

FINAL

Inventory of the Herptofauna of Shiloh National Military Park



**Accipiter Biological Consultants
PO Box 16332
Portal, AZ 85632**

MARCH 2006

**Cooperative Agreement
H5028 02 0473**

**National Park Service
Cumberland Piedmont Inventory and Monitoring Network
PO Box 112
Mammoth Cave, KY 42259**

FINAL

Inventory of the Herpetofauna of Shiloh National Military Park



**Accipiter Biological Consultants
PO Box 16332
Portal, AZ 85632**

To reference this report cite:

Accipiter Biological Consultants. March 2006. Inventory of the Herpetofauna of Shiloh National Military Park. Written for the US Department of the Interior, National Park Service, Cumberland Piedmont Inventory and Monitoring Network, Mammoth Cave, Kentucky.

**National Park Service
Cumberland Piedmont Inventory and Monitoring Network
PO Box 112
Mammoth Cave, KY 42259**

Inventory of the Herpetofauna Of Shiloh National Military Park

INTRODUCTION

Shiloh National Military Park (SHIL) was established December 27, 1894 to preserve the site of the largest Civil War battle during the Union's 1862 campaign. It was a two-day battle resulting in nearly 24,000 casualties and a decisive victory for Union forces, who later went on to seize control of the Confederate railway system in Corinth, Mississippi and military control of the lower Mississippi River Valley. In 1933 Shiloh was brought into the National Park System and is managed under the guidance of the 1916 Organic Act. The National Park Service (NPS) is responsible for the preservation of native wildlife, including amphibian and reptile species, within Shiloh National Military Park in accordance with the 1916 NPS Organic Act, as amended and this direction is re-enforced through both NPS policy and guidelines affecting natural resource management. The Cumberland/Piedmont Inventory and Monitoring Network was established by the NPS Natural Resource Challenge Initiative. Among the goals set forth by this initiative are documentation of the occurrence of at least 90% of the species of vertebrates and vascular plants that occur within each National Park unit containing "significant natural resources" and documenting relative frequencies of occurrence by habitat type and descriptions of the distribution and relative abundance of species of special concern. Following a preliminary review of the existing inventory data within each network park, the Inventory and Monitoring Network for the Cumberland/Piedmont determined that the largest and most pressing data gaps involved amphibian and reptile species. This lack of information was targeted as one of the network's highest priorities for funding. It is therefore necessary to conduct a baseline inventory of the herpetofauna resources within these NPS Parks, because the existing information is either non-existent or poorly defined.

This inventory effort will provide Park Managers with comprehensive, scientifically based information about the distribution and status of herpetofauna resources occurring within the parks. This information will be used for management decisions regarding park resources and protection, as well as education and outreach to the public. Further, this is an important part of the groundwork necessary for managers to develop effective monitoring programs designed to ensure the continued long-term health of Park natural resources.

Recent data shows that reptiles and amphibians are important, perhaps critical, components of terrestrial and aquatic ecosystems. Both groups are considered to be excellent indicator species of environmental degradation, amphibians because of their complex life cycle and permeable skin and reptiles because of their frequent position as the top carnivores in the food chain (Gibbons 1988). These facts have led to an increasing recognition of the need for collecting better data on the biodiversity and ecology of amphibians and reptiles by NPS managers (Scott and Seigel 1992).

Currently, NPS managers at Shiloh National Military Park possess neither a comprehensive baseline inventory nor the information upon which to base monitoring of the Park's amphibian

and reptile species utilizing park lands and waters. In recent years, the shift to protecting biodiversity through the preservation of functional ecosystems has made reliable inventory and monitoring programs of critical importance to NPS management. Without detailed information on the distribution, habitat requirements and relative abundance of native amphibian and reptile species, resource managers may only preserve that portion of the fauna which is highly visible or economically important (Bogan, *et al*, 1988). For these reasons, Accipiter Biological Consultants was contracted by the NPS to design and develop a park-wide inventory of reptile and amphibian species currently occurring at the Park as part of the overall Inventory and Monitoring Program being conducted for the Cumberland/Piedmont Inventory and Monitoring Network.

GOALS AND OBJECTIVES

This inventory program for surveying reptile and amphibian species at Shiloh National Military Park has the following goals:

1. To determine species presence information, both habitat specific and across landscapes and to document at least 90% of the species thought to occupy the Park lands.
2. To document relative frequencies of occurrence by habitat type within the Park.
3. To describe the distribution and relative abundance of species of special concern within the Park.
4. To collect voucher specimens or photographs of species occurring in the Park which are not already documented. Emphasis is put on photographic vouchers in this park.

DESCRIPTION OF THE STUDY AREA

Shiloh National Military Park is located in Hardin County, Tennessee and is bordered by Owl Creek on the west and the Tennessee River to the east. The park consists of approximately 1620 ha (4000 acres) and covers 96% of the original battle site. The park is made up of gently rolling to nearly level plains in upland areas with several steep ravines cutting through the landscape. The eastern boundary consists of steep, eroding river bluffs along the Tennessee River while, on the west occasionally flooded bottomland forest exists along Owl Creek. General vegetation categories consist of forest (1296 ha) and open fields (324 ha). Upland forests are dominated by mixed oak forest. Old abandoned fields in the uplands are now dominated by various pines and red cedar. Ravines and the river bluffs are dominated by mesic hardwoods and floodplains and the terraces above them are dominated by mixed bottomland forests (Jones and White, 1981).

Habitats and Descriptions

Nine major community types were utilized in this inventory process. These were provided by NPS personnel and include the following:

Mixed hardwood forest (MF) – This category consists of hardwood forest dominated by Beech and Maples. While it may occur under mesic conditions oak species do not dominate. It is usually found higher on the slopes than the following.

Mixed mesic hardwood forest (MH) – This habitat includes such tree species as Red and White Oaks, with smaller amounts of Beech, Basswood and Buckeye. It usually includes lower areas in the proximity of streams or springs.

Juniper/Hardwood forest (JH) – This habitat is characterized by mixed Juniper and a variety of hardwood species, usually with some degree of shrub or forb understory. This habitat is found in patches throughout the Park.

Pine/Juniper forest (PJ) – This habitat consists of mixed Pine and Juniper. It is usually found on slopes or ridges and usually has little understory. This habitat is usually drier than the previous habitat and is uncommon on the Park.

Open fields (OF) – This habitat consists of open, grassy areas and exists in several forms on the Park. Mowed fields and agricultural fields are also included in this habitat form.

Ponds (PO) – This habitat is comprised of water bodies which are encircled with hydric vegetation. It includes manmade lakes, as well as natural (beaver dams) water bodies. Emergent vegetation may or may not exist depending on conditions.

Springs (SP) – Springs occur where ground water discharges to the surface. Small stream flows often result, however, for purposes of this inventory, only stream flows where the ground water discharge point is readily apparent are considered springs.

Streams (ST) – These habitats feature flowing water of an ephemeral, intermittent or perennial nature. Substrate on the bottom ranges from mud or sand to various sized cobbles or even bedrock. Streams are also often associated with adjacent habitats such as forests.

Bogs (BO) – This habitat is uncommon in lower areas of the Park and is characterized, in general, by areas of seasonally flowing and standing water and hydric vegetation.

METHODOLOGIES

A detailed review of the field methods utilized in this inventory program is provided in the following paragraphs. This selection of methodologies was determined by the need to balance the availability of suitable personnel against the need to establish a valid, quantifiable inventory program.

This project began with a literature search to establish a potential list of reptile and amphibian species that include Shiloh National Military Park in their range of distribution. This search provided a potential list of 59 species or discernable subspecies. Further search was conducted to determine if potential habitat exists on Shiloh National Military Park for each species on that list and to gain insight on the life history of each species. A number of species reach the limit of their natural range at or near the Park. Confirming their presence was a priority during this inventory process.

We utilized seven primary inventory methods to attain goals 1 and 2. These are random plots with associated sampling frameworks to provide standardized results for defined habitat areas and general herpetological collecting and observation, minnow traps, coverboards, audio frog breeding surveys, road surveys and drift fences utilizing funnel type live traps or cover boards to inventory special habitat areas.

Random Plots with Associated Sampling Frameworks

Circular, 1-hectare random plots were established by the NPS as part of the networks' vegetation mapping/plant inventory project. Most of the plots fall within common habitats that comprise much of the area within the park – primarily terrestrial or rarely flooded environments. These include both open and wooded habitats. Operationally, the grid plots are sampled in a structured manner that involves cover boards and constrained-area searches within the 8 m² rectangular plots, as well as generalized searches of the remainder of the circular 1-hectare plot. The structured placement of the cover boards and 8m² rectangular plots for constrained-area searches is for the purpose of producing standardized results for defined habitat areas that can be compared to estimate relative species richness among parks and habitat types. Within plots, one of two survey techniques were applied uniformly across all spatial and temporal replicates, unless otherwise provided for. (a) Where the plots fell either in open environments or in floodplains (whether open or forested) cover boards were used, as shown in Statement of Work. (b) Where the plots fell in upland forest and woodland, 8m² plots without cover boards were used in a system of “area-constrained searches”.

a. Cover board methodology: Applicable in open environments such as prairies, old fields and hay fields, as well as flood plains and riparian corridors, and in forest/field edges.

- i. Within each 1-ha plot, four cover boards were laid out in a systematic cluster, as shown in the Statement of Work.
- ii. Two boards were placed flush with a line running north through each plot center. The northwest corner of one of these boards was placed flush with the east side of the line at 10 meters north of the center point. The southeast corner of the other board was placed flush with the west side of the line at 10 meters south of the center point.
- iii. Two boards were placed flush with a second line that runs perpendicular to the north running line (90°- 270°). The northeast corner of one of these boards was placed flush with the south side of the line at 10 meters east of the plot center. The southwest corner of the other board was placed flush with the north side of the line at 10 meters west of the center point.
- iv. At each plot, 2 of the boards were wooden and the other 2 were tin (of approximately equivalent dimensions). Preferred material for the wooden boards was 4' X 4' plywood.

b. Area constrained search (ACS) methodology: To be applied in wooded environments such as upland and successional forest (where cover boards are not used).

- i. At each 1 ha plot, four ACS plots were laid out in a systematic cluster as illustrated in the Statement of Work.

- ii. Each ACS plot was 8m².
- iii. Two ACS plots were placed flush with a line running north through each grid point. The northwest corner of one of these plots was placed flush with the east side of the line at 20 meters north of the plot center. The southeast corner of the other plot was placed flush with the west side of the line at 20 meters south of the center point.
- iv. Two ACS plots were placed flush with a second line that runs perpendicular to the north running line (90°- 270°). The northeast corner of one of these plots was placed flush with the south side of the line at 20 meters east of the plot center. The southwest corner of the other plot was placed flush with the north side of the line at 20 meters west of the center point.

Frequency of cover board and ACS sampling on sample plots: Within each 1 ha plot, each set of cover boards and/or set of ACS plots were sampled at least once during each season in which herpetofauna are active.

During the course of this inventory 21 of these plots were utilized and have been surveyed six times. Results of these surveys may be found in Appendix A. Table 1 lists the utilized plots and their location and affiliated habitat.

Table 1: Random Plots Established by Nature Serve

Plot #	UTM Coordinates NAD 83	Habitat
SHIL 1	16 S 375942 3886974	OF
SHIL 2	16 S 375930 3887999	MF
SHIL 3	16 S 375943 3889014	MF
SHIL 4	16 S 376949 3887988	MH
SHIL 5	16 S 376967 3889028	OF
SHIL 6	16 S 376965 3890032	MH
SHIL 8	16 S 377979 3887994	PJ
SHIL 9	16 S 377981 3889017	OF
SHIL 10	16 S 377984 3890037	OF
SHIL 11	16 S 377987 3891057	MH
SHIL 12	16 S 379013 3887978	MH
SHIL 13	16 S 378988 3889023	MH
SHIL 14	16 S 379000 3890039	MH
SHIL 15	16 S 377598 3892632	MF
SHIL 16	16 S 378152 3891969	MH
SHIL 17	16 S 376842 3888045	JH
SHIL 18	16 S 379721 3889878	MF
SHIL 19	16 S 379641 3890059	MF
SHIL 20	16 S 379654 3889701	MH
SHIL 21	16 S 378207 3888918	MF

Plot #	UTM Coordinates NAD 83	Habitat
SHIL 22	16 S 377322 3889430	MH

General Herpetological Collecting and Observation

Also known as hand collecting, this method is purported to provide the largest number of individuals and species based on comparable inventory projects. Specific methods included carefully turning and replacing ground cover, time constrained hand collecting, seining and dip netting of small ponds or streams within the area, and spotlight surveys of aquatic habitats. Some hand collecting was accomplished by raking small areas of forest floor debris on appropriate plots. All disturbed habitats were restored to their original condition to the greatest degree possible. This methodology also includes visual observations of reptiles and amphibians made during the survey of the area, including surveys of basking turtles, frogs and snakes at a distance utilizing binoculars. Sites have been chosen so as to sample each major habitat within the Park unit. During the course of this inventory 19 sites have been established to sample the major as well as specialized habitats within the Park. Each has been sampled six times. Data on reptiles and amphibians located during this sampling is located in Appendix A. Table 2 lists the utilized plots and their location and affiliated habitat.

Table 2: General Collecting Sites

Plot #	UTM Coordinates NAD 83	Habitat
G-1	16 S 379391 3889524	PO
G-2	16 S 376718 3889156	MF
G-3	16 S 377419 3891122	MH
G-4	16 S 377444 3890804	MH
G-5	16 S 378558 3890132	JH
G-6	16 S 378558 3890132	MH
G-7	16 S 376598 3890330	ST
G-8	16 S 376577 3890110	ST
G-9	16 S 376613 3890228	JH
G-10	16 S 376503 3888488	SP
G-11	16 S 376711 3888361	SP
G-12	16 S 378152 3891969	MH
G-13	16 S 379184 3888115	OF
G-14	16 S 378224 3890953	OF
G-15	16 S 377997 3889105	OF
G-16	16 S 377273 3889189	MH
G-17	16 S 376839 3887319	ST
G-18	16 S 378598 3888530	OF
G-19	16 S 378422 3888120	OF

Minnow Traps

Minnow traps are an effective means of capturing aquatic amphibians and reptiles, especially tadpoles, frogs, salamanders, salamander larvae and aquatic snakes. They can be set in most aquatic situations, but appear to be most effective in ponds or swamps with shallow waters. Traps are set near the shoreline, in water deep enough to at least cover the funnel openings. The traps are set from 5-10 meters apart and are checked daily. During the course of this inventory 8 sites have been identified for utilization of this methodology. Some of these suffered from lack of water depth during the late summer visits. All others were sampled during those timeframes. Data on reptiles and amphibians located during these samplings is located in Appendix A. Table 3 lists the utilized plots and their location and affiliated habitat.

