

Amphibian & Reptile Study for the Lilly ARBOR Project:
Historical Background

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Introduction

The Lilly ARBOR Project is an experimental reforestation of a riparian wetlands area spearheaded by the Center for Earth and Environmental Science of IUPUI. The project area is along the White River in Indianapolis, Indiana between the New York Street and 10th Street bridges. The wetlands area along the White River at the 96th Street Bridge in Fishers, Indiana has been considered one of the best examples of a floodplain forest community for 150 miles along the White River and is the model for the restoration (CEES 1999).

A study of the herpetological community of the restoration area is currently being performed. Discovering the general condition of the herpetological community is important because the site has been polluted with raw sewage and, until recently, garbage (CEES 2000). A concurrent study of the 96th Street floodplain is also being performed. A comparison of the herpetological communities of the two areas will be performed with two objectives. The first objective will be to determine if a difference exists in the structures of the two communities. If there is a difference between the two communities, the second objective will be to determine what impact the restoration may have on the current community of reptiles and amphibians in the project area.

One aspect of the study will compare the herpetological structure of both areas based on species found in each area. A preliminary observation of both areas from August 2000 to October 2000 has not yielded conclusive results. More thorough observations in the spring of 2001 may yield more conclusive data. If enough species population data can be collected, an analysis of each community can be performed using community statistical analysis as outlined in *Field and Laboratory Methods for General*

Ecology (Brower & Zar 1977). Differences in the two communities can be determined if such differences exist.

A second aspect of the study involves the development of a theoretical structure of a herpetological community based on similar areas and historical information of the project area. By examining historical studies and records, it may be possible to determine which amphibians and reptiles should be in the two areas. This theoretical community could be compared to the results of the present studies in order to determine which species of the community are present or missing. The presence of non-native species could also be determined from the theoretical community.

Herpetological Background

A herpetological community would consist of two classes of animals: amphibians and reptiles. The class Amphibia is divided into three groups: salamanders and newts (order Caudata), frogs and toads (order Anura), and caecilians (order Gymnophiona). Caecilians are limbless, worm-like amphibians native to the tropics and are not found in Indiana (Stebbins and Cohen 1997). There are several representatives of the Caudata and Anura orders in Indiana.

The class Reptilia is divided into five groups: the tuatara (order Rhynchocephalia), crocodilians (order Crocodylia), turtles (order Chelonia), lizards (order Sauria), and snakes (order Serpentes). The tuatara is only found in New Zealand and none of the crocodilians are native to Indiana (Minton 1972). Several species of snakes and turtles can be found in Indiana. The number of lizard species is few in this state, however.

Historical Background

When white settlers first entered Indiana, few records were kept concerning what species of amphibians and reptiles inhabited the territory, with the notable exception of reports of venomous snakes (Minton 1972). Although the ecology of Indiana has changed drastically since the time of the early settlers through urbanization, it is believed that most of species of amphibians and reptiles are still present in Indiana although with much less abundance (Minton 1972).

An exceptional study of Indiana's herpetological community was performed by the late Sherman A. Minton from 1947 to 1954. His studies covered most of the state, but were extensive in the Indianapolis area (Minton 1972). This study included distribution maps, as well as, habitat descriptions for each species. The species of amphibians and reptiles of interest for the present study would normally be found in a riparian floodplain. The habitat of interest would include the aquatic environment of the river to the mature floodplain stand (See Figure 1). This is the general structure of the 96th Street site and is the structure that is being restored by the Lilly ARBOR project at the Michigan Street site. Using Minton's data (see Appendix), a comprehensive list of all Indiana amphibians and reptiles could be formed comprised of species that could be found in the White River floodplains in Marion County in the period Minton performed his studies about fifty years ago (See Table 1).

