Proceedings of the Indiana Academy of Science
(1998) Volume 107 p. 105-113

REPTILES AND AMPHIBIANS OF THE NEWPORT CHEMICAL DEPOT, VERMILLION COUNTY, INDIANA

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ABSTRACT: A survey of the distribution and abundance of amphibians and reptiles was conducted at the Newport Chemical Depot in northern Vermillion County, Indiana. Based on trapping, hand-collecting, observation, and anuran breeding call surveys, thirty species of amphibians and reptiles have been recorded at the depot to date. We observed 15 species of amphibians and 15 species of reptiles. The most common amphibians in approximate order of decreasing abundance were: the spring peeper (*Pseudacris crucifer*), western chorus frog (*Pseudacris triseriata*), American toad (*Bufo americanus*), Fowler's toad (*Bufo woodhousii*), green frog (*Rana clamitans*), small-mouth salamander (*Ambystoma texanum*), and pickerel frog (*Rana palustris*). The most common reptiles in order of decreasing abundance were: the northern water snake (*Nerodea sipedon*), eastern box turtle (*Terrapene carolina*), snapping turtle (*Chelydra serpentina*), and black rat snake (*Elaphe obsoleta*). No federal or state listed species have been observed at the Newport Chemical Depot to date. The depot has a variety of habitats and is rich in wildlife species. We recommend that the natural areas of the depot be protected when the facility ends operations in the near future.

KEYWORDS: Amphibian, Newport Chemical Depot, reptile, Vermillion County, Indiana.

INTRODUCTION

The Newport Chemical Depot (formerly the Newport Army Ammunition Plant) in northern Vermillion County, Indiana, once produced military munitions, but the depot currently functions solely as a storage facility for VX nerve agent. The stockpiled nerve agent is to be disposed of by neutralization by 2007 in accordance with the Prohibition of Chemical Weapons Treaty. The Indiana Academy of Science's Committee on Biodiversity and Conservation and the Indiana Department of Natural Resources' Technical Advisory Committee on Mammals have recommended that natural areas in Indiana be surveyed to record their biotic diversity. Furthermore, the Department of Defense has directed that areas under its control be surveyed, especially for at-risk species. This study as well as our other studies on mammals and fishes (this issue) and the study of Chandler and Weiss (1996) on birds meet this objective.

In an earlier survey, Pinkham, *et al.* (1976) recorded seven species of amphibians and one species of reptile at the Newport Chemical Depot (Table 1). Jackson and Whitaker (1987) and Whitaker (1994) listed the species of reptiles and amphibians likely to occur in the area. Nine species were regarded as potential-

Table 1. Amphibians and reptiles known from the Newport Chemical Depot, Vermillion County, Indiana. Data taken from Whitaker (1994) and the current survey.

	Pinkham *et al.*, 1976	Estimate by Chorus Count	Number Taken in Minnow Traps	Number of Individuals Hand Caught/Observed	Estimate of Abundance
Amphibia					
Ambystomidae					
Ambystoma texanum			189	10	Abundant
Plethodontidae					
Plethodon glutinosus				1	Uncommon
Plethodon cinereus				3	Uncommon
Eurycea bislineata	•			2	Uncommon
Hylidae					
Psuedacris crucifer		5000+	27		Abundant
Pseudacris triseriata	•	3000+	12		Abundant
Acris crepitans	•	20			Uncommon
Hyla crysoscelis		10		1	Uncommon
Bufonidae					
Bufo americanus	•	1000+	31	90	Abundant
Bufo woodhousii		10			Uncommon
Ranidae					
Rana clamitans	•	190	7	4	Common
Rana palustris		80	22	7	Common
Rana catesbeiana		70			Uncommon
Rana utricularia	•	60	8		Uncommon
Rana sylvatica	•		1	3	Uncommon
Reptilia					
Chelydridae					
Chelydra serpentina				3	Uncommon
Emydidae					
Terrapene carolina	•			14	Abundant
Chrysemys picta					Common
Scincidae					
Eumeces fasciatus				1	Uncommon
Eumeces laticeps				1	Uncommon
Colubridae					
Nerodia sipedon			10	5	Abundant
Elaphe obsoleta				3	Common
Storeria dekayi				1	Uncommon
Thamnophis sirtalis			1		Uncommon
Coluber constrictor				1	Uncommon
Thamnophis sauritus[a]				•	Uncommon
Lampropeltis calligaster[a]				•	Uncommon
Heterodon platirhinos[a]				•	Uncommon
Diadophis punctatus[a]				•	Uncommon
Carphophis amoenus[a]				•	Uncommon

[a] Species observed on depot property by Joseph R. Burdick, an employee of the depot, but not verified by the authors.

