

Herpetological Notes from the Buffalo Flat Natural Area

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Introduction

The Buffalo Flat area in Dubois County is perhaps the finest wetland of any significant size remaining in southern Indiana (Anon. TNC Newsletter, 1984). The area first came to the attention of botanists associated with the Indiana Natural Heritage Program in 1982. In the spring of 1983 the Western Cottonmouth, *Agkistrodon piscivorus leucostoma* was discovered at Buffalo Flat, one of the most significant Indiana herpetological records in the recent past (Wilson & Minton, 1983; Minton, List, Lodato, 1983). This record is of interest on a larger zoogeographic scale in that it represents one of the northernmost extant records for the species in North America. Only an isolated Livingston County Missouri record (Anderson, 1965) appears to be known from a more northern latitude and the present status of that colony is uncertain. At the present time the Buffalo Flat colony is the only verifiable colony of the cottonmouth in Indiana. It occurs there is an isolated, disjunct relict population.

(There have been several reports of this species over the years from Indiana, mostly hearsay, but including some that were reportedly supported by specimens. I have investigated many of these reports and have concluded that none of them represent colonies of this species in Indiana, based on field visits to sites, examination of specimens, discussions with collectors and an analysis of topography, ecology and known sympatric species from the site. I believe it is best to regard reports of the cottonmouth other than the Buffalo Flat colony as "accidental" or "erroneous." The recently reported (Claude Baker, personal communication) Harrison County specimen (Indiana University Southeast, New Albany, Cat.No.277) is certainly *A.p. leucostoma*, but its provenance remains in doubt, because the circumstances of collection are poorly documented. The lack of additional or subsequent specimens to verify a colony is difficult to overlook since the snake bears a 1968 collection date. The author has surveyed the collection site and environs annually for nearly twenty five years without any evidence of the species and it was not known by residents in the area.

Since its discovery the Buffalo Flat area has generated a good deal of interest from botanists and naturalists, as well as from conservation and preservation oriented organizations. While the cottonmouth is only one of the many floral and faunal elements of interest it is without question the most intriguing resident so far discovered there. Minton (1983 a) traced the history of the ultimate discovery of the cottonmouth in Indiana. Because of its minute range and small population size the snake is presently on the state's list of endangered and threatened species.¹ The purpose of this paper is to report on a study of *Agkistrodon piscivorus* at Buffalo Flat commissioned by the Indiana Natural Heritage Program. The specific objectives of the study were: (1) to locate hibernacula used by the species on or adjacent to Buffalo Pond; and (2) to estimate the population size and status at the site, (3) to report observations on habits, behavior, and life history of the Indiana cottonmouth at Buffalo Flat and (4) to report other amphibians and reptiles encountered at the site.

General Site Description

At the request of the landowner and in the interest of protection for some of

¹ See Section 6; I.A.C. 3-3-6—Discretionary Order No. W-12 dated Aug. 31, 1984. Endangered, Threatened and Special Concern Wildlife.

the rare, endangered, or threatened plants and animals, the specific location of the site has been intentionally omitted in this report. The Buffalo Flat area proper consists of something less than a square mile, or approximately 500 acres. The area is bounded on the north by cropland and pasture, on the east by a paved county road, the Patoka River, and Southern Railway line. On the south the area is bordered by some cropland and light industrial development. A new east-west road was constructed near the southern edge of the tract in 1984. On the west there is a steeply sloping bluff that rises some 60-70 feet above the surrounding floodplain. For the most part, this bluff is heavily forested. Some sections show considerable sandstone outcrop and where the bluff faces the south and southeast, it is quite dry and open. Other sections, with a more northerly exposure or that are recessed, have moist soils and are shaded by a more dense canopy of trees. The top of the bluff is largely pasture, with some urban development toward the southwest. The "flat" itself consists of a broad alluvial wooded floodplain, lying between the sloping bluff on the west and the Patoka River on the east. The dominant feature of this tract is a large semi-permanent or seasonally wet swamp approximately 300 acres in size. The margin of the swamp is dominated by mixed hardwoods. The wettest parts of the swamp are fairly open are dominated by red maple, black willow, pumpkin ash, and swamp cotton-wood. There are dense thickets of buttonbush and stands of swamp loosestrife are common. The water in the swamp is clear and there is much emergent aquatic vegetation, the most conspicuous of which is arrow arum. Buffalo Creek to the west of the swamp has a mud and sand bottom and its water is usually turbid with a heavy load of silt. Although the area retains much natural character for such a site in modern day Indiana, signs of disturbance are common. There has been construction of drainage canals and dikes, logging has periodically occurred, and there is considerable agricultural, urban, and industrial encroachment. Buffalo Creek has been dredged and straightened on occasion (including late 1983) and two oil wells are in operation on sites immediately adjacent to the swamp. The interior of the swamp shows little or no sign of human activity.

