HERPETOLOGICAL SURVEY OF FAULKNER TRACT-CACHE RIVER

STATE NATURAL RESEARCH AREA

Wildlife Preservation Fund Contract # 09-013W

William T. McDowell
2511 S. Illinois Ave. # 103
Carbondale, Illinois 62903
618-549-3897
tmcdowell@siumed.edu

Time-frame- July 1 2008-September 30, 2009

Table of Contents:

	Page(s)
Project Objective	3
Completed Project Description	
Summary of Herpetological Survey	
Introduction/Figure 1	3-4
Materials and Methods	5-6
Results	6-7
Tables/Figure 2	8-15
"Pitfalls"	16
Discussion and Summary	16-17
Acknowledgements/Project Expenditures	17
Literature Cited	17-18
Appendices	19-33
Images/Prints	34-46

Project Objectives: As defined in Wildlife Preservation Fund Contract #09-013W

The primary objectives of this herpetological field survey are to determine characteristic and common amphibian and reptile species found at the Faulkner Tract-Cache River State Natural Research Area (Fig. 1) in Johnson Co. Illinois. In addition, the survey will also document rare/threatened/endangered species encountered. This will include > 100 hours of field work and collections to provide a voucher for any new county records or rare/threatened/endangered species documented with project completion by Sept. 30, 2009. The 2008-2009 Herpetological Field Survey of Faulkner Tract has been completed with 32 species found and with the following results and data interpretation(s).

Completed Project Description

Introduction:

The Faulkner Tract (303 acres/122.7 hectares) was purchased from Bill Faulkner by the Illinois Audubon Society in December 2007 and represents a very significant conservation effort by the Cache River Wetlands Joint Venture composed of various state and federal agencies (IDNR, USFWS, The Nature Conservancy, Ducks Unlimited, and Natural Resources Conservation Service). The goal of this conservation effort is to form a nature preserve that protects amphibian and reptile species (and all other biological life) found in this unique and fairly pristine land tract which has a large number of rare or uncommon coastal plain species found in southern Illinois. The tract is located (T13S, R2E, S9) in Johnson Co. Illinois 3 M SW of the junction of Route 37 and Route 146 at West Vienna (37.42 N 88.97 W) and has swamp forest (bald cypress and water tupelo~120 acres), bottomland (floodplain) forest (~140 acres) and upland forest (~37.5 acres) communities and also includes portions of the Cache River. I have been awarded a grant to conduct a herpetological survey of the Faulkner Tract. Field work was from July 1, 2008 through September 30, 2009.