Table 3: Minnow Trapping Sites

Plot #	UTM Coordinates NAD 83	Habitat
M-1	16 S 378040 3891897	BO
M-2	16 S 376637 3888388	ST
M-3	16 S 376969 3889204	PO
M-4	16 S 378642 3888679	PO
M-5	16 S 377731 3890048	ST
M-6	16 S 377720 3892455	PO
M-7	16 S 376472 3888424	ST
M-8	16 S 379502 3889610	PO

Coverboards (Artificial Shelters)

One of the major disadvantages of minnow and other “active” traps is that they must be set and monitored on a continual basis. An alternative method of inventorying herpetological communities involves the use of artificial shelters established in systematic arrays in various habitats. This method has been utilized extensively to sample reptile and amphibian populations nationwide in a variety of habitats. The major advantages of this approach are that they require no maintenance and they can be checked whenever time permits. These shelters are very effective in sampling salamanders, lizards, snakes and frogs. The sampling scheme utilized consists of the following; Arrays of coverboards consisting of .66 meter by .66 meter sections of exterior plywood were established and set up. Each array consisted of at least four boards and was arranged randomly through each terrestrial habitat block located on Park. All were sampled every field day during the study that investigators are in the area of the array. Realistically, arrays should be sampled at least a month after they are set up to allow the boards to age and to adequately compact the vegetation under them for easier visibility of reptiles and amphibians utilizing the shelters. These coverboards were also utilized in conjunction with drift fences because pitfall traps cannot be used due to the ground disturbing nature in an historical park. (See Drift Fences section below.)

Frog Breeding Surveys

The fact that anuran amphibians congregate for breeding allows for highly effective inventories of these species. These surveys involve the systematic survey of major aquatic habitats during the primary breeding seasons for these species in early spring and early summer.

Sites established under this approach were surveyed by spot lighting at night and by active listening in the various aquatic habitats by the biologists involved in this study. During the course of this inventory, the entire Park was driven twelve times at speeds appropriate for the road riding methodology detailed below, six times during the day and six times at night (after dark). At least 9 sites were established to have calling anurans during those surveys. Those sites were specifically monitored throughout the remainder of this inventory process. Data on frogs and toads located during this sampling is located in Appendix A. Table 4 lists the utilized plots and their location and affiliated habitat.

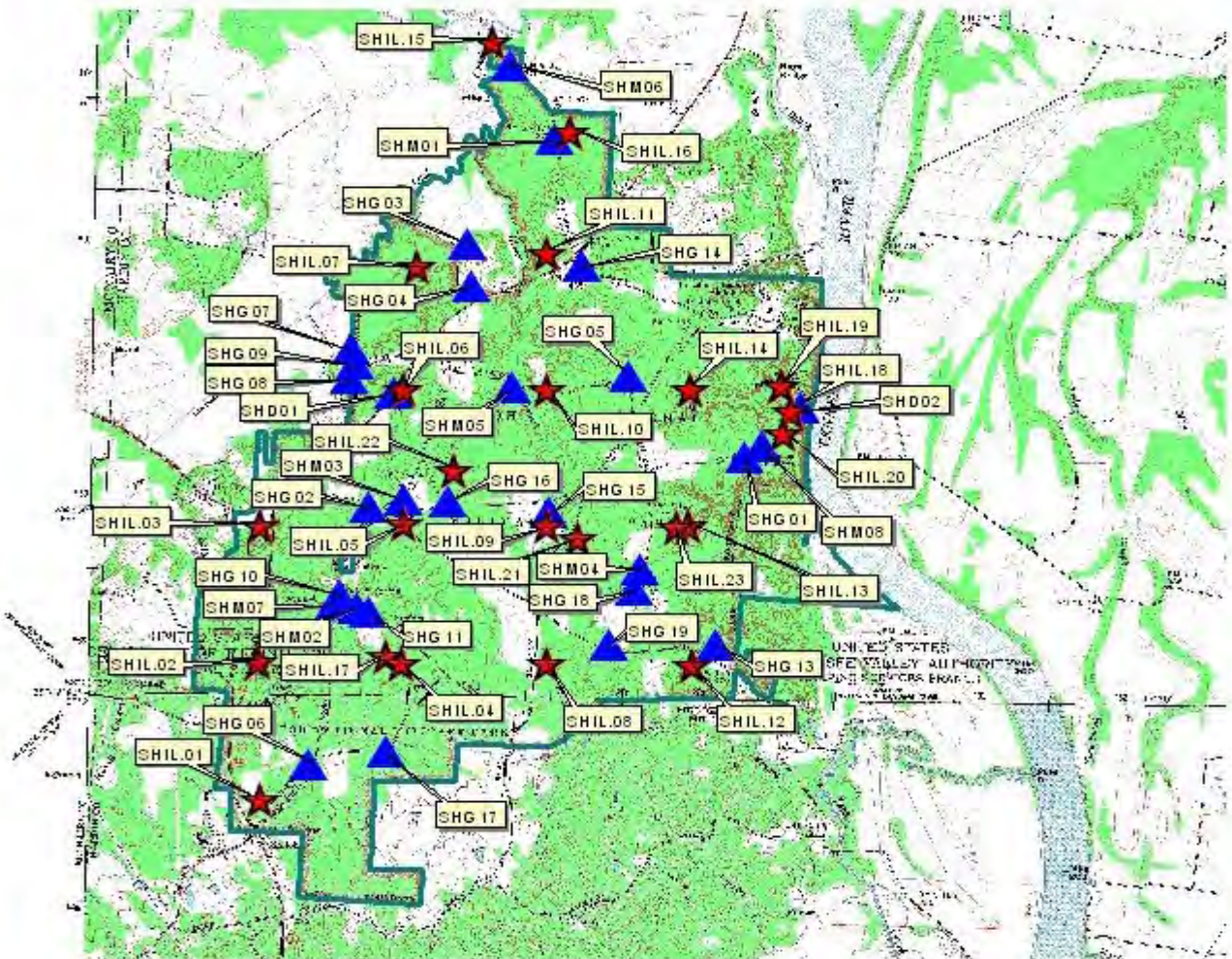
Table 4: Frog Breeding Survey Sites

Plot #	UTM Coordinates NAD 83	Habitat
M-1	16 S 378040 3891897	BO
M-2	16 S 376637 3888388	ST
M-3	16 S 376969 3889204	PO
M-4	16 S 378642 3888679	PO
M-8	16 S 379502 3889610	PO
G-1	16 S 379391 3889524	PO
G-2	16 S 376718 3889156	MF
G-8	16 S 376577 3890110	ST
R-8	16 S 377979 3887994	PJ

Road Surveys

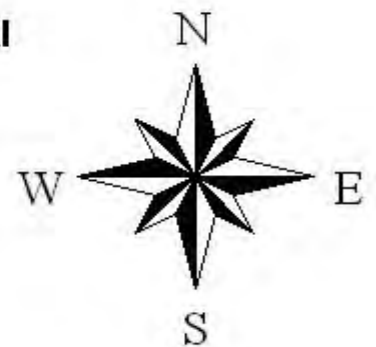
Many amphibians and reptiles routinely cross roads during their daily activities and investigators have found this approach to be the most effective method of sampling many terrestrial snakes, lizards, turtles, frogs and toads, as well as many semi-aquatic snakes. This approach has been used to successfully census and monitor amphibians and reptiles throughout the country and provides a transferable approach for use at Shiloh National Military Park. The sampling scheme for this approach consists of driving at slower speeds (10-25 miles per hour) and observing the amphibians and reptiles crossing or otherwise utilizing the roadway. The entire Park was sampled utilizing this methodology two times each visit to the Park, once during the day and once at night (after dark). The Park has been sampled in its entirety twelve times. Overall the results have been disappointing, with few reptiles and amphibians tallied utilizing this methodology. Data on reptiles and amphibians located during this sampling is located in Appendix A.

Shiloh Sampling Plot Locations



★ NatureServe plots

▲ Plots established by Accipiter Biological



Drift Fences

Drift fences are frequently a most productive method of inventorying herpetological communities. Equipped with pitfall traps, funnel traps or both, studies show that the productivity of drift fences is significantly higher than hand-captures, although, this does not always apply in all areas of the country. These arrays were set up to sample each terrestrial habitat identified on the Park lands. These arrays have been developed using 10 inch aluminum flashing for drift fence material with plastic 5-gallon pails embedded in the ground so that the top was flush with the ground surface being used for pitfalls. Aluminum screen funnel traps and plastic funnel traps used by commercial snake breeders were used to augment the trapping effort at the drift fence sites. This methodology was further augmented by the use of .66 meter by .66 meter coverboards placed alongside the drift fences since pitfall traps could not be utilized due to the ground disturbing nature in an historical park. 3 sites were established utilizing these sample methods on the Park with the first active trapping beginning during the spring 2004 surveys with data on reptiles and amphibians located during the sampling located in Appendix A. Table 5 lists the utilized plots and their location and affiliated habitat.

Table 5: Drift Fence Sites

Plot #	UTM Coordinates NAD 83	Habitat
D-1	16 S 376895 3890009	MF
D-2	16 S 379789 3889889	MF
D-3	16 S 379013 3887978	MH

ANALYSIS OF SURVEY METHODOLOGY EFFICIENCY

Table 6 summarizes the overall efficiency of the seven field methodologies utilized in this survey as well as the efficiency of all seven combined. An efficiency quotient has been established to enumerate this efficiency and is determined by dividing the number of species inventoried by a certain methodology by 56, the total number of species known to occur in the general area of Shiloh National Military Park. This would give a numerical value of the likelihood of a given methodology to accomplish a total inventory given the conditions available on Shiloh National Military Park during the survey.

Table 6: Field Methodology Efficiency Analysis

Methodology	No. of Species (n)	No. of Individuals	Efficiency Quotient (n/56)
General Herpetological Collecting	38	1474	.68
Minnow Traps	14	207	.25
Random Plots	4	7	.07
Frog Breeding Surveys	13	122+	.23

Methodology	No. of Species (n)	No. of Individuals	Efficiency Quotient (n/56)
Road Surveys	5	78	.09
Drift Fences	3	4	.05
Combined Six Methodologies	43	1892	.77

Table 6 shows very low efficiency quotients for several of the methodologies used in this inventory. This is to be expected as minnow traps and frog breeding surveys target smaller numbers of species than other methodologies. Each methodology has its own strengths and weaknesses as an inventory device. These and other potential biases will be discussed in the following paragraphs. Weather is a factor affecting the efficiency of all individual field methods, as well as the combination of the six.

PROCESSING OF INDIVIDUALS

All reptiles and amphibians captured or observed to date have been identified to species (many to identifiable subspecies), and where possible, sexed, measured for length (snout to vent length is becoming the standard for measuring snakes, lizards and amphibians, while carapace length is used for turtles), weighed and checked for reproductive condition. All lengths are recorded in millimeters while weights are recorded in grams. Sexing of snakes is done by probing which has a 96% reliability rate. Lizards are sometimes harder to sex, but anal pores and display markings of males are helpful in this respect. Turtles are sexed by a combination of indented plastron of most male individuals and location of the vent in relation to the end of the shell. Frogs, toads and salamanders are hard to sex with any degree of reliability outside the breeding season.

RESULTS

Analysis of Species Richness and Relative Abundance

The following tables and text analyze the species richness and relative abundance of the reptiles and amphibians found on Shiloh National Military Park in two contexts; parkwide and at the habitat level. The numbers in the tables reflect the relative abundance of that species compared to other species within that assemblage. This number is acquired by dividing the number of individuals found by the number of sampling points located within that geographic area or habitat (Jones, 1988). These numbers reflect only the results of this inventory and do not include previous or concurrent studies on the Park.

Table 7: Species Richness Analysis

<u>Level of Analysis</u>	<u>Number of Species</u>
Parkwide	43
Habitats	
Mixed Hardwood Forest	11
Mixed Mesic Hardwoods	19
Juniper/Hardwood Forest	10
Pine/Juniper Forest	2
Open Field	13
Pond	21
Spring	3
Stream	10
Bog	3

Table 8: Relative Abundance at Park Level

Species	Relative Abundance Factor
Red-spotted Newt (Central)	.133
Spotted Salamander	.683
Spotted Dusky Salamander	.233
Southern Two-lined Salamander	.017
Three-lined Salamander	.083
Zigzag Salamander	.017
Mississippi Slimy Salamander	.200
Southern Red Salamander	.017
American Toad	.500
Fowler's Toad	2.050
Northern Cricket Frog	1.250
Southern Cricket Frog	2.833
Green Treefrog	.017
Gray Treefrog (V)	.017
Cope's Gray Treefrog (C)	.250
Bird-voiced Treefrog	.217
Barking Treefrog	.033
Spring Peeper	.333
Eastern Narrowmouth Toad	.100
Bullfrog	2.767
Green Frog	9.017
Bronze Frog	.017

Species	Relative Abundance Factor
Southern Leopard Frog	7.700
Common Snapping Turtle	.017
Eastern Mud turtle	.017
Eastern Box Turtle	.150
Red-eared Slider	.017
Eastern Fence Lizard	2.167
Ground Skink	.117
Coal Skink	.033
Five-lined Skink	.033
Southeastern Five-lined Skink	.083
Six-lined Racerunner	.083
Black Racer	.067
Black Rat Snake	.017
Corn Snake	.017
Ring-necked Snake	.017
Eastern Worm Snake (Midwest)	.050
Midland Watersnake	.117
Yellow-bellied Watersnake	.083
Eastern Garter Snake	.017
Copperhead	.017
Eastern Cottonmouth	.050

Table 9: Relative Abundance by Terrestrial Habitats

Species	Mixed Hardwood Forest (10 Sites)	Mixed Mesic Hardwoods (15 Sites)	Juniper/Hardwood Forest (3 Sites)	Pine/Juniper Forest (2 Sites)	Open Field (9 Sites)
Red-spotted Newt (Central)					
Spotted Salamander					
Spotted Dusky Salamander					
Southern Two-lined Salamander					
Three-lined Salamander	.100	.133	.333		
Zigzag Salamander		.067			
Mississippi Slimy Salamander	.600	.133	1.000		
Southern Red Salamander		.067			
American Toad	.200	.200		4.500	.333
Fowler's Toad	.800	1.733		17.500	1.333
Northern Cricket Frog		1.000			

Species	Mixed Hardwood Forest (10 Sites)	Mixed Mesic Hardwoods (15 Sites)	Juniper/Hard wood Forest (3 Sites)	Pine/Juniper Forest (2 Sites)	Open Field (9 Sites)
Southern Cricket Frog	.400		1.333		
Green Treefrog					
Gray Treefrog (V)		.067			
Cope's Gray Treefrog (C)		.067			
Bird-voiced Treefrog					.111
Barking Treefrog					
Spring Peeper		.533			
Eastern Narrowmouth Toad					
Bullfrog	.500				
Green Frog		.133			
Bronze Frog					
Southern Leopard Frog	.200				
Common Snapping Turtle					.111
Eastern Mud turtle			.333		
Eastern Box Turtle	.300	.267			.111
Red-eared Slider					
Eastern Fence Lizard		.600	2.333		12.667
Ground Skink	.200	.133	.667		.111
Coal Skink			.333		.111
Five-lined Skink					.222
Southeastern Five-lined Skink					.556
Six-lined Racerunner					.556
Black Racer	.100		.333		.222
Black Rat Snake	.100				
Corn Snake		.067			
Ring-necked Snake		.067			
Eastern Worm Snake (Midwest)		.067	.667		
Midland Watersnake					
Yellow-bellied Watersnake					
Eastern Garter Snake		.067			
Copperhead		.067			
Eastern Cottonmouth					

Table 10: Relative Abundance by Aquatic Habitats

Species	Pond (9 Sites)	Stream (9 Sites)	Spring (2 Sites)	Bog (2 Sites)
Red-spotted Newt (Central)	.889			
Spotted Salamander	4.556			
Spotted Dusky Salamander		1.000	2.500	
Southern Two-lined Salamander		.111		
Three-lined Salamander	.111			
Zigzag Salamander				
Mississippi Slimy Salamander				.500
Southern Red Salamander				
American Toad	1.444			
Fowler's Toad	4.667			
Northern Cricket Frog	4.667	.222	8.000	
Southern Cricket Frog	16.556	1.444		
Green Treefrog	.111			
Gray Treefrog (V)				
Cope's Gray Treefrog (C)	1.556			
Bird-voiced Treefrog	1.333			
Barking Treefrog	.222			
Spring Peeper	1.111	.222		
Eastern Narrowmouth Toad	.667			
Bullfrog	16.778	.333	2.000	1.500
Green Frog	59.333	.556		
Bronze Frog	.111			
Southern Leopard Frog	51.111			
Common Snapping Turtle				
Eastern Mud turtle				
Eastern Box Turtle				.500
Red-eared Slider	.111			
Eastern Fence Lizard				
Ground Skink				
Coal Skink				
Five-lined Skink				
Southeastern Five-lined Skink				
Six-lined Racerunner				
Black Racer				
Black Rat Snake				
Corn Snake				
Ring-necked Snake				
Eastern Worm Snake (Midwest)				

Species	Pond (9 Sites)	Stream (9 Sites)	Spring (2 Sites)	Bog (2 Sites)
Midland Watersnake	.667	.111		
Yellow-bellied Watersnake	.444	.111		
Eastern Garter Snake				
Copperhead				
Eastern Cottonmouth	.222	.111		

THREATENED AND ENDANGERED SPECIES AND SPECIES IN NEED OF MANAGEMENT

Shiloh National Military Park is located in Hardin County Tennessee. The federal Endangered Species Act (ESA) does not list any reptile or amphibian species located in that area as threatened or endangered. No individuals of Federally or state listed threatened, endangered or candidate species were located during this inventory.

