

# DISTRIBUTION OF THE HERPETOFAUNA OF DAVIES ISLAND, CENTER HILL RESERVOIR<sup>1</sup>

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## INTRODUCTION

The reptiles and amphibians of Tennessee have received little attention. Gentry (1955) compiled a checklist of reptiles and amphibians for the state. Johnson (1958, 1964) and King (1939) surveyed the herpetofauna of eastern Tennessee, and Parker (1939, 1948) studied the herptiles of western Tennessee and the Reelfoot Lake area.

The objective of this study was to describe the composition and distribution of the herpetofauna of Davies Island which was disconnected from the mainland by the impoundment of Center Hill Reservoir 17 years before the present study was made. Field work was conducted over a period of one and one-half years, beginning in September, 1963, and ending in May, 1965.

## MATERIALS AND METHODS

*Study Area.* Davies Island is located in Center Hill Reservoir, DeKalb County, Middle Tennessee, approximately five miles upstream from Hurricane Boat Dock and five miles downstream from Sligo Boat Dock (Fig. 1).

Davies Island measures 536-acres and is 1.06 miles in length and one mile wide at the northern end, its widest point. The elevation ranges from 660 feet above sea level at the water's edge to 980 feet at the crest. Hills of limestone and shale are numerous, with flat areas being infrequent and small. There are no completely clear or grassy areas. There are five areas, probably under cultivation at one time, that contain a dense sod of grass with scattered pole-size saplings. The remainder of the island is covered with disturbed deciduous forest in which there are a few old road beds. Several areas appear to have been cut and two areas on the northern end have obviously been burned. Almost all of the island is in some stage of secondary succession.

A cabin and dilapidated barn stand on the east side of the island. Other than by occupants of the cabin during the summer months and occasionally by campers, the island is relatively undisturbed by humans.

*Habitat Types.* The categories of habitat types used are similar to those delineated by Johnson (1964); however, the descriptions of each category were modified to fit the habitat types examined in this study. Areas designated as springs included only those places

where ground water issues from the substrate. One or more springs occurred in each section. In all, seven were searched. Spring branches were characterized by clear water derived from one or more springs, relatively constant water temperature, bottom covered with limestone rock and/or gravel, flowing water except in very dry periods, and water depth seldom exceeding three or four inches except in pot-holes.

Important canopy trees were oaks, hickories, maples, tulip-trees, and beech, while the understory and shrub layers contained dogwood, oaks, hickories, maples, and beech. The ground cover consisted of seedlings of the canopy and/or understory species, ferns, and vernal herbaceous seed plants with conspicuous leaf litter.

A mixed hardwood and cedar forest with deciduous trees and red cedar, *Juniperus virginiana*, in nearly equal abundance, occurred on dry south and east slopes. It covered more area than any other single habitat type except the deciduous forest. The ground cover was comprised of grasses and forbs while the leaf litter contained both deciduous and cedar leaves.

There were five old fields containing numerous saplings and pole-size deciduous and cedar trees, and varying in size from approximately one to five acres each. The ground cover consisted of grasses, forbs, brambles (*Rubus* spp.), and vines, mostly Japanese honeysuckle. One area considered in this habitat type was covered with a dense growth of kudzu-vine, *Pueraria lobata*.

The habitat designated as a homesite included abandoned buildings and their immediate surroundings. Three of these occurred on the island and all contained vegetation of honeysuckle, brambles, grasses, and perennial forbs.

## RESULTS AND DISCUSSION

### CLASS AMPHIBIA: ORDER CAUDATA

Six species representing four genera of the family Plethodontidae were taken from the study area.

### Family Plethodontidae

*Desmognathus fuscus* (Rafinesque), Dusky Salamander. This was the most abundant salamander encountered. This species was restricted to two habitat types, springs and spring branches (Table I). Its habitat preference on Davies Island corresponds with that reported for this salamander in other parts of Tennessee (Gentry 1955, Johnson 1964, Parker 1948).