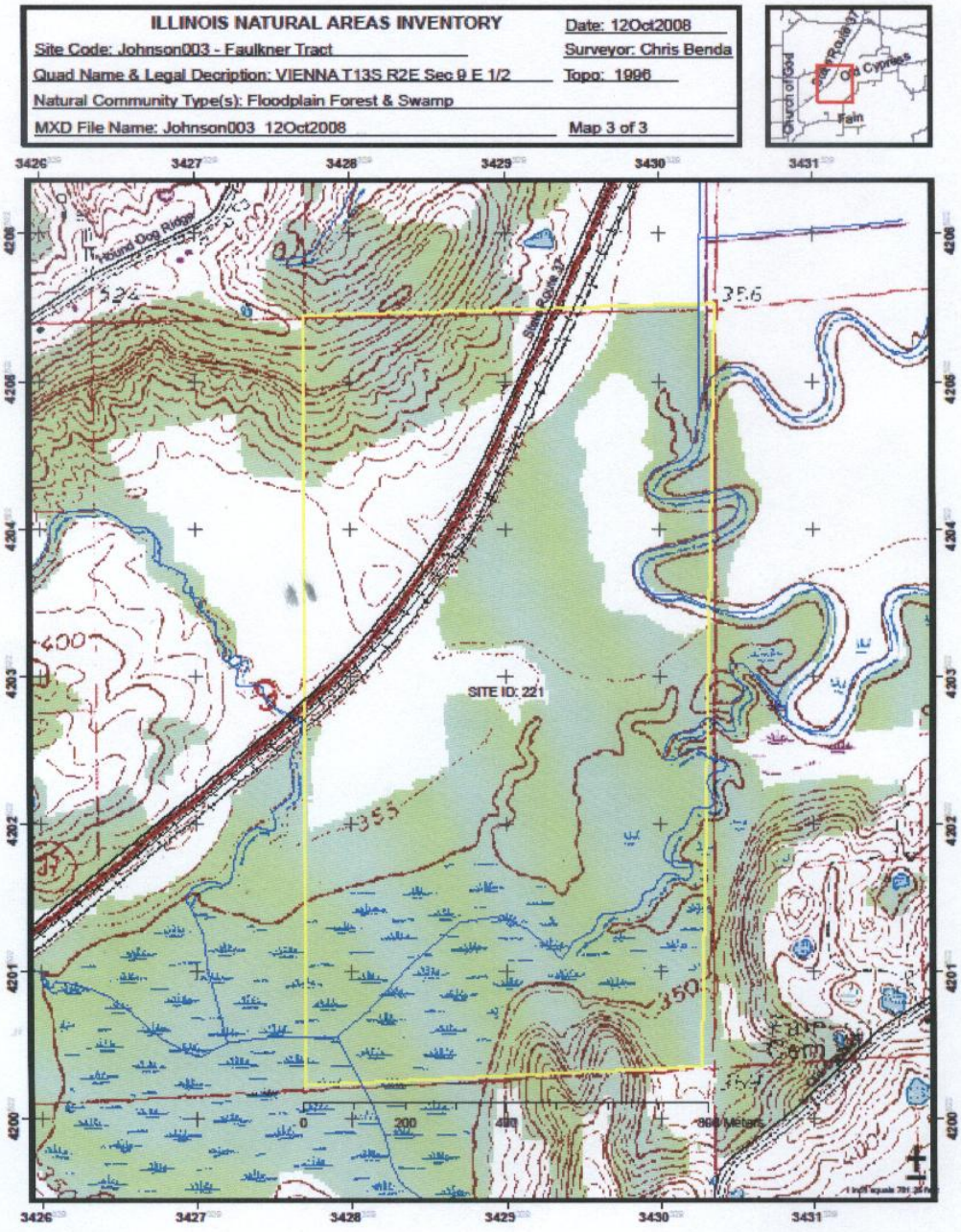


Figure 1. Location of the Faulkner Tract in Johnson Co., Illinois.

Methods and Materials:

A multitude of biomonitoring techniques were used in this herpetological field survey with least possible destructive methods (with the most minimal habitat disturbance) used when possible. These included audio frog call surveys (both day and night); tadpole and larval salamander sampling, visual encounters, pitfall traps, coverboards (including tin), DOR's, road cruising, aquatic dipnetting in both swamp and stream habitats; and log, timber and rock overturning. As many different microhabitats as possible were searched with repetitive sampling (checking good habitat sites several times) to find as many species as possible. Minnow traps (N=6) were placed on 7/29/08 near one of the stream culverts. Guetersloh (IDNR) left ~ 50 tin pieces at the northern gate entrances at the former rest area in early spring 2009 to be placed in the upland forest community. In addition tin pieces were placed in good possible collecting places on 4/21/09 in the upland forest habitat to especially attract reptiles and 6/18/09 at the western edge of the swamp forest. Pit fall traps (19 placed at the forest upland habitat and 20 at the swamp habitat) were made by using empty 3 pound coffee containers placed level deep with the ground surface with holes in the bottom. Traps were placed in a random fashion and checked periodically beginning 5/23/09 till 8/31/09. Both pitfall traps and tin pieces were removed at the end of the field survey to preserve the pristine nature of the tract. Heyer et al. (1994) and Ribeiro-Junior et al. (2008) discussed commonly used sampling techniques for reptile and amphibian communities. Species found within one mile (1.6 km) of the Faulkner Tract were also counted as if present within the surveyed area (Guetersloh, pers. comm.) due to certain species having a large home range.

Species identifications (including salamander larvae) were made in the field but more difficult to identify *Lithobates clamitans* frog tadpoles were identified in the laboratory. Texts used for identification of tadpoles were Phillips et al. (1999); Powell, et al. (1998); and Johnson (2000). Nomenclature was based on Dr. Ron Brandon's Zoology 408 Spring 2009 Herpetology Class Checklist used at SIU-C. Snout-vent length (SVL) was determined using a metric ruler for species used for digital prints and total length (TL) was also used when necessary. Digital photos of representative reptile and amphibian species were taken as were 35 mm prints (Print # 10-26) of unique and characteristic major habitat collection sites of specific species and field collection equipment (standard aquatic D-shaped net, yard rake, coffee can pitfall trap, and tin pieces). Tables were constructed to present the following: 1)-Checklist of Amphibians and Reptiles found 2)-List of Amphibians and Reptiles unvouchered since 1980 in Johnson Co. (Based on the recent 1999 Illinois Field Guide [Phillips, et al., 1999] and lists of recently collected reptile and amphibian species furnished by the SIU-C Vertebrate Fluid Collection and Illinois Natural History Survey [INHS]) and 3) Amphibinas and Reptiles found in the three respective forest communities; swamp, bottomland and upland. A descriptive ecological statistic, species richness {S-1 /ln (n)} which is independent of sample size, was determined to describe and compare the three differing forest communities species composition (Ludwig and Reynolds, 1988). In addition species importance values (IV) were determined for all species found and a Dominance-Diversity Curve determined and presented in a Figure. Topographic maps consisting of the Faulkner Tract geological area and terrain are in the appendices which

also includes copies of contract change(s), scientific collecting permits, etc. Deposits to be placed in the SIU-C Fluid Vertebrate Collection Carbondale, Illinois are three *Ambystoma talpoideum* larvae and a *Siren intermedia* larva.