Methods

Field studies for this report were conducted from 1983 to 1985, but primarily in 1984. Eight visits occurred in 1984, the earliest April 2 and the latest October 14. Few visits were made in May or June, normally the peak months of herpetofaunal activity. All field observations were during daylight hours. Field visits averaged between three and four hours duration.

Survey technique consisted of forays along the edge of and into the interior of the swamp, as well as along the margins of Buffalo Creek. An intensive search was made along the steeply sloping wooded bluff to the west of the swamp. A long handled rake was used to turn logs, bark, and stones, to uncover hiding animals. Binoculars were used to identify basking animals. Many amphibians and reptiles were captured for identification and promptly released. No animals were sacrificed or preserved for voucher specimens. Note was made of each amphibian or reptile encountered. Photographs were taken of the cottonmouth as well as one hibernating site.

Results/Discussion

The cottonmouth or "water moccasin" found in Indiana is the western form, *Agkistrodon piscivorus leucostoma* (Troost), one of three recognized subspecies. The species is generally southeastern in distribution but *leucostoma* is restricted to the Gulf coastal plain and Mississippi Valley (Conant, 1975). The author has collected or observed this species in all sixteen states where it is known to occur. The Indiana snakes, based on my small sample to ten individuals, appear to be typical of the western race in

adjacent states, with the exception of a marked tendency toward a lighter ground color in adults. Two individuals were very large, exceeding four feet in length. The nearest records are to the south and southwest in Daviess County, Kentucky at Crane Pond Slough near the headwaters of Panther Creek (Joe Ford, Owensboro Area Museum, personal communication) and Union County, Kentucky, near Henshaw (Lodato and Burnley, 1974). There is an old record from Mt. Carmel, Illinois, opposite the confluence of the White and Patoka with the Wabash River (Smith, 1961). In the northern periphery of its range, *A. p. leucostoma* is decidedly disjunct in its distribution. Most often, disjunct colonies occur where a swamp or other wetland is adjacent to higher ground with a southern exposure. The high ground is used for hibernating while the wetland provides food and cover during the active months (Barbour, 1956). Cottonmouths at Buffalo Flat use the bluff at the southern and western end of the tract for hibernation. On April 20, 1984, I found four cottonmouths, two adults and two young-of-the-year, that were undoubtedly born the preceding fall. The snakes were silt and dust covered and had just emerged from hibernation from under an old rotten stump at the base of the bluff. I had passed this spot earlier that day (around 10:00 a.m.) and had observed no snakes. I returned to this area around noon and found one large adult and two juveniles completely exposed sunning themselves. Another smaller adult had partially emerged from the base of the stump. After emergence Buffalo Flat cottonmouths apparently disperse quickly. I returned to this den site on April 22 and only a single medium sized adult was to be seen at midday. The season of activity for cottonmouths in Indiana, based on my field experience, apparently parallels that of its close relative, the copperhead, which has been observed in Indiana between April 20 and October 16 (Minton, 1972). The cottonmouth at Buffalo Flat was observed from April 20 until October 14. The season of activity for this species in Indiana, based on my field experience, is undoubtedly shorter than in adjacent states. In western Kentucky I have seen these snakes as early as April 7 in Union County (adjacent to Indiana) and in late March in Fulton County (adjacent to Tennessee). On October 14, 1984, I returned to the den site and found an extremely large adult of undetermined sex basking in leaf litter adjacent to the tree stump used as a hibernaculum and two brightly marked newborn young with sulfur yellow tails. These small snakes camouflage very well in leaf litter and are extremely difficult to locate. It is possible others were nearby and were overlooked. Based on this observation, it is apparent that cottonmouths at Buffalo Flat mate in the spring, probably shortly after emergence from hibernation and at the one site prior to dispersal. I did not observe any copulation, however, and it is possible that at least some fall mating occurs. The finding of young at the den site spring and fall is significant. It strongly suggests that gravid females return to the den sites to have their young so that the juveniles become "marked" for later "homing" and seasonal orientation at the Buffalo Flat locale. No other hibernating groups or individuals were located.

