GRANT AGREEMENT NUMBER: #07-021W.
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TIME FRAME OF REPORT: July 1 2006-June 30 2007-the period of the contract.
NAME AND TELEPHONE NUMBER OR E-MAIL OF GRANTEE REPRESENTATIVE COMPLETING REPORT: Same as given above.

PROJECT OBJECTIVE AND DESCRIPTION:

SEARCHING FOR BROAD BANDEDWATER, MISSISSIPPI GREEN WATER, FLATHEAD, GREAT PLAINS RAT AND EASTERN COACHWHIP SNAKES, AT KNOWN HISTORICAL LOCALITIES IN ILLINOIS:

INTRODUCTION: The purpose of this project was to try to confirm the continued existence of these five state threatened or state endangered snakes at known historical sites, where they are definitely known to have occurred in the past and have either been historically collected as museum specimens or recorded in scientific literature. In some cases, this search covered all of the known Illinois localities for a species, (i.e. the Broad banded Water snake), in other cases only the best known localities were investigated (i.e. for the Great Plains Rat, Flathead and Eastern Coachwhip snakes). While it would ideally have been best to search all known localities for all five species, limited time and budgetary constraints combined to make this impossible. Another factor was the difficulty in obtaining federal research permits for fieldwork in the Shawnee National Forest during the time period indicated. Also, I and Scott Ballard determined that it was unnecessary to search for Mississippi Green Water snakes at Larue swamp (in Union county) where they are relatively common and have been the focus of a number of scientific studies in the past. The following state lands were utilized (with permission) for this study: A. Horseshoe Lake Conservation Area (Alexander county) in searching for Broad banded and Mississippi Green Water snakes. B. Union County Conservation Area(Union County) in looking for Mississippi Green Water snakes. C. Fults Hill Prairie Nature Preserve (Monroe County). The above areas will be referred to by their title, followed by CA or HP (conservation area or hill prairie) for convenience. I would like to thank Joey Thurston (site superintendent of Horseshoe Lake and Union County CA's) and Joan Bade(site superintendent of Fults Hill Prairie) for their assistance and cooperation. A private boat launch/bait shop premises at Horseshoe Lake was also searched regularly with owner permission. A map is available for each CA utilized, as well as Fults HP. The following key should be used when examining these maps: A- Refers to an area of primary search focus that was visited at least four times during this survey. Keep in mind that several areas marked with a particular letter designation, were sometimes searched in a single day. B- Secondary search area that was visited at least three times during the survey. C- Occasional search area that was visited only once or twice during the survey. Finally, any area marked RFS indicates Recommended for Further Search-both visually and in particular, through the use of drift fences. The symbol "D" denotes an active snake den. Symbols may appear to overlap occasionally- for example checking dens during appropriate seasons was a high priority, hence the "A". A final note here, is that I was unable to find official names for the lakes I searched on

Union County Refuge. I tried topo maps, Google Earth and an Illinois Atlas. Also, the accompanying official map of the refuge does not name them either, and the refuge secretary (Dorothy Fleener) did not believe there were any particular names for these lakes. Because of this, I am taking the liberty of referring to these bodies of water as the Levee Bend lakes, because when traveling eastward on the levee road(from Hwy 3), they are the first lakes to be seen at the point where the levee road first makes a sharp bend to the right. To avoid any confusion, both are clearly labeled on the map. Both appear to be natural ,and have buttonbush, lily pads and other vegetation-especially lake #2.

MATERIALS AND METHODS: Most searching for these species consisted of actively searching for them during the day(and sometimes at night) by visually scanning areas and also turning over surface cover such as rocks, logs and occasional pieces of tin or boards. Searching along rocky bluffs, swamp, or lake edges at night with a flashlight was tried on several occasions, as was the technique of "road cruising"-searching for snakes at night by car on roads running through the above mentioned state lands. Road cruising was especially done during or after rain, since moisture can often enable better search results. Scanning lakes by canoe (borrowed from a friend) was done on five different occasions. Trapping (using minnow traps) was also tried, but was seldom used because I had only fourteen traps and could not afford to buy more. Wire minnow traps were used by placing them in a rough line inside shady swamps in what I considered to be potential habitat for the two water snakes mentioned above. The traps were baited with dead frogs and dead minnows (the frogs were collected from public roads-not state land. The minnows were bought, frozen and then thawed out). Trapping was only used as a last resort at both Horseshoe Lake and Union County CA for only one and three nights respectively. This technique could not be effectively used at Fults HP because time limitations and driving distance made regular trap checks (every 1-2 nights) impossible. All in all, I considered searching areas on foot more thorough and efficient. I tended to investigate what I considered to be the best parts of an area rather than the entire area which would have been next to impossible. See the accompanying maps for details. The following amount of hours were spent per site, as well as general time use (collecting frogs for trap bait and visiting ditches near Mermet). Fults Hill Prairie: 27.25 field hours. The area was visited eight times. Horseshoe Lake Conservation Area: 48.25 field hours. The area was visited sixteen times. Union County Conservation Area (Levee Bend Lakes only): 30.50 field hours. General time use: 7.5 hours getting trap bait and visiting ditches near Mermet. An approximate average of three hours per trip was spent in the field except for Mermet where it was likely an hour or slightly less.