Results

A total of 23 collect and release survey field trips were made to Faulkner Tract from July 2008 through September 30, 2009 except for winter (December, January, and February). Two reconnaissance surveys were taken in late November 2008 to determine the swamp forest location and other possible good collecting sites. Thirty-two different reptile and amphibian species (N= 301 total # of individuals, 13 families and 22 genera) were found (Table 1). Emphasis was placed on surveying all three major forest communities with several species (N=10) found that have been unvouchered since 1980 in Johnson Co. (Table 2). Amphibians (especially *Lithobates sphenocephalus*, N=176 and 59 % of the total herpetofauna) were by far the most dominant and common herps present with 82% of the total sample size found and released. This probably was due to the much greater hectare size of the swamp and bottomland (floodplain) forest communities and in addition there were few natural cover materials and refuge locations in the upland forest. Many more individuals (N=237) were found in the swamp and bottomland forest (Table 3) than the upland forest. The upland forest, though, had a greater number (N=10) and overall percentage (68%) of reptile species.

The most common and dominant species were *Lithobates sphenocephalus* (N=176), *Acris crepitans* (N=30) and *Ambystoma talpoideum* (N=16) with these three species accounting for 74% of the herpetofauna found at Faulkner Tract. *Ambystoma talpoideum* metamorphs were very common at the swamp and in the floodplain (bottomland) forest at all times except during winter. Both the floodplain and swamp forest had many downed trees which enabled the easy finding of metamorphic *A. talpoideum*. Mole salamanders (larva, juveniles, and adults) and a hatchling *Siren intermedia* larvae (SVL=14 mm) were also common in the swamp margins in May 2009. Only ~ 30 D-shaped aquatic dipnet attempts were taken (with very minimal habitat disturbance) in the bottom layer of the aquatic swamp margin and explains the ease of salamander larval collections. *Lithobates sphenocephalus* individuals were found throughout the year except during winter and were very common in both the bottomland (floodplain) and swamp forest but not the upland forest. A few *L. sphenocephalus* juveniles (N=20) were found in the upland forest after a recent rain during early summer 2009. Cricket frogs (*Acris crepitans*) were common along the swamp margin. Most frog species, except for the Southern Leopard Frog, were determined by calling (advertising) males (sometimes small choruses or isolated individuals) during spring and summer, Three *A. texanum* first year juveniles (SVL~35 mm) were found in late fall 2008 under railroad ties just east along IL Route 37. This area regularly filled with water during the spring and fall and would be good habitat for egg deposition and larval development of ambystomatid salamanders including *A. opacum* which was also collected and released. A second year *A. texanum* juvenile (SVL~46 mm) was found in a dried streambed tributary of the Cache River during July 2009.

Lizards of the families Phrynosomatidae and Scincidae (*Sceloporus undulatus* {N=10} and *Plestiodon fasciatus* {N=4}) were common within the crevices and on the rock wall (Print # 15 and 16) north (former rest area) in the northern boundary alongside the western edge of IL Route 37 adjacent to the upland forest community. Several reptile species having a large home range (*Terrapene carolina*, *Coluber constrictor*, and *Pantheropis spiloides*) were found DOR on IL Route 37. Only *Scincella lateralis* (N=11) was found within the tin placed in the upland habitat and reptile and amphibian species weren't found in the tin at the swamp forest margins. Cottonmouths (*Agkistrodon piscivorus*) were common (N=4) along the Cache River and swamp forest. *Nerodia erythrogaster* (N=3) and *P. spiloides* (N=3) were the second most common snakes found. A few other species (*Hyla versicolor*, *Hyla cinerea*, *Lithobates clamitans*, and *Plestiodon laticeps*) were also found along the Cache River.

The families Colubridae (6 species), Hylidae (5 species), Ambystomatidae (4 species), Ranidae (3 species), Emydidae (3 species) and Scincidae (3 species) were well represented at Faulkner Tract (Table 1). Assumed breeding populations (those species with > 2 individuals found) were indicated for 15 species (Table 3) with large breeding populations of *L. sphenocephalus*, *A. crepitans*, *A. talpoideum*, *S. lateralis*, and *S. undulatus*.

Species richness (S) defined as number of species/community size was determined and compared for the three forest communities (swamp = 2.34, bottomland = 1.91, and upland = 3.36) with the swamp forest having much greater total overall numbers (N= 167 and a total overall importance value {IV} of 56 %) which is greater than the other two forest communities combined. Contrary, though, most species of amphibians are much easier to find and have larger population densities/sizes which would skew the results in favor of the swamp forest. The upland forest community, though, had a greater S but this may be skewed due to DOR's being counted as if in this community. The determined Dominance-Diversity Curve Analysis (calculation of IV %'s for each species versus species rank {1-32} plotted on a 4-cycle semi-log scale) principally fits the Niche-Preemption Model (Figure 2) and indicates that one or two species i.e., *L. sphenocephalus* (IV=59%) and possibly *A. crepitans* (IV=10%), dominate resources at Faulkner Tract. Many species (N=17), though, were found only once or twice (Figure 2) which is indicative of a Log-Normal Model. The curve and analysis is assumed for the entire reptile and amphibian population present at Faulkner Tract but could also be determined for each individual major herp group.

