed logs (stream & land)	24
# of salamanders present	7

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	29.4	rock/log/root mass	stream/land	7.1 m
<i>Plethodon richmondi</i>	52.5	rock/log/root mass	stream/land	1.1 m
<i>Plethodon richmondi</i>	49	rock/log/root mass	stream/land	6.5 m
<i>Plethodon richmondi</i>	55.1	rock/log/root mass	stream/land	6.6 m
<i>Plethodon richmondi</i>	50.4	rock/log/root mass	stream/land	6.3 m
<i>Plethodon richmondi</i>	44.45	rock/log/root mass	stream/land	6.9 m
<i>Plethodon richmondi</i>	44.4	rock/log/root mass	stream/land	7.1 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/1/01
Day #	5
Plot #	8

Plot Characteristics

Location	36°33'33.8" / 82°15'5.7"
Weather conditions	Sunny/ little wind/ deep creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	-°C
Water Temperature	-°C
Water pH	6.7
Soil pH	7
Width and depth of stream	1.3 m / .13 m
# of trees > 12.7 cm (dbh)	3
# of rocks > 7.5 cm (stream)	12
# of downed logs (stream & land)	17
# of salamanders present	0

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes: First site in which no salamanders were found
 Plot 9 is extremely bad. site omitted -36°33'33.7" / 82°15'8.1"

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/1/01
Day #	5
Plot #	10

Plot Characteristics

Location	36°33'31.9" / 82°15'9.5"
Weather conditions	Sunny/ little wind/ deep creek
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	-°C
Water Temperature	-°C
Water pH	6.7
Soil pH	6
Width and depth of stream	1.45 m / .11 m
# of trees > 12.7 cm (dbh)	3
# of rocks > 7.5 cm (stream)	50+
# of downed logs (stream & land)	16
# of salamanders present	2

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	52.6	rock/log/root mass	stream/land	1.75 m
<i>Plethodon richmondi</i>	41	rock/log/root mass	stream/land	4.5 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

40

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/3/01
Day #	6
Plot #	11

Plot Characteristics

Location	36°33'30.6" / 82°15'10.5"
Weather conditions	Sunny / little wind
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	°C
Water Temperature	°C
Water pH	6.7
Soil pH	7
Width and depth of stream	2.5 m / .8 m
# of trees > 12.7 cm (dbh)	5
# of rocks > 7.5 cm (stream)	34
# of downed logs (stream & land)	21
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	55.8	rock/log/root mass	stream/land	.8 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

41

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/4/01
Day #	7
Plot #	12

Plot Characteristics

Location	36°33'29.9" / 82°15'10.5"
Weather conditions	Warm/sunny
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	38°C
Water Temperature	13°C
Water pH	6.7
Soil pH	7
Width and depth of stream	1.45 m / 1.1 m
# of trees > 12.7 cm (dbh)	2
# of rocks > 7.5 cm (stream)	17
# of downed logs (stream & land)	26
# of salamanders present	0

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/6/01
Day #	8
Plot #	13

Plot Characteristics

Location	36°33'29.5"/ 82°15'12"
Weather conditions	Humid, little wind
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	29°C
Water Temperature	11°C
Water pH	6.7
Soil pH	5.8
Width and depth of stream	-m / - m
# of trees > 12.7 cm (dbh)	6
# of rocks > 7.5 cm (stream)	0
# of downed logs (stream & land)	26
# of salamanders present	0

Salamander Characteristics

[illegible]

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/6/01
Day #	8
Plot #	14

Plot Characteristics

Location	36°33'28.1"/ 82°15'13.9"
Weather conditions	Warm/sunny
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	57°C
Water Temperature	11°C
Water pH	6.7
Soil pH	6.8
Width and depth of stream	.7 m / 1.08 m
# of trees > 12.7 cm (dbh)	7
# of rocks > 7.5 cm (stream)	50+
# of downed logs (stream & land)	25
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	32.7	rock/log/root mass, <u>tree bark</u>	stream/ <u>land</u>	-m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes: first time water pH was not a 6.7

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/6/01
Day #	8
Plot #	15

Plot Characteristics

Location	36°33'26.9" / 82°15'13.9"
Weather conditions	Warmer/sunnier
Presence of water	(Yes/No
Stream condition	(running/standing water
Air temperature	28°C
Water Temperature	11°C
Water pH	6.7
Soil pH	5.7
Width and depth of stream	1.5 m / .04 m
# of trees > 12.7 cm (dbh)	2
# of rocks > 7.5 cm (stream)	12
# of downed logs (stream & land)	18+ mass of downed trees
# of salamanders present	0

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

45

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/6/01
Day #	8
Plot #	16

Plot Characteristics

Location	36°33'25.9"/ 82°15'15.9"
Weather conditions	Warmer/sunnier
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	24°C
Water Temperature	11°C
Water pH	6.7
Soil pH	7
Width and depth of stream	1.7 m / 1.04 m
# of trees > 12.7 cm (dbh)	6
# of rocks > 7.5 cm (stream)	26
# of downed logs (stream & land)	20+ lots of twigs
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Plethodon richmondi</i>	37.6	rock/log/root mass	stream/land	.4 m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/6/01
Day #	8
Plot #	17