RESULTS: Despite spending a total of 106 field hours at these three sites, (plus another seven and a half hours getting trap bait and investigating another site which I will discuss later) I was unable to find any of the five species being sought. This makes a total of 113.5 project related hours. This does not include driving time. I was personally disappointed that none of the target species were found. I was also somewhat handicapped by rather dry weather at Fults HP which made it very difficult to do field work there until late April of this year. Two orientation visits there last summer yielded nothing because there was virtually no soil moisture and very few snakes were in evidence. Conditions did not improve much in the fall of 2006. I believe that a large

amount of additional field time (at least several hundred field hours) would be needed, along with extended trapping possibilities (drift fencing) in order to adequately assess the true status of these species in Illinois. I will present this further under "Discussion". Despite the absence of the target species, a number of other species of snake were encountered at these three sites. All of these species are listed here per site. Species that were encountered at least five times during the survey are referred to by a "C" meaning common. Horseshoe Lake Conservation Area: 1. Midland Brown snake C. 2. Eastern Garter snake C. 3. Western Ribbon snake C. 4. Northern (Midland in this area) Water snake. 5. Diamondback Water snake C. 6. Plainbellied Water snake C. 7. Rough Green snake. 8. Black Rat snake C. 9. Common Racer. 10. Common King snake. A Western Mud snake was also found dead on Hwy 3 about one mile east of the area. Union County Conservation Area (Levee Bend lakes): 1. Western Ribbon snake C 2. Plainbellied Water snake C. 3. Diamondback Water snake. 4. Common Racer. 5. Black Rat snake. 6. Western Cottonmouth C. Fults Hill Prairie Nature Preserve: 1. Common Racer. 2. Midwest Worm snake. 3. Ringneck snake. 4. Red Milk snake. 5. Northern Copperhead. A Black Rat snake was also found dead about .25 miles south of the preserve. A total of fifteen species of snake were found on these combined areas, with an additional species found nearby. Virtually all snakes were found during the day, only a few were found at night and only two (both Western Cottonmouths) were trapped. All snakes were either observed only or were released after being caught. Towards the end of the survey I took a brief trip to the vicinity of Mermet (near, but not on Mermet Lake Conservation Area) to look around a swampy ditch there for the Broad banded. I did this because one had been found dead on the road in that area last year, but there was some question as to whether the snake had been accidentally introduced. I felt that it was important to briefly check out the area in case there was an actual population. However there was little water in the ditch making for poor search conditions on the whole. No snakes of any kind were found.

DISCUSSION AND RECCOMMENDATIONS: I will briefly discuss the general status of each of the study species in Illinois with suggestions for further search efforts and study of their populations.

A. Broad banded Water snake: This snake had a definite but erratic history of occurrence at Horseshoe Lake Conservation Area. The species was apparently first recorded in 1907 with additional specimens collected in 1908, the 1920's and also in 1951-the last definite Illinois specimen known (Chris Phillips of Illinois Natural History Survey personal communication). Unfortunately there is no record of exactly where these snakes were found at the lake except for a few specimens having been found at the spillway. Except for a few unconfirmed reports (one in 1982 and another in the mid nineties) this species has not been found again. But why? It is obvious that this water snake survived the construction of a spillway and at least one drying of the lake in 1930. Even today I believe there is still extensive suitable habitat available around and near the lake (at least it appears identical to habitat in Louisiana where I observed many Broad bandeds over a period of four years). I have also seen them in Kentucky. There also seems to be an abundance of Southern Leopard frogs, Green frogs and Cricket frogs-all definite prey in Louisiana. However did it survive the big flood of 1993? This question is very difficult to answer. What is definite, is that mine is