Digital photos (Prints # 1-7) were made of the following species: *A. talpoideum* {adult (52 mm SVL) and larva (31 mm SVL)}, *A. texanum* (2nd year juvenile-46 mm SVL), *S. intermedia* (hatchling larva-14 mm SVL), *S. lateralis* (juvenile-22 mm SVL), *L. sphenocephalus* (juveniles-29 and 24 mm SVL) and a *Trachyemys scripta* shell fragment (plastron). Two 35 mm prints (# 8 and 9) of a gravid female *N. erythrogaster* were taken in the field near the swamp on the abandoned railroad track slightly east of Route 37. Several 35 mm prints of the characteristic three major forest community types are presented in pages 38-46.

TABLE 1. CHECKLIST AND NUMERICAL COUNT OF AMPHIBIANS AND REPTILES FOUND AT FAULKNER TRACT

AMPHIBIANS

ORDER CAUDATA

Family Ambystomatidae-Mole salamanders

Ambystoma opacum-Marbled salamander-1 adult

Ambystoma talpoideum-Mole salamander-16 including 4 larvae; One adult was found crossing IL Route 37 at night during a rain

Ambystoma texanum-Smallmouth salamander-4 1st and 2nd year juveniles

Ambystoma tigrinum-Tiger salamander-1 adult

Family Sirenidae-Sirens

Siren intermedia-Lesser Siren-1 hatchling larva

ORDER ANURA

Family Bufonidae-Toads

Anaxyrus fowleri-Fowler's Toad-1

Family Hylidae-Treefrogs

Acris crepitans-Cricket frog-30

Hyla avivoca-Bird-voiced treefrog-1 calling male

Hyla cinerea-Green treefrog-4 calling males and a small chorus

Hyla versicolor-Gray treefrog-2 calling males

Pseudacris crucifer-Spring peeper-1, 2nd record for Johnson Co.

