

A Herpetofaunal Inventory of Arkansas Post National Memorial

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Heartland Network
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Summary

Little information on current species composition, distribution, and abundance existed for the park prior the inventory. Information is needed for park managers to make appropriate decisions to ensure the long-term sustainability of species and abide by the National Park Service (NPS) mission statement. Surveys were conducted in the fall of 2001 and spring of 2002 via cover boards, general search and seizure, and road cruising. Aquatic methods included dip netting, seining, and the use of minnow and turtle traps. An expected species list incorrectly listed 10 amphibians and 18 reptiles due to incorrect species range and/or habitat requirements. Upon revising this list, the inventory yielded 71% of the amphibians (12 of 17) and 72% of the reptiles (26 of 36). Species richness and abundance was low and is attributed to lack of, or marginal, habitat. All species were native and no sensitive herpetofauna were encountered. One voucher displaying typical phenotypic variation for each species was collected. Management implications and recommendations identify possible steps to ensure the long-term sustainability of herpetofauna at Arkansas Post NM.

Acknowledgments

The authors wish to thank the staff at Arkansas Post National Memorial for their kindness and willing support of the project. Thanks also go to the National Park Service' Heartland Network Inventory and Monitoring Program and Regional Offices who funded the project and to staff who assisted with project logistics. We also thank Kevin Eads, Ben Wheeler, Vernon Hoffman, Ben Ball, Robyn Konvalinka, and Charles McDowell for their field assistance.

Introduction

In 1998 Congress passed the National Parks Omnibus Management Act in response to concerns about the condition of natural resources within the national parks. The act requires each park to gather baseline inventory data on pertinent natural resources, data that will provide a pivotal step toward establishing an effective monitoring program furthering the ability to effectively manage and protect park resources. The National Park Service (NPS) responded with the Natural Resource Challenge program, including the establishment of biome-based inventory and monitoring networks. The Heartland Network, as part of the NPS Inventory and Monitoring (I&M) program, has undertaken inventories of vascular plants and vertebrates within fifteen parks in eight Midwestern states.

Stemming from this challenge and a widespread concern regarding the status of herpetofaunal populations at Arkansas Post National Memorial, an inventory was deemed necessary to determine resident amphibians and reptiles. Due to a wide variety of habitats, the park may provide refuge for some species. Currently, there is no data documenting species composition, distribution, and abundance at the park and an inventory will aid in the development of a herpetofaunal monitoring plan.

Nearly all the natural habitat in the Mississippi Delta has been modified/fragmented by agriculture. Habitat fragmentation and alteration have been implicated as primary factors influencing amphibian declines (Pechmann and Wilbur 1994; Blaustein et al. 1994) and biodiversity declines in general (Heywood 1992). Many amphibian and reptilian populations are best described as metapopulations (Levins 1969; Hanski and Gilpin 1997) whose stability is dependent upon a balance between population extirpation and recolonization (Johnson et al. 2002). Although the habitats at the park are not virgin lands, their setting in the Delta makes it an important conservation area; thus, habitat management to limit disturbance may allow the park to act as ecological source for refueling adjacent populations (Wiens 1996). Despite its importance as a biodiversity holding ground, little is known about the park's wildlife and plant communities.

In the spring of 2000 we undertook a short-term, herpetofaunal survey at Arkansas Post NM with the cooperation of park personnel. Despite its small size, an array of amphibians and reptiles were found at that time with several species of turtles, lizards, and frogs abundant. The preliminary inventory resulted in four new county records for amphibians and reptiles and include the red milk snake (*Lampropeltis triangulum sypila*), Graham's crayfish snake (*Regina grahamii*), northern fence lizard (*Sceloporus undulatus hyacinthinus*), and the marbled salamander (*Ambystoma opacum*).

In response to a request for additional inventory work to be performed, we conducted a more thorough, one-year herpetofaunal survey in 2001-2002. The inventory had three objectives: 1) document at least 90% of the amphibian and reptile species reasonably expected to occur at Arkansas Post NM (Tables 5&6) and provide an up-to-date assessment of species richness; 2) estimation of relative abundance and local ranges; and 3) collection and deposition of voucher specimens.

Study Area

Arkansas Post National Memorial is located in Arkansas County 11.2 km (7 mi) south of Gillett, AR (Figure 1). The unit consists of a peninsula surrounded by water, and is comprised of 157.5 hectares (389 acres). A terrace landscape, flat terrain, and various stands of upland and lowland hardwoods, interspersed with bayous and swamps characterize the area. Also within the main unit are manicured lawns, prairie, and tall-grass areas. Moore and Post Bayous lie along the north/northwest border, and Post Lake, a backwater of the Arkansas River, lies on the north and northeastern border. Both bayous, as well as the backwater, empty into the Arkansas River along the southern edge of the main unit. The land base of 115.8 hectares (286 acres) consists of 13 different vegetation types ranging from primarily oak dominated forest stands to pine stands as well as a restored prairie and several, chronologically diverse, successional stands. Past fire regimes have reduced the canopy cover of forested regions and exposed the forest floor to sunlight. Due to the detrimental effects of these prescribed burns, additional use of fire has been halted until research can be completed for several projects including fire history and cultural landscape reports.

Materials and Methods

A preliminary inventory was conducted 21-23 April 2000, and a comprehensive inventory was conducted by seven-member teams (during most visits) from the fall of 2001 through the summer 2002 (8-9 August 2001, 19-20 October 2001, 15 March 2002, 12-14 April 2002, 7-8 May 2002). Data from both surveys were combined for this report. Terrestrial inventory methods included road cruising (Karns 1986) and general search and seizure activities (Vogt and Hine 1982) whereas aquatic methods included dip netting, seining (Karns 1986), and the use of minnow (Karns 1986) and turtle traps (Legler 1960). Most common and scientific names are based on Moriarty (2000).

A sampling grid consisted of primary and secondary points for the park (Figure 2). At each primary point, four secondary points were identified in each primary cardinal compass direction. Cover board use, adapted from Grant et al. (1992), utilized two wood and two tin cover boards alternately placed at each secondary point (to account for potential differences in cover board quality as herpetofaunal attractants). Twelve of the 37 primary points were designated as cover board plots and were visited at least once. Primary points falling outside the park boundary, or in water (points near shore had cover boards placed along the shoreline), were not surveyed (11 primary points). Two secondary points were removed for the same reason as described above.

If a primary grid point appeared in a heavily wooded area, cover boards were not used, and points were designated for time-area constrained searches (TACS). The TACS technique, used at 13 primary points, was a modification of the “time constrained search and seizure method” and the “quadrant search and seizure” methods utilized by Campbell and Christman (1982). Four secondary points were designated as described above and an 8 m² plot was delineated at each secondary point and searched systematically for 10 minutes. All logs, rocks, and other debris were returned to their original position after turning.

Each primary point was recorded using a Trimble GeoExplorer 3 Global Positioning System (GPS) portable hand-held unit at the highest accuracy possible. No less than 150 readings were collected for each primary point, and these saved as a single file for each grid point.

A map of the park with all primary points and added time area searches is shown in figure 2. ArcView 3.0 geographic information system (GIS) was used to produce species maps and analyze species richness throughout the park.

Generalized search and seizure methodology was utilized throughout the entire park in addition to the other two methods. All trails and east-west/north-south transects between cover board plots were hiked. Both day and night road cruising were implemented each night on all park roads and on roads immediately adjacent to the park. Animals were recorded as encountered.

Due to low water depth in most aquatic locations, turtle trapping was implemented only near one primary point (#1; 12-14 April 2002) via two turtle traps placed near basking logs where turtles were observed. Dip netting was implemented in roadside ditches, Alligator Slough, in the visitor center lake, and in a small backwater pond northeast of the lake.

Spotlighting was used at Alligator Slough and on the lake to observe frogs and alligators. These lights illuminate the frogs and alligators' eyes producing an "eye-shine" making documentation easy. These lights are also helpful in capturing amphibians and reptiles at night because the light prevents the animal from seeing an investigator's approach.

An expected species list (Boetsch et al. 2000) was revised based on species documented via this inventory and the authors' professional opinion.

In most cases, only a single voucher specimen of each species was taken during the primary inventory. Specimens prepared for museum storage were body positioned, fixed in 10% formalin, and preserved in 70% ethanol following Pisani 1973. All specimens were deposited in the National Park Service Heartland Division Special Collection within the Arkansas State University Museum of Zoology herpetology collection. Specimen accession numbers were entered into a Microsoft Access database for reference.

Results

Expected Species

The preliminary inventory yielded eight amphibian species (one salamander and seven anurans) and 21 reptilian species (one crocodylian, six turtles, five lizards, and nine snakes). The extensive inventory found eight additional species including three anurans, one salamander, two turtles, and two snakes.

An expected species list incorrectly listed 10 amphibians and 18 reptiles due to incorrect species range and/or habitat requirements. Upon revising this list, the inventory yielded 71% of the amphibians (12 of 17) and 72% of the reptiles (26 of 36) (Tables 5-7).

Species Richness and Abundance

Six species were represented by a single observation/specimen. These were the marbled salamander, red milk snake, green anole (*Anolis carolinensis*), rough green snake (*Opheodrys aestivus*), and the western slimy salamander (*Plethodon kisatchie*). The most common amphibians were Fowler's toad (*Bufo woodhousii fowleri*), northern cricket frog (*Acris crepitans*), southern leopard frog (*Rana sphenoccephala*) and the least common (rare) were Cope's gray treefrog (*Hyla chrysoscelis*) and the marbled salamander. The most common reptiles were the ground skink (*Scincella lateralis*), green water snake (*Nerodia cyclopion*), river cooter (*Pseudemys concinna*), and red-eared slider (*Trachemys scripta elegans*) and the least common (rare) were the red milk snake and rough green snake. Species observed and their relative abundances are provided in Tables 1 and 2. Range maps for each species observed on the park are provided in figures 3-15.

Overall herpetofaunal species richness (Figure 16) was highest at Alligator Slough (vicinity of primary points 22 and 23) followed by visitor center lake (vicinity of primary point 34). The northern two rows of primary points at the park were also relatively species rich. Amphibian species richness (Figure 17) was highest at Alligator Slough (primary points 22 and 23), at the visitor center lake (primary point 34), and in the vicinity of primary points 1, 6, and 7. Reptilian species richness centers are shown on figure 17 and appear to follow the general patterns of amphibian and total richness at Arkansas Post NM.

Discussion

Expected Species

Five amphibian species incorrectly listed (based on range) on the initial species list as expected include: the mole salamander (*Ambystoma talpoideum*) which does not have any records for Arkansas County and would not be found at Arkansas Post NM due to lack of habitat (ponds); the spotted dusky salamander (*Desmognathus fuscus conanti*) which does not occur in Arkansas County or in the surrounding counties--additionally there is no habitat at Arkansas Post NM for this species; the dwarf salamander (*Eurycea quadridigitata*), absent since there are no records north of the Arkansas River, and the eastern spadefoot (*Scaphiopus holbrooki*) which lacks any records for Arkansas County. The bird-voiced treefrog (*Hyla avivoca*) was not found since the closest record for this species is 55 miles north of the park. (Habitat at the park is a little restricted, but it may be possible to find the species there). The record for the eastern tiger salamander (*Ambystoma tigrinum tigrinum*) was a misidentification, since there are no records for the species in this region of Arkansas.

Six species were incorrectly listed based on habitat; i.e., habitat that is either absent or marginal. Five would not occur exclusively due to lack of habitat and include the spotted salamander (*Ambystoma maculatum*), the central newt (*Notophthalmus viridescens*), the smallmouth salamander (*Ambystoma texanum*), the crawfish frog (*Rana areolata*), and the pickerel frog (*Rana palustris*). There has been little collection for the crawfish frog resulting with few records; yet the park lacks breeding habitat (ponds). The lesser siren (*Siren intermedia nettingi*) was not found but should be around the park, maybe in the backwaters of Alligator Slough. Additionally, the western chorus frog (*Pseudacris triseriata feriarum*) was not found but may occur at the park. Problems in pinpointing the distribution of the western chorus frog occur due to few collections and nomenclatural innovations. Currently, no records exist near the park and habitat (temporary pools and ditches) is not conducive for the species persistence.

Currently, there exist problems in identifying specimens belonging to the *Plethodon albagula-kisatchie* complex. Typical *P. albagula* occur west of the Mississippi River, whereas *P. kisatchie* occurs south and westward of Arkansas County. In order to achieve definitive identification within the complex, DNA testing is required. Both species could be present at the park, and those observed during the inventory will be referred to as *P. kisatchie* (*P. albagula?*).

The three-toed amphiuma (*Amphiuma tridactylum*) and mudpuppy (*Necturus maculosus*), both river/stream species, were not detected by the inventory (habitat destructive methods would be required to find the species) but are probably in Alligator Slough.

Fourteen reptilian species were incorrectly listed based on range and include six that do not occur in the region: the ringneck snake (*Diadophis punctatus*), Missouri slider (*Pseudemys floridana*), Great Plains rat snake (*Elaphe guttata*), scarlet snake (*Cemophora coccinea*), false map turtle (*Graptemys pseudogeographica*), and the eastern coachwhip (*Masticophis flagellum flagellum*)--the latter typically not a deltaic species; five that do not occur near the park: gulf crayfish snake (*Regina rigida sinicola*), the western diamondback (*Crotalus atrox*), western pygmy rattlesnake (*Sistrurus miliarius*), slender glass lizard (*Ophisaurus attenuatus*), ornate box turtle (*Terrapene ornata*), and prairie kingsnake (*Lampropeltis calligaster*); and two

misidentifications: the northern water snake (*Nerodia sipedon*), which does not typically occur in the delta region, and the painted turtle (*Chrysemys picta dorsalis*) which lacks records in and around park.