After dispersal from hibernation the cottonmouth invades the swamp east of Buffalo Creek to forage and feed throughout the summer. They were found in Buffalo Creek, the swamp interior, and along a dike (cast skin) east of the bluff after June. How much of Buffalo Pond occupied by the snakes after they have emerged from hibernation is uncertain. I have observed only ten individual cottonmouths at the site, and these were predominantly at the southern and western end of the swamp. None were observed at the northern or eastern portions of the swamp, but this could reflect seasonal bias and or poor sampling. The snakes observed away from hibernating sites were in or near water. With the exception of the very small young-of-the-year snakes, those encountered away from water were pugnacious. When first approached they lie perfectly still, but further advance puts them into the well known defensive pose; body drawn together, mouth agape (showing white interior), tail rapidly vibrating, and the

glands at the base of the tail emitting scent. After this they thrash wildly and escape if possible. In the defensive pose they are easily captured.

The cottonmouth at Buffalo Flat is undoubtedly an opportunistic feeder, and its diet probably parallels that of its counterparts in adjacent states: fish, amphibians, reptiles (including other snakes) and mammals (Klimstra 1959; Barbour 1956). A sub-adult individual from Buffalo Flat kept throughout the summer months of 1984 fed readily on fish (*Cyprinidae*) and small frogs (*Rana*, *Pseudacris*), a snake (*Thamnophis*), and a small mouse (*Mus*). A small lizard (*Eumeces*) from the site was refused. Food items (small vertebrates) appear plentiful at Buffalo Pond and adjacent woodlands.

When not active or during cool weather these snakes retreat to hiding places under a fallen log, tangled tree roots, or mammal burrows. Two were found under such situations. In September of 1984 I found the cast skin of a large cottonmouth at the mouth of a muskrat burrow in the east-west dike that runs the southern edge of the swamp. It is likely the snake had spent some time in the burrow. Because of the small number of observations, it is difficult to estimate the population size or density of the cottonmouth at Buffalo Flat. Based on the number of encounters per unit of time spent in the field, and my experience with the species elsewhere the population is undoubtedly quite small—perhaps no more than two dozen animals exist. The status of the population is also uncertain. Very large adults and very small juveniles are encountered—medium sized adults are a rarity. I do not know if this is a significant observation on the population dynamics or if it merely reflects a difference in habits and behavior for different age classes of the snake. I suspect that the population has fallen dramatically within the very recent past due to habitat alteration and destruction and from other types of human encroachment. The swamp is smaller than it once was and a portion of the south facing slope is now permanently inundated by an impoundment, eliminating hibernating sites.

Other herpetofauna encountered at Buffalo Flat:

AMPHIBIANS

Salamanders

1. Small-mouthed salamander, *Ambystoma texanum*. Regularly encountered throughout the year under logs in the flatwoods. In the spring when the water is high it may be found ascending dead trees under bark.
2. Red-backed salamander, *Plethodon cinereus*. Several found on wooded slopes.
3. Slimy salamander, *Plethodon glutinosus*. Several on wooded slopes.