Family Ranidae-True frogs

Lithobates catesbeianus-Bullfrog-6 calling males

Lithobates clamitans-Green frog 1 adult + 2 tadpoles

Lithobates sphenocephalus-Southern Leopard frog-176-mostly juveniles

REPTILES

ORDER CHELONIA

Family Chelyridae-Snapping turtles

Chelydra serpentina-Snapping turtle-1 dead adult

Family Emydidae-Basking, Marsh, and Box turtles

Chrysemys picta-Painted turtle-2 found dead

Terrapene Carolina-Eastern box turtle-3 found along IL Route 37

Trachemys scripta-Pond slider-3 found along IL Route 37

Family Kinosternidae-Mud and Musk turtles

Sternotherus odoratus-Common musk turtle-1 new county record but unvouchered

Family Trionychidae-Softshell turtles

Apalone spinifera-Spiny softshell turtle-1 new county record but unvouchered

ORDER SQUAMATA

Family Scincidae-Skinks

Plestiodon fasciatus-Five-lined skink 3-adults and 1 juvenile

Plestiodon laticeps-Broadhead skink-2 adults

Scincella lateralis-Ground skink-11 adults and juveniles

Family Phrynosomatidae-Fence and Horned toad lizards

Sceloporus undulatus-Fence lizard-10 adults and juveniles

Family Colubridae-Nonvenomous Colubrid snakes

Coluber constrictor-Racer-2 one a DOR along IL Route 37

Lampropeltis getula-Common kingsnake-1

Nerodia erythrogaster-Plainbelly water snake-3

Nerodia rhombifer-Diamondback water snake-1

Pantherophis spiloides-Gray ratsnake-3-DOR

Thamnophis sirtalis-Common garter snake-1

Family Viperidae-Pit vipers

Agkistrodon contortix-Copperhead-1 found dead

Agkistrodon piscivorus-Cottonmouth-4 2nd year juveniles

at swamp forest and Cache River

TABLE 2. LIST OF AMPHIBIANS AND REPTILES FOUND AT FAULKNER TRACT UNVOUCHERED SINCE 1980 FROM JOHNSON COUNTY, ILLINOIS

Ambystoma opacum

Ambystoma tigrinum

Apalone spinifera

Lithobates catesbeianus

Lithobates clamitans

Sceloporus undulatus

Scincella lateralis

Siren intermedia

Sternotherus odoratus

Terrapene carolina

TABLE 3. CHECKLIST AND NUMERICAL COUNT OF AMPHIBIAN AND REPTILE SPECIES FOUND IN THE THREE MAJOR FOREST COMMUNITIES

SWAMP FOREST

Acris crepitans-30

Agkistrodon piscivorus-4

Ambystoma talpoideum-11

Chelydra serpetina-1

Hyla avivoca-1

Hyla cinerea-2

Lithobates catesbeianus-5

Lithobates sphenocephalus-106

Nerodia erythrogaster-3

Nerodia rhombifer-1

Pseudacris crucifer-1

Siren intermedia-1

Sternotherus odoratus-1

Total N=167 and13 species

BOTTOMLAND FOREST

Ambystoma talpoideum-5

Ambystoma texanum-4

Ambystoma opacum-1

Anaxyrus fowleri-1

Hyla cinerea-2

Hyla versicolor-2

Lithobates catesbeianus-1

Lithobates clamitans-3

Lithobates sphenocephalus-50

Plestiodon laticeps-1

Total N=70 and 10 species

UPLAND FOREST

Agkistrodon contortix-1

Ambystoma tigrinum-1

Apalone spinifera-1

Chrysemys picta-2

Coluber constrictor-2

Lampropeltis getula-1

Lithobates sphenocephalus-20

Pantherophis spiloides-3

Plestiodon fasciatus-4

Plestiodon laticeps-1

Sceloporus undulatus-10

Scincella lateralis-11

Terrapene carolina-3

Thamnophis sirtalis-1

Trachemys scripta-3

Total N=64 and 15 species

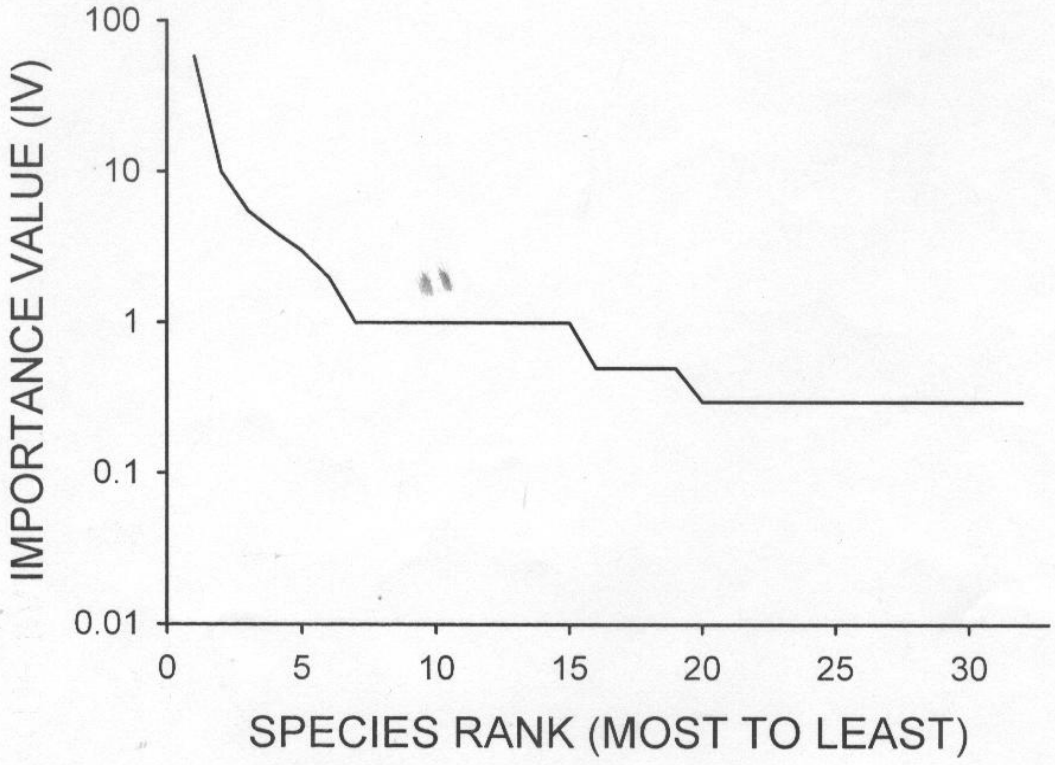


Figure 2. Dominance-Diversity Curve of the Herpetofauna of Faulkner Tract in Johnson Co. Illinois.

Project "Pitfalls"

Those which limited the collect and release field survey and lessened finding any other additional reptile and amphibian species.

1)-Six minnow traps were placed at the site on 7/28/08 and disappeared. They were believed to be stolen.

2)-Tin pieces (~50) were placed at the rest area gate by Guetersloh (IDNR) during early spring 2009 and were stolen within 3-4 days.

3)-Excessive rain during March, April, and May 2009 lessened the number of possible good field survey days.

4)-Drift fence-It was decided not to use a drift fence due to the excessive rain in spring 2009 that caused the number of good days to build and check a drift fence to be available beginning only in June 2009. Due to the hot air temperatures they would have to be checked almost every day and it was felt that individuals would die needlessly.

5)-Pitfall traps (Print #24 and 25)-Although small holes were made in the bottom of the coffee containers excess water was usually present in several. Deer also uprooted several of the traps.

DISCUSSION AND SUMMARY

A total of thirty-two reptile and amphibian species (N=301 individuals, 13 families and 22 genera) were found in this survey which included five salamanders, one toad, eight frogs, six turtles, four lizards and eight snakes. The Faulkner Tract is especially diverse with respect to its herpetofauna and reflects the dominance of the swamp and bottomland (floodplain) forest community types.