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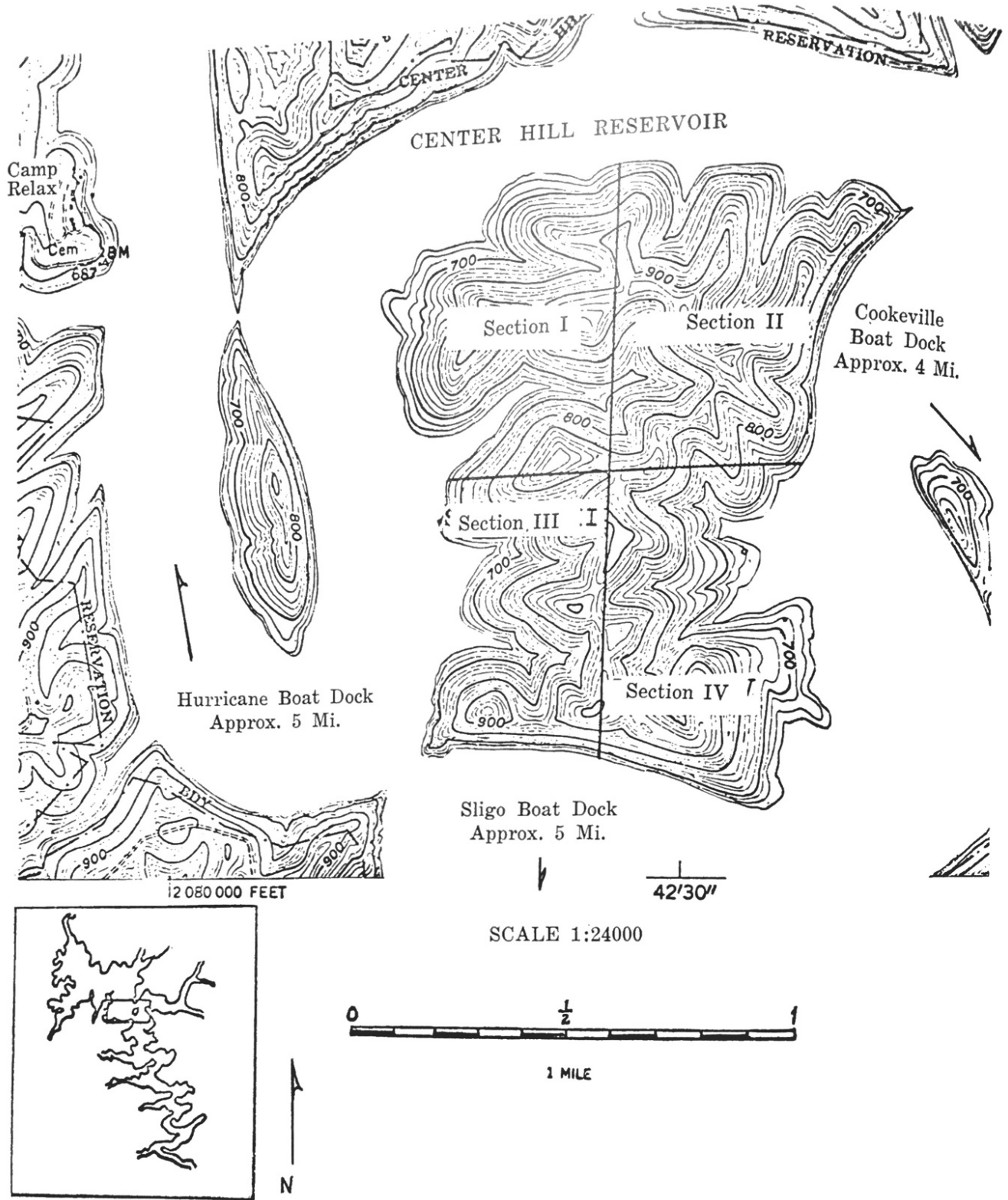


FIGURE I  
The Study Area, Davies Island, Center Hill Reservoir, DeKalb County, Tennessee \*

\* Reprinted from Silver Point Quadrangle, Tennessee. 7.5 Minute Series (Topographic) State of Tennessee. Department of Conservation. Division of Geology.