The State of Tennessee lists the following species as **wildlife in need of management**:

Black Mountain Dusky Salamander	Mole Salamander
Four-toed Salamander	Barking Treefrog
Janaluska Salamander	Eastern Slender Glass Lizard
Weller's Salamander	Green Anole
Wehrle's Salamander	Six-lined Racerunner
Seepage Salamander	Green Water Snake
Pygmy Salamander	Alligator Snapping Turtle
Black-bellied Salamander	

Of these species only the Mole Salamander, Barking Treefrog, Green Anole, Six-line Racerunner and Alligator Snapping Turtle have distributions close to the area of this park. Of these species only the Barking Treefrog and Six-lined Racerunner were located on this inventory. Neither of these species has standing of protection from the state so there exists no special management strategies for them. The Alligator Snapping Turtle is known to occupy the Tennessee River which borders Shiloh National Military Park on the east, however they tend to keep to the deeper waters of the waterway. They are known to occasionally stray into the shallower streams, but, two of the three streams which flow into the Tennessee River from the Park are not accessible from the river due to drop offs and the third was sampled with no individuals of this species located during this inventory process.

DISCUSSION

During the course of this inventory process several potential sources of bias were noted. Weather nearly always creates some bias in herpetological survey. Because of the need for fairly exacting moisture and heat parameters by most reptile and amphibian species, some bias is

certain to occur. During the time of our surveys, weather appeared to be within normal parameters for the area of the Park. Therefore, little bias would enter in to these survey results.

Another thing that became apparent was that randomly placed plots do not work well for reptiles and amphibians. They do work for birds, but, for more sedentary species, they do not seem to be of much value. Most reptiles and amphibians depend on fairly exacting microhabitats in which to live and randomly placed plots do not take this into account, thus leading to great inefficiency, especially as an inventory technique. This was borne out in other herpetological inventories conducted by Accipiter Biological Consultants including those on the Natchez Trace Parkway, Camp Dodge, Iowa Military Training Area, the Blue Ridge Parkway and now at Shiloh National Military Park. In all cases this technique utilized the most time and produced among the fewest individuals.

Past Herpetological Surveys of Shiloh National Historical Park

During the course of research for this project three previous studies were noted for this park. Between September 1997 and August 1998 Field Biologist Gary R. Pritts conducted a baseline herpetological survey of the Park. His survey netted seventeen species of amphibians and fourteen species of reptiles. Two other more informal surveys were conducted by Shiloh Ranger Kent Higgins who identified approximately 22 species of reptiles and amphibians and by Dr. William Gutzke of the University of Memphis who located approximately forty two species of Reptiles and amphibians at Shiloh. A summary of species found during these three studies occurs in the Annotated Checklist found in Appendix B of this document. Species located during these studies, but not located during the present study include the following:

Spiny Softshell Turtle	Mole Salamander
Broadhead Skink	Smallmouth Salamander
Diamondback Water Snake	Marbled Salamander
Brown Snake	Spring Salamander
Northern Redbelly snake	Northern Red Salamander
Eastern Hognose Snake	Upland Chorus Frog
Rough Green Snake	Mountain Chorus Frog
Gray Rat Snake	

Anecdotal Observation Records

Anecdotal observations are those observations made by other people, outside the study, which may or may not be verified as to the true species observed. The usefulness of this type of data is limited and depends, to a great extent, on the experience of the observer. One species has been reported to us by Park staff which was not located on this inventory or other known studies of the Park. The observer in this case is known to the researchers on this project and thus the reliability of the observations would be considered strong. This was the Gopher Frog which was heard by Park employee Marcus Johnson. Mr. Johnson has spent time with our researchers in the field and has a very strong knowledge of anuran vocal calls. This observation appears to be close to the range of distribution of this species (within 30 miles of populations in Mississippi) and **could** be found on the Park lands in the areas they were heard.

During the course of this study a number of NPS employees, especially maintenance workers and rangers, who are out on the Park daily, local inhabitants and visitors to the Park were interviewed in regards to reptile and amphibian species that they had observed on the Park. While this is not a reliable method of gaining information for a study of this type, several interesting conclusions could be drawn from the information.

1. Many local people fear all snakes and feel that all should be killed without delay.
2. Cottonmouths and Copperheads may have been more prevalent than survey methodologies led us to believe. Many were reported to us but few were found during the surveys.

Taxonomic Issues

Since the beginning of this project, all North American species in the Genus *Eumeces* have been changed to *Plestiodon*. This would include all species of skinks found on the Shiloh National Military Park with the exception of the Ground Skink. Additionally, all lizards of the Genus *Cnemidophorus* residing in North America north of Mexico have been relegated to the Genus *Aspidoscelis*. These changes have been made, where appropriate, in this text.

The Gray Treefrog complex, *Hyla versicolor* and *Hyla chrysoscelis* has also proven to be problematic on this inventory. One individual *Hyla versicolor* was heard during audio surveys on April 8, 2004 at General Collecting Site 2. Accipiter Biological Consultants' protocol for these surveys call for two researchers to agree on species and number calling before logging the calling anurans. In this case an individual *Hyla versicolor* was agreed upon based on the call heard. The call was from a low point where a chorus of Spring Peepers was also calling. Calling from a low point is more typical of *versicolor*, as *chrysoscelis* tends to be more arboreal in its calling locations. That said, the individual was well outside (approximately 30-40 miles) of currently mapped distribution for *Hyla versicolor*. Based on this individual, additional work may be in order for this particular Park to determine the possible presence of *Hyla versicolor* populations.

SUMMARY

During the course of this inventory 59 species of amphibians and reptiles were documented for Shiloh National Military Park. As our starting list consisted of 59 species the goal of 90% of expected species appears to be met. However, four species found on the final inventory list were not on our initial list. These include the Gray Treefrog, Barking Treefrog, Bronze Frog and Coal Skink. Each of these forms were at or slightly beyond their known distribution boundaries. Likewise, the Scarlet Kingsnake, Southeastern Crowned Snake, Northern Scarlet Snake and Alligator Snapping Turtle which may be expected on or in the near proximity of the Park were not found during this inventory or documented from other studies. Still the 90% goal has been met for this study.

Additionally, seven species were located during this inventory which had not been documented during the previous three studies. They include the Gray Treefrog, Bird-voiced Treefrog, Barking Treefrog, Bronze Frog, Six-lined Racerunner, Southeastern Five-lined Skink and the

Coal Skink. All are within their normal distribution or within 30 miles of known populations in other areas.

CONSERVATION AND MANAGEMENT RECOMMENDATIONS

Throughout history, many human activities have proven detrimental to the natural biota. As human populations increase, more and more natural habitat is eliminated or modified such that many species are now at risk. Several major threats to reptile and amphibian populations exist. The greatest include habitat destruction, modification of hydrologic controls that affect wetlands, pollution and collection for commercial or scientific purposes. The following are a series of conservation and management recommendations aimed at mitigating the effects of these threats on Shiloh National Military Park. These are not meant to be binding on the National Park Service, but rather recommendations for best management practices on the Park.

- As is the case with so many kinds of wildlife, reptiles and amphibians are under great pressure and they are rapidly disappearing from many areas where they were formerly abundant. This is due in the largest part to ignorance of the value of these animals, habitat destruction and exploitation for the pet trade. Current regulations of the National Park Service protect and manage all native wildlife within the National Park System lands. With this progressive attitude in mind, **land managers at Shiloh National Military Park should entirely eliminate the collection of native reptiles and amphibians, except as allowed by law through the scientific collecting permit process, and enforce laws relating to killing or harassing of these animals to the highest degree possible.**
- **All wetland areas should be managed to preserve, protect and, if necessary, restore natural functions in compliance with Executive Orders 11988 (requires agencies to preserve natural values served by floodplains) and 11990 (requires avoidance of adverse impacts associated with destruction or modification of wetlands), with the objective of minimizing degradation of stream banks and the loss of wetland habitat.**
- On several occasions Water Oaks Pond was mowed well into the wetland. This can have adverse affects on the hydrology of this pond which represents some of the best amphibian habitat on the Park. This mowing causes turbidity in the water, as well as opens the canopy of the marsh to more direct sunlight causing more rapid evaporation of the wetland. **Mowing should occur only up to, but not into the marshy area surrounding the pond.** In other words, if the tires are kicking up water, then, habitat damage is probably being done.
- **Rights-of-way should be placed near current habitat edge areas to reduce fragmentation of larger blocks of pristine habitat. Avoid building roads or new trails parallel to streams in riparian zones or through wet meadows. Stream crossings should be at right angles to minimize impacts on riparian vegetation, streambanks, soils, and water quality.**

- **Avoid straightening or diverting sections of stream channel. These activities increase stream velocity and erosion, reduce streambank stability, and negatively affect upstream and downstream habitat.**
- **Disturbed wetland areas could be enhanced by revegetation with native plants around the wetland to control erosion and reduce nutrient inputs into the water.** All amphibians and many aquatic reptiles are adversely affected by impurities in the water. To this end **chemical pesticides and non-biodegradable herbicides should be avoided, especially within 300 feet of any wetland. They should be used only in conjunction with an established Integrated Pest Management Plan.**
- **Where appropriate sites and habitat types exist, especially where ephemeral pools have been drained or otherwise destroyed, consideration should be given to construction of additional ephemeral pools, in close consultation with herpetologists and botanists familiar with the native species of the area.** Sites should be carefully chosen, so as not to destroy other valuable resources, or disrupt natural drainage patterns. They are relatively easy to create and provide potential habitat for a majority of the *Ambystoma* salamander species and anurans occupying the Park. The book entitled A Guide to Creating Vernal Ponds by Tom Biebighauser is an excellent sourcebook. If the NPS cannot find a copy, Accipiter Biological Consultants will provide one at no cost. Inexpensive labor and machinery exist with the Planning, Operations and Training Offices of the Tennessee Army National Guard. ABC has facilitated these cooperative efforts between military engineers and other National Parks and Forests and in each instance it produced a win-win situation. The engineers get excellent training on their equipment, the NPS gets new habitat built for the cost of allowing the troops to camp while they work and the wildlife gets additional habitat. ABC will gladly put NPS land managers in touch with the appropriate offices for this type of project.
- The following is recommended to further the success of the permanent wetlands on the Park for reptile and amphibian species. **Keep fish out of wetland areas, especially game fish, except for where nature provides them.** These fish are highly predatory on amphibian eggs and larvae. Large game fish are also capable of ingesting adult frogs or salamanders and young aquatic snakes and turtles. Many amphibian species will not breed where these species are present. Even small fish species are capable of making heavy inroads on amphibian eggs. Bloody Pond on Shiloh National Military Park is a good example of introduced fish decimating amphibian populations.
- While the wetlands on the Park appear to be in fair shape, they do not exist alone, but have hydrologic and biologic ties with the surrounding landscape. **Vegetative corridors should be provided or maintained where they exist between wetlands and surrounding upland areas. Land managers should encourage native vegetative diversity in all habitats located on the Park.**
- **Activities that will interrupt ecosystem processes should be avoided, or an alternative location for the activity should be sought. For example, avoid fragmentation activities that will interrupt the water flow patterns in wetland**

communities or create barriers between connected habitats used by reptile and amphibian species. Roads and firebreaks that disrupt natural hydrologic and burn patterns in higher quality ecotones that serve as reptile and amphibian habitat should be reduced to the minimum level necessary to accomplish the NPS mission, with remaining ecotones being allowed to recover. Roads that transect ecotones should be stabilized to prevent unnecessary erosion impacts and fire ditches and breaks should be restored to the original grade to restore natural hydrologic patterns. Where hydrologic fragmentation has already occurred, the NPS should conduct studies on its effect on reptile and amphibian populations. These studies should be comparative, comparing the fragmented habitats to more pristine habitats on the Park.

- Whenever a building is removed on the Park, the following plan of action is recommended. This strategy has been adopted by several military reserves in the midwestern United States because agricultural land uses have reduced the habitat quality and potential hibernation sites for snakes and salamanders. This strategy may also prove helpful on Shiloh National Military Park lands. **When buildings are removed, the foundation should be filled with the loose debris and covered with soil to create a snake and salamander hibernaculum. This practice should be repeated whenever a building is demolished at isolated sites on the Park.** Costs for this practice would likely not be higher than hauling the debris away. **Also, agricultural crops and manicured lawns in the immediate vicinity of these sites could be replaced by native grasses and plants to provide for a higher diversity of plant life.**
- No ecological benefits are gained by utilizing intensive site preparation activities that cause severe soil disturbance at sites. Therefore, **mechanical site preparation activities in susceptible areas should be minimal and restricted to nonmechanical approaches, if possible.** Intensive site preparation activities are known to lead to invasion by invasive exotic weedy species, and to exacerbate erosion problems.
- Maintenance personnel at the Park utilize a synthetic mesh to fight erosion in several areas of the Park including the stream area adjacent to the Shiloh Church. ABC personnel found several birds dead after being trapped in this mesh and also found a live, but, very trapped Corn Snake ensnared in the mesh. Several Park visitors were appalled at the sight of one dead bird within easy sight of the road. If possible a more wildlife friendly alternative should be sought to prevent erosion in these areas. Possible alternatives would be **native** grasses and forbs and even the use of rock or gravel.
- Hazards to reptile and amphibian species on the Park include automobile traffic and mowing of large, open areas of the Park lands. While there have been numerous studies made on the effects of traffic on herp movements, the NPS may wish to **investigate the effects of Park traffic on sedentary species such as woodland salamanders which make up a large percentage of the animal biomass in many areas of their ranges.** During the course of the initial inventory, box turtles were found with profound injuries or dead as the result of run-ins with automobiles and mowers on the Park. When possible, **mowers should be set to cut not less than at an eight-inch height to avoid damaging or killing turtles and snakes utilizing the grassy areas of the Park.** The

NPS should investigate the effects of mowing on home range and movement of herp species on the Park.