Species that would benefit the most by making the Faulkner Tract an Illinois State Nature Preserve are *H. avivoca* (threatened in Illinois), *A. talpoideum* (uncommon), *N. erythrogaster* (listed species by DNR and USFWS), *A. spinifera* (new Johnson county record) and *S. odoratus* (new Johnson county record). Other species that would benefit greatly are especially the *A. piscivorus* population present. Maintaining populations of these uncommon/rare species is of prime importance for their continued existence in Illinois. In actuality, though, all reptile and amphibian species and their specific microhabitats would greatly benefit by being afforded Illinois state protection. The general public can view these uncommon species in their native protected habitats.

Species of special interest include the state protected *H. avivoca* (a confirmation of its existence there) and *N. erythrogaster*. The swamp forest community affords excellent habitat and prey resources for both. It's also very important finding species (N=10) that haven't been documented since 1980 in Johnson County. The presence of the many *A. talpoideum* metamorphs and larvae is indicative of a good sized breeding

population of this uncommon ambystomatid. Newly hatched *S. intermedia* larvae have been rarely collected in Illinois (Smith, 1961; McDowell, 1997).

Other amphibian species that may be found at the Faulkner Tract are Plethodontid (lungless) salamanders (especially *Plethodon glutinosus* {slimy salamander}and *P. dorsalis* {zig-zag salamander}) which may eventually be found in the large sinkhole (Print # 22) within one of the rock outcrops in the upland forest community. This particular large rock outcrop with its large sinkhole opening possibly leads to a cave which could be a den site for several snake species. Additional reptile species may also be found. A population of six-lined racerunners (Family Teiidae-*Aspidoscelis sexlineata*) exists within 1.5 miles (2.4 km) north of the tract on the abandoned railroad track east along IL Route 37 (Steve Karsen, pers. comm. and SIU-C Vertebrate Fluid Collection records). In addition several other snake species (*Carphophis amoenus*, *Crotalus horridus*, *Diadophis punctatus*, *Farancia abacura*, *Lampropeltis triangulum*, *Storeria dekayi*, and *Thamnophis sauritis* may also be found at Faulkner Tract.

Future work (with IDNR permission and possibly a special permit to collect on an Illinois Nature Preserve) will include further study at the one large sinkhole (Print # 22) to determine if an internal cave (which would be a new Illinois cave) is present and also to determine if any plethodon salamanders (especially *P. dorsalis*) are present at this rock outcrop area. Finding *P. dorsalis* would connect the eastern and western southern Illinois populations of this species. Other good microhabitats will also be checked for other new species present in the Faulkner Tract.

Acknowledgements/Project Expenditures:

For his field expertise I especially thank Steve Karsen. Numerous other individuals also helped in many ways and they include: Mark Guetersloh, Ron Brandon, Scott Ballard, Greg Schaefer, April Strader, Wade Dover, and Cheng-Shu Li. Digital photography was by Cheryl Brodie and habitat photography was by the author. There were no project expenditures other than that listed in the Original Grant Agreement for $1950 for the vendor William T. McDowell (2511 S. Illinois Ave. # 103, Carbondale, Illinois 62903) and also no funds were used other than that of Special Wildlife Grant Funds.

Literature Cited

Heyer, W. R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and monitoring biological diversity: Standard methods for Amphibians. Smithsonian Institution Press, Washington, DC.

Johnson, T. R. 2000. The Amphibians and Reptiles of Missouri. Mo. Dept. of Conservation. pp. 1-400.

Ludwig, J. A. and J. F. Reynolds. 1988. Statistical Ecology, A primer on methods and computing. John Wiley, 337 pp.

McDowell, W. T. 1997. Life history notes on *Siren intermedia* in southern Illinois. Bull. Chicago Herp. Soc. 32(11):226-228.