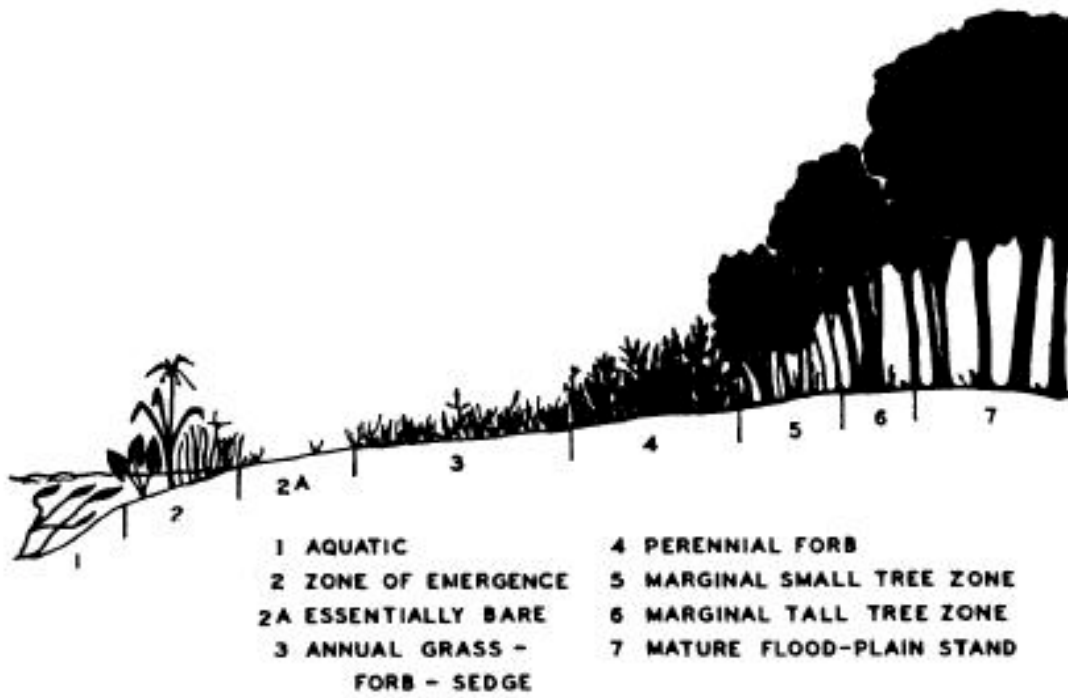


Figure 1 - Idealized profile of zonation of riparian vegetation (Lindsey et al. 1961).

Table 1 - Theoretical herpetological species list of a Marion County floodplain.

<i>Table 1</i>		
Common Name	Scientific Name	Habitat
Common Snapping Turtle	<i>Chelydra serpentina</i>	General aquatic habitats
Common Musk Turtle	<i>Sternotherus odoratus</i>	Muddy sloughs
Common Map Turtle	<i>Graptemys geographica</i>	Rivers and large creeks
False Map Turtle	<i>Graptemys pseudogeophica</i>	Rivers and large creeks
Ouachita Map Turtle	<i>Graptemys ouachitensis</i>	Rivers and large creeks
Midland Painted Turtle	<i>Chrysemys picta marginata</i>	Coves and backwaters
Eastern Spiny Softshell	<i>Apalone s. spinifera</i>	Rivers and creeks
Five-lined Skink	<i>Eumeces fasciatus</i>	Swampy forests
Broadhead Skink	<i>Eumeces laticeps</i>	Swampy forests
Northern Banded Water Snake	<i>Nerodia s. sipedon</i>	Shallow aquatic habitats
Midland Water Snake	<i>Nerodia s. pleuralis</i>	Shallow aquatic habitats
Queen Snake	<i>Regina septemvittata</i>	Edges of streams
Kirtland's Snake	<i>Clonophis kirtlandii</i>	Grassy areas near streams
Midland Brown Snake	<i>Storeria dekayi wrightorum</i>	Grassy areas near streams
Eastern Garter Snake	<i>Thamnophis s. sirtalis</i>	Embankments of streams
Butler's Garter Snake	<i>Thamnophis butleri</i>	Grassy areas near streams
Rough Green Snake	<i>Opheodrys aestivus</i>	Grassy areas near streams
Smooth Green Snake	<i>Opheodrys vernalis</i>	Grassy areas near streams
Black Rat Snake	<i>Elaphe o. obsoleta</i>	River swamps and bogs
Eastern Milk Snake	<i>Lampropeltis t. triangulum</i>	Grassy areas near streams
Mudpuppy	<i>Necturus maculosus</i>	Large streams
Marble Salamander	<i>Ambystoma opacum</i>	Lowland forests
Smallmouth Salamander	<i>Ambystoma texanum</i>	Wooded bottomland
Eastern Tiger Salamander	<i>Ambystoma tigrinum</i>	Bogs and marshes
Two-lined Salamander	<i>Eurycea cirrigera</i>	Wooded bottomland
Blanchard's Cricket Frog	<i>Acris crepitans blanchardi</i>	Margins of large streams
Western Chorus Frog	<i>Pseudacris t. triseriata</i>	Wooded bottomland
Upland Chorus Frog	<i>Pseudacris t. feriarum</i>	Wooded bottomland
Eastern Gray Treefrog	<i>Hyla versicolor</i>	Wooded bottomland
American Bullfrog	<i>Rana catesbeiana</i>	Backwaters of large streams
Green Frog	<i>Rana clamitans melanota</i>	Margins of streams
Northern Leopard Frog	<i>Rana pipiens</i>	Inlets and sloughs
Southern Leopard Frog	<i>Rana utricularia</i>	Inlets and sloughs
Pickeral Frog	<i>Rana palustris</i>	Inlets and sloughs
Wood Frog	<i>Rana s. sylvatica</i>	Wooded bottomland