- During 2003-2005 a baseline inventory of the reptile and amphibian species was accomplished on Shiloh National Military Park. The results of this survey are included in this report. **In addition, a monitoring plan for reptile species should be developed. This monitoring plan should be implemented as soon as time, personnel and financial resources are available.**
- **Visitors and employees at Shiloh National Military Park should be encouraged to leave microhabitats intact. Rocks, logs, boards and other ground debris should be replaced when disturbed.** These microhabitats form a large share of the usable reptile and amphibian habitat on Park lands. This encouragement could potentially come in the form of notices on Park maps, literature and bulletin boards currently located at a number of pullovers throughout the Park. Brief statements prior to or following the Park film shown in the Visitors Center could also be utilized. These same sources could also be used to **educate visitors and employees on the usefulness of these animals, and to prohibit the harassment of reptiles, amphibians and other native wildlife on Shiloh National Military Park.**

ACKNOWLEDGMENTS

Funding for this project was derived from the operating budget of the National Park Service—Cumberland/Piedmont Inventory and Monitoring Network. Our thanks go to Teresa Liebfreid and Tom Diggs of that organization who assisted in obtaining information and answering our questions, necessary to the accomplishment of this project. Our appreciation is also expressed to Stacy Allen and Marcus Johnson who were helpful in answering questions regarding habitats and locales on their Park. Special thanks also to the many rangers and maintenance personnel of the Park who took time from their busy schedules to give us locale information and information regarding anecdotal observations of reptiles and amphibians on the Park. Without the help of these individuals, this project would not have been possible.

REFERENCES

- Beacham, Walton, F.V. Castronova, S. Sessine, Eds. 2001. Beacham's Guide to the Endangered Species of North America: Volume 6: Dicots, Monocots, Glossary, Organizations, Indexes. Gale Group, Inc. Farmington Hills, Michigan. PP 3400-3401.
- Biebighauser, T.R. 2002. A Guide to Creating Vernal Ponds: All the Information You Need to Build and Maintain an Ephemeral Wetland. Published by the USDA Forest Service in cooperation with Ducks Unlimited, Inc. and the Izaak Walton League of America, South Morehead, KY. 33pp.
- Bogan, M. A., R. B. Finley, Jr. And S. J. Petersberg. 1988. IN: Management of Amphibians, Reptiles and Small Mammals in North America (R. C.Szaro, K. Severson and D. R. Patton, eds). USDA Forest Service Technical Report, RM-166, pp 254-261.

- Collins, J.T. and T.W. Taggart. 2002. Standard Common and Current Scientific Names for North American Amphibians, Turtles, Reptiles and Crocodilians. Fifth Edition. The Center for North American Herpetology, Lawrence, Kansas. 44pp.
- Conant, Roger and J.T. Collins. 1998. A Field Guide to Reptiles and Amphibians of Eastern/Central North America. Houghton Mifflin Company, Boston, Massachusetts. 569 pp.
- Cooperrider, A.Y., R.J. Boyd and H. R. Stuart, eds. 1986. Inventory and Monitoring of Wildlife Habitat. US Department of the Interior, Bureau of Land Management Service Center. Denver, Colorado. 858pp.
- Duellman, W.E and L. Trueb. 1986. Biology of Amphibians. Johns Hopkins University Press, Baltimore MD. 670 pp.
- Ernst, C.H., J.E. Lovich and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC and London. 577 pp.
- Fitch, H. S. 1992. Methods of Sampling Snake Populations and Their Relative Success. Herpetological Review. Rev. 23: 17-19.
- Gibbons, J. W. 1988. The Management of Amphibians, Reptiles and Small Mammals in North America: The Need for an Environmental Attitude Adjustment. IN: Management of Amphibians, Reptiles and Small Mammals in North America (R. C. Szaro, K. Severson and D. R. Patton, eds). USDA Forest Service Technical Report, RM-166, pp 4-10.
- Heyer, W. Ronald et al. eds. 1994. Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians. Smithsonian Institution Press, Washington DC. 364 pp.
- Jones, K.B. 1988. Distribution and Habitat Associations of Herpetofauna in Arizona: Comparisons by Habitat Type. IN: Management of Amphibians, Reptiles and Small Mammals in North America (R. C. Szaro, K. Severson and D. R. Patton, eds). USDA Forest Service Technical Report, RM-166, pp 109-127.
- Jones, R.L. and P.S. White. 1981. The Vascular Flora of Shiloh National Military Park, Hardin County, Tennessee. US Department of the Interior, National Park Service., NPS-SER Research/Resources Management. Rep. No. 50. 49 pp.
- Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, DC and London. 587 pp.
- Pritts, G.R. 1999. An Investigation and Assessment of Amphibian and Reptile Fauna of Shiloh National Military Park, Hardin County, Tennessee. Unpublished Paper. 12 pp.
- Ramos, E. 1999. State Reptile and Amphibian Regulations. Reptile and Amphibian Magazine Pottsville, PA. p 57.

- Scott, N. J. Jr. And R. A. Seigel. 1992. The Management of Amphibian and Reptile Populations: Species Priorities and Methodological and Theoretical Constraints. IN: Wildlife 2001: Populations (D. McCullough, ed). Elsevier Publishing Company, London. Pp 343-368.
- Tennessee Division of Natural Heritage. June 2005. Tennessee List of Rare Species by County. Tennessee Division of Natural Heritage. Nashville, Tennessee. Page 47.
- Vogt, R. C. and R. L. Hine. 1882. Evaluation of Techniques for Assessment of Amphibian and Reptile Populations. IN Herpetological Communities (N. J. Scott, Jr., ed). U. S. Department of the Interior, Fish and Wildlife Service, Wildlife Research Report 13. Pp 201-217.
- Wright, A.H. and A.A. Wright. 1994. Handbook of Snakes of the United States and Canada, Vols 1 and 2. Comstock Publishing Associates, Ithaca, NY. 1105 pp.

APPENDIX A

FIELD DATA

FOR

SHILOH

NATIONAL

MILITARY PARK

APPENDIX A KEY

HAB = Habitat

MF = Mixed Hardwood Forest

MH = Mixed Mesic Hardwoods

JH = Juniper/Hardwood Forest

PJ = Pine/Juniper Forest

OF = Open Field

PO = Pond

SP = Spring

ST = Stream

BO = Bog

SKY = Cloud Cover

0 = Clear or few clouds

1 = Partly cloudy or variable

2 = Cloudy or overcast

4 = Fog or smoke

5 = Drizzle

7 = Snow

8 = Showers

RAIN = Rainfall in last 24 hours

Y = Yes

N = No

= Number of individuals found

AGE

A = Adult

J = Juvenile

L = Larval Stage

U = Unknown

SEX

M = Male

F = Female

U = Unknown

S to V = Snout to Vent Length in mm.

WT = Weight in Grams

* = not weighed

Audio Frog Surveys

HEARD

1 = One frog calling

2 = Two frogs calling

3 = Three frogs calling

4 = Chorus of frogs calling

SHIL Random Plot Datasheet

[illegible]

SHIL General Collecting Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
04/08/04	G 11	SP	0	76	Y	NORTHERN CRICKET FROG	13	A	U	21	0.5	
04/08/04	M 3	PO	0	77	Y	NORTHERN CRICKET FROG	7	A	U	19	*	
04/08/04	M 3	PO	0	77	Y	SOUTHERN LEOPARD FROG	50	L	U	63	1.5	
04/08/04	M 3	PO	0	77	Y	GREEN FROG	3	L	U	72	1.5	
04/08/04	M 3	PO	0	77	Y	BULLFROG	5	L	U	138	3.0	
04/08/04	M 3	PO	0	77	Y	RED-SPOTTED NEWT (CENTRAL)	4	A	F	47	2.0	
04/08/04	M 3	PO	0	77	Y	SPOTTED SALAMANDER	4	L	U	37	1.5	
04/08/04	M 4	PO	0	76	Y	NORTHERN CRICKET FROG	3	A	U	*	*	OBSERVED
04/09/04	G 3	MH	0	69	N	EASTERN FENCE LIZARD	1	J	M	54	5.0	
04/09/04	G 5	JH	0	71	N	EASTERN FENCE LIZARD	1	A	M	*	*	OBSERVED
04/09/04	G 5	JH	0	71	N	MISSISSIPPI SLIMY SALAMANDER	1	A	U	64	8.0	
04/09/04	M 3	PO	0	73	N	NORTHERN CRICKET FROG	15	A	U	22	0.5	
04/09/04	M 3	PO	0	73	N	RED-SPOTTED NEWT (CENTRAL)	1	A	U	45	1.5	
04/09/04	G 10	SP	0	72	N	NORTHERN CRICKET FROG	3	A	U	22	0.5	
04/09/04	G 9	JH	0	72	N	COAL SKINK	1	A	U	52	2.5	ONE POSTMENTAL SCALE
04/10/04	G 9	JH	0	72	N	EASTERN MUD TURTLE	1	A	M	120	378.0	
04/10/04	G 8	MH	0	72	Y	EASTERN WORM SNAKE (MIDWEST)	1	J	F	84	0.5	TWO PREFRONTALS
04/10/04	G 8	MH	0	72	Y	NORTHERN CRICKET FROG	15	A	U	27	1.0	
06/17/04	M3	PO	2	83	Y	COPE'S GRAY TREEFROG	1	A	U	40	6.5	
06/17/04	M3	PO	1	87	Y	NORTHERN CRICKET FROG	9	A	U	26	1.5	
06/17/04	M3	PO	1	87	Y	SOUTHERN LEOPARD FROG	3	A	U	47	8.5	
06/17/04	M3	PO	1	87	Y	BIRD-VOICED TREEFROG	4	L	U	21	2.0	
06/17/04	M3	PO	1	87	Y	AMERICAN TOAD	4	L	U	6	*	
06/17/04	M3	PO	1	87	Y	BULLFROG	7	L	U	52	21.0	
06/17/04	M3	PO	1	87	Y	GREEN FROG	4	L	U	22	5.0	
06/17/04	M3	PO	1	87	Y	SOUTHERN LEOPARD FROG	12	L	U	8	0.5	
06/17/04	M3	PO	1	87	Y	SPOTTED SALAMANDER	1	L	U	31	1.0	
06/17/04	M3	PO	1	87	Y	GREEN TREEFROG	1	J	U	*	*	ESCAPED
06/17/04	M3	PO	1	87	Y	SPRING PEEPER	2	J	U	*	*	
06/18/04	M1	BO	1	79	Y	EASTERN BOX TURTLE	1	A	M	129	432.0	
06/18/04	M1	BO	1	79	Y	BULLFROG	3	A	U	*	*	OBSERVED
06/18/04	M1	BO	1	81	Y	MISSISSIPPI SLIMY SALAMANDER	1	A	U	*	*	OBSERVED
06/18/04	G12	MH	1	81	Y	AMERICAN TOAD	1	J	U	27	1.0	
06/18/04	R4	MH	1	84	Y	EASTERN FENCE LIZARD	3	A	M	59	6.0	
06/18/04	G13	OF	1	86	Y	EASTERN FENCE LIZARD	1	A	M	57	6.0	
06/18/04	G13	OF	1	86	Y	COAL SKINK	1	A	F	*	*	NEST WITH 8 EGGS
06/18/04	M7	ST	1	88	Y	SPOTTED DUSKY SALAMANDER	4	J	U	33	1.0	
06/18/04	G9	MH	0	88	Y	EASTERN BOX TURTLE	1	A	F	132	451.0	
06/18/04	G17	MH	0	87	Y	FOWLER'S TOAD	16	A	U	54	20.0	
06/18/04	G17	MH	0	87	Y	AMERICAN TOAD	2	A	M	58	19.0	
06/18/04	G17	MH	0	86	Y	GREEN FROG	2	A	U	31	2.0	
06/18/04	G17	MH	0	86	Y	COPE'S GRAY TREEFROG	1	A	U	58	9.5	

SHIL General Collecting Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
06/19/04	G18	OF	1	84	N	EASTERN FENCE LIZARD	8	A	F	83	13.5	GRAVID
06/19/04	G18	OF	1	84	N	SOUTHEASTERN FIVE-LINED SKINK	4	A	F	62	6.0	TAIL SCALES SAME SIZE
06/19/04	G14	OF	O	84	N	EASTERN FENCE LIZARD	2	A	F	78	12.5	GRAVID
06/19/04	G15	OF	0	89	N	EASTERN FENCE LIZARD	3	A	F	82	13.0	
06/19/04	G15	MH	0	89	N	FOWLER'S TOAD	1	A	U	53	18.0	
06/19/04	G1	PO	0	89	N	SOUTHERN LEOPARD FROG	3	A	U	*	*	OBSERVED
06/19/04	G1	PO	0	89	N	GREEN FROG	1	A	U	*	*	OBSERVED
06/19/04	G1	PO	0	89	N	BULLFROG	1	A	U	*	*	OBSERVED
06/20/04	G1	PO	0	79	N	SPOTTED SALAMANDER	17	L	U	27	1.0	
06/20/04	G1	PO	2	82	N	SOUTHERN CRICKET FROG	1	A	U	22	1.0	
06/20/04	G1	PO	2	85	N	GREEN FROG	2	J	U	26	0.5	
06/20/04	G1	PO	2	85	N	THREE-LINED SALAMANDER	1	A	U	64	55.0	
06/20/04	G1	MH	2	85	N	EASTERN FENCE LIZARD	1	A	U	*	*	OBSERVED
06/20/04	G1	PO	2	85	N	EASTERN COTTONMOUTH	1	A	U	*	*	OBSERVED
09/17/04	M8	MF	0	78	Y	BLACK RACER	1	A	F	*	*	OBSERVED
09/17/04	M8	MF	0	78	Y	EASTERN BOX TURTLE	1	A	M	125	357.0	
09/17/04	M8	MF	0	78	Y	GROUND SKINK	1	J	U	32	0.5	
09/17/04	M8	MF	0	78	Y	BULLFROG	5	A	U	*	*	OBSERVED
09/17/04	M3	OF	0	80	Y	BLACK RACER	1	A	U	*	*	OBSERVED
09/17/04	M3	PO	0	80	Y	RED-EARED SLIDER	1	A	U	*	*	OBSERVED
09/17/04	R3	MH	1	82	Y	COPPERHEAD	1	A	F	*	*	OBSERVED
09/17/04	R17	MH	1	83	Y	MISSISSIPPI SLIMY SALAMANDER	1	A	U	64	4.5	
09/17/04	R4	MH	1	83	Y	GROUND SKINK	1	J	U	27	*	
09/17/04	R20	MH	1	84	Y	ZIGZAG SALAMANDER	1	A	U	71	7.0	
09/18/04	M6	MF	0	71	N	EASTERN BOX TURTLE	1	A	M	137	487.0	
09/18/04	M6	PO	0	71	N	SOUTHERN LEOPARD FROG	1	A	U	57	20.0	
09/18/04	M1	PO	0	71	N	BULLFROG	1	A	U	*	*	OBSERVED
09/18/04	R16	MF	0	71	N	MISSISSIPPI SLIMY SALAMANDER	1	A	U	*	*	
09/18/04	G8	JH	0	74	N	EASTERN WORM SNAKE (MIDWEST)	2	A	F	208	3.5	1 JUV.
09/18/04	G8	JH	0	74	N	GROUND SKINK	1	J	U	24	*	
09/18/04	G8	JH	0	74	N	SOUTHERN CRICKET FROG	4	A	U	31	0.5	
09/18/04	G9	JH	0	74	N	EASTERN FENCE LIZARD	4	A	F	71	8.5	3 JUV.
09/18/04	M3	PO	0	74	N	BULLFROG	32	L	U	16	0.5	
09/18/04	G10	SP	0	77	N	SPOTTED DUSKY SALAMANDER	3	A	U	52	1.5	
09/18/04	M2	ST	0	82	N	SPOTTED DUSKY SALAMANDER	3	A	U	44	1.5	
09/18/04	M2	ST	0	82	N	SOUTHERN TWO-LINED SALAMANDER	1	A	U	32	0.5	
09/18/04	G17	ST	0	83	N	BULLFROG	1	J	U	60	12.0	
09/18/04	G17	ST	0	83	N	SPOTTED DUSKY SALAMANDER	1	A	U	46	1.5	
09/18/04	G19	OF	0	83	N	EASTERN FENCE LIZARD	11	A	M	71	12.0	10 JUV.
09/18/04	G19	OF	0	83	N	GROUND SKINK	1	A	U	39	1.5	
09/18/04	G19	OF	0	83	N	BIRD-VOICED TREEFROG	1	A	U	19	*	
09/18/04	G13	OF	0	84	N	EASTERN FENCE LIZARD	11	A	F	48	3.0	8 JUV.