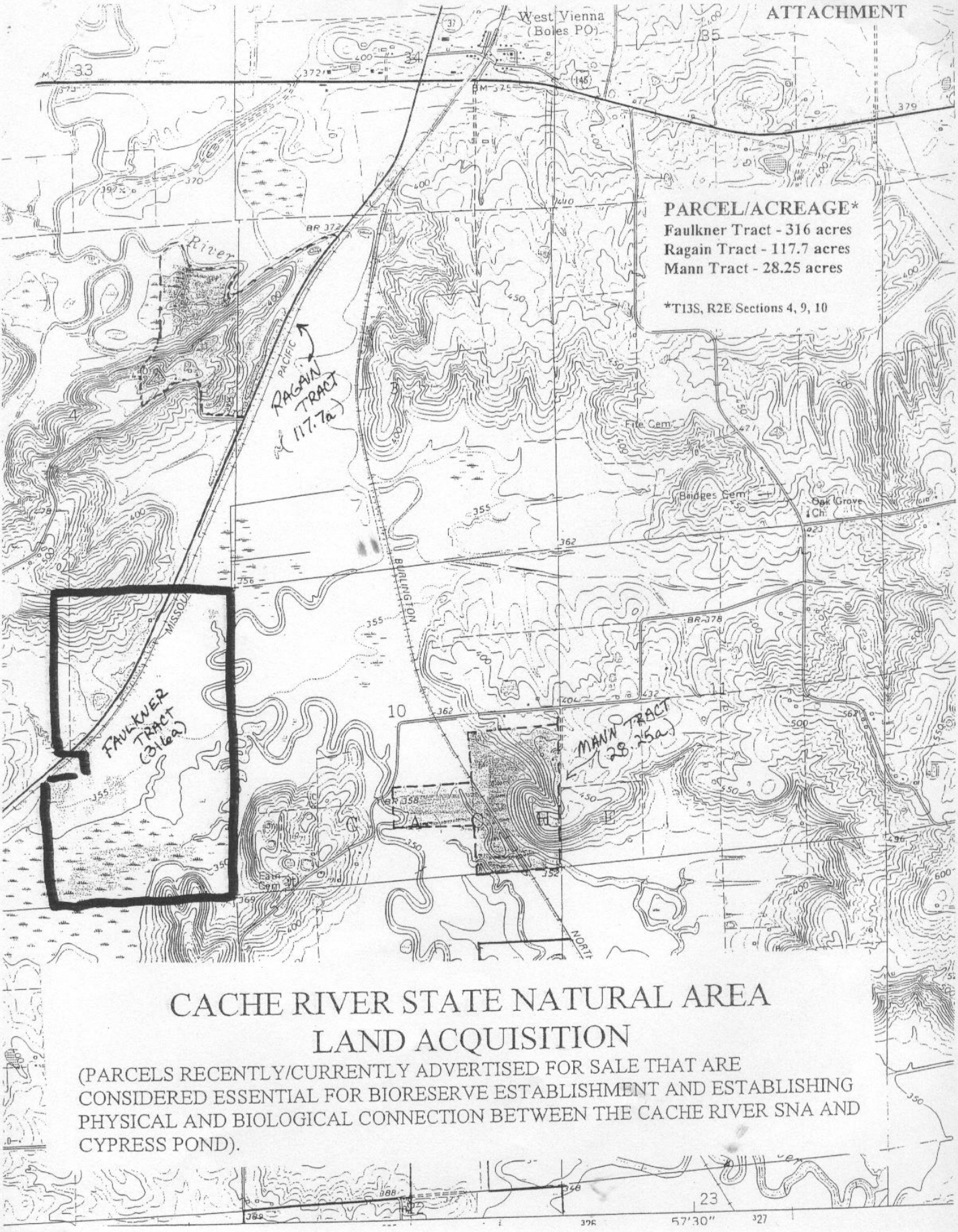
Phillips, C. A., R. A. Brandon, and E. O. Moll. 1999. Field guide to Amphibians and Reptiles of Illinois. Illinois Natural History Survey Manual 8. 300 pp.

Powell, R., J. T. Collins, and E. D. Hooper, Jr. 1998. A key to Amphibians and Reptiles of the continental United States and Canada. Univ. of Kansas Press. pp. 1-129.

Ribeiro-Junior, M.A., T.A. Gardner, and T.C.S. Avila-Pires. 2008. Evaluating the effectiveness of herpetofaunal sampling techniques across a gradient of habitat change in a tropical forest landscape. Journal of Herpetology. 42 (4), 733-749.

Smith, P.W. 1961. The Amphibians and Reptiles of Illinois. Illinois Natural History Survey Bulletin. 28:1-298.