Frogs and Toads

1. Cricket frog, *Acris crepitans blanchardi*. Moderately common.
2. Western chorus frog, *Pseudacris triseriata*. Frequently heard in April.
3. Spring peeper, *Hyla crucifer*. Occasional, spring and fall.
4. Gray tree frog, *Hyla chrysocelis*. Occasional.
5. Green frog, *Rana clamitans melanota*. Frequent.
6. Bullfrog, *Rana catesbeiana*. Uncommon. Overwintered larva in ponded areas.
7. Leopard frog *Rana utricularia*. Abundant. Frequently seen well away from water. Encountered under cover in late summer when swamp is dry.
8. Fowler's toad, *Bufo woodhousei fowleri*. Only one found. Its apparent rarity difficult to explain as it is normally one of the most conspicuous amphibians in Indiana.

REPTILES

Turtles

1. Snapping turtle, *Chelydra serpentina*. One seen.
2. Eastern box turtle, *Terrapene carolina*. Five located.

3. Midland painted turtle, *Chrysemys picta marginata*. Abundant in Buffalo Creek.

4. Musk turtle, *Sternotherus odoratus*. Probably abundant. Several plastrons and carapaces found along Buffalo Creek, apparently the victims of wire mesh crayfish traps.

Lizards

1. Five-lined skink, *Eumeces fasciatus*. Common on dry slope west of Buffalo Creek, including many young-of-the-year in fall. Not found in the wetland, but present in flatwoods between bluff and swamp.

2. Broad-headed skink, *Eumeces laticeps*. Single female captured.

Snakes

1. Southern black racer, *Coluber constrictor priapus*. Common in drier areas.

2. Rat snake, *Elaphe obsoleta obsoleta*. One seen.

3. Black kingsnake, *Lampropeltis getulus niger*. Two found.

4. Rough green snake, *Opheodrys aestivus*. Two located, fall.

5. Eastern garter snake, *Thamnophis sirtalis*. Infrequent.

6. Ribbon snake, *Thamnophis sauritus*. Ribbon snakes are generally rare throughout southwest Indiana, and those at Buffalo Flat were the first I'd seen from this part of the state in nearly a decade. They seem to be good indicators of environmental quality, often disappearing quickly with even moderate habitat alteration. They were tentatively assigned to the subspecies *septentrionalis* based on typical morphological characters (Rossman 1963). Mike Homoya of the Indiana Natural Heritage Program showed me a photographic transparency of *Thamnophis sauritus* from Wening-Sherritt seeps, also Dubois County, found in the fall of 1982. This snake, based on color and pattern, also suggests *septentrionalis*, although on geographic grounds (Minton 1972) one might expect *sauritus* here. One from Gibson County, taken in 1975 was assignable to that race, as are several from Henderson County, Kentucky immediately southwest of Evansville. The Dubois County ribbon snakes may be intergrades between *sauritus* and *septentrionalis*. Six ribbon snakes were found, five adults and one young-of-the-year. Some were on the east side of the swamp during spring high water. Others were at waters edge between the creek and swamp. The newborn was found in the fall on high dry rocky ground on the steeply sloped bluff. The shed skin of another juvenile was found near rock fissures in the bluff. This suggests that some ribbon snakes return to the bluff from the wetland in the fall for hibernation and to bear young.

7. Midland banded water snake *Nerodia sipedon pleuralis*. Infrequent, although seen on most visits.

8. Northern copperbelly water snake, *Nerodia erythrogaster neglecta*. Seems to be thriving at Buffalo Flat. On spring visits it was the most frequently encountered snake. Its sympatry with *Agkistrodon piscivorus* is notable. At many sites in Kentucky, *N. erythrogaster* is absent or uncommon at localities inhabited by cottonmouths (Barbour 1956).

I did not observe these snakes until April 6 when five were seen. They were covered with mud and had apparently just emerged from hibernation. All were basking on dry ground at the base of the bluff west of the swamp. It appeared that they had hibernated below the tangled roots of old stumps and fallen trees. Copperbellies appear to disperse quickly after hibernation. I counted six *erythrogaster*, sub-adult as well as fully grown snakes, basking on overhanging vegetation east of Buffalo Creek on April 13. A copulating pair was found April 20 on matted vegetation in the swamp interior. Mating was reported on April 22 and May 7 in Ohio (Conant 1934). It is noteworthy but inexplicable that no copperbellies were seen during late summer or

fall visits. This species had declined markedly in Indiana and elsewhere in the midwest in recent years. It is presently listed as threatened by the I.D.N.R. and is very much in need of protection.