Two species do not occur due to lack habitat and include the brown snake (*Storeria dekayi*) and the western worm snake (*Carphophis vermis*). Three species do not occur due to non-conductive habitat (i.e., ecosystem imbalance) and include the redbelly snake (*Storeria occipitomaculata*), chicken turtle (*Deirochelys reticularia*), and the six-lined racerunner (*Cnemidophorus sexlineatus*), the latter an inhabitant of exposed, sandy areas.

Nine species not found but expected to occur include the timber rattlesnake (*Crotalus horridus*), spiny softshell (*Apalone spinifera hartwegi*) (one record nearby in the Arkansas River), and the common garter snake (*Thamnophis sirtalis sirtalis*) (two county records exist), coal skinks (*Eumeces anthracinus pluvialis*), eastern hognose snake (*Heterodon platirhinos*) (county records exist). One record for the smooth softshell turtle (*Apalone mutica mutica*) exists close to the park and the species should eventually be found at the park. Historical records have documented the mud snake (*Farancia abacura reinwardtii*) near the Arkansas and White rivers in the delta. An extremely rare animal, the species could not be confirmed. A specimen of the northern copperhead (*Agkistrodon contortrix contortrix*) was documented by park staff and repositied by Dr. Trauth. No alligator snapping turtles (*Macrochelys temminckii*; syn. *Macrochelys t.*) were found in the pond surveyed but are in and around the waters.

Three species already listed as expected and observed (“2”) were not confirmed via this inventory. These include the mud snake-uncommon, Mississippi map turtle (*Graptemys kohnii*; syn. *G. pseudogeographica kohnii*), and the Mississippi mud turtle (*Kinosternon subrubrum hippocrepis*).

Species Richness and Abundance

The most important habitat resource for herpetofauna in the park is the area surrounding and including Alligator Slough as no other part of the park is nearly as rich. Species abundance in this area was also much higher than anywhere else in the park. Twenty-one species (Table 3) were found in this area, representing 57% of the total richness. Another seven species were observed close enough to Alligator Slough to derive benefits from its habitats. This suggests that 76% of the amphibians and reptiles may utilize the habitats of Alligator Slough. Although they could not be identified, several basking turtles were observed swimming there and all seven turtle species observed at the park probably utilize this area to some extent. Six species of amphibians were observed at Alligator Slough representing 50% of the amphibian species richness at the park. Twenty-two species of reptiles were observed at Alligator Slough representing 88% of the reptilian species richness at the park. At least one American alligator and its nest were observed within the area of Alligator Slough. The single nest was first sighted on 7 August 2001 (Figure 19) and 22 hatchlings were observed in the vicinity of the nest 10 months later (7 May 2002). The hatchlings remained in close association with their nest for the next several months. A second pod of hatchlings was observed in the visitor center lake around the same time, but the following spring none were observed. This suggests that Alligator Slough may be an important source habitat for American alligators. We observed populations of ghost

shrimp in the slough (7 August 2002) so dense that a dip net contained nearly a liter of the invertebrates. The abundance of ghost shrimp and other invertebrates in the waters of this location undoubtedly provides a rich, high-caloric diet to prepare the hatchlings for the winter months. This single factor may have been sufficient to relate the survivorship differences observed between the two pods during our study.

The high species richness at Alligator Slough may also be due to lower levels of visitors in this area as compared to other parts of the park. Alligator Slough has only one small dirt footpath and other areas have paved paths with mowed borders. This probably leads to heavier traffic and higher potential for human interaction with the wildlife. Additionally, the natural attractiveness of Alligator Slough make it an important natural resource at the park.

The visitor center lake also provides an important resource for the herpetofaunal community. Nine species were observed representing 30% of the total species richness at Arkansas Post NM (Table 4) and diamondback water snakes were particularly abundant. As mentioned previously, hatchling alligators were present here 7 August 2001, but were absent April 2002. Eastern narrowmouth toads, northern cricket frogs, green treefrogs, bronze frogs, bullfrogs, and southern leopard frogs were observed calling at this location. Except for the eastern narrowmouth toad, all amphibians and reptiles present at the pond were essentially aquatic species. The pond is entirely surrounded by mowed lawn grass and in most areas the grass is mowed to the water's edge (i.e. human activity at this small lake is heavy). These factors may be suppressive to amphibian and reptilian populations that might otherwise inhabit the terrestrial habitats adjacent to the visitor center lake.

The forested areas at the park are highly fragmented with the largest tracts of forested land containing areas of high species richness. A single species, the northern cricket frog, was observed in mowed areas away from the forest edge (fewer than 10 were observed in this habitat). The park has large tracts of mowed habitat for human use distributed in the central region of the park and this creates an atoll-shaped forest habitat within this region. This type of habitat distribution is typically expected to possess lower than average species diversity (MacArthur and Wilson 1967).

The low richness and abundance of mole salamanders (Ambystomatidae) are important. A single marbled salamander was recovered during the preliminary inventory from habitats adjacent to Alligator Slough yet no adults or larvae were observed during the entire comprehensive inventory. In fact, no fishless ephemeral ponds are present at the park-ponds that are essential for maintenance of mole salamander populations.

Species diversity is the variety of species present combined with their relative abundances, diversity that is thought to decrease when ecological integrity is compromised (Feinsinger 2001). The use of species richness alone, without adequate consideration of relative abundance, can lead to inappropriate decisions regarding natural resource management (Feinsinger 2001). Therefore, it is important that continued long-term monitoring occur at Arkansas Post NM in order to insure the accuracy and precision of the resultant data supporting future decision-making. Our brief, one-year study is primarily a species inventory and, except in a few cases, provides limited abundance information.

Conclusion

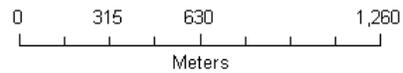
Based on this inventory and the authors' professional opinion, several management recommendations are made to secure and/or promote species diversity.

- 1) Construct up to five small, temporary wildlife ponds in forested areas to promote mole salamander populations.
- 2) Supplement currently depauperate marble salamander populations with egg clutches from nearby populations. This has a high probability of restoring the park's populations.
- 3) Alligator Slough should be considered a special biological resource and monitored routinely. Avoid "human use" improvements in this area.
- 4) Timber management should include a forest floor management plan so that sufficient logs, woody debris, and other refuge are available as amphibian and reptilian habitats. This should further include significant expansion of the forested areas on the park at the expense of the mowed lawn areas.
- 5) Alter human access and management by encouraging people to remain on the sidewalks, especially around the visitor center lake. An example of this may include posting warning signs for venomous snakes and alligators. These signs may discourage most people from entering the habitat proper but would not prevent people from enjoying the visual beauty of such areas and would definitely contribute to its preservation over the long-term.
- 6) Establish a long-term, population monitoring plan for the park.

Literature Cited

- Blaustein, A.R., D.B. Wake, and W.P. Sousa. 1994. Amphibian declines: Judging stability, persistence, and susceptibility of populations to local and global extinctions. *Conservation Biology* 8:60-71.
- Boetsch, J., M. DeBacker, P. Hughes, D. Peitz, L. Thomas, G. Wagner, and B. Witcher. 2000. A study plan to inventory vascular plants and vertebrates: Heartland Network, National Park Service.
- Campbell, H.W. and S.P. Christman. 1982. Field techniques for herpetofaunal community analysis. Pp. 193-200 In: Scott, N.J., Jr. (ed.), *Herpetological Communities*. Wildlife Research Report 13, Fish and Wildlife Service, U.S. Department of the Interior.
- Feinsinger, P. 2001. *Designing Field Studies for Biodiversity Conservation*. Island Press. Washington, D.C. 212 pp.
- Grant, B.W., A.D. Tucker, J.E. Lovich, A.M. Mills, P.M. Dixon, and J.W. Gibbons. 1992. The use of coverboards in estimating patterns of reptile and amphibian biodiversity. Pp. 379-403 In: D.R. McCullough and R.H. Barnett (eds.). *Wildlife 2001*. Elsevier Science Publications. London, England.
- Hanski, I.A. and M.E. Gilpin. 1997. *Metapopulation biology: Ecology, genetics, and evolution*. Academic Press. San Diego, CA. 358 pp.
- Heywood, V.H. 1992. *Global Biodiversity Assessment*. Cambridge University Press. New York, NY. 1140 pp.
- Johnson, C.M., L.B. Johnson, C. Richards, and V. Beasley. 2002. Predicting the occurrence of amphibians: An assessment of multiple-scale models. Pp. 157-170 In: Scott, M.J., P.J. Heglund, and M.L. Morrison. *Predicting Species Occurrences: Issues of accuracy and scale*. Island Press. Washington, D.C.
- Karns, D.R. 1986. *Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota*. University of Minnesota James Ford Bell Museum of Natural History Occasional Paper 18:1-88.
- Legler, J.M. 1960. A simple and inexpensive device for trapping aquatic turtles. *Utah Academy of Science Proceedings* 37:63-66.
- Levins, R. 1969. Some demographic and genetic consequences of environmental heterogeneity for biological control. *Bulletin of the Entomological Society of America* 15:237-240.
- MacArthur, R.H. and E.O. Wilson. 1967. *The Theory of Island Biogeography*. Princeton University Press. Princeton, NJ.
- Moriarty, J.J. 2000. Scientific and standard common English names of amphibians and reptiles of North America north of Mexico with comments regarding confidence in our understanding. *Herpetological Circular* 29:1-89
- Pechmann, J.H.K., and H.M. Wilbur. 1994. Putting declining amphibian populations in perspective: Natural fluctuations and human impacts. *Herpetologica* 50:65-84.
- Pisani, G.R. 1973. *A Guide to Preservation Techniques for Amphibians and Reptiles*. Herpetological Circular No. 1, Society for the Study of Amphibians and Reptiles. St. Louis, MO.
- Vogt, R.C. and R.L. Hine. 1982. Evaluation of techniques for the assessment of amphibian and reptile populations in Wisconsin. Pp. 201-217 In: Scott, N.J., Jr. (ed.), *Herpetological Communities*. Wildlife Research Report 13, Fish and Wildlife Service, U.S. Department of the Interior.

Arkansas Post National Memorial



1:18,589



Legend

-  Park Boundary
-  Roads
-  Trails



Figure 1. Location of Arkansas Post NM, Arkansas County, Arkansas.

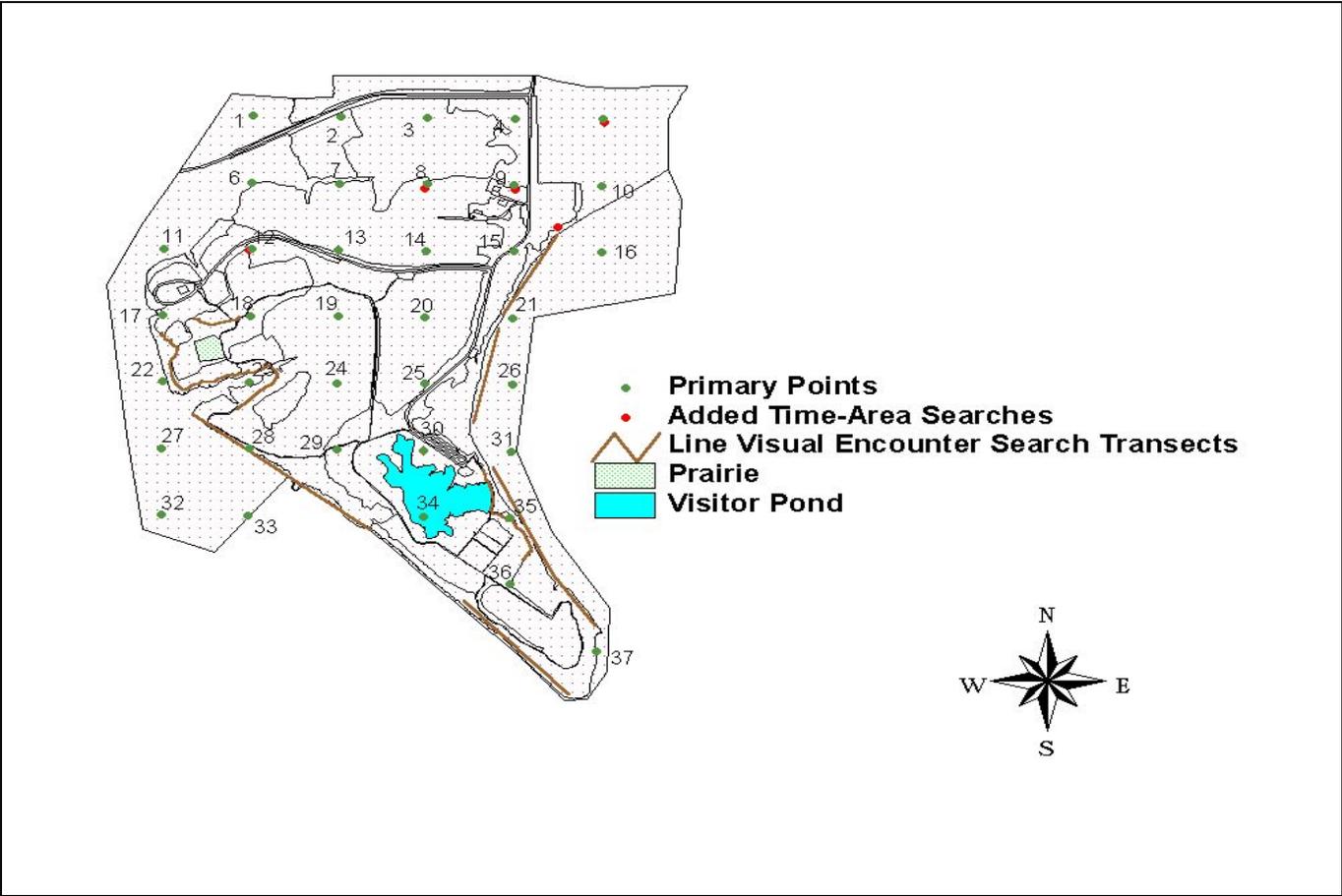


Figure 2. Map of Arkansas Post NM showing primary points and other search areas.