*Plethodon dorsalis* (Cope), Zigzag Salamander. This was the second most abundant salamander, being approximately one-third as abundant as *D. fuscus*. Although 34 specimens (the same number as *D. fuscus*) of this salamander were collected from two habitat types (mixed hardwoods and cedars and old field transitions), more man-hours were spent searching the habitats in which *P. dorsalis* were collected. *P. dorsalis* was found under logs, rocks, and other debris in these hab-

itat types, and was more numerous in early spring and summer when it was most active at night and during and following heavy rains. During hot, dry weather these salamanders apparently aestivate. This species was not recorded in eastern Tennessee (Johnson 1964) or in western Tennessee (Parker 1948). Gentry (1955) described its range from the foothills of the Appalachians through middle Tennessee.

TABLE I

NUMBER AND RELATIVE ABUNDANCE\* OF PLETHODONTIDAE, IGUANIDAE, SCINCIDAE, COLUBRIDAE, AND VIPERIDAE ACCORDING TO HABITAT TYPE ON DAVIES ISLAND, CENTER HILL RESERVOIR, DEKALB COUNTY, TENNESSEE

SPECIES	H A B I T A T T Y P E															
	Spring		Spring Branch		Hdwd Decd Forest		Mixed Hdwd & Cedar		Old Field Trans.		Home-Site		Shoreline Ecotone		TOTAL	
	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.	No. Obs.	Rel. Abun.
<i>D. fuscus</i>	10	1.43	24	2.00	—	—	—	—	—	—	—	—	—	—	34	1.79
<i>P. dorsalis</i>	—	—	—	—	—	—	21	0.64	13	0.37	—	—	—	—	34	0.51
<i>P. glutinosus</i>	—	—	—	—	20	0.38	5	0.15	1	0.03	3	0.30	—	—	29	0.22
<i>E. longicauda</i>	—	—	8	0.66	4	0.08	—	—	2	0.06	—	—	1	0.10	15	0.14
<i>P. ruber</i>	—	—	1	0.08	—	—	—	—	—	—	—	—	—	—	1	0.08
<i>E. lucifuga</i>	—	—	—	—	3	0.06	—	—	—	—	1	0.10	—	—	4	0.06
<i>S. undulatus</i>	—	—	—	—	7	0.13	9	0.27	8	0.23	2	0.20	20	2.00	46	0.35
<i>E. fasciatus</i>	—	—	—	—	13	0.25	2	0.06	3	0.09	5	0.50	3	0.30	26	0.18
<i>L. laterale</i>	—	—	—	—	9	0.17	4	0.12	4	0.11	—	—	—	—	17	0.14
<i>E. laticeps</i>	—	—	—	—	7	0.13	—	—	—	—	—	—	—	—	7	0.13
<i>C. amoenus</i>	—	—	—	—	76	1.43	25	0.76	21	0.60	—	—	1	0.10	123	0.94
<i>D. punctatus</i>	—	—	—	—	20	0.38	—	—	12	0.34	—	—	—	—	32	0.36
<i>N. sipedon</i>	—	—	1	0.08	—	—	—	—	—	—	—	—	—	—	1	0.08
<i>A. contortrix</i>	—	—	—	—	4	0.08	—	—	—	—	—	—	—	—	4	0.08
<i>L. getalus</i>	—	—	—	—	4	0.08	—	—	2	0.06	—	—	—	—	6	0.07
<i>C. horridus</i>	—	—	—	—	2	0.04	—	—	2	0.06	—	—	1	0.10	5	0.05
<i>T. sirtalis</i>	—	—	—	—	—	—	—	—	1	0.03	—	—	—	—	1	0.03
<i>C. constrictor</i>	—	—	—	—	1	0.02	—	—	—	—	—	—	1	0.10	2	0.03
<i>O. aestivus</i>	—	—	—	—	—	—	—	—	1	0.03	—	—	—	—	1	0.03
<i>L. doliata</i>	—	—	—	—	—	—	1	0.03	—	—	—	—	—	—	1	0.03
<i>S. dekayi</i>	—	—	—	—	1	0.02	—	—	—	—	—	—	—	—	1	0.02
<i>E. obsoleta</i>	—	—	—	—	1	0.02	—	—	—	—	—	—	—	—	1	0.02