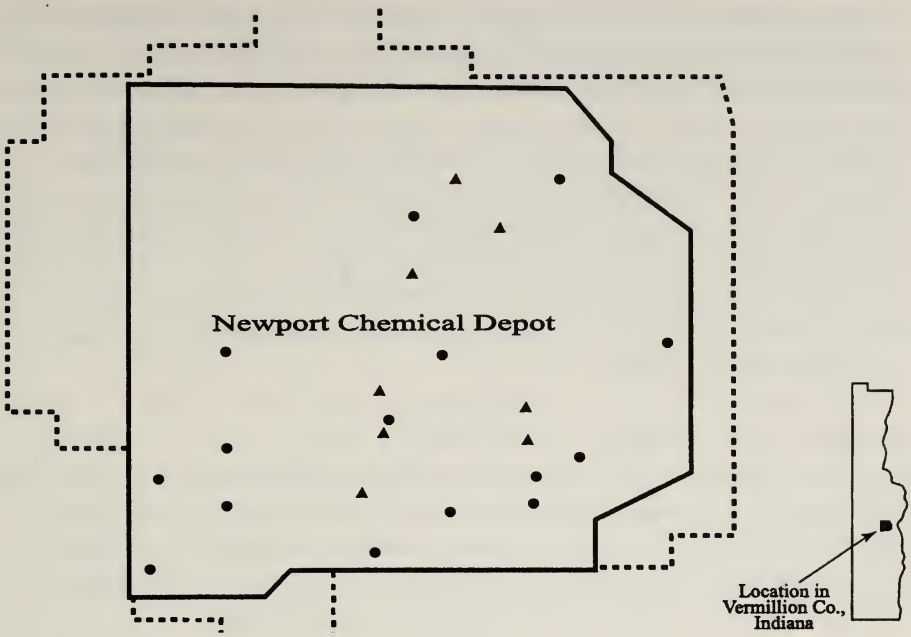

Fig. 1. Map of the Newport Chemical Depot study area, Vermillion Co., Indiana. Dashed lines indicate the property boundary, and solid lines indicate the position of the perimeter fence. Locations of minnow trap sites in 1998 are represented by triangles, and anuran chorus listening sites in 1994 and 1998 are represented by circles.

ly present, four state endangered and five state special concern species, respectively: the northern crawfish frog (*Rana areolata*), four-toed salamander (*Hemidactylium scutatum*), eastern mud turtle (*Kinosternon subrubrum*), Kirtland's snake (*Clonophis kirtlandii*), northern leopard frog (*Rana pipiens*), plains leopard frog (*Rana blairi*), mudpuppy (*Necturus maculosus*), western ribbon snake (*Thamnophis proximus*), and rough green snake (*Opheodrys aestivus*). We undertook the present study to assess the distribution and abundance of reptiles and amphibians at the depot. The information contained in this study will be useful when making land management recommendations upon closing the site.

DESCRIPTION OF THE STUDY AREA

The Newport Chemical Depot (Figure 1) is located on the Tipton Till Plain. Due to the Illiniosan and Wisconsinan glaciations (Jackson and Whitaker, 1987), the area is mainly flat although the land does slope to the north toward the Little Vermillion River and to the east toward the Wabash River. The plant encompasses 2,874 ha, the majority of which are enclosed within a security fence. Half of the acreage consists of cultivated fields of corn and soybeans; two thirds of the remainder represents forest and riparian habitats; and the last third includes developed areas, grasslands, brushy fields, and small marshes. The habitats surrounding the depot consist primarily of additional agricultural fields as well as wooded areas bordering local rivers and creeks.

Four streams are found on depot property (Figure 1). Little Vermillion Creek is located in the north-central portion of the plant and flows to the north before emptying into the Little Vermillion River. Little Vermillion Creek flows most of the spring but, except for isolated pools, dries by the end of July. Little Raccoon Creek is found in the southeastern corner of the plant and flows southward, connecting with Buck Creek approximately 2.5 km south of the depot. Little Raccoon Creek sustains some flow throughout the year. Jonathan Creek runs through the northwestern corner of the plant. This creek flows to the north throughout the spring but drys up by early July. An unnamed creek located outside of the perimeter fence, but on plant property, flows east of State Route 63 and empties into the Wabash River.