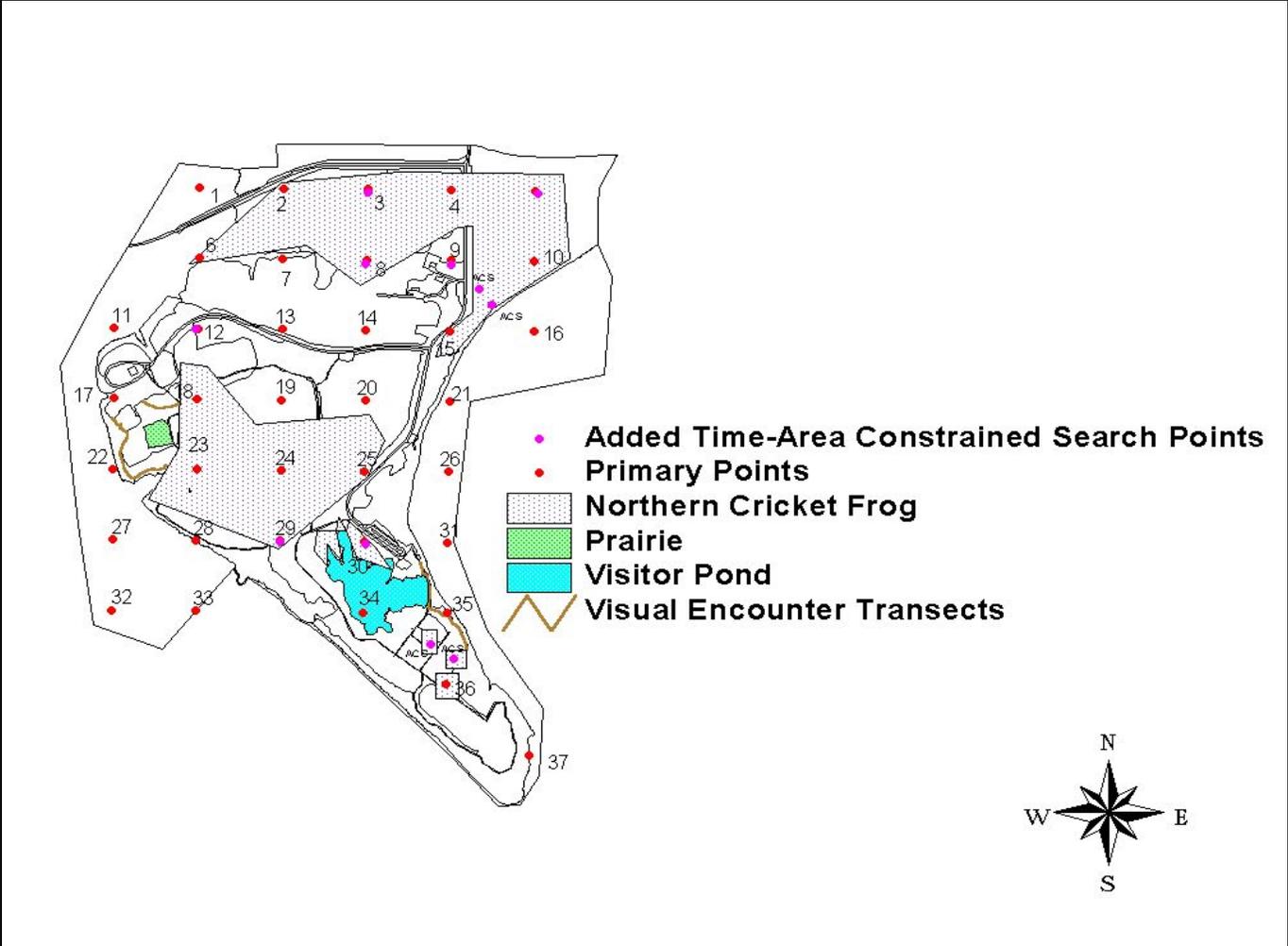


Figure 3. Distribution of the northern cricket frog at Arkansas Post NM.

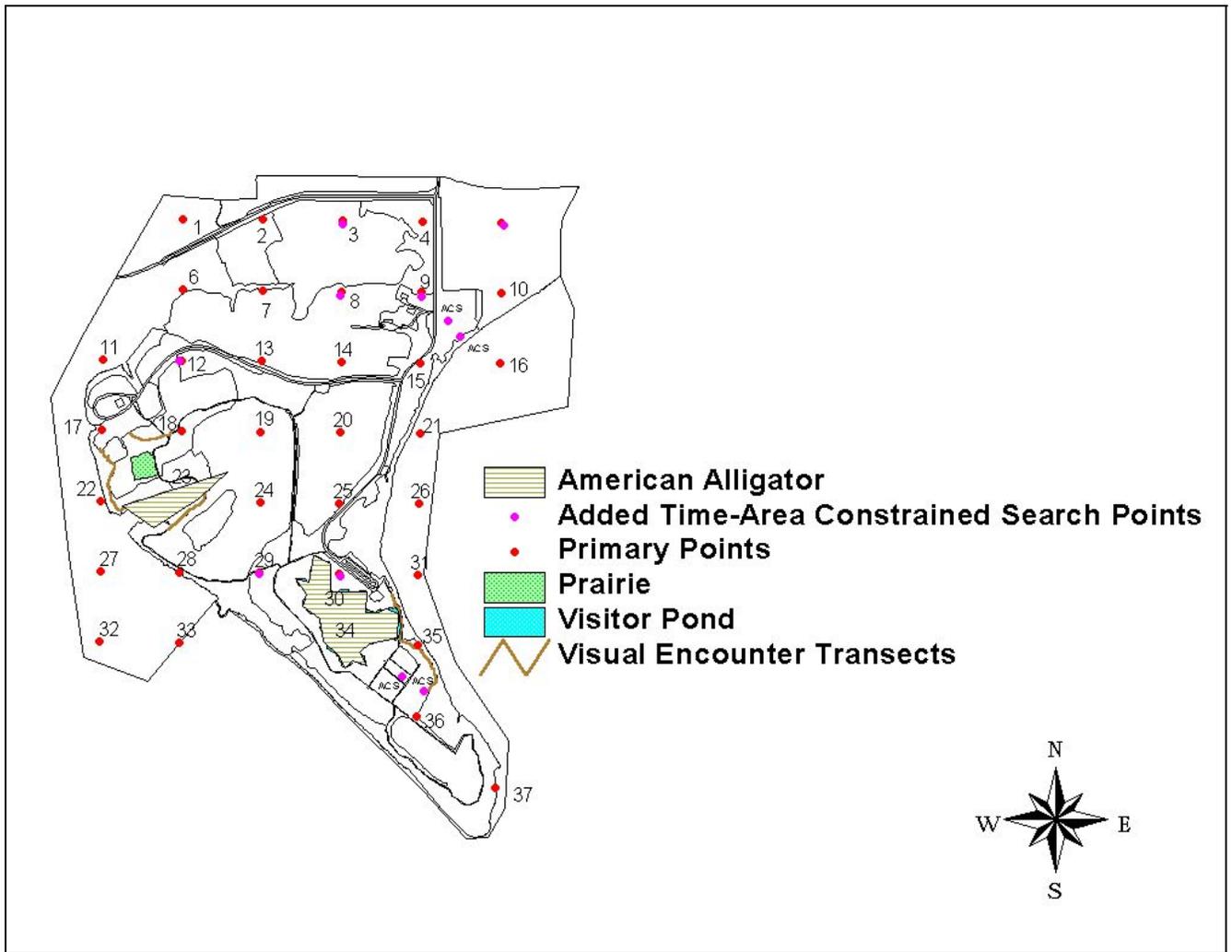


Figure 4. Distribution of the American alligator at Arkansas Post NM.

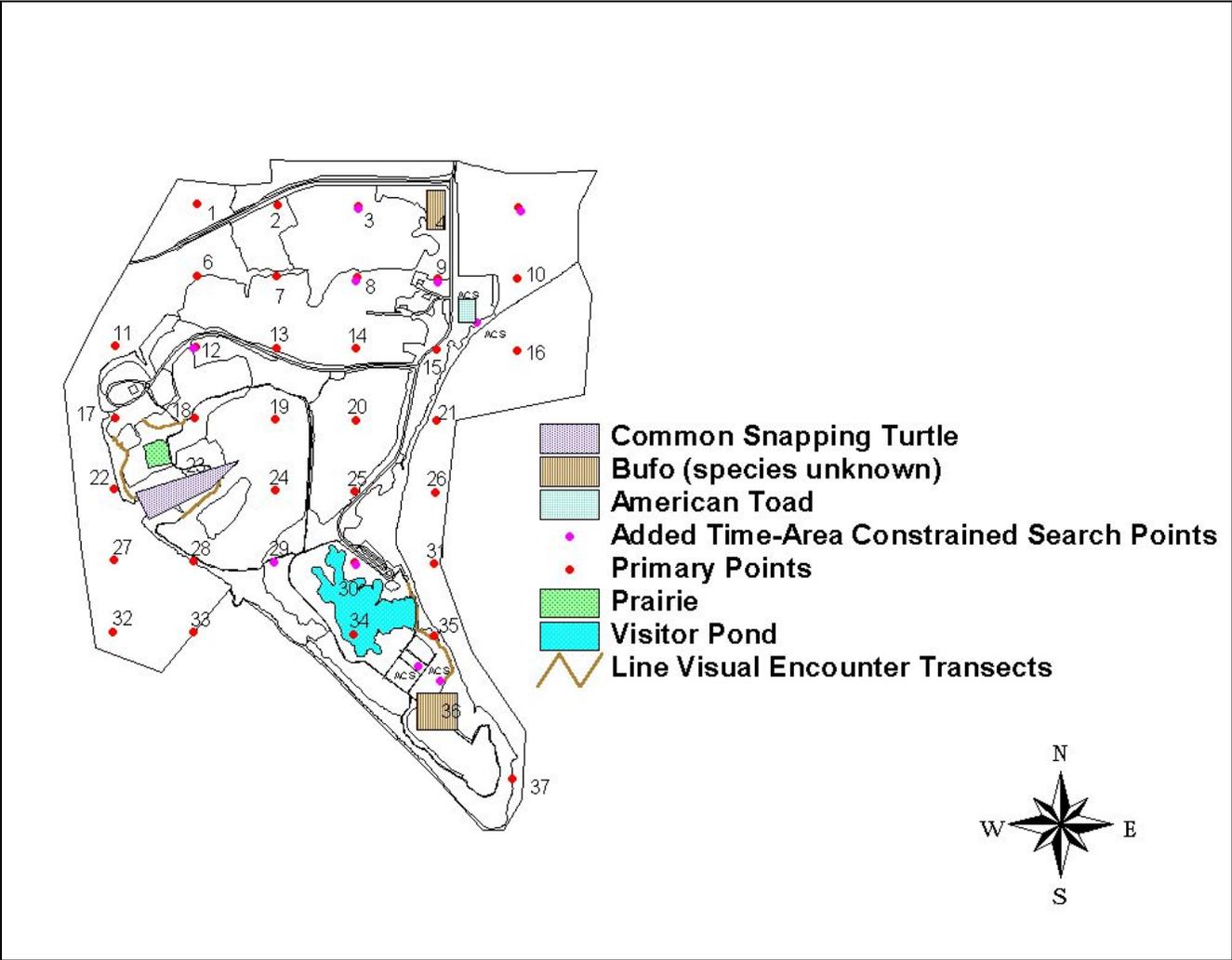


Figure 5. Distribution of three species of amphibians and reptiles at Arkansas Post NM.