Compiled from Minton 1972. See Appendix

Minton discusses several species that occurred in or near the project area. The

Common Map Turtle (*Graptemys geographica*) is one such example. Minton says, "Until

about 1950, it [Common Map Turtle] was regularly seen along the White River in Indianapolis between Tenth and Michigan Streets (1972)." Another species mentioned by Minton is the Northern Banded Water Snake (*Natrix s. sipedon*). He elaborates, "Until about 1950, they [Northern Banded Water Snakes] could be regularly seen basking along Fall Creek near the center of Indianapolis (1972)." The Northern Banded Water Snake was also found in the preliminary study of the 96th Street floodplain between August 2000 and October 2000. This species of snake was not found in the project area, however. Minton also did a population study of Eastern Garter Snakes (*Thamnophis s. sirtalis*) near the confluence of Fall Creek and White River in Indianapolis between September 1947 and May 1950.

Minton also discusses several species that may inhabit the project area that are very susceptible to pollution. The Mudpuppy (*Necturus m. maculosus*) is described as rare or absent in heavily polluted waters. Another species that is susceptible to pollution is the Eastern Spiny Softshell turtle (*Trionyx s. spinifer*). Minton states that this species does not seem to tolerate sewage, industrial waste, or chemicals. He further states that fish kills in streams from pollution are usually accompanied by high mortality rates among this species of turtle. The Common Musk Turtle (*Sternotherus odoratus*) is described as being quite tolerant in highly polluted water (Minton 1972), and may be present at the project site.

Summary

The theoretical community of herpetological species generated in this article will be used as a guide for detecting amphibians and reptiles in both study areas. The accuracy of the theoretical list depends on the several factors. The accuracy of the original study

performed by Minton will play a part in the accuracy of the list. Although some species are in decline and a handful of species are extinct in Indiana, most of the species detected by Minton should still be present. The effects of urbanization along the White River in the past fifty years may have significantly altered the entire herpetological community structure making the list obsolete. The theoretical list should be an important guide despite these changes.

Appendix

A comprehensive list of Indiana amphibians and reptiles circa 1950 (Minton 1972).

<i>Turtles</i>	
Common Snapping Turtle	<i>Chelydra serpentina</i>
Alligator Snapping Turtle	<i>Macrolemys temminckii</i>
Common Musk Turtle (Stinkpot)	<i>Sternotherus odoratus</i>
Eastern Mud Turtle	<i>Kinosternon subrubrum</i>
Spotted Turtle	<i>Clemmys guttata</i>
Eastern Box Turtle	<i>Terrapene c. carolina</i>
Ornate Box Turtle	<i>Terrapene c. ornata</i>
Common Map Turtle	<i>Graptemys geographica</i>
Mississippi Map Turtle	<i>Graptemys kohnii</i>
False Map Turtle	<i>Graptemys pseudogeographica</i>
Ouachita Map Turtle	<i>Graptemys ouachitensis</i>
Red-eared Slider	<i>Trachemys scripta elegans</i>
Hieroglyphic River Cooter	<i>Pseudemys concinna</i>
Midland Painted Turtle	<i>Chrysemys picta marginata</i>
Western Painted Turtle	<i>Chrysemys picta bellii</i>
Blanding's Turtle	<i>Emydoidea blandingii</i>
Midland Smooth Softshell	<i>Apalone m. mutica</i>
Eastern Spiny Softshell	<i>Apalone s. spinifera</i>

<i>Lizards</i>	
Northern Fence Lizard	<i>Sceloporus undulatus</i>
Slender Glass Lizard	<i>Ophisaurus a. attenuatus</i>
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>
Ground Skink	<i>Scincella laterale</i>
Five-lined Skink	<i>Eumeces fasciatus</i>
Broad-headed Skink	<i>Eumeces laticeps</i>