Old-field habitat consists of abandoned agricultural areas in later succession dominated by tree seedlings, shrubs, and vines. The most common plant species are planted larches, maples, and pine as well as mutliflora rose, poison ivy, and various grasses and sedges. Woodland habitat is located primarily along the creeks. The woodland in the north-central sector is dominated by oak and hickory and, in the central, southern, and southeastern sectors, by sugar maple, ash, tulip tree, basswood, beech, and elm (Jackson and Whitaker, 1987).

Marsh areas are found in the south-central portion of the plant around the 6200 holding and beaver ponds (Figure 1). Only the beaver pond retains water throughout the year. Dominant plants in these areas are willows, rushes, and occasional silver maples.

MATERIALS AND METHODS

Most collections were made inside the depot's fenced boundary, primarily in areas around water sources where amphibians and reptiles should be most prevalent (Figure 1). Data from 1993-1994 (Whitaker, 1994) and 1998 were combined for this report. In 1998, approximately 20 hours were devoted to turning over logs and stones along creeks and in the woods to search for salamanders. Eight hand collecting trips were made: two at Little Vermillion Creek, two at Little Raccoon Creek, and one at the unnamed creek, beaver pond, cattle pond, and each of the ephemeral ponds. These collections were made after rains during the spring and summer.

Minnow traps were used at 9 sites (total trapnights = 696; Figure 1) in 1998 to collect animals from small ponds and slow-running streams: Site 1, the cattle pond (six traps from 7 to 16 March; 2 traps from 22 March to 27 May; 114 total trapnights); Site 2, the beaver pond (1 trap from 7 to 16 March; 2 traps from 22 March to 17 July; 80 total trapnights); Site 3, the 6200 holding pond (6 traps from 22 March to 17 July; 204 total trapnights); Site 4, Little Vermillion Creek (1 trap from18 April to 17 July; 20 total trapnights); Site 5, a culvert at the point where Little Raccoon Creek exits the plant (1 trap from 14 April to 17 July; 21 total trapnights); Site 6, the drainage ditch near the intersection of 15th and Broadway Streets (5 traps from 7 to 16 March; 50 total trapnights); Site 7, the slow stream near Central Avenue (1 trap from 7 to 16 March; 3 traps from 22

March to 9 July; 109 total trapnights); Site 8, an ephemeral pond near EE Street (4 traps from 22 March to 25 April; 72 total trapnights); Site 9, a culvert near the intersection of West and North Streets (1 trap from 22 March to 17 July; 26 total trapnights).

In 1993-94, frog choruses were heard at 15 sites (Whitaker, 1994; Figure 1). Those sites were re-examined in 1998 (Figure 1). The sites were visited for at least two nights each year for 20 minutes per night to determine the species present and to estimate the abundance of each species at each site. Seasonal variation in approximate chorus abundance per species was tabulated (Table 2). Snakes were searched for during all phases of the survey, and special attention was paid to roads, roadsides, and other surfaces that snakes might use as sunning sites.

RESULTS

Fifteen species of amphibians (4 salamanders and 11 frogs and toads) and 10 species of reptiles (3 turtles, 5 snakes, and 2 lizards) were observed at the Newport Chemical Depot. An additional 5 species of snakes were observed by Joseph R. Burdick of the Newport Chemical Depot, bringing the total number of amphibian and reptile species present at the depot to 30.

Amphibia: Caudata (Salamanders)

Ambystomidae (Mole Salamanders). The small-mouth salamander (*Ambystoma texanum*) was common at the depot. One hundred and ninety-nine small-mouth salamanders were taken in minnow traps between 8 March and 20 April 1998. The majority (124) were taken at the cattle pond (Figure 1). We had anticipated that other species of *Ambystoma* would be taken, particularly the tiger salamander (*A. tigrinum*), since that species is common in the area (Minton, 1972). None were found.

Plethodontidae (Lungless Salamanders). Whitaker (1994) found three plethodontids at the plant: the two-lined salamander (*Eurycea bislineata*), red-backed salamander (*Plethodon cinereus*), and slimy salamander (*Plethodon glutinosus*). Each of these species was found along the unnamed creek east of the depot (Figure 1).

Amphibia: Anura (Frogs and Toads)

Hylidae (Tree Frogs). The most abundant hylids observed were the spring peeper (*Pseudacris crucifer*) and western chorus frog (*Pseudacris triseriata*). Large choruses of each species were heard. Choruses were heard from 28 February to 4 May 1998 (Table 2). The cricket frog (*Acris crepitans*) and Cope's gray tree frog (*Hyla chrysoscelis*) were found in low numbers. One cricket frog chorus was heard on 2 June 1998, and one Cope's gray tree frog chorus was heard on 16 June 1998 (Table 2).