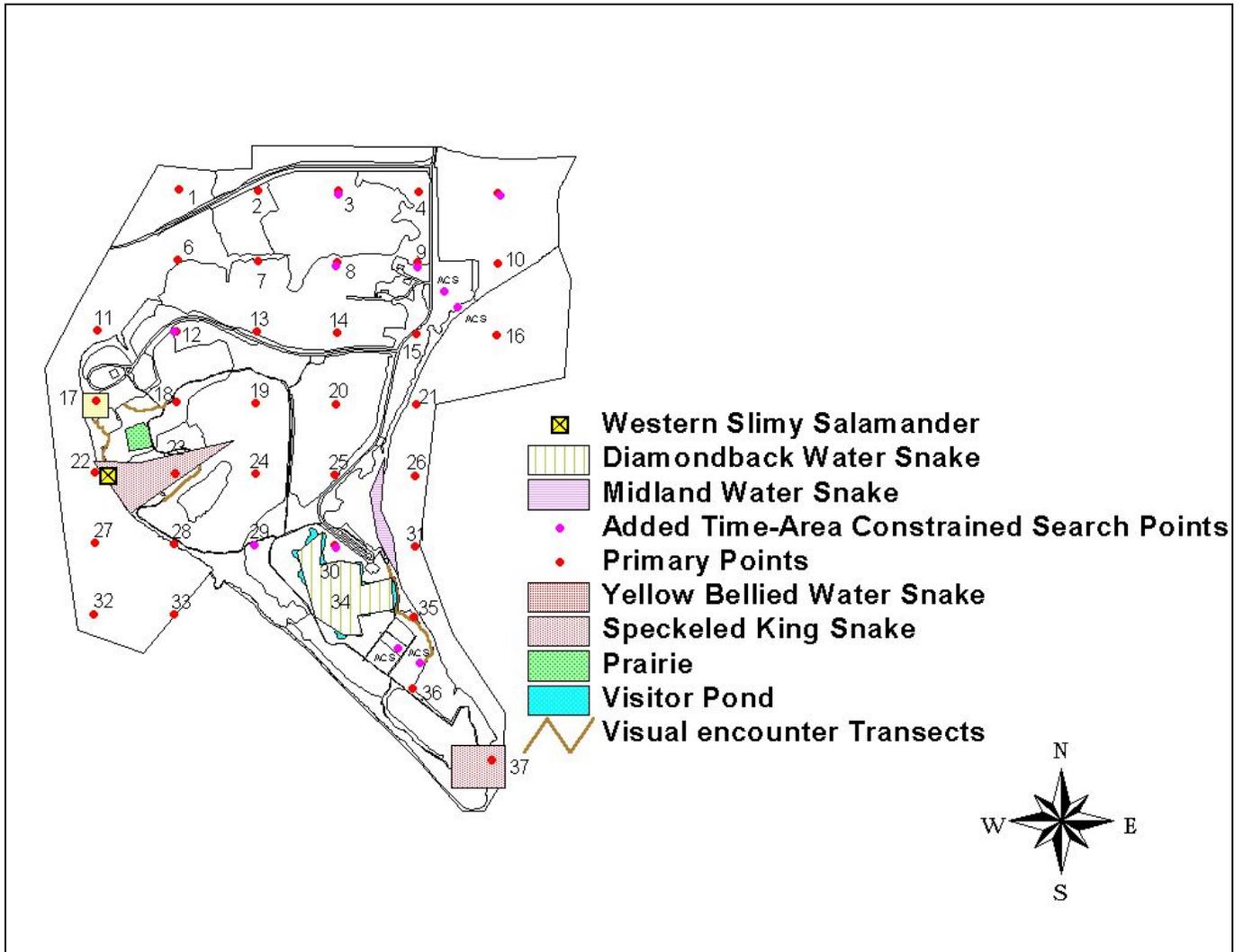


Figure 6. Distribution of five species of amphibians and reptiles at Arkansas Post NM.

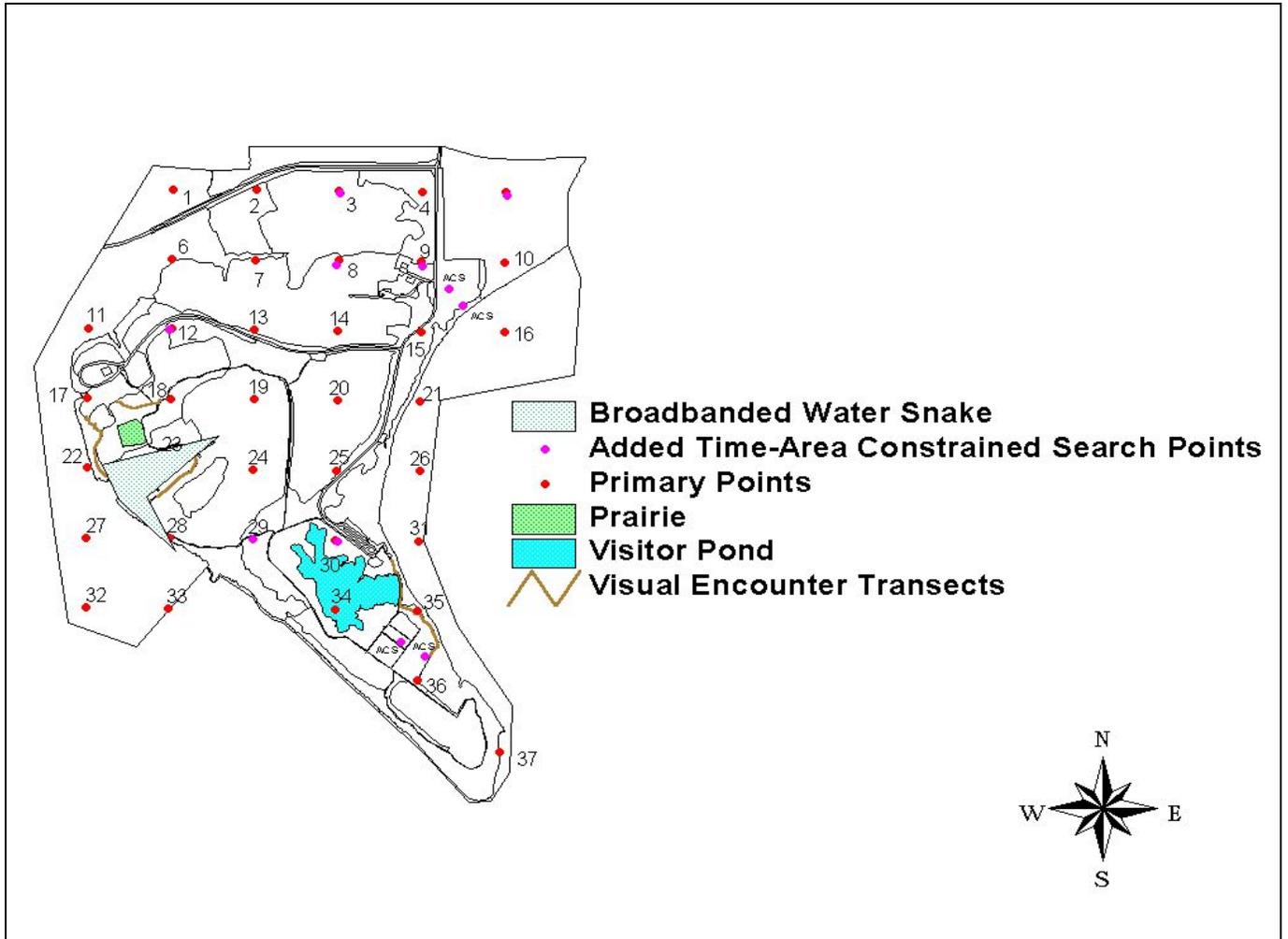


Figure 7. Distribution of the broad-banded water snake at Arkansas Post NM.

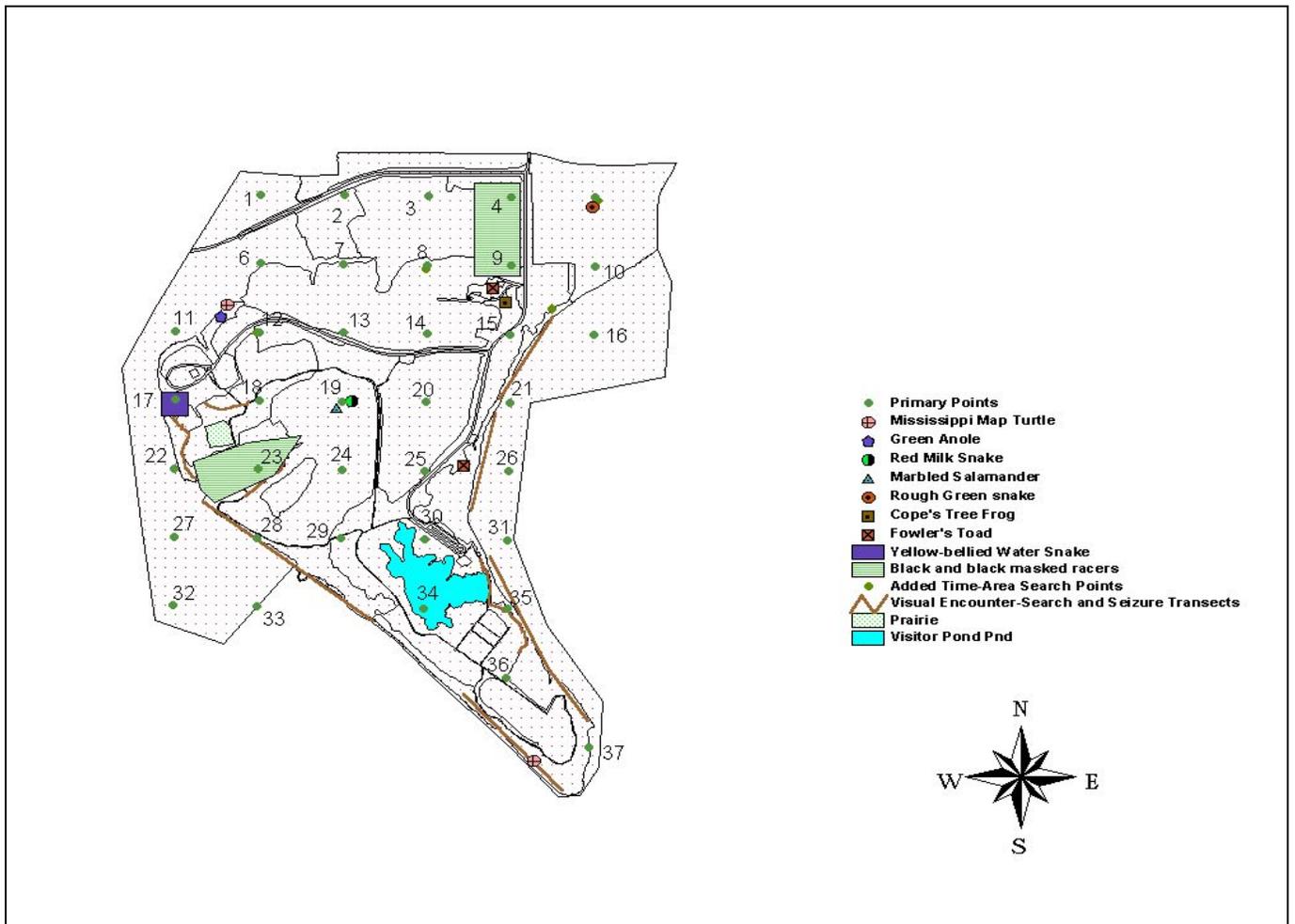


Figure 8. Distribution of nine amphibians and reptiles at Arkansas Post NM.

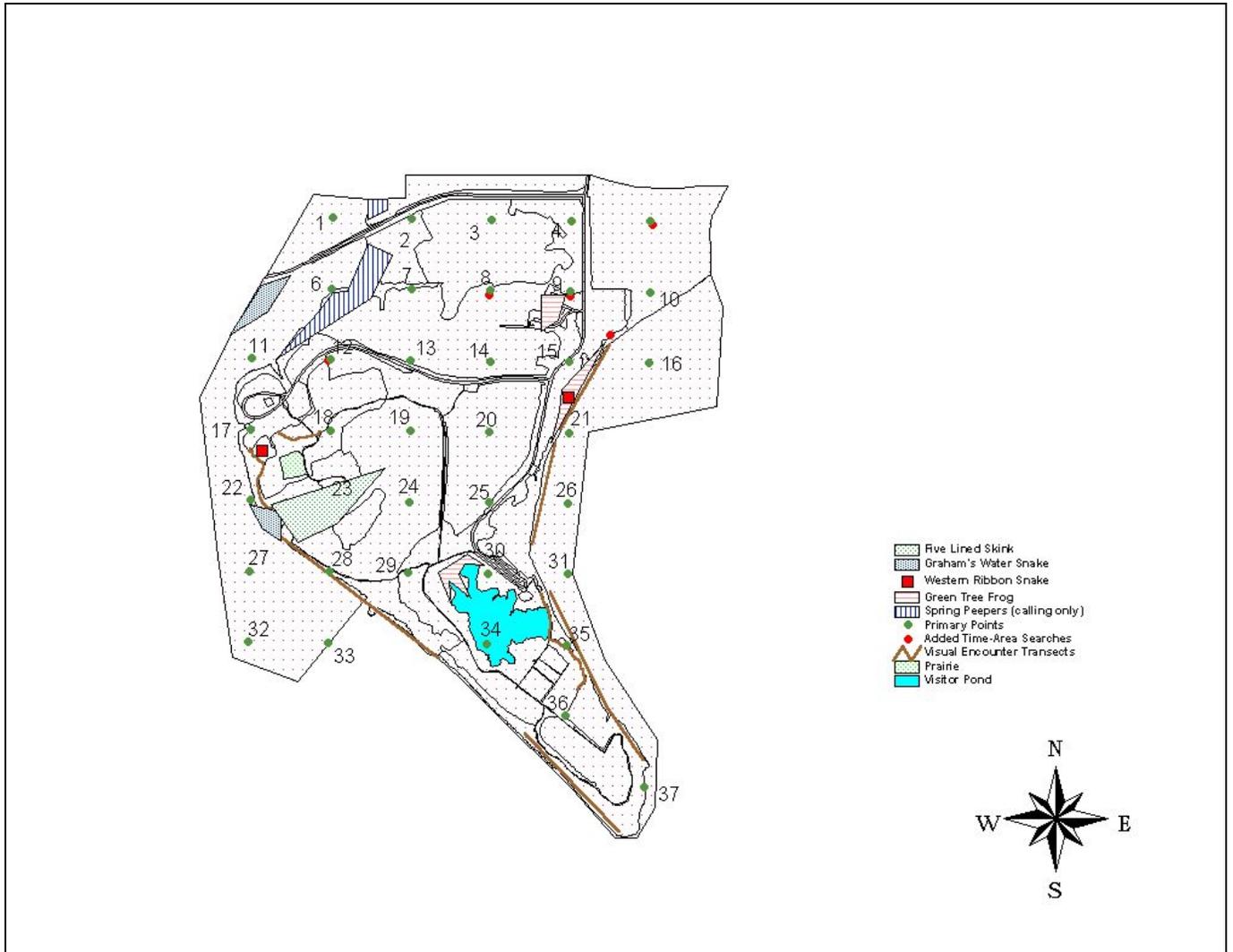


Figure 9. Distribution of five amphibians and reptiles at Arkansas Post NM.