SHIL General Collecting Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
09/19/04	M8	MF	0	75	N	GROUND SKINK	1	A	U	35	1.0	
09/19/04	M5	JH	0	79	N	BLACK RACER	1	A	M	1059	449.0	
09/19/04	G15	OF	0	80	N	EASTERN FENCE LIZARD	21	J	U	26	0.5	5 ADULTS
09/19/04	G15	OF	0	80	N	SIX-LINED RACE RUNNER	1	J	U	32	0.5	
09/19/04	G18	OF	0	82	N	EASTERN FENCE LIZARD	13	A	F	72	14.0	10 JUV.
09/19/04	G18	OF	0	82	N	SIX-LINED RACE RUNNER	1	A	U	66	2.5	
06/19/05	M3	PO	1	85	N	SOUTHERN CRICKET FROG	14	A	U	26	0.5	
06/19/05	M3	PO	1	85	N	GREEN FROG	35	L	U	8	0.5	
06/19/05	M3	PO	1	85	N	SOUTHERN LEOPARD FROG	300	L	U	10	1.0	
06/19/05	M3	PO	1	85	N	SPOTTED SALAMANDER	4	L	U	37	2.0	
06/19/05	M3	PO	1	85	N	BULLFROG	8	L	U	47	2.0	
06/19/05	M8	PO	1	87	N	YELLOW-BELLIED WATERSNAKE	1	A	F	640	203.0	
06/19/05	R3	MH	1	88	N	THREE-LINED SALAMANDER	2	A	U	59	2.5	
06/20/05	M1	MF	1	78	N	SOUTHERN LEOPARD FROG	1	A	U	*	*	OBSERVED
06/20/05	M3	PO	1	79	N	BULLFROG	19	L	U	42	18.0	
06/20/05	M3	PO	1	79	N	COPE'S GRAY TREEFROG	2	L	U	23	4.0	
06/20/05	M3	PO	1	79	N	GREEN FROG	450	L	U	10	0.5	
06/20/05	M3	PO	1	79	N	SOUTHERN CRICKET FROG	48	L	U	8	0.5	
06/20/05	M3	PO	1	79	N	MIDLAND WATERSNAKE	1	A	F	307	34.0	
06/20/05	M7	ST	1	81	N	YELLOW-BELLIED WATERSNAKE	1	A	U	*	*	
06/20/05	G10	MF	1	82	N	THREE-LINED SALAMANDER	1	A	U	61	3.0	
06/20/05	G10	MF	1	82	N	MISSISSIPPI SLIMY SALAMANDER	2	A	U	58	4.5	1 JUV.
06/20/05	G10	MH	1	85	N	SOUTHERN RED SALAMANDER	1	A	U	58	4.5	
06/20/05	M8	PO	1	85	N	SOUTHERN CRICKET FROG	31	A	U	26	1.0	
06/20/05	M8	PO	1	85	N	SOUTHERN LEOPARD FROG	6	J	U	29	1.5	
06/20/05	M8	PO	1	85	N	SPOTTED SALAMANDER	4	L	U	33	1.0	
06/20/05	M8	PO	1	85	N	EASTERN COTTONMOUTH	1	A	U	*	*	OBSERVED
06/20/05	M4	PO	1	87	N	FOWLER'S TOAD	3	J	U	17	0.5	
06/20/05	M2	SP	1	87	N	SPOTTED DUSKY SALAMANDER	2	A	U	44	1.0	
06/21/05	R11	PH	1	84	N	EASTERN FENCE LIZARD	1	A	M	*	*	OBSERVED
06/21/05	M8	PO	1	88	N	SOUTHERN CRICKET FROG	2	A	M	24	0.5	
06/21/05	G14	OF	1	90	N	FOWLER'S TOAD	1	A	U	*	*	
06/21/05	G14	OF	1	90	N	EASTERN FENCE LIZARD	2	A	M	*	*	OBSERVED
06/21/05	G9	HW	1	90	N	EASTERN FENCE LIZARD	1	A	M	*	*	OBSERVED
06/21/05	G8	HW	1	90	N	EASTERN FENCE LIZARD	1	A	M	*	*	OBSERVED
06/21/05	G8	HW	1	90	N	FOWLER'S TOAD	3	A	U	43	8.0	2 JUV
06/21/05	G15	OF	0	91	N	EASTERN FENCE LIZARD	4	A	F	58	7.0	GRAVID
06/21/05	G15	OF	0	91	N	EASTERN FENCE LIZARD	2	A	M	62	8.0	
06/21/05	G17	ST	0	92	N	SPOTTED DUSKY SALAMANDER	1	A	U	48	1.5	
06/21/05	G19	OF	0	92	N	EASTERN FENCE LIZARD	2	A	M	58	6.5	
06/21/05	G13	OF	0	92	N	EASTERN FENCE LIZARD	2	A	M	56	6.0	
06/21/05	G13	OF	0	92	N	BLACK RACER	1	A	U	*	*	OBSERVED

SHIL General Collecting Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
06/21/05	G18	OF	0	92	N	SOUTHEASTERN FIVE-LINED SKINK	1	A	U	60	5.0	
06/21/05	G18	OF	0	92	N	EASTERN FENCE LIZARD	6	A	M	58	6.0	
06/21/05	G18	OF	0	92	N	FOWLER'S TOAD	1	J	U	21	0.5	
06/22/05	G18	OF	0	79	N	COMMON SNAPPING TURTLE	1	J	U	176	*	
06/22/05	G12	PO	0	79	N	MIDLAND WATERSNAKE	1	J	U	352	36.0	
06/22/05	M3	PO	1	79	N	EASTERN NARROW-MOUTHED TOAD	1	A	U	31	0.5	
09/07/05	M1	ST	0	78	N	SOUTHERN LEOPARD FROG	2	A	U	56	18.0	
09/07/05	R15	MH	0	78	N	EASTERN BOX TURTLE	1	A	M	128	469.0	
09/07/05	R15	MH	0	78	N	EASTERN GARTER SNAKE	1	J	F	326	26.0	
09/07/05	M6	ST	0	78	N	MIDLAND WATERSNAKE	1	J	F	348	32.0	
09/07/05	R15	ST	0	78	N	SOUTHERN LEOPARD FROG	3	A	U	52	16.0	
09/07/05	M3	PO	0	81	N	GREEN FROG	1	L	U	9	0.5	
09/07/05	M3	PO	0	81	N	SOUTHERN CRICKET FROG	3	L	U	18	*	
09/07/05	M8	MF	0	82	N	BLACK RAT SNAKE	1	A	F	615	89.0	
09/07/05	R3	MF	0	85	N	EASTERN BOX TURTLE	1	A	M	131	482.0	
09/07/05	D1	PO	0	86	N	BULLFROG	2	A	U	*	*	
09/07/05	G9	JH	0	87	N	EASTERN FENCE LIZARD	2	J	U	37	3.5	
09/08/05	G14	OF	0	82	N	EASTERN FENCE LIZARD	1	J	U	41	4.0	
09/08/05	G15	OF	0	84	N	EASTERN FENCE LIZARD	7	A	F	44	4.5	
09/08/05	G15	OF	0	84	N	FIVE-LINED SKINK	1	A	U	64	8.0	
09/08/05	G15	OF	0	84	N	SIX-LINED RACE RUNNER	2	A	F	58	6.0	
09/08/05	G18	OF	0	87	N	EASTERN FENCE LIZARD	6	A	F	74	15.0	2 JUV.
09/08/05	G13	OF	0	88	N	EASTERN FENCE LIZARD	2	A	M	64	14.0	
09/08/05	R4	MH	0	89	N	FOWLER'S TOAD	1	A	M	54	16.0	
09/09/05	M8	PO	2	82	N	BULLFROG	6	A	U	*	*	OBSERVED
09/09/05	G12	MH	2	82	N	EASTERN BOX TURTLE	1	A	M	120	396.0	
09/09/05	M8	PO	2	82	N	GREEN FROG	2	A	U	*	*	OBSERVED
09/09/05	M8	PO	2	82	N	SPOTTED SALAMANDER	8	L	U	40	3.5	
09/09/05	R15	ST	2	84	N	EASTERN COTTONMOUTH	1	A	U	*	*	OBSERVED
09/09/05	M6	ST	2	84	N	SOUTHERN LEOPARD FROG	6	A	U	52	18.0	
09/09/05	M8	PO	2	82	N	BULLFROG	16	L	U	18	0.5	SIENED
09/09/05	G19	OF	1	86	N	EASTERN FENCE LIZARD	3	J	U	*	*	OBSERVED
09/09/05	G19	OF	1	86	N	FIVE-LINED SKINK	1	J	U	*	*	OBSERVED
09/09/05	M3	PO	1	87	N	BULLFROG	4	L	U	48	18.0	
09/09/05	M3	PO	1	87	N	GREEN FROG	3	L	U	10	0.5	
09/09/05	M3	PO	1	87	N	SOUTHERN LEOPARD FROG	5	L	U	48	0.5	
09/09/05	M3	PO	1	87	N	COPE'S GRAY TREEFROG	5	L	U	27	3.0	
09/09/05	G15	OF	1	87	N	EASTERN FENCE LIZARD	7	J	U	47	4.5	1 ADULT
09/09/05	G15	OF	1	88	N	SIX-LINED RACE RUNNER	1	A	F	63	6.0	
09/09/05	G10	MH	1	90	N	MISSISSIPPI SLIMY SALAMANDER	2	A	U	64	7.0	1 JUV.
09/09/05	M7	ST	1	90	N	GREEN FROG	1	A	U	*	*	OBSERVED
09/10/05	M8	MH	2	83	N	EASTERN FENCE LIZARD	1	J	U	41	3.0	

SHIL Minnow Trap Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
04/10/04	M 3	PO	2	64	Y	RED-SPOTTED NEWT (CENTRAL)	2	A	M	50	2.5	
04/10/04	M 3	PO	2	64	Y	SOUTHERN LEOPARD FROG	6	L	U	65	1.5	
04/10/04	M 3	PO	2	64	Y	SPOTTED SALAMANDER	2	L	U	39	1.5	
04/10/04	M 3	PO	2	64	Y	BULLFROG	5	L	U	142	3.0	
06/19/04	M3	PO	2	82	N	BULLFROG	5	L	U	40	15.0	
06/19/04	M7	ST	2	82	N	GREEN FROG	1	A	U	51	11.0	
06/19/04	M5	ST	2	82	N	GREEN FROG	1	A	U	66	22.0	
09/18/04	M3	PO	0	75	N	MIDLAND WATERSNAKE	1	A	M	785	312.0	
09/18/04	M3	PO	0	75	N	MIDLAND WATERSNAKE	1	A	F	888	309.0	
09/19/04	M8	PO	0	76	N	BULLFROG	1	A	F	63	18.0	
09/20/04	M3	PO	0	75	N	BULLFROG	3	L	U	36	12.0	
09/20/04	M8	PO	0	75	N	SOUTHERN LEOPARD FROG	5	L	U	8	0.3	
06/20/05	M3	PO	1	79	N	BULLFROG	5	L	U	37	13.0	
06/20/05	M3	PO	1	79	N	COPE'S GRAY TREEFROG	1	L	U	21	3.5	
06/20/05	M3	PO	1	79	N	GREEN FROG	8	L	U	9	0.5	
06/20/05	M3	PO	1	79	N	SOUTHERN CRICKET FROG	8	L	U	8	0.5	
06/20/05	M3	PO	1	79	N	SOUTHERN LEOPARD FROG	32	L	U	8	0.5	
06/20/05	M3	PO	1	79	N	AMERICAN TOAD	4	L	U	4	*	
06/20/05	M8	PO	1	86	N	BULLFROG	2	A	M	72	32.0	
06/20/05	M4	PO	1	87	N	FOWLER'S TOAD	35	L	U	14	*	
06/21/05	M3	PO	1	85	N	BULLFROG	7	L	U	34	10.0	
06/21/05	M3	PO	1	85	N	GREEN FROG	9	L	U	9	0.5	
06/21/05	M3	PO	1	85	N	GREEN FROG	1	A	U	42	8.0	
06/21/05	M3	PO	1	85	N	SOUTHERN LEOPARD FROG	25	L	U	8	0.5	
06/21/05	M3	PO	1	85	N	SOUTHERN CRICKET FROG	18	L	U	8	0.5	
06/21/05	M8	PO	1	88	N	SOUTHERN LEOPARD FROG	1	J	U	22	0.5	
06/21/05	M8	PO	1	88	N	GREEN FROG	1	J	U	32	3.0	
06/22/05	M6	PO	1	78	N	BRONZE FROG	1	A	U	77	20.0	
06/22/05	M1	PO	1	78	N	SOUTHERN LEOPARD FROG	1	A	U	58	12.0	
06/22/05	M1	PO	1	78	N	YELLOW-BELLIED WATERSNAKE	1	A	F	715	288.0	
06/22/05	M6	PO	1	79	N	GREEN FROG	1	A	U	51	12.0	
06/22/05	M3	PO	1	79	N	EASTERN NARROW-MOUTHED TOAD	1	L	U	6	*	
06/22/05	M3	PO	1	79	N	GREEN FROG	1	J	U	46	11.0	
06/22/05	M8	PO	1	83	N	GREEN FROG	2	A	M	68	26.0	
09/09/05	M8	PO	2	82	N	BULLFROG	5	A	M	62	21.0	
09/09/05	M8	PO	2	82	N	GREEN FROG	1	A	U	46	8.0	
09/09/05	M8	PO	2	82	N	SPOTTED SALAMANDER	1	L	U	46	8.0	
09/09/05	M3	PO	1	87	N	COPE'S GRAY TREEFROG	5	L	U	20	4.0	
09/09/05	M3	PO	1	87	N	RED-SPOTTED NEWT (CENTRAL)	1	A	U	44	4.0	
09/09/05	M3	PO	1	87	N	BARKING TREEFROG	1	L	U	40	4.0	
DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
09/09/05	M3	PO	1	87	N	YELLOW-BELLIED WATERSNAKE	1	A	M	603	172.0	