Plot Characteristics

Location	36°33'24.3" / 82°15'16.6"
Weather conditions	Warm/sunny
Presence of water	Yes/No
Stream condition	(running/standing water)
Air temperature	22°C
Water Temperature	11°C
Water pH	6.8
Soil pH	5.5
Width and depth of stream	1.7 m / .03 m
# of trees > 12.7 cm (dbh)	10
# of rocks > 7.5 cm (stream)	7
# of downed logs (stream & land)	11+ small mass
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Desmognathus f. fuscus</i>	44	rock/log/root mass	(stream)/land	N/A
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes: First Dusky

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/20/01
Day #	9
Plot #	18

Plot Characteristics

Location	36°33'23.4"/ 82°15'16.9"
Weather conditions	Gloomy/ green
Presence of water	(Yes/No
Stream condition	(running/standing water
Air temperature	25°C
Water Temperature	11°C
Water pH	6.7
Soil pH	6.7
Width and depth of stream	-m / - m
# of trees > 12.7 cm (dbh)	9
# of rocks > 7.5 cm (stream)	7
# of downed logs (stream & land)	50+, masses everywhere
# of salamanders present	1

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Desmognathus f. fuscus</i>	57.7	(rock/log/root mass	(stream/land	N/A
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/20/01
Day #	9
Plot #	19

Plot Characteristics

Location	36°33'24.4"/ 82°15'14"
Weather conditions	Gloomy
Presence of water	Yes/No
Stream condition	running/standing water
Air temperature	17°C
Water Temperature	11°C
Water pH	6.8
Soil pH	7
Width and depth of stream	1.1 m / .12 m
# of trees > 12.7 cm (dbh)	13
# of rocks > 7.5 cm (stream)	3
# of downed logs (stream & land)	App. 17, mass in creek
# of salamanders present	2

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Desmognathus f. fuscus</i>	18.5	rock/log/root mass	stream/land	N/A
<i>Desmognathus f. fuscus</i> (dead)	17	rock/log/root mass	stream/land	N/A
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m
		rock/log/root mass	stream/land	m

Notes:

49

Salamander Distribution/Density in Steele Creek Park Data Sheet

Date	4/22/01
Day #	10
Plot #	20

Plot Characteristics

Location	36°33'20" / 82°15'19.9"
Weather conditions	Sunny
Presence of water	(Yes/No
Stream condition	(running/standing water
Air temperature	29°C
Water Temperature	16°C
Water pH	6.9
Soil pH	6.5
Width and depth of stream	.95 m / .1 m
# of trees > 12.7 cm (dbh)	6
# of rocks > 7.5 cm (stream)	App. 10
# of downed logs (stream & land)	2 masses on both sides of plot/ 50+ twigs
# of salamanders present	22

Salamander Characteristics

Type	Size (mm)	Cover Object	Location	Distance from water
<i>Desmognathus f. fuscus</i>	28.8	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	23.7	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	19.8	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	20.23	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	15.6	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	24	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	30.6	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	20.8	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	18.8	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	20.32	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	29	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	30.8	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	26.7	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	19.6	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	24.7	rock/log/root mass	(stream/land	N/A
<i>Desmognathus f. fuscus</i>	25	rock/log/root mass	(stream/land	N/A
<i>Eurycea wildereae</i>	48.5	rock/log/root mass	(stream/land	N/A
<i>Eurycea wildereae</i>	49.1	rock/log/root mass	(stream/land	N/A
<i>Unidentified</i>	36.7	rock/log/root mass	(stream/land	N/A
<i>Unidentified</i>	20.2	rock/log/root mass	(stream/land	N/A

<i>Unidentified</i>	23.5	rock/log/root mass	stream/land	N/A
<i>Unidentified</i>	21	rock/log/root mass	stream/land	N/A

Notes: Frog, fish, lots of extremely small crayfish/ 1 large

APPENDIX B-**Howard Hughes Research Grant
Steele Creek Park Permission**



East Tennessee State University
College of Arts and Sciences

Department of Biological Sciences - Box 70703 - Johnson City, Tennessee 37614-0703 - (423) 439-4329 - FAX: (423) 439-5958

23 February 2001

Charlie Jennings
Tennessee High School
Bristol, TN

Dear Mr. Jennings:

Congratulations on having been selected to receive a research grant of \$125 for your project with Derek Slagle, "Salamander Distribution & Habitat Analysis." These funds are being provided by the Department of Biological Sciences at East Tennessee State University from a grant we received from the Howard Hughes Medical Institute. We will soon send a check that your teacher, Nancy Dickerson, can use to provide the money as you need it. We hope this will make it possible for you to learn a lot from your project. We also have travel funds available to help you present results of your research at the Tennessee Junior Academy of Sciences.

Sincerely,

Dan M. Johnson
Professor and Chair

cc: Nancy Dickerson
Hugh Miller

Salamander Project

To Whom It May Concern:

Our names are Charlie Jennings and Derek Slagle and we are currently in a Special Problems in Biology II class at Tennessee High School. We would like to request permission to do research in Steele Creek Park. We are planning to use the creeks and their surrounding areas to study the salamanders of the park. If you have any questions or comments, feel free to contact us at 652-9494. Thank you for your time and consideration.

Sincerely,

D.J.
Charlie Jennings

Charlie Jennings and Derek Slagle

Kevin

[Signature]

*This is for research
& is O.K. Please make
sure a copy of their
results are placed in our
files for future use.*

*Thanks
M.F.
2/15/01*

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