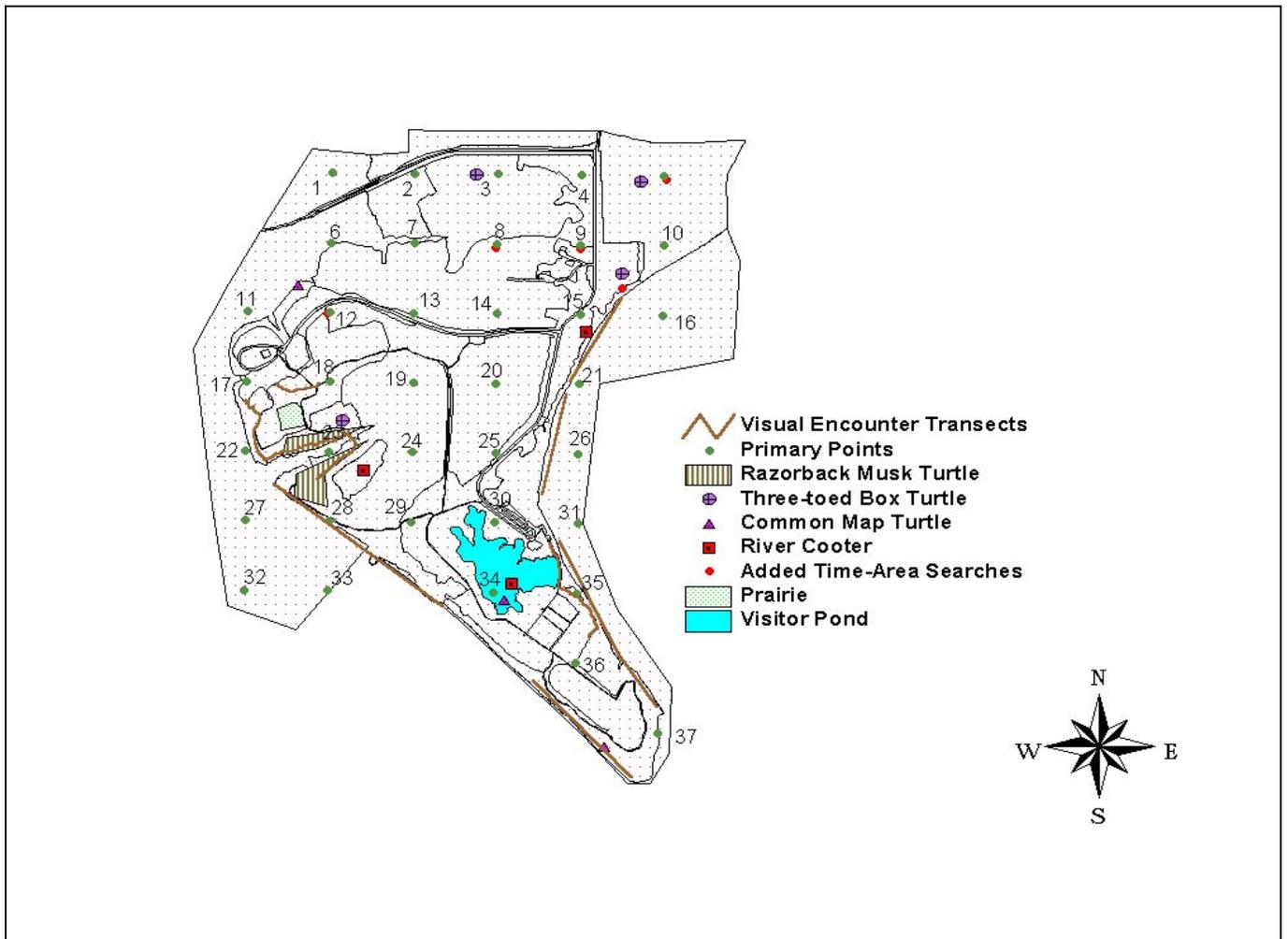


Figure 10. Distribution of four turtle species at Arkansas Post NM.

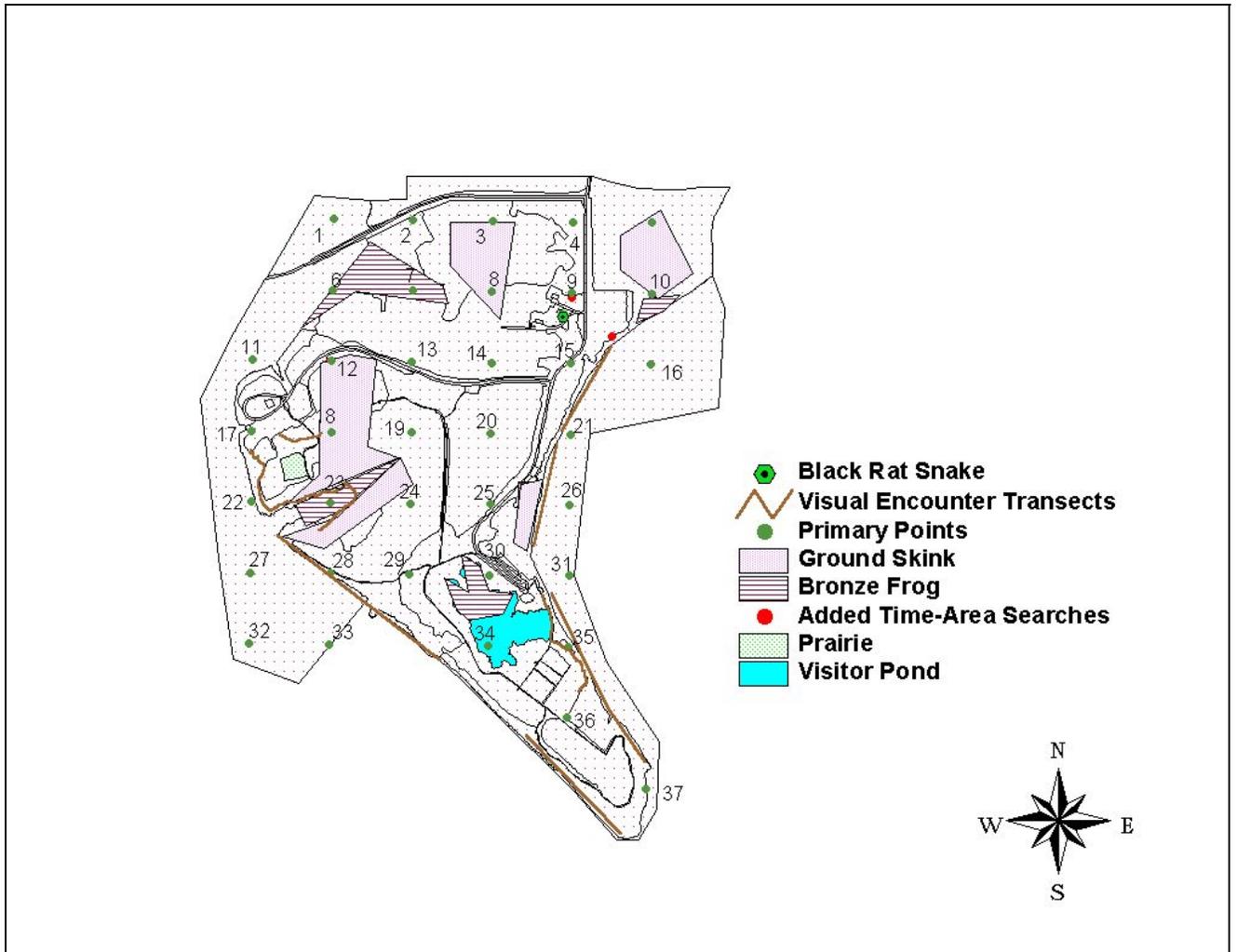


Figure 11. Distribution of three amphibians and reptiles at Arkansas Post NM.

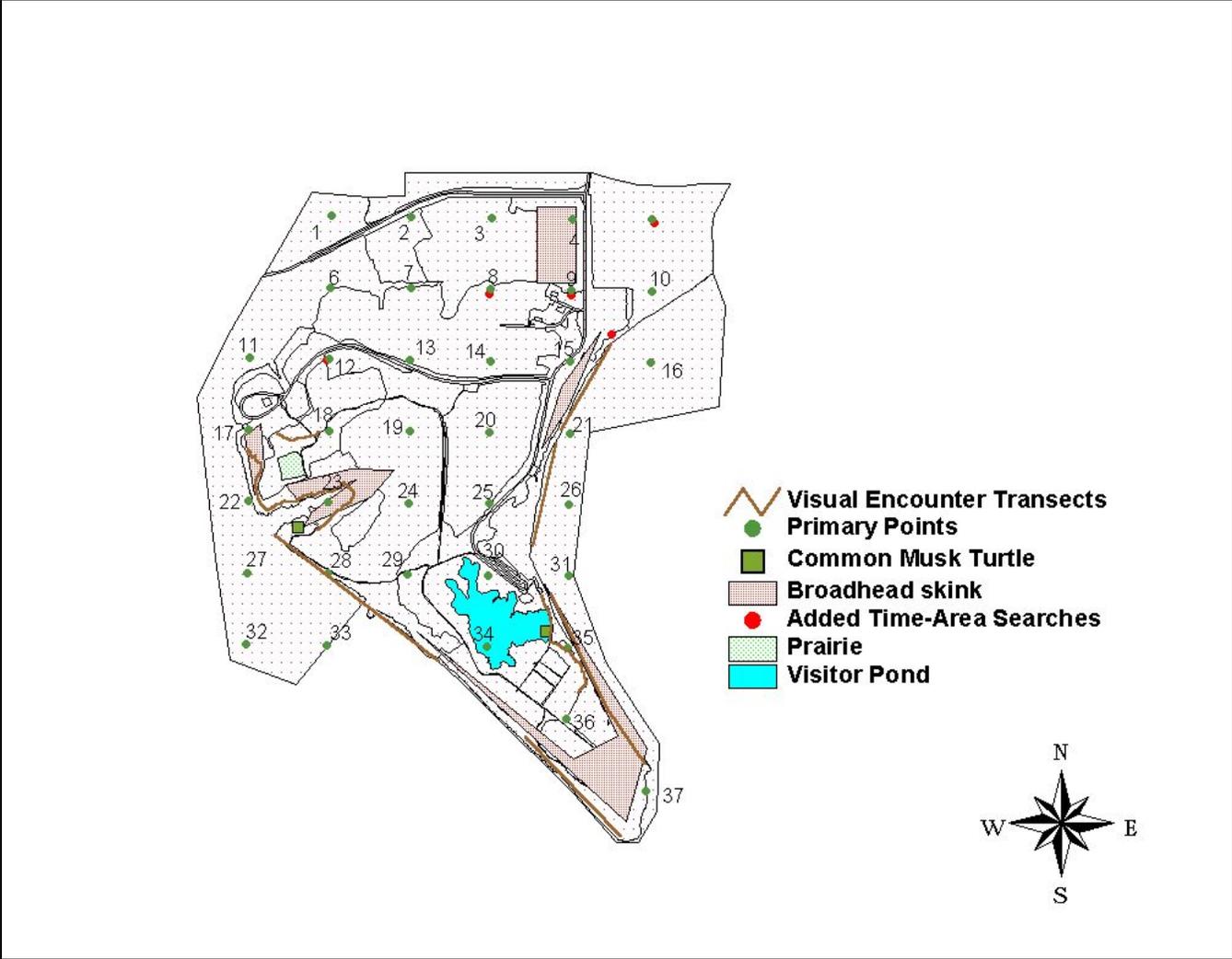


Figure 12. Distribution of the broadhead skink and common musk turtle at Arkansas Post NM.