\* Relative abundance is expressed as the number of individuals collected per man-hour of searching in each habitat type.

*Plethodon glutinosus* (Green), Slimy Salamander. Among the salamanders this species ranked third in abundance and it was encountered in as many habitat types (four) as any salamander collected. These were taken from rotted logs, under rocks, boards, and other debris, and from the edge of the lake to the highest and driest ridgetop.

*Eurycea longicauda* (Green), Long-Tailed Salamander. This was the fourth most abundant salamander on the study area. It was collected in four habitat types, ranging from the edge of the lake to the highest ridgetop. Most of these organisms were found under rocks, logs, and other debris in a hardwood deciduous forest; in old fields in secondary succession; and along the shoreline. Some, however, were collected in and around the spring branches. These habitat types correlate with

the preferences described for this species by other investigators (Bishop 1943, Conant 1958).

*Pseudotriton ruber* (Sonnini), Red Salamander. Ranking fifth in abundance among the salamanders, only one specimen of this salamander was collected under a limestone rock in a spring seep.

*Eurycea lucifuga* (Rafinesque), Cave Salamander. Even though more cave salamanders were collected than the red salamanders, the former was the least abundant salamander on the study area. Many more manhours were spent in the habitat types where *E. lucifuga* were found than in those where the one specimen of *P. ruber* was collected. All specimens were under large rocks approximately three feet in diameter and often partially underground in an old homesite and the

hardwood deciduous forest. Bishop (1943) and Conant (1958) described this salamander's favorite habitat as the twilight zone of caves. Gentry (1955) reported this species to be abundant in those regions of Tennessee containing caves. Since Davies Island contains no caves, this may account for the scarcity of the species.

#### CLASS AMPHIBIA: ORDER ANURA

Two families, each represented by a single species, were observed. Other families of Anurans which are found in middle Tennessee, but were not observed on the study area, include Microhylidae and Hylidae. The absence of these families may be contributed to the absence of a suitable habitat on the island.

#### Family Bufonidae

*Bufo americanus* (Holbrook), American Toad. These toads were common in most habitats. During the breeding season, however, they were aggregated at and in the water's edge where many were found in amplexus. At this time the toads were abundant and easily collected. After the breeding season, however, when they had dispersed, they were more difficult to find.

#### Family Ranidae

*Rana pipiens* (Schreber), Leopard Frog. The only specimen of this species encountered during the study was observed along the shore just below a stand of mixed hardwoods and cedars.

#### CLASS REPTILIA: ORDER TESTUDINATA

Only one species of this order was collected. Other genera were observed but were not collected; therefore, identification was uncertain.

#### Family Testudinidae

*Terrapene carolina* (Linnaeus), Eastern Box Turtle. This is the only species of "land turtle" in middle Tennessee (Carr 1952, Conant 1958). Three live specimens, collected in the deciduous forest, and four shells, found in old fields in secondary succession and in the deciduous forest, were collected during the study. Carr (1952) stated that this turtle is common in open woodlands, preferably in the vicinity of streams and ponds. On Davies Island, however, this species was never collected near water.

#### CLASS REPTILIA: ORDER SQUAMATA: SUBORDER LACERTILIA

Two families, three genera, and four species of this suborder were collected on the island.