the third unsuccessful detailed search for this species in the last twenty years. Dr. Ron Brandon, the late Mike Morris and Scott Ballard have been responsible for the other two. I personally believe that despite this lack of success that one or both of the following suggestions should be implemented. Should these fail, then I believe that there should be a feasibility study done for the reintroduction of this species to Horseshoe Lake. 1. Drift fence several large areas near the lake-specifically several swampy areas (see accompanying maps) and place a large number of appropriate buckets. Monitor this area for one year to allow reasonable time for results. It would obviously be completely impractical (to say nothing of expensive) to do this around the lake itself. It is possible that small remnant swamps like these might offer a better chance of success than the environs of the lake itself. 2. Other possible nearby habitats should be thoroughly searched for Broad bandeds. All of them are in the general vicinity of Horseshoe Lake. I refer specifically to the following areas: A. Several miles of the lower Cache River from the intersections of highways 3 and 127 southward to its diversion to the Mississippi river. This area appears swampy in places and also has low hills facing west and southwest-possibly good den areas for snakes. At least some of this area is now part of Cypress Creek National Wildlife Refuge. B. A wooded area of some hundreds of acres that appears (on Google Earth and topo maps) swampy in places. This land is undoubtedly private. It is located approximately 2.5 miles southwest of the town of Olive Branch. C. An old river channel located in Burnham Island Conservation Area. Searches in one or more of these areas might possibly reveal the continued existence of Broad banded water snakes.

3. Examine known den sites used by other species of snakes (see section on species benefited by project) during fall and spring to see if this or the following species may make use of such areas.

B. Mississippi Green Water snake: This species was historically recorded for the Bluff lakes region of Union County in 1892 as well as Horseshoe Lake in Alexander County in 1907. Larue swamp continues to have the only known population in Illinois. I am not surprised that I failed to find this species at Horseshoe Lake since there have been extensive changes to the hydrology and den habitat of the lake in the last 70+ years, and this species seems to be sensitive to such changes in the northern part of its range. For example, a good population at Mallard Lake west of Blytheville, Arkansas was eliminated by draining the lake and then rip rapping the shoreline while refilling it, (Trauth et al 2005). Also, this snake may have disappeared from Missouri in recent years. In Illinois this species requires swampy lakes, or swamp that has small lakes within it, that have abundant aquatic vegetation. Only a small part of Horseshoe Lake has such vegetation. Since the Levee Bend lakes have at least some aquatic vegetation and are in reasonable proximity to a den site (not more than a half mile) it is difficult to understand the apparent absence of Mississippi Greens there. Perhaps it is because this snake (especially as an adult) feeds heavily on fish-especially centrarchid fish. Perhaps these lakes are too shallow to support such prey-especially since one lake (judging by paddle depth) never seems to get much deeper than three feet. Suggestions made for the Broad banded Water snake may also turn up additional populations of this species. However I believe that drift

fencing along Upper Bluff lake in the Shawnee National Forest might be the best bet for relocating historical populations. I have hiked the area before and there would appear to be both suitable aquatic and den habitat present.

C. Flathead snake: I believe that I simply had bad luck in finding this species because for much of the year soil moisture was simply unsuitable. Since they were found occasionally in the eighties and early nineties by several people (including myself) and the habitat seems in good condition in some areas, I believe that these minute snakes will turn up sooner or later. However I would like to recommend that definite regulations be posted at Fults HP forbidding casual visitors from turning rocks along the trail, especially in the smallest accessible hill prairie (the first one arrived at on the steep hilly trail coming from the parking lot). While taking great care to replace rocks myself while searching, I noticed numerous rocks that had been flipped aside or carelessly replaced, which were now lying on grass rather than on moist soil. Rocky, shaded cover and underlying moist soil is needed by this species. The same is true of two other state threatened species, both of which were encountered during this survey. One was the Eastern Narrowmouth Toad, (of which four were seen) and the other was the Plains Scorpion (About two dozen were seen, however only five were seen on the small hill prairie). It is virtually certain that habitat for all three species is being damaged by excessive meddling with rocky cover. I would estimate that as much as 40-50% of rocks on the small prairie have been turned and sloppily "replaced" multiple times. I believe that it would also be a good idea to search Larue/Pine Hills in the Shawnee National Forest to verify the continued presence of this species.

D. Great Plains Rat Snake: My comments here are similar to the preceding species, except that large rocks and tin pieces were turned in the daytime attempting to locate this snake without success. Rocky bluff tops and edges were also searched. On two occasions, rock crevices were also searched at night. Road cruising was also tried on three occasions (one time being after the expiration of the contract, for which no mileage was recorded). I cruised as far north as Valmeyer and as far south as Prairie Du Rocher. Since this snake was occasionally found during the nineties, I think that persistent searching should again turn it up. I would also recommend that it be searched for at or near historic localities in St Clair and Jersey counties (near East St Louis and on the campus of Principia College).