SHIL Minnow Trap Datasheet

09/10/05	M8	PO	2	83	N	BULLFROG	3	L	U	34	11.0	
09/10/05	M8	PO	2	83	N	SOUTHERN LEOPARD FROG	3	L	U	8	0.5	
09/10/05	M3	PO	1	83	N	YELLOW-BELLIED WATERSNAKE	1	A	F	620	168.0	
09/10/05	M3	PO	1	83	N	MIDLAND WATERSNAKE	1	A	F	557	139.0	
09/10/05	M3	PO	1	83	N	MIDLAND WATERSNAKE	1	A	M	843	389.0	

SHIL Anuran Audio Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	NOTES
04/08/04	M 3	PO	0	70	Y	BULLFROG	2	
04/08/04	M 3	PO	0	70	Y	SOUTHERN LEOPARD FROG	4	
04/08/04	M 3	PO	0	70	Y	NORTHERN CRICKET FROG	4	
04/08/04	M 3	PO	0	70	Y	BIRD-VOICED TREEFROG	4	
04/08/04	M 3	PO	0	70	Y	GREEN FROG	1	
04/08/04	M 3	PO	0	70	Y	SPRING PEEPER	4	
04/08/04	M 4	PO	0	69	Y	BULLFROG	1	
04/08/04	M 4	PO	0	69	Y	SOUTHERN LEOPARD FROG	1	
04/08/04	G 1	MH	0	55	Y	SPRING PEEPER	4	
04/08/04	G 2	MF	0	55	Y	GRAY TREEFROG (VERSICOLOR)	1	
04/08/04	G 2	MF	0	55	Y	SPRING PEEPER	4	
04/08/04	M 2	ST	0	55	Y	SPRING PEEPER	2	
06/07/04	M3	PO	2	83	Y	SOUTHERN CRICKET FROG	4	
06/17/04	M3	PO	2	83	Y	GREEN FROG	1	
06/17/04	M3	PO	2	83	Y	BULLFROG	4	
06/17/04	M3	PO	2	83	Y	EASTERN NARROW-MOUTHED TOAD	4	
06/17/04	M2	SP	2	85	Y	BULLFROG	4	
06/17/04	M4	PO	2	86	Y	NORTHERN CRICKET FROG	4	
06/17/04	M4	PO	2	86	Y	AMERICAN TOAD	4	
06/17/04	M3	PO	2	87	Y	SOUTHERN LEOPARD FROG	1	
06/18/04	G8	ST	0	87	Y	NORTHERN CRICKET FROG	2	
06/19/04	G1	PO	0	80	N	SOUTHERN CRICKET FROG	4	
06/19/04	G1	PO	0	74	N	SPRING PEEPER	4	
06/19/04	G1	PO	0	74	N	GREEN FROG	1	
06/19/04	G1	PO	0	74	N	BULLFROG	1	
06/19/04	G1	PO	0	74	N	SOUTHERN LEOPARD FROG	1	
06/19/05	M3	PO	1	85	N	BULLFROG	2	
06/19/05	M3	PO	1	85	N	SOUTHERN CRICKET FROG	4	
06/19/05	M8	PO	1	87	N	BULLFROG	2	
06/19/05	M8	PO	1	87	N	SOUTHERN CRICKET FROG	4	
06/20/05	M3	PO	1	74	N	SOUTHERN CRICKET FROG	4	
06/20/05	M3	PO	1	74	N	BULLFROG	1	
06/20/05	M3	PO	1	74	N	GREEN FROG	3	
06/20/05	M3	PO	1	74	N	BIRD-VOICED TREEFROG	3	
06/20/05	R8	MF	1	74	N	SOUTHERN CRICKET FROG	4	
06/20/05	R8	MF	1	74	N	SOUTHERN LEOPARD FROG	1	
06/20/05	M8	PO	1	74	N	GREEN FROG	3	
06/20/05	M8	PO	1	74	N	BULLFROG	1	
06/20/05	M8	PO	1	74	N	SOUTHERN CRICKET FROG	4	
06/20/05	M8	PO	1	74	N	BARKING TREEFROG	2	
06/20/05	M8	PO	1	74	N	FOWLER'S TOAD	2	
06/20/05	M8	PO	1	74	N	BIRD-VOICED TREEFROG	1	

SHIL Road Ride Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	AGE	SEX	S to V	WT	NOTES
06/17/04	R11	MH	2	84	Y	EASTERN BOX TURTLE	1	A	F	129	171.0	
06/18/04	G16	MH	0	85	Y	CORN SNAKE	1	A	F	559	118.0	
06/19/04	G10	MF	0	74	N	FOWLER'S TOAD	3	A	U	55	15.0	
06/19/04	G10	MF	0	74	N	AMERICAN TOAD	1	A	U	57	16.0	
06/19/05	R8	PJ	0	74	N	FOWLER'S TOAD	16	A	U	48	13.0	
06/19/05	R8	PJ	0	74	N	AMERICAN TOAD	5	A	U	56	15.0	
06/19/05	R4	MF	0	73	N	FOWLER'S TOAD	4	A	U	56	17.0	
06/19/05	R13	OF	0	73	N	FOWLER'S TOAD	6	A	U	52	14.0	
06/20/05	R5	MF	1	74	N	AMERICAN TOAD	1	A	U	56	17.0	
06/20/05	M3	PO	1	74	N	AMERICAN TOAD	1	A	U	54	14.0	
06/20/05	G10	MF	1	74	N	FOWLER'S TOAD	1	A	U	49	15.0	
06/20/05	M2	OF	1	74	N	AMERICAN TOAD	1	A	U	58	16.0	
06/20/05	M2	OF	1	74	N	FOWLER'S TOAD	1	A	U	60	18.0	
06/20/05	R4	MH	1	74	N	FOWLER'S TOAD	5	A	U	56	14.0	
06/20/05	R8	PJ	1	74	N	FOWLER'S TOAD	19	A	U	56	17.0	
06/20/05	R8	PJ	1	74	N	AMERICAN TOAD	4	A	U	56	15.0	
06/20/05	R13	OF	1	74	N	FOWLER'S TOAD	3	A	U	52	14.0	
06/20/05	R13	OF	1	74	N	AMERICAN TOAD	1	A	U	57	16.0	
09/08/05	G14	OF	0	82	N	AMERICAN TOAD	1	A	U	47	9.0	
09/08/05	M8	PO	0	82	N	FOWLER'S TOAD	2	A	U	52	17.0	
09/10/05	G14	OF	0	81	N	EASTERN BOX TURTLE	1	A	M	116	390.0	

SHIL Drift Fence Datasheet

[illegible]

SHIL Anuran Audio Datasheet

DATE	SITE #	HAB	SKY	TEMP	RAIN	SPECIES	#	NOTES
06/20/05	M1	ST	1	74	N	SOUTHERN LEOPARD FROG	2	
06/20/05	M1	ST	1	74	N	BULLFROG	2	
06/20/05	M1	ST	1	74	N	SOUTHERN CRICKET FROG	4	
06/20/05	M1	ST	1	74	N	GREEN FROG	2	

APPENDIX B

**ANNOTATED
REPTILE AND
AMPHIBIAN
CHECKLIST
FOR
SHILOH
NATIONAL
MILITARY PARK**

ANNOTATED REPTILE AND AMPHIBIAN CHECKLIST KEY

Native

N = Native to SHIL-- Native; includes endemic or indigenous

I = Introduced to SHIL

Park Status

P = Present-- Extremely high confidence in park; Current, verifiable evidence exists; Extant.

PP = Probably Present-- Very high confidence in park; Verifiable evidence may exist, but not current; Park within range; Appropriate habitat exists; Adjacent to park.

H = Historical-- Extremely low confidence in park; Verifiable evidence exists but not current.

U = Unconfirmed-- Very low to high confidence in park; Verifiable evidence may exist, but not current or insufficient.

? = Unknown

Residency

R = Resident on the Park

B = Positive Breeder on the Park—Reproduces.

U = Unknown

Abundance

A = Abundant-- Large numbers; Habitats covering large portion of park.

C = Common-- Large numbers; Habitats not covering large portion of park.

U = Uncommon-- Few to moderate numbers; Sporadic; Habitats uncommon in park.

R = Rare-- Few individuals; Habitats rare.

? = Unknown

Previous Studies

P = Pritts (1997-1998)

G = Gutzke

H = Higgins

Voucher Exists

P = Photographic voucher obtained during this study

Other

A = Anecdotal record for the Park

ANNOTATED REPTILE AND AMPHIBIAN CHECKLIST	NATIVE	PARK STATUS	RESIDENCY	ABUNDANCE	FOUND 2003-2005	PREVIOUS STUDIES	VOUCHER THIS STUDY	OTHER
Ambystomatidae – Mole Salamanders								
Spotted Salamander - <i>Ambystoma maculatum</i>	N	P	B	C	X	P,G	P	
Mole Salamander – <i>Ambystoma talpoideum</i>	N	P	U	R		P,G		
Smallmouth Salamander – <i>Ambystoma texanum</i>	N	P	U	U		G		
Marbled Salamander – <i>Ambystoma opacum</i>	N	P	R	R		P,G		
Salamandridae – Newts								
Red-spotted (Central) Newt - <i>Notophthalmus viridescens louisianensis</i>	N	P	R	C	X	P	P	
Plethodontidae – Lungless Salamanders								
Spotted Dusky Salamander - <i>Desmognathus conanti</i>	N	P	B	C	X	P,G,H	P	
Zigzag Salamander – <i>Plethodon dorsalis</i>	N	PP	U	R	X	G		
Mississippi Slimy Salamander – <i>Plethodon mississippi</i>	N	P	B	C	X	P,G,H	P	
Spring Salamander - <i>Gyrinophilus porphyriticus</i>	N	P	U	?		G		
Northern Red Salamander - <i>Pseudotriton ruber ruber</i>	N	P	R	U		P,G,H		
Southern Red Salamander - <i>Pseudotriton ruber vioscai</i>	N	P	R	U	X	G	P	
Southern Two-lined Salamander - <i>Eurycea cirrigera</i>	N	P	R	U	X	P,G	P	
Three-lined Salamander – <i>Eurycea guttolineata</i>	N	P	R	C	X	P	P	
Order Anura – Frogs and Toads								
Bufonidae – True Toads								
American Toad - <i>Bufo americanus</i>	N	P	B	A	X	P,G	P	
Fowler's Toad - <i>Bufo woodhousii fowleri</i>	N	P	B	A	X	P,G	P	
Hylidae – Treefrogs and Allies								
Northern Cricket Frog - <i>Acris crepitans</i>	N	P	B	A	X	G	P	

ANNOTATED REPTILE AND AMPHIBIAN CHECKLIST	NATIVE	PARK STATUS	RESIDENCY	ABUNDANCE	FOUND 2003-2005	PREVIOUS STUDIES	VOUCHER THIS STUDY	OTHER
Southern Cricket Frog – <i>Acris gryllus</i>	N	P	B	A	X	P,G,H	P	
Green Treefrog – <i>Hyla cinerea</i>	N	P	B	R	X	G		
Gray Treefrog - <i>Hyla versicolor</i>	N	P	B	R	X			
Cope’s Gray Treefrog - <i>Hyla chrysoscelis</i>	N	P	B	C	X	P,G,H	P	
Bird-voiced Treefrog - <i>Hyla avivoca</i>	N	P	B	U	X		P	
Barking Treefrog – <i>Hyla gratiosa</i>	N	P	B	R	X		P	
Spring Peeper - <i>Hyla crucifer</i>	N	P	B	C	X	P,G,H		
Upland Chorus Frog - <i>Pseudacris triseriata</i>	N	PP	U	?		G		
Mountain Chorus Frog – <i>Pseudacris brachyphona</i>	N	?	U	?		G		
Microhylidae – Narrowmouth Toads								
Eastern Narrowmouth Toad – <i>Gastrophryne carolinensis</i>	N	P	B	U	X	G	P	
Ranidae – True Frogs								
Bullfrog - <i>Rana catesbeiana</i>	N	P	B	A	X	P,G,H	P	
Green Frog - <i>Rana clamitans melanota</i>	N	P	B	A	X	P,G,H	P	
Bronze Frog - <i>Rana clamitans clamitans</i>	N	P	R	R	X		P	
Southern Leopard Frog – <i>Rana utricularia</i>	N	P	B	A	X	P,H	P	
Gopher Frog – <i>Rana capito</i>	N	PP	B	R				A
Order Testudines - Turtles								
Chelydridae – Snapping Turtles								
Common Snapping Turtle - <i>Chelydra serpentina</i>	N	P	B	U	X	H		
Kinosternidae – Musk and Mud Turtles								
Eastern Mud Turtle- <i>Kinosternon subrubrum</i>	N	P	R	U	X	G	P	
Emydidae – Box and Water Turtles								
Red-eared Slider – <i>Trachemys scripta elegans</i>	N	P	R	U	X	P		
Eastern Box Turtle - <i>Terrapene carolina carolina</i>	N	P	R	C	X	P,G	P	
Trionychidae – Softshell Turtles								
Eastern Spiny Softshell – <i>Apalone spinifera spinifera</i>	N	P	R	?		P		
Order Squamata – Lizards and Snakes								
Suborder Lacertilia – Lizards								

ANNOTATED REPTILE AND AMPHIBIAN CHECKLIST	NATIVE	PARK STATUS	RESIDENCY	ABUNDANCE	FOUND 2003-2005	PREVIOUS STUDIES	VOUCHER THIS STUDY	OTHER
Phrynosomatidae – Spiny Lizards and Allies								
Eastern Fence Lizard - <i>Sceloporus undulatus</i>	N	P	B	A	X	P,G,H	P	
Teiidae – Whiptails								
Six-lined Racerunner – <i>Aspidoscelis sexlineatus</i>	N	P	B	U	X		P	
Scincidae – Skinks								
Five-lined Skink - <i>Plestiodon fasciatus</i>	N	P	B	U	X	P,G,H	P	
Broadhead Skink – <i>Plestiodon laticeps</i>	N	PP	U	?		G		
Southeastern Five-lined Skink – <i>Plestiodon inexpectatus</i>	N	P	R	U	X		P	
Coal Skink - <i>Plestiodon anthracinus</i>	N	P	B	U	X		P	
Ground Skink – <i>Scincella lateralis</i>	N	P	B	C	X	P,G	P	
Suborder Serpentes - Snakes								
Colubridae – Colubrids								
Diamondback Watersnake – <i>Nerodia rhombifer rhombifer</i>	N	PP	U	?		G		
Yellow-bellied Watersnake – <i>Nerodia erythrogaster flavigaster</i>	N	P	R	C	X	G	P	
Midland Watersnake - <i>Nerodia sipedon pleuralis</i>	N	P	B	C	X	P	P	
Midland Brown Snake - <i>Storeria dekayi wrightorum</i>	N	P	R	C		P,G,H		
Northern Redbelly Snake – <i>Storeria occipitomaculata</i>	N	P	R	R		P,G		
Eastern Garter Snake - <i>Thamnophis sirtalis</i>	N	P	R	U	X	G,H	P	
Eastern Hognose Snake – <i>Heterodon platirhinos</i>	N	P	R	U		P,G,H		
Ring-necked Snake - <i>Diadophis punctatus</i>	N	P	R	U	X	P,G	P	
Eastern (Midwest)Worm Snake - <i>Carphophis amoenus helenae</i>	N	P	B	U	X	G,H	P	
Southern Black Racer - <i>Coluber constrictor priapus</i>	N	P	R	C	X	P,G	P	
Rough Green Snake - <i>Opheodrys aestivus</i>	N	P	R	?		H		
Corn Snake [Red Rat Snake] - <i>Elaphe guttata</i>	N	P	R	U	X	H		
Black Rat Snake - <i>Elaphe obsoleta obsoleta</i>	N	P	R	U	X	H		
Gray Rat Snake - <i>Elaphe obsoleta spiloides</i>	N	P	R	U		G,H		
Viperidae - Vipers								
Crotalinae – Pit Vipers								
Northern Copperhead - <i>Agkistrodon contortrix mokasen</i>	N	P	R	U	X	P,G,H		
Eastern Cottonmouth – <i>Agkistrodon piscivorus leucostoma</i>	N	P	R	U	X	P,G,H		

APPENDIX C

LIFE HISTORY INFORMATION OF THE REPTILE AND AMPHIBIAN SPECIES OF SHILOH NATIONAL MILITARY PARK

SPOTTED SALAMANDER

(Ambystoma maculatum)

Status:

Common

Distribution and Habitat:

This species inhabits forested areas with nearby ponds throughout the Park. Water Oaks Pond is the stronghold for this species on the Park.