Bufonidae (Toads). The American toad (*Bufo americanus*) was abundant at the depot. Large choruses were heard at all ponds between 28 March and 6 May 1998 with peak activity at the 6200 holding pond. Individuals were regu-

Table 2. Amphibian numbers for traps and chorus estimation numbers by date (1998) from the Newport Chemical Depot, Vermillion County, Indiana (L = low numbers (1 to 10 individuals); M = moderate numbers (10 to 50 individuals); and H = high numbers (> 50 individuals)).

Month		Feb.	Mar.		Apr.		May		June		July		Aug.		Sept.	
Days		15-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	Total
N		2	3	5	3	3	6	4	2	4	4	6	1	3	1	
Ambystomidae																
Ambystoma texanum	Trap		129	63				5				2				199
Plethodontidae																
Plethodon cinereus	Trap														3	3
Eurycea bislineata	Trap														2	2
Hylidae																
Psuedacris crucifer	Trap		13	7	3	1	3									27
	Chorus	1L	1M	3M, 9H	1L	1L										
Pseudacris triseriata	Trap		9	3												12
	Chorus	1M, 1H	2M	1M, 12H	2L, 1M											
Acris crepitans	Trap															
	Chorus							1L	1L							
Hyla crysoscelis	Trap															1
	Chorus									1L						
Bufonidae																
Bufo americanus	Trap				23	7	1	2	1			2		3		39
	Chorus			1L, 2M, 2H	1M		1M									
Bufo woodhousii	Trap															
	Chorus							1L								
Ranidae																
Rana clamitans	Trap						2	2		3		2				9
	Chorus						1L, 2M		1M	1L	2L					
Rana palustris	Trap			9	10	5					5					29
	Chorus			2L		1M	1L									
Rana catesbeiana	Trap															
	Chorus							1M		1L	1L					
Rana utricularia	Trap				4	1	3									8
	Chorus			1M						1L						
Rana sylvatica	Trap									1	1	1				3
	Chorus															

larly taken in minnow traps. Fowler's toad (*Bufo woodhousii*) was found in low numbers on 16 June 1998 in a wooded area along Little Raccoon Creek.

Ranidae (True Frogs). The most common ranid at the Newport Chemical Depot was the green frog (*Rana clamitans*; Table 1). Choruses were heard from 4 May to 9 July 1998. The pickerel frog (*Rana palustris*) was also abundant at the plant. Most individuals were observed at the shallow 6200 holding pond located in the south-central portion of the plant (Figure 1). The first pick-

erel frogs were observed on 17 March and the last were heard on 2 May 1998. Three additional ranids occurred in low numbers at the depot. The southern leopard frog (*Rana utricularia*) was heard in low numbers. Moderate choruses of the southern leopard frog were heard on 28 March 1998 and a small chorus on 16 June 1998. Eight individuals were captured in minnow traps at the 6200 holding pond and beaver pond between 13 April and 11 May 1998. The bullfrog (*Rana catesbeiana*) was uncommon at the depot. Small choruses were heard on three occasions along small streams in wooded areas. The first chorus was heard on 27 May and the last on 4 July 1998. Four wood frogs (*Rana sylvatica*) were captured in 1998. This species is uncommon at the depot.

Reptilia: Testudinata (Turtles)

Emydidae (Box and Water Turtles). The eastern box turtle (*Terrapene carolina*) was the only turtle reported by Pinkham, *et al.* (1976). Numerous individuals were observed throughout the depot between 20 May and 8 August 1998. The earliest sightings were in wooded areas and along roads, while later sightings were along streambeds where the turtles were often found lying in shallow water. The eastern painted turtle (*Chrysemys picta*) was reported by Whitaker (1994), but no individuals were observed in 1998.

Chelydridae (Snapping Turtles). Three snapping turtles (*Chelydra serpentina*) were observed at the Newport Chemical Depot in 1998. One was seen in a drainage ditch filled with water which connected to the beaver pond, and two large individuals were observed in a shallow pool along Little Vermillion Creek.

Reptilia: Squamata: Lacertilla (Lizards)

Scincidae (Skinks). Two species of skink were found at the depot. One broad headed skink (*Eumeces laticeps*) was observed on a tree in a wooded area near the north-central section of the perimeter fence, and one five-lined skink (*Eumeces fasciatus*) was observed in a second growth woods near the east-central entrance to the depot.