<i>Snakes</i>	
Diamondback Water Snake	<i>Nerodia rhombifer</i>
Northern Copperbelly	<i>Nerodia e. neglecta</i>
N. Banded Water Snake	<i>Nerodia s. sipedon</i>
Midland Water Snake	<i>Nerodia s. pleuralis</i>
Queen Snake	<i>Regina septemvittata</i>
Graham's Crayfish Snake	<i>Regina grahamii</i>
Kirtland's Snake	<i>Clonophis kirtlandii</i>
Midland Brown Snake	<i>Storeria dekayi wrightorum</i>
Northern Redbellied Snake	<i>Storeria occipitomaculata</i>
Eastern Garter Snake	<i>Thamnophis s. sirtalis</i>
Red-sided Garter Snake	<i>Thamnophis s. parietalis</i>
E. Plains Garter Snake	<i>Thamnophis radix</i>
Butler's Garter Snake	<i>Thamnophis butleri</i>
Eastern Ribbon Snake	<i>Thamnophis s. sauritus</i>
Northern Ribbon Snake	<i>Thamnophis s. serpentrionalis</i>
Western Ribbon Snake	<i>Thamnophis p. proximus</i>
Lined Snake	<i>Tropidoclonion lineatum</i>
Western Earth Snake	<i>Virginia valeriae elegans</i>
Eastern Hognose Snake	<i>Heterodon platirhinos</i>
Northern Ringneck snake	<i>Diadphis punctatus edwardsii</i>
Blue Racer	<i>Coluber constrictor foxii</i>
Southern Black Racer	<i>Coluber constrictor priapus</i>
Black Rat Snake	<i>Elaphe o. obsoleta</i>
Western Fox Snake	<i>Elaphe v. vulpina</i>
Bull Snake	<i>Pituophis melanoleucus sayi</i>
Prairie Kingsnake	<i>Lampropeltis c. calligaster</i>
Black Kingsnake	<i>Lampropeltis getulus niger</i>
Eastern Milk Snake	<i>Lampropeltis t. triangulum</i>
Red Milk Snake	<i>Lampropeltis t. sypila</i>
Scarlet Snake	<i>Cemophora coccinea copei</i>
Rough Green Snake	<i>Opheodrys aestivus</i>
Smooth Green Snake	<i>Opheodrys vernalis</i>
Crowned Snake	<i>Tantilla c. coronata</i>
Midwest Worm Snake	<i>Carphophis amoenus helenae</i>
Northern Copperhead	<i>Agkistrodon contortrix mokeson</i>
Cottonmouth Moccasin	<i>Agkistrodon piscivorus</i>
Eastern Massasauga	<i>Sistrurus c. catenatus</i>
Timber Rattlesnake	<i>Crotalus h. horridus</i>

<i>Frogs & Toads</i>	
Eastern Spadefoot Toad	Scaphiopus h. holbrookii
American Toad	Bufo americanus
Fowler's Toad	Bufo fowleri
Blanchard's Cricket Frog	Acris crepitans blanchardi
Western Chorus Frog	Pseudacris t. triseriata
Spring Peeper	Hyla c. crucifer
Eastern Gray Treefrog	Hyla versicolor
Green Frog	Rana clamitans melanota
American Bullfrog	Rana catesbeiana
Crawfish Frog	Rana areolata circulosa
Northern Leopard Frog	Rana pipiens
Southern Leopard Frog	Rana utricularia
Pickerel Frog	Rana palustris
Wood Frog	Rana s. sylvatica

<i>Salamanders & Newts</i>	
Hellbender	Cryptobranchus alleganiensis
Mudpuppy	Necturus maculosus
Streamside Salamander	Ambystoma barbouri
Jefferson's Salamander	Ambystoma jeffersonianum
Blue-spotted Salamander	Ambystoma laterale
Spotted Salamander	Ambystoma maculatum
Marble Salamander	Ambystoma opacum
Smallmouth Salamander	Ambystoma texanum
Eastern Tiger Salamander	Ambystoma tigrinum
Eastern Newt	Notophthalmus viridescens
Green Salamander	Aneides aeneus
Northern Dusky Salamander	Desmognathus fuscus
Two-lined Salamander	Eurycea cirrigera
Longtailed Salamander	Eurycea longicuada
Cave Salamander	Eurycea lucifuga
Four-toed Salamander	Hemidactylium scutatum
Redbacked Salamander	Plethodon cinereus
Zigzag Salamander	Plethodon dorsalis
Slimy Salamander	Plethodon gluinosus
Ravine Salamander	Plethodon richmondi
Red Salamander	Pseudotriton ruber
Lesser Siren	Siren intermedia

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