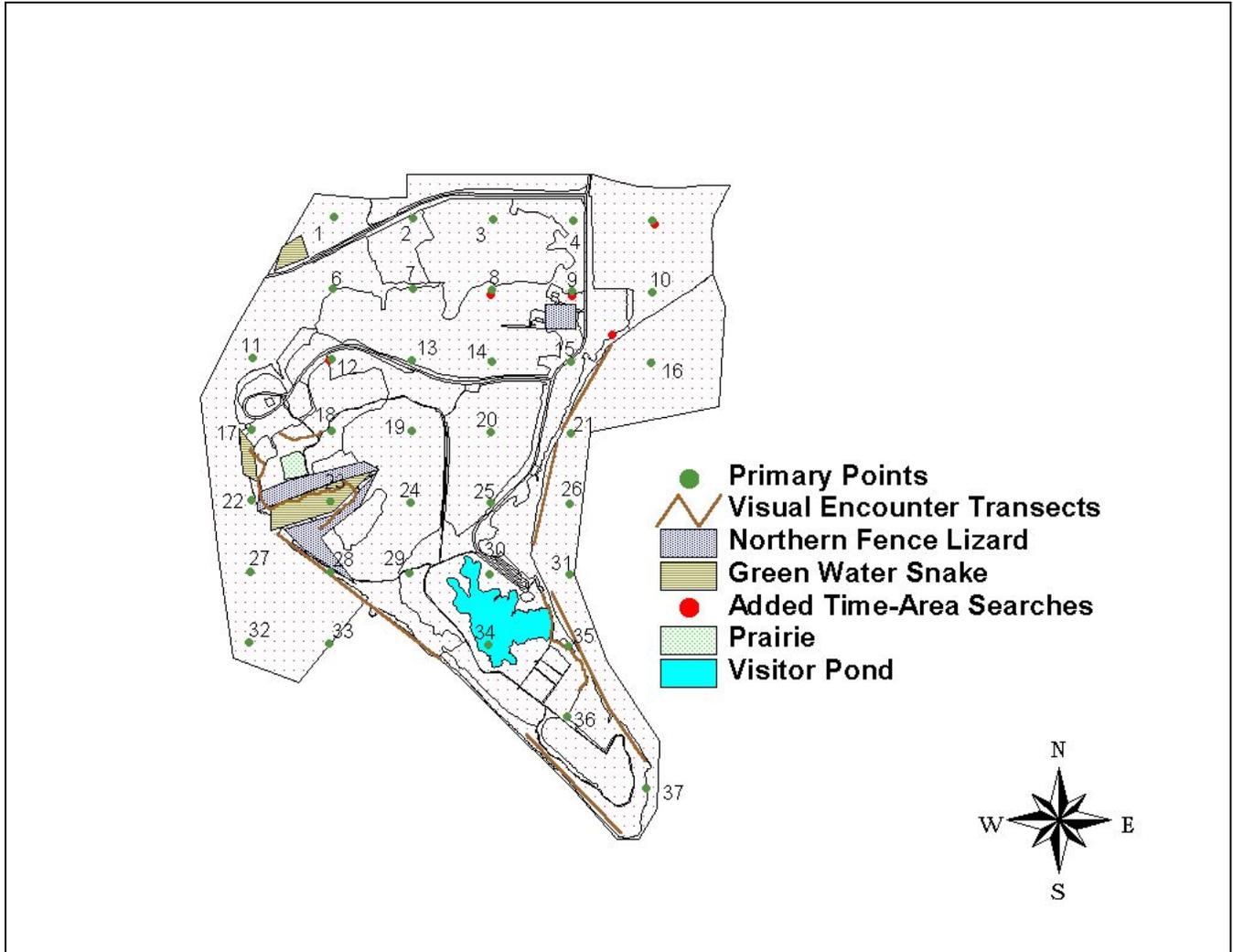


Figure 13. Distribution of the green water snake and northern fence lizard at Arkansas Post NM.

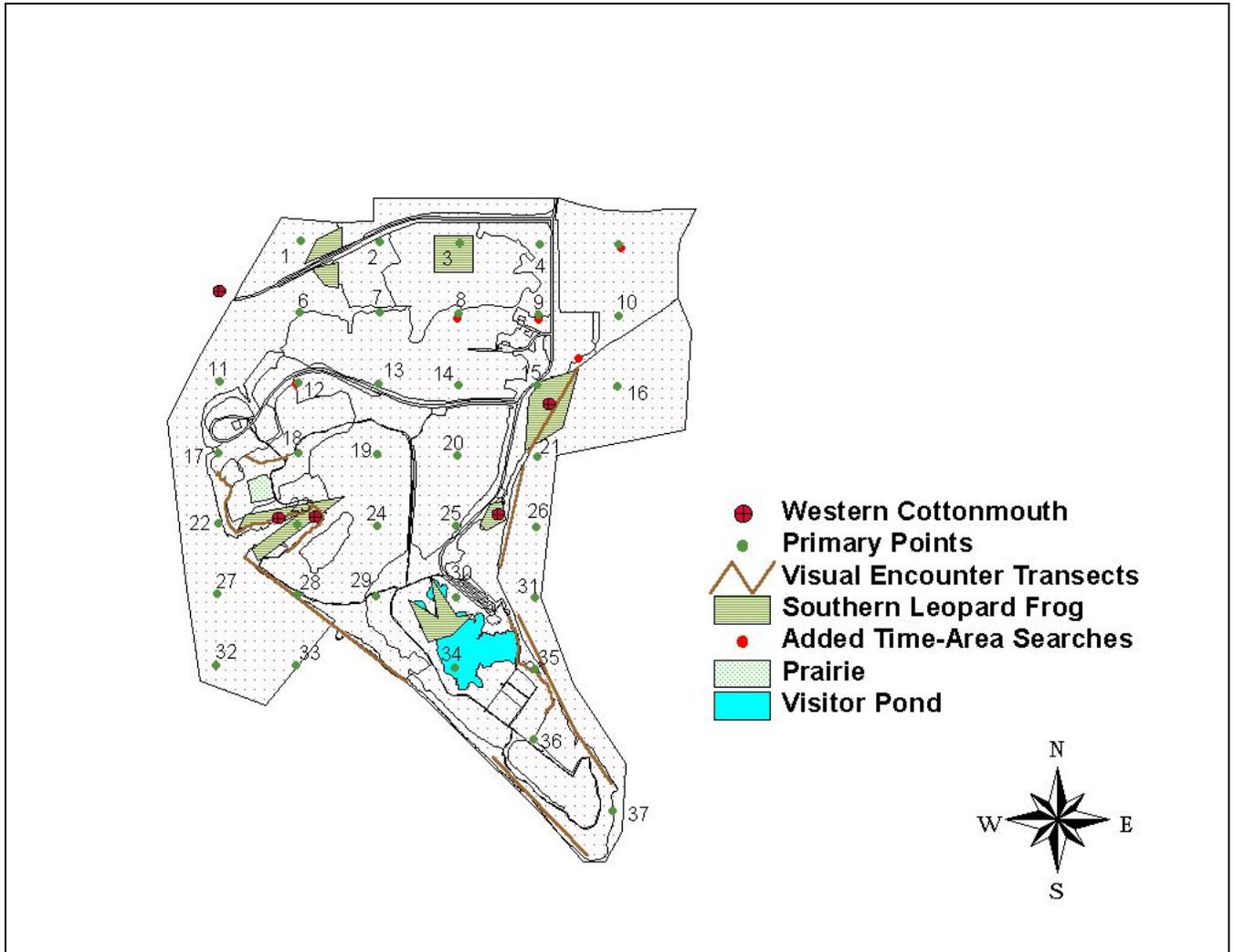


Figure 14. Distribution of the western cottonmouth and southern leopard frog at Arkansas Post NM.

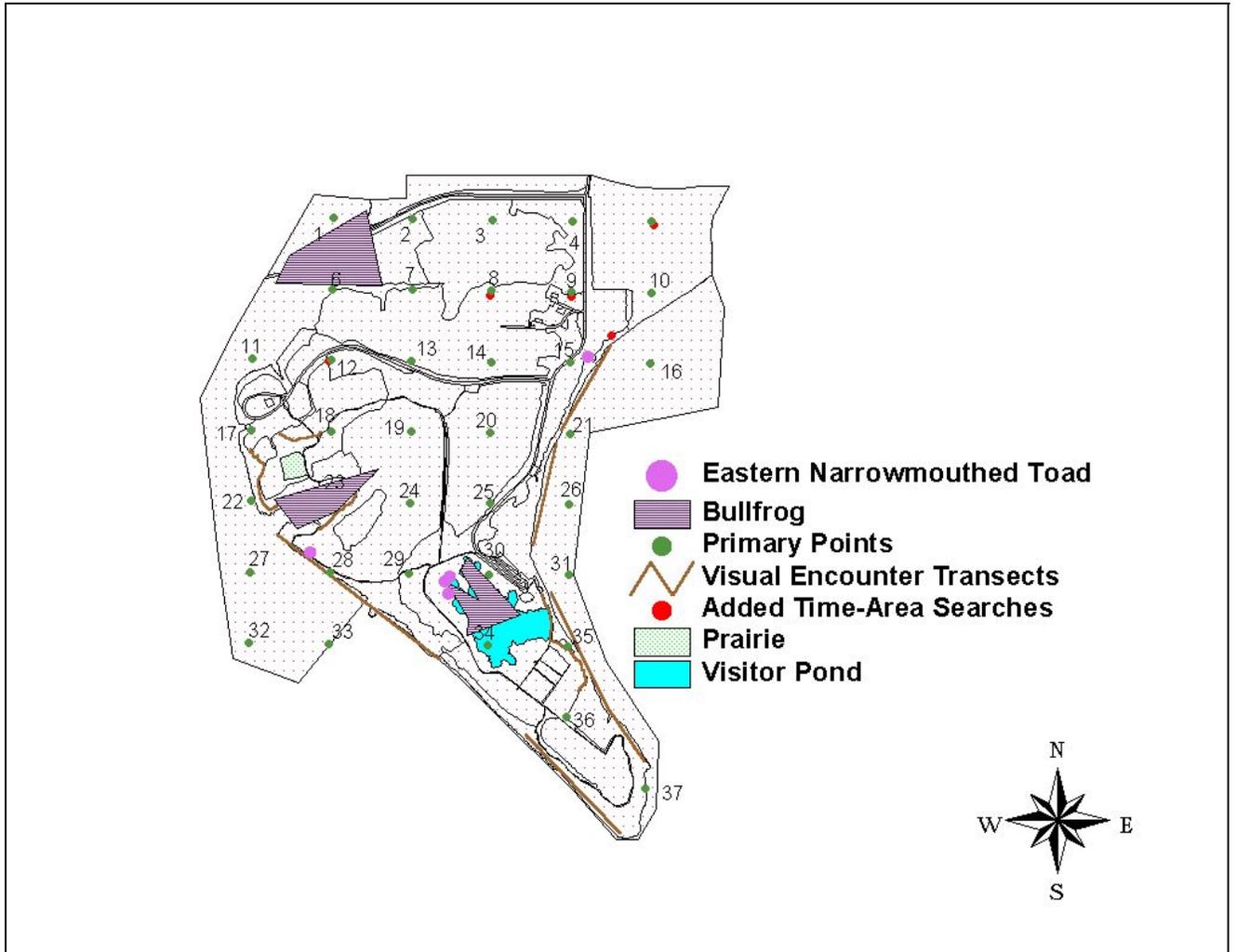


Figure 15. Distribution of the bullfrog and eastern narrowmouth toad at Arkansas Post NM.

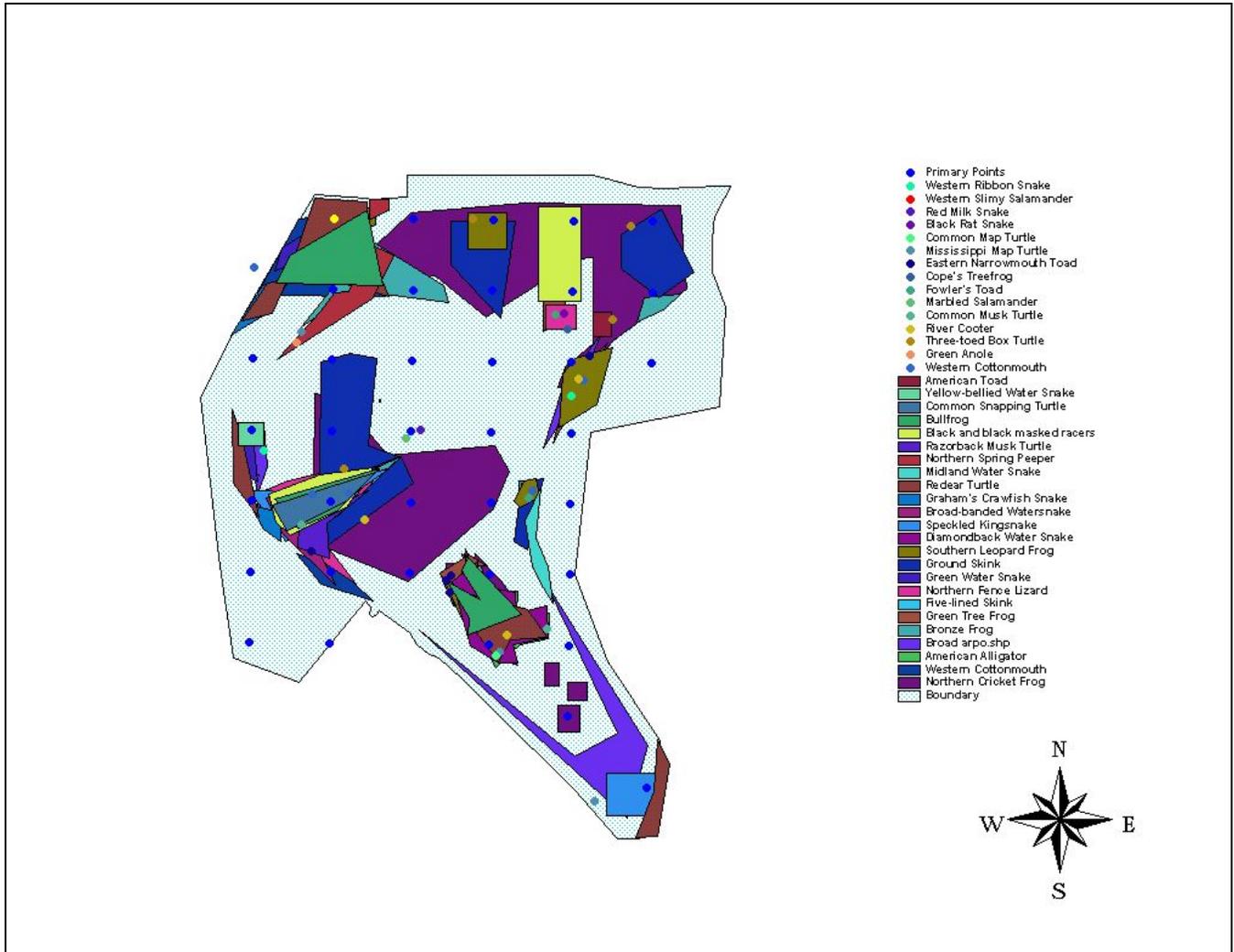


Figure 16. Overlay of all amphibian and reptilian ranges revealing centers of herpetofaunal species richness at Arkansas Post NM.