E. Eastern Coachwhip Snake: I walked and scanned a number of grassy hillsides hoping to see this species, but no luck. I was told by Dr Ralph Axtell of Southern Illinois University (Edwardsville), that the last dead on road specimen he found was in 1974. Hugh Gilbert(A local herpetologist from Chester), told me that several people had told him of seeing this snake in the last few years-but no definite proof, only unconfirmed sightings. The Coachwhip has either disappeared from Illinois or is very rare. Interestingly enough, this snake does not turn up regularly in southeast Missouri either,(though it seems more common in SW Missouri where I saw one recently)judging by looking at the website photos and narratives of numerous herpetologists from that area. None of them have found Coachwhips in the aforementioned area. Perhaps drift fencing might be successful

in relocating this snake again at Fults HP. If implemented, it would probably have to be done some distance away from public trails.

WILDLIFE SPECIES THAT BENEFITED FROM THIS PROJECT:

A. Diamondbacked Water Snake: This snake was observed somewhat regularly at Horseshoe Lake and could perhaps be referred to as somewhat common. Six were seen alive and another two were found dead on the road. However, this was definitely not the case at Levee Bend lakes, where only three were observed. I really wonder if this species may not have experienced something of a population decline in recent years. I say this, because I am very familiar with the habits and habitat of Diamondbacks and I used to encounter many of them at both areas mentioned. At Horseshoe Lake, this was especially noticeable during the late eighties to early nineties, when I would often see anywhere from eight to twelve per day-sometimes more than that. About five of the ten snakes encountered during this study (including dead ones) seemed to be somewhat thin. It is possible that this species has simply had a bad year or two reproductively and I don't want to jump to conclusions. However if this is so, it appears to be happening in a number of areas where I used to find this big water snake quite abundantly. I believe this situation may merit further study.
B. Plains Scorpion and Eastern Narrowmouthed Toad: Fieldwork for this project unexpectedly revealed that the rocky habitat in the lowest hill prairie was being badly damaged in some areas by extensive rock turning (likely caused by herpetologists illegally collecting). This may have affected both the Flathead snake and the above species. I got the impression that there were less scorpions found on this prairie than in past years. However scorpions were still quite abundant along gravelly road cuts along the preserve/Bluff road interface. Hopefully this situation can be easily monitored. I replaced all "misplaced" rocks except for some where damp soil was developing.
C. General snake inventories: The lists of snakes found at each of the three state areas may add species to area lists, confirm the continued presence of some species, and aid in monitoring of uncommon or rare species. For example, I believe that there are very few recent records of Western Mud snakes in the Horseshoe Lake area, although I am aware of one found dead on Promised Land road in 2003.
D. Identification of definite snake dens at Hoseshoe Lake: During this study, several areas that appeared suitable were examined to see if snakes made use of them for winter hibernation. I hoped that the Broad banded and Mississippi Green Water snakes might be found using such dens during the appropriate season. Similar attempts were made at Union County CA and Fults HP, but were unsuccessful. Cold weather came earlier than usual to Fults-an orientation visit there in early October was unsuccessful. Union County CA snakes may use levee banks-or a bluff on adjacent federal land (Shawnee National Forest) alongside Upper Bluff Lake. The following species were found using two dens at Horseshoe Lake CA: Western Ribbon snake, Black Rat snake, Common Racer, Eastern Garter snake,

Plain bellied Water snake, Common King snake. Unlike large bluff areas, only small numbers of snakes were seen at any one time-never more than six or seven. Both areas faced south.

E. AUDIENCE AFFECTED,OUTCOME AND PRODUCTS: This report is primarily a technical report, but portions of it could easily be used to educate the general public-particularly in post secondary or university education. These species must obviously continue to be sought until their status in Illinois is fully understood. Although this search for these five species was unsuccessful, two state threatened species benefited indirectly from it, as well as a number of unprotected species of snakes as described above. This makes for a useful end product.

LITERATURE CITED: "The Amphibians and Reptiles of Arkansas", 2004, by Stanley E Trauth, Henry W Robison and Michael V Plummer. Page 317.

PAYMENT AND BILLING INFORMATION: The total amount of funds used was $1,998.99. This included $1249 as hourly pay, at a rate of eleven dollars per hour, for a total of 113.5 project hours. It also includes mileage reimbursement.. The mileage reimbursement rate is 40.5 cents per mile, for a total project mileage of 1851 miles, which equals $749.65. I also spent my own money on occasion for additional gas and also traps, but do not expect reimbursement for this additional expense because it was not part of the contract.