ATTACHMENT



CACHE RIVER STATE NATURAL AREA
LAND ACQUISITION

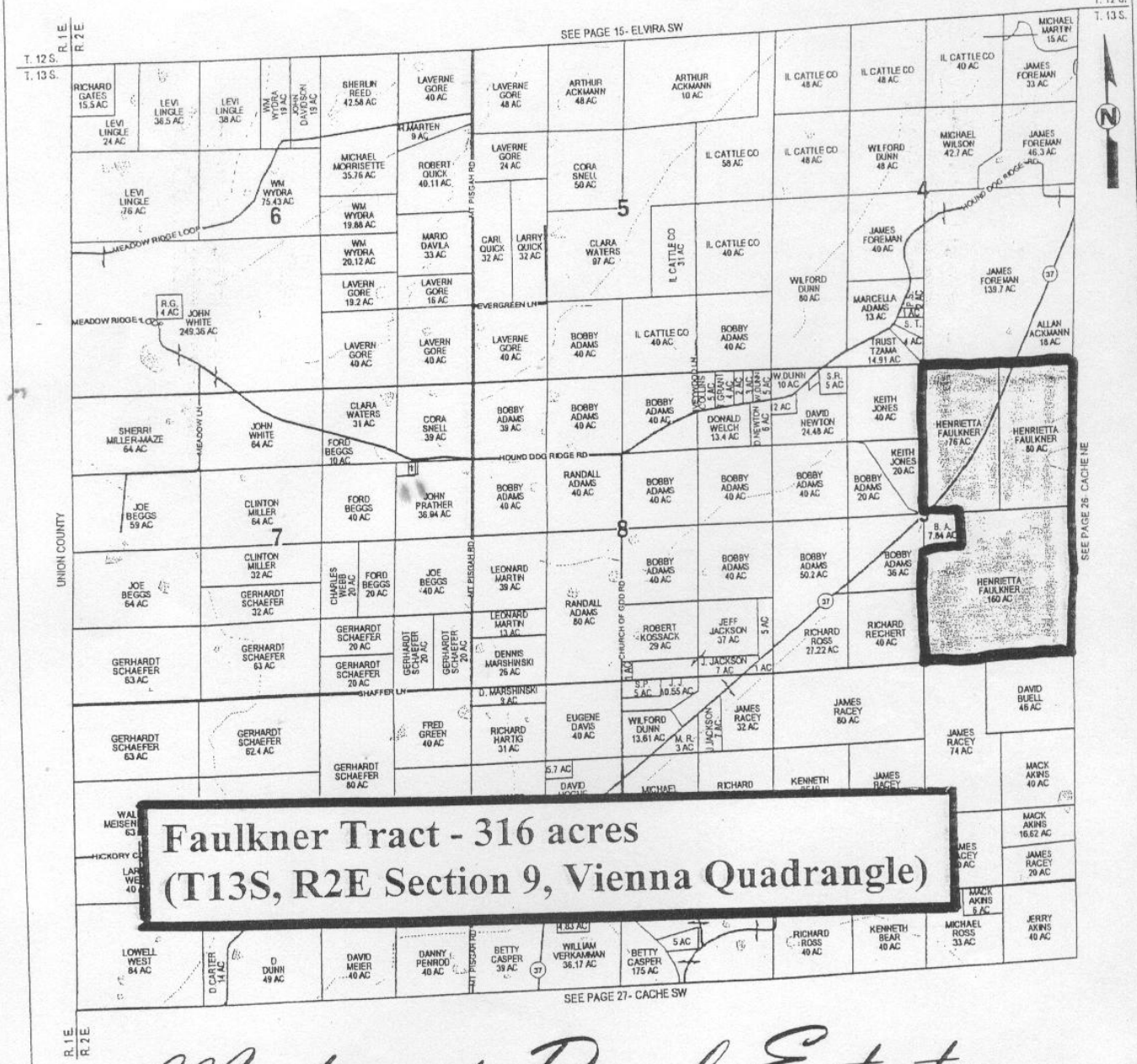
(PARCELS RECENTLY/CURRENTLY ADVERTISED FOR SALE THAT ARE CONSIDERED ESSENTIAL FOR BIORESERVE ESTABLISHMENT AND ESTABLISHING PHYSICAL AND BIOLOGICAL CONNECTION BETWEEN THE CACHE RIVER SNA AND CYPRESS POND).

ATTACHMENT

CACHE NORTHWEST

T. 13 S. - R. 2 E.

0 MI 1/4 MI 1/2 MI 1 MI
0 FT 1320 FT 2640 FT 5280 FT
SCALE



Faulkner Tract - 316 acres
(T13S, R2E Section 9, Vienna Quadrangle)

Midwest Real Estate

400 Red Bud Rd.
Vienna, IL 62995
Phone: 618-658-2006
e-mail midwest@accessus.net

PRINTS

#1-*Ambystoma talpoideum* adult (52 mm SVL) found at swamp margin under a log.

#2-*Ambystoma talpoideum* large larvae (31 mm SVL) found within swamp.

3-*Ambystoma texanum* juvenile (46 mm SVL) found under log in bottomland forest.

4-Hatchling *Siren intermedia* larva (14 mm SVL) found in swamp.

5-Juvenile *Scincella lateralis* (22 mm SVL) found in upland forest.

#6-*Lithobates sphenocephalus* (29 and 24 mm SVL) found in bottomland forest.

7- *Trachemys scripta* shell fragment found along IL Route 37.

8-*Nerodia erythrogaster* gravid female (112 cm TL) basking on abandoned RR track.

9-*Nerodia erythrogaster* gravid female (112 cm TL) held by Steve Karsen.

10-Swamp forest where *A. talpoideum*, *L. sphenocophela*, *A. crepitans* and *A. piscivorus* are common.

11-Large view of swamp forest.

12-Bottomland forest pools where *Ambystoma* spp. larvae would be common.

13-Bottomland forest where Ambystomatidae, including *A. opacum*, were found.

#14-Bottomland forest where *Ambystoma talpoideum* adults were common.

15-Abandoned rest area located along north-west side of IL Route 37.

16-One specific location at rock area (rest area) where adult *P. fasciatus* were found.

17-General view of upland forest.

18-Dried up streambed leading from one large rock outcrop in upland forest.

19-One rock outcrop in upland forest.

20-Side view of one major rock outcrop in upland forest

21-Closeup of major rock outcrop in upland forest.

22-One large sinkhole present in upland forest which possibly leads to an internal cave.

23-Tin placed in upland forest where *S. lateralis* were common.

24-Pitfall trap in upland forest.

25-Pitfall trap filled with water.

26-Collection and field equipment used in field survey.