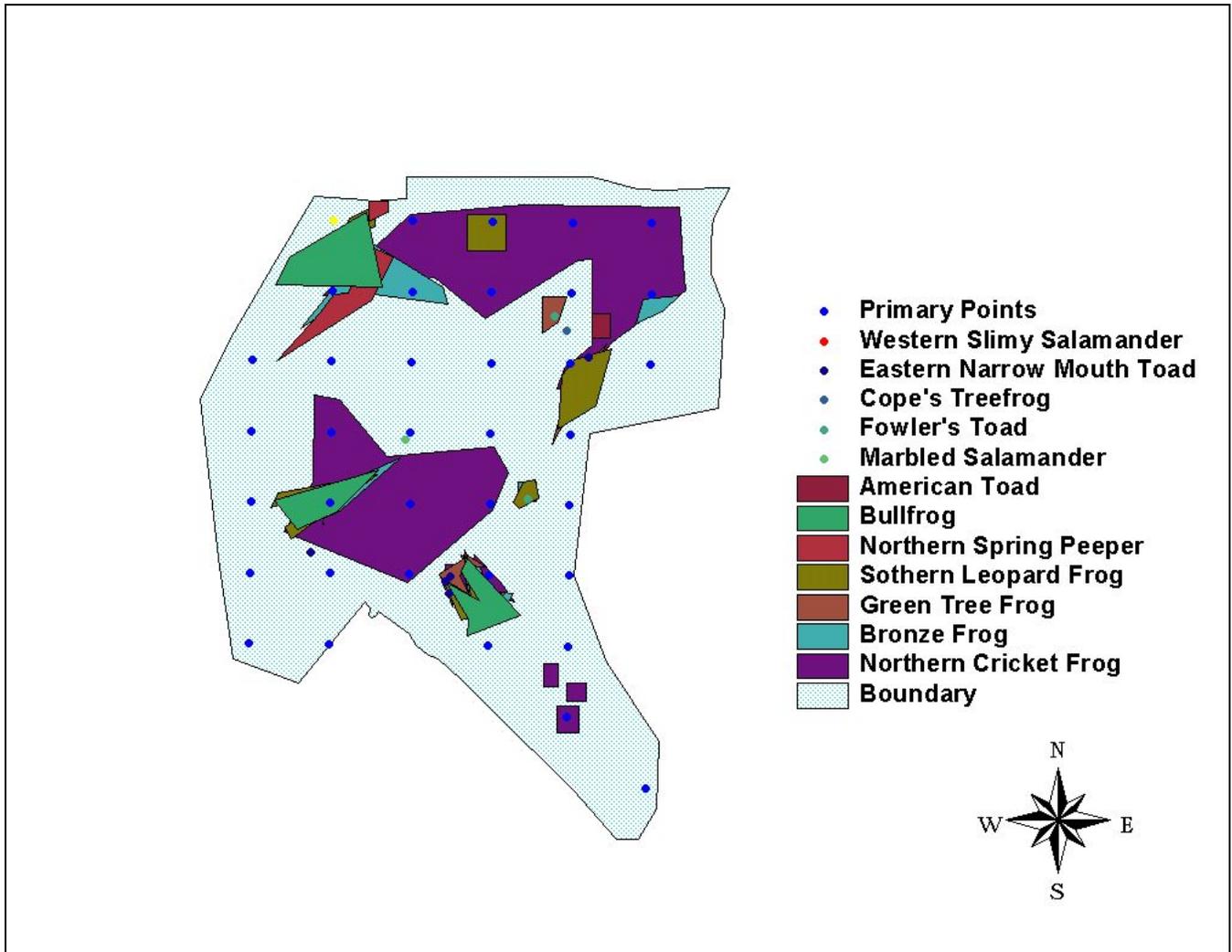


Figure 17. Overlay of all amphibian ranges revealing centers of amphibian species richness at Arkansas Post NM.

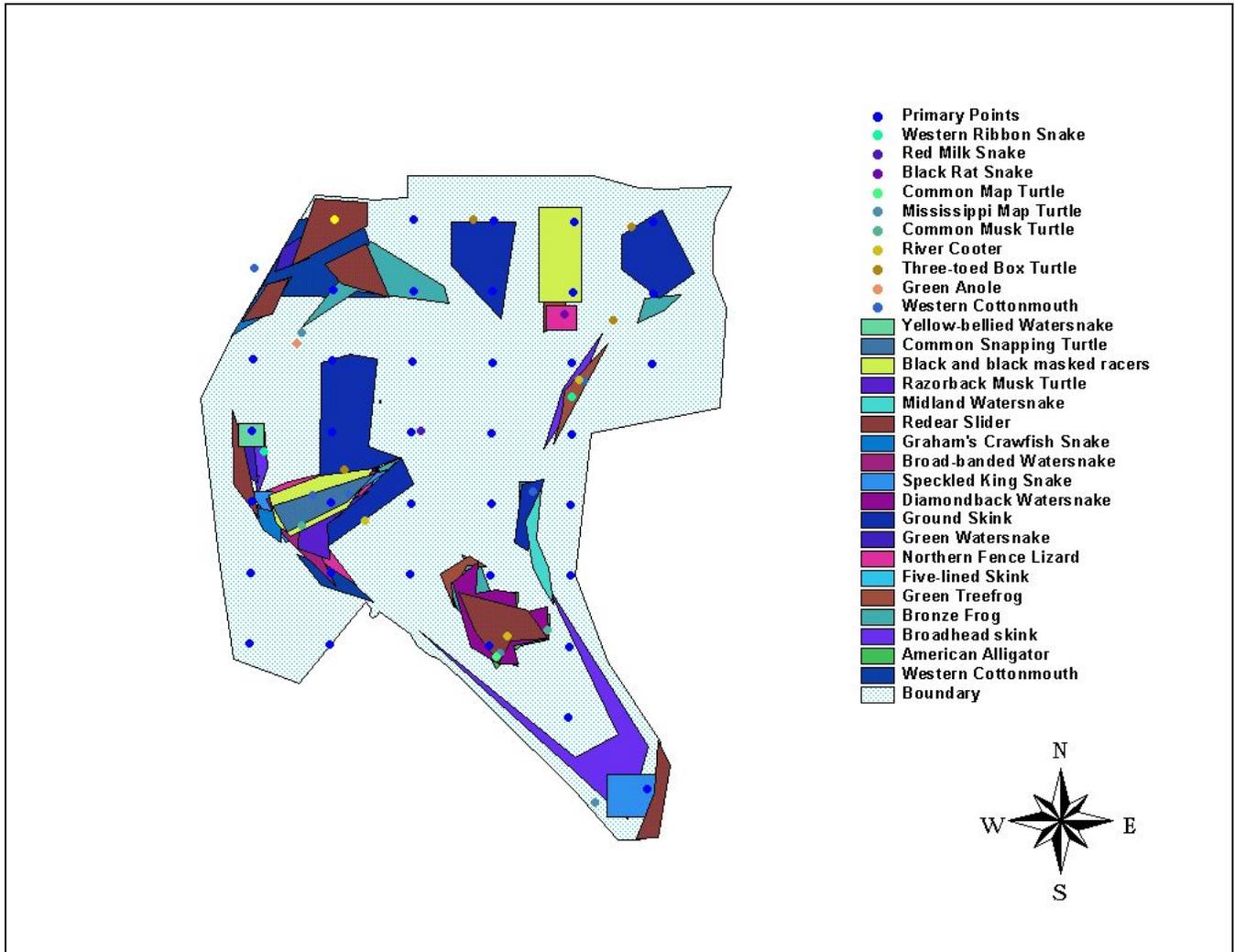


Figure 18. Overlay of all reptilian ranges revealing centers of reptilian species richness at Arkansas Post NM.



Figure 19. Photos of the American alligator nest and eggs at Alligator Slough, Arkansas Post NM.

Table 1. Amphibians of Arkansas Post NM.

Key: (+++++) = Commonly encountered, (+) = Rare, (?) = unverified observation

	Scientific Name	Common Name	Relative Abundance
Order Anura			
Bufonidae	Bufo americanus		
	charlesmithi	American toad	+++
	Bufo woodhousii fowleri	Fowler's toad	+++++
Hylidae	Acris crepitans	Northern cricket frog	+++++
	Hyla chrysoscelis	Cope's gray treefrog	+
	Hyla cinerea	Green treefrog	++++
	Pseudacris crucifer crucifer	Spring peeper	+++
Microhylidae	Gastrophryne carolinensis	Eastern narrowmouth	+++
Ranidae	Rana catesbeiana	Bullfrog	+++
	Rana clamitans clamitans	Bronze frog	++++
	Rana sphenoccephala	Southern leopard frog	+++++
Order Caudata			
Ambystomatidae	Ambystoma opacum	Marbled salamander	+
Plethodontidae	Plethodon kisatchie	Western slimy	
		salamander	?

Table 2. Reptiles of Arkansas Post NM.

Key: (+++++) = Commonly encountered, (+) = Rare, (?) = unverified observation

	Scientific Name	Common Name	Relative Abundance
Order Crocodilia			
Alligatoridae	Alligator mississippiensis	American alligator	++
Order Squamata			
Colubridae	Coluber constrictor priapus	Blackmask racer	+++
	Elaphe obsoleta	Western rat snake	
	Lampropeltis getula holbrooki	Speckled king snake	+++
	Lampropeltis triangulum sypila	Red milk snake	+
	Nerodia cyclopion	Green water snake	+++++
	Nerodia erythrogaster	Yellowbelly water snake	+++++
	Nerodia fasciatus confluens	Broad-banded water snake	+++++
	Nerodia rhombifer rhombifer	Diamondback water snake	+++++
	Opheodrys aestivus	Rough green snake	+
	Regina grahamii	Graham's crayfish snake	+++
	Thamnophis proximus proximus	Western ribbon snake	++
Phrynosomatidae	Sceloporus undulatus hyacinthinus	Northern fence lizard	+++
Polychrotidae	Anolis carolinensis	Green anole	?
Scincidae	Eumeces fasciatus	Five-lined skink	+++++
	Eumeces laticeps	Broadhead skink	+++
	Scincella lateralis	Ground skink	+++++
Viperidae	Agkistrodon piscivorus leucostoma	Western cottonmouth	+++++
Order Testudines			
Chelydridae	Chelydra serpentina serpentina	Common snapping turtle	+++++
Emydidae	Graptemys geographica	Common map turtle	++
	Pseudemys concinna	River cooter	+++++
	Terrapene carolina triunguis	Three-toed box turtle	+++++
	Trachemys scripta elegans	Red-eared slider	+++++
Kinosternidae	Sternotherus odoratus	Common musk turtle	++
	Sternotherus carinatus	Razorback musk turtle	+++++

Table 3. Species richness at Alligator Slough.

Common Name	Inhabitant	Observed In Vicinity
American alligator	X	
Black racer	X	
Broad-banded water snake	X	
Broadhead skink	X	
Bronze frog	X	
Bullfrog	X	
Common musk turtle	X	
Common snapping turtle	X	
Diamondback water snake		X
Eastern narrowmouth toad		X
Five-lined skink	X	
Graham's crawfish snake	X	
Green treefrog		X
Green water snake	X	
Ground skink	X	
Marbled salamander		X
Northern cricket frog	X	
Northern fence lizard	X	
Razorback musk turtle	X	
Red milk snake		X
River cooter		X
Southern leopard frog	X	
Speckled king snake	X	
Three-toed box turtle	X	
Western cottonmouth	X	
Western ribbon snake		X
Western slimy salamander	X	
Yellowbelly water snake	X	

Table 4. Species richness at the visitor center lake.