#### Family Iguanidae

*Sceloporus undulatus* (Laterille), Southern Fence Lizard. This is the only Spiny Lizard inhabiting middle Tennessee (Conant 1958, Smith 1946). *S. undulatus*, which was the most abundant species of lizard on the island, was encountered in all terrestrial habitats. Although this lizard was found under rocks, logs, and other debris, it was most frequently observed basking, and sought refuge in trees or under rocks when startled. This variety of habitats agrees with those given by former investigators (Conant 1958, Gentry 1955).

#### Family Scincidae

*Lygosoma laterale* (Say), Ground Skink. Although this skink was not numerous (seven specimens collected), it was the third most abundant lizard on the island. *L. laterale* was taken from under rocks and logs in old fields, but it was most often collected in the hardwood deciduous forest and mixed hardwoods and cedars. Smith (1946) noted that this species frequented wet places or areas near water, however, such habitat preference was not apparent on Davies Island, where it was most often collected far from water on the highest and driest hills.

*Eumeces fasciatus* (Linnaeus), Five-Lined Skink. This species was collected in all sections and in all terrestrial habitat types and ranked second in abundance of the lizards on Davies Island. This species was most frequently encountered basking on logs, rocks, or other debris. Parker (1948) and Smith (1946) reported that this species preferred moist environments or areas near water, however, on Davies Island this species was most abundant at old homesites, which were dry. They were second highest in relative abundance along the shoreline where on one occasion a young skink took refuge in the reservoir.

*Eumeces laticeps* (Schneider), Broad-Headed Skink. This was the least abundant lizard of those found on the study area and all specimens observed were on the ground in the deciduous forest. Smith (1946) stated that *E. laticeps* was much more arboreal than *E. fasciatus*. Parker (1948), however, did not observe this difference in behavior and reported the two species to have similar habits.

#### CLASS REPTILIA: ORDER SQUAMATA: SUBORDER SERPENTES

Two families, eleven genera, and twelve species of this suborder were collected. This consisted of nine genera and ten species of the family Colubridae and two genera of Viperidae, each with one species.

#### Family Colubridae

*Natrix sipedon* (Linnaeus), Banded Water Snake. This species was restricted primarily to the reservoir. Nevertheless, one individual was collected inland in a spring branch. Two were collected from the boat while actively feeding at night; others were observed as they slid into the reservoir from overhanging limbs.

*Storeria dekayi* (Holbrook), Brown Snake. This snake may be encountered in almost any habitat type within its range. The only specimen found on Davies Island was under a small limestone rock in the hardwood deciduous forest.

*Thamnophis sirtalis* (Linnaeus), Garter Snake. One individual was found under a limestone rock where excess water entered a ravine. Gentry (1955) considered this species one of the most common snakes in Tennessee. The reason for its rarity on Davies Island, however, is unknown.

*Diadophis punctatus* (Linnaeus), Ring-Necked Snake. This small secretive snake was the second most abundant species of snake on the island. These animals were

usually found under rocks, beneath logs, and other debris in the hardwood deciduous forest and in old field transitions. This habitat preference agrees with that described for this species by Conant (1958) and Wright and Wright (1957). The ring-neck snake is reported to be primarily nocturnal, although it was not collected after dark during this study.

*Carphophis amoenus* (Say), Worm Snake. The worm snake, being the most numerous species of snake on the island, was found in almost all terrestrial habitats except old homesites. Even in the driest months, both young and adults of this species were collected from beneath logs, rocks or other concealing objects.

*Coluber constrictor* (Linnaeus), Black Racer. This snake occupies a wide latitude of habitat types within its geographical range. Although most of the island appeared suitable for this species, *C. constrictor* was collected only in the hardwood deciduous forest and at the shoreline. Since this diurnal species is usually readily observed when abundant, its rarity during this study is believed a true representation of the population density on the island.