Reptilia: Serpentes (Snakes)

Colubridae (Common Snakes). Ten colubrids have been documented at the plant. The northern water snake (*Nerodia sipedon*) was the most common. Fifteen individuals were observed in 1998. Most were caught in minnow traps set at Little Raccoon Creek, Little Vermillion Creek, and the 6200 holding and beaver ponds. Three black rat snakes (*Elaphe obsoleta*) were observed in 1998. One was found in old-field habitat near the center of the plant; two others were observed along roadsides. One eastern garter snake (*Thamnophis sirtalis*), one black racer (*Coluber constrictor*), and one Dekay's snake (*Storeria dekayi*) were also found at the depot. The garter snake was caught in a minnow trap placed at the beaver pond in 1998. The Dekay's snake was found dead on a roadside near the unnamed creek (Whitaker, 1994). Five additional species were observed

by J.R. Burdick of the Newport Chemical Depot (Whitaker, 1994), including the eastern ribbon snake (*Thamnophis sauritus*), worm snake (*Carphophis amoenus*), northern ringneck snake (*Diadophis punctatus*), eastern hognose snake (*Heterodon platirhinos*), and prairie king snake (*Lampropeltis calligaster*). The prairie king snake should be verified as there are few records from near this locality (Minton, 1972).

DISCUSSION

The Newport Chemical Depot provides habitat for at least fifteen species of amphibians and fifteen species of reptiles along creeks, in wooded areas, and at ephemeral and permanent ponds. Data (Whitaker (1994) and the current study) show an additional eight species of amphibians and fourteen of reptiles present at the depot which were not reported by Pinkam, *et al.* (1976). One salamander (*Plethodon glutinosus*), one turtle (*Chrysemy picta*), and six snakes (*Coluber constrictor*, *Thamnophis sauritus*, *Lampropeltis calligaster*, *Heterodon platyrhinos*, *Diadophis punctatus*, and *Carphophis amoenus*) reported by Whitaker (1994) were not observed in 1998.

Other amphibians which could logically occur by virtue of their range and habitat preference which were not observed during this survey include: the eastern newt (*Notophthalmus viridescens*), tiger salamander (*Ambystoma tigrinum*), spotted salamander (*Ambystoma maculatum*), Jefferson's salamander (*Ambystoma jeffersonianum*), marbled salamander (*Ambystoma opacum*), zig-zag salamander (*Plethodon dorsalis*), and longtail salamander (*Eurycea longicauda*). Four amphibians were reported as potentially present by Jackson and Whitaker (1987). Crawfish frogs (*Rana areolata*) could occur at the depot but should have been heard if present. The four-toed salamander (*Hemidactylium scutatum*) is probably absent as this species is now confined mainly to the northern edge of Indiana. The *Rana pipiens* group (leopard frogs) has been revised; the leopard frog present at the Newport Chemical Depot is the southern leopard frog (*Rana utricularia*). The mudpuppy (*Necturus maculosus*) may also be absent as this species inhabits bigger streams and deeper water than exist at the depot.

Reptiles not found but which occur in the vicinity and for which proper habitat exists are: the eastern milk snake (*Lampropeltis triangulum*), black king snake (*L. getulus*), northern redbellied snake (*Storeria occipitomaculata*), and western fox snake (*Elaphe vulpina*). The following four species of reptiles were listed as potentially present by Whitaker (1994). The western ribbon snake (*Thamnophis proximus*) and rough green snake (*Opheodrys aestivus*) were not found, but they are probably present. The eastern mud turtle (*Kinosternon subrubrum*) as well as Kirtland's snake (*Clonophis kirtlandii*) are probably absent due to the lack of proper habitat; these two species are also uncommon in the area.

Frogs, like neotropical migrant birds and certain bat species, appear to be undergoing population declines. However, many frog and bird species at Newport have good populations, and, additionally, the federally endangered Indiana bat occurs on site. Large areas where these and other life forms can thrive

should be preserved, and Newport is such an area. In addition, good baseline data on all the vertebrates of this area are available—birds (Chandler and Weiss, 1996) as well as mammals and fishes (this issue). Therefore, the depot could be used for future comparisons during later studies of vertebrate population changes.

The information gained in this study will be useful in making recommendations for the future of the Newport Chemical Depot when the VX nerve agent is disposed of and the plant closes. The depot is a large, biologically valuable area, and we recommend that its natural areas be set aside to help preserve the biological diversity of the region once operations end.

ACKNOWLEDGMENTS

Special thanks go to Phillip Cox of the Newport Chemical Depot for access to the plant and for enthusiasm and support throughout the study. We also thank J.R. Burdick for the use of his data. Finally, we thank the United States Army Materiel Command for providing funding for this project.

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