Common Name	Inhabitant	Observed In Vicinity
American alligator	X	
Bronze frog	X	
Common map turtle	X	
Diamondback water snake	X	
Eastern narrowmouth toad	X	
Green treefrog	X	
Northern cricket frog	X	
River cooter	X	
Southern leopard frog	X	

Table 5. List of amphibians expected and current status of occurrence at Arkansas Post NM.

	Scientific Name	Common Name	Old	New	Trauth
Order Caudata					
Ambystomatidae	<i>Ambystoma maculatum</i>	Spotted salamander	1	0	No
	<i>Ambystoma opacum</i>	Marbled salamander	2	2	Yes
	<i>Ambystoma talpoideum</i>	Mole salamander	1	0	No
	<i>Ambystoma texanum</i>	Smallmouth salamander	1	0	No
	<i>Ambystoma tigrinum tigrinum</i>	Eastern tiger salamander	2	0	No
Amphiumidae	<i>Amphiuma tridactylum</i>	Three-toed amphiuma	1	1	No
Plethodontidae	<i>Desmognathus fuscus conanti</i>	Spotted dusky salamander	1	0	No
	<i>Eurycea quadridigitata</i>	Dwarf salamander	1	0	No
	<i>Plethodon kisatchie</i>	Louisiana slimy salamander	1	2?	Yes
Proteidae	<i>Necturus maculosus</i>	Mudpuppy	2	1	No
Salamandridae	<i>Notophthalmus viridescens</i>	Central newt	1	0	No
Sirenidae	<i>Siren intermedia nettingi</i>	Lesser siren	1	1	No
Order Salienta					
Bufonidae	<i>Bufo americanus charlesmithi</i>	American toad	2	2	Yes
	<i>Bufo woodhousii fowleri</i>	Woodhouse's toad	2	2	Yes
Hylidae	<i>Acris crepitans</i>	Cricket frog	2	2	Yes
	<i>Hyla avivoca</i>	Bird-voiced treefrog	1	1	No
	<i>Hyla chrysoscelis</i>	Gray treefrog	2	2	Yes
	<i>Hyla cinerea</i>	Green treefrog	2	2	Yes
	<i>Pseudacris crucifer crucifer</i>	Northern spring peeper	1	2	Yes
	<i>Pseudacris triseriata feriarum</i>	Western chorus frog	1	1	No
Microhylidae	<i>Gastrophryne carolinensis</i>	Eastern narrowmouth toad	2	2	Yes
Pelobatidae	<i>Scaphiopus holbrookii</i>	Eastern spadefoot	1	0	No
Ranidae	<i>Rana areolata</i>	Crawfish frog	1	0	No
	<i>Rana catesbeiana</i>	Bullfrog	2	2	Yes
	<i>Rana clamitans clamitans</i>	Green frog	2	2	Yes
	<i>Rana palustris</i>	Pickerel frog	2	0	No
	<i>Rana sphenoccephala</i>	Southern leopard frog	2	2	Yes

“Old” indicates the status prior the inventory, “New” the status after the inventory, and “Trauth” indicates whether the author vouchered the species. Values for Old and New follow Boetsch et al (2000): a “1” is used to indicate that a given species is expected, “2” indicates that the species was observed (documented within the park), “3” indicates species that were not on the expected species list but were observed, and “4” indicates an extinct or regionally extirpated species.

Table 6. List of reptiles expected and current status of occurrence at Arkansas Post NM.

Order Crocodilia	Scientific Name	Common Name	Old	New	Trauth
Alligatoridae	Alligator mississippiensis	American alligator	2	2	Yes
Order Squamata					
Anguidae	Ophisaurus attenuatus	Slender glass lizard	2	0	No
Colubridae	Carphophis vermis	Western worm snake	1	0	No
	Cemophora coccinea	Scarlet snake	2	0	No
	Coluber constrictor priapus	Racer	2	2	Yes
	Diadophis punctatus	Ringneck snake	1	0	No
	Elaphe obsoleta	Black rat snake	2	2	Yes
	Farancia abacura reinwardtii	Mud snake	2	1	No
	Heterodon platirhinos	Eastern hognose snake	1	1	No
	Lampropeltis calligaster	Prairie kingsnake	1	0	No
	Lampropeltis getula holbrooki	Speckled kingsnake	1	2	Yes
	Lampropeltis triangulum sypila	Milk snake	2	2	Yes
	Masticophis flagellum flagellum	Eastern coachwhip	2	0	No
	Nerodia cyclopion	Green water snake	2	2	Yes
	Nerodia erythrogaster	Plainbelly water snake	1	2	Yes
	Nerodia fasciata confluens	Broad-banded water snake	2	2	Yes
	Nerodia rhombifer rhombifer	Diamondback water snake	2	2	Yes
	Nerodia sipedon	Northern water snake	1	0	No
	Opheodrys aestivus	Rough green snake	2	2	Yes
	Regina grahamii	Graham's crayfish snake	2	2	Yes
	Regina rigida sinicola	Gulf crayfish snake	1	0	No
	Storeria dekayi	Brown snake	1	0	No
	Storeria occipitomaculata	Redbelly snake	1	0	No
	Thamnophis proximus proximus	Western ribbon snake	2	2	Yes
	Thamnophis sirtalis sirtalis	Common garter snake	1	1	No
Phrynosomatidae	Sceloporus undulatus hyacinthinus	Fence lizard	2	2	Yes
Polychrotidae	Anolis carolinensis	Green anole	2	2	Yes
Scincidae	Eumeces anthracinus pluvialis	Coal skink	1	1	No
	Eumeces fasciatus	Five-lined skink	2	2	Yes
	Eumeces laticeps	Broadhead skink	2	2	Yes
	Scincella lateralis	Ground skink	2	2	Yes
Teiidae	Cnemidophorus sexlineatus	Six-lined racerunner	2	0	No

Table 6. List of reptiles expected and current status of occurrence at Arkansas Post NM (cont.)

Order Squamata	Scientific Name	Common Name	Old	New	Truth
Viperidae	<i>Agkistrodon contortrix contortrix</i>	Northern copperhead	1	2	Yes
	<i>Agkistrodon piscivorus leucostoma</i>	Cottonmouth	2	2	Yes
	<i>Crotalus atrox</i>	W.diamondback rattlesnake	1	0	No
	<i>Crotalus horridus</i>	Timber rattlesnake	1	1	No
	<i>Sistrurus miliarius</i>	Western pygmy rattlesnake	1	0	No
Order Testudines					
Chelydridae	<i>Chelydra serpentina serpentina</i>	Snapping turtle	2	2	Yes
	<i>Macrolemys temminckii</i> (= <i>Macrochelys t.</i>)	Alligator snapping turtle	2	1	No
Emydidae	<i>Pseudemys concinna</i>	River cooter	2	2	Yes
	<i>Pseudemys floridana</i>	Missouri slider	2	0	No
	<i>Chrysemys picta</i>	Painted turtle	2	0	No
	<i>Deirochelys reticularia</i>	Chicken turtle	1	0	No
	<i>Graptemys kohnii</i> (= <i>pseudogeographica k.</i>)	Mississippi map turtle	2	1	No
	<i>Graptemys pseudogeographica</i>	False map turtle	2	0	No
	<i>Graptemys geographica</i>	Map turtle	1	2	Yes
	<i>Terrapene ornata</i>	Ornate box turtle	1	0	No
	<i>Terrapene carolina triunguis</i>	Three-toed box turtle	2	2	Yes
	<i>Trachemys scripta elegans</i>	Red-eared slider	2	2	Yes
Kinosternidae	<i>Kinosternon subrubrum hippocrepis</i>	Mississippi mud turtle	2	2	No
	<i>Sternotherus carinatus</i>	Razorback musk turtle	2	2	Yes
	<i>Sternotherus odoratus</i>	Musk turtle (stinkpot)	2	2	Yes
Trionychidae	<i>Apalone mutica mutica</i>	Smooth softshell	1	1	No
	<i>Apalone spinifera hartwegi</i>	Spiny softshell	1	1	No

Table 7. List of amphibians and reptiles park status, abundance, and residency at Arkansas Post NM.

Category	Order	Family	Standard Scientific Name	Park Status	Abundance	Residency
Amphibian	Anura	Bufo	<i>Bufo americanus charlesmithi</i>	Present in Park	Common	Resident
			<i>Bufo woodhousii fowleri</i>	Present in Park	Abundant	Resident
		Hylidae	<i>Acris crepitans</i>	Present in Park	Abundant	Resident
			<i>Hyla avivoca</i>	Probably Present	Unknown	Unknown
			<i>Hyla chrysoscelis</i>	Present in Park	Rare	Resident
			<i>Hyla cinerea</i>	Present in Park	Common	Resident
			<i>Pseudacris crucifer crucifer</i>	Present in Park	Common	Resident
			<i>Pseudacris triseriata feriarum</i>	Probably Present	Unknown	Unknown
		Microhylidae	<i>Gastrophryne carolinensis</i>	Present in Park	Common	Resident
		Ranidae	<i>Rana catesbeiana</i>	Present in Park	Common	Resident
			<i>Rana clamitans clamitans</i>	Present in Park	Common	Resident
			<i>Rana sphenoccephala</i>	Present in Park	Abundant	Resident
	Caudata	Ambystomatidae	<i>Ambystoma opacum</i>	Present in Park	Rare	Resident
		Amphiumidae	<i>Amphiuma tridactylum</i>	Probably Present	Unknown	Unknown
		Plethodontidae	<i>Plethodon kisatchie</i>	Present in Park	Unknown	Resident
		Proteidae	<i>Necturus maculosus</i>	Probably Present	Unknown	Unknown
		Sirenidae	<i>Siren intermedia nettingi</i>	Probably Present	Unknown	Unknown
Reptile	Crocodylia	Alligatoridae	<i>Alligator mississippiensis</i>	Present in Park	Uncommon	Resident
	Squamata	Colubridae	<i>Coluber constrictor priapus</i>	Present in Park	Common	Resident
			<i>Elaphe obsoleta obsoleta</i>	Present in Park	Unknown	Resident
			<i>Farancia abacura reinwardtii</i>	Probably Present	Unknown	Unknown
			<i>Heterodon platyrhinus</i>	Probably Present	Unknown	Unknown
			<i>Lampropeltis getula holbrooki</i>	Present in Park	Common	Resident
			<i>Lampropeltis triangulum sypila</i>	Present in Park	Uncommon	Resident
			<i>Nerodia cyclopion</i>	Present in Park	Abundant	Resident

Table 7. List of amphibians and reptiles park status, abundance, and residency at Arkansas Post NM (cont.).

Category	Order	Family	Standard Scientific Name	Park Status	Abundance	Residency
Reptile	Squamata	Colubridae	<i>Nerodia erythrogaster</i>	Present in Park	Common	Resident
			<i>Nerodia fasciata confluens</i>	Present in Park	Common	Resident
			<i>Nerodia rhombifer rhombifer</i>	Present in Park	Common	Resident
			<i>Opheodrys aestivus</i>	Present in Park	Rare	Resident
			<i>Regina grahamii</i>	Present in Park	Common	Resident
			<i>Thamnophis proximus proximus</i>	Present in Park	Uncommon	Resident
			<i>Thamnophis sirtalis sirtalis</i>	Probably Present	Unknown	Unknown
		Phrynosomatidae	<i>Sceloporus undulatus hyacinthinus</i>	Present in Park	Common	Resident
		Polychrotidae	<i>Anolis carolinensis</i>	Present in Park	Unknown	Resident
		Scincidae	<i>Eumeces anthracinus pluvialis</i>	Probably Present	Unknown	Unknown
			<i>Eumeces fasciatus</i>	Present in Park	Common	Resident
			<i>Eumeces laticeps</i>	Present in Park	Common	Resident
			<i>Scincella lateralis</i>	Present in Park	Abundant	Resident
		Viperidae	<i>Agkistrodon contortrix contortrix</i>	Present in Park	Unknown	Unknown
			<i>Agkistrodon piscivorus leucostoma</i>	Present in Park	Common	Resident
			<i>Crotalus horridus</i>	Probably Present	Unknown	Unknown
	Testudines	Chelydridae	<i>Chelydra serpentina serpentina</i>	Present in Park	Common	Resident
			<i>Macrolemys temminckii</i>	Present in Park	Unknown	Resident
		Emydidae	<i>Graptemys geographica</i>	Present in Park	Uncommon	Resident
			<i>Graptemys kohnii</i>	Present in Park	Uncommon	Resident
			<i>Pseudemys concinna</i>	Present in Park	Abundant	Resident
			<i>Terrapene carolina triunguis</i>	Present in Park	Common	Resident
			<i>Trachemys scripta elegans</i>	Present in Park	Abundant	Resident
		Kinosternidae	<i>Kinosternon subrubrum hippocrepis</i>	Present in Park	Unknown	Resident
			<i>Sternotherus odoratus</i>	Present in Park	Uncommon	Resident

Table 7. List of amphibians and reptiles park status, abundance, and residency at Arkansas Post NM (cont.).

Category	Order	Family	Standard Scientific Name	Park Status	Abundance	Residency
Reptile	Testudines	Trionychidae	<i>Apalone mutica mutica</i>	Probably Present	Unknown	Unknown
			<i>Apalone spinifera hartwegi</i>	Probably Present	Unknown	Unknown
			<i>Trionyx muticus</i>	Probably Present	Unknown	Unknown