SUMMARY: Fifteen reptiles were encountered at Buffalo Flat—four species of turtles, two lizards, and nine snakes. Eleven species of amphibians were encountered—three salamanders and eight anurans. Three species are of particular interest—all are snakes. *Nerodia erythrogaster neglecta* and *Agkistrodon piscivorous leucostoma* because of their threatened status, and *Thamnophis sauritus* because of its general rarity in southern Indiana and because this species serves as an indicator of the high natural quality of the site.

Conservation and Management

The Indiana Natural Heritage Program and the Indiana Chapter of the Nature Conservancy have done much to insure the preservation of the Buffalo Flat tract. More needs to be done to protect the plant and animal communities there. The following is recommended:

1. Acquire additional acreage including: (a) the steeply sloping wooded bluff west of Buffalo Creek either side of the oil well access road that descends the slope. This must include the crest of the slope to its bottom and south and west at least to the juncture of the slope with the eastern dam for the impoundment just west of Buffalo Flat; (b) the cultivated land between the dikes on the south and Buffalo Creek to the north and the bluff to the northwest. It is apparent that this open unprotected area is being used by *Agkistrodon piscivorous* migrating from hibernating sites and the swamp.

2. Post land and label it as a protected nature preserve.

3. Restrict or prohibit further dredging of Buffalo Creek. Considerable damage was done to Buffalo Creek in 1983 posing a real threat to water level and water quality in the adjacent swamp.

4. Restrict further oil exploration or production at the site. Two currently producing wells threaten potentially irreparable damage to Buffalo Flat. In 1984 a large "slick" from an oil well at the south end of the tract had dispersed over a wide area covering the ground and vegetation.

5. The cottonmouth should be re-classified from threatened to endangered as this is the only known Indiana population and its viability is uncertain. Unless both conservation and management practices are enacted the continued existence of the cottonmouth as part of the Indiana fauna is questionable.

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Literature Cited

- Anderson P., The Reptiles Of Missouri, University of Missouri Press, Columbia, pp. 330.
- Anon., 1984, Fish Creek Fen, Buffalo Flat, James-Tippy Addition, Pokagon Addition Acquired. *The Nature Conservancy Indiana Newsletter*, No. 3, pp. 1-6.
- Barbour, R. W., 1956, A Study of The Cottonmouth, *Ancistrodon piscivorous leucostoma*, in Kentucky. *Transactions of the Kentucky Academy of Science* 17(1):33-41.

- Conant, R., 1934. The Red Bellied Watersnake, *Natrix sipedon erythrogaster* (Forster) in Ohio. *Ohio Journal of Science*, 34:21-30.
- Conant, R., 1975, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston Mass., pp. 429.
- Klimstra, W. D., 1959, Food Habits of the Cottonmouth in Southern Illinois. *Chicago Academy of Science Natural History Miscellanea* 168. pp. 8.
- Lodato, M. J. and Ben Burnley, 1974. The Kentucky Herpetologist, A New Locality for *Agkistrodon piscivorus* in Kentucky. Vol. V, Nos. 4 and 5.
- Minton, S. A., Jr., 1972. Amphibians and Reptiles of Indiana. Indiana Academy of Science Monograph (3):1-346.
- _____, 1983 (a), "Cottonmouth", *Outdoor Indiana*, Vol. 48, No. 7, pp. 14-19.
- _____, and J. C. List and M. J. Lodato, 1983 (b), Recent Records and Status of Amphibians and Reptiles in Indiana. *Proc. Ind. Acad. Sci.*, Vol. 92, pp. 489-498.
- Rossman, Douglas A., 1963, The Colubrid Snake Genus *Thamnophis*: a revision of the *sauritus* group. Bulletin of the Florida State Museum, 7 pp. 100-178.
- Smith, P. W., 1961, The Amphibians And Reptiles Of Illinois. Illinois Natural History Survey Bulletin. 28:1-298.
- Wilson, A. B., and S. A. Minton, Jr., 1983, Geographic Distribution: *Agkistrodon piscivorus leucostoma*. SSAR Herpetological Review 14(3).