*Ophedrys aestivus* (Linnaeus), Green Snake. This species is largely arboreal and common in bushes overhanging the water (Wright and Wright 1957). The only individual collected on Davies Island was found under a limestone rock in the hardwood deciduous forest.

*Elaphe obsoleta* (Say), Rat Snake. The only rat snake collected was captured in the hardwood deciduous forest. This species was evidently not common on the island.

*Lampropeltis getulus* (Linnaeus), Black Kingsnake. Conant (1958) described the habitat of this species as ranging from dry rocky hills to stream valleys. On Davies Island, *L. getulus* was encountered in two habitat types, under limestone rocks in the hardwood deciduous forest and lying in the open in an old field.

*Lampropeltis doliata* (Linnaeus), Scarlet Kingsnake. While Gentry (1955) did not observe this species in eastern Middle Tennessee, Conant (1958) and Wright and Wright (1957) indicated that the range of this species included this area. One scarlet kingsnake was collected from under a slate rock in a mixed hardwoods and cedars habitat, confirming its presence in the area.

#### Family Viperidae

*Agkistrodon contortrix* (Linnaeus), Copperhead. Four copperheads were found in or under rotten logs in the hardwood deciduous forest. The habitat selection is in accordance with that described by former investigators (Conant 1958, Wright and Wright 1957).

*Crotalus horridus* (Linnaeus), Rattlesnake. This species was collected under limestone rocks in the old field transition and lying in the open in the hardwood deciduous forest and in the shoreline ecotone. According to the habitat description given by Conant (1958) and

Wright and Wright (1957), most of this island appears to be suitable habitat for this species.

#### CONCLUSIONS

Many species of herptiles common in middle Tennessee apparently were rare or absent on Davies Island. Two species of salamanders, *Pseudotriton ruber* and *Eurycea lucifuga* were uncommon. Habitats on the island may not be suitable for them, especially *E. lucifuga* which has a preference for caves, none of which are on the island. *P. ruber* is rare, but reasons for its scarcity are not known. Only one member of the family Ranidae was observed, *Rana pipiens*. Scarcity of members of the family may be due to Davies Island having few areas suitable for breeding. Several species of reptiles were present, but uncommon; these being: *Terrapene carolina*, *Natrix sipedon*, *Storeria dekayi*, *Thamnopsis sirtalis*, *Coluber constrictor*, *Elaphe obsoleta*, and *Lampropeltis doliata*. It is possible that lack of food and suitable breeding conditions have suppressed population growth. For some species, *N. sipedon*, for example, there is a dearth of suitable habitats. The small numbers of these species collected precluded determining their distribution on the island.

Of those species which have well established populations, some showed habitat preference and some did not. *Desmognathus fuscus* and *Plethodon dorsalis* were restricted to two habitat types—*D. fuscus* to springs and spring branches, and *P. dorsalis* to mixed hardwoods and cedars and old field transitions. *Plethodon glutinosus* was found in all terrestrial habitat types except the shoreline ecotone while *Eurycea longicauda* was found in four of the seven habitat types. It appears obvious that terrestrial salamanders in general are less restricted in their ecological distribution than aquatic forms. *Bufo americanus* exhibited no habitat preference except during the breeding season at which time large numbers were aggregated at the edge of the reservoir. *Eumeces laticeps* was the only lizard with restricted habitat preference, namely, the hardwood deciduous forest. Three species of snakes, *Agkistrodon contortrix*, *Lampropeltis getulus*, and *Diadophis punctatus*, showed specific habitat preferences. The other species, although not collected in all habitat types, were encountered in at least three or more, indicating relatively wide ranges of adaptation to habitat types.

No habitat type searched was completely devoid of herptiles. The hardwood deciduous forest, which covered most of the study area and consisted of many microhabitats, contained the most diversified herpetofauna. The second most favorable habitat was the old field transition; though small, constituting a small portion of the island, they contained more cover and available food for the herptiles than many other habitats. The old homesites contained the fewest herptiles.

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