Special Habitat Requirements:

Requirements include shallow water bodies in which to breed and moist areas in which to hide.

Breeding:

Breeds February through April. Females normally deposit 2-4 egg masses containing 1-250 eggs each. Incubation is 3-4 weeks with metamorphosis occurring at 6-16 weeks.

Food Habits:

This species will eat any insect or invertebrate it can fit into its mouth.

Other Information

This species is often found in small pools within the Park. In most cases, the spent egg masses are more noticeable than the salamander or its larvae. Adults seen primarily during early spring breeding period.

RED-SPOTTED NEWT (RED

EFT)

(Notophthalmus viridescens)

Status:

Common

Distribution and Habitat:

Occupies ponds, small lakes, marshes and quiet portions of small streams throughout the Park.

Special Habitat Requirements:

Requirements include shallow permanent or semi permanent bodies of unpolluted water with live vegetation.

Breeding:

After courtship in spring and fall the female deposits eggs singly on submerged vegetation, folding a leaf around each egg. Eggs hatch is about 35 days.

Food Habits:

Food includes insects, crustaceans, mollusks and eggs of other amphibians.

Other Information

Aquatic stages are easily seen in small ponds within the Park.

**SPOTTED DUSKY
SALAMANDER**
(*Desmognathus conanti*)

Status:

Common.

Distribution and Habitat:

Occupies edges of small woodland streams, brooks, springs and seepage areas over the entire Park. Seldom wanders far from running or trickling water.

Special Habitat Requirements:

Requirements include running waterways with stones, chunks of wood or other miscellaneous debris to provide shelter for the salamanders and their food.

Breeding:

Breeding takes place in the spring and eggs are deposited in small clusters under stones or logs near water where the female stays curled around them until they hatch. The aquatic larval period lasts from 2-8 months

Food Habits:

The diet consists of small arthropods including snails, earthworms, beetles and flies.

Other Information

Commonly seen in many of the small streams within the Park. Particularly noticeable in streams or seeps with good leaf beds.

ZIGZAG SALAMANDER
(*Plethodon dorsalis*)

Status:

Rare.

Distribution and Habitat:

This species inhabits seepages near rock outcroppings on slopes in mixed hardwood forests.

Special Habitat Requirements:

Requirements include talus slopes, rocky hillsides and other habitats with rocky substrates in mesic forests.

Breeding:

Breeding occurs from fall to midspring. Females deposit 1-10 eggs in underground retreats in late spring or early summer and attend them until hatching some 90 days later. The young are miniature replicas of the adults and are terrestrial.

Food Habits:

This species eats primarily spiders, beetles, mites and other small arthropods.

Other Information

Look for this species in appropriate habitats in the Riverside Drive portions of the Park.

**MISSISSIPPI SLIMY
SALAMANDER**
(*Plethodon mississippi*)

Status:

Common

Distribution and Habitat:

This species inhabits moist woodland habitats which are not susceptible to flooding. They should be found throughout the Park.

Special Habitat Requirements:

This species generally requires more moisture than other salamanders of this genus.

Breeding:

Eggs are laid in late summer or fall in or under logs and among roots. Young do not have an aquatic stage.

Food Habits:

Invertebrates including earthworms, beetles and ants are the mainstay of the diet.

Other Information

This species is often found by turning logs or flat rocks in their preferred habitat.

SOUTHERN RED SALAMANDER
(*Pseudotriton ruber vioscai*)

Status:

Uncommon

Distribution and Habitat:

This species inhabits habitats in or near springs or streams in open or wooded areas in the Park.

Special Habitat Requirements:

Requirements include areas of clear, cool and not stagnant water. Streams with substrates of sand, gravel or rock are preferred.

Breeding:

Courtship occurs in summer, spawning in October and hatching in December. About 70 eggs are laid in aquatic vegetation. The larval stage lasts about 32 months.

Food Habits:

Earthworms, insects and smaller salamanders are the chief foods.

Other Information

This species is most easily found by looking under moss, stones, logs or within leaf beds in the preferred habitat.

**SOUTHERN TWO-LINED
SALAMANDER**
(*Eurycea cirrigera*)

Status:

Uncommon.

Distribution and Habitat:

This species lives in or near springs, seepages and streams in hardwood forests and swamps in the Park.

Special Habitat Requirements:

Requirements include rocks or logs in their preferred habitat under which to hide and rocks or logs in running water for egg laying.

Breeding:

Mating occurs in the fall, and eggs are laid in the winter or early spring. The female deposits a flat cluster of eggs on the underside of rocks or logs in running water. The female remains with the eggs until the aquatic larvae hatch. Larval period lasts from 1-3 years.

Food Habits:

Food consists of small terrestrial or aquatic invertebrates and their larvae.

Other Information

This species was commonly located in or near small streams or seeps by turning logs and rocks.

THREE-LINED SALAMANDER
(*Eurycea guttolineata*)

Status:

Common.

Distribution and Habitat:

This species lives in or near the margins of shaded seeps, springs, bogs, streams or vernal ponds in bottomland hardwood forested areas.

Special Habitat Requirements:

Requirements include rocks or logs in their preferred habitat under which to hide and shaded waterways for larval stages.

Breeding:

Mating occurs in the fall or early winter. Females lay groups of approximately 8-14 eggs which are attached to stones, roots or boards in running water or suspended above the water. Hatching occurs in 4-12 weeks. Larval period lasts from 4-7 months.

Food Habits:

Food consists of a wide variety of small terrestrial or aquatic invertebrates and their larvae.

Other Information

This species should be looked for in appropriate habitat throughout the Park by turning logs and rocks.

AMERICAN TOAD

(Bufo americanus)

Status:

Abundant

Distribution and Habitat:

These toads are habitat generalists, inhabiting nearly all habitats within the Park.

Special Habitat Requirements:

Requirements include shallow water bodies in which to breed and moist areas in which to hide.

Breeding:

Breeds February through April. The female lays approximately 6000 eggs in two long strings on the bottom of shallow pools. Metamorphosis takes about 2 months.

Food Habits:

This species will eat any insect or invertebrate it can fit into its mouth.

Other Information

Often seen crossing the roads at night.

FOWLER'S TOAD

(Bufo woodhousii fowler)

Status:

Abundant

Distribution and Habitat:

These toads are habitat generalists, inhabiting nearly all habitats within Park.

Special Habitat Requirements:

Requirements include sandy areas.

Breeding:

Breeds March through May. The female lays approximately 7000 eggs in two long strings on the bottom of shallow pools. Eggs hatch in about one week. Metamorphosis takes about 1-2 months.

Food Habits:

This species will eat any insect or invertebrate it can fit into its mouth.

Other Information

Often seen crossing the roads at night or after rains. They disappear under ground during droughts.

NORTHERN CRICKET FROG

(Acris crepitans)

Status:

Abundant.

Distribution and Habitat:

Occupies open grassy margins of ponds and streams throughout the Park.

Special Habitat Requirements:

Requirements include emergent vegetation or vegetation along the shore.

Breeding:

Breeding takes place when weather warms up in spring. Eggs are laid singly or in small groups attached to stems or scattered on the bottom in shallow water. Transformation occurs in late summer.

Food Habits:

Small insects and spiders are the major food sources.

Other Information

Commonly seen or heard in appropriate habitats in warm weather throughout the Park.

SOUTHERN CRICKET FROG

(Acris gryllus)

Status:

Abundant.

Distribution and Habitat:

Occupies open grassy margins of ponds and streams in the Park.

Special Habitat Requirements:

Requirements include emergent vegetation or vegetation along the shore.

Breeding:

Breeding takes place when weather warms up in spring. Eggs are laid singly or in small groups attached to stems or scattered on the bottom in shallow water. Transformation occurs in late summer.

Food Habits:

Small insects and spiders are the major food sources.

Other Information

Commonly seen or heard in appropriate habitats in warm weather throughout the Park.

GREEN TREEFROG

(Hyla cinerea)

Status:

Rare.

Distribution and Habitat:

Occupies areas with emergent vegetation, small trees or shrubs near or standing in shallow bodies of water.

Special Habitat Requirements:

Requirements include emergent vegetation in unpolluted water bodies.

Breeding:

Breeding takes place from May to June. Approximately 400 eggs are laid amid floating vegetation. Hatching occurs in 5 days and metamorphosis occurs in about 60 days.

Food Habits:

The diet consists of arboreal insects.

Other Information

This frog is seldom seen outside of the breeding season. It may be heard singing in appropriate habitats within the Park.

GRAY TREEFROG

(Hyla versicolor)

Status:

Rare.

Distribution and Habitat:

Occupies areas with small trees or shrubs near or standing in shallow bodies of water within the Park.

Special Habitat Requirements:

Requirements include emergent vegetation in unpolluted water bodies.

Breeding:

Breeding takes place from May to August. Scattered groups of 10-40 eggs are laid on the surface of shallow ditches, puddles and ponds. Hatching occurs in 5 days and metamorphosis occurs in about 50 days.

Food Habits:

The diet consists of arboreal insects.

Other Information

This frog is seldom seen outside of the breeding season. It may be heard singing in appropriate habitats within the Park.

COPE'S GRAY TREEFROG

(*Hyla chrysoscelis*)

Status:

Common.

Distribution and Habitat:

Occupies areas with small trees or shrubs near or standing in shallow bodies of water within the Park.

Special Habitat Requirements:

Requirements include emergent vegetation in unpolluted water bodies.

Breeding:

Breeding takes place from May to August. Scattered groups of 10-40 eggs are laid on the surface of shallow ditches, puddles and ponds. Hatching occurs in 5 days and metamorphosis occurs in about 50 days.

Food Habits:

The diet consists of arboreal insects.

Other Information

This frog is seldom seen outside of the breeding season. It may be heard singing in appropriate habitats within the Park. It generally sings from higher points than *Hyla versicolor*.

BIRD-VOICED TREEFROG

(*Hyla avivoca*)

Status:

Uncommon.

Distribution and Habitat:

Occupies heavily wooded swamps bordering rivers and streams.

Special Habitat Requirements:

Requirements include emergent vegetation in unpolluted water bodies.

Breeding:

Breeding takes place from May to August. The female deposits about 650 eggs in packets of 6-15. Hatching occurs in about 40 hours and metamorphosis occurs in about 32 days.

Food Habits:

The diet consists of arboreal insects.

Other Information

This frog is seldom seen outside of the breeding season. It may be heard singing in appropriate habitats within the Park.

BARKING TREEFROG

(Hyla gratiosa)

Status:

Rare.

Distribution and Habitat:

Occupies areas with shallow bodies of water and low, wet woods within the Park.

Special Habitat Requirements:

Requirements include emergent vegetation in unpolluted water bodies.

Breeding:

Breeding takes place from May to August. Females deposit approximately 2000 eggs singly on the bottom of a pond.. Hatching occurs in 5 days and metamorphosis occurs in 40-70 days.

Food Habits:

The diet consists of arboreal insects.

Other Information

This frog is seldom seen outside of the breeding season. It may be heard singing in appropriate habitats within the Park.

SPRING PEEPER

(Hyla crucifer)

Status:

Common.

Distribution and Habitat:

Occupies woodlands near temporary or semi permanent ponds or swamps throughout the Park.

Special Habitat Requirements:

Requirements include second growth or cutover woodlots near unpolluted water body.

Breeding:

Breeding takes place from October through March. About 900 eggs are attached singly to submerged objects in shallow water. Eggs hatch in 5-7 days and metamorphosis occurs in 3-4 months.

Food Habits:

The diet consists of small arthropods.

Other Information

This frog is seldom seen outside of the breeding season. It may sometimes be seen wandering in woody areas after rains. More often heard than seen.

EASTERN NARROWMOUTH TOAD

(Gastrophryne carolinensis)

Status:

Uncommon.

Distribution and Habitat:

Occupies areas containing logs, rocks, boards or burrows under which they may hide.

Special Habitat Requirements:

Requirements include containing logs, rocks, boards or burrows under which they may hide.

Breeding:

Breeding takes place from May through July. Packets of about 850 eggs are layed on the surface of the water. Eggs hatch in 5-7 days and metamorphosis occurs in 20-70 days.

Food Habits:

The diet consists primarily of ants.

Other Information

This species is very secretive, entirely terrestrial and more often heard than seen.

BULLFROG
(*Rana catesbeyiana*)

Status:

Abundant

Distribution and Habitat:

This species inhabits larger lakes, ponds, bogs and sluggish stream habitats throughout the Park.

Special Habitat Requirements:

Requirements include vegetation or snags at the water edge in which to hide.

Breeding:

Breeding takes place in late spring and summer. About 12,000 eggs are laid with hatching occurring in 5 days and metamorphosis occurring about a year later.

Food Habits:

The diet consists of insects, crayfish and any small vertebrate which will fit in their mouths.

Other Information

Often seen basking on logs or shores within the Park.

GREEN FROG
(*Rana clamitans melanota*)

Status:

Abundant

Distribution and Habitat:

This species inhabits shallow fresh water habitats throughout the Park. Streams and brooks are preferred.

Special Habitat Requirements:

Requirements include shallow and unpolluted water bodies.

Breeding:

Breeding takes place in May and June. The female lays about 3000 eggs in a raftlike surface film. Most tadpoles transform within a few months, but, some overwinter.

Food Habits:

The diet consists primarily of arthropods, snails and worms.

Other Information

The banjo-like twang of their call is often heard within the Park. It is readily seen at most water bodies within the Park.

BRONZE FROG

(Rana clamitans clamitans)

Status:

Rare.

Distribution and Habitat:

This species inhabits shallow fresh water habitats throughout the Park. Streams and brooks are preferred.

Special Habitat Requirements:

Requirements include shallow and unpolluted water bodies.

Breeding:

Breeding takes place in May and June. The female lays about 3000 eggs in a raftlike surface film. Most tadpoles transform within a few months, but, some overwinter.

Food Habits:

The diet consists primarily of arthropods, snails and worms.

Other Information

Only one specimen of this species was located during the inventory process. Judging from color, this specimen may be a hybrid with *Rana clamitans melanota*.

SOUTHERN LEOPARD FROG

(Rana utricularia)

Status:

Abundant.

Distribution and Habitat:

This species inhabits shallow fresh water habitats throughout the Park. Streams and ponds are preferred.

Special Habitat Requirements:

Requirements include shallow and unpolluted water bodies.

Breeding:

Breeding takes place in winter or early spring. The female attaches a firm cluster of several hundred eggs to vegetation just below the water surface. Eggs hatch in 7-14 days. Most tadpoles transform within a few months, but, some overwinter.

Food Habits:

The diet consists primarily of insects.

Other Information

This species is easily found at any pond in the Park.

COMMON SNAPPING TURTLE

(Chelydra serpentina)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits large or small permanent bodies of fresh water throughout the Park.

Special Habitat Requirements:

This species is a habitat generalist within aquatic habitat types.

Breeding:

Females lay approximately 25 spherical eggs in early spring in a shallow nest, sometimes at considerable distance from water.

Food Habits:

This species is omnivorous. It includes aquatic invertebrates, fish, reptiles, birds, mammals, carrion and aquatic vegetation in its diet.

Other Information

Most often observed in spring as adults wander from one water body to another and young travel from nests to water.

EASTERN MUD TURTLE

(Kinosternon subrubrum)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits a variety of aquatic habitats including marshes, lakes and ponds.

Special Habitat Requirements:

This species requires shallow water with muddy bottom. Abundant vegetation is also required.

Breeding:

Females lay approximately 3-5 eggs in midsummer. A shallow nest is made in loose soil near the water. Hatching occurs about 100 days after laying.

Food Habits:

This species is omnivorous and primarily consists of aquatic vegetation, insects, crayfish and small mollusks, as well as carrion.

Other Information

This species is most often observed while traveling from one water source to another on the Park.

RED-EARED SLIDER

(Trachemys scripta elegans)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits a variety of aquatic habitats including rivers, ditches, sloughs, lakes and ponds.

Special Habitat Requirements:

This species requires quiet water with muddy bottom and a profusion of vegetation.

Breeding:

Females lay approximately 10 eggs in May or June. A shallow nest is made in loose soil and the nest may be far from water. Multiple clutches may be laid.

Food Habits:

This species is omnivorous, but juveniles are more carnivorous eating small aquatic insects and snails. Adults eat large amounts of aquatic vegetation.

Other Information

This species can most easily be seen in the Owl Creek portions of the Park.

EASTERN BOX TURTLE

(Terrapene carolina carolina)

Status:

Common.

Distribution and Habitat:

This species is largely terrestrial and they utilize forested habitats and field edges throughout the Park.

Special Habitat Requirements:

While being largely terrestrial, they do need water close at hand in which to soak.

Breeding:

Females lay 3-8 eggs in June or July. A shallow nest is made in loose soil.

Food Habits:

A wide variety of plants and small animals are eaten.

Other Information

This species is often seen crossing the roads, especially after rains.

EASTERN FENCE LIZARD

(Sceloporus undulatus)

Status:

Abundant.

Distribution and Habitat:

This species inhabits open pine and mixed woods, building sites and fences at lower elevations.

Special Habitat Requirements:

Requirements include open areas with plenty of sunlight.

Breeding:

Females lay from 6-10 eggs in late spring in burrows under rotten logs. Second clutches are sometimes produced in early summer.

Food Habits:

This species eats arthropods such as spiders, crickets, grasshoppers, beetles and snails.

Other Information

Most often observed sunning on rail fences in developed portions of the Park.

SIX-LINED RACERUNNER

(Aspidoscelis sexlineatus)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits open sandy fields, building sites and fences at lower elevations.

Special Habitat Requirements:

Requirements include open areas with plenty of sunlight.

Breeding:

Females lay from 5-6 eggs. Second clutches are sometimes produced in early summer. Hatchlings appear from late June into September.

Food Habits:

This species eats arthropods such as spiders, crickets, grasshoppers, beetles and snails.

Other Information

Most often observed near rail fences in developed portions of the Park.

FIVE-LINED SKINK

(Plestiodon fasciatus)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits moist, wooded areas in the throughout the Park.

Special Habitat Requirements:

Requirements include damp areas, dead trees and snags where insects are abundant.

Breeding:

Females lay from 6-12 eggs in June in nests in rotten wood or under rocks.

Food Habits:

This species eats arthropods such as spiders, crickets, grasshoppers and beetles.

Other Information

Most often observed sunning on fences in developed portions of the Park.

SOUTHEASTERN FIVE-LINED SKINK

(Plestiodon inexpectatus)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits disturbed areas and old building sites throughout the Park.

Special Habitat Requirements:

Requirements include damp areas, dead trees and snags where insects are abundant.

Breeding:

Females lay from 6-12 eggs in June in nests in rotten wood or under rocks.

Food Habits:

This species eats arthropods such as spiders, crickets, grasshoppers and beetles.

Other Information

Most often observed sunning on fences in developed portions of the Park.

COAL SKINK

(*Plestiodon anthracinus*)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits rocky, wooded areas.

Special Habitat Requirements:

Requirements include logs, rocks or leaf litter on wooded rocky hillsides, usually near water.

Breeding:

Females lay from 2-6 eggs in June or July in nests under forest debris, rotten wood or under rocks or logs.

Food Habits:

This species eats arthropods such as spiders, crickets, grasshoppers and beetles.

Other Information

Look for this species in rocky, wooded areas of the Park. Often associated with mixed hardwood/pine forest.

GROUND SKINK

(*Shinwell lateralis*)

Status:

Common.

Distribution and Habitat:

This species inhabits disturbed areas and open woodlands at lower elevations.

Special Habitat Requirements:

Requirements include areas of leaf litter or detritus in which to forage.

Breeding:

Two or more clutches of from 1-7 eggs are laid in burrows under leaf litter.

Food Habits:

This species eats primarily small insects and spiders.

Other Information

Look for this species in appropriate habitats throughout the Park.

**YELLOW-BELLIED
WATERSNAKE**

(Natrix eryrogaster flavigaster)

Status:

Common.

Distribution and Habitat:

This species inhabits river bottoms, swamps, marshes, ponds and lakes.

Special Habitat Requirements:

This species requires larger, more permanent bodies of water.

Breeding:

Five to thirty young are born live in late summer or early fall after spring mating.

Food Habits:

This species actively seeks fish, toads and frogs as the chief food items.

Other Information

This species often wanders far from water in hot, humid weather.

MIDLAND WATERSNAKE

(Nerodia sipedon pleuralis)

Status:

Common.

Distribution and Habitat:

This species inhabits swamps, marshes, streams, ponds and lakes throughout the Park.

Special Habitat Requirements:

This species requires quiet water with fish populations.

Breeding:

Eight to fifty young are born live in late summer.

Food Habits:

This species actively seeks fish and amphibians as the chief food items.

Other Information

This species is often observed basking on logs or overhanging limbs at the water's edge.

EASTERN GARTER SNAKE

(Thamnophis sirtalis)

Status:

Uncommon.

Distribution and Habitat:

This species is a habitat generalist and may be found in meadows, marshes, woodlands, hillsides, and along streams and ditches throughout the Park.

Special Habitat Requirements:

This species is most often associated with moist environments and is sensitive to pollution.

Breeding:

Seven to more than one hundred young are born live in late summer.

Food Habits:

Earthworms, fish and amphibians form the bulk of the diet.

Other Information

Most often seen foraging on forest floors or crossing the roads during the day.

RING-NECKED SNAKE

(Diadophis punctatus)

Status:

Uncommon.

Distribution and Habitat:

This species frequents forested habitats with decaying logs or stumps throughout the Park.

Special Habitat Requirements:

While not aquatic, these snakes prefer areas where there is evidence of moisture such as around springs, damp forested hillsides and poorly drained pine woods.

Breeding:

Females lay from 1-10 eggs in sawdust piles, rotten logs or in damp soil under flat stones.

Food Habits:

Earthworms and small salamanders are the principal foods, but frogs, lizards and other small snakes are sometimes eaten.

Other Information

These snakes are almost entirely nocturnal. Individuals may be observed on the Park at night, especially during or following rains.

EASTERN (MIDWEST) WORM SNAKE

(Carphophis amoenus helenae)

Status:

Uncommon. This species could be more common on the Park than is indicated by this inventory survey. Very secretive.

Distribution and Habitat:

This species frequents moist, forested habitats at low to medium elevations and should be found throughout the Park.

Special Habitat Requirements:

Requires moist earth and will bury deep underground in dry weather.

Breeding:

Females lay from 2-8 eggs in sawdust piles or rotten logs in early summer.

Food Habits:

Earthworms and soft bodied insects are the principal foods of this diminutive species.

Other Information

Sometimes seen crossing roads at night, especially following rains. The best way to find these snakes is to turn over logs or flat rocks in moist woods.

SOUTHERN BLACK RACER *(Coluber constrictor priapus)*

Status:

Common.

Distribution and Habitat:

This species is a habitat generalist and can be found throughout the Park.

Special Habitat Requirements:

Preferred habitats include brushy open areas, open woods and rocky hillsides.

Breeding:

Females lay from 4-20 eggs in sawdust piles, rotten logs, stumps or under rocks in June or July.

Food Habits:

Insects, amphibians, reptiles, birds and small mammals are eaten.

Other Information

This diurnal species is commonly seen crossing the roads in the Park.

CORN (RED RAT) SNAKE

(Elaphe guttata)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits forested environments at low elevations throughout the Park.

Special Habitat Requirements:

Preferred habitats include pine barrens or wooded areas on rocky slopes. This species spends most of its time prowling rodent burrows or other subterranean passageways.

Breeding:

Females lay from 3-27 eggs in abandoned rodent burrows or in or under rotten logs or sawdust piles.

Food Habits:

Small mammals, birds and their eggs, frogs and lizards are eaten.

Other Information

These snakes may be seen crossing the roads during the day.

BLACK RAT SNAKE

(Elaphe obsoleta obsoleta)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits rocky timbered hillsides to flat farmland throughout the Park.

Special Habitat Requirements:

Generally found near wooded areas.

Breeding:

Females lay from 5-25 eggs in or under rotten logs, stumps or sawdust piles in late spring or early summer.

Food Habits:

Small mammals, birds and their eggs, frogs and lizards are eaten.

Other Information

These snakes may be seen crossing the roads during the day.

NORTHERN COPPERHEAD

(Agkistrodon contortrix mokasen)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits woodlands throughout the Park.

Special Habitat Requirements:

Requires surface cover under which to hide.

Breeding:

Three to fourteen young are born live in late summer after spring mating.

Food Habits:

Insects, amphibians, reptiles, birds and small mammals are eaten.

Other Information

Often seen crossing the roads, especially after rains. Also seen on the forest floor during the day.

EASTERN COTTENMOUTH

(Agkistrodon piscivorus leucostoma)

Status:

Uncommon.

Distribution and Habitat:

This species inhabits lowland swamps, lakes and rivers within the Park.

Special Habitat Requirements:

Prefers aquatic habitats with logs or overhanging branches on which to sun.

Breeding:

Three to fourteen young are born live in late summer.

Food Habits:

Fish and amphibians are the primary foods although reptiles, birds and small mammals are also taken..

Other Information

These snakes may be observed swimming in many small ponds within the Park.

APPENDIX D

VOUCHER

PHOTOGRAPH LOG

FOR

SHILOH

NATIONAL

MILITARY PARK

Shiloh National Military Park Photographic Voucher Log

ABC PHOTO #	COMMON NAME	SCIENTIFIC NAME	DATE	COORDINATES
1	Mississippi Slimy Salamander	<i>Plethodon mississippi</i>	4/8/04	16 S 376842 3888045
2	Northern Cricket Frog	<i>Acris crepitans</i>	4/8/04	16 S 376711 3888361
3	Red-spotted (Central) Newt	<i>Notophthalmus viridescens louisianensis</i>	4/8/04	16 S 376969 3889204
4	Eastern Fence Lizard	<i>Sceloporus undulatus</i>	4/9/04	16 S 377419 3891122
5	Eastern Mud Turtle	<i>Kinosternon subrubrum</i>	4/9/04	16 S 376613 3890228
6	Coal Skink	<i>Plestiodon anthracinus</i>	4/9/04	16 S 376613 3890228
7	Eastern (Midwest)Worm Snake	<i>Carphophis amoenus helenae</i>	4/10/04	16 S 376577 3890110
8	Spotted Dusky Salamander	<i>Desmognathus conanti</i>	6/18/04	16 S 376472 3888424
9	Fowler's Toad	<i>Bufo woodhousii fowleri</i>	6/18/04	16 S 376839 3887319
10	American Toad	<i>Bufo americanus</i>	6/18/04	16 S 376839 3887319
11	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	6/18/04	16 S 376839 3887319
12	Green Frog	<i>Rana clamitans melanota</i>	6/19/04	16 S 376472 3888424
13	Southeastern Five-lined Skink	<i>Plestiodon inexpectatus</i>	6/19/04	16 S 378598 3888530
14	Southern Cricket Frog	<i>Acris gryllus</i>	6/20/04	16 S 379391 3889524
15	Spotted Salamander	<i>Ambystoma maculatum</i>	6/20/04	16 S 379391 3889524
16	Three-lined Salamander	<i>Eurycea guttolineata</i>	6/20/04	16 S 379391 3889524
17	Five-lined Skink	<i>Plestiodon fasciatus</i>	9/8/05	16 S 377997 3889105
18	Ring-necked Snake	<i>Diadophis punctatus</i>	9/17/04	16 S 375943 3889014
19	Eastern Garter Snake	<i>Thamnophis sirtalis</i>	9/7/05	16 S 377598 3892632
20	Common Snapping Turtle	<i>Chelydra serpentina</i>	6/22/05	16 S 378598 3888530
21	Southern Leopard Frog	<i>Rana utricularia</i>	9/18/04	16 S 377720 3892455
22	Southern Two-lined Salamander	<i>Eurycea cirrigera</i>	9/18/04	16 S 376637 3888388
23	Ground Skink	<i>Scincella lateralis</i>	9/17/04	16 S 376949 3887988
24	Southern Red Salamander	<i>Pseudotriton ruber vioscai</i>	9/17/04	16 S 379654 3889701
25	Eastern Box Turtle	<i>Terrapene carolina carolina</i>	9/18/04	16 S 377720 3892455
26	Bullfrog	<i>Rana catesbeiana</i>	9/18/04	16 S 376839 3887319
27	Bird-voiced Treefrog	<i>Hyla avivoca</i>	9/18/04	16 S 378422 3888120
28	Southern Black Racer	<i>Coluber constrictor priapus</i>	9/19/04	16 S 377731 3890048
29	Six-lined Racerunner	<i>Aspidoscelis sexlineatus</i>	9/18/04	16 S 377997 3889105

Shiloh National Military Park Photographic Voucher Log

ABC PHOTO #	COMMON NAME	SCIENTIFIC NAME	DATE	COORDINATES
30	Yellow-bellied Watersnake	<i>Nerodia erythrogaster flavigaster</i>	6/19/05	16 S 379502 3889610
31	Bronze Frog	<i>Rana clamitans clamitans</i>	6/22/05	16 S 377720 3892455
32	Eastern Narrowmouth Toad	<i>Gastrophryne carolinensis</i>	6/22/05	16 S 376969 3889204
33	Midland Watersnake	<i>Nerodia sipedon pleuralis</i>	6/22/05	16 S 379502 3889610
34	Barking Treefrog	<i>Hyla gratiosa</i>	9/9/05	16 S 376969 3889204